A "SPORTS" PEDAL-CAR

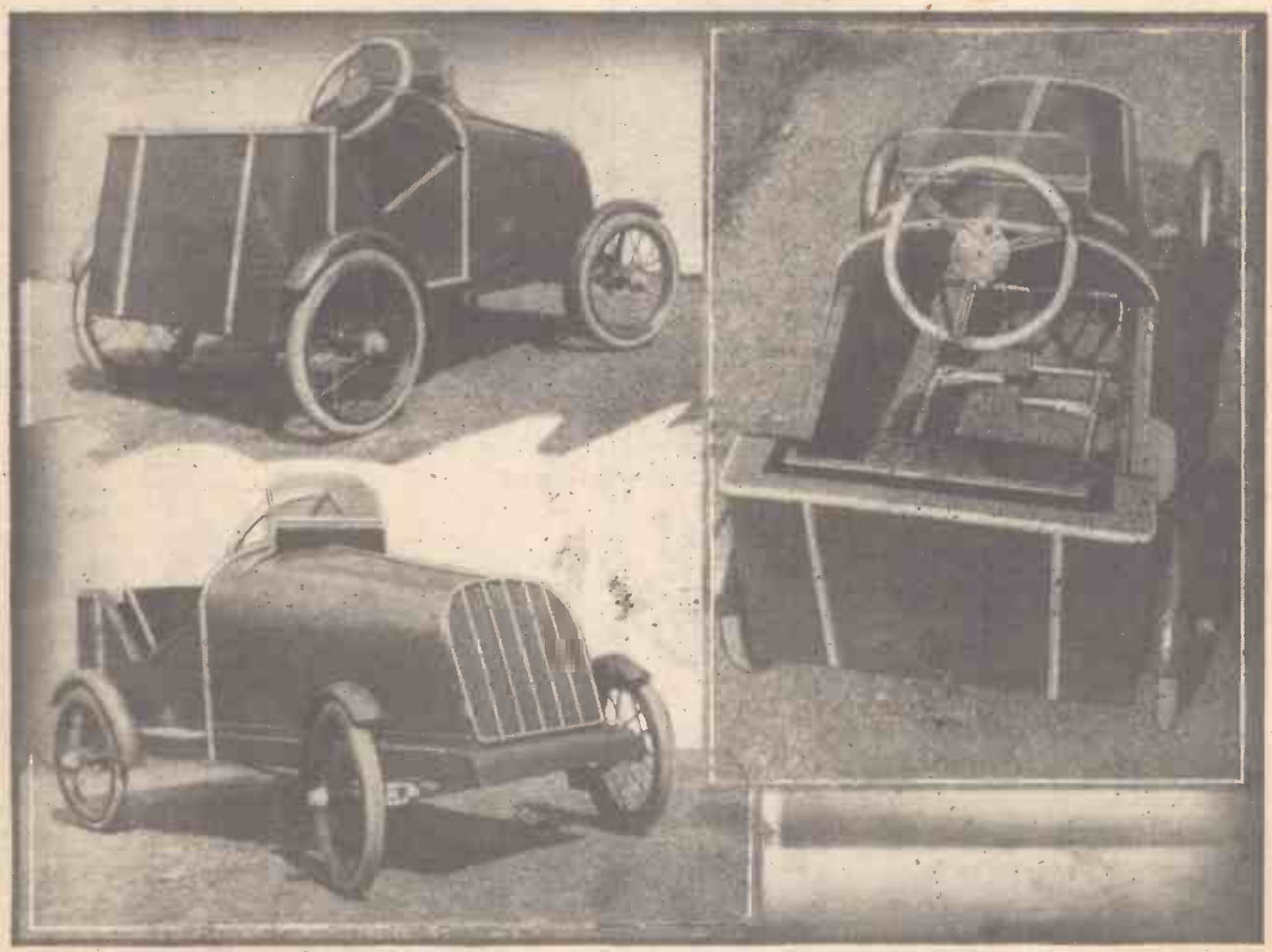
NEWNES

PRACTICAL MECHANICS

9d.

EDITOR : F. J. CAMM

OCTOBER 1947



A STURDY "SPORTS" PEDAL-CAR. (For Constructional Details see page 8).

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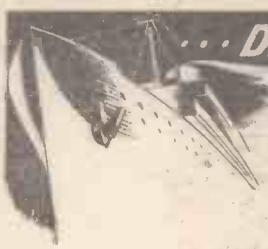

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PRACTICAL MECHANICS

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

Editor: F. J. CAMM

VOL. XV OCTOBER, 1947 No. 168

FAIR COMMENT — BY THE EDITOR

Our Expanding Blueprint Service

ONE of the difficulties brought about by the paper shortage is the lack of back issues containing constructional details of particular apparatus, and which are frequently called for by readers. Unfortunately we are not enabled to carry a stock of back issues. Indeed, every copy of this journal which is printed is bespoke, and there is a long waiting list of would-be subscribers. Hitherto we could only recommend readers to consult the file copies of this journal, which may be kept at their nearest library.

We have also endeavoured, where a demand has been insistent, to reprint articles which have appeared in issues long since out of print, when space has been available. These issues also rapidly go out of print, and it is therefore not a feasible solution to go on reprinting the same article.

We have, therefore, decided to expand our blueprint service. Recent additions to this include our Three-cylinder Compressed-air Engine, the 12ft. All-wood Canoe, the Ten-watt Motor, and our Flash Steam Plant. We shall shortly add the synchronous Clock and the Pedal-driven Motor-car.

We propose to produce prints of all those articles in back issues which have proved popular and which have invoked a considerable demand for copies.

Our blueprints already include our £20 Car, the Master Battery Clock, the Outboard Speed Boat, a Model Autogiro, a Super Duration Biplane, a 1 c.c. two-stroke Petrol Engine, a Streamline Wakefield Monoplane, a Lightweight Model Monoplane, a Trailer Caravan, and a Battery Slave Clock.

We also propose, in future, to issue prints currently with the publication of certain articles to appear in this journal. Readers, therefore, requiring constructional details of anything which has appeared in this journal should first consult our list of blueprints which appears in every issue.

This is a reader service which we are sure they will appreciate.

Electrical Queries

WE still continue to receive large numbers of electrical and radio queries, notwithstanding our frequent announcements that this service has been discontinued for the time being. One or two readers, seeing in current issues published replies to electrical queries, have presumed that we have reinstated this service. We wish to point out, therefore, that all queries sent in to us are promptly replied to through the post; but each month for the benefit of other readers we make a selection of old interesting questions and answers.

As soon as our electrical and radio readers' service is continued an announcement will be made in this journal.

Model Engineer Exhibition

WE tender our congratulations to Percival Marshall on the successful organisation of the recently-concluded Model Engineer Exhibition. At the Horticultural Hall were to be seen the most ingenious examples of British craftsmanship, and those who think that British skill is declining must have changed their views if they took the trouble to visit the Horticultural Hall.

Models of every type in great variety were exhibited, and machine tools specially designed and produced for model makers were also shown.

Percival Marshall may be regarded as a national institution. He has performed a great work during the past 30 years, and we hope that it will be recognised.

Uniformity in Technical Literature

AN important resolution was adopted by the Royal Society Empire Scientific Conference held last July, and it was in the following terms: "If textbooks and scientific data or memoirs are expressed in systems other than the Metric, conversion factors, or the Metric equivalents, should be included."

The object behind this resolution is to make British scientific publications more intelligible to overseas readers only familiar with the Metric system, and we are told that steps are to be taken to work out a uniform system which can be recommended to publishers of journals and textbooks.

In the interim it is intended to implement the resolution in the reports of work of the Department of Scientific and Industrial Research published by H.M. Stationery Office, either by giving the Metric equivalent of data expressed in British units, or by the provision of conversion factors. The Royal Society is also proposing to implement the resolution in its own publications.

We do not think this resolution goes far enough, since it only relates to British scientific and technical publications. The effect is to bring Great Britain into line with continental and foreign systems, whether Decimal and/or Metric. It is only fair that foreign publishers should be asked to adopt collateral arrangements, by giving English equivalents in their various publications, where the Metric system at present only is given.

The Metric system has undoubted advantages. It was recognised in this country as long ago as 1898, when it was enacted that, notwithstanding anything in the Weights and Measures Act of 1878, the use in trade of a weight or measure of the Metric system shall be lawful, and nothing in Section 19 of that Act rendered void any contract, bargain, sale or dealing by reason only of its being made or had according to weights or measures of the Metric system.

The Board of Trade standards include Metric standards, but little use of them has been made in this country, chiefly because of the cost of the change-over. Before the war it was estimated that the repainting of the tare weights on the rolling stock of this country would alone cost nearly one million pounds. If we add to this the cost of reprinting all of the packages, literature, etc., used in commerce, and the cost of resetting all of our textbooks, and generally changing over to the Metric system, it can be seen that the advantages are outweighed by the disadvantages.

We must also remember that in England the public is accustomed to our English system of weights and measures which, though archaic, is now readily comprehended by them, although it may be difficult for our overseas customers to translate them into the terms of the Metric and the Decimal systems. For, of course, interwoven with the question of the Metric system of weights and measures is that of coinage, which is largely based on the Decimal system, where units are based on 10 and sub-units on one-tenth, etc.

If the decision to change over to the Metric system in Great Britain rested with the schoolboys in this country, we have no doubt as to the overwhelming majority in favour!

It must, however, be borne in mind that the difficulties experienced by foreigners in dealing with our system of weights and measures is also experienced by us in dealing with theirs, and it is, therefore, not so much a national agreement which is needed on this matter, but an international agreement to give both systems and conversion factors. The Royal Society should therefore remember that in adopting their resolution they are making a gesture to overseas countries without securing from those countries an agreement to do the same for us.

Whether the time is ripe in these days of international difficulties further to complicate the situation by introducing so radical a change in the units by means of which we trade is a moot point.

New Volume

THIS issue commences a new volume—XV. Indexes to Vol. XIV will be available shortly. Readers are advised, in view of the paper shortage, to have their copies bound, and so preserve for future reference information which may not be required now, but may be in the future. The bound volumes of this journal are a veritable encyclopædia, worthy of permanent preservation.

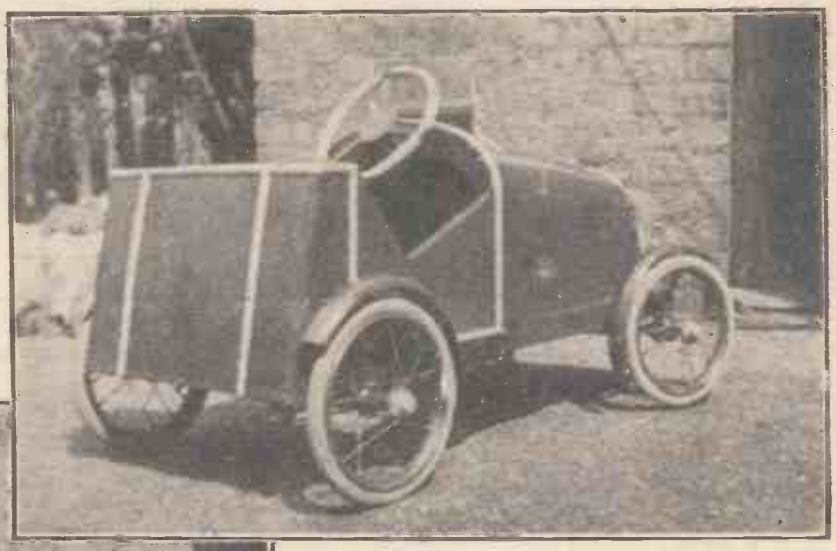
A "Sports" Pedal-car

Constructional Details of a Sturdy Miniature Car for a Small Child

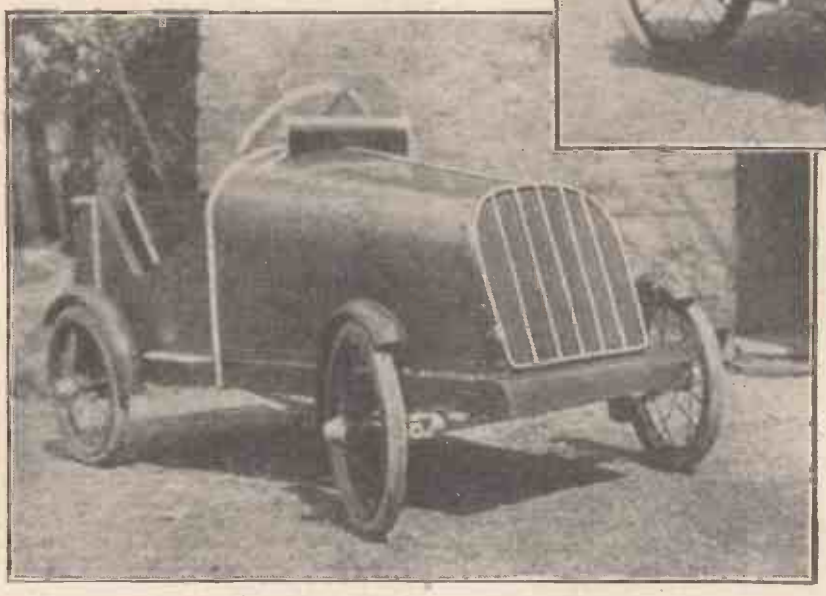
By H. E. W. FOSTER

WHEN I first toyed with the idea of making a pedal-car, I thought in terms of a scale model of one of our popular sports cars, but lack of materials and building facilities forced me to a design which, while it retains some of the earmarks of the sports car, does not resemble any particular make.

One of the best ways of designing a car of this nature is to decide on a wheel diameter, and then build up the car proportionately. Wheels, incidentally, I found most difficult to obtain, and it was some time before I finally located something suitable: four secondhand 10in. overall pram wheels, complete with cycle-type mudguards.



Three-quarter rear view of the pedal-car.



Front view of the finished pedal-car.

With these as a guide, I then proceeded to draw out my chassis, and eventually decided on the dimensions shown in Fig. 1.

The Chassis

The chassis frame is made of 1½in. by 1½in. section wood, screwed together with additional metal plates at the corners for rigidity. To this frame, at the front end, is attached the bonnet former, which is made of ¾in. wide by ⅛in. thick mild steel strip. Due to the bonnet sloping upwards and outwards, plus the fact that the radiator leans backwards, this former was one of the most difficult parts to make. To help stretch the metal at the top corners, I put a series of saw cuts along the aft edge so that they spread when hammered out to the required angles, these cuts were then welded up afterwards.

The former or frame at the dashboard is constructed as shown in Fig. 2, using 1½in. by 1in. section wood, and faced with 18G aluminium sheet, small angle cleats being used to secure it to the main frame. The rear former also of 1½in. by 1in. section wood, is made up as illustrated in Fig. 3, shaped to follow the lines of the body, and anchored to the main frame in a similar manner as the dashboard frame.

Front Axle

The front axle consists of a 1in. diameter tube to which are brazed two mounting

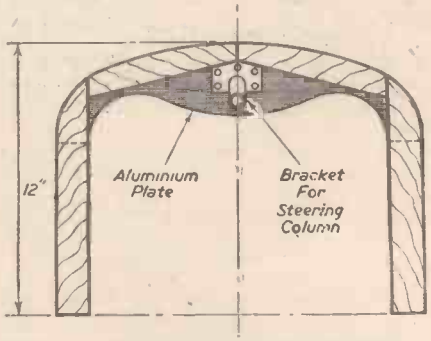


Fig. 2.—Details of the dashboard former.

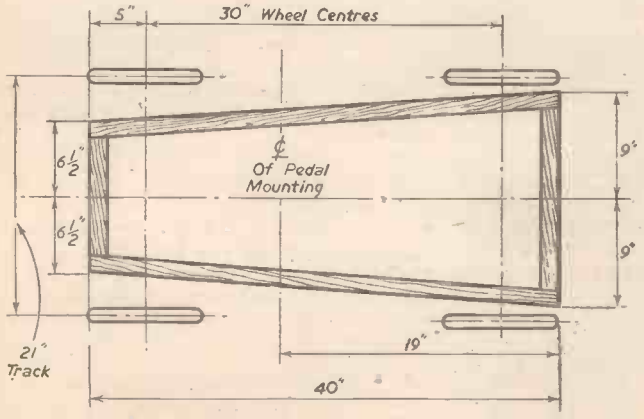


Fig. 1.—Dimensions of chassis framework.

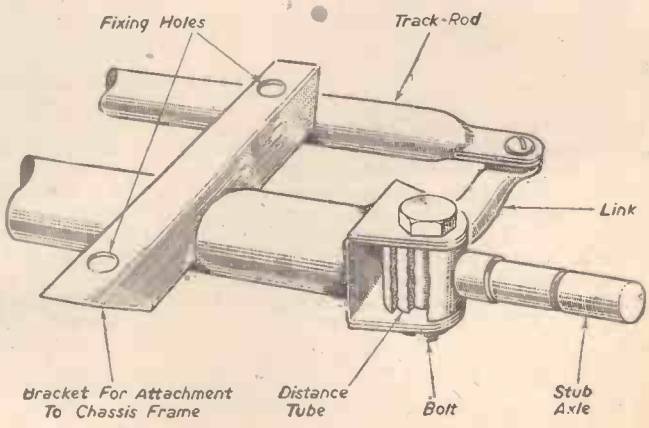
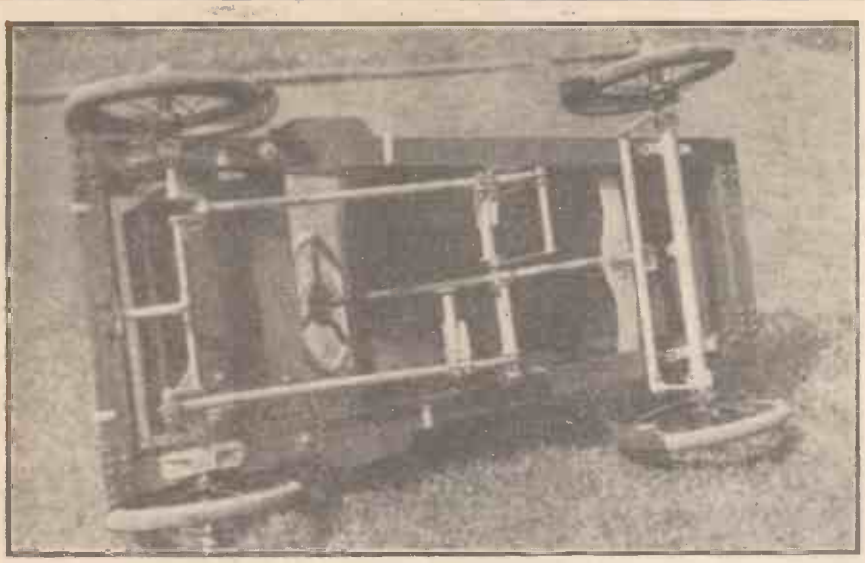


Fig. 4.—Part of front axle, showing track rod and stub axle.



Underside view showing pedals and cranked drive.

brackets for bolting it to the chassis frame. Each end of the tube is opened out and stiffened to form a bearing for the stub axles (Fig. 4).

The stub axle assembly is a piece of 1in. diameter bar with a ½in. diameter hole drilled through the centre, and two ⅜in. diameter B.S.F. tapped holes at right-angles to each other on the diameter, one tapped hole for the stub axle and the other for the steering link. This assembly is attached to the main axle, as shown in Fig. 4, the "distance tube" being a tight fit between the jaws of the axle tube, while the stub axle assembly has a slight clearance, so that it is free to rotate after the bolt has been tightened.

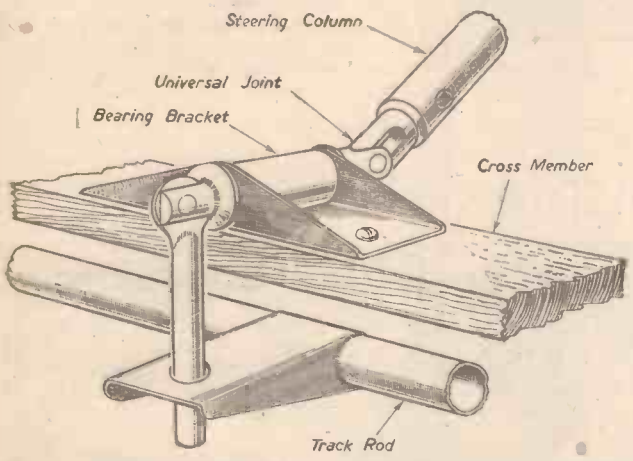


Fig. 5.—Details of steering column, universal joint, and track rod linkage.

The track rod is a piece of tube of the split curtain rod variety, flattened at each end to pick up the link on the stub axle; these links, incidentally, are bent in towards the centre of the car. If one cares to do so, the actual angle can be calculated by the Ackerman steering formula. In the centre of the track rod, I had welded a small bracket for the purpose of picking up the pin at the base of the steering column (Fig. 5).

Steering

The angle of the steering column is governed by the position and diameter of the steering wheel. Many of the pedal-cars one sees on the road, or pavement, seem to have wheels at very odd angles, chiefly due to the large clearance required for the knees of the occupant. I have endeavoured to bring mine higher and further aft than is usual, so that it assumes a position rather more akin to a full-sized sports car. To achieve this, I have incorporated a universal joint at the base of the steering column, which runs in a bearing and has been lengthened in order to fix a pin for moving the track rod (Fig. 5). The whole assembly is attached to the chassis frame by means of a cross member. If so desired, a length of chain or cable may be attached between the cross member and the lower end of the pin, and by varying its length, the turning radius can be restricted as desired. Although this steering gear may smack a little of the late Mr. Heath Robinson, it really works quite efficiently. The top end of the column is supported by a bracket shown in Fig. 2.

While dealing with steering gear, I may as well include the steering wheel itself. This, as can be seen by the accompanying photograph, has been made up on the "sprung type" lines.

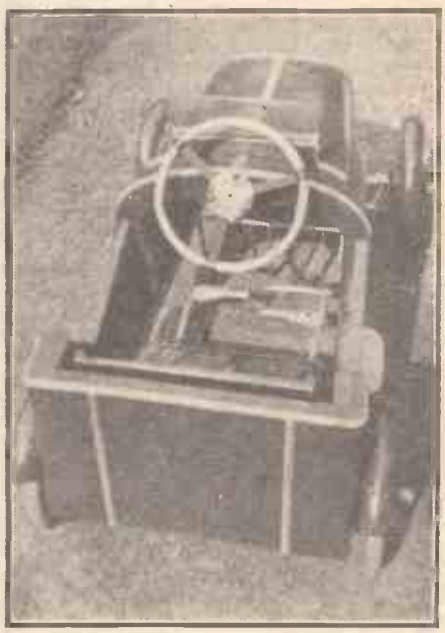
Once again the medium of oxy-acetylene welding was used to join two semi-circles of ½in. tubing, and to attach the spokes. Each spoke is made of three lengths of 6G galvanised iron wire laid side by side. They are welded in the centre to a disc of mild steel, which also supports a short length of tube used for attaching the wheel to the steering column.

The bending of the tube was not easy, but I managed by filling it with sand and bending over a wooden former; close examination of the wheel will show that I was not entirely successful in my efforts, as the wheel is not 100 per cent. round.

Transmission

Transmission is of the standard type, a cranked back axle, driven by pedals through the medium of connecting rods.

The usual form of cranked axle is bent up from one piece of bar; because of the large radii required, the pick up points tend to come rather close together, resulting in the cranking also of the connecting rods, in order that they line up with the outside of the pedals. To avoid this I have fabricated an axle with approximately 2in. throw, as shown in Fig. 6. The "straight" portion is of ½in. mild steel bar, the cranked portion is made up of two pieces of ¼in. by ⅜in. mild steel bar, and the short length of ⅜in. diameter mild steel bar. The webs are of 10G plate, and the whole thing is brazed together, as shown. A constructional note perhaps worthy of mentioning is that the straight portion of the axle was in one piece before welding, the short length in the way of the crank throw being sawn out afterwards.



Another view of the pedal-car from above.

Axle Bearings

Though it is not absolutely essential, I put a bearing in the centre of the axle as a precaution against distortion.

The main bearing for the back axle is quite plain, and consists of a fabricated bracket bolted to the chassis frame on which is

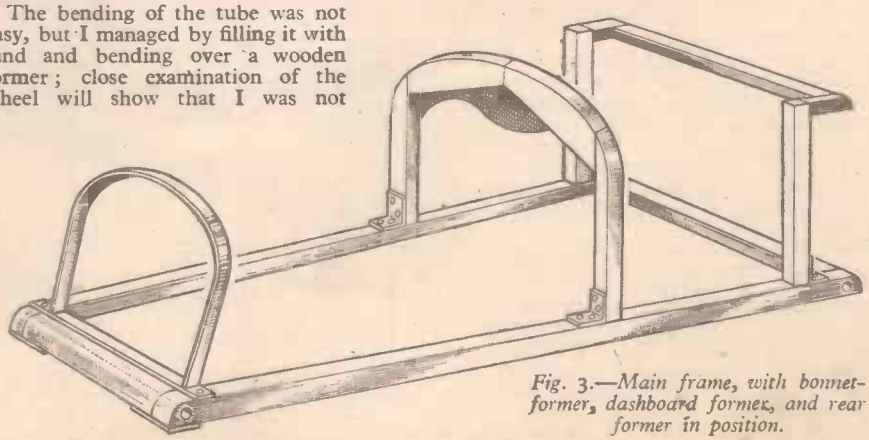


Fig. 3.—Main frame, with bonnet-former, dashboard former, and rear former in position.

mounted a short length of tube for the axle to run in.

Locking of Rear Wheel

While on the subject of the rear axle, I will cover the locking of the rear wheel. It is only necessary to lock one, of course, as this provides the alternative to a differential box. I did not use the most popular method of locking, that of drilling the axle for the following reason—close examination of my pram wheels showed that the hub could be turned independently of the spokes, these being mounted on a shaped washer fitting over the hub, I had therefore to resort once again to welding. I had first the spoke mounting washer brazed to the hub, then a 2in. diameter plate with four bolt-holes also brazed to the hub. To the axle I had brazed a 2in. diameter plate with similar bolt holes to that on the hub, the wheel was then slid on to the axle and locked by means of four 3/16in. diameter bolts.

Pedals

Fig. 6 also shows the rear end of the connecting rods, consisting of two mild steel blocks bolted together and drilled for the crank bearing with a straight tube running forward to the pedals.

The pedals themselves are made up in the form of stirrups, and slung on a ¼in. diameter bar from two flat plates attached to the inside of the chassis frame; the foot rests of split tube project beyond the stirrups to pick up the connecting rods which are flattened at the ends, and prevented from slipping off by a split pin and washer.

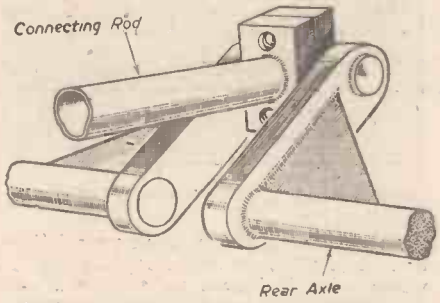


Fig. 6.—Connecting-rod end and crank.

Shown in the "inverted" photograph are two pedals added temporarily until my small son grows sufficiently to reach the proper ones. They are made in such a way that they can be moved anywhere along the connecting rods, and bolted by means of clips in the appropriate position.

Seating

The seat is a separate unit, and can be detached, which also means that it can be adjusted. Fig. 7 gives the details of its construction.

The sides are of wood, the back and bottom one continuous sheet of 24G mild steel, formed up at the front it retains the cushion. Underneath are two wooden bearers, these are attached by means of screws through the bottom and cleats on the outside. It is fixed to the chassis frame by means of carriage bolts passing through the fixing holes indicated.

Panelling

Finally the panelling, which was carried out after all working parts were assembled and tested. Material used is 24G mild steel sheet which is certainly useful for its bending properties, but is inclined to be heavy. Soft aluminium sheet, even of a thicker gauge, is much superior if it can be obtained. I cut the bonnet out of one piece after many tryouts with a large sheet of corrugated cardboard, this laps over the two side panels, which stretch between the dashboard frame and the upright of the rear former. The tail portion is also of one piece and attached, like the rest, with 1in. panel nails, with the exception, of course, of the front end.

The radiator portion, again 24G, is flanged (with many cut-outs) inside the front former, which, together with the bonnet are bolted together with round head bolts.

Stoneguard

In order to avoid a lot of complex work

The young driver at the wheel of the "sports" pedal-car.

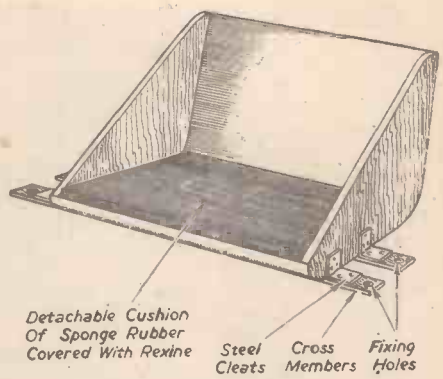


Fig. 7.—Seat construction.

on the construction of an actual radiator, I fitted a stoneguard made of 6 gauge wire. This effectively covers the front end, and is attached by metal strips to the bonnet.

To cover the joints in the sheeting, I obtained some ¼in. wide half-round aluminium beading, it is quite easy to bend and covers any sharp edges or corners. The only accessory mounted at the moment is an aero type wind-screen, which consists of a wooden block screwed to the bonnet on which is mounted a frame containing a piece of ⅛in. thick Perspex. The screen is hinged and can be folded flat if desired.

Finishing

The car is finished a dark green, with the exception of the stoneguard, wheel hubs, windscreen, and all working parts, which are finished in aluminium.

Although this cannot be called a detailed description, I hope that it may prove useful to any intending builders. Alternative materials, of course, can be used throughout.

A Fine Display of Model Ships

The boat section of the model exhibition held at the County Grammar School, Bromley, Kent, recently, when everything from passenger-carrying railways to locomotives, aircraft and boats was put on show by a score of societies. The exhibition was organised by the South-Eastern Association of Model Engineers, and lasted a week.

A Watch Demagnetiser

Constructional Details of a Useful Unit

By H. C. PALMER

NOW that alternating current is generally available, it is a simple matter to make a demagnetiser.

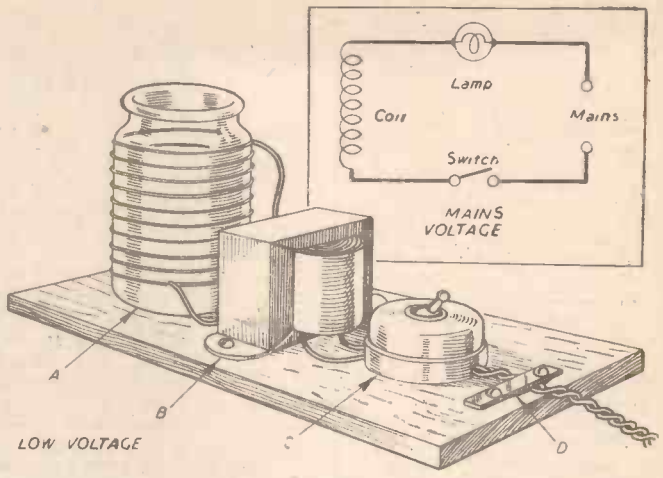
Using a 1lb. jam jar as a coil former, wind on it, quite roughly, about 2oz. of 24-gauge copper wire with any kind of insulation. This will have a resistance of rather under 2 ohms. The coil should be secured at its ends with insulating tape, and it is a good thing to moisten the windings with shellac varnish or melted paraffin wax in order to secure them. This coil, indicated at A in the diagram, is then wired to the 4-volt secondary of a wireless power transformer, B, and the joints should be soldered and taped. The primary of the transformer is connected through a switch, C, to the mains, the mains lead being held in place on the baseboard by a wooden cleat, D, fixed by two screws, as shown.

It is of interest to observe that with a transformer whose low voltage secondary has a low resistance, the amount of wire can be varied within quite wide limits without altering the effectiveness of the apparatus, for if we double the number of turns we double the resistance and halve the current, thus keeping the "ampere-turns" the same. The ampere-turns are what matter. Of course, if we have too little wire, something will burn out.

Operation

In order to demagnetise a watch, switch on the current and then slowly lower the watch into the coil and raise it out again. The whole operation takes about three seconds. During this time all the steel parts will have been magnetised, demagnetised, and re-magnetised some 150 times, and at the end of the process, when the watch is well outside the magnetic field of the coil, steel portions of the watch are thoroughly demagnetised.

In order to study the action of this apparatus, it is a good thing to carry out the following experiment. Take an ordinary chisel or knife and place it in the coil before switching on, then switch on and off. You will find that the steel is magnetised because it was present in a magnetic field that suddenly ceased instead of diminishing gradually. Now, using the same piece of steel, switch on the current, plunge the steel into the coil, and withdraw slowly as before, when it will be demagnetised. After that, you can try your watch with some confidence.



General arrangement of a simple watch demagnetiser for use with A.C. mains.

Alternative Method

For those who wish to avoid the use of a transformer, it is possible to get exactly the same results by winding about 3oz. of number 32 insulated copper wire on a similar former and joining to the alternating mains through a lamp in series. This is indicated in the inset diagram. The transformer, B, is removed and a lampholder included in one wire. The other wire is joined to the switch. Since mains voltages are present in the coil in this case, it is worth while to pay great attention to insulation, and this may be simply done by finding a glass or earthenware pot just large enough to take the jam jar with its windings.

Wax Insulation

Then melt in the pot, some paraffin wax sufficient to flood the coil when forced down into the liquid. Hold it there until the wax is solid, and you have a really well-insulated job. The fine-gauge wire should be soldered to short lengths of flex, and the flex then bound to the coil with string, so as to take any pull. These connections can well be thrust under the wax, and the trailing leads can then be carried neatly to their places.

Selenium Rectifier Developments

THIS report, prepared by Mr. T. M. Odarenko, gives up-to-date details of German developments in Selenium rectifier manufacture. Two firms are engaged on this work on a large scale, these being A. E. G. and the Suddeutsche Apparate Fabrik. Unfortunately, a full description of the A. E. G. process is not given in the report as the investigator anticipated that this would be dealt with by another team.

The S. A. F. rectifier consists of a specially treated layer of selenium between a nickel plated iron base and a low melting alloy second electrode. The selenium layer is heat-treated in order to give it the proper crystalline structure. Originally this layer was obtained by smearing molten selenium over the base plate but more recently a hot press method had been used. It is interesting to note here that E. A. G. used a vacuum evaporation technique for the production of the selenium layer on the base plate.

Hot Press Method

Briefly the hot press method consists of the following operations. The base discs are flash-coated with a 0.5 mm. thick layer of bismuth and a thin base coat of selenium is then brushed on to the plates. Powdered selenium is next sieved on to the base plates which are then pressed under a polished steel plate for 1 to 1½ minutes at 0.2 lbs. per sq. in. and temperature of 110 to 150 deg. C.

The pressing operation is then repeated under the same conditions except that the temperature is raised to about 220 deg. C. After smoking the finished selenium layers over selenium trioxide for 2-5 seconds, the second electrodes (consisting of 26 per cent. tin; 53 per cent. bismuth and 21 per cent. cadmium) are applied and then spray-gunned with carbon dioxide at a pressure of one atmosphere.

The electro-formation is effected by applying a potential of 5 to 20 volts to a series of selenium plates so that a D.C. pulsating current is produced in the rectified direction. This treatment is continued for a period of up to 24 hours, time and voltage necessary being determined by the quality of the discs.

It should be noted that S. A. F. add 200 milligrams of iodine to every 100 grams of selenium used. It is claimed that this treatment accelerates the formation of crystalline selenium. The function of iodine in the preparation of selenium rectifiers is discussed in a paper by Drs. Brill and Kreb, a translation of which is included in the report.

The following points made by Brill and Kreb may be worth emphasising.

The transitional layer formed by interaction between the solenium and the base plate has an important effect on the back current of the rectifier.

A relationship has been reduced connecting the crystalline structure of the selenium layer and the usable load rating of the rectifier; this relationship is not yet fully understood however.

A number of factors influence the final structure of the selenium, such as iodine content, temperature conditions, etc.; in addition the method of application of this layer affects the characteristics of the resultant rectifier.

Many further important details are mentioned and interested technicians are advised to read the report which is published by H.M. Stationery Office.

Note.—This report is issued with the warning that if the subject matter should be protected by British and/or U.S. patents or patent applications, this publication cannot be held to give any protection against action for infringement.

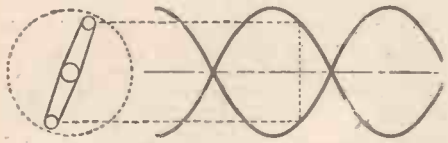
Electric Light and Power Installation

Notes on Supply Systems, Layouts and Wiring Methods.

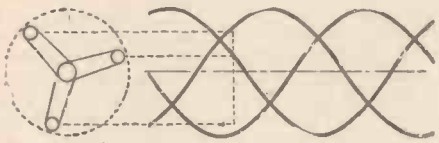
By S. T. CORNER

A CRAFTSMAN skilled in practical work, but without technical knowledge, is like a ship without a rudder. Any handyman, however, with a little gumption and a diagram can carry out a wiring scheme, provided the diagram is correct. It is not possible in a short article to give more than a brief technical outline of such an extensive subject, but readers really interested in electricity will find ample opportunities to extend their knowledge.

Electromotive force, or the power generated at the supply station, is subject to three natural laws or governing factors which are inter-related, viz., the volt, ampere and ohm.



(A) Single Phase Cycle



(B) Three Phase Cycle

Fig. 1.—Wave forms of alternating current.

Voltage is the pressure at which the power is supplied. It varies according to the town or district, but is approximately constant at a fixed value, which may be 100, 110, 230 or 240 volts for lighting purposes and 400, 415 or 460 volts for power supply. On the Control Board standard lighting system the pressure is 230v. at 50 cycles per second. This will probably be the ultimate standard for the whole country.

The ampere is the standard measurement of the flow of current in a wire or cable. The term is more or less synonymous to the measurement of the flow of water through a pipe in gallons.

The ohm is the unit of measurement of resistance to flow of the current. It is similar to the frictional resistance to the flow of water through a pipe.

As an equation $\frac{\text{voltage}}{\text{current}} = \text{resistance}$.

As an example, let us take a circuit with a potential of 230 volts passing a current of 10 amperes; from this it will be seen that the circuit has a resistance tof $\frac{230}{10} = 23$ ohms.

By the ordinary rules of mathematics, $\frac{\text{voltage}}{\text{resistance}} = \text{current}$, and current × resistance = voltage. When given two of the factors, the third is easily deduced.

Electricity wires—conductors they are usually called—are almost invariably made of copper, because this metal has a low resistance and, therefore, high conductivity. It must not be assumed that the larger the conductor the lower will be its resistance. Up to a point this is true, but there is an economical limit beyond which it would be unwise to go: copper wire is an expensive conductor.

Direct and Alternating Currents

There are two electricity systems available according to the local supply, viz., direct and alternating current. Direct current flows in one direction with a stable potential. In conventional terms it always flows from positive to negative. Some scientists assert that the current actually flows from negative to positive, but, be that as it may, it always flows in the same direction.

Alternating current systems are rather more complicated and difficult to deal with; although A.C. has substituted D.C. in most districts and will eventually supersede it as the grid system develops. A.C. current flows in waves and, as the name implies, it alternates, or changes its direction of flow at periodic intervals. The standard frequency of the grid system is 50 cycles per second, i.e., the current changes its direction 50 times in one second. The shape of the wave is dependent on the generating dynamo, but it generally takes a form similar to that shown in Fig. 1 (A). If its shape is theoretically perfect it forms a pure sine wave, that is, it conforms to a mathematical law and its complex values can be accurately calculated.

Referring to the diagram, Fig. 1 (A), it will be seen that the voltage (and current) have a continuous sequence, rising to a maximum value in one direction of flow in the circuit and then subsiding to zero. This is followed by an alternation, and the current

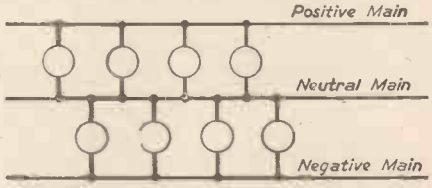


Fig. 2.—Diagram of three-wire distribution.

in the circuit changes its direction, increases to a maximum and again returns to zero. The sequence is continuous so long as the current flows. The time taken to make a complete cycle is called a period, and the number of periods or cycles per second is known as the frequency.

Distribution Systems

When a heavy current has to be generated to supply a large number of consumers at a comparatively low potentional of 230v. the demand could be met only by laying down extra cables. To overcome this difficulty economically, the power is generated at a potential of 460v. and distributed on a three-wire system; by this means only half the current is needed for the same power output. The third wire, connected to earth, is run from the power station. Two power mains have potentials, one 230v. above and the other 230v. below the potential of the earth, as shown diagramatically in Fig. 2. An equal number of consumers are connected between the positive and negative power mains and the neutral, or earthed lead, to obtain a balance as near as possible.

The two mains currents flow in opposite directions in the earth wire, so that the current it actually carries is only the difference between currents carried by the positive and negative main cables; in consequence, the neutral wire need be only of small capacity.

Electric systems with three wires were first used for direct current, when two voltages are available, i.e., 230v. or voltage according to the supply, between either outer lead and earth, or 460v. between the two "outers," or positive and negative mains. With simple alternating current the electricity is driven to and fro through the two main leads from the power station. This system is known as "single phase" to distinguish from the "three phase" system now in general use.

The difference between single-phase and three-phase systems is synonymous to the difference between a two-crank and a three-crank engine. The former has its cranks 180 degrees apart, giving two dead points per revolution, see Fig. 1 (A). In the same way the alternator raises the potential of each lead in turn so that when the potential of one is up, that of the other is down by an equal amount, and twice in every alternation the potential difference between the leads is at zero. Using the same simile, three cranks equally spaced would be at 120 degrees apart, giving a more even turning movement. This corresponds to rise and fall of the alternating potentials of a three-phase current supply; in the three mains they rise and fall in regular succession (see Fig. 1 (B)).

For lighting and heating, connections are made between different pairs so as to distribute the power equally among the three wires. Electric motors can be connected between a pair of wires as for a single-phase supply, but the three-phase supply is specially suited to drive motors which have three windings connected to the three power mains.

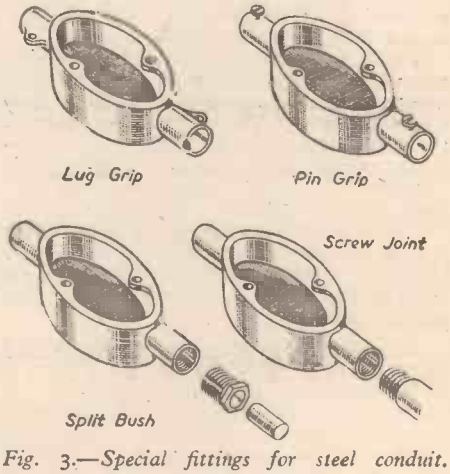


Fig. 3.—Special fittings for steel conduit.

Conductors

The conductors are the most important part of any electrical installation. They must be fully protected against mechanical

damage to the insulation, and from deterioration that may be caused by dampness or, in some positions, by chemical fumes. Fire is the greatest danger, and this is generally caused by a failure of the insulation allowing two wires to make contact or a short circuit to earth.

Local electricity authorities are not favourably disposed towards exposed V.I.R. (vulcanised india rubber) cables, even when they are apparently well insulated, and some insurance concerns will not grant a fire policy for premises with installations of this type. Practically all modern lighting and power installations now employ steel conduit. Lead-covered cables are equally satisfactory for exposed wiring, but where it is buried in wall plaster there is always a danger of nails being driven through it.

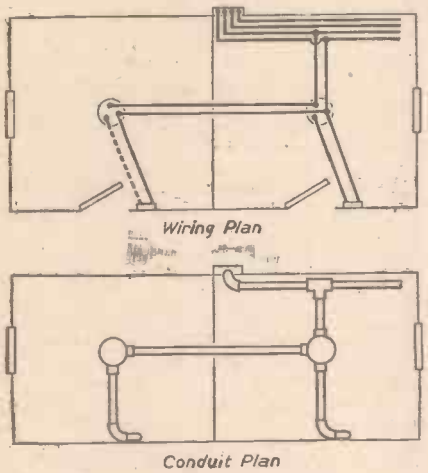


Fig. 4.—A typical point plan.

Steel Conduits

There are three types of steel conduit, viz., closed joint, brazed joint and solid drawn.

Closed joint tubing is made from rolled metal and has a more or less open seam through which dampness can penetrate. In dry positions it gives satisfactory protection to the cables, if properly fitted. Brazed joint tubing is similar to the closed joint, except that the seam is closed by brazing. It provides greater protection for the cables, but as the joints are of the slip-in type they are not watertight. The special fittings are secured by pin grip or by grip joints, as shown in Fig. 3.

Solid drawn tubing is used on all first-class work. It is similar to gas piping, but of lighter gauge and smoother internal finish. All the joints are screwed with standard gas threads, and, if properly fitted, the installation will be watertight. This tubing is of much better quality than the closed and brazed joint tubing, and is, therefore, more costly to buy, and more labour has to be expended to cut and screw it. For small installation, the extra first cost is not very much greater and the extra expense is well worth while. The initial outlay can be reduced by using closed joint tubing in perfectly dry positions and screwed tubing in cellars, bathrooms and kitchens where dampness may cause trouble.

Steel conduit sizes are graded according to the outside diameter of the tube, not the bore, as in the case of gas and steam pipes. Solid drawn tubing conforms to pipe size threads, so that standard gas screw dies can be used. To ensure electrical continuity it is essential to clean off the enamel at the joints from both the tubing and the inside of the fittings. Care must always be taken to ensure that the tubing goes well inside the fitting so that it is securely gripped without damage to the cables.

Planning the Installation

Every installation should be properly planned before work is started. It is better to obtain a plan of the house from the builder or architect showing the positions of windows and doors, and indicating the materials of which the internal walls are constructed. On the plan mark the proposed positions of lamps, switches, plugs and other fittings. The layout of the wiring can then be drawn in, showing the positions of the fuse-box, junction boxes or looping-in points if these are more convenient. In some cases it may be preferable to loop-in at a three-point ceiling rose or at the switch. The positions of the distribution board and fuse-boxes are most important. They should be in an easily accessible place, both for running in the main cable and for switching on and off as may be necessary. A typical point plan is shown in Fig. 4.

After making a careful study of the plan, the live wire runs can be marked in with red ink and the neutral wires with black ink. When this has been completed, the sizes of the cables can be indicated, according to the current they will carry. The sizes of the tube runs can also be arranged in accordance with the number and size of wires they will carry. These items will be dealt with in greater detail later. When fixing the size of the tubing it is always advisable to leave room for one or two more wires that may be required for future extension. A close estimate of the number and type of fittings should be made so that the whole installation can be purchased without waste of material.

Bending the Tubes

For solid drawn tubing it will be necessary to have a pipe vice and a set of stocks and gas dies from $\frac{1}{4}$in. to $\frac{3}{4}$in. For any type of tubing it is a great advantage to have a bending machine. A good substitute is a piece of strong wood about 4in. by 2in. in section. Through this holes are drilled to take $\frac{1}{2}$in., $\frac{5}{8}$in. and $\frac{3}{4}$in. tubing, as shown in Fig. 5. The edges of the holes should have a good radius, or the tubing will be kinked and spoiled. The tubing is set by putting it through the appropriate hole and gradually bending until the desired angle is obtained. The tube should be moved backward and forward during the process and the radius made as great as the position of the angle permits. Sharp bends are difficult to form; in fact, should not be attempted. It is much better to cut the tube and use a standard elbow if a sharp right-angle bend is required. Closed joint tubing should be bent with the seam on the inside or outside of the radius, otherwise it will collapse. Very large tubing for main cables is usually filled with lead or dry sand before bending.

Measuring and Cutting

Measurement of all tubing work must be very accurate and well finished, even if it is hidden from sight. If at any future time it is necessary to run additional wires, the tubes may pull out of the fittings and cause great inconvenience and a waste of time and material. There are two ways of approaching a conduit layout, viz., to do the fitting *in situ* or, if room is available, to plan it out on a floor. For measuring, a steel tape and a steel rule should be used in preference to a linen tape, which is liable to vary in length according to humidity of the atmosphere.

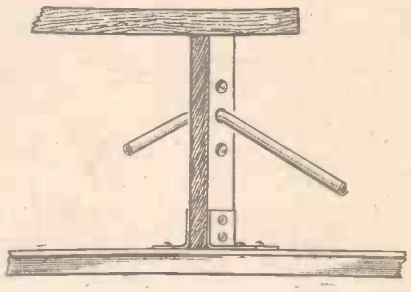
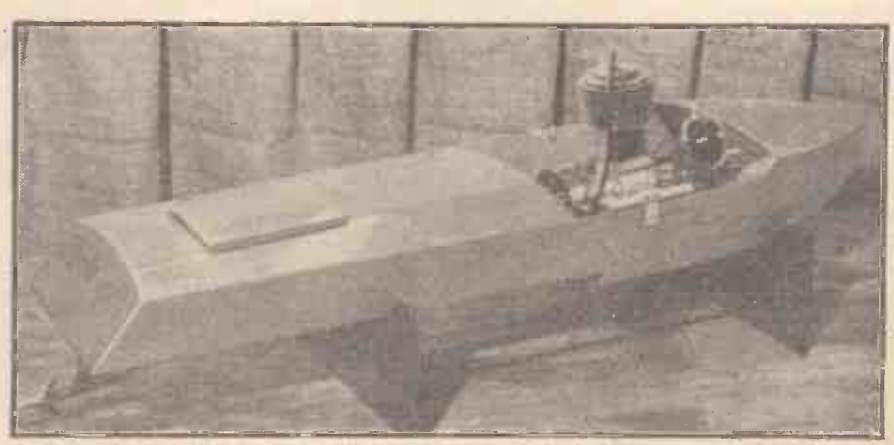


Fig. 5.—A bending block.

Tubing of small size can be cut by filing a groove all round it with a three-cornered file and then breaking it across the knee. Larger tubing of heavier gauge can be cut with a hacksaw, fitted with a fine blade; pipe cutters are better for solid drawn tubing. The tube ends should be filed square and the burrs removed. A slight radius filed on the bore with a small half-round or round file will prevent the insulation from being chafed when the wires are drawn in. Where the tube ends at a switch or other outlet a metal terminal box must be fitted. If a wooden distribution board is used, a rubber or vulcanite bush must be fitted to the tube end to prevent chafing.

A High-speed Model Hydroplane



An "A" class hydroplane powered by a 26 c.c. two-stroke petrol engine. Made by F. Weaver, of the North London Society of Model Engineers, this craft was exhibited at the recent Model Engineer Exhibition at the New Horticultural Hall, Westminster, London, S.W.

The "Hatchet" Planimeter

Constructional Details and Method of Operation

By H. D. E. GOODALL

ENGINEERS and designers often require the area of a given irregular figure and, for lack of a planimeter, have to use one of the ordinate or squared-paper methods. These methods involve a considerable amount of work, which could be saved by the use of a planimeter, without any appreciable decrease in accuracy. On the other hand, it may be that the need to evaluate such an area only arises occasionally and the expense of a planimeter of the usual type would not be justified.

A type of planimeter to which this objection does not apply is that known as the "hatchet" planimeter, which is simple in design, easy to use, has no moving parts, and is reasonably accurate.

This type of planimeter was invented by Captain Prytz, a Dane, and acquired the name "hatchet" planimeter, from the shape of the knife edge. It consists of a knife edge and a tracing point rigidly connected together, the whole being usually made from one piece of steel rod.

If well made, this instrument will give accurate results, in spite of its simplicity and absence of moving parts. Unfortunately, its value does not appear to be appreciated in this country, and a certain amount of suspicion is entertained as to its reliability. This, however, is not justified, and has probably arisen from experience with instruments in which the knife edge was not correctly lined up with the tracing point. If an accurately-made "hatchet" planimeter is given the same care as is usually accorded to the more expensive instruments, it will give excellent service, as there is nothing to go wrong, the point and knife edge needing only occasional attention.

The usual form of this instrument is shown in Fig. 1, and consists of a metal rod, usually steel for rigidity, bent at right angles at the ends. One end is formed to a point, and the other to a knife edge shaped as shown, the two being accurately lined up.

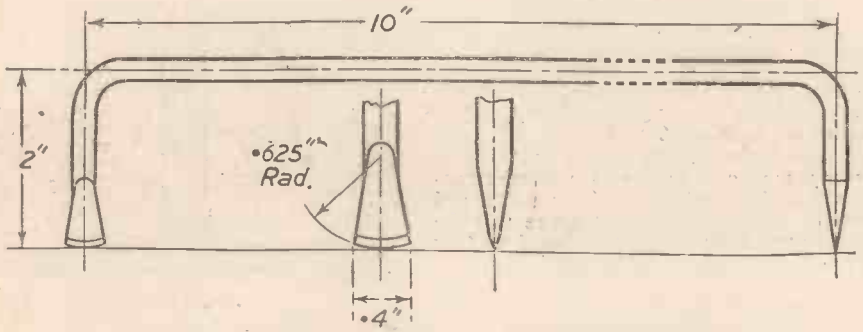


Fig. 1.—Constructional details of a "hatchet" planimeter.

Constructional Details

The construction of the instrument presents no serious difficulties. Both the bending and the forming of the hatchet head need to be carefully done to ensure that the knife edge will line up correctly with the point. As shown in Fig. 1, the knife edge is formed by forging the end of the rod, making the end thin enough to be ground and honed to a very fine edge. The material used is round silver or similar grade steel rod, 3/16 to ¼in. diameter, but not less than 3/16in. to ensure rigidity.

The dimension of 10ins. from the point to the centre of the knife edge is an arbitrary figure and can be altered if desired, but as this length will be used as a multiplier, the dimension stated is recommended as the most convenient for this purpose. In any case, it should not be less than 10ins., otherwise the scope of the instrument will be unduly limited, since this dimension should be at least twice the maximum linear dimension of the area to be measured.

It is important that the knife edge lines up exactly with the point, otherwise there will be a tendency for it to wander. Therefore, during the grinding, frequent tests should be made to check this alignment. To make this check, pin a piece of smooth surface drawing paper on a drawing board and draw a straight line across it. Make sure that the surface is level, then place the point and knife edge on the line. Holding the instrument between the horizontal part and the point, draw it along the line with the knife edge trailing for a distance of about 6in., then reverse the direction and return to the starting point (with the knife edge leading). If the alignment is correct, the knife edge will have followed the line and returned to its original position. Any deviation at the finishing point will indicate the correction required to the knife edge.

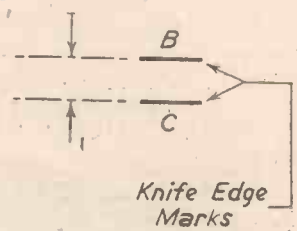


Fig. 2.—Diagram illustrating the method of operation.

The grinding having been completed and proved correct by the above test, the point and knife edge are hardened and tempered and finished off by honing—the knife edge should be finished to almost a razor edge—with a final check for alignment.

Method of Operation

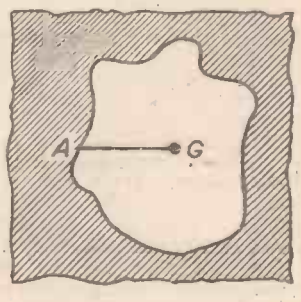
To use the instrument, pin a sheet of paper on a level drawing board, and on this pin down the sheet bearing the area to be measured. By inspection, estimate the centre of the mass of the area as nearly as possible and mark this point G (Fig. 2). Take any point A on the boundary and join G A. Place the point of the planimeter at G and press down the knife edge to make the indentation B in the paper. Let the point then travel from G to A, around the boundary of the area to A and back to G. Make second indentation of the knife edge at C. The indentation C will be below or above the first one, depending on the direction of travel of the point round the boundary line. Measure the distance B C.

It should be noted here that the knife edge moves in the direction of its length in a straight line or along a curve, or the whole may turn about the knife edge, but it is essential that it does not move sideways. The instrument should be held between the finger and the thumb by the vertical portion just above the point. The grip should not be tight, and should allow any angular movement to take place freely.

It will be remembered that the centre of mass G was decided by inspection. This introduces a possible source of error, and to counteract this the above process is repeated after the planimeter has been turned about G through 180 degrees, obtaining a second value B C. The mean of these two values of B C is taken, and the area of the figure will be:

B C × the distance between the point and the centre of the knife edge.

It was stated above that the maximum linear dimension of the area to be measured should not exceed one-half the distance between the point and the centre of the knife edge. Where this condition is not met, the area should be divided into sections, the area of each determined separately, and the total area obtained by summation.



Testing the Instrument

Three tests were made, using a 2in. diameter circle as the area, since the area of this can be easily calculated. The length B C was in each case the mean of two readings as indicated above. The results were 3.15, 3.17 and 3.17, the average being 3.163, and error rather less than 0.7 per cent.

It will be seen, therefore, that a "hatchet" planimeter, if well made and given reasonable maintenance, is capable of good results.

It is not intended to infer that this form of planimeter is superior to the more usual types, but it will bear comparison on the score of accuracy and can be recommended as a reliable instrument.

Rocket Propulsion

The Transatlantic Rocket

By K. W. GATLAND

(*Continued from page 387, September issue*)

"THE design of true *spaceships* is all but practicable to-day, and research will bring them into being in the foreseeable future," so wrote H. H. Arnold, Commanding General of the United States Army Air Forces, in his Third Report to the Secretary of War, dated November 12, 1945.

The statement evoked no great surprise. It merely emphasised what the V-2 had made seem perfectly logical, and though we may doubt whether the U.S.A.A.F. will succeed in reaching the moon with a guided missile inside eighteen months—as was predicted by one of its spokesmen a year ago—there must be few who do not recognise the immense implications that now lie ahead in the development of rockets for the navigation of space.

The "A" Programme

What has already been accomplished in the realm of long-range rockets is due almost exclusively to von Braun and his technicians at Peenemunde where, in the middle "thirties," Hitler had built an expansive rocket development station at a cost of 300 million Reichmarks.

There is little that need be remarked about the V-2 as very complete accounts of the design and operation of this missile have been published elsewhere.

Not so widely known are the other projects which Braun had under development. One was an improved, winged, V-2 (the A-9) for use against England; the second (A-10), a much more ambitious project to extend the range of the adapted V-2 to the Atlantic seaboard of America, and the third, a giant three-step combination rocket for scientific investigations *beyond the atmosphere*. This final development was aimed at getting a modified V-2 to take up an orbit around the earth 400 miles from the surface.

The accompanying table shows that Germany embarked upon military rocket research as early as 1933 and that by 1940 the necessary data had been acquired with which to formulate the design of really powerful rockets—and one in particular, the A-4, which was later to be fired against London as Hitler's second "revenge" weapon, V-2.

Origin of the V-2

The A-5 was the experimental prototype for the later A-4 and was launched in hundreds between 1936 and 1942 in studies of aerodynamic, control and stabilisation problems. It was of particular importance in being the first rocket to employ *graphite* vanes in the jet-stream.

The larger A-4 was 45ft. 10in. long and had a maximum diameter of 5ft. 5½in. It weighed 12.48 tons when fully fuelled for take-off and developed an initial thrust of 24.7 tons.

Main individual weights were as follows: propellant (liquid oxygen and a 75 per cent. solution of ethyl alcohol), 19,310lb.; power plant (complete with turbine and ancillaries), 6,320lb.; Amatol warhead, 2,150lb.

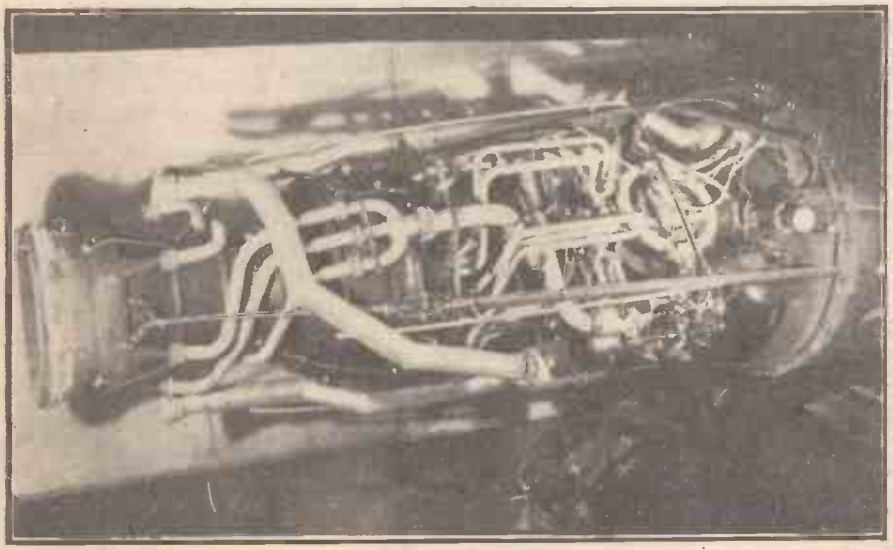
The specific impulse at ground level was 210 seconds (mean), but the high figure of 222 seconds had been recorded on occasions during German tests. It would be interesting to know how this maximum figure compares with the figures now being obtained by U.S. Army technicians in New Mexico, where, earlier this year, a modified V-2 travelled to a height of 111 miles.

Control

It was the four *internal* gas-stream vanes that provided the main controlling effect during the initial 10 to 15 seconds of flight, and their influence was most noticeable just as the rocket left its launching base, when the ascent appeared amazingly slow and yet was obviously well controlled. The external fins and airstream vanes could not possibly have exercised any influence in those first critical seconds, and again it is not too apparent that they had much effect even when the V-2 moved at about 3,400 m.p.h., by which time the rocket would have reached an altitude of 23 miles, where the relative density of the air is at the low figure of 0.0053.

The two sets of steering vanes were linked, and in the earliest V-2s pitch and azimuth gyroscopes were used to control them, opposing any deviation from course by a counter deflection of the jet and air-stream.

Adapted for the U.S. Army for scientific soundings of the upper atmosphere, this V-2 is seen here being readied for flight at White Sands, New Mexico.



The V-2 power plant. Weighing 6,320lb. (less tanks), it developed fully 60,000lb. thrust for 70 seconds.

The Integrating Accelerometer

A cut-out gear was embodied to ensure that the rocket fell within the target area and worked when it had reached a velocity of 5,100ft. per second, velocity being the main determinant of range. Thrust ended some 70 seconds after take-off and impulse carried the missile 37 miles beyond that point as it described a parabolic curve, turning slowly back to earth 60 miles high. The average *distance* travelled by V-2 was between 180 and 190 miles.

In 90 per cent. of the rockets fired on London it was found that a specially developed *integrating accelerometer* had caused the cut-out, but in later missiles (including the A-9) a *double-integrating accelerometer* had been incorporated.

This latter scheme was a great improvement. A first accelerometer controlled the revolutions of an electric motor, the angular velocity of which was always proportional to the missile's velocity; in the second stage

the number of revolutions were automatically counted to give the distance travelled, functioning only when a preselected figure had been reached.

After V-2

The A-9 (Fig. 96) had been formed by the simple addition of 75 sq. ft. of wing to the A-4, the power plant and all essential components remaining unchanged. Thus it was planned that the bombardment range of the basic missile should be extended by at least 100 miles—and this without resorting to a smaller warhead.

Operation of this winged rocket would be near enough the same as adopted for the A-4, which stood upright on a flat concrete base and rose vertically. In the latter case an internal mechanism was designed to move the missile into a 45-degree angle after reaching an altitude of eight miles, and this phase was completed about 52 seconds after take-off.

The addition of wings would naturally have modified these figures by virtue of the increased weight and extra drag, although it is true that they would not have incurred anything like the same resistance in the much thinned atmosphere through which the rocket moved 30 seconds after take-off. In point of fact, the adapted missile would not have risen anything like so high. The zenith of its calculated trajectory was little more than 18 miles, the path of which was near parabolic at the top and automatically controlled. The rocket was intended to cease thrusting just as it began to turn horizontal to the surface prior to curving back to earth.

The design was such that as the wings struck denser air, aerodynamic controls on the fins helped the A-9 into a glide, and it would finally hit the ground some 300 miles from the point of ascent, having been in flight about 15 minutes. Impact with the ground would be made in a dive which would occur when the rocket's speed dropped to sonic values.

The A-9 cannot, of course, be classified as a rocket aeroplane, for it could perform aerodynamically only after the thrust period, when the tanks had been drained and the all-up weight was 4 tons, as compared to over 12½ tons at take-off.

A-9 on Test

The Germans produced some experimental A-9s during the winter of 1944-45, and one or two had actually been launched in stability trials before the Allies took charge.

The results were disappointing in the extreme. Though the rockets were steady enough at take-off, it was clearly apparent that as speed increased, an oscillation of increasing amplitude was being set up which the gas-stream vanes could not fully overcome. This quickly developed into a jerky, zig-zag motion which one might liken to the vicious swinging of a harpooned whale, and each missile exploded in the ground.

The nozzle end. At the root ends of the four fins are the plates which hold the graphite vanes. Shafts from these extend into the fins and link up with the airstream vanes so that both sets of controllers work in tune with the controlling gyroscopes.

These, however, were initial tests. It might be remarked that the "teething" stages of V-2 development were equally troublesome; the first missile of the series (fired on July 6, 1942) rose about 3ft. and then exploded; the second climbed some 16,000ft. and exploded, as also did the third. The fourth was completely successful and travelled 170 miles.

It would undoubtedly have been much the same story with the A-9 had Braun and his colleagues been allowed more time for research.

Improvements were on the way, and it was confidently expected that, had the war continued, winged V-2s would have begun to flow from underground factories by the summer of 1945. The London area and some parts of the Midlands would then have been brought within range from bases in Germany.

The Transatlantic Project

A large proportion of German production had been gambled on providing means for desolating London and other European cities, and nothing would have pleased Hitler more than to rain bombs on New York as a grand climax.

A dream? Perhaps! But not without some foundation.

The Spanish Civil War had given Hitler definite ideas about bombing, and accordingly he set to work on providing the means with which to penetrate the weak spot which his reasoning told him lay in the civilian population. The early part of the war saw Germany producing bombers on a large scale to make the Luftwaffe an invincible force wherever it chose to operate. And when, later, the Luftwaffe failed to bring off the seemingly inevitable over London and the provinces, a large part of German industry was switched over to building the flying-

Code No.	Year	Length (ft.)	Dia. (ins.)	Weight, Total (lbs.)	Weight, Propellant (lbs.)	Thrust (lbs.)	Thrust Duration (secs.)	Specific Impulse (secs.)	Remarks
A-1	1933	4.6	11.8	330.6	88.2	661.0	16	143	Directly stabilised by one large gyro in nose. N_2 pressure feed. Nine launched, vertically.
A-2	1934	4.6	11.8	330.6	88.2	661.0	16	143	As A-1 but with gyro in centre. Maximum height attained, 6,560ft.
A-3	1938	25.0	30.0	1,653.3	992.0	3,306.0	45	167	First rocket to use gyro-steering vanes in jet stream. Reached an altitude of nearly 40,000ft.
A-4	1940–1942	46.0	65.3	27,556.0	19,310.0	60,000.0	70	208	Popularly known as V-2. Most effective of all rockets built in Germany. Range, 180–190 miles.
A-5	1938	25.0	30.0	1,653.3	992.0	3,306.0	45	—	Experimental prototype of A-4. First rocket to use *graphite* vanes in jet stream. Maximum range, 11 miles.
A-6	—	—	—	—	—	—	—	—	Sub-sonic project—design only.
A-7	1941	25.0	30.0	1,763.6	1,102.0	3,306.0	45	—	A-5 plus wings. Experimental prototype of A-9 and Wasserfall defence missile.
A-8	—	—	—	—	—	—	—	—	——
A-9	1945	46.0	65.3	28,658.0	19,310.0	60,000.0	70	208	A-4 plus wings. Maximum range, 300 miles. Prototypes under test at time of surrender.
A-10	Project 1945	—	—	191,780.0	136,680.0	440,840.0	50	166	Booster for A-9 intended to extend the range to 3,500 miles; exhaust velocity, 53,000 ft./sec.; jet flow, 2,728 lb./sec. N_2 pressure feed.

The "A" programme of rocket development which, under Hitler's direction, German technicians commenced in 1933. Highspots of the work were: A-3, the first rocket to use gyro-synchronised vanes in the jet stream; A-5, small-scale prototype of A-4 with graphite vanes; A-4, operational missile known as V-2; A-9, winged V-2; and A-10, booster for A-9. Each was specified to employ liquid oxygen and ethyl alcohol as propellant.

Table showing German rocket development.

The secret of V-2's perfect stability at take-off was in the four gyro-synchronised vanes, made from graphite, which worked in the jet stream.

bomb, and when eventually this weapon also ceased to bring the results expected, it was the turn of von Braun and his V-2.

The advent of so long-ranging a rocket brought fears that many at the time were not prepared to admit. Against it there was no defence but the prompt despatch of fast fighter-bombers to strafe the launching sites and supply trains; the wholesale bombing of storage depôts and production centres.

Eventually it became possible to occupy the territory from which the missiles were fired and so force the launching sites deeper inland and at length to make them wholly ineffective because they could no longer reach the London area.

This was the main reason why, right up to the surrender, German technicians were hard at work striving to perfect the A-9.

Berlin to New York

When Allied technicians conducted their examinations of Peenemunde shortly after the surrender, they found among the vast files of rocket data the first indications of a long-range missile beyond A-9. This was the project A-10, a giant 85-ton booster on to which the A-9 was designed to fit as a second stage. It would have its purpose in accelerating the smaller winged rocket to a velocity sufficient to carry it across the Atlantic, with the object of exploding in New York or in any other city within its 3,000 to 3,500 miles range.

The A-10 was more than an idea. Its development had passed the preliminary engineering stage, and if Braun's estimates are to be relied upon, it could have been built and ready for action within a year of the war's ending.

Take-off Hazards

It is not known exactly how it was proposed to launch the A-9/A-10 combination, for the aggregate weight worked out to nearly 100 tons. The "flat-base" technique would have been too dangerous for a rocket of this size for reason alone of the amount of propellant it carried—about 79 tons at take-off—plus a 1-ton warhead, which, to say the least of it, would have put paid to the launching site and any of the operating crew who remained in the vicinity had the giant missile failed to lift but merely toppled. It was bad enough when a V-2 fell over on its launching base, and this happened on more than one occasion.

There can be little doubt that some form of launching tower would have been necessary, and even more so with the *atomic* warhead which it was hoped that German scientists would have ready by the time the project was in full-scale production.

Two-Hundred Tons' Thrust

The two-step rocket would have ascended in much the same manner as the V-2, with the A-10 supplying fully 200 tons' thrust for the first 50 seconds of flight. The booster was intended to release automatically with the falling off of thrust, dropping astern as the A-9 moved off under its own power. The smaller rocket would accelerate rapidly in the highly attenuated atmosphere through which it moved 16 miles above the surface, building up on the imparted velocity of 5,000-ft. per second. This, it was reckoned, would result in a peak altitude of about 45 miles, the control of which was to be similar to that adopted for the single A-9.

It was considered that a maximum velocity of 9,200-ft.' per second might easily be attained as the missile began its plunge earthward. With this great amount of kinetic energy to dissipate in the lower atmosphere, it is quite feasible that Braun's claim of 3,500 miles range for the boosted A-9 is within the bounds of reason. The figure, unfortunately, is impossible to check with the small amount of data available.

The missile would be brought into horizontal flight with the aid of automatic controllers, the remainder of its travel taking effect in an extended glide, in which it was expected that no height at all would be lost during the first several hundred miles after levelling out. The flight was planned to last 45 minutes.

Meanwhile, the A-10 would have begun to drop back, the release of a multi-parachute gear by a special timer permitting the empty component to drift slowly to the ground somewhere over France for collection and re-use.

Self-inflating Parachutes

The parachutes considered for this project were of a special design to enable them to open, despite the rarefied nature of the atmosphere. Each was to have double panels in its canopy which inflated from compressed-air bottles situated inside the rocket body. When fully spread, they would form a semi-rigid structure which gradually took effect upon the atmosphere, serving as a gentle brake for several miles until the condition of free-fall was safely arrested.

Had parachutes of a standard pattern been used, they would certainly have been torn to pieces as the A-10 plunged through air of rapidly increasing density and became subject to violent pressures.

The Question of Altitude

It will have been noticed that the boosted

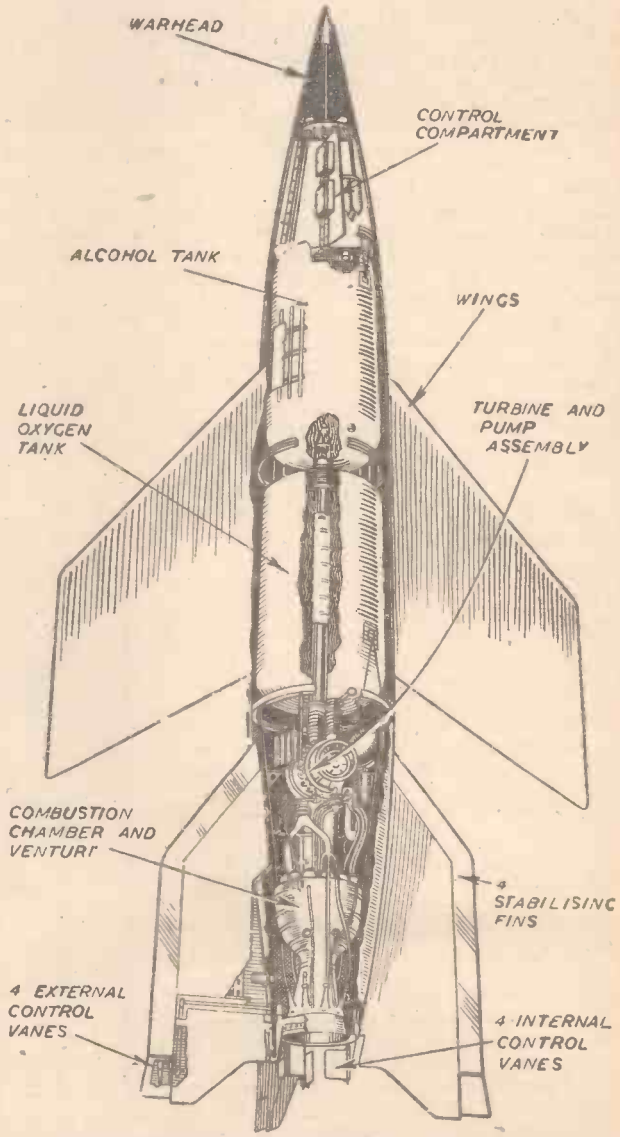
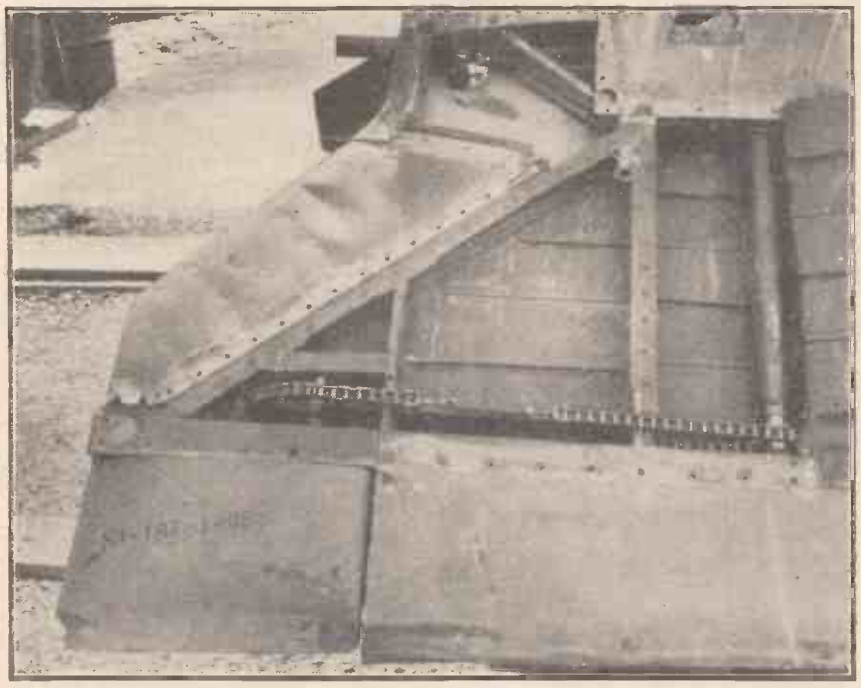


Fig. 96.—How the Germans were about to adapt the V-2 is shown in this cut-away drawing. The addition of wings would have increased the range by at least 100 miles. In a later project an 85-ton boost rocket was to accelerate this A-9 to a speed of over 3,000 m.p.h. before it began thrusting on its own account. A final speed of about 8,000 m.p.h. would have enabled the missile to glide in the denser atmosphere and (it was calculated) to reach territory in the region of New York within 45 minutes. A still later development in conjunction with a 200-ton booster was to enable the missile to carry a pilot.



The simple arrangement of the airstream control-vanes, one in each fin, is apparent in this photograph.

A-9 was not intended to achieve anything like the 60-miles altitude of the V-2, whereas it might seem logical to assume—in view of the increased powers available—that the A-9 should greatly exceed this figure. The answer is that the V-2 ascended vertically, so that the regions of most resistance should be overcome in the shortest possible time, after which it was turned to follow a path of 45 degrees—the angle for optimum range—for the remainder of the thrust period. Maximum height was reached under *impulse*, as we have already seen.

Take-off for the A-9/A-10 combination was to be arranged in a similar manner, with the booster section supplying powerful but comparatively short-lived thrust. The aim in this case was to outclimb the layers of dense atmosphere and, at the same time, impart the highest possible velocity to the A-9 before it separated.

This phase completed, the smaller rocket accelerated away and, just as power ran out, it would be turned back to earth. Thus, at no time would the A-9 rise under *momentum*, for, indeed, had it done so, its speed on falling back into the lower atmosphere would have been insufficient to permit it to glide.

One might summarise the foregoing by adding that whereas the V-2 required *height* in its trajectory to achieve range, the important factor in the operation of A-9 was *speed*.

Skin Friction

How it was proposed to overcome excessive skin heating at the speeds contemplated for these missiles is not known. Even in the V-2, temperatures were approaching 920 degrees K. at certain critical points on the surface, and had it not been for the effects of conduction and radiation, the figure would have risen to 1,400 degrees K., the stagnation value at a velocity of 5,000ft. per second.

When velocities of over 8,000 m.p.h. are considered—as in the case of the boosted A-9—the stagnation temperature approaches 7,000 degrees K., and, though in practice a considerable reduction may result from radiation, the heat would still be sufficient to affect the propellant system and (in consideration of a later development) to make it decidedly uncomfortable for a crew.

A Piloted Rocket

It had, in fact, been proposed to fit a pressurised cabin and undercarriage to the A-9 so that a pilot could be carried. This would have made the prospect of hitting American targets a much less chanceful business than hitherto, and in this case the explosive (smaller to make up in part for the extra weight of equipment and pilot) would be released to fall on the objective whilst the rocket hurtled past miles overhead, eventually to land in friendly or neutral territory. It is of interest to note that, with propellant and explosive gone, the calculated landing speed was little greater than 100 m.p.h.

For a piloted A-9 to cross the Atlantic, it was found necessary to increase the weight of the booster to 200 tons. This was largely to enable the rocket to accelerate *less rapidly*, though the final speed of the small missile would have been well into five figures as it approached cut-out. Even then the pilot would have to withstand quite considerable "g" pressures (negative in the dive back to denser atmosphere), and what with the frictional heat, it is difficult to imagine an airman of the orthodox school volunteering for the job.

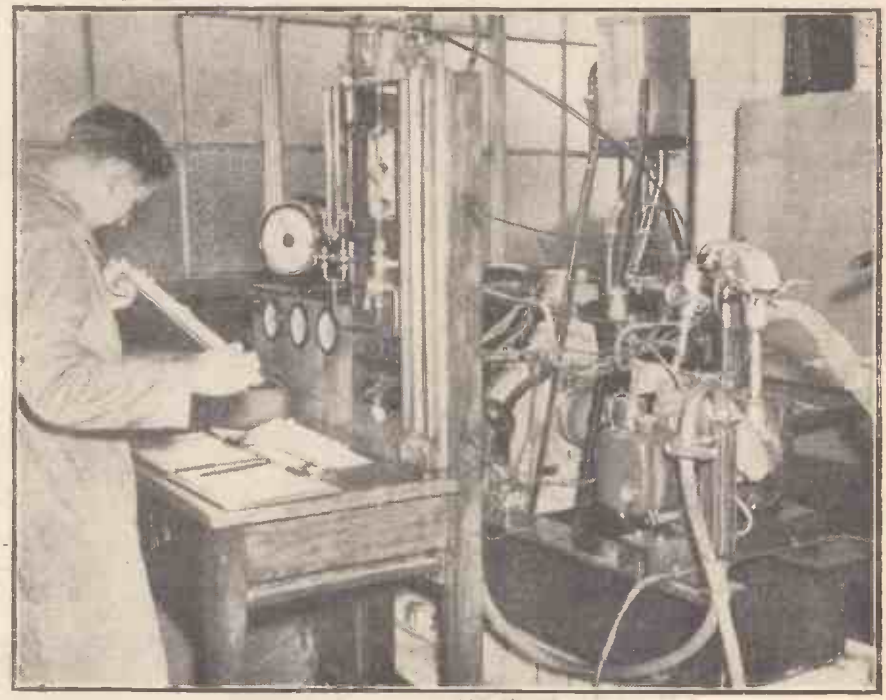
"Future Warfare"

Here, indeed, is a foretaste of future warfare, if such there must be. The rocket and the atomic bomb are clearly inseparable in their rôle of destruction and bring the prospect of "press-button" desolation of entire cities over thousands of miles.

The U.S. Army are reported to have testing rigs under development with which to try out rocket engines for 150-ton projectiles, and this is a clue to the scale of research now being undertaken. Happily, there is another side of the picture, as we shall see in the concluding article.

(To be concluded)

Research Work in Motor Industry



The laboratory of the Motor Industry Research Association on the Great West Road, Brentford, has been established for the purpose of providing up-to-date knowledge of technical developments likely to be of use to members. The illustration shows a single-cylinder water-cooled engine that provides data on temperature of the exhaust valve and various parts of the cylinder head.

The Cinegram

A Novel Instrument for Reproducing Motion Pictures and Sound from a Disc Record

By F. TOWNSEND PAMMENT

PROBABLY the earliest form of sight and sound entertainment was the stage, then came the silent films—an entertainment of sight only. The advent of the sound track converted this into an entertainment of sight and sound; later came radio, an entertainment of sound only. The addition of television made broadcasting an entertainment of sight and sound.

During the early period of the above developments the gramophone was produced, an entertainment of sound only, therefore the logical development of the gramophone is the Cinegram, which gives an entertainment of sight and sound from a disc record.

For many years, technicians in several countries have been trying to design a simple mechanism, that would reproduce motion pictures and sound from a disc record, all realising its vast commercial possibilities.

There is, of course, the home cinema—for example, the 16mm. sound-film equipment—but this is, in general, too expensive for the average home and also too complicated; it has to be set up when required, films threaded through sprockets, rewound after use, the films are expensive to buy and, of course, they break.

The public is already record conscious, thousands of homes having either a gramophone or radiogram.

The Cinegram is very similar to any standard radiogram, it has a small screen at the front about 18in by 15in., and for operation it is only necessary to place the record on the turntable and switch on; it then reproduces motion pictures on the screen and sound from the loudspeaker. There is no needle to buy or change, therefore no scratch, no wear and the records are virtually unbreakable.

The reason many technicians failed to produce a disc sound and picture machine is that they kept too rigidly to the idea of moving the tone arm across the record as is usual with the standard gramophone; such a method of reproducing motion pictures and sound was too complicated; in fact, it is not a practical proposition at all.

Fixed Tone Arm

The fundamental reason for the success of the Cinegram is that it departs from the usual method of moving the tone arm and introduces the simple and original method of keeping the tone arm fixed and moving the turntable instead, i.e., as the turntable rotates it also moves forward under the tone arm.

On the technical side, dealing first with the disc record, this is 14in. in diameter and gives about the same playing time as a 12in. wax record, i.e., about three to four minutes. The experimental records are of standard cine film stock and acknowledgements are paid to Messrs. Kodak, Ltd., who very kindly supplied quantities of this for experimental purposes.

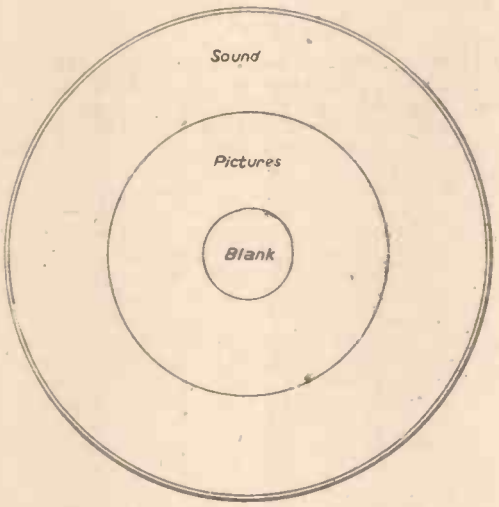


Fig. 1.—A sound and vision disc record.

Referring to Fig. 1 the record is divided into three sections, the outer circle carries the sound track, the centre circle the series of pictures, while the inner circle is blank. Fig. 2 is an enlarged portion of the record, to indicate how the sound track and pictures appear on the actual record.

The pictures are printed on the disc in a dark room from any standard film, i.e., 35mm., 16mm. or 8mm.; whatever size of film is used, the picture is reduced by a lens to 0.1in. × 0.08in. on the disc.

A printer was designed to print one frame of the film on the disc, the light screened, the film moved to the next frame and the disc moved 0.1in., the light unscreened to print this next picture, and so on, until the complete film was printed to cover the picture section on the disc.

The Sound Track

The sound track was then printed on the disc in the usual manner with a light valve, the sound being recorded through the usual microphone and amplifier.

The record is then developed as for any standard film. If it is cine positive it is ready for reproduction on the Cinegram, but if cine negative it is simply placed on a blank disc, a light flashed and a positive print obtained. In this manner a master record in cine negative enables any number of positive records to be printed very rapidly.

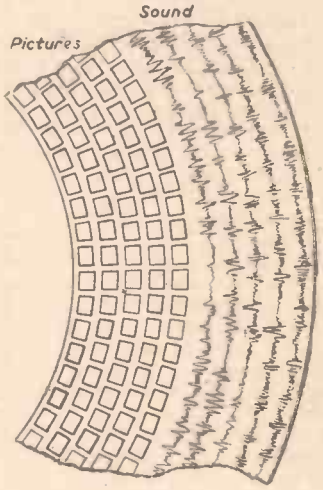


Fig. 2.—An enlarged part of the record showing sound track and pictures.

The sound and picture track are in concentric circles 1/12in. wide, and as the turntable rotates it travels forward 1/12in. per revolution, thus covering the entire range of the sound and picture track.

A diagrammatic outline of the machine is shown in Fig. 3, where A is a housing containing the projection lamp B and a prism C. This unit is fixed and replaces the usual tone arm of a gramophone.

The turntable M is plate glass on which the record L is placed, the sound and picture portions on the record being indicated S and P; the turntable spindle R carries a bevel gear N which rotates the screw O, thus imparting a forward movement to the turntable as it rotates. Also fixed to the spindle R is a disc P which is rotated by the driving motor Q; as the motor drives near the centre of P the speed of the turntable is progressively increased thus maintaining the linear speed of the sound and picture track substantially constant.

The light from the lamp B passes through the lens D, the picture on the record, through the focusing lens F to the oscillating mirror G, thence to another mirror H and then on to the screen. This light also passes through the prism C and the lens E, through the sound

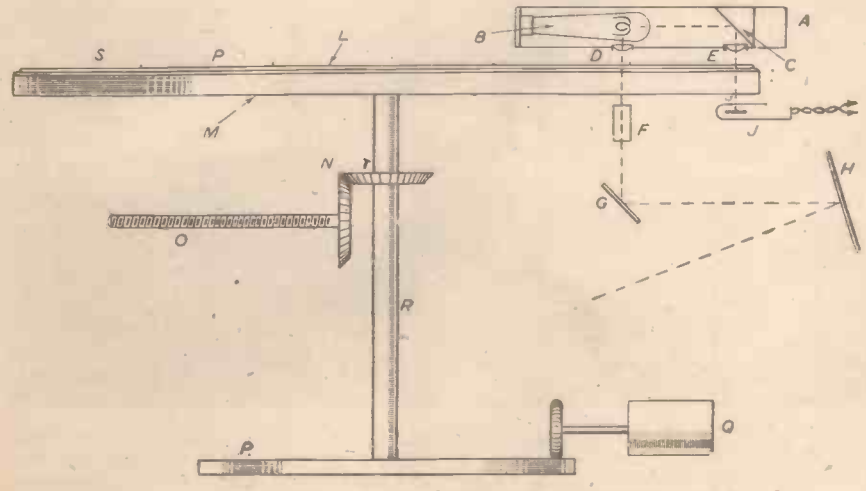


Fig. 3.—Diagrammatic outline of the Cinegram.

track on the record to the photo-electric cell J, and from there to the amplifier and loud-speaker.

Compensating Movement

For the reproduction of sound the sound track must rotate continuously at constant speed, whereas the pictures must remain stationary on the screen for a fraction of a second. The first requirement is obtained by the turntable revolving continuously and the compensation for the picture movement is obtained by the oscillating mirror, which is operated by a cam and follows the movement of the picture during its travel past the lens and keeps it steady on the screen, the mirror then flicks back and picks up the next picture.

In theory the oscillating mirror is perfect; in practice it is not ideal owing to the high speed, and any suggestions as to a better method would be welcomed.

The results obtained on a very rough experimental model were quite good, the sound reproduction being about equal to radio, and the picture definition on the screen being about equal to a good 8mm. film.

For home entertainment the Cinegram could have television and radio incorporated in the same cabinet, giving a choice of picture and sound entertainment from either the record or television and the ordinary broadcast programmes, thus making it an ultra modern cine-radiogram.

With record-changing mechanism it can be used for advertising, or for coin-operated amusement machines. It is, of course, particularly valuable for educational purposes, and lessons could be given by experts and illustrated by motion pictures. Schools could be provided with an instrument, and a library of records circulated to all schools in turn.

The Cinegram is fully covered by a complete patent, but has yet to be developed commercially.

Science Notes

Interesting Facts About Everyday Topics

By Prof. A. M. LOW

Human Electricity

PEOPLE will tell you that they are full of electricity, that their hair crackles and that they cannot wear a wrist watch. I imagine that quite 99 per cent. of this is nonsense, although I have known people sensitive to queer electric emanations, and I attribute it to what old-fashioned electricians used to call "tasting" the current in the mouth, in other words slight electrolysis of the contained liquid.

It is this sensitivity which forecast modern geophysics, when tests are made to determine the nature of underlying ground strata in searching for minerals or water.

The old-fashioned water diviner does not, in my opinion, speak the truth when he says that the twig "simply would not keep still." It is his muscles which move it and the tighter he grips the more easily are these muscles the subject of psychological effect. This does not mean that water at a depth may not be faintly felt by some individuals. But this sensitivity of electric forces usually means a very dry skin or an "acid" skin. I remember my mother telling me—and she was always right—that in the ballroom of her house as a girl she would sometimes slide across the floor in felt slippers and then light the gas by a spark from her knuckles.

Static electricity is often produced in a thunderstorm by cloud friction, and if you take a piece of brown paper about 18in. square, dry it very thoroughly and then fold it into a strip about 3½in. wide you can draw long sparks from it with your knuckle. First dry it, then dry it again when it is folded and before each experiment: choose a dry day and draw the brown paper smartly half a dozen times between your coat sleeve and your body, pressing rather tightly. Held over your head loose hair stands very quaintly on end.

Like Savages

WE are like savages in the state of our ignorance. Only a few days ago I was on my way to take part in a Brains Trust. Donald McCulloch was the Question Master, and I tried to prepare myself for the ordeal by thinking of all the questions which might be put to me without my knowing what to reply.

After about five minutes I gave up the job, for I can ask myself questions all day long without the faintest hope of finding any answer. Indeed, I walk about the world like a question mark, often thanking goodness that no-one can read my thoughts.

Most people have heard of lemmings, a peculiar kind of rat which lives in Norway. At certain seasons or periods of years these queer creatures rush down to the sea and drown themselves in their hundreds of thousands. I imagine that this has no connection with the biblical swine, and many theories have been advanced to explain this mass suicide. None of them is quite so ludicrous as the comparison made between themselves and those of the Nazi regime!

Can it be that the ground upon which they build their homes was at one time under the sea and that they think they are returning to the old home town, finding too late that it was submerged a hundred centuries ago? Or is it that they are Malthusiasts determined, at all costs to maintain the theories attributed to their master?

I have not the slightest idea. But it is interesting. Almost as interesting as the academic priesthood which accounts for all these happenings by different explanations, and despises the enquirer for his ignorance of the origin of species.

Making a New Moon

IT has been seriously suggested in Germany and Russia that one construction of a planetette, or shall we say an island in space, will not be beyond the capacities of future men. Parts, presumably, would be prefabricated and taken up by rockets to a point at which they would become part of the system of the universe. And at heights of many thousands of miles above the earth they would be used for the transmission of television programmes to the earth.

This suggestion has been considered in some detail from the technical aspect, and although a few thousand years may elapse I do believe that it is not utterly impossible. For that matter, what *is*?

International Trophy Winner

Mr. C. T. Buffery, of Morden, Surrey, has won the Bowden international trophy for model power-driven aircraft for England. About 150 models, representing seven nations, were flown at the competition, which was held at Fairlop aerodrome, Essex, recently. In the illustration Mr. Buffery is seen with his prize-winning model aircraft.

Electrics for Beginners

1.—Making a Simple Electric Motor

By "HANDYMAN"

AFTER becoming acquainted with the principles of magnetism and electricity the beginner usually desires to make a piece of apparatus that will work. In this series of short articles practical instructions will be given for the construction of simple electro-motors, shocking coil, electric beam engine, etc., most of the models being made chiefly from odds and ends usually to be found in the scrap box.

The first model to be described is an electro-motor, shown in Figs. 1 and 2. It consists of an electro-magnet at the ends of which an armature, in the form of a cross, is caused to rotate. By means of a contact breaker on the armature shaft, the circuit is broken at the right moments, so that the armature revolves continuously, and at a rapid rate, while connected to a battery. The armature shaft is provided with a small pulley for driving light models.

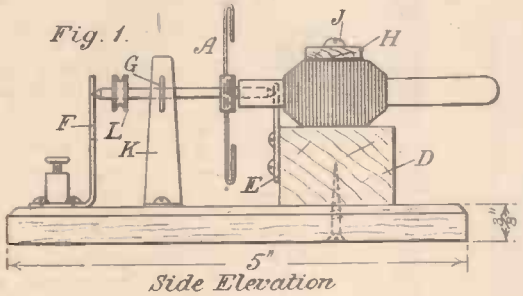


Fig. 1. Side Elevation

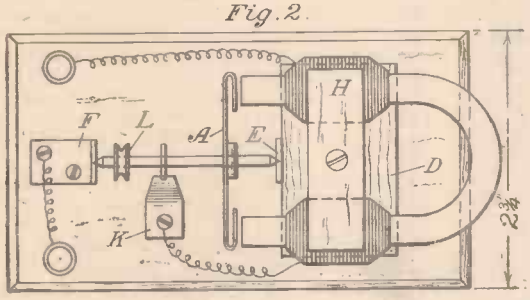


Fig. 2. Plan

The Electro-magnet

First of all, obtain a stout iron staple, such as can be purchased from an ironmonger's shop for a few pence. The staple should be about 3½in. long and 1½in. wide between the limbs, so that when the points are cut off with a hacksaw the magnet will appear as shown in Fig. 5. File the ends of the magnet smooth and square.

Winding the Coils

About 12yds. of No. 26 gauge cotton-covered copper wire will be required for the magnet coils, 6yds. for each. Start winding the wire round one limb of the magnet in the manner indicated in Fig. 5, leaving a free end of about 6in. for connecting up purposes. The turns of wire must be wound on as closely and evenly as possible, the first layer of turns coming to within ⅛in. of the end of the magnet limb. When half of the wire has been wound on for one coil, tie a piece of strong thread round the last two turns to keep the wire from unwinding. Cross the wire over and wind in the reverse direction on the other magnet limb, as indicated in Fig. 5. Tie a piece of thread round the last two turns, leaving about 6in. free as before.

Armature and Spindle

For the armature, A, cut two strips of thick tinplate (B, Fig. 6) and round the ends with a file. In the middle of each strip drill a $^3/_{32}$in. hole, bend over the ends and pinch together with pliers.

The armature spindle consists of a 2in. length of bright steel rod $^3/_{32}$in. diameter with the ends carefully pointed with a file. A piece cut from a steel knitting needle of the required diameter would make a suitable spindle. Press the armature arms on to the spindle at a distance of ⅛in. from one end, and at right-angles to each other. Adjust them carefully for squareness, and then solder them together, and to the spindle.

The contact-breaker G can be filed to shape from a piece of sheet brass ⅜in. square, a hole being drilled in the centre a tight fit to the spindle. Round the corners carefully with a fine file and then press the contact-breaker on to the spindle to the position shown in Fig. 1.

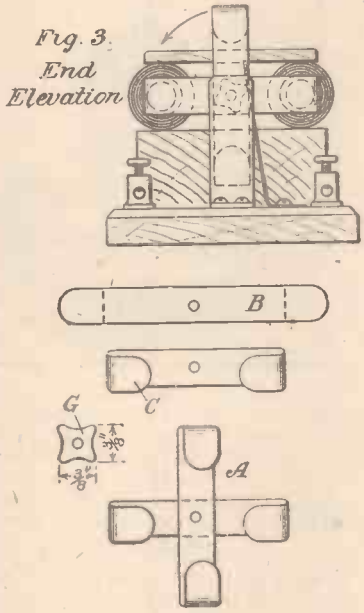


Fig. 3. End Elevation

Fig. 6. Method of making the armature

Baseboard and Bearing Plates

At this stage the baseboard can be prepared from a piece of planed wood 5in. long, 2¾in. wide and ⅝in. thick. Bevel the top edge all round, as indicated in Figs. 1 and 2. A rectangular block of wood D 2⅛in. long, 1½in. wide and ⅝in. thick can now be made for supporting the magnet. Fix the block in position with two screws driven in from underneath the baseboard.

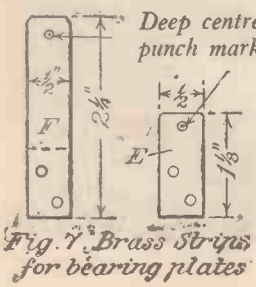


Fig. 7. Brass Strips for bearing plates

To make the bearing plates E and F, prepare a strip of thin sheet brass 3½in. long by ⅝in. wide. Cut off a piece 1⅛in. long (E), and drill two holes in the lower part for fixing screws. Near the top edge make a deep centre-punch mark, as shown in Fig. 7. Make a similar centre-punch mark near the top end of the other strip (F), and, after drilling the two holes in the lower part, bend the strip at a right-angle on the dotted line so that the centre-punch mark is on the opposite side of the strip to the bent foot.

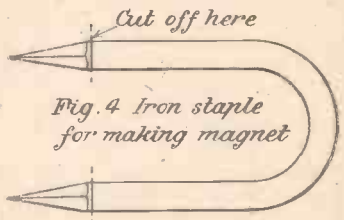


Fig. 4. Iron staple for making magnet

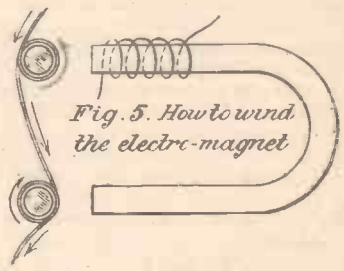


Fig. 5. How to wind the electro-magnet

Assembling the Parts

Clamp the electro-magnet firmly in place on top of the block D by means of a strip of ⅛in. wood (H), and a round-headed screw (J), allowing about ⅜in. of the magnet limbs to project beyond the face of the block D.

The two bearing plates can be screwed in position and adjusted so that the spindle runs quite freely and is parallel to the baseboard. When the spindle is revolving the bent-over parts of the armature should clear the ends of the magnet by a bare $^1/_{16}$in. The magnet can be finally adjusted to bring this right by slightly turning the holding-down screw.

A strip of thin springy brass ⅜in. wide and 2in. long is used for the contact brush K, which should be cut to a slight taper, as in Fig. 1. Bend the bottom part to a right-angle, drill a hole in the foot and then screw it down to the baseboard in the position indicated in Figs. 1 and 2, so that it presses lightly against the rounded corners of the contact-breaker when the armature revolves.

Making the Connections

After screwing two terminals in the baseboard, proceed to connect up the wire from the magnet coils. The end of the wire from one coil is clamped under the head of the screw which fixes the brush to the baseboard, the end of the wire from the other coil being screwed down under one of the terminals, as shown in Fig. 2. The other terminal is connected to one of the fixing screws of the bearing bracket F.

The motor is now ready for connecting up to the battery, which may preferably consist of a 4-volt accumulator. After giving the armature a turn to start it, it should revolve at a rapid rate if the contact-breaker is carefully adjusted so that it is just breaking contact with the brush when either of the two arms are directly opposite the ends of the magnet. Reference to Fig. 3 will make this point clear. When the correct position is found, fix the contact-breaker to the spindle with a touch of solder.

Memoirs of the Metals—3

The Properties of Platinum

And Some Facts About Its Uses

"AS dear as a pound of platinum" may be an excellent up-to-date simile to connote an expensive article, but, believe it or not, there was a time when platinum crudes were thrown into the sea by order of the Spanish government, which government, about the middle of the eighteenth century, expressly forbade the export of platinum from South America for fear that it might be used nefariously for the adulteration of gold.

In those days the "platino del Pinto"—the "little silver of the Pinto river"—was regarded as nothing other than an unmitigated nuisance. For one thing, it was extremely difficult to smelt. It had a habit of getting mixed up with the silver ores of South America, and spoiling them by its infusibility and, worst of all, there was always the temptation for some fraudulent metallurgist to use it for mixing with gold, thereby adulterating the latter metal. Indeed, there are on record instances of platinum ingots being surface-gilded and passed off as pure gold blocks—but that, naturally, was at a period when platinum was much cheaper than gold.

Perhaps platinum was known to the early Spanish colonists in South America in the seventeenth century, but it seems to have been first brought to Europe by an individual named Wood about the year 1735. Its properties, however, were only first described by Richard Watson in 1750.

Although at that time this curious South American "platina" was attracting much attention in early scientific circles in consequence of its great infusibility and its total resistance to oxidation and corrosion, the metal was anything but expensive. Even towards the end of the eighteenth century you could buy platinum metal for about 10 shillings a pound, and you would possibly have some difficulty in disposing of much of it at that price.

It was a medical man, one W. H. Wollaston, a London practitioner who gave up doctoring for chemistry, who first put platinum on the map. This he did by inventing processes for its more convenient smelting, and, incidentally, by discovering two other similar metals—rhodium and palladium—in native platinum. These discoveries were made in the years 1803 and 1804, whilst in 1802 and 1803 another chemist, Smithson Tennant, made metallurgical history by isolating metallic iridium and osmium from crude platinum.

A perfume vapouriser. A little perfume is added to the fuel of a spirit lamp and a fragment of platinised asbestos is secured to the wick of the lamp. The wick is lighted momentarily and the flame is then blown out. Owing to the catalytic activity of the platinum the wick continues to glow and to diffuse the vapourised perfume around it.

Finally, in 1829, ruthenium, another metal, was discovered in platinum crudes.

Forging an ingot of platinum in the works of Messrs. Johnson, Matthey and Co., Ltd.

Laboratory crucibles made in pure platinum. (Johnson, Matthey and Co., Ltd.)

The Platinum Metals

Crude platinum, therefore, was found eventually to contain six metals, all very much alike in the majority of their properties, but falling conveniently into two distinct groups according to their weights, viz., the "light platinum metals," comprising palladium, ruthenium and rhodium, and the "heavy platinum metals" embodying platinum, iridium and osmium.

By far the greater bulk of native platinum consists of metallic platinum itself, the remaining five platinum metals being present in relatively small amounts.

The outstanding property of platinum is its extreme incorrodibility. It will resist oxidation even at red heat, whilst the only acid which will attack it is that curious combination of concentrated hydrochloric and nitric acids which has long been known by the name of *aqua regia*, or "Royal Water."

Platinum has excellent metallurgical properties. It is very ductile and very highly malleable. So ductile is it that it may be drawn into wire having a diameter of only 1-100,000in. This is effected by coating fine platinum wire with pure silver. The coated wire is then drawn out to its utmost limit, after which the silver is dissolved away with nitric acid, leaving the ultra-fine platinum core intact.

Because of its sturdy resistance to all forms of chemical attack, platinum has long been a popular metal. And just because of this fact its value increased accordingly.

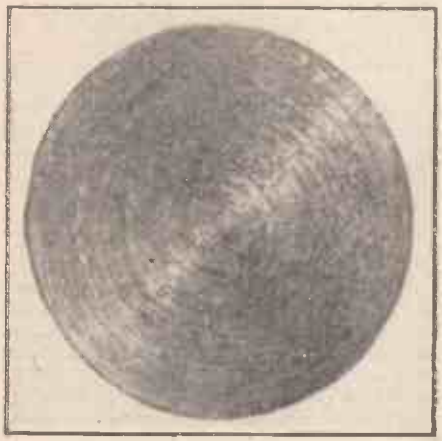
Throughout the last century, platinum was very definitely a scarce metal. In the year 1820 Russia started to work the platinum deposits in the Ural mountains, and that country quickly became the world's chief source of platinum and platinum metals. Indeed, the Russians had virtually a monopoly of platinum supplies until about 1920, at which period South Africa began to enter the platinum market and contributed considerable quantities of the precious metal to the world's stock.

Platinum and its associated metals are normally found in their metallic form, the six metals being naturally alloyed and demanding careful separation by intricate chemical

processes before the pure platinum itself can be obtained.

The Price of Platinum

The price of metallic platinum has always reflected the combined scarcity and utility of the metal. Until about 1850 fairly pure platinum could usually be obtained at a lower price than silver, that is to say, at something below three shillings an ounce. Although its price advanced continuously throughout the second half of the nineteenth century, even at the beginning of our present twentieth century, the metal was still cheaper



An enlarged surface view of a platinum contact piece of an aeroplane engine magneto. Note the perfect freedom from pitting and burning.

than gold. At the commencement of the first world war (1914) platinum was twice as dear as gold, whilst in 1924, at £29 per oz. troy, it was about six times as dear as gold. During the slump years around 1931, platinum fell to about £5 per oz. The commencement of World War No. 2 (1939) saw it at a little over £6 per oz. It shot up to approximately £9 per oz. in 1941, whilst at the present time its cost is somewhere in the region of £14 per oz. troy, with gold at £8 15s. per troy oz.

The price of platinum has not been entirely connected with its scarcity, for the metal nowadays is not as scarce as it was formerly. It is the essential popularity of platinum combined with the ever-increasing demand for it which causes its market price to soar. Metallurgical history shows that the more platinum the world gets the more it wants. The metal is so useful in innumerable ways that there is always an unsatisfied demand for it.

Consider, for a moment, the demands which are being made on metallic platinum (including platinum alloys) at the present day.

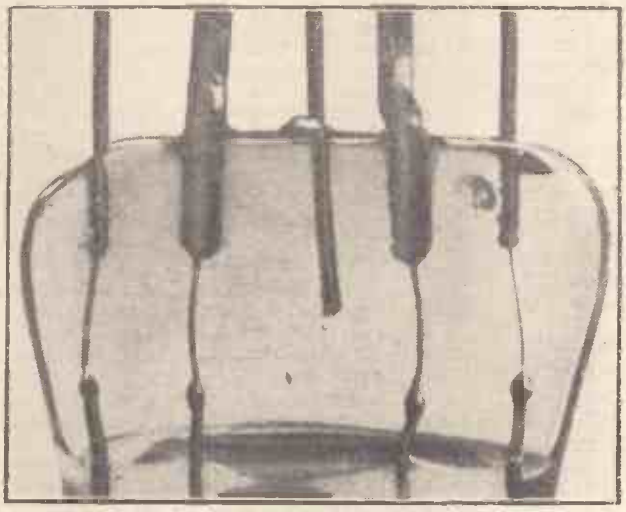
First of all comes the jewellery trade, the biggest normal user of the metal. Jewellery trades absorb some two-fifths of the total annual consumption of platinum.

The second largest platinum users are the dentists, who take about a quarter of the annual production of platinum. Mainly the platinum is used in the dental profession in the form of palladium-platinum alloys, although quite often the pure platinum metal is called for.

The electrical and the chemical industries call for more than one-eighth of a year's total platinum production, and this demand is very definitely on the upgrade. In the electrical industries platinum and its alloys are required for magneto contacts (chiefly for aircraft work), for electrodes, for high-temperature furnace components, for power switches, for radio apparatus and for a variety of other uses.

In the ever-advancing chemical industries of the world, platinum (pure, alloyed, and in the form of its chemical salts) is utilised as a catalyst—or "reaction promoter"—in various chemical processes, notably in the manufacture of sulphuric acid, nitric acid, and in the various hydrogenation processes. It finds an increasing use for the making of scientific apparatus of the highest degree of accuracy, for the construction of analytical crucibles, dishes and other apparatus of laboratory use and even in the form of vessel-linings for dealing with highly corrosive substances.

The remaining production of platinum goes to a great variety of uses—not mentioning those pertaining more specifically to wartime purposes. The new industries concerned with the production of artificial fibres ("Art silk," etc.) use considerable quantities of platinum for the making of "spinnerets" through which the synthetic thread is drawn. Hospitals and the medical professional generally are increasing platinum users. And finally,



Showing the seal wires running through the glass pinch of a radio valve. Originally platinum was the only metal which could be used for this purpose.

we have the artists and the designers who employ platinum by way of plating, metallic paints, leaf, and in other forms.

Had not platinum production taken a great leap forwards during our own times, had we remained dependent upon Russia for our platinum supplies, the price of the commercial metal would have shot up to impossible heights.

Canadian Platinum

There is, indeed, a very curious story concerning the winning of platinum and its related metals in modern times.

We have noted that South Africa entered the world's arena as a platinum producer about 1920, but, unfortunately, at a later date, difficulties arose in connection with the concentration of the South African platinum ores, which only made commercial extraction possible as long as the price of the metal tended to high levels. With platinum prices falling, as they did around 1930, the South African platinum production began to drop off considerably, and this, indeed, was the position at the beginning of the last war, despite the fact that the Dominion has large reserves of platinum deposits.

The outstanding event in the platinum trade during the last couple of decades, however, has been the entry of Canada into the platinum market, an entry which has been so successful that Canada is now reckoned as the foremost of the world's producers of this much-wanted metal.

Another unexpected factor of the Canadian production of platinum and its associated metals is that the precious metals are all to be regarded as by-product material. Canada did not originally set out to produce platinum, but, rather, nickel. International nickel interests located vast amounts of nickel ores in the Sudbury district of Ontario, Canada. About 1925, operations commenced on the winning of metallic nickel in this district. They were eminently successful operations, but they became more successful still when it was discovered that the electrolytic "sludges" and "slimes" from the nickel refining contained appreciable percentages of the platinum metals. It was discovered that the platinum metals occur in these Canadian areas along with sulphides of iron, copper and nickel. The amount of the platinum in the nickel deposits is small, but considering the vast amount of nickel which is now being produced, Canadian platinum is able to aggregate to a relatively large amount annually.

London Refining

Very little of the platinum material is refined in Canada. The greater

Casting a block of pure platinum in the works of Johnson, Matthey and Co., Ltd.

amount is exported to Britain in the form of "concentrates" and it is refined in London.

The task of refining the Canadian concentrates is by no means a straightforward one; the group of six platinum metals has to be chemically separated from about 15 accompanying base metals, after which the six platinum metals have to be separated from one another.

It is mainly a business of removing the base metals by means of acid solution, and then of treating the crude platinum with *aqua regia* and of subsequently working up chemically both the resulting solution and the insoluble residues from the *aqua regia* treatment. Yet such is the efficiency at which the London refineries operate that they are able to turn out from the Canadian "concentrates" commercial platinum of 99.93 per cent. purity, whilst for special purposes even this high figure may be improved on.

Four countries to-day contribute platinum metals to the world's stock. They are Canada, Russia, South Africa and Columbia, the output of the latter region going to the United States of America.

Detailed consumption figures covering platinum and the platinum metals are difficult to obtain, and they are not available for the period covering the war years. However, according to the estimates of a leading platinum dealer, the world's consumption of platinum in 1938 totalled 460,000 troy ozs. compared with 440,000 ozs. in 1937, and 175,000 ozs. in 1933. These figures certainly show the upwards tendency in platinum usage in the years preceding the last war.

Platinum's Properties

Platinum is a greyish-white metal having a brilliant lustre. It melts at the very high temperature of 1,755 deg. C. By pushing up the temperature to the limits of the electric arc the pure metal can actually be made to boil. This happens at a temperature of about 2,450 deg. C.

One of the most valuable properties of platinum is that it can be welded. Like iron, platinum has the curious—and valuable—property of softening and becoming semi-plastic before its melting-point is reached. On this fact platinum welding depends.

Another curious property of platinum is that it is capable of dissolving oxygen in the molten state. Silver exhibits this characteristic also, and when either silver or platinum cools down from the molten condition, the dissolved oxygen is forcibly ejected, causing a rather spectacular "spitting" of the metal.

Platinum has the least expansion-coefficient of all the metals. Its coefficient of expansion is nearly the same as that of glass, a property which enables platinum wires to be fused in glass so as to make gas-tight joints. When platinum was relatively cheap, all the early electric lamps had platinum seal wires, but nowadays, of course, base metal alloys are necessarily used for this purpose.

Although platinum in its pure state is generally looked on as being entirely incorrodible, this is not quite the case. If you heat carbon in a platinum crucible a little of the carbon will combine with the platinum, forming a platinum carbide which is brittle and which will often scale away from the sides of the crucible to the slow deterioration of the latter. Again, any solutions containing free chlorine will exert some action on platinum. The metal, too, is attacked to some extent by phosphorus and it is not even proof against common lead, the latter metal forming an alloy with it, and this alloy having very poor anti-corrosion properties.

In fact, if platinum is alloyed with some of the common metals, such as lead, zinc, copper or silver, it becomes soluble in ordinary nitric acid, an acid which it completely resists when in the pure state.

There are some alkalies, cyanides, nitrates and phosphates which will attack platinum under certain conditions. Hence it will be seen that platinum is not quite the 100 per cent. unattackable, all-resistant metal which it is sometimes made out to be. Nevertheless, it is a metal which is growing exceedingly in world-wide estimation and popularity, for, unlike gold, the one-time supposedly perfect metal, its uses can be very severely utilitarian as well as purely decorative and corrosion-resistant.

"Platinum Black"

If platinum chloride or, indeed, any platinum solution is evaporated to dryness and the residue heated strongly, metallic platinum will be obtained in the form of an intensely black powder. This is the well-known "platinum black." If asbestos fibre is saturated with a solution of a platinum salt and similarly heated, the metallic platinum is obtained as a black deposit on the asbestos. Such is "platinised asbestos." Platinum in either of these states is extremely reactive from a chemical standpoint. It can set up all kinds of chemical reactions. It can ignite various gas mixtures and bring about the combination of two or more materials. Unfortunately, the reactivity of platinum in this condition is not a permanent one. The platinum gets "tired." It tends to absorb impurities from its surroundings and to become "poisoned." For this reason all these "active platinums" require periodic renewal. If things were otherwise, then the many automatic gas-lighters which have, from time to time, been put on the market would have had a greater and a more far-reaching success than has actually been the case.

"Platinotype"

The world's finest and most permanent system of photographic printing—now, alas, obsolete in view of the high cost of platinum—was based on the production of platinum black in the form of a photographic image on paper. For more than 30 years, the "platinotype" process of photography reigned supreme in the best-class photographic studios. It was a slow process, but in the opinion of many of our leading photographers, it gave results which have never been bettered. And, of course, its permanency was unquestioned.

Considerable amounts of metallic platinum must have been used in the manufacture of the chemical salts for the making of the once very popular "platinum paper." But, nowadays, it is doubtful whether there exists a single individual in Britain, however keen and enthusiastic a photographer he may be, who works the process. If platinum metal, however, should ever return to its former relatively low price, the re-introduction of platinum printing into photography would constitute a very desirable result, and a lasting tribute to platinum's world-wide popularity.

Making Ball Bearings

ALMOST important feature of all Britain's exports is the fact that the many and variable types of machinery necessary to create these exports, are dependent upon ball bearings. The types of these bearings range from the most minute to those in the giant class, and there are also the roller type, but all serve the same purpose, the smooth running of industry and its products. At the Fischer Bearings Co., of Wolverhampton, and British Timken, of Northampton, millions of bearings are produced annually. Though not always directly concerned in exporting, bearings are to be found in a wide range of exported commodities such as cars, machinery, railway rolling stock, etc.

A machine rough-grinding steel balls at the Fischer Bearing Company's works at Wolverhampton.

Typewriter Maintenance

Notes on Cleaning and General Overhaul

By E. S. BROWN

TO-DAY a typewriter is an article of considerable value and, moreover, is very difficult to replace owing to the restricted supply position. It is therefore essential that regular and thorough cleaning and attention be given to these machines to ensure long life and easy action.

There are, of course, many firms who specialise in typewriter maintenance either by contract or otherwise, but owing to the difficult labour situation their services are sometimes unduly protracted and restricted, and it is hoped that the following notes may be of some interest and assistance to those readers who from choice or necessity are desirous of caring for and maintaining their own machines.

It is not possible to give precise instructions on any one make of machine owing to the number and multiplicity of models, but the following notes are a generalisation and can be adapted to suit most machines.

It is assumed that the typewriter that calls for attention requires overhauling due to use or perhaps neglect and is not mechanically disarranged as the result of an accident. In the latter case it is most emphatically stressed that such a repair is nearly always beyond the capabilities of most handymen and should be attended to by a qualified typewriter mechanic.

A common cause of sluggish action is the congealing and hardening of unsuitable lubricating oil and the presence of dust in the mechanism.

The first cause can be mitigated by using a suitable oil as recommended by the makers. "Oilit" or "Three-in-One" oil is very suitable. Unfortunately, however, it is a fact that oily surfaces rapidly attract dust and foreign bodies. The best prevention is to keep the machine in a dust-free atmosphere and to always replace the dust-cover when not in use.

Cleansing Fluid

To remove the oil and dust from the working surfaces it will be necessary to remove the carriage and ribbon and the base-plate, if one is fitted. A cleansing fluid of 75 per cent. petrol or benzine, preferably benzine, and 25 per cent. paraffin oil is prepared and is applied to the affected parts by a small mop brush. It will be necessary to stand the machine upside down in a tray during this procedure in order to reach the actuating mechanism.

The brush should be worked well into the parts and frequently recharged with the fluid until all traces of dirt, oil, etc., have been removed. Then go over the parts again with neat petrol or benzine and put the machine aside to dry. It should be stated that as these fluids are extremely inflammable extreme caution should be exercised in their use, which should always be carried out in the open.

When dry, the machine should be carefully lubricated with a good quality oil, preferably by applying with a small camel-hair brush. Do not overoil, as this will tend to attract dust. Gently working the keys will greatly assist the oil in penetrating to the various working parts. The machine is then ready to be reassembled.

Clogged Type

After much use the type becomes filled with carbon from the ribbon, which makes the printed matter indistinct and blurred. Gently remove the carbon with a pin. Do not use a needle, as this being of harder metal than the type may damage it. Pay particular attention to the "Os, As, Bs, Ds and Qs," which being closed letters tend to hold and accumulate more carbon than the others. When the letters have been satisfactorily cleared, dip a small brush—a toothbrush is admirable—into methylated spirit and thoroughly clean the type by brushing down and across. Do not brush too vigorously as this may upset the alignment of the type. When the type is clean, leave to dry. This will only take a few moments.

Should the type be slightly misaligned, it is possible to correct this by the judicious use of a pair of long-nose pliers on the type bars. Extreme care should be used in making corrections of this nature. The bars should be slightly twisted in the direction indicated until the alignment is correct. If the misalignment is of a serious nature, such as one block of type fouling another, then the services of a typewriter mechanic should be sought.

Improving a Shiny Platen

After much use the platen becomes shiny and refuses to grip the paper. A new matt surface is made on the platen by applying very fine sandpaper along its entire length. Slowly revolve the platen while doing so, to ensure that the whole surface is treated. When finished, remove any dust with a rag slightly moistened with methylated spirit.

Sometimes the platen will persist in slipping, even after the foregoing treatment. In that event a piece of resin gently rubbed over the surface will, in most cases, be found to effect a cure.

A platen with imperfections in its surface, such as deep scratches, indentations, etc., makes good typewriting impossible, for it is essential to have a smooth level surface for the type to imprint against in order to produce clear characters.

These imperfections may be removed by filling with a cellulose stopping, which is made by dissolving pieces of celluloid in equal proportions of acetone and amyl acetate until the cellulose has the consistency of syrup. It will take anything up to 24 hours for the celluloid to melt. It can be materially assisted during this time by being occasionally stirred.

(Above) Cleaning the type with a small brush dipped in methylated spirit.

(Right) Cleaning the type levers, etc., while the machine is stood up on its back.

When the mixture is of a satisfactory consistency stir in a little powdered emery as an hardening medium, together with just sufficient lampblack to colour.

This cellulose stopping must be kept in a tightly corked bottle to prevent evaporation, and also kept away from any fire, owing to its highly inflammable nature.

To prepare the platen for repair, remove same from the machine and roughen all the damaged parts with sandpaper, afterwards applying a slightly petrol-moistened cloth to remove any possible oil. Apply the stopping with an old knife blade, pressing well into the damaged part, then finish by leaving the surface slightly higher than its surroundings.

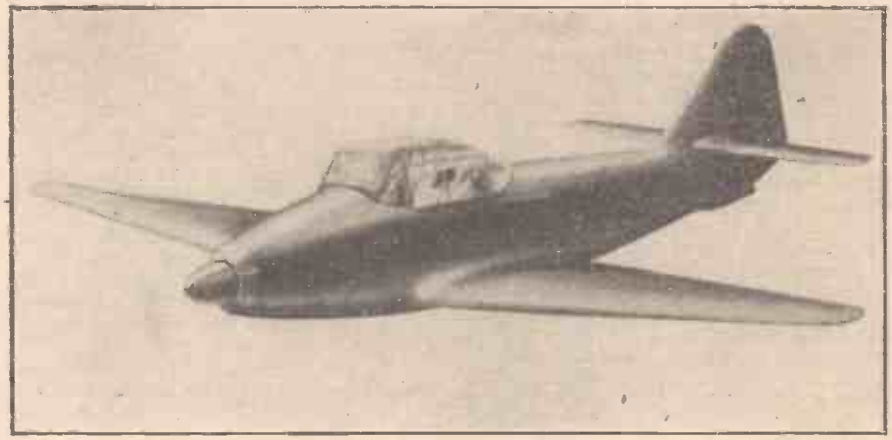
Allow at least four to five days for the stopping to set, then gently smooth down to the level of the platen surface with fine sandpaper.

Sluggish Carriage

A speedy typist is sometimes too fast for her machine, especially if the machine has seen much service, and the carriage tensioning spring is either weak or out of adjustment. The carriage should move concisely at every movement of the keys. If its action is delayed and sluggish the adjustment nut or screw should be slowly turned until the action is correct.

The Avro Athena Trainer

Brief Details of a New Training Aircraft for the R.A.F.



The Avro Athena Trainer in flight.

RECENTLY revealed for the first time in the Part Publication List issued by the three Services are the names Athena Trainer Mk. I and the Anson XX, XXI and XXII.

That A. V. Roe & Co., Ltd., Manchester, should be awarded contracts for new training aircraft for the Royal Air Force is a tribute to the famous breed of Avro training aircraft which have been the very foundation on which all flying training has been based.

As long ago as 1914 the Avro 504 was designed, built and supplied to the Royal Flying Corps and after being used successfully for a variety of military purposes it was chosen by Colonel Smith-Barry as the standard training aeroplane for flying instruction. At the end of the war in 1918 it was stated that more aeroplanes of this type had been built than any other in the world.

In the following years practically every Air Force of note throughout the world equipped its squadrons with this machine, and it continued in service use until 1932. The good old Avro 504 was replaced by the Avro Company's Tutor trainer after a big, lengthy and rigorous competition, in which all suitable types took part. The Tutor was adopted as the new standard training aircraft of the Royal Air Force. A later development, known as the Avro 626, was equipped for all types of instruction, including flying, gunnery, bombing, radio and photography.

When the expansion of the Royal Air Force began about 1935 the Avro Company had already received contracts for the twin-engined Avro Anson—an aeroplane which can rightly be described as one of the most successful ever produced. It has been produced in thousands, and after doing sterling work with Coastal Command it was switched to the even harder task of training. The Anson became one of the most important units of the Empire Air Training Scheme, and tens of thousands of aircrew still speak affectionately of "Faithful Annie."

It is logical, then, to find the Avro Company once again in the forefront with a new trainer which benefits immeasurably from unequalled experience in the design and production of aircraft for the essential and all-important aspects of flying training.

Gas Turbine Propeller Engine

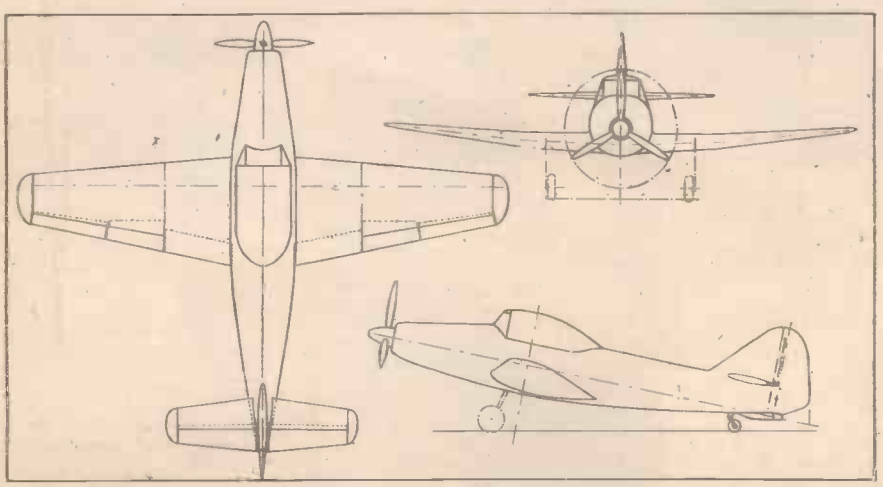
The Athena Trainer Mk. I is an advanced trainer of exceptionally clean appearance fitted with either an Armstrong Siddeley Mamba or Rolls-Royce Dart engine. Both power plants are gas turbine propeller engines of 1,000 h.p. The Athena has a wing span of 40ft., length of 37ft. 10in., and an overall height with the tail down of 12ft. 3in.

During the initial design study, emphasis naturally tended to centre on the cockpit, because such features as all-round view, ease of ingress and egress, layout of seats and controls are, next to pleasant flying characteristics, the very essence of a satisfactory trainer. Examination of the accompanying illustration will reveal that the view from the cockpit of the Avro Athena in all-important directions is exceptionally fine. The forward and downward view is particularly good.

The cockpit is extremely roomy and provides side-by-side seating for the instructor and pupil, with a third seat behind for a passenger. Another important feature which has been the subject of a great deal of research is the desirability of providing maximum accessibility. In this respect Avro Trainers have always been renowned for their ease of maintenance which, coupled with robust construction, means that more flying hours can be put in.

Further Developments

The Anson XX, XXI and XXII are further developments of the world famous Avro Anson, and in general appearance these new trainers are similar to the Anson Mk. XII Communications machine which is familiar to thousands. The XX is to be used for Empire Navigation training, the XXI is a home trainer and the XXII is a radio trainer. Specialised equipment for each version provides the main difference between these aircraft.



Plan, front and side view outline diagrams of the Avro Athena single-engined trainer.

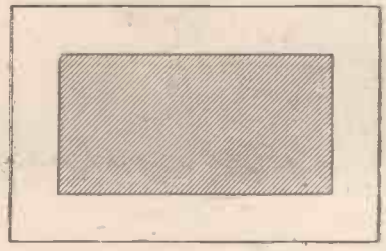
Mathematics as a Pastime—8

Proportion.

By W. J. WESTON

"LIKE as the waves move towards the pebbled shore, so do our minutes hasten to their end." Quantities, like other things, may be in a constant relation to one another; and this relation—this variability or proportion—at times calls for your very alert mathematical reasoning. Two questions you need to answer when confronted with instances where proportion may exist: Is there any real connection between the numbers? What exactly is the nature of that connection? The answers call for thought.

You see at once that there can be no connection in such instances as: "Two men on a cliff can see 10 miles out to sea; how far could four men see?" or "Four eggs are cooked in three minutes; how long should

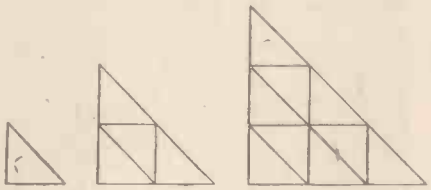


two eggs take?" or "It takes counsel an hour to persuade a jury of 12 that the prisoner is innocent; how long would he take to persuade a judge without a jury?" The answer to this last may, indeed, be "never." At all events, proportionality is absent.

Moreover, even when a connection does exist, the relation may not be simple. You can paper your room in three hours. You may hope that three workers sent to remedy war damage will paper a similar room in one hour; but probably disappointment awaits you. And you cannot answer with mathematical precision such questions as "At 12 years a boy weighed six stone; what would he weigh at 18 years?" or "If two porters load a truck in 10 minutes, how long will 12 porters take?"

Rectangles

These considerations find admirable instances in what the mathematician calls "similar figures." Circles are, quite clearly, such figures; and their measurements vary in a constant manner. The radius being given, you could, for instance, construct a ready reckoner of areas. Squares, too, are similar figures, and have measurements in



Figs. 1, 2 and 3.—Diagrams illustrating rectangles and triangles.

proportion. But now examine this rectangle within a rectangle, the border being of one width, as in the diagram, Fig. 1.

Are the rectangles "similar figures"?

No, you say, the small rectangle is not similar to the large one. For, by taking off the same length from long and short sides, we have destroyed the proportionality of the sides. The angles are the same, but the sides are not in proportion, and any reasoning about measurements would fail, if we based that reasoning on proportion.

Triangles

Only in one most interesting instance, that of the triangle, does equality of angles imply proportionality of sides. We can, therefore, reason with confidence upon relative measures. Thus, the base of the three triangles being 1, 2, 3, the areas are 1, 4, 9 (Fig. 2).

We can solve many problems in a most effective way by applying this truth about triangles. Try one such problem that will give you a deal of fun. Take two rods, AB of 20in. and CD of 14in. (Fig. 3).

Join A to C and B to D by pieces of elastic crossing at X. Fix AB vertically on the table, and move CD (also vertical on the table) farther from AB. Does X come nearer to the table?

Your experiment suggests that, whether CD comes nearer to or goes farther from AB, the height of X above the table is always the same; and your calculation shows that this is so.

Suppose any length you like of BC, say 15in., and let XY be the height of X above the table. Let x stand for XY and y for BY; then $(15-y)$ will stand for YC. Now, since the triangle ABC is similar to the triangle XYC, then you have the proportion:

$$20 : 15 :: x : (15-y).$$

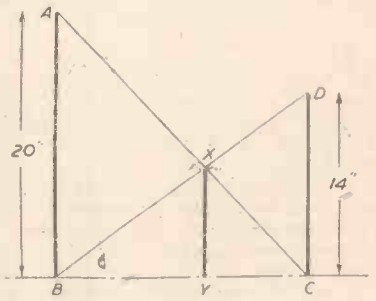
And, since the triangle DCB is similar to the triangle XYB, you have the proportion:

$$14 : 15 :: x : y$$

$$\text{or } 14y = 15x$$

$$\text{so that } y = \frac{15x}{14}$$

Replace in the first proportion this value of y.



Then

$$20\left(15-\frac{15x}{14}\right)=15x$$

$$\text{or } 300-\frac{300x}{14}=15x$$

$$\text{or } 300=\frac{15x+300x}{14}$$

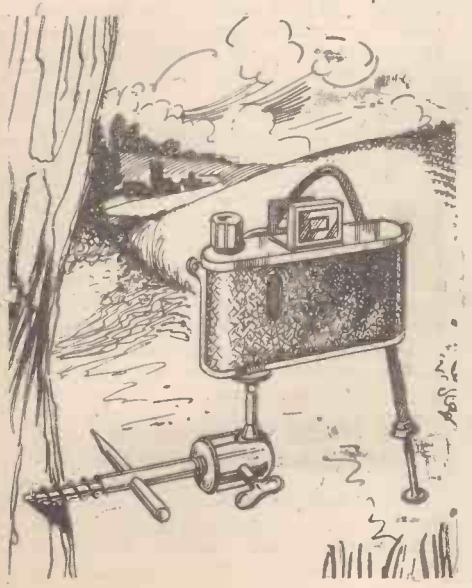
$$\text{or } 4200=510x$$

$$\text{so that } x=\frac{4200}{510} \text{ or } 8\ {}^{4}/_{17} \text{ in.}$$

And you find that, whatever length you give to BC, you get the same result.

A Vest-pocket Tripod

By H. JOSEPH



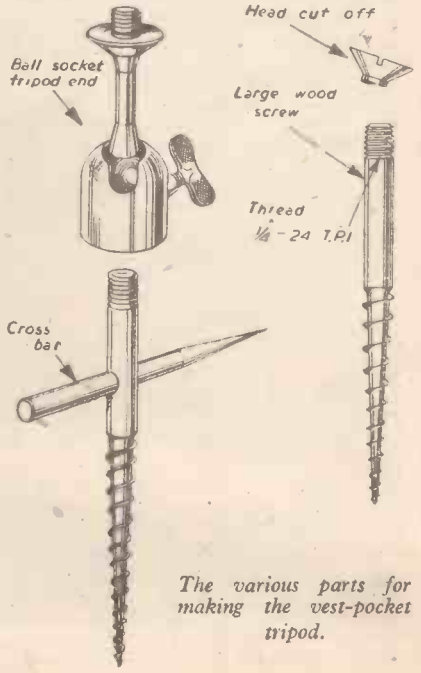
PROVIDED you already possess a ball-socket tripod end, as most photographers do, all that is needed is a stout wood-screw and a short metal crossbar, which can be made from scrap.

The accompanying illustrations show what is wanted and the details are left to the handyman, who should have no difficulty in threading the cut-off end of the wood-screw.

The method of using is to make a hole with the pointed end of the crossbar and screw in the screw. Next screw on the tripod ball-socket end and then the camera. A tree, as in the illustration on the left, or a place to fix the screw can generally be found, but don't damage good woodwork.

If a stick is cut it can be pressed into the ground and the gadget screwed into the top. Better still, a walking-stick can be made and used for the purpose.

With this simple device the camera can be fixed in positions which would otherwise be impossible, such as hanging down from a bough of a tree to take a waterfall, etc.



The various parts for making the vest-pocket tripod.

THE WORLD OF MODELS

Model Liners : Display of Model Work in Lincoln and Nottingham : Radio-controlled Boat

By "MOTILUS"

READERS may remember that in June, 1946, I wrote of some of the models made by Mr. Dennis Sears, of Nottingham. Now, after over twelve months, I have further news of his model work. It is amazing to know just how much work has been accomplished by this model maker in just over a year.

Model Liners

In 1946, the *Queen Elizabeth* returned to Southampton to shed her wartime guise of drab grey paint and to be refitted as the world's No. 1 liner. The first voyage of this great "Queen of the Seas" as a passenger liner was awaited by ship-lovers all over the world, and when she had been refitted she was seen for the first time with black hull, white upperwork and Cunard red and black funnels. All the publicity given to this gigantic ship prompted Mr. Sears to make a model of her. By kind permission of the Cunard White Star Line he was able to borrow the plan drawings of the vessel to a scale of $^1/_{32}$, straight off the drawing board. Having had to wait patiently (or rather, impatiently) for the arrival of the plans, he obtained some excellent photographs of the liner and commenced work on the model. The length of the hull is just over 3ft., being carved from Canadian mahogany of varied types. Mr. Sears says that he finds this wood very easy to work with as it is ideal for carving and shaping. For the construction of the hull he used the laminated system, better known as "bread and butter building." The superstructure and bridge, etc., were all made from ¼in. wood, the two funnels being shaped from 1¼in. round wood and bored through the centre. The usual procedure followed for the painting and rigging of the model. Fig. 1 shows the model of the *Queen Elizabeth*, taken the actual week that the liner sailed from Southampton on her maiden peacetime voyage.

Mr. Sears has also constructed a fine trio of 3ft. models of famous Cunard White Star liners, viz., the *Queen Mary*, *Queen Elizabeth*, and the old *Mauretania*. All have been made from plans kindly supplied by the Cunard White Star Line, Liverpool. The first of the three was the old *Mauretania*, constructed in 1942. This was carved out of solid Canadian mahogany, which Mr. Sears managed to obtain just after the outbreak of war, and the superstructure was built up with ¼in. wood planks. The *Queen Mary* was the next to be built, and this was made out of 1in. planks, with the upperwork out of ¼in. wood. The funnels were made from 1¼in. wood, shaped to section of the plan. Both these are floating models. The last of the trio, the *Queen Elizabeth*, has only just been completed, and now Mr. Sears can show a very clear picture, with his models, of the advance made in the Cunard White Star Line's North Atlantic service.

Fig. 2.—Mr. Welter launching his model cabin cruiser on the lake at Abington Park, Northampton. The radio control apparatus can be seen to the left of the group of bystanders.

Fig. 1.—Mr. D. Sears with his model of the Cunard White Star liner, "Queen Elizabeth."

Ruston & Hornsby's Model Exhibition

Mr. Sears tells me that in the late summer of last year he assisted in the display of model work for the annual show held by Messrs. Ruston & Hornsby, Ltd., marine engineers, of Lincoln. It was the annual Gala Day of the firm and the proceeds of the show went to the Lincoln hospitals. Exhibited for the first time on this occasion was a model of a naval base, built to a scale of 100ft. to the inch, set out on a base 4ft. by 3ft. The model is complete with all dock buildings, offices, storehouses, work repair shops, a power station, building slipways, and a small convoy coming into port with cargo ships accompanied by naval escorts. Vessels to be seen in the base include H.M.S. *Rodney*, an aircraft carrier, naval tugs, corvettes and trawlers. H.M.S. *Hood* is seen in dry dock. Fig. 3 shows part of the exhibition, and reading from left to right can be seen the *Queen Mary* and the old *Mauretania*, two 8ft. models which were described in the June, 1946, issue of PRACTICAL MECHANICS. In front of the *Mauretania* is a model of Britain's largest permanent troopship, M.V. *Georgic*, after her wartime conversion. In the centre are models of the *Prince of Wales*, one of Britain's newest battleships, which was lost during the war in Far Eastern waters, and on the right the famous *Ark Royal*. In the foreground of the photograph is the naval base model described above.

Model Making in Nottingham

In Nottingham, it seems that the hobby of model making has a large following if the recent exhibition held by the Nottingham Society of Model and Experimental Engineers can be taken as the criterion. This Society, formed in 1928 by a few enthusiasts, is now a

very flourishing affair. It has fortnightly meetings, and, with the object of fostering and encouraging the hobby of model engineering, its members have now equipped a workshop for the use of members who have not their own machine tools. This shop is in charge of a skilled superintendent and committee, who are prepared and willing to instruct any member who cares to make use of the shop. The exhibition was a huge success, the total visitors numbering over 5,000. Over 200 models were on view, ranging from tiny electric motors of $\frac{1}{16}$in. outside diameter, to 2in. scale Pacific locomotives. Children who visited the show were allowed two free trips on the 100ft. track belonging to the Society. The locomotives using this track were Mr. J. Barkes' $\frac{3}{4}$in. scale *Princess Royal*, Mr. Ruffle's 3$\frac{1}{2}$in. gauge *Flying Scotsman*, and the Society's 5in. gauge 0-6-0 goods engine. The Club's electrically operated "0" gauge layout was running most of the time, and was usually surrounded by a large crowd. This layout is run on two levels, and has approximately 420ft. of track. The standard of work in the many exhibits was very high and the models very varied.

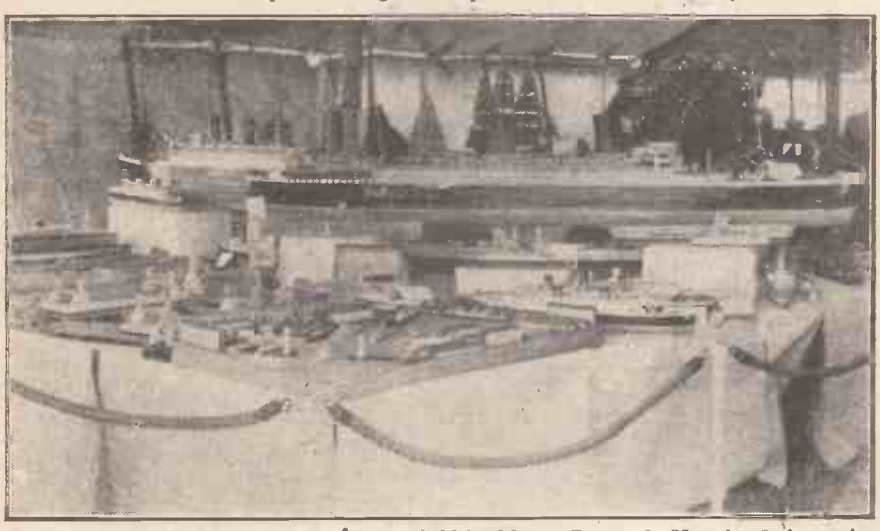


Fig. 3.—Model display in the annual show held by Messrs. Ruston & Hornsby, Ltd., marine engineers, of Lincoln. The models shown are to various scales. The two large models, made by Mr. D. Sears, are over eight feet in length: reading from left to right, these are the "Queen Mary" and the "Mauretania." In front of the "Mauretania," near her stern, is a model of M.V. "Georgic," showing her wartime conversion to a permanent troopship. Near "Mauretania's" bow is a model of the famous "Ark Royal," which, with the "Mauretania," was built at the shipyards of Messrs. Cammell Lairds at Birkenhead. In the foreground of the picture is a model of a naval base, built to a scale of a hundred feet to the inch: it shows offices, storehouses, etc., and a display of model vessels, including battleships, destroyers, trawlers and tankers.

Radio-controlled Boat

Latest news from the Northampton Society of Model Engineers is of a demonstration of a radio-controlled model cabin cruiser, belonging to one of the members, Mr. A. W. Welter. This boat, about 4ft. long, was put through its trials on the large lake in Abington Park at Northampton, where a large crowd assembled to see the demonstration. The watchers were thrilled while the vessel responded to the directions of Mr. Welter through his radio-controlled apparatus, which was only recently developed by this ingenious model maker. The cruiser twisted, turned and reversed, showing instantaneous reaction to the control, and the trials were generally pronounced a success.

The Northampton Society are staging their first exhibition at the Northampton Town Hall this September, when visitors will be able to see the fine work done by members in the various branches of model-making: locomotives, ships, aircraft, stationary engines, etc. Messrs. Bassett-Lowke, Ltd., have offered a silver challenge cup for the best model shown in the exhibition showing originality in design combined with good workmanship. This event should give a splendid opening to the Society's autumn and winter programme and visitors are expected from several nearby towns.

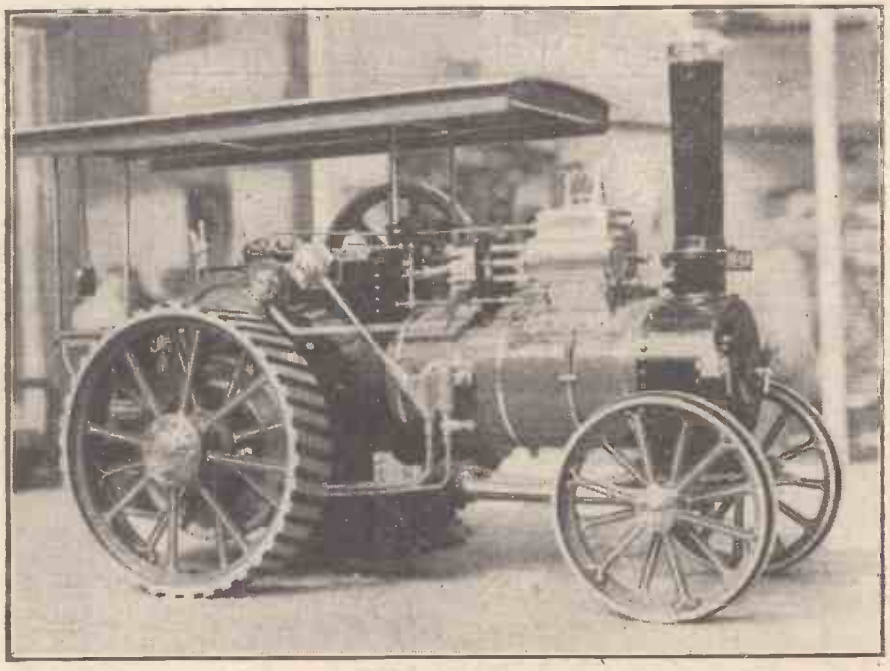
Model Boiler Fittings

When in High Holborn recently, I was struck with the evidence of the improved position of model supplies when I called at Messrs. Bassett-Lowke's London branch. I was pleased to see a new, comprehensive range of boiler fittings, water gauges, regulators, blower valves, small pressure gauges, unions and small finished parts. The pressure gauges, made in $\frac{3}{4}$in. and 1in. diameter, were of a very good design for small locomotive work, calibrated for easy reading, and altogether a first-class job, added to which they were not expensive. In addition, there is a very well-designed banjo syphon fitting. This consists of a U-shaped piece of copper tubing, silver soldered into a neatly designed gunmetal fitting which can be screwed straight into the boiler end and can be located in any desired position. Because of its special design, it has an advantage over the usual pattern of syphon in so far that it can be mounted close to any other fitting. This is an important space-saving factor in small locomotive work. An interesting feature in this connection is the use of a special form of aluminium washer. These washers are used in particular with the pressure gauge syphon, but are also suitable for use when mounting any type of screw end boiler fitting. Being of a soft material, the fitting can be tightened up to any desired position and the seating will be steam-tight, which again is a great improvement on the old method of fixing. When fitting water gauge mountings it is desirable to get them lined up accurately.

I also noticed a range of boiler feed pumps and force pumps, in both horizontal and diagonal drive, lever hand pumps for use in locomotives, and also axle-driven pumps suitable for building into $\frac{1}{2}$in. scale locomotives. The very nice range of union fittings now being produced are all made to carefully designed standards and with interchangeable parts. For instance, a male end union can be adapted for use as a double-ended union. A range of stainless steel nipples, which to the model engineer will be a blessing, as they are far stronger than the usual gunmetal fittings of this type, was also on show.

Scale Model Stanchions

For the ship model maker, I noticed that amongst a somewhat enlarged range of fittings both for the power boat and sailing boat builder there was an extremely well finished range of shiprail stanchions—$\frac{1}{2}$in. scale and 3/16in. scale; in each size there are three types, 2-ball, 3-ball and 2-ball with spiked top for wood rail. These parts are beautifully and accurately finished, and add the final touch of realism to the amateur's model.



A fine example of high-class model making. A 1$\frac{1}{2}$in. scale model traction engine made by W. C. Gould, of Staines, and shown at the recent Model Engineer Exhibition at the New Horticultural Hall, Westminster, London, S.W.

Letters from Readers

SIR,—With reference to the letter from G. H. Child, in the August issue, concerning the trisection of an angle, I would like to point out that while his equation for a value of θ is correct, the right hand side of the equation, $\frac{\sin\theta}{1+2\sin\left(\frac{\pi}{2}-\frac{2}{3}\theta\right)}$, can easily be reduced to $\sin\frac{\theta}{3}$, showing that the equation is true for all values of θ.—S. COPPELMAN (Tottenham).

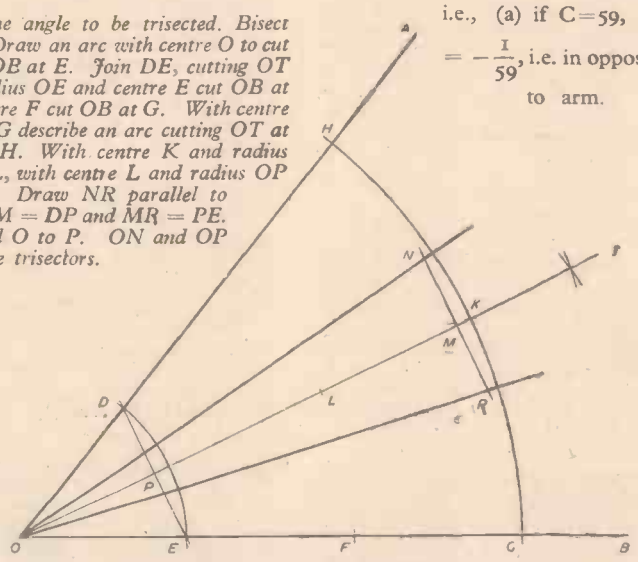
Trisection of an Angle

SIR,—A letter from one of your readers, G. H. Child, in the August issue, has made me put pen to paper. The letter commences with the statement that an angle cannot be trisected geometrically, which is what we are told in our early education.

It may, however, be of interest that after some experiment I fail to see anything wrong in my method, as illustrated in the accompanying sketch.

The construction could, of course, be made a little more clear, but the actual method is fairly simple.—R. RHODES (Newton Abbot).

Let AOB be the angle to be trisected. Bisect AOB by OT. Draw an arc with centre O to cut OA at D, and OB at E. Join DE, cutting OT at P. With radius OE and centre E cut OB at F, and with centre F cut OB at G. With centre O and radius OG describe an arc cutting OT at K, and OA at H. With centre K and radius OE cut OT at L, with centre L and radius OP cut OT at M. Draw NR parallel to DPE making NM = DP and MR = PE. Join O to N and O to P. ON and OP are trisectors.



Mechanical Paradox

SIR,—Your article on the "Mechanical Paradox" in a recent issue brings to mind what might be the simplest method of dealing with epicyclic gear problems, and which does not require the remembering of any formula; it is the "Tabular Method."

Operation	Revs. of A 60 teeth	Revs. of B x teeth	Revs. of C y teeth	Revs. of D (arm)
Fix arm and give A one rev.	1	$-\frac{60}{x}$	$\frac{60}{x}\times\frac{x}{y}$	0
Fix A, i.e. apply −1 rev to system	0	$-\frac{60}{x}-1$	$\frac{60}{y}-1$	−1

The first operation is invariably to fix the arm and give the fixed wheel one revolution, then to give the whole system a negative rotation to fix the "fixed" wheel from the table, when the arm rotates once C makes $\left(1-\frac{60}{y}\right)$ revolutions:

i.e., (a) if C=59, no. of revs. $=-\frac{1}{59}$, i.e. in opposite direction to arm.

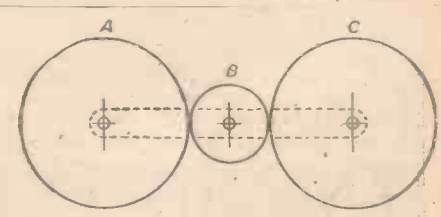


Diagram of mechanical paradox.

(b) if C=60, no. of revs.=zero.

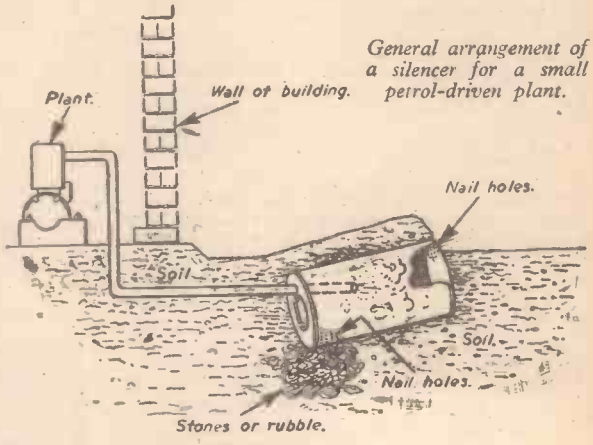
(c) if C=61, no. of revs. $=+\frac{1}{61}$, i.e. in same direction as arm.—P. J. G. HUGGINS (Wolverton).

Silencer for Small Petrol-driven Plant

SIR,—With reference to the article on small petrol-driven generating sets in the May-June issue, I used a very simple and effective method of silencing a small petrol engine some years ago which may be of interest.

The accompanying sketch explains itself, and as will be seen the silencer consists of an old five-gallon drum nearly buried in the ground; the holes at the bottom will be found necessary to take away condensation.

The engine used was an old 500 c.c. motor cycle unit, driving a pump, and when the grass grew over the "silencer" it was not scorched within a few inches of the exhaust holes and the gases did not even feel warm.—V. O. Harvey (Colchester).



General arrangement of a silencer for a small petrol-driven plant.

Books Received

"New Developments in Railway Modelling." By Edward Beal. Published by A. and C. Black, Ltd. 268 pages. Price 15s. net.

IN this book the author has set out to indicate to the railway modelling enthusiast anything of outstanding value in recent developments connected with the craft, to offer new designs for standard features, and in a general way to provide the constructor with useful ideas for his guidance. The aim has been to keep in mind the requirements of workers in OO-Gauge, HO-Gauge and O-Gauge, and the bulk of the information given accords with any of these standards. The book is profusely illustrated with line drawings and photographs.

"The Microscope, Its Theory and Applications." By J. H. Wredden, F.R.M.S. Published by J and A. Churchill, Ltd. 296 pages. Price 21s.

THIS book has been designed to meet the needs of students in various branches of science and industry. It explains simply the optical principles, the construction and components of this complex instrument. The development of the present-day microscope is dealt with in the Historical Introduction, contributed by W. E. Watson-Baker, an acknowledged authority on the subject. Besides giving general information about the theory and construction of the microscope, the author also sets down a number of more unorthodox applications and processes which he has developed as a result of constant use of the instrument. Illustrated by numerous diagrams and photographs, the book should prove a useful work of reference for anyone proposing to take up microscopy as a serious study.

"Miniature Building Construction." By John H. Shern. Published by Percival Marshall and Co., Ltd. 154 pages. Price 8s. 6d. net.

THOSE interested in the construction of miniature buildings and scenic work, especially lineside features for model railway layouts, will find much to interest them in this handy book. Valuable instruction in modelling is given in such widely differing subjects as houses, industrial premises, farms, garages and country inns. There are chapters on The Ultra-modern and Low-relief Modelling, and in an appendix there are some noteworthy designs for a variety of buildings, including a Modern Villa, Village General Shop, Filling Station and Garage and Small Country Railway Station.

Chemical Supplies

FROM time to time readers require to know where they can obtain chemicals or chemical apparatus for their experiments, and we frequently give the names and addresses where the necessary chemicals, etc., can be obtained. Interested readers may like to know that all kinds of chemicals and laboratory apparatus can also be obtained from Vicsons and Co., 114, Pinner Road, Harrow, Middlesex, who specialise in high grade chemicals and apparatus for students and experimenters. This firm will forward their latest apparatus price list on receipt of a 1d. S.A.E.

QUERIES and ENQUIRIES

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

Zinc Chloride

I AM interested in making a small quantity of oxide of zinc and chloride of zinc. Would you please state the method of doing this and also the price ready made and possible suppliers ?—J. Henessy (Barnet).

ZINC chloride can be made very easily by dissolving scrap zinc in a dilute solution of hydrochloric acid (hydrochloric acid, 1 part by volume, water 3 parts by volume). After no more zinc will dissolve, the solution is strained or filtered and slowly evaporated to dryness.

Pure zinc chloride in the form of white sticks costs about 6d. per oz.

Zinc oxide can conveniently be made by dissolving 1 part of zinc chloride in 3 parts of water and by adding a solution of caustic soda to the solution gradually until no white precipitate is formed. This is filtered off and washed well on the filter paper by pouring cold water through it.

The white precipitate consists of zinc hydroxide. It is converted into zinc oxide by heating to a dull red heat for a few minutes.

Pure zinc oxide costs (retail) about 2s. per lb.

All the above chemicals can be obtained from any dealer in chemical and laboratory supplies, such as Messrs. Harrington Brothers, Ltd., 4, Oliver's Yard, 53A, City Road, London, E.C.1, or Messrs. W. & J. George & Becker, Ltd., 17-29, Hatton Wall, London, E.C.1.

Liquid for Storm Glass

WOULD you kindly inform me as to the amount and type of ingredients to be used, and the procedure to follow, in the making of half a gallon of the substance used in the storm glasses of barometers ?—R. A. Denley (Holloway).

THE following is the required formula for making the active liquid of the old-fashioned weather glass, the liquid which clouds or crystallises in various climatic conditions :

Camphor	2½ drachms.
Rectified spirit ..	11 drachms.
Water	6 drachms.
Saltpetre	38 grains.
Sal ammoniac ..	38 grains.

Dissolve the camphor in the rectified spirit, then dissolve the saltpetre and sal ammoniac in the water and mix the two solutions.

N.B.—Methylated spirit or other impure form of alcohol will not do in place of the pure rectified spirit.

We have given you the normal quantity formula for the above material. It would be very expensive to make half a gallon of the above liquid owing to the cost of the rectified spirit, which is about 25s. per lb. There are 8 fluid drachms in 1 fluid ounce and 20 fluid ounces in a pint, 4 pints equalling 1 gallon.

Transparent-Coloured Cellulose Paint

I HAVE occasion to use transparent coloured cellulose paint. It was procurable before the war but is now unobtainable. Will you please inform me of any coloured pigments, liquid or in any other form, which are soluble in celluloid varnish (celluloid, acetone and amyl acetate)? The main colours required are blues (various), greens (various), reds, orange, yellow and purple. Also is there any way in which I can tell pure tin from soft solder, apart from a test by melting ? —F. Baldwin (Holloway).

THE majority of dyes are not soluble in celluloid solvents. They may, however, be persuaded to enter into such solutions indirectly.

Make up your normal celluloid solution in the ordinary way. Then dissolve in methylated spirit sufficient of a spirit-soluble dye to make up a very strong dye solution. Add this dye solution in small amount (not greater than 10 per cent.) to the celluloid solution. The latter will be coloured and will remain clear. Note very carefully that if too much of the spirit dye solution is mixed with the varnish the liquid will either separate into two immiscible layers or else a muddy solution will result. The same effect may be obtained by dissolving your dyes in either benzene or toluene. In fact these solvents are, perhaps, slightly more compatible with the celluloid varnish than the alcohol (methylated spirit).

Tin may be differentiated from solder by its appearance. Tin, when pure, has a bright, lustrous appearance. It does not tarnish or become dull in contact with air. Solder quickly dulls in air. If a little dilute *aqua regia* is poured on to tin, the surface of the metal will assume a crystalline appearance. This is not the case with solder.

You can make dilute *aqua regia* by mixing 2 volumes of strong hydrochloric acid with 1 volume of strong nitric acid, and then by diluting 1 part of the mixed acids with 2 parts of water.

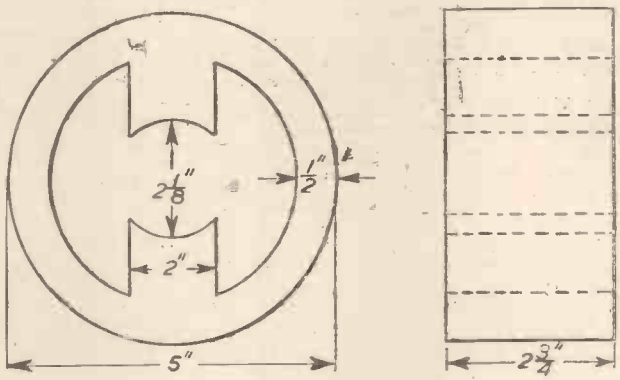
Boil together equal parts of lime and sulphur in a pan of water for 10 minutes until a yellow solution results. Strain this off, and place one drop of it on the metal. If it is solder a dull black stain will result. If the metal is pure tin, a much lighter stain will be present.

A bar of tin on being bent emits a slight crackling noise—the so-called "tin cry." Solder does not give rise to this effect.

Rewinding a D.C. Motor

COULD you please tell me how to rewind an old 200-volt D.C. motor to work off 6 volts ? Also, what gauge of wire and number of turns for poles and armature will be necessary ?—H. Hill (Chinley).

TO convert the motor to operate on 6 volts the armature and field coils could be rewound with exactly the same connections and coil span as at present, each coil however having 1/40 of the present number of turns, using wire having approximately 40 times the cross sectional area of the present wire (approximately 6.25 times the present diameter). The total cross sectional area of the brush, or brushes, on each brush spindle should be about one-half square inch, so that new brushes and brush holders may be required. The converted motor will probably take about 25 amps. on full load.



Armature 1⅞in. long, 2 1/16in. diam., 11 slots, built up of stalloy stampings.

Diagram of field magnet for small D.C. motor.—(H. Hill.)

In order to suggest suitable windings we should like a dimensioned sketch of the armature slots and teeth, and to know the air gap clearance between the armature and field poles (which may be measured by means of feeler gauges). We should also like to know whether a shunt or a series field winding is required. The former is perhaps the most difficult to wind but gives a more constant speed on a varying load, whilst the latter gives a high starting torque.

Shiny Garments

WHAT is it that makes garments take a shine after they have had a little use (particularly noticeable in dark suits)?

There are processes for removing the shine—can you suggest anything which I can do to remove it ?—R. Robinson (Halifax).

GARMENTS take a shine after considerable wear in virtue of the fact that the individual strands of fabric are tough and tend always to resist abrasive wear. A soft fabric will actually wear rapidly and fracture after a considerable amount of frictional abrasion, but a tough fabric will tend to become polished. This, therefore, is the underlying reason of the often annoying shine on male garments. It takes place on both light and dark shades of material, but it is always more noticeable on the darker shades since these shades which normally absorb the greater amount of light falling on them now begin to reflect some of the light.

There is no real cure for a "shined" garment. Going over the surface of the fabric with a piece of very fine glasspaper may slightly roughen the surface and so reduce the amount of shine, but unless this roughening process is very carefully carried out the fabric itself will become so thinned that it will rupture and so produce a hole.

The "shineless" garment is a long sought-for material, which the textile industry, despite research, has not yet succeeded in bringing into reliable being.

Water Softening Apparatus

MY domestic water supply is very hard, the water containing a high proportion of chalk.

I would like to make a water softening apparatus, if possible of the type which softens the whole supply at the inlet. Could you please give me any advice on the principles of the above apparatus, and any information concerning practical books on the subject?—L. A. Morledge (Bodenham).

THE water-softening principle to which you refer is the "Permutit" system. Here, the hard water is trickled through a bed of a special zeolite or "exchange" material. The material extracts the hardness-forming salts from the water so that the water becomes soft and fit to drink. After a time, the material loses its activity, becoming choked with extracted hardness-forming elements. It can then be reactivated or regenerated by trickling a solution of common salt through it and then washing it with soft water.

If you can obtain some of the active material, pack it into a suitable narrow cylinder, say one about 1ft. high, and arrange to trickle water through this, you will then have an improvised softener. The material is called "Deminrolit" and is obtained (normally) from The Permutit Co., Ltd., Gunnersbury Avenue, London, W.4. This company will, no doubt, send you copies of their literature concerning water-softener equipment, as, also, will Sofnol, Ltd., Greenwich, London, S.E. It is, of course, hardly possible to make for oneself a water-softener having the all-round efficiency, convenience, speed and ease of working of the commercial article.

There are very few books on water-softening. You will get most of the literature you require from the above-mentioned firms. Alternatively, apply to Messrs. Wm. Bryce, 54, Lothian Street, Edinburgh, for any available books (new or secondhand) on this subject.

Paint in Glycerine : "Miniature Snow"

(1) CAN you tell me if there would be any decomposition of rubber or enamel (the ordinary household paint) if these substances were kept in glycerine ?

(2) What is the white substance used to represent snow in the toy consisting of a glass globe in which is water and a hut, the whole representing a snowstorm?—K. Armitage (Cranleigh).

(1) A SURFACE painted with a good hard gloss paint or enamel would be proof against immersion in glycerine, provided that the temperature of the glycerine was not approaching that of the softening-point of the paint.

At ordinary temperatures a rubber article will withstand glycerine, but if the temperature is raised very appreciably (say, to the "warm" state) the glycerine

may sometimes attack the rubber. It all depends in this instance on the precise composition of the rubber.

These remarks apply to concentrated glycerine. If the glycerine is diluted with water, any possibility of deterioration of the rubber or enamel is very much reduced, even when the temperature is raised, always provided that the glycerine is pure and is free from admixture of salt solutions.

(2) The "miniature snow" substance to which you refer is powdered mica, a fairly cheap material, which may be had from any good firm of chemical laboratory furnishers as, for example, Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2, or Messrs. W. & J. George & Baker, Ltd., 17-29, Hatton Wall, London, E.C.1.

Removing Rust Stains on an Enamelled Bath

WILL you please inform me as to the best method of removing rusty water-stains from a stove-enamelled bath? I have tried various chemicals including oxalic acid, salts of lemon, paint remover, etc., but without success.—J. Dimond (Bournemouth).

JUDGING by the number of treatments which you have applied, we imagine that the stain is well below the enamel surface, and if this is the case, there is no treatment which you can apply without injuring the enamel.

You may, however, care to apply the following treatment:

Make up a paste of chloride of lime and water. Apply this to the stained area. Then mop dilute hydrochloric acid (50 : 50 water-diluted) over the area. Chlorine gas will be generated and this may remove the stain.

If the method does not work, the inference is that the stain has formed under the enamel (the water having penetrated thereto through some tiny chip or crevice), and there is, unfortunately, no method which will remove it without, at the same time, removing the enamel.

The same thing occasionally happens in the case of high-gloss porcelain enamelled baths. If the enamel becomes at all porous, or if it has originally been defective in any way, water penetrates down to the iron base of the structure, rusts it, and so sets up a stain or discolouration which is quite indelible.

Eliminating Condensation Trouble

I HAVE a workshop constructed of galvanised sheet iron, and my machinery and work become very rusty due to severe condensation.

I would greatly appreciate your advice regarding an efficient and fairly inexpensive method to overcome this trouble. The use of Essex board or panelling is, unfortunately, barred because of the fire risk involved.—R. D. Baxter (Boreham Wood).

THE condensation trouble such as you experience is almost universal in these days of light buildings and prefabs. It is caused by the warm air within the structure depositing its moisture in the form of an artificial dew on the cold sides of the building. In other words, the cause of the trouble is to be found in the rapid heat-loss from the building.

Anything which you can do to prevent or to lower this heat-loss will bring about an improvement of conditions. The best plan is to try to convert the existing walls into a double-wall system with an air-space between them. Alternatively, you can place tarred or bituminised felt on the outside of the structure so as to lower the escape of heat therefrom. Asbestos sheeting will have the same effect, and even a coating or two of an asbestos paint will help.

We observe in the trade literature that Chemical & Allied Products, Ltd., Midland Bank Buildings, 225b, Kensington High Street, London, W.8, advertise a "Watson's Plastic Paint," which is stated to have anti-condensation properties. We have no knowledge of this product, but apparently it might be worth while your inquiring about it.

Making "Chalks"

I WISH to manufacture white chalks as used in schools. Can you give details of mixtures and of the forming process, i.e., are they cast or pressed into moulds? If the latter, can you give me either details of a press or the address of a firm who can supply a suitable appliance?—H. A. Searle (St. Ives).

THE so-called "chalks" are composed merely of pipeclay. The pipeclay is mixed with water to form a stiff dough. Sometimes the material is made harder by adding a little soap and/or gelatine to the water. The material may also be coloured (or whitened) by adding suitable pigments, a good white pigment being titanium oxide, obtainable from British Titan Products, Ltd., Billingham, Co. Durham. The material is allowed to stand a few hours, after which it is pressed into balls. These are then rolled between boards until they acquire a cylindrical shape, and finally they are cut up into lengths and put aside to dry out slowly.

In other instances, the plain or pigmented material is packed into wooden cylindrical moulds which have been drilled in a piece of fine-grained wood and then cut across downwards so that the wooden moulds come apart into two halves. The two halves are assembled together, the material is packed into the moulds so formed and, after drying, the two halves of the wooden mould assembly are again divided, thereby releasing the moulded chalks. The time taken to produce a batch of chalks under these conditions would be two or three days, the precise number of chalks depending on the number of moulds available.

Most of the moulding machinery for this type of production was of German manufacture, and we regret that we are quite unable to trace such former manufacturers. So far as we can ascertain, production of such moulds has not been set up in this country. It should not, however, be very difficult for you to make your own. Merely drill holes in a block of wood, and then cut vertically downwards through the holes, thus dividing the wood block into two equal halves.

Invisible Line Drawings

I AM desirous of ascertaining the method of producing line drawings which are invisible until a piece of orange glass is passed over. Can you give me any information on the subject?—A. Craig (Barrow).

THE only drawings of this nature with which we are familiar are those produced on an azure paper in very faint blue ink, which drawings in all but a very strong light are almost invisible. Viewing them through reddish orange or red glass throws up the image in dark grey lines against a lighter grey background.

Another way is to make the drawing on smooth paper in a strong solution of quinine sulphate in ammonia. This liquid absorbs ultra-violet light and the paper which is impregnated with it has the same properties. Hence, when viewed through orange-yellow glass the unequal absorption of light on the paper surface shows up the quinine-treated areas in a greyish shade.

No doubt, therefore, it is one or other of these methods which you are referring to.

Silvering Mirrors

WILL you please inform me how to silver mirrors and electric lamps?—E. H. Wellings (Bristol).

GLASS silvering is not an easy job. If you attempt it, you will, no doubt, encounter failures and difficulties. Nevertheless, with care and patience it is possible for an amateur satisfactorily to silver glassware by chemical means. Here is the method:

First of all, the glass must be cleaned very thoroughly and made grease-free. Ordinary cleaning with soap and water is hardly sufficient if the glass has been dirty. Immersion in dilute nitric acid is better, followed by a wiping down with a paste of chalk and water, and finally by a good rinsing in water—preferably distilled. Two chemical solutions are necessary.

Solution A:

Silver nitrate	6 grams
Water	75 c.cs.

To the above solution add ammonia *drop by drop* until the copious precipitate which is first formed re-dissolves on shaking or stirring. Add the ammonia very carefully and do not over-shoot the mark. If the solution contains too much ammonia the silver will not precipitate in mirror form. There must be just sufficient ammonia to dissolve the precipitate—*and no more!*

Solution B:

Glucose	10 grams
Water	100 c.cs.

Just before silvering the glass, pour over it a 10 per cent. solution of stannous chloride (tin chloride) in water (i.e. 10 parts of stannous chloride dissolved in 90 parts of water). This is not absolutely essential, but it improves the appearance of the mirror film and its adhesion to the glass.

Then put the glass in a shallow porcelain dish, such as a photographic dish. Rapidly mix equal quantities of solutions A and B, and pour it over the prepared glass surface. Slightly warm the dish over a water or a steam bath. The silver mirror will form at once and will be completed within five or six minutes. Then, remove the mirror, rinse it in water and allow it to dry, subsequently flowing a layer of protective varnish over the back.

Electric bulbs can be silvered by dipping them in the mixed silvering liquids. Very large sheets of glass can be treated by pouring the mixed liquids over them and by lowering them on to a warm surface, but it is not advisable to attempt large silverings until competence in small work has first been attained.

The solutions should preferably be made up with distilled water.

All dishes and even the hands and fingers must be scrupulously clean and grease-free. The slightest trace of grease, oil or other contamination will ruin the silvering.

Imitation Panel Work: Floor Polish

COULD you give me details of how to create imitation panel work, as used for the lower half of kitchen walls, and also the best materials to use? Also, how could I make floor polish in appreciable quantities?—F. J. Tresidder (Spennymoor).

BY "imitation panel work" we take it that you refer to the "leatherette" papers which are used for this purpose. We are afraid that you would not be able to make any of this material for yourself. The next best thing, therefore, is to fasten a good quality thick wallpaper in position on the wall, to let it dry out thoroughly, and then to stain it to your requirements, using a spirit stain. Finally, give the surface two coats of a good clear varnish.

Floor polishes are very easily made. Hence the enormous number of small polish-manufacturing concerns. You can make a good floor polish by dissolving 30 per cent. of a suitable wax mixture in 70 per cent. of white spirit. That is to say, 30 parts dissolved in 70 parts.

A suitable blend of waxes is 60 per cent. beeswax, 10 per cent. paraffin wax and 30 per cent. carnauba wax. This will give a very excellent hard polish. Dye and perfume may be added to the polish, if required. Merely warm the white spirit, add the waxes, stir until they have dissolved, and then pour the resulting solutions into flat tins to solidify. Waxes named above may be obtained from any good firm of wax merchants and manufacturers, as, for example, Messrs. Wilkins, Cambell and Co., Ltd., West Drayton Middlesex.

Liming Oak Furniture

I SHOULD be glad if you could give me some information about "limed oak," as I have some light oak furniture which I would like to finish in this manner.—R. W. Poole (Oulton).

TO "lime" oak wood, remove all of its varnish and, if possible, give it a scrubbing down with hot water and caustic soda—say 1 part of caustic soda in 5 parts of water. This will open the wood grain. Allow the wood to dry slowly. Then make up a stiff paste of glue water and whiting. With a suitable pad or even with the ball of the thumb, wipe this paste over the wood surface, pressing it well into the grain. Then take a blunt knife or scraper and draw it closely over the wood surface, removing all the surplus paste. You will be left with a plain wood surface the grain of which has been "filled" with the white paste. This is allowed to dry thoroughly. The wood may then be left "naked" or else it may be lightly varnished over. The latter treatment is the better, since a "naked" wood quickly becomes dirty in ordinary use.

If you want something whiter than ordinary whiting, you may use titanium oxide, magnesium carbonate or zinc oxide, but usually any good grade of whiting is satisfactory enough.

Electrolyte for Nickel-cadmium Cells

I HAVE some nickel-cadmium cells which I desire to refill with electrolyte. I understand that a caustic solution is required.

Would a caustic soda solution be suitable for these cells? What is the difference between caustic soda and caustic potash (potassium hydroxide)?

Also, could you please supply me with the name and address of a firm who could supply the necessary materials for the making up of this electrolyte, preferably in dry form.—B. Poots (Whiteabbey).

IT is usual for potassium hydroxide to be used as an electrolyte in the cells you name, but, no doubt, sodium hydroxide solution would be quite effective. It is essential, however, that the sodium or potassium hydroxide are pure and not highly contaminated with iron or other impurities. For this reason, you should use the purest material available.

Potassium hydroxide and sodium hydroxide are entirely different compounds, yet similar in chemical pattern. Potassium hydroxide may be regarded as a combination of the metal potassium with the "hydroxyl" or —OH group of atoms. Thus it has the chemical formula K—OR (*K* being the abbreviation for *Kalium*, the latin for potash).

Sodium hydroxide, on the other hand, contains the metal sodium in place of potassium. It has the chemical formula Na—OH (*Na* denoting *Natrium*, the latin for soda).

Any large chemical store should be able to supply you with either potassium or sodium hydroxide in dry form. Alternatively, these materials can be procured from Messrs. Wm. Canning and Co., Ltd., Great Hampton Street, Birmingham, or from any good firm of laboratory furnishers, such as Messrs. J. W. Towers and Co., Ltd., Victoria House, Widnes, Lancs; or Messrs. A. Gallenkamp and Co., Ltd., 17-29, Sun Street, Hatton Garden, London, E.C.1.

Bleaching Furniture

I WISH to bleach some walnut and mahogany furniture so as to finish it in an off white or creamy effect. Can you give me a formula for the bleaching agent?—S. A. Wright (Loughton).

REMOVE all traces of varnish from the wood surface, and scrub it down with soap and water. Then make a paste of chloride of lime and water. Spread this evenly on the wood surface, working it well in. Obtain some hydrochloric acid (spirit of salts). Dilute this with an equal volume of water, and sprinkle it on the surface of the paste. Effervescence will take place, chlorine gas will be generated in small amount and this will exert a bleaching effect on the wood. After an hour, wash the paste off the wood and wash the surface very thoroughly in plenty of water. On drying, the wood will be very considerably lightened in colour. The process can be repeated if desired. If the sun is allowed to shine on the wood whilst it is undergoing this treatment, the bleaching effect will be enhanced.

Another method is to make up a strong solution of potassium permanganate and to paint this on to the wood so that the latter is very much darkened and discoloured. 1 part of sodium sulphite (not sulphate) is dissolved in 4 parts of water and a little dilute hydrochloric acid is added to the liquid. The liquid is then liberally mopped over the woodwork. Within a few minutes the permanganate stain will disappear, leaving the wood very much lightened. Needless to say, all traces of the solution must be removed with plenty of water afterwards.

Of the two, the chloride of lime bleaching method is the more satisfactory, and is rather easier to apply.

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

Comments of the Month

By F. J. C.

The Cost of Road Accidents

PROFESSOR J. H. JONES, Professor of Economics of the University of Leeds, has estimated that in terms of the national income the cost of road accidents to the community for the years 1935-1938, averaged annually during that period at the price and income levels then prevailing, was nearly sixty million pounds. If the same total number of similar accidents were to occur under present conditions the cost would be over one hundred million pounds. For the period quoted the cost of road accidents thus represented 1.33 per cent. of the total national income. Of that cost, nine-tenths represented human injury. A small group of one-eighth of the total number of accidents (the most serious of all the accidents) accounted for nearly seven-eighths of the total annual cost to the community. Pedestrians, cyclists and motor-cyclists were the road users most likely to suffer death and serious injury in road accidents.

The Government's Actuary, adopting a different method of assessment, gave the total loss to the State as fifty million pounds. Thus fatalities and accidents represent an annual cost to the community equal to the amount of money spent on the whole of the highways. Every mile of the one hundred and eighty thousand miles of British roads is thus costing the State, in accidents, between three hundred and four hundred pounds a year.

Now a great move is on to try to speed up traffic. Whether this increase in speed will result in an increase in safety remains to be seen. We are of the opinion that speed is not necessarily dangerous, since many of these accidents occur in areas where the speed limit applies, and it is observed that accidents increase as the speed goes down. Congestion is a great cause of accidents, and one of the causes of congestion is the horse-drawn vehicle.

In 1934 there were 1,263,507 horse-drawn vehicles on the roads of this country, as compared with 1,892,205 in 1924. Other statistics are not available, but in 1944 there were nearly 700,000 horses used for agricultural purposes and which used the roads of the country. In 1939, the last year for which statistics are available, there were 180,527 miles of roads in this country, including Trunk Roads, Class 1 and Class 2 roads. This is only an increase of about three thousand miles of roads since 1924, and an increase of five thousand since 1911. The number of vehicles using the roads, however, has increased by over one thousand per cent. since that time, and the number of regulations controlling the construction and use of vehicles, and the use of the roads, has grown from about three hundred to over two thousand.

In the House of Commons on May 6th, 1946, the Minister of Transport made a statement on the Government's programme for the development of the highway system. The objects of the Government's programme are as follows:

1. Promotion of safety on the highways.
2. Improvements to assist development areas in particular and industrial development generally, including better access to ports and markets.
3. Improved through communications.
4. Rehabilitation and improvements of towns and countryside, the re-development of devastated areas, the improvement of access between the home and the workshop or office, and reduction of traffic congestion.
5. In the country, the promotion of the efficiency of agriculture.

In order to include major works of construction and reconstruction, a period of ten years has been envisaged for the highway programme, divided into three stages:—

1. Two years—of renewed maintenance and beginning of works of first priority.
2. Three years—of increased activity on major road works, including a limited number of motor roads for the development areas.
3. Five years—in which comprehensive reconstruction of the principal national routes will be undertaken, including a further number of motor roads.

In this way "movement on our highways will be made freer and safer for all classes of road users with corresponding advantage to the economy and well-being of the country as a whole."

It is interesting to trace the development of the Road Fund which was instituted by Mr. Lloyd George in 1909, being set up by the Development and Road Improvement Funds Act, 1909. In his Budget speech, Mr. Lloyd George gave his reasons for setting up the Fund, stating that motorists would provide the finance, that the Exchequer would derive no advantage from the new taxation imposed on motorists, and that the whole of the money collected was to be spent on the roads. To this end he introduced a graduated scale of motor vehicle duties and a petrol tax of 3d. per gallon, with a half rebate to commercial vehicles. The relevant portions of Mr. Lloyd George's Budget speech of 1909 are as follows:

Mr. Lloyd George: "It is quite clear that our present system of roads and of road-making is inadequate for the demands which are increasingly made upon it by the new form of traction. . . . The State has for a very long period done nothing at all for our roads. . . . Both the general public and motorists are crying out for something to be done, and we propose to make a real start. How the funds will be raised for the purpose it will be my duty later on to explain; the only indication I shall give now is that the brunt of the expense must be borne by motorists, and to do them justice they are willing, and even anxious, to subscribe handsomely towards such a purpose, so long as a guarantee is given in the method and control of the expenditure that the funds so raised will not merely be devoted exclusively to the improvement of the roads, but that they will be well and wisely spent for that end. . . . Once more I want to make it clear before I dismiss this part of the subject that expenditure undertaken out of the fund must be directly referable to work done in connection with the exigencies of the motor traffic of the country.

"I think it will be to the convenience of the Committee if I deal first with motor-cars, and so dispose at once of revenue from which, as I have explained, I, as Chancellor of the Exchequer, shall derive no advantage."

"Is it intended by the Chancellor of the Exchequer that the tax upon petrol, like the tax upon motor-cars, should go to the roads, or is it intended that it should go to the general Imperial revenue? Our attitude towards the tax depends on the answer to that question. If it is going to the support of the roads, we think it a very fair proposition; if it is intended to take it for the general revenue, we shall oppose it," said Mr. Chamberlain.

To which Mr. Lloyd George replied:

"With regard to petrol, my proposal is that the whole of the money raised, whether by increasing the graduation of the scale or by the amount of the petrol duty, should go to the improvement of the roads. They are not going to the local authorities, but to the central authority, and the central authority dispenses the whole of the money, which will amount, as I anticipate, to something like £600,000 in the course of the present year, upon a scheme for the improvement of the roads, but the improvement must be made in reference to motor traffic."

The money raised by the two taxes, the motor-vehicle tax and the petrol tax, was paid to what was called the "Road Improvement Fund," which later became more generally known as the "Road Fund." At the same time a Board, known as the "Road Board," was set up to control the expenditure of the money collected. The Road Board did not in the main undertake the construction and maintenance of new roads themselves, but largely confined their activities to making grants to Local Authorities of part of the cost of the expenditure undertaken by them.

We mention these facts to explain why it is that road improvements so urgently necessary have not been carried out. The money has been raised to carry out those improvements, but it has been spent in other directions.

Lincoln
A view of the lovely 13th-century cathedral and the old gateway

Paragrams

Four-wheeled " Bicycle "

MR. E. R. PHILLIPS, a Peterborough electrician and keen model engineer, has built himself a four-wheeled " bicycle " on which he and his wife can ride side by side, with a small son in a seat behind. Steering is by means of a car-type wheel, there is three-speed gear fitted and powerful brakes operating on the rear wheels. The two front wheels are over 4ft. apart, but the rear wheel base is about 12in. Mr. Phillips claims 28 m.p.h. as the maximum speed reached.

Wot ! No Clips?

" I NOTICED he had no trouser clips and had just tucked his trousers into his socks," said a Loughborough (Leics) policeman, describing to the magistrates how he caught a man riding a stolen bicycle. It must have been the policeman's lucky day, as the " socks outside trousers " fashion is still not uncommon, even if cycle clips are to be seen in the shops nowadays.

Showing Them Up

THE Chief Constable of Hull has organised a team of police photographers who watch out for children cycling to the danger of themselves and others or in any other way behaving so as to be the possible cause of a street accident. Any offender will probably find when he or she goes to school next day that the teacher has a photograph showing how the child disregarded the rules of road safety. One of the Hull police sergeants has lectured to several thousand children on road safety, and he has offered to give a 15s. Savings Certificate to anyone who can catch him breaking a rule of the road.

They Say

IT is reported that for a £5 bet a workman in one of the brickyards at Yaxley, near Peterborough, hauled his cycle up to the top of one of the brickyard chimneys and cycled round the parapet. Unfortunately there were no photographers at hand at the time.

Grantham Rider's Win

GEORGE RAINES, of the Grantham Road Club, was the winner of the first handicap award in the Lincolnshire Road Riding Association's Championship " 100 " which was held at Lincoln on July 13th.

To Mark the Spot

SO that other road-users should be given cause for thought, a member of Litherland (Liverpool) Road Safety Committee suggests that roads should be marked wherever an accident has happened. The site of a fatal accident, he suggests, should be marked with a red cross, with blue crosses to show non-fatal accidents and white crosses for mere collisions where no one was injured. His idea is that ordinary road safety posters are ignored by the very people who ought to take notice of them, whereas crosses on the road would be seen by all road-users.

New Champion

TWO riders in the Grantham Road Club's 100 miles championship broke existing records for the run. The winner, J. O'Connor, beat the course record, which had stood for a number of years, by twelve minutes, his time being 4 hours 34 minutes 58 seconds. G. Raines, who came in second, checked in with a time of 4 hours 39 minutes 47 seconds and clipped seven minutes off the previous best time.

Cycles Round the Course

EVEN when his legs were seriously injured by a flying bomb, 34-year-old Joe Ainsbury, who is a member of Swinton Park Golf Club, Manchester, refused to think of the possibility of his golfing days being ended. At one time it was thought that his legs would have to be amputated, but now, by wearing a pair of special supporting boots and riding a low-built cycle, adapted to carry his clubs in two containers, one either side of the front wheel, Joe manages to get round the course almost as well as he did before. He can only walk a few steps unaided without the help of his cycle.

Too True

ANNOUNCING that a summons against a cyclist offender would be dismissed under the Probation of Offenders Act, the chairman of Lambeth Juvenile Court said it was manifestly unfair that cyclists should be banned from Dulwich Park, while motorists were allowed to take their cars into the park.

Keep to the Roads

LEICESTERSHIRE County Council are preparing to introduce a by-law which will give them power to prosecute cyclists who ride on footpaths. Local authorities in the county are being asked by the council to supply details of all footpaths to which they consider this proposed by-law should apply.

Progress

THE telegram boy on his red bicycle looks like being superseded by a postman on an autocycle, if experiments now being carried out by the Post Office in country districts are successful. Where telegrams are delivered over a wide area in the country a cyclist takes too long and so, to avoid the use of a mail van for the delivery of two or three telegrams, the use of autocycles is under consideration.

Promising Boston Rider

ALTHOUGH he is only 16 years old, Peter Brotherton, one of the youngest members of the Boston Cycling and Athletic Club, is making a name for himself and looks like becoming one of Lincolnshire's leading track riders. Peter got his enthusiasm for the sport from his elder brother, George, a keen competition rider and former secretary of the Boston Club, and early last year he started a little track riding on a machine made by himself from various bits and pieces. A few months ago his brother helped him to get a better cycle and shortly afterwards he entered in his first event, but without success. He made up for this, however, at six subsequent meetings in Lincolnshire, winning four firsts, two seconds and a third in open events. At Horncastle on August Monday he scored his biggest success so far, winning the Lincolnshire mile championship, in spite of strong opposition from older riders.

Glow-worm Lamp

IN these days of scarcity and high prices it is usually a case of making do or going without, and according to a report of police court proceedings at Rushden, Northants, on an August day just 47 years ago, old-time cyclists were not devoid of ingenuity. One rider, being unable to get a cycle lamp, collected three glow-worms and corked them up in a bottle, which he fastened to his jacket. When he was subsequently summoned for riding without a light he explained to the magistrates that according to his calculations the light from three glow-worms equalled one candle-power and therefore he was not riding without a light. The magistrates disagreed, as magistrates are apt to do, and told him that after he had paid his fine he should throw away his bottle of glow-worms and buy a proper lamp.

Rutland's Fight

IN its fight to avoid being swallowed up by some other county, Rutland, England's smallest county, has notices reading " This is Rutland," erected on all the roads crossing the county boundaries. One of these notices, where Rutland meets Lincolnshire, just outside Stamford, has been improved by some unknown hand. Additions have been made in the spaces between the words and the sign now reads : " As It Was In The Beginning THIS IS Now RUTLAND And Ever Shall Be."

Bicycle Made for Twelve

A CONVERSATION between a group of cycling enthusiasts the other day resulted in reference being made to a real family cycle, which was built in the early days of the sport by a Leicester cycle-maker. In those Victorian days, families were really families, and did not consist of the odd child or two of to-day, and this machine was built to carry papa, mamma and 10 offspring. If every member of the family worked with a will, this contraption must have got up a good speed, even in those days of solid tyres and bumpy roads, but it is to be hoped the machine never had to negotiate a hairpin bend.

Puncture Led to Death

A PUNCTURE sustained by one of two boy cyclists who were riding near Biggleswade was the indirect cause of the death of the other. When the puncture was discovered, the boys went into an ammunition store to see if they could find any scrap metal suitable for a tyre lever. They found no metal, but they did find a phosphorus smoke bomb into which they inserted a detonator. As the boy with the puncture was bending over his cycle, the other boy balanced the bomb on his back. It fell off and exploded, enveloping both boys in a mass of flames. One died later in Bedford County Hospital and the other was critically ill for several days.

Bedstead Alley

LOCAL people have nicknamed what was once an attractive stretch of road between Louth and Binbrook, Lincs, " Bedstead Alley " because of the thousands of service bedsteads which have been dumped there. These bedsteads are stacked out in the open on the grass verges by the roadside and the villagers say the road has been used as a dump for over a year. Mr. Cyril Osborne, M.P. for the Division, is now to raise the matter in Parliament in the hope that some better use may be found for the bedsteads.

Giving Us a Bad Name

TWO examples of bad cycling, which result in every cyclist getting a bad name from unthinking people, were seen during the holiday season. On a busy road to Skegness, crowded with buses, cars and other traffic, a man and his wife were cycling along side by side, with one hand each on their handlebars and the other towing between them a pram containing a young baby. Nothing could have saved them had they come to a sudden " squeeze " in the traffic streams. The same day another couple were seen using the same method of transport, but, in this case, in addition to the baby in the pram on tow, a second child was seated on the crossbar of the man's cycle. These people may be tired of life in post-war Britain, but they could choose a means of suicide less inconvenient to other people.

Pedal-car

WISHING to have something a little more weather-proof than the ordinary tandem, Mr. Dando, of Eastcote, Middlesex, has just built a lightweight " pedal-car " to carry himself and his wife. It runs on four cycle wheels, the front pair being steered by a car-type steering wheel. There is a very light body and a most impressive looking radiator, something on the lines of one of the American Dodge limousines, complete with mascot, and a bumper to protect the wheels. The driver sits at the wheel in a comfortable seat with a back to it and his passenger, sitting directly behind him, is expected to pedal with a will and pull her weight. Altogether this novel vehicle is a very workmanlike job and is so much like a tiny car that the police have pulled it up several times to see why it was carrying no licence plates.

Back to the Bicycle

THE bicycle has been called upon to help aircraft engineers, now engaged on the problems of designing machines to fly faster than sound, out of their difficulties. The Glenn Martin Company is engaged on the construction of a multi-jet aircraft with particularly thin wings, which wings make it impossible for the normal retractable undercarriage to be used as there is no space into which the under-carriage can retract. The new-type undercarriage copies the bicycle, with two wheels, one behind the other, retracting into the fuselage. To prevent the aircraft falling over when not moving, a thin outrigger wheel is fitted to each wing, but on take-off and landing the machine rides its two fuselage wheels exactly like a bicycle.

They Know What's Best

THE secretary of a Kettering Youth Club which although named the Kettering Toller Youth Fireside specialises in outdoor events, has been checking up on the activities most popular with the members. Cycle trips to the surrounding towns and villages attract some 30 or 40 members while the average number taking part in rambles is often around a dozen, and on occasions has been as low as seven.

Tricycle With Propeller

PIERRE ST. AMAND, an ingenious youth who lives at Fairbanks, Alaska, has built himself from bits of old bicycles, scrap aircraft parts and other odd-ments a tricycle which is driven by an airscrew at the rear. A two-cylinder petrol engine provides the motive power and the driver sits in a bucket seat just in front of it, controlling the tricycle by means of a " joy-stick " which steers the single front wheel. A top speed of 15 miles an hour is attained, but it is to be hoped that petrol is cheaper in Alaska than it is here for the contraption can only travel five miles to the gallon.

Strayed !

IF 81-year-old Mr. Joseph William Kennewell, of Harlaxton, Grantham, had stuck to his old love, the bicycle, he would now be one of the oldest cyclists on the road but, sad to say, he slipped and now he rides one of those noisy machines known as motorcycles. His first bicycle was made of lumps of iron and wood and, to the rider, appeared to weigh nearly a ton, but he gradually progressed by way of the " penny-farthing " to solid-tyred safeties and models with cushion and pneumatic tyres, and then to a modern lightweight. Eventually, however, he decided that to get to work in all weathers he would have to have a motorcycle as cycling was getting to be hard work.

Black Mark for Boys

CAMBRIDGE police recently carried out a road-worthiness check on the cycles ridden by local schoolchildren. A total of 3,368 machines were checked, and it was found that the girls' cycles were kept much better than those belonging to the boys. It looks as if the girls are becoming more mechanically minded than the boys these days.

Around the Wheelworld

By ICARUS

St. Catherine's Chapel.

The old chapel (1317) built on St. Catherine's Hill outside Guildford. To the left lies the Pilgrims way across the downs to Canterbury.

Old Timers

AT the Roadfarers' Club luncheon recently, when Sir Malcolm Campbell was the guest speaker, I met several old timers of the cycling movement and was amazed to learn of their age. For example, W. G. James, one of the first manufacturers of the safety bicycle, was present, as virile and young looking as ever and tells me that he is still in business as a valve manufacturer. He is over 82 years of age.

A. H. Bentley, of the Resilion Brake fame, whilst he has not yet attained that age which qualifies him to be classed as an old timer, was also there, looking fit and healthy, no doubt as a result of his now being domiciled in the salubrious district of Ockley.

Sir Malcolm is an old cyclist who maintains his youth for all his sixty or so years, and tells me that his plans for attack on the speed record for boats are well ahead.

And then there was the perennial evergreen, ever cheerful, lively and experienced Coles-Webb (Coley for short), who celebrated his 81st birthday. His interest in cycling is keener if anything to-day than it was 50 years ago, when he was vigorously improving the lustre of the family escutcheon and piling up loads of silverware, clocks, pianos, bureaux and bric-a-brac as a result of his success with a bicycle on the road, and at sports meetings.

The Roadfarers' Club has a generous sprinkling of cyclists as members. R. A. West, the secretary, is an old cyclist and an ex-member of a now defunct cycling club, the Bath Road Club, which has since been reformed as a limited company!

Frank Urry, almost 70 years young, and a keen exponent of the free-wheeler; Major H. R. Watling, director of the Bicycle Manufacturers' Union; Frank Southall, of record-breaking fame; J. Dudley Daymond, another record-breaker; Ballantyne, of the Cycle Retailers' Association; these are but a few of those who belong to the Roadfarers' Club. Members of every aspect of roadfaring belong to this famous club, and also members of every shade of political opinion. Noel Baker, M.P. for Derby, and ex-Parliamentary Secretary to the Ministry of Transport; Lord Brabazon, ex-Minister of Transport and President; Lord Perry, of Ford car fame; Lord Iliffe, one of the founders of the famous publishing firm; Lord Kenilworth, of Armstrong-Siddeley fame (Jack Siddeley) another old cyclist, these are a fair sample of the membership of this world-renowned club, which seeks to weld the interests of all road users; it is non-sectarian, non-political, non-profit-making, and you cannot join it! For membership is by invitation only, and that invitation is only issued after a unanimous vote of the committee. I always enjoy these Roadfarers' meetings and the good-fellowship which permeates them. How different from the meetings of other cycling organisations, with their petty jealousies, hates and intrigues. And how glad I am that the old order is changing, and that those who have framed the cycling policy, conceived in hate and born in malice, are vanishing from the cycling scene. They have all done very well out of it, as paid advocates. In a movement which is jealous of its amateur status, let us exclude professionals from the top!

Gordon Randall's Sketches

IT is easy for any cyclist to visit and impress upon his memory the views so travel-temptingly depicted in these pages by our artist, Gordon Randall. This journal, however, circulates all over the world and those sketches provide a nostalgic reminder to our overseas readers of the joys of the English fairyland they have left behind. I received a letter the other day from Mr. F. A. Jones, who resides in Western Australia. He says that whilst wading through some back numbers of PRACTICAL MECHANICS he came across Gordon Randall's sketches, and it aroused in him a desire to revisit the old country and the spots so delightfully sketched by Gordon Randall, who is the leading cycling artist in this country. These sketches impart to those overseas something of the beauty of the English countryside which many of them have not been privileged to see.

London to have 32 Special Police Patrols

TRAFFIC jams and bad accidents are now being specially handled by the Metropolitan Police. Eight traffic accident groups, each consisting of a car with an escort of two Triumph twin motor-cycles, have already been given areas to patrol, and any police officer on duty who has trouble with the traffic, or with any smash of more than a minor nature, telephones Scotland Yard, who in turn send on the nearest patrol to help him. The patrol car has a two-way radio transmitter to keep in constant touch with headquarters. The intention is to raise the number of patrols from eight to 32.

Eventually, each motor-cyclist in the Metropolitan Police is also to have a two-way radio transmitter with military valves, a handlebar flick-switch and an upright aerial which is fixed at the back of his machine.

The rider will not wear headphones and, to leave his hands free for control, he will have a mouthpiece fitted round the neck. It is hoped that each machine will carry a loudspeaker to allow the rider to address the general public when on the move.

The work of the motor-cycles now on patrol in London has been so satisfactory that the number is being doubled. Apart from these new traffic-accident groups, their main job is to patrol a beat in order to keep an eye on erring traffic and to assist in traffic-control. Motor-cycles (single-cylinder Triumphs) are also used, mainly in outlying districts of London, to take a police officer from one beat to another. He does one beat on foot, gets on his machine, and rides off to his next beat.

New Plant for Alloy Rims

NEW Dunlop plant is being installed for the production of light alloy bicycle rims weighing 17oz. and 18oz. as against 21½oz. and 22½oz. for similar rims in steel.

The rims, which are of the Endrick type, have been developed by Dunlop and are now in restricted production, mainly for manufacturers to incorporate in new bicycles. Intended for the Dunlop road-racing (high pressure) tyre, they will provide light and fast matched equipment for road racing. The two sizes are 26in. by 1¼in. and 27in. by 1¼in.

The rims are not depressed for nipple head location but are drilled in two-way, one for large flange hubs of 1⅞in. diameter and over, and alternatively for small flange hubs of less than 1⅞in. diameter. Those drilled for large hubs are identified by a transfer in blue of the name "Dunlop," and those for small hubs by a similar transfer in yellow. The drillings are not interchangeable. As alloy rims are susceptible to corrosion, it is essential that only cadmium-plated nipples be used.

To ensure that, when the production position allows, the public will be able to obtain these new alloy rims at a reasonable cost, the price has been fixed at 39s. 6d. per pair.

"Sprites" Come Back

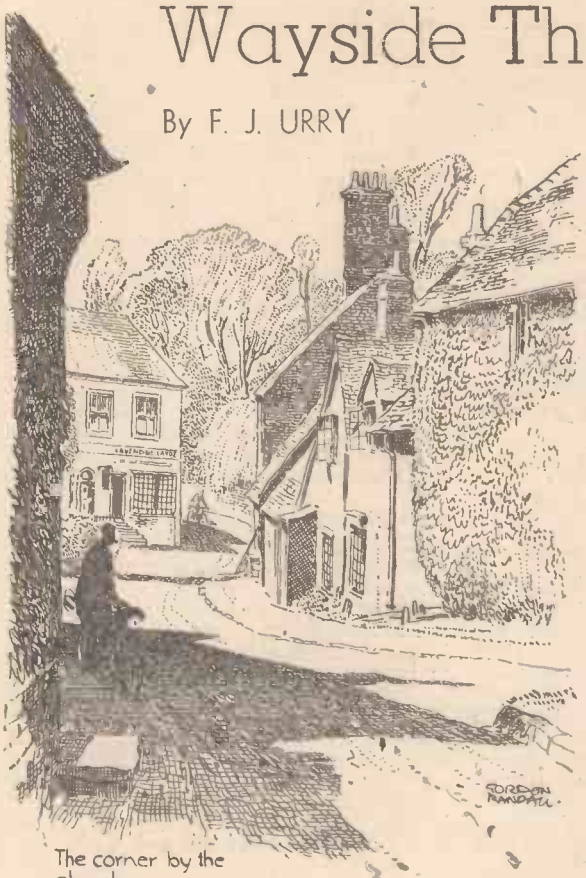
DUNLOP are once more making their "Sprite" cycle tyre, production of which had to stop during the war. It is again being made with black tread and translucent side walls. Output, which is still small, is going mainly to manufacturers for new models. When the "Sprite" was first introduced in 1933 it was awarded the Cyclists' Touring Club plaque for the most noteworthy improvement in cycle design construction or equipment in that year.

The Social Season Starts

BY the time these notes appear in print the social round of club luncheons, dinners and prize presentations will have started. I already have an over-full diary, and although I have been attending these functions for many years, I do not tire of them. They come as a pleasant relaxation after a hard season on the road. Moreover, they enable one to meet old friends. A word of advice, however. I have observed a tendency in the past to have an over-full toast list, and this is a mistake if a prize presentation and dancing are to follow. Another fault is to make a late start; this often eats into the time allowed to speakers. Seven o'clock sharp does not mean seven-thirty. I would urge those responsible at planning the annual function to start promptly, especially when ladies are present.

Wayside Thoughts

By F. J. URRY



The corner by the church, Shere, Surrey

Not a Game!

THE Purchase Tax was reduced on the utensils for playing games from 33⅓ per cent. to 16⅔ per cent.—but not on bicycles. Riding a bicycle for pleasure is apparently not a game in the eyes of Mr. Dalton, yet personally I should consider it the greatest game of them all. And I doubt if any of the other games possess so many advocates as cycling. I see a lawn tennis enthusiast says tennis is the most popular game of the age; but then I suppose he doesn't consider cycling is a game, but only a swifter means of travel than walking by people who cannot afford a car. It is, of course, that, but it's a lot more, too. There are probably some 2,000,000 riders out and about every week-end for the sheer enjoyment of the game, either as a sport, or pastime, or both. It is difficult to assess their numbers, and probably the figure given is grossly under-estimated, for the groups of riders are widely segregated from Cornwall to Caithness, and the numbers are growing year by year. Yet cycling is not a game in the eyes of authority, and the instrument by which we play this mode of travel still must bear the impost of one-third tax on its wholesale price. I am not jealous of the tax reduction on other sporting materials, indeed I'm very glad about it, because it gives point to my argument that the bicycle is the means by which we play a great game, a recognised game in the world's arena of sport, and therefore I think the chance of tax reduction on the bicycle must occur in the near future, and ought to be prominently stressed immediately. The industry has so often emphasised the utility of the bicycle, purely for its own purposes, that it has almost forgotten cycling is still a great game, and now it is left out of the benefit of tax reduction in the Chancellor's scheme of things, the trade will probably feel sorry it has not made more value of the cyclist's enthusiasm, and a little less of the bicycle's utility.

Our Assorted Elements

DURING the first holiday of the year, I rode rather more than 400 miles in an astonishing assortment of weather. The day before Good Friday, twenty miles from home I was pitching little avalanches of snow out of the lap of my cape, and right through that day of ninety miles the rain never ceased. Fortunately the bitter north-easter leaned on my back and made the journeying easy; otherwise the collection of leagues would have been much smaller. On a day of storm like that when the wind is behind, it is astonishing how comfortably dry the well-caped rider can keep. Only my shoes and the bottom of my stockings were wet, and my shoulder damp with condensation, and sixpenny-worth of gas in the bedroom at night righted those matters. Three days later I was over Dunkery Beacon, on Exmoor, facing a wind that cut to the bone and made riding on the exposed moor an impossibility, for had I been able to push the gale away, I could have steered a fairly safe course. When I did turn with the wind, from Exford to Dunster, it was just a float down a succession of such vivid green meadowlands, yet with scarcely a leaf unfurled, so late was the coming of spring. Three days later still I was on the home road, north this time, with a south-easter to help, a warm and sunny wind that burned me bronze and put crackle in my hair. In a couple of easy days I rode just over 150 miles, and the bare hedgerows of the southern journey a week before were now on the point of bursting into leaf, and in the sheltered places twinkled primrose and violet. What a metamorphosis in the space of a week, and what a joy to be out and among it while the change-over was in operation. And another thing that gave me pleasurable satisfaction was to discover that, although I may travel a trifle more slowly, I can still prowl through a day of storm without feeling annoyed with the weather.

The Light Hours

AGE cannot wither or custom stale the infinite variety of cycling. That old tag fits the pastime admirably, for though its tempo changes with the years and its incident alters with the stretch of your leisure, it remains as fresh and variable in outlook as on the first road adventure we undertook. At least it does to those of us who have kept riding and eschewed the ease of travel that seems to overtake far too many people and make them old before their time. It is only six months—or little more—since I wondered if the way to work was reasonably safe for an ancient nomad to take, so icy were the ways and so uncertain the hour-to-hour condition of them; now one wanders during these long evenings, donned in the filmiest of raiment under a rosy sunset through the arcadia of late summer, when every growing thing adds tribute to the endless shades of green, and the last thanks-giving of the day comes sleepily from the throats of birds. At such times the value of double summer-time was acknowledged; but I must confess the early morning rising would suit my general habits much better if the anticipation of sun time was halved. But that is a personal matter; the point is that Willet's notion of giving us an extra slice of daylight, when we are prepared to take it, was a great triumph, notwithstanding its early critics, and no outdoor folk ought to be more grateful to "the prophet of light" than cyclists. I know the long evenings frequently give me twenty miles of easy riding which probably I would not otherwise possess, because there never does seem anything very truant in conduct if you are home before dark. I am merely following the early Victorian training of my youth, though I am bound to confess there were times when those strictures had to undergo a dickens of a twist. All praise to Willet; a pity he did not live to see his idea work.

Such Little Things

HOW little we know of the small material things concerned with our vehicles. The other day while riding to work, my four-speed hub ceased to function; it free-wheeled both ways. I got off and looked to see if the change controls were in order but everything seemed perfect, although I could not understand why the gear would not perform on any of its ratios. While I was engaged in this operation, a friend came by in a car, stopped to see what the trouble was, and finally we hoisted the machine into the boot and both of us were taken to my nearest dealer friend. I felt I could not grumble overmuch, for it was the first time a four-speed hub, fitted to a single, had let me down, and in all I must have ridden 40,000 miles on various machines so equipped. But how my dealer friend did laugh, when after a very cursory examination he discovered the splined sprocket had merely unslipped itself because the locking-ring had worked loose and allowed the sprocket to shift. Had the lock-ring come right off and dangled on the spindle, no doubt I should have spotted the maladjustment. It only goes to prove how simple a thing will prevent delicate machinery from functioning. When I got home that evening I tested the lock-rings on three other four-speeds, and two of them needed attention. That is a weakness in the splined sprocket, that liability of the locking-ring to work loose, and it is the main reason, I understand, why the makers have reverted to the screwed-on sprocket. Just a simple thing like that—a two-minute job to hammer home the ring—might easily spoil a ride, and involve the owner in a long walk or a needless rail journey. It is well to know as much about the mechanism of our bicycles as we reasonably can; it sometimes saves a lot of trouble.

Good of the Trade

RECENTLY I spent a long week-end with a big company of elderly men—average age 52—in Herefordshire, with the quarters centred on Leominster. It was a cycling week-end, and the individuals taking part were all high executives of the cycle trade. True the mileage was not very great, roughly 110 miles for Saturday, Sunday and part of the Monday; but at any rate it is something to know that cycle and fittings makers do use and test their own products. Of that party about half of them were over 58 years of age, and several well into the sixties, and I think, if anything, the older ones were also the livelier cyclists. During the evening discussions over the habitual night-cap (or several) I learned a lot of things regarding the difficulties of the industry, which I am under tribute not to reveal, and occasionally was able to give a cyclist's point of view on the question of quality and information relative to good riding which may bear fruit when the stringent circumstances of the times have improved for the better. I would ask you, however, not to think of these cycle-trade men as hard-faced business automata when out on these occasional week-ends. Rather they are like boys let loose from arduous tasks, and the bubbles of joy that emanate from their association with each other is making for them a new outlook on their businesses and the associations it has with the sport and pastime of cycling. No one can point to a single thing for the good of the game, for the effects are cumulative through the close agency of personal experience, and the varying reasons proven among a considerable company why certain types and fashions are better than others. Some of the cycle trade executives are no longer relying too much on the advice of experts, they are trying things themselves and in the process are finding great joy.

Forgotten Corner

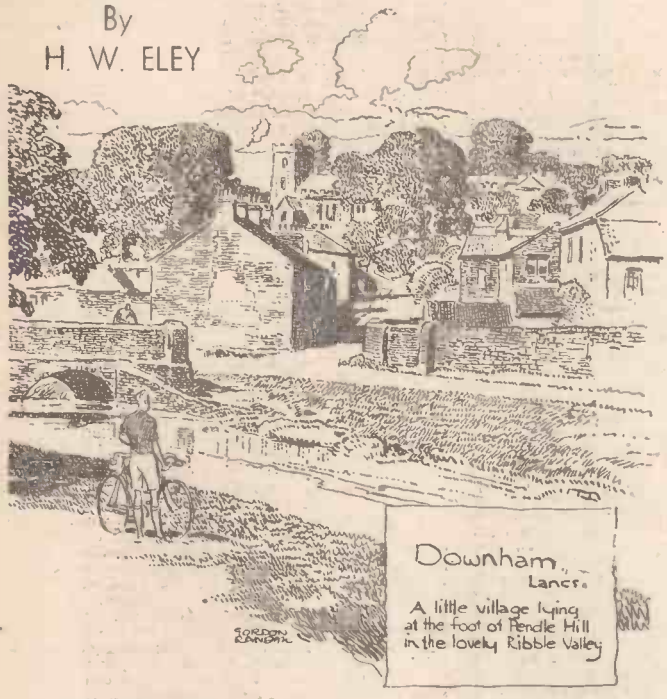
WHAT a lovely county Hereford is, Hereford and the Welsh borders! We folk who roam know too little of these places, tucked away in the bye-lanes, often within sight and sound of the main roads, and always out of the press and urgency of modern traffic. It is a great mistake to think the best places in these green islands are those that have been made popular, or that those same popular ones can give to the stranger within their borders a warmer welcome or better fare than the native country folk. Since 1940 I've not enjoyed a better lunch or tea than was served to us at the Radnorshire Arms in Presteigne, or been given a kindlier welcome than at a farmer friend's of mine on whom I called to pass on the good wishes of the season, and who insisted on regaling the whole party with a brew of tea that must have put a strain on the rations, as it quite evidently did on the crockery. We went to see Weobley, too, on that trip, the village of black and white that always charms the eye and especially so when the sun shines on it and the garden flowers respond in colourful glory; and we found a new lane-way to Leominster drifting between the low hills, which threaded Little Dilwyn, used a mile of the Roman Road, crossed the Little Arrow and danced over the hill to Leominster. We also saw on a stormy afternoon that mighty view of the Clees and the Teme Valley on the way up to Layster's Pole, and from its western slope the guardian hills of Ludlow, the long reach of Bringewood Chase, and faintly in the smoke of storm the comely tops of the Welsh mountains. Yes, there is much to commend this border country, its dozens of valleys down which the streams run swiftly, its air of old-fashioned contentment, and its gifts of hospitality; but because it lacks the sea too often we go hurrying through without a thought for its loveliness.

What is It?

A FRIEND writes to ask what he shall say to an audience of teachers who desire to know something of cycling, and a little on the care of the machine. The short and true answer is, ride it and discover, for there is nothing so good as experience. This man knows everything about bicycles but the most important thing—cycling. That is the way things are moulded in these days; we concentrate on the article to the exclusion of its use and services, and the result is chrome-plating and vivid enamel, which invites more rust by lying idle in the shed than ever it does in ordinary weather. That, however, is merely blowing off steam generated by a request which ought never to come out of the mouth of a manufacturer. What is cycling? Why do people ride? In the young the answer is excitement, the excitement of personal propulsion at high speed. The phase passes and then comes the test. Will a man forsake the freedom of wide horizons to see his world intimately, splendidly and healthily, or will he whisk through it with the superficiality of motoring in much the same way as he whisks to his office to "save time?" Time is a measure you cannot save, you can merely use it violently in the sense of speed. But then "Midas has asses ears," and is far too important to consider the things he misses because of the multitude of things he has. There stands my bicycle waiting to be made alive, waiting for the magic touch which only I can give it, and in return it will give to me the magic, the mystery, the laughter and the joy of the world. Its greatest blessing is health, its greatest joy the wide blue sky, the wind and the rain, the great visions flaring in the dawns and sunsets on the road to nowhere and everywhere. You will work for these things, mostly gently, sometimes vigorously, but the reward is the purified gold of life.

CYCLORAMA

By
H. W. ELEY



The Benevolent Fund

I HAVE previously referred to the excellent fund which was inaugurated—I think as long ago as 1905—by the late A. J. Wilson ("Faed" of immortal memory)—and now I gather that the big propaganda campaign, intended to greatly increase membership, is about to be launched. A paid organiser has been appointed, who will be responsible for co-ordinating the work of the voluntary helpers, and altogether the activities of the fund have been stimulated and extended. A. H. Dawson, who has served the fund so long and well, continues to act as general secretary, and I trust that the attractive literature which I have seen will bring in many new members . . . the fund is efficiently administered, and has done a tremendous amount of good work. "Faed" built better than he knew in those early days!

Road Safety

RECENTLY I had a most interesting talk with a high official of the Ministry of Transport on the subject of road safety, and particularly about the advertising campaign to "keep death off the road." I was glad to find that this official did not lay all the blame for accidents on the long-suffering cyclist! Indeed, I found him most sympathetic about the problems of the cyclist, and he had much praise for the great majority of riders. This was refreshing, as I have so often met men who seem to think that the cyclist is a menace . . . to be hounded off the road and made to take all the blame for the unfortunate accident-roll which is still such a black spot in our social life.

Back to the Bike

WILL the disappearance of the basic petrol ration mean, once again, a return to the cycle? I fancy that as in the war years there will be many men who will get out the bike and return to riding pleasures . . . and find, apart from the conveniences of the cycle, a new health and pleasure. This was certainly the case in those dark war years when cars almost vanished from our roads, and I commend cycling as an alternative means of transport to all those who are now "grousing" about this latest piece of austerity. And . . . once a man renews his love for cycling, he is not likely to lose it in a hurry!

Autumn Glory

HOW I welcome the mellow autumn days . . . when the spiders' webs are festooned across the road, and the countryside is colourful with all the berries which gleam in the October sun! It is a grand time of the year for the cyclist, and I enjoy nothing better than a ride through the lanes when there is a nip in the air, the stubble fields are kissed by the sun, and the trees in the woodland glade are all glorious in russets and browns and golds. Even the green beauty of spring does not exceed the beauty of an autumn day, and I trust that cyclists everywhere will be awheel during October . . . and I hope that after a run they will find a welcome at some village inn where "October brew" is on tap in some quiet little room where the rafters are black with age, the smoke of many pipes ascends like incense, and old men of the fields sup their ale from pewter tankards in the fashion of their forefathers.

"Mac" of Hercules

I THINK that almost everyone in the cycle trade knows "Mac" (D. D. MacLachlan)—and his many friends will be glad to know that he has thoroughly recovered from his recent illness . . . and he is back at his desk as vigorous and cheery as ever. And I am reminded that Mac is one of the stalwarts who have had much to do with that Benevolent Fund propaganda campaign to which I have referred in another paragraph. A "Hercules" for work, I wonder if regular cycling is one of the secrets of Mac's energy and enterprise?

Cycling and the Press

IN the main I do not believe that newspaper editors appreciate the extent of the cycling movement or give it adequate space in their columns. Of course, I am only too well aware of the difficulties of "space" these days, and I appreciate the implications of the newsprint "cuts." But they have affected mainly the national newspapers and not the local provincials . . . and I have often wondered why more space and attention is not devoted to cycling and cyclists in the weekly newspaper. Gardening, poultry, many pastimes . . . all get their due share of publicity, but cycling is, in my view, neglected. Am I wrong? And if I am right, what is the reason for this strange neglect of a national pastime?

Where Shall I Tour?

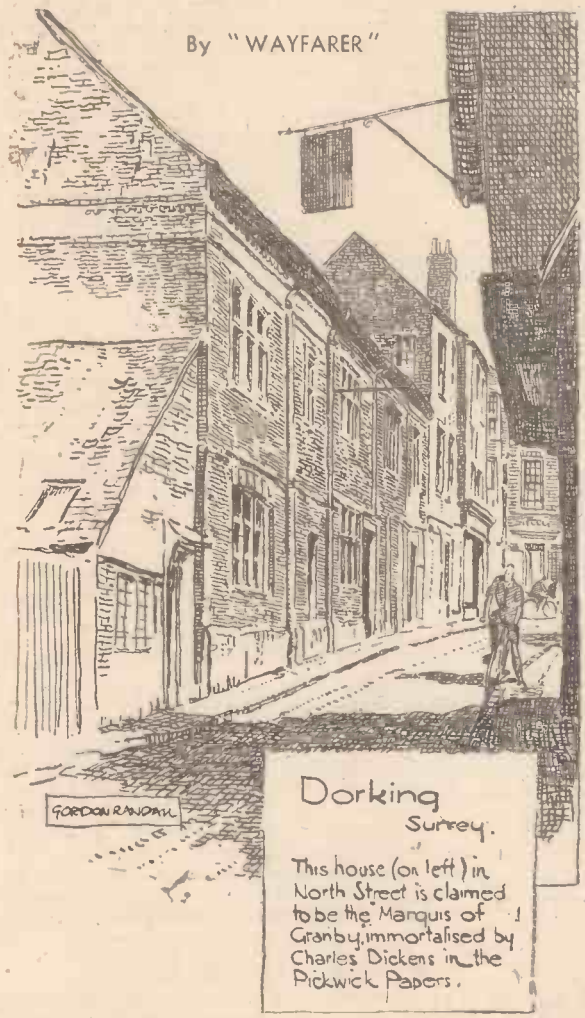
THAT was the question put to me during the summer by quite a number of cyclists . . . who, whilst keen to see something of the English countryside, seemed strangely ignorant of our counties, our beauty spots and best touring grounds. I tried to be helpful, and in fact have got one or two quite enthusiastic letters from inquirers I sent a-roaming. One went, on my advice, to Shropshire and made acquaintance with the elfin land which Mary Webb did so much to popularise. Shropshire is one of my favourite counties, and it is full of charm. What better area to tour than Wenlock Edge, or the Clee Hills? What finer sight to gaze upon than old Ludlow Castle? Another rider took my advice and cycled for a fortnight in quiet and unspoiled East Anglia . . . in the Constable country, the country of Flatford Mill and the quiet lanes where Constable found some of his inspiration. This rider was not disappointed; he wrote me in eulogistic terms about Suffolk . . . and he will go again to that peaceful land where the poppies bloom and the villages are much the same as they were a century ago.

Well-stocked Dealers' Shops

WINDOWS full of new gleaming bikes . . . and plenty of accessories; that was my impression of a saunter round the streets of Worthing when, a few weeks ago, I was there on my way to ancient Arundel. The British cycle manufacturer, in spite of the shortage of steel, has worked wonders in the way of production, and I imagine that the days are gone when one had to wait patiently for a new machine. Tyres are not yet in full enough supply, but the position is improving every day.

My Point of View

By "WAYFARER"



The Unteachables

IT appears to me that the cycling movement contains a very high proportion of unteachables. I deplore the fact—and I think it *is* a fact. The majority of people who ride bicycles are (a) exponents of tyre under-inflation; (b) believers in, or practisers of, excessive gearing; and (c) indulgers in over-long leg reach. Any one of these faults is enough to kill cycling enthusiasm. When all three are to be found in an individual case—as they are to be found by the thousand—one realises why cycling is accounted hard work and why "real" cyclists constitute a small minority of the immense army of people with bicycles.

The unteachables occupy their unenviable position not of necessity through lack of brains but rather because of the absence of any proper interest in the cycling game. All bicycles are alike to them, and they buy "a bicycle," and that's that. Nobody tells them about tyre inflation, or suggests moderation in gearing, or mentions the advantage of being within easy reach of their "work." They don't read anything about cycling. To them the pastime is just a matter of sitting on a bicycle and pushing down the pedals as they come up. It is abundantly clear to me that when the unteachables take real interest in the game and give themselves a chance of learning—the best way, probably, is through the medium of club life—they will be all the better for it. So will the great pastime of which, at present, they are such feeble exponents.

The Way of It

DURING your day's journey you have indulged in little detours and extensions, and you have dawdled some of the happy hours away. After tea, you sustain a mild shock through observing that you are some 40 miles away from home, with quite a good mileage already to your credit. What are you going to do about it? Two-score miles in an evening is quite a ride; it is as much as some cyclists do in a full day—or as much as certain other folks do in a week. I repeat: What are you going to do about it? You—if you are wise—are going to tackle those 40 miles as 40 pieces of pleasure. The distance is not going to worry you. You will settle down to the job and reel off the miles, one, by one, enjoying each section of your journey. You will not insist on riding up the hills you usually walk, on the score that walking would be a waste of time. The contrary is the case. If you feel a shade thirsty or hungry, you will not eschew a pause for a few moments. It will be a case of "business as usual" with you. You will avoid worrying or getting excited. You will settle down to your task, remembering that "dogged does it," and you will reach journey's end feeling in fine fettle, thankful for the ability to ride 40 miles after tea without turning a hair. That is the way of it—steady plodding, and a recollection that each mile is a chunk of pleasure. Then the thing becomes easy.

Solution

THE nice tailor-made ice-cream jacket which I obtained a few years ago gradually fell to pieces on my back, incidentally proving the truth of the Biblical statement that you cannot put new wine into old bottles—for when one part of the coat was repaired, another part would disintegrate. All last summer—those two days in July, you will remember!—I did without a light coat, reverting to an old tweed affair, which was far too warm, even for a summer of the 1946 type. This year my clothing book and my bank book gave me a pair of shocks, and it seemed to me that an ice-cream jacket was beyond my means from both points of view. Then I saw in a shop-window just what I sought, a near-white jacket poshed-up with a coloured handkerchief in one of the pockets. My hopes were dashed to the ground when I went inside, because I was told that this was not a sports affair, bu merely a painter's jacket—an industrial garment priced at 10s. 6d., plus two coupons. I tried the thing on and had no hesitation in buying it. It fits in quite a number of places, and provided that it does not shrink too severely during the washing process, it will fill the bill for me. There's a hint for any of my readers who are next door to beggary from the coupon viewpoint and who resent the high prices now levied for tailor-made clothes.

'Ware Speed

I ALWAYS make a point of giving faster traffic than myself the benefit of the doubt, preferring not to pass out long before my appointed time. One evening recently, when nearing the end of a journey, I observed that a motor-car, coming out of a slightly less important main road than that on which I was travelling, was converging on to my course. It was running pretty fast, and my first impulse was that I would have ample time to cross in front of it and take up my normal position in or near the gutter. A second glance over my shoulder gave me a new impression of things, and changed my plan. Edging away, I let the fellow annex whatever rights I possessed as being on the major road, and he overtook on my left and blazed onwards. Actually, he was going rather faster than perhaps he ought, but that was not a suitable moment for arguing about speed, or for voicing criticisms. From my point of view the great thing was to keep out of his way, and to go on living in one whole piece; and that is the result of my hurried action. Quick thinking pays, and it is a positive advantage to exaggerate the speed at which motor-cars can eat up space.

Qualified Approval

THE latest advertisement in the "Keep Death Off the Road" series of advertisements, sponsored by the Ministry of Transport, earns my qualified approval. It depicts a boy cyclist carrying a bulky parcel under his arm—a practice which I always view as, at least, an undesirable one. The letterpress indicates that the boy met with an accident, as a result of which he lost a leg, and "he will never ride again." This dogmatic statement is not justified by the facts, seeing that there are many one-legged cyclists still able to participate in their chosen pastime. (What a joy it is to encounter these disabled folk, making the best of the trouble which has overtaken them!) Then the advertisement dwells on "the mistake of carrying a parcel when riding a bicycle. Its weight spoils the rider's balance and prevents him from keeping the bicycle under control." Once again, that dogmatism requires toning down. It is quite safe to carry a parcel when riding a bicycle, so long as the parcel is correctly placed. If, for instance, the luggage is slung on the back of the rider, it will do no harm. It appears to me that a little more discrimination—and a little more knowledge of the subject—is called for in the preparation of these advertisements, which, in any case, are probably seldom read by the people to whom they are addressed.

Tacks-ation

I KNOW at least one cyclist who will be glad when the regular sweeping of our roads is once again normal. Twice within a fortnight, recently, one of his tyres picked up and carried home a tack, which necessitated a repair operation. He—that is to say, I—was "not amused," and is strongly inclined to resent tacks-ation in this form.

Vain Imagining

THE *Birmingham Post* of 9th June, 1897, printed a paragraph which began thus: "If the day ever comes when cycling shall have had its vogue. . . ." Half a century later our great pastime seems to be as far from ever off that grim day, and this despite the popularity of motoring (carrying with it grossly exaggerated dangers and discomforts) and the wailings of the Jeremiahs that all is lost. I shall not be here to see it, but there is no reason why a second reprinting of the above paragraph, on 9th June, 1997, should not be viewed with the interest it attracts to-day.

Still Possible

MY experience at Whitsuntide leads me to the conclusion that it is still possible to tour in comfort on the easily-achieved pre-war figure of 10s. a day. Mind you, I am not all that keen on doing the job at this favourable rate: I merely desire to establish the practicability of the plan. Having regard to the hardening of prices, generally, it is not unreasonable to expect an increase in the cost of touring. This is how the thing could be made to work: I stayed for three nights at a house where I was charged the sum of 8s. 6d. for supper, bed, and breakfast. Both meals were substantial, breakfast consisting of porridge, bacon and egg (or sausage), bread, butter, marmalade, and a pot of tea. Supper (many people would call it dinner) was composed of meat (or fish) and vegetables, a sweet, cheese, margarine, bread, biscuits, and a pot of tea. Now, I am not unaware that, when 8s. 6d. is taken from 10s., only 1s. 6d. remains. Having breakfast at 9 a.m., and supper (or dinner) at 7 or 8 p.m., could you not get through the day on an eighteenpenny meal? I could—but I haven't the slightest intention of doing so! I am merely concerned to prove that a touring cost of 10s. a day is still within the range of "practical politics." You can obtain a substantial plain tea in dozens of places for 1s. 6d., and there's your 10s. gone west.

Now, it may be objected to that this budget allows nothing for tobacco and picture-postcards. Admitted—but is tobacco and are picture-postcards an inevitable touring expense? As a non-smoker and a non-sender of p.p.cs, I reply most emphatically in the negative. In any event, the purchase of a postcard or two would not make a lot of difference, while it is to be assumed that the tobacco would be used whether one was at home or on holiday. In my view, these things—and chocolate, when you can get it—have no bearing on touring costs. But here is something—on the other side of the account—which must certainly be taken into consideration. The figure being featured is the gross cost of touring. We all pay, directly or indirectly, for living at home, and in most cases, I imagine, that cost ceases, or is modified, when we are away. So that, as I have so often insisted, you arrive at the actual cost of touring only by deducting the money saved on food not consumed elsewhere.

New Interpretation

I PAUSED, as usual, on coming to a "Halt" sign. Not so two young lads, who dashed forward regardless of their obligation in the matter. On catching up with them I—always peeved at the thought of actions which tend to bring discredit on the pastime—said that I supposed the boys couldn't read. "Didn't you see the 'Halt' sign?" The reply was that there was nothing coming, and so they felt justified in failing to pause. To me, this is a new interpretation, which I am sure would not "hold water" in a police-court. No such condition or exception is attached to a "Halt" sign. If the case were otherwise, it would be equally right to ignore the red of an automatic signal if "there was nothing coming"—and equally right to travel the wrong way round a traffic island. There are many occasions on which it may seem ridiculous to come to a standstill in the shadow of a "Halt" sign, but I am sure that the rule is one for consistent observation. That way lies safety—a subject in which we are all interested and vitally concerned.

Does It Rain Nails?

THIS question often comes into my mind when I think of the number of nails I pick up in the course of twelve months. Each of those nails is a source of danger to cyclists and motorists, and I take care to see that they are put in a safe place. But the number of these dangerous objects is really amazing.

Non Possumus

KNOWING something about the habits of railway companies, I am not in the least surprised to learn that they have refused to make any attempt to comply with the suggestion that they should fit hooks in their luggage-vans for the safer conveyance of bicycles. The powers-that-be, I gather, would not feel "justified" in adopting an idea which is already in successful operation throughout certain Continental countries. This *non possumus* attitude confirms my firmly-held opinion that the railway companies do not want cycle traffic. Well, so far as I am concerned, I am quite prepared to "oblige" by keeping away from trains when a cycle journey is in contemplation. I never was enthusiastic on buying "home rails," though I admit the great convenience when a tour of distant territory is contemplated.

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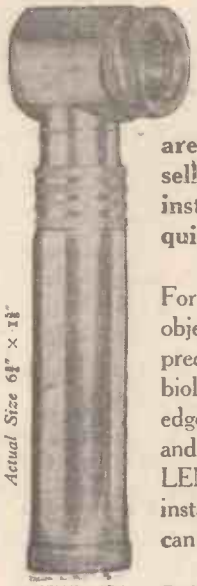

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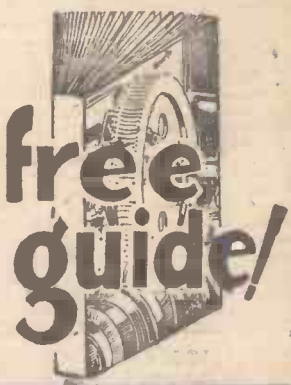

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