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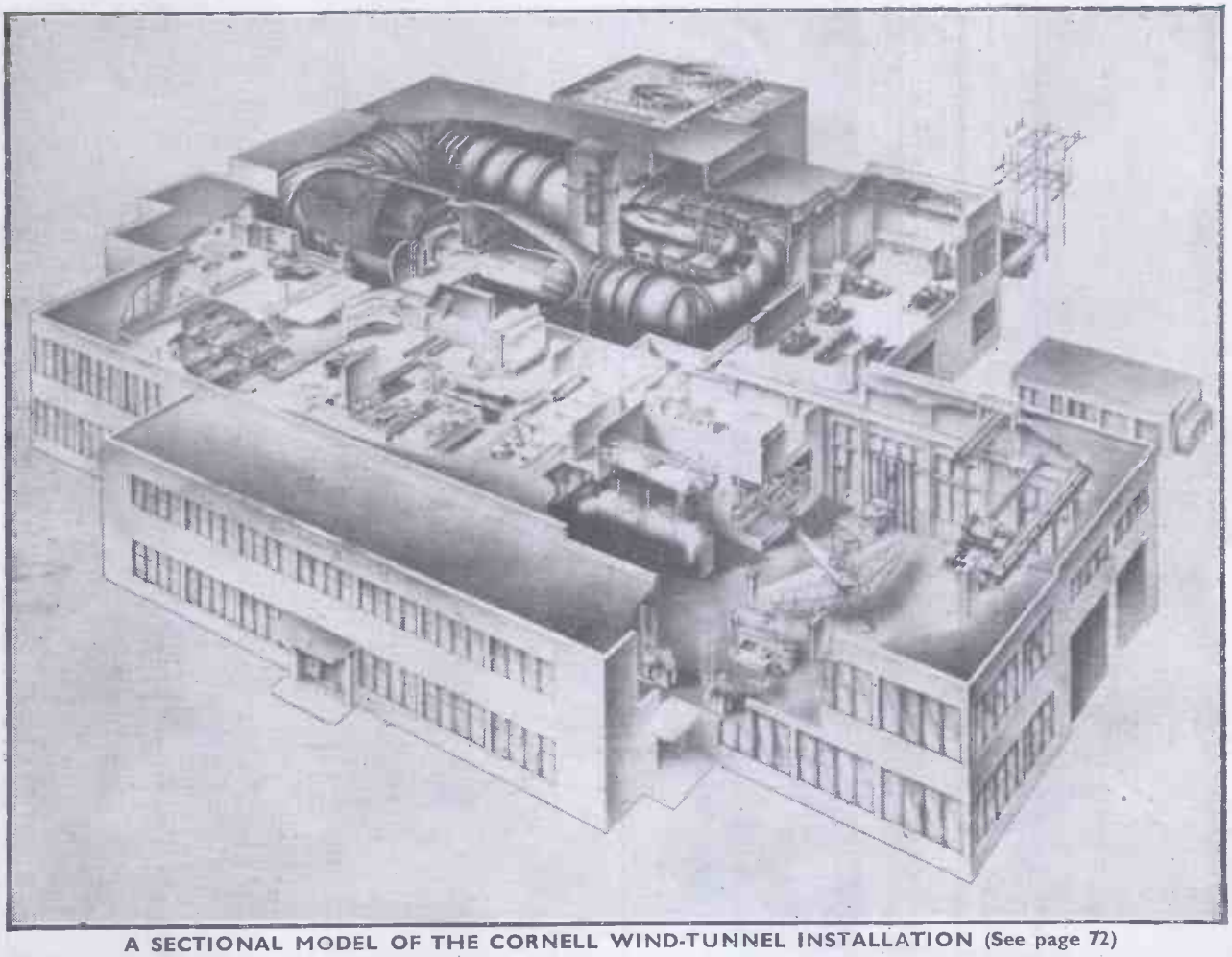
PRACTICAL MECHANICS

9D

EDITOR : F. J. CAMM

DECEMBER 1948



A SECTIONAL MODEL OF THE CORNELL WIND-TUNNEL INSTALLATION (See page 72)

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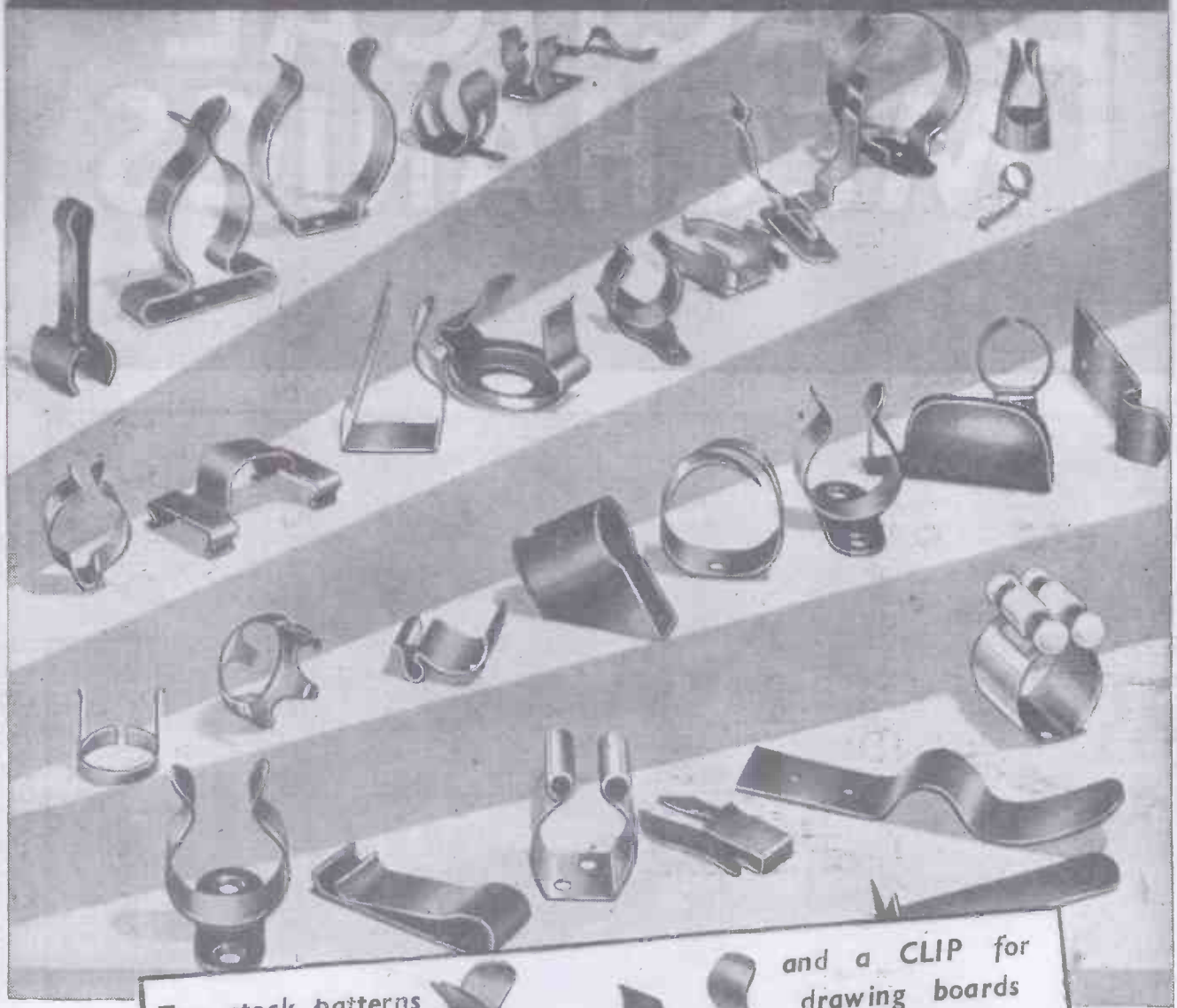

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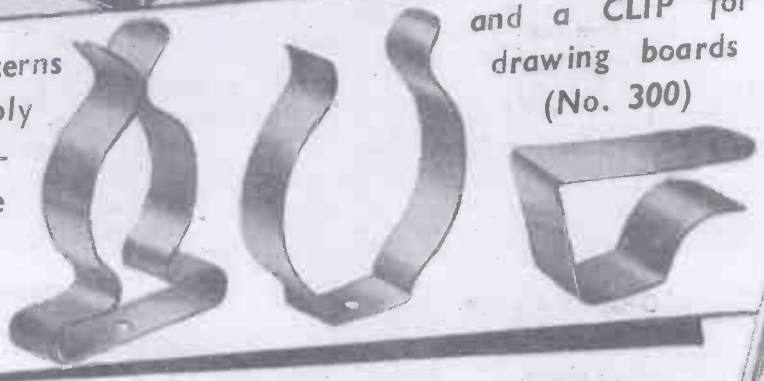

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Tower House, Southampton Street, Strand, W.C.2
'Phone: Temple Bar 4363
Telegrams: Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

PRACTICAL MECHANICS

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

Editor: F. J. CAMM

VOL. XVI DECEMBER, 1948 No. 182

FAIR COMMENT

By THE EDITOR

Research and Productivity

AT a recent industrial conference Mr. Morrison stressed the importance of the work that research associations were doing in advancing the prestige and the productivity of Great Britain.

The keynote of his speech was that all should endeavour to acquire more knowledge about our resources and their use. In 1946 an Advisory Council on Scientific Policy was set up and one of the first tasks assigned to them was to report on the most appropriate form of research to assist in increasing national productivity during the next 10 years.

Sir Edward Appleton made a general survey covering the work of research associations which shows the extent of their work and the ways in which they could help even more. They form the spearhead of the advance of British industry, and it rests with them as to whether we are to regain the lead in the competitive world or whether we are to drop back into the position of a third-rate Power and a pensioner with declining standards of life and a feeble voice in the affairs of nations.

Thus it will be seen that research associations cannot be regarded entirely as academic institutions divorced from politics and commerce.

The Government, indeed, is supporting the associations. In 1938 the total expenditure in this way was £470,000. Last year it was nearly £2,000,000, and the total estimated for next year is £2,500,000. The number of research associations has almost doubled from 21 in 1938 to 38 at the present time. The British Boot, Shoe, and Allied Trades Research Association has developed a method of infra-red heating which has cut the time for drying adhesives to a remarkable extent, and infra-red driers are now being extensively used in the factories.

The Linen Industry Research Association has analysed causes of loss of time, and found that while in one works stoppages on warp yarn were less than 1 per cent., in another they were nearly 5 per cent. Armed with this information factory managements have been able to make the necessary improvements.

The British Cast Iron Research Association played a large part in raising the output of the iron-founding industry from 2½ million tons pre-war to 3½ million tons a year at present. At the same time much fuel has been saved and the product has been improved. This association has also developed a remarkable new product of great sheer strength: nodular cast iron.

The British Coal Research Association has developed a new inset fire which can be fitted into an existing grate at a moderate cost, and gives a total heat output of 37 per cent. with normal house coal, and 48 per cent. with coke, compared with the performance of the ordinary coal fire which normally radiates not more than 25 per cent. of the heat of combustion.

Work on the surface dressing of roads carried out by the Road Research Laboratory has shown that road surfaces which now last only 2 or 3 years can be given a life of anything up to 12 years, thus reducing the cost of repairs by several million pounds a year. These are but a few of the examples of the work of research associations which are providing jobs for qualified young men with the necessary scientific education.

Suppression of Interference

FOR many years the radio industry has urged the Government to legislate for the effective suppression of interference with radio and broadcasting, and early this year the Radio Industry Council started a campaign for the voluntary suppression of interference with television, car ignition and diathermy being the principal sources of interference.

Interference with radio caused by electric cleaners, lifts, motor-car ignition systems, hair driers, and other electrical apparatus has been a cause of complaint for years and the Post Office can do no more than to track down the source and tactfully suggest to the offender that he fits suppressors. It is not until the electrical interference of this sort can be seen, as it can on a television tube, as well as heard, that the Government begins to take action.

A new Bill before Parliament will make the fitting of suppressors to car ignition systems compulsory. Suppressors are already available in the shops, and no doubt car manufacturers in future will fit them as standard equipment. There are penalties for those who continue to offend after receiving a warning.

It ought to be possible to suppress the average portable domestic electrical apparatus by fitting a condenser costing a very few shillings. The interference caused by car ignition to television can be eliminated to the extent of 85 per cent. by fitting a single resistor of 5,000 to 15,000 ohms, costing 1s. 6d.

Although the G.P.O. themselves also fit suppressors to each sparking plug, thus bringing the cost up to 7s. 6d., we are confident that any car owner fitting a single resistor in the high tension lead between the coil and the distributor or in the distributor cap would achieve all that is required.

Here, again, it should be emphasised that the ignition systems of cars are being increasingly designed to minimise interference and all cars fitted with car radio are already suppressed.

New Blueprints

Readers will note from our list of PRACTICAL MECHANICS blueprints on another page that we are increasing their scope. Last month our Astronomical Telescope, and this month our Canvas Canoe, have been added to the list.

Wind Tunnels

Technical and Operational Details

By H. E. HUTTER, A.M.I.E.E.

THE degree of development reached by present-day aircraft is largely due to the wide employment of wind tunnels for the compiling of basic data and for the testing of models. New types as models can be brought to aero dynamic perfection before the 'plane itself is built. Design changes, such as new types of control surfaces, alterations to fuselage structure, can be studied to learn exactly how they will affect the performance of the 'plane itself.

The design of modern aeroplanes requires a large amount of basic data to be compiled, and this is usually obtained by wind tunnel tests. Furthermore, the cost of flight testing of modifications is very high and takes a considerable amount of time compared with the alternative low cost and speed of constructing a small model for a wind tunnel test.

The basis of all wind tunnels, irrespective of their type, is the provision of an airstream of controllable speed through a working chamber in which the model may be placed, coupled usually, in the majority of applications, with means of measuring all the forces and moments acting on the model.

The design of aircraft to fly at speeds approaching that of sound, and under present conditions the possibility of speeds in excess of that, calls for investigation into the so-called compressibility effect experienced when approaching the speed of sound.

The essential condition for similarity at low speeds is the constancy of the Reynolds Number, but when the velocity of the airstream approaches that of sound the Mach Number M is involved; the maintenance of the M Number is incompatible with the maintenance of the Reynolds Number with a given density. This means that the small scale models employed in wind tunnel testing will not have exactly the same characteristics as the full-size 'plane; forces and moments measured by the wind tunnel balance will not correspond exactly to those which will affect the motion of the full-size aircraft.

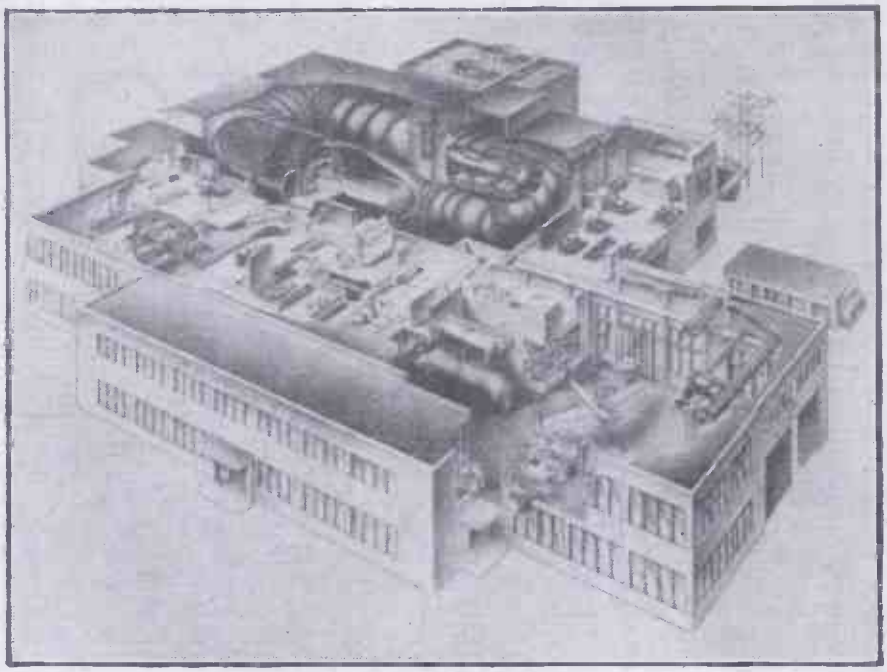


Fig. 2.—View of the Cornell Tunnel Installation.

The only solution which enables the Reynolds Number to be maintained at the same figure without increasing the tunnel velocity consists of increasing the density of the air in inverse proportion to the reduction of linear dimensions. It was for this purpose that the variable density wind tunnel was first introduced and is now so widely employed.

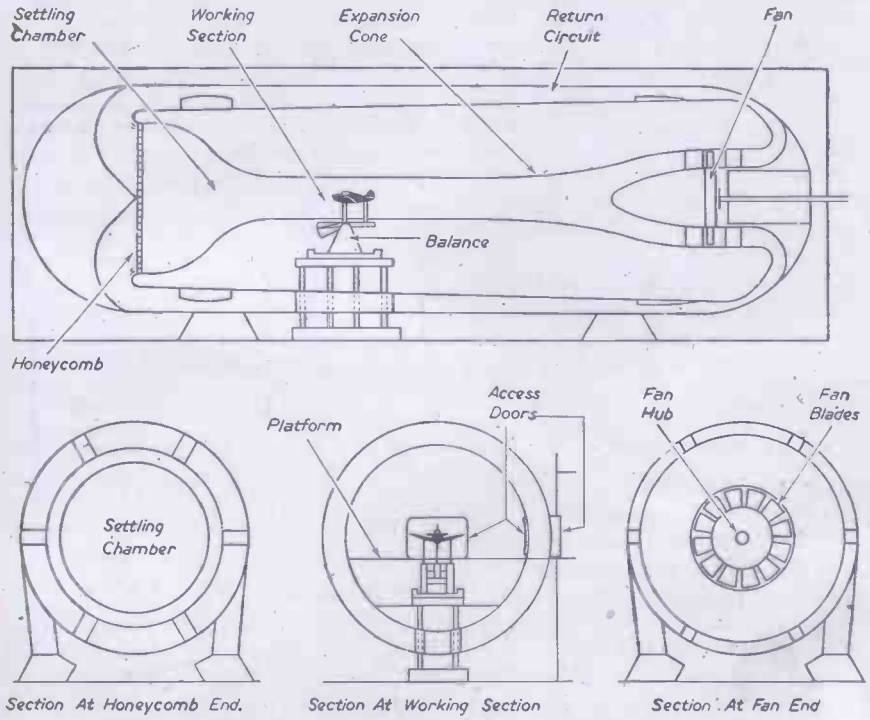


Fig. 1.—General arrangement of the R.A.E. high-speed tunnel.

Aero Dynamic Coefficients

In the early days of aviation errors of 5 to 10 per cent. in aero-dynamic coefficients were so small as to be unimportant, but these times have changed, and experience now shows that with the variation of aero-dynamic coefficients Reynolds Numbers when plotted may show three or four reversals in successive Reynolds Number ranges. These can be overcome to a considerable extent by the use of the variable density tunnel. An increase in the pressure is the same as increasing the Reynolds Number, but this also means increasing the h.p., and this is one reason why the tunnels are increasing in size. For instance, the new tunnels to be installed at Bedford are proposed to be powered at 40,000 h.p., and this will give a Reynolds Number 10 times as high as that obtainable in the R.A.E. high-speed tunnel (Fig. 1) now powered by a 4,000-h.p. motor.

The number of tunnels which have been constructed throughout the world is now very large. For instance, in the United States there are now over 40 Government tunnels, 13 belonging to the armed services, 17 to aircraft companies, and 44 in educational establishments, with more than 12 large ones under construction. In this country the number is limited, though there will be a considerable improvement in the position when the new Government establishment at Bedford is operating. The Germans also had a considerable number of tunnels, some employing very special features.

The power involved is frequently very large, especially as considerably more power is required for driving the fan only, particularly in a variable density tunnel. For instance, 14 American tunnels have fan motors totalling 257,000 h.p.

Closed Circuit Tunnels

A number of what may be termed basic type tunnels are in use, but the need to investigate specific problems has resulted in the construction of many other types. The two leading types are the Goettingen type closed circuit, usually with single return and with either closed or open working section.

The Eiffel open jet is largely employed in France, and a further type is a symmetrical layout, of which the R.A.E. high-speed tunnel is the leading example (Fig. 1).

The special tunnels include the N.A.C.A. free flight type for self-propelled models, supersonic tunnels, icing tunnels, ballastic and cross wind types (Figs. 5 and 6), and also the German type operated by the opening of a large evacuated chamber.

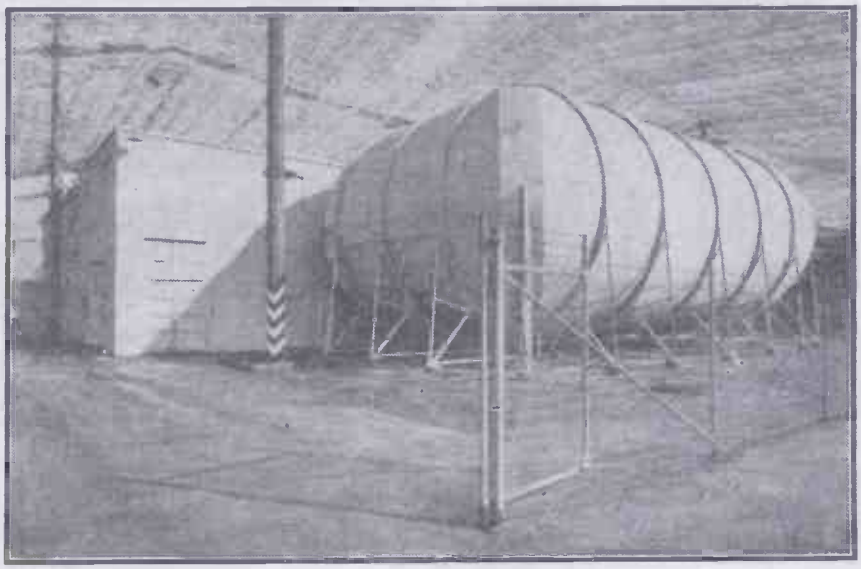


Fig. 4.—Outside view of Northrop wind tunnel.

The two most important materials for tunnel construction are steel and concrete, and in their respective uses considerable difference of opinion exists. The objection raised to concrete is the presence of fine dust, causing damage to high-speed models, yet one of the outstanding high-speed tunnels, the Boeing, is constructed of this material, as are many others. One important tunnel, the Convair, has certain parts lined with a hard plywood.

Dimensional accuracy of the tunnels as regards their internal outline is very important, and surprisingly low limits are worked to in either material. The internal finish of steel tunnels is always very good, and frequently the entire surface is ground and polished to a glass finish. Limits of the fan ring and working section are frequently a few thousandths of an inch for steel tunnels, while concrete construction is also of a very high standard. The Convair tunnel calls for a limit of ¼in. in 10ft. for most parts, and 1/16in. in 12ft. for the working section and propeller ring. When wood construction is used, as is sometimes done for the working section, limits of plus or minus 1/16in. are regularly obtained.

The precision demanded applies equally to the Eiffel open jet type when built of concrete, and limits as low as .1 of an inch are called for in the Honeycomb air filter, and in one instance a diffuser having a width of 75ft. was limited to plus or minus ¾in., the whole diffuser weighing 570 tons.

Structural Weight

The weight of a complete tunnel structure is frequently very high. The Eiffel type installed at Charais'meuden has some 240,000 cu. ft. of concrete in its construction, while as an example of steel structures the California Co-operative tunnel has 1,500 tons of steel in a shell alone.

The supporting of such weights, and frequently the allowing of considerable movement due to expansion and contraction, calls for very careful design, and many methods have been devised. Steel tunnels may be enclosed in a building, which reduces the temperature range, but others are mounted out of doors with a view to reducing the capital expenditure. In these cases a separate building is erected around the working section, with a further housing for the motor. Pillars, rollers and other devices are frequently employed, according to the degree of expansion likely to be experienced.

The elimination of vibration is equally of importance, and this is one advantage of concrete tunnels. In some instances the buildings are completely isolated structurally from the tunnel, while in other instances an insulated motor room only is provided.

The section of the working chamber will be controlled by the purpose for which the tunnel is required; rectangular appears to be the most common, but oval and octagonal shapes are used. The remainder of the return flow circuit may be circular or rectangular, according to the designer's ideas.

The internal pressure to be withstood naturally has a considerable effect on the structural design, and conditions will vary with each type. In the Eiffel open jet tunnel the pressure drop is proportional to the square of the velocity of the jet and frequently there is a pressure difference between two parts of the tunnel of 16lb. a sq. ft., to which there must be added adequate loading to cover windage and snow.

Return Flow Type

In the return flow type the conditions will vary according to the use of constant or variable density. The Convair tunnel operating at atmospheric pressure is designed to withstand a maximum internal bursting pressure of 307lb. per sq. ft. at the point of greatest cross sectional area, and is progressively reduced to atmospheric pressure at the test section. The California Co-operative tunnel operating at varying density has internal loads ranging from 1.5lb./sq. in. absolute to 58.8lb./sq. in.

In all the tunnels it will be noted that the working section is very much smaller than the other parts, and the purpose for this is to reduce the energy loss. In the case of a return flow tunnel, unless the most extravagant design is used, it is impossible to avoid the airstream turning a number of corners, and to reduce the loss at these points elaborate provision is made for turning veins of aerofoil section to reduce any losses to a minimum. In the majority of cases the tunnel corners are square, though in some variable density types hemispherical construction has been adopted purely from the structural standpoint.

The input of these very high powers into the airstream results in the generation of a very considerable amount of heat; in most tunnels the operating temperature of the air is limited to 125 deg. Fahr., and this calls for the removal of a large amount of heat. In the case of tunnels operating at atmospheric pressure special scoops are provided by means of which 10 to 20 per cent. of the air can be removed and replaced by fresh air, thus providing adequate cooling. Normally, when working with a variable density tunnel this means is no longer available and liquid cooling is essential. As an example of this the California tunnel calls for the removal of 500,000 B.T.U. per min. This heat is removed by the use of a water-cooled radiator consisting of three rows of tubes in depth and built up of 80 sections; the flow of water at the rate of 3,600 gallons per min. is then pumped to a cooling tower before being re-circulated.

In one special tunnel, to be described later, provision is made for high-power engine exhaust to remove and fresh air to be admitted even when working at very low density.

When dealing with high-speed flows of air, particularly at subsonic speeds, the question of humidity becomes of considerable importance, and provision is now always made for control of this feature. In some instances silica gel plants are used to reduce the air to a very low dew point, with the alternative method of employing refrigeration. In such cases it is usual to embody a brine heat exchanger delivering air with a dew point of 40 degs., or, alternatively, Freon direct expansion coils may be used.

The most important tunnel in this country is the high-speed unit of the R.A.E., Farnborough. The scheme to build this tunnel was under consideration for some time and the tunnel itself was officially opened in 1942.

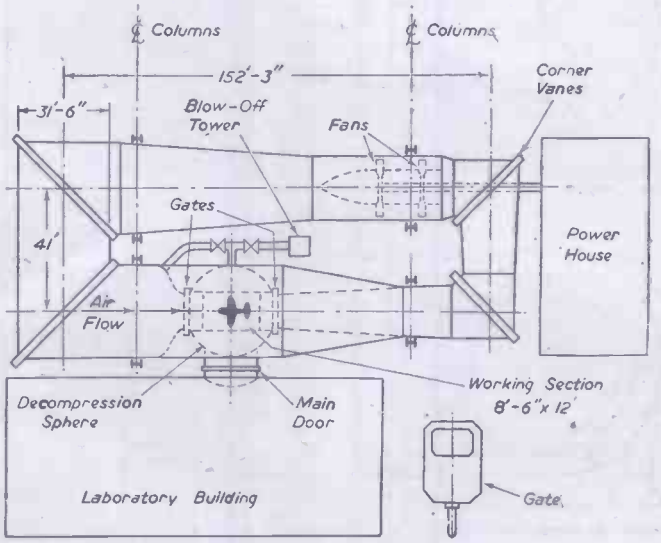


Fig. 3.—Diagrammatic plan of Southern Co-operative tunnel.

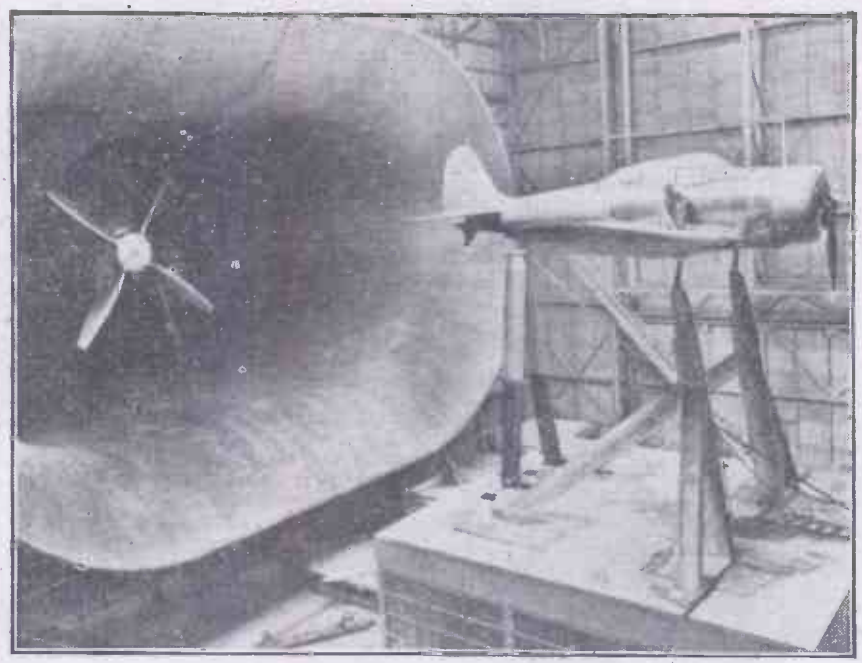


Fig. 5.—N.A.C.A. tunnel with full-size working space.

The tunnel is of the return flow type with enclosed working section and differs from other types in that it is of a symmetrical design as shown in Fig. 1. The return path completely encircles the inner section and the tunnel is cylindrical with hemispherical ends. The design incorporates advanced variable density features and with a power input of 4,000 h.p. and a pressure of one-sixth of an atmosphere maximum speed is 600 m.p.h., though it is understood that recent modifications have enabled this figure to be exceeded.

The dimensions of the tunnel are imposing inasmuch as the outer shell is 37ft. diameter by 130ft. long; to allow for expansion and contraction strains the tunnel is supported only on four supports spaced 90ft. apart along the length. The interior shell is supported from the interior by six streamlined struts at each end of the cylindrical portion.

An interesting feature of this tunnel is the considerable care that has been given to the internal finish, and a number of parts, particularly the working section, are built up from castings machined all over where any contact with the airstream is made, and as a preventive against corrosion they have all been sprayed with aluminium.

The fan, always one of the most important features, was a design proposition of considerable difficulty to ensure using the full power under all conditions. Full power can be obtained over the full pressure range of one-seventh to four atmospheres, and this is done without the employment of any pitch-changing equipment. To ensure that the air flow is without any axial rotation guide frames are fitted upstream of the fan, and these cause some rotation of the airstream; the fan blade in operation reverses this rotation and any residual effect left is overcome by a further set of vanes.

A 16ft. diameter fan is provided running at 800 r.p.m to reduce the operating clearances as much as possible. The fan throat is machined and 13 blades are provided, made up of light alloy forgings, their total weight being of two tons.

To provide variable speed of the fan a D.C. driving system is employed consisting of two 1,000-h.p. motors in tandem and capable of operation at a speed range of 320 to 960 r.p.m. Power for the generators is provided by a motor generator set operated by the synchronous motor. In common with all variable density tunnels, a considerable amount of accessory equipment is provided, and this includes two compressors, each driven by 400-h.p. motors and capable of being used as exhausters.

Due to the power input into the tunnel considerable heat is generated, and this has to be removed by means of external cooling. The method adopted here has been to fit cooling jackets around the outer shell, through which brine is circulated. Under maximum conditions a 4,000-h.p. input and an airspeed corresponding to an M number of .8, the temperature for the working section is only 15 degs. when the outer walls are maintained at 5 degs. C.

The Cornell Tunnel

As an example of a return flow type tunnel with closed working section, the Cornell tunnel, shown in Figure 2, is a good example, and this shows all the other departments which are associated with this method of testing. The cut away portion of the tunnel shows a working section with a model in it, and how the section of the tunnel expands. To the rear can be seen a portion of the tandem fan, while the elevated structure in the middle is the air exchange tower, which is also used for releasing the pressure when a high density is employed. The two circular funnels at the rear are part of the cooling tower installation for the water cooling of the airstream.

As an example of the large dimensions of these types of tunnels, Figure 3 is a diagram of the California Co-operative tunnel; both this tunnel and the Northrop tunnel shown in Figure 4 are mounted in the open, with separate buildings for the powerhouse and laboratory.

The N.A.C.A. open working space return flow tunnel is shown in Figure 5. This shows one of the twin 6,000-h.p. driven fans and a full-sized 'plane mounted on the supporting struts, which couple it to the balance which is in the building below. The extremely large dimensions of the complete tunnel are shown in the plan Figure 6.

The general arrangements of the turning vanes in a tunnel are very similar, irrespective of the cross section of the tunnel at the corners. *(To be continued)*

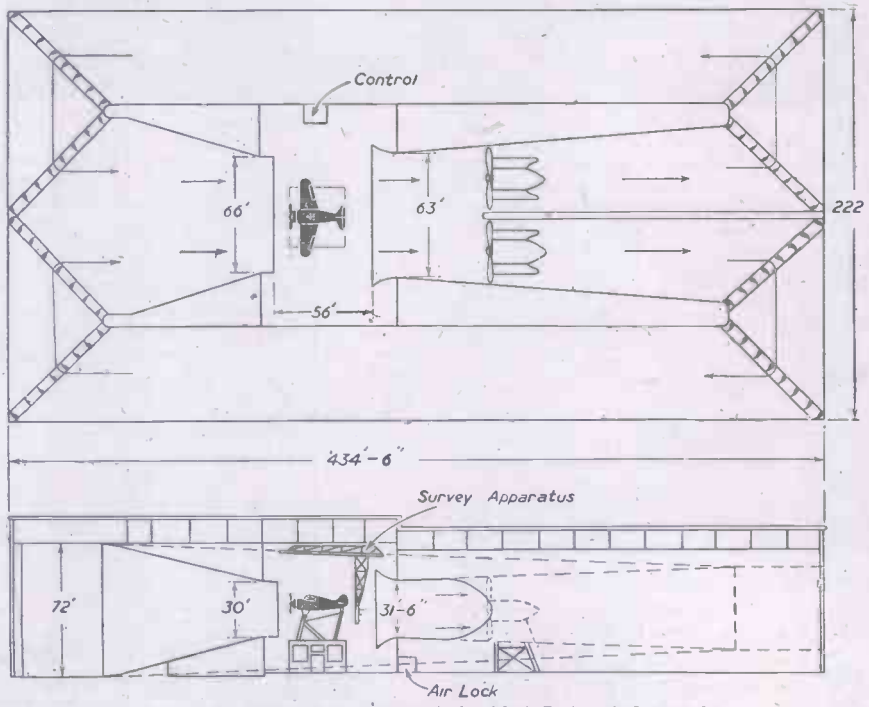


Fig. 6.—Plan and section of the N.A.C.A. wind tunnel.

A Push for Door Chimes

Constructional Details of a Novel Push-button Switch

By W. L. WILLIAMSON

THIS push is very efficient when used in conjunction with almost any type of "Door Chimes," especially the chimes detailed in the May issue of PRACTICAL MECHANICS. The idea of the push is to eliminate the buzz when a caller keeps his finger on the ordinary bell push. Try this with your own chimes, when you will understand what is meant. The function of the new type of push is as follows: On pressing the push the circuit is made just long enough to cause the impulse tube to be struck; the striker is released immediately and strikes the

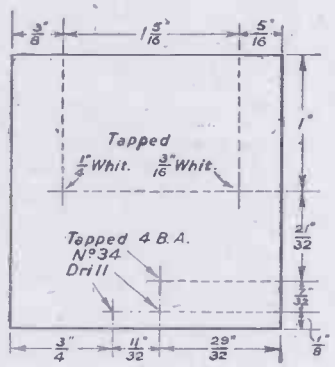


Fig. 1.—Plan of base.

rebound tube thus causing one correct operation of the chimes. Now we come to the second advantage gained as at this point we have only pressed the push knob in. On releasing it we hear another operation of the chimes, having had two complete operations for a normal method of the pressing and

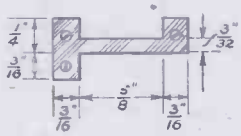


Fig. 5.—Details of bridge contact.

releasing of an ordinary bell push.

Constructional Details

The material required for the base and bridge piece is either Perspex or ebonite ¼in. thick; cut out, drill and tap both these parts accurately (Figs. 1 and 2). The push knob (Fig. 3) can be made from similar

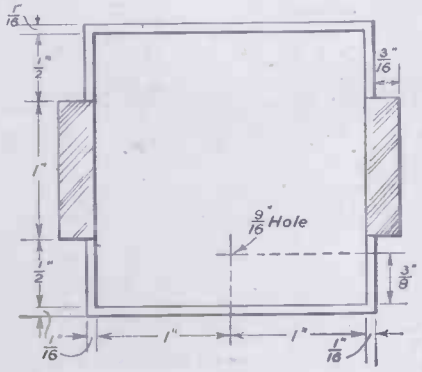


Fig. 6.—Dimensions for cover.

material, and if it is made from Perspex the 6 BA fixing holes in this and the bridge may be omitted as these two parts may be joined together by using Perspex cement. For the guide rods use brass rod ¼in. and 3/16in.

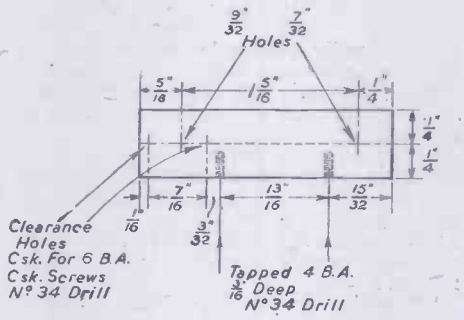
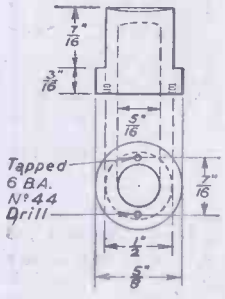


Fig. 2 (Left).—Details of bridge piece. Fig. 3 (Right).—Elevation and underside view of push knob.



diameter respectively and screw these with a thread ¼in. long at one end only. The 3/16in. rod is drilled 1-3/16in. from the screwed end with a 3/32 drill to take the split pin. A suitable spring may be found in the junk box; if not, one can be made from 19 s.w.g. piano wire, winding it on a 3/16in. rod. The finished length of the spring must be exactly ¼in. with open turns, as in Fig. 4, and when closed it should be 5/16in. This gives a 5/16in. stroke of the push knob. It is important that the spring is strong enough to return the bridge piece to the stop; if not, the whole object of the push is defeated. The next part to make is the brass contact strip (Fig. 5). A good chamfer is filed on both edges of its narrow part to allow it to move easily on to the fixed contact in either direction. This strip can be made from a piece of brass 1in. long, ¼in. wide and no more than ¼in. thick. The fixed contact is cut from a piece of 24 s.w.g. springy brass. This is bent as shown in Fig. 4. Using it as a template, drill the fixing holes so that the 4 BA tap passes easily through them. Now obtain the screws, washers and split pin ready for the assembly, which is as follows: Screw the guide rods into the base and see that they are parallel with one another, then put the spring over the ¼in. rod and try the bridge piece to see if it can be moved freely up and down. If not, ease the holes a little. When this is done fit the washer and split pin to the 3/16in. rod. Next fit the two contact parts and try the bridge piece up and down making sure the springy contact does not jam, and at the same time see that a good square clean contact is made. Connect a short piece of light flex between the bridge strip and the left hand screw in the base (Fig. 4). The push is now ready for trying out. Disconnect the two wires from your bell push and connect them to your new one when it will be found that it will do all that is claimed for it. Finally, the cover (Fig. 6) is made from 1/16in. Perspex. Use black for preference as it makes a neat finish. Fixing holes are not shown as they can be drilled to suit the reader's requirements. As will be seen, the shoulder on the push knob provides a stop at one end of the bridge, the other stop, of course, being the split pin and washer.

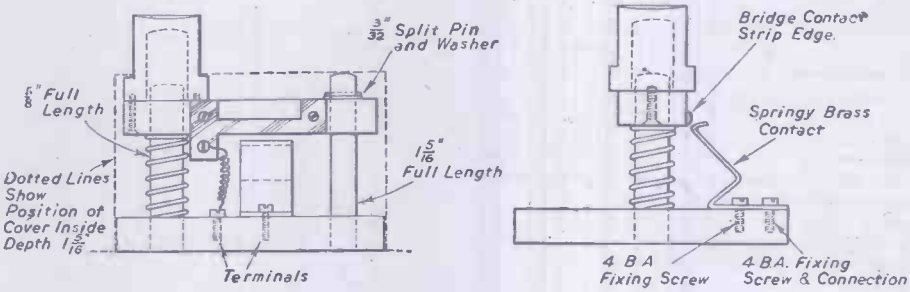


Fig. 4.—Side and end views of the completed push.

New Boiler Plant for Canada

THE Dominion Bridge Company, of Lachine, Quebec, have recently completed one of the most modern boiler plants in Canada. Having a peak capacity of 75,000lb. of steam per hour, the plant is part of an extensive programme of works expansion, including a new plate and boiler shop of considerable size, a machine shop extension and a new general stores building. The new installation consists of three Dominion Bridge water-tube boilers, each with a maximum continuous capacity of 23,000lb. per hour. All three boilers can readily be adapted to firing by coal or fuel oil. At the present time one unit is equipped for oil firing, while the other two are stoker fired. A three-pass fire-tube auxiliary steam boiler, with a capacity of 4,600lb. per hour, has been installed for the supply of hot water through a heat exchanger during the summer months. This unit is at present stoker fired, with provision for change-over to oil if desired.

Dynamo and Motor Problems—5

D.C. Dynamo–Motor Connections : A Dynamotor Question : Battery Cut-outs

By H. REES, A.M.I.E.E.

(*Continued from page 298, June issue*)

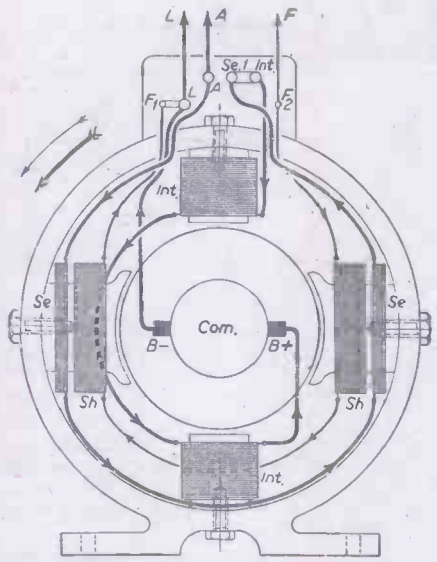


Fig. 1.—How would you reverse this motor? Internal leads are brought out to the terminal box, as shown. Directions of windings are not indicated, but arrows show the current directions.

IN this article I propose to discuss miscellaneous questions—some arising from previous notes, others introduced for the first time.

First, I am going to set an exercise on D.C. dynamo/motor connections.

In Fig. 1 is shown the internal connections of a typical compound machine fitted with interpoles.

Suppose it is a motor running anti-clockwise in the direction of the tailed arrow. The three outgoing leads to the starter are shown as "L," "A" and "F."

I want you, first, to draw a schematic diagram of the connections as they stand. Then, draw other schematics showing how you would re-arrange the connections *in the terminal box* for reversed rotation.

Deal with the two normal methods : (a) Reversing the armature current ; (b) reversing the field, but leaving the armature connections unaltered.

You will have to proceed carefully. There are altogether three stationary windings to rearrange correctly. You should not go wrong if you keep in mind the rules outlined in the previous articles.

Ask yourself a few questions : What does the series field winding do? How is it connected? What will happen if it is connected the wrong way relative to the shunt?

What about the interpoles? How are they connected? What is one important purpose they serve? When is it necessary to reverse the interpole polarity?

Finally, consider carefully the way the ends of the various windings are brought to the terminal box. For example, how would you reverse the armature current without at the same time putting the series (and/or interpole ?) coils the wrong way round?

You see, you must *know your theory* to handle machines with certainty—without having to grope in the dark, using "rules of thumb."

Mistakes

But suppose you did go wrong! Reversed windings will not blow-up the machine, although you should go carefully about running it up to speed on no-load.

If your error is such as to give a very weak field, "racing" may take place, which may cause damage if allowed to continue for a few seconds. Let us glance briefly at one or two other results.

The field may not be so weak as to cause racing—usually nothing less than a break in the shunt, or wrong shunt connections, will cause that—but, still, the reverse speed may be much in excess of normal, or may even tend to rise with load.

In other words, the field is weaker than normal, or becomes weaker still if mechanical load is put on the shaft, resulting in the motor taking more current.

What is the one and only explanation of this behaviour? How would you remedy matters?

Or, again, the speed is O.K., but after reversal there is rather severe sparking at *all* the brushes.

We have not dealt fully with the function of interpoles in "forcing" commutation, but we should make brief mention of the fact. In any case, if of the wrong polarity, they will *strengthen* armature cross-magnetisation, distorting the field and shifting the neutral points worse than without interpoles.

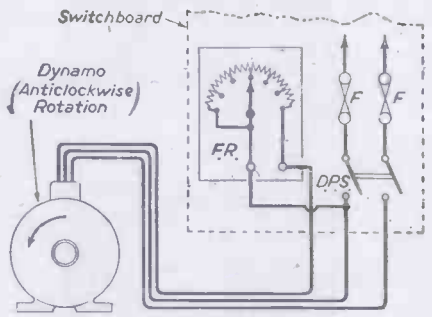


Fig. 2.—Extraneous connections of the motor of Fig. 1 used as a dynamo having the same—anti-clockwise—rotation.

Use as Generator

To continue with our exercises, if you are quite clear how to reverse rotation, as a motor, I want you next to consider a second problem.

We want to use this machine as a compound *dynamo*, with interpoles. Our external connections will have to be to a switchboard and field rheostat F.R., somewhat as shown in Fig. 2.

We are going to drive the machine anti-clockwise, in the same direction as it was running as a motor when supplied with current, and—it is hoped—the brush and terminal which was the + in the motor will be the + terminal of the dynamo.

Is this last assumption correct? Remember, we will now have to depend upon the machine *self-exciting*, that is to say, as a generator it must *build up* the weak residual magnetism in the pole pieces.

It can do this only if started up in the right direction, or, alternatively, we must decide whether anti-clockwise rotation (the same as the motor) will give us the correct terminal polarity to reinforce the residual—and not wipe it out.

Well, you should be able to see that anti-clockwise rotation is O.K. as far as terminal polarity and shunt excitation are concerned. If not quite clear, look up the first article of this series.

But will everything else be in order? Is self-excitation a sufficient guarantee that commutation will be satisfactory, or that the general behaviour of the machine *on load* will be as desired?

Draw again two schematic diagrams : One showing the *current* directions in all the windings as a motor ; the second indicating *reversed* currents, in some parts, when used as a dynamo.

Can you see what must be done? A compound interpole machine cannot be used satisfactorily as a dynamo merely by running it in the same direction as it was previously run as a motor. Certain important connections must be changed.

If you have solved this one, let us take a more complicated problem.

A Further Complication

Suppose, for some reason, you want to use the machine as a dynamo driven in the *reverse* direction to that which it was previously running as a motor.

As a theoretical question which may have practical applications, let us consider things in their present form.

The dynamo is to be driven "in reverse" on the motor. Residual magnetism and field build-up must engage our attention. It should not be too difficult to decide that the two shunt connections must be changed over—to begin with.

Because rotation is reversed the terminal that was the + in the motor will have a – sign. But this will reverse the current in the shunt, removing the residual magnetism, i.e., the machine will fail to generate until we change over the shunt connections.

"Until"? Is that the right word? If we start the dynamo with the shunt wrongly connected we shall wipe-out the residual magnetism. It is not too difficult to put in some more—of the right polarity—but we can save that trouble by simply changing over the two shunt leads as a first step.

Let us be quite clear what we have done, and are about to do.

Suppose the original motor was running

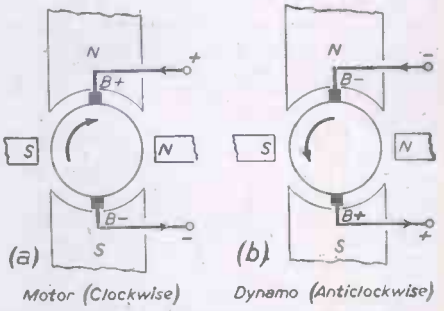


Fig. 3.—Using a compound-interpole motor as a dynamo, having reversed rotation. What windings need changing? (Interpoles polarities must be as shown in the motor (a), and dynamo (b).

clockwise, with N and S poles as shown (Fig. 3a) and with the top brush the positive.

In 3b we are going to run anti-clockwise as a dynamo. In consequence, *with the same magnetic polarity*, the brush electrical polarities will reverse—the top brush becoming the negative and the bottom one the positive.

To maintain this condition we have changed over the shunt connections, i.e., the magnetic polarity is *not* reversed—it remains exactly the same as in Fig. 3a.

Will the armature current be reversed? As a motor, the supply current passed through the armature from B+ to B—. As a dynamo (Fig. 3b) the armature will *supply* a current which flows outwards from B+ (now the bottom brush) and re-enters the armature at B— (top brush). Hence, as in 3a, current *enters* the armature at the top brush.

In a dynamo having reversed rotation to the corresponding motor, therefore: (a) The field current and polarity may be kept the same as in the motor, for purposes of self-excitation; and (b) the *direction* of current in the armature will then be the same in both cases.

Now, the series field winding must assist the shunt—not magnetically oppose it. The shunt current is the same as before, and so is the armature current. It must follow, therefore, that the series turns will still assist the shunt—we need not alter the two leads going to the series windings.

But what about the interpoles? Bear in mind from the procedure we have adopted: Armature and field currents remain precisely the same as in the motor with clockwise rotation.

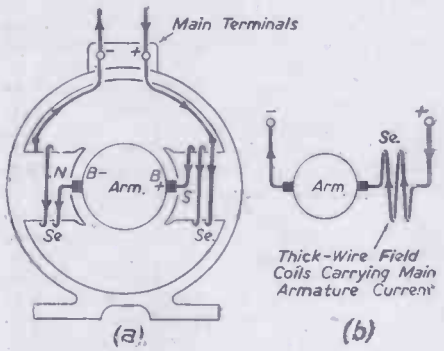


Fig 4.—A series-wound, two-pole motor (diagrammatic representation in (b)). In (a), the field windings are "split," one in series in each armature line.

We have reversed rotation in the dynamo, and the interpoles must be given a magnetic polarity opposite to what they have in a motor for the *same* direction of rotation, i.e., in a dynamo they must take the polarity of the leading poles, and of the trailing poles in a motor, Fig. 3 (a) and (b).

Bearing these principles in mind, noting that the dynamo rotation is reversed, but that the current direction in the interpoles (armature current again) remains unchanged, you should be able to deduce easily that the interpole connections need no reversing.

All that is necessary is to change over the shunt leads to permit self-excitation. I have discussed this problem fairly fully, and it should help you to check upon your answers to the previous problem of a dynamo running in the same direction as the corresponding motor.

A Different Procedure

Of course, we might have tackled the job differently.

For instance, we might decide to keep the brush (or "busbar") *electrical* polarity the same when running in reverse as a dynamo, by reversing the shunt field polarity.

This would involve more work in changing over series and interpole leads, as you should be able to see by reasoning as above. In all these problems of "reversal" (using a machine as a motor/dynamo with forward or reverse rotation) it is very helpful to draw schematic diagrams, as indicated earlier, or represent conditions as in Fig. 3.

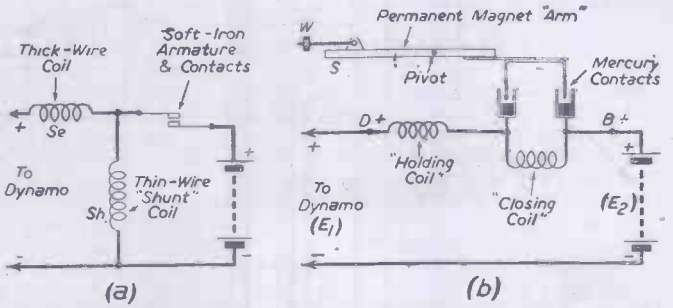


Fig. 6.—Diagrammatic outline of two different types of cut-out (iron cores omitted, and coils shown as isolated windings). In the switchboard, pattern (b), a permanent magnet is used, and the contacts are of the mercury-cup type; (a) represents the cheaper form of car cut-out.

A "Dynamotor" Question

In a recent query, I was asked to show the circuit connections for using a plain shunt charging dynamo as a motor for engine-starting.

I will not go into the problem in full at present. A plain shunt machine may or may not be suitable for engine-starting. It depends on the amount of starting torque required, and a shunt motor starting characteristic is by no means the best for the purpose.

It should also be remembered that, although every dynamo may be "run" as a motor, and operate as such quite satisfactorily on light loads (or loads within the capacity of the machine), the armature windings may be ill adapted to carry heavy starting currents even for short intervals.

The torque necessary to start up a heavy engine can only be adequately supplied by a series motor (Fig. 4). The armature winding then usually consists of robust copper bar, capable easily of carrying peak currents from the starting battery of the order of 200-300 amperes.

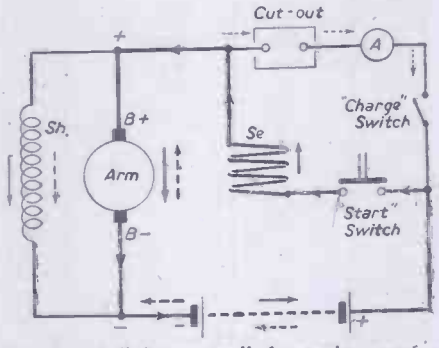


Fig. 5.—A "dynamotor" for engine-starting, with shunt and series windings. Both are in circuit for starting, to get enough starting torque, but it will be seen that the series winding is not included in the generator output circuit when the motor starting switch is released. Full arrows show direction of motor current; dotted arrows show the charging-current when the dynamo is up to speed. (Current through the dynamo shunt has the same direction throughout.)

Because that same current traverses the thick-wire field winding, the starting torque is roughly proportional to (armature current)^2.

A shunt dynamo may have about the same "power" (or h.p.) rating, but it would be quite incapable of coping with the starting conditions. First, because the armature windings are not designed to handle large currents—in fact, the armature resistance would limit the peak current and probably be dangerously overheated in the process. Secondly, because, even with the same armature current, the starting torque is much less than in a series machine.

To get over the difficulty, dynamotors for engine-starting generally have a dual winding on the armature—a particularly heavy gauge winding for the motor—and series coils in addition to the shunt.

We show in Fig. 5 a "compound" field winding of this type. "Compound" in the sense that both shunt and series turns are usually in circuit when starting, but the series turns must be out of circuit in the dynamo.

Sometimes, the series turns may be employed in reverse, as a differential winding for voltage-regulation in a car dynamo, but we needn't consider this case now.

Suppose the motor is started by a pedal switch Sw. Series and shunt field windings operate cumulatively, magnetically assisting to produce a strong field. Current direction will be *from the battery* as indicated by the arrows.

When up to speed the machine functions as a dynamo, supplying charging current to the battery in the direction of the reversed dotted arrows.

The shunt remains correctly excited, but in the dynamo the current in the series turns is the wrong way—such as to *weaken* the field. As suggested, this is a useful feature which may be utilised for output control in car dynamos, although simple differential-compounding will seldom be sufficient by itself to give adequate control over a wide range of engine speeds.

Otherwise, for constant speed working of a stationary or portable plant, it would obviously be highly undesirable to leave in circuit a strong series winding acting in magnetic opposition to the shunt—even if a differential characteristic was essential for some purpose the number of series turns used for starting would probably be far too many.

The example is given here as a further practical illustration of machine principles. Some means would be necessary to cut-out the series winding after the "motor" has finished operating. Thus we might have our connections as in Fig. 5, where the series turns are in circuit only when the pedal switch is pressed "On."

About Battery Cut-outs

Another query arising out of this dynamotor problem was the connections to an auto-cut-out.

The battery cut-outs used on cars are relatively simple affairs, "made to a price," but giving marvellously reliable service.

First, there is a shunt coil Sh (Fig. 6a) connected directly across the output voltage of the dynamo. When the voltage ($\propto$ generator speed) is sufficient to pass enough current through this thin-wire winding, the magnetic pull will overcome spring tension, closing the cut-out contacts—hence the main charging circuit.

The voltage will also then be sufficient to cause a forward charging current, which

flows via the few thick-wire turns of a series coil Se. The magnetic effect of the latter reinforces that of the shunt to keep the contacts closed.

But, now, when the speed falls to a point where the E.M.F. generated = the back E.M.F. of the battery no charging current can flow. A little later, when the battery E.M.F. preponderates, a reverse current will pass from + to − of battery via the dynamo and Se coil of the cut-out.

The cut-out will open only when this gives enough reverse (demagnetising) effect to overcome that of the coil Sh.—which remains across the dynamo whatever the voltage (or rather will be energised by the battery as long as the contacts are closed).

Usually, this type of cut-out requires anything from 5 to 10 amperes reverse current to open the contacts. This is no disadvantage as long as there are no series windings in the dynamo to cause reversal of residual polarity—it is of too short duration to impose any serious drain on the battery.

Polarised Cut-outs

Nevertheless, one form of cut-out used on switchboards is a more precise affair than this "soft iron" job.

It is a magnetically polarised pattern (Fig. 6b), embodying a carefully balanced permanent magnet NS—no spring is used, but the balance is adjusted by a counterweight w.

The thin-wire coil is not really connected in "shunt" at all, but in series between the dynamo and the battery; "differentially," in the sense that the current through it depends upon the *difference* of two opposing E.M.F.s, E1 and E2.

Immediately E1 exceeds E2 there will be a (small) current through the turns in the "forward" direction, dynamo to battery. The fixed soft iron core will then be magnetised to a polarity which attracts the permanent magnet arm, thus closing the main current contacts.

The contacts will short-circuit the thin-wire "closing coil," and complete the main charging circuit via the thick-wire ("main current") coil.

Thus the cut-out is maintained closed by the thick-wire coil only. When the engine speed is reduced, to bring the dynamo forward E.M.F. equal to the counter E.M.F. from the battery, charging current will cease at this point, when the cut-out arm should drop out under its own weight without any necessity for reverse current.

Often, however, enough reverse current will pass to change the polarity of the core, so exercising magnetic repulsion instead of attraction on the permanent magnet.

Evidently, because of the fixed magnetic poles of the latter, it is most important to connect up the coils of this type of cut-out correctly to the dynamo and battery.

For example, think what would happen if the closing coil was connected up the wrong way round. A *discharge* current from the battery would *close* the main contacts when the dynamo is at a standstill! Then what?

Generally, the right connections will be somewhat as indicated in Fig. 6b: D+ and B+ terminals must be taken respectively to dynamo *positive* and battery *positive*.

It is always better to learn the reason why than work by "labels." Bear in mind what is said about two E.M.F.s *in mutual opposition* acting on the closing coil, when it will be clear that this must be joined across *like* terminals of the dynamo and battery.

(*To be continued.*)

The Vanishing Chinaman

Solution to the Puzzle Set on Page 394 of Our September, 1948, Issue, Together With List of Prizewinners

WE received several thousand entries for the interesting puzzle set in our September issue. The work of judging, therefore, has taken a considerable time, and the judging has only just been completed.

We offered six books to the senders of the first six correct solutions opened, but in view of the large number of entries received we have increased the number of prizes to 50. Below appear the names and addresses of the prizewinners.

The solution to this ingenious puzzle is apparent from the diagram given here. In the first illustration is shown a piece of card with 13 vertical lines of equal height and equal spacing. A diagonal line is drawn through the rectangle which they form and the card is cut along this line.

If the two pieces are then slid up a distance equal to the pitch of two of the adjacent vertical lines it will be noted that one of the lines vanishes. It is obvious, of course, that the remaining lines have increased in height by 1/13th.

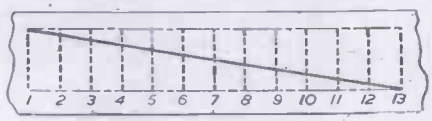
Now imagine that this diagram is drawn in the form of a circle, with one part on a central disc. There you have the elements of the vanishing Chinaman puzzle, for in the 12 positions each Chinaman has grown in height by 1/12th. This fact, plus the artistic licence in the drawing of the Chinamen explains the apparent mystery.

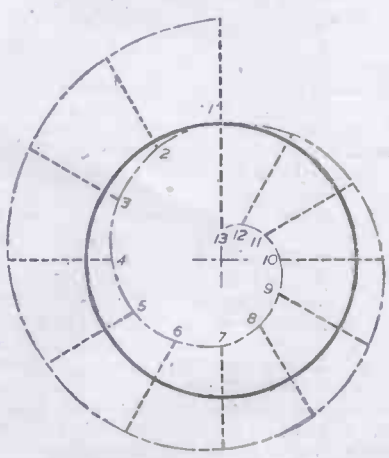
A large number of readers did not send in correct solutions. Some readers had gone to an enormous amount of trouble, and arrived at the correct solution.

Others went to a great amount of labour to prove what we already knew, namely, that there were 12 Chinamen in one position and 13 in another. We hope in later issues to publish similar puzzles in view of the interest evinced.

List of prizewinners for the Chinese puzzle:

W. Schram, 64, Compayne Gardens, London, N.W.6; R. H. G. Thomson, 10, Weld Rd., Birkdale, Southport, Lancs; W. C. Smith, 28, Worsley Rd., Walton, Warrington, Lancs; P. Hewitt, "Avoca," Rayne Hill, Braintree, Essex; J. F. Lucas, 158, Princes Gardens, West Acton, W.3; C. D. Thompson, c/o Electrical Test House, C. A. Parsons & Co., Ltd., Heaton Works, Heaton, Newcastle-on-Tyne, 6; D. L. Brown, 3, Hackness Grove, Willerby Rd., Hull, Yorks; J. P. Egford, 22, Wordsworth Ave., Roath, Cardiff; L. L. Holmwood, 33, Randall Rd., Leatherhead, Surrey; H. Waller, Hay Farm Bungalow, Woodlead, Burley in W'dale, Yorks; Lt.-Col. E. Parbury, Fairfield, North Cliff, Tenby; C. J. E. Kempster, The Mance, Studley, Warwickshire; L. Heath, 2, Cardale Rd., Nottingham; D. H. Adkins, 73, Aylestone Drive, Leicester; C. Elliot, 121, Parkside, Darlington, Co. Durham; H. Bannan, 55, Robins Lane, Sutton, St. Helens, Lancs; R. W. Seward, 20, Salter Fell Rd., Scale Hall, Lancaster, Lancs; A. Clarke, 20; Dora St., Walsall, Staffs; R. Holmes, 14, Castle Rd., Unsworth, Whitefield, Manchester, E. Cannon, 7, Kinsbourne Ave., Ensbury Park, Bournemouth; P. Symond, 33, Grangethorpe Drive, Burnage, Manchester, 19; J. A. Smith, 63, Nalla Gardens, Chelmsford, Essex; R. C. Dyer, Lieut.-Cdr. (E) R.N. R.N.S.R.B., 64 H.Q. C.C.G. (B.E.), B.A.O.R.1; R. Capron, 4, Hawley Crescent, Camden Town, London, N.W.1; 22019666 Pte. A. B. Leys, Ward 57, Connaught Mil. Hospital, Yinch Head, Surrey; S. A. Copper, 153, Well Lane, Harden, Walsall, Staffs; E. W. Bagent, 12, Havenfield Rd., Booker, High Wycombe, Bucks; J. Evans, "Brontfell," Woollard Lane, Whitchurch, Nr. Bristol; K. H. Lock, "Srinagar," Whittington, Nr. Worcester; R. Thornton, 22, Cross St., Leyland, Lancs; S. C. Tyneman, 1, Preston Gardens, Willesden, N.W.10; R. J. Butler, 1, Wilford Rd., Ruddington, Notts; John McNeill, "Rosemount," 3, Newbattle Terrace, Edinburgh, 10; K. J. Scattergood, 34, St. Lawrences Rd., Foleshill, Coventry, Warwicks; J. M. Ree, 5, Stoney Hey Rd., Wallasey, Cheshire; C. F. W. Frier, 166, Milkwood Rd., Herne Hill, S.E.24; R. B. Osmond, 16, Friars Gate, Onslow Village, Guildford, Surrey; J. S. Collett, 1, Elmbridge Ave., Surbiton, Surrey; R. E. Wicks, 50, Vincent Rd., Norwich, Norfolk; B. C. Wood, 55, St. Michaels Rd., Cardiff; J. Dunn, 10, Squire St., Whiteinch, Glasgow, W.4; R. C. Coles, 37, King Harold Rd., Shrub End, Colchester, Essex; A. Malein, R.A.S.C. "Gharial," Kennel Lane, Fetcham, Nr. Leatherhead, Surrey; C. W. Baler, 43, Quarry Rd., Ryde, Isle of Wight; K. J. Ming, 123, Gammons Lane, Watford, Herts; R. J. Lane, 80, Windmill Lane, Cheshunt, Herts; H. Senior, 9, Gnaiz Park Circle, Malpas, Newport; J. C. Kenney, "Bon-Accord," Swinstons Hill Rd., Dinnington, Sheffield; W. Brookes, 27, Livingstone Ave., Fox Platt, Mossley, Nr. Manchester, Lancs; S. Hall, 18, Springfield Gardens, Wallsend-on-Tyne; G. E. Smith, 56, Grove Rd., Hardway, Gosport, Hants.





These two diagrams show the elements of the "Vanishing Chinaman" puzzle.

The Elements of Mechanics and Mechanisms—14

Liquid Pressure.

By F. J. CAMM

IN Fig. 1 is shown a vessel filled with any liquid, and having several outlet pipes. We will presume that the liquid has no weight and that the cross-sectional area of each orifice is 1 sq. in. In each orifice is a piston. If we press on any one of the pistons by a force of, say, 1lb., pressure will be transmitted through the fluid in every direction and the pistons will each be forced outwards with a force of 1lb. It would seem from this that we have converted a force of 1lb. into a force of 4lb. but in reality it has been converted into a greater force, because every square inch of the interior of the vessel is pressed upon by the liquid with a force of 1lb. So that if we make the area of each piston 2 sq. in., they will be forced outwards with a force of 2lb. The greater the area of the piston, the greater the force.

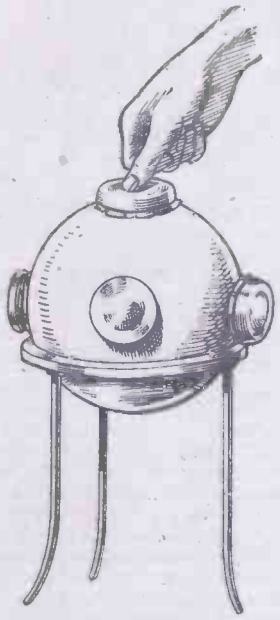


Fig. 1.—Apparatus for demonstrating Pascal's Law. If a pressure of 1lb. is exerted on one of the pistons, pressure will be transmitted in every direction and all the other pistons will be pressed outwards with a force of 1lb.

The Hydrostatic Bellows

Let a suitable piece of tubing be connected by another tube to a container. Two pistons are provided in them. If the smaller tube has a cross-sectional area of 1 sq. in., whilst that of the larger has a cross-sectional area of 100 sq. in., a weight of 1lb. placed on the first piston will exert a force of 100lb. on the other, of course, in an upwards direction. The hydrostatic bellows is based upon this principle. This consists of a tube about 6ft. long and about ½in. internal diameter connected to a pair of bellows. The top of the tube is funnel-shaped, and if water is poured into the funnel it will run down the pipe into the bellows until the water stands at the same height in the bellows and the pipe. If a weight of 500lb. be placed on top of the bellows and 1lb. of water is poured into the funnel, the water will lift a weight of 500lb.

The Accumulator

When water is confined in a pipe under pressure the pressure per square foot is the same throughout, irrespective of the length of the pipe. This is the principle of the accumulator, which is used in a number of devices. It is shown in Fig. 2. In one form a weight of several tons has attached to its lower surface a solid piston, fitting into a cylinder, which is kept full of water by means of a pumping engine. By this means water is forced along the pipes to operate the particular mechanism.

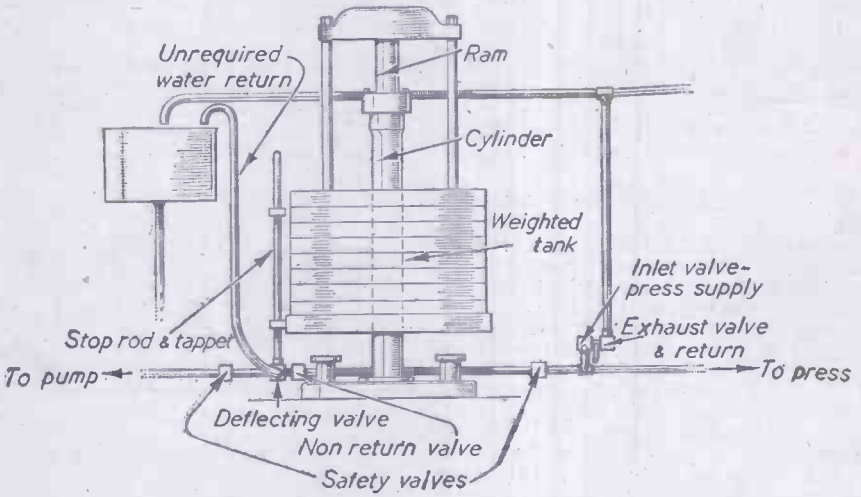


Fig. 2.—Diagram illustrating the principle of a high-pressure water accumulator.

Hydraulic Accumulator

In consequence, a hydraulic accumulator (Fig. 2) is used which stores an artificial head of water. The water is fed by gravity from an elevated tank into a pump, and is then forced by that pump through the inlet valve in the centre of the ram into the hydraulic cylinder. The accumulator is a steel or cast-iron cylinder into which is fitted a ram. This ram or piston carries a heavy weight of ballast which is usually effected by incorporating a tank of water or by filling the hollow chamber with metal plates. As an example, the area of a 6in. ram being 28.27 sq. in., and the total weight of the ballast and fittings with ram is 113,080lb., then the pressure exerted is approximately 4,000lb. per sq. in. on the water in the cylinder. And since this cylinder is connected by a pipe with the main supply, then the water is at the same pressure so long as the weight is floating upon the water in the cylinder. As the pump feeds high pressure water into the main the ram of the accumulator is raised, and as the water is taken from the main to raise the hydraulic presses to which it is attached by pipe line, then the accumulator falls. The characteristics of the pump cannot be so adjusted as to supply an irregular quantity of water required to raise the presses, and therefore the accumulator is used as a reservoir of high pressure. Should the pump continue to feed high pressure water into the accumulator when no pressure is being withdrawn from the accumulator, then the accumulator would be forced out of its bearings together with the ballast. To overcome this a safety valve is fitted immediately after the pump and deflecting valve, together with a non-return valve which is incorporated in the system immediately

Fig. 3.—Diagram illustrating the action of gravity, and showing that wherever raindrops form they fall towards the centre of the earth or the centre of gravity.

before the branch to the accumulator. The deflecting valve is actuated by a rod carrying an adjustable tappet which is lifted by the raising weight attached to the ram at some predetermined point approaching the full stroke permissible. This valve opens the main pipe and allows the unwanted water to flow back to the feed tank when the accumulator has risen to the maximum permissible height. To prevent the high pressure water in the accumulator and the mains from returning to the tank, a non-return valve is incorporated in the deflecting valve.

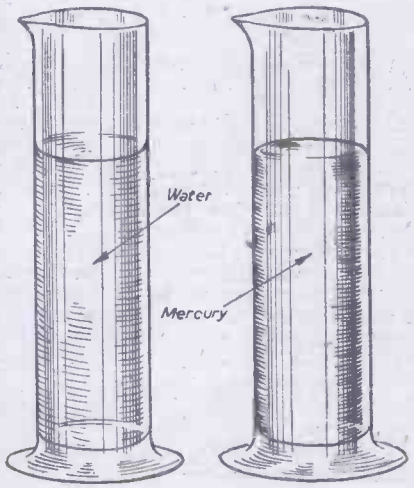


Fig. 4.—Diagram showing the concave surface of water and the convex surface of mercury.

The capacity of the pump depends upon the amount of water required for the installation when working at peak. A large capacity accumulator will provide hydraulic pressure for a large number of presses. Many pumps are fitted with an automatic starter which engages the motor when the accumulator has reached a certain level, and which cuts out the motor when the accumulator has reached the required height.

Water is not the only medium which may be employed, in fact any liquid can be used. Under certain conditions oil is used.

Liquids Under the Action of Gravity

We have already seen that gravity is proportional to the mass of the body and inversely proportional to the square of the distance. If we spill water it falls to the ground, being drawn down by the force of gravity. Now, all falling bodies move towards the centre of the earth (see Fig. 3). So that raindrops falling at our antipodes are falling in the opposite direction to those in this country.

We have also seen that the force of cohesion of liquids is very slight. In consequence, the force of gravity acts upon the molecules of liquid more strongly than the force of cohesion; so that when we pour a liquid into a vessel the molecules are pulled down by gravity and fill the vessel, the liquid finally coming to rest with a horizontal surface.

If the liquid is water it will be noted that the liquid stands a little higher at the point where it touches the sides of the glass. This is because the adhesion of the water for the glass is greater than the cohesion of the molecules of the water for one another. If mercury is the liquid it will be noted that it is lower at the point where it touches the glass than in the middle. This is because the cohesion of the molecules of mercury is greater than their adhesion to glass. If capillary tubes are used for the liquid the *meniscus* will be even more pronounced.

Surface of a Liquid at Rest

Every molecule of a liquid is drawn towards the centre of the earth, and as a consequence it tries to move towards it. In fact it does do so, unless it is obstructed by some other force. The molecules at the surface of a liquid at rest are supported on each side by other molecules, and they are therefore prevented from moving downwards because of the molecules which lie beneath them.

If the containing vessel be tilted, then any surface molecule may be considered as upon an inclined plane, and it will roll down this plane and continue to do so until the surface has again become horizontal.

Plane Surfaces

It is here necessary to make the distinction between a horizontal surface and a horizontal plane. A horizontal plane is one which is at right-angles to a vertical plane. Now the surface of the sea is a horizontal surface, because it is everywhere at the same distance from the centre of the earth. And, moreover, it is everywhere at right-angles to a vertical line drawn from that point to the centre of the earth. It is obvious that the surface of the ocean is not a horizontal plane because it has a curved surface, the earth having the form of a spheroid. If, however, we consider the surface of only a tiny portion of water, the curvature is so slight that for all practical purposes it may be ignored.

All Liquids Find Their Own Level

It is easy to see from the diagram, and from what has been said about the pressure of liquids, that if a number of vessels of different capacities are connected together by a pipe and a liquid be poured into one of them, it will flow into all of them and stand at the same level in all of the vessels.

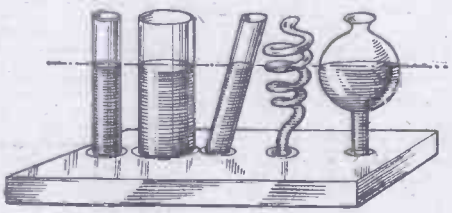


Fig. 5.—Pascal's vases, a series of differently shaped vessels secured to a hollow base containing water. When water is poured into any one of the vessels it rises to the same height in all of them.

Water Supply

Large towns are often supplied with water from a reservoir located on some high ground close by. Pipes lead from the reservoir underground to the various houses and buildings to be supplied with water. The water will rise in the pipes to any point not exceeding the level of the surface of the water in the reservoir. If the water pipe be pierced at any point below the level of the reservoir the water will gush out and endeavour to obtain the height of the surface of the reservoir.

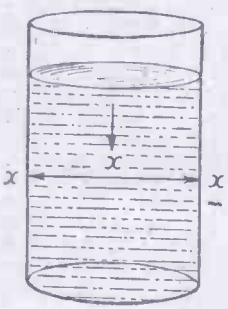


Fig. 6. — Showing the liquid pressure at any point x in a mass of liquid, is accompanied by a corresponding equal pressure on the sides of the vessel at the same depth.

Artesian Wells

Some smaller towns obtain their water supply, or some of it, from wells, which may be 1,500ft. or more deep. The water in such wells often rises nearly to the surface and sometimes it rises above it, forming a natural fountain. These are known as artesian wells and they obtain their name from Artois in France, where they were first used. Fig. 10 shows a section through an artesian well. It will be seen that there are various strata of clay, sandstone, and another bed of clay. The rain which falls on the surface runs over the clay, but sinks into the sandstone, so that the bed is full of water. The water at the lowest part is subject to the pressure of the water above it on each side, so that when the well is bored through the clay, immediately it reaches the sandstone the water oozes into the well and is forced up it, on the principle already explained. The fountains in Trafalgar Square are supplied with water from an artesian well which is about 600ft. deep, passing through beds of clay and finally penetrating the porous limestone or chalk, which underlies all London.

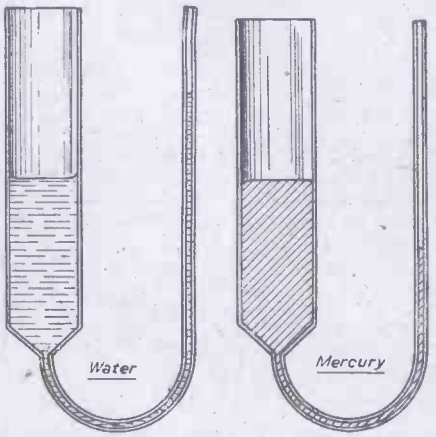


Fig. 7.—An effective demonstration of capillary elevation and depression. Water in the capillary limb of a U tube rises above the water level in the wide limb. Mercury in the capillary limb sinks below the mercury level in the wider limb.

The Hydraulic Press

It was Pascal who found that if he had water contained in a vessel of small sectional area and he subjected it to pressure, this pressure would be magnified in a much larger vessel if the two were placed in communication. From this was born the idea of the hydrostatic or hydraulic press, invented by Bramah. In Fig. 8 is shown a force pump having a small diameter plunger and connected with both a suction and delivery pipe. The delivery pipe is connected to the hydraulic cylinder and immediately before and behind the pump are placed non-return valves, assuring that the direction of flow is one way only. R is the ram, the base of which is fitted into the hydraulic cylinder, and to the top is fitted the bottom plate of the press. The columns C and C serve as guides for the ram and a stout leather washer W is fitted to prevent the escape of water from the cylinder.

Now, if the pump has a plunger having an area of 2 sq. in., and that of the ram is 100 sq. in., and the leverage of the handle from point of application of force to fulcrum is 10 to 1, and a force is exerted on the handle equal to 50lb. pressure, then what will be the total pressure exerted on an object placed between the two plates, one being stationary and the other movable, with and by the

pressure force? The factors which increase the force of the machine are: (1) The force applied to the lever end; (2) the purchase of the lever; and (3) the sectional area of the ram. The factors which counterbalance are: (1) The distance of plunger from fulcrum; and (2) the sectional area of the plunger. Now if we divide the product of the latter into the product of the former, we shall obtain the pressure exerted. Thus

$$\frac{100 \times 10 \times 50}{2 \times 1} = 25{,}000,$$

and since some percentage of the theoretical energy is lost in friction then the total pressure is 25,000lb. less X per cent. The force exerted by a liquid on any surface is always perpendicular to that surface. That is, should we have a vessel, regardless of shape, containing liquid, the pressure exerted by the liquid against the sides or bottom of the vessel will act at right-angles to the surface under consideration provided the liquid remains at rest. From this it must follow that the total pressure on the horizontal base of a tank, exerted by the water it contains, can be found by calculating the cubic capacity of the tank.

The Head

Furthermore, in a vertical pipe containing a liquid, the pressure at the base depends upon the area of the pipe and the height of the column of water. This pressure is technically known as the "head"; thus it is obvious that a head of water 20ft. high will exert twice as much pressure per square unit as a head of water 10ft. high.

A liquid is practicably incompressible and its use for transference of energy along a pipe is analogous to forcing through that pipe an endless rod. The mechanical energy of the pump is merely transferred through the moving liquid.

Were it possible to have liquid at an elevation which would give several hundred pounds pressure a considerable amount of energy would be available on tap, to be released for work as and when required. But this, however, is quite impracticable due to the height to which the tank would need to be raised.

Terms Used in Hydraulics

The following is a summary of the terms and laws relating to hydraulics:

Vena contracta or *contracted vein* is the reduced diameter of a jet of water escaping from an orifice, due to cross currents. With a circular orifice in a thin plate or thin edge in a thick plate, the reduced diameter will be $\frac{4}{5}$=0.9 (Weisback) or 0.787 (D'Aubuisson) at a distance of 0.498 d, say $\frac{1}{2}$ d, from the orifice.

Coefficient of contraction is a fraction by which the theoretical area of jet flowing through an orifice is reduced by reason of the vena contracta, and varies with the shape of the orifice. For a circular orifice it is $(\frac{4}{5})^2 = 0.64$.

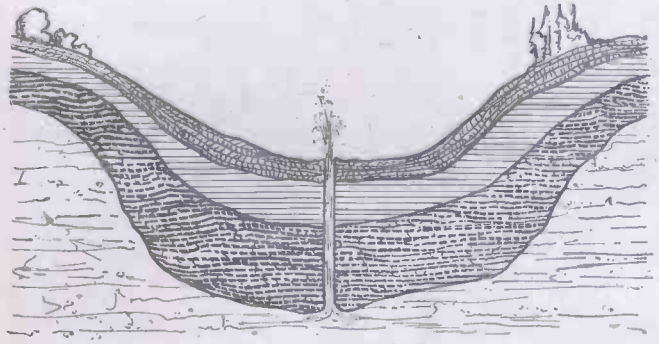


Fig. 10.—An artesian well. The water is derived from the sandy bed which lies between two beds of clay.

Coefficient of discharge is the fraction represented by the actual discharge divided by the theoretical discharge. For a circular orifice this is 0.62. For a short pipe 1½ d long, outside the plate = 0.815, inside the plate = 0.68.

Coefficient of velocity is the fraction represented by the coefficient of discharge divided by the coefficient of contraction. For a circular orifice $\frac{0.62}{0.64} = 0.97$.

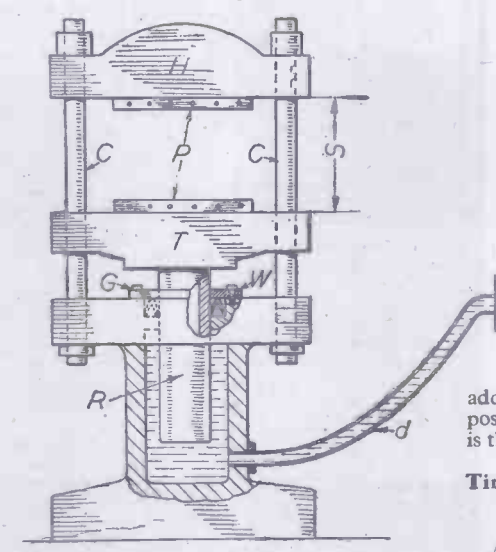


Fig. 8.—Schematic diagram of hydraulic press and hand pump in which H is the head casting, T the moving table, P the platens, S the stroke, G the gland, W washer, R the ram, V1 delivery valve, V2 supply valve, d delivery pipe, F plunger, f the fulcrum, L the lever and J suction pipe.

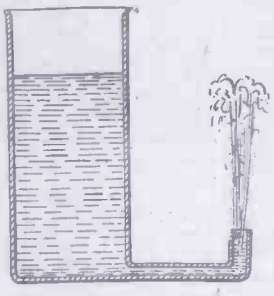


Fig. 9.—Diagram showing that if water is allowed to escape from a reservoir the escaping jet will endeavour to reach a height equal to the level in the reservoir.

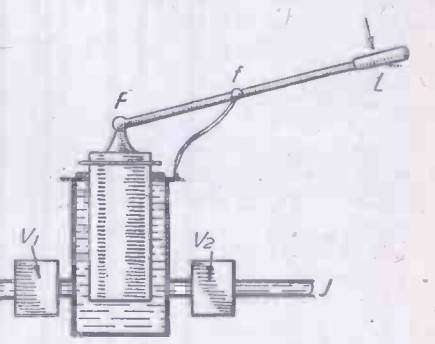
Wasted Head.—The wasted head in water flowing through an orifice is the difference between the actual head and the calculated head required to produce the actual velocity. In a circular orifice it will be 0.0591 actual head.

Coefficient of resistance is the wasted head divided by the calculated head to produce the actual velocity. For circular orifice = 0.06281 actual head.

Law of Hydraulic Resistances.—Whenever water flows over a rough surface or suddenly changes its velocity, either in magnitude or direction, there is a hydraulic resistance to the flow, and each of these resistances causes a waste of head which bears a fixed ratio to $V^2 \div 2g$, where V is velocity of flow past the obstacle.

Torricelli's Theorem.—Particles of fluid escaping from an orifice possess the same velocity as if they had fallen freely *in vacuo* from a height equal to that of the fluid surface above the centre of the orifice.

Bernoulli's Theorem.—When a liquid is flowing in a pipe or channel it possesses kinetic energy in virtue of its motion in addition to the potential energy due to its position and pressure, and the total energy is the sum of these three.



Time taken to Empty Tank

$$t = \frac{2A}{ac} \times \sqrt{\frac{H}{2g}} \quad \text{Approx. } t = \frac{75A\sqrt{H}}{d^2}$$

A = area of water surface in square feet.
H = depth of water in feet.
a = area of outlet in square feet.
c = coefficient for outlet.
g = gravity 32.2
t = time in seconds.
d = diameter of outlet in inches.

In emptying a tank under uniform loss of head, or in filling a tank from a constant head to which the level rises, the velocity or rate of discharge varies as head and therefore reduces uniformly with the time elapsing.

Vertical Overflow from Tank

D = diameter of trumpet mouth in inches.
d = depth of water above lip in inches (measured from still water).
G = gallons discharged per minute.

$$G = 8.4D\,d/d, D = \frac{G}{8.4\,d/d^1\sqrt{d3}} = \frac{G}{8.4D}$$

Mouth should be 3in. below top of tank.

Pressure of Water.—Water transmits pressure equally in all directions (Paseal), and its own weight acts as additional pressure in proportion to the depth from surface. Pressure is perpendicular to containing surface. Water is only compressible to a very small extent. Pressure per unit of area is affected solely by depth and is entirely independent of extent of surface.

Area of any portion of containing surface in square feet × distance of its centre of gravity in feet below surface of liquid × weight of liquid per cubic foot = pressure upon that portion of containing surface.

The pressure of the air is not able to sustain a column of water more than 34ft. high, hence water cannot by any possibility be raised by direct suction from a greater depth—the exact amount varies with the barometric pressure and the method employed.

If pressure be applied to a liquid entirely filling a closed vessel, that pressure will be transmitted equally to all parts of the liquid.

(To be continued)

Power Model Aircraft—3

Engine Mountings : Control Handles : Control Plate and Wires

By C. E. BOWDEN, A.I.Mech.E.

(*Continued from page 15, October issue*)

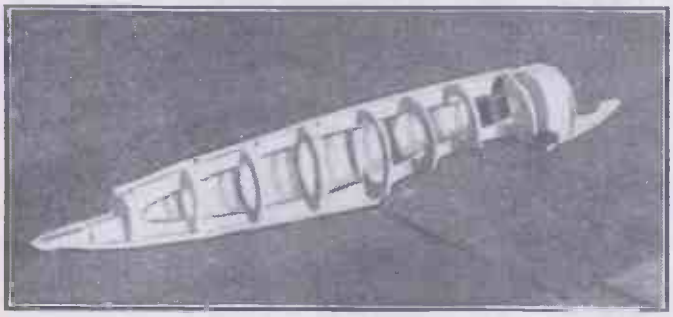


Fig. 17.—The fuselage has the other half formers cemented into place and the planking takes place over these as described for the original side.

THE control plate, made from 1/8in. three-ply can be seen in Fig. 1a (September issue). Reinforce it well with plastic wood where it is anchored on its bolt pivot. The plate is located beside the central rib on the inside of the flying circle.

I have used detachable mounts since the first post world war No. 1 record power free flight which I set up, and I have never seriously damaged an engine except on one occasion when the model stupidly flew at full bore straight into one of those Somerset stone walls at the end of a field. In fact, so popular did my detachable mounts become that I had them cast in electron, which is very light and easy to cut and file, and these are now available on the market. Beam engines just bolt on to them, and so save a lot of trouble. The wing is now cemented into the fuselage, and to make a really sound job it is filleted with plastic wood. This adds greatly to the strength. Refer back to Fig. 6, which shows this highly desirable feature. Clean airflow is also helped by filleting, which thus serves two purposes.

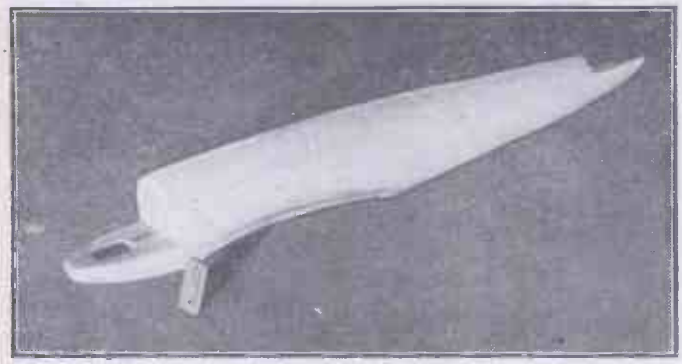


Fig. 18.—The planking has been completed and the fuselage is sandpapered down smooth.

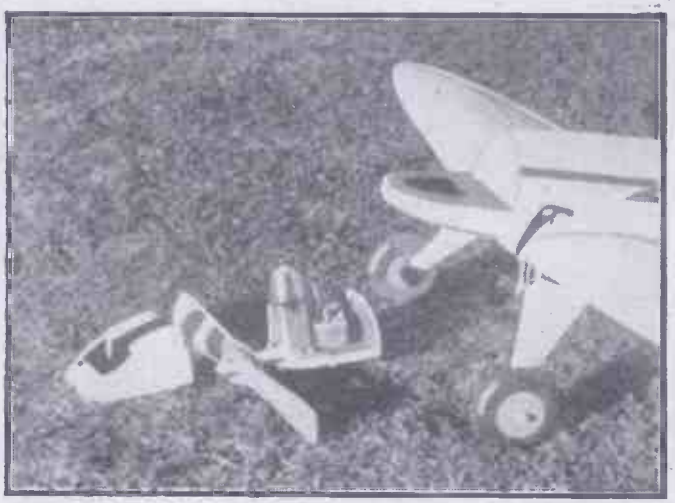


Fig. 20.—This photograph shows the Mills diesel with its beam mounting on the three-ply base with sheet metal stop. The hollow balsa cowling can be seen in front of the engine. The mount is placed on the fuselage ledge and held in position to the fuselage by elastic bands, as can be seen in the next photograph, Fig. 21.

Engine Mountings

The next operation is to cement on the other side half oval balsa formers as seen in Fig. 17. These are then planked in the same way as already described and the whole fuselage is sandpapered smooth, as seen in Fig. 18, which also shows the engine mount ledge for the detachable engine mount when a beam-mounted engine is used. If on the other hand the FROG conical type of mount is used, one merely makes a round nose from solid balsa with a round of three-ply cemented on to the nose, and this is glued on to the fuselage front former. In this case the engine is bolted to a circular piece of 3/16th three-ply which has wire hooks, and is held to the nose by rubber bands. When the beam type of engine is employed, it is bolted down to a three-ply 3/16in. bed that has a sheet metal stop, as seen in Fig. 19.

This detachable engine mount is kept to the ledge type of nose by elastic bands. Most designers bolt their engines direct to rigid wooden engine bearers protruding from the fuselage. I far prefer my own detachable mounts, for I can change engines in a moment, and they are not damaged should a bad landing be made, as is sure to occasionally take place even with an experienced pilot. My detachable mounts can easily be cowled in as will be seen by referring back to the photograph of the "Meteorite" in Fig. 13. On receiving a blow in a crash the mount gives to its rubber bands instead of the fuselage, thus saving the expensive engine crankshaft from becoming damaged.

Tail Plane

The tail plane, which we have discussed from the constructional point of view, is now cemented into position at no angle of incidence (see Fig. 1A). It is also filleted as in the case of the wing. Here it should be emphasised that most speed or stunt control-line models have their wings set at no angle of incidence which is a different practice to free flight models. Certain models, where a sport performance and easy flying are desired in addition, such as my model "Bullet," should have a very slight angle of incidence. The elevator is best hinged, as already stated, by little squares of cloth which are cemented in position with the edges alternating on top and below. Make sure the elevator can move up and down freely.

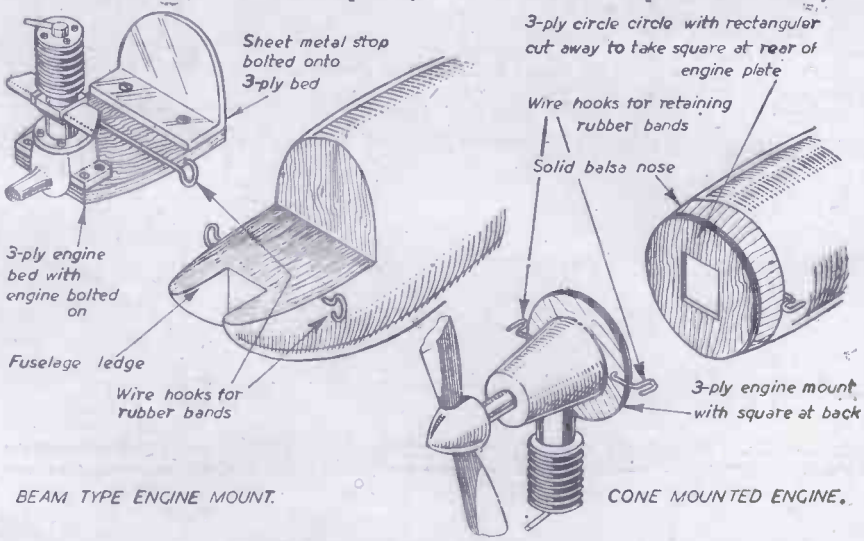


Fig. 19.—Detachable engine mounts.

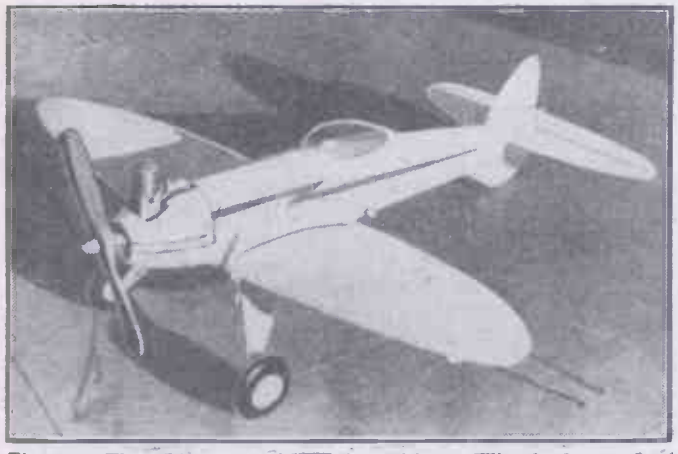


Fig. 21.—The engine mount is now in position. Wire hooks are fixed in the fuselage, reinforced with plenty of plastic wood to prevent tearing out. A spinner can be added as in the model shown in Fig. 6, if desired.

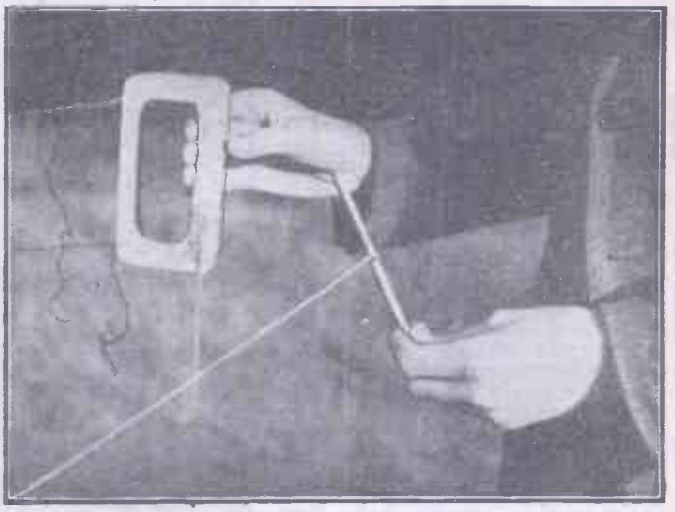


Fig. 22.—A three-ply handle is simple to make. It should have a wire spike to go into the ground when the operator is starting up his engine so that lines do not get crossed. If flying off concrete paint the top red to recognise.

Control Handles

Before we proceed further, let us see how we can make a simple control handle. There are handles to be bought on the market, but my simple handle works well and the lines, if fishing line is used, can be wound up on to the handle after flying. This handle can be cut from stout three-ply, as seen in Fig. 22. The two lines are fixed or tied to the two holes drilled in the forward end. The hand grips the rear end, and the handle is made just long enough to accommodate the hand. A wire spike is fitted into the bottom of the handle and bound, glued, and reinforced with plastic wood. This spike can then be stuck into the ground *with the lines NOT crossed*, when the operator is starting up his engine. This can be seen in Fig. 23. It will also be noticed that there are two other lines shown in these photographs. They are luxuries and not strictly necessary for the beginner, but nevertheless are well worth fitting.

In Fig. 22 the operator is seen also holding up a stick. This is attached to a line to the tail end of the model where there is a pin going through a wire loop on the model. This pin also goes through a wire prong in the ground, and so the model is pegged to the ground whilst the engine is running up. The owner therefore starts up his engine and walks over to the control handle which is spiked into the ground at the centre of the flying circle. He can now take up the handle with uncrossed lines, and then give the extra line a tweak when the retaining pin will release the model's tail from its tethering spike, and off goes the model. With this device the owner can carry on control-line flying without the aid of a starting assistant.

In Fig. 23, the second extra line can be seen loosely attached to the base of the handle on a little wire arm. The line goes to the model, being attached to a device that opens and shuts a throttle. This is most useful for sport flying for one can throttle the motor up and down in the air. The speed and stunt enthusiasts cannot afford this extra line, because it adds to the drag and makes the lines become entangled during loops. But there may be many who will like these extra aids for sport flying.

It is not always realised by the novice what a great deal of speed is lost due to drag of control lines. If speed is the aim then it is advisable to use thin special control line wire that can be purchased at the model shops. This reduces drag, is safer at high speed, and allows less friction of twisted wires when looping. It is a nuisance, however, because it has to be wound off at the end of flying on to a special large bore drum, otherwise the wire becomes kinked and useless.

For medium speed flight, really first class waterproof fishing line guaranteed tested to a given breaking strain is most satisfactory, for it can be wound straight on to the three-ply handle previously described. The line can be unwound quickly for the next flight session by simply grasping the wire prong and letting it revolve in the fingers whilst one walks away from the model. *Never forget when lining up the model for its first flight to get the elevator horizontal*, the handle spiked into the ground in a vertical position, and the two control lines equally taut. If this is not done the elevator will not work with the same degree of movement up and down, and the model will either dive in or climb when the handle is vertical in the hand.

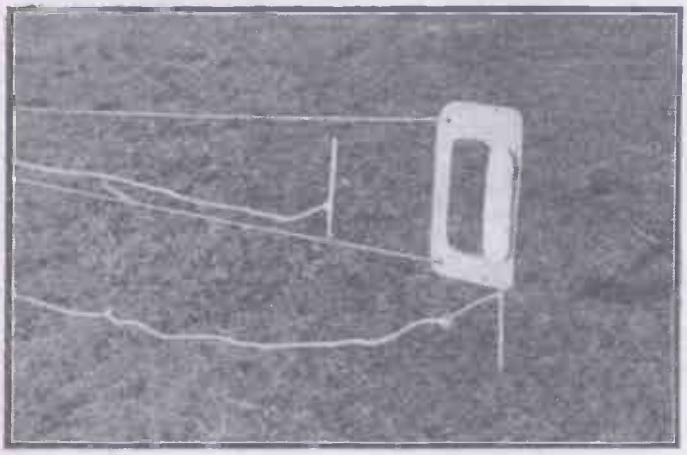


Fig. 23.—The handle is here seen stuck into the ground during starting-up operations. Two extra lines are seen for starting single-handed and throttle control.

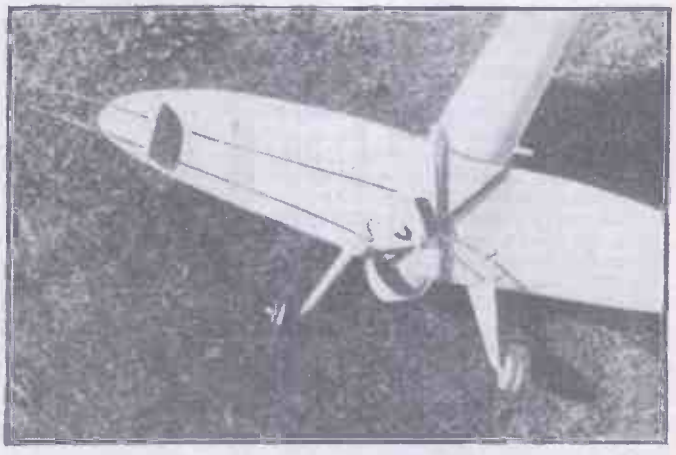


Fig. 24.—An external control plate and wing wires, etc., can be fitted very quickly to any model if the owner is interested to try control lining without delay. Internal apparatus is better for a specially built speed model in order to cut down drag and for the sake of neatness.

External Control Plate and Wires

Some enthusiasts will want to convert quickly their existing free-flight models. This can be done without all the trouble of building the control apparatus inside the wing and fuselage. A glance at Fig. 24 shows the triangular three-ply control plate on its pivot bolt with two wires running to the wing. An external wire of heavy gauge that will not easily bend under flying load on the elevator must be connected from the control plate to the wire horn on the bottom of the elevator. For slow models the size of the plate and horn is not critical.

(To be continued)

Farnborough Flying Display

Notes and Comments on the Various Types of Aircraft Seen at the Show

By THE MARQUIS OF DONEGALL

IT is small wonder that the Ninth Flying Display and Exhibition should have created something of a sensation both at home and among all the journalists representing newspapers outside the Iron Curtain. It was a very comprehensive and superbly organised show.

In Spain where I happened to go directly after the show the Press gave a great deal of space, including the front page of Spain's only illustrated daily, which showed the "La Cierva" 26-seater helicopter, the "Satelite Planet," and another helicopter looking like a whale with a bulging fuselage called the "Fairey Gyrodyne," which set up an international speed record for helicopters.

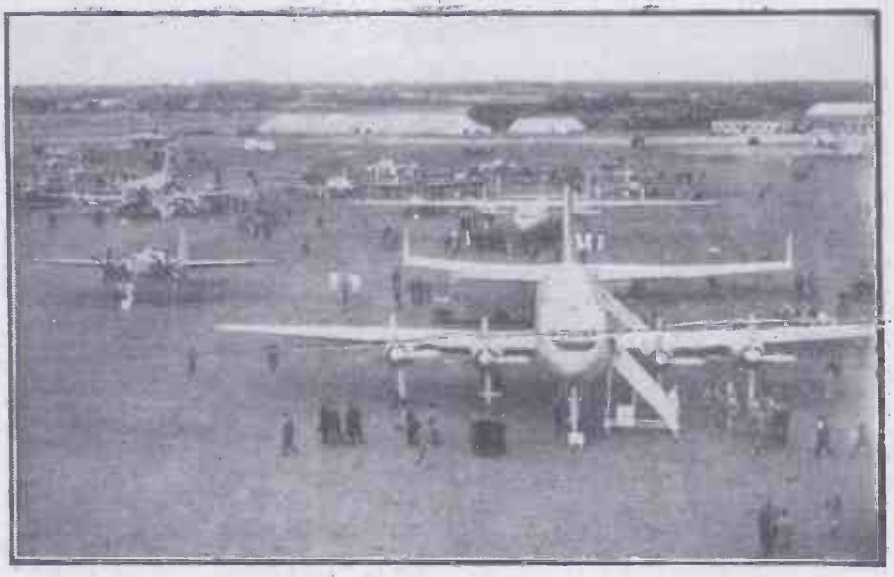
On the opening day almost every member of the Diplomatic Service accepted an invitation to the giant luncheon at which Sir Roy Dobson, C.B.E., President of the Society of British Aircraft Constructors, and Mr. G. B. Strauss, the Minister of Supply, spoke.

Attention to detail was well illustrated by the fact that wherever you stood on the whole of Farnborough R.A.F. Station you could hardly fail to hear the speeches from one loud-speaker or another. The same applied, of course, to the description of the machines as they took the air and landed during the afternoon flying displays.

Low Ceiling

As I write I have vividly in mind the bad luck that the R.A.F. sustained on their celebration day of the Battle of Britain. Certainly, on one afternoon when I was at Farnborough the ceiling came down to 300ft., and, as a rather bogus old pilot, I had my heart in my mouth for the chaps trying to perform at 300 to 400 miles an hour in those conditions. However, as far as I know, nobody, pilot or public, was even dented, and I feel that it would be unfair to attribute this remarkable achievement to pure luck.

It is obvious that we cannot take item by item the whole week's flying displays. So let us take as typical the opening day. After the speeches, already mentioned, the Display started at 2.30 p.m. It began with the



A general view of some of the planes seen at the recent Farnborough display.

Handley-Page "Hastings," the A. V. Roe "Lincoln," the Bristol "Lincoln" (Theseus), the Vickers' "Valetta," the Handley-Page "Marathon," the De Havilland "Dove," and the Bristol "Freighter," appearing in circus formation—and, indeed, an impressive sight they were.

After that we had a fly-past by the Short "Solent" and the Saunders-Roe "SR/A1." The former is a flying-boat air-liner with four Bristol Hercules engines, and the latter a twin-jet flying-boat fighter with two Metropolitan-Vickers Beryl turbo-jet engines.

Passing on, the Fairey Company put the "Gyrodyne" through its paces. This is, as you know, the fastest helicopter to date, with a cruising speed of somewhere around 125 miles an hour.

We pass on to the aerobatics of Boulton Paul's "Balliol T.2," an advance trainer with a Merlin engine. I suppose they have to do this sort of thing in these days, but, quite frankly, I should hate to be sent off on my first solo riding such a thoroughbred.

The Tudor VIII

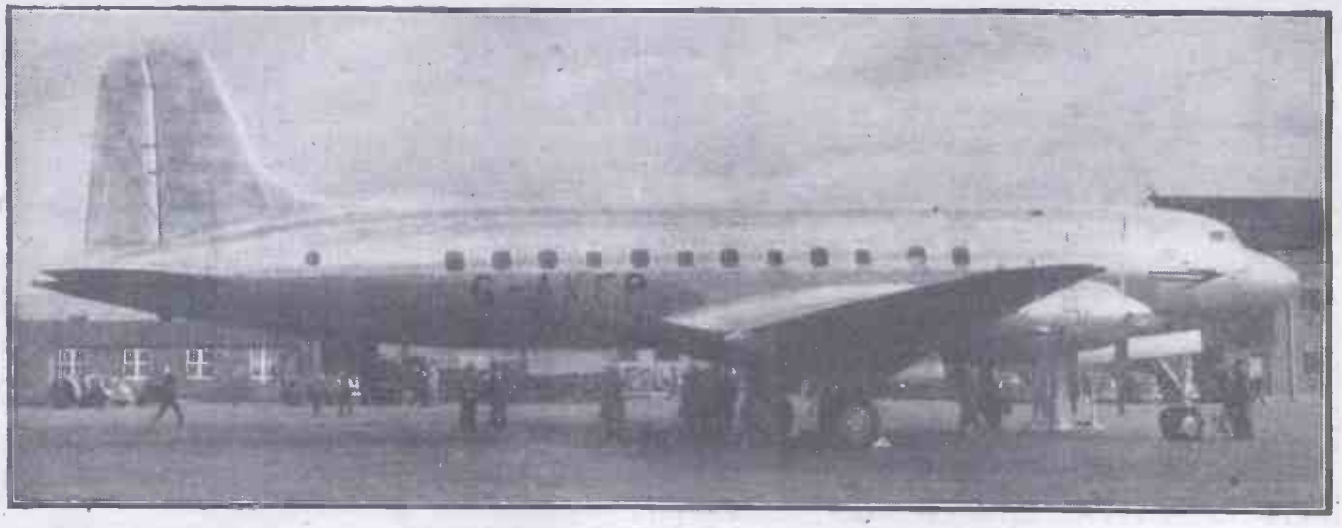
One of the sensations of the whole show was A. V. Roe's "Tudor VIII." This is an experimental air-liner with four Rolls Royce "Nene" turbo-jet engines.

Next we had the "Prince," an eight-passenger transport, or, alternatively, a freighter, with two Alvis "Leonides" engines.

Then we came to another sensation in the shape of the Handley-Page "Hermes IV." This is an Adonis among aircraft, being to my amateur eye the larger and more resplendent cousin of the De Havilland "Dove." It is pressurised, with four Bristol "Hercules" engines. According to my notes it takes 63 passengers.

Next to take off was the Short "Sealand"—a beautiful-looking amphibian air-liner powered by two De Havilland "Gypsy Queen" engines. If the "Gypsy Queen" is as reliable as the old "Gypsy I" behind which I rode for six years without so much as a cough in a car-load, I would like to be rich enough to own a "Sealand."

It was about this time that the ceiling came down to 300ft.' But that did not stop the De Havilland "Vampire 5." Under the low cloud this aircraft just became, first a colossal noise and then, for a split second, a silver streak travelling at what seemed like



The Handley-Page "Hermes IV" pressurised air-liner with four Bristol "Hercules" engines.

near-supersonic. This was De Havilland's Fighter Bomber with a "Goblin" turbo-jet engine. Unfortunately, I did not see De Havilland's "Ghost Vampire," the international record-breaker, except on the ground. It has one De Havilland "Ghost" turbo-jet engine.

Vickers-Armstrong "Viking"

As I have to deal with the extremely interesting exhibitions in the East and West Exhibition Halls, we must pack up the flying display. But we cannot do so without mentioning the Vickers-Armstrong "Viking"—a 27-seater civil transport with two Rolls Royce "Nene" turbo-jet engines which, as you will remember, did London-Paris in something like 25 minutes; 240 miles—not bad?

Two other Vickers-Armstrong machines come next, the "Seagull," an amphibious aircraft with a Rolls Royce "Griffon" engine,

The world's first all-jet four-engined transport aircraft the Tudor VIII, which is powered with four Rolls Royce Nene engines.

and the "Viscount," a 32-seater civil transport with four Rolls Royce "Dart" turbo-propeller engines. Next A. V. Roe's "Athena I"—an advanced trainer with an Armstrong-Siddeley "Mamba" turbo-propeller engine, and Napier's Avro "Lincoln" heavy bomber, which was fitted for experimental purposes with a "Naiad" turbo-propeller engine in the nose.

Last year the air speed "Ambassador" probably caused the greatest sensation. It was there again this year, having been adopted by British European Airways. It was still drawing the crowds, although it had newer rivals for public interest in the Handley-Page "Hermes IV," the "Tudor VIII," the "Nene-Viking," the "Viscount" and the two Flying-Wings.

The "Viscount" is full-bodied like its cousin, the "Viking," and I think has an even better appearance with its four narrow turbo-propeller "Dart" engines with four-bladed propellers.

The two Flying-Wings look practically alike except that one has two "Nene" engines which project slightly, and the other has two Derwent engines completely enclosed in the wing. Everybody remarked how these curious-looking aircraft appeared to change shape, according to the angle at which they are viewed. They seemed to vary from bat to boomerang as they were put through their paces.

The individual flying display ended with De Havilland's Canadian "Chipmunk," a little two-seat all-metal trainer with a Gypsy Major engine.

Circus Formations

The flying display wound up with two circus formations, the first consisting of the Derwent Flying-Wing, "Athena II," "Balliol I," "Sturgeon" and "Brigand BI." The second circus showed Blackburn's S28/43, "Firefly" trainer, Spitfire trainer, "Sea Fury," "Sea Hornet" and the graceful Gloster Meteor IV, the jet-propelled fighter with two Rolls Royce Derwent turbo-jet engines.

It being quite impossible to deal adequately with the two Exhibition Halls, I shall confine myself to picking out exhibits that caught my attention and apologise to other exhibitors whose displays and courtesy were universally of the highest order.

I went first to Rolls Royce. They generally give one a souvenir of some kind. This time they presented me with a leather-bound booklet of conversion tables. It is true that I cannot understand half of it, but the other half of it tells me how to convert cubic metres to cubic feet and even such simple things as centimetres to inches. On the other hand, I should much like to know if anybody can tell me what this means:—

"Flying at any altitude, the thrust of a turbo-jet remains nearly constant whatever the speed of the aircraft. Hence the power of the turbo-jet (thrust multiplied by speed) increases proportionately to the speed.

"In the case of the airscrew engines, the power output is constant, hence, the thrust given by the airscrew (power divided by speed) is inversely proportional to the velocity."

So much for Rolls Royce.

Fairey's Display

We now move to a most ingenious display by Fairey's in the East Exhibition. As one looked at their stand, consciousness came that something was moving high up in the background. What was moving turned out to be the models of the Fairey Company's main designs since 1921 coming round on a continuous belt. Altogether eleven, starting with the machine that some of us remember called the Fairey 3D (1921), through the "Swordfish" (1934), the "Firefly MI" (1941)—remember how they said you had only to cough and it was airborne?—through the "Firefly M4" (1945) up to two secret machines, the models of which were completely hidden by cards which said: "Secret 1948."

Aircraft Models

On the stands in the two Exhibition Halls there were many complete models of aircraft and sectioned full-scale aero engines. Two exhibits that I thought specially worthy of note were the "Sea-Gull's" variable incidence wing and the Boulton Paul power-operated controls. Bristol showed a one-twenty-fourth scale model of the "Brabazon I" and De Havilland a "Ghost" turbine of five-thousand-pound thrust. Also a Gypsy Queen six-in-line geared and super-charged engine. Fairey showed a mock-up full-scale model of the "Gyrodyne" helicopter cabin and details of its engineering. Hawker showed a working-scale model of a "Sea Fury" as at present in service with the Royal Navy.

There were two examples of ejection-seats by Martin-Baker, one of which was the fully automatic parachute type, and Saunders Roe displayed the latest and past products of the company including the SR/A1 Jet Fighter and the SR/45 Long-range Civil Machine.

Unfortunately, it is impossible to cover the 163 stands devoted to parts, materials and accessories. They provided a fascinating study covering every branch of aviation from radar to publications devoted to aircraft.

Well, it looks as though that is about as much of an impression as I can give you of this great British Exhibition. I must, however, give Hawker a mention because they were the only people who had Press prints of their aircraft readily available at the particular moment that I asked for them.

I can only say that I hope very much that the Society of British Aircraft Constructors will be able to make and manage so superbly this Exhibition and Display as an annual event. I end on the same note as at the beginning of this article, having seen the results of their efforts in at least one foreign country, which, from 1939 up to the beginning of 1946, was not noted for its impartiality towards things British.

Splitting Tubes

By A. H. GOZZARD

I HAD occasion to split two thin tubes, ¼in. outside diam. by 14in. long, to make an edge on a metal tray, as shown in the enlarged diagram. (Fig. 1.)

I mounted the tube between the centres of a small treadle lathe, with a parting-tool in the tool-post and a support behind the tube, as in Fig. 2. By slowly traversing the slide rest along by hand, and gradually applying the cut, I was able to finish the job satisfactorily.

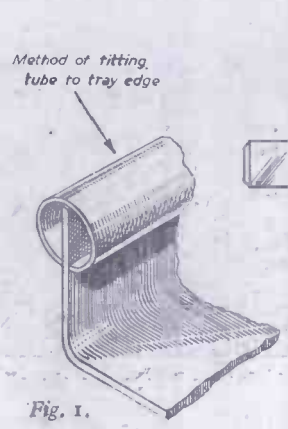
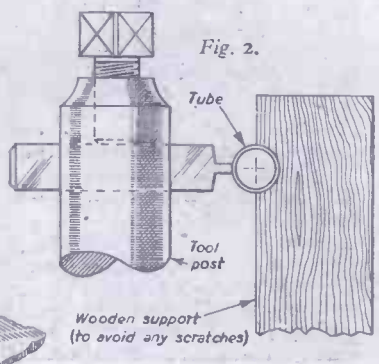


Fig. 1.



Method of splitting a tube, and details of tray edging.

New "Two-wheeled Car"

Particulars of the New Velocette "149"

The comfortable "feet down" position of the new Velocette "149," described as a car on two wheels, demonstrated during a traffic hold-up in the centre of Birmingham.

A TWO-WHEELED machine which, according to its makers, "may be treated like a bicycle and used like a car," was introduced at the Motor-cycle Show held in London, November 18-24.

Produced by Veloce Limited, of Birmingham, one of the leading manufacturers of motor-cycles, this new product sets up standards which cannot reasonably be measured by comparison with motor-cycles of traditional type. Broadly speaking, the only point of similarity with the orthodox motor-cycle is that it has two wheels and handlebar control. Beyond that, all preconceived ideas of motor-cycling must be abandoned in considering the new "two-wheeled car."

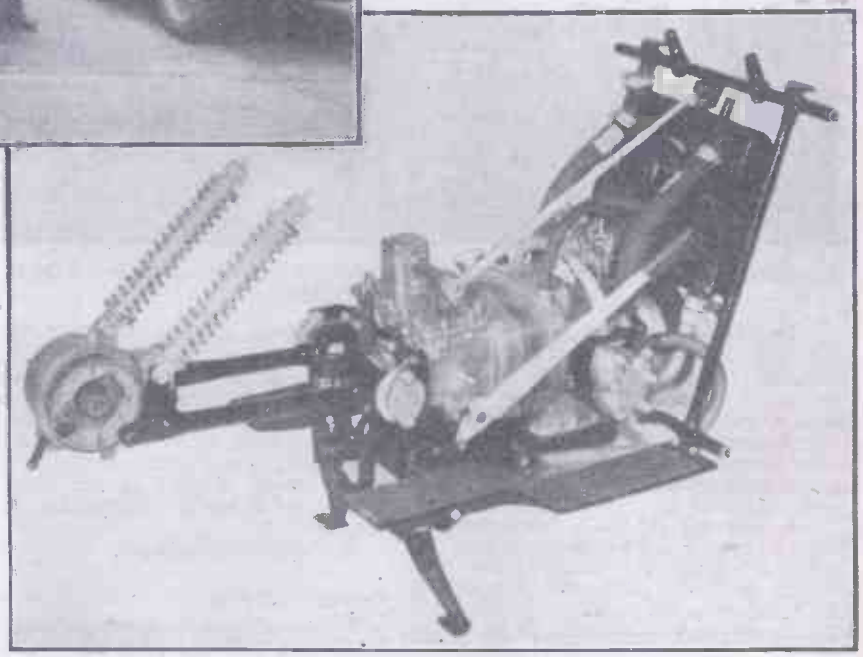
Opposed Twin Four-Stroke Engine

Of the Volocette "149"—which will sell for £99 10s., plus £26 17s. 4d. purchase tax—the makers declare: "We set ourselves the task of producing a motor-cycle which shall provide comfortable, trouble-free transport for people of all ages and types, instead of being merely the means of obtaining athletic exercise by the few." The main requirements of maximum silence, elimination of vibration and low fuel consumption, coupled with reasonably high maximum speed, have been met by introducing a water-cooled horizontally opposed twin four-stroke engine of 149 c.c. capacity. The gear box is in unit with the engine, and the drive to the rear wheel is by a shaft.

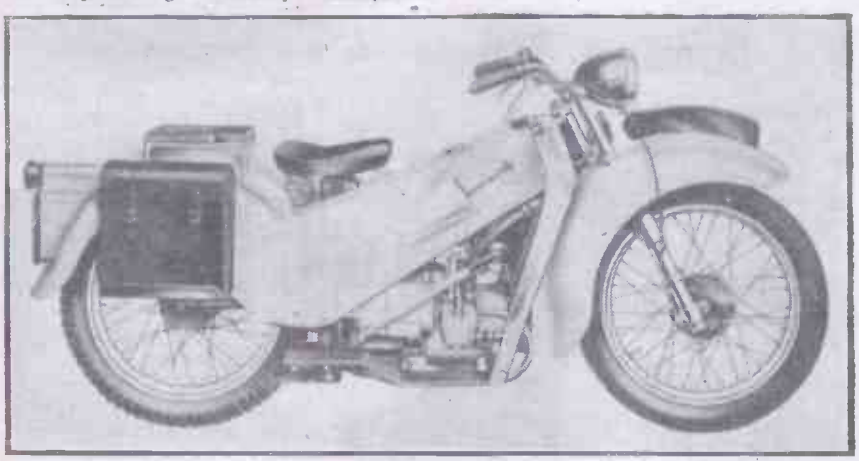
All the mechanism is enclosed, the power unit is mounted on rubber, and the degree of silence is uncanny. Petrol consumption is more than 100 miles to the gallon, and maximum speed exceeds 50 m.p.h.

Front and Rear Suspension

A hand-operated lever supplants the normal kick starter, and gear change is also by hand. There is front and rear suspension, and by a simple adjustment the rear suspension can be adapted to suit riders of varying weights. Long foot-boards, leg-shields and mudguarding of a type hitherto impracticable make it virtually impossible for any mud or wet thrown up by the wheels to reach the rider or any part of the mechanism. Nothing is exposed, everything is impervious to the weather, nothing can shake loose.



The engine unit of the new Velocette 149 c.c. "two-wheeled car". The silence of the engine is a remarkable feature.



The new Velocette 149 c.c. "two-wheeled car," showing the all-round protection for the rider, and for the water-cooled, horizontally opposed twin four-stroke engine. The machine has shaft drive, hand starting and gear change, and front and rear suspension.

The machine has a legitimate claim to be regarded as heralding a new era in motor-cycling. Research and development have been carried on for a long time with the object of producing a practical and economical vehicle for the vast numbers of people who would not normally ride orthodox motor-cycles, and an official of the company commented: "Our experience shows us that the type of machine we have built in the past touches only the fringe of the potential market—both at home and overseas. This new Velocette is being put onto the road in such a state of excellence that it will stay there and give the type of service one expects—and gets—from a car."

No More Punctures!

A New Compound Which Solves the Tyre Problem

ONE of the most important developments in motoring since the pneumatic tyre is the recent announcement of a product which eliminates punctures. With the use of this new product punctures will no longer exist, tyre inner-tubes automatically sealing themselves and making the fifth wheel unnecessary.

Stringent Tests

The new compound, known as "Punctureprufe," has such properties within its rubber and glycerine base that during a recent demonstration the tyre of a lorry showed little loss of air after being pierced with nails and bolts, and even a ¼in. twist drill. A private car was subjected to the same stringent test, and both vehicles, after a short run, returned with no appreciable loss of air pressure in the punctured tyres.

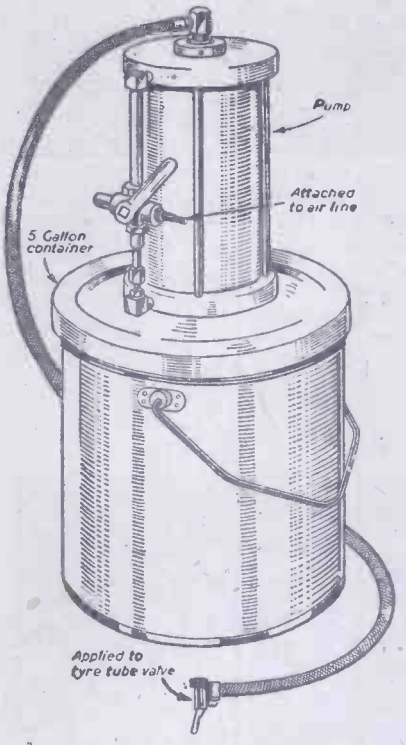
This "automatic repair" compound

Pumping the Punctureprufe compound into a tyre.

retains its full properties during the complete life of the tube, while actual severe tests and laboratory experiments have shown that an ordinary tube can be punctured many hundreds of times and still be used safely at its original air pressure.

In Good Supply

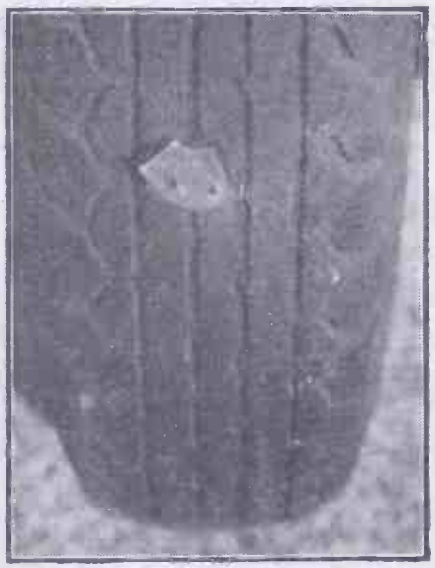
During the war Punctureprufe was used by the United States on all kinds of motor vehicles. Production by the British company, Punctureprufe Ltd., 1-7 Crawley Mews, Eversholt Street, London, N.W.1, was held up during the war but has now become possible with the lifting of restrictions on necessary raw materials. Supplies



Detailed view of the pressure pump.

are good in view of large-scale manufacture now taking place.

The new compound has been put to the severest tests by important British organisations in addition to Government departments, and has proved all its unusual claims.



A puncture caused by a sharp metal object is automatically sealed with the new compound.

Punctureprufe will not harm inner-tubes because it contains nothing detrimental to rubber or metal. It will not cause swelling, softening or other deterioration of natural and butyl rubber under normal conditions of automobile and truck operation.

Any type of tyre or tube, whether cycle, motor-cycle or motor-car, can be quickly and inexpensively treated. A simple garage service, which handles four tyres in eight minutes, injects one quart (for private cars) into each temporarily deflated tube. Motor-cycle tyres are dealt with in the same way, but cyclists are able to treat their own tyres by means of the compound supplied in handy tubes.

The Punctureprufe compound remains in its original form indefinitely inside the inner-tube, and in the event of the tube being pierced by any object, provides an instantaneous airtight film over the break in the tube service. When the nail, flint, glass or other object is removed the compound extends over the whole of the inner surface of the tube, welding it firmly and securely together, thus completing the automatic repair. It is interesting to note that in a particular test one Punctureprufed inner-tube showed a record mileage of 287,000 miles, having been transferred from eight individual tyres as they were worn through.

Club Notes

Staines Society of Model Engineers and Craftsmen

THE annual general meeting, held in October, 1948, although devoted entirely to business, nevertheless proved interesting to all members present. The first item was the "swearing in" of 15 new members, a direct result of the third annual exhibition held at Staines Town Hall on September 18th, which was a great success, over 1,500 people visiting the show. The secretary's report followed and gave the following items of interest: The society had, during the last 12 months, become "a power in the land," the local council having granted the use of land at Lammas Park, where the club's portable track was in operation each week-end until closing down for the winter season. The exhibition was opened by a local councillor, and a councillor, Mr. V. E. Vass, is to become the society's first president, all this after a period of two years' hard work fighting for recognition. The society now owns a 100ft. portable track, a useful library, "club shop" where material, etc., can be bought at low prices, and is half-way through the building of a 3½in. gauge loco with modifications and tender added; bogie trucks for passenger-carrying are nearing completion, and a separate "live steam section" to run the track and loco. Membership had grown to 44 and the financial position was good.

An annual dinner has been arranged for December 16th, at which the society's bronze medal, awarded for work displayed during the year, will be presented to the winner. New members will be welcome at any of our meetings held on the first and third Wednesdays each month at the Phœnix Hotel, Church Street, Staines. All communications should be addressed to the secretary, Mr. R. F. Slade, 166, Kingston Road, Staines.

The Preston and District Society of Model Engineers

AT the first annual exhibition, held recently in the Harris Institute Technical College, Preston, the public demonstrated their interest by the fact that over 2,000 visitors passed through the exhibition during the 13 hours it was open. Financially it was a great asset to the funds of the society, and at the same time it gained the society several new members.

A total of 133 exhibits were on show, including a well-filled loan section of models from Bolton, Warrington, Leigh, Blackburn, Wolverhampton, Kirkham and Ormskirk. A proportion of the models were shown working under compressed air.

The society covers Preston and surrounding districts up to approximately 10 miles radius. New members are welcomed into the society's ranks, and interested persons should communicate with the secretary, Mr. F. C. Hill, 25, Wheelton Lane, Farington, nr. Preston.

THE WORLD OF MODELS

Model Engineering Displays at Leicester and Exeter

By "MOTILUS"

ABOUT this time of the year newspapers and popular household magazines are constantly reminding us that there are "only so many shopping days to Christmas." Whether we heed this gentle prompting or no, most of us will take advantage of an opportunity, sooner or later, to visit a large store before Christmas, especially if we have sons and daughters, nephews and nieces, or any other young acquaintance who looks to us for a Christmas gift.

Special Christmas surprises for the children are now quite a tradition in these large stores. A novel display this year will be Mr. H. Elliott's mobile gauge "o" model railway exhibition, which is to be on view at the well-known Morgan's Stores, Cardiff (Fig. 1). No guarantee is needed that this railway will attract as many adults as children, for it is a layout to be envied by any model railway fan. The model railway is not of mushroom growth; it is the result of careful planning and contrivance, bearing in mind that every piece of equipment must be portable, for the purposes of an itinerant exhibition.

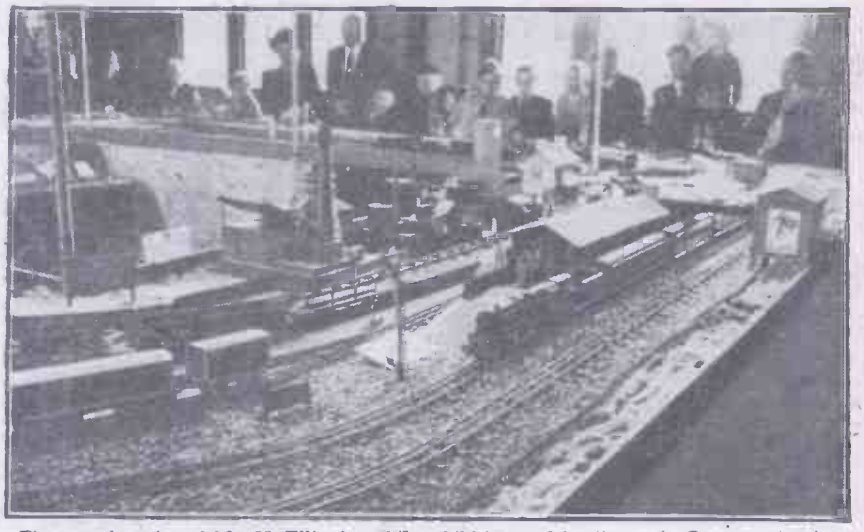


Fig. 1.—A section of Mr. H. Elliott's mobile exhibition model railway, in Gauge 0, showing the four main-line tracks, the two-rail steam track being in the centre, nearest the operating-space. This picture also shows some of the extensive scenic buildings that surround the layout.

Over 350ft. of track are used, in simple formation, with four main lines and various sidings, branch lines, etc. One line is two-rail, for the sole use of steam-driven locomotives, the rest of the track being three-rail, for the electrical control from the central controller-unit. This mobile unit was specially designed for Mr. Elliott by Mr. L. Adlington, of Spalding. As well as controlling the trains, this central panel is the point where all the stand and line-side lighting can be switched on and off. The unit also boasts a microphone, which Mr. Elliott finds invaluable for describing operations to the onlookers and also, no doubt, for saving his precious equipment from too close an examination by the less scrupulous of the younger generation.

The lineside accessories, stations, sheds and scenic buildings vary from time to time, but they include factories, gasworks, hotels and an iron and steel works, all made from an assortment of material, "some of which," Mr. Elliott writes, "would disgrace a scrap merchant's yard." The finished product, however, certainly "graces" the model railway.

The signals are all scale models and are not centrally controlled because of the difficulty of arranging this for a mobile exhibition. Even this problem, however, is in the process of being solved by preparation of a scheme whereby semaphore signalling will be controlled by the movement of the trains.

Of the nine locomotives on this railway three are steam-driven and the others are steam-type but electrically-driven. With the exception of two of the electrically-driven ones, all are Bassett-Lowke models. The steamers are two "Enterprise" models and one "Super Enterprise," all fired by methylated spirit. One of the "Enterprise" locomotives has been doing exhibition work for 10 years without any major repairs—an excellent record. A model water-tower is used for filling all the steamers with water.

The electrically-driven locomotives are a representative group and include an L.N.E.R. 4-6-2 "Flying Scotsman," an L.M.S. 4-6-2 "Duchess of Montrose" and an L.M.S. 4-6-2 "Princess Elizabeth," this last being a Hornby model. There are three other goods locomotives, including an 0-6-0 shunting tank.

The rolling stock presents a wide variety in both passenger and goods vehicles, including six furnished third- and first-class Pullman cars, main-line vestibule coaches and a dining-car set. There are also "secondary service" suburban coaches with electric lights and 33 sundry goods vehicles, as well as two vestibuled parcels vans.

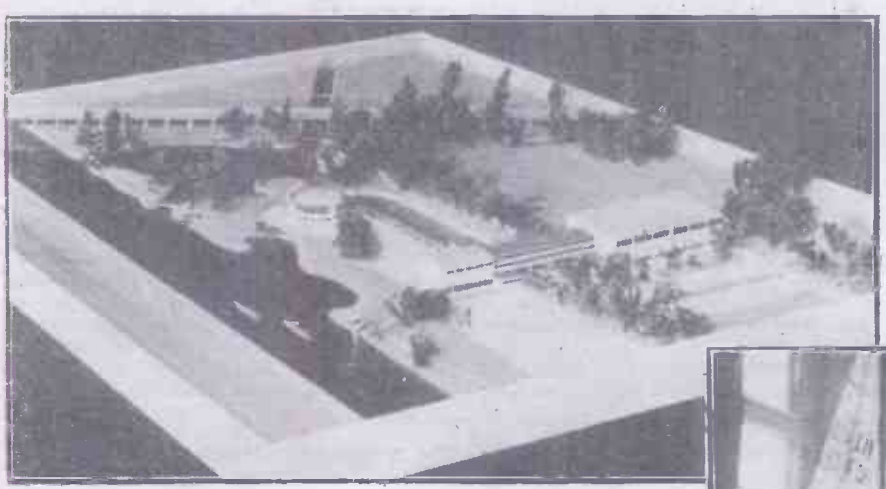


Fig. 2.—An architectural student's design for a "Recreational Group." This model was designed and built by Miss M. E. Burrows, a student at the Leicester School of Architecture and Building.

Leicester Architectural Model Display

Each year a most interesting exhibition is held at the Leicester School of Archi-

Fig. 3.—Leicester Model Yacht Club were responsible for this striking display of 10 raters at the Leicester Society Model Engineers' Exhibition. According to club records, their performance equals their fine appearance.

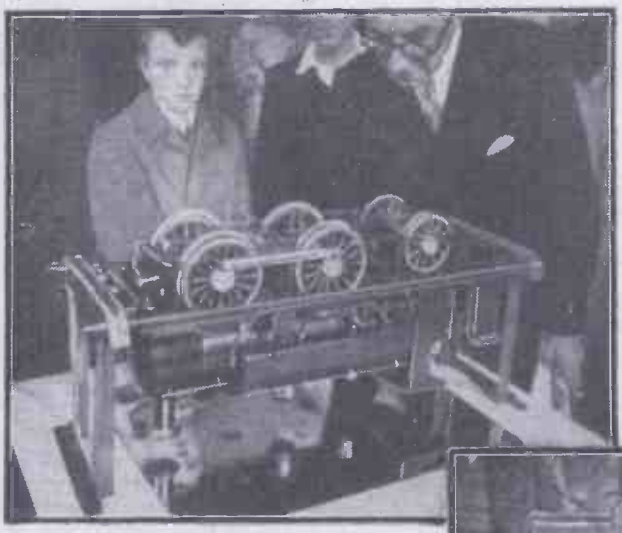


Fig. 4.—An ideal method of display for those who want to "examine the works." A 5in. gauge, 0-4-2 saddle tank locomotive made by Mr. Mason of Rugby, and loaned to the Leicester Society's Exhibition by Mr. A. E. Sage.

tecture and Building, for which students are required to make a model from one of their own designs prepared during the previous session. Simple forms of architecture are studied by the first year, increasingly elaborate or difficult designs being reserved for those in the second, third, fourth and fifth years. Their plans complete, students are encouraged to build scale models from them. The main purpose is for the design to be viewed in three-dimensional form—an opportunity otherwise denied to the would-be architect.

This year altogether over 40 models were displayed, all of them of a remarkably high standard relative to the age and experience of the maker. Some of the students had chosen to design a brick-works entrance, and although this may seem a somewhat prosaic subject I was amazed at the combination of utility and good proportion in the majority of them.

Other subjects included a school chapel, an Alpine chapel, an orthodox dwelling-house, an unorthodox artist's châlet, a rowing club-house and a public-house.

I am not qualified to express an opinion on the purely architectural features, but was greatly impressed with the quality of the model work. Broadly speaking, amateur-built architectural models do not reach the high level of perfection attained in other spheres, and I am sure that the standard achieved by the Leicester students is due largely to the encouragement and guidance given by the principal, Mr. F. Chippendale, F.R.I.B.A.

An exhibit of outstand-merit was a Recreational tional Group designed and built by Miss M. E. Burrows, a fifth year student. This work was submitted for the Diploma of the School, and the photograph clearly shows the crisp, clean workmanship in the buildings. Particular notice should be taken of the trees and foliage because this most difficult subject has been given clever treatment (Fig. 2).

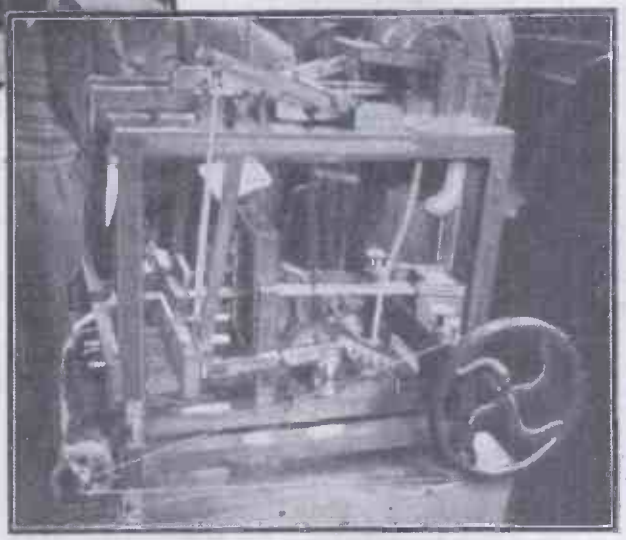


Fig. 5.—An unusual working model displayed at the Leicester Society of Model Engineers' Exhibition, 1948. Designed and built by Mr. R. L. Stant, this model ribbon loom is driven by an electric motor.

It was a particular pleasure to have the privilege of spending some hours examining the models and to sense the atmosphere of keenness in the staff and students at this centre of learning.

Model Engineering Exhibition

The Leicester Society of Model Engineers' Exhibition, with its orderly, well-displayed collection of models and its likely atmosphere, is an annual event which it is a joy to attend. This year there were over 300 excellent exhibits, most of them the work of Leicester members, although some generous support had been given by the Model Engineering Societies of Coventry, Rugby, Nuneaton, Derby, Nottingham and Northampton. The quality of workmanship was generally very high: an indication of the general upward trend in the standard now attained by the amateur and of the ever widening interest in the hobby.

A most striking exhibit by the Leicester Model Yacht Club consisted of six 10-raters (Fig. 3), a marble-head and a 36in. Sharpie, all beautifully built and excellently finished. The honorary secretary, Mr. A. J. Roxburgh, told me of the many successes the members have in inter-club racing and spoke most enthusiastically of the objects of the club, which are to promote model yacht designing, building and sailing and to encourage racing amongst members with other clubs in the country. This ambition merits support, for the hobby of model yachting combines the craft of building and the art of sailing, both of which call for a high degree of skill.

Many models of locomotives of all gauges were on view, but an unusual method of display was used by Mr. A. E. Sage for his 5in. gauge 0-4-2 saddle tank built by Mr. Mason, of Rugby. Being an inside-cylinder type, the whole of the motion is mounted between the frames. The locomotive was inverted and supported on a special metal stand to display the highly finished steel work. It also afforded the opportunity to everyone to turn the wheels round. A mirror placed flat underneath the model presented the usual view. (Fig. 4.)

A very gay and attractive model was that of a steam-driven roundabout with galloping horses, built by Messrs. S. and R. Taylor.

Another unusual exhibit in the same category, by Mr. R. H. Glover, was that of a complete model fairground, with two road locomotives, box trucks, frame trucks and all the usual sideshows, built to a scale of 1in. to 1ft. This display occupied one whole stand, nearly 12ft. long.

A feature of the exhibition was a number of working models. Of these, my attention was attracted particularly to a ribbon loom. (Fig. 5.) This ingenious mechanism, designed and built by Mr. R. L. Stant, is

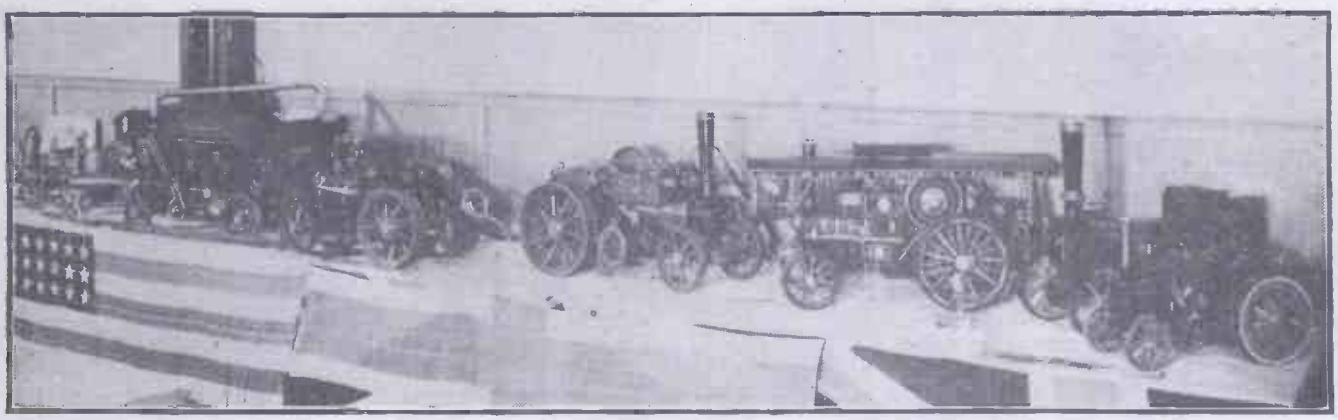


Fig. 7.—A fine array of road locomotive models on show at the exhibition held in September by the Exeter and District Society of Model Engineers.

driven by an electric motor. It was operating for considerable periods and had been set up to make 1in.-wide silk Petersham ribbon with five strands of colour. A sample length which I examined was equal in quality to professionally made material, for which Leicester is well known.

A demonstration of current aircraft and jet engine design was given by the display of models loaned by permission of the National Gas Turbine Establishment. These consisted of jet engine units, some of which were

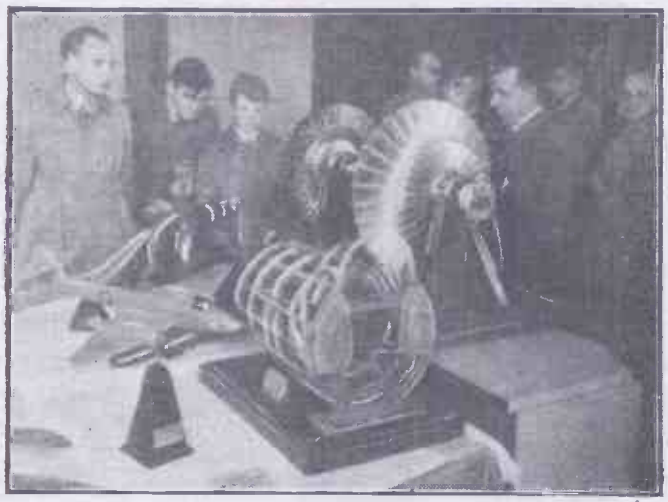


Fig. 6.—Gas turbine models and a Gloster Meteor aeroplane model, loaned for the Leicester Society's Exhibition by courtesy of the National Gas Turbine Establishment.

modelled in perspex to offer a clear view of interior layout, and also a well-finished model of a Gloster Meteor jet engine aircraft. (Fig. 6.)

Altogether, the exhibition was a great success. The total of more than 4,000 visitors must have been impressed not only by the workmanship but also by the extraordinary range of the exhibits. These included medieval subjects such as galleons and a miniature suit of armour, ships of all periods, engineering models covering almost the whole of modern industrial history, and, finally, the latest developments in power boats, locomotives and aircraft.

Models Display in Exeter

Another September model exhibition this year was that held by the Exeter and District Model Engineers' Society at the Barton Motor Showrooms in Exeter. West countrymen evidently believe in quality before quantity, for the standard of work displayed in this comparatively small exhibition was remarkably high, especially in the railway, locomotive and engine sections. There is no need to worry about eventual quantity: with such enthusiasm for model engineering as abounds nowadays, quantity is sure to follow. As well as members' exhibits from Exeter and district, there were loan exhibits from the North Devon and Plymouth Societies and members of several West Country fraternities visited the exhibition during the course of the week it was open.

Although space was limited in the hall, good use had been made of the room. The layout of a gauge o model railway was contrived so as to occupy the least possible space while allowing a good run for the trains and ample length for observation by spectators; at the same time the layout afforded publicity by running through into the showroom window and back again into the hall. This railway was electrically-operated and organised by Major W. Sparkes, the Exhibition Chairman, who had several interesting locomotives running over the track, and quite a unique collection of rolling stock. One electric goods engine, built by Major Sparkes when in Quetta and based on a local prototype, hauled 57 trucks at scale speed: an impressive performance.

In the Railways and Locomotives Section there was an unusual exhibit made and contributed by the Exeter Society's chairman, Mr. G. J. Websdale: a working 50-lever interlocking frame for a gauge o model railway. There was also an historical exhibit, loaned by Lt.-Col. C. C. Haynes, of Exeter; this was a Bassett-Lowke, tinplate, old L.N.W.R. locomotive and train, in original colours. The model had been purchased for £2 in 1904! Happy days!

Among the locomotive models were two old friends that have been mentioned in these pages earlier this year. One was the 3½in. gauge "Hielan' Lassie," finished although unpainted, built by Mr. J. E. P. Hutchinson, of Barnstaple, who is now secretary to the North Devon Society of Model Engineers. The finished model certainly lives up to the promise shown in the unfinished chassis and boiler I saw in Mr. Hutchinson's workshop last March. The other was Mr. Ellis' 2½in. gauge Caledonian Railway locomotive, "Dunalastair No. 3," which was also shown at the Exhibition held by Plymouth and District Society of Model and Experimental Engineers in May.

Readers may remember that the Exeter Society have a 3½in. gauge running track which they erected in the grounds of the Exeter Orthopædic Hospital, so that young patients of the children's ward might share their pleasure. Two locomotives much in demand for use on this track were displayed during the Exhibition, an L.M.S. "Royal Scot," of ¾in. to 1ft. scale, by Dr. D. T. Mackie, J.P., and an excellent 0-6-0 tank locomotive, to the same scale, by Mr. W. J. Manley. Mr. Manley's locomotive, "Molly," built to a design by L.B.S.C., is in such constant demand for the Society's track runs, being so good for passenger-hauling, that Mr. Manley has never had time to paint his model! Another well-finished locomotive bearing the stamp of good workmanship was a 2½in. S.R. "King Arthur," made by Mr. S. Eves Down, of the Exeter Society. Mr. G. Bainbridge, well known in model engineering circles, is a member of the N. Devon Society, and his contribution to the Exhibition was a well constructed locomotive boiler to a scale of ½in. to 1ft.

Road locomotives were well to the fore, as can be seen from the illustration (Fig. 7). Mr. F. G. Bettles, of Taunton, loaned his 1½in. to 1ft. showman's traction engine, a Silver Medal winner in a former Model Engineer Exhibition and Championship Prize winner at Bristol in 1946. Mr. Eves Down owns an Aveline and Porter road locomotive, and his 1½in. to 1ft. scale model of this engine was displayed; a very good model, showing the adaptability of Mr. Down's skill. Mr. W. H. Balkwill had also made two fine models to the same scale of machines in his own possession, a Garett type traction engine and thresher, and also a model rack saw-bench

Excellent model engineering work was evident in the section devoted to engines. Mr. L. J. Oldridge, secretary to the Exeter Society, is himself a steam-engine enthusiast; he contributed to the Exhibition a well-made vertical steam engine ("Susan") of ¾in. bore and ¾in. stroke. Mr. T. Spike, of Exeter, had made a compound condensing mill engine from scrap, driven by a boiler; he also had on display a model power-shaping machine of 3in. stroke, which won a V.H.C. Diploma at the Model Engineer Exhibition this year. All the engines were shown to best advantage, as the Society had been able to arrange for compressed air supplies for all the working models.

It was surprising to find, in the Ship Section, only two waterline models, this form of ship modelling being so popular in these days. However, it may be that West Country modellers are practical folk and prefer the proof of their work to be in the performance. Of the full-hull models, two were quite outstanding, both by members who have recently joined the Exeter Society. One was a detailed model of a Thames coasting sailing barge, to a scale of ½in. to 1ft., by Mr. G. R. Sinclair; this ship won a Bronze Medal at a Model Engineer Exhibition in the 1920s. The other was a 6-metre model sailing yacht to a scale of 1 2/3in. to 1ft. Her builder, Mr. A. R. Litton, had previously won a Challenge Cup at Inverleith for this fine model.

As this is the last time we will "meet" before Christmas, I take this opportunity of sending greetings to all readers of PRACTICAL MECHANICS, wishing them all the best for a merry Christmas holiday.

This fine 1/10th scale model racing boat, constructed by Capt. Hans Timm of Oslo, was exhibited at the recent Model Engineer Exhibition in London.

Letters from Readers

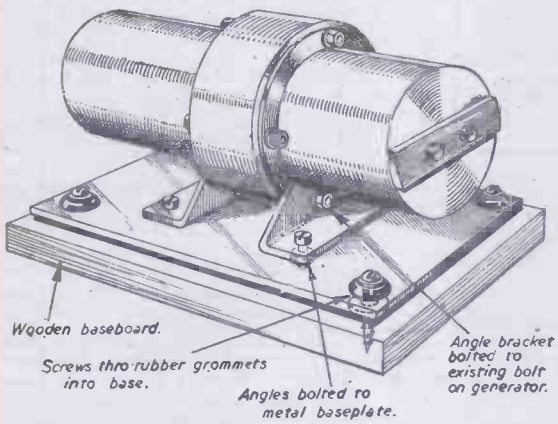
Space Flight

SIR,—I much appreciate the interesting letters from your correspondents regarding space flight. I was, of course, fully aware as to the need for high initial velocity in the case of gun-propelled spaceships, but use is hardly likely to be made of such relatively out-of-date principles.

Rockets with sections which could be jettisoned are quite another story, and if atomic power should eventually become possible, space flight success may be largely a matter of expense. The cost of two day modern warfare should be ample, and the results less trying for those who are not interested.—A. M. Low (London, W.).

Mounting Rotary Transformers

SIR,—I was interested in the article by Mr. Wm. Nimmons, in the October issue of PRACTICAL MECHANICS on the mounting of rotary transformers. I have possessed one of these generators for some time now, and find I can charge at 5 amps continually day and night. It certainly is the best surplus bargain I have purchased. I herewith submit another method of mounting which I have found quite satisfactory.—L. A. TURNER (Kidderminster).



—Method of Mounting Rotary Transformers.

Immersion Heater

SIR,—In the November issue under "Queries and Enquiries," Mr. P. Emmott of Upminster apparently is having trouble with an immersion heater. With all due respects, I suggest that he will never obtain satisfactory results with his heater in the top of the tank, and all the lagging he can manage will not prevent the thermostat operating due to the fact that the heat will not circulate throughout the tank properly.

If the querist finds the thermostat and immersion heater too long to insert horizontally near the bottom of the tank, he may either (as it is a copper tank) braze an extension piece to the side or, preferably, obtain another thermostat to insert lower down the tank. However, the latter will still be very wasteful in consumption of electricity. Lagging is essential in any case to conserve heat. —A. W. SIMKINS (Addlestone).

Another Mechanical Paradox

SIR,—Regarding the article "Another Mechanical Paradox" in the October issue of PRACTICAL MECHANICS, the mechanism drawn and described does not appear to be capable of alternate clockwise and anti-clockwise motion. If, however, a reversing spur wheel is placed to mesh with the spur wheels "e" and "f," the mechanism can produce alternating motion. The spur wheels "e" and "f" would have to be displaced laterally or decreased in size.

To show that the mechanism does not produce alternating motion is quite simple. Bearing in mind the idea of relative motion, rotate the shaft "a" clockwise; this turns the cage "bb" clockwise. Relative to the cage, the fixed spur "e" rotates anti-clockwise, and so "f" and "k" rotate clockwise. Items "l" and "m" rotate anti-clockwise, and finally the spur wheel "n" rotates clockwise, relative to the cage, which itself is rotating clockwise. Thus the observed motion of the shaft "j" is the result of two clockwise motions, which never combine to give anti-clockwise motion.

If the suggested reversing spur wheel is placed between "e" and "f," it is easily seen that "l" and "m" now rotate clockwise, and so "n" rotates anti-clockwise relative to the cage, which, as before, rotates clockwise. Here, the observed motion of the shaft "j" is the result of a clockwise and an anti-clockwise motion. Since the mechanism contains elliptical spur gears, there is a continuously variable gear ratio, ranging from $1 : 1/r$ to $1 : v$, where $v : 1$ is the ratio between the major and minor axes of the pitch ellipses.

Assume that the combined gear ratio of "e," the reversing spur, "f," "j" "m" and "n" is $1 : sx$, and that the instantaneous value of the variable elliptical gear ratio is $1 : x$. Then the ratio of the motions of "e" and "n," relative to the cage, through the elliptical gears, is $1 : sx$, both motions being anti-clockwise.

But the cage is rotating clockwise. So the ratio between the shafts "a" and "j" is

$$1 : (1 - sx),$$

where $1/v < x < v$.

There are now three cases to consider:—

(i) if $s/v > 1$, then $(1 - sx)$ is negative and "j" rotates anti-clockwise.

(ii) if $sv < 1$, then $(1 - sx)$ is positive and "j" rotates clockwise;

and (iii) if $s/v > 1$, $sv > 1$, then $(1 - sx)$ takes positive and negative values and "j" rotates clockwise and anti-clockwise.

This shows that the altered mechanism can produce alternating motion.—R. GOOD (Edinburgh).

Trade Notes

Runbaken "Autofeed" Soldering Iron

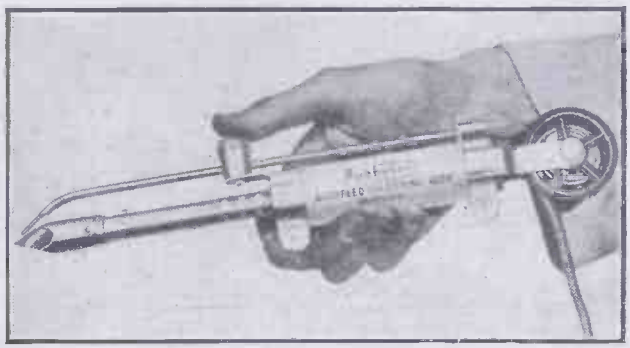
A NEW "Autofeed" electric soldering iron is now being marketed by Runbaken Electrical Products, Manchester, 1. The copper bit is readily interchangeable and the rotary magazine holds 20ft. of resin or acid cored solder. The appliance, which is finished in bright chromium plate, and carries a 12 months' guarantee, is rated at 60 watts with a voltage of 100/110, 200/250 A.C. or D.C. The new tool is 1in. long, 1in. wide, 2½in. deep, and weighs 13 ozs. Further particulars and prices can be obtained from the firm mentioned above.

"Buying a Lathe"

AN interesting booklet, titled as above, has been issued by T. Garner and Son, Ltd., of Redbrook Works, Gawber, Barnsley, giving suggestions on purchasing a lathe, with particular reference to the well-known Myford "M" type 3½in. lathe. Particulars are also given of the Type ML7 3½in. Heavy Duty Centre Lathe, and the new Myford ML8 woodworking lathe. The technical features of this range of machines are outlined and prices are also given. Anyone contemplating the purchase of a first-class lathe for small power engineering, or similar work, should obtain a copy of the booklet from the address given above.

"Spectra-Color" Layout Fluids

FOR scribing and layout work on metal surfaces the use of whitewash and chalk has been superseded by "Spectra-Color," a special fluid which is obtainable in 10 distinctive colours. Easily applied to any metal surface, it is harmless when used on the highest grade precision finished surfaces. Scribed lines remain sharp and highly visible throughout all normal shop handling. "Spectra-Color" prevents inaccuracies caused through metal glare and relieves eye strain. The fluid dries instantly, and actual markings are made in the special colour film which is less than .0002in. thick, and does not crack, peel, chip or smudge. Two varieties of "Spectra-Color" are available: Standard, for use on all bright metals, and Opaque, for all black metals and rough castings. Further particulars can be obtained from Spectra Products, Spectra Works, High Street, Caterham, Surrey.



The Runbaken Autofeed Soldering Iron.

QUERIES and ENQUIRIES

A stamped addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 24 (THE CYCLIST), must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

"Crinkle" Effect on Painted Furniture

CAN you please inform me as to how the cracked effect is obtained on antique and reproduction painted furniture ?

I have a small table painted in a greyish green, with a floral design painted on it and the all-over effect is cracked paint, similar to a crushed egg shell.—E. Darking (Woking).

THE "crinkle" effect in a paint layer is obtained either by subjecting a painted surface to heat treatment, or by incorporating with the paint a material, such as aluminium stearate, which tends to interfere with the continuity of the paint film. The latter process is generally applied to metallic paints in conjunction with controlled heat treatment, the aluminium stearate being dissolved in benzene and added to the paint in the proportion of about 5 per cent. of its bulk.

We do not think that this process would work in your case. Furthermore, if you applied heat treatment you would probably blister the paint instead of obtaining the "crinkle" effect desired.

Your best plan, if you are using a cellulose paint, is to add acetone to it. This will thin it down and give it a high rate of drying, which will be conducive to the effect required. If you use an oil paint, dissolve more resin in it, and add petrol or some very light solvent to increase the rate of drying. All these will work towards a final discontinuity of the paint film, which is the effect you want. But we cannot give you an exact formula, since so much depends on the type of paint being used, the conditions of use, the surface painted on and the temperature of the surroundings. You will have to experiment.

"Westminster" Chimes

IN your reply to a query under the above heading, in the August issue, you state that a tube one-half the length of the basic tube will give a pitch one octave higher than that of the basic tube.

You then proceed to describe the construction of a diagram for an octave of tubes, giving the length of the eighth tube as half that of the first.

If your first statement is correct then the tube of half length should be the ninth in the series, and not the eighth.

I shall be glad if you will kindly reply, as I am contemplating making some chimes in the future.—T. A. Clarke (Barnehurst).

OUR statement concerning the approximate length of tubes necessary for the construction of an octave of notes is quite correct, and the half-length tube to which you refer should be the eighth and *not* the ninth of the series.

The reason why this is the case is a little difficult to explain, but it may become clear on the following grounds.

The present-day musical scale of eight notes does not consist of notes separated from one another by equal intervals or equal measurements of pitch. Why this should be so is because present-day tuning operates on the system of "equal temperament," for particulars of which abstruse subject we must refer you to a musical dictionary or reference book. But in the present-day (major) musical scale, two sets of notes (the third and the fourth and the seventh and eighth) are separated from each other by semi-tones, all the remaining notes being separated by complete tones.

To make this clearer. Glance at any pianoforte keyboard and locate the white note, "Middle C." Three white notes above this comes "E" which is closely adjacent to its next higher note "F" and which has not a black note interposed between. In the same way, the seventh note from middle C, which is "B," is similarly adjacent to its next higher note, which is the octave of middle C. Now between these two sets of notes there is only a semi-tone interval. Hence, in constructing any appliance which will give a scalic or step-like succession of sounds you must allow for this contraction of pitches, simply because you cannot space your sounds evenly between a given note and its octave. That is why the half-length tube to which you refer must be the eighth in the series and not the ninth.

Polishing Cream for Leather Shoes

WILL you please supply me with formulæ for leather polishes suitable for boots and shoes and leather generally, in both the solid paste form and the cream emulsion form.

I would be grateful if you would indicate what dyes are suitable, and where they may be obtained.—I. Jacobsohn (Northampton).

THE following is a formula suitable for a leather boot or shoe polish :

Carnauba wax, fatty grey	..	3 parts (by weight)
Candellila wax	..	11 " "
Beeswax	..	4 " "
Paraffin wax or ceresin wax	..	12 " "
Dye (black, brown or red)	..	To suit
White spirit	..	90 parts (by weight)

Add the dye to the waxes and gently melt them. Then run in the white spirit, mix thoroughly and pour into tins to cool. The consistency of the polish may be varied by altering the amount of white spirit.

The dye used must be of the oil-soluble variety.

A polishing cream for a similar purpose can be made according to the following formula :

Carnauba wax, fatty grey	..	6 parts (by weight)
Japan wax (or candellila wax)	..	3½ " "
Paraffin or ceresin wax	..	1½ " "
Turpentine	..	12 " "
White soap	..	3 " "
Water	..	30 " "

Gently melt the waxes. Add the turpentine. Then, with mechanical stirring, add the water in which the soap has been dissolved. If a coloured cream is desired, dissolve the oil-soluble dye in the turpentine-waxes mixture.

A creamy emulsion will form as a result of the stirring.

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

The paste polish in the preceding formula is the better product of the two.

The ingredients above mentioned can be obtained from any form of chemical wholesalers. Suitable firms are undermentioned. It must, however, be remembered that all these ingredients are scarce and are difficult to obtain at the present time.

Messrs. Hopkin and Williams, Ltd., 16-17, St. Cross Street, London, E.C.1. Messrs. A. Gallenkamp and Co., Ltd., 17-29, Sun Street, Finsbury Square, London, E.C.2. Messrs. Vicsons, Ltd., 148, Pinner Road, Harrow, Middlesex.

Waterproof Glues

I HAVE to make some wooden fittings to be used on a motor boat, and they will have to withstand very humid conditions. As it is impossible to make these without the use of some kind of glue, I am seeking your advice upon the best kind to use.

I do not think ordinary glues will do as I cannot be sure that the joints will always be protected with varnish ; Casein glue (such as "Casco") might be better, but that also is not entirely waterproof I believe.

Would it not be better to use one of the new "resin" glues ? If you agree with this idea can you tell me where I can buy a small quantity ?—E. E. Benest (Norwich).

YOU can make ordinary glue very highly waterproof by painting it over (after setting) with formalin solution (strength immaterial). Casein glues are also waterproof, and this quality may be increased by the same treatment.

However, as you infer, a synthetic resin adhesive is essentially and inherently waterproof. Such materials are now being extensively developed, mainly by Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1, and we think that if you write to this firm, explaining your problem, they may feel disposed to put you in touch with manufacturers who can supply your needs.

Removing a Carpet Stain

I HAVE a plain, coloured cream carpet which has been damaged by footmarks from a tarry or asphalted road. The pile is short and does not show marks where furniture has rested. The usual remedies, butter and fat, are only partially successful.

Can you suggest a better remedy ?—W. H. Tinney (Belstone).

THE stain on your carpet will probably be one of tar, not asphalt or bitumen. To treat the stain with butter or fat was the worst possible thing to do, since it cannot possibly remove the stain.

Your best plan is to put a large saucer or basin under the stained area and to purchase some carbon tetrachloride ("Thawpit"). Warm this in a pan (it is not inflammable). Then pour it onto the stained area so that it soaks through the carpet into the basin or saucer below. Repeat this process several times. The liquid will dissolve out the tar and will become blackened. If you cannot obtain carbon tetrachloride, use hot solvent naphtha, hot benzene or hot paraffin oil, but remember that these liquids are very inflammable.

Finally, when most of the stain has gone, make a paste of the solvent and chalk, whiting or fuller's earth, spread this on the carpet surface in the area of the stain, and around it, as well. Let it dry on, taking a day or two for the purpose. Do the same on the underside of the carpet. Finally, when all is thoroughly dry, brush the powder away with a stiff brush. The carpet should now be quite free from the stain, but, naturally, the treated area will have a "new look" which will take time to vanish entirely.

The paste of chalk and solvent acts by dissolving out the last traces of stain and by absorbing it into the powder which itself becomes stained. This, however, when brushed away leaves the carpet clean.

It should, perhaps, be observed that the dry powder should not be removed with a vacuum cleaner. Brushing is usually essential, because the mechanical rubbing action involved in the process helps to get the last stains away from the material.

Oxidising Copper

I WISH to oxidise copper, and shall be glad if you will inform me what acid to use first to clean the copper—and what acid to use to oxidise it ? Also, how is the finished appearance obtained ? Where can I obtain these acids in London ?—G. H. Kelly (Leytonstone).

IN order to clean copper for chemical treatment, immerse it in warm dilute nitric, or, preferably, in the following mixed acid, which will do its work within a few seconds :—

Strong sulphuric acid	..	435 ccs.	These
Strong nitric acid	..	75 "	quantities
Strong hydrochloric acid	..	2 "	must be
Water	..	491 "	exact.

This "cleaning acid" can be used over and over again.

Copper can be oxidised merely by heating it at varying temperatures. If, however, as we surmise, you wish to obtain the usual brown-black coloration, this is effected by a process of sulphurisation. All you need to do is apply to the copper a solution of sodium sulphide (1 part) and water (99 parts).

Or, alternatively, you can boil together in a pan for ten minutes or so equal quantities of lime and sulphur with enough water to cover them. A yellow liquid will result, which, after filtration and dilution, will act in the same way as sodium sulphide solution.

After coloration, the copper article must be well washed and dried. It can then be lacquered, using

either a shellac solution or, better, a clear cellulose lacquer.

London suppliers of acids are the following: Messrs. Griffen & Tatlock, Ltd., Kemble Street, Kingsway, W.C.2. Messrs. W. & J. George & Becker, Ltd., 17-29, Hatton Wall, E.C.1. Messrs. Hopkin & Williams, Ltd., 16-17, St. Cross Street, Hatton Garden, E.C.1.

Soot, and its Uses

WILL you please inform me what is the composition of ordinary soot? Also, what uses can it be put to other than manure? Is there a book on the subject?—D. Gill (Luton).

SOOT consists principally of amorphous carbon. As ordinarily collected, it contains, also, small amounts of ash, ammonium sulphate, ammonia, pyridine and other organic nitrogenous substances, tar and tar acids, absorbed gases and moisture. It can be purified from most of these contaminating traces by heating to redness.

Apart from its use as a land fertiliser (this results from its nitrogenous contents), soot, after purification, can be used in some instances as a pigment in place of lampblack, although the latter is denser and has better qualities in this respect. It can be used for the making of carbon inks (Indian ink, etc.), for pigmenting rubber compositions, for enhancing the blackness of tars and pitches and for making black varnishes and enamels. It is slightly electrically conducting. Hence, it can be used in various plastic compositions such as asphalt, pitch and tar to decrease the resistance and to permit of electrical leakage paths. In all such instances, however, it is preferable to use specially-manufactured lampblack.

There are no books dealing exclusively with the subject of soot. You may find passing references to it, however, in various textbooks of organic chemistry and also in books dealing with pigments as, for example, in H. M. Lawton's "Blacks and Pitches."

Floor Polish

I HAVE a quantity of beeswax which I wish to make into a good floor polish, but in its present state it is much too hard and dry to work with. Could you inform me how to make it more workable, similar to other well-known floor polishes?—B. V. Burrows (Birmingham).

YOU can readily make your beeswax into a good paste polish by dissolving 3 parts of it (by weight) in 7 parts of white spirit or paraffin. The liquid must, of course, be warmed for this purpose, and you must take great care that it does not catch fire during the process.

The polish thus made is used in just the same way as an ordinary furniture or floor polish, but you may find that the polish film will be a little too soft. It may fingermark badly. In this event, the polish will have to be hardened up by the inclusion of a hard wax in it. The best hard wax is carnauba wax, which you may be able to obtain from Messrs. W. & J. George & Becker, Ltd., 157, Great Charles Street, Birmingham 3.

Take 1 part carnauba wax, 2 parts of beeswax, and dissolve these in 7 parts of white spirit or paraffin. This will give you a very satisfactory polish, which, if you desire, you may perfume by adding a few drops of an oil perfume.

Paint for Re-marking Tennis Court

CAN you supply me with a formula for making up a suitable white paint for use in re-marking a hard tennis court? I have tried several kinds without success. Could I add something to ordinary white paint to make it suitable?—A. Lowe (Southampton).

TWO coats of an ordinary oil-base white paint applied over an initial coat of grey priming paint should give the desired result in marking white lines on a shale tennis court. There is nothing extra which you can add to ordinary white paint to make it more suitable for the purpose if you have found it to be unsatisfactory for that use.

Alternatively, we suggest that you use a white paint based on a synthetic resin of the bakelite type. This can be obtained from many big paint shops. If you are unable to obtain it, then direct your inquiry to Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1, who will, no doubt, be glad to put you in touch with one of their subsidiary manufacturing companies.

You do not, however, say exactly why your ordinary white paint has not been successful. You will, of course, have observed the ordinary precaution of seeing that the surface is clean and grease-free before applying the paint, because no paint will adhere to an oily surface.

Removing Fruit Juice Stains from Linen

COULD you please inform me of a suitable process for the removal of fruit juice stains from new linen?

The article is a new linen tablecloth (not yet washed), and the stains are approximately ¼in. diameter, made by the juice of cooked bilberries. Previous experience shows that these stains are spread by the normal household washing methods.

The process must not be harmful to the linen.—R. W. Tabron (Halifax).

IMMEDIATELY after staining, the tablecloth should have been plunged into cold water and allowed to remain there overnight. It should then have been normally laundered and, if possible, spread on the grass to dry in the sunshine.

It is true, of course, that washing tends to spread such stains as those of fruit juices, but, normally, these stains are fugitive, so that very little treatment serves to remove them.

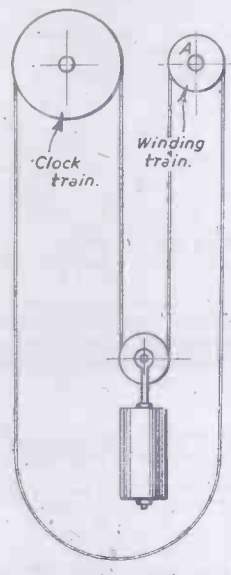
As matters stand, the best thing you can do is to wash the tablecloth normally and then spread or hang it up in the sunshine to dry. If the stain is not thereby removed, it must be bleached out chemically. To do this, grind up a small quantity of chloride of lime with about an equal amount of water so as to form a cream. Dilute this with five times its bulk of water and strain through a cloth. Then dab the liquid on to the stained area, and subsequently dab on the area either strong vinegar, or, preferably, dilute acetic acid (1 part acid, 4 parts water). The stain will rapidly bleach away under this treatment. The material should then be most thoroughly rinsed in warm water (not necessarily re-washed) in order to get rid of every possible trace of the chloride of lime.

This mild treatment will not harm the material, bu before applying it, you might like to try the effect on the stain of hydrogen peroxide with or without ammonia. If the stain is not very extensive this treatment may be quite effective.

It is always a great advantage to perform all these bleaching operations in full sunlight, since the light-action very greatly aids the chemical process. It is most essential to remove every trace of the bleaching agent by thorough rinsing.

Raising a Clock Weight

I AM building a rather unique clock. Can you tell me what voltage and amperage an electric motor should be to lift a weight of 11 lbs. suspended on a single block? The final wheel in the winding train is a 1¼in. diameter sprocket wheel, at A. It would be preferable for the rewinding of the weight through a height of 4ft. 6in. to occupy not less than 40 seconds. I previously used a 6/12 motor (4 amps.) running on 8 volts, but it was too much for it. Its bearings rattled. I had a reduction gear of 190: 1.—P. Iliffe (Pontefract).



Gearing for raising a clock weight—(P. Iliffe)

THE actual power of the motor required to raise the weight will, of course, depend on the speed of lift. The theoretical horse power to lift the weight in 40 seconds is only about 1/1,000 h.p., but allowance must be made for the friction losses in the gearing, etc. As you will doubtless require the motor to run as silently as possible you would be well advised to use a fairly slow speed motor of liberal size, provided with sleeve bearings of adequate size. If the gearing is reasonably efficient we suggest you try a motor having an input of 50 to 60 watts; any convenient voltage could be used.

Dyeing Jute

WOULD you please answer me the following? What are the dyes and method used for dyeing jute?—T. H. Bacon (Rainham).

JUTE has a natural affinity for synthetic dyestuffs of the "basic" class, and for some of those of "acid" class. It is best, however, to mordant the material previous to dyeing. This consists of soaking the jute material in a cold 2 or 3 per cent. solution of tannic acid or of tannin extract for several hours, with continual turning over in the mordant bath. The material is then withdrawn, passed through a roller, but not rinsed, and, afterwards entered into the dyebath in the cold. During the next half-hour the dyebath is gradually raised to near boiling point, after which it is retained at that temperature for half-hour. The material may then be removed and rinsed or it may be allowed to remain in the dyebath until the latter has re-cooled. The material necessarily requires constant movement whilst in the dyebath, otherwise unequal dyeing and patchiness will result.

Any of the "basic" dyes will serve the above purpose. Below are the names of some of the more common of these. They may be obtained from laboratory and chemical dealers:

Magentas, rhodamine, neutral red, safranine (orange), chrysoidine (yellow), auramine (yellow), methyl green, malachite green, brilliant green, methylene green, aniline blue, victoria blue, night blue, methylene blue, Meldola's blue, Nile blue, methyl violet, ethyl violet, mauve, Bismarck brown, fast black, diazine black, nigrosine black.

Water Softener Details

I HAVE recently obtained about 33lb. of sodium aluminium silicate and wish to make a water softener for insertion in the mains. I intend to make a cylinder about 28in. high by 8in. or 9in. diameter, using copper. Will you please let me know if this material is suitable?—W. Slingsby (Preston).

THE copper cylinder which you mention will be quite suitable for a water-softener, but ordinary sodium aluminium silicate will not be efficient. You should use the specially prepared zeolite material for this purpose. It should be packed loosely in the cylinder so that the water is readily able to percolate downwards at not too slow a speed.

The zeolite material may be obtained from The Burgess Zeolite Co., Ltd., 68-82, Horseferry Road, London, S.W.1, or from firms of laboratory suppliers, such as Messrs. Griffen & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2.

Particulars of the detailed construction of a water-softener constitute too big a subject to be answered by a single reply, but you will be able to obtain such details by consulting any book on water-softening in the County Library, Fishergate, Preston.

Surface Tension: Absolute Zero

CAN you answer the following problems:

(1) Why does it happen that some liquids wet glass and some do not?

(2) How does one mathematically prove what absolute zero should be?

(3) How is it when one moves on a bicycle, one can balance, but not when the machine is not moving? What forces come into play?—W. Howden (Bearsden).

PROVIDED that glass is perfectly clean and grease-free, all liquids will wet it in varying degrees. Liquids have a property known as "surface tension." In virtue of this, a liquid tends to diminish its area as much as possible because of the molecular forces which tend to draw the constituent particles of the liquid towards its interior. Different liquids have different surface tensions. The higher the surface tension of the liquid the less readily will it wet glass even when the latter is perfectly clean. If we place on the glass a layer of a material, such as grease, which tends to oppose the particles of the liquid, the liquid under these conditions will not spread. Thus a film of water will not spread on a greasy surface.

An exception to the rule above stated is mercury, which, when perfectly pure, will *not* wet glass. It is because of this perfectly non-clinging property that mercury is the ideal liquid in this respect for use in barometers and similar instruments.

(2) It can be shown experimentally that all gases expand approximately 1/273rd of their volume for every degree rise in temperature, and, likewise, that they contract at a similar rate on cooling.

Now, if we plot the volume of a gas on a graph against its temperature, we are forced to the conclusion that if we cool a gas down to minus 273 deg. C., it will have a volume of nothing, and, furthermore, if we cool it down beyond minus 273 deg. C., it would have a negative volume, that is to say, a volume less than nothing! Clearly this is an absurdity, and, in practice, we find that long before gases arrive at a temperature approaching minus 273 deg. C., they condense into liquids. The fact, however, does not affect the real position, for it is clear that if a gas did strictly obey the law of expansion and contraction, then if such a gas were cooled down to minus 273 deg. C., it would, in that state (whatever its physical condition might be) be entirely heatless. All its constituent particles would be motionless, at rest. And because heat is merely a physical manifestation of particle motion, it follows also that such a gas would be in a heatless condition. Hence, we infer that minus 273 deg. C. (that is to say 273 degrees below the freezing-point of water on the Centigrade scale), is the very ultimate of temperature. Temperature *starts* at −273 deg. C. It has no upper limit which we yet know of, but this commencing point of temperature is known as the Absolute Zero, beyond which it is theoretically impossible to have any heat.

The mathematical formula used for plotting the above-mentioned graph is:—

$$V = v_0\left(1 + \frac{\theta}{273}\right)$$

where v_0 = volume of the gas at 0 deg. C.
and θ = temperature degrees through which the gas is heated.

(3) The state in which two or more opposing forces are caused to balance one another is known as that of *equilibrium*, or condition of equal balance. A man is able to stand upright because by his very make-up he is able unconsciously to balance one set of muscles against another and so to oppose the forces which tend to pull him to the ground. A tightrope walker as he proceeds along his stretched rope sways unevenly. He throws his umbrella over to the opposite side to that to which the sway takes place. By this means he counteracts the tendency which would cause him to topple sideways.

In exactly the same manner a moving cyclist learns unconsciously the slight but continual movements of balance which enable him to equalise and thus to counteract the toppling tendencies. In this, too, he is, unlike the tightrope walker, enormously aided by the fact that his body (with the bicycle) has acquired the property of *momentum*. Now, momentum is an attribute of a body which depends on its mass and its velocity. The product of these, — — m × v — is the momentum or the "movement quality" of the body. A moving body can only be stopped by the application of a greater force. As the momentum of a body increases, the greater must be the force which is required to stop it or to direct it out of its line of movement. So, by this virtue, does the cyclist successfully oppose the earth's tendency to pull him downwards towards itself. When a cyclist turns a corner his momentum is sufficient to counteract the toppling tendency. If it is not, he certainly topples!

THE Cyclist
Editor: F. J. CAMM

VOL. XVII DECEMBER, 1948 No. 321

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

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

Comments of the Month

By F. J. C.

N.C.U. Sees the Red Light!

THE disastrous policy pursued by the N.C.U. for the past 50 years, and particularly in the post-war years, has caused some fluttering in the dovecotes of Doughty Street. That may account for the changes which have been announced at N.C.U. headquarters. The secretary, Mr. A. P. Chamberlin, is extending his visits to centres with the object of increasing membership, with the 100,000 mark in mind.

Mr. H. E. Miles, the deputary secretary, now becomes the general manager and will be in complete control of the head office, as well as being responsible for finance and attending to the general running of the Union.

Mr. A. R. Haine has been in charge of the Herne Hill events, acting under instructions from a sub-committee of the Racing and Records Committee. It is generally admitted that the results have been disappointing, and the Union proposes to alter the bye-law making it possible for Mr. A. R. Haine to have complete control of all activities on the track, excepting finance.

It is thought that Mr. Haine will be able to achieve the results in mind if he is free from the cumbrousness of the sub-committee. Whilst the N.C.U. has promoted some good Herne Hill meetings they will admit that such have not been of world championship class. It is true that bad weather would account for some of the lack of support of these meetings but by no means all of it. The general arrangement and management was poor, and the publicity puerile.

The office staff is to be enlarged. Members of the N.C.U. must now see to it that only the most capable men are elected to their committee. As committee-men are elected from the delegates it is important for each centre to see that the right delegate represents them.

You cannot run a cycling organisation in 1948 with methods appropriate to 1898, and the N.C.U. leopard has not changed its spots in that period. It began by banning road racing and record breaking, confining its attention to racing on closed circuits only. Yet it has always sought to have a finger in the road-racing pie. But for the ill-conceived N.C.U. policy there would not have been a Road Records Association, nor a Road Time Trials Council—perhaps it is fortunate for road sport that the N.C.U. cut adrift from it.

We shall await the results of the change with interest. An entirely new spirit needs to be infused into the N.C.U. and we hope in future that it will refrain from endeavouring to kill other forms of road sport which it finds likely to offer severe competition to track racing.

That has been its policy in the past. Take the matter of massed-start racing. The N.C.U. has been endeavouring behind the scenes and in a manner which we consider unsportsmanlike to get massed-start racing suppressed, and it has used every means in its power by writing to the Ministry of Transport and others to impose its puny will on the rest of the cycling community. The fact that it has never succeeded will, we hope, not be lost upon those whose duty it is to frame the new policy, and, we hope, the new accord.

Special Road Bill

THE Minister of Transport has presented to the House of Commons an Enabling Bill in the form of a Special Road Bill which recognises the principle of motorways, and other special-purpose roads and provides the necessary powers for their construction.

When the Bill is passed it will enable proposals for these roads to be included in the development plans now being drawn up for the whole country. It is unlikely, however, that construction will proceed for some time, for the work will depend upon the resources in men and money that can be made available according to the economic situation.

It is stated that special roads will be reserved exclusively for particular classes of traffic, such as motor vehicles, pedestrians, cyclists, or other prescribed traffic.

The most important type of special road will be the motorway, restricted to motor vehicles (with certain exceptions, such as those with solid tyres, or those restricted to a maximum speed of less than 20 miles an hour). These special roads may be trunk, classified, or unclassified roads. In the case of trunk roads the cost of construction and maintenance will be met out of the Road Fund. If classified roads, grants will be available from that Fund in the ordinary way.

A scheme for a special-purpose road will define the route, which may include parts of existing roads, and prescribe the class or classes of traffic which may use it. It will be an offence for any traffic other than that authorised to use the special roads, and the Minister will be able to make traffic regulations respecting the use of a special road.

Penalties for misuse of a special road provides for maximum fines of £20 on summary conviction, and of £50 or imprisonment up to three months for second and subsequent convictions.

Provision is made for including existing bridges or parts of existing roads in a special road and for diverting or stopping up existing highways crossing the route of a special road.

The procedure for making or confirming schemes and orders for special roads provides for advertisement, and for the holding of public local enquiries into objections raised by interested parties.

The Bill also enables the highway authority for a special road to buy land for service stations or other buildings or facilities needed in connection with a special road.

First Roadfarers' Gold Badge Awarded to Lord Brabazon

THE first Ladies' Festival organised by the Roadfarers' Club, held at the Savoy Hotel on October 23rd, was made the occasion for the presentation to the President, Lord Brabazon of Tara, of the first Gold Badge of the Club.

The rules of the Club provide for the award of the Club's Gold Medal to those who have performed during the year meritorious service in the interests of road travel.

Mr. F. J. Camm, in making the presentation, stated that the Council had no difficulty in choosing Lord Brabazon to be the recipient of the first Gold Badge to be awarded by the Club.

The law relating to the manufacture of gold medals precluded the award of a medal, and so for the present gold badges are to be awarded. When the law changes, recipients of gold badges will also receive the Club's Gold Medal, the design of which has been approved and the die struck.

The speaker mentioned the pride the Club felt in having as its president one who had for so long been so effectively associated with all aspects of travel by road, by water, and by air.

He it was who, at the inaugural dinner, laid down the general principles on which the Club has been run. Lord Brabazon was Parliamentary Secretary to the Ministry of Transport for 1923-24, and from November, 1924-27; Minister of Transport, 1940-41; Minister of Aircraft Production, 1941-42; pioneer motorist; holder of Pilot Certificate No. 1; winner of the Circuit des Ardennes in 1907; won the *Daily Mail* £1,000 for flying a circular mile on an all-English-made machine, 1909; won the first British Empire British Michelin Cup; was in the Flying Corps during the European War, and responsible for the photographic section of it, and the development of aerial photography; member of the original Civil Aviation Committee, of Lord Weir's Advisory Committee; Chairman of the Airways Committee, 1923; President of the Royal Aero Club; Assessor of the R101 Inquiry, 1930-31; President of the Royal Aeronautical Society, 1935; member of the L.C.C., St. George's Division, Westminster, 1931-32; President of the English Golfing Union, 1938; winner of Curzon Cup, St. Moritz, 1920-22-27; director of many companies; Chairman of the Air Registration Board, and numerous other activities. His recreations are golf, tobogganing, yachting and model railways.

Under his presidency the Club has moved from the Clarendon to the Savoy, and it has progressed in strength and prestige, having been called upon by the Ministry of Transport on a number of occasions to submit memoranda on road problems.

Paragrams.

Roller Racing at St. Neots

CYCLE roller racing has been introduced to the citizens of St. Neots, Hunts, by the St. Neots Cycling Club and the first meeting was held on September 12th. There were some 400 spectators and the events were: 440 flying start time trial, 440 scratch and 880 scratch. Another meeting will be arranged later and it is hoped that the sport will increase in popularity.

New Look for Cycles

THE Firestone Tyre and Rubber Company, of Akron, Ohio, announce that they have started producing a new type of cycle tyre. It has a foundation of rayon instead of fabric, and is of the white-walled type. The company claim that the use of rayon gives double the normal strength to the tyre and doubles its mileage life.

Fenland's Best All-Rounder

PETER PETCH, of the Fenland Clarion Club, won the 12-hour time trial sponsored by the Fenland Road Riding Association on September 5th, covering 230 miles. He also secures the Association's best all-rounder championship for this year. The championship is awarded each year to the member of the Association who puts up the best average speed in the 25-mile, 50-mile, 100-mile and 12-hour events. An unfortunate puncture during the last hour of the trial nearly stole the victory from Petch, but he had enough in hand to overcome this.

The Parking Problem

BOSTON Town Council have been considering complaints about the number of bicycles left standing about the town in narrow lanes and passages while the owners are doing their shopping, and it was pointed out by several councillors that there was not one authorised parking place for cycles in the whole town. The Mayor told the council meeting: "I remember bringing the matter up years ago, when it was turned down flat. Perhaps the highways committee will reconsider it." The council came to no definite decision as to the provision of cycle stands but it is likely that the matter will be raised later.

On the Hot Seat

A BABY pulse-jet engine known as the D5-1 and designed for propelling bicycles has been put on the market by the Aeromarine Company, of Vandalia, Ohio. It weighs 8½lbs. and is described as having a static thrust of 30lbs. and being capable of propelling cycle and rider at a speed of 70 miles an hour—if anyone wants to travel that fast on a bicycle. A spark coil and compressed air start the jet, which burns petrol. Although the rider is protected from the jet by a shield, asbestos pants would appear to be the most suitable wear for the daring rider. The makers of the jet do not say how long it takes the rider to stop, or how much space he should be given by other road users who happen to be near him in a traffic block.

Cycle Was His Sign

WHILE he was walking in the garden of his home at 132, High Street, March, Cambs., Mr. Henry Rose, a cycle agent and repairer in business at March for many years, suddenly collapsed, and died shortly afterwards. Mr. Rose, who was 79 years of age, went to March in 1897 and opened his first shop in St. Peter's Road, over which still hangs the old penny-farthing which he used to ride in the early days of cycling. The premises were later enlarged and on his retirement some two years ago his only son, Mr. Horace Rose, took over the business, with which he has been connected for 24 years.

Huntingdonshire Safety Drive

AT the instance of the Chief Constable of Huntingdonshire, leaflets are being distributed to householders in the county emphasising the very heavy toll of the roads and urging everyone to help in reducing this slaughter. In his message in the leaflet, the Chief Constable says: "Lastly, please see that the headlamps, sidelamps and brakes of your car or cycle are in perfect condition and see that your child's cycle is in the same condition. Police examination of children's cycles at schools shows that more than half are defective."

Shows Promise

THERE was an entry of 50 riders from local clubs in the 25-mile time trial for the Peterborough Cycle Traders' Cup, held on September 12th, and the winner was Peter Petch, of Peterborough Clarion Club, with a time of 1hr. 3 mins. 49 secs. Second came S. A. White, who clocked 1hr. 5 mins. 8 secs., and a fine show was put up by 17-year-old Peter Adcock, of the Clarion Club, with a speed of 1hr. 6 mins. 14 secs., who came third. This was his first trial with an official timekeeper and he also gained the first handicap award. He rode without any special equipment on his machine.

Belling the Pedestrian

A SPEAKER from Haslemere, Surrey, addressing the recent National Safety Congress in London, suggested that every pedestrian ought to carry a bell to ring when about to cross the road. But supposing the pedestrians were fitted with bells and took no more notice of each other's bells than they do when a cyclist rings his bell—what then?

In a Poor Way

AN Edgware cyclist, caught riding in Huntingdonshire without a rear light and later summoned, wrote to the Bench explaining that he had cycled 380 miles and at the time he was stopped was on the look-out for a haystack under which to spend the night, and as he only had ninepence he could not buy a rear light. The police inspector told the magistrates they had reason to believe the cyclist's explanation, although they did not know of it at the time, so the magistrates imposed a nominal fine of 5s.

More Cycle Parks

CHESTERFIELD Markets Committee has informed the Town Council that it approves in principle the provision of facilities for the parking of bicycles on the Corporation car parks.

No Brakes

AT an inquest at Garthorpe, Lincs, on a nine-year-old boy cyclist who was killed in a collision with a lorry, it was stated in evidence that the boy's cycle had no brakes at all and that he rode out of a yard near the village school right into the path of the lorry. The North Lincolnshire coroner, recording a verdict of accidental death, commented on the fact that the boy had to keep his cycle in a yard because no cycle shed was provided at the village school.

Pounds from Heaven!

A WOMAN cyclist rode down a street in Rochdale the other day in a cloud of £1 notes which fell from her pocket and fluttered around her like very attractive butterflies. There were 50 of them altogether and she got every one back.

Hit and Run

A 20-YEAR-OLD Sawtry (Hunts) motor-cyclist and his pillion passenger were sharply criticised at Norman Cross Police Court when the motor-cyclist was charged with driving without due care and with failing to stop after an accident. After knocking down a cyclist at about 10.30 p.m., they carried on, without bothering to see whether the cyclist was dead or alive. The chairman of the Bench told them: "Careless driving is bad enough, but as to the second one, it has been an extremely callous case. The poor fellow might have been so badly injured that he might have bled to death. But you carefully drove away and did nothing to ascertain whether he was badly hurt or not." The motor-cyclist was fined a total of £8, with £4 10s. costs, and his licence was suspended for a month.

Must Start Sometime!

A KETTERING cyclist who was charged at the local Police Court for failing to obey a Halt Sign, wrote to the magistrates apologising for the offence and told them: "I have ridden a bicycle for 50 years without an accident." But there is a first time for everything, and for his initiation into the ways of crime and the police the offender had to pay £1.

Safety Films Frightening?

BRIGG (Lincs) Road Safety Committee has been notified by the headmistress of Brigg Girls' High School that she will send no more pupils to see road safety films unless she or her representative has previously seen the films. The complaint was made following the showing of an American safety film, "Traffic with the Devil," and the headmistress told the Committee that, while appreciating efforts made to teach the children road sense, she thought there ought to be no risk of frightening younger children. The film was described as being full of crazy driving, with nothing about road safety.

Countryside Record

MR. LEONARD M. WILDE, who has just died at his Doncaster home at the age of 73, for many years kept records of those countryside objects which are gradually vanishing as the years go by. He made a survey of dovecotes throughout the country, so comprehensive that it filled three large volumes, together with photographs. He also compiled records of the many attractive tithe barns and old market crosses which still stand. Mr. Wilde has bequeathed his dovecote records, which are unique, to the National Buildings Record Society.

To Shock Us

THE suggestion that, in order to shock the public into realising how many deaths there are on the road each year, victims should be buried in a mass grave, was made when awards were presented at March, Cambs, to Post Office drivers with accident-free records. The chairman of the local Urban District Council said: "I am staggered at the astonishing figures of road fatalities throughout the country in one year. It occurred to me that if all those fatalities could have been buried in a common grave it would shock old England. It would be a cemetery that would vie with the cemeteries of Flanders."

Proposed Severn Bridge

EXHAUSTIVE tests are being made in a large wind tunnel in a hangar at the aerodrome at Thurleigh, Beds, used by the Americans during the war, to determine the best design for the proposed bridge over the Severn, which will be the largest suspension bridge in Europe. A 52ft. long model has been built for the tests and is mounted on a turntable so that the effects of winds on the structure from varying directions and of varying force can be studied. A design is being sought which will be safe during the highest wind that may be expected and will also be economical in material. American scientists are also working on the problem of finding the best suspension bridge design.

Effective But Noisy!

A 17-YEAR-OLD Doncaster youth, charged at Doncaster Borough Police Court with stealing accessories from a cycle and various other thefts, was stated to have devised a method of his own for breaking into shops. He stole a dozen railway fog signals and, after choosing a shop in a quiet part, he would fasten a fog signal to the shop window with a tarred band, light the band and hide round a corner. When the fog signal exploded with a terrific crash it smashed the window and he was able to steal what he wanted before the noise fetched out the neighbours. He always chose early morning for his exploits, when all good people are asleep, but he evidently forgot that the police keep awake, and he let off his demolition charge once too often.

Interval—Without Work!

WHEN a woman worker in a cycle factory at Smethwick, Staffordshire, got married, she gave in her notice and said she would have to have time off from work, but she would like to go back later. That was 19 years ago and she is now back at work again in the factory, having had 13 children during her period of "resting."

Three Months' Safety Campaign

A THREE months' safety campaign, having a particular bearing on cyclists, is being organised by the Boston Road Safety Committee. A number of local cycle traders have agreed to inspect cycles during the campaign, free of charge, and there are to be special Safety First displays in shop windows. A film, appropriately called "The Ballad of the Battered Bicycle," with a commentary by Stanley Holloway, has been booked for screening at a local cinema and later, presumably, after the message of the film has been learned, errand boys and schoolchildren will take part in a cycle trial.

Golden Wedding

MR. A. E. GRIMMER, of 3, Station Road, Ampthill, Beds, one of the pioneers of the cycle trade in the town, has just celebrated his golden wedding. He commenced business in the early days of cycling and later added a garage to his business and established the Flitt Motor Company. He also took a keen interest in flying, and he flew and owned a monoplane—not so very unlike a bicycle itself—of the type used by Bleriot on his first cross-Channel flight. His youngest daughter was the first Bedfordshire woman to gain her pilot's "A" licence with the pre-war Civil Air Guard.

That Sugar Beet

WE may get a good deal of sweetness for our austerity life from the humble sugar beet, but even a sugar beet has its place, and should learn to keep in it and the remarks of a cyclist who happens to collide with a hefty beet left in the middle of a country road at night are far from sweet. In spite of the appearance of transport drivers before the magistrates, the fall of the leaf in the autumn still sees the fall of sugar beet on our roads and also, shortly afterwards, the fall of some unwary cyclist in a cloud of dust and rude words.

Around the Wheelworld

By ICARUS

The Resilion Brake Lever Cycle Lock

IT is not often that A. H. Bentley of Resilion Brakes asks to meet his friends of the Press. When he does it is because he has something interesting to disclose, and so it proved when I accepted his invitation, with an appetite whetted by the cryptic manner in which it was expressed, at the Savoy Hotel, on November 8th. His invitation said that the new Resilion device was to do with brakes, but had nothing to do with braking, and it turned out to be the new brake lever illustrated here.

You will notice that it has a Yale lock incorporated in it, enabling the brakes to be locked in the hard "on" position, thus rendering it impossible to wheel the bicycle away.

In 1947, the last year for which statistics are available, the enormous total of 69,000 bicycles were stolen. No less than 9,055 were stolen in the Metropolitan Area alone and of this number only 675 were recovered. Over the whole country the police were only able to institute proceedings in less than 1,000 cases.

The Resilion lock is of the Yale type and is supplied with two keys, which are available in numerous different combinations.

It can be used on any bicycle, old or new, which is fitted with cable brakes.

Three different locking positions are provided for various rim clearances and to allow for wear of brake blocks.

When the brakes are locked on, the pivot bolt cannot be withdrawn, and it is impossible to ride or wheel the bicycle away.

It is simple and clean to operate.

It is ready for use at any moment, and being an integral part of the brake, the inconvenience of carrying a separate article, fixing and dismantling to secure or free the bicycle, is avoided.

Strength is combined with lightness, the materials being of a high quality hiduminium and all wearing parts being reinforced with steel. The complete assembly, which is not over-bulky and is shapely in design, weighs only 3½ozs. and is actually lighter than the ordinary steel lever complete, which weighs 4ozs.

It will be noted that the firm now produces the "Cantilever" brake in light alloy with all bearing parts bushed.

Cyclists' Marathon

TO greet the King next year, an 8,000-mile Marathon of motorists, motor cyclists, and cyclists across the Australian continent has been proposed to the Prime Minister, Mr. Chifley, by Dunlop in Australia, who organised a similar event in 1912. Ninety-six motorists in 48 cars, 150 motor cyclists, and 940 cyclists would take part in a relay contest, setting out for Canberra from Darwin in the north, Perth in the west and Cairns in the north-east.

Each of the three divisions would carry a scroll for mayoral greetings from all cities and towns on the way. The couriers would be handicapped according to their average speed capabilities and the highway conditions of their routes. In 1912, the cyclists were six hours 18 minutes ahead of the motor cyclists and the first car arrived 54 minutes later.

Dunlop Tubular Sprints

RACING cyclists of national standing have now tested out over roads and tracks in different parts of the country, a new range of Dunlop tubular sprint tyres shown at the Bicycle and Motor Cycle Show.

Mr. F. J. Camm presenting Lord Brabazon of Tara (president) with the first gold badge of the Roadfarers' Club for his services to the club and to transport, at the Savoy Hotel, on October 23rd. *See paragraph on page 17.*

Increasingly higher speeds on track and road had demanded changes in the weight, size and tread of the pre-war racing tyre, and these new tyres are substantially lighter. For example, the tyre (No. 2) designed for rough cement, cinder or shale tracks, or for short distance light road racing, is now 2ozs. 12drms. less than its predecessor, a saving of more than 22 per cent. in weight, and the lightest of the new tyres (No. 0), with a plain tread for fast sprint distances on smooth-surface tracks, such as cement or wood, weighs only 5ozs., 1oz. or nearly 17 per cent. less than the tyre it succeeds. As with several others, sectional diameter has also been reduced, in this case from one inch to fifteen-sixteenths of an inch.

Tread sections have been re-designed to concentrate the greatest thickness of rubber in the middle of the tread. These new tread sections give a "line contact" with road and track at an average inflation pressure of 85 to 100lbs. per square inch for the road and of 100 to 120lbs. per square inch for the track.

The tread pattern is plain for smooth-track surfaces, except grass, but a finely ribbed pattern can also be satisfactorily used for rough cement, cinder or shale tracks. Four distinctive treads have been designed for road work, each of them specially suited to its particular purpose. One (No. 3) is designed for long-distance racing on all kinds of road or track, and is also suitable for tandem track work; its plain centre and file pattern sides gives easy pedalling when the bicycle is upright; when cornering, the patterned sides prevent sideslips.

Another new tread (Nos. 4 and 5), has been developed from the Dunlop Sprite for racing and general speed work on rough tracks and roads and also for general tandem work.

A third tread (No. 7) has been included for those riders who still prefer the old coarse file pattern for road racing, tandem and general training purposes. A coarse file tread pattern is also used for two tyres (Nos. 9 and 10), which are heavily built for training and rough road work on single-rider machines.

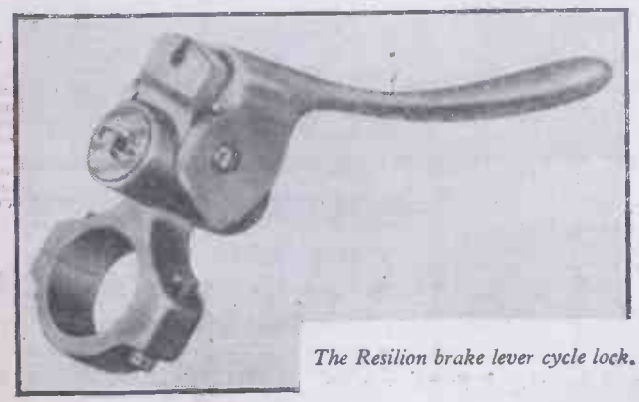
Racing cyclists who have tested it particularly welcome a new grass-track tyre (No. 6). Its ribbed tread pattern is broken up into segments to give the greatest forward grip and prevent sideslips, and on wet grass the sharp, upstanding edges bite down between the grass blades and grip the ground.

Two small but important features of the new range are the sewing thread and base tape. The new sewing thread of Irish linen stands up without breaking to higher inflation pressures than before, and the base tape, made from a stronger yarn, more closely woven, gives better resistance to any damage which might otherwise be done when a tyre is being repaired. The new tape is also better for use with light alloy rims which are apt to chafe base tapes more than wooden rims do.

Less power is consumed by the new tyres themselves and a greater proportion of the rider's effort goes to propelling the machine.

In the Olympic games, cyclists from 16 countries used between two and three hundred of the new range in the various races.

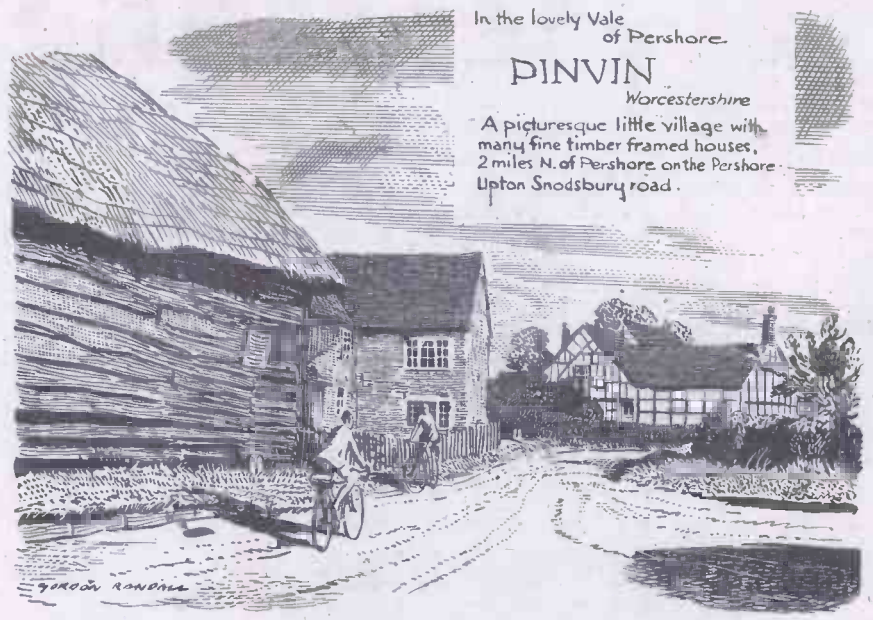
(*Continued on page 23.*)



The Resilion brake lever cycle lock.

Wayside Thoughts

By F. J. URRY



The Best in Now

IT may be that the vacillation found in most country lovers who praise that season of the year that is immediately with them is one of those provisions of nature that makes them more contented with life than the folk who stay indoors when the elements are rough and rude. That I can welcome all the seasons as they arrive certainly gives a spice to life and relieves in me that ennui which seems to attack so many people. To have a bicycle ready for all conditions of weather, except ice, snow and fog, and possess the ability and the desire to ride it, is a far better way of using existence than allowing the hours to slip away unheeded and then regret the wastage. And by that I do not mean I go out to get myself thoroughly soaked, or bend myself double to defy the gale, for there is no necessity to do such things if you use a bicycle rightly and have chosen your raiment with wisdom. When the rough days come, as come they will, then go by the lane ways and gain the marvellous protection of the hedges as you steer into the wind. A low gear and a very comfortable speed into a countryside that is nearly always lovely in such conditions is a delight to the active individual not merely because of the exercise, the change and the variety of scene, but more especially perhaps for the mental awareness and satisfaction that here is a game we can play and enjoy right through the year. I am lucky in so far that my daily journey to work and home keeps me fit—weather fit as well as the physical condition—and so my week-ends are as happy in winter as in spring even though the scene may be a trifle more dull. Usually, unless I have a settled fixture, I go into the weather with easy circumspection, take my refreshment as near a turning point as possible, and, if the luck holds, sail home on the wind in time enough to escape lamplight, or at least only use it on the last few miles. And the quiet hours with a friend, or a book, that follows the exercise are very precious, for the gold in them has been burnished by the glory of the great outdoors.

Autumn Riding

THESE thoughts came to me in the first stormy ride of the fall; but since then there have been others as calm and as delightfully reminiscent of many autumns that I began to wonder if the summer of '48 was so disappointing as we imagined. The flame of decay came late and was never so brilliant as one hoped, due no doubt to the persistent wetness; but it was very beautiful, and I'm glad I saw Sherwood changing its green for gold, and week by week watched Arden forest flutter its foliage to earth and bare the beauty of its branches. Sometimes it is astonishing to me that so many people have so little interest in the coming and going of the seasons. They will grow enthusiastic for the coloured formality of an orderly garden, but apparently find little attraction in a forest glade where a flash of sun creates a million pictures of loveliness. Give me the open spaces every time; they smack of freshness and the long, lone vista possessing the charm of exploration that must ever be part of the make-up of an enthusiastic cyclist. I like the formal garden, but better do I like the woods and the plains at autumntide, the wide spaces and the sheltered aisles, the wind in the trees, and the long reaches of pale gold stubbles, the rich brown of plough and the vivid green of kale and roots. And if you can get there, the moors under an autumn sky. I frequently envy our northern friends who live within an hour's ride of the wide spaces, and the southerners with their rolling heathland buttoned with the gold of gorse. But I have no real complaints beyond the lack of time to fill the frequent desires to see places I have known under the aspects of all seasons. To be a cyclist is never to be fully satisfied; there is always something more you want to see and experience, and that indeed is one of the secrets that make the pastime a prince in its own right. There is always another journey to venture, another delight to acquire, another promise to fulfil. It is never-ending, and it never will be. That is the prospect and, indeed, it is good to behold.

Publicising Cycling

A CERTAIN big retailer of bicycles called to see me the other day with a request to write him a letter, a copy of which he could send to all his customers. After the usual thanks for trade and the promise of service, he desired to tell his customers as briefly as possible how to get the best from cycling in pleasure and utility, and how to grow intimate with the pastime and to learn, finally, the difference between a bicycle and a real bicycle. It is the right idea even if it is quite impossible to "put over" within the limited scope of a letter. This man is an old racing cyclist whose introduction to the game and the pastime came through the £3 19s. 0d. machine of post World War I, and he knows how much he owes to the people who made him wise in the matter of bicycle selection, gave him a sporting interest in the game, and finally launched him along the road as a full-blown and competent tourist, which he still is. He realises the retail trade has little spare time to "sell cycling" and considers this should be the job of the makers, but since the latter appear to think such an effort would be wasted (themselves having no interest, or little, in the sport and pastime) he is out to do as much as possible on his own behalf. I have been saying for years that the trade for its own service ought to undertake to teach the buying public how best to use their purchases to add a pleasurable chapter to existence. Instruction books on upkeep are legion and useful in their sphere, but at present we have no volume to make an individual *want* to ride, improve his method of riding, or point the way to enjoy life awheel; and that is a pity. Any scheme worth while must embody the strictly personal view of cycling by a competent rider, a view that may not always be completely agreeable to the whole trade, because unless the personal note is dominant the contents will be flabby and reminiscent of the puff paragraph. Handing a well-printed, choicely illustrated volume on "Cycling and What it Can Mean to *You*" to every buyer of a bicycle with the dealer's compliments would, I verily believe, result in publicising cycling as it has never previously been done, increasing sales, and raising the quality of purchases. It is a theory that can be translated into fact for the benefit of all concerned, but it needs men of wide vision and firm belief in their products to put it into action.

The Great Evil

AS you who read these random notes are aware, I am a daily cyclist riding to work and home again, and I believe this joyous activity has given and preserved in me the health I enjoy. From week to week I see a good deal of traffic, a lot of impatience, some very bad riding and driving, and sometimes I begin to wonder if our boasted civilisation is only a cultured veneer for use in the home and office, to be disowned directly we get on the road. We are not all like that, but it is an astonishing thing that when you have just been "cut up" by some foolhardy fellow, your temper frayed to a ragged edge and there is no remedy for the insult, how inclined you are to look on the rest of the traffic for the next half hour as enemies to your simple road rights. I suppose it is natural it should be so. I'm quite certain it occurs, anyhow as far as I am concerned. I have never been able to understand the mentality of people who will take a risk to save a second, yet such appears to be the rule rather than the exception, and the charge is equally true of bus drivers, cyclists and motorists. The former pass me ten yards before a stop, cut in and block my passage. Cyclists hurrying to work or home, especially in wet weather frequently do the most extraordinary things, and though they are more dangerous to themselves than other traffic, their actions irritate and give the pastime a bad name. The town driver of the private car is usually decent to me, but his habit of "nosing in" to save a second exhibits a rudeness he would not tolerate in his home; but it is the van and lorry drivers—the young driver—I fear, for *he* has no decency, and apparently assumes the bully that weight and power give him. The staid, middle-aged man in charge of the commercial vehicle is usually a gentleman who calls you on and as often as not has a cheery—or impudent—word to say. I like him; he has been on the road long enough to know the dangers if you treat other traffic casually, and he has no superiority, that sense of the ego which frequently leads to trouble. There is no need for all this risk and irritation, for all the road-user wants to remember to practise is good manners, and in that simple advice resides the cure for most of the accidents, and all the mental irritation.

Another Side of Impatience

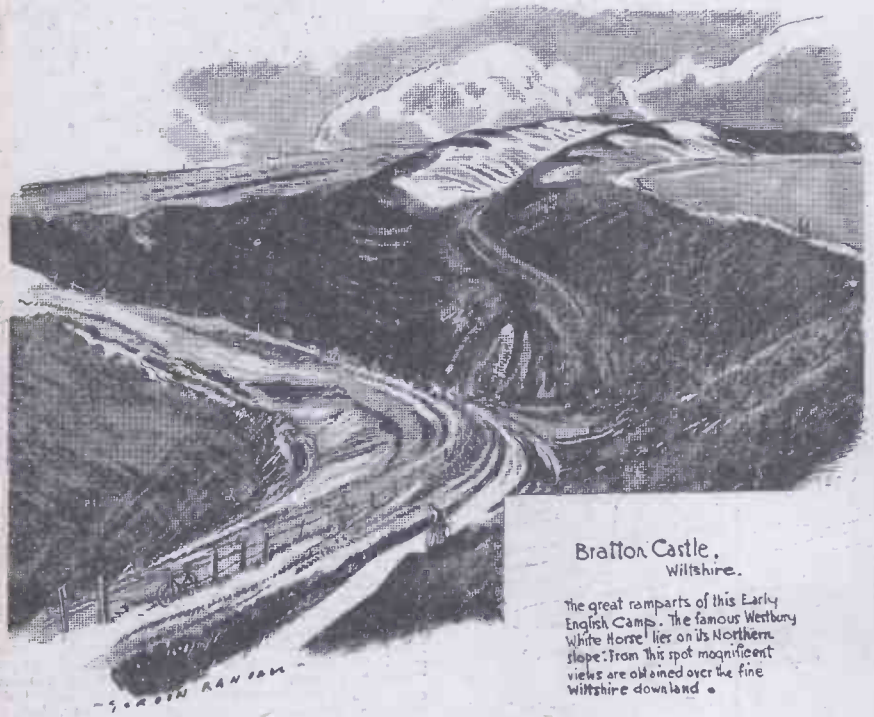
A YOUNG friend of mine has just been having trouble with a four-speed hub gear; indeed the mishap cut short a week's hostel tour of Wales and sent him home by train, much to his annoyance. I do not know the cause of the breakdown, but I have a shrewd idea that the trouble developed from lack of immediate adjustment on the first indication of a slip in driving or any of the ratios. It is a common neglect and has probably done more harm to hub gears than any other single lack of attention. I have seen it occur on numerous occasions, for it is a curious neglect in the average cyclists' mind that he will not trouble to read and *learn* the instructions for adjustment, which are bound to be necessary owing to the slight stretching of the operating cable. They are very simple. Remove the thimble nut on the left side of the spindle, and then adjust the operating rod by tensioning the screwed end of the cable until the rod is dead level with the axle-end, when the 4-speed gear is in the second position from bottom. A couple of minutes and the job is done. I have five four-speed hubs in service, wide, medium and close range, and I've never had the slightest trouble with any of them, and a couple are of pre-war vintage. It seems necessary to give this information because it is a shame that such excellent workmanship should be ruined by neglect or impatience, or both. I've seen people fiddle about with gear adjustments without knowing anything about the first importance of the exact position of the operating rod when in second gear. Another little tip is to see that the operating rod is firmly screwed home on itself—the rod is in two sections—but when home, do not force the screwing, for it is a delicate bit of mechanism.

The Ideal Time

I HAD some good riding in September, occasionally upset by the showers when a cloud flaunted its reason for existence, yet even so I used waterproofs rather less than any time during summer. What a lovely month September is for touring, warm enough to be supremely comfortable, with as many daylight hours as an ordinary individual can use and enjoy. I'm sorry that no real holiday space was left for me in the ninth month of the year, for there is a richness about travel when the harvest is nearly over and the earth is ready for the golden glory of autumn. It is so pleasant too, that the end of the day coincides with the desire to feed, for in the mid-season one is often tempted to neglect that gastronomic exercise for the pageantry of a sunset along the high ridges, and so upset the time-table, and frequently the tempers of the people who provide for us. But September nicely suggests through its solar relations that we cyclists can conform to common amenities without damage to our freedom, or the feeling that we are wasting precious daylight hours. A September holiday, too, especially fairly late in the month, is not over-crowded, and that, to me, is an additional recommendation, for I'm still selfish enough to like the scene without too much humanity, and am inclined to think that opinion is largely held by my kind. I shall in future have to save a brief holiday for September, something a trifle longer than a week-end, with two or three hundred miles of roaming in it. And I suppose, having fulfilled that desire, the next thing would be to sample a mid-winter lapse, and see the wild places under the impact of storm. We are never satisfied, and indeed why should we be so long as we can ride bicycles and retain our love of the land?

CYCLORAMA

By H. W. ELEY



Bratton Castle, Wiltshire.

The great ramparts of this Early English Camp. The famous Westbury White Horse lies on its Northern slope. From this spot magnificent views are obtained over the fine Wiltshire downland.

The Undergrad and the Bike

I WONDER whether there can be any place in England where there are more cycles, in relation to the size of the town, than in Cambridge? Visiting the varsity town recently, I was again struck by the crowds of machines . . . . everyone seemed to be out shopping, with a bicycle; every undergraduate seemed to be either riding a bike, or leaning against one as he chatted with a friend, and tradesmen's boys were weaving their way on bikes everywhere. Of course, the country around Cambridge is the ideal country for the cyclist, but I think it is true to say that Cambridge does possess an extraordinary number of machines. Some, I am afraid, are decrepit, and the fact that they function at all is quite a marvel!

Criticism From the North

FROM time to time I have referred in these columns to touring in various parts of England: I touched on the varied delights of Suffolk recently, and I know that in times past I have often eulogised the glories of leafy Warwickshire, and the grandeur of Shropshire and Hereford. Now, I have a letter from a Durham cyclist, who says (more in sorrow than in anger) that I neglect the northern counties. Well, well! Maybe I have not often written about Durham, or Northumberland . . . but that does not mean that I am ignorant of their beauty: I love the north, and can look back on some splendid tours in Yorkshire, and the Durham border. No! I am no bigoted southerner: rather, my heart is really in my native Midlands, but I will look up some of my old note-books, and in a future article describe some of the good scenes I visited up north . . . in the piping days of peace, when I recall that it was in fair Yorkshire that I was served with meals which seem, in retrospect, to be gargantuan. I trust my Durham correspondent will forgive me, and accept my assurance that I have no bias against the north.

Lure of the Night

GONE are the long summer evenings, and by the time one has finished an evening meal, got out the bike for a spin, the mantle of dusk has fallen, owls hoot from the spinney, and in the suburban roads cats slip stealthily across the roads, and the lamps twinkle and beckon us to ride on . . . ride on to romance. For there *is* romance in the night ride! With good lamps, the winding ribbon road is ours . . . and we may explore all the mysteries of the purpling night. And how fascinating a night-ride can be! Familiar things take on strange shapes when the darkness comes; the countryside looks different; and there is a nip in the air which is good after the fumes and stuffiness of the city. The good earth sends up a pleasing smell; a rabbit scuttles across the road . . . and after an hour's ride, one may come to a village inn, where the lighted windows welcome one to ease and refreshment. Yes! it is good to cycle through the night; and even November is not so foggy as is generally supposed. . . .

Pioneer Days

IN a popular periodical recently, I saw an article by Sir Arthur du Cros . . . that pioneer of the early cycling days, whose name will always be associated with the beginnings of the great Dunlop Company. It was a fascinating article, and Sir Arthur had drawn, with retentive memory, upon all the romantic happenings of those days when the bicycle "boomed," and all the world and his wife were taking to the "newfangled" machines. Such world-famed names as Rover and Humber came back to me as I read the article. Of course, there was a good deal about the early days of the pneumatic tyre, and to-day, when the pneumatic principle has been applied to every type of tyre, from cycle to tractor, it is strange to recall that it was opposed quite vigorously in those pioneer days! To men of my generation, it is always fascinating to look back . . . and muse upon the beginnings of a great industry.

Snow Comes to the Peak

THE English winter is notoriously fickle, and it is never safe to predict when we shall get the first snow. As a rule, however, it is a pretty safe bet that grey Derbyshire will receive the first snowfall, and I was not surprised to read in my paper the other day that the Peak had snow . . . snow on Kinder Scout, and around Mill Dale and fringe of the Peak proper. How well I know that delectable country! Hilly—maybe, but good cycling country nevertheless; and how full of variety of scene is Derbyshire! The grandeur of Dovedale; the grey, rather grim fascination of Wirksworth and Youlgreave—and the green and fertile country by the Staffordshire border. I recall, with longing, the good village of Sudbury, where one may cycle past the kennels of the Meynell Hunt. I see in my mind's eye, the stately Vernon Hall; I remember the good rich farms, producing rich milk for the factories of Messrs. Nestle at ancient Tutbury, where the ruins of the castle remind one that Mary Queen of Scots was once a prisoner there. And, reading my paper, I see the Peak enchanting under its mantle of snow. King Winter begins his long reign . . . but my tyres are sound, and my bike ready for all the delights of winter riding. . . .

AROUND THE WHEELWORLD

(*Continued from page* 19)

Advice to the London Section of the B.L.R.C.

NOW that the N.C.U. is endeavouring to remodel its policy my advice to the B.L.R.C. is to do the same. There is one section of this League which is unpopular and which has caused a lot of trouble among League members.

I am referring to the London section, which is lacking in tact, regards itself as more or less the proprietor of the League, and has done its best to alienate the sympathies of its supporters. The time is overripe for a purge of the Augean Stables. I understand from a side wind that drastic changes are likely at the A.G.M. They are long overdue.

Course Measurement

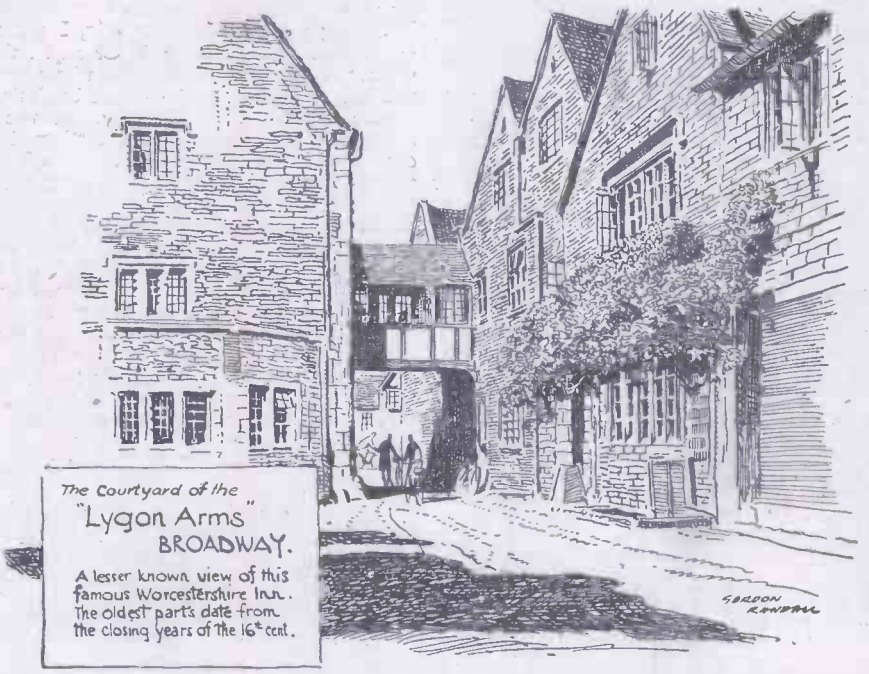
A CONTRIBUTOR to a contemporary has dealt with the subject of course measurement, and particularly with short courses. He thinks that a slight kink in the chain which is sometimes used for measurement would account for the slight discrepancies, and this could account for one yard in one mile. I do not think it would be possible for a surveyor to have the same kink or entanglement of the chains 80 times in the mile.

The contributor goes on to say "experience has shown that accuracy is possible between limits of plus or minus one yard per mile. Having finished his calculations on a 50-mile course, therefore, the measurer should be able to certify with confidence that the total distance is not less than 50 miles and not more than 50 miles 50 yards." His reasoning here is incorrect. Plus or minus one yard means that the measured mile can be one yard over or one yard under. It is not possible, therefore, for a measurer to be able to certify with confidence that the total distance is not less than 50 miles and not more than 50 miles 50 yards.

Assuming that it is possible to measure the course within the limits named all the measurer can do is to certify that a 50-mile course is 50 yards less or 50 yards more, that is to say, plus or minus 50 yards.

My Point of View

By "WAYFARER"



The Danger Look

THE sight of a small girl mounted on a very juvenile bicycle and descending a sharp hill at speed was a very disturbing one. It was obvious that the machine was hardly under control, and I trembled for the youngster's immediate future. Had she struck a loose stone on the road she would have sustained a nasty fall, with the definite possibility of fatal effects. As it was, she just about managed to keep her bicycle on an even keel, and I was greatly relieved when she reached the foot of the hill without mishap. What her parents thought of the performance, and whether they realised the measure of their responsibility, I do not know. I, personally, would not have liked to carry that responsibility. No doubt the business looked far more hazardous than it really was—that is usually the case—but I am bound to say that it possessed a distinct danger look.

Family Club-run

THAT evening, as I wended my way homewards, I was overtaken by what can only be described as a family club-run. It consisted of a triplet carrying two adults and one child, all of whom were pedalling, with a second child as a passenger disposed of between father and mother. The expedition was proceeding at a fine "bat" and in perfect safety. A pleasant change from the sight which had made my blood run cold a few hours earlier!

Don't "Wait For It"

DRILL sergeants in the army have a favourite ejaculation in connection with their job of training recruits. A tendency to anticipate an order is sometimes observed, and the sergeant then bellows: "Wait for it!" My advice to brother cyclists, in quite a different connection, is "Don't wait for it"—"it" being the legal lighting-up time. At certain periods of the year it is dark before the moment arrives for obeying the law in respect of one's lamps. In days gone by I was a stickler for not having a light one minute before time. Now, however, I realise the advantage of lighting-up in advance of the legal moment—an advantage which I myself share with others—and I commend the plan to all cyclists. No! I am not "slipping"; this is just a matter of plain common sense.

Envy: Not Sympathy

SOMETIMES one hears a friendly motorist express his sympathy towards the cyclists he encounters because he feels that they are having a hard time. "Sorry for that chap," he says, when he sees a cyclist slogging up a long hill, or fighting his way against the wind, or facing a spell of rain. Believe me, there is no need for this expression of sympathy. The cyclist does not want it. On those rare—fortunately rare!—occasions when "the boot is on the other leg" and I am in a motor car, my attitude is just the reverse. I envy the cyclists who are met or overtaken, and wish that I could change places with them. I believe that the cyclist is on "the right side of the hedge." We prefer our own method of travel and we look for no sympathy, however well intentioned, from our big brothers of the wheel.

Those Recommendations

EXPERIENCE has demonstrated the folly of blindly accepting other people's recommendations of stopping-places, and the importance of obtaining first-hand knowledge is stressed. Just a year ago a fellow club-man discovered what he considered an admirable house at which to put up. After a couple of nights there he was so impressed that he booked the necessary accommodation for his wife and family in respect of their 1948 holiday. I felt that my friend's recommendation was one which could be relied on, and last August, when I was not able to get into the farm of my choice, I put in three nights there. Disillusionment awaited me. The place was spotlessly clean and the people were kindness itself, but the food was rough and distinctly sub-standard. The arrangements generally were crude, and the lighting arrangements were deplorable, it being impossible to read when darkness fell. At the end of three days I crossed the valley to the farm of my own choice, and what a change was then experienced!

A year or two ago in the same neighbourhood, I accepted the advice of another friend regarding a third establishment, which (I was assured) was practically "a land flowing with milk and honey"—in other words with butter and cream, *ad lib.* If it is good, as the old saying suggests, to get up hungry from table at the end of a meal, then that establishment can be classed as "good"—but it was not good enough for me! I arrived there (on advice) in time for late dinner. This consisted of two sausage rolls, which wou'd have been all right as a snack. As a dinner, they are all wrong. With a spartan diet and a not too friendly atmosphere I have written off the place as indifferent, and recorded my friend's ideas of what's what in the way of catering as not quite running on parallel lines with my own views. In assessing the standard of our stopping-places, so much depends on the personal equation.

Welsh Back Way

IT was a pleasant surprise to me to discover, after many years, that there is a "back" way round that engaging Welsh lake, Tal-y-llyn. A more careful study of the map would have revealed the fact long since. Meanwhile, I have always enjoyed the ride along that minor road which runs at the very edge of the lake. It provides an inspiring journey, but the alternative is worth doing. The "back" way, which at one point does the farmyard act, is easily found. Incidentally, it comprises two water-splashes, one of which I think is the most picturesque ford I have ever seen. Visitors to mid-Wales are heartily recommended to look at their maps and then to make the complete circuit of Tal-y-llyn.

Still Thrills

A GIRL whom I met at tea the other day said to me: "You've lived for so long in this district that you must know all the roads, and I don't suppose there are any thrills left now." "Aren't there?" I replied, and I rode off on my hobby-horse. In the first place, I do not pretend to know all the roads and lanes. If I did, there are so many of them that they would often enough come back as something new. Moreover, they are never the same. There are the seasonal changes; there are the day-by-day changes; there are the changes resulting from the weather, from the time of day, from the lighting, and from one's varying moods. There are still thrills to be found even in the most familiar district.

On Velvet

HE may not be aware of the fact, but the cyclist of to-day is on velvet. Unless he is old enough to recall the roads of the pre-motor era he does not know how well off he is, with the fine surfaces of these times—fine, even after years of neglect during the war period. It may be urged, of course, that what we have gained on the swings we have lost on the roundabouts (or vice versa), but I, personally, am prepared to believe that, on balance, we are emphatically the gainers by the coming of the motor-car. Our old-time kingship of the road—for what it was worth—has, of course, departed, and as recompense we have these grand road surfaces which undoubtedly make cycling easier, are practically dustless, and which dry very quickly after rain. Moreover, the incidence of punctures has been greatly reduced.

The difference in roads was brought home to me in a curious way on a recent Saturday. After two or three hours' cycling on good main roads, I turned off and rode along a dirt track leading to a farmhouse where I intended to have tea. Down went my pace instantly, and it was quite hard propelling the bicycle over that "dead" surface. To say that is not to suggest that our roads in pre-motor times were made of dirt. Some of them, indeed, were of excellent quality, but the tendency during the summer months was for them to be very dusty, while in the winter months they were often muddy and slippery, providing quite hard going. Yes, we cyclists have lots for which to be thankful.

Lanes for Me

IT has probably been made clear by now that I have a penchant for lane-riding. Probably the truth would not be far away if I suggested that I cycle in lanes and byways to a greater extent than on main roads, which remark applies to night as well as day. Fortunately for me, I dwell in a neighbourhood—or on the edge of a neighbourhood—where the lesser ways have been supplied with a prodigal hand, so that little difficulty in keeping off the main roads is experienced. (Not, mark you! that there is any objection to using main roads. But my mental demand for lanes is not to be denied.)

So normally, week-end after week-end, a goodly proportion of my Saturday and Sunday cycling is done in the lanes. Usually, the surface of these minor ways is good, though here and there roughness is encountered. Many of the lanes are narrow; many of them are tortuous and it may be said that the narrower and more tortuous they are the better I am pleased. Often enough the network of lanes is confusing, bewildering; but that factor increases my joy. They are almost completely devoid of traffic, though occasionally at night-time a blazing motor-car comes along, while here and there a country yokel on an unlighted bicycle slinks by. The motor-car may call for a dismount, in the interests of safety (even in daylight). But usually one can "scrape" by at a very slow pace.

The other Sunday evening it suddenly came to my notice, by the lane being "set on fire," that a motor-car was overtaking me. The lane was so very narrow that I could do nothing about it except go ahead. No bay or recess into which it would be possible for me to withdraw for a moment or two presented itself. The driver of the oncoming car was evidently a "local" who knew the facts. He did not blare at me but was content to follow quietly and patiently until, at last, there came an opportunity for me to draw aside and wave him on.

Published about the 30th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by W. Speaight & Sons, Ltd., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand—Gordon & Gotch (A/sia), Ltd. Sole Agents for South Africa—Central News Agency, Ltd. Subscription Rates (including postage): Inland, 10s. 6d. per annum. Abroad, 10s. per annum. Canada, 10s. per annum. Registered at the G.P.O. for transmission by Canadian Magazine Post.

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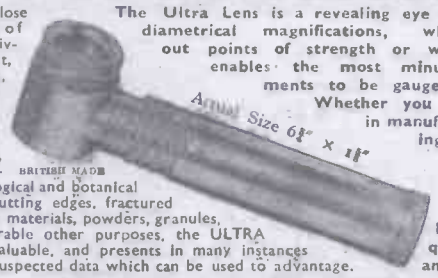

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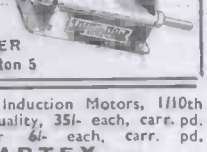

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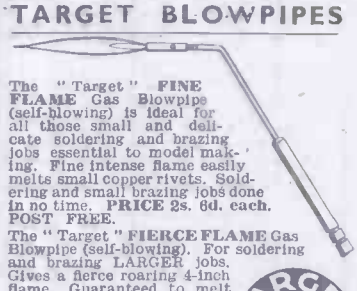

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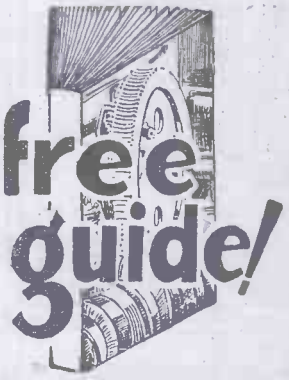

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