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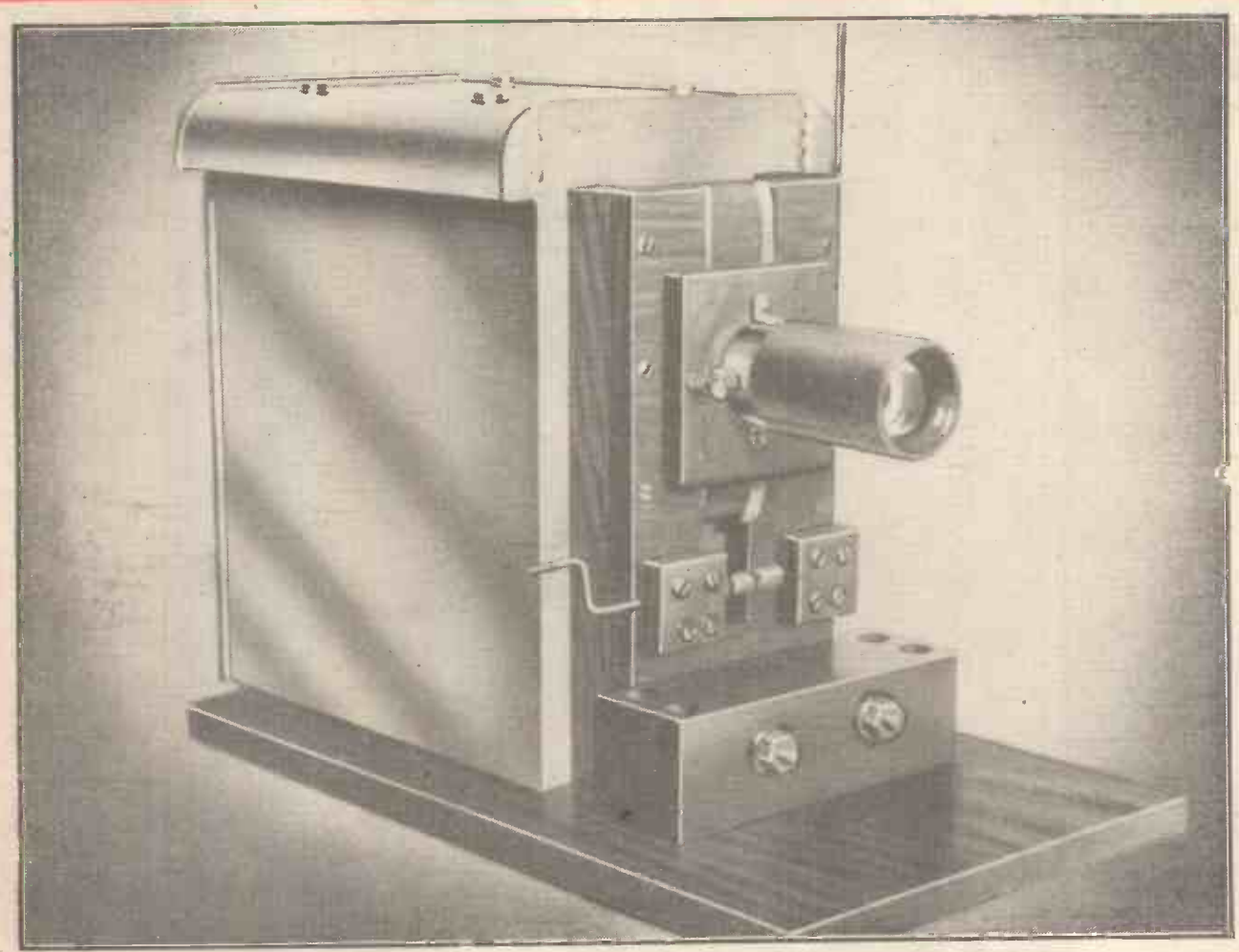
NEWNES

PRACTICAL MECHANICS

9D.

EDITOR : F. J. CAMM

SEPTEMBER 1949



A FILM STRIP PROJECTOR. FOR CONSTRUCTIONAL DETAILS SEE PAGE 368

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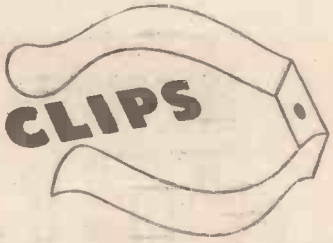

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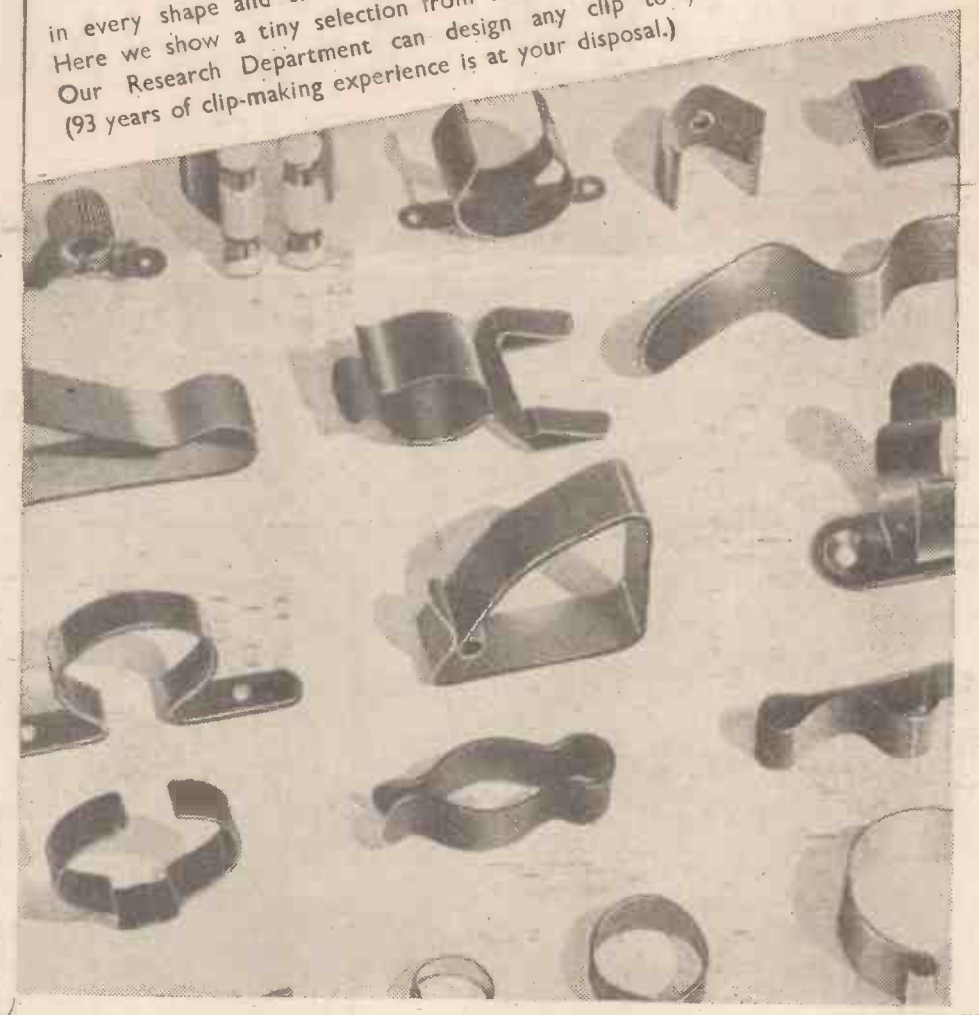

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MONTHLY NEWSLETTER

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PRACTICAL MECHANICS

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

Editor: F. J. CAMM

VOL. XVI SEPTEMBER, 1949 No. 191

FAIR COMMENT By THE EDITOR

The Advance of Recording Technique

L.P.R.

THE initials L.P.R. refer to long playing records, which have been on the American market for some time. Gramophone records are recorded, and must be played, at a turntable speed of 78 r.p.m. These new long playing records are recorded at speeds of 45 r.p.m. and in some cases 33⅓ r.p.m. and they give, of course, a much longer playing time for a given size of disc. Their introduction to the American market has caused dealers to unload 78 r.p.m. instruments at greatly reduced prices and an instrument which in America cost sixty pounds or so is now being retailed at about ten pounds.

The new gramophones are designed to take records playing at 78, 45 and 33⅓ r.p.m. I understand that although research is going on over here it may be some time before the British public will have benefits of this great advance. It seems curious that odd speeds such as 78, 45 and 33⅓ should be chosen. There is no valid reason why the speeds should not be 80, 40 and 30—much more convenient for calculations and for design of motors.

It is understandable that in difficult times manufacturers who are concentrating on export are not anxious to disturb conditions on the home market already sufficiently chaotic and disrupted by the continuation of war-time controls and the superimposition of post-war controls. In America, however, the new system has taken the country quite by storm and it can be stated with certainty that L.P.R. will eventually replace the older system throughout the world.

Recording technique has made enormous strides during the past fifty years. I often wonder what the real history of the world would be had recording technique been invented a couple of thousand years ago. History of past centuries has been largely dependent upon historians anxious to portray national history to the credit of the particular country concerned. An English book on English history differs in important details from a French or German book on English history. What we claim as victories other nations have claimed as victories, too. The earliest method of recording the spoken word was by means of engravings on stones and, later, on the earliest form of paper made from papyrus leaves. It would be nice to know what Gladstone really did say in 1888, what Napoleon said when he landed on Elba, and the remarks of Canute when he commanded the waves to recede. Is the story of Bruce and the spider really true, and did Alfred really burn the cakes? It is true to say that all history is inaccurate because of the lack of methods of recording scenes and the spoken word.

Fortunately, the history of the world from the middle of the last century will not be in any doubt. We have photography, by means of which are recorded famous battles, famous persons and notable events which can leave no doubt in the mind of a future historian as to the venue of an event, the people there and what they really looked like. Prior to the invention of the camera we relied upon oil paintings, water colours and black and white drawings; few artists are accurate in their delineations. They portray as they would like a person or a scene to appear rather than as it really is. Even spoken words of past centuries are not accurately recorded, for there was no shorthand then, no wire recorders, no photo-electric cells to records on celluloid, no wax discs. To-day we have the wax disc, the wire and tape recorders, the sound track on celluloid, the talkies, shorthand and many other methods of recording sound and scenes. Future generations will be able to hear and actually see our King, Mr. Winston Churchill, Mr. Attlee and other famous people speaking long after they have departed to that bourne from which no traveller returns. Later generations will be able to hear the voice of Caruso and the great divas of our time and not rely upon written impressions.

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NOTICE TO INTENDING CONTRIBUTORS

THE EDITOR OF PRACTICAL MECHANICS is always pleased to consider manuscripts suitable for publication in the columns of this journal. As a general guide, articles should be about 1,200 words in length, although where the subject warrants it, the article may be extended to 2,000 words. Short articles of 500 to 750 words are also accepted.

To avoid the possibility of overlapping, intending contributors are advised to write in the first instance to the Editor, giving a brief outline of the article they intend to write, and at the same time enclosing details of their qualifications.

MSS. should be typewritten, using one side of the paper only, and double spacing. Preferential consideration will be given to those MSS. which are accompanied by sketches and/or photographs, and these should be properly captioned.

The Editor does not hold himself responsible for the safe custody of manuscripts, but every effort will be made to return unaccepted contributions if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL MECHANICS, Tower House, Southampton Street, Strand, W.C.2.

Wire Recording

WIRE and tape recording are making great advances. At present the fine wire used on some recorders has certain disadvantages. One of them is that it tends to stretch after frequent re-playing, giving rise to flat notes and slurred speech. Moreover it is not perhaps quite so permanent or durable as a wax disc. It has, however, the great advantage that a lengthy recording can be played continuously without frequent changing of records, without needle scratch, and moreover such a recording occupies but a fraction of the space of an equivalent number of wax records. Also, with certain instruments the wire can be demagnetised and used for a fresh recording.

Many years ago a photo-electric instrument which achieved somewhat the same results was marketed in this country. It consisted of the usual motor, a photo-electric cell and a reel of strip celluloid on which was recorded the music or the speech, as on the sound track of a talkie film. It was bought up and put into cold storage. From this it will be seen that the gramophone as it has developed from Edison's famous invention is undergoing a scientific metamorphosis, and it will not be many years before our present disc machines are as obsolete as the old Edison cylinder, with agate stylus.

The Kew A Tests

AS readers interested in horology will know, at regular intervals the National Physical Laboratory conducts tests of watches and awards the Kew A certificate for those which pass, awarding marks according to the performance. The test lasts for 44 days, and watches are tested for a number of days in the pendant up, pendant right, pendant left, dial up, and dial down positions and also for temperature compensations in temperatures varying from 42 degrees Fahrenheit to 67 degrees Fahrenheit. The system of awarding marks is complicated, and is given in full in my hand-book entitled "Watches: Adjustment and Repair." There is also a less rigorous test known as the Kew B, but this is of much shorter duration, and the limits are not so stringent.

Of course, most of the watches which are submitted are of extremely high grade, many of them indeed being hand made, as are my own watches which have obtained Kew A certificates.

It takes many months of work to tune up and rate a watch for these tests, as may be

(*Continued on page* 384)

A Film Strip Projector

Details of Construction of an Efficient Home-constructed Unit

By W. J. KAY

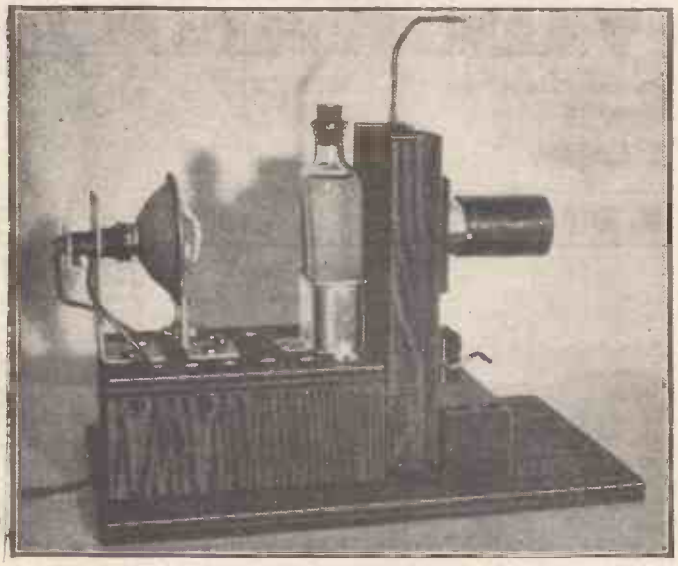


Fig. 2.—The projector with lamphouse removed.

WITH the coming of film strips on a wide variety of subjects, and not wanting to go to the expense of buying a projector for home use only, I designed and built the projector shown in the accompanying illustration (Fig. 2). Being an amateur photographer with a reasonable knowledge of photo-optics and a user of a "Reflex-Korelle" camera (with which the accompanying photographs were taken) I have not gone out for mathematical or optical perfection, but have endeavoured to produce a projector to throw a good 3ft. x 2ft. picture at a distance of about 8ft.

The moderately priced range of film-strips by "Photo-Union" and "The Cartoon Film Strip Co." is suitable for the downward movement provided.

Constructional Details

The projector is made chiefly of tin and five-ply wood. The baseboard (Fig. 2) is 14in. x 8in. and on this is fixed the lamphouse chassis. This is 7in. long by 5in. wide and 3in. deep with holes along both sides of the top to assist ventilation; both ends are left open, and the inside and the section of the baseboard it covers should be given a coat of dead black paint before fixing to the baseboard by screws from underneath.

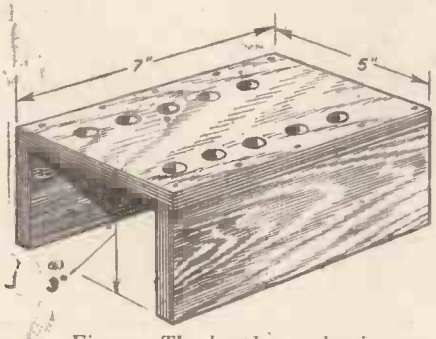


Fig. 1.—The lamphouse chassis.

The illustration, Fig. 2, of the projector with lamphouse removed shows the method of mounting the lampholder and reflector; the bottle contains water, slightly clouded; which acts as a diffuser and prevents the burning of the film by the "hot spot" caused by the reflector.

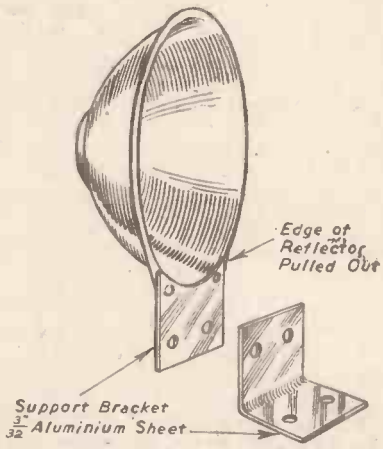


Fig. 3.—The reflector and its support.

Lamp and Reflector

Now a word about the electrical side of the projector. The lamp is a "Lucas Automobile" No. 90 (12volt. 60watt.) fixed in a suitable holder and fed from a transformer. The last two items were obtained cheaply from Government surplus.

A cycle headlamp reflector 3½in. diam. and 1¼in. deep, correctly focused, directs the maximum amount of light on to the film.

The best position for the lamp will be found by trial and error, and the reflector must be able to move around the lamp as well as along the optical axis. This is best done by having the holes in the reflector support, Fig. 3, large enough to give good clearance for the screws; the bottle is held firm by the tin case, as shown. By the way, it is necessary to provide a vent hole in the cork.

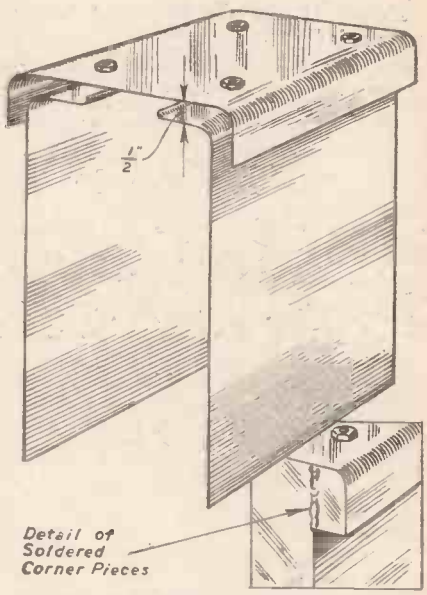


Fig. 4.—Details of lamphouse.

Lamphouse

The lamphouse should present no difficulty. Cut two pieces of medium gauge tinplate 11in. x 8½in., bend the 11in. side over to a right angle 1½in. from the end, screw both to chassis and place a piece of cardboard about postcard thickness between chassis and tin to allow for easy removal when complete.

The front and back can now be cut 9in. x 5¼in. and a 1¾in. diam. hole cut in the

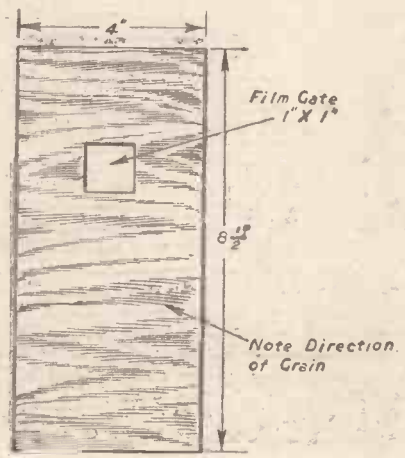


Fig. 5.—Details of film gate.

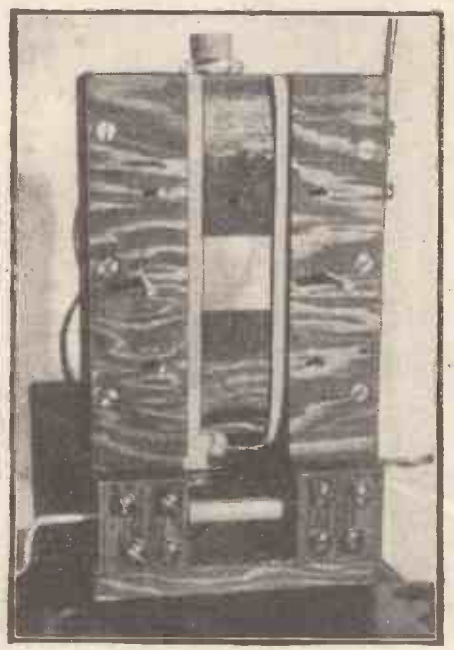


Fig. 6.—The film gate and winder shaft.

front end 6in. from the bottom; the ends can now be soldered to the sides, which are attached to the chassis.

The lamphouse top can be cut and shaped and then fixed with four 3/16in. Whitworth screws to the lamphouse sides with ½in. distance pieces inserted (see Fig. 4) and soldered to the lamphouse ends.

To make the light trapping more effective four small pieces cut to shape can be soldered in position as shown in the inset, Fig. 4.

Film Gate

The film gate of five-ply wood measures 8½in. x 4in. Before cutting make sure the grain of the top layer runs across (see Fig. 5) so that when a layer 35mm. wide is cut out the layer underneath runs from top to bottom to give a smooth track for the sides of the film strip.

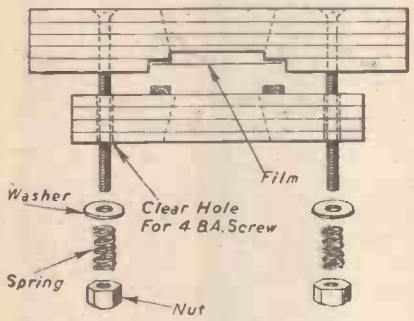


Fig. 7.—Plan of gate and pressure plate.

A further layer the width of picture area can then be cut out.

The idea to follow is that during the passage of the film down the gate only the sides are touching, nowhere does the picture area come in contact with the gate or

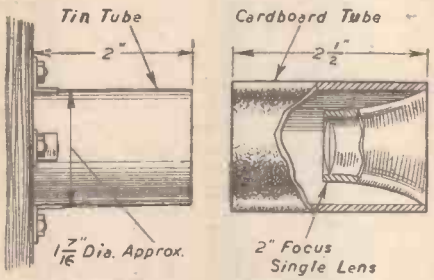


Fig. 10.—Lens mounting details.

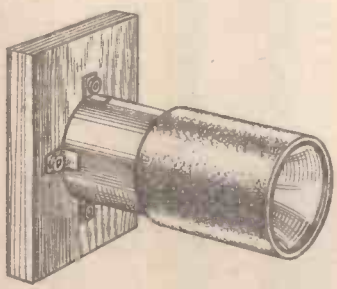


Fig. 11.—Projection lens tube and mounting.

pressure plate (see Figs. 6, 7 and 8). The winder shaft should be friction held. For the roller, part of a cigarette machine roller was used, and being made of hardwood it stood drilling without splitting. A spring clip out of an electric kettle connector was found ideal for holding the film on to the roller.

The gate is fixed to a piece of hardwood

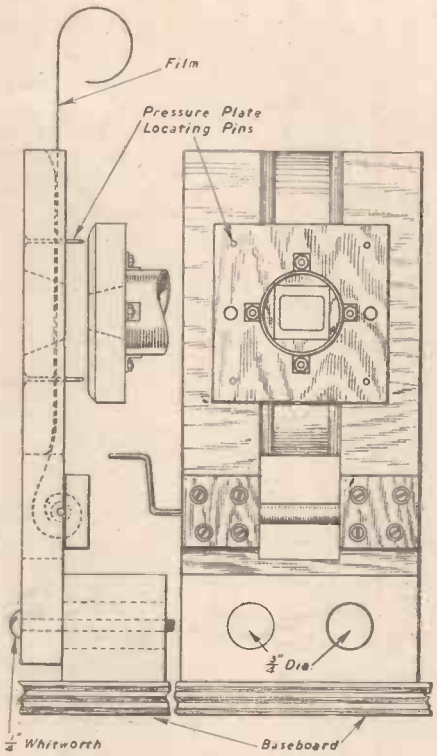


Fig. 8.—Side and front views of gate, pressure plate, and lens tube mounting.

1½in. square and 6in. long, with ¼in. Whitworth screws, the holes in hardwood allowing enough clearance for the final lining up of the optical axis.

The pressure plate measures 3in. x 3in., and its construction is clearly shown in Figs. 7, 8 and 9.

Projection Lens

The projection lens is a watchmaker's eyeglass of 2in. focus mounted in a cardboard tube, which should be a sliding fit on the tin tube attached to the pressure plate. Fig. 10 shows the approximate lens mounting sizes for a 2in. lens.

The lens aperture should be "stopped down," to about ½in. The amount of stopping down required to ensure good definition will depend on the quality of the lens.

The adjustment of the projector when complete should be in the following order: arrange the lamp and reflector on the lamphouse chassis so that the beam of light will pass through the centre of the hole in the lamphouse front, then move the combined

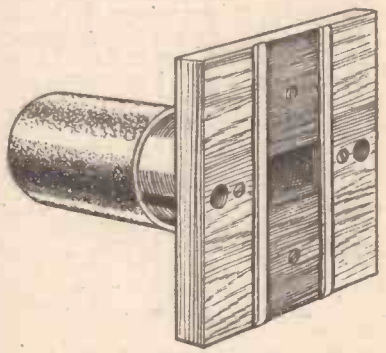


Fig. 9.—Projection lens tube and pressure plate.

film "gate," pressure plate-cum-lens panel, so that an evenly lit screen is obtained.

Give a coat of dead black paint to all parts where it is necessary to cut down light reflection. Finally, there may be variations in construction to suit personal tastes and materials available, but the projector described will give good results if the necessary care to work to reasonably fine limits is taken.

A Blow-lamp Improvement

A Useful and Easy Modification

By E. S. BROWN

MOST readers are familiar with the annoying habit of some blow-lamps frequently going out, especially at some inopportune moment when reignition is difficult, as for instance when one is on a ladder engaged in paint burning. The cause of this fault is mostly due to the underheating of the burner throat. Any slight deviation of the paraffin vapour from the throat of the burner is sufficient to put the lamp out, as the vapour will not automatically reignite as the throat temperature is below the flash optimum of the vapour.

Some blow-lamps are more prone to this fault than others, but all are more or less subject to this annoying defect under certain conditions of use. It is, however, not very difficult to effect a cure, and a glance at the accompanying illustration will show how this can be accomplished.

The burner is removed completely from the lamp, exposing the looped vaporising tubes. At the end of same is twisted a small piece of 1/16in. steel or iron wire, and the lamp is then reassembled. During the action of the lamp, the wire quickly becomes heated to a very bright redness. This incandescent wire, positioned in the direct vapour stream, instantly reignites same should a momentary deflection occur, and the lamp will continue to burn for as long as required.

Showing the position of the wire twisted on the loop of the vaporising tubes.

Constructing a Clavichord

The Modern Revival of an Old-time Keyboard Instrument

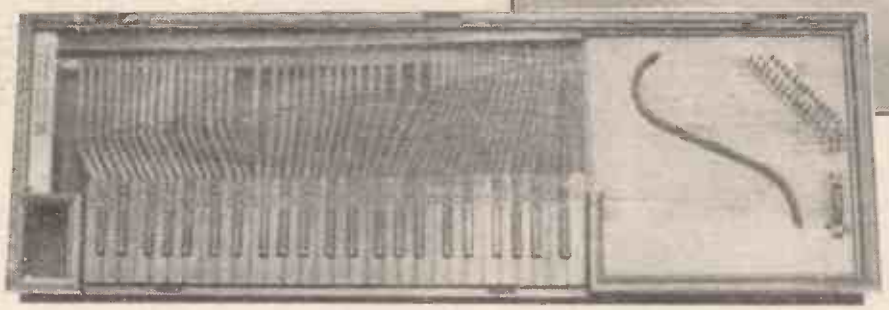
By J. F. STIRLING

THE sustained interest which has been shown in recent years in the simple clavichord as an instrument of musical enjoyment has resulted in a number of British craft-workers producing these keyboard instruments for commercial sale.

Some exquisite instruments of this type are, nowadays being turned out, instruments in which the whole art of the craftsman-musician is manifested ; instruments, indeed, which are as perfect in their simple way as the finest concert grand pianoforte which ever appeared on a public platform.

The modern piano is the direct descendant of the old-time clavichord. Both are instruments of percussion. But, apart from that single fact, there is very little else in common between them. The piano, even in the hands of the most skilled of players, is clearly a mechanical instrument. In it an essential and more or less complicated mechanism in interposed between the fingers of the player and the strings of the instrument, whereby the player is continually under the necessity of obtaining his tonal effects by a process of literally *throwing* felted hammers at the strings. In fact, before the pianoforte key has reached the bottom of its descent the player has lost all control of the hammer, for once the playing mechanism or "action" throws the hammer at the string the player cannot by any conceivable means control, vary or modify the sound which it produces.

A modern clavichord in an inlaid case of figured walnut. It is an exact copy of a 17th century instrument.



Showing the layout of the clavichord with its strings in position.

This is not the case with the clavichord. Essentially, all that a clavichord consists of is a set of tuned strings which are struck by small upright brass members or "jacks" which are mounted on the ends of the keys. The principle of the instrument is shown in the diagram on this page, from which illustration it will be seen that, unlike the pianoforte hammer, the clavichord "jack" is at all times under the control of the player. It is, indeed, as much under the player's direct guidance as the fingers of the violinist when pressed against the strings of his fiddle.

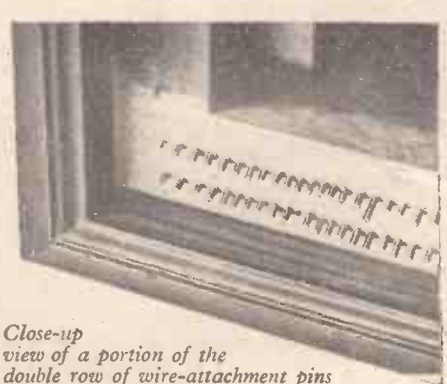
The keyboard of the instrument.

The "Bebung"

It is for this reason that the clavichord is capable of such a wide range of tone quality and variation. In fact, the clavichord is capable of producing a vibrato effect (or "bebung," as it was traditionally called by the Germans, in whose country the clavichord was most popular) merely by a rapid alteration of finger pressure on the key. Here, of course, the clavichord copies the violin in its effect, an effect which cannot be produced directly by any other keyboard instrument in use to-day.

Except, perhaps, for the organ in its cruder forms, the clavichord is the oldest of the keyboard instruments. Deriving its name from the Latin *clavis*, "a key," it was popular, particularly on the Continent, as far back as the fourteenth century. But it reached its zenith as a practicable instrument in the late seventeenth and early-eighteenth centuries, after which time it began to decline under the competition of the much more powerful harpsichord, in which instrument the strings were mechanically plucked instead of being directly struck.

Although the clavichord, musically speaking, is a very beautiful and a very delightful and simple instrument to play, it has one decided drawback, and any reader who essays to construct one of these instruments should realise this deficiency at the outset of his constructional efforts. It is this: the



Close-up view of a portion of the double row of wire-attachment pins on the left-hand side of the instrument.

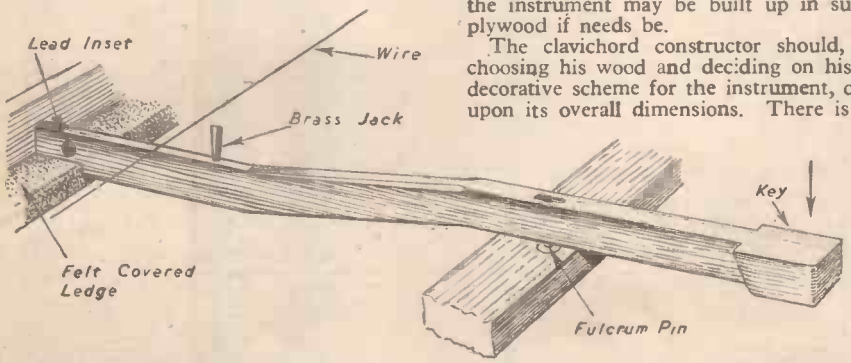
(Top) The front end of a white key. (Middle) The front end of a black key. (Bottom) The rear end of a key, showing the upright brass "jack" and the lead inset at the extremity of the key shank.

clavichord, although it has a very wide tonal range, has a very small tonal power. It is a very sweet and mellow instrument, but its voice is never much above a whisper of tone compared with modern standards. This being the case, the clavichord must be used exclusively as a solo instrument. Its tone, under these circumstances, will be sufficient to fill a room. But should an attempt be made to combine it, by way of accompaniment or otherwise, with any other instrument or with the human voice, the clavichord will at once be drowned out by the greater vigour of the competing tone.

So that whosoever makes and uses a clavichord has got to put up with these severe tonal limitations. If he requires greater tone he must go to the piano.

Advantages

But there are advantages in the very drawbacks of the clavichord. You can play to your heart's content without disturbing any sleeping member of the family. You can practise the instrument 12 hours a day, seven days a week (if you have a mind to), without receiving pertinent and indignant complaints from your next-door neighbour.



Showing the simple principle of the clavichord. When the key is depressed, the "jack" or "tangent" rises and strikes the wire.

And the average clavichord is fairly compact and light in weight, in consequence of which you can take it about with you and even sit up in bed to play it. Played with average skill, it will give you music, as distinct from mere noise.

The clavichord is rectangular in shape, being, on an average, about 4ft. long, 1½ft. wide and about 4in. deep. Provided with an upward-rising lid, it has the appearance of a shallow box which can be rested on a specially designed underframe or else laid on a table or on any other suitable support.

In its heyday the clavichord was made in many beautiful designs, and, as previously mentioned, the whole art of the craftsman was given over to it. But the modern reader may elect to make his clavichord in any kind of wood which he may have available. If one of the "furniture woods"—oak, mahogany, walnut—are chosen, such woods may be inlaid and polished, and a very handsome-looking instrument will result. But equally satisfactory will be the instrument which is made in a common, well-seasoned wood and which has been painted a suitable colour, such as a dull green or a dark red. Instruments of this type will be quite in keeping with many of the old clavichords which were similarly lacquered and sometimes additionally decorated by a few gold lines around the sides and lid of the case.

One thing is essential, however. The base and sides of the case should not be of plywood, although the lid may be made in this material. The clavichord needs a solid wood case and sides to develop its feeble resonance. Apart from this feature, however, practically all the other parts of the instrument may be built up in suitable plywood if needs be.

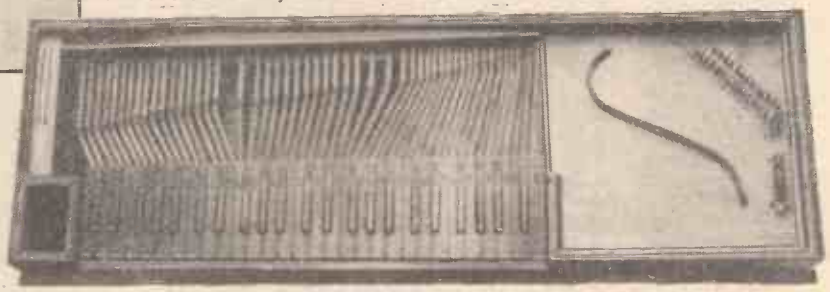
The clavichord constructor should, after choosing his wood and deciding on his final decorative scheme for the instrument, decide upon its overall dimensions. There is little point in making an instrument more than 4ft. in length, whilst an instrument under 3ft. long would have a very restricted compass. It is best, therefore, to decide on a 4ft. instrument, which allows for 51 keys, giving a tonal range of two octaves and two notes above "middle C" and exactly two octaves below "middle C," making four octaves and two notes altogether.

The working diagram accompanying this description will give the constructor all the necessary dimensional information for the building of the instrument. It must be stressed, however, that the dimensions given therein are merely approximate ones. They can be varied at will according to the individual ideas of the instrument maker.

Constructing the Keys

If there is any practical difficulty at all about the making of a clavichord it will concern itself merely with the neat and accurate construction of the keys. There are readers who may be in a position to utilise keys removed from an old and worn-out piano. In this event much of the work will be simplified and the rest of the instrument may, as it were, be built around the four-octave range of keys.

But those who have to make their own keys should note that the old clavichord keys were somewhat smaller than those of its pianoforte descendant. Whereas the modern piano "white" key measures nearly 6in. from front to back, the old clavichord was only 4¼in. "deep." Its width was about the same as that of the modern piano key, that is to say ⅞in., so that the key constructor can take his exact measurements from any pianoforte key.



The layout of the clavichord with its strings removed.

The old clavichord keys were often made in ebony in place of the modern "white" keys, solid ivory being used for the modern "black" keys. But frequently, too, the entire keyboard was constructed in boxwood, and sometimes in mahogany. The clavichord illustrated in these pages has a mahogany keyboard. Amateurs, therefore, would be well advised to choose this readily-worked wood for making their keys, since the whole key and key shaft behind it may be made in one piece and with the minimum of difficulty.

Alternatively, it is quite feasible to make the keys in plywood of suitable thickness. This material would certainly ensure against warping or twisting, which would render the free operation of the keys impossible. If wooden keys are chosen their playing surface should not be varnished, since this tends to make them slightly tacky under the natural oil and moisture of the fingers. The best treatment to give them is to brush them over with a shellac polish and then, after drying, to rub away the polish with fine sandpaper, leaving a perfectly smooth and well-filled wood surface. This is then lightly rubbed over with a hard wax polish.

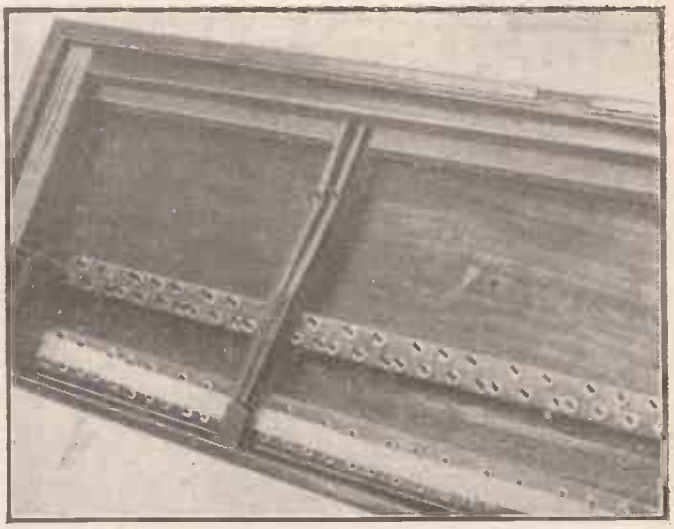
Take care to round the front upper edges of the "white" keys very slightly and to give a still greater degree of "roundness" to the "black" keys, otherwise the player's fingers will be apt to catch unpleasantly on "corners."

The baseboard of the instrument should be two boards of at least 1in. wood, joined in the middle. Having provided this, build up the sides so that the overall dimensions of the instrument become manifest.

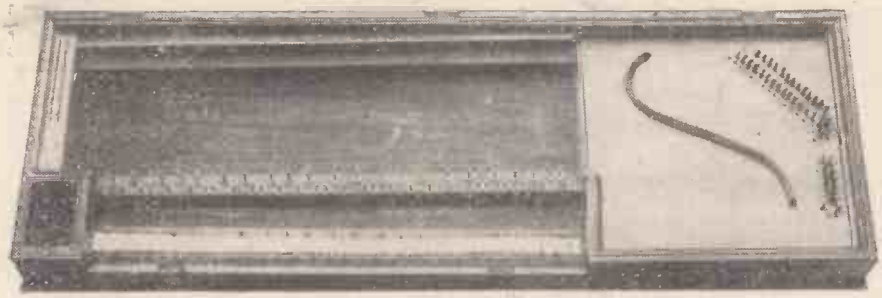
It is now necessary to provide the stout "plank" in which the tuning pegs of the instrument are to be fitted and, also, the wooden member which must hold the pins to which the opposite ends of the wires are attached.

The Tuning "Plank"

The tuning-peg "plank" should preferably be of well-seasoned beech wood, but in lieu of this, playwood of sufficient depth may be used. The position of the tuning-peg "plank" for the instrument will be seen in the diagram, and also that of the narrower "plank" on the opposite side of the instrument in which the attachment pins are to be driven. Note that this latter member is continued along the rear side of the instrument. Since these members must be absolutely unyielding they must be firmly glued down to the base and sides, and, also, they should be screwed down, using countersunk screws inserted into the wood base of the instrument.



A close-up view of the clavichord interior showing an adjacent pair of "black" and "white" keys in position. The manner in which they are positioned is clearly shown.



The layout of the clavichord after the removal of the keys. Note the two rows of upright metal pins on which the keys operate.

We have now to consider the soundboard, the "heart" of the instrument. This is usually square in shape and it is glued down at its edges over the tuning-peg "plank" and, also, on to narrow wooden supporting rails all round it. The soundboard should not be screwed down, but its edges, for the sake of neatness and extra strength, may be covered on its upper side by a wooden fillet running all round it, this fillet being glued into position and, also, tacked down by small panel pins.

Soundboard Timber

The nature of the wood used for the soundboard may present a problem. Fir, spruce, pine and sycamore are the best woods, and, of these, the best specimens are those which have a long, parallel grain. Again, the ideal soundboard should be made in one piece, being not more than $\frac{1}{4}$in. thick. In practice, however, it will be found advisable to join two or more selected wooden pieces to make up a soundboard of the necessary width. This will not affect the tone provided that similar material is thus joined and that the joints are perfectly sound and rigid.

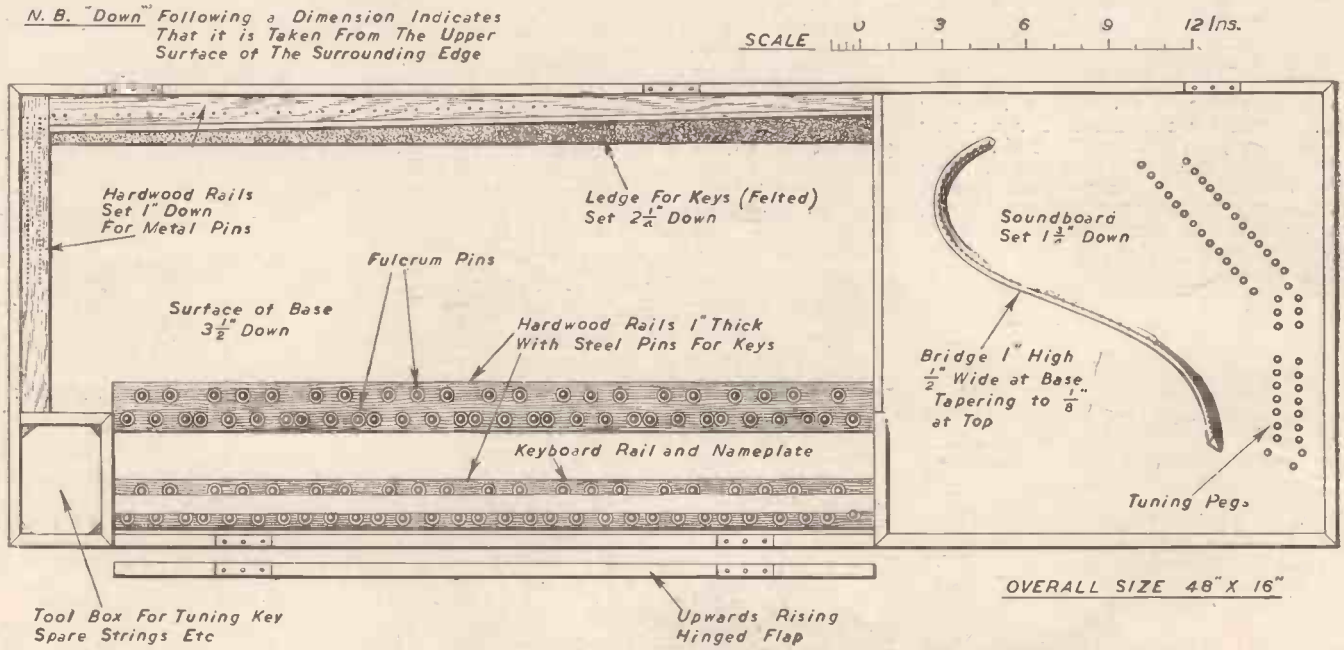
If any of the above woods are not available, mahogany or walnut or fruitwood may be used, but oak should be eschewed on account of its coarse grain, and plywood is, of course, inadmissible for this purpose.

Before fixing the soundboard finally into position the "bridge" must be attached to it. In the clavichord the "bridge" takes the form of an "S"-shaped strip of wood, 1in. high, $\frac{1}{2}$in. wide at its base and tapering to about $\frac{1}{8}$in. or 3/16in. wide at its upper surface. The strings of the instrument pass over the bridge between little steel or brass pins which are inserted into its upper edge. The strings press downwards on to the bridge and so convey their vibrations to the amplifying soundboard which vibrates in sympathy with them.

The bridge needs careful construction. Its exact shape and positioning is not very material, but the "S" bridge is the traditional form and is apparently the best. The bridge may be cut out of solid wood, but plywood may be employed just as well provided that it is of perfectly uniform construction, and is free from flaws.

After cutting out the bridge and smoothing its base and sides, its narrow upper edge must be marked out to receive the guide-pins for the strings. These must equal in number the number of strings in the clavichord *plus one more*. The exact spacing of the guide-pins on the bridge will be determined by the spacing of the tuning pegs.

(To be concluded.)



General layout of the clavichord. This instrument is a modern copy of a German "Ruckens" clavichord C.1700. It has 51 keys.

Jet Reaction Power Models

Various Types of Jet Power Engines for Model Aircraft and Boats

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

(*Continued from page 348, August issue*)

Fig. 10.—This fine example of a control line jet model comes from America, and has an enclosed Dynajet with suitable heat insulation. The air intake is situated inside the open cockpit. (Photo by courtesy of The Dynajet-Aerodynamic Co., Dayton Municipal Airport, Vandalia, Ohio, U.S.A.)

Notes on Operation

The fuel consumption is approximately three times as great as the "hot" racing 10 c.c. class petrol motor. The latest Dynajet Red Head produces over 4½lbs. static thrust.

Ram air as the model's speed rises increases thrust and must be allowed for in the design of the model.

If air bubbles get into the fuel line the motor will cut dead, whereas a reciprocating engine will generally misfire and keep going through flywheel effect. There is no flywheel on a jet engine of this type. It is therefore vital to ensure a perfect flow and the fuel pipe must not be smaller than ⅛in. bore internally. An undercarriage and wheels which do not cause undue bumps on take-off are necessary. On many occasions I have watched modellers trying to get their control-line jet jobs into the air and the engine cuts shortly after it commences the take-off run. They blame all sorts of things, except the true fact that the model is bucking and therefore causing uneven fuel flow. Air wheels are not often suitable because they cause a bouncy take-off. The solid rubber control-line type are best.

Never look down the business end of the tail pipe to see if the spark plug is sparking properly. There may be some petrol in the pipe which may suddenly give a blast with very unpleasant results. Never touch the engine when it is working as it glows red hot. It must be mounted on the model with a good air space for insulation, and it should have a shield or asbestos protection on the model immediately below the engine. Steel straps should be used rather than thin aluminium, which have been known to burn through.

Petrol feed should always be arranged to suck up and not be gravity fed, as this may cause a fire by allowing fuel to collect in the combustion chamber.

To start, it is usually a good plan to "choke" the nose orifice by the fingers or a rag to enrich the mixture. One soon learns the best amount of choke to give to suit individual engines.

Finally, remember that petrol is highly combustible stuff, and an open flaming exhaust can be a source of danger if operated by an irresponsible person; and do not forget one is dealing with a lot of power which builds up due to ram effect.

The Model Gas Turbine

Several experiments have recently been made with a gas turbine for model work and I am therefore illustrating the general principle in Fig. 7 (See previous issue). It is only a matter of time before we have turbo-jets like miniatures of the most usual full-size jet engine commercially obtainable. Mr. McEntee, the editor of the well-known American model aircraft journal, "Model Airplane News," tells me he has heard from a Swiss reader who claims to have successfully flown a model of the American Grumman F9F, powered by a genuine model gas turbine he has built. The gas turbine draws in its own air supply by a compressor (fan) at the front of the motor. The air is mixed with fuel and the mixture burns and expands in one or more flame tubes. The resulting gases drive a turbine at the rear of the engine. This turbine is mounted on a shaft with the compressor at the other end, so that the turbine drives the compressor, which in turn provides the air for combustion. It is quite a simple basic principle, but requires some care in design and careful selection of metals to stand up to the high operating temperatures. It may interest readers to hear that the exhaust gases emerge from the tail end of a full-size gas turbine at over 1,000 m.p.h.

Fig. 8.—The writer's free-flight flying-boat powered by a dynajet has been found to be too fast because of the immense power when "ram air" effect comes in. It now awaits a smaller jet motor.

Fig. 9.—This Dynajet-powered model is flown in England on control lines, and is capable of well over 100 m.p.h. Note the fuel is suction fed from a tank just in front of the motor's nose.

Models Suitable for Jet Engines

The great power of existing engines obviously means that they are particularly suitable for control-line flying on *really stout and well-bound steel lines, properly anchored in the model.* High speed round-the-pole hydroplane racing is also most suitable for jet engines.

The only safe way to indulge in free flight with the existing engines is to choose a nice open moorland and use a large model having sufficient drag to slow down the model. At least 8 to 10ft. wingspan is desirable with a slow speed fat wing-section. This does not, of course, apply to the tiny (controlled rocket-type) Jetex engines, which I will describe shortly.

I am fitting up a large "goat" control-line flying model with a pulse-jet motor having a wingspan of 8ft., which should give me good sport flying at reasonable speeds. I have fitted a Dynajet into a good flying-boat, as seen in Fig. 8. This has proved to be too fast, and will now wait upon a smaller 14in. jet engine being built, or may be converted to control-line flying. The wingspan is only 5ft. Mr. Adams, who is responsible for the delightful scale Adamcraft series of boats,

Fig. 11.—The author's duration type flight model which has a soaring glide after the power has ceased from a little British-made "Jetex 200" jet engine.

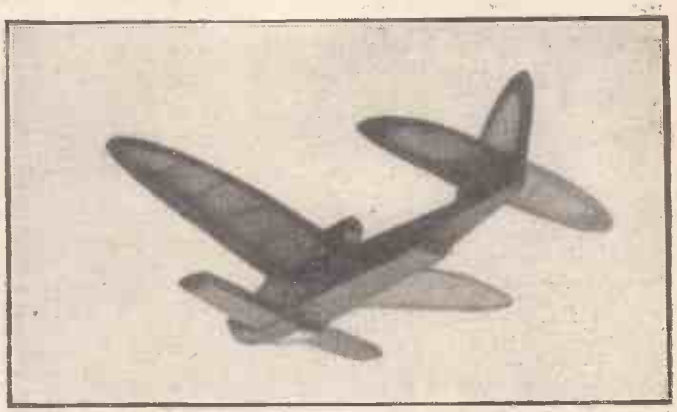


Fig. 12.—This little flying-boat of 24in. wing-span by the author is flown by the largest size "Jetex" solid fuel jet motor, the "350."

fitted a Dynajet Red Head into a hydroplane; and last year I was fortunate to be in at the first run when I actually witnessed a complete loop by the hull which accelerated like a bomb for a lap round the pole, then lifted clear of the water by centrifugal force from the rather tall pole and neatly somersaulted. The moral is to use a low pole in the water and a hull that cannot provide lifting air surfaces! The Americans have done quite a lot of round-the-pole hydroplane work, using pulse-jet engines. We have as yet done little with this exciting project over here.

Controlled Rocket Motors

We have so far discussed the non-rocket-type of motor. However, there is an extraordinary useful little motor on the British market using solid fuel. This is a *controlled* rocket type. One has come to associate the rocket with a dangerous instrument giving off a huge burst of power and flames and smoke subsidising to nothing quickly. The Jetex engine has none of these bad features. The solid fuel burns with a constant and equal thrust, and is quite safe.

These little motors are made in three sizes and all come into the small model class. I have built a number of model aeroplanes and baby hydroplanes to suit these little motors, and have had much fun flying the aeroplanes and operating the hydroplanes. In the latter case little balsa hydroplanes can be made in an evening, and several can be raced over smooth pond water reaching really exciting and high speeds, provided the hulls are kept really light. In fact, so fast are they that it is quite a problem to keep them from turning over. The three-point outboard suspension hydroplane on American full size racing lines is about the best type. The second size in the range of engines is the best for this hydroplane work.

Jetex engines have a light alloy cylinder or combustion chamber into which the solid fuel charge is inserted. A wick is then lighted, and as the burning gas expands it escapes from the jet orifice with a pleasant hiss, and a realistic trail of white vapour is left behind the model. Fast models are best for these engines. At the filling end there are three or more springs which retain the filling cap and act as a safety device should the jet orifice become blocked by an unlikely mischance. Any boy can operate a Jetex engine in safety, and all he has to remember is not to take hold of the rather hot motor immediately after a flight. They do not glow red like the large pulse-jet engines we have discussed, but they are hot to the touch.

The smallest "100" Jetex engine flies my little "Shooting Star" solid balsa glider delightfully. This is now on the market as a simple kit. The motor weighs only 10 drams, having a run of 20 seconds which gets the model high enough for a long glide. There are several other suitable kits on the market to suit this engine.

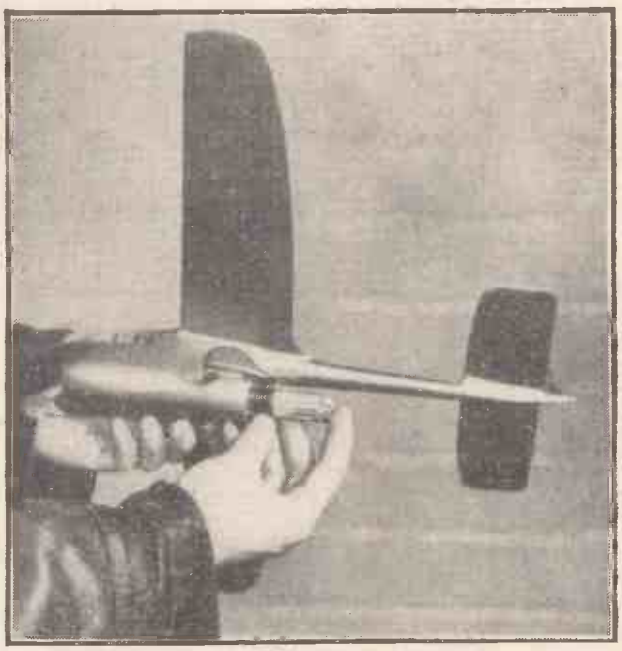


Fig. 13.—A "Jetex" motor is being fitted into the retaining clip on its aircraft. A wick from the jet orifice is lighted to start. The springs at the rear are a safety device in the very unlikely event of the jet orifice becoming blocked. (Photo by courtesy of Wilmot Mansour Ltd., manufacturers of "Jetex" motors.)

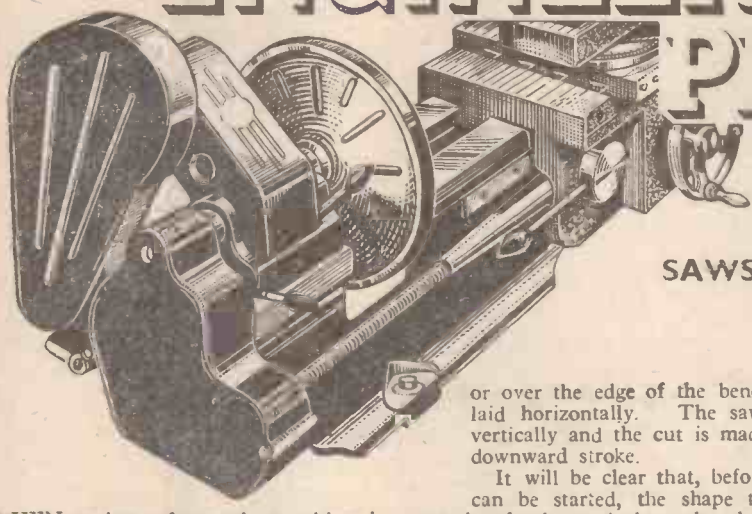
The second size of Jetex engine is known as the "200," and takes two fuel pellets having a weight of 18 drams and a run of up to 40 seconds. If this motor is fitted into a model such as my kit "Junior Soarer" or the model shown in Fig. 11, it will give flights which may last for many minutes like a duration soaring rubber model. If a thermal is found the model may even be lost out of sight unless a dethermaliser is fitted. Finally there is the "Jetex 350," which is a larger engine, having three fuel pellets. This engine can be seen flying my little 24in. wingspan flying boat in Fig. 12.

I consider that the first two motors are the best for the average boy, because they are cheaper to operate, and they give excellent flying results, *without any upsetting torque of a propeller model.* Fig. 13 shows a Jetex motor being snapped into its clip on a model. The operator's finger is over the jet end, and the filler safety spring end, which I have already mentioned, is situated near the aeroplane body. These little jet engines must be arranged in the model so that there is a free flow of air around the jet orifice if the thrust is to operate properly.

This one-inch scale locomotive is a replica of Cadbury Brothers' locomotives. The gauge is 5in., and, like its prototype, the model is a two-cylinder simple locomotive, with slide valves. The boiler has two superheater flues and 20 fire tubes; boiler pressure 100 lbs. per sq. in.

3rd Article of a New Series

MODEL ENGINEERING PRACTICE



by J. J. Camm

SAWS—SHEARS—STRAIGHT EDGES—CALIPERS, etc.

WHEN sawing soft metal or tubing it might even be desirable to lift the saw slightly so that the cut is made clean on both sides.

The beginner often finds it better to make a small V-cut across the metal with the edge of a half-round file before sawing. This acts as a guide in the same way that a centre-punch mark is used as a guide when drilling.

When an internal cut has to be made parallel to the edge of the metal the blade should be turned through a right angle, for otherwise the frame would be in the way. This is generally done by removing the squared screw at the end remote from the handle and replacing it after turning, and by hooking the other end of the blade to another pin on the handle shank. In other cases the handle also can be turned after removal.

Piercing Saws

The piercing saw is comparable to the fret-saw used for woodwork, but is much smaller. The bowed part of the frame can be moved along a square hole through the end piece which carries the handle. There is a wing-nut for adjusting blade tension. Instead of the blade having holes for fitting to the frame, the latter has two pairs of jaws; this is because the blade is very narrow for following curves.

Tooth Direction

A point of special importance is that the teeth of the piercing saw should be pointing toward the handle. In sawing, the sheet of metal is generally held over the vice jaws or over the edge of the bench and is laid horizontally. The saw is held vertically and the cut is made on the downward stroke.

It will be clear that, before sawing can be started, the shape to be cut must be clearly marked on the sheet metal, and that at least one hole must be drilled in the waste portion so that the blade may be passed through it. In most cases it is helpful to drill a hole in the waste metal at each corner or angle of the design so that the saw can be turned.

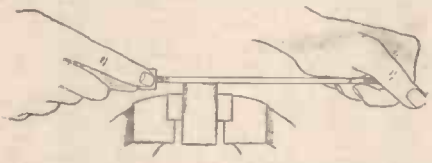


Fig. 15.—Method of holding the file when taking a heavy cut.

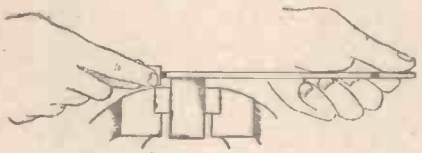


Fig. 16.—Making a light cross cut.

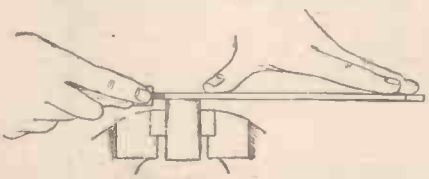


Fig. 17.—It is often easier to keep the file level, especially when dealing with a wide surface, if the fingers are spanned, as here shown.

The use of a piercing saw is better than the arrangement of drilling a series of holes inside the waste metal and cutting between them with a chisel. When using the latter method the design has to be filed to finish, whereas if the shape has been carefully cut with a piercing saw it is necessary only to clean up the edge by lightly draw-filing. The drilling and chiselling method is, of course, essential when the metal is more than about ⅛in. thick, or if the hole to be cut is farther from the edge than the depth of the saw frame.

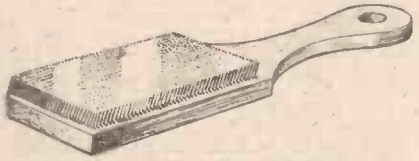


Fig. 18.—A file card for cleaning files.

Shears or Snips

Hand shears or snips are most suitable for cutting tinplate and sheet metal of fairly fine gauge, but should not normally be used for sheet iron thicker than about 20 gauge. Primarily they are intended for tinplate work, and are often called tinman's shears or snips. There are two principal types: straight and curved or bent. There are, however, universal types and others of heavy construction and with compound levers so that they can be used with stouter materials.

The most widely used types are illustrated in Fig. 14 (August issue), and any of these are obtainable in sizes from 6in. to 14in., this dimension representing the overall length. For most purposes, a pair of 10in. straight and a pair of 8in. curved will be found suitable. When only a small amount of sheet-metal work is to be done it may be more convenient to have a single pair of universal shears. The blades of these are less robust than are those of the other types and they are curved outward to permit of easy "pivoting" round a curve. Usual sizes of these universal shears are 8in. and 10in.

Cutting with Shears

The method of holding shears of any type is illustrated in Fig. 19. One handle is held between the thumb and the palm of the hand, while all but one of the fingers are used to pull on the other. Some workers prefer to use the little finger for opening the shears after each cut, while others use both the third and the little finger. In cutting along a straight

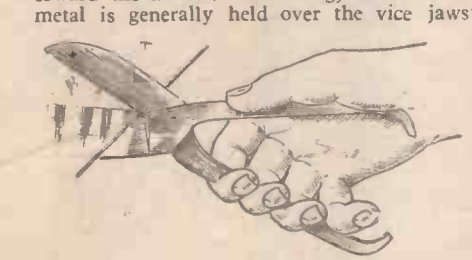


Fig. 19.—The correct method of holding hand shears to avoid pinching the skin of the palm of the hand.

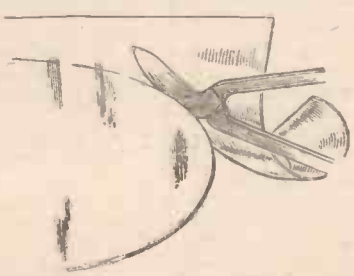


Fig. 20.—When using curved shears the blade tips should point away from the cutting line.

line, the main thing is to take long cuts and to hold the sheet and the shears straight in front of the body.

Curved or bent shears are often used incorrectly. For all except small curves it is best to hold the shears so that they point away from the line. By this means it is possible to "pivot" them more easily, and to press away the waste metal on the right. This is shown in Fig. 20. While cutting along a curved line the shears should be slowly turned to follow the curve as each cut is made, for if a series of cuts is made, turning the shears only after each cut, the line will be jagged and uneven.

When dealing with fairly heavy-gauge metal—20 gauge iron, for example, it is often found better to grip one handle of the shears in the vice. By this means greater pressure can be applied to the other handle, whilst it is easier to guide the sheet with the left hand. This method must not be abused, however, or else there will be a danger of bending or breaking the tool.

Sharpening

A good pair of shears requires very little attention beyond the occasional oiling of the rivet and still less rarely, tightening of the rivet. If the cutting edges become blunt or snipped it is necessary to sharpen them, either by grinding the edge or by rubbing it down with a coarse oilstone slip. In case any such attention is required, it is well to remember that the angle of the edge should be approximately 85 deg. If it is made too sharp there will be greater likelihood of its being snipped, whilst if the angle is too blunt the shears will not cut as easily. If any sharpening is required, take care that metal is removed from the actual cutting edge only; the shearing faces should be left perfectly flat. To ensure this they should be rubbed down with an oilstone or oilstone slip after sharpening, holding this flat against the side of the blades.

Straight Edges

As the name implies, these simple tools are used for testing whether or not a surface is *flat*. The straight edge may be merely a ruler with its edge accurately ground, or it may be of a rather more elaborate type.

The use of the straight edge requires but little explanation; you have a piece of work which is intended to be quite flat; you lay your straight edge along it in various positions, and if the job *is* flat, no daylight will show anywhere between the straight edge and the work itself. If daylight does show at any point, then the work has not been accurately done and the straight edge indicates just where the inaccuracy lies.

The Try Square

This is used primarily for testing whether or not two surfaces are accurately at right-angles with each other. Some of them are quite plain and the best are manufactured from a single piece of steel, machined to shape, hardened, and then accurately ground to size.

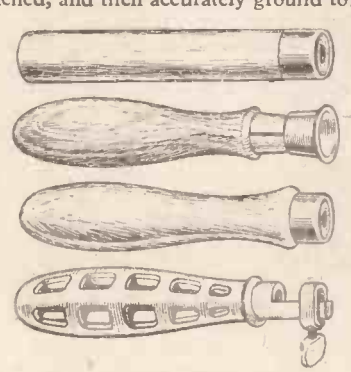


Fig. 28.—Set of file handles.

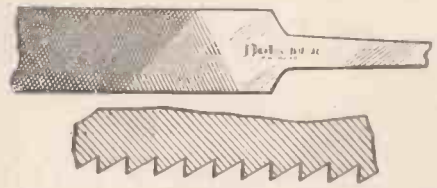


Fig. 21.—Top, the face of a file showing the cross cut. Below, section of file teeth.

Fig. 22.—Top, cant file. Below, warding file.

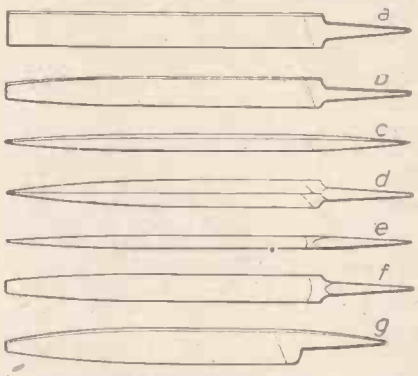


Fig. 23.—Longitudinal shape of files: (a) flat, (b) roughing file with bellied sides, (c) square, (d) triangular, (e) round, (f) half round, (g) knife edge.

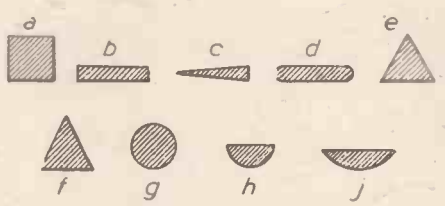


Fig. 24.—File sections: (a) square, (b) flat, (c) knife edge, (d) cotter, (e) and (f) triangular, (g) round, (h) and (j) semi round.

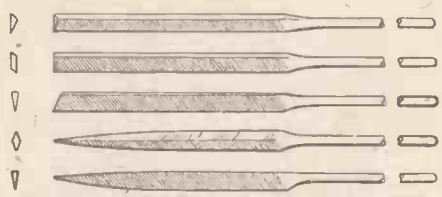


Fig. 25.—Set of Swiss files.

Fig. 26.—Dreadnought pattern files.

The Centre Punch

The centre or "dot" punch is a length of steel of round, hexagonal or octagonal (i.e. six-sided or eight-sided) section, having a point ground to a 60 deg. angle, and finally hardened. Where a piece of work has to be machined down to a line already marked out on its surface, the dot punch is used to make a series of small indented dots along the whole length of the line. These dots should be about ⅛in. apart, should be quite light, and should be *exactly* on the line so that when the machining is finished, half of each dot can still be seen on the edge of the work.

There is a special "spacing punch" available which has an attachment at its point to enable the spacing of the dots to be done much more accurately than is possible with the ordinary type of punch. Moreover, the spacing punch is automatic; the point is actuated by means of a powerful spring so that the dots are not only accurately spaced, but are also all one size.

Dividers and Scribers

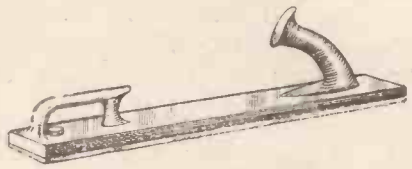
These tools are used for scratching or marking out lines on metal surfaces. The dividers of the simplest type are very like the simple compasses of our school days, and are used for scribing out circles and arcs (an arc being, of course, merely part of a circle). Scribers are single-point tools used for scratching lines of any shape. They may be either straight or bent; it is often possible to use the bent scriber in positions where the straight type cannot be used.

Where it is required to mark the surface of a *finished* job, the scriber is made from brass with a pointed end—this will not scratch and spoil the surface. In all other cases the scribers are made from carbon steel with hardened points.

The Surface Gauge

The surface gauge (or scribing block as it is often termed) is used for accurately marking out centre and other lines on work, the required lines having to be parallel to a common base. There are many different types of scribing blocks, the simplest being a steel pillar set into a cast-iron base, fitted with a scriber, and provided with adjustments for altering the height of the scriber point.

(*To be continued*)



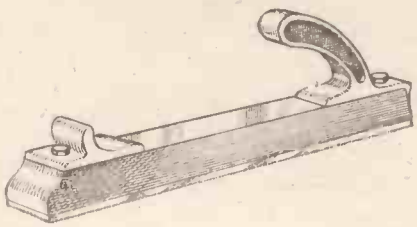


Fig. 29.—Two forms of hand milling files.

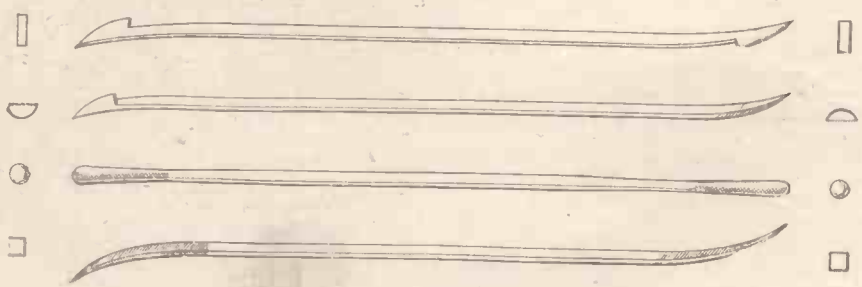


Fig. 27.—Riffling files.

An Electric Gas-lighter

A Novel and Efficient Device for the Home

By E. S. BROWN

MOST readers are familiar with the commercial type of gas-lighter. They are usually either mechanically flint-operated or of the battery-heated filament pattern. These lighters are sometimes erratic in their action, and flint renewals, or in the case of the electric type battery and element replacements, become periodically necessary.

The high-tension electrical gas-lighter which is described in this article is extremely efficient and certain in action and, if used in conjunction with the small mains transformer recently described in the March issue of PRACTICAL MECHANICS, will operate for an infinitesimal cost. Moreover, as no replacements are required, the lighter is always ready for instant use.

Components Required

The principle of the lighter is very simple and consists essentially of a high-tension car ignition coil, obtainable from any car-breaker for a few shillings, a circuit interrupter, adapted from a small buzzer or electric bell, and a car ignition condenser. These components are suitably mounted on a baseboard and wired up. The high-tension current is then taken by a heavily-insulated cable to a convenient holder incorporating a spark-gap at its extreme end.

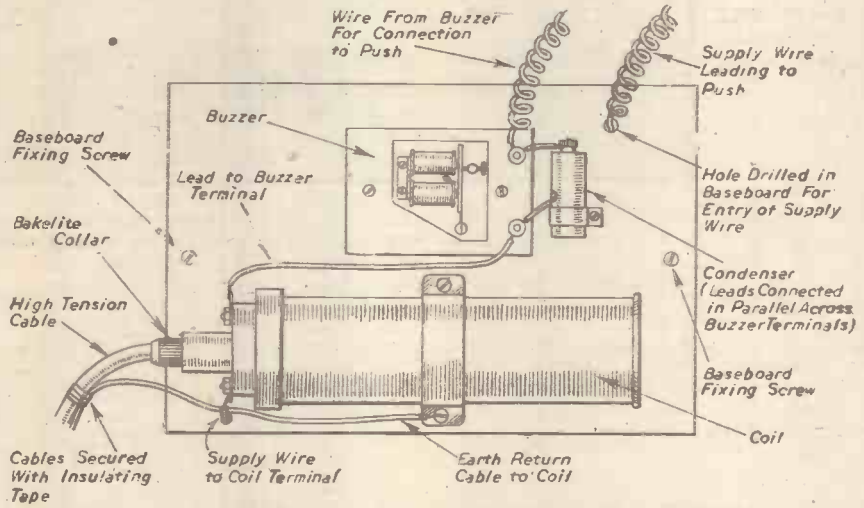


Fig. 1.—General layout and wiring of the electric gas-lighter. Cover of buzzer is removed, and the condenser is shown mounted on the baseboard for clarity.

Although the lighter is primarily designed to operate with the PRACTICAL MECHANICS transformer on a 12-volt circuit, it is equally effective on a small 6-volt accumulator or large capacity dry battery providing, of course, that a 6-volt coil is employed instead of the 12-volt one as specified below. For the purpose of this article, however, it is assumed that the reader desires to operate the lighter from the transformer, and we will therefore proceed accordingly.

In the first place it should be mentioned that no measurements will be given as it is obviously desirable to give some latitude to enable readers to use materials and components which are readily obtainable locally. If the general instructions are adhered to, however, no difficulty should be experienced in making a neat and workmanlike device which will give sound and satisfactory service.

To generate the necessary high-tension potential a 12-volt car ignition coil and condenser is required. As before stated, these two components can be obtained from any car-breakers for a nominal sum. The coil is mounted horizontally on the lower part of a suitably-sized baseboard by two screws in the fixing strap, as shown in Fig. 1.

Circuit Breaker

A small buzzer or electric bell is next required as the circuit-breaker. Should a bell be used, the clapper must be removed from the vibrator arm and the bell dismantled. The coil must next have its windings removed and rewound with two or three layers of No. 22 S.W.G. enamelled wire, to carry the necessary amount of current to the ignition coil primary windings. The wire must, of course, be wound on as evenly as possible. The amount of wire quoted is, of course, a generalisation and will depend upon the design and magnetic characteristics of the unit employed. The actual amount is best determined by experiment, and just sufficient wire should be wound on to operate the vibrator satisfactorily. This will then ensure an adequate intake of current to the ignition coil.

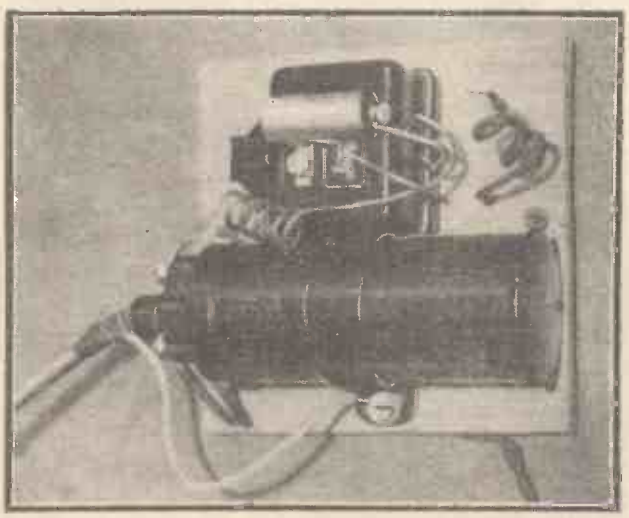


Fig. 2.—Showing the compact assembly of components mounted on the baseboard. The connecting wire from the buzzer to push is not shown.

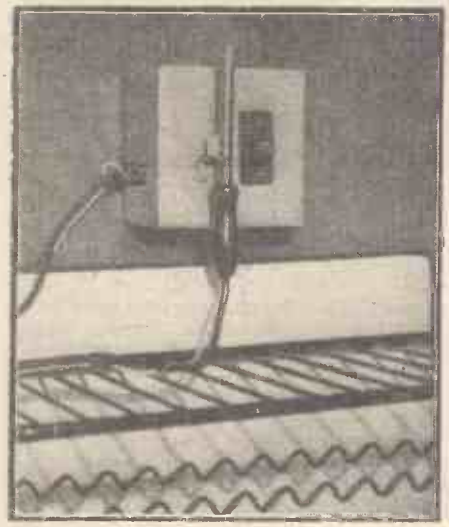


Fig. 6.—The completed electric gas-lighter installed ready for use.

Having rewound the bell or buzzer, it is then mounted in a suitable position on the baseboard, giving due attention to keeping the length of the connecting wires at the very minimum. In the illustration, Fig. 2, it will be seen that the condenser is mounted directly upon the buzzer cover, thus making a very compact unit.

Two small holes are drilled in the baseboard for the supply leads—one adjacent to the ignition coil low-tension terminals, the other slightly offset from the centre of the baseboard.

The two free ends of the supply lead are introduced through the holes. The lead adjacent to the coil is connected to one of the low-tension terminals, the other is pulled through the second hole until a length of approximately 12in. protrudes. The wire is then prevented from retracting by means of a pull-knot tied near the baseboard. Although not essential, a neat appearance is given by finally coiling the wire.

The other low-tension terminal is connected to one of the two terminals of the buzzer. The remaining buzzer terminal is connected to a 12in. length of free wire which can also be coiled. This wire provides the connection to the push-switch. All connections must be made with good quality insulated wire of not less than No. 22 S.W.G. The condenser is next connected in parallel across the buzzer terminals, keeping the connecting wires as short as possible.

The baseboard assembly is now screwed in an accessible position on the wall by two or four screws, using wall-plugs to ensure a firm and rigid fixture. Washers or distance-pieces should be interposed between the baseboard and wall to

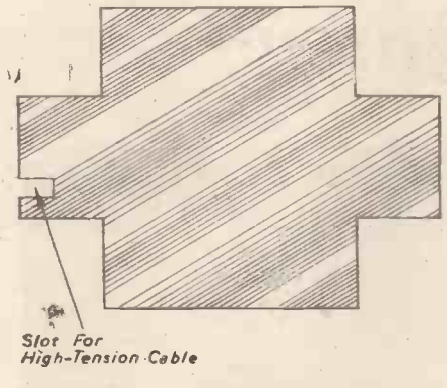


Fig. 3.—Shape of blank for forming the cover.

ensure sufficient clearance for the supply lead.

The cover is made from heavy gauge tinplate cut out with a paper template as shown in Fig. 3. The sides are carefully bent until parallel, then soldered along the four corners, afterwards removing any surplus metal with an old file and finally smoothing with emery paper.

The igniter holder is made from a "U"-shaped strip of fairly heavy gauge brass. This is well sweated in with solder or riveted in a suitable position on the front of the cover. A bell push is next placed into position beside the holder, and the fixing holes carefully marked out on the cover. These are then drilled out with a suitably-sized drill, and a slightly larger hole is made midway between for the bell push connecting wires.

A small piece of wood is required as a backing, with holes drilled in same identical with those in the cover, which is now given two coats of good quality enamel, allowing sufficient time between coats for the enamel to thoroughly harden. When the enamel is perfectly dry, the two free wires on the baseboard assembly, that is, the supply and buzzer leads, are passed through the larger hole in the wood backing and the cases and connected to the respective terminals of the bell push. The bell push is then carefully screwed on to the case and wood backing, and the case gently pushed over the edges of the baseboard and secured by two small screws.

Igniter Details

The igniter is constructed from a short length of ⅜in. internal diameter brass or copper tubing. A suitable length of high-tension car ignition cable is then passed through the tubing until it protrudes a short distance from the opposite end. Sufficient length of cable should be allowed to enable the igniter to easily reach all the gas burners.

The insulation is removed from the end of the cable for a distance of ⅛in. and a short length of fairly thick wire, preferably nickel or nickel steel, is pushed down into same until approximately ½in. projects. It is then secured into position with a light touch of solder. The cable is then withdrawn into the tube until the electrode wire only projects above the end. The tube is then held firmly in a vertical position in a vice, and molten sealing-wax or shellac is run in at the top to surround the cable. The wax or shellac hardens in a very few seconds and securely fixes the cable and electrode into position.

The side electrode is a piece of wire similar to that employed on the centre electrode, and is soldered at the top of the tube and bent inwards to nearly meet same, leaving a spark-gap of approximately 1/16in. between.

The earth return cable to the metal container of the coil is soldered to the bottom end of the tube. To prevent the two cables from subsequently separating and sagging, they are secured together with insulating tape at intervals of 6in. A wood handle to hold the igniter with is next required. It can, of course, be made or purchased according to the inclination of the handyman. A point to note, however, is that the hole in the handle extends throughout its entire length and affords a tight fit for the igniter-tube. The handle is fixed upon the tube by first passing the cables through, then pushing the handle home until secure. Should the handle tend to loosen during use, it should be re-assembled with an application of thick shellac varnish and allowed to thoroughly dry out before being placed into service. When assembled, the handle may be stained and varnished or painted according to choice. A small brass ring is now placed over the tube in a convenient position above the handle and soldered into place. This ring forms a convenient means of hanging the igniter upon its clip when out of use. A general view showing the construction of the igniter assembly is shown in sketch Fig. 4, and a view of the completed igniter is given in Fig. 5.

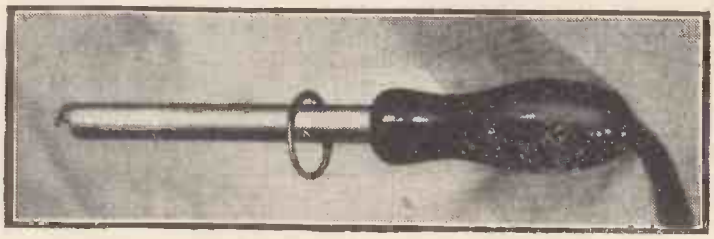


Fig. 5.—The completed igniter. Note the position of the brass ring for hanging up the igniter when not in use.

The high-tension cable is connected to the coil by slipping the coil bakelite screw-collar over same, removing the insulation from the end of the cable for approximately ½in., then spreading the wire out fanwise and screwing in the collar until tight. It is possible, especially if the coil has been stored in a damp atmosphere, that the contact stud has become badly corroded. It is therefore advisable to check over and clean if necessary, before making connection with the high-tension cable. Corrosion can also occur at this point by a loose connection causing internal arcing.

Final Adjustments

The earth return cable is connected to beneath one of the coil-fastening strap screws, having, of course, previously removed any paint or rust that may prevent good electrical contact. In order to obtain a good hot firing spark, the buzzer should be adjusted until it gives a clear high note. As the adjustment proceeds, the character of the spark should be frequently tested. It is correct when it is continuous and emits a sharp crackling noise. Careful attention to the tuning of the buzzer will be amply repaid in the subsequent results.

In view of the forthcoming legislation making it compulsory to instal suppressors on all electrical equipment that is liable to cause electrical disturbances and interference, it will, of course, be necessary for this addition to be made to the above-described instrument. At the time when the photographs were taken no such legislation was anticipated, and in consequence no suppressors were fitted. However, a car ignition suppressor, purchasable for quite a modest sum, can be very easily installed in the high-tension circuit.

To operate the lighter, the igniter is removed from its holder and placed immediately over the gas jet. The gas is then turned on and the push sharply depressed. The gas will instantly ignite and the igniter is then returned to its holder.

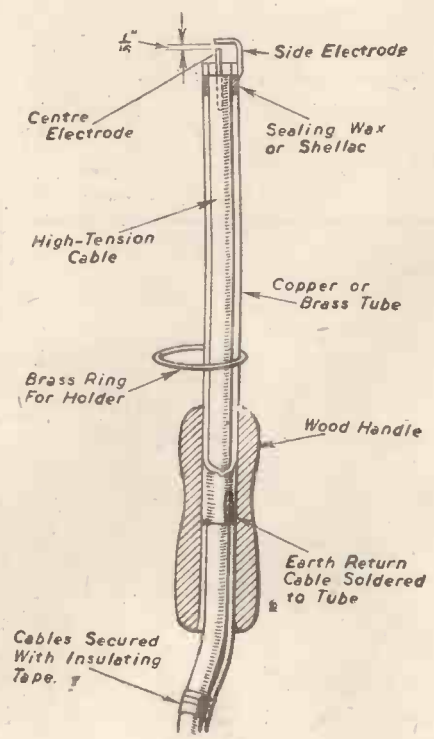


Fig. 4.—Sectional view giving details of the igniter.

New "Argonaut" Aircraft

TWENTY-TWO Canadian aircraft, ordered by B.O.A.C. for use on its routes to the East and Far East, are now nearing completion. Some have already been delivered. These pressurised air-liners, which will be known as the "Argonaut" class, will each carry 40 passengers. The aircraft is powered by four Rolls-Royce Merlin engines, and has a tricyle undercarriage. The normal cruising speed ranges are 230 to 240 m.p.h. at 10,000ft. and 250 to 270 m.p.h. at 20,000ft., at an average weight of 80,200lb. With a full complement of 40 passengers, crew and cargo load, the total weight of the aircraft is over 36 tons and has a range of 2,400 miles.

The Elements of Mechanics and Mechanisms—23

Intermittent Mechanisms (continued)

By F. J. CAMM

Inverse Geneva Mechanism for Heavy Duty

The inverse Geneva mechanism illustrated in Fig. 15 is ideal for heavy duty, and is an interesting variation with unique advantages. In heavy duty applications it is desirable to apply the turning force of the driving crank pin or roller as near to the periphery of the driven wheel as possible.

Fig. 13.—Method of locking inverse Geneva mechanism.

This can be effected by mounting the crank lever on a countershaft driven through a spur gear train by the driving shaft. The kinematics of the mechanism would then be the same as those of the fundamental inverse form already considered.

The introduction of a toothed sector in place of a driving spur wheel as shown introduces an important variation from the standard form. The stationary period of the driven wheel is no longer governed solely by the number of slots, and the mean speed of the wheel movement can be considerably increased by increasing the velocity ratio of segment and countershaft pinion.

Consider a diagrammatic end view of the mechanism as illustrated in Fig. 16. The sector which has the same number of teeth as the spur pinion on the crank or countershaft rotates through an angle γ before engaging the pinion. After engagement the pinion revolves idly through an angle Φ before the crank pin or roller engages a wheel slot. Hence the stationary period of the wheel will be the sum of the times taken for a sector revolution of γ degrees and a pinion.

$$\text{Angle } \gamma = 360 - \left(\frac{360\ Np}{2\pi R}\right) \text{ degrees.}$$

$$= 360\left(1 - \frac{Np}{2\pi R}\right) \quad \ldots\ldots\ldots\ldots (17)$$

Where N = number of teeth in sector.
= number of teeth in pinion.
p = pitch of teeth.
R = pitch radius of section.

From equation (8),

$$\text{Angle } \Phi = 180\left(1 - \frac{z}{n}\right) = 180\left(\frac{n-z}{n}\right) \quad \ldots (18)$$

Where n = number of slots.

The ratio, $\dfrac{\text{Angular velocity of sector}}{\text{Angular velocity of pinion}} = \dfrac{r}{R}$

where r = pitch radius of pinion.

Hence the stationary period of the driven wheel can be represented by an angle of rotation of the sector of:

$$\gamma + \frac{r\Phi}{R} \text{ degrees} \quad \ldots\ldots\ldots\ldots\ldots (19)$$

The duration of the driven wheel movement can be represented by an angle of rotation of the driving crank and pinion of $180\left(\dfrac{n+2}{n}\right)$ degrees, which can be represented as an angle of sector (or driving shaft) of:

$$\frac{180(n+2)\,r}{n\,R} \text{ degrees} \quad \ldots\ldots\ldots\ldots\ldots (20)$$

From equations (19) and (20), the ratio—

$$\frac{\text{Wheel idle period}}{\text{Wheel moving period}} = \frac{R\left(\gamma + \dfrac{r\Phi}{R}\right)}{180r(n+2)}$$

$$= \frac{NR\left[360\left(1 - \dfrac{NP}{2\pi r}\right) + \dfrac{180\,r\,(n-2)}{nR}\right]}{180\,r(n+2)}$$

$$= \frac{nR}{(n+2)r}\left[2\left(1 - \frac{r}{R}\right) + \frac{(n-2)r}{nR}\right]$$

$$= \frac{2n(R-r)}{r\,(n+2)} + \frac{(n-2)}{(n+2)} \quad \ldots\ldots\ldots\ldots\ldots (21)$$

For example, consider an eight-slot wheel when the pitch radius of the sector is three times larger than the pitch radius of the pinion.

n = 8 and R = 3r.

Hence $\dfrac{\text{Wheel idle period.}}{\text{Wheel moving period.}}$

$$= \frac{2.8(3r-r)}{r(8+2)} + \frac{(8-2)}{(8+2)}$$

$$= 3.8.$$

Compare this figure with the ratio 2.666 obtained without a sector drive.

To effect large ratios without considerably increasing the overall size of the mechanism, the sector can be replaced by an annulus having a number of internal teeth equal to the number of teeth in the pinion.

Two important advantages of the above mechanism should be noted; it is suitable for heavy duty since the thrust of the driving crank pin or roller is applied very close to the periphery of the driven wheel, and since the pinion revolves idly for a time after engagement with the sector, there is little or no shock on engagement.

Indexing of Machine Tools

An application of the Geneva principle to an automatic traversing and indexing mechanism is illustrated in Fig. 17. The turret head (not shown), carrying a radial arrangement of cutting tools, is mounted on a horizontal shaft F, which passes through a cross bearing in the slide casting. A Geneva wheel with six slots is fixed to one end of the shaft F and is engaged by the pin D of a disc crank fixed to a shaft E, which is parallel to shaft F.

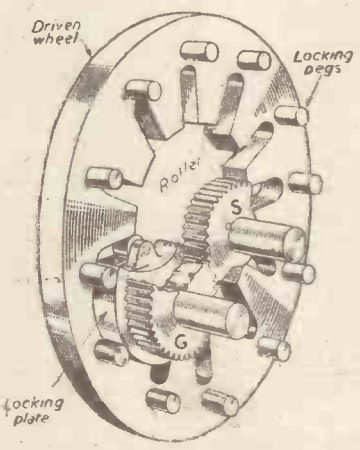


Fig. 15.—Inverse Geneva mechanism for heavy duty.

The Geneva mechanism is designed to

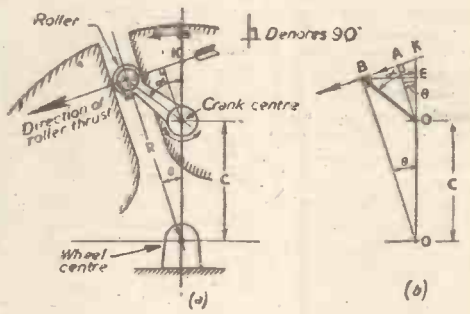


Fig. 14.—Diagrams for determination of velocity ratio of inverse Geneva mechanism.

give the required throw and one revolution of the disc crank effects rotation of the Geneva wheel, and consequently the turret head, through one sixth of a revolution. Before the turret can be rotated, however, a locking bolt is withdrawn by means of a cam on the crankshaft.

A transverse pin B in a rack A is coupled by a link C to the crank pin D so that one revolution of the crankshaft E from the position shown causes the slide to be drawn back and the turret to be indexed. The slide which carries the workpieces is then moved again towards the working position when the workpieces contact the tools.

Since the motion of the turret head and slide is practically harmonic, the action of the mechanism is quite smooth and free from shock. Where two pins can be employed on the disc crank two capstan stations are indexed at the same time.

The method of indexing a turret of an early New Britain-Prentice automatic lathe is illustrated diagrammatically in Fig. 18. On this machine, contrary to the general practice of employing stationary tools, the workpieces are held stationary while the cutting tools revolve. The tools, one for each cutting operation, such as turning, boring, or facing, are secured to the ends of four gear spindles having bearings in the lathe headstock. The work is secured on the turret head to five chucks or faceplates, each four of these being in line with a tool carrying spindle A; the fifth chuck is used for loading and unloading the workpieces.

The turret head B is secured to the end of a comparatively large diameter shaft C, collinear with the centre of the pitch circle of the tool-carrying spindles and carrying a Geneva wheel F and a dividing disc G at the opposite end.

The turret shaft C carries a radial roller which is mounted on the base of a collar E and engages narrow strips of plate secured

obliquely to the outer surface of a cylindrical main drum D on the driving cam shaft and produces axial movement of shaft C, necessary to move the workpieces on the turret head into contact with the cutting tools.

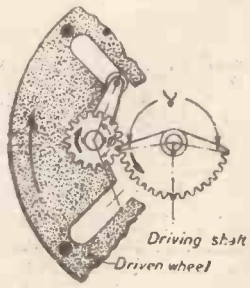


Fig. 16. — Diagram for determination of stationary period of wheels; locking sector not shown.

The cam strips on the drum D also effect withdrawal of the work from the tools, and at the end of each return stroke the turret is indexed by a crank on the drum shaft engaging the five-slot Geneva wheel F. The turret head is then approximately located by a segmental locking plate integral with the crank web; accurate location is effected by a spring-loaded bolt which engages a notch in the dividing wheel.

The method of indexing a spindle carrier of an Acme-Gridley Auto-bar machine is illustrated in Fig. 19. The carrier is rapidly indexed to bring the spindles to their next consecutive position, after the cutting tools have been withdrawn from the workpieces.

A crank lever A drives the Geneva wheel W through one quarter of a revolution and consequently indexes the carrier locking disc D and the spindle carrier by means of the meshing spur gear wheels x and y. As the roller R, at the end of the crank lever, enters a slot in the driven wheel, a cam C integral with the boss of lever A contacts a roller r and actuates a frame F, which causes a locking pin P to be released against the compression of a spring S. When the roller R is being disengaged from the slot in the Geneva wheel, the pin P, under the action of the spring, engages a slot in the carrier disc and prevents rotation of the spindle carrier; at the same instant (of disengagement of roller R) the roller r is leaving contact with cam C.

Intermittent Reversing Mechanism

The function of the mechanism illustrated in Fig. 20 is in the transformation of continuous rotary motion of a driving shaft into intermittent rotation of a carrier C in the same direction through half a revolution at regular intervals; this action effects displacement of a workpiece A from a position on table X to a position opposite on table Y, and at the same time the workpiece is turned upside down. The workpiece in the mechanism illustrated is in the form of a rectangular prism.

The driving shaft carries a crank lever with integral locking disc, which effects rotation of the Geneva wheel W through a fraction of a revolution according to the number of slots. The fractional revolution of the Geneva wheel is transformed into half a revolution of the work-carrier C by a spur gear train 1, 2, 3 and 4.

A complete cycle of operations is as follows:

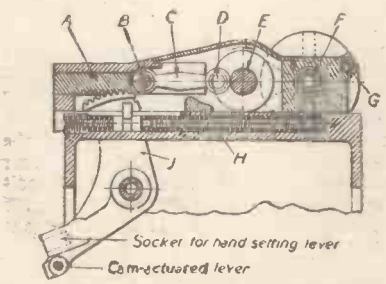


Fig. 17.—Brown and Sharpe method of turret traversing and indexing.

1. Workpiece A is rammed into the leading slot of the stationary carrier by a reciprocating member R. A spring-loaded plate p clamps the workpiece in the slot.

2. Member R is withdrawn and the driving crank lever engages the Geneva wheel and effects rotation of the carrier through 180 deg., thus reversing the workpiece.

3. The locking sector plate of the crank lever engages the corresponding periphery of the Geneva wheel and locks the mechanism.

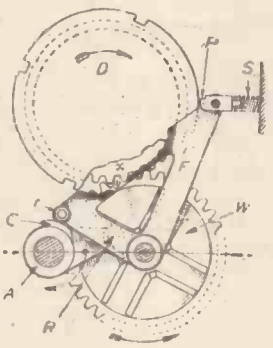


Fig. 19. — Indexing and locking mechanism for spindle carrier of Acme-Gridley auto-bar machine.

4. Member R now rams a second (identical) workpiece into the remaining empty slot, causing simultaneous ejection of the first (now reversed) workpiece by means of a straight bar B, which passes longitudinally through the carrier in the plane of the axis of the slots.

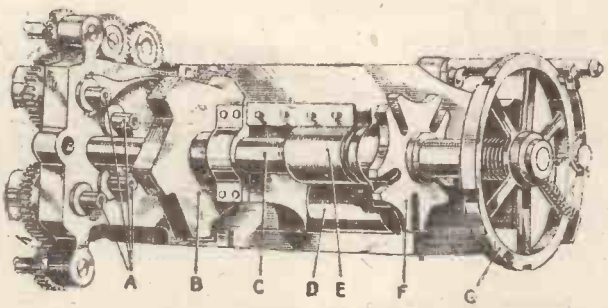


Fig. 18.—Incomplete plan view of early New Britain-Prentice automatic lathe.

5. Member R is then withdrawn and the driving crank locking plate is disengaged from the Geneva wheel as the crank roller enters a slot to effect rotation of the carrier through half a revolution.

Turning of the carrier through half a revolution can only be effected when the overall velocity ratio of the spur gear train has a particular value which depends solely on the number of slots used in the Geneva wheel. The numbers of teeth required on the spur wheels are calculated as follows:

Revolutions of carrier per 1 rev. of driving shaft $= +\frac{1}{2}$ where the plus sign denotes rotation in the same direction.

Revolutions of spur wheel 1 per 1 rev. of driving shaft $= \frac{(T4)\,(T2)}{n\,(T3)\,(T1)}$ where n = number of Geneva wheel slots; T1, T2, T3 and T4 = number of teeth on gear 1, 2, 3 and 4 respectively.

But the carrier and spur wheel 1 are rigidly connected,

$$\text{thus } \tfrac{1}{2} = \frac{(T4)\,(T2)}{n(T3)\,(T1)}$$

This formula can be expressed in the form

$$n = \frac{2\,(T4)\,(T2)}{n\,(T3)\,(T1)}$$

As an example, if T1 = T2 and the number of slots in the Geneva wheel is four, then the velocity ratio of the gear trains 3 and 4 is 1 : 2, i.e.,

$$\frac{T4}{T3} = \frac{2}{1}$$

If the number of Geneva wheel slots is six, then the required ratio is T4 : T3 = 3 : 1.

When the carrier is required to rotate in a direction opposite to that of the driving shaft only two spur gear wheels are essential. If the gear wheels 2 and 3 of the mechanism illustrated in Fig. 20 are not employed, the carrier will rotate in the opposite direction and the ratio T4 : T1 = n : 2.

(*To be continued*)

Configuration at roller entry	Centre distance C	Max. velocity ratio r/(C+r)
120° 120° 3 slots	1·154r	0·4643
90° 4 slots	1·414r	0·4142
72° 72° 5 slots	1·702r	0·3701
60° 6 slots	2r	0·3333
45° 45° 45° 8 slots	2·617r	0·2765
40° 40° 9 slots	2·924r	0·2548
36° 10 slots	3·236r	0·2361

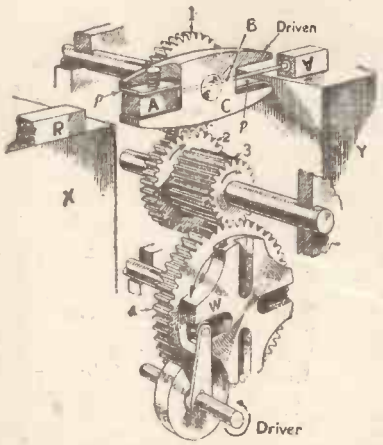


Fig. 20.—Geneva mechanism employed in an intermittent reversing mechanism.

NEW SERIES

Wood Turning.—2

Speeds—Centres—Chucks—Wood Turning Tools

By FREDERICK JACE

GENERALLY speaking, the spindle of a wood turning lathe revolves at a much higher speed than a metal worker's lathe, the normal pulley of which revolves at about 900 r.p.m. In fact the higher the speed of a wood-turning lathe, within practical limits, the better. With a treadle lathe those limits are set by muscular power. Obviously a very high speed could not be maintained by this means for very long. With a motorised lathe, however, the higher the speed possible, within the capacity of the motor, the better. Much less effort is required to pare off the wood with high speed than with low. Moreover, the finish is better, requiring the minimum amount of finishing with sandpaper.

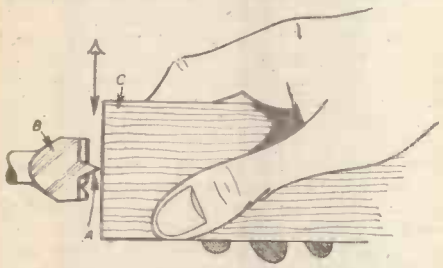


Fig. 4.—The Prong Chuck, in which A is the point, B the driving wings and C the work.

A speed of about 2,000 r.p.m. up to 1in. diameter work will be found satisfactory, and about 1,500 revolutions for work of 3in. diameter. Obviously as the diameter of the work increases the speed must be reduced. For rough turning, prior to finishing, a speed of about 600 r.p.m. is about right. The mandrel pulley should be about 5in. in diameter to provide a good arc of contact with the belt and thus avoid slip. It is useful to have fast and loose pulleys so that the work can be quickly started and stopped. Obviously pulleys of various diameters will be necessary, either on the driving shaft and/or the lathe mandrel.

In commercial lathes used for mass production of wood turnings a different arrangement is employed. The cutting tools are attached to moving carriages which automatically turn to a given shape, length and diameter. Large round rods of any length are not turned in a lathe at all. The wood is pushed through a hollow cutter.

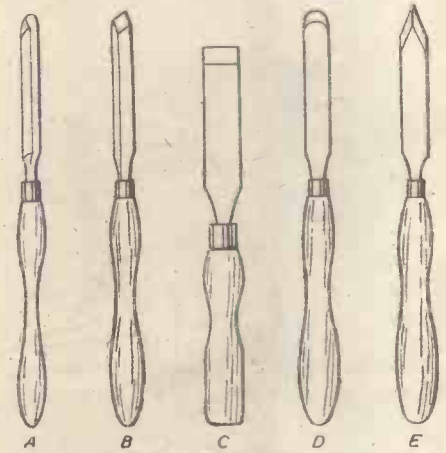


Fig. 9.—Wood Turning Tools. A, turning gauge; B, side chisel; C, facing chisel; D, round-nosed chisel; E, diamond point chisel.

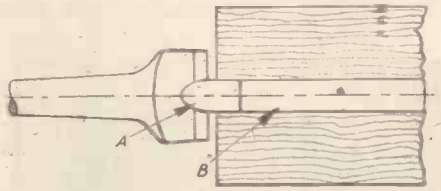


Fig. 5.—Another style of prong chuck. A is the pilot and B the bore of the work.

Other wood turning lathes are made for face plate work only, and they are suitable for such items as bread boards, wooden trays, circular plinths and similar work. Such lathes, of course, have not a tail stop or bed, just a spindle and a support for the hand rest.

The head stock of a lathe is usually provided with a screwed nose at each end so that face plates can be attached on each. The diameter of work which can be accommodated on the right hand end of the spindle is, of course, limited to the centre height above the bed or the gap of the bed. Larger work is turned on a face plate attached to the left hand end of the lathe spindle. When this latter arrangement is used the hand rest is attached not to the lathe itself but to a floor stand.

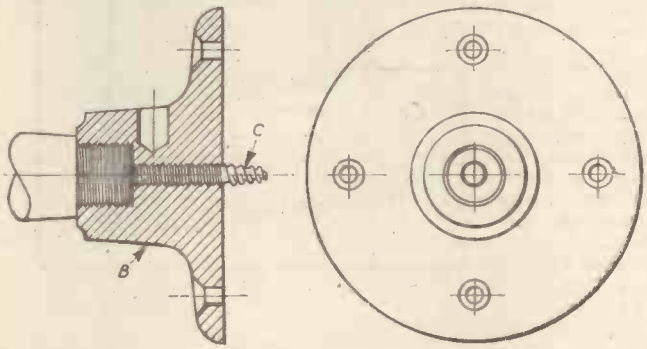


Fig. 7.—The Screw Chuck.

Other wood turning lathes, known as copying lathes, are used for special purposes such as turning irregular shapes—ovals, airscrew blades, etc. In these lathes the tool is advanced and withdrawn, in conformity with the shape desired, by means of a cam plate

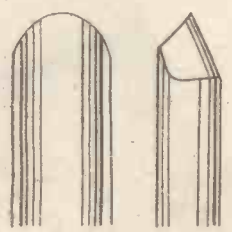


Fig. 10.—Front and side views of the Gauge.

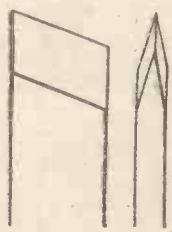


Fig. 11.—Side and bottom views of the Side Chisel.

arrangement shaped to the pattern the work is required to be.

Chucks

The prong chuck is shown in Fig. 4. This enables the centre of the work very easily to be gauged, because the point projects beyond the wings. When the centre has been found a light tap on the end of the chuck will drive the point in and force the wings also into the wood, thus providing the drive.

Another type of prong chuck is shown in Fig. 5. It is used for chucking work that is bored before turning, the pilot, of course, fitting the hole.

The usual sizes for the prong chuck are 1in. and ¾in., the dimensions, of course, to be the diameter over the wings.

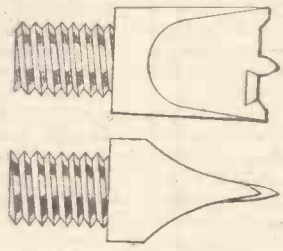


Fig. 6.—The Fork Centre.

Centres

The forked centre is shown in Fig. 6, from which it will be seen that it resembles the prong chuck. It is screwed to the mandrel nose for turning articles between centres. It drives the work in a manner similar to the prong chuck.

The screw chuck, Fig. 7, is made of cast iron, generally, and also screws into the mandrel nose.

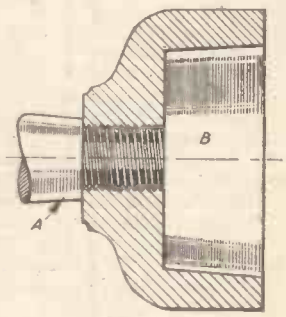


Fig. 8.—The Cup Chuck; A, lathe spindle, B, taper recess in chuck.

Cup chucks, Fig. 8, drive by means of the work being forced into them. They thus drive by friction only. A 2in. and a 2½in. diameter cover the usual range of amateur work.

(To be continued)

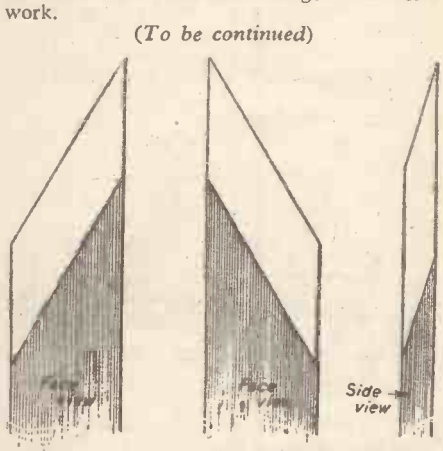


Fig. 12.—Right- and left-hand diamond point tools.

A Roll-film Holder for a Plate Camera

Constructional Details of a Useful Accessory for the Photographer

By R. L. G.

THERE are usually different schools of thought with most subjects, and the photographic art is no exception. With photography this may be reduced to two general schools—the miniature camera enthusiasts and the plate camera enthusiasts. Many years ago the latter were often referred to as "serious workers," possibly on account of the bulky equipment and accessories which were characteristic of any photographic outings in those early days.

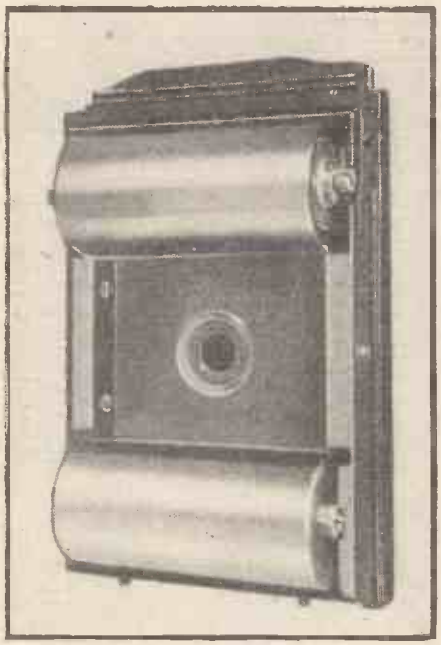
Progress, producing improvements in design and material, has brought into being the miniature camera, and as many exhibition awards are won annually by miniature camera users the original size of negative is now quite a minor consideration, excepting perhaps in press-work where the larger negative has some points in its favour.

The large camera still has a large popularity, however, even with the extra cost of the sensitive material used in them, whether plates, flat film, or film packs. It is not surprising, however, that economy of material for these larger cameras has been accomplished for many years by the introduction of such accessories as plate adaptors and roll-film adaptors, allowing as they do smaller sizes of picture to be taken in the larger type of camera.

A further accessory associated with the plate camera and generally included in the equipment, is the film pack adaptor which accommodates the film pack and allows the less bulky film to be used instead of glass plates.

Roll-film holders, or adaptors, are used for a similar purpose—to accommodate roll films instead of flat films as taken in the film pack. These roll-film holders may be purchased complete to take the place of the ordinary dark slide. The holders or adaptors are, however, usually specially designed for a particular camera model, and one particular make may not always fit other camera models without some modifications. This is because the film must register at the exact distance from the lens, as does the plate, so that the focusing and its associated scales correspond.

The film pack adaptor makes due allowance for this distance, and it was therefore on this factor that the writer worked to construct a roll-film holder which would fit exactly in the film pack adaptor in place of the film pack. The size of roll film to be accommodated was, of course, governed by the inside dimensions of the film pack adaptor. In the writer's case the camera was the popular quarter-plate size, i.e., 4¼in. x 3¼in., and it was found that the 3¼in. x 2¼in. roll film could be accommodated comfortably if a suitable mask was incorporated giving a final picture size of 2in. x 2in.



The finished roll-film holder.

Simplicity of Design

Simplicity of design and construction was desired, so it was decided to construct the holder from medium-gauge sheet brass. The 22 s.w.g. material used was found to give a workable thickness easy both to cut and solder, whilst at the same time giving a rigid job. Soldering was considered essential to give the necessary squareness and light tightness.

As a general guide, sizes have been given and will apply, with slight variations, to most adaptors of the quarter-plate size. It was very necessary, however, to build up the roll-film holder with the film pack adaptor handy for reference and trial fittings during construction. In this way the minimum of filing work was found necessary to give the desired light-tight fitting.

Three complete views of the holder are given in the drawings, from which the construction can be readily followed. Fig. 1 shows the holder from the back with the central red window. Fig. 2 from the front, whilst Fig. 5 shows the holder as it appears when fitted into a typical film pack adaptor and ready for sliding into the plate camera. In this latter view the removable light-tight sheath is shown partially cut away to show part of the film behind the aperture of the mask ready for exposure.

Details of Construction

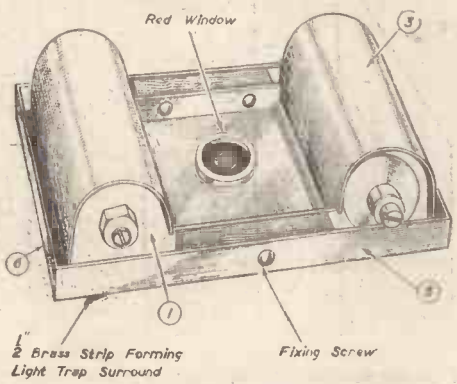
The first parts to be made were the two side plates each numbered (1) in the drawing, the dimensions being given in Fig. 4. The 22 s.w.g. sheet brass was found quite easy to cut with small metal snips. To avoid unduly bending the metal the straight section between the two half-circles was scored deeply and the waste metal bent until it severed along this line.

One side plate was drilled with two 2BA clearance holes for the pivots, as shown, whilst the other has only one pivot hole, the other being a larger hole to take the film winder.

The winder was obtained from an old 3¼in. x 2¼in. box camera. This was carefully removed from the box camera by accurately drilling out the three rivets securing it to the camera casing. This winder was soldered around the rim to the side plate, although this could have been riveted.

The two side plates (1) were then each clamped between two pieces of planed hardwood in a vice and bent accurately along the dotted line to produce a projecting flange of ¼in. width.

This flange is governed as to width by



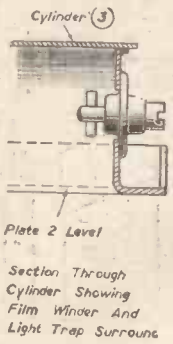


Fig. 1.—Back view of holder and enlarged detail of film winder.

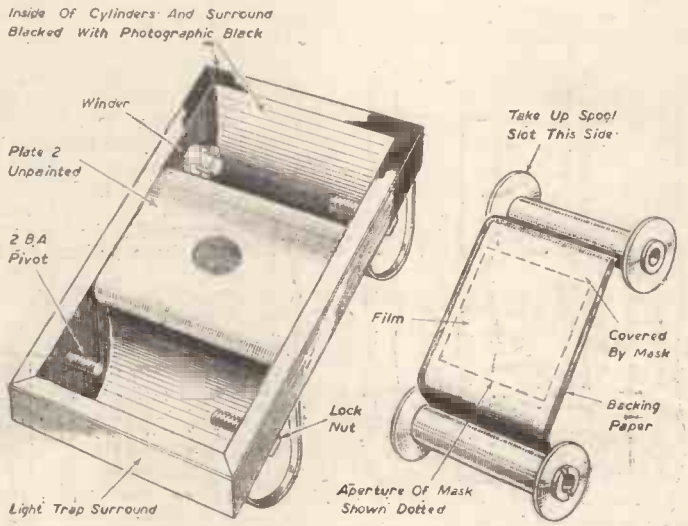


Fig. 2.—Front view of holder and details of the spools, showing how they are arranged in the adaptor.

the distance between the plates and the inside size of the film pack adaptor. In the present case this opening measured 5¼in. x 3 7/16in.

The next part to be made was the plate numbered (2). As it is across this plate that the film eventually passes, face upwards, it was necessary to make this plate with particular care as to its flatness.

Both ends of this plate were then given a ¼in.-radius bend; this was done on a ¼in. diameter rod. Accuracy was necessary here, too, in order that the film would lie perfectly flat. A ¼in.-diameter hole was drilled in the exact centre. Plate (2) was next placed on a flat surface with curved ends upwards. It was also slightly raised by the insertion of two thicknesses of backing paper to approximate to the thickness of the film plus backing paper.

Each side in turn was then placed against plate (2) and soldered on opposite sides, the solder being run along the inside edges, as shown in Fig. 3. As dead squareness of the holder was a vital point, an accurately drawn rectangle was outlined on the flat surface and used as a guide during soldering operations. It was found preferable to spot solder at several points first and, finally, fully solder when the correct alignment of parts was obtained.

Cylindrical Covers

These are each numbered (3) and their shape, in the flat, is shown in Fig. 4. The curve in each was obtained by bending over a brass tube of 1¼in. diameter.

These covers were then soldered to the side plates. As the covers were made to slightly overlap the side plates the soldering of the parts was found simplified and gave a very rigid job. A generous amount of solder was used to give perfectly light-tight joints. An electric soldering iron with an ample-sized bit was found preferable in all soldering operations as the sheet metal is inclined to dissipate the heat.

The flanges of both side plates and top covers now gave a flange all round the rectangle, and only a small amount of filing was necessary to allow the holder to fit accurately inside the film pack adaptor.

Four plain brass strips, shown as parts (5) and (6), were then carefully soldered at exact right-angles to this flange to provide a light-trap surround. Careful filing was necessary to give a very close fit to the inner rectangle of the film pack adaptor.

Alterations to the Film Pack Adaptor

The only alteration necessary in the writer's film pack adaptor was that of removing the hinged back cover, and this was quickly accomplished by withdrawal of the thin rod acting as a hinge. This cover could, of course, be replaced at a moment's notice if the film pack holder was required at any time for its normal purpose.

Two mahogany strips or blocks numbered (4) were then made, each fitting closely at the central point of the roll-film holder between the channel formed by its side plates and surround. These blocks are merely used to afford a grip to the small brass fixing screws screwed in from the outside of the film pack adaptor casing. The blocks themselves are secured from inside the side plates by two c/sk screws; these can be clearly seen in Fig. 1.

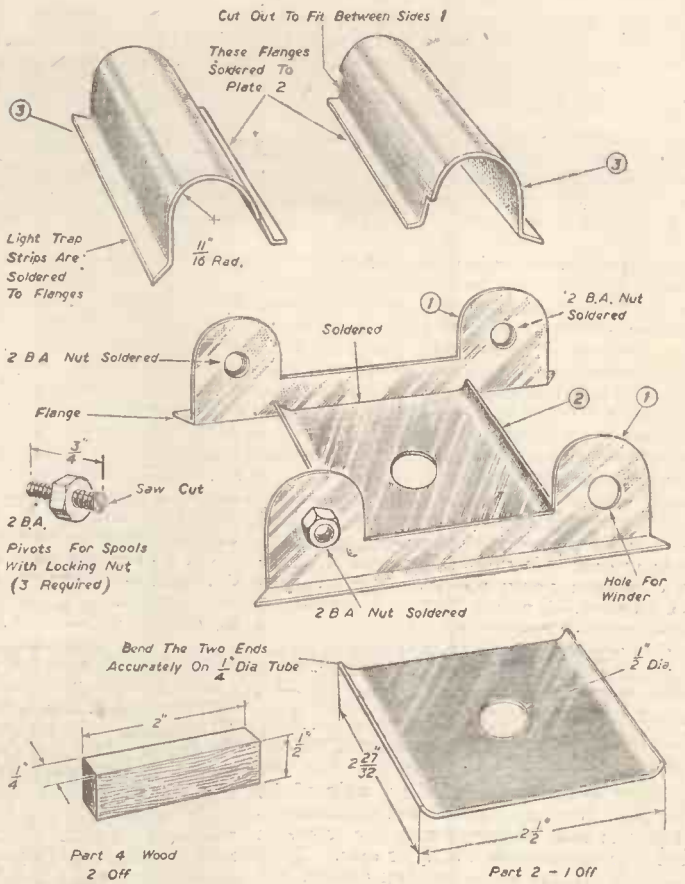


Fig. 3.—Showing how the various parts are bent to shape and assembled.

The Pivots

To hold the film and take-up spool in the half-cylinder receptacles, three short lengths of 2BA brass screwed rod were used with nuts to act as lock nuts. Fig. 2 shows these screwed into the positions they occupy when the two spools are in place, the spools themselves being omitted in this view for clearness. The correct way of fitting the spools so that the film comes right side up is shown in the right-hand sketch in Fig. 2.

A piece of suitable red celluloid or similar material was cut to ⅜in. diameter and placed centrally over the ¼in.-diameter hole on the back of plate (2). This disc was held in position by means of a simple flat brass ring, a small discarded brass lens mount being used for the purpose. This was soldered to plate (2), care being necessary to avoid damaging the red material.

The whole of the inside of the roll film holder was then given a coat of photographic dead black, including the sides of the light-trap surround. Plate (2) was left unblackened as, of course, there is some friction from the film backing paper. A hard-drying black enamel could have been used for this, although no detrimental results should occur by leaving the plate unpainted. The whole of

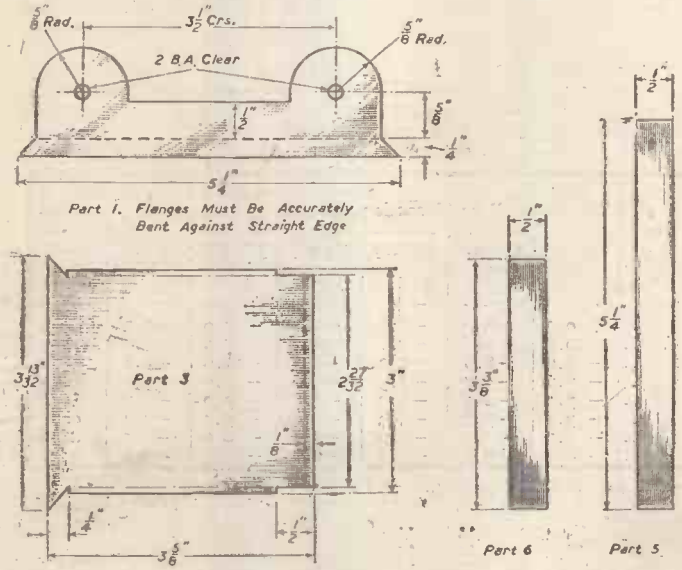


Fig. 4.—Details of side plates, and blank for forming cylindrical cover.

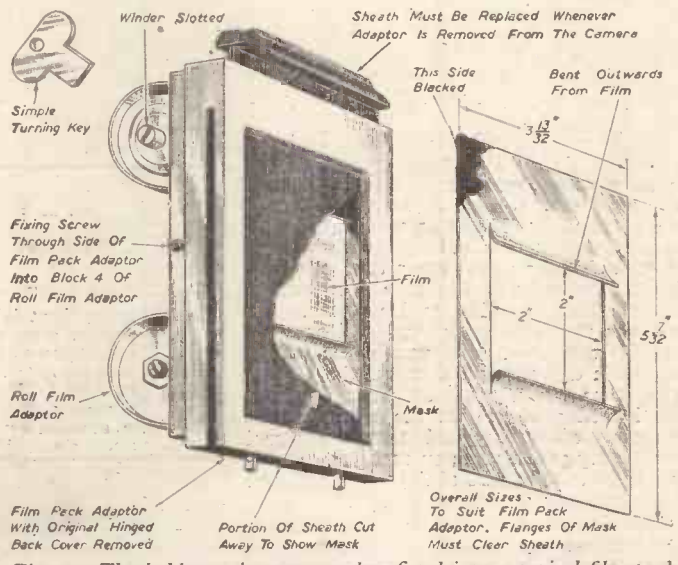


Fig. 5.—The holder as it appears when fitted into a typical film pack adaptor; and details of the mask.

the plate is covered by the backing paper of the film and no reflections from light are possible from the lens.

The Mask

A mask was necessary to give the reduced picture size and this was cut from very thin gauge tin plate. Brass foil would also have been suitable for this fitment. The shape and size adopted is shown to the right of Fig. 5. Great care was taken in cutting out the aperture of the mask and in bending out the narrow flanges. The latter were necessary to avoid scratch of the film as this passed across the aperture between each exposure. These flanges were, of course, bent outwards from the film surface and as these slight projections had also to clear the dark slide or sheath, the angle of bend was very small and quite critical. As the writer's camera is a reflex a similar mask made from black paper was fitted over the ground glass inside the viewing hood.

The aperture of 2in. square was decided upon as giving a sufficient margin under the mask at each side of the film, and it allows 12 exposures being taken on the standard No. 120 film. A rather full margin was found to be present between each exposure, but a greater width of aperture would have necessitated an increase in spool centres or a more complicated design of the roll-film holder itself.

Inserting the Film

Owing to the mask and the margin of the film pack adaptor it was found necessary to insert the film before fixing the roll-film holder to the film pack adaptor case.

As the winder from the box camera was not of the pull-out pattern the take-up spool had to be inserted at a slightly tilted angle, It was for this reason that ample width between side plates was arranged to allow for this. The three 2BA pivots were screwed in afterwards and the ⅜in. lengths were found to be about correct to allow the two spools to be centred correctly, without the necessity of fitting loose washers or collars between the side plates of the holder and the spools. This applies to the wood-type spool. Such washers might, however, be required if the all-metal type No. 120 spool were used, as the latter has a clear hole right through. The correct arrangement of the spools and film in the holder is shown to the left in Fig. 2. With the backing paper anchored in the take-up spool in the normal manner the mask was placed in the film pack adaptor and the roll-film holder carefully pushed into the film pack adaptor. Two brass screws were used to secure the two parts together. On completion of the film these two screws only needed removal to release the roll-film holder for fitting a fresh film.

The sheath must, of course, be in position before the film is actually turned to No. 1, and is removed only when the holder is in the camera. It is necessary, too, to remember that this sheath must be replaced should the holder be removed from the camera before the full length of film has been exposed.

On no account must the sheath be drawn out until the complete holder is in place in the camera. The sheath must always be reinserted before removal of holder from camera. In fact, one must always look on this holder as a normal dark slide, although it may, of course, remain in the camera until the whole film has been exposed and need be removed only for inserting another film. By the way, do not forget to pull out the sheath when ready for exposures or your film will, of course, be blank.

Test the holder well for light leakage before risking a full film. If any doubt of light tightness is present it is a good plan to put strips of ordinary black insulating tape along the sides and ends where the surround fits the film pack adaptor.

It will be noticed from the drawing Fig. 1 that the original turning lugs of the winder have been sawn off and turning of the film is accomplished by a screwdriver or the simply made turning key shown in Fig. 5. This was necessary as the lugs were found to foul the side of the adaptor. The end or boss of the winder was cut with a slot, as shown, for winding purposes.

Testing the Roll Film Adaptor

It was, of course, necessary to try a few tests before actually exposing a film. To prove that smooth turning of the film would be possible tests were made with a spare length of backing paper from a used No. 120 film, and to it was attached a length of thickish paper approximating to film thickness and length.

This test having proved satisfactory a length of bromide paper was attached in the dark room and actual trial exposures made in the camera. Various focusing distances were tried and long exposures given to allow for the slower speed of the bromide paper.

These trials having proved satisfactory a film was next inserted for final tests.

As is always advisable when using panchromatic films the red window was covered by a piece of opaque sticky tape, this being lifted up only when winding the film to the next number. As is normal with No. 120 films, the numbers for picture size approximating 2in. square appear at the centre of backing paper, which was the reason for the window being fitted in the position shown.

Although the writer has not found it necessary to include a springy pressure strip under the film spool to keep the film taut, this simple fitment would not be difficult, and a suitable spring strip might eventually be fitted from the box camera previously referred to. The sides of the mask, of course, help to keep the film perfectly flat.

Several films have already been taken with this roll-film holder, and the exposures show no signs of scratch or pressure marks. The fact that one has to stand further away from the subject is an advantage, giving in effect a longer focal length lens. Great care was, of course, taken to well black the mask side facing the lens to avoid reflections.

Fair Comment

(*Continued from page* 367.)

gauged from the fact that many of them which pass have a mean daily rate of less than one second. Watches so rated keep their rate almost indefinitely. They are extremely costly and there are not so many of them in existence—only a few hundreds of them having passed since the tests were inaugurated in 1888. Such watches are not available in the shops. If you need one it is necessary to select a watch of Kew A quality and employ a rater to tune it up for you.

Noon at Greenwich was signalised by means of three balls, which were allowed to drop at twelve noon each day. A man who possessed a Kew A watch of certain make had such belief in its accuracy that he made a hobby of checking it against this Greenwich time signal every day. On one day he noticed that the balls were twenty seconds late according to his watch. He wrote to the Astronomer-Royal pointing out that his watch could not possibly be twenty seconds a day out and therefore the Greenwich time signal must be wrong! Such did indeed prove to be the case, for the Astronomer-Royal replied that the signal was twenty seconds late on that day. Needless to say, the makers of the watch achieved great publicity as a result of this.

Machine made watches in general do not perform so consistently as hand made watches, nor do they obtain such high marks. When a watch of similar make to that which found the Greenwich time signal to be in error came into my possession some months ago, I was interested to see how it would respond to adjustment and rating by comparison with my other Kew A watches of much higher quality. After a few months of adjustment I submitted it to the N.P.L. for the Kew A. tests, and those interested in how the marks are computed may like to study the following record of its performance during those tests.

It will be understood that a watch that would just pass the Kew A test would not receive any marks, whilst a perfect watch would, of course, receive 100; this one obtained 67.4 out of a possible 100.

This watch was manufactured in 1874, or 75 years ago—a tribute to the quality of the workmanship which was put in even to machine-made watches in those days. Even the mainspring barrel is jewelled—really an unnecessary refinement, since the arbor is only in use when the watch is being wound.

The National Physical Laboratory conducts subsidiary tests for Kew A watches, the original certificate being current for two years.

The chief difficulties in adjusting watches for the A test are in eliminating position errors, adjusting for isochronism, and correcting for temperature compensation. It is not work which can be hurried.

Position and Temperature of Watch	Rate (Seconds per Day) 1st day	2nd day	3rd day	4th day	5th day	Mean Rate Sec./Day	Mean Variation of Rate Sec./Day
Pendant up, at about 67° F. ..	+ 0.2	−2.0	−0.6	−0.9	− 1.0	−0.9	0.53
,, right, at about 67° F. ..	−10.8	−8.6	−7.1	−4.6	− 8.3	−7.9	1.62
,, left, at about 67° F. ..	− 8.6	−8.9	−9.3	−8.0	−10.9	−9.1	0.77
Dial up, at about 42° F.	− 7.6	−5.7	−7.5	−8.0	− 7.0	−7.2	0.65
,, at about 67° F.	− 3.5	−2.5	−3.2	−4.1	− 3.0	−3.3	0.43
,, at about 92° F.	− 3.8	−3.7	−3.3	−2.4	− 3.3	−3.3	0.36
Dial down, at about 67° F. ..	− 2.2	−1.5	−1.6	−1.6	− 0.6	−1.5	0.36
Pendant up, at about 67° F. ..	− 0.1	+0.4	−1.0	−0.7	− 0.8	−0.4	0.47

\+ Signifies gaining. − Losing.

		Marks Awarded
Mean variation of rate	0.65 sec./day	27.0
Mean change of rate with change of position	3.11 ,,	27.6
Mean change of rate per 1° F.	0.107 ,,	12.8
	Total marks ..	67.4

Double-decked Rail Coaches

The General Design and Layout Briefly Explained

By H. A. ROBINSON

DOUBLE-DECKED rail coaches are run in America and on the Continent, but, due to the comparatively small construction gauge that is found in England, which greatly restricts the size to which rolling stock can be built, their operation in this country has always been thought impossible.

A coach, however, has now been designed by the chief mechanical engineer of the Southern Region—Mr. O. V. Bullied, M.I.Mech.E.—which, by a clever interweaving of the seats, has made the two levels feasible. A full-sized "mock-up" of the vehicle has been constructed, and at the recommendation of the Railway Executive it is being fully examined by the Transport Commission, and it is hoped to have a complete eight-coach experimental train running between London and Dartford by October of this year.

The advantage of a two-level coach is its increased seating capacity, and the purpose of the new English vehicle is to assist in relieving the congestion on suburban lines during the peak rush-hours.

There are limits beyond which trains cannot be lengthened, the number per unit in time increased, or parallel tracks multiplied, and as in much of the London area these limits have been reached, great hopes are placed in the new coach, which over a complete train will be able to offer 31 per cent. more seating room. British Railways state that they are regarding the vehicle as "an alternative solution to costly major widening works."

While a complete train will be able to supply a 31 per cent. increase in seating capacity, this percentage will vary a little in the individual vehicle according to whether it is a trailer or motor-coach with driving compartment—it being intended to operate on the usual "multiple unit" principle.

General Design

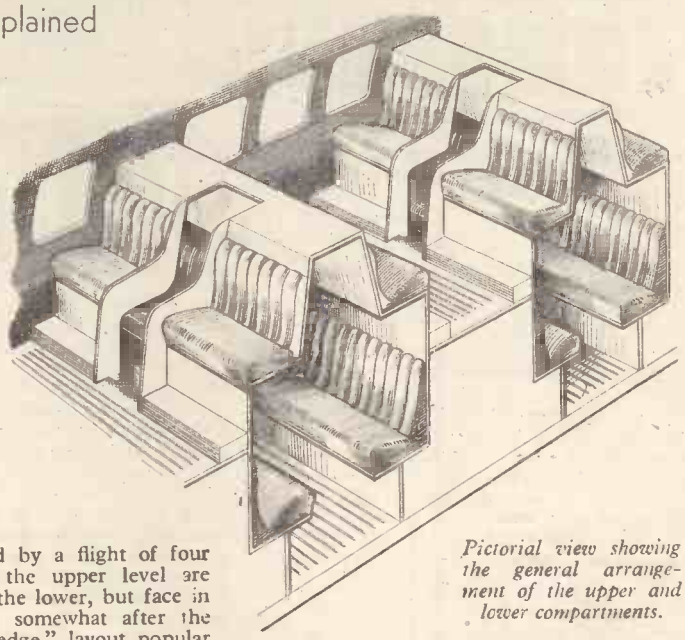
In design the new coach is divided into several non-connected sections, each of which contains an upper and lower compartment connected by a flight of four steps. The seats on the upper level are directly over those on the lower, but face in the opposite direction, somewhat after the fashion of the "knife-edge" layout popular at one time on tramcars. Each section is entered by side doors at platform level.

Both upper and lower compartments will accommodate 11 persons, six on one side and five on the other, the missing seat allowing for the stairway, which is about 1ft. 6in. wide. The compartments themselves are 6ft. 11¼in. across, i.e., longitudinal to the train, the distance between the seats 3ft. 3in., while the actual seating positions are about 1ft. 6in. by 1ft. 10in.

To get the upper seats as high as possible and yet allow passengers to stand upright when moving in or out, the floor of the upper compartment has been given a central channel about 1ft. 4in. wide. Seated persons therefore have their feet on what in effect is a raised ledge, but step down into the channel when wishing to move to the lower deck. On the lower deck the headroom directly above the space between the seats is ample.

The vehicle has been taken to a height of 12ft. 10½in. above rail level, and the upper windows extend into the curvature of the roof. This brings them extremely near the masonry of bridges and tunnels, and, owing to the narrow margin of clearance, for safety these have been made not to open. Those on the lower level open in the usual way. The non-opening of the upper windows does not mean that ventilation will be poor on this level, for electrically operated fans will be continually at work.

Lighting is of the "strip" variety and so located that shadows will not be cast on the book or paper of a seated passenger by persons on the move, while spaces for small items of luggage are provided below the seats on the lower deck, and above the backs of the seats on the upper deck. "Grab" handles have been carefully placed to assist movement between the two decks and for standing passengers on the lower deck.



Pictorial view showing the general arrangement of the upper and lower compartments.

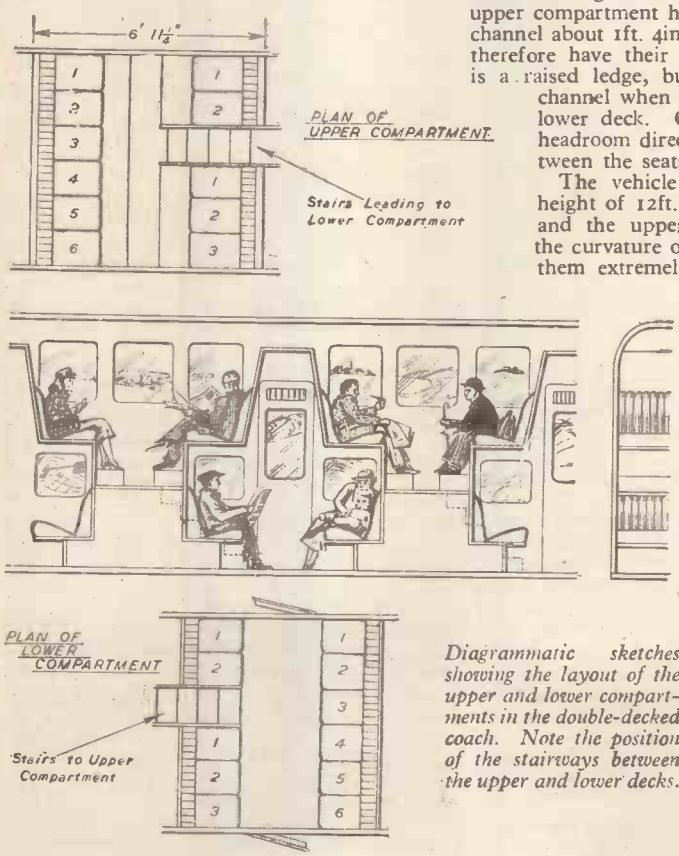
A trailer coach will have seven lower and six upper compartments, while a motor-coach will have five upper and five lower. This means that the former will give 143 seats and the latter 110 seats, so that a full eight-coach train will carry 1,016 persons, against the 772 of a present electric train consisting of six open and two compartment type vehicles. In other words, there will be four seats in a two-tier coach for every three in existing carriages.

Sheet Metal Construction

The double-decked coach has been made possible on the British Railways chiefly by a new method of sheet metal construction, in which roof and sides (and, if necessary, the floor) are welded together. This it has been found gives a perfectly stiff structure without space-wasting, internal joists, etc. The method also yields a maximum inside capacity and that means every inch within the "construction profile" can be usefully employed for passenger accommodation, etc.

Abroad, the "well" principle of construction is popular for double-decking. Here the floor between the supporting bogies is taken down almost to rail-level to give the lower deck, but this system has the disadvantage that it allows of only two end doors per coach, which prevents the speedy movement of passengers. In the English design, which is intended for the rapid transit of large bodies of people, a well has not been used, thus making possible the retention of side doors down the whole train with all their attendant advantages of rapid entraining and detraining. The floor of the new vehicle has been dropped a few inches, however, by reducing the depth of the main frame longitudinal members.

With regard to cost, it is estimated that a double-decked train will work out at about 40 per cent. more than a single-decker of similar length. Thus, as a present eight-coach electric train costs £50,000, the outlay for an eight-coach double-decker will be in the neighbourhood of £70,000.



Diagrammatic sketches showing the layout of the upper and lower compartments in the double-decked coach. Note the position of the stairways between the upper and lower decks.

Long Sight and Presbyopia

SIR,—Your correspondent, Mr. W. E. Thom is, of course, perfectly right.

Long sight is the term popularly used to include both presbyopia (old sight) and hypermetropia (true long sight). In my article, Lens Calculations Made Easy, I was only concerned with the simplest calculations, and did not think it necessary to call attention to this distinction.

It might interest Mr. Thom to know that the spectacles I have to use for continued close work are 3.3 diopters (as mentioned in my paragraph "First Calculations") and my age is, in fact, about 60.—J. A. STORER (Hemsworth).

Screwdriver Theory

SIR,—Regarding Prof. A. M. Low's conundrum of the long-handled screwdriver, surely the explanation lies in the greater springiness or give of the longer blade which allows it to store, for a short space, more torque than can be imparted by the muscles during a single instant of effort.

Mechanically, this may be nonsense, but I feel that the explanation is more likely to be found along these lines than on any consideration of leverage. Incidentally, I remember seeing a driver with a transverse handle like a gimlet but apparently it failed to "catch on," although the leverage must have been very great.—C. FRANCIS (Heston).

Converting Ex-Aircraft Generators

SIR,—I have read with interest Mr. H. H. Ward's article in the July issue regarding the conversion of ex-aircraft generators to A.C. motors. Whilst the suggested method of increasing the field current will no doubt enable the torque to be increased, it should, of course, be understood that the power output obtainable by simple conversion of these machines is limited for the following reasons:

(1) The connection of the resistance across the motor armature will cause the field current to become out of phase with the armature current, as the machine is not then a simple series motor; thus the field windings may not be completely effective.

(2) The possible strength of the field magnets is limited by the degree of magnetism which can be passed through them, as mentioned by Mr. Ward, and also by the amount of current which the field coils can carry without overheating to such an extent that the insulation is subject to rapid deterioration. The rate of heat generation in a winding is proportional to the square of the current value.

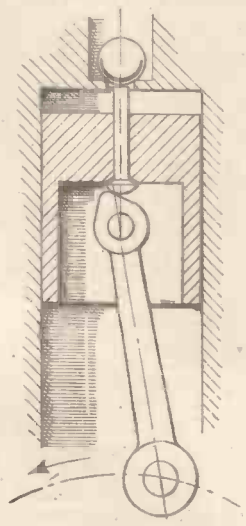
(3) The safe full load power is also limited by the current which can safely be carried by the armature winding without overheating. This is likely to be rather low, due to the small size of wire required with the large number of turns on a 1,000-volt winding.

In the case of the machine referred to in the article, i.e., having an input of 3.2 amps. at 24 volts; if this could be converted into a motor with 100 per cent. efficiency one might expect about one-tenth horse-power, since one horse-power corresponds to 746 watts. Actually, 100 per cent. efficiency is impossible in any machine; with such a radical conversion of the functions of the machine it is unlikely that the efficiency would exceed, say, 30 per cent., and may be appreciably less than this, which brings the horse-power down to less than one-thirtieth. Now this gives an idea of the possible horse-power if the rate of heating of the machine is to be limited to that which was intended by the designer. It is, of course, possible to drive a somewhat increased load, with increased rate of heat generation, but in this case the motor should be kept under observation and switched off before the temperature reaches a dangerously high value.

It thus appears that if the machines are to be used as A.C. motors for long periods at a time there is much to be said for rewinding them to suit the available supply unless they only require to be lightly loaded. The field coils could then be rewound with more turns of thinner wire and connected in series with the armature winding, having fewer turns of thicker wire. This method is particularly advantageous in the case of a machine which has two armature windings, as it enables the armature slots to be fully utilised with effective windings.—J. L. WATTS (Southampton).

Model CO_2 Engines

SIR,—I was interested in one or two items in the June issue of PRACTICAL MECHANICS. My brother and I experimented about two years ago with a push-up ball valve CO_2 engine. It worked, but not too well. We intended to try making the cylinder and crankcase of perspex in the next model which was never finished owing to pressure of work. I did not like the valve lifting before t.d.c. and have an idea that for a one-way-running engine it could be worked by the connecting-rod. Also, existing engines have to do work on the up-stroke compressing some of the previous charge. In this idea the pin-valve would allow compression to leak by on the up-stroke, and as con-rod went over t.d.c. the cam surface on it would lift pin, opening ball valve and seating itself. To allow latitude an inset seating of hard rubber or similar material might be a help.



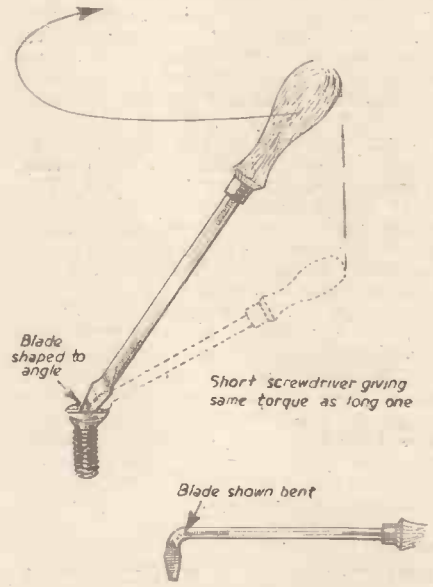
Operating the valve of a small CO_2 engine from the connecting rod.

The Long-handled Screwdriver

As I see it, both arguments are correct, with qualifications. If you have a short and a long driver of same diameters of handle and shaft, by holding them with one hand, the long one would be no better than the short one (while used upright). But if you get a better hold with both hands, the long one has an advantage. In practice, longer drivers usually have larger heads which give greater leverage.

As Mr. Toon points out, if the driver were inclined the angle is limited by the blade leaving the screw-slot.

If you wanted to obtain the greater torque it would be necessary to shape the blade to an angle, or bend the shank. This process could be applied to the horizontal position when the driver would be a "tommy-bar" in the slot. I have seen a bent screwdriver made as shown in the sketch. For myself, I use a short ratchet type, and for obstinate screws I clamp a pair of grip-pliers on to the flat just above the screw. That shifts them.



Special types of screwdriver.

Writing Pad

Your correspondent (G. G. Doig, Glasgow) seems to be thinking of the "Printator," which I believe is again on the market. In this, writing is formed by pressing down through thin celluloid, a thin white paper on to a waxed black card. Where it sticks down the black shows through.—E. W. BAIGENT (High Wycombe).

Double-action Push for Door Chimes

SIR,—In a recent issue there appears a design for a bell-push suitable to obtain a double action with chiming door bells, i.e., a total of four actual strokes on the chimes by single pressure and release of the bell push.

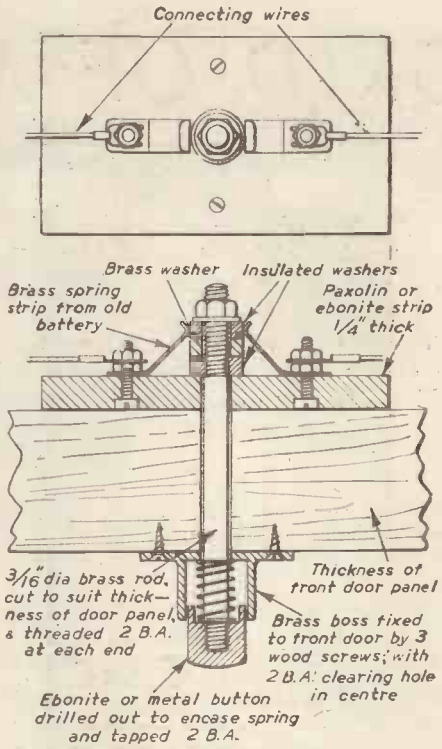
I was struck by the cumbersome shape of this push and, finding it effective but not ornamental, I endeavoured to dispense with bulk. The result is shown in the accompanying sketch, and although no bigger than a normal bell push it works well. No matter how thick the panel of the front door or door post, the push is easily fitted and shows only a neat boss and button on the exterior.

The size and shape of the boss and button is left to individual choice so long as a total "in-and-out" movement of 5/16in. is obtained. The button can be of any material, and is drilled in to accommodate

the return spring when the button is depressed. Finally, it is drilled and tapped with a 2BA thread in which screws the operating rod of 3/16in. brass. This comprises the entire exterior fittings, and as no electrical contact is brought out through the door all wiring is free from the effects of damp from outside.

The electrical connections are made inside the door on an insulated strip approximately 2½in. x 1½in. and ¼in. thick. Paxolin is suitable for this purpose. Two pieces of springy brass strip from an old flat type 4½-volt dry battery are used for the contacts and are bent as shown in the sketch. When mounted on the paxolin, the point of contact with the washers should be 5/16in. from the paxolin. As the three washers are each ⅛in. thick this brings the contacts central on the outer washer when the push is at rest. The springy contacts are drilled at their base to clear 4BA brass screws countersunk into the paxolin from the underside and which protrude through to accommodate a 4BA locking nut (securing the brass strips) and a further nut to clamp the connecting wires.

The three washers come next. The two outer ones are of ebonite or like insulating material, whilst the central one is of brass. All are ¼in. thick and ⅞in. diameter. The washer next to the paxolin mounting strip is tapped 2BA centrally, the other two having clearing holes and being locked against one another by the 2BA nut and washer at the end of the 3/16in. brass operating rod. A clearing hole is drilled through the door panel and the paxolin strip with washers and operating rod attached is lined up to the hole and secured to the back of the door by two wood screws suitably drilled through the paxolin strip. The operating rod is left amply long enough to protrude beyond the outer side of the front door, and the button boss is then fitted, allowing



End view and section of a double-action push.

free movement of the rod. The rod is then marked off to the correct length to enable its end to be threaded 2BA for attaching the push button. Before screwing on the button, a small but strong spring is slipped over the rod and partly encased in the drilled-out portion of the button as it is screwed on to the operating rod. The push is now complete, and when the button is pressed the contacts touch the brass washer as operating rod moves in, ringing the chimes. When fully pressed, the contacts then pass over the brass washer and rest on the other insulated one. Removing the finger from the push causes the return spring to draw the rod back, and the brass washer once again passes over the two contacts and operates the chimes a second time before the insulating washer takes up position between the contacts. A small sheet metal case fitted over the contact strip with inlet hole for the wiring completes the ensemble. Although measurements are given, the push can be made with widely varying sizes to suit any material available to the constructor, the main aim being to keep down the size for neatness.

As the only connection between the "works" and the push button is the 3/16in. brass rod, the apparatus can be mounted on any thickness of woodwork, etc., the rod being cut to the desired length.—G. CHALK (London, S.E.).

Telescope Mirror

SIR,—In reading the June issue of PRACTICAL MECHANICS I was interested in an inquiry about literature on the grinding of mirrors for astronomical telescopes.

The reader concerned may like to know that there is a very good book published by Blackie & Co., namely, *Mirrors for Astronomical Telescopes*, by George McHardie. It is one of "Blackie's Technique Series."

This book gives full practical details for the making of an astronomical mirror. It is written specially for the amateur, the author himself being an amateur astronomer. Most of the tools used can be made for a few pence, and details for making them are given in the book.—IAN G. P. MCHARDIE (Baillieston).

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.

Harrow and Wembley Society of Model Engineers

THE above society will hold its 1949 Exhibition on Thursday, Friday and Saturday, September 22nd, 23rd and 24th. (Models received on Wednesday evening, September 21st) and the place as last year, the Wesley Hall, High Road, Wembley. We hope to make this year's show even more successful than last year. The features of the exhibition will be much as before, but it will be noted that it is proposed to open for one more day.

Other societies are particularly invited to enter models for display only or for open competition in the following sections: Locomotive, marine, general engineering, aero, i.c. engines, and handicrafts. A cup and silver and bronze medals are being offered in each of the above sections. Secretaries of interested clubs please communicate with the Exhibition Secretary, Mr. C. R. Fox, 71, Norval Road, North Wembley, Middlesex. All models are fully covered by insurance for the duration of the exhibition.

The club's fixture list for September is as follows:—

Sunday, September 4th, Gala Day at Track, Kenton.

Wednesday, September 7th, Talk on "The Wonders of Oil," by Mr. S. C. Saunders.

Sunday, September 18th, Gala Day at Track, Kenton.

Wednesday, September 21st, Acceptance of entries for exhibition.

All meetings will be held at our headquarters, 7.30 p.m., Heathfield School, College Road, Harrow, unless otherwise stated. Members of other societies are always welcome at any of our gala days and meetings.

Beaufoy Model Engineering Society

THE above society's workshops will reopen after redecorating on Monday, September 26th. The workshops will be open every evening from 6.30—9.30 p.m. Monday to Friday inclusive, with a qualified technical adviser in attendance every evening.

Besides providing opportunities for modellers to make their own castings in the moulding shop, experienced modellers will find every type of machine tool available for their use. It is also proposed to run an instructional class for beginners.

Members of other clubs are also invited to make use of these facilities and visitors or new members are especially welcome. The subscription per year is 3s. and any further particulars may be obtained from Mr. S. T. Hunt, The Beaufoy Institute, Albert Embankment, S.E.11.

Staines and District Society of Model Engineers and Craftsmen

THE Annual Exhibition of the above Society will be held on September 16th and 17th at Staines Town Hall. Many new features will be introduced—and lone hands and societies are asked to offer models on loan or for competition. Bronze and silver medals will be awarded in each section. All communications to.—Exhibition Manager, R. F. Slade, 166, Kingston Road, Staines, Middx.

THE WORLD OF MODELS

Leipzig Model Makers : Model of the King's Coach : Swiss Diesel-driven Steamer : Society for Nautical Research

By "MOTILUS"

IN these days of the "cold war" and threatened atomic warfare we are all glad to learn of any means of fostering good fellowship between nation and nation, however small or unimportant that means may be. The application of time and skill to model-making is so much more worthwhile

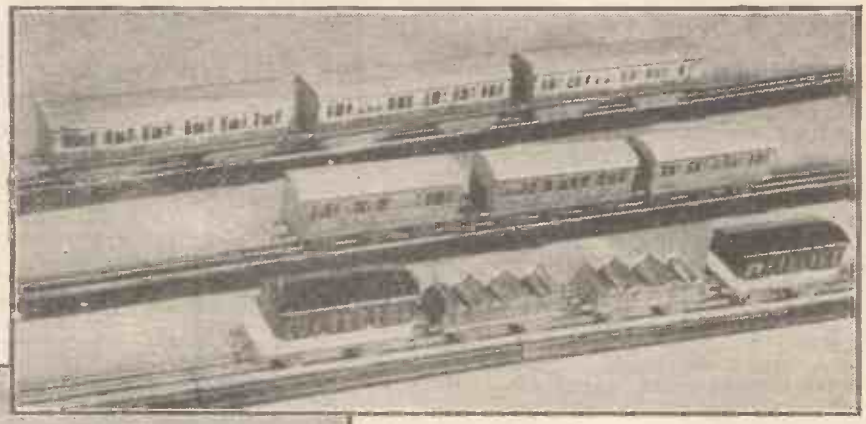


Fig. 1.—Mr. W. Richter's 00 *Gauge railway coaches, showing three periods of English coach these represent: (1) Old Liverpool-Manchester construction. Reading from front to back Railway, about 1835; (2) G.N.R. train of about 1880, with six-wheeled stock; and (3) Bogie coach train of L.N.W.R., about 1875.*

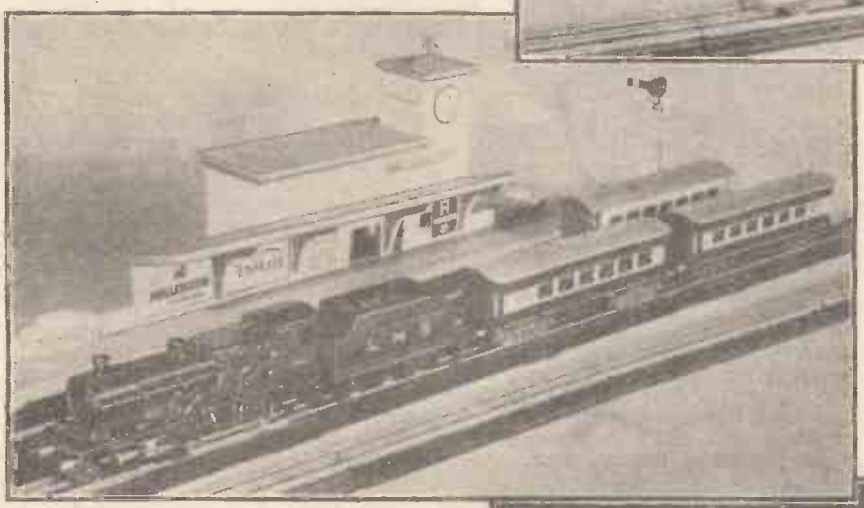


Fig. 2.—Mr. W. Richter's 00 *Gauge "English-type" station.*

than the making of munitions, whether in this country or elsewhere! People whose hobbies are of such an absorbing and creative nature as model-making are not easily drawn into extreme political groups, whose creeds embrace war and destruction. I also feel that frequent exchange of model-making news between ex-enemy countries, such as ourselves and Germany, must become a contributory factor in establishing goodwill and trust between our peoples.

Leipzig Model Makers

I now have a few correspondents in the Russian Zone of Germany who are keen model enthusiasts. One of them, Mr. G. Arndt, of Leipzig, has sent me one or two copies of a model railway periodical he is sometimes able to obtain from the Western Zone. It is published by a firm of dealers in model railway equipment, and is a good medium of contact between amateur enthusiasts, as it contains contributions from all parts of Germany. Mr. Arndt himself has had an article published on the subject of a model exhibition held in Leipzig recently which, of course, drew large crowds of interested visitors. It was so successful that another is to be held early in September. Mr. Arndt has sent me an invitation to attend, but I regret this will not be possible. The enthusiasm of these model railway builders is to be commended, as model-making materials are still in extremely short supply in Germany.

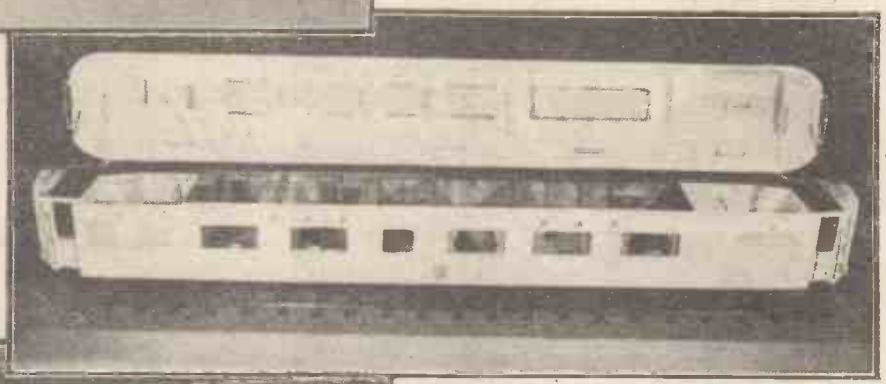


Fig. 3.—A general view of the scale model of H.M. the King's coach on the Royal South African train, showing the roof of the model raised to give a clear view of the interior.

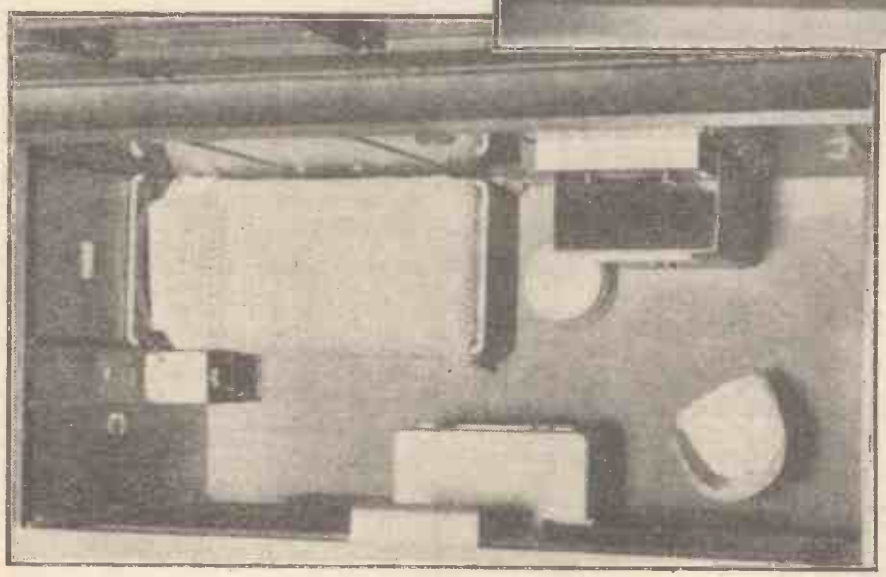


Fig. 4.—One of the compartments on the scale model Royal coach. This shows the King's bedroom, and all the other compartments are as fully detailed.

Not long ago I heard again from Mr. W. Richter, also of Leipzig, who is such a keen student of English railway rolling stock, whether ancient or modern. He has sent

me a photograph showing his 00 gauge models of English coaches of the nineteenth century. (Fig. 1.) These he has made with underframes and roofs of tin, walls of cardboard and cut-out windows "glazed" with transparent paper. The other illustration, Fig. 2, shows his "English" model railway station, with one of his converted English-style locomotives and train. Mr. Richter also has some German gauge 0 coaches and locomotives, but until a short while ago had no track for them. Now he has obtained components for building the track and is engaged in constructing a realistic layout.

Model of the King's Coach

In far off pre-war days some of my readers may have had the pleasure of seeing one of those very fascinating models of a railway coach complete with all interior fittings. Not many of these models have been displayed since the war, but recently I was privileged to view an exceptionally "de luxe" version of this type of model. This was a scale model of H.M. The King's coach on the train used during the post-war Royal South African tour. It was made by Bassett-Lowke, Ltd., of Northampton, to the order of the Metropolitan-Cammell Carriage and Wagon Company, Ltd., of Birmingham, the coach-builders. (Fig. 3.)

Fig. 6. (Right).—The new motorship on the Lake of Lucerne. A bow view of m.s. "Waldstätter," showing the Captain's bridge and the large, covered upper saloon deck.

Fig. 7.—A stern view of m.s. "Waldstätter," showing the large, open upper deck, with a crowd of holidaymakers aboard.

Hinged Roof

The roof of the model is hinged, so as to lift up and reveal the interior with all the compartments in full detail. This comprises the King's study, bedroom, Fig. 4, and bathroom as well as bedrooms and bathroom for his equerry and his doctor and a room for his valet, complete with wardrobe equipped with an ironing board. The car is illuminated with fluorescent strip lighting, which is reproduced in the model with perspex strips lit by concealed miniature bulbs, giving a most realistic effect for evening display.

The fabrics of the prototype for carpets, bedspreads, curtains and upholstery were supplied by Messrs. Waring and Gillow, who also afforded considerable help to the model-makers by supplying "model" fabrics which, in cases where a floral design was used, had to be hand-painted.

The car is fitted with the latest type of air-conditioning, necessitating double windows, which are shown on the model, along with the gratings in the ceiling through which the conditioned air is introduced into the compartments. The equipment necessary to produce this particular feature has been modelled in full detail in its position under the coach framing, together with all the complicated apparatus that is necessary to make a vehicle of this type what is virtually a complete "h o m e on wheels."

An Architectural Model

Educational authorities in this country are having to increase considerably accommodation in all schools, supplying canteen facilities, gymnasiums, playing fields, laboratories and so on, to meet the requirements of more and more pupils. Our universities are also having to follow suit, and one outstanding proposed extension is that for Nottingham University. A model has been completed to assist the planning of the major extensions that are contemplated for this university, to supplement its amenities for ever-increasing numbers of students.

The model was built to the order of the Vice Chancellor of the University and is the work of Mr. E. H. Clifton, of Northampton. It shows all the existing buildings and grounds, together with the suggested extensions. The illustration, Fig. 5, shows a good bird's eye view of the model, which is to a scale of 66 ft. to 1 in., or about 1/800th actual size.

Swiss Diesel-driven Steamer

Switzerland is not only famous for her beautiful lakes but also for her excellent steamship service on those lakes in both winter and summer. On the Lake of Geneva (Lac Léman) this custom dates

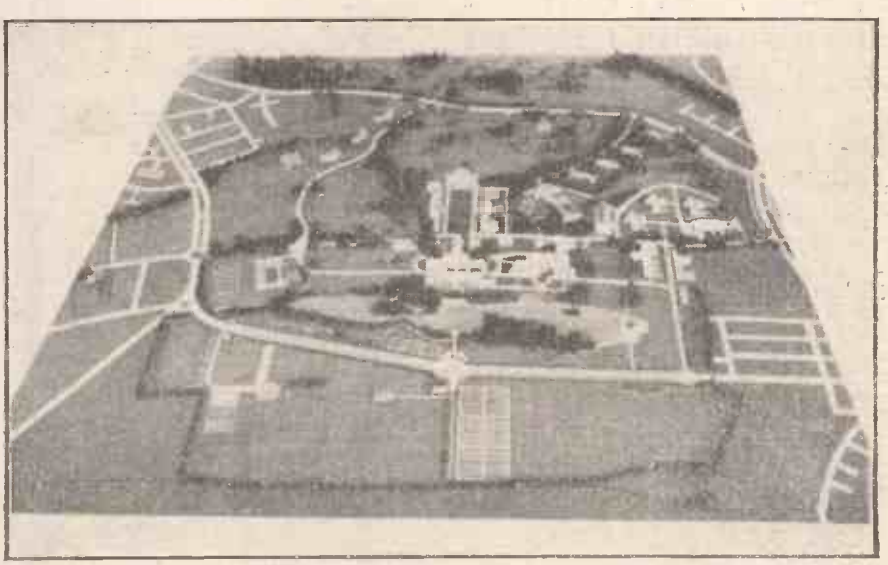


Fig. 5.—The model of Nottingham University site, to a scale of 66ft. to 1in. (approximately 1/800th actual size).

back to 1823, when the first passenger steamer, *Guillaume Tell,* with capacity for 200 passengers, was put into service. The two largest steamers now on this lake are *Simplon and Helvétie,* built in the years 1920 and 1926 respectively, and both having accommodation for 1,600 passengers.

Although the Lake of Geneva is the largest of the Swiss lakes, the heaviest traffic is on the Lake of Lucerne, (Vierwaldstättersee), where there is the finest fleet of steamboats. These are used not only for pleasure cruising but also for goods and cattle transport in the summer months. The largest boat in this fleet is the *Stadt Luzern,* built in 1928. Recently, however, an innovation in design and propulsion for lake ships has occurred, with the introduction of the motorship, *Waldstätter.*

The *Waldstätter* has quite an interesting history, as she was built on the hull of the s.s. *Rhein,* a Thames boat bought by the Swiss about 1912, when she sailed under her own power from London to Basle. For conversion the hull had to be reconditioned and lengthened and the existing paddle steam engine replaced by diesel twin-screw engines. The superstructure built on this hull is unique, as will be seen from the illustrations, Figs. 6 and 7. This peculiar external design, however, gives opportunity for a most attractive and roomy interior for the vessel's public rooms, where the decoration is in the modern style with the accent on comfort. The *Waldstätter* is very popular both with the Swiss themselves and with visitors to the Lake of Lucerne.

Society for Nautical Research

This summer I again had the pleasure of visiting the National Maritime Museum at Greenwich, on the occasion of the Annual General Meeting of the Society for Nautical Research. The meeting was most interesting, and time was given to discussion of the possibilities of reconditioning the famous old warship, *Implacable.* It was the general opinion of the experts, however (an opinion confirmed by information received from the Admiralty), that the expense of doing the necessary reconstruction to preserve the ship would be too heavy to consider in these difficult times.

Trade Notes

"Avo" Exposure Meter—Model I

A NEW pocket-size exposure meter for still or cine work in black-and-white and colour, combining a high degree of accuracy with extreme simplicity in operation, is being marketed by Kodak Ltd.

The "Avo" exposure meter—model I

Automatic mechanism gives great sensitivity over a very wide range, and a readable deflection is obtainable even under the weakest illumination. Provision for automatic change-over from low-brightness to high-brightness settings and vice versa, is a unique feature of the design. Exposure times covered by the calculator range from 1/2,000th second to 60 seconds. A red dot indicates the normal cine speed of 16 frames per second. Finished in ivory-coloured plastic, the meter is fitted with a non-kinking neck-cord. Overall dimensions are 3 3/16in. by 2¼in. by 1 3/16in. The weight is 8 oz.

Runbaken Portable Shock Finder

DURING the past few years there has been a steady increase in the number of industrial electrical accidents, many of them proving fatal. The highest number of accidents and fatalities were with portable tools and flexible cables, and most of these accidents could have been prevented by an occasional check with the Runbaken Portable Shock Finder. Two of the most common causes of shocks are faulty or damaged earth wire and cable wrongly connected to plug. These faults are instantly detected by the operator by simply plugging into the shock finder, which is so designed that the worker can take a portable tool to the instrument and make a test himself, or it can be taken to the machine when not portable. Conforming to the latest Home Office regulations and Factory Acts, the new shock finder registers the state of the earth, whether good, bad or dangerous. A heavy current flows which will blow two strands of conductor. The instrument, which is simple to operate, is fitted with a 5 amp. and 15 amp. socket to take all standard plugs. A press-button switch is provided so that the equipment cannot be left on. The instrument is supplied complete with test leads, clips, mains on-and-off switch, and a double-wound transformer impregnated and flash tested on 2,000 volts. Further particulars can be obtained from Runbaken Electrical Products, Oxford Road, Manchester, 1.

The Runbaken portable shock finder.

G.E.C. Torches and Lighting Batteries

A HANDY booklet (BA (1) Section) is issued by the G.E.C. covering a range of their high quality torches, cycle lamps, hand lamps, etc. Special attention has been given in manufacture to overseas requirements. The torches are claimed to stand up to all tropical conditions are are of particularly robust construction for withstanding hard usage.

G.E.C. lighting batteries are manufactured at the company's works at Witton, Birmingham, where a modern plant for the production of batteries is installed. Among the torches listed are focusing and non-focusing types, including pen torches. The batteries range from tiny pen torch refills to 4½-volt heavy-duty batteries with terminals. There are also a combined cycle and hand lamp, cycle rear light, a safety (weatherproof and flameproof) torch, a battery hand lamp, and Osram flashlight bulbs.

Books Received

First Steps in Engineering for the Apprentice. By Major G. McAlpine, M.I.E.E. Published by Percival Marshall and Co., Ltd. 42 pages. Price 3s. net.

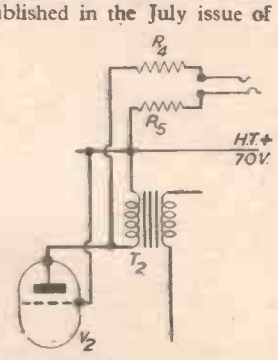
THIS book, written by a well-known engineer of wide experience, is intended to form a guide for boys of school-leaving age who may be contemplating entering the engineering profession as a career. The necessity of reading the right kind of books is pointed out, and the first 12 months of training in an engineering workshop is discussed. Information is also given concerning technical institutes and Polytechnics at which light engineering is taught.

They Made Your World. By Prof. A. M. Low. Published by John Gifford, Ltd. 176 pages. Price 7s. 6d. net.

IN this book the author gives a brief and fascinating story of the life and work of some of the famous pioneers of science from William Gilbert (1540-1603) to Sir Arthur Stanley Eddington (1882-1944). Among the great men covered in the book are Sir Isaac Newton, Joseph Priestley, John Dalton, Sir Humphry Davy, George Stephenson, Michael Faraday, Charles Darwin, Lord Kelvin, James Clerk Maxwell, Sir Oliver Lodge and Sir James Hopwood Jeans.

A CORRECTION

IN the article on a Radio-controlled Model Battleship published in the July issue of PRACTICAL MECHANICS, a slight error appears in the circuit diagram of the receiver. As shown the anode of valve V2 would receive no HT+. The top end of the primary of transformer T2 should, of course, be connected to the HT+70v. line, as in the accompanying diagram.



QUERIES and ENQUIRIES

A stamped addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 96 (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.

Electro-deposition of Rubber

I WOULD appreciate any information you could give me regarding electro-deposition of rubber, and also the addresses of any London suppliers of rubber latex.—A. Somers (Battersea, S.W.).

ELECTRO-DEPOSITED rubber is sometimes called "anodic rubber" because it is deposited at the anode or positive electrode of an electrolytic cell.

The idea of electro-deposition rubber is an old one, going back to 1908, but it is only lately that the process has been made practicable. "Anodic rubber" is often stronger than other rubbers, and it has good ageing properties. Moreover, it can be formed in very intricate shapes.

Anodic rubber is deposited from rubber latex, which, as you are probably aware, consists of a suspension of rubber particles in a liquid medium. So fine is the suspension that it is estimated that 1 cc. of latex contains about 7 trillion (7,000,000,000,000) rubber particles. These tiny particles all have a negative charge. Hence, when a current is passed through the latex they tend to travel to the anode of the cell under the directive influence of the current. The article on which the rubber is to be deposited is made the anode or positive electrode of the cell, and a rod of nickel or stainless steel is made the cathode or negative electrode. The thickness of the rubber at the anode depends on the current density of the cell and the concentration of rubber in the latex, as well, of course, as the length of time during which the current is allowed to flow.

In commercial establishments about 100 volts D.C. is used, giving current densities of from 0.1 to 1 ampere per square decimetre of anode surface. Much lower voltages, however, are quite practicable.

Complications often arise owing to gases given off the anode, thereby making the deposited rubber porous and/or spongy. This drawback is overcome by placing the anode in a porous pot and by other means, but these are all complicated, and for their details we must refer you to any modern textbook on rubber technology.

Rubber latex can be obtained from Revertex, Ltd., Upper Thames Street, E.C.4., and Vicsons, Ltd., 148, Pinner Road, Harrow, Middlesex.

Producing Mirrors on Transparent Plastics

COULD you kindly give me a formula for producing mirrors (silver) on Perspex? None of the usual methods applicable to glass is satisfactory.—A. Williamson (Farnborough).

THE production of mirrors on transparent plastics such as Perspex is a difficult operation for any amateur to carry out, and even under laboratory conditions the process is not always successful. Perspex can be silvered by the method of electrical sputtering, but we do not think you would have the necessary facilities for this. The following is an outline of the chemical method of treating Perspex, but please note that we cannot guarantee the process, since so much depends on the mode of operation.

Five solutions are required, viz.:

Solution 1

Caustic soda	35 grams.
Water	100 ccs.

Solution 2

Cane sugar (Sucrose)	9 grams.
Nitric acid	0.4 ccs.
Rectified spirit	17 ccs.
Water to make	100 ccs.

Dissolve the sugar in one-half of the water. Add the nitric acid. Then shake. Then add the water. Shake again and allow to stand for one week.

Solution 3

Silver nitrate	10 grams.
Water	100 ccs.

Solution 4

Caustic soda	10 grams.
Water	100 ccs.

Solution 5

Ammonia	40 ccs.
Water	60 ccs.

In making up the above solutions distilled water should be used.

Method

Soak the Perspex to be silvered in Solution 1 for 24 hours. Then place it in a clean vulcanite or xylonite dish (a photographic developing dish of this nature will do) and pour over it the silvering solution prepared as follows:

Add 5 parts of Solution 4 and 4 parts of Solution 5 to 12 parts of water. To the resulting mixture add 15 parts of Solution 3. The result should be an almost clear solution. To each 20 parts of this latter solution add 1 part of Solution 2.

This mixture should be prepared immediately before silvering. In any case, the mixture will not keep more than an hour or two.

Pour the prepared solution over the Perspex sheet in the dish. Rock the dish gently until the solution is colourless. Then pour it away and rinse the Perspex with distilled water. Repeat the operation twice more. Finally, give the silvered Perspex a thorough rinsing with distilled water and stand it in a rack to drain and to dry.

The great difficulty in silvering Perspex is to get an even layer of silver deposit. Perspex resists water; hence the silvering solution does not "key" well to its surface. You must, therefore, be prepared for disappointments.

Removing Black Lacquer: Removing Paint from Plaster Wall

I WISH to remove black lacquer from a grate Could you please tell me the best way of doing this? Also, what is the best method of removing oil paint from a plaster wall? Or, alternatively, is there any method of killing the paint so that it can be papered or painted over without the old paint showing through?—D. Bell (Leith).

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.

IF you can manage it, the best way to remove the black lacquer from the grate is to put the entire grate fitting into a hot fire and thus burn the lacquer off. Alternatively, you could use a blow lamp for the removal of the lacquer.

If neither of these methods is convenient, use either one of the many proprietary paint-stripping preparations on the market or else a solution of caustic soda (say, 1 part to 2 of water). Apply the caustic to the grate with a rag tied to the end of a stick, and then scrape away the softened paint or lacquer with a blunt edge, finally using plenty of water to wash the surface down and to get rid of the caustic. If the grate can be taken down in small portions, these can be bodily immersed in the caustic solution and the lacquer will almost instantly come away.

The precise method for removing paint from a plaster surface depends on the condition of the plaster. Some plasters will not permit any surface treatment. However, you can use a weak solution of caustic soda (say, 1 part in 10 parts of water), or else strong ammonia diluted with an equal volume of water. Either of these will soften the paint so as to permit of its being removed by scraping. Again, you could use a proprietary paint-stripping preparation for the purpose.

An oil paint which is old and which has become hard on a surface should not come through paper which has been laid on top of it. Neither should it affect a fresh coat of paint placed over it. You can insulate the paint on the wall quite effectively by rubbing it over with button polish (i.e., a solution of shellac in methylated spirit), but, if you do this, the resulting shiny surface will be very difficult to stick paper to.

Instrument Marking Lacquer

WOULD you please inform me as to the correct method of obtaining a blue-grey matt finish on small quantities of machine tool indicator plates? This particular finish can be seen on some makes of micrometers and has the effect of making index markings, etc., easier to read.—S. Woodhouse (Belfast).

THE type of finish which you describe is not produced by the chemical treatment of the metal surface. It is actually an applied pigmented lacquer, usually of the cellulose type.

You could make it experimentally for yourself by making up the following composition:

Clear celluloid film scrap	15 grams
Ethyl acetate	17 ccs.
Amyl acetate	25 "
Xylene	60 "
Benzene	40 "
Boiled linseed oil	8 "
Tricresyl phosphate (or di-butyl phthalate)	3 "
Ethyl alcohol	26 "

Into three parts of the above clear lacquer, one part of the desired dry pigment is ground. The finer the pigment, the better the result.

You will see that these lacquers have rather complicated compositions, and are somewhat difficult to make up, as well as being expensive in material costs.

It might be better for you to make inquiries to a firm of lacquer specialists which would possibly be able to offer you a suitable instrument-marking lacquer at a fraction of the cost which it would entail for you to prepare it yourself. Such a firm of specialists in lacquers is Messrs. Nobles and Hoare, Ltd., 3, Cromwell Road, London, S.E.1.

Waterproofing Plaster of Paris Mixture

I HAVE made a mixture of Scotch glue and plaster of Paris which suits my purpose admirably, with the exception that it is not waterproof; it goes soft when placed in water. Could you suggest anything to add to this mixture to remedy the trouble?—D. Leek (Edmonton).

THERE are two ways in which you can make your glue preparation waterproof, as given below:

(a) For every 100 parts of glue used dissolve in the water two parts of potassium bichromate. When the mixture has been made and moulded or cast or otherwise worked, expose the final product to sunlight for a few hours, or to ordinary daylight for two or three days. The action of the bichromate plus the light action will gradually render the glue completely insoluble.

(b) This is a quicker method. All you have to do here is to dilute commercial formalin with an equal bulk of water and to immerse the moulded or cast article in this for five or six minutes, afterwards allowing it to dry without heat. Alternatively, you can brush the diluted formalin over the surface of the hardened mixture. The formalin will attack the glue, rendering it completely insoluble even in hot water.

The formalin can be used stronger if required, and its action will be more intense, but in this case there may be some danger of the formalin shrinking the glue and thus causing a warping of the product.

Increasing Contrast of Bromide-Gelatine Emulsion

WILL you please inform me what to add to an ordinary silver bromide-gelatine photographic emulsion, before application to glass or paper, to increase the contrast i.e., to produce extra "vigorous" or "hard" negatives? For the special purpose I have in view, the ordinary emulsion does not give sufficient contrast, even with a contrasty developer, and I wish to avoid resorting to subsequent intensification.—T. R. Adlam (Edinburgh).

THE contrast (to say nothing of the speed) of a bromide-gelatine emulsion is entirely dependent on its chemical and physical composition, and since you do not give us any information on this point we cannot give you any definite instructions for heightening the contrast of your emulsion. Furthermore, it is not usually a practicable matter to increase the contrast of an emulsion once it has been made. The method of making the emulsion has much to do with its subsequent contrast properties, and such knowledge, together with the precise chemical compositions of emulsions, is invariably maintained secret by the modern photographic manufacturing trade.

It is usually possible, however, to heighten emulsion contrast by the incorporation of chrome alum. To this end, dissolve half grain of chrome alum in dram of water and add it to the very gently-melted emulsion with continual stirring. This quantity is sufficient to treat 6 oz. of emulsion.

Note, however, that the chrome alum treatment will reduce the speed of the emulsion. It is stated by some that the addition of tannic acid (half grain) in place of the chrome alum will not have this effect, although we ourselves doubt the validity of this assertion.

If you have not yourself made the emulsion and wish to increase its contrast after it has been coated on to plates or films, you can still apply the chrome alum or tannin treatment. Make up a solution of half part of chrome alum in 99½ parts of water. Immerse the plates in this for 10 minutes. Then dry slowly (without heat).

Please note that we cannot guarantee the reliability of these treatments. All depends, as we have already mentioned, on the chemical and physical nature of the emulsion in question.

Staining Asbestos Sheets

I WISH to stain some corrugated asbestos sheets a red ochre colour. Could you please suggest a mixture, or stain suitable and method of applying same? The asbestos sheets are for roofing a shed and the stain must be waterproof. I do not wish to paint them.—J. R. Murrell (Chelmsford).

ASBESTOS fibre does not take up dyes very well, and any dyed effect which you could obtain on it would be anything but waterproof or light-fast. The only way in which you can dye asbestos is either by brushing on a spirit stain (which is not very satisfactory), or by immersing the whole of the asbestos sheet in a strong (five per cent.) solution of the dye in water and by slowly raising it to the boiling-point during half an hour, retaining it at that temperature for another half hour, and then by letting it cool down to normal. During this process, however, the sheet will soften and probably disintegrate, being then of no use to you. On the other hand, any system of pressure dyeing would have the same effect.

We are afraid, therefore, that if you want to get durable, even and light-fast results, you will have to make use of a flat red oxide paint, which could be brushed on very thinly. This would dry dull and it would give the effect which you seem to require. On the other hand, if you elect to carry out the dyeing process, you can use any red water or spirit-soluble dye, but you will be well advised to try the process out on a small sheet of the material before committing yourself to treat an entire roof of sheets in this manner.

Increasing Power of Telescope

I SHALL be glad of your advice on the following problem. I am desirous of making alterations to a hand telescope so that I can increase its power from 35X up to 60X.

This I understand is possible by fitting a fourth "Pancratic" tube. I would, therefore, be pleased if you could tell me, what lenses are necessary, the position they take, and how to arrive at the focal length of these lenses in relation to the existing lenses?

Also, the name and address of a manufacturer who could supply such lenses, and the name of any publication which deals with hand telescopes. The diameter of the object lens of my telescope is 1⅜in.—F. C. Coppen (Reading).

THE light-collecting and space-penetrating power of a telescope is dependent solely on its object glass. The function of the object glass (or front lens of a telescope) is not to magnify the distant object but, rather, to form an image of it, which image is then magnified by the eyepiece lens of the instrument. The flatter the object glass (provided that it has some degree of convexity) or the greater its focal length, the larger is the image which it forms.

Now, it is possible to provide for a sort of two-stage magnification of the "aerial image" which is formed by the object glass, and this is done by providing the extra tube-length in which is fitted a sort of auxiliary eyepiece lens.

Opinions differ as to the effectiveness of this method, but ours is that it is not very successful except for very special purposes. In the first place, the provision of the extra tube-length with special lens cannot possibly increase the space-penetrating power of the telescope. It can only give greater enlargement or magnification of the received image, and this it does at the expense of brilliancy, and sometimes of detail.

The focal-length of the supplementary lens can only be determined after consideration of the eyepiece lens. It should be equal approximately to that of the front lens of the eyepiece (the lens farthest from the eye). We do not know any manufacturer who would be prepared to grind a special lens for this purpose for you, and we think you will have to rely on the second-hand market, which, at this time, is, unfortunately, not very reliable. Try any of the following firms, giving fullest particulars of your requirements, and asking for lenses on trial. Do not purchase outright until you have actually fitted and tested the lens: Messrs. Broadhurst Clarkson and Co., Ltd., Farringdon Street, London, E.C.4; Messrs. C. Baker, 244, High Holborn, London, W.C.1; Messrs. R. J. Beck, Ltd., 69, Mortimer Street, London, W.1; Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.

There are no in-print books dealing with the making of small telescopes, but years ago a number of such books were published. You will have to search for these on the second-hand market. Try Messrs. W. and G. Foyle, Ltd., Charing Cross Road, London, W.C.2, or Messrs. Wm. Bryce, Ltd., Lothian Street, Edinburgh. Also Messrs. Wm. Heffer and Co., Ltd., Petty Cury, Cambridge, or Messrs. H. K. Lewis and Co., Ltd., 136, Gower Street, London, W.C.1.

Painting Stonework

I WISH to paint the stonework of an old shop a light cream.

What would be the correct base paint? Would it be successful without requiring several coats? Also, would it be better to finish with a varnish paint or a flat paint and then a clear copal varnish? —T. Cartmel (Manchester).

IF the stonework is in good condition, it is usually preferable not to paint it, but to scrub it clean with soap and water only. Natural stonework generally has a better effect as regards appearance than painted stone.

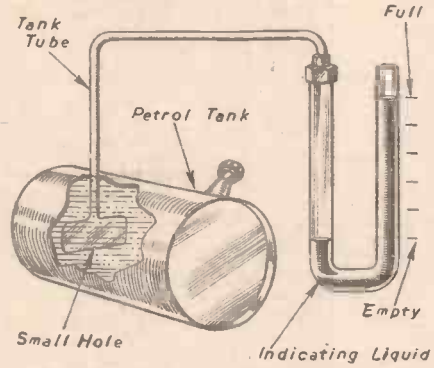
However, if you have a special reason for wishing to paint the stonework, proceed as follows. Give it a scrubbing down with hot water and soap to remove dirt and grease. Do not use any soda or other substance in the water, since these things tend to bring about the slow decay of stonework. Then give the stone a thin coat of any flat paint of the approximate colour required. After this has dried and hardened, paint over this flat paint layer with a varnish paint. Do not use a separate varnish, since the latter might tend to yellow and crack on the stonework.

Thus you will only require two coats of paint on the clean stone base; first, the flat paint of approximate colour; second, the varnish paint of the exact shade required. If you were painting stonework blue, you would paint a blue varnish paint over a blue flat paint, and so on.

But we should like to repeat that, from an artistic point of view, it is always undesirable to cover up good stonework with paint. Hence, we should advise you to think about the matter again before finally deciding to apply the paint to your stonework.

Indicating Liquid for Petrol Gauge

COULD you please tell me what the liquid is in the petrol gauge of my 1934 Ford 8, and where it can be purchased? Also, how can the gauge be filled and adjusted, and what type of unit is in the tank?—R. Parker (Dewsbury).



Sketch illustrating the principle of a petrol gauge for a car. (R. Parker)

THE liquid in your petrol gauge is acetylene tetrabromide. It has a specific gravity of from 2.9 to 3.0 and is thus much heavier than water. It is coloured by means of an alcohol-soluble aniline dye. You should be able to purchase a small quantity of this material from any laboratory supplier, your nearest, perhaps, being Messrs. Reynolds and Branson, Ltd., of Leeds. You could also obtain it from Messrs. Griffen and Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2.

The accompanying sketch illustrates the principle of the petrol gauge. The tank element consists of a special flat-ended metal tube with a small hole in its end. The upper end is connected by means of an air tube to the U-tube on the dashboard. This U-tube is filled with acetylene tetrabromide or some other similar indicating liquid.

Petrol tries to enter the bottom hole in the tank tube and the greater the level of the petrol in the tank the higher will be the air-pressure within the tube and, consequently, the higher the level of the indicating liquid in the dashboard U-tube. The entire principle is very simple.

To adjust the gauge, disconnect the air line and drop the indicating fluid into the U-tube drop by drop until its level reads zero.

It is most important to see that the whole system is absolutely free from air leaks. Note, also that the upper end of the U-tube column in which the indicating liquid rises must be open to the air. This does not mean that the limb must be entirely open. It can be corked so long as the cork or stopper is pierced with a hole through which air can escape or make its entry.

Any coloured liquid can be used in the U-tube as an indicator, provided that it is heavy and non-evaporative.

Rendering Coloured Enamels Luminous

CAN you give me any information enabling me to render small quantities of coloured enamels luminous? Sources where I could obtain necessary materials would also be appreciated. —G. Barley (Stoke-on-Trent).

IT is not easy to render coloured enamels luminous, either permanently or otherwise, and the success which will meet your efforts in this direction will be governed by the nature of the enamel, its colour, and its chemical and physical nature. We note that you do not enlighten us as to whether you refer to a vitreous enamel, a stove enamel or an ordinary paint (oil or cellulose) enamel.

In any case, to make the enamel luminous, you must incorporate a luminous material with the pigment of the enamel. For absolutely permanent luminescence, you would require a small quantity of "radium compound" for mixing with the enamel powder. This radium compound is, of course, radioactive, and it is exceedingly expensive, costing about 20s. per milligram. It can be obtained from Thorium, Ltd., London, S.W.1, but it is subject to recently-imposed restrictions of the sale of radioactive materials.

The alternative is to mix with the enamel a quantity of luminescent zinc sulphide. This is rather expensive, costing about 5s. per oz., but it can be had freely from most chemical dealers, as, for example, Messrs. Baird and Tatlock (London), Ltd., 14-17, St. Cross Street, Hatton Garden, London, E.C.1, or possibly from Messrs. Philip Harris and Co., Ltd., Birmingham. This material needs reactivating from time to time by exposure to bright light. Given this, and given, also, the absence of certain detrimental materials in the enamel pigment, it should be fairly satisfactory.

Polishing a Maple Floor

I WOULD appreciate your advice on the best way of polishing a maple wood floor I have fitted in my dining-room. I intend hiring a sandpapering machine to level the edges, and I wish to have a finish the natural colour of the wood, or perhaps a little darker.—W. J. Evans (Clondalkin, Co. Dublin).

IT will not be a difficult job for you to get a good polish on your maple floor. After you have finally sanded the surface and got everything nice and smooth, brush thinly a coating of white polish (a shellac preparation obtainable from any large paint store) over the surface, or, alternatively, use a solution of one part of shellac in two parts of methylated spirit. Let this dry, and then go over the floor surface with any uncoloured floor polish. A good preparation of this nature consists of a mixture of equal amounts of paraffin, carnauba and bees waxes dissolved in a mixture of equal volumes of paraffin and turpentine; 30 per cent. of the wax mixture to be dissolved in 70 per cent. of the turps-paraffin mixture. This gives a colourless wax film which, after the evaporation, is very hard. So hard, indeed, that it is apt to be too slippery, in which case increase the percentage of the paraffin wax in the mixture.

Do not attempt to stain the wood with any artificial or chemical stain. If you only want the wood to be slightly toned down in colour, the wax polish will effect that requirement.

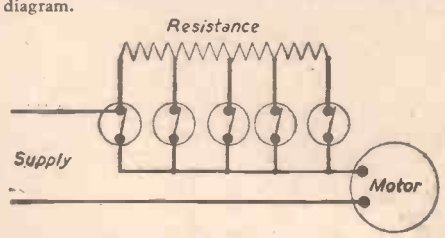
Methylol Fuel

I HAVE a 9 h.p. car and shall be glad of your advice on methylol fuel. It is a spirit chemically known as CH_2 $(OCH_3)_2$. Is this harmful to the engine in any way? Also can it be mixed with petrol? This is said to be different from methanol fuel.—G. Lilley (Wembley).

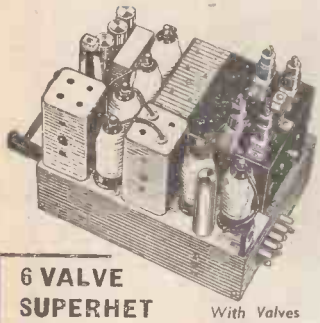
THE spirit which you name is not the simple methyl alcohol, $CH_3.OH$ (or "methanol"), but an alcohol of more complex composition. It has a higher boiling-point than methyl alcohol and consequently it is not as readily vapourisable. This means that if it were used in the pure state some form of pre-heating would probably be necessary for starting-up. It cannot be mixed normally with petrol any more than ordinary methyl alcohol can. It is only by admixture with a considerable amount of butyl alcohol that it can be blended with petrol, and this, of course, puts up the cost, and lowers the volatility of the fuel. It could, however, be mixed with methyl alcohol or "methanol." It would not be any more harmful to the engine than any other type of alcohol fuel. Most alcohol fuels tend to form traces of acids in engine exhausts, but it is not often that any serious corrosion is set up therein.

Starter for Small Motor: A Correction.

IN answer to a reader's enquiry in the July issue of PRACTICAL MECHANICS a circuit diagram was given of a simple starter for a small electric motor. Owing to a draughtsman's error one of the supply leads was shown wrongly connected. These leads should, of course, be connected as shown in the accompanying diagram.



Circuit diagram of a starter for a small electric motor.



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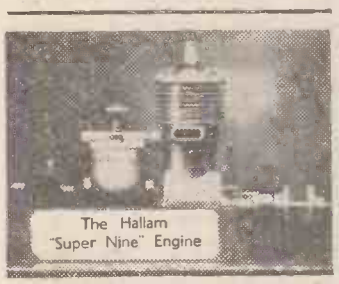

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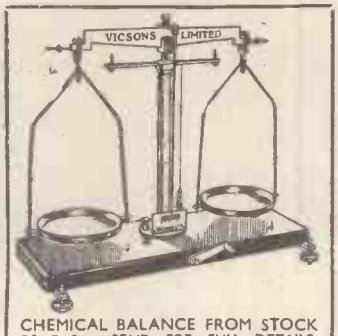

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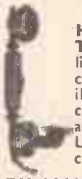

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THE Cyclist
Editor: F. J. CAMM

VOL. XVII SEPTEMBER, 1949 No. 330

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Comments of the Month

By F. J. C.

Toll Bridges

THE public has always disliked toll bridges and many of our byways owe their existence to the public's objection to paying tolls; they found alternative routes to dodge them. At one time there was a toll or turn-pike at Hyde Park Corner and so the travellers of those days dodged it by using Hyde Park. An objectionable feature of toll gates and bridges was that they could be bought and sold. They were not owned by a local district council nor by the Government, but were purchased by private individuals who bought and sold at a profit.

The official barriers of this sort were erected under the Turn-pike Act of 1663. There were many riots, and wherever they were erected they were pulled down by incensed locals. In fact when the toll-keepers raised any objection to this conduct they were included in the general destruction.

This grievance had not abated by 1799, for an infuriated traveller wrote in that year: "From Grimsthorpe to Colsterworth near the North-East Coast are eight miles called by courtesy of the neighbourhood a turn-pike, but in which we were every moment either buried in quagmires of mud or racked to dislocation by pieces of rock which they called mending."

Plenty of toll roads still exist. There are 32 toll roads and 51 toll bridges operating in Britain even to-day—only Scotland having succeeded in ridding herself of toll roads though her three toll bridges still remain.

North-east England is still the most toll-ridden area, having eight toll roads and 15 toll bridges. The north-west comes second with six toll roads, nine toll bridges and one toll tunnel. Wales is third with four toll roads and five toll bridges. The total length of British toll roads is approximately 50 miles, the longest, the well-known Porlock toll road, being 4.19 miles long.

Road Fund Report

THE Ministry of Transport, however, continues with its plans, even though slowly, to modernise our road system. Payments from the Road Fund in the year ended March, 1948, for the maintenance and improvement of roads and the construction of new ones totalled over £24,000,000, including over £8,000,000 on trunk roads. These figures, which compare with £15,600,000 and £7,000,000 respectively in the previous year, are given in the Annual Report on the Administration of the Road Fund, published by H.M. Stationery Office. Payments for all purposes totalled about £26,000,000, or £9,000,000 more than in the previous year.

Trunk Roads

AT the end of March, 1948, the mileage of trunk roads was about 8,000. During the year over £7,000,000 was spent on maintenance and minor improvements, including the resurfacing of about 673 miles and surface dressing of about 13,400,000 square yards.

Two air surveys were completed covering about 80 miles of principal national routes, and extensive preliminary survey and road location work was carried out on proposed trunk roads.

Record Cycle Exports for 1949

RECORD bicycle and motor cycle exports of close on £15,000,000 for the first half of 1949 are £2,500,000 up on the first half of 1948, state the British Cycle and Motor Cycle Manufacturers' and Traders' Union in a review of the first six months of the year. The bicycle industry has increased its exports from £8,451,509 to £10,905,949; the motor cycle industry from £3,779,477 to £3,937,514.

In a rush to get British bicycles and motor cycles before the complete prohibition of imports, India bought 2,489 motor cycles, twice the 1948 figure, and 315,586 bicycles, as against 34,830 during the first half of last year. The Argentine more than doubled her purchase of motor cycles (2,818 as against 1,296) and increased from 28,297 to 41,146 the number of bicycles bought. The Dutch East Indies had 62,000 bicycles as against 1,600. More motor cycles also went to Australia, Canada and New Zealand and more bicycles to Canada, British West Africa, British West Indies, Hong Kong, Iran and Southern Rhodesia.

Special Roads Act

SPEAKING as guest of honour at a recent luncheon given by the British Road Federation to celebrate the passing of the Special Roads Act, Mr. Barnes said that the Bill received support from all sides of both Houses of Parliament.

"I know," said Mr. Barnes, "from long experience and from commercial experience outside my parliamentary life, that for various reasons our roads seem hopelessly behind current needs."

Continuing, the Minister said that he was unable to prophesy when it would be possible to overtake arrears. He would be gratified if construction of the first motorway could start within the next 12 months, but it was of immense importance that the Special Roads Act was on the Statute Book. It placed a great lever in the hands of the appropriate Minister when economic and financial conditions were ripe for further road construction.

A thousand miles of motorway as planned will cost £150,000,000. That is a great deal of money, but the construction programme would be spread over 10 or 15 years. In that case the annual capital expenditure would be a negligible cost when one weighed the final and ultimate economies and advantages that it would represent to a highly industrialised community like the British people. Had we attempted in the past to improve and modernise our existing road system, its ultimate cost would have been much more than £150,000,000. At the end of it we would have solved no problem. During the past 50 years we had poured a large annual sum of expenditure on obsolete roads without making them fit for modern traffic.

"If," said the Minister, "by the special roads system we can provide an opportunity for the heavy lorry or fast-moving car to reach its long-distance objective and to lift it out of local traffic for the main stretches of its journey, then we shall contribute a good deal to minimise the accident problem and, of course, to solving it altogether."

A Spurious Russian Claim

LIKE the Japanese, the Russians are anxious to impress their own people with the fact that they have invented everything. They do not, of course, succeed in impressing anyone outside their own country, but the Russian people are kept in such ignorance that they cannot be expected to believe anything except that which appears in their two Government sponsored newspapers, *Pravda* and *Izvestia*. Their latest claim concerns the invention of the bicycle. They have dug up an old machine which they say was invented and built in 1801 by a Russian named Artomonev, a resident of the Ural Mountains. They go further and say that he rode it from his home to Moscow, a mere one thousand miles, and on a hobby horse at that!

This old Russian machine now stands side by side with the German 1813 bicycle invented by Drais. Those who have seen the machine assert that it must have been built much later than that built by Drais.

The credit for the invention of the first rear-driven bicycle has already been accorded to Kirk Patrick Macmillan, although we have always had doubts as to whether he was really the first. Cycling history from 1800 to 1850 is dubious, and there are so many conflicting claims. For many years the credit went to Gavin Dalziell, but as a result of researches it was discovered that Macmillan was many years before him. Macmillan, as a matter of fact, was the very first cyclist to be fined for riding a bicycle to the common danger. It seems reasonably certain from later records that there were several successful rear-driven bicycles built by Englishmen long before 1839, as a reference to early scientific magazines indicates.

However, it is very certain that the Russian claim cannot be substantiated, and, like so many other statements emanating from that country, is, in our view, deliberately false.

The researches of the late H. H. Griffin do not indicate that the Russians were even aware of two-wheeled vehicles in 1839, much less than in 1801. Their country at that time was abysmally ignorant, especially on scientific matters relating to locomotives. It has not progressed far since. Has anyone seen a Russian bicycle or a Russian motorcar?

GORDON RANDALL

The old George Inn.
WINCHCOMB
Glos.

The Pilgrims' Gallery running along one side of the courtyard, beneath the stairs stands a fine stone water-trough.

Paragrams.

Four-leg Power Tricycle

A SOUTHAMPTON cyclist recently completed a tricycle to his own design capable of carrying himself, his wife and his young daughter. The chassis is constructed from light tubing and there are two cycle-type wheels in front and a single wheel at the rear which is driven by two sets of pedals and chains. The driver pedals and steers by means of a car steering wheel, while the driver's wife, who sits alongside, also has the honour of pedalling but keeps herself in position by holding on to handlebars. Daughter sits at the back and does no work at all, but as the inventor has fitted a three-speed gear the going is not too hard.

Fell by the Roadside

PERHAPS the most exciting event held by the local branch of the British Legion at Enderby, Leics, at Whitsun was the five-mile grass track championship of Leicestershire and Rutland. Clubs from the two counties sent their best riders, twenty-four in all, but only four reached the winning post. During the last mile, E. F. Foster and K. R. Branston, both members of the East Midland Clarion Club, fought for first place and eventually Branston passed the post half a wheel ahead of his clubmate. Third came C. B. Day, of the Leicester Forest Club. The winner's time was 16 mins. 2 secs.

Going Up?

THE Lord Lieutenant of Northamptonshire has suggested to local magistrates that they do not impose sufficiently high fines on cyclists who are caught riding without lights, as there is such grave danger both to the cyclists and other road users. Several of the Road Safety Committees in Northamptonshire have agreed to support the Lord Lieutenant's proposal, but the County Committee has refused its support. The County Committee feels it would be improper to take action on the lines which have been suggested.

Wanted More Speed

MARKET RASEN (Lincs) magistrates heard the story the other day of the steam roller driver who, after years of crawling along the highway at a speed of about one mile per hour, craved a lighter mount with more speed, and stole one of the latest types of racing cycle. The man, aged 61, was fined £10 for the theft. A police sergeant found the cycle wrapped in sacking and sewn into a blanket which was hidden in a locker at the back of the steam roller caravan.

Hotting Up the Roads

IT is reported that an experimental stretch of road is now being constructed with electrical heaters built in under the surface, in the same way as the electrical heating equipment which is installed in some garden frames. The current is switched on when there is snow or ice on the road and the surface is quickly cleared and kept clear without the use of grit or salt and the usual dislocation of traffic.

Carrying the Can!

THE days when members of the Forces used automatically to take the can back for all cycle thefts and "borrowings" were recalled by the Mayor of Boston when he presented R.A.F. Station, Coningsby, Boston's adopted R.A.F. station, with an engraved silver cup to be competed for in the station's sports events. He recalled that during the war many of the airmen stationed at Coningsby took a great fancy to the Bostonians' cycles, particularly after the last bus back to camp had gone. One daring airman trailed a police sergeant back to the police station; watched where he left his bicycle, and promptly borrowed it and rode back to camp on it.

Budding Tourer!

AFTER the police had been searching for several hours for 4-year-old Gordon Brown, of Kidlington, near Oxford, who had been reported missing with his tricycle, a policeman at Cumnor, some 12 miles away, found the boy pedalling slowly up the hill into the village. It was then almost midnight, and as Gordon had no lights the constable thought he had better take him into custody. He refused to be parted from his tricycle, and this was put into a police car with him, and he was soon back home again. Apart from a quite understandable feeling of tiredness, he was none the worse for his long ride.

Pictures on the Wall

AFTER several thicknesses of wallpaper had been stripped off during redecoration work at the shop of Messrs. Curry's, Ltd., in Swan Street, Loughborough, a number of oil paintings on the plaster came to light in one of the rooms. At one time the shop was an old coaching inn, "The Grapes," and two of the paintings show women in the dresses of those more leisurely days. Another painting is intended to represent Hamlet, holding a skull in one hand, while another shows a group of people engaging in the sport of falconry, with their horses and dogs. Some of the other paintings have been damaged by time, and also probably by the wallpaper paste, but it is thought they were all done at the same time and may possibly be the work of some travelling artist who earned himself a few days lodging and refreshment at "The Grapes."

Doncaster Rider's New Record

ALF MARTIN, crack rider for Doncaster Wheelers C.C., whose successful career dates back to 1933, set up a new 25-miles record for the district by winning the Mansfield Victoria C.C. open trial in 1h. 46s. This was Martin's fastest ride in his long career, and the club record he has just broken had been standing at 1h. 1m. 13s. since it was set up by Dennis Clamp in 1938. Clamp also rode in the Mansfield "25," setting up his best time for such an event this year, of 1h. 2m. 13s.

Rugby Cycle Speedway

RIDERS at Rugby have become very keen on the cycle speedway idea, and a Rugby and District League has been formed; the clubs already in the league being: New Bilton Bees, Rugby Falcons, Dunchurch Devils, Newbold, Old Bilton Newts, Crick, Lutterworth Lions, Bretford Monarchs, and Kilsby Kestrels and Hillmorton Diamonds; the latter club being the prime movers behind the formation of the league. The Diamonds have obtained a piece of ground at Hillmorton Wharf, Rugby, and have laid it out to conform with league rules. There was a good deal of perspiration before the job was done, as some 250 tons of sand had to be moved, but events are now being held, which attract several hundred spectators. Leader of the Diamonds is 15-year-old Alec Malins, and an adult committee has been formed to help with the management of the speedway.

Tandem For Four

A CYCLIST seen the other day riding along a quiet Leicestershire road with his wife on a tandem, had solved the problem of what to do with the family when mother and father want some fresh air. One young daughter sat in a seat attached to the front of the tandem while the other girl was in a seat at the back. Mother and father did the hard work while the children acted as observers.

Disappearing Landmark

THE 150-year-old Maud Foster mill at Boston, Lincs, one of the very few five-sailed windmills left in this country, is to have its sails taken away. This mill can be seen for miles across the flat Fen country, and has stood since 1819; was built by Thomas and Isaac Reckitt, of "Reckitt's Blue" fame, and for the past 35 years it has belonged to the Ostler family. The sails each measure nearly 37ft. long and weigh between 28 cwt. and 30 cwt., and the dismantling of the sails will be a tricky business.

More Speedway

YOUNG riders at Leicester have scratched themselves out a speedway track in Navigation Street, Leicester, on a site that was covered with broken glass and bricks and other rubbish. It is the home track of the "Red Devils," members of the Central Boys' Club, Orchard Street, Leicester, and already they have held several events. The police told the boys that the stripped speedway cycles must not be ridden on the road away from the track, but otherwise, neither they nor people living nearby have raised any objections.

The Fun Comes Next

LOTS of hard work has been put in by members of Kettering Lawn Youth Cycling Club, who decided some time ago to build themselves their own grass track. They are busy levelling a piece of ground for the track, and have moved well over 20 tons of earth and stones to a spot some 300 yards away, where they are building a bank for the track. By the time the track is ready there should be plenty of muscular devolopment ready for the serious business of racing.

Around the Wheelworld

By ICARUS

Memorial Plaque to Welch?

MRS. KINGSTON WELCH, wife of the inventor of the wires in tyres, died on the very day that the Roadfarers' Club were celebrating the diamond jubilee of the marketing of the pneumatic tyre and honouring Sir Arthur Du Cros, son of the founder of the original pneumatic tyre company. She thus did not receive the telegram sent on that occasion by the Roadfarers' Club in the following terms:

"The members of the Roadfarers' Club are commemorating to-night at the Savoy Hotel, the sixtieth year of the founding of the pneumatic tyre industry, and send you their respectful greetings and good wishes in recognition of the vital services rendered by your late husband, Charles Kingston Welch, in adapting the pneumatic tyre principle for cycling, motoring and general purposes, thus giving practical form to an earlier invention, for the pleasure and benefit of humanity."

Sir Arthur, in his speech, made the proposal that a memorial plaque should be placed on the front of his residence either by the Roadfaring Community, or officially by the City of Coventry. The suggestion was unanimously adopted, and the Roadfarers' Club is moving in the matter.

The Hundred Miles Championship

THE Hundred Miles R.T.C.C. Championship was won by S. Haslam, of the Lancashire R.C., in four hours, twenty minutes, seventeen seconds, whilst J. Baines, of the Lancaster C.C., was second with four hours, twenty minutes, twenty-eight seconds. The Medway Trio, R. Enfield, K. H. Joy and P. Beardsmore, occupied third, fourth and fifth places at four hours, twenty minutes, and fifty seconds, four hours, twenty-one minutes, fifteen seconds, and four hours, twenty-one minutes, twenty-seven seconds, respectively—a total of thirteen hours, three minutes, thirty-two seconds—a competition record. This championship was run under the auspices of the Bath Road Club. Thus, the old Bath Road Hundred, formerly considered the Blue Riband of the road, loses its identity under the new title of the R.T.C.C. Hundred Miles Championship, with the B.R. Hundred as a sort of sub title.

Major H. R. Watling

MY congratulations to Major H. R. Watling upon his election as Master of the Worshipful Company of Masons for the coming year. The Company, founded about 1220, was one of the four Associated Companies of the City of London responsible for the original Plantation of Ulster. The other three were the Mercers, the Cooks and the Broderers, and the four are now interested in the development of Northern Rhodesia, where a new empire settlement is being organised.

The Apex Trophy

ONE of the most interesting events at the N.C.U. Rally at Leamington on July 22nd was the bicycle polo match. This game was arranged by the Bicycle Polo Association between two selected counties, Lancashire and Warwickshire.

It is hoped to make this match an annual event to be held each year at the N.C.U. Rally.

This first match was won after six exciting ten minute "Chukkas" by Warwickshire, who thus became the first winners of the Apex Trophy. This beautiful silver cup has been given to the Bicycle Polo Association by the Apex Inflator Co., Ltd., manufacturers of the well-known bicycle pumps.

The N.C.U. and the C.T.C.

SOME of my readers who have read my comments and criticisms of the N.C.U. may be interested in the following extract from a leading article in *Wheels* for January 19th, 1898, and which supports my arguments that it is a dictatorial body. Indeed, my statement that it has consistently upset cycling sport for the past fifty years makes this quotation almost prophetic.

"Unless the cyclist who has carefully studied the rise of the two great institutions of the world of wheels, the Cyclists' Touring Club and the National Cyclists' Union, be peculiarly biased, he cannot fail to have noticed the steady progress of the former, in spite of the two increases of subscription, and the practical decline of the latter, when its present position is considered in connection with the great increase in the popularity of cycling. The career of these bodies is a splendid object-lesson, for they indicate the vast difference between a more or less chaotic mob without a leader and a well-organised body under a firm hand. If, for example, the C.T.C. had been ruled by a number of irresponsible busybodies, it is inconceivable that, in the ordinary course of things, it could have hoped to succeed. It would have been in much the same position as the N.C.U. to-day, that is to say, an organisation with a nominally large membership, existing mostly upon paper.

"The Union might be a well-organised and influential body, doing much good for the sport and the pastime, and we believe that there is room for both institutions, but it has been managed, or rather mis-managed, by people, the majority of whom have had their particular axes to grind. The very system of estimating membership is defective, for, out of the numbers given, it must be borne in mind that by far and away the greater portion of the Union's so-called adherents are members of affiliated clubs.

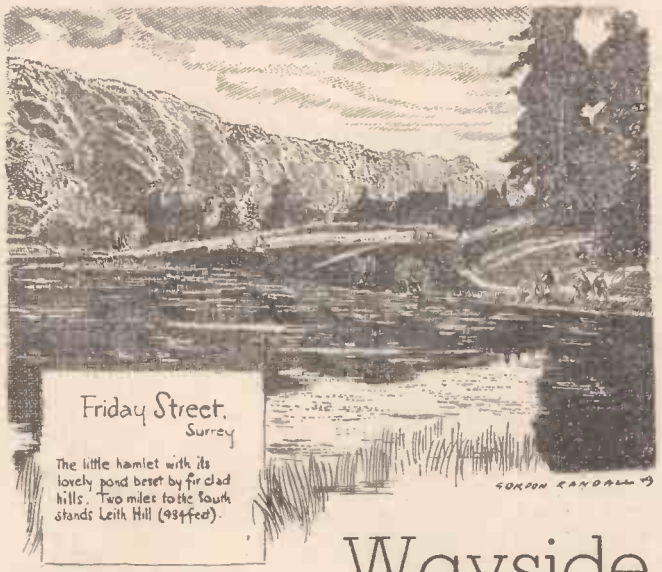
"It is the clubs which keep the Union alive—not the individual members—although the executive would like the public to think otherwise. At the present time a club can pay 10s. 6d. per annum and send a representative to attend four meetings of its district centre. If it has more than fifty members it can send two representatives at a payment of £1 1s., and so on, at the rate of 10s. 6d. for every twenty-five members. But it need not send more than one member, though its membership be one hundred or more, and hence 10s. 6d. may possibly cover a hundred or more cyclists. The strength of the Union is apparently estimated upon the total number of members of the affiliated clubs, so that it would seem that the subscription rate must be very low, or the official expenses very high, which may possibly account for so little being done for cyclists generally."

Three Beautiful Signposts

THREE of the loveliest village signs to be found in England are in Norfolk, in the villages around Sandringham. These signs, designed, carved and painted on the Royal estates, are in the fascinating Black Forest style, and they were gifts to the several communities by the King in 1912.

At Shernborne you see a picture of Thomas de Shernborne in full armour as a jousting knight. He is leaping across the castle moat while his wife, with hands in praying stance, looks on. At Flitcham the scene depicted shows St. Felix crossing the Channel in an open boat on his journey to introduce Christianity into Norfolk. Wolverton's picture shows the mythical conflict—famous in Norse legend—from which the village derived its name. The great demon wolf, Fenrir, is in mortal combat with Tyr, god of war, and beneath them is an ancient church with a curious detached tower.

Gomshall, Surrey. The picturesque old mill on the Tillingbourne.



Wayside Thoughts

By F. J. URRY

The Little Handicaps

THE old cyclist, if he is reasonably fit, doesn't get leg weary or saddle sore; or puffed or blown; he is too wise for that, but he is sometimes worn to a tiredness by the effects of vibration in both hands and feet. I have found that out in the last few years, resented it and tried to overcome its effects by fitting felt pedal-blocks and good rubber grips. Both have been valuable to a degree, but the best cure of all is to take more rest and smokes over a given journey, and feed a little more frequently than of old. How hard the old Adam of speed and distance dies in us when the conditions give the opportunity of indulging the youth in us we cherish; and perhaps it is just as well it is so, or we might forget entirely how much we owe to the aid of a bicycle. Yet there is wisdom in tempering cycling to the years that have gone over us, for by that means I imagine we can enjoy it to the very end of the story. It must now be years since I was conscious of real weariness as far as riding is concerned, but latterly I have, on occasions, been aware of a feeling something between an ache and an irritation in hands and wrists and feet, and while you can ease your hands by a change of position, that is not possible for your feet unless you descend to middle-footed awkwardness, adding that burden to your pedal power. No, the only thing is more frequent rests, a walk now and then and a genial acceptance of the fact that years are a handicap which cannot be slurred, but can be enjoyably endured. One is bound to gather a few aches and pains along the road of the years; they come to all of us in any case, but, I firmly believe, in less acute form if we ride within the limits of our enjoyment, and count the hours rather than the miles of achievement.

The Right Reply

I FIND, too, that quite a number of people "getting on in years" are inclined to tension their bodies in the manner of the younger people, part of whose enjoyment is undoubtedly attained from sheer physical effort of speed which automatically needs tension, the conscious acceptance of effort well within their powers. I know that error, a kind of hangover from my younger years, often enough catches me out, particularly when I am a lone wanderer, and frequently enough I pull myself up with the mental observation that the need to "work" my passage has ceased long ago, yet after a spell of very easy going the subsequent rising slopes shape me to the tensioned effort of climbing them unless I keep in mind the fact that I am cycling for joy. I mention these reactions of an elderly cyclist, who apparently is not so expert as he sometimes imagines, because I believe they are common little faults which, when unconsciously practised, can make a fellow think he has grown too old for the game, and I don't want anyone to think that. I was taken on a ride by my grandson the other day, and after cycling for some time I became aware of the fact that my companion was travelling a trifle faster than was good for him. "Am I riding too fast?" I asked the lad. "No, Gramp," said he, "but I am." And there you have the precise answer to the question posed. If you are cycling for pleasure, then ride well within the orbit of ease, and walk rather than invade that imaginary limit. Each of us must mark the limit of our own powers in this matter and, broadly speaking, these limits I have endeavoured to define, and then cycling will be for you a joy and a recreation just as long as you have health and strength and that delightful consciousness, a love of country in all its changing aspects under the changing skies.

A Holiday Run

LATE in June I started to ride from Abergavenny to Fishguard, where my people were spending a recuperative holiday. It was at the beginning of that heat wave, and as I left the lively Welsh town just before 11 o'clock I rode into a hot, misty air full of the scent of cut grass, and with an east wind to make me gallop. I swung along because I could not help it, a new James between my legs, the friendly wind and those ever delightful first impulses of a holiday. And it is an easy road until you climb the shoulder of Talgarth Mountain to the village of Bwlch perched on the top. I rode all but a couple of hundred yards of that long slope, just to try out the machine more than the man, and found both of them in good fettle, slipped into Brecon for an early lunch and then intended to saunter along to Carmarthen to end a perfect day.

In a Hurry

WHEN I rolled out of Brecon the breeze had gone south, but the going was still reasonably easy, I thought of those green slopes before Senny Bridge where a long smoke would be delicious. But the devil of haste was in me that day, a state of mind frequently associated with the lone rider finding himself hurrying for no purpose but enjoying it. I whirled down the long drop to Llandovery and crossed the Towy too early for tea; indeed the town seemed sound asleep, though I suspect most of the inhabitants were out in the fields making and gathering the scented hay. I would get the afternoon refreshment somewhere on the way to Llandilo; but this is a countryside where travelling needs are not advertised and it was into Llandilo I went before the very needful tea was obtainable.

The Unkind People

IT was really too far for me to ride betwixt lunch and tea—33 miles, with the wind now coming from the south-west—and it was bad judgment on my part that gave me the vibratory ache in hands and feet. The last half-dozen miles into Llandilo were not comfortable and it was my own fault. An excellent tea, however, put that right, and I took an hour over it before passing through Golden Grove and along the Towy valley to Carmarthen. That was a glorious ride, for the wind had fallen almost asleep as the shadows lengthened, and I just let the speed flick me along without thinking of it. That, of course, is the time to ride on a hot day when to breathe the air is a joy in itself. St. Clears was only nine miles away, a rolling road with easy hills; should I take the risk of finding accommodation? And before I had half debated the matter I was beyond the Picton column and away. It was nearly eight when I rode into St. Clears, and for the next half hour I became more and more annoyed as hotel after inn and rest house turned down my desire for a bed with the obviously untruthful statement that they were full-up. My last hope was a mile out of the town near the station, the biggest of the hotels with the same tale to tell, and it was there my temper flew off the edge and I told the proprietor what I thought of him and an administration that allowed people to hold a licence and refuse to carry out the first conditions attaching thereunto. It all made no difference to that grim cold fellow whose advice was a return to Carmarthen or a forward march to Haverfordwest, 21 of the hardest miles in this land of many hills. The old signalman at the station had been hanging out of his box listenng to the altercation and with a sudden thought I asked him when was the next train to Haverford. "In five minutes," he said. I gave St. Clears to anybody who wanted it, begged a glass of water off my friend of the signal box (I was too cross to buy a drink in such a place), caught the train, and was delightfully entertained to supper, bed and breakfast at the small Railway Hotel in Haverford.

They are Still There

AT 9.30 a.m. I was ready for the road and the morning was hot, very hot, but tempered by a breeze from the sea. It was 15 miles to Goodwick, where I was due at four o'clock, and even I would find difficulty in killing time along that route. So I took the St. David's road, those 16 miles reputed to roll over 17 hills, and they do. I have known them for years, for in the good days before the war we camped every August on the edge of this fine coast-line. I had not ridden that way for ten years, but the hills were still there for no one had eased the grades by cutting off the tops; and very soon my coat was off and the feel of the breeze through a thin shirt was delicious. Plenty of time and no need to hurry, and I took it, with a rest at Newgate before mounting the long slope out, coffee at Solva and time for a walk round the cathedral before lunch at St. David's. It was good to be alive, good to feel the urge to ride was still with me, and really funny to think I had packed a pair of gloves—in case. I took those 15 miles to Goodwick very quietly and did my best to admire the wide visions along that rather featureless road, for that stretch, I think, is the least attractive of the ways of Pembrokeshire except for the mile or so of tree-lined descent to Goodwick and the sea. I arrived in time for a bath and tea and then the welcome of my people who had made the journey without incident.

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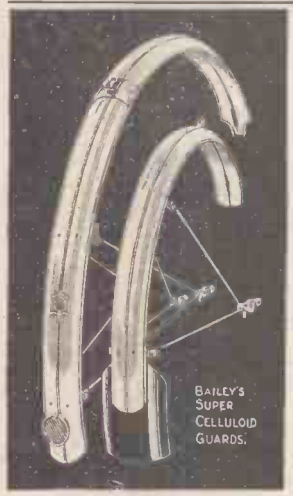

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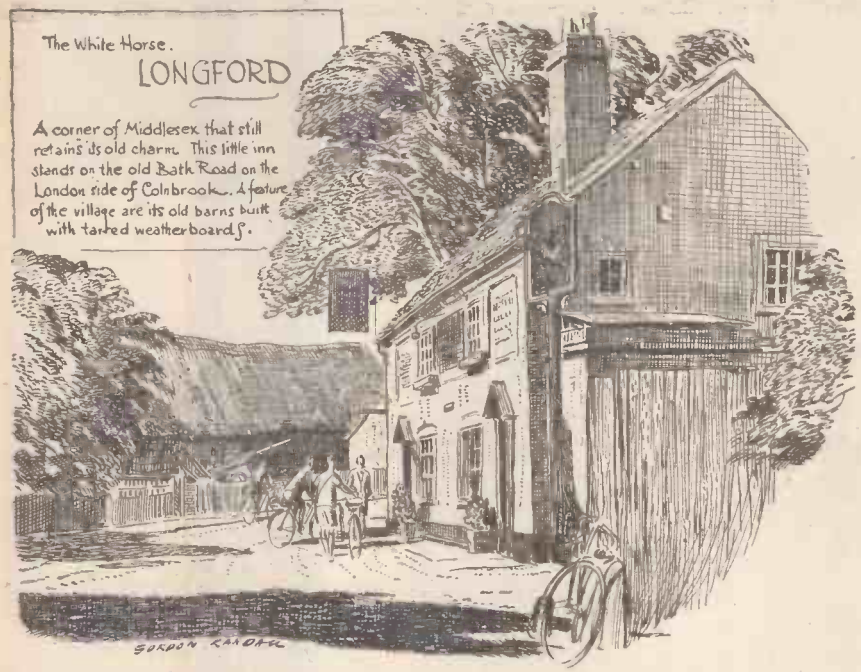


CYCLORAMA

By H. W. ELEY

The Caress of September

TO each month of the year . . . its own particular loveliness, and its own charm. September is mellow and alluring, and there is nothing I love better than a ride into the September countryside, where the fruit is ripening or ripe on the trees in the lush orchards, and the rabbits are at their best, and every tangled lane is colourful with berries and the first autumn-tinted leaves. In the woods, so silent and mysterious, there is bright fungus at the boles of some of the old trees, and as I ride through some quiet glade I am greeted by the raucous cry of the jays. . . .

Cottage Gardens

IN the cottage gardens the Michaelmas daisies make a fine show, and it is not too late to see some of the best of the year's roses abloom. How right was Keats in his ever-living description of this season of the year . . . "Season of mellow fruitfulness." It is well worth while to go for a long September ride!

Village Signs

MANY cyclists will recall the good movement instituted some few years ago in connection with the provision of descriptive signs at the entrance to villages and country towns. I do not mean a sign which merely gives the name of the place, and the distances to nearby places . . . but those useful picturesque signs which illustrated the outstanding feature of the place, gave interesting items about its history, and generally aroused real and abiding interest in the mind of the tourist. The movement, as far as I can judge, "petered out." It is a pity, for in England we have so many places which are literally steeped in history, and have so much to show, that descriptive signs are such an obvious method of education and, such a handy way of explaining the chequered past. I remember that the late Ed. J. Burrow, of Cheltenham, was a keen supporter of the movement, and I rather fancy that his firm, at the time, provided some signs for certain villages, in association with the Dunlop Company. I think the time is ripe for a revival of this excellent scheme.

Making Hard Work of It

IT is really surprising how many cyclists (and not only unthinking boys!) seem to think that a bike will run easily, and for ever, without a drop of oil! In my own young days, when I rejoiced in the possession of my first cycle, I observed a strict ritual in connection with cleaning and oiling . . . and pumping up tyres. In those far-off Victorian days folks did things according to a system, and I recall that in the home Saturday night was "bath night"—and there was much vigorous scrubbing and swilling to make clean for the Sabbath! And the systematic working extended to the realm of the bike, and every Saturday morning my machine was thoroughly cleaned and oiled. And what a difference a spot of oil can make to one's riding! I suggest to those lazy riders who neglect the oil-can that they will rob themselves of a lot of hard work if they will go in for regular lubrication . . . (and I mean lubrication of the *cycle*!)

Value for Money

IN these post-war difficult years we hear a good deal about *poor* value for money, and in any company of people old enough to recall what they are pleased to refer to as "the good old times," there is always a lot of talk about high prices, and poor quality, and "pre-war standards." Well, in my view, there is one article, at any rate, which to-day represents really astonishing value for money . . . and that is the cycle tyre. Just consider the phenomenal mileages which hundreds of hard-riding cyclists obtain from their covers and tubes! In some cases, the records are quite fantastic . . . and when one thinks of the moderate prices charged, I do feel that here is a case where there is no justification for moaning, or comparing with the "golden days of the past." And . . . it should be remembered that comparatively few riders give their tyres that little regular attention and care so constantly advocated by the manufacturers!

The Immemorial Inn

BOOKS continue to be written . . . and some of them are very good books indeed . . . about the English inn—its history, its charm, its place in our economic life. And the brewers, fully alive to keeping up the old traditions of the inn, have recently issued some quite charming advertisements about inns. And what a glorious theme the truly English inn provides . . . for both writer and artist! Old blackened beams in little, cosy bars and tap-rooms ; rows of gleaming tankards on a shelf ; the slow ticking of an old clock in a little "snug" ; and the pleasing, creamy head on a pot of good ale: these are features which the average country-loving Englishman treasures, and it is small wonder that when there were rumours of changing the inn, and all that it stands for, we heard the cry "hands off our inns."

Good Examples

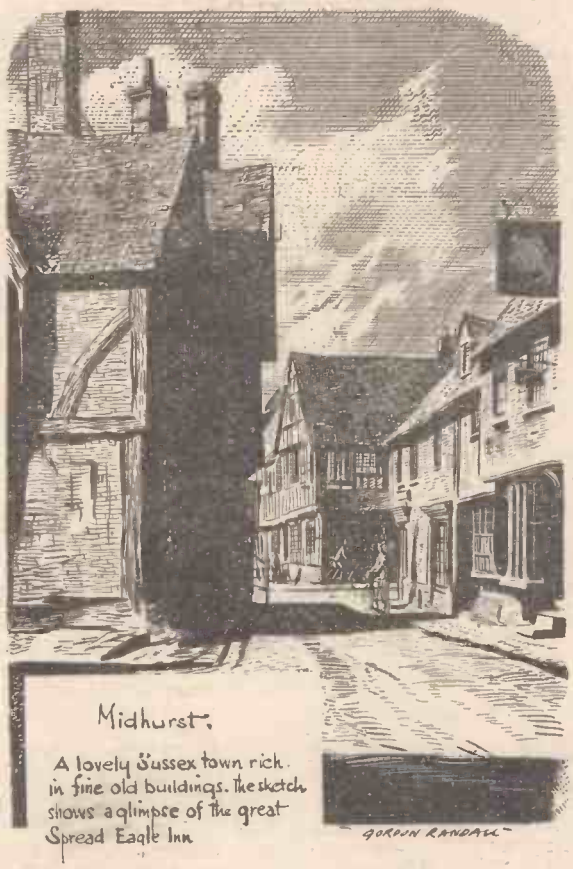
ONE meets with good examples of inns in every English county—and in a recent sojourn in that country around the Staffordshire-Derbyshire borderland I came across some real gems. And the very names are something to rejoice over!—the "Buck in the Park" in a Derby street was a new "find" for my collection of unusual names, and I also jotted down a name I caught sight of from the train, passing Tamworth . . . "The Pretty Pigs."

The Hardy Annual

STRANGE . . . how the subject of "taxing the bicycle" crops up from time to time. I had not heard this thorny topic mentioned for ages, until the other day, I listened to some amateur politicians parading all the old arguments, and discussing the pros and cons . . . and debating about the extreme difficulties of ever imposing such a tax. Some topics, like old soldiers, never die!

My Point of View

By "WAYFARER"



Here is Enthusiasm

A SOMEWHAT wide experience of affairs suggests to me that the leading characteristic of many people is apathy—a deep-seated, dyed-in-the-wool apathy (bordering on defeatism) which tends to drive an enthusiast to exasperation and distraction. Fortunately, that apathy is rare in cycling circles.

It so happens that I have had a long experience on what is called—and wrongly called—the legislative side of the pastime, and it was good to observe the keenness with which cyclists thronged to the meetings. For nearly 20 years I was an elected member of the governing body of one of the national cycling organisations. There were 30 of us coming from all parts of the country, and the average attendance throughout any one year was gratifyingly near to that figure. The various sub-committees of the body comprised seven or eight persons, and here again the average attendance was "grateful and comforting." There was never any danger of a meeting entering the abortive class because of the absence of a quorum of members. These statistics suggest that the folks concerned were interested in the job of work they had taken on. They were prepared to give more than lip-service to the cause espoused by the organisation. Attendance at the meetings occasioned at times no little inconvenience. In my case, for instance, an evening meeting in London involved me in more than 220 miles of railway travel after my day's work was done, with a 2½-mile walk home at midnight, or in the wee sma' hours.

Altogether, the state of affairs here mentioned was satisfactory. If other—non-cycling—bodies were infected with the same measure of enthusiasm, how much better it would be . . . for those bodies!

Prime County

A FEW days' sojourn in Herefordshire reminded me of the glory of a very lovely county, which somebody has described as "the most beautiful" in England. Such comparisons — such sweeping statements — are not for me, and I am content to believe that Herefordshire takes a lot of beating. It is still mainly unindustrialised; it possesses practically everything that the cyclist can desire; its people are charming and friendly. Herefordshire does nothing to get itself into the picture, but knowledgeable cyclists need no telling of its beauty and variety. What a county to play about in for a week or so!

Local Touch

ONE hears from time to time of the resentment which many folks feel because of the tendency to institute central government in place of the local article. I do not think that this is a party matter: if it were, I would not discuss it here. People complain that decisions which should be made locally are made in London, the authority on the spot being overruled by a remote Government Department. An example of this, which concerns cyclists, is ready at hand. In my part of the world the speed-limit on a certain stretch of busy road was recently removed by central authority. The local elements—the County Council, the Parish Council and others who are all too familiar with the conditions and are personally and vitally concerned with them—want the speed-limit restored in the interests of safety. The Minister of Transport refuses the request; he does not consider that a speed-limit is justified. It seems to me altogether wrong that local opinion and desires should be side-tracked in this manner by one who is stationed over 100 miles away. I have personally observed the road conditions. In my view, a speed-limit would be an advantage. But my view, and the views of others who use, or are likely to use, the road in question do not count. The Government Department in London is all-important; it has the last word.

Thrill of Maps

I WAS away from home when writing my recent paragraphs about maps, and was thus unable to refer to my books, and (as I desired) to quote what I consider is the most thrilling passage ever penned on this subject. That passage occurs in the late A. E. W. Mason's novel called *The Watchers*, and I shall try here to summarise it—though I would prefer my readers to peruse the thing for themselves in full. Let me hope that my condensation does not destroy the thrill.

The story, related by Mr. Berkeley, concerns the late eighteenth century, and Dick Parmiter brought a message from the Scilly Islands to Lieutentant Clutterbuck in London. Having delivered his message, Parmiter started back for his home, and "I bought one of the new maps of the Great West Road and began to pick off the stages of his journey. . . . Every day for a week I kept in this way an imagined tally of his progress, following him from county to county. . . ." Then: "I came back again to my map and followed Parmiter through Knightsbridge, along the Thames, between the pine trees of Hampshire and into the county of Devon. The road was unwound before my eyes like a tape. I saw it slant upwards to the brow of a hill and dip into the cup of a valley; here through a boskage of green I saw a flash of silver where the river ran; there between flat, green fields it lay, a broad, white line, geometrically straight, to the gate of a city; it curved amongst the churches and houses, but never lost itself in that labyrinth, aiming with every wind and turn at that other gate, from which it leaped free at last to the hills. And always on the road I saw Dick Parmiter, drunk with fatigue, tottering and stumbling down to the West."

For a time Parmiter was alone, and then Berkeley saw that he was followed by a man on horseback, "who spurred out from London and rode with the speed of the wind. For a while I watched that rider, curious only to discern how far he travelled, and whether he would pass Dick Parmiter. . . . I gazed at my map upon the table as one might gaze into a magician's globe. It was no longer a map; it was the road itself imprisoned in hedges, sunlit, and chequered with the shadows of trees. I could see the horseman: I could see the dust spirting up from beneath his horse's hoofs like smoke from a gun-barrel. . . . I could have clapped my hands with sheer pleasure. I wished that my voice could reach out to Parmiter, tramping wearily so far beyond; in my excitement, I believed that it would, and before I knew what I did I cried out aloud: 'Parmiter! Parmiter!' and a voice behind me answered: 'You must be mad, Berkeley! What in the world has come to you?'" The newcomer was Lieutenant Clutterbuck, who thought that Berkeley was either drunk or crazy. But he, too, fell to studying the map, finally observing that "it is a curious, suggestive thing, the map of a road. I'll not deny but what it seizes one's fancies. Its simple lines and curves call up I know not what pictures of flowering hedgerows; a little black blot means a village of stone cottages, very likely overhung with ivy and climbed upon with roses."

That, I say, is the most thrilling passage about maps I have ever read.

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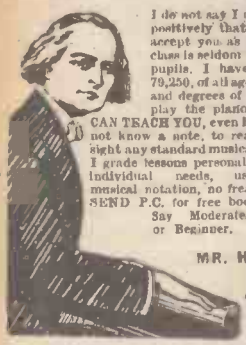

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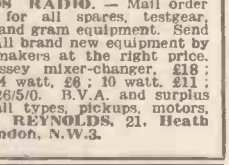

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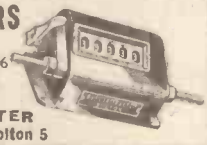

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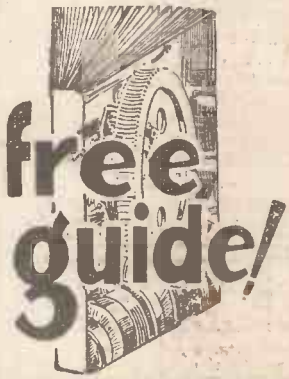

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