AN INGENIOUS NEW ESCAPEMENT

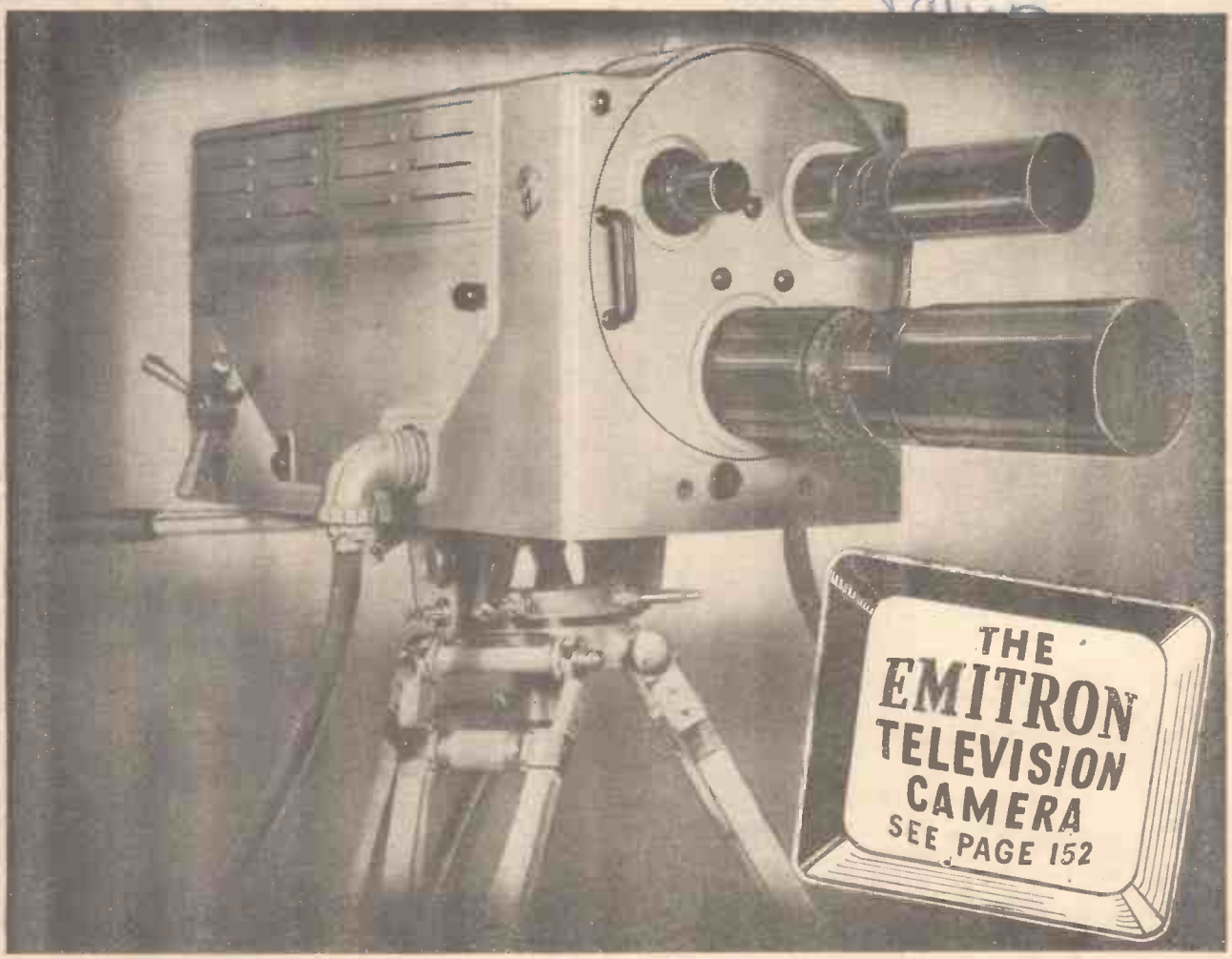
NEWNES

PRACTICAL MECHANICS

9D.

EDITOR: F. J. CAMM

FEBRUARY 1950



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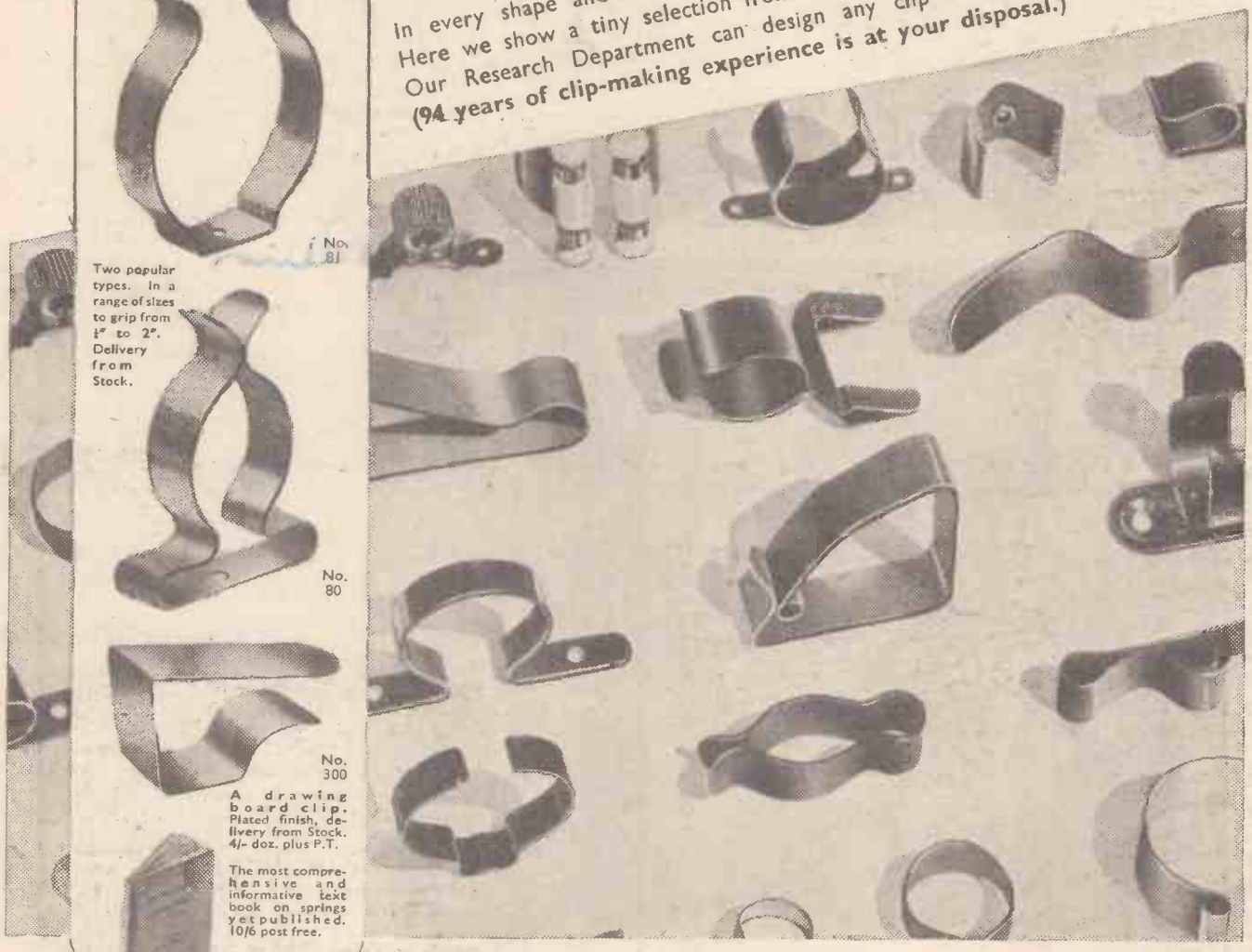

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PRACTICAL MECHANICS

EDITOR F. J. CAMM

FEBRUARY 1950
VOL. XVII. No. 196

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

FAIR COMMENT

By THE EDITOR

NEW THEORY OF GRAVITATION

FOR the second time Professor Einstein has upset pre-conceived physical notions. His theory of relativity announced earlier in the century proved beyond all doubt, for example, that light rays do not travel in a straight line. In his recently published "Generalised Theory of Gravitation" he endeavours to establish a relationship between gravitation and electro-magnetism. At present no one seems to understand his arguments. He is, however, by no means the first to endeavour to establish such a relationship, for as long ago as January, 1943, one of our contributors dealt very fully with this self-same theory in an article entitled "The Electrogravitic World."

This article aroused enormous interest. Professor Einstein himself does not seem too sure of his theories, for his claims are expressed in the subjunctive. He says: "The heart of the generalised theory of gravitation is expressed in four equations, shown in the accompanying illustration.

$$G_{\substack{i\,k;e \\ +\,-}}=0\;;\quad \Gamma_{ik}=0\;;\quad R_{ik}=0\;;\quad g^{\substack{i\,s \\ v}}_{,\sigma}=0$$

The equations have the mathematical properties which seem to be required in order to describe the known effects, but they must be tested against observed physical facts before their validity can be absolutely established."

It was in 1820 that Oersted demonstrated a relation between electricity and magnetism, and about a century ago Faraday endeavoured to carry his work a little further by his efforts to connect gravity and electricity. In 1850 he wrote at the end of a memorandum on the subject: "Here end my trials for the present. The results are negative. They do not shake my strong feeling of the existence of a relation between gravity and electricity, though they give no proof that such a relation exists."

In 1908 the late W. D. Verschoyle, inspired by these notes, commenced some experiments in this the most obscure problem in the whole world of physics. He found a form of radiation which undoubtedly slightly affected weight even at a distance of 10ft. from the radiator. During the solar eclipse of 1919 scientists proved the truth of Einstein's mathematical prediction that a ray of light would be found to be deflected in the strong gravity field. It is known that electro-magnetic effects are sometimes reversible, and it seems a justifiable inference that if gravity can so affect electro-magnetic radiation it should be able to find some energetic form of radiation capable of affecting gravity. In 1923 Sir James Jeans wrote: "It is at least conceivable that a slight step from a gravitational force M/r^2 in the direction of a force v^2/r might be found to provide explanations of some of the unsolved enigmas of the solar system, such as the moon's motion in longitude, Bode's Law and the circularity of planetary orbits."

Many other experimenters in this country and in America have made small discoveries all pointing to the electro-gravitic relationship. A great deal more, however, needs to be discovered before the theory can be put to practical use. World conditions are subject to no influence more productive of change than rapid transportation, and in the electro-gravitic world this influence will reach the limiting possibility of speed, the limits of which are as yet unknown.

ANOTHER COMPETITION

FOLLOWING the success of our recent competitions I have pleasure in announcing a further contest. This time a prize will be awarded for the best design for a mechanical pencil. There are a number of excellent mechanical pencils on the market but most of those which I have owned have had several inherent disadvantages—the leads frequently break because they are not tightly gripped at the point, the propelling mechanism does not enable all of the lead to be used, the mechanism itself occupies so much space that only short lengths can be used (as much as a half an inch of lead has to be thrown away with some designs), the mechanism itself is too flimsy for lengthy service and frequently gives trouble, and few if any of them can be easily dismantled for cleaning and adjustment. Some indeed are soldered together and are not intended to be repaired once they have broken. Designs must be submitted by April 30th and must comply with the following conditions:

1st Prize, £20; 2nd Prize, £10; 3rd Prize, £5.

1. All designs must be original.
2. When submitting designs readers should state whether they have patented or intend to patent the design. Publication invalidates the possibility of obtaining a patent.
3. The action must be propelling and expelling, but not necessarily repelling.
4. The leads must be at least 2in. in length.
5. It must be possible to use all of the lead up to the last eighth of an inch.
6. The entire mechanism must be detachable.
7. Designs may be submitted as drawings or as actual prototypes. Stamps must be enclosed for registered return of the latter.
8. Entries should be addressed to:

The Editor, PRACTICAL MECHANICS, Tower House, Southampton Street, Strand, London, W.C.2, and the word "Pencil" should be marked in the top left-hand corner.

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JUBILEE OF THE N.P.L.

THE National Physical Laboratory, at Teddington, is the second of the world's standardising laboratories, the first being the Physikalisch Technische Reichsanstalt, in Berlin, and the third the National Bureau of Standards, in Washington. The N.P.L. was founded in 1900, whilst the P.T.R. was founded in 1887 and the N.B.S. in 1901. It should have been an occasion for rejoicing and celebration, but it will not be until the summer of 1951 that the occasion will be publicly recognised, because the Lord President of the Council, who is the Minister responsible for the Department of Scientific and Industrial Research (under whose aegis the N.P.L. operates), has decided that the Golden Jubilee celebrations shall form part of the Festival of Great Britain.

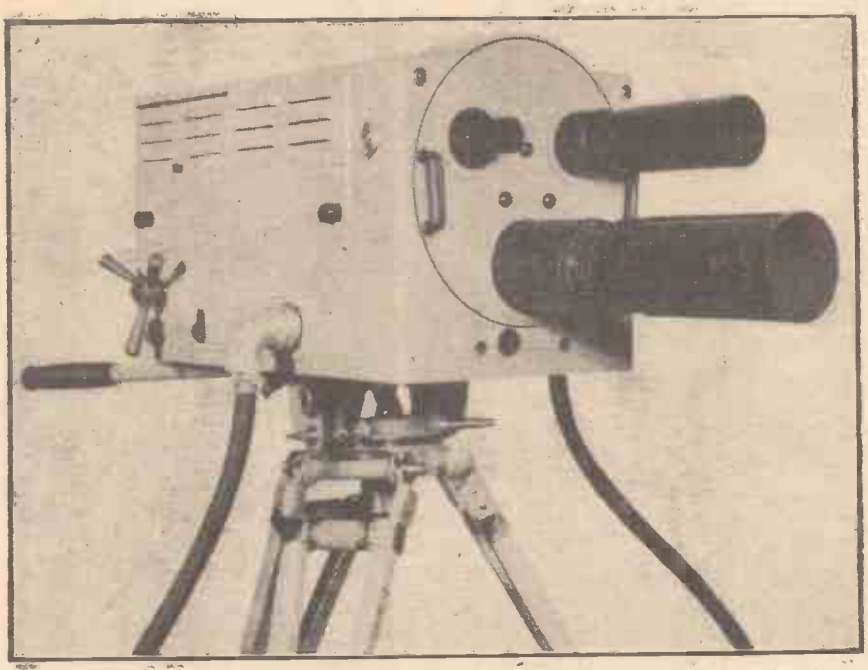
The N.P.L. has mainly concerned itself with measurement, and evolving systems of measurement and standards of measurement. It was opened by King George V, then Prince of Wales, in 1902 for the purposes of bringing "scientific knowledge to bear practically on our everyday industrial and commercial life, to break down the barrier between theory and practice and to effect a union between science and commerce." And so it functioned until 1918, when it was taken over by the newly-formed D.S.I.R. Previously it was controlled by the Royal Society. This transference was rendered necessary by the great expansion of the laboratory during the Great World War, although the Royal Society still appoints a general board and an executive committee to advise on scientific aspects of the work of the laboratory; and the President of the Royal Society remains *ex officio* chairman of the General Board.

The great work of the N.P.L. has influenced industry and commerce throughout the world. An N.P.L. certificate of performance or an N.P.L. report is accepted by every country without question. It has greatly influenced the design of practically every piece of apparatus in use to-day. It is able to conduct tests and experiments for private firms which they could not possibly afford to undertake themselves, and it also conducts tests for Government departments, for the Admiralty, the War Office and the Air Ministry. It is true to say that our aircraft would not lead the world as they undoubtedly do to-day but for the tests on wing sections, airscrews, aero engines and other parts which the N.P.L. has carried out. In the course of its tests it has made many important discoveries, and it has evolved apparatus for research and for the control of industrial processes which are standard throughout the world. It also carries out investigations into special problems for research associations and technical institutions as well as for industrial firms. The N.P.L. is responsible for the maintenance of all standard measures of lengths, weight and capacity. It carries out investigations on the physical constants of materials, the properties of engineering materials, as well as tests and calibrations on volumetric glassware, clocks and watches, thermometers and optical instruments.

The Emitron Television Camera

Operational Details of the Television Transmission System

By G. I. HITCHCOX



The modern CPS camera is a direct development of the original Emitron designed over twelve years ago.

THE television camera undoubtedly is the most impressive and interesting feature of the television transmission system; it is the vital link which converts the light signals into corresponding electrical impulses, in which form the programme information must remain during very many sequential, yet substantially simultaneous, processes until finally it is re-created on a cathode-ray tube in the viewer's own home.

At the present time there are in use several types of camera which differ considerably in detail but which all bear a close family resemblance to each other. This is not surprising since all of them are based upon the principles suggested by Campbell Swinton more than forty years ago in one of the most remarkable reasoned technical prophecies of all time. In England we have the Emitron and its improved descendant, the Super-Emitron; from America comes the Iconoscope, a closely similar parallel development, followed by the Orthiconoscope or Orthicon, in its turn soon to be superseded by the Image Orthicon, the type in most common use there to-day.

Spatial Distribution

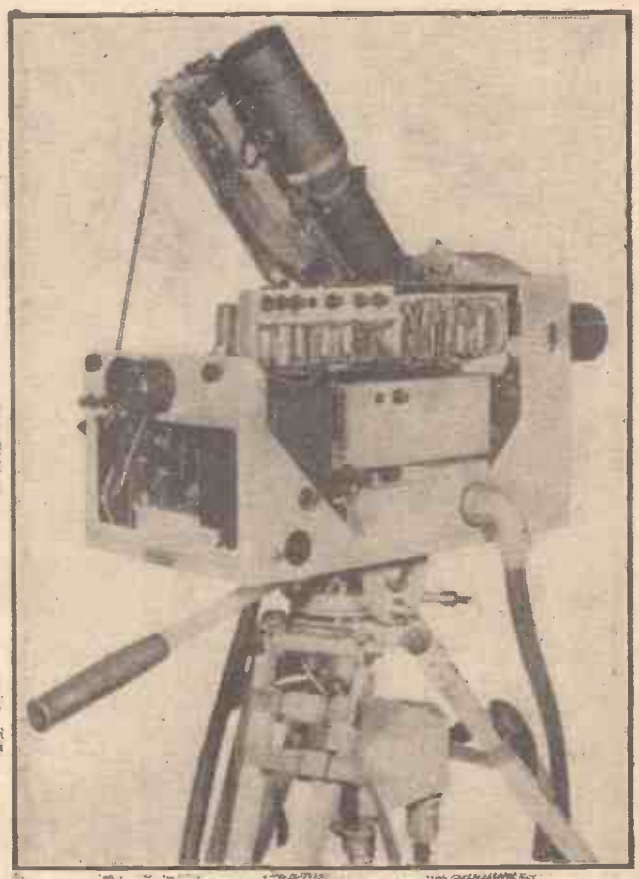
In both sound and vision systems the received signal is made up of one or more (usually very many) periodic waveforms following a sine law; they are waves of air pressure in the case of sound and variations of strain in what is postulated as the ether in the case of vision. In both it is necessary, for perfect reproduction, to transmit the following properties: (a) amplitude—strength or intensity; (b) frequency—pitch or colour; (c) phase—the relationship in time between one component waveform and another, and (d) spatial distribution—which signal comes from what direction. It is the vital importance of the latter in television, compared with its very slight importance in sound, that marks the principal difference between the two systems.

In ordinary broadcasting accurate transmission of amplitudes is desirable and accurate reproduction of frequencies—relatively, at any rate—is essential. It fortunately happens that a direct system inherently cannot alter frequency and even with recordings a slow motor cannot alter the mutual relationship of the various components although their absolute values may be incorrect. Phase is quite unimportant; the ear is an analytical device which splits up the sound wave into its component frequencies and detects them independently, paying no attention to their relative phase. This is just as well because otherwise broadcasting as we know it to-day would probably be impossible. Lastly, spatial relationship is unessential though desirable; the lack of it is probably one of the two main reasons why no one could mistake the output from any loudspeaker, however good, for the real thing, even though he should be blindfolded.

Now in television reproduction it is obvious that spatial distribution is vitally important; it is no good indicating the strength of a light impulse or even its colour unless you relate it to that exact point where it fits into the jigsaw puzzle as a whole. At any one time the output from one photo-cell can convey one single item of information only, and it will produce exactly the same current whether it is looking at a checker-board of black and white squares or at a scene of uniform grey.

There are only two solutions to this problem: either the system may consist of a number of separate channels each confined to one small section of the picture, or if that is impracticable because of the number—and it most certainly is impracticable—it must confine itself to one section at any one time, covering the whole scene in an orderly process called scanning, and then repeating the whole operation at a rate sufficiently fast to deceive the eye into thinking that it is viewing a continuously present picture. This is the system which is always adopted in practice.

One vital point is the number of sections into which the picture must be broken up for good reproduction, or definition, as it is usually called. In the original Baird 30 line system the number was roughly 1,000 and this was at once seen to be totally inadequate. The optimum number—which in turn determines the number of lines—will perhaps be a permanent subject for difference of opinion—but as a rough guide it may be said that it clearly should not be less than 50,000 and that any increase above one million is not justified by any improvement in definition which is perceptible to a normal human eye. In the standard B.B.C. system the picture is broken up into approximately 200,000 elements.



In this view the tube holder is elevated to give access to the signal pre-amplifier situated beneath it.

Scanning

It is the duty of the television camera to scan the picture and at any and every instant to produce an output current which is proportional to the intensity of the light falling upon the camera at that instant.

The exact process of scanning is outside the scope of this article; no doubt all readers are familiar with it. The picture is scanned in zigzag lines from left to right; the "start" of each line is below that of its predecessor by a distance equal to twice its own thickness or depth. When 202½ lines have been covered the scanning spot returns to the top of the picture and scans the lines which have been missed out during the first half of the process, making 405 lines in all. The whole process is then repeated 25 times every second, which is fast enough to take full advantage of the well-known persistence of vision effect in the eye. Readers will remember that in film reproduction a similar device is used; although only 24 frames pass through the projector every second each frame is actually viewed twice, giving the same smoothness as if the frame frequency were 48. The equivalent television frequency is increased to 50 to take advantage of the controlled grid supply in this country.

With sequential scanning one difficulty which immediately arises is that of getting adequate sensitivity, bearing in mind that each individual section is only viewed for roughly one two-hundred-thousandth part of the duration of each picture, which in any case only lasts one twenty-fifth of a second itself. Camera-minded readers will appreciate the problem of exposure times in the order of 0.0000002 second! It is this problem of combining a sensitivity high enough to overcome the inevitable background noises with the demand for a high rate of scanning, and therefore a short duration of coverage on each individual section, that has determined the characteristics of the television camera as we know it to-day.

In the early days, Baird produced an interesting example of what may be called solution by evasion. The scene to be televised was photographed by a fairly conventional film camera on to a continuous band of film. In a matter of seconds this continuously moving band was processed and developed and passed through a scanning raster which directly televised it. The great practical advantage is, of course, that practically unlimited light can then be made available to illuminate it under these conditions. The film was then "washed" clean and returned via the camera head to complete a continuous moving loop; needless to say, it was necessary to delay the sound by a corresponding interval, using a magnetic tape or wire recording system also based upon a closed loop.

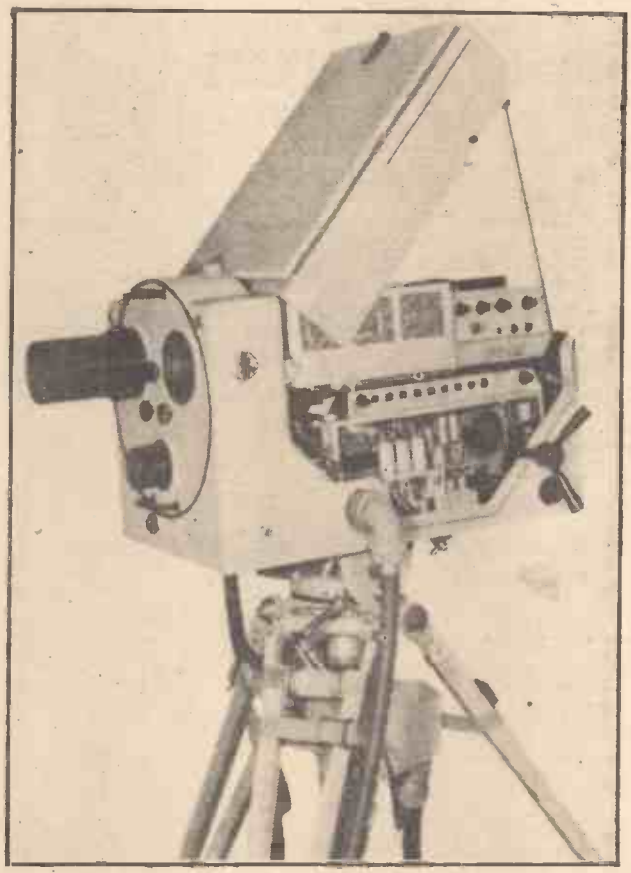
Ingenious as such a system was, it had many disadvantages; an outstanding one is the fact that such apparatus is too bulky and complicated to be suitable for outside broadcasts. It was also found that the loss of complete topicality, short as the actual interval was, proved an important psychological deterrent.

The first successful direct action cameras were the Emitron, produced by McGee and others for Electrical and Musical Industries, Ltd. (hence its name), and the Iconoscope, developed at about the same time by Vladimir Zworikin for RCA in America. They are not unnaturally very similar in general design, and one description will serve for both.

The Storage Principle

It has already been mentioned that one most serious problem is to get adequate sensitivity bearing in mind that each individual section of the scene is under observation for a fraction of a microsecond. The Emitron solves it by what may be called the storage principle, in which each little section is building up a charge during the whole of the blind period between one scanning operation and the next; this charge is transferred to a small condenser, and when this is suddenly discharged during scanning, the quantity is a measure of the intensity of light that has fallen upon that particular area since the last operation.

Fundamentally, the camera consists of a conventional optical system in which the lenses focus the scene upon a flat screen about four inches square, which occupies a position in the camera where one would normally expect to find the photographic plate. This screen is not homogeneous as would appear at first sight; it is made up of several million photocells, all insulated from each other and distributed more or less uniformly over its entire surface. It will be remembered that a photocell consists essentially of some material—usually a cæsium compound—which has the remarkable property of emitting negative electrons, their number increasing with the intensity of light falling upon the material. The cell is usually completed by some second electrode or anode, which collects the electrons; they would otherwise eventually return to the emitter or cathode.



The cover and sides of the camera housing are detachable to facilitate adjustment and service.

Each individual cell is connected to a small condenser; during the whole of the blind period when other sections are being scanned in their turn, a current is flowing in, its amplitude, and therefore that of the ultimate electrical charge that is built up, being proportional to the intensity of light falling upon that particular small emissive surface.

The construction of a system involving millions of separate photocells, complete with their own load condensers, each group insulated from all the others, would appear to be extremely complicated; in practice it is very simple. Each cell consists of a globule of pure silver coated with cæsium to give it its photo-electric properties. These globules are deposited upon a mica sheet which forms the body of the screen, and on its blind side—away from that on which the scene is focused—it is backed by a supporting metal plate. Each globule is, of course, insulated from this plate by the intervening mica, and it is the self-capacitance between the two across the mica dielectric which forms the load condenser for each globule or cell.

It is interesting to note that the mosaic of globules is made by first applying a continuous film of silver; the plate is then heated in an oven, causing the silver to break up into small separate globules because of surface tension, exactly as water collects into drops on the side of a glass. The plate is then rapidly cooled.

Electron Gun

During the scanning operation each small section is discharged in turn by an electron gun, mounted in front of the photo-electric mosaic, but to one side (usually below) in order not to impede the view. This gun is very like that which forms the basis of an ordinary cathode-ray tube; it consists of a heated cathode, a system of positive anodes and focusing electrodes which concentrate the electron emission into a beam and accelerate it to a sufficiently high velocity which ultimately carries it to the mosaic, and a deflection system which scans the spot across and down the mosaic screen in accordance with time-base signals generated in the control room.

When the ray plays upon any particular element, the negative electrons neutralise the positive charge which has been built up across it, or rather across its capacitance to the metal plate on the other side of the mica, and the current that flows during this brief discharging period is proportional to the intensity of light that has built up the charge during the time that has elapsed since the last scanning operation, an interval many thousands of times longer than the brief operation itself.

Camera Details

The construction and the external appearance of the Emitron camera are clearly shown in the accompanying illustrations; some practical details will be of interest. All power supplies, together with the time-base signals which operate the scanning gun, are generated in a central control room since it is essential that all cameras should be synchronised both with each other and with the transmitted waveform. These time-base signals are saw-tooth in shape; that which controls frame movement is at 50 cycles and the line frequency is 10,125—that is, 50 multiplied by 202½ since half the total number of lines are traversed during each frame transmission. The signal output is taken from the metal backing plate which forms one elec-

trode common to all the individual load condensers; it is taken direct to a cathode follower, which acts rather like a step-down transformer, but without any large reduction in voltage. The output from this is amplified several hundred times by an internal valve unit, in order to raise the signal well above any normal interference level, and then fed *via* a second cathode follower to the cable which connects the camera to the control room and ultimately to the modulation circuits of the transmitter.

All the variations to the Emitron are similar in general principle, and a brief description of one will suffice. The Super-Emitron, the instrument most widely used in this country, separates the functions of photo-electric cell and storage condenser. The light is focused on to a continuous transparent sheet which emits electrons from its reverse side in proportion to the light falling upon each particular area. These electrons are drawn away in strictly parallel lines to a second sheet, which is a mosaic but without any photo-electric properties. The action of the primary electrons in striking this second screen disturb many other electrons—it is the possibility of a multiplicative effect due to secondary emission which forms the main advantage of the Super-Emitron—and each individual unit of the mosaic is sequentially scanned by a cathode-ray beam exactly as in the original instrument.

A Low-voltage Electric Soldering Iron

Constructional Details of a Useful Tool for the Handyman

By W. L. WILLIAMSON

THIS electric soldering iron has been designed with a view to efficiency and, at the same time, safety. Quite a number of those on the market to-day have been designed to operate on a 250-volt 50-cycle supply, and this voltage can be dangerous when a soldering iron is used without an earth connection, and the user is standing on a damp or concrete floor. With this in mind, an iron to operate at 18 volts or a little less has been devised by the writer. The chief factor in this job is a suitable transformer to work off, say, 230-250 volts 50-cycle supply for the primary side, and giving 18 volts 3-4 amps. from the secondary winding. There should be an earthed screen between the primary and secondary windings, otherwise the safety factor in using a low-voltage iron is lost. After a number of tests on the iron it was connected to a low-voltage metal rectifier (full wave) between the 18-volt AC side and the electric iron, and the result achieved showed a slight improvement in its operation. It took a little longer to heat up, but maintained a nice working heat on direct current, and the current consumption was 2.2 amps., against 3.0 amps. on AC.

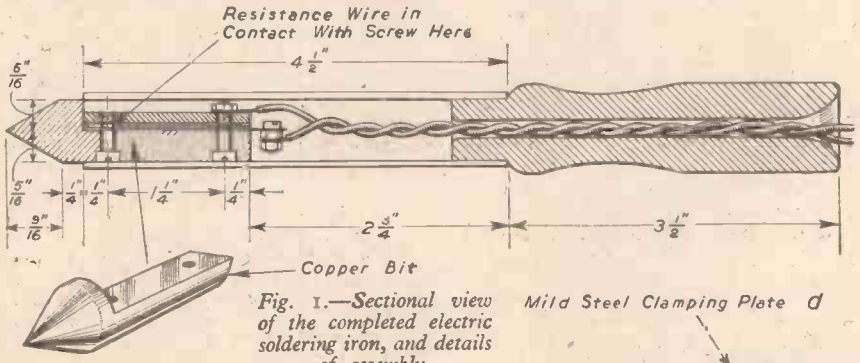


Fig. 1.—Sectional view of the completed electric soldering iron, and details of assembly.

Constructional Details

The component parts are few and are easily obtained. They are as follow: One piece ⅜in. round copper rod; one piece mild steel, 1¼in. long, ⅝in. wide, and ⅛in. thick; some good-quality mica; about 2ft. of strip resistance wire, .025in. wide and .007in. thickness, rated at 12 ohms per yard; two 4 BA cheese-headed tap screws; one 4 BA nut; one 5 BA cheese-headed tap screw; and a few 4 and 5 BA brass washers. As a sheath for the copper bit use a length of asbestos tubing, ⅜in. bore and ¾in. outside diameter. After obtaining all the parts first cut the copper rod to size and shape it as shown in Fig. 1. Drill and countersink the two 4 BA clearance holes, making sure that the heads are flush with the radius of the copper.

Next, make up the mild steel clamping plate, drilling and tapping the two 4 BA holes, and radius the top sides of the plate, otherwise it will not allow the asbestos tube to fit over the assembly when completed. The mica strips should now be cut out and

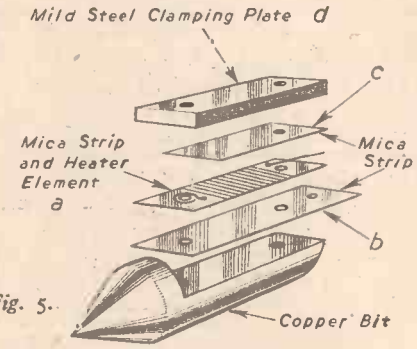


Fig. 5.

the holes punched out as shown in Figs. 2, 3 and 4; the strips should be .02in. in thickness. The heater unit should now be made up for this; cut off 18½ inches of the strip resistance wire, pierce a small hole at the left-hand end of the mica strip (Fig. 2) near the 4 BA hole, and bring the wire end from the underside through the hole and leave sufficient wire to be able to take one or

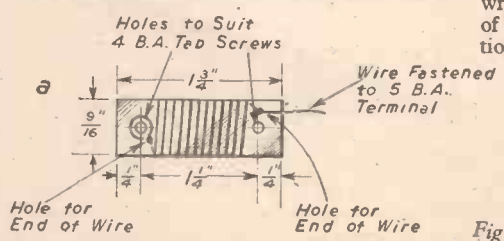


Fig. 2.—Mica strip and heater element.

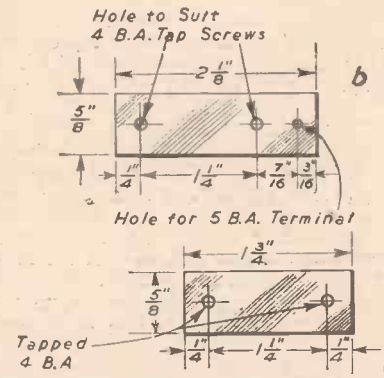


Fig. 3.—Mica strip and steel clamping plate.

two turns round the 4 BA tap screw after assembly. Wind on 12 turns, taking care to keep the wire flat and tight, also see that the turns do not touch. Thread the finishing end through the right-hand hole and enough to connect to the terminal on mica strip (Fig. 3). See that the wire does not touch the 4 BA screw when assembling.

Assembly

Lay the mica strip *b* on the copper bit (Fig. 5), and on top fit heater unit and the next mica strip *c* (Fig. 4). Lay the wire end carefully in position round the lower 4 BA tap screw and place a 4 BA washer over it; this should be slightly higher than the mica strip (Fig. 4) so that when the mild steel clamping plate *d* is fitted, it presses firmly on the wire end and washer. After laying this plate in position, fix it by means of the two 4 BA screws, the longer one at the right-hand end (see Fig. 1), as this has a nut and washer fitted for one of the connection points, the other being the terminal nut on the mica strip (Fig. 3). On completion, try the assembly in the asbestos tube; it should be a nice push fit. If it is too easy, a thin piece of mica could be used to keep it in position finally. Remove the copper bit and connect a 5ft. length of twin flex (5 amp. rating) to it, then thread the flex through the tube and replace the "bit" and make secure. All that remains is to fit the handle, after boring, to take the flex and securing by means of two wood screws. The electric iron is now ready for trying out. Connect flex to the low-voltage supply, either AC or DC, whichever has been decided upon, when it will be found that the iron attains a nice working heat in about seven minutes, or slightly less on AC. The current consumed on the mains side by the writer's transformer is approximately .116 of a unit per hour with the iron in operation.

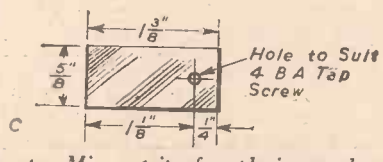


Fig. 4.—Mica strip for placing under the clamping plate.

An Ingenious New Escapement

An Important Development for Clocks, Watches, and Industrial Mechanisms, such as Meters, Interrupters, Timers, etc.

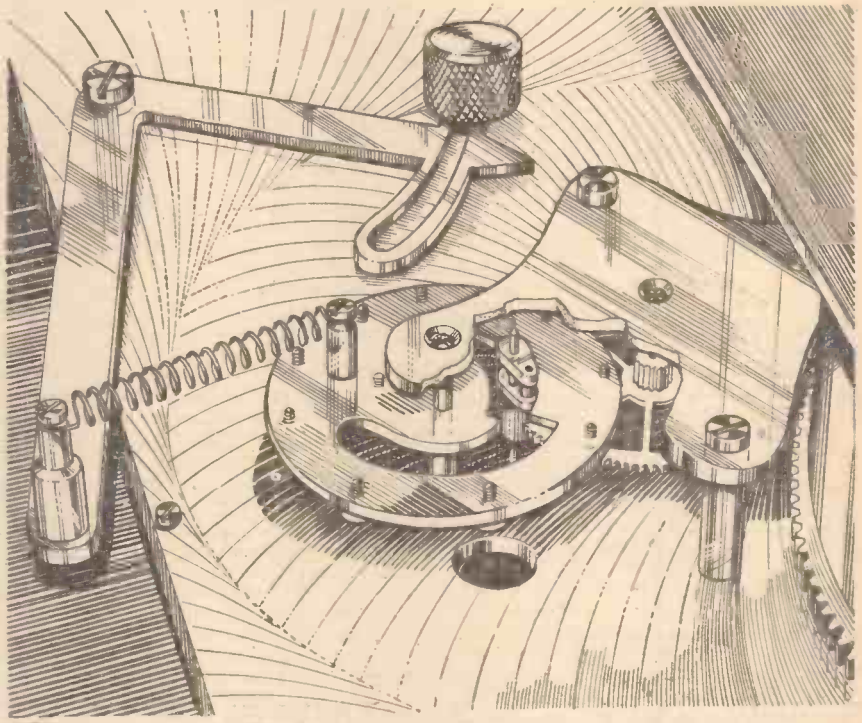
By F. J. CAMM

THE retarding mechanism used in clocks, watches, and other time-controlled apparatus has been the subject of research and invention from the earliest days. The Chinese use dripping water in their Clepsydra or Water Clocks. The earliest clocks have used escape wheels and pallets, whilst watches have variously used the Verge, the Duplex, the Cylinder, the Chrometer, the Pin Pallet or Roskopff, and latterly the Lever.

Lever Escapement

The lever escapement now almost entirely holds the field, and it was considered that it was the ultimate, and incapable of improvement.

A new and important invention in escapements by the National Watch Company of Switzerland has just been released, and its operating principles are shown in the accompanying diagrams. Designers of time-controlled mechanisms do not like lever escapements for relays, timers, and interrupters because: (1) they are fragile; (2) the starting of a lever escapement is not automatic (usually the mechanism has to be shaken); (3) the price of a lever escapement is out of all proportion to the total apparatus; and (4) on lever, cylinder and Roskopff escapements the range of error correction or regulation available by means of a regulator is very small indeed, and in any case it is too



Pictorial view, part broken away, of the new escapement.

small to have any noticeable effect on short-running mechanisms, such as those which only need to run for a minute or so.

For these reasons designers prefer other regulating devices such as condensers, air-brake flywheels, centrifugal vibrators, heating blades, etc. All of these devices, however, suffer from the drawback that they do not allow any independent regulation and therefore there is an absence of precision.

The new escapement shown in the drawings has a number of important advantages. In the first place it is extremely robust, and can be constructed solidly and without stones or jewels.

The very fragile hairspring used in ordinary timekeeping is replaced by means of a simple spiral spring. The mechanism can thus be handled by labour which is quite unskilled. The mechanism is quite self-starting. It starts infallibly as soon as the spring is wound.

The new escapement has only two main pivoting pieces and does not require the high precision of a lever escapement. Its construction is therefore cheap.

Timing or Regulation can be varied

Moreover, the timing or regulation can be varied to an enormous degree, exceeding a ratio of 1 : 2, by the mere stretching of the spring. This point is most important when regulating short-running mechanisms. A precision of plus or minus 2 per cent. is guaranteed.

Referring to the illustration (Fig. 1), the escape pinion 1 bears on a roller 2, pivoting on a pin fixed by two plates pressed on the escape pinion. This pinion passes through the balance wheel 8, which, as will be seen, is of special form.

Fig. 2 represents the position of equilibrium,

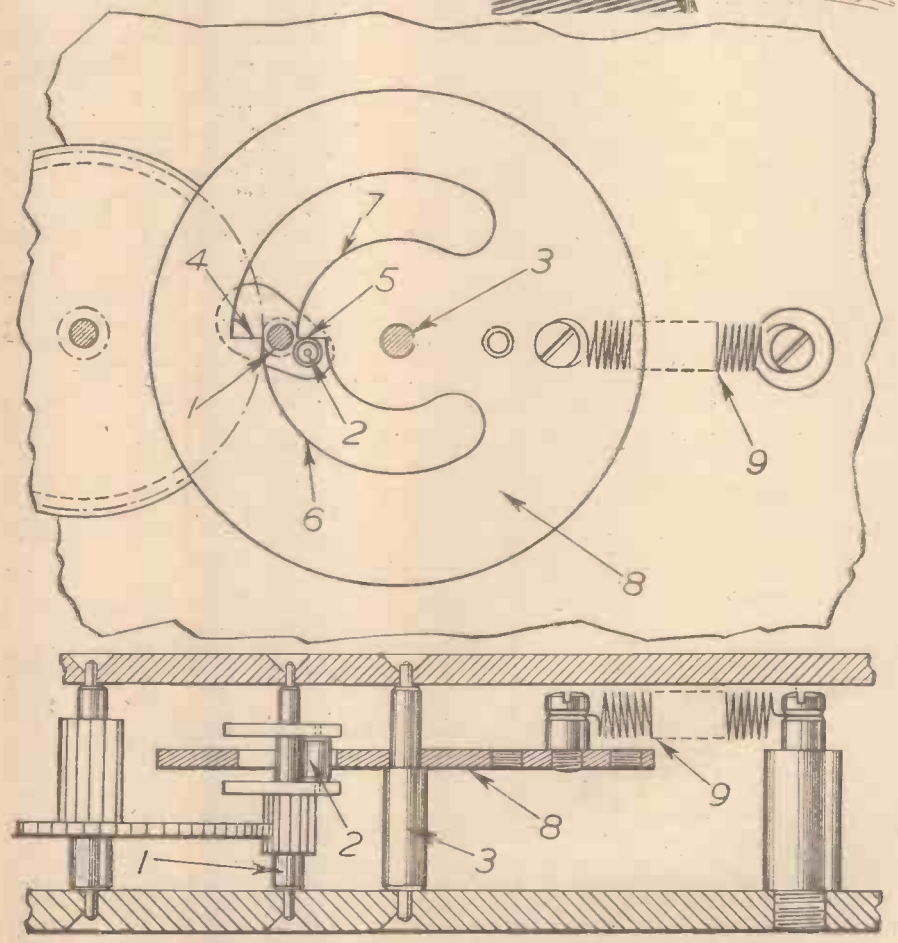


Fig. 1.—Enlarged plan and section of the movement, with the various parts enumerated.

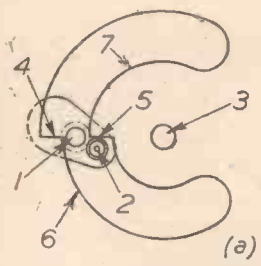


Fig. 2.

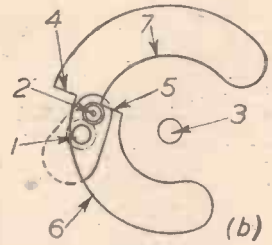


Fig. 3.

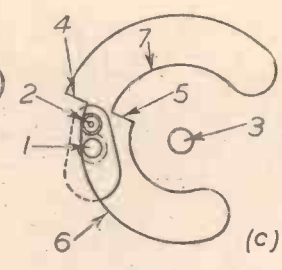


Fig. 4.

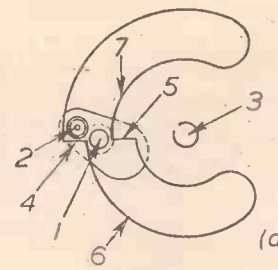


Fig. 5.

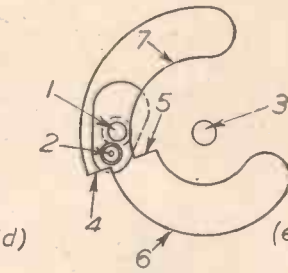


Fig. 6.

When the apparatus starts working, that is to say, when the motor or spring power causes the escape pinion to turn from right to left, the roller 2 impinges against the surface 5 of the balance wheel entry, and the latter then turns more or less according to the power transmitted by the roller.

Fig. 3 shows the end of the impulse. The roller 2 is about to leave the surface 5.

Fig. 4 indicates that roller 2 has fallen against surface 6 of the balance wheel entry, and this surface being concentric with the balance wheel, the roller merely turns on the balance wheel during its additional oscillation. As soon as the balance wheel has accomplished its ascending oscillation it returns to the dead point under the influence of spring 9.

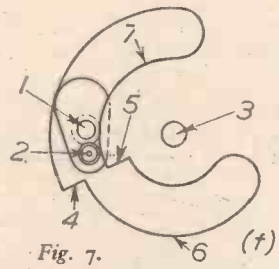


Fig. 7.

Figs. 2 to 7.—Diagrams illustrating the sequence of operations of the new escapement mechanism.

The roller 2 then meets surface 4, and gives an impulse to the balance wheel in a direction opposite to that which took place at first. (See Fig. 5.)

Fig. 6 shows the end of this second impulse and Fig. 7 shows the roller arrested in its run on the concentric surface 7.

When the balance wheel returns to its dead point the cycle of operations is repeated. It is obvious that there is no possibility of the escapement not starting immediately there is power on the train. This is an important point wherever movement cannot be shaken, and sometimes are only used very intermittently.

Better Controls for B.R. Engine Drivers

A FULL-SIZE mock-up has been constructed of one of the new standard steam locomotives to be built in 1951 for British Railways. This shows all relevant detail from the front of the firebox as far back as the middle of the tender, and all the controls and fittings in the cab are reproduced as they will be seen and handled by the driver and fireman of the future.

Although the design is completely new, it embodies what are considered to be the best practices from each of the railway regions, plus several new ideas, and regard has been paid to suggestions already made by members of the railway staff and the trade unions.

The arrangement of fittings in the cab is intended to be representative of what will be provided in all 12 standard locomotive types eventually to be built and to which reference has already been made in the Press.

The objective of the design is to provide a locomotive cab in which the driver, completely protected from the weather, has all his controls so placed that he is able to operate them without leaving his seat and without taking his eyes off the track ahead. The fittings under the fireman's control are conveniently grouped on his side of the cab. For both men, special provision has been made for locker accommodation, including a stainless steel lined cupboard for food with double doors to exclude dirt, and a special feature is that the usual movable flap between engine and tender is eliminated, giving a firm level floor for the fireman to work on.

Technical Features

The following are some of the objects sought after in the arrangement of the mock-up:—

(1) To take the steam manifold, the majority of steam pipes and valves and the regulator gland outside the cab, as a contribution to keeping it cool and free from leaks and also to improve accessibility.

(2) To present the simplest possible layout of fittings, grouping on the driver's side those controls for which he is responsible, and placing on the fireman's side those appropriate to his duties.

(3) To provide a firm level floor right back to the tender by extending the footplate rearward and eliminating the hinged fall-plate. This also allows the provision of better side-doors.

(4) By securing the cab to the boiler instead of to the main frame to eliminate relative movements, and thus to enable floorboards and cab front to fit snugly up to the boiler.

(5) On the driver's side, a new arrangement of reversing wheel and vacuum brake valve endeavours to give more room and greater convenience.

(6) The blower valve is placed in a position instantly operable by either driver or fireman as need arises.

(7) The injectors are secured to the firebox in accessible positions, and steam and delivery pipes are carried on firebox and boiler, thus avoiding relative movement and undue vibration. The controls to both injectors are on the fireman's side, and both overflows are visible on that side.

(8) Large front windows are provided, free of obstruction and set at an angle to avoid glare. The front side windows are movable so that the outside of the front windows can easily be cleaned from inside the cab.

(9) The tender front carries the following features:—

Large folding doors for access to coal space.

Vertical handles for brake and water pick-up.

Rear windows with clear vision along inset coal bunker for setting back.

Large-sized tunnel for firing-tools.

Separate locker lined with stainless steel for food.

Large locker for clothing; in addition there are on the engine, lockers for bucket, brush, spanners, etc., on the one hand, and for oil bottles on the other.

(10) The controls for the rocking grate are sunk below the floorboard level with substantial cover plates, so that draught and dust will not blow up from that source. The control for the self-emptying ashpan doors is at ground level on the left-hand side of the engines.

(11) Ashpan damper doors are provided at the front only and are operated by a single wheel. The amount of opening can be seen by day and felt by night by the amount of screw which protrudes.

Flight Refuelling Development

THE Boeing Airplane Co., co-operating with the U.S.A.A.F., has developed a novel flight refuelling system utilising a telescopic boom for the transfer of fuel, instead of the normal flexible hose. The new system is claimed to alleviate some of the difficulties experienced with the use of a flexible hose, and to enable refuelling to take place quicker and at higher altitudes than is now possible.

For take-off and landing the boom extends almost straight back from the tanker's tail. The B-29 bombers used as the receivers in the experiments have been fitted with a special fuelling socket in the top of the fuselage just forward of the upper gun turret. Two small V-shaped control surfaces are attached to the "Flying Boom," as it is called, and control its movement either up or down or to either side. During the refuelling operation, the tanker flies ahead of and slightly above the receiving aircraft, and the telescopic boom is then extended and the nozzle guided into the special socket by an operator seated in the tail of the fuselage. When the connection has been made fuel is then pumped under pressure into the receiving aircraft. Flight tests which commenced in the middle of 1948, are continuing under the direction of Boeings.

A major difference in technique between this system and the British developed method using a flexible hose is that the tanker flies ahead of the receiving aircraft instead of behind it. A disadvantage would appear to be that it calls for considerably more skill on the parts of the pilots of both aircraft, as extremely accurate flying must be necessary once the connection has been made. The large mass of the Flying Boom could also cause serious damage to the lower aircraft in gust conditions. The method would not appear to be an advance on the novel "Probe and Drogue" method recently demonstrated by Flight Refuelling, Ltd., for single-seat fighters.—M. F. A.

The Elements of Mechanics and Mechanisms—28

Gear Tooth-forms (contd.)

Direction of Friction on Profiles

CONSIDERING profiles 1 and 2 in the positions shown in Fig. 44, the relative motions at C causes 2 to exert on 1 a dragging effect towards the root of 1. Conversely, 1 exerts on 2 a dragging effect towards the pitch circle of

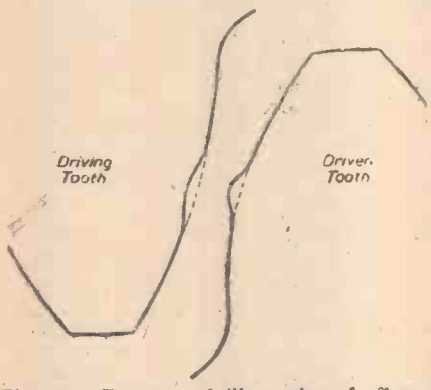


Fig. 45.—Exaggerated illustration of effect of wear sometimes observed on gear teeth.

2. Considering the same profiles in positions 3 and 4, it will be found that 3 exerts on 4 a dragging effect towards the pitch circle of 4, and 4 exerts on 3 a dragging effect towards the tip of 3.

These effects are summarised by saying that:

(1) The dragging effect on the driving tooth is always away from the pitch circle, and

(2) The dragging effect on the driven tooth is always towards the pitch circle.

In some circumstances these effects are shown on the profiles of much-worn soft steel gears by visible deformation approximately as shown in Fig. 45.

Approach and Recession

Contact is first established between a pair of gear teeth at a point near the root of the driving tooth and at the tip of the driven tooth. This is shown in Fig. 46 at A. At that instant the profile of the driving tooth intersects its pitch circle at B, the corresponding point for the driven tooth being C.

As the gears rotate the point of contact moves along the path of contact to P, and the points of intersection of the profiles with their pitch circles reach P at the same instant. The stage of engagement which is just completed is called "approach." The arc BP is the "arc of approach" for the upper gear, and CP is the arc of approach for the lower gear.

As the gears rotate farther, the point of contact moves along the path of contact to its point of intersection D with the tip circle of the upper gear, when contact ceases between these particular teeth. The stage of engagement corresponding to movement of the point of contact from P to D is called "recession." When the teeth are touching at D, the profile of the tooth of the upper gear cuts its pitch circle at E, and that of the tooth of the lower gear cuts its pitch circle at F. The arc PE is the "arc of recession" for the upper gear, and PF is the arc of recession for the lower gear.

Careful study of the effect of tooth friction shows that if the arcs of approach and recession are equal, the efficiency of tooth contact is somewhat lower during approach than during recession.

If the addendum of the driving gear is greater than that of the driven gear the arc of recession is longer than the arc of approach, and the efficiency is slightly higher than if the addenda were equal. Thus the usual practice of making the addendum of the pinion greater than that of the wheel is advantageous from the point of view of efficiency if the pinion is the driver, as is usually the case. Otherwise a long addendum for the pinion tends to reduce the efficiency.

Efficiency of Spur Gears

As the power lost by friction between the teeth of spur gears is usually small compared with losses in bearings and oil, the effect of variation in relative lengths of arcs of approach and recession is unimportant in most practical cases. Gear combinations in which the wheel is the driver are more sensitive in this respect, but there is more to be gained by minimising the diameter of the pinion bearings than by reducing the addendum of the pinion teeth below the standard figure.

Assuming spur gear teeth of normal

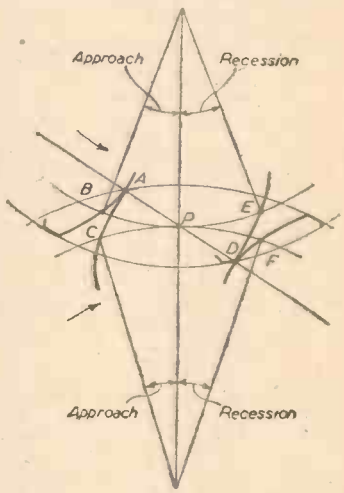
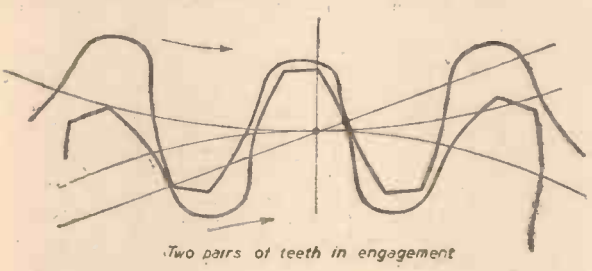


Fig. 46.—Arcs of approach and recession.

proportions to be smoothly and accurately finished and properly lubricated, the power lost by friction between them will not exceed about half per cent. of the transmitted power. Losses in bearings and in oil turbulence may be two or three per cent. of the transmitted power if the speed of the gears is high. Tooth friction in spur gears is, therefore, comparatively small, and no practicable variation in tooth proportions is likely to have much effect on the mechanical efficiency of the gear assembly.



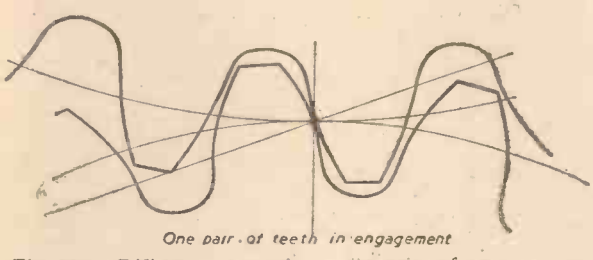


Fig. 47.—Different stages in engagement of spur gears.

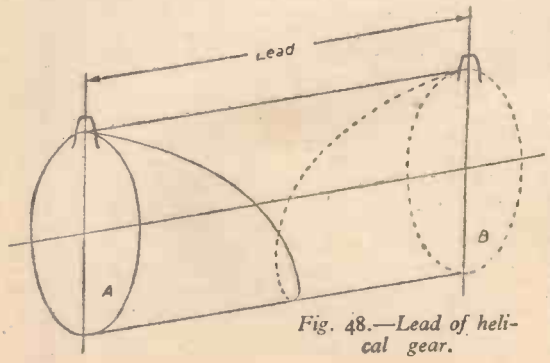


Fig. 48.—Lead of helical gear.

Durability of Spur Gear Teeth

The foregoing examination of contact between spur gear teeth shows that every point on the active part of the tooth profile (except the point of intersection with the pitch circle) is subjected to sliding action. The greater the distance of a point on the profile from the pitch circle, the greater the sliding velocity at that point. With a pressure angle of 20 deg. the sliding velocity at any point is equal to the distance of the point from the pitch circle multiplied by about 17 times the sum of the rotational speeds of the gears. For example, if the addendum of the pinion is 0.25in. and the speeds of pinion and wheel are 1,000 and 250 r.p.m. the sliding velocity at the tip of the pinion is about:

$17 \times 0.25 \times (1{,}000 + 250) = 5{,}300$ in. per minute, or 442ft. per minute.

The maximum sliding velocity may thus be high, and lubrication is essential if the surfaces are to give a reasonable length of life. Absence of lubrication leads to quick failure by "seizure" of the tooth surfaces.

(to be continued)

Detergents

The New Soap Substitutes for Aiding Engineers and for Domestic Use

By "TECHNICUS"

THE widespread publicity that has accompanied the marketing to the public of various proprietary brands of "soap substitutes" lately has focused the attention of industry also on them. They are not new, for detergents and wetting agents, with which they are synonymous, were in use for process work before the war. During the war years they were listed as essential materials and, therefore, not available for general use, but the rapid increase in their production, coupled with a world-wide shortage of soap, has enabled them to be made available to the huge domestic market. This is significant as far as the engineer is concerned, for the new market has enabled the production of detergents to be stepped up tenfold or more, thus bringing down the price which, in turn, makes them economical in engineering, where before they proved somewhat of a luxury. They have revolutionised many industrial processes, and are now used on a wide scale in textiles, leather, for degreasing in engineering, in laundry work and for a multitude of applications in the pharmaceutical profession. And now must be added the nation's homes.

What is a *detergent*? The word is derived from the latin meaning "to wipe" or "wash." In other words, a detergent is something which cleans, or washes, like soap. But there is an important difference between it and ordinary soap, which helps to explain the enormous popularity of detergents today. It might be added here that a detergent is not a particular substance, but a whole family of substances, which possess the property of detergency to a greater or smaller degree. There are, in fact, dozens of related chemical compounds which have this valuable property, and they can be grouped into classes, some of the latter being more suitable for particular industries.

Detergency

They are made from petroleum, as a by-product, and the large-scale production of petroleum has, in turn, made it possible to turn out detergents in the increasing quantities necessary each year. They are synthetic products in so far as they are made by chemical reactions; that is to say, they

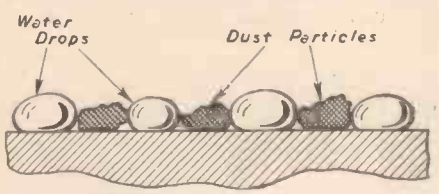


Fig. 2.—Water fails to "wet" a dusty surface and lies in droplets.

do not "happen," but must be made. Plans are in hand, in Britain alone, to produce more than two hundred thousand tons of detergents annually, while in the States the estimated requirements are well above that.

While it is easy to describe a detergent as something which washes or cleans, the actual process may still elude the engineer. Fig. 1 explains diagrammatically how "dirt" is removed by a soap, or detergent. The molecules of these have two dissimilar ends, each of which performs a rôle. One end has an affinity for the surface of the "dirt" particle while the other is soluble in water. The result is that the soap or detergent molecules grapple a dirt particle, anchor it, as it were, to the water, so that it can be swept away by the latter. Before the molecule can get at the surface of the particle it may have to shift a thin film of grease around the particle. This can be done by the molecule partially combining with the grease molecule, to render the latter more or less soluble in water, and thus capable of being swept away by excess water.

Once the film has been removed, or rendered partly soluble in water, the detergent molecules can then anchor the dirt particles to the water, so that they are floated away, as mentioned above. Where there is much grease or oil present with the dirt, an

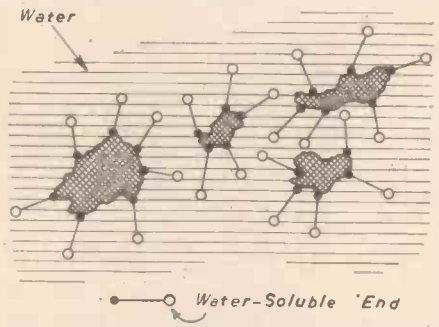


Fig. 1.—How molecules of detergent "anchor" particles of water.

excess of detergent is required to deal first of all with that contaminant. To borrow, in this instance, an appropriate expression, it must be "liquidated."

The next question is: Why does the water float away the dirt particle? To understand this one must go back a little and discuss another important feature of detergency called "wetting." Just as its name implies, this is the process of a liquid making the surface of a solid moist or wet. It is not as simple as it sounds, for it is sometimes quite difficult to moisten, for example, dry dust particles. You may have noticed that when you sprinkle water on a dusty floor the water gathers up into small globules, and fails to form a wet film on the floor. If, now, you add a small amount of a detergent chemical to the water the dust particles are wetted and the water spreads over the floor. In Fig. 2 is shown what happens to water when it is put on a dry surface which is difficult to wet. The high interfacial tension between water and solid surface causes the former to roll up into a drop or globule. Therefore, the water and the solid surface, failing to "mix," maintain their independence and do little good in the way of cleaning. If the water wets the surface it forms an envelope of liquid around the latter, as shown in Fig. 3. As the liquid itself is soluble in more of the same liquid, this means that the particle to which the surface belongs can be floated into the mass of that liquid. It is, in effect, washed away, which is the process of cleaning.

The new synthetic detergents or wetting agents perform a dual rôle in forming an anchoring layer of molecules around the particles of dirt and wetting the latter. They are really complementary, although certain detergents are better washing agents, while some are superior for wetting. For industrial processes a selection is made of the chemical most suitable. Thus, for leather

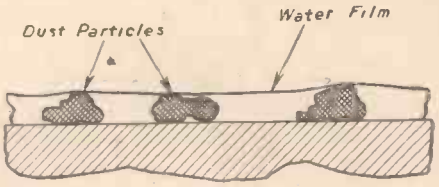


Fig. 3.—When a wetting agent or detergent is present in water the latter wets the dusty surface.

treatment a good wetter is aimed at, while for laundry work detergency is desired.

Various Detergents

There is now quite a big family of chemicals being marketed for detergents and wetters, but it is not proposed to describe them chemically in detail. The chemist knows them as alkyl esters and amides, sulphonated oils, akyl sulphates and the wide group of petroleum sulphonates. They are characterised by the presence of sulphur in their molecular structure, in the form of sulphur dioxide. Some, however, do not contain sulphur dioxide.

Most detergents marketed commercially are harmless liquids with a slight smell, often best described as "musty." Their colour varies from off-white to light brown, and they feel soapy, looking like liquid soap. Slight shaking creates a lather and indicates, graphically, their cleaning ability. In fact, those who have never before used detergents are generally amazed by the way they soften water and get rid of grease, a small quantity only being required for a lot of water. It is a misnomer to describe them as "soap substitutes." For the work they are called upon to do they are superior to soap. Indeed, they mark the death knell for soaps in many processes, having swept the latter out of use.

Commercial Detergents

There are many brands of detergents now on the market, and their number is increasing steadily. "Teepol" is made and marketed by Shell Chemicals, Ltd., associates of the well-known Shell Oil Company. "Lissapol," of which there are various grades, is the trade name for detergents made by Imperial Chemical Industries, Ltd., while "Iranpol" is that for the product of the Anglo-Iranian Oil Co., Ltd. There are other products becoming equally well known, employing, more or less, the same principle, but a feature of this market is the fact that it is being well supplied by the manufacturers, and specialised developments are the solid powders now available to the general public. These are obtained by a slight variation in the composition of the chemicals mentioned above.

Finally, the tremendous contribution which detergents are making to domestic users will be appreciated. The housewife is already finding a boon what industry found indispensable some years ago, but it is hoped that the high handling and marketing costs in "putting over" the idea to the public will not discourage the adoption of detergents in every home where they can save much work. These high marketing costs, resulting in comparatively expensive, packaged products available in the shop, will possibly hold up the rapid development of this new idea on the scale which it deserves. One reason why soap is used universally is because of its cheapness and availability, and there is no reason why detergents should not be cheaper still, if handled as an essential commodity, and not as a novelty.

Aircraft Pressurisation

Details of a British System Used on Modern Aircraft

By J. C. LAINE

THE reasons for high altitude flying are primarily two in number. Firstly, increased operational efficiency, and secondly, the ability to fly above varying weather conditions.

With regard to passenger aircraft, however, since the need for oxygen above an altitude of approximately 10,000ft. is essential, it means that normally separate oxygen appliances would be required for each passenger. This undesirable feature can be, and is, avoided by simulating low altitude conditions within the fuselage at high altitudes on pressurised aircraft. A British example of this type of aircraft at present in use is the Avro Tudor. This aircraft is designed to operate at an altitude of 25,000ft. whilst simulating a cabin condition corresponding to an altitude of 8,000ft. This involves pressurising the hull to a maximum differential pressure of 5½lb. a square inch at 25,000ft.

The pressure hull consists of the fuselage skin bounded at each end by a diaphragm as illustrated in Fig. 1. The method about to be described of pressurising this hull illustrates the principle involved. Reference to Fig. 1 shows that the air intake is *via* an airscoop, the air being filtered through a Vokes filter before entering the blower. From the blower air is pumped into the hull *via* a silencer, an air-to-air cooler, a further silencer and a combined non-return valve and air-spill valve. Within the fuselage the air enters a mixing-box, from which it is ducted to various points within the hull. It will be observed that a heating unit is part and parcel of the system, although its actual use is optional. This sequence of operations is duplicated in the starboard wing so that two sources of supply are available, and the pressure in the hull can be built up until pressure equivalent to an altitude of 8,000ft. is obtained. Once the system is brought into operation, the pressure in the hull is maintained automatically up to the maximum operating altitude. Beyond this point the differential pressure is maintained constantly at 5½lb. a square inch.

Pressure Control

The pressure is controlled by a Westland master-control valve, which is diagrammatically shown in Fig. 2. It comprises a box housing two bellows (A) and (B). Bellows (A) is exhausted of air internally and bellows (B) is subjected internally to atmospheric pressure. At sea level (A) is fully contracted and (B) is fully expanded. The net result of this arrangement is to put valve (C) in the open position. The pressure in the box is led to a further bellows (D) which operates the cabin discharge valve and will also be open. Now, as altitude is gained, bellows (A) expands, gradually lifting the rocker arm until valve (C) is closed. As there is now no bleed to atmosphere, pressure will build up in the box and hence in bellows (D) which will expand and close, and allow pressure to build up in the cabin. This process continues with increased height, and the effect is that, as the aircraft rises from 0-25,000ft., the cabin conditions go from 0-8,000ft. The regulating pressure is not fixed but is determined by pre-setting bellows (A) to operate at a required altitude. This is done by operation of cam (E) which lifts the base of bellows (A). A stop prevents this bellows from expanding to a point when a pressure greater than 5½lb. a square inch would occur. In addition, bellows (B) will collapse when pressure exceeds 5½lb. which opens valve (C) and drops the pressure in the box. Hence the pressure in bellows (D) will drop and cabin pressure will overcome it, and so fall back to 5½lb.

Cam (E) is operated through an electric motor and gearing which adjust bellows (A) so that cabin pressure will change at a rate equivalent to a change of altitude of 300ft. per minute. This is in order to prevent dangerous pressure fluctuations. Two Westland units and two discharge valves are employed in cascade.

During rapid descent, or if for any reason the atmospheric pressure exceeds the cabin pressure, an inward relief valve is situated on the underside of the fuselage, through which the internal and external pressures can be equalised. A further precaution is that of a safety valve which opens at 6.2lb. and closes at 5.75lb., should the control valve become inoperative. It can also be operated manually or by an electric actuator.

In a pressurised hull, ventilation is a matter of importance, and, in addition to the flow of incoming and outgoing air, all of which leaves *via* the discharge valve, a circulating fan maintains the air in motion by blowing the existing air in the hull in a constant circuit through the ducting. An exhaust collector box at the after end of the fuselage ducts the exhausted air to atmosphere *via* the discharge valve.

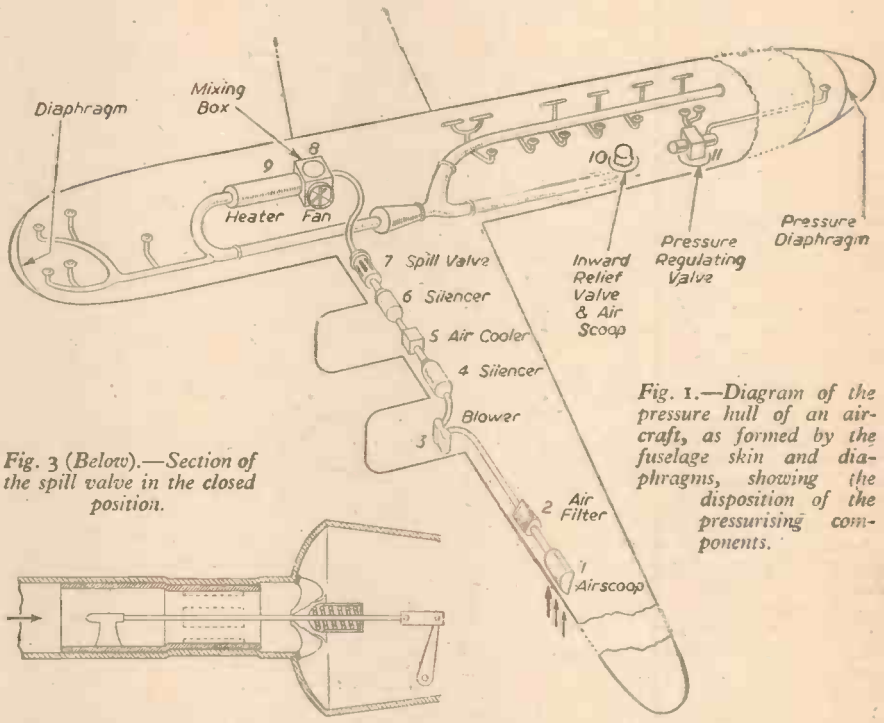


Fig. 1.—Diagram of the pressure hull of an aircraft, as formed by the fuselage skin and diaphragms, showing the disposition of the pressurising components.

Fig. 3 (Below).—Section of the spill valve in the closed position.

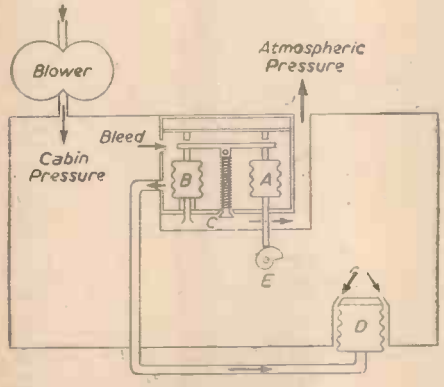


Fig. 2.—Diagram of a Westland master-control valve.

Components

The two blowers are driven from the port and starboard outer engines and have an intake air capacity of 467 cub. ft. a minute at 25,000ft. at cruising revolutions, and are of the rotary displacement type.

The silencers are of the anti-resonance type, consisting of light alloy cylinders with four radially disposed tubes designed to cut off high-pitched sound waves generated by the blowers.

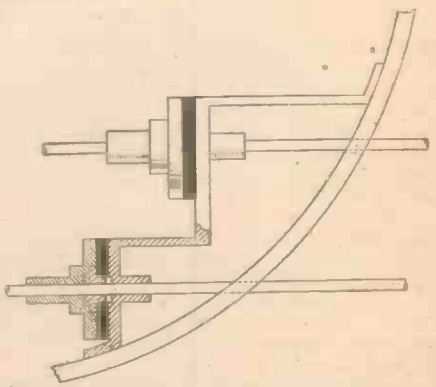


Fig. 4.—Special glands for minimising leakage.

The air-to-air cooler is of the simple honeycomb type, blown air passing through it in one direction, cooling being obtained by the slipstream. The cooler is behind the leading edge of the mainplane, and the passage of cooling air is controlled by an electrically-operated flap. The temperature rise of air in the blower is 130 deg. to 140 deg. Centigrade. Hence, by optional cooling this heat can be utilised for cabin heating or dissipated as required.

The spill valve is illustrated in Fig. 3, and it is a simple sleeve valve. In the open-position all air from the blower is spilled *via* the radial ports to atmosphere. In the closed position, ram air pressure lifts the spring-loaded valve and passes into the fuselage. This valve is of the non-return type and is free to pivot on the valve face ot secure a firm seat should small malalignment of the piston-rod occur. The lift of this valve is determined by the degree of opening of the spill valve, so that in a medium setting the amount of air entering the cabin is proportional to the amount of air spilled. Obviously, at fairly low altitudes the delivery of the blowers if unrelieved would be excessive.

In unpressurised flight, for ventilation purposes, an airscoop, electrically operated, is incorporated with the inward relief valve.

Fuselage

The fuselage is of the pre-stretched skin monocoque type, and all skin joints and rivet holes are sealed from inside with a special sealing compound called Peretol. In order to minimise leakage at those points in the fuselage where control rods and cables to ailerons and rudder, etc., pass out of the pressurised hull, special glands are employed of the type illustrated in Fig. 4. Hydraulic pipes can be disconnected at either side of the pressurised hull, and the electrical connections are made through screwed breeze blocks.

Pressurised American aircraft, such as the Canadair, operate in a manner similar in principle to the Tudor but differing widely in method. The air supply is provided by a centrifugal type supercharger, which has "an infinite gear ratio drive" to give a steady output—60lb. of air a minute. The drive is so designed that this output remains fairly constant over varying engine speeds. As in the Tudor, two such units are mounted, one on the starboard outer and one on the port outer engines, and they can be disengaged by a clutch mechanism. The diagrammatic layout of the pressure control units is shown in Fig. 5. Air leaving the supercharger passes through an air-conditioner into the cabin. Within the cabin is a pressure regulator which is set manually to control the cabin pressure to a given altitude condition. Variations of pressure result in this unit giving minute electrical impulses, which pass to an amplifier. This amplifier converts these minute pulses into currents which are used to operate the cabin pressure control valve.

A further instrument, known as the rate limit control, by-passes the pressure regulator when the rate of change of pressure is greater than the figure for which the limit control is set. As in the case of the regulator, it acts through an anticipatory circuit to the amplifier, which opens the pressure control valve. A third instrument, a pressure limit control, can overcome the rate limit control and/or the pressure regulator when the cabin pressure exceeds structural limitations—in this case 4.16lb. a square inch. These instruments are all of the sensitive pressure differential type. As can be seen from the diagrams, they are subjected to the difference between cabin pressure and outside static pressure.

Amplifier

The amplifier consists of two grid-controlled thyratrons, feeding relays which supply 28 volts D.C. to the cabin pressure control motor. The pressure control valve is of the butterfly type, which can turn through 90° and, in addition to its operation by the amplifier, can also be operated by a manual electric control and manually by cable. A device is incorporated to shut the valve when carbondioxide is fired in the belly of the aircraft. This is a necessary fire precaution. An automatic vacuum relief valve is fitted, serving an identical purpose to the inward relief valve in the Tudor. That is, when the outside pressure exceeds cabin pressure, as might occur in the case of a fast descent, the valve opens to equalise the pressure. It is set to operate at a differential pressure of ¼lb. a square inch. A cable-operated manual pressure control valve and an automatic pressure relief valve are two further safety precautions. When the aircraft is about to land and the landing gear is lowered, a relay comes into operation which operates the pressure control valve and releases any internal pressure. The system is designed to operate at 20,000ft. with a cabin pressure equivalent to 8,000ft.

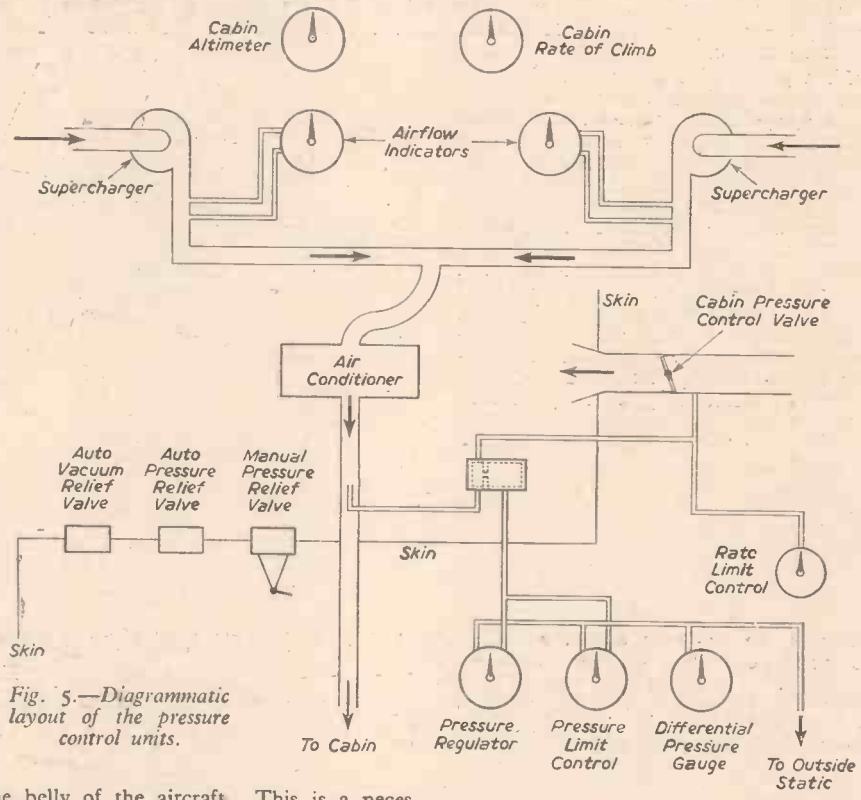


Fig. 5.—Diagrammatic layout of the pressure control units.

Turbo-superchargers

Space does not permit the investigation of further types of pressurising systems, but there are on other aircraft one or two points of salient interest. The Boeing Stratocruiser has exhaust-driven turbo-superchargers on its engines. These superchargers compress ram air only, and from these units 20lb. of air a minute are bled from each engine turbo-supercharger to pressurise the hull. It has the usual inter-cooler to remove the heat of compression, or if additional heat is required, two combustion heaters with a capacity of 400,000 btu/hr.

Located downstream from the cabin heaters are an air recovery unit containing filters, an activated-charcoal odour absorber, a Freon cooling system and a two-stage axial flow circulation fan. Cabin pressure control is of the variable Isobaric and fixed maximum differential type, controlled by valves manufactured by AiResearch. The complete control unit and outflow valve are integral in the one assembly.

This mode of control is also employed on the Constellation, Convair-Liner and Douglas DC.6.

Books Received

Motor Cycling Manual. By the Staff of Motor Cycling. Published by Temple Press, Ltd., 164 pages. Price, 5s. net.

THIS popular manual is intended to provide the newcomer to the ranks of motor cyclists with a groundwork of knowledge, which should make him self-reliant, and in a position to benefit from conversations with experienced riders prone to use technical terms, which are often puzzling to the beginner.

In this thirteenth edition the intricacies of construction and operation are explained in a manner which, whilst being satisfactory to the most exacting enthusiast, is easily understandable by the novice. The question of keeping a motorcycle in good condition is dealt with systematically, and several pages of fault-detecting tables help the novice to diagnose possible causes of trouble, the accompanying text giving guidance on running repairs. The manual which is packed with practical information, is profusely illustrated with clear-cut diagrams.

Garden Railways. By R. E. Tustin. Published by Percival Marshall and Co., Ltd. 110 pages. Price 10s. 6d. net.

OUT-OF-DOORS model railways require specialised treatment when compared with indoor lines, and in this book the author, who has a wide experience of the subject, deals with the problems of layout, track foundations, bridges, and stations in a very practical manner. There are also chapters dealing with the choice of site, viaducts, bridges and tunnels, track and track laying, signalling, motive power, construction of rolling stock, and some general notes on garden layout and planting, streams and ponds, and garden villages. The book is well illustrated with half tones and line drawings.

NEW SERIES

Wood Turning—6

Use of Calipers and Rules—Finishing and Testing

By FREDERICK JACE

FIGURES 41 to 43 (see last month's issue) show methods of checking work for size, and of setting the calipers to a predetermined measurement against a rule, as well as the method of using the dividers to scribe off diameters on faceplate work. Fig. 44 shows how to mark off work to given lengths by means of a pair of dividers held against the "T" rest, as, for example, when turning a number of cylindrical pieces at one setting between

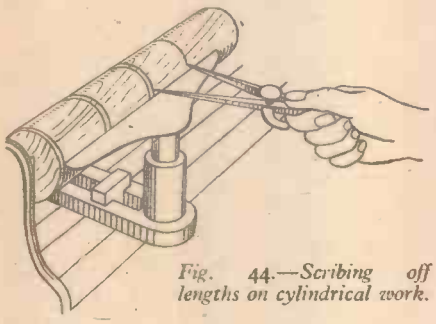


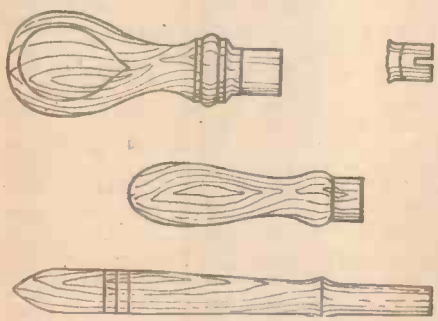
Fig. 44.—Scribing off lengths on cylindrical work.

centres, or when turning a particular symmetrical pattern needing grooves at set intervals.

It is seldom, in wood-turning, that sizes need to be exact, the possible exception being when dowels have to be turned to fit in exact-size holes. An allowance should be made, of course, on the caliper size for glasspapering and finishing. It is always wise to stop the lathe when taking caliper measurements. Some skilled operatives are able to use the calipers whilst the work is in motion.

A set of calipers of varying sizes is necessary to accommodate various diameters of work.

When the diameters are outside caliper measurement capacity trammels must be



Figs. 50-53.—Various types of handle.

used. A pair of trammel heads can be purchased quite cheaply, and these are mounted on either a round bar or a rectangular beam of wood according to the make.

Where complicated profiles are concerned, such as ornate pillars making use of combinations of the Ogee, Ovolu, Cycloid, etc., it is necessary to cut from a piece of wood or thin sheet metal a pattern, in reverse, of course, to the required profile. Having mounted the work between centres and scribed off the positions of the various undercuts as shown in Fig. 44, roughing cuts are taken until the work is approaching the required shape. Then the template is offered up to the work. It will be understood that a number of templates will be necessary so that each part of the profile can be checked independently; with one master template to check the whole when finished.

Inside measurements are taken with inside calipers or outside calipers reversed, as shown in Fig. 46. With very small bores proper inside calipers must be used.

Glasspapering should be carried out at as high a speed as is possible, using first

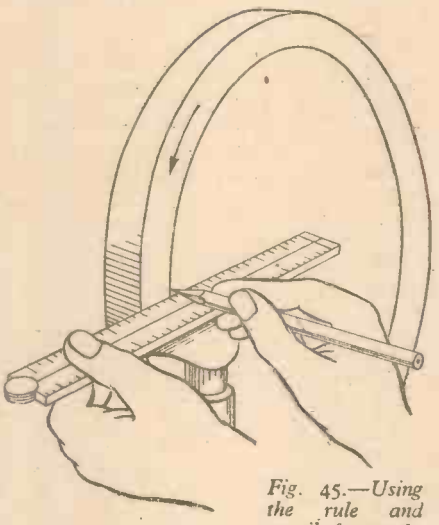


Fig. 45.—Using the rule and pencil for marking off diameters.

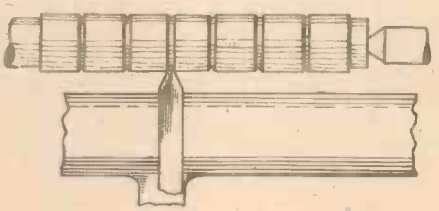


Fig. 47.—Turning grooves at regular intervals.

Fig. 48.—Turning a tool handle : the ferrule is slipped over the tailstop centre.

Fig. 49.—Turning a ferrule seating.

coarse, then medium, followed by fine and finally flour sandpaper. Keep the sandpaper on the move lengthwise to the work. Any tendency to dwell on one particular spot will destroy the smoothness of the curve. It may be necessary to mount the sandpaper on a block of wood of suitable shape.

Similarly finishing with paint or varnish, even sometimes French polish, can be carried out advantageously whilst the work is running in the lathe. For varnished work the grain should first be filled with gold size. When this is dry the work should again be sandpapered with flour sandpaper before the varnish is applied. A much more even result is obtained than by brushing on with the work stationary. With French polishing, several applications of a plaster of Paris mixture, each rubbed down with fine sandpaper, is necessary before staining and final polishing. Even large surfaces, such as circular table tops, can be finished in this way.

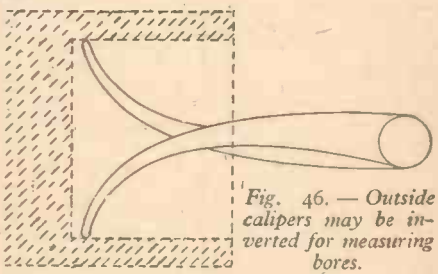


Fig. 46. — Outside calipers may be inverted for measuring bores.

A hint worth remembering is that a handful of turnings held against the work whilst running fast gives it a beautiful burnished appearance and helps the finishing coats to go on evenly.

Handles

The usual timber used for handles is boxwood, birch, beech, elm, oak, teak, in fact, any of the hardwoods. Some of these are difficult to obtain, but ash is in fairly general supply and is quite satisfactory. Handles of percussion tools, such as chisels, need, of course, to be of straight grain and free from knots, and to prevent the head of the handle from furring over or splitting under the action of a mallet sometimes a ferrule is fitted. The end into which the tang of the tool is inserted must, of course, be tightly ferruled, and a hole should be drilled up into the wood of a size smaller than that of the tang, but not so small as to cause the handle to split when the tang is driven home. The shapes of tool handles are illimitable, and it is a matter of personal taste. As a general rule the shape should be such as to provide a convenient grip and look pleasing to the eye.

Fig. 54.—Mallet handle.

Screwdriver handles are first turned and then two flats are planed on the upper end to provide a grip.

The ferrule can be passed over the tailstop centre before turning commences, in which position it serves as a convenient gauge when turning the ferrule end of the handle. The shoulder should be slightly undercut to allow the ferrule end to enter. A centre punch is sometimes used on the ferrule to prevent it working loose. Other illustrations on this page are self-explanatory.

(To be continued)

Making a "Lie Detector"

A Novel and Easily Made Apparatus with Several Uses

By FRANK DIXON, M.A. (Oxon)

PSYCHOLOGISTS tell us that the emotional stress which we experience when practising a deliberate deception is accompanied by certain physical changes that can be measured: changes in breathing, blood pressure, and the electrical resistance of the skin.

The device I am about to describe—the psychogalvanometer, to call it by its scientific name—records the last of these. When we are in a situation fraught with danger or uncertainty we perspire more profusely than at normal times. This increase in sweat secretion, though it might not be sufficient to produce drops on the forehead, does produce a "drop" in the electrical resistance of the skin. This lowering of resistance can be measured by attaching to the palm and back of a person's hand two electrodes, which are connected to the circuit shown in Fig. 1.

Look at this circuit carefully. You will see that it is an arrangement of the Wheatstone Bridge. When the electrodes are attached, if the variable resistances are adjusted so that the potential is equal at the opposite corners of the square which are connected through the galvanometer, that instrument will register no flow of current. But if the subject's skin resistance suddenly decreases the balance will be upset and current *will* flow through the galvanometer, causing it to give a "kick." From the medical data given above it should be obvious that such deflections may be expected whenever the person tells a lie.

Constructional Details

This handy form of lie detector can be built quite cheaply, the most expensive piece of apparatus being the galvanometer itself. The kind you use depends upon your personal attitude to the experiment. If you are genuinely interested and have the money to spare, your choice will undoubtedly be the "mirror" galvanometer with a light spot scale. If, on the other hand, you are seeking a new stunt for your next birthday party, a humbler instrument of the moving needle type will probably suffice.

A word about the electrons. When making these great care must be taken to avoid possible polarisation effects. Two brass or copper discs about the size of half-pennies are recommended. Clean and polish them and cover them with chamois leather soaked in saline solution. Make sure, though, that there is a good *dry* connection between the electrode and the copper wire of the circuit.

As for the resistances, preferably they should be Post Office box types, or Wheatstone Bridge nichrome wire; but here your choice will be dictated by circumstances. Since the war, for instance, it has been possible to pick up useful parts, often at bargain prices, at those shops which specialise in the sale of surplus Service equipment. Don't forget that materials already in your possession can often be incorporated. In the present case, if you have resistances lying around which you think might be suitable, by all means give them a trial.

For the benefit of those who are unable for some reason to use the circuit given in Fig. 1, a practical alternative circuit is given in Fig. 2. This is much simpler, as it omits the galvanometer shunt and includes only one variable resistance.

Using the Apparatus

Here are some directions for using the lie detector. They must be followed most carefully if your experiments are to be successful:

1. Wash the subject's left hand, removing all grease and dirt in order to make the skin highly conductive.

2. Encourage the subject to relax in a

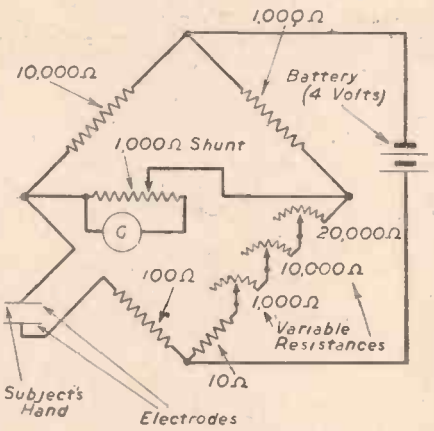


Fig. 1.—Circuit diagram.

comfortable chair, to the arm of which his or her left arm is strapped. (This is necessary in order to prevent false readings as a result of muscular movements.)

3. Attach the electrodes to the subject's left

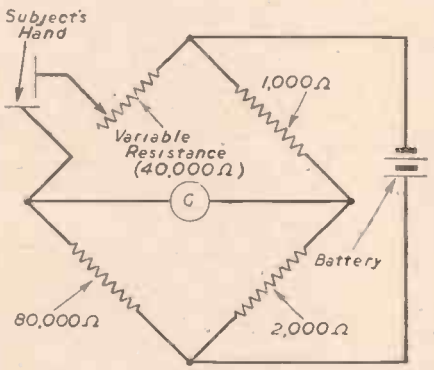


Fig. 2.—Alternative circuit diagram.

hand. These may be held in place by an elastic band.

4. Wait for five minutes to allow the subject's bodily resistance to reach normal.

5. Adjust the variable resistance(s) until the galvanometer gives an average reading of zero.

6. If the circuit shown in Fig. 1 is used, adjust the galvanometer shunt until the needle or light spot stays reasonably steady whilst the subject is at rest.

7. Start to put your questions, all of which should lead to a straight "Yes" or "No" in answer. Before going on to the more pointed queries, ask trivial ones which the subject can deal with easily and truthfully. Ask them at intervals of 30 seconds, adjusting your main resistance(s) at five-minute intervals to allow for a gradual change in the subject's resistance whilst the interrogation is proceeding.

Various Tests

Several tests may be carried out with the lie detector. The questioner may say, for example, "I want you to try *not* to tell me the month in which you were born. As I read out the months please answer "No" to each one, whether it is right or wrong. Was it January . . . February . . . March?" As he reads through all twelve the galvanometer will usually give a deflection when the correct month is mentioned and denied.

A similar experiment can be conducted with playing cards. The subject takes a card, which he memorises and puts back in the pack without showing it to anybody. He is then shown each card in turn, and more often than not will betray involuntarily the card chosen. (This experiment is more effective, and takes less time, if a small selection of cards is used instead of the whole pack.)

The party game "False Witness," popularised on the radio by Lionel Gamlin, is much more interesting when played with a lie detector. Two people are sent out of the room. One is isolated, hears nothing; the other is told a crime story, perhaps about a spiv filtering red petrol to remove the dye. They return and are both asked questions containing the words "spiv," "red," "dye" and "petrol." The readings of the machine, which can be compared with the independent findings of a "judge" or "jury," show who is the false witness.

The psychogalvanometer has other more serious uses, but there is not space to give a detailed account of them in the present article. Psychologists enlist the help of the instrument when analysing dreams, investigating complexes, treating amnesia, and diagnosing different types of insanity. In America various police departments use it in conjunction with apparatus for measuring respiration and blood pressure when questioning suspects. They have a machine which simultaneously traces three graphs, one for each test, providing three records which are correlated and interpreted by an expert.

Even in the States, however, lie detectors have not yet been accorded general recognition in the law courts, and their infallibity has not been conclusively proved. Therefore, if you build one, remember this final word of warning: don't take the readings too seriously!

References

CATTELL, R. B. *A Guide to Mental Testing* (London Univ. Press).

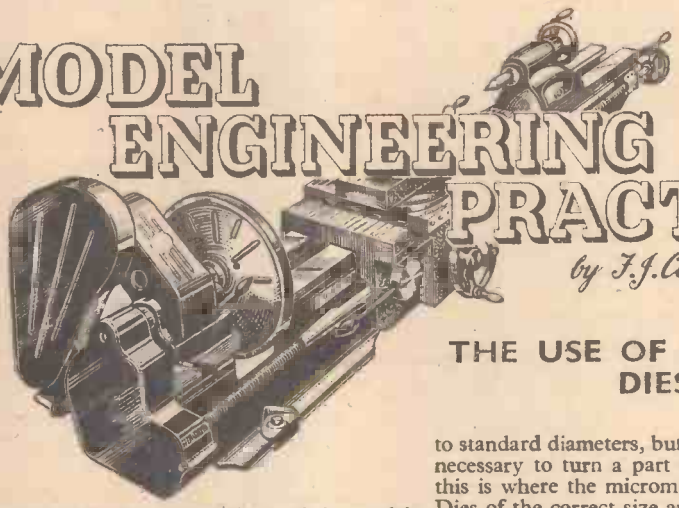
WOODWORTH, R. S. *Experimental Psychology* (Methuen).

The above books, although written by psychologists, contain much information that is of interest to the electrician.

8th Article of a New Series

MODEL ENGINEERING PRACTICE

by J. J. Camm



THE USE OF TAPS AND DIES

THE screw threads mostly used in model engineering are either of Whitworth, B.A. (British Association) or B.S.F. (British Standard Fine) form. Standards have been evolved for the use of model fittings which make use of the Whitworth form only. Here is the table as laid down by the standardisation committee.

Model Screw Threads

Model threads are cut to Whitworth Form

¼in. and less	40 threads per in
5/16 in. „ „	32 „ „ „
⅜in. „ „	32 „ „ „
7/16 in. „ „	26 „ „ „
½in. „ „	26 „ „ „

Screw threads are greatly used in joining parts together, the other methods being by soldering, brazing and welding, and riveting. Sets of taps and dies complete with dieholder and tapholder are available from the model stores. In using taps it is important to drill a hole of the correct diameter to avoid tap breakage, and also to ensure that a full thread is produced. The core diameter of a screw thread with a little for clearance represents the size of the tap drill required. These sizes do not correspond to fractional drill sizes, and it will therefore be necessary to purchase what are known as letter size drills and number size drills. The diameters of these drills are given in the appended tables.

Letter Sizes of Drills

	in.		in.		in.		in.		in.
A	.234	G	.261	L	.290	Q	.332	V	.377
B	.238	H	.266	M	.295	R	.339	W	.386
C	.242	I	.272	N	.302	S	.348	X	.397
D	.246	J	.277	O	.316	T	.358	Y	.404
E	.250	K	.281	P	.323	U	.368	Z	.413
F	.257								

Number Sizes of Drills

No. Drill	Decimal Size	No. Drill	Decimal Size	No. Drill	Decimal Size
1	.2280	21	.1590	41	.0960
2	.2210	22	.1570	42	.0935
3	.2130	23	.1540	43	.0890
4	.2090	24	.1520	44	.0860
5	.2055	25	.1495	45	.0820
6	.2040	26	.1470	46	.0810
7	.2010	27	.1440	47	.0785
8	.1990	28	.1405	48	.0760
9	.1960	29	.1360	49	.0730
10	.1935	30	.1285	50	.0700
11	.1910	31	.1200	51	.0670
12	.1890	32	.1160	52	.0635
13	.1850	33	.1130	53	.0595
14	.1820	34	.1110	54	.0550
15	.1800	35	.1100	55	.0520
16	.1770	36	.1065	56	.0465
17	.1730	37	.1040	57	.0430
18	.1695	38	.1015	58	.0420
19	.1660	39	.0995	59	.0410
20	.1610	40	.0980	60	.0400

When using a stock and die it is important to see that the work diameter is correct. Mild steel and brass rods can be purchased to standard diameters, but otherwise it may be necessary to turn a part to a given size, and this is where the micrometer should be used. Dies of the correct size are then placed at the end of the metal and slightly tightened; they are then turned the required distance and turned back again. The process is repeated several times until a full-sized thread is produced. Care must always be taken to keep the die clearance spaces clear and to keep the metal lubricated with oil when cutting iron or steel. Dies cut in one direction only,

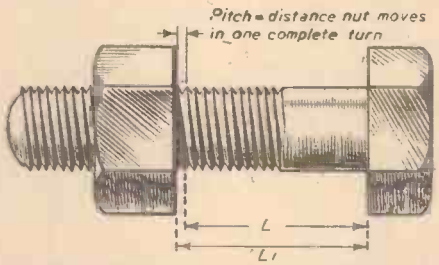


Fig. 78.—If the nut is moved one complete turn then the distance it has moved axially is the pitch.

and must therefore be tightened up just previous to the cutting movement. Slightly taper the work end to give the die a lead. It is important, of course, to keep the die at true right-angles with the axis of the work, otherwise the result will be a drunken thread. Having started the die, it is worked by a to-and-fro motion; it is not screwed continuously in one direction. Each forward motion of the die cuts into the metal and a backward movement shears a little piece of the metal away, which drops into the clearance holes in the die. Adjustable dies enable the thread to be cut gradually by a succession of passes over the work. Some dies are in two pieces whilst banjo dies are in one piece, the cut of which can be varied by means of a grub screw. It is wise to use a standard nut of the required size as a gauge.

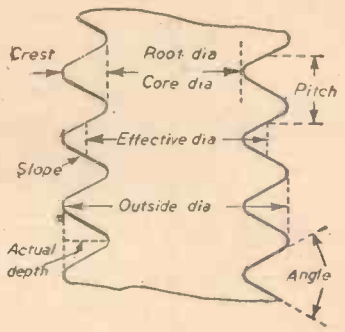


Fig. 79.—Diagram illustrating terms applied to various parts of a screw.

Taps

Taps are of two types; they are in sets of three, these being the taper, the second, and the plug. You will note that, whereas one end of each tap is threaded right down to the tip, the opposite end is finished off with a square butt. A "tap wrench" can be fitted to this butt end, whereby leverage can be obtained to turn the tap in the hole.

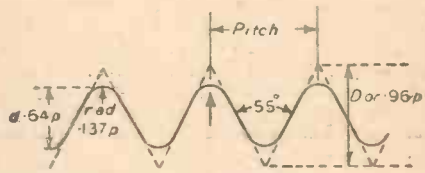


Fig. 80.—Section of Whitworth thread.

The hole to be threaded is first drilled to the correct size; then the taper is inserted into into the hole and carefully turned back and forth with the tap wrench. When the required depth of thread is obtained, it is removed and all chips of metal are blown out. Then comes the turn of the second tap, with which the same process is repeated. When this has been done, the thread can be finished off

TAPPING AND CLEARING SIZES

WHITWORTH THREADS

Diameter	in. ¼	in. 5/32	in. 3/16	in. ¼	in. 5/16
Tapping size	3/32	No. 31	9/64	3/16	Letter D
Clearing size	9/64	11/64	13/64	17/64	21/64

B.S.F. THREADS

Diameter	in. ¼	in. 9/32	in. 5/16	in. ⅜
Tapping size	No. 5	Letter B	Letter G	Letter O
Clearing size	17/64	19/64	21/64	25/64

B.A. THREADS

Diameter	0	1	2	3	4	5	6	7	8
Tapping size	No. 10	No. 17	No. 24	No. 29	No. 32	No. 37	No. 43	No. 46	No. 50
Clearing size	Letter B	No. 3	3/16 in.	No. 19	No. 27	No. 30	No. 33	No. 39	No. 43

WOOD SCREWS

Size No.	00	0	1	2	3	4	5	6	7	8
Clearing size	No. 52	No. 51	No. 50	No. 44	No. 40	7/64 in.	⅛ in.	9/64 in.	5/32 in.	11/64 in.

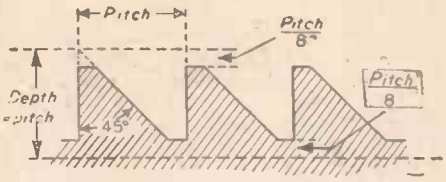


Fig. 81.—Terms relating to buttress threads.

by running it down with the third (or "plug") tap.

Whereas (as the name implies) taper taps are tapered to permit insertion into the hole to commence the thread (that is, all except the plug), the parallel taps are not tapered, but in this case the first tap is slightly smaller in diameter than the second tap and has a somewhat shallower thread. The second tap has, of course a slightly deeper thread and the plug is full size with a thread of full depth. Apart from these differences, the method of using them is exactly the same as in the case of the taper taps.

Drill Sizes

It has been mentioned above that before using the taps a hole of the correct size must be drilled. This point needs explanation. To determine which size drill to use for a hole to give a full Whitworth thread, the pitch of the screw must be multiplied by 1.28, and then the product of that subtracted from the outside diameter of the required threaded hole.

For instance, to find the correct size drill to use for a hole to be tapped with a 1in. Whitworth thread:

8 threads per in. = $\frac{1}{8}$th pitch = 0.125

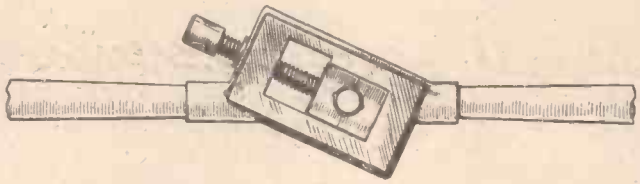


Fig. 82.—Stock and dies. The dies are clearly shown.

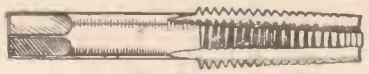


Fig. 83.—Taper Tap.

Then $0.125 \times 1.28 = 0.16$

Required hole 1in. minus $0.16 = 0.84$.

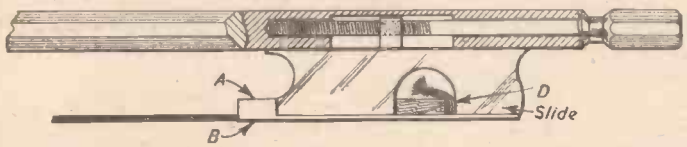
Therefore the exact size of the required drill is 0.84in. which, to the nearest standard size, is 27/32nds.

With a tap, after the first bite has been obtained a square, where this is possible, should be held against the shank of the tap to check its uprightness with the surface of the work. This test should be frequently applied until the tap is well into the hole. In tapping blind holes the tap should be frequently withdrawn and the swarf removed. Smaller taps should be held in a handled pin-vice, which is more sensitive than the usual tap-holder.

Rehairing a Violin Bow

By W. KITCHENER, L.R.A.M.

THIS is an appropriate time to renovate musical instruments ready for the activities of the coming season. The article requiring most frequent attention is the bow with which stringed instruments are played. The hair of a violin bow will lose all its spikes after a season of playing, and consequently will refuse to "bite." In appearance it may seem good for another season, yet upon rehairing it will be found much more pleasurable to use.



A detailed sketch showing how the various parts of the bow are removed ready for rehairing.

There may be a neglected bow lying about which could be used with the one-string fiddle which you are going to make.

A 'cello bow is a much safer proposition with which to commence, and a bass bow is best of all, because of the greater strength.

It must be remembered that the thinnest part of a violin bow is only a shade over $\frac{1}{8}$in. thick, that it is made of very dry wood and is somewhat tricky to handle. There are three kinds of wood commonly used—Pernambuco, snakewood and beech. It would be best to do all experimenting with the cheapest bow, which would be beech.

Tools Required

Not many tools are required. A wood clamp, a knife, scissors or chisel, a pad of cloth, a fine comb, cotton, some resin and a pair of pliers.

The time taken by a practised hand is half an hour, and he proceeds in the following way.

Place the hair in a bowl of slightly warm water and dismantle the bow by first cutting the old hair near the two ends, then sliding the metal ferrule from the nut with the aid of pliers. It is marked A in the sketch.

A wedge of wood, B, will then be removable. Next take the slide out. Sometimes it is removable by hand. If too tight, then a fine penknife blade will be necessary to give it a start. Remove the wooden plug D. Usually a penknife will be necessary for this, too. Another wedge will be found at the point end of the bow, and this may be removed by the same means.

Having taken all down, take the hair which is tied and sealed at one end and reduce the size of the knob of sealing-wax by melting it in a candle flame. A hot-iron surface gives better results. It is hardly necessary to coat this end with resin, since the sealing-wax is quite good for this purpose. Gently tapping on the plug in the hole will make this end secure, but first a word of warning. The nut should be placed back on the stick and held firm by the screw, and the whole held in the clamp with plenty of cloth padding to prevent injury to the stick. The slide, ferrule and wedge are now replaced.

Combing

Combing should be done with a very fine comb and should continue until all clogginess has gone. Having slacked the nut to the full depth of the slot, nip the combed hair at the point of the bow, getting a length of hair which extends to the extreme side of the hole. Tie the hair with cotton close to the finger and thumb. Having then cut off the excess hair, burn the end close to the cotton and cover it with melted resin. Take the nut off altogether and, after fastening the point end of the bow in the clamp with plenty of cloth packing, run the comb through the hair to get the right surface uppermost, and then plug it with gentle taps into the hole. Replace the nut, run the back of the comb down the tautened hair and the job is done.

The Law About Patents

3.—The Applicant for the Privilege

By W. J. WESTON

WITH only a few variations the rule all over the world as regards the proper applicant for a patent is this: Only the true inventor or his heir or his assignee may apply. The rule had been evolved in Great Britain long before other countries had awakened to the wisdom of giving a privilege to the successful inventor. In the United States and in Canada, however, only the actual inventor may apply, and he states on oath that he is the inventor; it is only if he is dead or insane that his representative may apply. In Great Britain and in the United States this further limitation holds: The right to apply belongs to the *first* inventor; and in this country "first inventor" has received the perhaps unexpected interpretation of "first applicant."

Communicated from Abroad

Very soon, too, after the British Parliament had accorded the privilege of monopoly to the inventor, the term "inventor" itself got a curious twist in law. "Whether learned by travel or by study, it is the same thing." Very likely you disagree; you probably look upon an inventor as one who devises ar produces something new by original contrivance. But such is the law. That is why in this country we have an alternative to the true and first inventor. Application for a patent may be made by any person who in writing declares himself to be the true and first inventor or by anyone residing in Great Britain to whom the invention has been communicated by anyone residing abroad. These "communicated from abroad patents" were possibly justified in the early days of patents; our propensity to cling to custom enables them to survive even now.

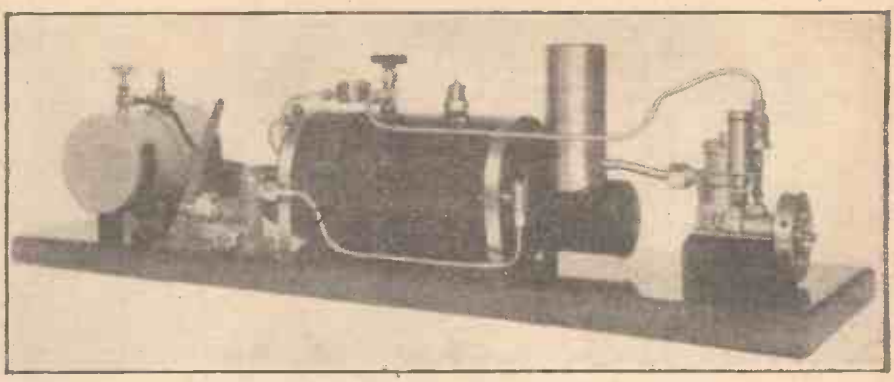
A Justification

You will doubtless enjoy the reading of this extract dealing with the topic. It is from one of the earliest patent cases, the cloth-workers of Ipswich case, argued in 1615. The judgment runs on: "But if a man hath brought in a new invention and a new trade within the kingdom, in peril of his life and consumption of his estate, or if a man hath made a new discovery of anything, in such cases the King of his grace and favour in recompense of his costs and travail may grant by charter unto him that he only shall use such a trade or traffic for a certain time, because at first people of the kingdom are ignorant and have not the knowledge and skill to use it. But when the patent is expired the King cannot make a new grant thereof."

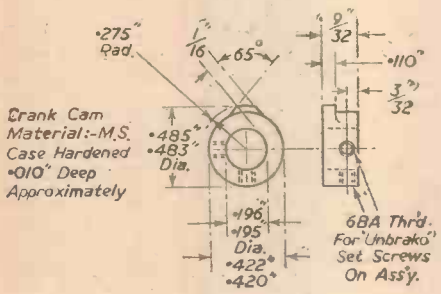
The B.L. Model Uniflow Engine

Further Detailed Drawings for This Unique Power Plant

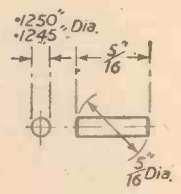
LAST month we published particulars of this new model Uniflow engine, and gave details of its performance. Dimensioned drawings were given with tolerances for machining some of the component parts, including the cylinder, piston, connecting rod, crankshaft and crank-disc. On this page several other parts are dealt with, including the crank-case and several smaller fittings such as the crank cam, gudgeon pin, valve spring, valve, valve union connecting and tappet guide bush. The material to be used for the castings, spindles, etc., is also stated. The few remaining drawings for this engine will be given next month.



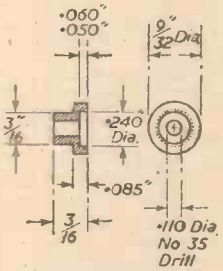
The complete Uniflow plant. Note the boiler feed pump.



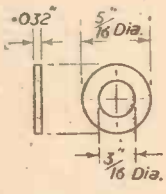
Crank Cam
Material:-M.S.
Case Hardened
·010" Deep
Approximately



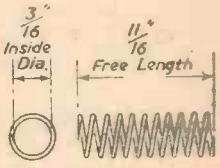
Gudgeon Pin
Material:- M.S.
Case Hardened



Spring Retaining Cup
Material:- Duralumin

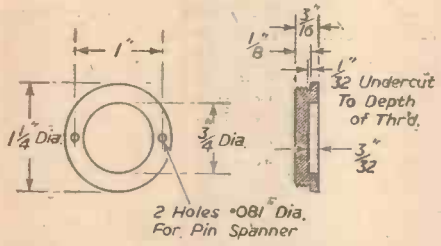


Flywheel Spacer
Material:- M.S.
To Be Used If Gear Wheel Is Not Used

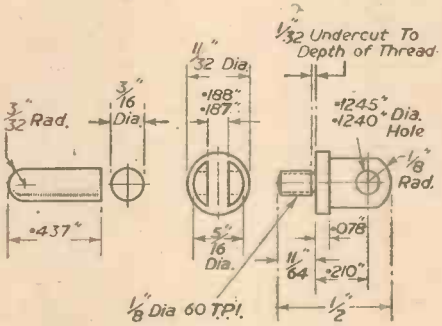


11 Full Turns, Ends Ground Square
·024" (23 S.W.G.)

Valve Spring
Material:- Spring Steel Wire

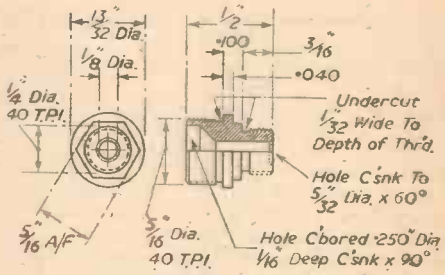


Crank-Case Cover Plate Material:- Duralumin

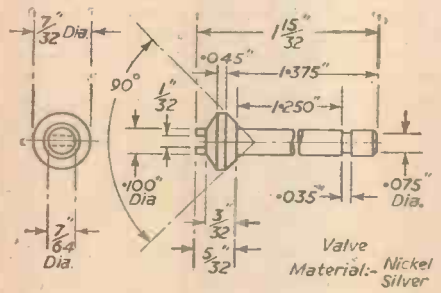


Tappet
Material:- M.S.
Case Hardened

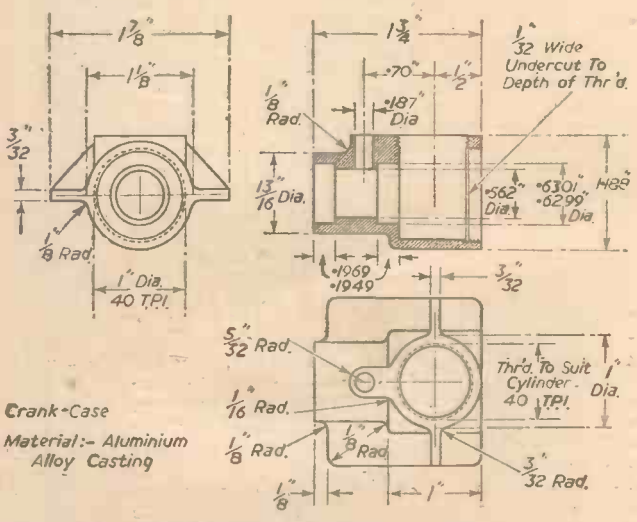
Small End Pivot
Material:- M.S.
Case Hardened



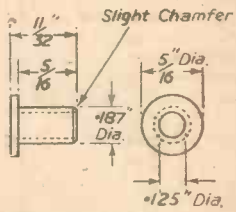
Valve Union Connection Material:- Brass



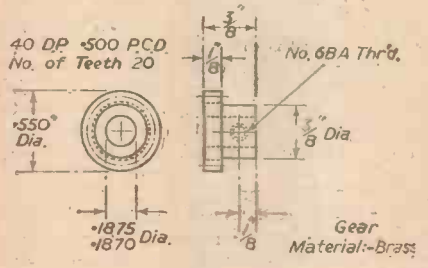
Valve
Material:- Nickel Silver



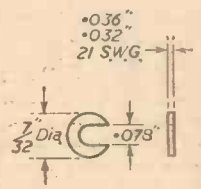
Crank-Case
Material:- Aluminium Alloy Casting



Tappet Guide Bush
Material:- Phos. Bronze



Gear
Material:-Brass



Valve Spindle Washer
Material:- M.S.

Details of crank cam, valve spring, valve, crank-case, tappet, etc.

Model Internal Combustion Engines–2

A Review of British Commercial Model Engines

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

(*Continued from page 97, December issue*).

INTERNATIONAL Model Aircraft Ltd., Morden Road, Merton, London, S.W.19, have seriously gone into flow production of model I.C. engines and their accessories such as plastic propellers, spinners, marine flywheels and water propellers suit these engines. Large production requires careful organisation and good testing, which benefits the public in a reliable product at a low cost. If an engine is not good it will not sell in quantity, and flow production does not pay. "Frog" engines have sold in thousands, having given satisfaction to many newcomers to power modelling as well as the old hands. I always feel I can fit and forget a Frog motor. This makes them attractive for my experimental models because one wants to concentrate on the model's performance undisturbed by the whims of a motor. "Frogs" were the leaders in this country of the plastic propeller, which is now becoming a popular line with several leading manufacturers. Particularly is this so with the latest flexible propellers which are so difficult to break.

Frog "100" Series II, 1 c.c. Diesel

This little 1 c.c. diesel makes an ideal boy's motor, for it suits small models, is inexpensive to produce and easy to carry. The price of the motor is low and spares are very cheap. It is an easy motor to start and manage. Provided it is run inverted, and a certain recommended technique is followed which prevents flooding, I have found that the many "100s" which have passed through my hands are quite foolproof. Of course, if people depart from a recommended method, the results must fall upon their own heads. Manufacturers always have the greatest difficulty in getting owners to "follow the book of words," and also not to take the engine to pieces as soon as purchased "to see how it works." Incidentally, a "Frog" 100 fitted to an aircraft won the Bowden International Power Trophy in 1947, a trophy to be flown for yearly. A special sleeve is provided for this engine if it is to be run upright. The sleeve is then fitted into the induction pipe. Bore .375 in., stroke .55 in. Rotary induction valve; weight bare, 3.25 oz.; static thrust, 12 oz. plus; speed range, 600 to 6,000 r.p.m. with plastic propeller, 8in. diam. 5in. pitch, free flight; or 6 to 8in. pitch for control-line work. A special boat propeller and transmission, and a hydroplane hull kit are available for this engine. The mounting is a cone to be bolted to a front bulkhead, the cone also acting as a fuel tank. The performance has been increased recently by a new type of spray-bar carburettor. (See Fig. 11.)

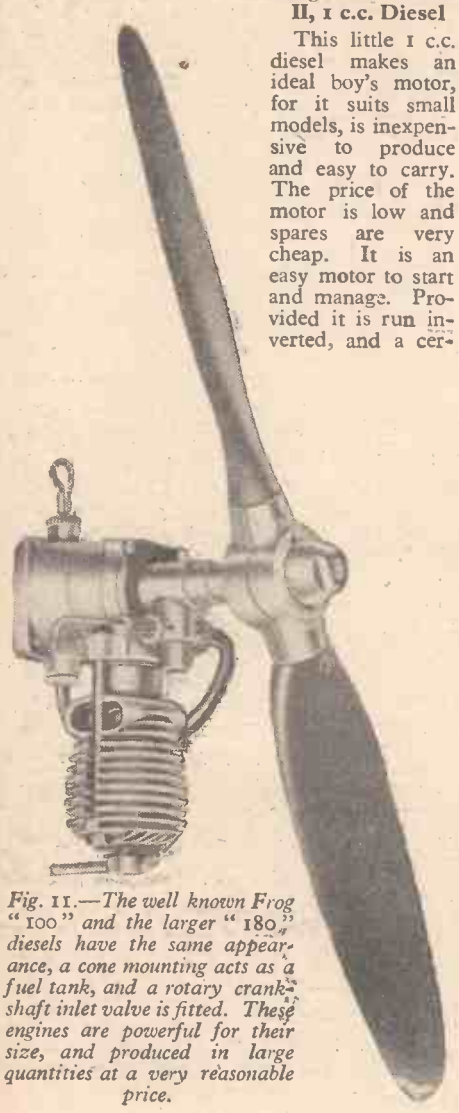


Fig. 11.—The well known Frog "100" and the larger "180" diesels have the same appearance, a cone mounting acts as a fuel tank, and a rotary crankshaft inlet valve is fitted. These engines are powerful for their size, and produced in large quantities at a very reasonable price.

Frog "180" Diesel, 1.66 c.c.

A rotary valve and cone mounting are provided, as on all "Frog" engines. The capacity is larger than the "100" by increasing the bore, thus making a nearly "square" engine, which is helpful towards high revolutions. This engine produces a good deal more power than the "100," although the weight and the appearance are nearly the same. An adjustable pitch propeller of 10in. diameter is available. Altogether a very useful engine for the larger size "small" models or the smaller "middle size" models.

Bore .485in., stroke .55in., weight (bare), 3.75 oz., static thrust, .20 oz., speed range, 1,000 to 7,500 r.p.m., max. revs., of course, vary according to propeller pitch.

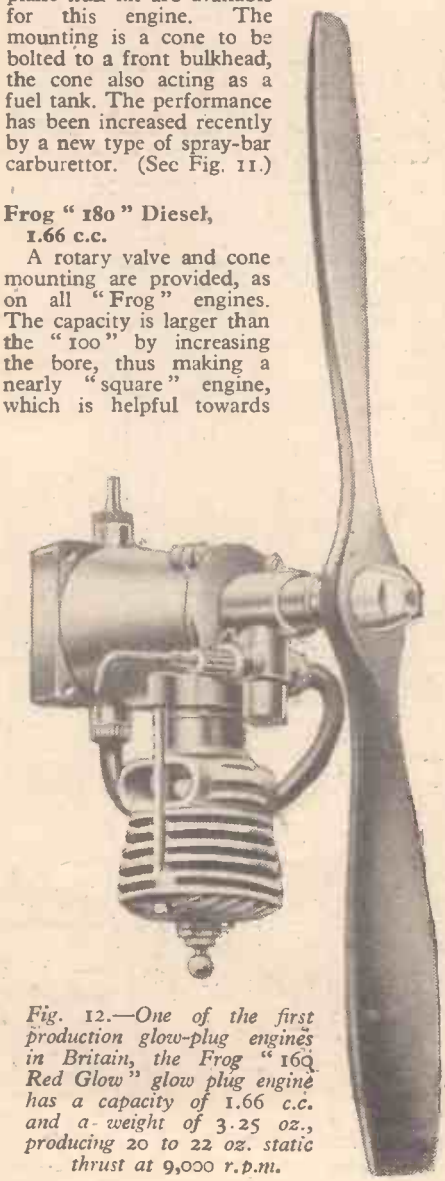


Fig. 12.—One of the first production glow-plug engines in Britain, the Frog "160 Red Glow" glow plug engine has a capacity of 1.66 c.c. and a weight of 3.25 oz., producing 20 to 22 oz. static thrust at 9,000 r.p.m.

Fig. 13.—A very compact and unusual glow-plug motor, the Yulon 30 of 4.9 c.c. has a "hot" racing performance. The height is only $3\frac{7}{16}$ in. This short stroke engine has a ring of exhaust ports located completely around the cylinder.

Frog "160 Red Glow", Glow-Plug Engine

This engine was one of the first glow-plug engines to be made for production in Britain, and comes in the small (but very powerful) class provided one of the Frog plastic propellers is fitted, which will ensure that the engine can turn at high revolutions. This motor has recently been slightly altered internally to increase its already high performance, and a new needle valve to give less critical fuel flow has been fitted to suit centrifugal force factors in control-line flight. I have used these engines considerably for free flight as well as C/L. The claimed thrust is 20 to 22 oz. (static), at 9,000 r.p.m. under a load of 8in. diam., 5in. pitch pro-

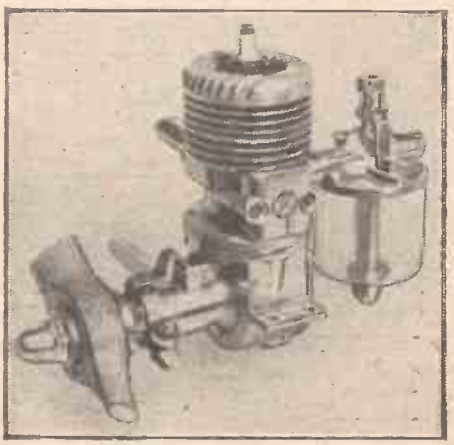


Fig. 14.—A well known medium size petrol spark ignition engine which also operates well on McCoy glow-plug, is the Majesco "45", having a capacity of 4.5 c.c.

peller, free flight, and 8in. by 6 or 8in. for control-line. Cubic capacity 1.66 c.c. Weight 3.25 oz. Special castor methanol based on "Red Glow" fuel is used, produced by "Frog." (See Fig. 12.)

The New Frog "500, Red Glow" Glow-Plug Engine

A powerful glow-plug engine of 5 c.c. is required in this country for the larger control-line model and also for radio controlled models which are becoming so popular. Frog has recently entered this market by a very powerful but outstandingly flexible engine selling for a very reasonable figure. It has the appearance and finish of the most advanced American engines. Most glow-plug engines are not flexible. The new Frog can be run comparatively quite slowly at around 4,000 r.p.m. by fitting a large propeller and using a slightly richer mixture, or maximum power can be obtained by using a propeller of approx. 10in. diam. at high revs. in the neighbourhood of 8,000 r.p.m. to 9,000 r.p.m. This is a most useful asset for radio control models or boats. The best cruising speed for good stability can be obtained by fitting a larger propeller to "throttle down the motor" as desired. I have one of these engines and find it a very easy starter as well as outstandingly flexible.

The weight is 7¾ oz., bore .75 in., stroke .680 in.

The 5 c.c. Yulon

The Yulon Engineering Company, 53, Woodland Road, Northfield, Birmingham, 31, have recently introduced a glow-plug engine of great promise and an unusual set up, called the Yulon 30 (Fig. 13). This engine has already won several local speed and stunt events in its home area. I have one of these engines which has greatly impressed me by its fierce performance, very compact size, due to design, and a "square" bore and stroke, not to mention an exciting exhaust note due to very high revolutions and a ring of exhaust ports located completely around the cylinder like the American Arden. The short stroke and the porting have a lot to do with the high performance, assisted by a large crankshaft rotary inlet valve. A small propeller revolving at extremely high speeds in American glow-plug fashion is a performance secret of this engine. Here it may interest

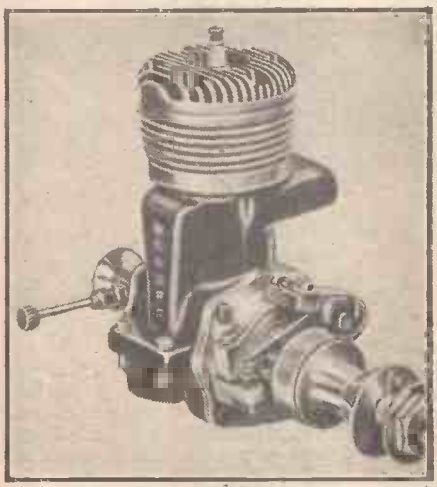


Fig. 17.—The high performance racing Nordec 10 c.c. engine is available in glow-plug ignition or spark ignition form. It is noted for great power at high revolutions and has gained a British record control-line speed of 95.3 m.p.h. Fitted with two piston rings and two ball bearings.

Fig. 15.—The Rowell 60 is a true racing engine on American well-tried lines having a very high performance. This 10 c.c. petrol engine has been officially timed to do 84.4 m.p.h. in a model car and can be bought as an integral unit with spur gearing and axle complete.

readers to observe that where an engine is designed for very high speeds and has large porting, steady performance can be obtained only by keeping the revolutions very high. A large propeller kills revolutions and upsets the suction through the large inlet orifice.

Fig. 16.—A Scots 5 c.c. diesel of well thought out detail construction is the "Clansman" provided with a crankshaft rotary inlet valve and a specially domed piston.

This engine is worth keeping an eye upon. The bore is 0.746in., stroke 0.691in., weight 5½oz., length 3¾in., width 1 11/16in., height 3 7/16in. Mounting beam or radial. 360 degrees transfer, 360 degrees exhaust port. The makers claim 11,000/12,000 r.p.m. on a 9in. by 6in. propeller, or 20,000 plus with flywheel, using a straight undoped methanol castor oil fuel. Naturally, nitromethane fuel will increase performance. It comes as a surprise that the capacity of the engine is quite large, namely 4.9 c.c. This surprise is due to the small overall dimensions.

The Majesco "45", Petrol or Glow-Plug Engine, 4.5 c.c.

Majesco Miniature Motors, Vale Road, Parkstone, Dorset, are well known for reliable and easy starting engines, and were in the business years before the last war. The 2 c.c. diesel appears to have been dropped, which is a pity, for it was one of the most reliable of motors. The firm are concentrating upon their well-known petrol and glow-plug engine.

This is one of the few medium-size petrol engines available on the British market. It forms a very reliable source of power for quite large models down to the medium small model, for those who are fond of the old well-tried petrol engine. Certainly one could not wish for a more steady performer with a good power output than the "45," and those interested in the smaller radio-controlled model having controlled engine speed by spark advance and retard, might do well to consider the "45," which has recently had an improved contact breaker fitted, designed to eliminate any tendency to "float" at the increased performance speeds obtained. This contact breaker is not shown in the accompanying photograph. (Fig. 14).

The bore is ¾in., stroke ⅝in, capacity .275 cubic inches, power 1/5 h.p. at 7,000 r.p.m. Best airscrew diam. is 11in. Four-port design. Height 3¼in. This motor is supplied as a marine unit with flywheel, which I have used in several of my model planing speed-boats with success.

The Rowell 60 Racing Engine, 10 c.c.

Rowell Motors Ltd., 93, Victoria Road, Dundee, have concentrated on a large capacity 10 c.c. petrol engine after the "hot" American racing pattern, especially for racing cars. These engines are also suitable for high-speed work in the aeroplane and boat field. In fact, I have one fitted to a hydroplane. Control-line flying is especially suitable for this powerful motor when a large model is used. The spark ignition timer points are set and cannot be varied by hand lever once the engine has started. The engine is also suitable for glow-plug ignition and is supplied with plain front housing for this purpose. The engine has put up an officially timed speed of 85.4 m.p.h. in a model car and therefore comes very definitely in the "high performance" class. The Rowell racing engine is also produced as a spur gear unit integral with back axle, or front axle, ready to bolt into a model racing car. Spur gearing is much favoured by the high-speed American racing cars. The firm also supply many race car accessories of interest.

This engine has rotary disc induction,

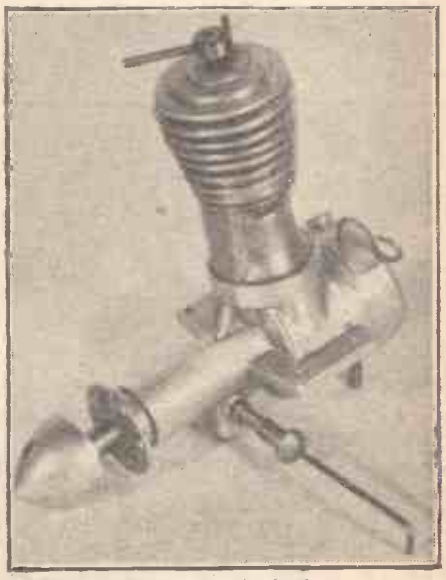


Fig. 18.—The Reeves diesel of 3.4 c.c. is a medium-capacity motor which can be converted to glow-plug ignition if desired. A rotary crankshaft valve is employed with a plain bearing crankshaft and fuel tank situated at rear of the crankcase with positive fuel cut off to time the duration of flight.

with ball-bearing crank-shaft and light alloy piston having a special shape to ensure high turbulence combustion with low turbulence scavaging. Two piston rings are fitted with car type ignition make-and-break contact breaker. Very large porting for easy gas flow with a carburettor having a big throat located at the rear of the crankcase makes a compact engine. Finish is good, as is to be expected from a firm of racing enthusiasts. Bore 15/16in., stroke ⅞in., max. r.p.m. 20,000 plus. (See Fig. 15.)

The " Clansman " 5 c.c. Diesel

The Caledonia Model Co., of 5, Pitt Street, Glasgow, C.2, make a nicely finished and well thought out 5 c.c. diesel. A further engine will shortly be announced called the " Chieftain."

The 5 c.c. diesel is a useful " large " size motor in this type, and owing to high torque at comparatively low revolutions can fly quite surprisingly large and heavy models if a large diameter and suitably pitched propeller is used to take advantage of this characteristic of the larger size diesel. Many modellers get confused over the characteristic performances of diesel and glow-plug engines. The diesel is a slower revving pulling type and the glow-plug engine, with its " early ignition " effect, is by nature a power producer at high revs. This is slightly qualified by the smaller diesel having higher revs. than the larger diesel.

Specification: Bore 11/16in., stroke 13/16in., height 4½in., length 5½in., width (over brackets) .2in., weight 9½oz. approx. Compression ratio 16 to 1. Rotary valve induction. Crankshaft dia. ⅛in., crankpin 9/32in. dia. Piston cast iron domed. Long bearing for crankshaft to give steady running and long life. Rotation of engine clockwise, an unusual feature for model engines, which normally run anti-clockwise. The domed piston is claimed to give a high degree of cut-off and excellent turbulence. The engine uses "Clansman" fuel with three parts ether B.P. (Fig 16.)

The North Down Engineering Company, Godstone Road, Whyteleafe, Surrey, are responsible for a nicely finished high-performance petrol and glow-plug engine in the large 10 c.c. racing class, designed along well-tried American lines which have proved so successful in this size. A sensible car type contact breaker is fitted, and porting is really large and efficient for high speed. The induction is at the rear of the motor direct to a rotary disc valve.

Britain for a long time lagged seriously in this class of engine, but is now well up in the race. I have used the Nordec engine in various models and have been struck by its great power. A friend has recently fitted a glow-plug version in a large speed vee-bottomed planing hull of my design, called the " Sword Fish." This is fitted with radio control, and the Nordec engine has been found to provide plenty of power when allowed to revolve at high speed by fitting a small, correctly pitched propeller, remembering that this is the glow-plug version, and my previous remarks on the necessity of high revs. for glow-plug ignition. Nordec engines are used for racing cars as well as aircraft and boats. A British control-line record was put up by a Nordec engine with a speed of 95.3 m.p.h.

Fig. 20.—A novel diesel is the 2.147 c.c. Airstar having compression adjustment by eccentric crankshaft bearing. Note the lever behind airscrew which effects this. As a result the height is only 3 1/16 in. and damage can not be done by screwing a contra-piston down too far.

The Nordec R.10 and RG10 Petrol and Glow-plug Engines]

Bore .940in., stroke 875in., capacity 9.95 c.c. Height 4.2in., width 2-5in., length 4.5in., weight 14.5oz. Performance (on bench): Standard flywheel, 22,000 r.p.m. Prop. 9in. by 10in. pitch, 12,500 r.p.m.; 10in. by 8in., 11,800 r.p.m.; 12in. by 7in., 11,000 r.p.m. and 10in. by 10in., 10,000 r.p.m. Two piston rings and two ball bearings are fitted, which, together with large and well-designed porting, account for the high performance figures. (Fig. 17.)

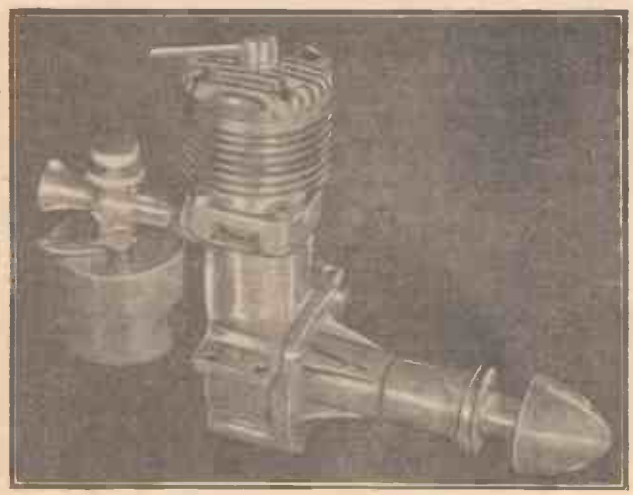


Fig. 19.—The Wildcat diesel is 5 c.c. and has recently undergone improvements to port design with a 20 per cent. increase of power. The makers find their new vernier fuel adjustment, seen in the photograph, gives better burning of the mixture and more even running.

Reeves 3.4 c.c. Specification

The Reeves Engineering Co., Victoria Road, Shifnal, Shropshire, manufacture a medium size diesel engine of 3.4 c.c. with rotary crankshaft valve and plain bearing, suitable for glow-plug conversion. This engine is recommended by the makers for 'planes of 2ft. 6in. to 6ft. wingspan, or control-line or car models. Two exhaust ports and one transfer port are provided with a long, plain, main bearing. The fuel tank is situated at the rear of the beam-mounted crankcase. (Fig. 18.)

Bore .570in., stroke .760in., weight approx. 6½oz., r.p.m. 2,000 to 7,000. Propeller 11in. to 13in. dia., 6 to 9in. pitch. Cut-out, positive valve type. Main bearing 11/32in. dia. Fuel recommended, 45 per cent. ether, 20 per cent. X.L. oil, 35 per cent. paraffin.

Wildcat II 5 c.c. Diesel.

Davies Charlton and Co., 13, Rainhill Road, Barnoldswick, via Colne, Lancs, make a large 5 c.c. diesel called the Wildcat. A 36in. span stunt control-line aircraft kit supports this engine. A 20 per cent. increase of power has been obtained during development work recently. Free flight models up to 7ft. span are recommended. A fully machined kit to build the engine is also obtainable (see Fig. 19). The engine is also suitable for glow-plug conversion after it is well run in. A special head is provided.

Specification: Bore 11/16in., stroke ⅞in., weight 9½oz., height 4½in., max. r.p.m. 11,000, recommended range 5,500 to 6,500. Vernier fuel adjustment provided. Recommended fuel is 10 per cent. castor oil, 40 per cent. diesel oil or paraffin and 50 per cent. ether.

The Airstar 2.147 Diesel

J. P. Steward and Co., Ltd., York Street, Luton, Beds, last year introduced a very interesting little diesel having several novel features which perform very well in practice, as I know from the experience of trying one of their engines.

The J.P.S. Airstar is a diesel of 2.147 c.c. of small overall height, because instead of the usual contra piston and adjusting lever at the top of the cylinder the compression ratio is increased or reduced by moving a hand lever behind the propeller, which rotates the main bearing mounted in an eccentric. This causes the bearing to move towards or away from the cylinder head, thus increasing or decreasing the compression, as desired.

Fixed Fuel Jet

Contrary to usual practice on model engines, the Airstar has a fixed fuel jet and an adjustable air supply by throttle screw, which certainly gives easy starting and reliable running.

The height of the motor is only 3 1/16in., and an excellent feature not often seen on diesels is a drain screw in the crankcase which permits clearing out the crankcase in no uncertain manner should a mistake be made and the engine grossly over-flooded. There are two sizes of fuel tank provided which are easily changed over and have graduated ring markings so that the operator can send off the model when the fuel is at a known ring which produces a certain duration of engine run. One tank is larger than the other. This method should prevent flyaways due to time switches possibly sticking.

Specification: Bore .12 mm., stroke 19 mm., compression ratio (high) 30-69 (normal), 15-33 (low), 10-23. Weight without propeller 5oz. No nuts and bolts are used in the assembly. Propeller for free flight, 10in. dia. by 6.5in. pitch. Engine may be run in either direction. Fuel: Ether 60 per cent., Castrol X.L. oil 25 per cent., paraffin 15 per cent. (Fig. 20.)

(To be continued)

Schoolboys' Exhibition

AT the Schoolboys' Exhibition, held at the Royal Horticultural Hall from December 31st, 1949, to January 14th, 1950, a large exhibit, sponsored by Johnsons of Hendon, Ltd., the photographic chemical manufacturers, showed by practical demonstrations, how easy it is for boys to start home photography.

The process of developing films was explained and contact prints, exposed by the boys, were developed on the spot. An enlarger was in operation for the visitors to see and, after finishing with a demonstration on toning and tinting, every boy received a free copy of a book on photography.

Long-distance Telephones

SIR,—The Marquis of Donegall does not make any comparisons in his article "Long-distance Telephones (PRACTICAL MECHANICS, November, 1949). In the same spirit neither do I. I merely wish to put on record two facts.

Firstly, operators in a number of towns outside London dial London numbers direct. For instance, in the small village of Brookland, in South-east Kent, a subscriber wanting a London number dials O, which connects him with the operator. The operator, having ascertained the London number required, prefixes it a code, to route it via the London exchange concerned, plugs into a London junction and dials the combination. This gives the London number direct.

Secondly, a quote from Herbert & Proctor's *Telephony*, volume 1—an old and well-known book:

"In key sending, a strip of 10 digit keys of the press down type, one for each of the digits 1-0, is used in place of a dial, by utilising a principle much used in automatic telephony, whereby four relays are used to store any one of 10 digits, four voice frequency currents can be used in combination; to signal any one of 10 digits."

The word "Tones" could be used in place of "voice frequency currents."—D. R. ELDERKIN (Lydd).

Motor-controlled Model Stage Curtains

SIR,—May I suggest a modification to the "Motor-controlled Curtains" (PRACTICAL MECHANICS, October issue) by which

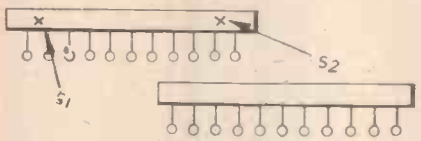


Fig. 1.—Showing the position of the additional interrupter switches.

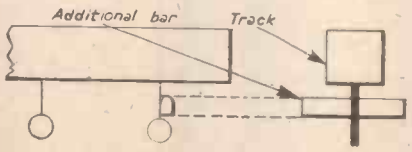


Fig. 2.—Side and elevations, showing the additional bar fitted to the leading track runner.

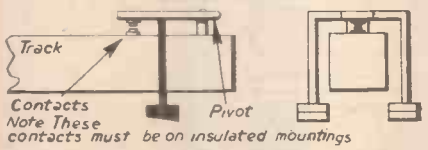


Fig. 3.—Details of the switch S2. Switch S1, at the other end of the track, is of similar construction, but the bevelled edge will slope in the opposite direction.

the motor is automatically stopped when the curtains have opened or closed to the required amount.

The modification involves only changes in the wiring of the reversing switch, together with the provision of two interrupter switches placed at opposite ends of one track, as shown by S1 and S2 (Fig. 1). These switches, the construction of which is simple, and is shown in Fig. 3, are opened by means of the arm on the leading runner (Fig. 2) pushing on the bevelled foot of the switch, thus breaking the circuit to the motor. This circuit is restored on altering the position of the reversing switch.

If it is occasionally required to stop the curtains before they have fully opened, this

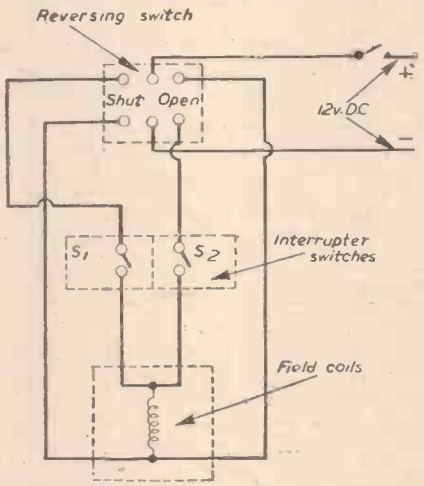


Fig. 4.—Wiring diagram for switches and motor. The 12-volt input is taken to the centre terminals of the reversing switch.

may be done by use of the switch on the 12-volt supply line (Fig. 4), i.e., it is possible to stop the curtains manually as in the original article, if this is necessary.—A. T. DAVIES (Wallasey).

Contact Lenses

SIR,—Like your correspondent, C. Pallonza, of Hull, I was interested in the article on "The Story of Spectacles" in the October issue of PRACTICAL MECHANICS.

I agree almost entirely with his remarks re contact lenses, with the exception of his "disadvantage" of a bubble of air and the insertion with salt solution.

Present methods are such that contact lenses are fitted much closer to the eyes than the pattern your correspondent wears. What is more, a small bottle of air is deliberately made to enter the small space between the periphery of the cornea and the white of the eye. This is done by having a small hole in a particular section of the contact lens, and so allows the eye to have access to air, and thus to breathe, and to allow a continual flow of tears.

This again overcomes entirely the mistiness of vision seen with non-ventilated lenses after wearing them for a few hours.

Further developments are also taking place with corneal lenses, namely, a small lens which is fitted to the cornea only.

Generally speaking, all contact lenses these days are of plastic material and are thus practically unbreakable. — E. A. PLAICE (Croydon).

SIR,—Regarding the letter on contact lenses in the December issue, I feel that one small point is likely to be misleading unless a little extra detail is given.

Mr. Pallonza states that one of the advantages of contact lenses is that they give 100 per cent. better vision as compared with spectacles. This only applies in special cases and is not a normal state of affairs at all.

In many cases the visual acuity with contacts is very little better than spectacles—sometimes it is only just equal to spectacles, but in the case mentioned—a scarred cornea—ordinary spectacles are sometimes quite useless because the beautiful refracting surface of the cornea has been destroyed. The contact lens obliterates many of the irregularities with the film of liquid which joins the contact lens to the eye and, as Mr. Pallonza has found, a very decent image results.

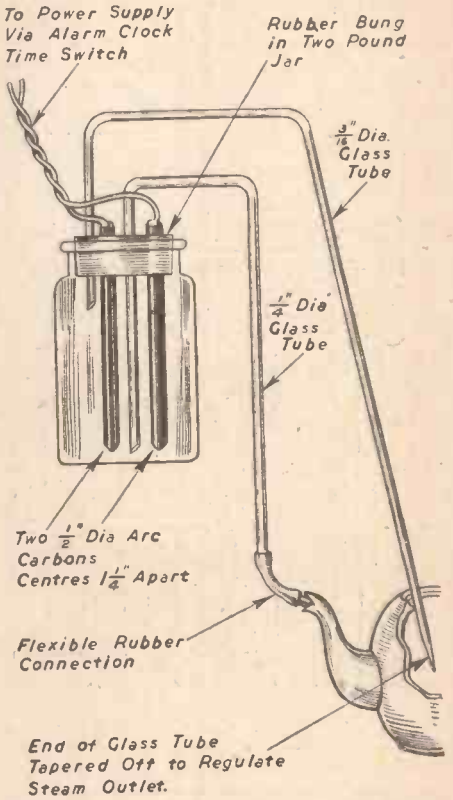
In no circumstances would I infer that contact lenses are of little value to ordinary people needing glasses, but they have their *good*—and *bad*—points, and it is wise to leave the final judgment to the optician who specialises in this type of work.

I must congratulate your correspondent on the length of time he is able to retain them in his eyes—some people can only endure them for two or three hours, but the usual time seems to be about six hours.—S. PATRICK, F.S.M.C. (Mitcham).

A Radio Awakener

SIR,—I was very interested by your correspondents' methods of waking themselves in the morning, but I still prefer my own way, which can also include the sweet music from a radio.

Briefly, the alarm clock is used in a similar way to close a circuit when the alarm goes off. My switching is not so elaborate, and could probably be improved, as all I have is a two-pole jack which is moved by the key of the alarm.



The tea-making device used in conjunction with a radio awakener.

However, once the circuit is made, there is a lapse of about two minutes, and then I have a pot of fresh, hot tea waiting for me, and, if I wish it, the radio playing as well. The tea-making gadget, as shown in the illustration, works as follows:

The electricity, flowing through the water between the two arc carbons, heats the water to boiling point, and the closer together the carbons are the quicker the water will boil, although the current consumed is correspondingly higher. The resultant increase in pressure from steam, etc., forces the water up the larger glass tube, until it passes over the top of the bend, when it syphons over into the teapot below via the spout. (This is merely for convenience in removing the pot.) The main points, both for and against, are these:

(1) Once the water has syphoned off, no further current will flow, unlike a unit using a filament.

(2) The secondary glass tube, which is necessary to allow the initial pressure due to expansion, and electrolysis, to escape, also serves to warm the teapot prior to the flow of boiling water entering it. This is achieved with a certain amount of steam which comes through before sufficient pressure builds up to force the water over.

(3) The efficacy of the heating arrangements depends upon the water used—hard water is essential, as the soft water found in some parts will not act as a conductor of electricity.—D. OVERTON (Thornton Heath).

Converting Ex-aircraft Generators

SIR,—I have read the articles that have appeared in PRACTICAL MECHANICS on this subject and note that one variation in the wiring has not been mentioned.

My experience relates to one of the larger types of generator, intended for an input of 12 volts at 32 amps, with an output of 1,200 volts at 200 m. amps, the overall size of the unit being 11 x 5½ x 5½in.

The usual connections are as follows:

In Fig. 1, with 230 volts A.C. input a high speed is obtained, but with very little power, and the machine stops if anything more than very light work is attempted.

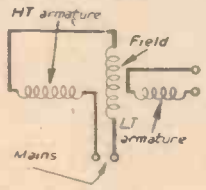


Fig. 1.

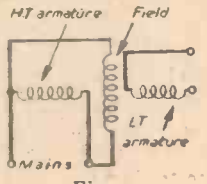


Fig. 2.

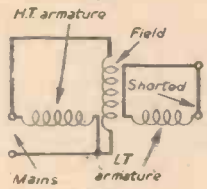


Fig. 3.

Diagrams showing the variations and connections of the windings in converting ex-aircraft generators.

In Fig. 2 the speed is not so high and slightly more power is gained, but the machine will slow down if anything like heavy grinding or polishing work is attempted.

A further method of connection is as shown in Fig. 3.

This makes a motor with considerable power but with the disadvantage that, due to the shorter L.T. armature, it heats up rapidly. A thick shorting wire—of around No. 12 gauge—must be used, otherwise the wire will be burnt through. I have tried to substitute the wire by a 12-volt car bulb and by resistance wires, but no effective difference has resulted. As it is, the "motor," although it will tackle almost any grinding job and could be used for heavier work, can only be switched on for short periods, and then at the risk of a seized bearing, or even a breakdown due to overheating.

I have been forced to the conclusion that the only practical conversion is a rewinding of the field.

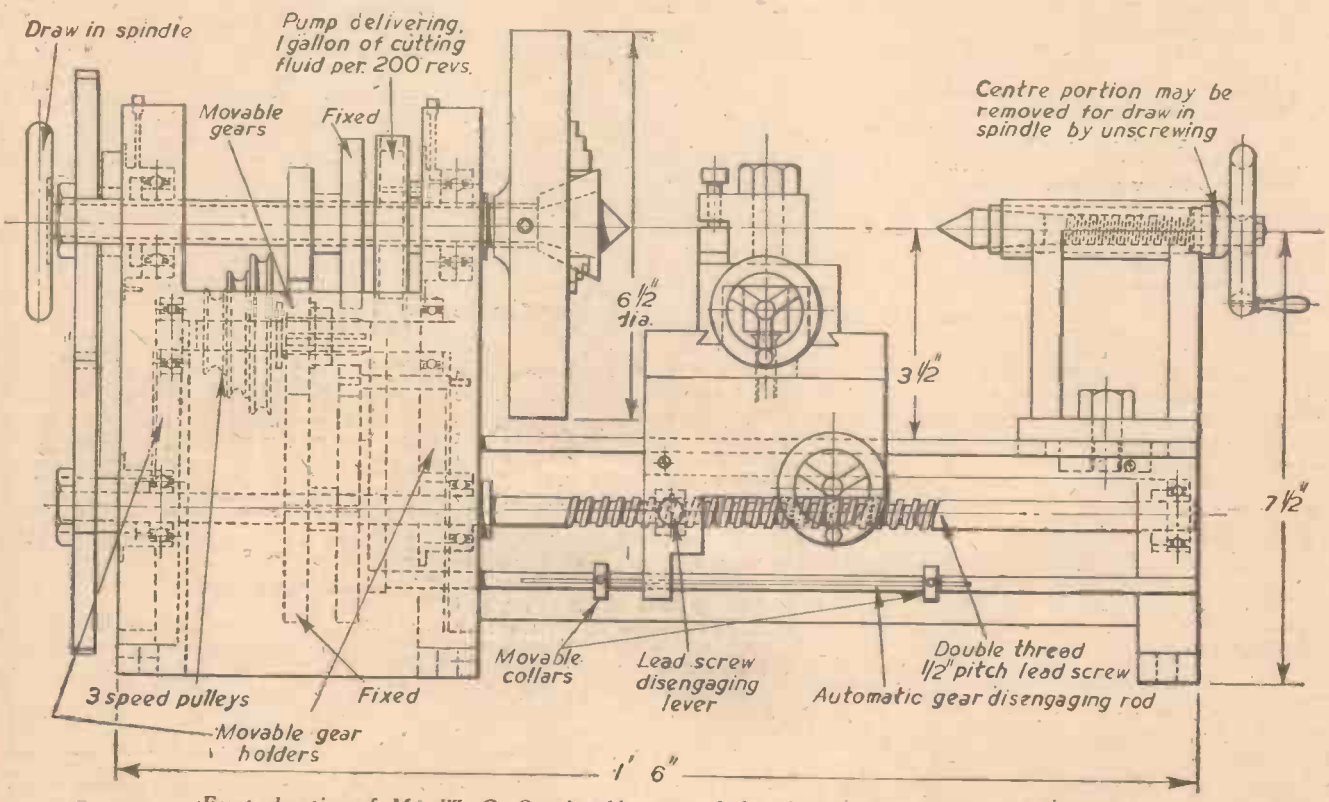
Perhaps other readers have had experience with this type of generator, and I should be glad to learn whether they have succeeded in overcoming the difficulties of converting it to a useful addition to the amateur's workshop. I should also appreciate any details of the rewinding of the field (if, in fact, this is the only sound means of conversion), including gauges of wire and methods.—T. J. WADESON (Kenton).

Covering for Concrete Floors

SIR,—I was interested in the reply to a query by B. Cutter (Shaftesbury) in the December issue concerning the treatment of concrete floors to prevent linoleum "sweating" and rotting. Years ago I had the same trouble and cured it by first covering the concrete with roofing felt and laying the linoleum on the top. After more than 20 years the lino still remains good, no damp having penetrated the felt. This has proved to be an inexpensive way of curing the trouble.—J. G. SUTTON (Hastings).

Our Lathe Competition

W. C. Owen's Design for a 3½in.-centre Lathe which was Awarded Third Prize



Front elevation of Mr. W. C. Owen's 3½in.-centre lathe, showing some of its novel features.

Club Notes

Club secretaries are asked to note that the latest date for receiving copy is the first of the month for the following month's issue.

G.E.C. Model Engineering Exhibition

THE G.E.C. Model Engineering and Electronic Society held its first post-war exhibition at Magnet House, Kingsway, on November 24th and 25th.

The exhibits, which attained a very high standard of craftsmanship, covered a great variety of subjects which included model aircraft, an air-sea rescue launch, a Clyde drifter, locomotives of many types, a 35 mm. and standard slide projector, and even a wash boiler.

Mr. J. N. Maskelyne, of the *Model Engineer*, kindly judged the exhibits and paid a tribute to the general excellence of the workmanship, which made it no easy task to decide the final order of merit.

Mr. T. W. Heather, a director of The General Electric Company Ltd., who has himself been active in model engineering for many years, presented the prizes. The "Lord Hirst Cup" was won by Mr. M. H. Mounsden, of Exterior Lighting Department, who gained a "double first," in the Marine and General Engineering Sections. The "T. W. Heather Trophy" for the best model in the Locomotive Section was won by Mr. H. H. Mills.

Hastings and District Society of Model and Experimental Engineers

THE membership of this club is now over the 70 mark, and an interesting series of lectures and films have been arranged for our general meetings, which are held every fourth Thursday of each month. Due to members complaining that the club rooms were not suitable for lectures, the general meetings are now being held at the Trades Labour Council Hall, Robertson Terrace.

A sub-committee is dealing with the building of a 5in. gauge Ajax (Dick Simmonds), and several parts are already being tackled by several members at home, pending the completion of the club workshop. Material is also being purchased for a 100ft. portable track.

Nearly all branches of model engineering are being tackled by various members, and the power boat section is very keen, with club nights every Tuesday evening, and on the pond Sunday mornings. Model racing-car meetings are held every Friday evening in the New Bowls Pavilion, Falaise Road.

Hon. Sec.: P. Keller, 3, Portland Terrace, Hastings.

The Portsmouth and District Model Power Boat Club

THE club's first annual general meeting was held on Thursday, November 17th, but pressure of business necessitated it being continued on December 1st. The various reports showed a good progress. Officers were elected as follows:

Chairman, Mr. Cæsar; vice-chairman, Mr. Abrahams; committee, Messrs. Chandler, Sidey, S. R. Palmer and Ford.

All interested persons in the Portsmouth area are invited to write to the secretary, R. Talbot, 65, Cobden Avenue, Copnor, Portsmouth.

Items of Interest

The F.V. "Capella"

A FISHING boat which has created much interest has recently run her trials and gone in service. This is the *Capella*, built by Herd and MacKenzie, Boatbuilders, Buckie, and intended for Seine Net and Drift Net fishing.

With a tonnage of approximately 45 tons she is 69ft. in length overall, 18ft. 3in. in beam, and has a moulded depth of 9ft. 6in. Frames, keel, stern and sternpost are of oak, while the planking is of larch.

The machinery, also installed by the boatbuilder, was supplied by Associated British Oil Engines Limited, Marine Division, Stockport, and comprises:—

(a) The Mirrlees "TLGRB4" marine propulsion engine, developing 190 s.h.p. (12 hour rating) or 172 s.h.p. continuously at 600 r.p.m., with SLM reverse 2/1 reduction gear.

(b) General purpose set comprising Petter "AV1" diesel 5 b.h.p. radiator cooled engine driving compressor, G.G.G. Giljector bilge general service pump and 24 volt C.A.V. generator.

This is the first Mirrlees installation in a fishing boat on the Moray Firth.

The robustness of construction of the Mirrlees engine and the quality of the stern-gear and installation fittings should tend to satisfactory service in the arduous duty of Seine Net fishing.

The boat is equipped with a Coastal Radio Land Link set, Hughes Echo sounder, Herd and MacKenzie 4-speed Seine Net winch, and Beccles coiler.

Her galley is on more modern lines than usually found on a fishing boat and is fitted out with Formica panelling edged with chromium, and there is a stainless steel sink and calor gas cooker.

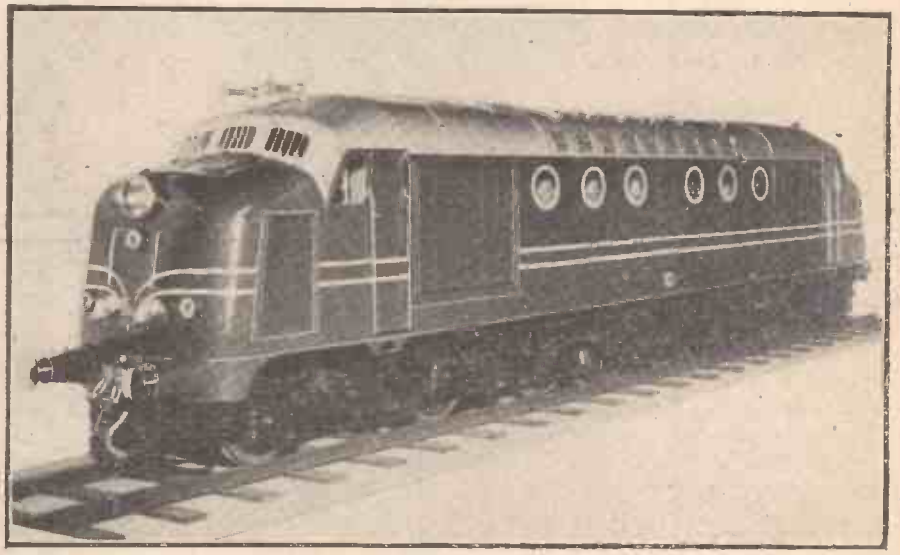
The crew's quarters aft are commodious with light fittings and panelling to a high standard.

Model Diesel-electric Locomotive

A MODEL of great interest was recently completed at the works of Messrs. Edward Exley & Co., the well-known firm of Bradford model engineers. It is a 1in. scale model of a Diesel-electric locomotive made to the order of the English Electric Company, Ltd., the prototype having been supplied to the Egyptian State Railways. The model has been shipped to Egypt and will be on view at the forthcoming Centenary Exhibition of the Egyptian State Railways and afterwards it will find a permanent resting place in the Cairo Museum. It was intended that the model would take two years to build, but production was speeded up so much that it was delivered within 12 months of the order being placed.

Weighs Two Hundredweights

Although all the working parts are dummy, a considerable amount of ingenuity has gone into the production, and it is hard to realise that some of the parts, including the engine cylinder "castings," are made of wood carved to shape. All internal and external details are incorporated, and the model has been finished in green, with yellow streamlining and aluminium roof. It weighs nearly two hundredweights. The accompanying illustration shows the amount of detail which has been incorporated in the model.



A three-quarter side view of a 1in. scale model Diesel-electric model locomotive, made to the order of the English Electric Company, Ltd., for the Egyptian State Railways.
(Photo by Leslie Overend)

The WORLD of MODELS

Elliott Model Railway Exhibition : Model s.s. "Rio Grande" : Model Making in Esslingen

By "MOTILUS"

IN December, 1948, I wrote comprehensively of an extensive working model railway run by Mr. H. Elliott (Elliott Model Railway Exhibitions). Since then, this exhibition model railway has travelled far and been in constant use touring the country, giving displays in many towns and cities. The track layout has been extended, further rolling stock added, as well as other improvements and introduction of attractive scenic features.

Having already described this model railway in detail, suffice it to say that the equipment has proved itself durable, an essential quality when it is subjected to such constant use. For long service with continuous wear and tear, rolling stock needs to be well designed and strongly built. The steam locomotives and several of the electric ones are by Bassett-Lowke, Ltd.: the electric stock also includes a Hornby 4-6-2 "Princess Elizabeth" locomotive, which has proved a sturdy and reliable model for exhibition displays.

This popular railway visited Skegness last September, and was a great attraction for the local male population.

Mr. Harold Elliott is a model railway enthusiast and usually erects and operates the exhibition himself during the stay in each centre. Although he has been doing this for many years now, he is still as keen as ever.

Readers will remember that in PRACTICAL MECHANICS for June, 1949, I referred to some excellent model work shown in a model and handicraft exhibition held in Parel, Bombay. News of model hobbies in India is infrequent, so I was pleased when a short while ago I heard from Mr. W. H. Gatehouse, who spent some years in India and developed his hobby of ship modelling while out there. He is now back in England, where no doubt he finds better facilities for model-making, although there must have been a great deal of satisfaction in overcoming difficulties that face those who dwell in primitive parts of the earth when they adopt such an occupation for their spare time.

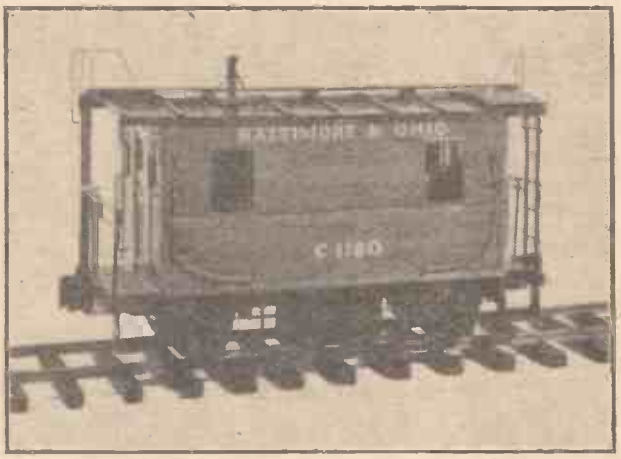


Fig. 3.—Model of an old-type American railroad vehicle, gauge o; also the work of Mr. Hans Buehlmann.

Mr. Gatehouse has a prime interest in working model ships and being in the electrical industry he was able to utilise scrap and oddments that came his way and incorporate them as parts of engines and boilers for his power plants. This must have been a decided asset in India, where suitable materials, and even sometimes tools, are hard to come by. Unlike England, where a local model shop is usually available to recommend the right tools and materials for a particular job and accessories are relatively easy to obtain, the model-making enthusiast in India relies a great deal on his own ingenuity in obtaining these requisites: to have them sent by post means a long period of waiting and can be quite expensive.

Model s.s. *Rio Grande*

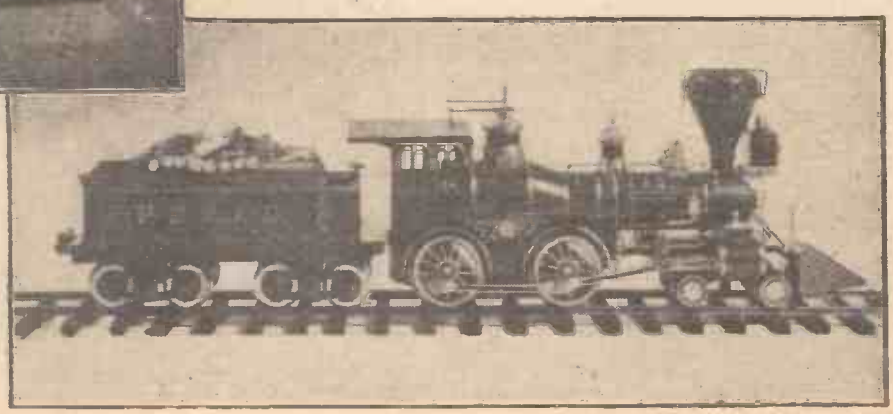
A good example of Mr. Gatehouse's modelling is the s.s. *Rio Grande* (Fig. 1), 30in. long and 6in. beam. The hull of this vessel was made from Burma teak and constructed under difficulties as no proper bench or table was available for the painstaking model-maker. It is powered by a 2-cylinder, single-action engine, $\frac{3}{8}$in. by $\frac{1}{4}$in. The boiler, 6in. by 2in., is of brass, with two $\frac{1}{4}$in. water tubes. The "boating lake" whereon the finished model gave some good performances was a nearby locomotive tank!

Mr. Gatehouse improvised with two kerosene tins for one of his models, a tramp steamer made to his own design. He first made a wooden former and then built up the hull on this with strips of tin and solder. In this model the fore and aft well decks and the bridge were all removable, so as to allow access to the power plant which was of the same type and construction as that in the s.s. *Rio Grande*. The "tramp" bore the distinguished name of s.s. *Bolton Abbey*.

In addition, Mr. Gatehouse constructed many other working model ships while in India. They included a tug boat with a single-action oscillating cylinder ($\frac{5}{8}$in. by

Fig. 1.—(Above) A steam-driven ship model, s.s. Rio Grande, built by Mr. W. H. Gatehouse, when in India in pre-war days.

Fig. 2.—(Right) An excellent example of good, detailed work in an ancient gauge o locomotive model, by Mr. Hans Buehlmann, of Zurich, Switzerland.



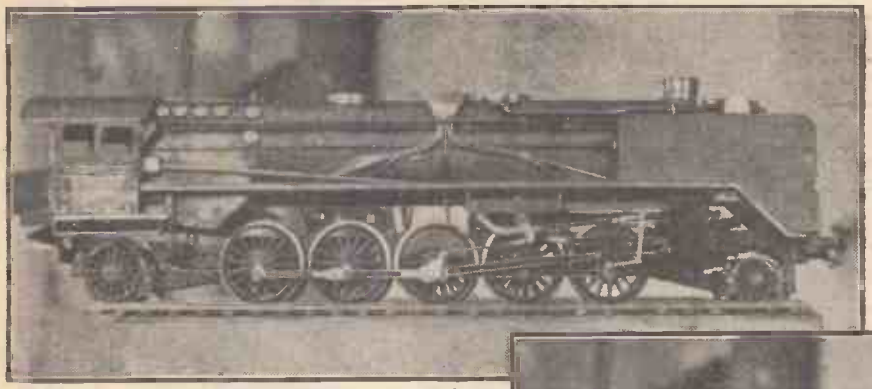


Fig. 4.—An electrically-driven model of an express goods steam locomotive of the German Railways. A gauge 1 model built by Mr. F. Spielhoff of the Esslingen Model Railway Club.

¾in.), brass boiler and two ¼in. water tubes, which could make a good turn of speed: also a scale model of the *Caledonian Monarch*, from Mr. H. A. Underwood's design. When Mr. Gatehouse wrote me from his present home in Worthing, he was busy building a model trawler.

During a brief autumnal visit to Switzerland last year I met once more Mr. H. Buehlmann, the Zurich model-maker, with a passion for early American prototypes for his amateur-made railway models. I have received from him some interesting photographs, one of which, Fig. 2, shows Mr. Buehlmann's unique gauge 0 model American steam locomotive of the year 1865, "Seminole," to a scale of ¾in. to 1ft. The external detail is accurate to a fine degree. This is a brass model, all hand made, and is worthy of a place in any museum where high-class, fully detailed engineering models are displayed. The other illustration, Fig. 3, shows a model of an old four-wheeled vehicle of the Baltimore and Ohio Railway of a similar period, also a brass model. I look forward to seeing some of the further quaint old-fashioned models Mr. Buehlmann is building.

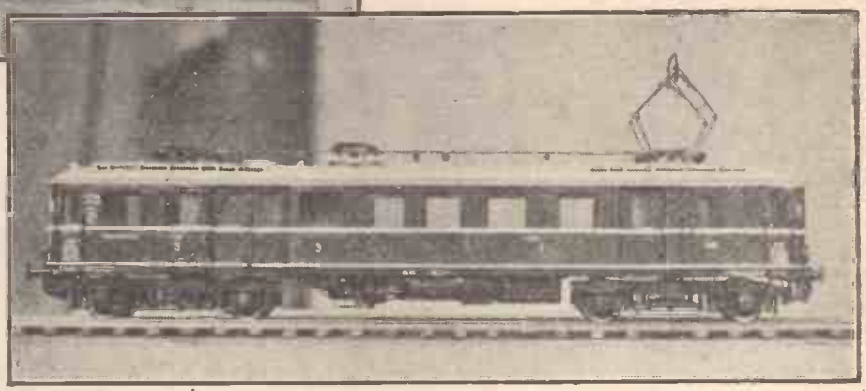


Fig. 5.—Esslingen Model Railway Club; a gauge 0 model of a German electric coach, as used for light suburban services.

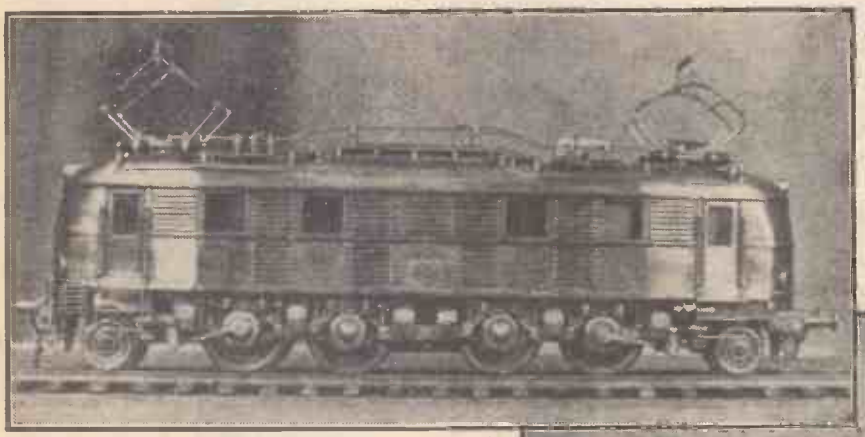


Fig. 6.—Esslingen Model Railway Club: an electric, gauge 0 model of an express electric locomotive of the German Railways.

Model-making in Esslingen

Now for some more model news from Germany; this time from Esslingen, near Stuttgart. Some excellent railway models are being made by the Esslingen Model Railway Club, founded in 1946. Their first exhibition was held last year, where some of these models were shown; another instance of keen model-makers overcoming current difficulties in lack of materials and tools. The members build to various scales, but the most popular are gauges 0 and 00, and occasionally gauge 1.

From a number of photographs I have received of the work done by members of this club I have selected three, showing something of the variety of models constructed. These photographs were sent me by club member Mr. F. Spielhoff, who is also the builder of the first model, shown in Fig. 4. This is a gauge 1 model of a German express long-distance goods locomotive of the 2-10-2 type. Although having the steam outline and detail of its prototype, the model is electrically driven.

Secondly, a gauge 0 bogie passenger coach, electrically driven with pantograph connection. The coach comprises second- and third-class carriages for light service on suburban railways. It is a most realistic model of good workmanship (Fig. 5).

Thirdly, and included in the electrically-driven models, is a standard type electric locomotive of the German Railways, for express service, also for gauge 0 (Fig. 6). This has been carefully based on its prototype, having a wealth of external detail as well as the mechanical devices necessary for a good working model.

The remaining photographs show many other examples of the work of this comparatively young German club, and these three give a fair representation of the good models they are building and of the wide range of interest they have among their members.

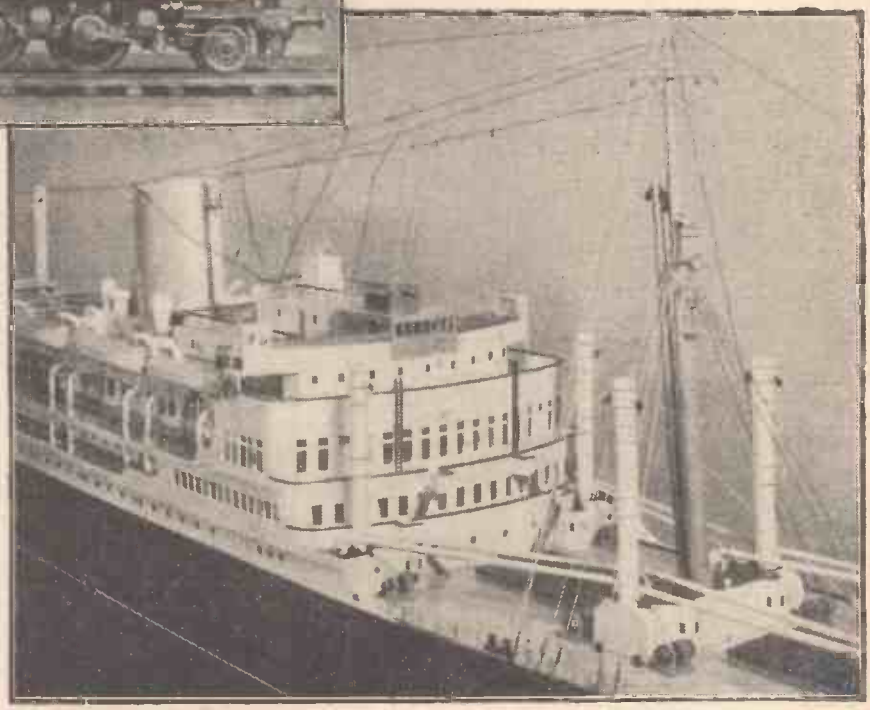


Fig. 7.—A photograph amidships of the ⅛in. to 1ft. model of m.s. Rangitoto. *This is a new one-class passenger cargo ship for service between Britain and New Zealand.*

Model Motor Ship "Rangitoto"

An interesting innovation in shipbuilding since the war has been the appearance of the m.s. *Rangitoto*, built by Vickers-Armstrongs, Ltd., for the New Zealand Shipping Co. She is a one-class passenger cargo motor ship, and is also the largest passenger vessel built for the New Zealand route, and the largest ship constructed on the Tyne for over ten years. At the time of writing, her sister ship, m.s. *Rangitane*, is being built by John Brown & Co., Ltd., of Clydebank.

The *Rangitoto* has three complete decks. Her chief dimensions are: overall length 609ft., breadth 78ft., and she is 19,000 gross tonnage. She is capable of carrying 399 passengers and has a service speed of 17 knots. The principal public rooms are on "A" deck, the forward end of which is enclosed with a bow-fronted screen with vertical slide windows which protect the deck-house. The ship's café is also bow-fronted, and faces on to the sports area of the promenade, overlooking the swimming pool, which is sunk flush with the deck.

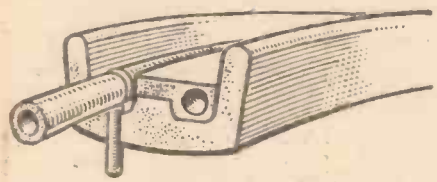
Our illustration, Fig. 7, shows a close-up amidships view of a model of the *Rangitoto*, two of which, both to a scale of ⅛in. to 1ft., have been built by Bassett-Lowke, Ltd., to the order of Vickers-Armstrongs, Ltd. Two similar models have also been built by this well known model-making firm of the sister ship, *Rangitane*, one to the order of Vickers-Armstrongs, and the other to the order of John Brown & Co., Ltd.

It will be interesting to note how this new type of one-class passenger cargo vessel is received by long-distance sea travellers.

Trade Notes

Fox Wired-on Rims

THE Fox rim, introduced for the first time into this country, is a new development in wired-on rims. The bugbear of removing and replacing a wired-on tyre, with the need to use tyre levers, and the risk of nipping the inner tube, is eliminated. With a Fox rim, the tyre and tube can be removed by hand, without effort, and replaced just as easily. As shown in the accompanying illustration, the Fox rim has a deep well base, which gives sufficient extra depth to allow the wired edge of the tyre to sink in, allowing



A cross section of the Fox rim, showing the deep well base and the rubber rim tape and detachable ring.

that much extra clearance on the other side of the rim, so that the tyre can be lifted off with the fingers.

The well base is fitted with a double rubber rim tape. One tape is shaped to fit the base and one well, and fully protects the inner tube against projecting nipple heads and spoke ends. The other rim tape is in the form of a rubber ring, which is detached first, to give the necessary clearance for the tyre to be removed easily.

The rim itself is perfectly round, and truly balanced, as it is machine-turned. The rim is light, rigid and robust, due to the high quality of the duralumin alloy used, the large sides of the rim, and the central stiffening web. Another refinement is the special washer under each nipple, which transforms the nipples into ball-and-socket joints, so that, when the spokes are tightened up, no unequal strain is thrown on to the rim. The Fox rim is available in size 27in. by 1¼in., drilled 32-40 for English spoking. Further information can be obtained from Fonteyn and Co., Ltd., 14, Percy Street, London, W.1.

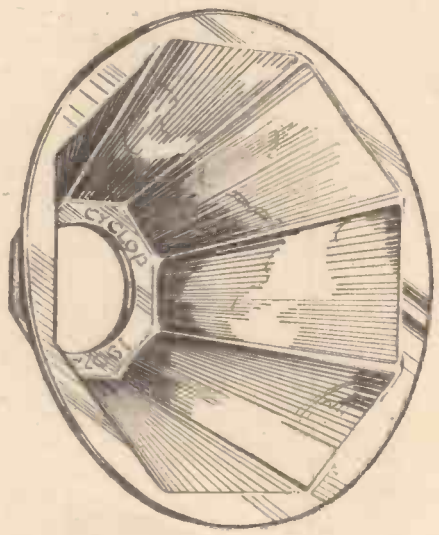
Multicraft Catalin

A HANDY stock list of Multicraft Catalin, a hard plastic of S.G. 1.30, has just been issued by Coulden and Smith, of 44, Manor Park Road, West Wickham, Kent. This plastic has excellent machining properties, and is made in a variety of colours, and a wide range of rods, cylinders, sheets and special sections especially suitable for the amateur mechanic, handyman and toy-maker. Catalin does not burn, is washable, tough, non-absorbent, oil and petrol resistant: yet you can readily fashion it with the same tools you now use for hard wood or soft metal. An inherent sparkle and depth of colour is brought out by the high polish taken by Catalin.

In addition to the numerous items which lend themselves to production throughout in this versatile material, there are many articles, such as handles, knobs, cases and trimming, where Catalin is ideal for use in combination with the more regular materials, metal and wood.

Cyclop Reflectors

MUCH attention is being given these days to ways and means of ensuring greater safety on the roads, and one way is improved lighting from cycle lamps. These lamps, fitted with ordinary parabolic reflectors usually throw either a narrow shaft of light, or a ring of light with a near-blacked-out centre. The new truncated pyramidal Cyclop reflectors floodlight the road with a wide beam of evenly spread light, thus lighting up the road clearly without any irritating differences of intensity of light. An important point worth noting is that if one of these reflectors is used in a front lamp fitted with a red glass, a powerful rear lamp would be thus provided. Such a rear lamp by itself would be more visible to traffic behind, than the multiple safety com-



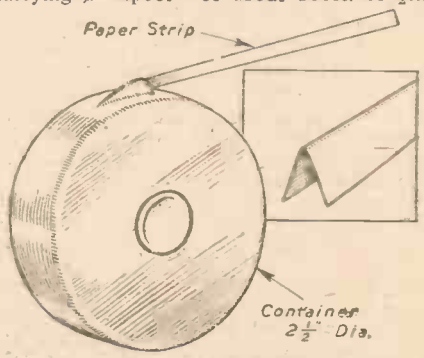
The Cyclop reflector which gives a flood of light with no "dead" areas.

bination of rear light plus white patch plus reflector. Two models of the Cyclop reflector are now available, one with 12 panels for use with dynamo lamps, up to 3½in. diameter, and a further model with 8 or 12 panels for use with all standard battery lamps. Cyclop reflectors are manufactured by Korving, Ltd., 12, Duke Street, St. James's, London, S.W.1, and are obtainable from most dealers, priced 1s. 6d. for the eight-panelled battery model, and 2s. 6d. for the 12-panelled model.

A Compact Spill Holder

A NOVEL and compact spill holder has been introduced by Mr. S. James, of 137, Cob Lane, Bournville, Birmingham, 30.

The device consists of a bakelite, or metal, container, approximately 2½in. in diameter, carrying a "spool" of about 100ft. of ½in.



The new spill holder.

paper tape. This tape is withdrawn through a shaped aperture which creases it longitudinally so that a length will remain rigidly extended (somewhat after the style of the spring rule) and may thus be lighted and used as a spill for many purposes. Specimens have been tested, and it is found that one "spool" gives about six months' use, and that it forms a neat and useful gadget either in the kitchen or in the "smoking" room.

The spill holder is covered by Patent No. 616366.

British Railway Colours

A NEW range of paints and enamels in authentic colours from official samples, have been introduced by Bassett-Lowke, Ltd., of St. Andrew's Street, Northampton. These paints are specially produced for model-makers and are of the finest quality. They are classified as follows:—

Locomotives

Blue for Express Passenger Steam and Electric Locomotives.
Dark Green for selected Express Passenger Steam Locomotives.
Black for Passenger, Mixed Traffic and Freight Steam, and Mixed Traffic Electric Locomotives.
Green, Electric Stock.
Per 5 oz. Airtight Tin. 2/10d. (Postage 4d.).

Passenger Coaches

Crimson Lake for all vehicles.
Cream for use with Crimson Lake on all Main-line Coaches on principal trains.
Light Grey for roofs.
Per 5 oz. Airtight Tin, 2/10d. (Postage 4d.).

Orange Lining for Locomotives.
Gold Lining for Passenger Coaches.
Per 1 oz. Metal Screw Top Glass Jar, 1s. 3d. (Postage 3d.).

Cyclop Pump Clips

There was an inaccuracy in the name and address of the makers of these clips as given on page 138 of the January issue. The firm, of course, is Korving, Ltd., 12, Duke Street, Piccadilly, London, S.W.1.

QUERIES and ENQUIRIES

A stamped, addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 40 (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.

Red Mercury Sulphide

HAVING a quantity of mercury, I have made several attempts to make the sulphide by heating together with sulphur, but instead of getting what I was expecting—vermilion, I merely got a black, charred mass.

Would you please tell me what is the cause of this?—G. Tapley (Manchester).

WHEN mercury and sulphur are ground together, or heated, black mercury sulphide, HgS is obtained. Hence the black, charred mass which you have obtained is black mercury sulphide.

If this is sublimed it will be converted into the red variety of mercury sulphide. To do this, place it at the bottom of a large crucible and heat it moderately. Allow its vapour to impinge on a cool surface, on which it will condense in the form of scarlet micro-crystals. Be careful not to breathe the vapour, since, like all mercury compounds, it is very poisonous.

The black sulphide can also be converted into the red variety by gently heating it for several hours in a solution of sodium or potassium sulphide. A soluble double sulphide is first formed, but this splits up again, with the production of red mercury sulphide.

Ink for Typewriter Ribbons

CAN you inform me what causes black typewriter ribbons to dry out so quickly, even with little or no use?

Is there any way to regenerate such ribbons, say, by impregnating, and how can this be practically done by an amateur?

Also, what sort of ink is used for typewriter ribbons, from where can such ink (in small quantities) be obtained, and what is it likely to cost?

Is there any other way to prolong the life of such ribbons?—A. R. Weyl (Dunstable).

THE impregnating ink of typewriter ribbons is made up on an oily basis. If the oil is not sufficient in quantity, or if it becomes semi-oxidised, the ink loses its plasticity and becomes "hard" or "dried." This is the underlying reason for the effect which you describe. It should not, however, occur in ribbons of good manufacture.

There is no very satisfactory process for regenerating such ribbons. However, for what it is worth, here is one process which has been suggested for regenerating purposes:

Make up a mixture of equal parts of oleic acid and neatsfoot oil. Moisten the fingers with this and pass the ribbon inch by inch between the fingers. The difficulty here is, of course, to get the correct and uniform amount of the regenerating mixture on to the ribbon fabric. If too much is used the ribbon will become impossibly messy.

Failure with typewriter ribbons comes usually not as a result of a drying up of the ink but from mechanical disintegration of the ribbon. Hence the only way to prolong the life of a ribbon is to avoid a heavy and snatchy touch at the typewriter. It is to be observed in this connection that the silent typewriters, which operate in virtue of a pressure contact of the type with the ribbon instead of the more usual impact contact, have a greater life because they are less subject to mechanical disintegration.

The ideal, wear-proof ribbon fabric has, of course, still to be evolved.

Typewriter ribbon ink is not sold to the public. You can, however, prepare this substance for yourself from the following formula:

Petrol	100 parts
Carbon black (finest)	30 ,,
Oleic acid	20 ,,
Medium thin mineral oil ..	5–10 ,,

Grind the carbon black with the oleic acid. Then add the mineral oil. Finally, thin the mixture down with petrol (not all the above-stated amount may be required). It should be pressed into the ribbon fabric by means of pressure rollers, the lower roller revolving in a small bath of the ink.

Enamelling a Bath

CAN you please inform me if there is some method of treating a zinc bath before painting, so that the paint can take a grip? I have tried rubbing it with emery paper, then applying a flat paint before the bath enamel, but it only lasts a few weeks before it starts peeling off.—G. R Alexander (Edinburgh).

YOU should not have any trouble in enamelling your zinc bath; and, incidentally, when you refer to a "zinc" bath we presume that you mean a galvanised one, that is to say a zinc-coated bath.

Instead of using emery paper for roughening the surface it would be better to employ a solution of caustic soda of strength, say 1 part caustic soda in 5 parts of water. Use the solution warm. Swill it round the sides of the bath, mopping it on the sides by means of a piece of rag tied to the end of a wooden broom handle. Then rinse all traces of the solution away most thoroughly with plenty of fresh water and wipe the bath dry with a clean cloth.

When dry, give a thin coating of a grey priming paint. Let this dry dead hard, and then place on it a thin coating of the enamel paint. This, also, should be allowed to dry dead hard, a process which may take several days. You should now have an enduring base on which you can give two lasting coats of the surface enamel. If, by any chance, the enamel film should begin to peel off, then the fault lies with the composition of the enamel and not with your treatment of the bath.

Making Bath Salts

I AM informed that bath salts can be made very cheaply with common soda, colouring and scent. I shall be glad if you can let me know the correct ingredients, the proportionate quantities and the method of making the bath salts.—A. R. Walton (Lincoln).

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.

FOR the making of bath salts you can use common washing soda, but you will get rather better results if you use sodium sesquicarbonate, which is obtainable from Messrs. B. Laporte, Ltd., Luton, Beds, price about 2s. per lb. The basic formula of bath salts is:

Sodium sesquicarbonate (or sodium carbonate—washing soda) ..	99 per cent.
Perfume	0.5 per cent.
Dye	0.5 per cent.

Dissolve the carbonate in hot water. Strain the solution (if necessary) and put it away into a large shallow basin to crystallise. Strain off the liquid above the crystals, and then spread the crystals on a tray to dry slowly. Do not try to dry them by heat.

There are two ways of applying the perfume and the dye. The perfume can be dissolved in spirit (surgical spirit will do) along with the dye, and the crystals can be immersed in this solution, or, alternatively, and perhaps better, the dye-perfume solution can be sprayed on to the drying crystals.

To make up the dye-perfume solution, the following formula is suitable:

Spirit (rectified or surgical, but not methylated)	90 parts.
Dye	5 parts.
Perfume	5 parts.

Any compounded spirit-soluble perfume oil will be suitable. Naturally, also, the dye must be spirit-soluble. The following dyes are recommended: Chrysoidine R (orange), Acridine Orange R, Safranine GR (yellow), Methyl Violet, Brilliant Green, Methylene Blue, Acid Scarlet. Most of these dyes can be obtained from any chemical wholesaler, as, for example, Messrs. Vicsons, Ltd., 148, Pinner Road, Harrow, Middlesex, price about 2s. per oz. Compounded perfumes are much dearer, and they are subject to purchase tax. A plain Oil of Spike (lavender perfume) or, better still, a true Lavender Oil might be best here, and would not be subject to purchase tax, being uncompounded.

Iodine Crystals

I WOULD be much obliged if you could give me a formula for making iodine crystals. I am given to understand that liquid iodine is made from these crystals. Is this correct?—G. A. King (Newark).

YOU cannot "make" iodine. Iodine is an element. It is abstracted from its natural sources, which comprise various salts of iodine. It is, therefore, in no way a "made" or a synthetic product.

The liquid "tincture of iodine" which you buy at the pharmacies is nothing more than a solution of solid iodine in alcohol. Hence, you are quite correct in saying that the "liquid iodine" is made from iodine crystals.

Solid iodine takes the form of bluish-black metallic-looking crystals which are only slightly soluble in water, but dissolve readily in alcohol or spirit. If a little free potassium iodine is in the solvent, the iodine dissolves more readily and stronger solutions can be made.

You can obtain solid iodine from tincture of iodine merely by allowing the solution to evaporate in a warm place, or by gently heating it. But here you will have to be careful, because even the solid iodine crystals are very volatile, and they will go off into a violet vapour whenever their temperature is substantially raised.

Solid iodine crystals can be purchased from any chemical dealer such as Messrs. Vicsons, Ltd., 148, Pinner Road, Harrow, Middx., the current price of the crystals being about 2/- per oz.

Copper-plating Lead-Alloy Castings

FROM time to time I make for my own use small quantities of metal castings, which are of small size (up to 2in. long), and are cast after the manner of making toy soldiers, etc., making use of plaster of paris moulds. The metal used is lead and white metal mixed.

What I would like to know is how can I "plate" this metal with copper, giving it a coating which will be durable enough to take a little polishing?—G. Davies (Carmarthen).

YOU will readily be able to plate your castings by a very simple means. First of all the castings should be thoroughly degreased and made as smooth as possible. They are then plated in the following bath:

Copper sulphate ..	1lb.
Sulphuric acid ..	4oz.
Water	1 gallon

The castings are best degreased by passage through a hot caustic soda solution (strength immaterial), after which they are well washed. Each casting is made the cathode or negative electrode in the above bath, the positive electrode (cathode) being a strip of pure copper.

The bath is best worked slightly warm. Use a current of 2-3 volts E.M.F. This is best obtained from an accumulator, but if such is not available, a battery will suffice for occasional plating. Alternating current cannot be used. The current must be of the "direct" variety. About 15 minutes' plating gives an ample and well-adherent deposit of copper of a pleasing shade.

The plating bath will last almost indefinitely, for as the copper is deposited at the cathode, an equivalent amount is dissolved from the anode.

Magnifying Emanations from Pitchblende

I HAVE a piece of pitchblende fitted with a luminous zinc sulphide screen 1¼in. square. In total darkness, with the aid of a single lens microscope, the emanations from the pitchblende give a scintillating effect.

I want to magnify these about 100 per cent., keeping the same 1¼in. square area under view.

What kind and make of microscope would I need to obtain this result, and where could the same be obtained? Would radio-active salt give off the same emanations as pitchblende, and what would be the probable cost?—W. Aldcroft (Manchester).

IN order to get the result which you desire with your pitchblende screen, you require a microscope fitted with a 1in. object lens. This would give very good results in a darkened room. Alternatively, you could use one of the compound hand-magnifiers of magnification about x10. These, we think, you will be able to obtain from Messrs. Haldens, of Albert Square, or Messrs. A. Franks, Deansgate, Manchester. Microscopes are very difficult to obtain at the present time. You might be able to get a second-hand one from the latter firm, or from Messrs. C. Baker, High Holborn, London, W.C.2, or Messrs. Broadhurst, Clarkson & Co., Ltd., Farringdon Road, London, E.C.4.

Any radio-active compound would give off similar radiations, which would be rendered visible by means of your zinc sulphide screen. A good radio-active preparation would cost about 25s. per gram, and could be obtained from Thorium, Ltd., Amersham, Bucks., but, unfortunately, you would have to obtain a special permit for this purpose, for the sale of all radio-active preparations has been restricted.

Fixing Oak Weatherboarding

I INTEND fixing English oak weatherboarding to a timber frame, and also oak laths for roof tiling.

I understand that acids in oak attack ferrous alloys and have myself noted discoloration of the timber where it has been in contact with some ironwork. I shall be glad if you will answer the following queries bearing on this subject:

Are wire nails likely to deteriorate completely within 20 years?

Would galvanised nails resist attack, and if so, is there a thin gauge in the market to avoid splitting the boarding?

Also, can you suggest a reasonably cheap way of fixing the boarding and the laths?—E. G. Ansted (Stapleford).

IT is quite true that oak (particularly the moist, unseasoned wood) will attack iron and therefore produce discoloration in the wood. It will do the same with zinc, brass, copper and other metals. From a practical standpoint, however, the chemical attack is very slight, and is of no material consequence. Iron or galvanised nails will not materially deteriorate after being 20 years in oak. We ourselves have many a time extracted old wrought-iron nails which have been in English oak since Cromwellian days—that is, for approximately 300 years, and, although the nails have rusted away where they have been exposed to the air and moisture, those portions of the nails which have been in contact with the wood have invariably been in good condition, although covered over with a black coating of iron tannate which, rather than anything else, is actually protective in nature. Hence, iron nails which you may drive into oak will not materially deteriorate in your lifetime—even if you live to be a hundred! The same applies to galvanised nails.

To fix the oak boarding and laths to the timber frame nails can be used quite well. The wood should be pre-drilled throughout and the nailheads should be sunk a little below the level of the lath surfaces, the small depression resulting in the wood surface being neatly filled up with any filling compound which may be handy. A hard "wax stopping" in various colours may be had from Messrs. James Beard, Ltd., 16, Great Ancoats Street, Manchester. This, like sealing-wax, is gently melted into the holes.

Lead and Antimony Alloy

I HAVE some scrap lead of doubtful origin, and I wish to make small lead castings from this metal, but the final casting must be tougher than pure lead. Tin is too expensive, so I intend to use antimony to toughen it.

Can you tell me: (a) How to introduce the antimony to the lead, and at what temperature? (b) How high can I raise the resulting temperature of the alloy above the melting point of the alloy without detrimental effect on the alloy? (c) Will either Ni or Si crucibles stand up to these operations? (d) What percentage of Pb is contained in antimonial Pb scrap?—C. W. Russell (West Bridgford).

IN order to alloy lead with antimony use an iron, graphite or plumbago crucible. Melt the antimony first at a temperature of about 650 deg. C. In another crucible melt the lead (M.P. 326 deg. C.). Add the molten lead to the molten antimony very slowly, stirring with an iron or a wooden rod. When all the lead has been added, cool the alloy quickly to about 375 deg. C. Then allow it to cool to its freezing point more slowly and with constant stirring. Nickel or silica crucibles will be perfectly suitable for the above work, in addition to the ones previously mentioned.

Between 2 and 7 per cent. of antimony is contained in antimonial lead.

You cannot raise the temperature of the alloy above its melting-point without burning (i.e., oxidising) some of the lead, which oxide will form a skin on the surface, but provided that the molten metal does not exceed, say, 450 deg. C. in contact with air, little harm will come to it unless, of course, the heating and exposure to air is very unduly prolonged.

Hand-painting on Silk

I WISH to know what is the correct type of paint, or a formula for the type of paint, to use in the hand-painting of silk or artificial silk (squares, ties, etc.). I have tried many different paints and combinations without success.—R. G. Cousins (Oxford).

FOR the hand-painting of silk materials use "cake" water-colours moistened with a solution of white dextrine in water, this solution being made by dissolving 1 part of dextrine in 1 part of water. This paint will not be washable.

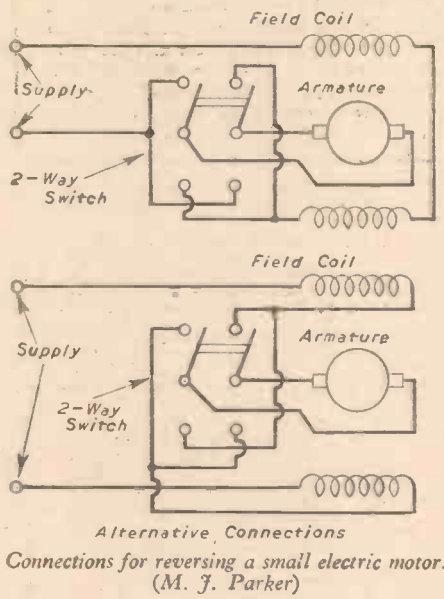
Washable paint may be made from ordinary cellulose paint thinned down with acetone and/or amyl acetate. This should be obtainable from your local paint shop, or, if not, from Messrs. Nobles & Hoare, Ltd., 3, Cromwell Road, S.E.1. Similar paints are, also, we think, obtainable from Dryad Handicrafts, Ltd., 42, St. Nicholas Street, Leicester.

You can also make a waterproof paint by dissolving gum arabic in water, and then by adding sufficient potassium bichromate to it to colour the solution yellow. This solution is then mixed to paint consistency with dry powder colours, and the painted article is exposed to strong light (preferably sunlight) for a few hours. The action of the light on the bichromated gum insolubilises the latter and thereby renders the paint water-resistant. The bichromated gum arabic solution should not be exposed to daylight, otherwise it will slowly become insoluble. It may, however, be exposed safely to ordinary artificial illumination.

Reversing a Small Electric Motor

CAN you please advise me on the following problem?:—

I recently purchased two small ex-Government surplus motors for driving small working models. These motors are supposed to be 24-volts D.C. and will, in fact, run off a 24-volt battery, but for some reason I cannot get them to reverse. I dismantled one, and the connections appear to be through the field winding to the brushes to the armature. I would presume it is series wound, and would be grateful if you can advise me how to alter this.—M. J. Parker (Knebworth).



Connections for reversing a small electric motor. (M. J. Parker)

IN order to reverse a D.C. motor it is necessary to reverse either the magnetic polarity of the field magnets or the direction of current in the armature windings, but not both. The polarity of the field magnets depends on the direction of the field current. It follows that a D.C. motor which has a permanent magnet field system is the only one which can be reversed by simply reversing the supply to the motor as a whole.

From your description it appears that the motor is a series machine, in which case it could be reversed by means of a 2-pole 2-way switch connected as in the accompanying diagrams.

Brightening Dips for Brass and Steel

I WISH to plate some small parts at fairly frequent intervals. I would rather not leave a cyanide bath about, but at the same time it is not convenient to make a fresh solution every time I wish to use it. Can you give me alternative baths for cleaning and brightening buff polished brass and steel parts prior to copper and nickel plating?—D. R. Diprose (Thornton Heath).

AS a brightening dip for brass and copper, the following bath is excellent:—

Sulphuric acid (S.G. 1.84)	.. ..	435 ccs.
Nitric acid (S.G. 1.38) ..	.. ..	75 "
Hydrochloric acid (S.G. 1.17)	.. ..	2 "
Water	.. ..	491 "

The bath should be made up accurately, adding the acids to the water in the order given. Very great care should be taken to see that articles removed from the acid bath are most thoroughly rinsed before being transferred to a cyanide plating solution, otherwise the excessively poisonous hydrogen cyanide gas might be disengaged by the action of traces of acid in the cyanide.

For iron and steel articles an acid dip consisting of hydrochloric acid and water (equal parts) is usually satisfactory. Surprising as it may seem, the addition of a little chimney soot to this acid bath acts as an inhibitor of the acid's action, restraining it from making too energetic an attack on the metal.

Wax for Gramophone Records

WOULD you please let me know of suitable compositions for high resolution, direct, recording on discs? I have found most waxes by themselves unsuitable.—G. Cramp (Harrow).

FEW technical materials have a more secret composition than the raw material of gramophone records. They are compounded of hard wax mixtures of resins, shellac, fillers and black pigments. Synthetic resins are sometimes added in some instances.

You will have to work for yourself in devising the most suitable compound for your purpose. Start off with your wax mixture, say 3 parts prime yellow carnauba wax, 1 part candillila wax, 1 part beeswax. Melt this up carefully, and add about ½ part resin and, when molten and mixed with the wax, add ½ part fine shellac powder. The whole should then be pigmented with lampblack powder. If the resulting compound is too soft, add more carnauba wax, and, conversely, if too hard, more candillila wax. If the smooth surface of the wax tends to drag, incorporate a little (say ½ part) of stearic acid with the mixture.

Lampshade Making

I AM making some lampshades of the paper parchment variety, and would like to know how to obtain the crackled effect sometimes seen on these.

Could you also tell me what to use, and how to apply the plaster effect edging on top and bottom of these? (I assume that plaster of Paris is not used.)

Finally, where could I obtain real parchment, and what is its approximate cost per square foot?—J. McGoldrick (Glasgow).

THE crackled effect on lampshades is obtained by coating them with a fairly thick varnish and then by subjecting the material to a controlled heat, which causes the varnish to deteriorate partially and to "wrinkle" and "run."

A dammar varnish (to be had from a local dealer in artists' materials) will give this effect after the varnish film has been heated in a warm oven for a few hours. A varnish made by dissolving resin in hot paraffin oil will give the same effect. Many synthetic resins can also undergo similar treatment.

The "plaster effect" to which you refer is merely a form of "gesso," which is a very old artists' material. It is made very simply by grinding together about equal parts of whiting and zinc oxide. This will give a dead white effect. If a cream effect is desired, grind into the mixture a trace of yellow ochre pigment.

Dissolve 4 parts of glue in 96 parts of hot water. Using this hot solution, make the mixed and tinted powder into a paste about the consistency of thin mortar. This is the "gesso." It is "trowelled" into position by means of a small steel spatula and it is left overnight to dry. It is a very durable material.

Genuine parchment (NOT parchment paper, which is a mere imitation) is prepared from sheepskins. It can be obtained in various grades and colours and thicknesses from Messrs. G. W. Russell & Sons, Ltd., Hitchin, Herts. It is sold only in whole skins, the price being about 12s. 6d. to 15s. per skin. For really artistic lampshade work, this is undoubtedly by far the best material to use. Remember, however, that the effect of prolonged heat on parchment is to render it brittle and liable to break up. Too much heat also turns it darker in colour. Furthermore, parchment will not withstand washing.

Bonding Agent for Cork Granules

I HAVE a quantity of scrap cork obtained from expanded cork insulating slabs. This material appears to be manufactured from expanded cork granules which are bonded into slabs and blocks by the use of a binding medium together with the aid of heat and pressure.

I should be grateful if you could tell me how I could go about re-manufacturing the scrap pieces into new blocks. Can you tell me what binding medium is used and at what pressure the blocks are squeezed; also the temperature at which the blocks are baked? I should also appreciate it if you would suggest a method of breaking up the scrap pieces prior to re-manufacture. It has occurred to me that there might be a solvent which would dissolve the binder and allow the scrap pieces to fall apart into their component granules.—J. A Stewart (Paisley).

VARIOUS bonding agents are used for cork bonding. Nowadays, these are usually of the synthetic resin type, many of them being soluble in hydrocarbon liquids. Thus, you will probably be able to break up your scrap cork slabs by soaking them in warm paraffin oil. This will dissolve out the bonding agent. The cork material is then withdrawn from the solution and spread out to dry, after which it can very readily be crumbled to a coarse powder.

Cork resists pressure to a considerable extent. Hence, the pressure used for its bonding has to be fairly heavy—from ½ ton to 1½ tons per square inch, which pressures can only be effected in a hydraulic press, the cork material being packed into steel moulds. Cork *can* be bonded at lower pressures, using about 10 per cent. of any water-insoluble resin dissolved in a suitable solvent, but the resulting compaction is not good, and the bonded material soon disintegrates.

You will be able to obtain particulars of a synthetic resin bonding agent from Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1. Possibly, too, I.C.I., Ltd., London, S.W.1, may be able to supply a suitable solution for bonding purposes. You cannot, however, hope to produce or formulate any of these resinous bonding materials yourself.

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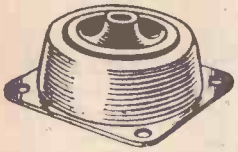

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THE Cyclist
Editor: F. J. CAMM

VOL. XVIII FEBRUARY, 1950 No. 335

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Comments of the Month

By F. J. C.

BELLS AND BRAKES

AT present a cyclist is not compelled to fit brakes to his cycle, nor need he fit a bell. No manufacturer, however, would think of marketing a bicycle without brakes, usually a pair of them. Where a fixed wheel is used a front brake only is necessary, but even so most riders of such machines also fit a rear brake. There is the risk, of course, when the pedals are used to retard motion that the chain may break, but that is a very minute risk if the chain is kept in good condition and renewed when it shows signs of wear.

Although the conditions of the law are satisfied if a cyclist gives audible warning of approach by shouting, for example, most of them carry a bell.

In view of this satisfactory state of affairs is any change in the law necessary? A contributor to a daily paper suggests that there should be, and that the Minister of Transport might make some fresh laws under the Road Traffic Act of 1930 to make the fitting of brakes and bells compulsory. Now, a Minister should only make laws if the existing state of affairs makes such changes necessary, and we are yet to discover any considerable volume of evidence that accidents to, or caused by, cyclists are due in the main to lack of bells or lack of brakes.

All free-wheel machines are fitted with two brakes and a law therefore as far as that is concerned would be unnecessary. As far as a device for giving audible warning of approach is concerned any law which merely forced cyclists to fit a bell would be absurd, for a bell would not be satisfactory under modern traffic conditions. Therefore cyclists, if such a law becomes fact, might be compelled to fit a weighty horn to add to the general din on our roads to-day. We must remember that it is illegal under certain conditions for a motorist to sound his horn at all except to avoid an accident, and after 11 p.m. at night horns may not be sounded at all. What is the need therefore for disturbing a set of conditions which are entirely satisfactory?

FOREIGN TOURING CONCESSION

THE Alliance Internationale de Tourisme has secured for cyclists going on continental tours a concession which should be of benefit to them. As from March 1st they will be able to take their bicycles into Switzerland without any formalities whatsoever. This condition already applies in the three western occupation zones of Germany. The A.I.T. has for a long time concerned itself with the elimination of frontier restrictions. It is possible that Italy will also fall into line. Negotiations are already in hand with Czechoslovakia. Thus, cyclists now have a free passage across most of the frontiers of European countries.

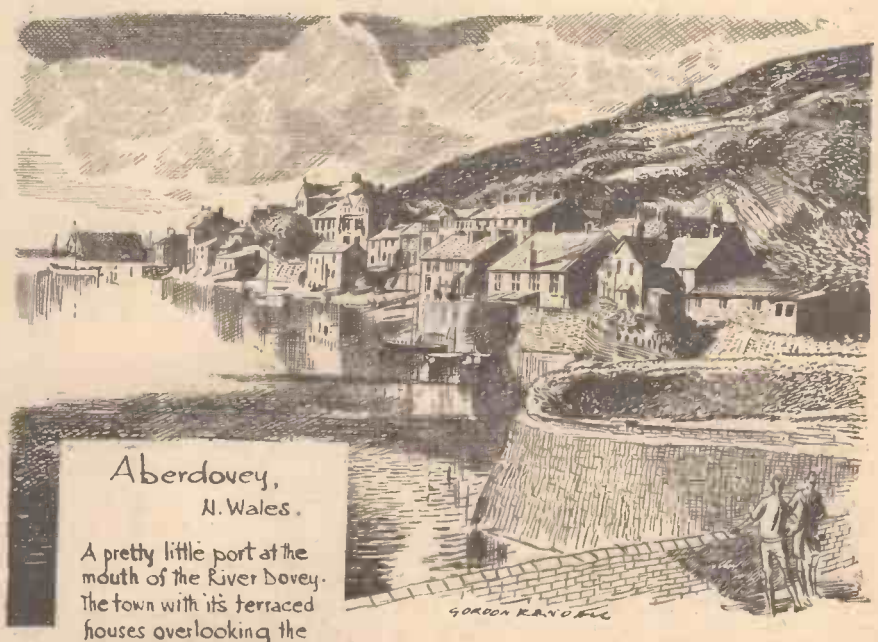
COMPULSORY INSURANCE

ONE of our vigilant readers has sent us a cutting from an insurance weekly in which a contributor suggests that the whole question of compulsory insurance for cyclists is likely to be raised in the near future. We quite thought this question had been suitably interred after the careful consideration given to it from time to time by successive governments. For, of course, a sound case cannot be made out for it. There are cases in which cyclists are responsible for accidents, but they are usually trivial in character. We are surprised that this insurance "expert," who has the experience of motor-car insurance from which to draw, is so ill-advised as to raise a matter which is bound to embarrass the insurance companies themselves. The very small annual sum which could reasonably be imposed on cyclists would raise *in toto* something less than £250,000 a year from which to meet claims which, over the whole country, would probably not amount to more than £20,000. We know the cost of administering State insurance, and the remaining £230,000 would be quite inadequate to meet the costs of collection, and the salaries of the various officials necessary to staff a new department. The insurance companies certainly do not wish to be troubled with small business of this sort, for under their existing knock for knock agreements (which really mean that it is cheaper for each insurance company to pay the claims, than to fight it out in the courts, irrespective of who is in the wrong) they would be paying claims out of all proportion to the total sum collected from cyclists. We do not think that compulsory insurance for cyclists is contemplated. Certainly it cannot be justified. Indeed, it was because so many cyclists were injured by motorists who proved to be men of straw that compulsory third party insurance for motorists was introduced some years ago. The thought that cyclists are likely to cause damage to motorists, and that therefore compulsory insurance should apply to them, is too ludicrous to contemplate.

OPENING OF CAR DOORS

READERS will remember the decision of the Court of Appeal that a motorist who had carelessly opened the offside door and brought a cyclist down was not guilty of negligence since he was not driving the car at the time. The police were not satisfied, however, with this decision, and they took the matter before the King's Bench Divisional Court, with Lord Justice Goddard as judge. In his judgment Lord Goddard gave it as his view that the motorist in the particular case was not charged with being a negligent driver, but that he was negligent in opening the car door as he did and therefore the magistrates were wrong in their decision. The appeal was allowed.

The Gilbertian aspect of the matter is that cyclists have always recovered damages against motorists in such cases, and this is tantamount to an admittance of negligence. The point at issue was whether magistrates have power also to impose a fine. Lord Goddard has made it quite clear that they have. There is no suggestion that the matter will be taken to the House of Lords.



Aberdovey, N. Wales.

A pretty little port at the mouth of the River Dovey. The town with its terraced houses overlooking the estuary are shielded from the north by high hills,

Paragrams

Alnwick.

The great Northumberland fortress dating from Norman days and the home of the Percys. The castle is said to cover five acres.

Speed Models!

A HERTFORDSHIRE man is the proud possessor of two of those early cycles which were built apparently neither for comfort nor speed. One is a Phantom Velocipede, some 80 years old and the first "safety" to have rubber tyres. The other relic is an old boneshaker which came out years before the penny-farthing. It has a diamond frame, wooden wheels and iron tyres, and really does live up to its name. As an instrument of torture, on the roads of its time, it must have been unequalled.

Wheels Beat Feet At Last

FOR the first time in the third of the annual cross-country scrambles organised by the Boston Cycling and Atheltic Club between cyclists and runners, the cyclists proved the winners. On the two previous occasions the runners won easily, but this time the cyclists filled the first four places. Only one cyclist failed to complete the course, and he had to fall out because of a buckled front wheel. There were seven cyclists and nine runners at the starting-line and the cyclists, who this year did not have to contend with so much mud and water, quickly got the lead and held it throughout.

Another Family Model

A SOUTHAMPTON man, who set out to build himself some means for transporting himself and his family into the country, decided to make a new kind of tricycle. After quite a bit of planning he produced a 3-seater tricycle with two wheels in front and one at the back. Father sits on the offside behind a car-type steering wheel, mother sits on the nearside with a pair of handlebars, and the daughter sits at the rear. Father and mother both pedal, but father has been thinking of adding a small power unit to reduce the strain on the family's leg muscles.

No Cyclists on Council?

A SUGGESTION that the old cobblestones in the Market-place at Newark, Notts., ought either to be dug up and thrown away or covered with a tarmac surface has been rejected by the Town Council by a large majority. The council feel that the cobblestones are one of the features of ancient Newark and should not be disturbed. One woman councillor remarked that no other town in the country has a market square like that at Newark.

Prop for Cycles

THE police of Paris are tired of parked cycles falling round their feet like autumn leaves and police headquarters have now issued an order that every cycle used in the city must be fitted with a special stand which will prevent the machine falling over when it is parked. Cyclists caught leaning their machines against walls, trees and shop windows or poising them by one pedal against the kerb will be fined.

Those Level-Crossings

THE Isle of Ely County Council have once more been considering the question of the 80 or so "unlevel-crossings" in their area, which are all considered to be a danger to road users. An alderman, who said the work needed doing without delay, told the council that the crossing at Chettisham was the worst in England; but a colleague promptly said he would take him to see one that was even worse. The County Surveyor is to negotiate further with the Railway Executive to see what can be done before the level crossings are strewn with bodies.

More Ironmongery

THE American boy, who cannot believe a bicycle is a bicycle unless it looks like some mechanical horror, can now buy a length of metal tubing to attach to his rear forks and make a bit more weight for him to push around. This flashy piece of tubing, described by its ingenious manufacturers as a "Strato-jet bike exhaust pipe," is supposed to give the cycle the appearance of being jet-propelled. By fitting this horror to one's machine, one immediately becomes "the envy of the neighbourhood," and the proud owner "adds tremendously to his biking fun."

Coincidence?

A CYCLIST the other day decided to give himself a treat so he bought a new cover and tube for his rear wheel. Both were of well-known makes, but the tube went soft after a few hours. After a few days of changing valve rubbers and pumping, the cyclist inspected the tube and found the join had not been properly finished and was leaking. He took it back to the dealer and changed it for another tube, also of a well-known make. This tube was in a rideable condition for four days and then it burst. The hole was repaired, but the only consolation received from the cycle agent was: "We get a lot of complaints about inner tubes these days."

Fine!

FOR a month, cyclists, motorists and pedestrians in Kings Lynn, Norfolk, have had the opportunity of being caught observing the Highway Code instead of disregarding it. Policemen with cameras have been taking photographs of the traffic in the streets at intervals and the enlarged pictures have been displayed in a shop window. Those people in the photographs who were marked by the police as being well-behaved on the road could collect 5s. from the police station. These good behaviour prizes were given by the local council, so the Kings Lynn citizens have had a chance of getting back a little of what they have paid in rates.

She prefers Tricycle

MRS. MONA HOLLOWELL, 32-year-old member of Peterborough Cycling Club, feels there is quite a fascination about riding a tricycle. Fellow-members persuaded her to "have a go" about a year ago, and since then she has put up some good times over measured distances. She claims, unofficially, to have beaten the women's national championship record for 30 miles with her recent time of 1 hr. 41 mins. 47 secs. Her eight-year-old son may decide to follow in mother's footsteps, as at the moment he gets around quite a bit on his own tricycle.

New World Cycling Record

IT is learned that A. van Vliet, of Holland, has recently set up a new world cycling record at an indoor meeting at Zurich, when he covered a one-kilometre stretch in 1 min. 9.4 secs.

Although only outdoor track records are recognised officially, his time is the best ever recorded. The outdoor record is held by Reg. Harris (1 min. 9.8 secs.), who came in tenth in 1 min. 13 secs.

No Slacking

TO keep himself in training, Dennis Probert, champion rider for Skegness Wheelers, whose home is in Skegness and who works in Boston, regularly cycles every day the 46 miles to and from his work in order to keep himself in trim for racing. He has won a number of local events recently and has established new records for his club, so his recipe for keeping fit seems to be a very useful one.

Ideas from Sweden

A KETTERING business man, Mr. Jack Mobbs, recently returned from a visit to Sweden, has brought back with him a novel combination cycle lock. In appearance it is roughly like a handcuff, and it is fastened to the frame of the cycle above the rear mudguard so that the opening of the lock extends over the rim of the rear wheel. When the lock is fastened the wheel is firmly clamped and is quite immovable and, as the lock has several hundred different combinations, any would-be thief is going to be kept busy for a very long time. Mr. Mobbs was also interested to notice in Sweden that all the railway stations of any size have their own covered cycle parks in which travellers can leave their machines.

St. Neots' Club Dinner

TWO of the country's outstanding riders of the year, Ken Whitmarsh (Southampton Wheelers), second-best all-rounder in Great Britain, and Bob Wynott (North Road Club), the 1949 winner of the North Road "25," were among the guests at the annual dinner and presentation of prizes of the St. Neots and District Cycling Club, at St. Neots, Hunts. Also present were representatives from Luton Wheelers, Cambridge Road Club, Century Road Club, Beds Road Club, and the Ouse and Kym Valley Athletic Club. Ken Whitmarsh was described by one speaker, Mr. C. H. Paget, as an example to all racing cyclists. He said: "He rides all the year round, races and rides with his club and always rides to a schedule."

Around the Wheelworld

By ICARUS

Average or Aggregate?

ONE of my readers presents me with the following problem: A cyclist rides three miles non-stop, covering the first mile in three minutes, the second in five minutes, and the third in two minutes. Therefore the total time is ten minutes and the total distance three miles.

From this the average speed is obviously 18 m.p.h. Now comes his query. Why is the following not correct?

1st mile, 3 minutes = 20 m.p.h.
2nd mile, 5 minutes = 12 m.p.h.
3rd mile, 2 minutes = 30 m.p.h.

$$\text{Average } 20+12+30=\frac{62}{3}=20.66 \text{ m.p.h.}$$

He wants to know why! The answer to it is an implied criticism of the formula used to find the best all-rounder. Looking through our files I find that the Editor dealt very fully with this problem on page 81 of our August, 1946, issue. Under the conditions enumerated the average speed is obviously 18 miles an hour. The second example (20.66 m.p.h.) is merely an average of the average speeds, and certainly does not find the best all-rounder. Here is the example which the Editor gave in our August, 1946, issue:

A Two-Distance B.A.R.

	1 mile Avg. Min.	(m.p.h.)	100 miles Avg. Hrs.	(m.p.h.)	Avg. Speed (m.p.h.)
B. Bloggs ..	3	20	5.0	20	20
H. Hotcog ..	1½	40	20.0	5	22.5

H.H. could take as long as he likes over the 100 and his average would still be better than B.B.

I am aware, of course, that the figures given would not occur in practice, but if the B.A.R. formula is right it should yield the correct result in all circumstances.

The fallacy in the second argument raised by my correspondent is that as the cyclist did not ride for one hour at 20 m.p.h., one hour at 12 m.p.h. and one hour at 30 m.p.h., he obviously could not have ridden at an average speed of 20.66 m.p.h. The cyclist rode the first mile in three minutes, and 3/10ths of 20 is 6, 5/10ths of 12 is 6 and 2/10ths of 30 is 6. The sum of 6 plus 6 plus 6 is 18, as in the first example.

Old Bicycles

APROPOS my paragraph in the December issue dealing with a reader's bicycle which is 27 years old, Mr. L. A. Duke gives a further example of bicycle longevity. He has a machine 44 years old and it has been in regular use for pleasure cycling. It is made of B.S.A. fittings supplied at a time when B.S.A. were not making bicycles. The machine had replacements, of course. The reader estimates during the 44 years he must have travelled over 200,000 miles on it.

Cyclist Look-outs

WHEN rubber-tyred vehicles first appeared in Birmingham, a member of the Municipal Council suggested that these vehicles should have automatic bells ringing whilst being driven through the streets. This story was told by Mr. Shankland, whose paper was read recently before the members of the Institute of Transport. Mr. Shankland was associated with Mr. Charles Challener, who invented a method of mounting solid rubber segments to metal-tyred wheels, an important stage in the evolution of the commercial vehicle tyre. The method of securing these rubber sections was rather crude and in the experimental stages it was not unusual for a cyclist to ride behind steam lorries fitted with "test" tyres to warn the driver should the rear tyres show signs of parting company from the wheels.

Heavy or Light?

ONE of my readers disagrees with the recent statement in this journal that a heavyweight bicycle is easier to maintain in motion than a lightweight, the only advantage being that the lightweight is easier to start and to stop. My critic thinks that if this is so the best thing to do is to use a massive solid frame, an engine as heavy as possible, using the latter merely to get started and then under leg power to skate past all the lightweights with ease! He cannot see that the equation $M=mv$. helps, for, assuming v to be constant, then M must increase proportionately to m. In strict theory and ignoring tractive resistance, extra pressure on bearings, etc., it can undoubtedly be shown that once moving, a heavyweight requires no extra propulsive effort above that required for a lightweight. Against air resistance to keep v constant implies a constant acceleration, and since H, says my correspondent, has greater inertia than L, more effort must continually be exerted. My correspondent does not want to believe that heavyweights have any advantage over lightweights and erects the usual Aunt Sallies. I suggest that he studies an elementary text-book on mechanics, when he will quite easily perceive the fallacy of his arguments about solid frames and heavy engines.

The 1949 Concert and Prize Distribution

PROMOTED by the Road Time Trials Council, to honour the British Best All Rounder, and the National Cycling Champions, the above concert was held at the Empress Hall, Earls Court. This was generally conceded to be a more suitable venue than the Albert Hall (writes E. Coles-Webb), where it was held for several years. Another welcome innovation was the change from evening to afternoon, thus giving better opportunity for return travel to provincial visitors. The concert was good and well balanced and included the Dagenham Girl Pipers, some clever jugglers and acrobats, the inevitable crazy trick cyclist, and the ever-popular Tessie O'Shea.

Vic Jenner, of the Charlotteville Club, who made the announcements with great clarity, introduced Miss Elizabeth England to present the awards. This was a graceful compliment to her father, who has been so prominently associated with the event from its inception.

Ken Joy received a great ovation from the 7,000 enthusiasts present. He displaced his club-mate, Peter Beardsmore, from the proud position of Best All Rounder which Beardsmore held last year and who in this year's competition finished third with probably the youngest competitor, Ken Whitmarsh, of the Southampton Wheelers, filling second place.

The B.B.A.R. team competition provoked great rivalry between the Medway, led by Ken Joy, and the Norwood Paragon, led by the 12-hours champion, B. J. Brown and including that wonderful veteran, Stan Butler, who at the time of Southall's supremacy ran second in the All-Rounder competition 16 years ago. Among the National Champions, Geo. Fell, 25 in 58.10, was noteworthy, inasmuch as it was not an isolated achievement but one of many during the season when he rode the 25 miles inside the hour. Jack Simpson, Midland C. and A.C., won the 50 miles championship in 2hr. 2m. 14sec., Stan Haslam, the 100 and also the Bath Road Cup. In this event the Medway boys finished third, fourth and fifth, with Enfield heading the trio. The 12 hours championship was won by B. J. Brown, with 250.6 miles. The 24 hours was won by S. E. Harvey, of the Addiscombe C.C., with 439.97 miles.

A notable feature of the competition was the number of fine rides achieved by the women with Miss Eileen Sheridan the star performer. By beating Miss Susie Denham, she reversed last year's position of the two. Her average over the three qualifying distances was 21.827 m.p.h. Having won the All-Rounder competition, she made a first attempt at a 12 hours and she actually accomplished the splendid total of 237 miles.

Other fine performances by the women were the 25 miles championship by Miss S. M. Farrell and the 50 miles by Miss J. Gregory.

R. Maitland, of the Concorde R.R.C.C. is the National Hill Climb Champion.

After the interval there was played a thrilling ice hockey match between the Medway boys, led by Ken Joy, and the Norwood Paragon, led by Bernard Brown, in which the Medway team had less difficulty in defeating their great rivals than in the cycling competition.

with its old world thatched cottages and lovely woods. This beautiful spot is protected now under the National Trust.

Wayside Thoughts

By F. J. URRY

A Case in Point

IN the early part of last autumn I went out for the day — a lovely day of high cloud and violet shadows—with two companions, and we met our picknicking familes on the verge of a wood under the Edge Hills. The wind was against us, but as we went by lane ways into the heart of Warwickshire that did not matter much, for an early start put us on easy terms with time, and we came to our appointed place at the proper hour, to find the feast laid out and the kettle on the boil. That thirty-odd miles of sunny-shadowed riding under the goldening wood of Walton Park and along the old Roman road of the Fossway was for me the perfect expression of cycling. All that afternoon I sat and smoked watching grandchildren at play under the great white clouds that came sailing over the hills like galleons coming home, trailing their violet shadows along the shorn valleys. Then it was time for an early tea and a wind-winged ride home before the roads became choked with the returning traffic. As a fact, we mainly used the lanes, borrowing the drive of a private park near Warwick to escape the press, and finally emerging on the main road within ten miles of home. Why not have gone in the cars? I can only speak for myself; car riding makes me feel old and stiff, it is too fast, even at a moderate speed, to give me really satisfactory travel, and at the end of such a day leaves me lazy. Cycling makes me feel alive and muscularly intact, valuable still, as an individual able to dictate the terms of my own endeavour.

Jolly Parties

JUST before the Cycle Show I spent a week-end in the company of six and twenty members of the trade, riding amid the delectable lanes of the county of Salop, using the fine old town of Shrewsbury as headquarters. As usual for centenary club functions the weather gave us a perfect sample of the fall of the year, which made the visit a memorable one. Outings in such company are always memorable, for when the heads of the industry do go cycling their company is gay and splendid. I do not pretend we rode dozens of strenuous journeys, we didn't; but we drifted along the vari-coloured lanes of the Severn plain, climbed among the hills, and some of us crossed the rough but lovely road over Longmynd, with its gorgeous visions of the plain, the near rugged outline of the Stiperstones and the distant back screen of the Welsh hills. Since these executive members of the industry first ventured aboard their own products in April, 1939, their taste in bicycles and equipment has improved greatly. They now know why so many of us capable of thousands of miles annually use the best possible gear moderately and like a comfortably dropped bar and a good saddle, and I believe—perhaps egotistically—that some of the improvements in lightweight practice has come about through the heads of firms having practical experience over all kinds of roads. Be that as it may, it is certain that these fellows thoroughly enjoy such breaks, which have created a much more friendly spirit amid the industry and have at least given one cyclist the opportunity of saying what he thinks without the risk of publication. My regular club contemporaries often pull my leg about the Centenary Club and their cordially extravagant ways, but I am satisfied to have found so many friends who take some notice of the opinion of an old cyclist. He has at least helped to restore and encourage the opinion that the sport and pastime will never die so long as legs will work and roads remain.

The Rich Counties

WHAT a delightful county Shropshire is; rich in hills and vales and little rivers, traced with lovely lanes, historic and, in places, antique in design and outlook, with no great towns, and large areas where few villages intrude. It is an ideal land for cyclists, and I frequently envy my Salop friends in their immediate domain. One can be among the mountain ranges of Wales in half a day's ride, or, circling from a point in the county, cover a century of miles as varied in outlook and beauty as any South of the Border. We folk who live beyond Shropshire's boundary are too apt to scamper through it on our way West and to miss much of the loveliness that invites, without protesting, its beauty. I shall never forget the thrill of my first ride over the Longmynd many an autumn ago when the heather was in bloom, and that long ridge, a mauve mass of splendour under an October sun; or on the same day the invasion of the Stiperstones from the Pulverbatch side, when a couple of us got badly bogged on the way over the ridge and dried out along the lovely valley ride to Bishop's Castle. I must have visited Longmynd dozens of times since to recapture that feeling of finding a bit of Scotland dropped like a dream among the comely hills of Salop. These are but two of Shropshire's attractions for the wandering cyclist; there are thousands of others, and not the least of them among the lanes that seem to lead to nowhere, and then suddenly land you in a tiny village, with an old inn nestling by the church and sufficient refreshment to lead you to a resting place never too far away.

Wonderful Season

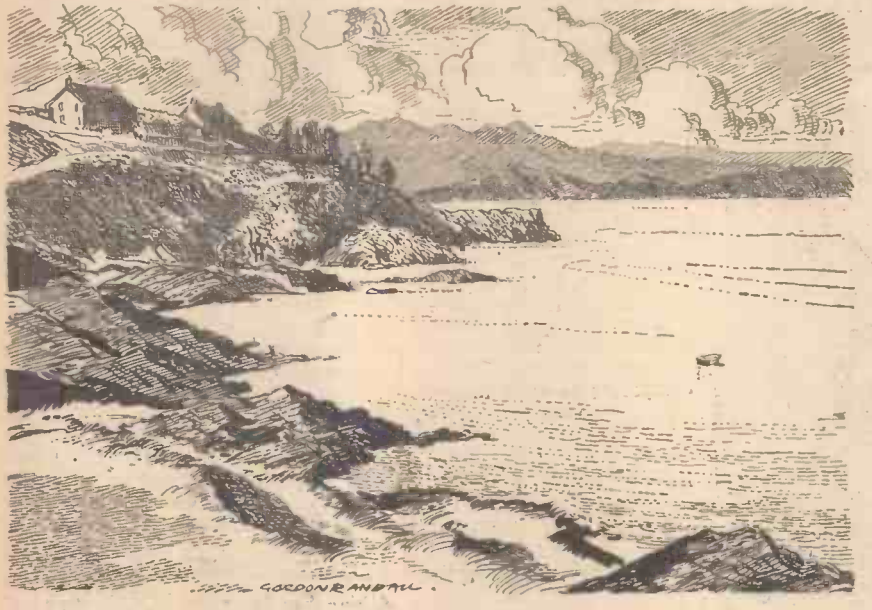
TO register the late summer as the finest I remember during the allotted span of life is merely a proper compliment to it. Possibly there has never been more cycle touring than during the past year in this or any other country, and the people who have tasted the joy of this type of holiday freedom will, I hope, be keen to repeat the performance again and again. It may be true that the troubles of accommodation have presented certain difficulties and possibly curtailed wide wandering between the tea and supper time, the finest period of the day for pleasant riding; but this shortage will improve, for I am told the handbooks of the cycle touring organisations have expanded very considerably, and that the catering business is once more attracting many wayside people. We cannot expect 1950 to present roadfarers with so glorious a season, and perhaps it would be scarcely wise to wish it, remembering the water troubles of the past summer. For myself, I think my touring mileage has been below the average owing to the illness of my colleagues, so I have done more work than I desired. Maybe the coming summer will restore the balance on my behalf, and if it sometimes rains I shall not worry, for, as an old inhabitant, I can enjoy a rough journey as part of the variety of this most varied game.

The Good Hacks

I HAVE been giving my winter bicycles an oiling and overhaul, and though they are a trifle battered, with a little rust here and there on the edges of cranks and pedals and bars, it is remarkable how good they look after a cursory polish. I tried a couple of them the other morning and thought they ran as sweetly as their new companions of the summer, despite the fact that one was built in 1933 and the other was sent to me from U.S.A. in 1941 by an American friend who thought I might be short of machines. The latter has been a fine cycle, built on English lines and as good as anything I possess in this type of machinery. Although it is rather an upright design, the fork rake makes the steering almost as easy as on a 68° frame, and quite a number of my trade friends have been interested in it. The old Sunbeam, of course, is going as well as ever. Recently it went to a dealer friend for a slight repair and stood in his depôt for a week or so because I did not want it, and during that period no fewer than seven people tried to buy it. Such is the reputation of a J. Marston Sunbeam made in 1921.

CYCLORAMA

By H. W. ELEY



Looking from Borth-y-gest Bay towards Portmadoc and the distant mountains of Snowdonia.

The "Veterans" Write In

IN response to my recent suggestion that riders of really old machines should write in, with their experiences, I have received some most interesting letters. One comes from Mr. R. S. Jackson, of the Orwell Yacht Club, Ipswich, and it records the fact that Mr. Jackson still rides a machine purchased early in 1906 . . . a single-geared "Swift," 27in. frame, thumb brake on front wheel, with beaded-edge tyres. And this old bike has been ridden in some curious places! Mr. Jackson is fond of cruising along the East Coast in an auxiliary-engined sailing sloop, and it appears that he has often lashed the bike down in the dinghy, and towed it at sea from port to port. Then he has ridden this veteran "Swift" along the sandbank known as Barrow Sand, some three to four miles in length! Ashore, Mr. Jackson used to ride from Hammersmith to Ipswich without a single stop. I salute Mr. Jackson, and his aged mount, and wish him many days of happy sailing and cycling.

Then there is Mr. John Terry, who writes me from Blackpool. He owns a B.S.A. purchased in 1906 . . . a machine which he says still "runs like velvet." Mr. Terry mentions in his interesting letter that the Eadie two-speed gear, with control cable and catch, are still in the original condition . . . and "not a single bearing has had a new ball."

Thirdly, I had a letter from Mr. Jim Heckman, of William Heckman & Sons, of Henley-on-Thames. It is a long letter, and space does not permit me to quote extensively from it. But it is interesting to note that Mr. Heckman is still riding a "Royce-Henley" cycle, made on his own premises by his brother and partner in the year 1904. Mr. Heckman gives a mass of technical details, and refers to the weight of early cycles: one made by his father weighed "considerably over a hundredweight." A brother of Mr. Heckman was appointed 1st Grade Official Repairer to the C.T.C. in 1883. There's history for you . . . and I am deeply grateful to the gentlemen I have named for troubling to write me, and for the fascinating information they give: these breaths from the past are a joy to me . . . and to many others.

"February Fill-dyke"

GURGLING brooks and gutters . . . silvery raindrops splashing from the bare trees; gardens saturated with water . . . these are the evidences of February, and they are good omens; it is the rain which later on brings the flowers; it is the precious purifier . . . and I like the feel of it on my cheek as I ride down the lane, which in high summer was covered with a green canopy, with gay flowerets on hedge and in ditch. Each month, in turn, brings its delights and beauty, and February is no exception. . . .

The Shopper's Friend

NOT for years have I been so conscious of the general utility of the bicycle; now that I am living in the heart of the country, and having to do my shopping in a small town some few miles from "my village," I have found that it is all so easy . . . with a cycle and a large basket-carrier fitted to the handlebars. From shop to shop . . . a friendly greeting from butcher, from ironmonger, from tobacconist, from bank manager . . . and a pleasant ride home, through some good Derbyshire villages: it all makes life very pleasant, and the "basket on the bike" really does solve many a problem. Sometimes I prop my bike up against a gate and light my pipe, and gaze long at cows and sheep, and the lines of trees, and watch the antics of rooks as they forage over the newly-ploughed fields. And the bustle of Mother London seems very far away!

Our Smallest County

SMALLEST . . . but by no means the least beautiful: that is my verdict on Rutland, where ancient Oakham graces the shire, and the fertile Vale of Catmose is full of charm. Rutland is a county where the horse is king, and contains the country of the Cottesmore Hunt. It also boasts of Uppingham, that great public school which was brought to such eminence by that great headmaster Edward Thring. And when in Rutland, we might well think of Stilton cheese, for it was originally made at Braunston, and sent to an inn at Stilton, on the Great North Road. I fear that this place on the historic North Road has robbed little Braunston of its fame . . . but the really important thing is to look forward to the day when a "bite of ripe Stilton" will again grace our tables . . . in place of the hard and soapy substance which nowadays so often masquerades as cheese.

Anticipating Spring

I NEVER tear off a February slip from my calendar without thinking that soon . . . quite soon . . . spring will be here. Even on these chill February days, there can be a suggestion of spring in the air . . . but I look ahead, towards the days when the hedges will be green again, when the birds will sing in sweet chorus in the thickets and woods and orchards; to the days when the shy violet will peep out from the dell, and the pale primrose dot the railway bank. A blue sky with white clouds scudding before a March breeze and the sharp showers of April are features which make these *the* days for cycling down an English lane, or through an English village.

My Point of View

By "WAYFARER"

What Did I Tell You?

IT would be difficult, if not impossible, for one to keep track of all the accidents arising out of rear lights, but here is a note of the latest fatality which has come to my notice. A coach-driver attending to his rear light, on the Southampton-Bournemouth road (so says my newspaper), was struck by another car and killed. It is the old story—and far too familiar. The legislation compelling the carrying of rear lights has created a new and perhaps unexpected danger. Road-users of a certain mentality presume that everything on the public highway is now lighted, and act accordingly. The absence of a light means, to this type of individual, an empty road. A false position is thus set up. The plain fact is—and the sooner we all grasp it the better—that no light in view does *not* indicate that there is nothing there: it does *not* mean that you have the road to yourself: it does *not* give you liberty to "step on the gas," as regards motorists, and to go "hell for leather," as regards cyclists and horse-drivers.

There may be something on that road which looks quite empty. There may be pedestrians: there may be straying cattle: there may be part of a load which has fallen off a lorry: there may be a tree which has just toppled across the highway. These possibilities—and they are ever-present—must always be taken into account, and one's speed adjusted accordingly. Again and again I proclaim that there is only one safe night travel plan. Look where you are going, and don't go if you can't see. Depend entirely on your own front lights, and travel at a speed which is strictly related to the power of those lights. Use rear-lighting as an aid to visibility, and nothing more. That, I say, is the one and only safe night travel plan. It does not apply to any one section of road-users: it concerns everybody and everything on wheels. If, then, you think that plan is sheer common sense, adopt it instantly and make it yours for ever. It will effectively rule out accidents occurring in the dark.

Moving with the Times

EVEN cycling clubs must move with the times, and consequently it is desirable for rules occasionally to be revised. One large and ancient wheel body with which I am connected has just discovered that it has been harbouring for years a regulation to the effect that the captain must wear in his cap the special badge provided for the purpose. This regulation, like the one-time rule as to control of a club run being effected by the blowing of a bugle, has long been outmoded. It is now in the comic-opera class, having regard to the fact that so many cyclists do not wear any headgear: and so this rule is now to be dragged out by the roots and cast on the scrap-heap!

'Ware Thieves

THERE are so many bicycle thieves about nowadays that the custom of securing the machine by means of a chain and padlock, when it has to be left for a few minutes, is becoming very common. While we rightly beware of thieves, we must, however, also beware of forgetfulness. A cyclist who left his bicycle, so secured, standing at the kerb the other day, afterwards attempted to ride away without doing, or rather undoing, the needful. The result was not beneficial.

A Skye Occasion

IT is interesting to note that Skye, one of Scotland's most attractive islands, is planning to be "at home to the world" for a week in May, 1950. This ought to be a great occasion for "the Misty Isle," if only the co-operation of the Clerk of the Weather can be secured, for fine weather in Skye is something to be remembered. Cycle tourists who are considering early holidays for 1950 might, with great advantage, bear in mind the possibility of sharing in Skye's festivities.

Really Good

ONE good thing which modern traffic conditions and regulations have produced is the "Halt" sign. It is a true safety measure—if it is observed. Possibly it is sown with too prodigal a hand, but better an excess of "Halt" signs than a paucity. As a general rule the "Halt" sign is treated correctly, but there are certain road-users—cyclists, I deplore to admit, among them—who ignore the warning. It cannot be made too clear that "Halt" does mean "Halt." It is a positive injunction, whereas the alternative "Slow" means anything.

I feel more strongly than ever on the subject of "Halt" signs because, so far as cyclists are concerned, it tends to bring discredit on the whole of the pedalling community, instead of on the lawless few, when the warning is ignored and flouted. I shall welcome the day when the police, back at something like full strength, have the means for seeing to it that "Halt" signs are obeyed by all. If there are savage penalties for failure, it will be a cause for rejoicing in my case.

Asking For It

WE cyclists have operated over a long term of years with an absolute minimum of irksome restrictions, to our great advantage. Now and then, in these latter days, we hear rumbles about certain regulations being imposed. These are not very harmful, but they would still be regulations, or restrictions. Chief among them is the suggestion that we shall be compelled to carry two brakes (one, in the case of a fixed-gear bicycle), and when I say that I am not surprised—and that "it" serves us right—I hope not to be misunderstood. While gazing out of the window of a stationary bus the other day I observed what was probably a typical "cyclist." His machine was incredibly rusty, and appeared to be in danger of falling to pieces at any moment. His tyres cried aloud for sustenance. On the rear luggage carrier he had an ill-disposed parcel which might easily have broken loose and fouled his legs: and one, at least, of his brakes was out of action. Unfortunately, there are no means of attacking this type of "cyclist." He does not read cycling literature of any kind: he is completely disinterested in the pastime, and he uses a bicycle merely because it is a time-saver, and because riding is easier than walking. So what can be done about it?

Forward

A FIRM of tube-makers in the Black Country—they know something about the celebrated figures "531"—have just been celebrating their jubilee and have published a brochure telling their story. In this the head of the firm, a member of one of the leading cycling clubs, says, "We have come a long way, and it is pleasant to look back, but there is a better view forward." That, it appears to me, is a good slogan for cyclists. We have had great fun in the past—tours, week-ends, day rides, night rides, road races, etc., but with due respect to "the good old days," I believe that better times await us, and that the best is yet to come.

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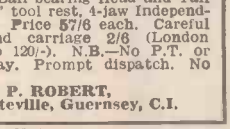

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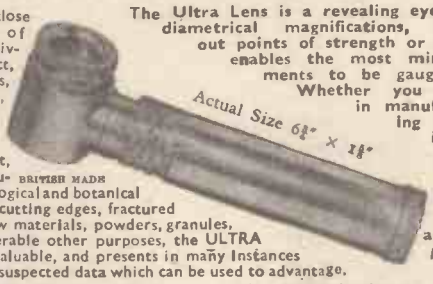

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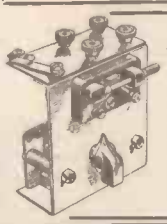

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