An Electric Guitarette

NEWNES

PRACTICAL MECHANICS

1/-

EDITOR : F.J.CAMM
FEBRUARY 1954

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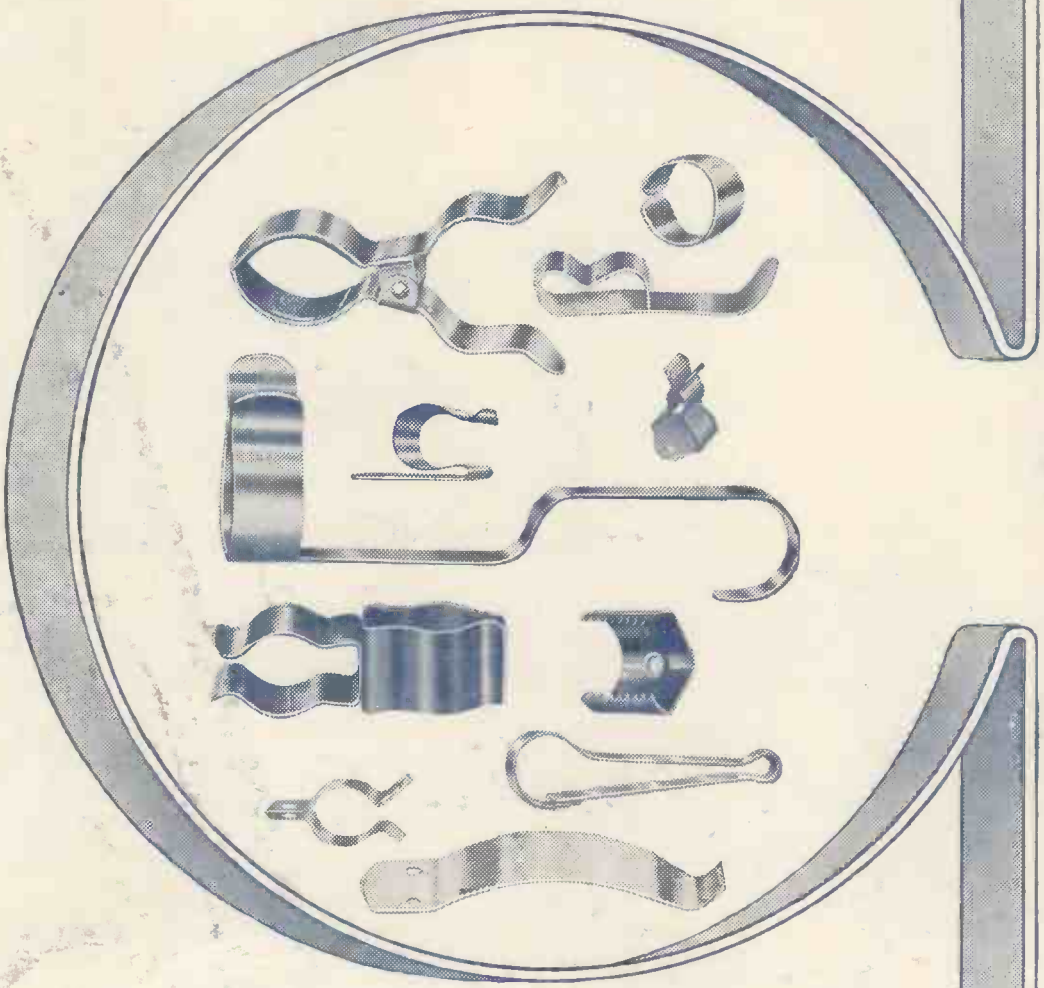

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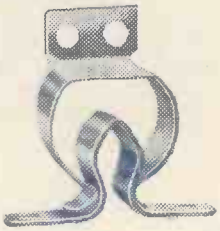

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FEBRUARY, 1954
VOL. XXI
No. 242

PRACTICAL MECHANICS

EDITOR
F. J. CAMM

The "Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

FAIR COMMENT — By The Editor

Television On Tape

UP to the present the only satisfactory means of recording a television programme has been by means of film. Unlike sound broadcasting, programmes cannot be recorded on wax, because of the wide frequency band involved. Telefilm has certain drawbacks and this means that every time a particular programme, such as a play, is repeated, the cast must be present in costume in the studio and the scenes reassembled. This is costly. Magnetic tape, however, has provided the answer. The recording of television pictures on tape in colour and in black and white was publicly demonstrated for the first time in December, 1953, by the Radio Corporation of America at its laboratories in New York in a preview of a new technique that will simplify the entire art of making motion pictures. The new method of recording vision is similar in basic principles to the recording of sound on tape. It is the first major step into an era of electronic photography in which motion pictures in colour, black or monochrome will be produced quickly and economically without any photographic development or processing.

Hitherto there have been two major missing links in television—a video tape recorder and a means of amplifying light, just as we can amplify sound. The first of the missing links has been forged and experiments are continuing with the second.

The new system has great possibilities, not only for television broadcasting but for national defence, for the cinema industry, for education, home entertainment and for industry in general. It is likely that it will be in general use within two years. The cost of recording a colour television programme on tape will be only about 5 per cent. of what it would cost to put it on colour film, since the tape can be re-used. Video tape recorders give the television industry a practical low cost solution to programme recording, immediate playback and rapid distribution. Pictures can be viewed the instant they are recorded and an unlimited number of copies can be made quickly. Recorded tapes can be preserved indefinitely for historic reference, or they can be electronically erased and the tape used over and over again.

With further developments of the technique, numerous possibilities occur. Small portable television cameras are already in wide use in industry, schools and colleges. Low cost television cameras that work like slaves off home television receivers are ultimately possible.

In the demonstration a colour television programme originating in the studios in the Radio City, New York, was beamed by radio micro-waves across the forty-five mile span to the R.C.A. research centre at Princeton, New Jersey. The programme was seen as it arrived. At the same instant R.C.A.'s tape recording system recorded the television picture on a strip of magnetically coated plastic tape, half an inch wide and of newsprint thickness. During part of the transmission both the live programme from the micro-wave radio relay and an immediate playback of the magnetic tape recording were shown. As soon as the tape wheel was rewound it was played back and the recorded television pictures appeared on two colour television receivers.

The advantages over the film process are obvious. In the latter the pictures pass from the television camera through most of the television system to be reproduced on a small picture tube. A camera then photographs the programme on to film, which must be chemically processed and a print made before the pictures can be reproduced. The reproduction requires another installation in which a television camera tube picks up the scene from a motion picture projector for re-broadcast.

Great Britain was the first to record a television programme, but it was in connection with the low definition (30 line) transmissions.

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Competition for Model Engineers

A NATIONAL competition, organised by the Auto-Cycle Union, which controls motor cycling sport in this country and, by its race promotions, improves the "breed" of British motor cycles, announces a national competition for *models* of motor cycles, which should be of great interest to our model engineering readers. Competitors are invited to submit models not more than 10 ins. long of pioneer motor cycles (models of machines manufactured up to December 31st, 1914); models of vintage motor cycles (models of machines manufactured between January 1st, 1915, and December 31st, 1930); models of modern motor cycles (models of machines manufactured since January 1st, 1931).

The Auto-Cycle Union will be responsible for the safe custody of all models sent in and will return them to entrants immediately after the 1954 Motor Cycle Show. Entries should be received at the offices of the A.C.U. not later than September 30th, 1954.

It is a condition of entry that all models entered in the competition may at the absolute discretion of the Auto-Cycle Union be placed on exhibition on the A.C.U. stand at the Motor Cycle Show to be held in November, 1954. All entries and correspondence in connection with the competition should be addressed to the Secretary, marking envelopes and/or packages "Model Competition." The address is 83, Pall Mall, London, S.W.1.

In each category there are three prizes: first £20 and an engraved souvenir plaque, second £10 and third prize £5. I have no doubt there will be some excellent entries. I think that instead of limiting the length, competitors should have been asked to make models to a positive scale, say an inch to the foot, so that visitors to the Motor Cycle Show would gain an idea of the relative sizes of the prototypes.

—F. J. C.

AN Electric Guitarette

A Novel Musical Instrument to Construct

By "EXPERIMENTALIST"

THIS instrument is played like a Hawaiian guitar and sounds like one, but unlike such six-stringed instruments, it only boasts a single steel string. A test model, designed and built by the writer, gave surprisingly good results, using an earphone as a reproducer unit. Reproduction has to be heard to be believed; the familiar wailing notes come through the amplifier (any radio receiver having pick-up terminals or sockets) as clear as a bell and, to play this instrument, one does not have to be an experienced musician.

The smooth-playing "comb" used was the back of a penknife, the "plectrum" was the forefinger of the right hand and the amplifier a straight two-valve set. It is possible, with such primitive accessories, to get as much pleasure from the Guitarette as from a proper, expensive model.

There is no harmony, of course, because there are no other strings for tuning in unison. The effect obtained is reminiscent of the sound obtained from a one-stringed fiddle, only the notes are louder, sharper and of longer duration. The notes can be prolonged if a celluloid plectrum is used and the tremolo (shake) put on the string as in mandolin playing.

The Handle

The handle piece, detailed in Fig. 1, is cut to size and shape from, preferably ¾in. thick American whitewood. However, a cheap softwood such as deal serves the purpose, or in fact any wood of a soft nature, easily cut with a fretsaw handframe fitted with a coarse toy-making blade.

The handle requires a piece of wood 26in. long by 1⅞in. wide. A recess is cut for the earphone casing, as shown. The bottom side is recessed 2in. long by ¼in. deep for the knee piece, the latter (see Fig. 2) being recessed to make a groove, allowing both parts to half-lap accurately together.

When cutting the handle to shape, note that the head end (for the string peg) is ½in. narrower in width. The neck shape, when cut, is rounded at the underside with a spokeshave and rasp, then filed and glass-papered smooth. This is done more for appearance, since the instrument is laid across the knees, not held in the left hand, which is the case with most stringed instruments.

A ⅛in. square notch, for the bone nut piece is cut across the fingerboard surface, 3½in. from the head end, then the latter cut to slope and planed neatly as shown in Fig. 1. Bore a 3/16in. hole for the peg about 1in. from the head end; the hole is bored at right angles to the head slope, as seen in the side view, Fig. 1.

The nut piece, which is fitted and glued in position at this juncture, measures ¾in. long by ¼in. wide by ⅛in. thick. It may be cut from bone or any white composition, such as a piece of comb. A light groove is cut or filed in the centre of the top edge to keep the string in place.

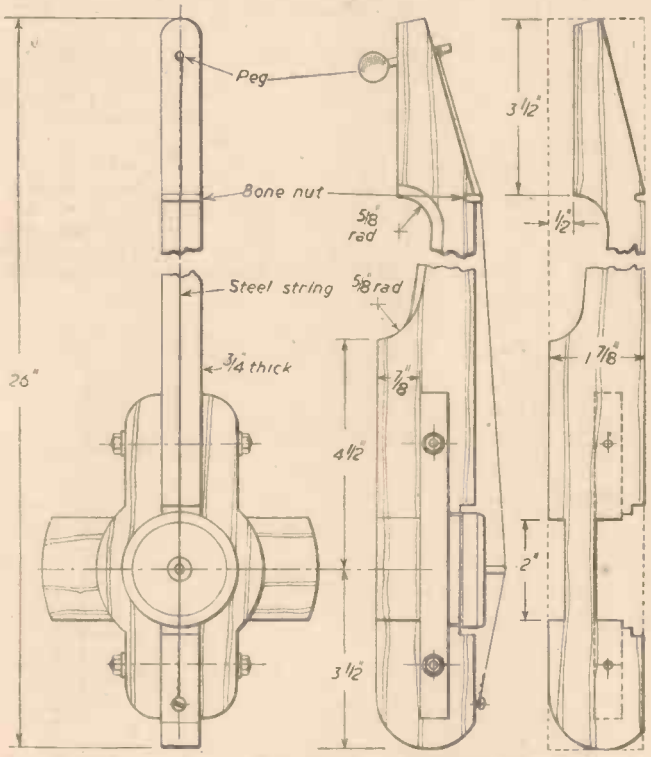


Fig. 1.—Shortened top and side views of instrument and handle.

Earphone Collar Pieces

Two "collar" pieces to grip the base of the earphone casing are prepared by marking out the shape shown in Fig. 2 on ⅛in. thick wood. Keep the shapes ¾in. apart, as this is the distance they will be apart when attached to the side of the handle piece. The central circular aperture is scribed according to the diameter of the earphone used.

Having cut the collar pieces to shape, true up the side edges with a plane, or by rubbing on a sheet of medium glasspaper thumb-tacked to a flat board. Alternatively, the collar pieces could be marked out along the planed edges of a piece of wood, thus avoiding the need for truing with a plane.

The collar pieces are affixed to the handle by means of two 2½in. lengths of B.A. threaded brass rod about ⅛in. diameter; old coil rods would suit. Suitable holes for the entry of the rods are made with a 5/32in. drill about 1in. from the ends of the collar pieces and similar holes to correspond are made in the handle.

The Assembly

Glue and screw the knee piece to the handle, then attach the collar pieces; the nuts on the fixing rods should be based with ⅛in. or ¼in. brass washers. A ¾in. No. 6 mooring screw for the string is driven into the handle piece in the position shown by the enlarged side view in Fig. 3.

The peg used was a ukelele type, but a suitable one can be made from ¼in. wood, as shown in Fig. 3. The finger grip may be left flat or made convex or concave by

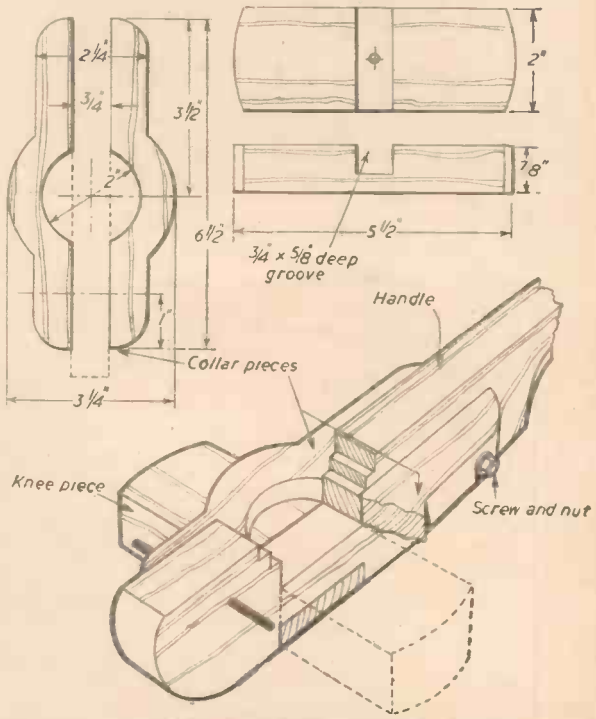


Fig. 2.—Shape and sizes of collar pieces and knee piece, with constructional detail.

filing, as preferred. A very fine hole should be bored for the string near the tip.

Try the earphone in position. The casing should be a neat tight fit. If a bit slack, a few shavings can be removed from the sides of the collar pieces or a short piece of insulation could be pressed around the base of the casing. By adjusting the tightness of the rod nuts, it should be possible to ease or tighten the grip on the reproducer unit. Slackness must be avoided, if possible, as it is apt to "deaden" some of the necessary vibration set up by the manipulated string.

A Special Diaphragm

Readers who have made the 3/32in. thick diaphragm shown—greatly exaggerated in comparison with the other enlarged views at Fig. 3—need to file the three "arm" shapes to half thickness. A ⅛in. hole is drilled in the centre and countersunk on the reverse side for a ½in. long by ⅛in. dia. bolt with a flat head.

A tiny nick (for the string) is made across the end of the bolt which is then inserted in the diaphragm by means of a suitable washer and nut. The bolt head needs to be filed flush with the surface of the diaphragm should it project a trifle, or else the hole countersunk a little more.

An alternative diaphragm, cut from 1/16in. thick sheet iron or mild steel, is detailed. The shape is one easily cut with a hacksaw. It can, if necessary, be made more sensitive by filing the "arms" a trifle thinner.

The Steel String Used

The writer used a plain steel 2nd (A) mandolin string. It was hooked over the mooring screw and brought over the diaphragm post and nut to the peg, it being threaded through this and turned in an anti-clockwise direction to tighten it. Owing to the exceptional length, in comparison with the fingerboard of a mandolin, the string is best tuned to middle C on a piano or organ.

Owing to the difficulty of obtaining steel strings for musical instruments in most districts, the strands of steel wire found in bicycle brake cables can be used as a temporary substitute. Such strands are finer and not so smooth as a proper "A" mandolin string, naturally. They are more like "E" mandolin strings, which may also be used.

The Keyboard Fret Positions

Actual frets need not be fixed upon the fingerboard, which the writer has marked out as a piano keyboard. Only the fret positions need be marked, such positions being indicated in Fig. 4.

Along one edge the sharp and flat "key" positions are made, the natural key positions being marked along the opposite edge. Consequently, looking down on the instrument upon one's knees; a piano keyboard can be made out.

The natural notes are C (the open string note), D, E, F, G, A, B, C. That is one octave and as there are two octaves complete with sharps and flats quite a useful range of melodies is possible.

Always begin your tunes approximately in the middle of the fingerboard. This ensures a good compass of high and low notes and keeps the melody going at an even rate, without sudden "jumps" to notes of a higher octave.

Final Hints

When using the steel comb or penknife, press on the string with it gently, but firmly. Pluck the string with the forefinger of the right hand for each note wanted. When a note is a breve or semibreve (lasting for four beats to a bar in the first case, and two beats in the latter case), keep gliding the comb quickly from side to side to produce the proper sustained wailing affect.

Adjusting the Diaphragm

If, under test, reproduction is weak, the diaphragm is likely to be too far distant from the earphone pole pieces, or vice versa, in which case packing with 2in. rings of blotting paper is necessary. Volume can be controlled by adjusting the earphone cover itself. The tightness or slackness of the cover of the diaphragm also affects reproduction, either making it bad or improving it.

The writer had to pack his diaphragm between two rings of blotting paper. The surface ring (on which the cover screws) helped to cut out a slight harshness.

Painting

A good long piece of twin flex is wanted, of course. For ordinary purposes, an 8ft. length should suffice. As a finish, the writer painted his model with ebony polish and marked the fingerboard fret positions with white paint.

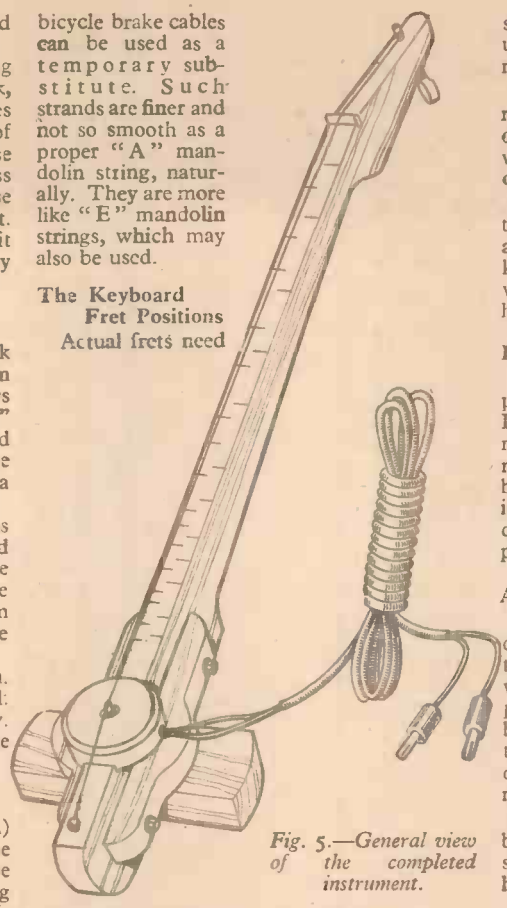


Fig. 5.—General view of the completed instrument.

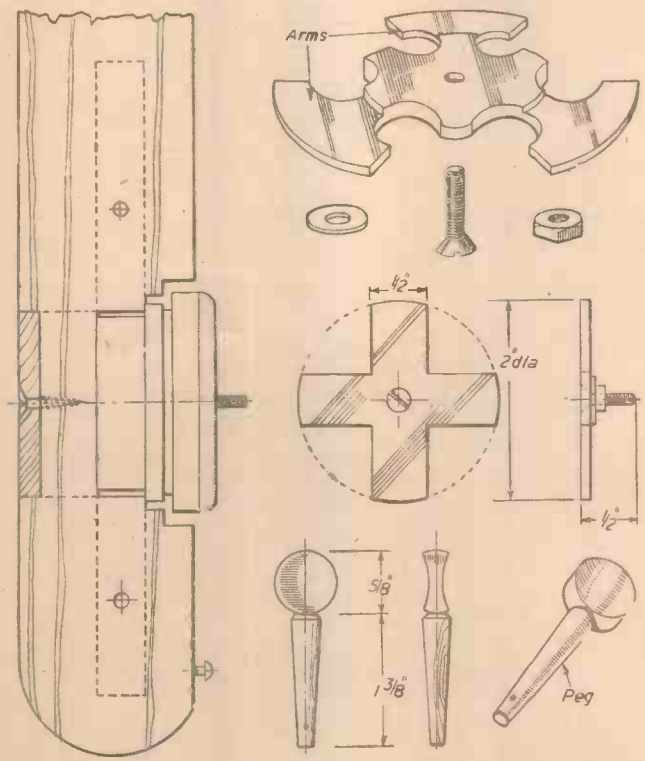


Fig. 3.—Enlarged detail of body, showing how earphone fits in its recess, with details of diaphragm and wooden peg.

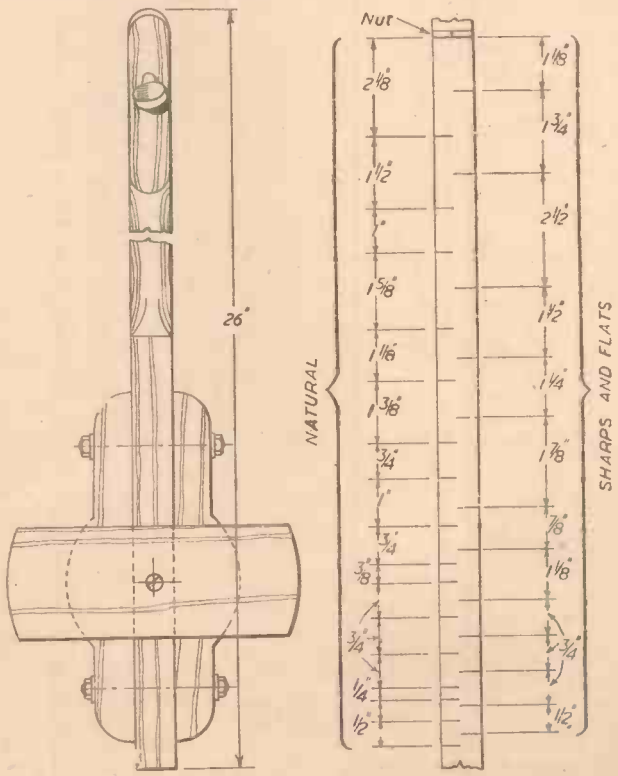
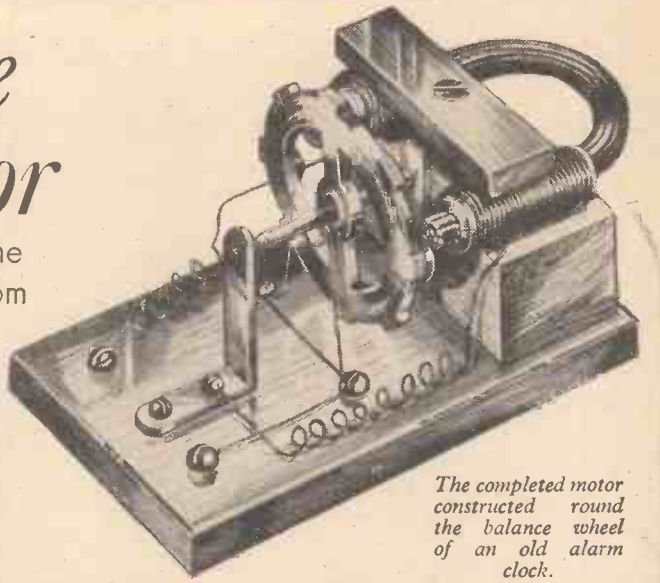


Fig. 4.—A back view and diagram showing how the fingerboard is marked to give the usual "fret" positions.

A Miniature Electric Motor

This Easily Made Working Model is Built Round the Balance Wheel of an Alarm Clock, and Operates from a 4-volt Flashlight Battery

By "HANDYMAN"



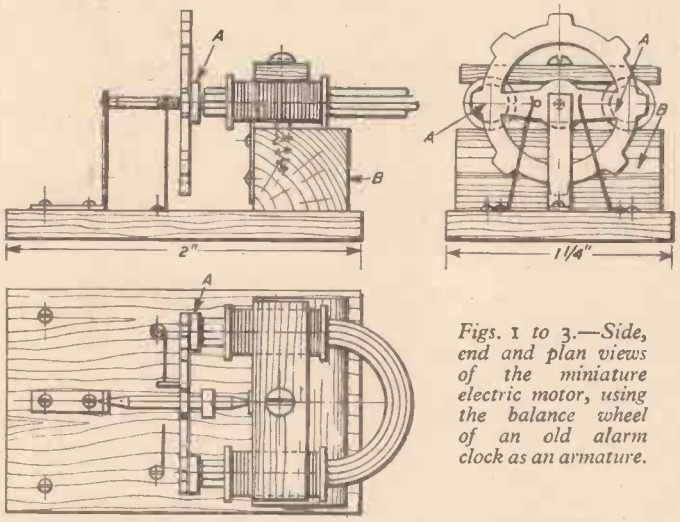
The completed motor constructed round the balance wheel of an old alarm clock.

THIS novel form of electric motor, which can be made in a couple of hours, runs at a good speed when connected to an ordinary flash-lamp battery.

Many interesting models have had their origin in the junk box, and the tiny motor shown in the accompanying illustrations is no exception, as the chief part, the armature, is a balance wheel taken from the works of a discarded alarm clock.

Preparing the Rotor

To prepare the armature, or rotor, two soft iron discs are sweated to the side of the rim of the wheel at the ends of the two radial arms, as shown at A in Figs. 1, 2 and 3. These discs are 5/32in. dia., and were cut with a hacksaw from the shank of an iron wood-screw. They are filed to a thickness of 1/20in. before sweating in place.



Figs. 1 to 3.—Side, end and plan views of the miniature electric motor, using the balance wheel of an old alarm clock as an armature.

The bearing plates are cut from a strip of 22 gauge sheet brass to the sizes given in Fig. 5, and two holes are drilled in each to take small brass round-headed screws. Near the top end of each bearing a deep centre-punch mark is made to take the pointed ends of the armature spindle.

The supporting block, B, is a piece of ½in. square wood 1⅛in. long, and is fixed to the baseboard with two countersunk screws driven in from underneath.

The short bearing plate is screwed to the block, B, while the longer plate is bent at right angles and screwed to the base, as shown in Figs. 1 and 2. The distance between these plates must be such that the rotor revolves easily when the pointed ends of the spindle engage in the centre-punched holes made to receive them.

The Magnet

The magnet consists of eight pieces of 16 gauge soft iron wire 2⅞in. long, each bent to a horse-shoe shape and then bunched together. The ends of the magnet must be the same distance apart as the soft iron discs, A, A, on the rotor. Two brass washers, about ¼in. dia., are slipped on to each magnet limb to form the cheeks for the the coils, as shown in Fig 4. The distance between the washers is ½in., and the end washers are ⅛in. from the ends of the magnet. The ends of the magnet must be filed flat and square, and to do this bind each end tightly with copper wire and use a fine file.

The magnet is wound with No. 30 gauge enamelled wire, 3yds. being wound on each coil. After winding one coil, the other one is wound in the reverse direction, as indicated at C, Fig. 4. A few inches of wire should be left at the starting and finishing ends of the winding for connecting-up purposes.

A thin strip of oak is used for clamping the magnet in place, a hole being bored through the centre of the wood to take a ½in. round-headed wood-screw which is driven into block B. Before tightening the screw the magnet must be adjusted so that its ends clear the soft iron discs on the rotor by about 1/32in. The smaller this space the better, provided, of course, that the parts do not touch when the rotor revolves.

Making the Connections

The circuit diagram is given in Fig. 6, from which it will be seen that the wire from one magnet coil is connected to one of the screws near the front corner of the baseboard. The wire from the other coil is connected to one of the screws at the foot of the L-shaped bearing plate. The two "brushes," with which the small pin on the rotor makes contact, consist of pieces of No. 28 gauge bare copper wire, clamped under the heads of two screws near the rotor. A wire from one of these screws is connected to another screw near the front corner of the baseboard, as indicated in Fig. 6. By having two brushes connected as shown, two impulses per revolution are given to the rotor.

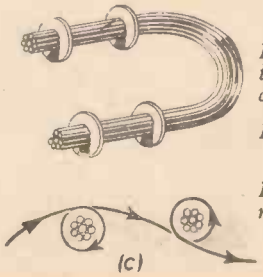


Fig. 4 (Left).—Details of magnet and direction of winding.

Fig. 5 (Right).—Bearing plates.

Fig. 6 (Extreme right).—Diagram of connections.

The wire "brushes" should be inclined towards the spindle so that they press lightly against the contact pin when the rotor revolves. It is also necessary to slightly bend the top end of each wire so that the pin just makes contact as the iron discs approach the ends of the magnet. Contact must be broken the moment the discs come opposite the magnet ends.

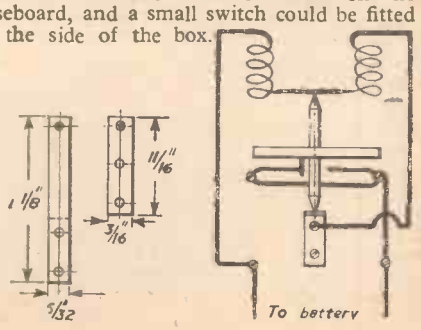
Final Adjustments

On connecting up to a flash-lamp battery the little motor will run at a fast rate after the necessary adjustments to the wire "brushes" have been made. A touch of very fine machine oil should be applied to the ends of the rotor spindle before starting up the motor.

As an alternative to using a balance wheel for the rotor, a strip of tinplate with a soft iron disc soldered to each end would answer the purpose. A piece of steel knitting needle of the required length, with both ends filed to a point, will do for the spindle. Drill a hole in the centre of the tinplate strip, put it on the spindle and solder it in place after making adjustments so that the whole runs truly when placed between the bearings.

Concealing the Battery

The battery could be conveniently concealed by mounting the motor on a hollow plinth in the form of a box, so arranged that the battery lies flat within it. Suitable connections could be made through the top of the box to the screw terminals on the baseboard, and a small switch could be fitted to the side of the box.



A Motion-picture Machine

A Simple Device for Producing Motion Pictures of Cartoons, Diagrams, or Mechanisms

By R. BRIERLEY

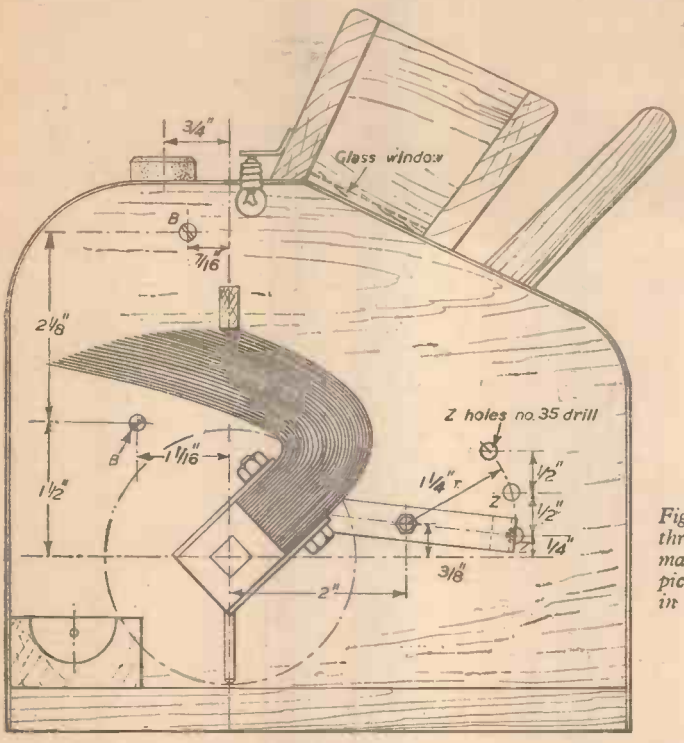
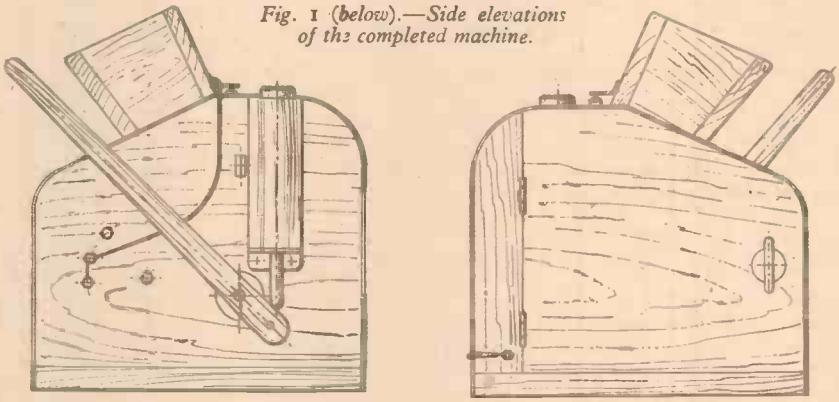


Fig. 2 (left).—Section through the centre line of machine, showing the picture pack and handle in the operating position.

THE general arrangement of the machine is shown in Figs. 1 and 2. By pressing the handle downwards against the resistance of the spring plunger unit, the pictures or diagrams are made to flip rapidly across the line of vision, through the glass panel contained within the cowl. Each picture or diagram is retained in the viewing position for a fraction of a second by the fixed horizontal bar protruding from the side. The pictures are illuminated by a 2.5 volt bulb located at the top of the housing. The light is operated automatically by a swinging arm contact, and is synchronised to provide illumination at the correct period.

Fig. 1 (below).—Side elevations of the completed machine.



Construction

Cut the base (Fig. 3) from ½in. thick wood and the battery cradle (Fig. 4) from wood,

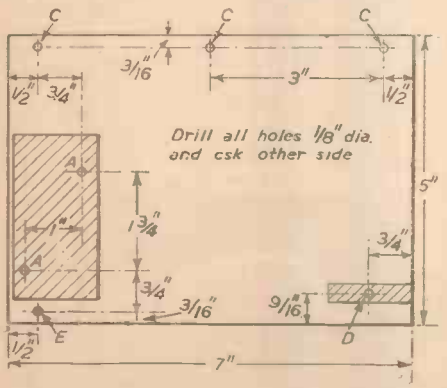


Fig. 3.—The base. The shaded portions show positions of battery cradle and door stop.

making a metal strip ⅛in. thick to fit one end of the cradle. Drill three holes in this strip, two for wood screws which secure the strip to the cradle, and drill the third and centre hole with morse No. 32, and tap 4 B.A. to take a screw which serves the dual purpose of holding the battery in position and providing an electrical contact. The cradle assembly should be screwed to the rear left-hand corner of the base through the holes marked "A" (Fig. 3). Next cut the right-hand side from ⅜in. wood (Fig. 5).

Drill the two holes marked "B" (Fig. 2) to enable the spring plunger unit to be fitted easily at a later stage in construction. The ⅜in. dia. hole must be undersize to provide a press fit for the spindle bearing bush (Fig. 13). The ½in. by ¼in. slot must also be cut slightly undersize to allow for the fitting of the picture stop bar (Fig. 16). This must be pushed and glued into the slot in a truly square position. The right-hand side is screwed to the base through the holes marked "C." Make the door stop (Fig. 9) from ⅜in. wood and screw it to the base through the hole marked "D" (Fig. 3) after the key plate (Fig. 11G) has been cut from brass or steel and screwed on the inner face. When making the door and pillar from ⅜in. wood (Fig. 6) recess each part according to the size of hinges utilised. Hinge the door to the pillar and screw the pillar to the base through the hole marked "E" (Fig. 3). The sheet-metal wrapper plate (Fig. 7) is drilled and filed before bending and setting accurately to the required shape. Care must be taken to file the large hole neatly as this forms the mask for the picture shape.

Next the cowl (Fig. 8) is made. The grooves shown dotted in the sides are cut to suit the thickness of glass available for the window.

The interior of the cowl, base, sides and wrapper plate are painted a matt black at this stage in construction.

When dry, the glass window (2¼in. by 1½in.) is placed within the cowl slots and the cowl is screwed to the outside of the wrapper plate through the holes marked "F" (Fig. 7). The wrapper plate is placed in position on the sides and screwed through the holes marked "G" (Fig. 7).

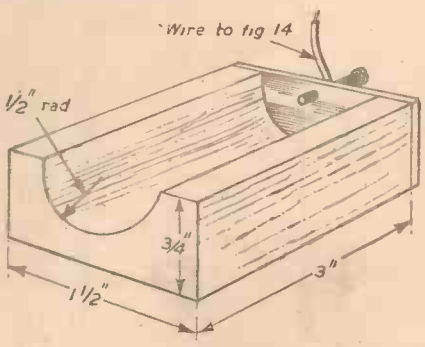


Fig. 4.—Battery cradle.

Spring Plunger

The spring plunger assembly (Fig. 10) provides a resistance to movement of the handle, enabling it to be pressed steadily downwards thus providing a uniform speed of picture movement. This is constructed to the details given and assembled as a complete unit, which is fixed to the side of the cabinet by means of two screws "B"

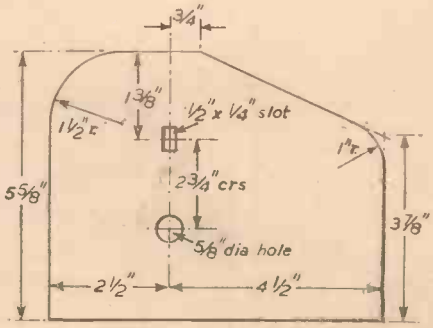


Fig. 5.—The right-hand side of cabinet. The drill holes are shown in Fig. 2.

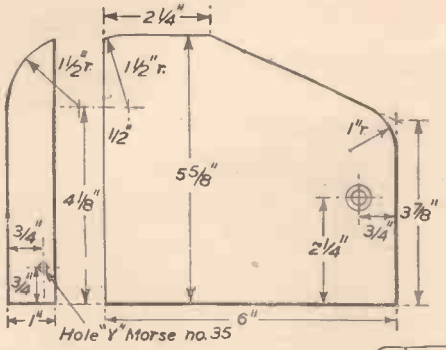


Fig. 6 (above left).—Door and pillar.

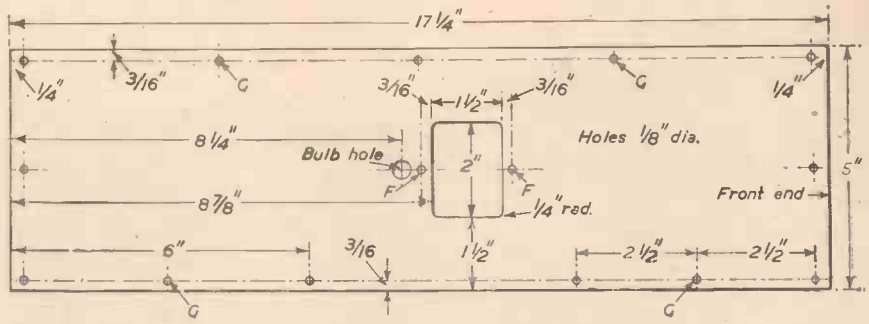


Fig. 7 (above right).—Wrapper plate.

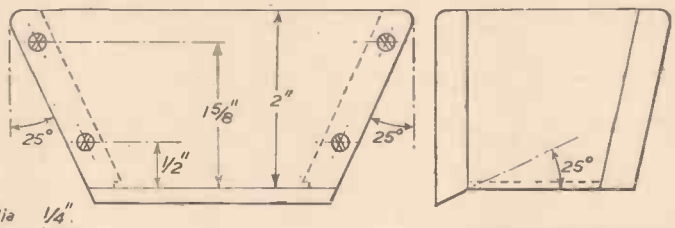


Fig. 8 (right).—Plan and elevations of cowl.

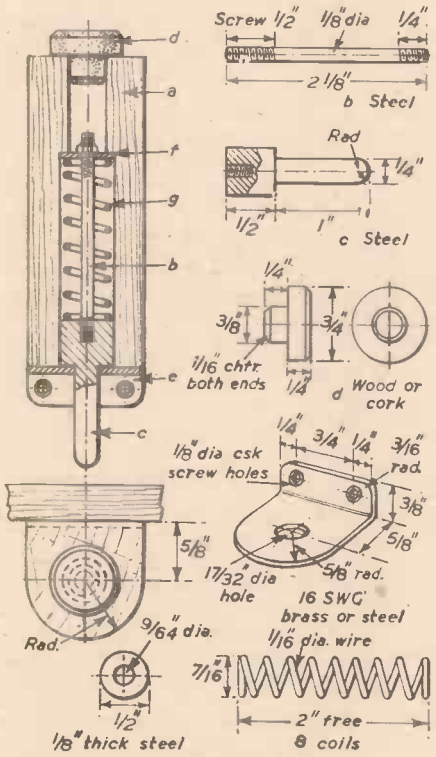


Fig. 10.—Assembly of spring plunger unit and plunger unit details.

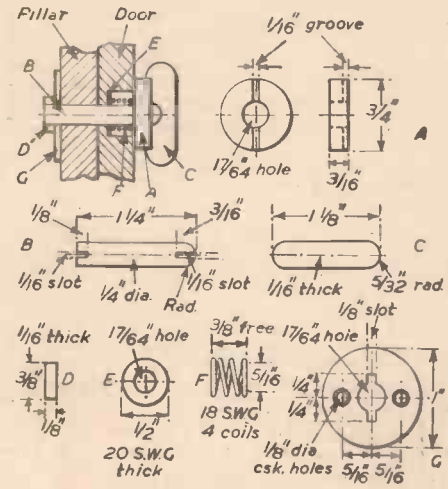


Fig. 11.—Assembly and details of door catch made from brass.

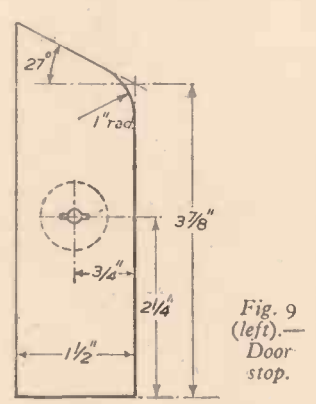
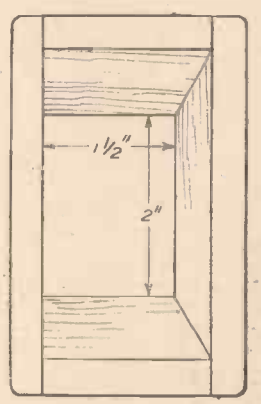


Fig. 9 (left).—Door stop.



(Fig. 2). The finished bore of the wooden cylinder "A" (Fig. 10) should be as smooth as possible to enable the plunger to slide up and down.

The door catch assembly is built up by soldering the pad (Fig. 11A) and wing (Fig. 11C) to the shaft (Fig. 11B). Place the spring "F" and washer "E" on the shaft, as shown, and thread the shaft through the hole in the door. The key piece "D" is then pressed in the shaft end, checked for true position, and then soldered.

Press the main spindle bush (Fig. 13) into the large hole on the right-hand side from the outside; also press three brass "contact" screws (6 B.A.) ¼in. long under the heads, into the holes marked "Z" (Fig. 2). Thread a short, thin piece of wire between the bottom two studs and add washers and nuts to hold the wire and studs in position. The third and uppermost screw or contact stud provides a continuous platform for the contact arm (Fig. 15) and also enables the capacity of the machine to be increased if desired by providing a longer lighting period. A further connecting wire would, of course, be necessary between the two top studs. For preliminary tests, however, the bottom two contacts provide a sufficient period of illumination. A similar screw or contact stud should be put through the hole "Y" in the door pillar (Fig. 6) which is coupled to the metal casing with a short wire, internally or externally as desired. It is shown externally in Fig. 1. Two other short lengths of wire are also required to complete the electrical circuit. One runs from the middle contact stud (right-hand side) to the bulb contact bracket (Fig. 18). The other wire is screwed to the terminal on the battery cradle at one end, and soldered to the switch leg (Fig. 14) at the other end. This wire must be run carefully and be of sufficient length to facilitate a free movement of the internal components.

Fig. 12 Fig. 13 Fig. 14

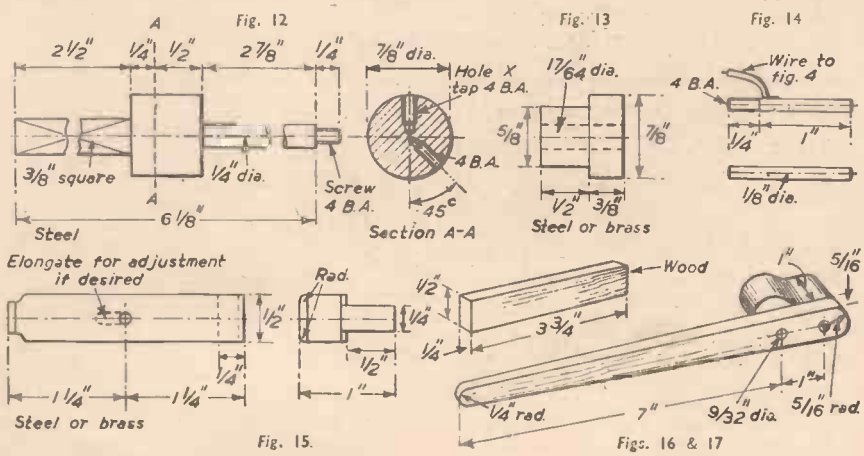


Fig. 15. Figs. 16 & 17

Fig. 12.—Main spindle. Fig. 13.—Bush. Fig. 14.—Switch legs. Fig. 15.—Switch contact arm. Fig. 16.—Picture stop bar. Fig. 17.—Assembly of handle and cam.

Switch Details

The metal switch leg with the wire attached is screwed into the main spindle boss at hole "X" (Fig. 12) and the wooden contact arm resetting leg (Fig. 14) forced into the other tapped hole with a clockwise twisting action. This constitutes the main spindle assembly which is now threaded into the bush, the wooden handle and cam (Fig. 17) being placed on the outside and secured with a 4 B.A. washer and nut. The handle should be in line with one of the flats and

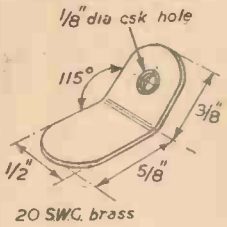


Fig. 18 (left). — Bulb contact bracket.

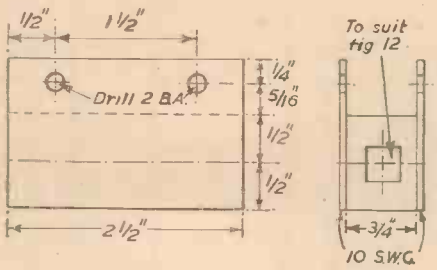


Fig. 19 (right). — Picture clip.

the metal contact arm of the main spindle. Assemble the metal contact arm (Fig. 15) with a 6 B.A. bolt (1¼in. long) and nut, fitting a small spring between the arm and side of cabinet. Screw the bulb in position and the bulb bracket (Fig. 18). Load the battery in its cradle and test the function of the machine.

The picture clip is made from metal (Fig. 19). It is essential that the clip is a push fit on the shaft in order that the pictures will run steadily and to facilitate easy removal and changing of the clip and picture pack. The picture pack can be made by cutting strips of paper 4in. by 2½in. Punch the two location holes in the position shown and then assemble in the clip, ensuring all strips are exactly the same length at the free end and are in alignment with the clip, otherwise the time lag between pictures will vary, resulting in uneven movement. Now load the pack into the machine and test the action. Make any necessary adjustment to the pack and then set the swinging arm contact, if necessary. Adjustment of the picture period in conjunction with the lighting period may also be made by using longer or shorter, thicker or thinner, paper strips, or by utilising packing within the clip to shorten the period, or packing on the clip boss to increase the capacity.

Preparing the Diagrams

We are now ready to sketch or trace our cartoons, diagrams, or mechanisms. When the first drawing has been made a good plan is to trace consecutive drawings by means of the simple apparatus shown in Fig. 20. Each sketch will, of course, vary slightly from the previous one, in order to produce the desired movement. Tone and colours

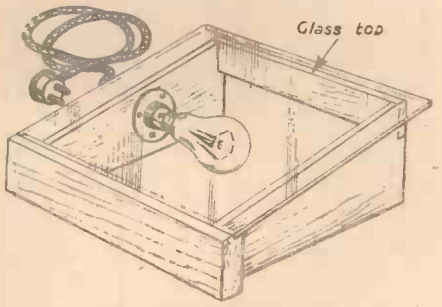


Fig. 20.—Tracing table.

may be added to the sketches to give additional effect. Any number of picture packs may be made, both sides of each pack being utilised.

With care in construction the machine will function effectually. The appearance of the cabinet may be greatly enhanced by staining the wooden sections and enamelling the metal portions.

Drilling for Oil in England

Drilling for oil at Arreton, Isle of Wight, where operations have already reached a depth of over 1,700ft. Illustration shows the connecting link on the drill being tightened.

AN early record of oil or natural gas in England goes back to the middle of the 17th century, when gas escaping from a spring near Wigan was found to be inflammable. Later, in the same vicinity, crude oil was noticed on the surface of water in the drainage ditches and it was also observed that portions of peat were impregnated with oil. In Shropshire, too, tarry oil saturated many of the rocks and in some of the coal mines colliers had to be protected by iron plates from oil that dripped from the roofs of the underground workings. About 100 years ago, Dr. James Young, a Glasgow chemist, built a refinery to treat the oil that seeped into the workings of an Alfreton (Derbyshire) coal mine. This supply was small and was soon exhausted, and later he founded the Scottish shale oil industry, which to-day is producing useful quantities of oil by distillation of the solid shale from mines. In 1911, natural oil was unexpectedly found in a borehole near Newark—the object of the borehole being to determine the extent of a coal field.

These traces of oil led to exploration and research. At first, the results were disappointing, despite the completion of the first producing well at Hardstoft, in Derbyshire, in October, 1919, but geological research was continued and finally, by 1935, sufficient evidence had been collected to justify renewed exploration. Boreholes were drilled at Portsdown, Kingsclere, Henfield, Poxwell, Pevensey, Eskdale, Hardstoft, Keele, Cousland, Formby and Eakring. Once more, these early borings proved disappointing, but finally, in 1939, oil in commercial quantities was secured from the Eakring district in Nottinghamshire and, to a smaller extent, at Formby in Lancashire. Success in locating the oil-bearing rocks was due largely to the geophysical exploration of the underground strata, the seismic (refraction) system being chiefly used.

Owing to the great demand for oil during the war years every effort was made to develop the home production of natural crude oil, and in 1943 the output of Eakring field, coupled with that of the smaller field at Formby, and a small production in Midlothian, was at the rate of over 100,000 tons (26,000,000 gals.) a year—a comparatively small but useful contribution to Britain's oil requirements. The crude oil is of excellent quality and provides a raw material for the manufacture of high-quality petroleum products; petrol, lubricants and paraffin wax.

Britain's oil wells are pumping wells, owing to rapid decline of underground pressures; at Eakring producing depths are 2,000/2,500 feet; at Formby they are very shallow. Production has declined since 1943, being at an annual rate of about 45,000 tons in 1950, but exploration and drilling have been continued in several areas. During the exploration for oil, valuable information about the geology and mineral resources in the sub-soil, including new coal and potash deposits, has been obtained.

The ownership of natural petroleum deposits in Great Britain is vested in the Crown, by the Petroleum (Production) Act, 1934. Licences to bore and obtain petroleum are granted by the Board of Trade to "such persons as they think fit" on a royalty (or other) basis.

(Reprinted by courtesy of the Petroleum Information Bureau.)

A New Radar Meteorological System

Particulars of the World's First Fully Automatic Radar System for Weather Observations in the Upper Air

The aerial unit.

THE world's first fully automatic meteorological system for accurately observing or "sounding" weather conditions in the upper air is at present being installed at a new meteorological station near Crawley, Sussex. This station will form a vital part of a network of eight upper-air meteorological stations that have, in recent years, been set up in Great Britain. It will also link up with a similar network of stations located in Western Europe, and thence throughout the world.

In order to take full advantage of the improved features of the new system, the Crawley Meteorological Station is of an entirely new design, and might well provide a pattern for future meteorological stations of this type in Great Britain and in many other parts of the world. Experimental operation of the station for the precise computation of wind conditions in the upper air commenced last October; it is anticipated that the system will be ready for automatic observations of temperature, pressure and humidity—sonde working—early this year. The system employs a continuous rate method of computation providing instantaneous readings of wind speed and direction.

When the station is set up for routine operation, the final meteorological readings, in the form of numerically coded weather reports, will be sent via teleprinters to the Central Meteorological Office, at Dunstable. These reports, together with similar reports obtained from meteorological observing centres throughout the world, will be used for all kinds of weather forecasting; they will be essential for airlines operating high-speed, high-flying aircraft.

Significance of Improved Upper-air Observations

There is no doubt that this new meteorological system, which is called "radar sonde" as distinct from the well-known radio sonde system, marks an important step forward in world meteorological progress. For accurate upper-air observations of wind, temperature, pressure and humidity at the greatest possible height have, in recent years, assumed a new and vital importance. It is, for example, on information of this kind that the forecaster bases his estimate of the present and anticipated winds that will be encountered by high-flying aircraft. These winds also determine, to a large extent, the movement and pattern of other weather characteristics of interest in aviation and shipping and for every other form of general weather forecasting.

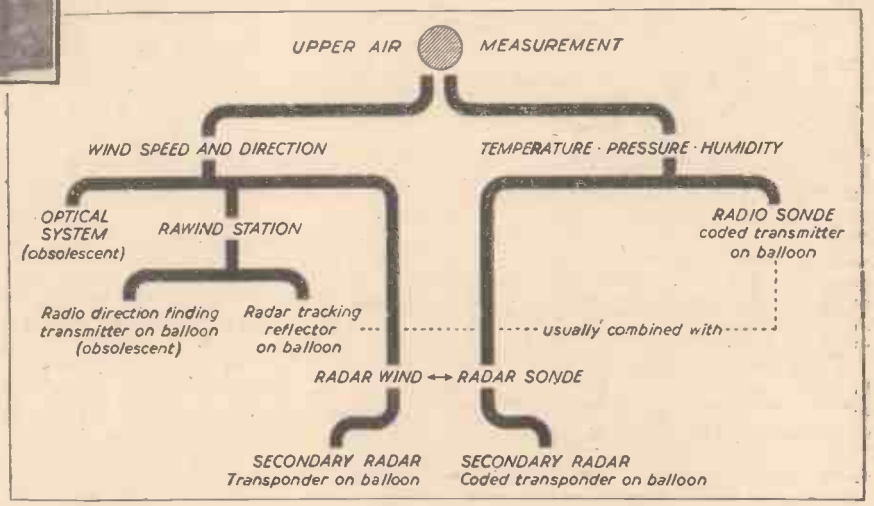
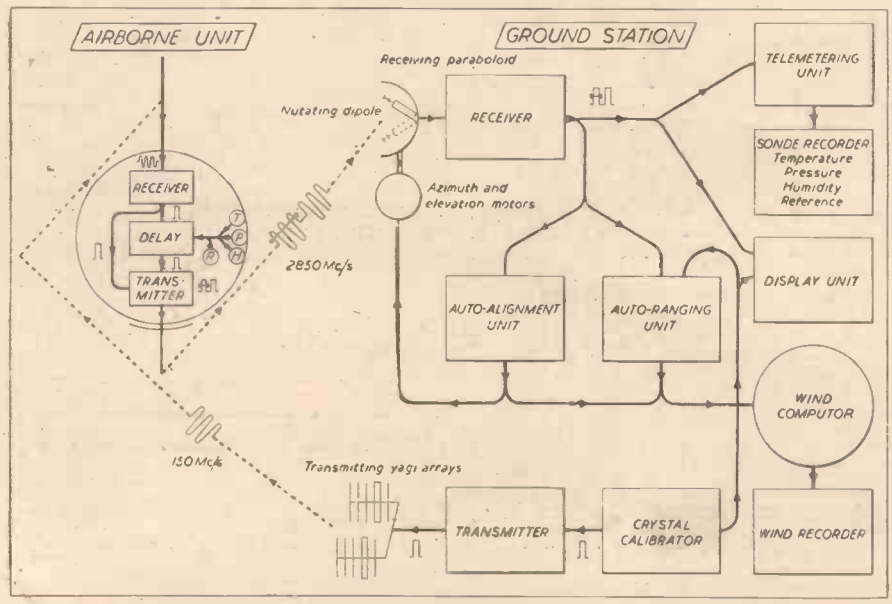


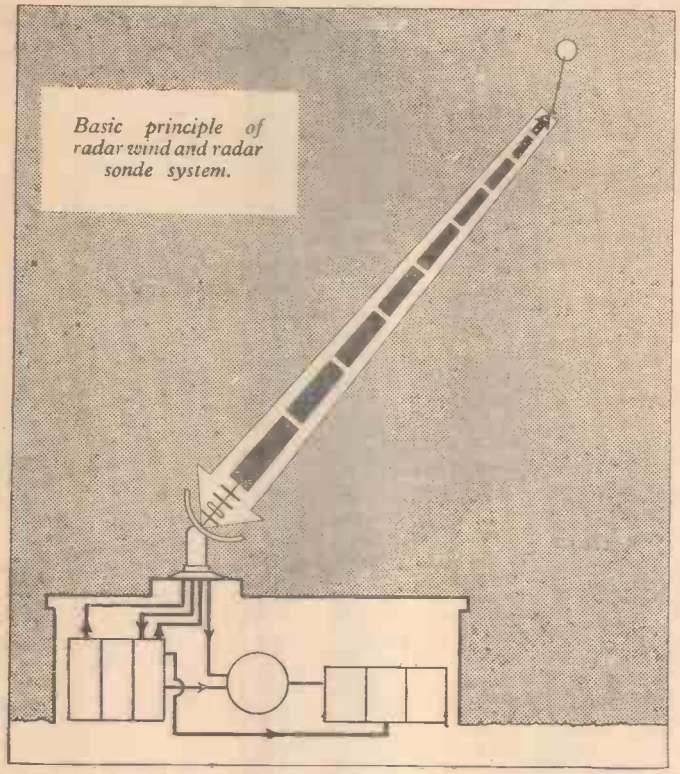
Diagram illustrating methods of upper-air measurement.



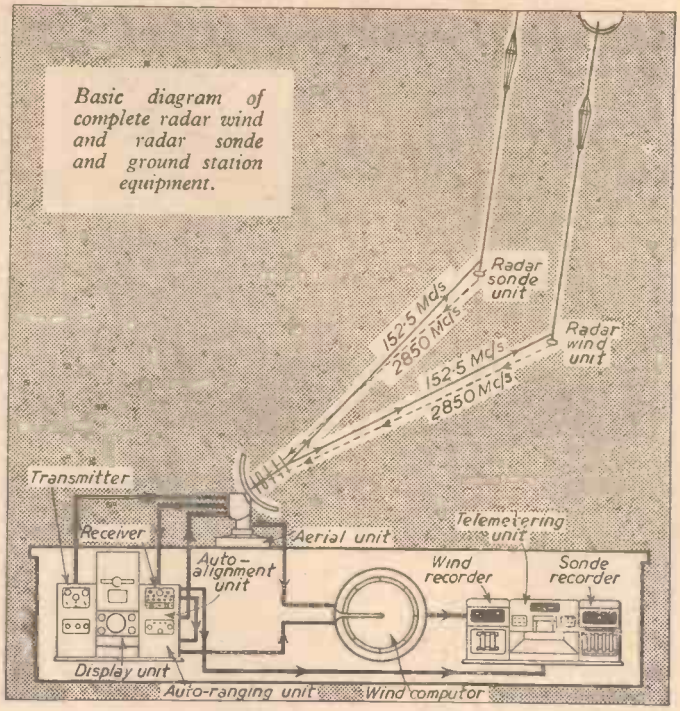
Schematic diagram of complete radar wind and radar sonde theodolite.

Upper-air observations are of equal importance in many other fields. For instance, statistics of the mean and extreme upper-air weather conditions, experienced in different parts of the world and at different seasons, are required by designers of aircraft engines and structures, and by civil aviation planning experts. Such information is likewise of vital importance for planning the tactics of military aircraft operations, for research work in radar and radio establishments and for many other purposes.

Greatly improved meteorological services



Basic principle of radar wind and radar sonde system.



Basic diagram of complete radar wind and radar sonde and ground station equipment.

are of particular significance to-day in view of the world-wide tendency to operate modern aircraft at increased ceiling heights and speeds. In 1944 the average ceiling height for civil transport was 12,000ft. (3,600 metres). By 1950 this figure had increased to 23,000ft. (7,000 metres). To-day jet aircraft, such as the Comet, are carrying out normal flights at heights of up to 40,000ft. (12,000 metres), and recently a jet aircraft broke the world's altitude record by reaching a height of over 60,000ft. (18,000 metres).

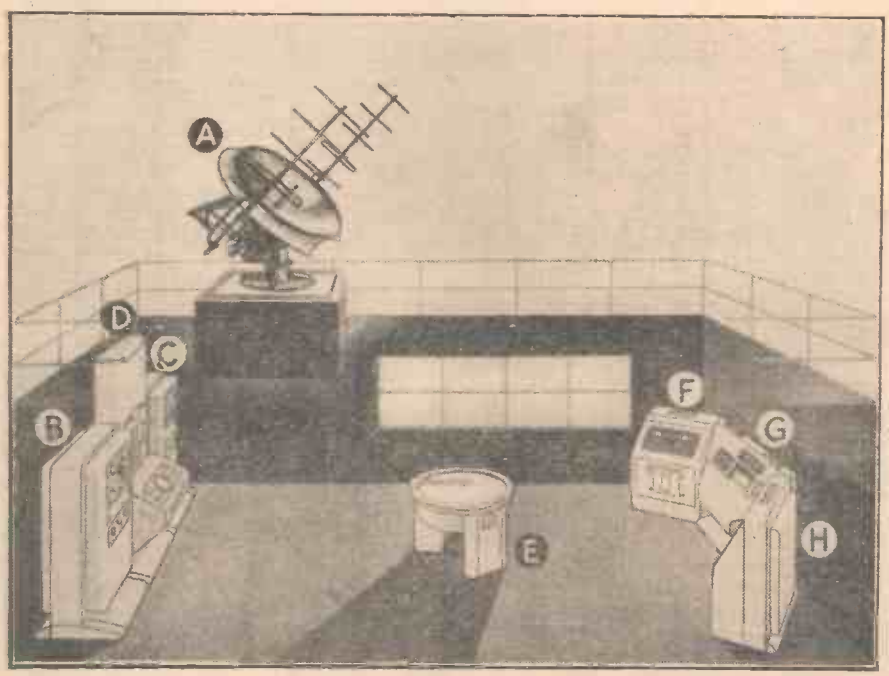
These rapid developments in aviation have brought into prominence the need for a completely automatic meteorological system capable of maintaining a high order of wind-finding accuracy at a range of at least 100 nautical miles, and at the same time providing means of telemetering sonde information to the ground with greater accuracy. Meteorological information from ever-increasing heights is likewise required more and more as an aid to every-day forecasting. For weather at ground level cannot be forecasted on the basis of knowledge of the prevailing surface conditions alone; it is closely bound up with conditions in the upper air. Any new system must also be capable of measuring the very strong winds—particularly jet streams*—that are encountered at great heights. The new radar observing system, now being installed at the Crawley Meteorological Station, has been specifically designed to meet these requirements. It represents Britain's latest contribution to upper-air meteorology, and it is considered that if the system could form the basis of a world-wide network of upper-air observing stations, it would certainly lead to notable improvements in weather forecasting throughout the world.

Basic Principle of Operation

The new meteorological equipment has been developed and built for the British Meteorological Office by the Research Laboratories of Mullard Ltd. in collaboration with other laboratories in the organisation. It is based on initial research work undertaken some years ago by the Telecommunications Research Establishment (T.R.E.) of the Ministry of Supply, and the project has been carried through with their collaboration.

The system consists basically of an automatic ground interrogator and computing station, working in conjunction with airborne electronic units called transponders. Two types of transponder are available; one is confined to wind measurements only; the other, in addition, provides sonde information. During the operation of the system, one of these units, depending on the extent of the observations to be made, is suspended from a hydrogen-filled balloon. The maximum slant range of the system is about 100 nautical miles (185 km.). In order to reach this extreme range under normal conditions, the balloon would have to ascend to a very great height. A standard balloon, as at present used, would burst before this height is reached. Thus, the height to which soundings and wind measurements can be made is, at present, largely limited by the height performance of the balloon. It is important to note, however, that the equipment is capable of operating at a ceiling height of at least 100,000ft. (30.5 km.).

The balloons are released from the ground station at certain internationally agreed times. As the balloon ascends into the upper air, its airborne transponder is interrogated from the ground station by radar pulses of 2-microsecond duration. These



Artist's impression of the Meteorological Ground Station with radar wind and radar sonde theodolite installed. (a) aerial unit; (b) transmitter; (c) receiver; (d) display unit; (e) wind computor; (f) wind recorder; (g) telemetering unit; (h) sonde recorder.

* Narrow tracks with winds of phenomenally high speeds.

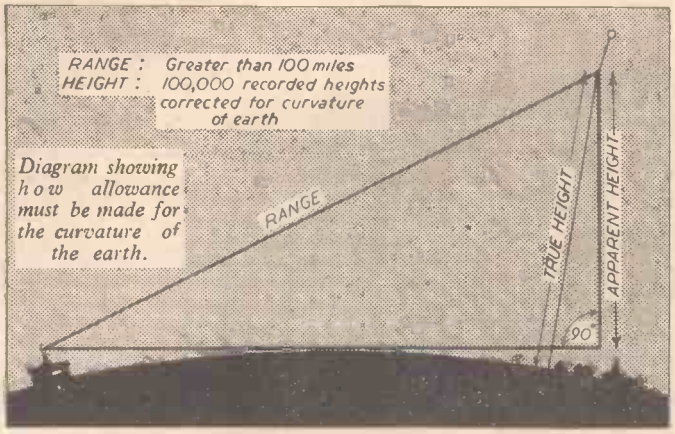


Diagram showing how allowance must be made for the curvature of the earth.

The complete transmitter / receiver and display unit.

are transmitted from a 50-kW. (peak) transmitter, operating on a primary frequency of 152.5 Mc/s. The interrogating pulses are received by the balloon-borne unit. Here they are used to make the airborne transmitter send back pulses to the ground station on a secondary frequency of 2,850 Mc/s (10 cm. band). These pulses, in turn, are received at the ground station by an automatic following aerial.

The slant range of the airborne unit is readily determined by measuring the transit time of the pulse to and from the transponder. From this, and from the values of the azimuth and elevation angles of the aerial unit, the drift of the airborne unit in space is computed. Wind speed and direction are computed automatically and continuously from the rates of change of the measured parameters. The height of the balloon is also computed and a correction for the curvature of the earth is applied automatically.

Telemetering of temperature, pressure and humidity information, registered by the meteorological elements in the sonde unit, is effected by causing the sonde to transmit twin pulses each time it is interrogated from the ground station. The degree of separation between the two pulses serves as a measure of the meteorological parameter in circuit at any particular time. The three elements for measuring pressure, temperature and humidity are switched into the telemetering circuit in sequence by a motor-driven switch. In this way, a complete cycle of sonde observations is telemetered to the ground station every 15 seconds during the flight of the balloon. A fourth element is included in the cycle providing a constant reference reading. Any change in the constants of the telemetering circuits affecting the accuracy of the meteorological readings will be indicated by a change in the reference reading. When the balloon bursts on reaching its maximum altitude, a parachute opens and the transponder unit slowly descends. During the descent, the airborne unit continues to be interrogated by the ground station provided, of course, that it remains within the 100 nautical-mile range of the equipment.

The wind computor.

Advantages of the New System

This new radar meteorological system has many distinct advantages over previous radio sonde methods. The use of secondary radar, for example, allows for greater ranges to be obtained than can be economically achieved with primary radar with the same degree of accuracy. In other words, observations over longer ranges can be made using transmitters of normal power, whereas with primary radar, transmitters of greatly increased power would have to be used to obtain the same range. It is important to note that greater ranges will enable balloons to be followed to their bursting level, even under conditions of the strongest winds.

The new system also makes possible notable improvements in measuring accuracies. For example, temperature, pressure and humidity can be telemetered to an accuracy of 0.1 per cent. of their operating range, although the elements at present available may not be capable of measuring meteorological parameters to this degree of accuracy. In view of this, the equipment will be of enhanced value when advances are made in the design of any of the measuring elements. Another important feature of the system is that it is completely automatic in operation, thereby eliminating human errors and reducing operating staff to a minimum. Moreover, all information is obtained with a single ground station and there are no severe restrictions on its siting. At the ground station, a continuous rate method of wind computation is employed giving instantaneous values of speed, direction and height. Wind direction is recorded on a polar chart, whilst speed and height are registered on standard strip recorders. Duplicate records are made of the sonde parameters—graphical records for the rapid pictorial observation of changes in the meteorological readings, and accurate digital recordings from which information can be extracted for sending to the forecasting centre. The graphical records are made by pen recorders to an accuracy of 2 per cent.; the digital recordings to an accuracy of 2 per cent.; the digital recordings are given by a printer to an accuracy of 0.1 per cent.

Servicing and Maintenance

In the design of the equipment, particular attention has been paid to servicing and maintenance. The electronic circuits are divided into standard unit chassis, most of which are fitted with a tip-up and quick-release mechanism to enable maintenance work to be carried out without removal from the main equipment. Internal monitoring is provided, including three oscilloscopes and some hundred meter readings.

(To be concluded)

The complete recording and telemetering unit.

Westminster Chimes Mechanism

A Re-modelled Motorised Version of the Striking Gear

By "TEST ENGINEER"

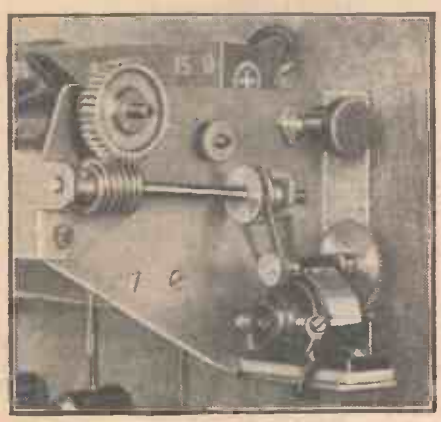


Fig. 2.—End view showing the gearing, motor and the speed control knob in the top right hand corner.

THIS is a modified version of the Westminster Door Chimes which appeared in our May, 1952, issue. It is much simplified and, therefore, easier to construct and its compactness can be seen from the overall dimensions which are 8½in. by 4½in. by 4 1/16in. It is motorised and the rate of chiming can be adjusted to suit individual taste. What is more important is that the parts—gearing, motor, etc.—can be obtained easily. The finished unit is contained in a felt-lined box with holes in the base for the chiming tubes. Figs. 1, 2 and 3 show the unit from various angles and are almost self-explanatory.

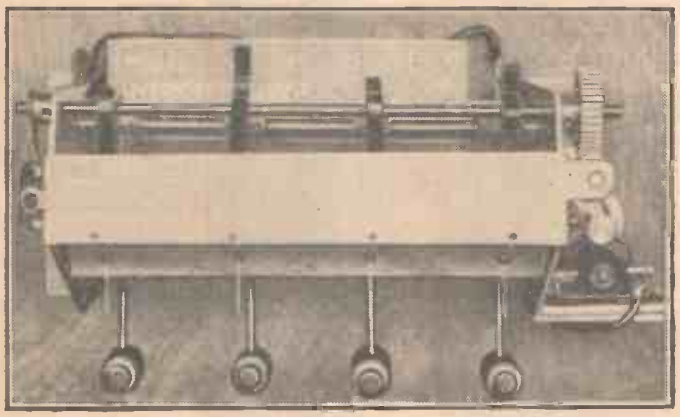


Fig. 1 (left).—Front view of the completed chimes mechanism.

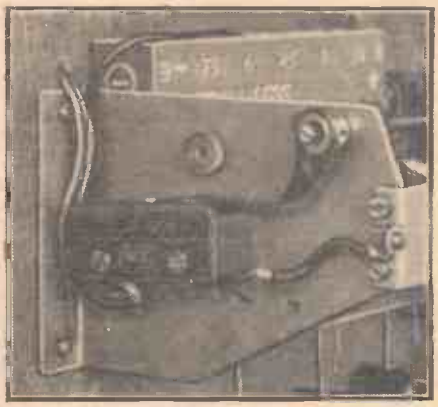


Fig. 3 (Right).—End view showing the micro switch and in the top left-hand corner the leads to the push button.

Frame Rigidity

The end-plates are of 16 s.w.g. brass, 4in. by 3in., with surplus metal cut away to lessen weight and improve appearance. Rigidity of the frame is due to the 3-hole fixing in the end-plates, the wooden stop beam, the 1in. strip on the front and the retaining bar of the hammer mechanism which is screwed into the end-plates, these being 6in. apart.

Strikers

From Fig. 4 it can be seen that the striker blade and rod are silver soldered to a brass tube. The original hammer heads, at 19 gms. were found to bounce on striking and so six different sets of hammer heads were made in 1, 2, 4, 8, 11 and 16 gms. weight from various materials and combinations of these materials. All hammers were the original size, but I preferred tufnol at 4 gms., or a heavier one at 11 gms. consisting of 16 s.w.g brass tube with a ⅜in. wood insert. The tension springs lie across the beam with one end fixed to the front brass strip. Tensioning was first roughly obtained and the fine adjustment arrived at by pushing the springs up the striker rod, then fixing into position.

Suspension of Chiming Tubes

Hooks made from cheese wire were screwed to the wooden beam. Another piece of cheese wire was connected between the holes in the tubes. This had a small kink in the centre which enables the chiming tube to be attached to the hook. This method of suspension meant that the chiming tubes always hung vertically. The wooden bar has a 1in. by ½in. cross section which includes a ¼in. diameter thin-walled rubber tube. The rubber tube acting as a stop to the striking rods.

Motor

On looking for a small motor I came across information on the "Mighty Midget" in PRACTICAL MECHANICS "Trade Notes." A 3 to 6 volt motor with a speed of 600-800 r.p.m. I decided to use this, although it was slightly noisy its current consumption was low and its speed known. It was mounted on a piece of felt to cut down vibrational noise.

Timing my original bell chimes with a stop watch, I found that a total chiming time of 5 seconds was most pleasing to me, and I worked out the gearing accordingly.

Gearing

All rods were made from 5/32in. silver steel. The gearing can be seen on Fig. 2; it consists of a worm gear driving a 38-toothed gear wheel. The drive from the motor being connected to a ½in. pulley. The motor belt can either be an elastic band or a thin spiral spring if this can be obtained.

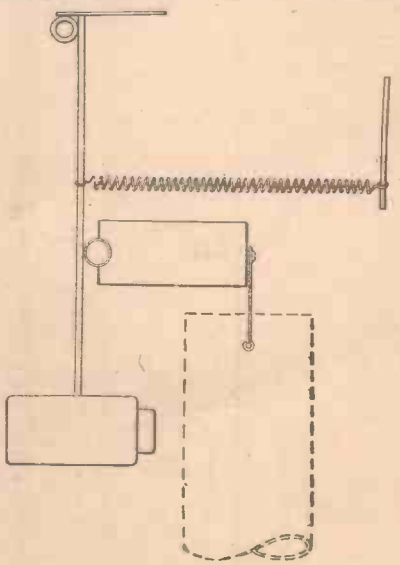


Fig. 4.—Details of striker rod and spring tension.

Circuits

If the motor is battery driven then the circuit diagram is as shown in Fig. 5, but if driven from the mains then the circuit diagram is as shown in Fig. 6. The circuit shows two switches in parallel. Before the button (P) on the door is pressed both switches are open. When (P) is depressed (S) automatically closes and remains so until one revolution of the camshaft has been completed and it again opens. Switch (S) is the micro switch shown in Fig. 3 and is operated by a rachet attached to the camshaft touching the switch strip and thus operating the switch. The strip is made from a piece of clock spring which gives

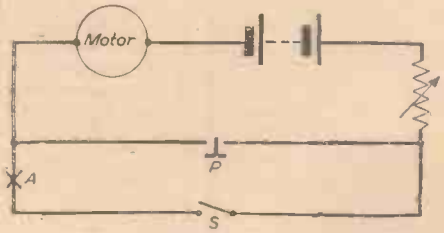


Fig. 5.—Circuit diagram if the motor is battery driven.

necessary flexibility and strength. If it were heavier the motor might not be strong enough to "break" the switch. Furthermore the heel of the rachet is filed away in order to give a one point contact only.

A 10 ohms centre-tapped rheostat is shown in the circuit diagram and also in Fig. 2. This enables the rate of chiming to be adjusted to within fine limits after the rough adjustment on the grid bias battery.

If an extra kick in starting the chimes is needed or if the voltage drop in the push button circuit needs accounting for then break the circuit at A, putting the rheostat in at that point. This would enable a starting voltage of 6 volts and a motor working

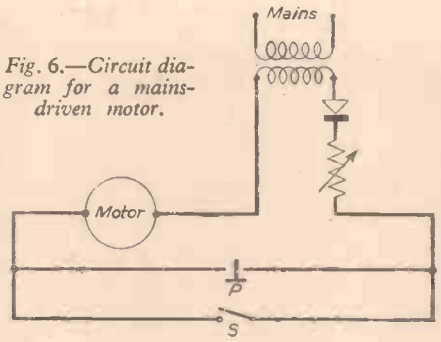


Fig. 6.—Circuit diagram for a mains-driven motor.

voltage of, say, 4½ to 5 volts.

The makers of the "Mighty Midget" do not recommend a current loading of greater than 300 milli-amps which would cause excessive wear and tear on the brushes and commutator. But this figure is not exceeded even on 6 volts and on 4½ volts the model has a load of about 230 milli-amps. If a mains unit is employed then the transformer is a radio filament transformer of 6.3 volts rating and the rectifier is ½ amp., 2-6 volt half-wave rectifier which works equally as well as the equivalent battery.

The transformer, rectifier and rheostat can be assembled in the one box and placed in a convenient place.

A Mechanical Weather Vane

Design for a Novelty All-weather Garden Device

By A. WARNE

THE weather vane described here is a robust appliance capable of withstanding rough weather, provided good materials are used.

The framework, a, b, and c, Fig. 1, is made up of metal strips ⅞in. wide by ¼in. thick, c being 1¼in. wide so as to form a good bearing for the sprocket wheel, e, Figs. 1 and 2. The top bearing, d, Fig. 1, could be made of stout brass and cut to shape shown.

"Fan" Wheel

The fan wheel shown in Fig. 1 has twelve blades, and each blade has a metal strip secured to it by rivets as shown. The strips have a slight twist given to them of about 30 deg. as shown in the inset marked x; the other ends of these strips are riveted to a circular disc, f, Figs. 1, 2 and 3.

The disc is welded to one end of a piece of thick brass tube, g, and at the other end a sprocket wheel, h, is welded, which engages with a chain, such as a length of bicycle chain, to the other sprocket wheel, e, Fig. 2. This wheel is omitted from Fig. 1 for clearness.

Through the tube, g, Figs. 2 and 3, a spindle is inserted to form a good bearing for g to revolve without shake. This spindle, when assembled, fits into the two bearing plates, d, but before this can be done, the whole of g, with fan blades and sprocket wheel attached, must be slid over the spindle, the latter being secured in some way so that it does not revolve with g. Spacers should be put in to keep the fan wheel in position, as indicated in Fig. 2.

The drawings are not drawn to scale, but are intended to give the reader some idea of a working basis. I suggest the diameter of the fan wheel should be at least 3ft., and if all other parts are made in proportion then a good working model should result.

The speed at which a fan wheel of this diameter revolves would make the figure of the "man" appear to be working with ease, and not as in the case of a smaller diameter where he would appear to be working as though "he" had not a moment to spare.

With regard to the base, details of this are given in Fig. 4. It should be made of well-seasoned wood about 1in. thick, and should have cross-pieces P screwed on the underside for preventing any warp; metal strips could also be used.

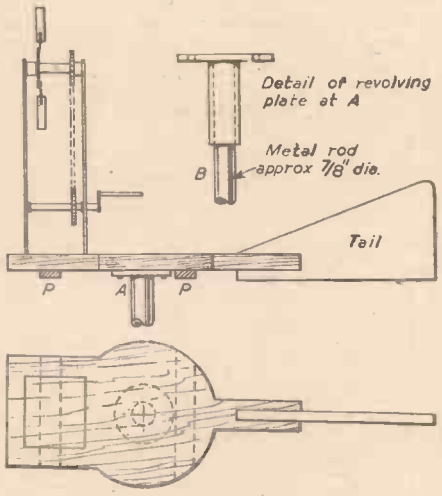


Fig. 4.—Elevation and plan of platform showing tail-piece.

Fixed to this base is a metal disc, A, Fig. 4, with a stout metal tube welded to it at right angles. This tube will revolve on a stout metal rod which is fixed into a pole or secured to a building.

Tail-piece

Before the tube and disc are fixed to the base, the centre of gravity must be found otherwise the whole will not revolve correctly. A tail-piece cut to the shape shown should be fixed to the base.

Finally, before fixing to the pole or building, find out which way the fan wheel will rotate, so that the "man" can be fixed as though winding and not unwinding. Also the whole structure should be painted with a good weather-resisting paint.

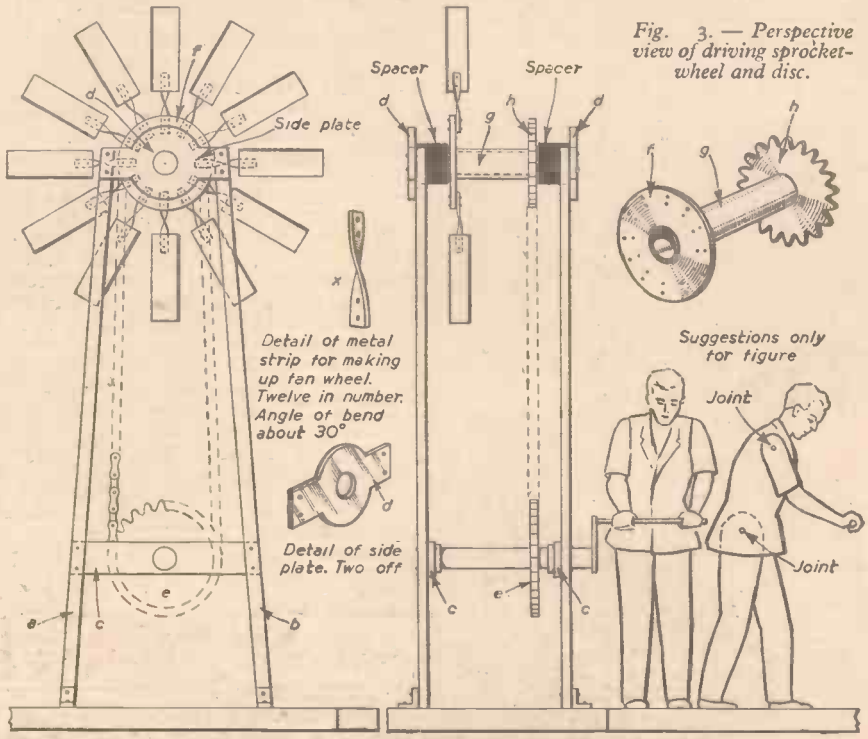


Fig. 3. — Perspective view of driving sprocket-wheel and disc.

Figs. 1 and 2.—Front and side elevation, and details of side plate and vane fixing strip.

AN A.C. ARC WELDER

Constructional Details of the Transformer and Choke

By J. L. WATTS

THERE are many purposes for which a small arc welding plant is useful, such as model making, repair work, etc. The following equipment has been designed for use from a single-phase 15 amp A.C. supply of 230-250 volts at 50 cycles. It is suitable for use with welding electrodes of 0.064in. or 0.080in. in diameter, and can be used for welding mild steel pieces up to about $\frac{1}{8}$in. thick. The principal items of the equipment are the transformer and the choke coil. The transformer is used to step down the supply voltage to a suitable value for striking the arc, i.e., 80 to 100 volts; whilst the choke coil is used to reduce the voltage between the electrode and the workpiece after the arc has been struck.

The core of the transformer is built up of Stalloy stampings of standard thickness 0.014in. Pairs of stampings of the dimensions shown in Fig. 1 can be used to provide adequate space for the windings, if the coils

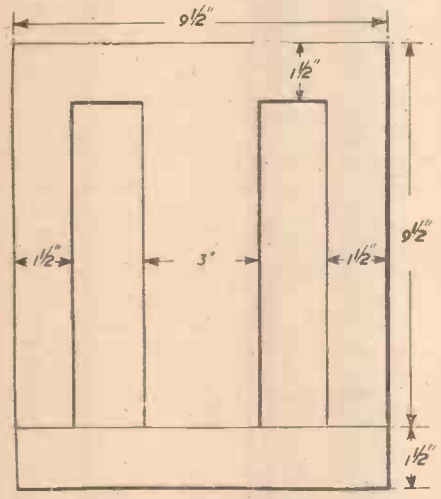
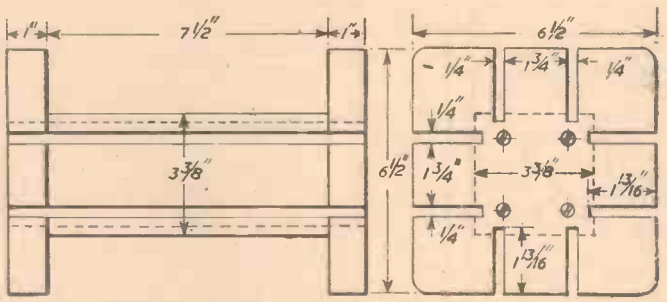


Fig. 1.—(Left) Diagram of transformer core stampings.

Fig. 2.—(Right) Side and end views of the hardwood former for transformer winding.



are carefully wound. These stampings should be lightly insulated on one side by means of varnish or a china clay composition; the function of which is to prevent metallic contact between different layers of stampings, and thus minimise the production of eddy currents in the core which would otherwise reduce the efficiency of the transformer and cause it to heat up unduly. The transformer core is to be built up to approximately 3in. thick. Allowing for the thickness of the insulation on the stampings, approximately 64 stampings are required to make up 1in. in thickness when pressed together, so that approximately 200 pairs of stampings should be obtained.

Winding the Transformer

The next step is to prepare a former for winding the primary and secondary coils. The former may be built of hardwood to the dimensions given in Fig. 2, the former being in three parts which are fastened together with wood screws so that it can be dismantled after the coils have been wound. Eight slots should be cut in the flanges of the former as shown, these cuts being continued about 3/16in. or $\frac{1}{4}$in. into the centre piece. The purpose of these slots is to enable the leads to be brought out from the windings, and also to allow string to be threaded round the coils after winding.

After the former has been made the body and insides of the flanges should be rubbed with french chalk to enable the windings to be removed without undue force being used. The former is then mounted between centres or on a turntable so that it can be easily wound. A strip of leatheroid about 0.010in. thick is then cut 7½in. wide by 39in. long, which is then wrapped round the former. This is followed by a similar strip of empire cloth, which may be secured by Chatterton's compound. The primary coil is then wound. This consists of 240 turns of 11 s.w.g. (0.116in. diameter) double cotton-covered copper wire for use on a 230 to 250 volt supply. One end of this wire, about 18in. long, is covered with varnished sleeving or systoflex and passed out of the former through one of the slots; it is then secured with about 1in. of the sleeving inside the former. The former is then slowly turned to commence the winding. During this process the wire should be kept reasonably tight and should be laid flat in order to conserve winding space. This is most important, but the beginner may find it rather difficult because the wire tends to bulge out in the centre of the former. This tendency must be overcome by giving the wire a contrary bend before each side is laid flat in the former. In order to facilitate the winding of the secondary coil the primary winding should be as smooth as possible; this may be effected by winding 48 turns of the primary on each layer, the turns being closely wound near the ends of each layer and evenly distributed across the rest of the layer. A strip of paper about 0.010in. thick should be wound round each layer of the coil before winding on the next layer.

After completing the 240 turns in five layers the end of the wire should be insulated with sleeving, with 1in. of sleeving inside the former, the end of the wire being passed through a slot in the flange of the former and secured, after cutting off the wire to leave about 18in. of wire outside the former. About 14lb. of 11 s.w.g. should be sufficient for the primary coil. If the transformer is to be used on a 200 volt 50 cycle single-phase supply the primary coil should have four layers of 10 s.w.g. (0.128in. diameter) double cotton-covered wire, a total of 200 turns. Sixteen pounds of 10 s.w.g. should be sufficient. After the primary coil has been satisfactorily wound it should be wrapped with three layers of leatheroid about 0.010in. thick and three layers of empire tape, before winding on the secondary. The leads from the transformer coils may be brought out from both ends of the former, but must be brought out from one side, or from opposite sides, otherwise they will foul the core.

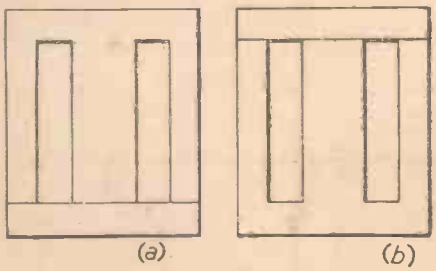


Fig. 4.—Layers of transformer stampings.

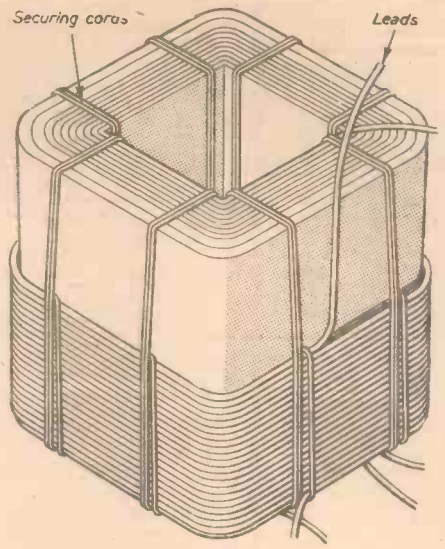
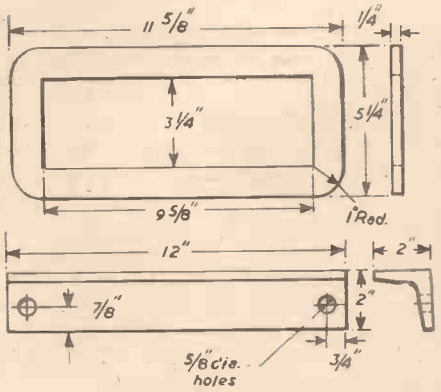


Fig. 3.—Method of securing the windings of the transformer coils.

Since the secondary coil has to carry the welding current thick copper wire is required. This is most difficult to wind and fairly soft copper, which is double-cotton-covered, should be used. The cross sectional area of the wire for the secondary coil should be about 0.020 sq.in., and 9 s.w.g. (0.144in. diameter) wire is probably the most suitable wire for this purpose and 16lb. of wire will be required. About 18in. of the wire are insulated with insulating sleeving and secured outside the former with about 1in. of the sleeving inside the former, and secondary winding is commenced. It cannot be emphasised too much that the wire must be laid flat and great care must be exercised; if necessary the coil may be tapped gently between two wooden blocks during winding to facilitate such levelling. If the various turns and insulation are not tight the coil will be too large.

The secondary coil should have 100 turns. It should be possible to wind 40 turns on the first layer, which is then wrapped with a strip of leatheroid about 0.010in. thick before winding on the next layer of 40 turns. When the second layer is completed it should be wrapped with leatheroid and the wire carried out of the former through one of



Figs. 5 and 6.—Hardwood pieces and angle-steel clamps for transformer core.

the slots and then into the former again, leaving a loop about 30in. long outside the former. A piece of thin string is then passed through the grooves and wrapped round the coil. The third layer is then wound on; this layer has 20 turns, the end being insulated with sleeving, carried outside the former and cut off with about 18in. to spare.

Finishing the Winding

After completing the secondary coil strong thin string is passed through the slots in the former which is used to tie the coil firmly, as indicated in Fig. 3. The string which was wrapped over the second layer of the secondary should then be turned back and tied round the third layer. The flange of the former is then removed and the body of the former pushed through the coil so that the coil can be removed, as in Fig. 3. It is then advisable to dry the coil to remove any moisture which may have been absorbed by the cotton insulation. This may be done by placing it, on a few strips of wood, in an oven for about two hours, during which period the temperature of the oven should be kept within about 180 to 200 deg. F. It is important that the oven temperature should not exceed about 200 deg. F. and a thermometer should be used to check the temperature periodically.

Whilst the coil is being dried a tin should be filled with sufficient insulating oil to immerse the windings. Immediately the coil is taken out of the oven it should be placed in the varnish; the cooling of the oil by its immersion in the cold varnish causes it to suck the varnish between the layers so that good penetration is assured. The coil should remain in the varnish for five or six hours. It should then be removed from the varnish and allowed to drain for about an hour, during which period it should be turned round occasionally in order to avoid an accumulation of varnish at any point. The coil may then be suspended in the oven at a temperature of 180 deg. to 200 deg. F. for six to eight hours if stoving varnish is used. However, the instructions of the makers of the varnish should be studied and closely followed if they differ from the above. Naked lights should not be used near insulating varnish, however, as such varnishes contain inflammable solvents.

Transformer Assembly

The coil is next wrapped. One thickness of leatheroid about 0.010in. thick should be passed through the centre of the coil and round the coil, followed by a strip of ½in. empire tape half lapped round and through the coil so as to cover the coil. The tape may be secured with Chatterton's compound. The overall thickness of the coil must not exceed 6½in.

The core can then be assembled by inserting the centre limbs of the stampings through the centre of the coil. When this is done care should be taken to ensure that the insulated sides of the stampings are all on one side. The second precaution to observe is that the joints in adjacent layers of stampings are covered by the stampings on the next layer. Thus a layer of stampings, as at (a) in Fig. 4, should be covered by a layer of stampings at (b), followed by a layer as at (a), and so on. It is also important that no air gaps should be left between the two stampings in any layer, as such air gaps tend to increase the magnetic reluctance of the core, with increase of magnetising current, transformer losses and heating, and reduce the secondary voltage. For the same reason, and also in order to avoid magnetic hum when the transformer is switched on, the stampings should be tightly packed together. If necessary, thin strips of wood may be used to wedge the windings on to the core.

The transformer core should be clamped together. If uninsulated bolts were passed through holes in the core these would tend to permit the passage of unwanted eddy currents and would defeat the object of the insulation on the stampings, as would also any burrs which short-circuited the insulation. Such burrs might be formed by drilling holes in the stampings. The clamping bolts should therefore be outside the core. Two-inch angle steel pieces, as shown in Fig. 6, can be used to clamp the core; four such pieces being required. Two hardwood pieces, as shown in Fig 5, may be slipped over the core before clamping by means of ¼in. steel bolts, as shown in Fig. 7. The bolts should not touch the stampings. Holes should be drilled through the angle-iron and hardwood pieces for the coil leads.

A terminal panel may be fastened to one of the top clamping pieces, and this may be of bakelite or similar material about ⅛in. thick which is drilled for five ¼in. dia. screwed brass rods which act as terminals. The terminals may be about 2in. apart. Two terminals, marked P_1 and P_2 (Fig. 12), should be connected to the ends of the primary coil. One terminal, marked A, should be connected to the start of the secondary coil, with a terminal B connected to the cut ends of the loop between the 80th and 81st turns. The fifth terminal, marked C, is connected to the 100th turn, i.e., to the finish of the coil. The ends of the wire should be cut off at suitable lengths and soldered into spade terminals which are clamped on the brass terminals by means of lock-nuts. The secondary terminals A and B are used to give about 80 volts, whilst a higher voltage may be obtainable from terminals A and C, if required, in order to obtain a high striking voltage and a fairly long arc.

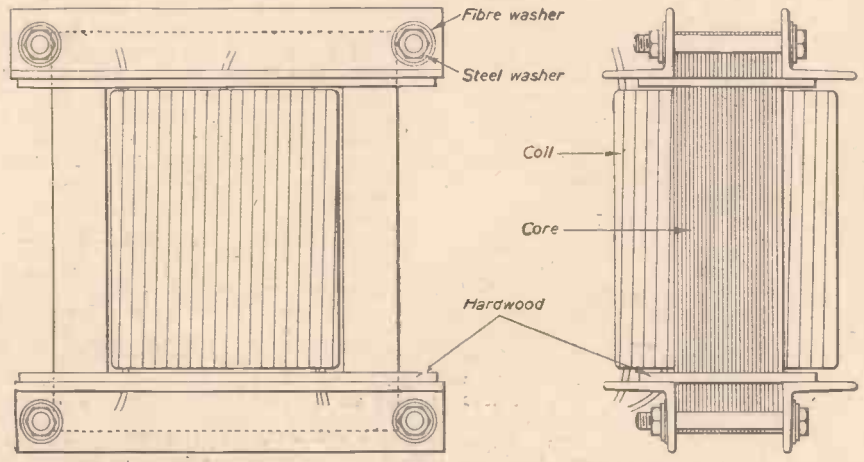


Fig. 7.—Side and end views showing transformer assembly.

Winding the Choke Coil

The core of the choke coil should be built of insulated Stalloy stampings, 0.014in. thick, to the dimensions given in Fig. 8. Sufficient stampings should be obtained to build up the core to 4in. thick. Thus, approximately 260 pairs of stampings will be required. A hardwood former of the dimensions shown in Fig. 9 should be made, on which the coil is to be wound. The coil should be similarly wound to the transformer, with a layer of leatheroid about 0.010in. thick between each of the layers of wire. The coil should be wound with the same size of wire as the secondary winding of the transformer; 12lb. of wire should be sufficient for the choke coil.

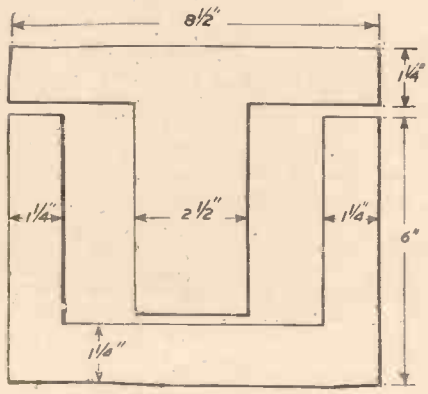


Fig. 8.—Choke coil stampings.

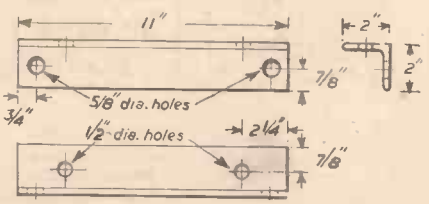


Fig. 10.—Angle steel clamps for choke.

Four layers of wire, each with 18 turns, should be wound on, the wire then being brought out of the coil and then taken back into the former, leaving a loop about 2ft. long outside the former, and the fifth layer continued. At the 82nd turn a connection should be made to the wire and brought out of the former at the same end as the 72nd turn. This connection may be made by cleaning the insulation from the wire and soldering along this for about 1in. the end of

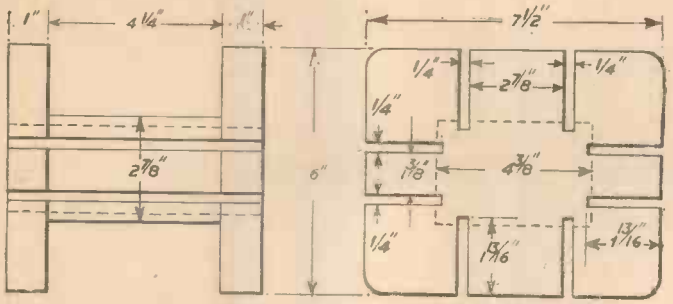


Fig. 9.—(Left) Side and end views of hardwood former for choke coil winding.

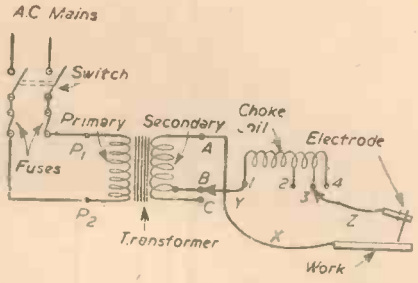


Fig. 12.—(Right) Diagram of connections of welding equipment.

a conductor of the same wire. A clip of thin copper may be placed round the connection before soldering, the copper wire first being tinned. The connection should be wrapped with empire tape before continuing the fifth layer to complete 90 turns. After wrapping leatheroid round the layer the sixth layer is wound; this layer has only seven turns, the wire then being secured, insulated with sleeving and brought out at the opposite end of the coil to the lead from the 82nd turn. All the leads should be brought out from the narrow side of the former. The coil should be securely tied together before removing the former, and should then be taped up, doped with varnish, drained, baked and finished as for the transformer winding.

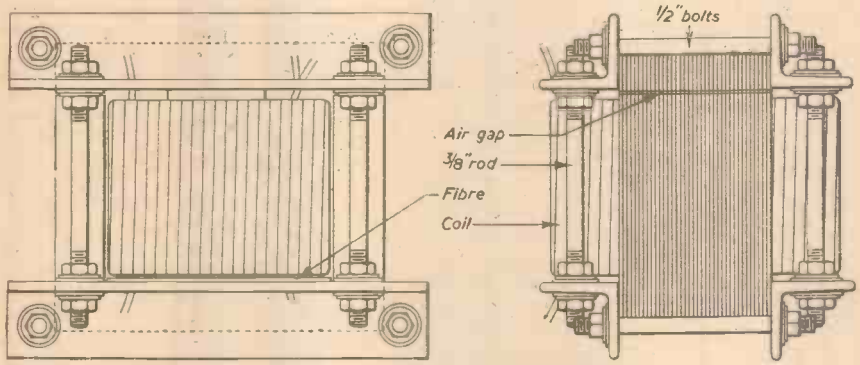


Fig. 11.—Choke coil assembly.

Four angle steel clamping pieces may then be prepared as shown in Fig. 10. The choke coil may then be assembled. When building up the core all the stampings of the same shape should be laid upon each other, with the insulated sides of the stampings facing the same way. The laminations should be threaded through the coil and the coil may be secured on the centre limb by means of thin wooden wedges, a piece of thin fibre being placed over the end of the coil before threading the centre limbs of the stampings through the coil. The two sections of the core stampings are clamped by means of ½in. steel bolts, thin fibre bushes and washers being used to insulate these bolts from the angle pieces.

The two sections of the core are then clamped together by means of ⅜in. screwed steel rod, insulated from the angle pieces by means of thin fibre bushes and washers, leaving an air gap of about 0.08in. at each point where the two sets of stampings would normally come together. The choking effect of the coil will largely depend on the length of this gap, which is rather critical. An increased air gap will reduce the choking effect and thus increase the voltage across the arc. The gap may be filled with wood or fibre if required. A terminal panel may then be made as for the transformer, this having four terminals marked 1, 2, 3 and 4 (Fig. 12). Terminal 1 is to be connected to the start of the coil, terminal 2 to the cut ends of the loop between the 72nd and 73rd turns, terminal 3 to the tapping from the 82nd turn, and terminal 4 to the finish of the coil.

Connections and Protection

The connections of the equipment are shown in Fig. 12. A 15-amp double-pole combined switch and fuse box may be used in the primary circuit, flexible cables of 296/0.010in. may be used for the connections X, Y and Z. All connections between conductors and terminals should be made by soldering the leads into spade terminals. Permanent connections between the spade terminals and screwed rod terminals should be made by means of lock-nuts, with a nut on both sides of the spade. The flexible leads may, however, be connected to the terminals B, C, 2, 3 or 4 by means of ¼in. brass wing-nuts.

The case of the switch-fuse box, the cores of the choke coil and transformer, and terminal A of the transformer should be connected to earth, using a conductor of 7/0.029in. This connection may be made to a mains cold water pipe by means of a suitable clip, the connection preferably being made as near as possible to the point of entry of the water pipe into the building.

Base and Cover

The apparatus may be mounted on a wooden base or iron frame with an expanded metal cover. The terminals P1 and P2 of the transformer should be provided with a cover so that they cannot accidentally be touched. If required these two terminals can be mounted inside the expanded metal cover with the other terminals on a separate panel outside the cover, together with the switch-fuse box.

Electrode Holder

The reader is advised to purchase or make a spring type of electrode holder, which does not impose a strain on the hand muscles of the operator. A spade terminal on the flexible cable X is to be connected to the workpiece by means of a substantial clamp. When it is required to operate with minimum welding current the flexible cable Z should be connected to the terminal 4, so that the welding current passes through all the turns of the choke coil. In order to obtain the same arc voltage with maximum welding current the cable Z should be connected to terminal 2; for intermediate current the cable should be connected to the terminal 3.

Moving a Complete House

In response to a request from an oil company operating in the Middle East, Messrs. Maycrete Ltd., in conjunction with G. H. Burgess & Co., have produced a fully mobile camp building for use in connection with oil prospecting. The illustration shows the building, known as the "Supalite" Mobile House, being tested on very rough ground at Heston, such as might be encountered in the Middle East.

Electrical Repairs at Home

Useful Hints on the Upkeep and Repair of Domestic Electrical Appliances, and How to Avoid the Many Pitfalls That May be Encountered by the Home Electrician

By "HOME MECHANIC"

Fig. 7.—A group of "heater" appliances.

IN this country nearly all supplies are A.C. at about 230 volts. Now the peak voltage on A.C. is 230 multiplied by the square root of two, i.e., 230 x 1.414, or something over 300. If you keep this point in mind you will avoid shocks from the mains. When making an examination of any apparatus, always disconnect from the supply, either by removing the plug or switching off at the mains. If you are doing

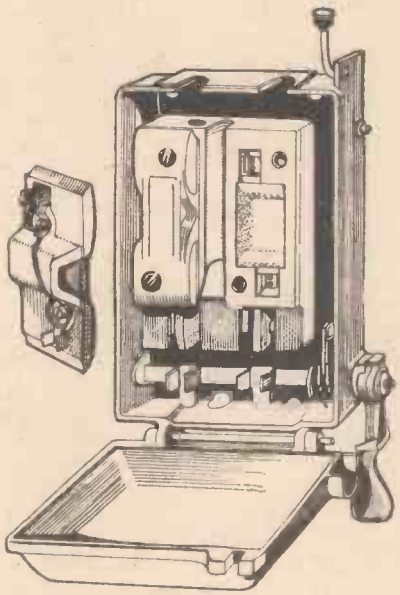


Fig. 1.— A fuse box and fuses.

any work on an installation, such as changing a fitting or plug, or anything connected with the permanent wiring, then switch off at the mains and pull the fuses. This is the only way to make certain that someone will not come along and switch on again.

The Main Fuse

We will start with the point of entrance of the cable and follow it to the various points dealing with the possible faults as they arise. If a main fuse blows, you cannot replace it, but must telephone the supply company, who will send a man to do it. The main fuse box is sealed and it is an offence to break this. If a main goes, there must be some serious fault in the circuit.

Replacing Local Fuse

If a local fuse blows, first find the reason. There is always a reason and a very good one. Generally, it is an overload on the circuit, although it may be some accidental short, worn flexes, or cut wires. Remedy this and replace the fuse with the correct size of fuse wire. It is usual to employ 5-amp. wire for lighting circuits, and 10 or 15 for power. Switch off the mains, remove the fuse carrier, clean off all carbon and fused wires, put in the new wire and replace. Switch on. Remember to remove all the

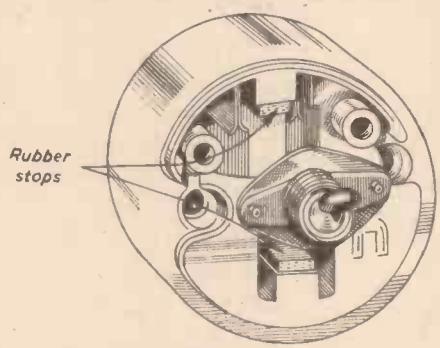


Fig. 2.—An efficient type of switch.

old wire. Make certain of good connections at the fuse clips. (See Fig. 1.)

Replacing a Switch

Often a switch may need replacing, especially in such places as garages and workrooms, etc. First obtain a good switch of the same type and pattern, i.e., 5- or 10-amp. sunk or surface mounting, etc. (See Fig. 2.) Switch off at the main and pull the fuses. Now slacken the connecting screws on the switch, remove the fixing screws, pull out the switch and then put in the new one. Take care to mount this the right way up and to put the wires on the same sides as before. It is quite possible to put the switch in so that the knob is down and the light off. Do not throw away the old switch, it may be kept as a useful spare for future repairs.

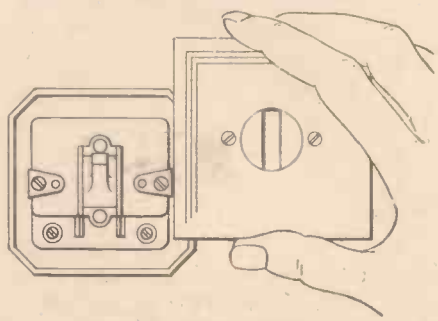


Fig. 3.—This type of switch fits flush to the wall.

The cover and terminal and the action spring can be removed and put into broken switches. You may not think this worth while, but the repairing of a switch is quite intricate and interesting work and the procedure is as follows. To "open up" remove the sealing wax from the heads of the screws at the back, undo these and the dolly will pull out. It may leave the movable contacts behind. If not, a slight pull will remove them, exposing the action spring. You now have the switch in pieces and it is easy, if you have a spare, to replace a broken part. Contacts may be tightened up by judicious pressure with the blade of a screw-driver. Always use good quality switches. It should not be possible to hold the contacts either just in or just out so that arcing occurs. The switch should open and close quickly with a snap, except in the case of the new silent switches for hospital work. Here the action is barely audible. (See Fig. 3.)

The Distribution Point

Flex often gets worn and frayed when the lamp swings in a draught or when a portable appliance is used at that point. If you are doubtful about the condition of a flex, replace it—the cost is negligible. In the case of large and powerful lamps, the heat will cause the insulation to perish, and finally the rubber cracks away, causing a short or the holder to become "live." Never remove or replace a lamp with the switch on. When replacing a flex switch off at the mains and remove the fuses. Unscrew the cover of the ceiling rose and disconnect the flex. Now, in a more comfortable position, examine the holder. If the springs in the contacts are quite good, it may be replaced on a new length of flex. Slip the rose cover on the flex, climb the ladder and connect up. Make sure that the weight of the flex and fitting is taken by the little hooks or projections

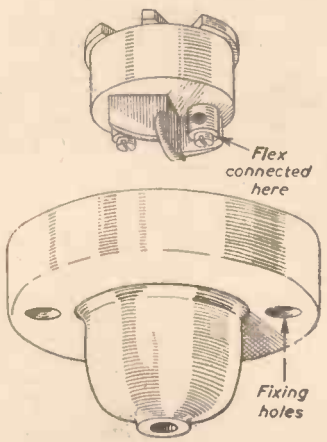


Fig. 4.—Details of a ceiling rose, showing the method of fixing.

on the rose base, and screw back the cover. (See Fig. 4.)

A word on using portable appliances from light points. The flex and holder are rated at 3 amps. You should not use anything taking more than 500 watts from a holder. All portable apparatus should be earthed. It cannot be earthed if used from the ordinary holder. Yet, you may say, why are irons, fires and vacuum cleaners all sold with adaptors for use on the light. This, of course, is to give them a universal appeal, but the day is not far off when all apparatus will be sold with a special plug of the three-pin type. Fig. 5 shows how easy it is to get a shock from a two-pin point of, say, a fire or iron. In our opinion, the iron is almost a lethal weapon when used from the lamp-holder. The housewife is there with damp hands in the kitchen ironing, in easy reach of gas and water taps and earthed

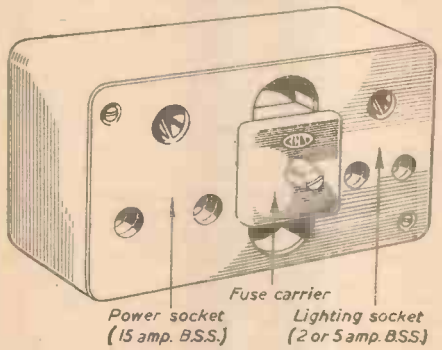


Fig. 6.—A safe socket for all appliances.

ironwork. A fault develops in the iron. With one hand she touches the water tap, and a very bad shock results. The same can happen with open fires of the bowl type. Also, with two-pin plugs and fires with switches incorporated, it is possible for the switches to be off and the plug in and yet the element "live." If you wish to test all these statements, get a lamp, holder and flex with crocodile clips as leads and use this as your subject or patient. Connect one lead to earth and the other to the iron or fire, as above, and observe that the lamp will light. Wherever possible, use only lamps at the lamp-holders and the proper apparatus at the two-pin point. These points are designed for use with reading lamps and wireless sets which, theoretically, may not require earthing. (See Fig. 6.)

The Power Point

This has an earth pin which must be used. You may feel tempted to connect up the iron to the plug with the original twin flex. Don't, it is safer to get a good quality triple cable and the extra safety will well repay the outlay. Braided cable has a nasty habit of fraying at the adaptor and then shorting. The wires in the cable each have their own colour, so that it is an easy matter to earth the correct one. The latest iron adaptor has a small spring tongue that touches the metal case of the iron. This is the earth contact. Bend it out so that it makes good contact. The same general remarks apply to frayed cables, etc., but one must use the cable of the correct size for the appliance. If you are using a 3-kilowatt fire from a plug, do not wire up with lighting flex. Use the correct cable (this is generally supplied with the appliance). On the other hand, if you are using a 750-watt fire from a 15-amp. point, thinner flex can be used, but to protect the circuit the 15-amp. fuse must be replaced with a 5-amp. one. This is very important, because the earth might burn before the fuse blows if a fault develops in the fire. Fig. 6 shows a socket from which any apparatus may be used with safety.

Two Types

All domestic appliances can be divided into two types, heating and motor-driven. Special notes will be given for the various types, but first a general survey of the heating

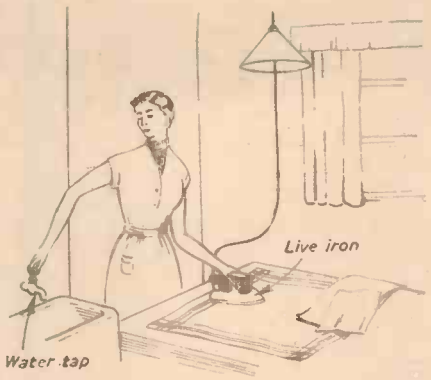


Fig. 5.—Showing how a housewife may obtain a shock from an unearthed iron.

type. Here are included irons, fires, toasters, hair dryers, kettles, hot plates, stoves and cookers, because in each case the element is a length of wire that becomes hot when in use.

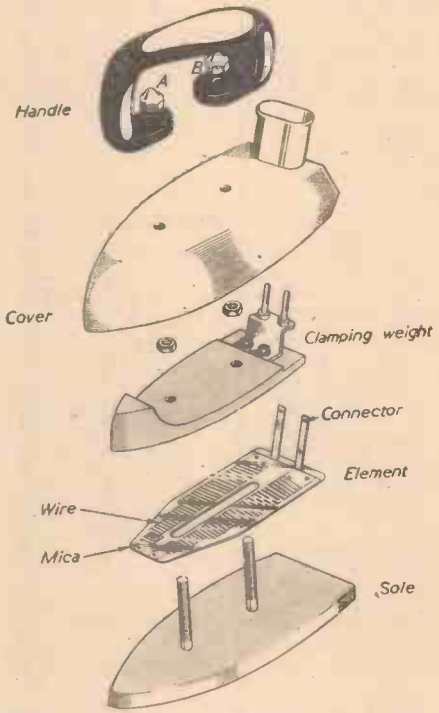


Fig. 8.—An exploded view of an electric iron.

A group of appliances is shown in Fig. 7. A combination of the two types is found in modern fires and hair dryers, etc. Nowadays all heating elements are standard, i.e., if your iron burns out a new element can be bought from the makers. The sketch (Fig. 8) shows a dismantled iron; we will deal with fitting a new element first. Remove the cable connector. The shell is fixed to the base by two domed nuts, A and B. Unscrew these and gently lift the cover off. In some types connection is made by two springs from the adaptor to the element; in others it is a strip of metal. If by springs, the cover comes straight off; if by strips, unscrew these at the connector. The element is clamped to the base by a heavy iron stop and may now be removed. The element is wound of strip on a mica former and is completely insulated from the frame. When removed, take it to your testing bench and connect in series with a lamp. If it lights, then the element is not at fault and the connector must be to blame. A faulty element can generally be spotted by holding up to the light; the burnt spot shows as a black dot. Do not attempt to repair an element but put in a new one, lay it flat on the plate, put on the iron weight and the cover and tighten up the nuts. Make sure that the springs touch the element correctly, and warm up the iron. When hot, disconnect and put another half-turn on the clamping nuts.

Repairing an Electric Kettle

A kettle element is very similar to that of an iron, but is generally in two halves. The replacing of the element is carried out in the same way. First invert the kettle, then remove the cover plate exposing the elements. These are clamped under a thick copper disc by one screw passing through the centre. Remove this and the elements. Connections are made through copper flexibles insulated with porcelain beads. Preserve these as they must be put back on the new element. Observe the position of the old element and replace the new in exactly the same way. Connect up as before. Most kettles, sterilizers and similar appliances are fitted with a cut-out (see Fig. 9) that opens the circuit when the vessel boils dry. Some have a small fusible capsule, which has to be replaced each time it boils dry. The commonest method, which is found on all good-class apparatus, is the bimetal thermostat. The actual design varies with the maker, but the principle is the same. A bimetal strip forms part of the circuit and when this

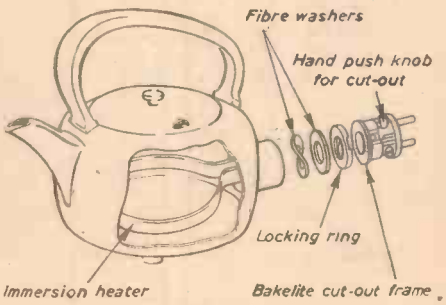


Fig. 9.—Details of an electric kettle.

is overheated it bends outwards and opens the circuit. Any repairs here consist of cleaning the contacts and perhaps bending the strip slightly so that a good contact is made. The contacts can be reset by a knob on the base of the kettle and need not be touched in the ordinary way.

(To be concluded)

Making a Power-driven Nibbling Machine

Fig. 3.—Showing how a template is clamped to the material to be worked.

Constructional Details of a Useful Machine for the Amateur's Workshop

By C. H. HALL

AT some time or other most model engineers are faced with the task of cutting out sheet metal in some more or less intricate pattern. There are numerous ways of doing this, hand shears can be used for certain light gauges, or the job can be done by sawing or drilling, both of which methods are slow and laborious, and in the final resort there is the hammer and chisel method, with its consequent bruising and distortion.

The need of something rather better than these methods for the purpose of cutting out a number of awkwardly shaped blanks from 10 g. mild steel strip led the writer to the idea of a power-driven nibbling machine. As the main source of power available was the lathe, as is the case in most amateur workshops, it was decided that the tool would have to be driven by the lathe and mounted upon the same, and this, incidentally, had the added advantage of giving a number of varying speeds for driving.

In the illustration, Fig. 1, the nibbler is seen mounted on a standard ML4 lathe, and as the tool has now been in use for some considerable time and has tackled work upon material considerably heavier than that for which it was originally designed without ill-effect, it can be said to be most successful.

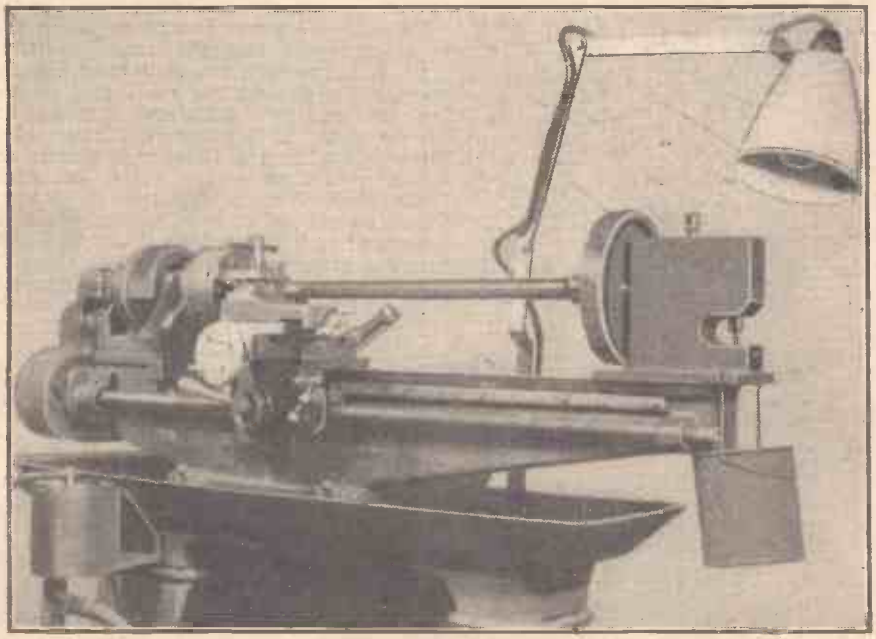


Fig. 1.—The nibbling machine mounted on a lathe bed.

Perhaps one of the most appealing features of the tool is the ability to accurately reproduce almost any shape without even marking out the workpiece simply by clamping a template or pattern piece upon the material to be worked (see Figs. 3 and 7), always providing that the combined thickness of the template and work-piece exceeds the stroke of the ram. The template will then act as an accurate guide by pressing up to the side of the punch in a similar manner to that used on wood routing machines. Another advantage is that the finish that can be obtained is so good that only a very little cleaning up is needed.

Constructional Details

The main body of the job (Fig. 4) is cut from a piece of 1½in. thick mild steel, and for this purpose a pattern piece was made and the job profiled out by a local firm with an oxy-gas plant; this made a very clean job and little cleaning was needed. First of all it was drilled vertically for the ⅝in. dia. ram, and this drilling was taken across the throat to accommodate the die for the punch. The bottom of the die hole was cleaned out with a flat-ended drill. The horizontal hole was then bored in the lathe, this being 1in. dia., to take the camshaft and its bush (Fig. 2). As the bush retains the camshaft it is necessary for this unit to be pushed into position complete in assembly, the bush being located by two socket-head grub screws when pressed right home. This horizontal bore is carried nearly through the vertical bore for the ram, and the end of the bore is squared out to accommodate the cam.

Camshaft and Ram

The camshaft and ram (Fig. 5) are both made from a well-known brand of non-shrinking die steel. This material was used simply because it was available, but, no doubt, any good quality case-hardening steel would be equally suitable. The end of the camshaft was hardened and tempered back very lightly to leave the actual eccentric nearly dead hard. The ram was treated the same way, with the exception that the rather thin strip connecting the upper and lower portions of the ram was tempered back fairly heavily by the application of local heat, leaving the working faces almost dead hard.

Punch

The 3/16in. dia. punch is made from silver steel, a material which is particularly suitable for this purpose, and is located in

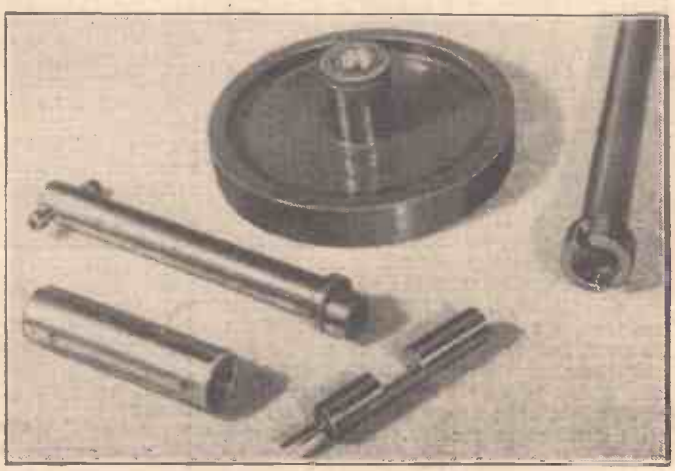


Fig. 5.—The flywheel, camshaft, ram and driving shaft.

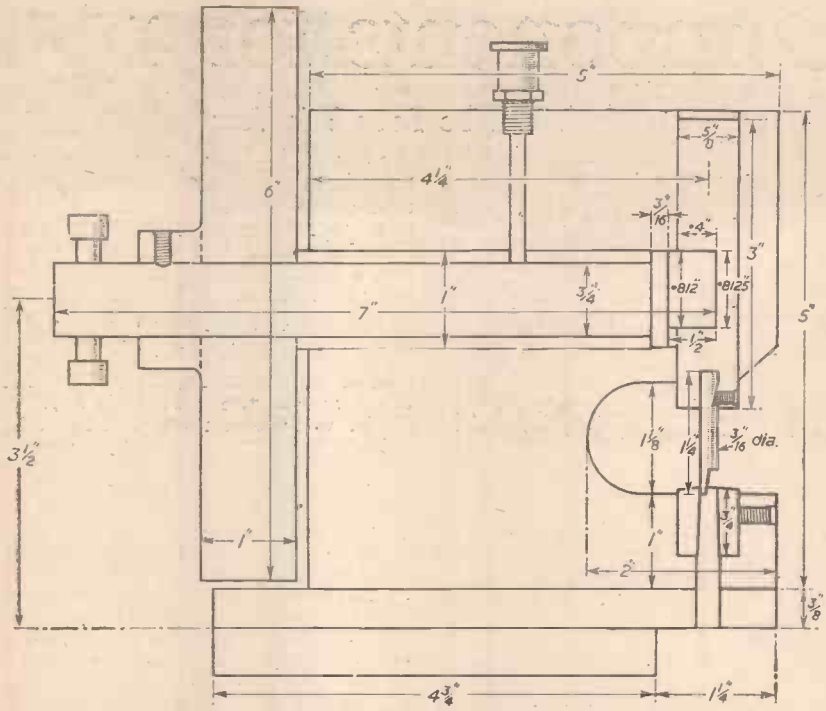


Fig. 2.—Sectional diagrammatic view of the nibbling machine.

the ram by a small socket-headed grub screw. The die is again of the same die steel as the ram and camshaft, and is made with only slight punch clearance to obtain as straight an edge to the work-piece as possible. It is important that a slight taper be given to the lead piece of the punch to prevent slugs being drawn up again by the punch in work. The stroke of the punch is 3/16in. and it is set to enter the die by .020in.; the bore of the die is very slightly tapered with a diemaker's reamer giving two degrees of taper. The die is located in its recess by another small grub screw as shown in Fig. 2.

Flywheel

The flywheel is a necessity for fast working, though the tool will work without this with the lathe suitably geared down. On 10 g. material the top speed is used with the flywheel, but the lowest of the plain speeds is needed without it. At this high speed the punch only nibbles out a series of small crescent-shaped pieces, giving a fine finish to the work and lightening the load upon both cam and ram faces.

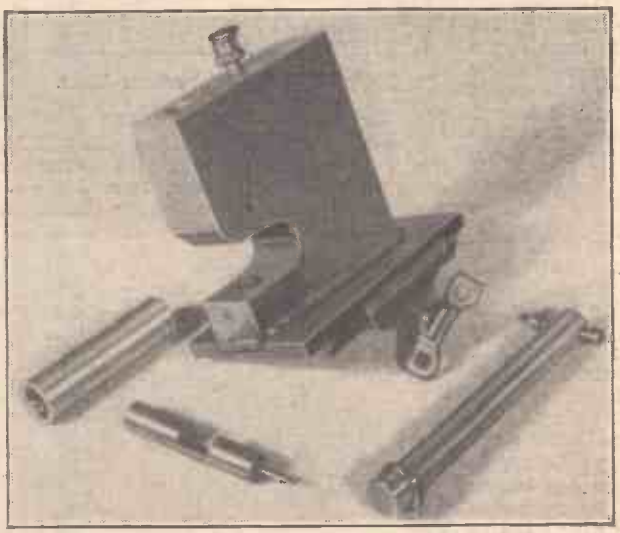


Fig. 4.—The main body, camshaft and bush.

It will be seen by reference to Fig. 2 that the flywheel is fixed to the camshaft by means of a grub screw through the boss. A small lubricator for the camshaft is screwed into the top of the body of the machine.

The Base

The base of the tool was separately fabricated from a piece of ⅜in. M.S. plate. Under this on the front side a gib strip of ⅝in. by 3/16in. was welded in position, and on the back side, viewed from the front of the lathe, a similar strip was welded at one end only, for about 1in. Outside this a nut was welded on to take the 5/16in. dia. thumbscrew which, pressing upon the back gib strip, locks the machine in any position on the bed of the lathe.

It will be seen that the machine is mounted upon the end of the bed, and this is for two reasons. First, that the machine may be left in position without preventing the general use of the lathe and, secondly, that it is necessary to have an outlet from the base of the tool for the punchings, which drop past the end of the bed into the can, as shown in Fig. 6. This can is also shown in position in Fig. 1.

Driving Shaft

The driving shaft is made from a piece of 1in. dia. mild steel bar, it being important that this member should not spring or whip; the little added weight is no disadvantage. On to the end of this bar a collar was welded and slotted to take the two driving pins in the end of the camshaft. Finally, the main body of the tool was located upon the base unit and then electrically welded (as are all the other welded parts) upon the base unit.

Universal Movement

The long driving shaft with its slotted ends has the double advantage of giving a small degree of universal movement if needed, and also can be quickly and simply slipped out of the way to leave the lathe free for other jobs without disturbing the nibbling machine.

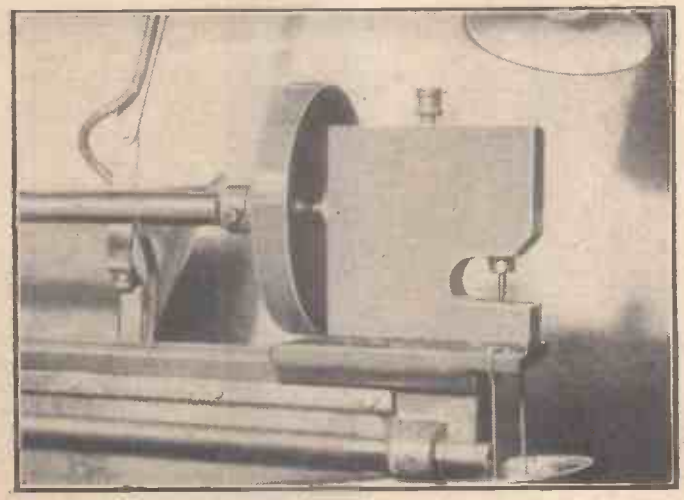


Fig. 6.—Enlarged view of the nibbling machine.

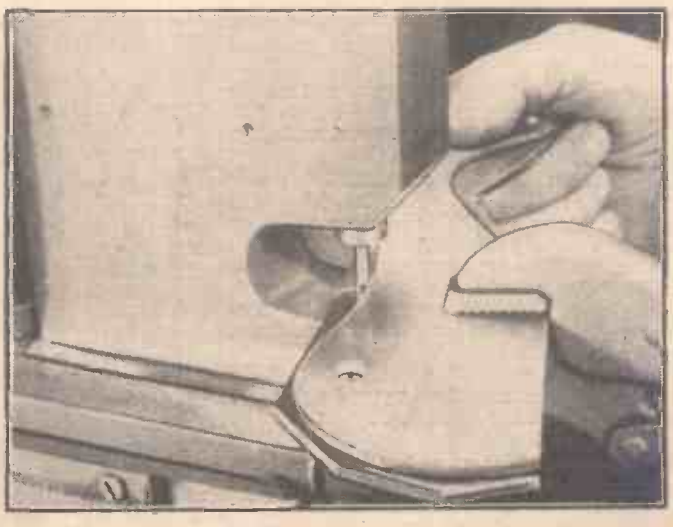


Fig. 7.—Another view showing how a template is used as a guide.

Cycles and Components for 1954

A Review of the Cycling Equipment Which Will be Seen This Year

By R. L. JEFFERSON

ON my way to the Show last year I was amazed to see the following extract from an article in my morning paper. "But one of the biggest cycle exhibitors said: 'This is the last cycle show. From now on it will be all power-assisted bicycles and motor scooters. The bicycle apart from the racing enthusiast is finished.'"

In almost a lifetime of close connection with the sport and trade I cannot recall a statement so much at variance with the facts as the above.

Since the war the trade has brought into Britain £200 million, and at last year's Show one firm alone (B.S.A.) took orders for £357,000 from the U.S.A. There is no reason to believe that this state of affairs will not continue for a long time. The trade is sufficiently flexible to meet competition from any quarter.

Armstrong Cycles

This year Armstrong Cycles are using silver brazing on the "Moth" and "Continental" model frames. The initial cost of silver brazing is much higher than brass, the result is a much cleaner frame, and the lower temperature at which the joints are brazed avoids distortion. The Model 33 has a frame of 531 tubing, B.H. large flange hubs, G.B. Coureur brakes, choice of either Cyclo Benelux or Simplex gears with double chainwheels. At £39 9s. 7d. this is a most attractive machine. Armstrongs have also reintroduced a range of touring and sports tandems.

B.S.A. Group

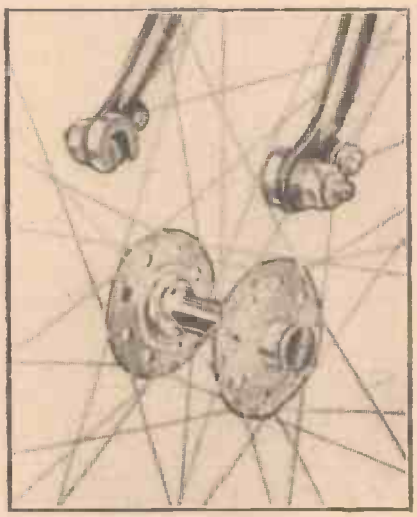
This year the B.S.A., Sunbeam, New Hudson group have introduced a Safety Shopping Model for ladies—this model has a semi-upright frame of the loop type, and a substantial carrier is fitted to the head tube and holds a shopping basket fitted with a metal handle; the basket is instantly detachable and stands well away from the brake cables. At the basic price of £15 16s. 2d., this model should meet with a ready market.

On the Gold Vase Special and Gold Vase models there is an entirely new drop-out to front and rear wheels, and by means of spring-loaded attachments the wheels can be removed or replaced almost instantaneously. One attractive New Hudson model is the Junior; it has standard-sized tubing and lugs, 20in. x 1⅜in. tyres on Westwood rims, and sells at the reasonable price of £11 2s. 8d.

On several of the Sunbeam tourist models the new B.S.A. 3-speed quick release hub is fitted—this consists of hardened steel dogs engaging together at the sprocket.

Mention must be made of B.S.A.'s new "Tour of Britain" sports model. The 70 deg. frame is available in either 21½in. or 22½in. sizes of 531 tubing with inserted head races; the forks are D to round section with 2½in rake, wheels are 27in. H.P. with double-butted spokes on new B.S.A. wide-flange hubs; c/w and cranks are 6½in. fluted 5-pin detachable type. The pedals are B.S.A. quill pattern, and with a Brooks B15 saddle and a choice of four flamboyant finishes this model represents outstanding value at £19 18s. 11d.

The well known and tried Amalgam system of frame jointing is being used this year on Dayton machines. The popular Roadmaster has been improved for the new season by the fitting of a Nicklin 300 47-tooth chainwheel, which has bosses to enable an additional ring to be added if required.



The new B.S.A. quick-release device.

New Hercules Machines

Hercules have introduced a new Glido model for juveniles. This is a pavement cycle with a 13in. frame, 13in. by ⅞in. cushion tyres, and an attractive finish, at £6 19s. 6d., or £7 13s. 10d. with pneumatics.

At the other end of the scale is the Pullman Super Tourist of Tru-Wel 2030 tubing, with Dunlop translucent Fort tyres, fitted to 26in. x 1⅜in. Westwood rims, a Hercules 3-speed gear with handlebar control, a gearcase, North Road handlebars and roller lever brakes. A Brooks B 35/1 saddle, and rubber pedals complete a machine, finished in wine flamboyant with double gold lining, that is eminently suitable for a gentleman of the professional class. The price of this very attractive machine is £21.

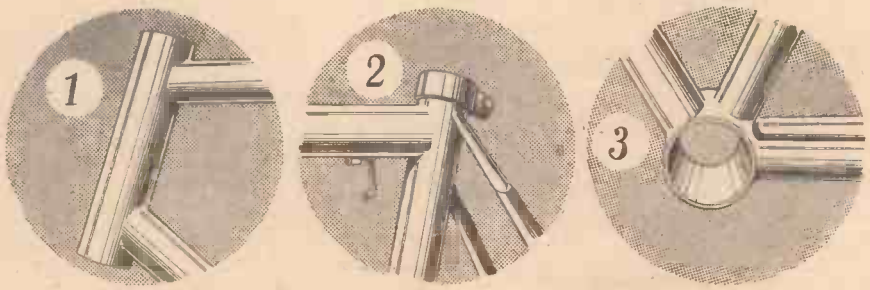
The well-known range of Kestrel lightweights has been re-named this year to Aston. This is due to the firm's Aston factory being close to the spot where the former Aston track was, and where Aston Villa still play football.

This year it has been found possible by Hercules to make an average reduction of 5s. in 19 models of cycles and at the same time to improve the specifications.

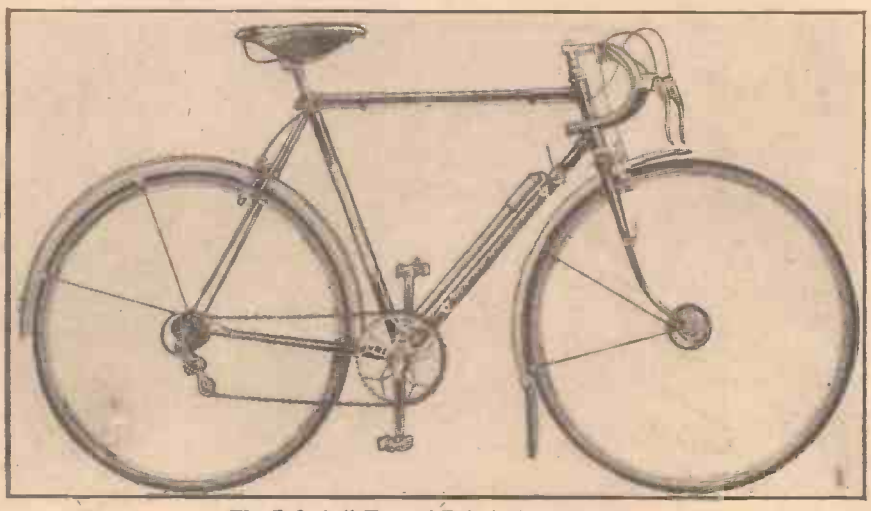
The old-established firm of James is alive to the need for a special cycle to cope with the growing demand for auxiliary motors. Models 120 MBT and its feminine version 121 MBT have reinforced frames and forks, stout gauge spokes, roller lever hub-braked wheels enclosed by wide D-section mudguards. The machines are finished in black enamel with red/gold lining. The price of £19 10s. includes number plates.

The Raleigh Group

As last year, the Raleigh group of Raleigh, Rudge-Whitworth, Humber and Robin Hood, are marketing the complete range of low-priced Robin Hood cycles, eight models in all, and this range is now made in



The "Amalgam" system of frame jointing used by Dayton Cycles.



The B.S.A. "Tour of Britain" sports cycle.

the Nottingham factory of Raleigh Industries. There are two attractive juvenile models, one with a 15½in. frame and 20in. wheels, the other with 17in. frame and 24in. wheels.

In the Raleigh range of Sports light roadster and Dawn models, 19½in. frames have been introduced to attract the youngster. The already established 19in. junior model has been brought into line with modern practice by having normal-sized tubing and lugs.

There has been a reintroduction of the police models, which have 24in. reinforced frames, 28in. x 1½in. wheels, and 4½in. wide pedals. These models have the A.G. dynamo and D.B.V. lock, and are offered alternatively with a single gear and a front Dynohub.

Many of the roller-levered roadster models are fitted with a new anti-vibration brake shoe, and on these models there is also a welcome return to chromium-plated saddle frames and springs. On the sports models fitted with the Dynohub there is a new streamlined head-lamp finished in silver enamel with chromium-plated rim, an unbreakable focusing front lens and a visible means of ascertaining whether the light is on or off. Fixing of this lamp is by a single bolt ; the total weight is seven ounces. There is a silver-grey tail lamp visible from all angles with a dome diameter of 1⅛in.

New Royal Enfields

Royal Enfields have introduced a new range of juvenile and junior models, and in conjunction with these models they have launched a scheme called "the Gun Club." In the saddle bags of these machines the youngsters will find an entry form which only needs filling up and sending to Enfields. In return they will receive the Gun Club badge and will be enrolled as members. This scheme should help dealers to sell these machines ; we all know how kiddies love badges. In this range the boy's model is a replica of the machine supplied last year to the Duke of Edinburgh for the use of his son, Prince Charles. Both boys' and girls' machines are priced at £11 17s. 6d. These machines are designed for children between the ages of five and eight years.

Tyres and Accessories

A very neat cape or map carrier is being manufactured by Frank Ashby. The carrier of anodised aluminium fits below the head of the handlebar expander bolt; at 2s. 6d. this fitment should find a ready market.

The new Palmer oad-racing tyre.

The new Michelin sports tyre.

This year Bluemel Bros. are making a useful combination spanner and tyre lever designed to fit every nut—including the domed mudguard stay nuts—on the average cycle. All the well known range of celluloid and alloy guards are again available.

Noteworthy amongst a host of good things produced by Brampton Fittings is the Brampton No. 140A 3-speed hub, now released to the home market. This component was formerly available for export only.

The firm of Cyclo have introduced a new version of the Benelux four-speed gear, also a coaster derailleur, and a range of standard freewheels in a range of sizes 16 to 28 (not including 27). This range is guaranteed for 50,000 miles.

This year, in addition to the well-known range, Dunlops have introduced the No. 5 massed start tubular. This stout tyre has a ribbed and file tread, and should take its place on the wheels of many cycles in 1954.

The Motorette tyre received a tremendous boost last year with the completion of Lee-Warner's world tour; the size is 26in. x 1⅜in., and it is recommended for use with all auxiliary motors.

A much needed fitment has been brought out by Gills Cables. This is a cable lubricator of the brass reservoir type; by the turn of a knurled dust shield a small hole is exposed into which an ordinary cycle oilcan can be screwed. An occasional treatment by the oilcan will ensure thorough lubrication of the cables—it has been my own experience that when a brake cable breaks it is nearly always at the lever end. These lubricators should go a long way towards eliminating cable breakages which are always annoying and sometimes dangerous. This fitment has the trade name of Permaflow.

Sporting riders will be pleased to see the reintroduction of the B17 Champion Flyer. In addition to Brooks' well-known range of saddles this firm are selling an attractive range of touring bags. Noteworthy is the Leabrook of grained material; this bag, suitable especially for low saddle fitting, measures 13in. x 7in. x 6½in., and sells at £1 5s. 10d.

I was pleased to see that this year the Michelin sports tyre is available in both 26in. and 27in. x 1¼in., and 26in. x 1⅜in. sizes. These covers have the well-known zigzag tread with translucent walls.

H. Miller and Co. Ltd. have put on the market a new dynamo set 6TM. This set is designed for motorised bicycles with incorporated lighting coils; finish is in silver grey, or black. The No. 596 tail lamp has a panel for illuminating the rear number plate; with cable and bulbs the set retails at 25s.

In addition to their large and very well-known range of dyno hubs and hub gears, Sturmey Archers have introduced a new streamlined lamp.

A welcome note has been struck by Edward Williams. All their well-known range of C1200, C34 and C1000 chainwheel sets will now be available in 3/32in. size as well as the standard width of ⅛in.

The British Hub Co., Ltd., makers of Airlite and Solite hubs, have produced something new for the racing man—a quick-release hub. This component should be in great demand as for a long time the only quick-release hubs available have been of Continental manufacture.

Improvements have been made to the well-known G.B. "Coureur" brakes. Small bosses have been positioned on the back of forged stirrups to carry straight-shank springs, thus reducing friction, while maintaining efficient release of the stirrups. The use of a moulded nylon bush on the main brake pivot eliminates the need for lubrication ; for improved efficiency in wet weather, new moulded studded brake-blocks have been introduced.

Peter Lee-Warner seen standing with Mr. H. K. H. Cook, outside Australia House before commencing a 23,000 mile bicycle trip to Australia and back, on a bicycle equipped with a synchromatic drive Power Pak ½ h.p. bicycle motor and a Dunlop "Motorette" tyre.

JET AIRCRAFT FUELS

The Fuel Requirements of Modern Jet Aircraft Engines

IN this country, the Whittle jet aircraft made its first flight in the spring of 1941. Since then, developments have been rapid and are still continuing. The fuel requirements of the ordinary jet engine (the turbo-jet) are in essence those of the gas turbine, for the turbo-jet produces the stream of high-velocity gases which make up the jet by burning a fuel in compressed air, while the air compressor is connected to a gas turbine. Part of the force in the jet of gases drives the turbine and the remaining force is the actual jet which drives the plane.

Also based on the gas turbine is the turbo-prop, or propeller-turbine engine, in which a gas turbine replaces the piston-engine of the older types. Virtually all the force in the stream of gases is used to drive the turbine, so that the aircraft is not jet-propelled at all. Nevertheless, its fuel requirements are similar to the turbo-jet.

Other modern engines such as the ram-jet and the rocket engine, which are not based on the gas turbine, and are used only for special purposes, are not discussed here.

Although it is not to be expected that piston-engined aircraft will, at least in the near future, be wholly replaced by gas-turbine types, the use of these modern engines will continue to increase, particularly in the United Kingdom which is recognised as leading the world in their development. Thus, the oil industry is faced with a steadily rising demand for fuels which are somewhat different from those used in a piston engine. Military needs for the new fuels would increase sharply in the event of a war.

Past experience has shown that the oil industry is fully capable of adjusting its output to meet new requirements—it is particularly flexible in its organisation and processes—and the aviation fuel situation is continually under review. Gas turbines are still in an early stage of their evolution and, as research continues, it is likely that they will become less selective in their fuel requirements. This is in sharp contrast to the piston-engine, which needed more highly specialised fuels as engine development progressed.

Fuel for the Older Engines

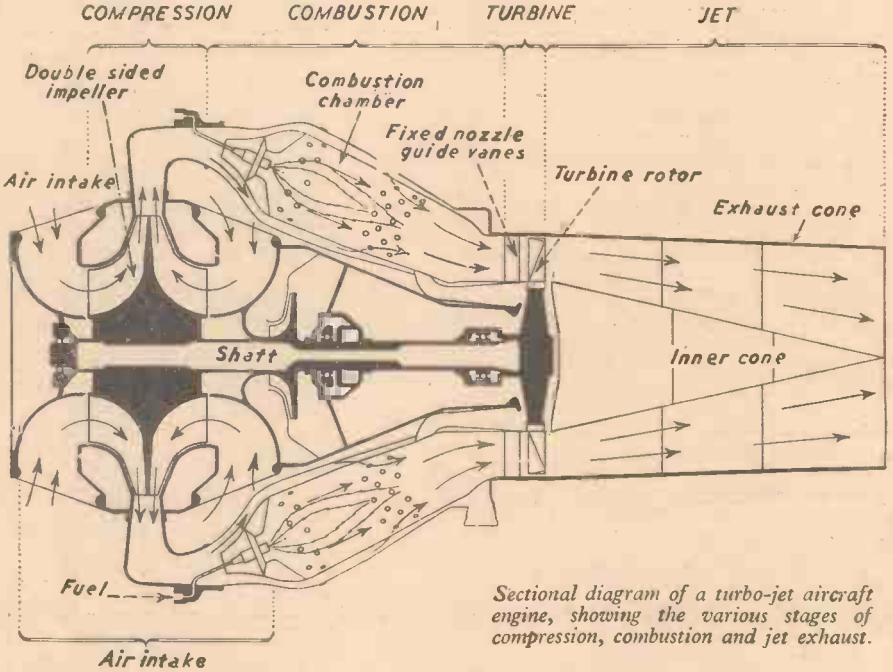
Piston-engine fuel requirements depend on a number of factors, only a few of which can be briefly mentioned here to provide a comparison with aircraft turbine fuel needs.

The aircraft piston-engine works on the same principle as the ordinary car engine, and its fuel is therefore basically similar, but the engine's very high power-output, the need for absolute reliability, and the more severe operating conditions call for more stringent specification in aviation gasoline (petrol) than in motor gasoline. Of primary importance are the anti-knock rating of the gasoline and its volatility, that is, the ease with which the gasoline evaporates and forms a vapour. Volatility must be high enough for easy ignition, yet not so high that, particularly under the influence of changes in temperature and atmospheric pressure, bubbles of vapour may form in the fuel pipes and restrict or even prevent the flow of gasoline.

The anti-knock rating denotes the ability of the fuel to burn smoothly in the cylinder without "knocking," which results both in loss of power and overheating, a potential cause of serious damage to the engine. The high anti-knock rating required in aviation gasoline is secured by including a relatively high proportion of "aromatic" components (e.g. benzene) which are produced during petroleum cracking, or the use of anti-knock additives such as tetra-ethyl lead. New petroleum refining techniques have been developed to obtain components of high anti-knock quality for aviation gasoline, notably the "alkylation" process, which was of supreme importance during the last war.

Fuel for the Newer Engines

It has already been explained that fuels for turbo-jet and turbo-prop engines must meet the needs of the aircraft gas turbine.



Sectional diagram of a turbo-jet aircraft engine, showing the various stages of compression, combustion and jet exhaust.

Gas turbine engines (not "jet" engines) are also being developed for many applications in industry, and inland and sea transport, so that the possible range of fuels for such engines is an unusually wide one, including not only petroleum products, but even such substances as pulverised peat, powdered coal and sewage gas. For use in aircraft, however, a considerably narrower range of fuels has to be considered but, compared with the piston-engine, the aircraft gas turbine is considerably less selective in its requirements.

Broadly it may be said that a petroleum fuel of the kerosene type appears to be best suited to the aircraft gas turbine. Lighter fuels such as aviation, gasoline, and heavier petroleum products (even as heavy as "topped" crude oil) have been tried, but they are unsatisfactory for the reasons explained later. Kerosene (paraffin oil) was used in the first Whittle jet plane, and it seems likely that fuels with similar properties will remain the most popular for general use.

The needs of military and civil aircraft have certain important differences. Availability is more important to an air force than any other factor; in wartime, particularly, it must be fully assured of ample supplies. Civil airlines, on the other hand, are obliged to make cost the primary consideration, while a fuel which reduces fire hazards proves an additional attraction to them. These differences must be borne in mind when considering the technical properties of the possible fuel.

Main Technical Factors

(*a*) *Specific Gravity.* The higher the specific gravity the greater is the calorific value of a given *volume*. The fuel capacity of aircraft is limited by volume rather than by weight (except in the case of very large planes which tend to be more restricted in the weight they can carry). Thus, for jet planes a high calorific value per gallon is desirable, and so a high specific gravity—a heavy petroleum fuel—is advantageous from this point of view, although, in fact, other considerations at present dictate the choice of fuel.

The consumption of a jet engine is appreciably greater per hour than a piston engine, so that for military use, where time in the air is often more important than distance covered, the highest calorific value compatible with other considerations is particularly desirable. In civil airlines, miles per gallon are of greater importance than hours per gallon (when covering a fixed route), and the greater speed of the jet plane helps to offset its higher consumption, since it operates at considerably higher altitudes than piston-engined craft, so that air drag is reduced. If, therefore, a turbine plane has to fly for any length of time at lower altitudes consumption increases substantially.

(*b*) *Volatility.* Volatility need not be as high as that of fuel for a piston-engine, but if it is too low, so that the fuel does not vaporise easily, difficulty may be experienced in starting the engine and unvaporised fuel may collect and cause overheating and damage. As the lighter fuels are normally the more volatile, this tends to limit the choice of a fuel with a high specific gravity.

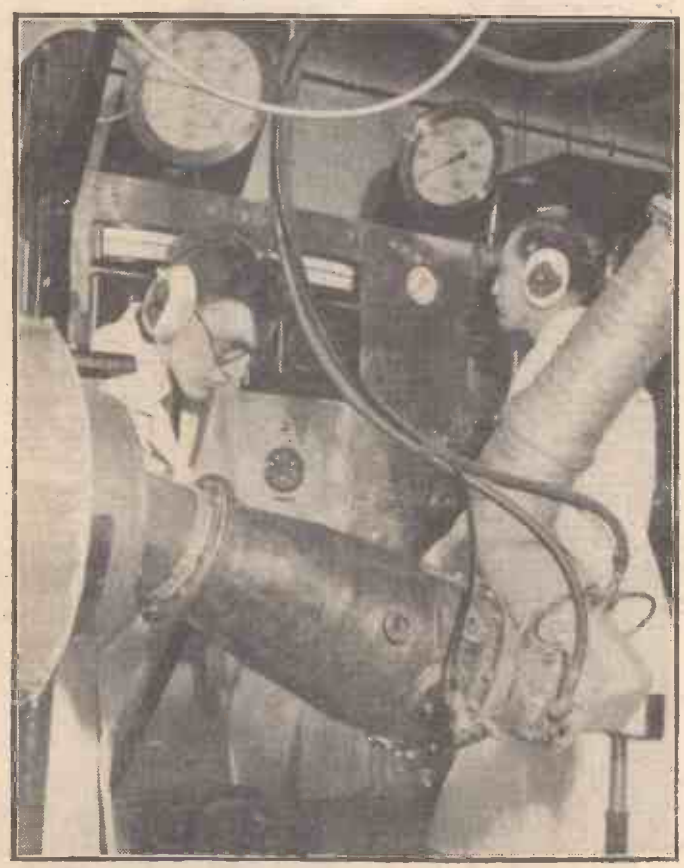
Military aircraft are liable to operate in exceptionally cold climates and so easy starting under severe conditions is important, while, in certain cases, civil aircraft may find it an advantage to stop one or more engines temporarily while in flight, for economy

(*Continued on page 217*)

reasons, and then restart them under low temperature conditions.

As in piston-engined aircraft, there are disadvantages in having a fuel with too high a volatility. Vapour locks may form in the fuel feed system, and on a rapid climb to high altitudes, which is an outstanding feature of a jet plane, the fuel may remain more or less at ground temperature, and, as the fall in atmospheric pressure due to the increase in altitude lowers the boiling-point of a liquid, a volatile fuel may be warm enough to boil or at least to evaporate rapidly. Another disadvantage of a volatile fuel is that the fire hazard is increased.

(*c*) *Freezing point.* A heavy fuel, or heavy constituents in a fuel with a wider range of components, might freeze at very cold altitudes or at least become so viscous as to be unable to flow easily along the feed pipes and through the fuel filters. This consideration favours a lighter and more volatile fuel.



The photo on the left is of a gas turbine research laboratory of an oil company's research station, where comprehensive testing of fuels for jet aircraft is carried out. A test is shown in progress using a Rolls-Royce Derwent V combustion chamber. The special ear pads worn by the operators are to protect their hearing from the high pitched whistle of the jet exhaust.

The very low temperature of the air at high altitudes may appear to make serious freezing problems likely, but there are two mitigating factors: the fuel takes an appreciable time to cool down to the air temperature, and the friction of the air as it flows over the aircraft raises its temperature.

If we consider these three requirements, (*a*) to (*c*), it will be seen that they are to some extent contradictory. (*b*) and (*c*) favour a light fuel giving a satisfactory degree of volatility and a low freezing-point, while (*a*) points to the desirability of a heavier fuel, other things being equal, because of its greater calorific value per gallon. Thus, a petroleum product, or products, of the light/medium-distillate category is indicated, and kerosene has the desired properties. So also would a fuel containing a wider range of components (for example, a mixture of gasoline, kerosene and diesel oil) for this would include some components with high volatility, for easy starting, and other heavier components which by themselves would be unsatisfactory from this point of view.

(*d*) *Other factors.* High aromatic content of the fuel was mentioned as a feature of gasoline because of its anti-knock properties. There is no comparable "knock" problem in the gas turbine. It was earlier thought to be essential to keep the aromatic content of turbine fuel low, because these compounds are responsible for greater deposition of carbon during combustion, with a resultant overheating and possible damage, but improved combustion conditions have already reduced such dangers, and further improvement appears to be likely. Thus, quite a high proportion of aromatics can be tolerated, and this will increase the availability of suitable fuels.

The influence of sulphur compounds in the fuel has also been investigated. Under certain combustion conditions corrosive acids can be formed, but it does not appear that these conditions obtain in most of the combustion zones of a jet engine. Another possible danger is corrosion of the fuel tanks and pipes by sulphur compounds, but simple tests can ensure that the amount and type of these compounds are harmless.

Availability

The yield of kerosene from crude oil is not very large—recently in the U.S.A. it averaged 6 per cent. of a barrel of crude oil. Such a quantity would be quite insufficient to meet a military emergency, but in such a case it would be possible to use a fuel with a wider range of components, drawing on gasoline, kerosene and diesel oil, If cracked gasoline stocks were included, it has been estimated that the availability of such a "wide-range" turbine fuel might even be as high as 50 per cent. of crude oil supplies. This would only be possible at the expense of other users of petroleum products, but the significant fact is that the oil industry would be able to meet any emergency even to-day or to-morrow, if necessary.

The other uses to which kerosene is at present being put are mainly lighting and heating, and as a tractor fuel, particularly in agriculture. The use as tractor vaporising oil is likely to grow, but kerosene for lighting and heating is largely concentrated in undeveloped regions, and modernisation is such areas might result in a fall in kerosene demand which would help in counter-balance the rising needs of aviation turbines. Modification of "cracking" processes would always be possible to increase the yield of kerosene at the expense of other crude oil fractions, but any change to a more complex refining process would undoubtedly result in increased cost, and this would tell against its use, more especially by commercial airlines. Indeed, in the long run, as overall demand for turbine fuel outstrips the yield of kerosene, the "wide-range" type of fuel appears to be the easier

Pictured on the right is the measuring of the characteristics of a jet fuel spray in a specially designed piece of equipment in an oil company's research station.

and more likely alternative to increased kerosene production, particularly as turbo engines are expected to become less selective in their fuel requirements.

Cost

Just as considerations of availability are primarily concerned with military needs, so a discussion of cost is mainly related to commercial airline operations. Kerosene is relatively cheap (and, in the United Kingdom at present, carries no taxes, whereas the current tax on aviation gasoline for internal flights is 1s. 10½d. per gallon). When civil airlines reach the stage where turbine needs can no longer be met by kerosene, a wide-range fuel can probably be obtained at reasonable cost: it does not involve more complex refining processes, and so its manufacturing cost is not very high. Its initial distribution cost would probably be greater than kerosene, for it would represent a special grade, unsuitable for other uses, but if demand had reached reasonable proportions the fuel would soon be distributed in sufficient volume to displace one of the present grades of aviation gasoline at a similar cost.

A comparison of the operating costs of piston-engined, turbo-prop and turbo-jet aircraft, which was given last year by Mr. Masefield, chief executive of British European Airways, is of interest.

For a short flight of about 200 miles (London-Paris) the piston-engine proved still to be the cheapest.

Mr. Masefield explained that the differences in fixed annual costs are due to the fact that turbine planes are at present rather more expensive to build than piston-engined aircraft, while jets are in any case more expensive to manufacture, as they are appreciably larger than piston or turbo-prop aircraft for the same payload. Hourly cruising costs of the turbine planes are higher, in spite of the cheaper kerosene fuel, because of their greater consumption rate.

GASOLINE KEROSENE	Piston-aircraft	Turbo-prop.	Turbo-jet
Aircraft :			
All-up weight, tons	26	26	39
Cruising speed, m.p.h. ...	260	310	450
Block Time, minutes ...	75	68	55
Block Speed, m.p.h. ...	160	180	225
Costs :			
Fixed annual costs, £	515,000	536,000	632,000
Hourly cruising costs, £ ...	47	51	79
Landing costs, £...	48	48	52
Operating costs :			
Per year, £ ...	1,850,000	1,860,000	2,204,000
Per hour, £ ...	120	132	198
Per aircraft-mile...	14s. 9d.	14s. 11d.	16s. 11d.

The operating cost of the turbo-prop is scarcely greater than the piston plane, and it is slightly faster. The turbo-jet is 19 per cent. more expensive to run than the piston-engine, with 25 per cent. reduction in flying time.

On longer flights the turbine aircraft starts to come into its own. For a London-Rome trip (about 900 miles) the jet's operating cost would be only 11 per cent. above the piston aircraft with 1½ hours less flying time. For 1,500 miles the jet would save 2½ hours in flight compared with the piston-prop, and 1½ hours compared with the turbo-prop. For distances such as these, passengers would be likely to show a strong preference for the rapid jet plane, if the price of the ticket was not much greater, and this would compensate for the higher operating cost. For still longer flights the jet would probably be an excellent proposition, even at a higher fare.

For distances of 500-1,000 miles the turbo-prop is likely to supersede the piston plane because the operating cost is similar—it is faster, and the absence of vibration and quieter flight are considerable attractions. If fuel consumption and maintenance cost of both the turbine types are reduced, their advantages over the older propeller planes will be even greater.

The present state of development of the gas turbine aircraft indicates that the kerosene fuel now in general use will, when demand makes it necessary, be replaced by a wider-range petroleum fuel.

Research into the engines and their fuels is continuing, and at present only part of the story of their evolution can be written.

(Reproduced by courtesy of the Petroleum Information Bureau.)

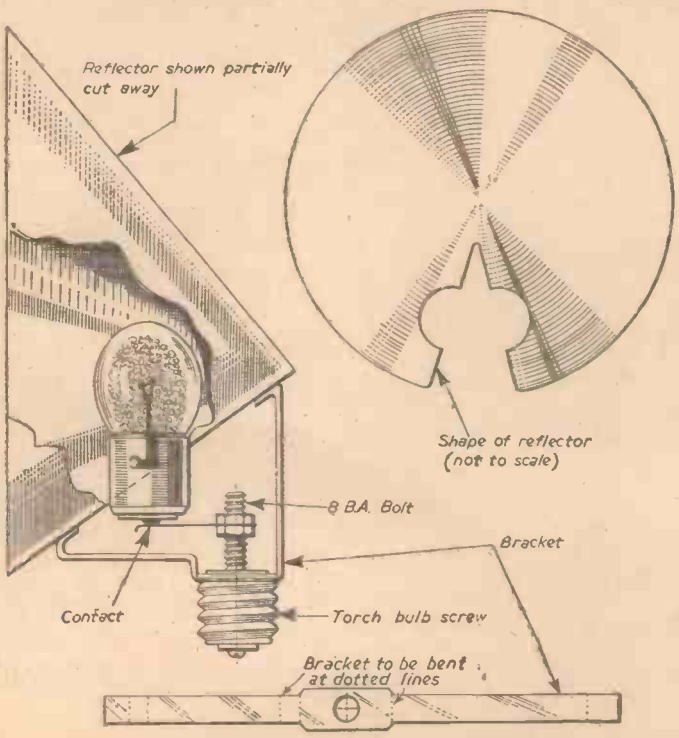
An Open-flash Adaptor

An Easily Made Unit for Use With a Torch

By F. G. RAYER

THIS simple unit was made up to permit an ordinary torch or flash-lamp to be used for flash photography, and it is screwed in to replace the torch bulb. The general appearance of the completed flash-gun is shown by the photograph.

The diagram illustrates how the adaptor is made up, and the parts were cut from tin-plate, which is satisfactory for the reflector, and easy to solder. The reflector itself is about 6in. in diameter, and bent into a conical shape. It directs light on to the subject, and keeps it away from the camera lens, and should not be omitted.



Details of the flash-bulb holder and reflector.

Flash-bulb Holder

The flash-bulb holder was made by cutting a strip of metal, fashioning it into a tubular section, and soldering along the joint. Two "L" shaped notches are cut so that bayonet-cap type bulbs may be inserted. The pip of the bulb touches a contact secured to the 8 B.A. bolt. The latter passes through the torch-bulb screw, its head occupying the position normally taken up by the contact on the bottom of the bulb. An old bulb was carefully broken to obtain this screw, and subsequently filled with plastic wood, through which the 8 B.A. bolt passes. Other insulating compounds could be used.

The gun can be used in conjunction with any camera which has a "B" or "T" shutter setting. An aperture of about F11 at 8ft. is usually suitable, so that box cameras and similar cameras with small lenses may be used. The subject should be in fairly subdued light. The shutter is opened, the bulb fired, then the shutter closed. The subject need not be motionless, since the duration of the flash is sufficiently short to "freeze" all normal action. A range of flash-bulbs may be obtained from photographic dealers, and the various makers give exact details of the aperture which should be used, to obtain a correct exposure with various films, and at various distances. Indoor subjects may therefore be photographed with the minimum of trouble, and good results obtained.

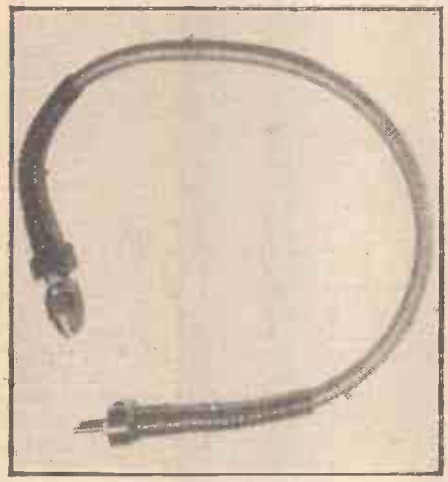
The completed flash-gun ready for use.

Trade Notes

The "Mini" Flexible Shaft

MESSRS. E. C. HOPKINS, LTD., of Birmingham, had the owner of the small private workshop in mind when they produced the latest addition to their range—The Hopkins "Mini" Flexible Shaft, but its robust design has led to its use by large companies, including an important aircraft manufacturer.

This versatile lightweight tool can be driven from any type of motor available, and



The "Mini" Flexible Shaft.

will perform all the duties of a flexible shaft—drilling, filing, sanding, etc. The lightweight construction makes it an easy tool to operate in awkward positions.

The shaft rotates on ball bearings, an important refinement in models of this size.

Other details are as follows: Standard size, 3ft. long. Special lengths supplied to customers' own requirements. ¼in. diam. shaft; ¼in. diam. drill chuck; ¼in. diam. shank on driving end. Flexible inner cable is guarded by a substantial outer casing.

It is priced at £3 3s. 9d., and is available direct from the makers, plus 1s. 6d. postage, or through their showrooms at London, Birmingham and Manchester.

Note.—This shaft was recently advertised in PRACTICAL MECHANICS as being 5ft. long for the above price whereas the standard length is 3ft. Longer shafts are available on quotation.

Johnson's Photographic Competitions

IN addition to the usual autumn competition last year there was a competition especially for club members. The autumn competition was, as usual, divided into three classes. The first class was divided into three sections: Section A, Country Life; Section B, Town Life; and Section C, Portraits or Figure Studies. Class 2 was for novices and Class 3 for the under-eighteens. In each section of Class 1 the prizes awarded were one first prize of £10, two second prizes of £5 and three third prizes of £2. In Classes 2 and 3 the prizes were one first prize of £5, one second prize of £2, and four third prizes of £1.

In the club competition there were two classes, each divided into two sections. In Class 1, Section A was for A Picture Indicating Work, and Section B was for A Picture Indicating Pleasure. In Class 2, Section A was for Pictures of People, and Section B was for Any Other Subject. The prizes in each section were one first prize of £10, two second prizes of £5, two third prizes of £2, and two fourth prizes of £1. In Class 1, no awards were given for 1st, 2nd and 3rd in Section A, or for 1st and 2nd in Section B. Eighteen consolation prizes were awarded for pictures taken from all classes.

A new competition, solely for flashlight photography, is announced for 1954, and entries will be judged on technique, quality and originality. Entries may be indoor, outdoor, day or night, and may be taken by any form of flash. The rules are similar to those of other Johnson competitions, and the prizes will be three first prizes of £10 each, five second prizes of £5, eight third prizes of £3 and twenty fourth prizes of one guinea. Further particulars, if required, may be obtained from Messrs. Johnson's, of Hendon, Ltd., Hendon Way, London, N.W.4.

The Venner Park-O-Meter opened on left to show table position for easy maintenance.

First British-made Parking Meter

THERE is much speculation on how soon the first parking meters to be legalised for public highway parking will be operating in famous London thoroughfares. There have been reports that these meters will be imported at the expenditure of valuable dollars, but this may not be the case, as an enterprising company situated in the suburbs of London has been planning a parking meter to be produced entirely in this country. This is by arrangement with an American company which manufactures the most popular parking meter in existence.

This British parking meter is called the Venner Park-O-Meter, and is being manufactured by the company so well known for its time switch mechanisms, Venner Limited, New Malden, Surrey.

It is expected to be available in quantity early this year, and will cost about £30.

The "Inca" Woodworking Machine

THIS precision-built woodworking machine, recently arrived from Switzerland, is the first universal woodworker of its type to be seen in this country, and is an important addition to the range of woodworking machines available from A. G. Gamage Ltd., Holborn, E.C.1.

The machine will carry out the following operations quickly, precisely, and without effort: Ripping, bevelling, cross-cutting, mitring, grooving, rebating, sanding, drilling, long-hole boring and slotting.

The "Inca" comprises a saw-bench unit, having alloy table and extension giving 16½in. x 25¼in. area, with self-aligning rip-fence and special mitre gauge and guard. It will take up to a 7in. blade. Also incorporated is a rise-and-fall table which tilts 45 deg. The saw spindle, which accommodates also the moulding head, a wobble saw and corner-locking cutter-head, is extended to take the ⅜in. capacity drill chuck, disc-sander, sanding drum and boring bits.

A special table, which is an independent unit, is bolted to the bench to provide for boring and slotting and sanding. The table elevation (2¾in.) is controlled by hand knob, transverse movement 3½in. and depth-feed movement 4in. are by hand levers. Feed stop, series guide and clamping device are provided.

A protecting device for grooving and moulding operations is supplied, and incorporates sprung guides for horizontal and vertical clamping of workpiece, ensuring smooth and accurate operations in safety.

This multi-purpose machine is available for joiners, cabinet makers, light industries, maintenance departments, etc.

Various combinations of the "Inca" are available at prices between £45 and £65, or complete with ¾ h.p. motor mounted on floor stand £64-£84. It is also possible to purchase just the saw-bench unit without extension tables or motor for as little as £24.

The "Inca" Woodworking Machine.

Flash Photography—A Correction

In the article on Flash Photography, published in our November issue, reference was incorrectly made to a Mazda S.F.15 tube. This, of course, is the "Sieflash" flash-bulb, type S.F.15, made by Siemens Electric Lamps and Supplies Ltd.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views of his correspondents.

Conservation of Energy

SIR,—May I answer the remarks made by S. R. Morgan in the November issue?

He appears to confuse energy used with the final effect of that usage. I am sure that he could not convince Sir Edmund Hilary that the energy used on his ascent and descent of Everest was nil, even though, except for a few small flags at the top, the final effect was the same as that before starting out. It should be quite clear that the nullification of the effect of output of energy does in no way nullify the fact that there has been an output of energy, except, of course, "algebraically." Furthermore your correspondent admits that stripping is done against the field, implying resistance and, therefore, reactive force. He also states that the amount of the original energising is irrelevant. I agree, though he seems to assume I thought otherwise. The force required to resolve pre-existing opposing and neutralising forces into useful power need be relatively very small, as in the tiller-work involved in sailing a ship almost into the eye of the wind, or in the detonating of a bomb.

His analogy of the stone is bad. I presume the stone did displace some soil or at least suffer a slight rise of temperature on impact. His furthering of the analogy is beyond my ken, since, though gravity and magnetism are akin, but not so as it seems to be to him, gravity is dependent on and directly related to mass (density-volume), and naturally any addition to earth's mass would increase its gravity. I trust he does not presume I suggested contrariwise.

With regard to his reply to Mr. W. J. Land, I wonder if he has pondered on the possibility of the heating of meteors being partly due to relief from interspacial forces on reaching earth's damping field, or do his books (with all respect to recorded knowledge) tell him that such forces do not exist?—E. T. BAILEY (Barnsley).

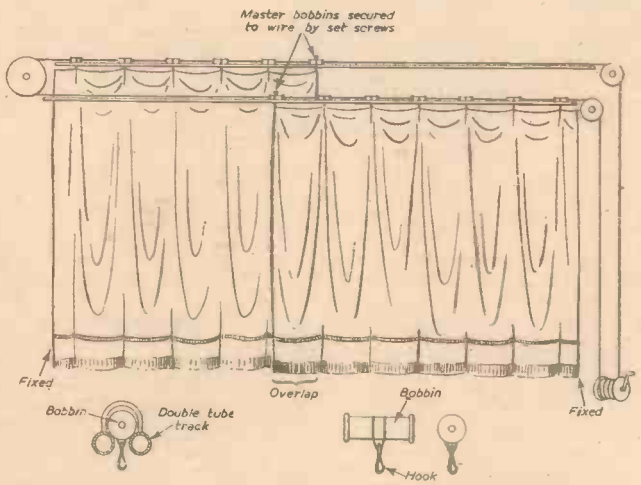
Perpetual Motion

SIR,—Replying to A. A. Tyler, who comments on my previous letter on perpetual motion, I can assure him that Prof. Andrades' book "Engines" (1928) is not unknown to me. I have also attended quite a lot of discussions on the subject, and I have made several attempts myself—unbalanced wheels, magnetic gadgets and capillary things. Needless to say, none of them worked.

To my mind, to say a perpetual machine is one that receives no power from outside and that will go for ever is somewhat egregious. Simply because there is no such thing as perpetuity. Let me try to illustrate my view.

No one could say that a peg top is perpetual motion. This I take it is because it received an impulse to start it and it will eventually run down. Carrying on from there the gyroscopes used in Brennen's monorail train would run for a very long time before they ran down. And, of course, they received an impulse to start. Carrying on still more, the world has been spinning for countless millions of years. Now let us talk *practical sense*. Never mind the view of the theorist who, to me, talks learned nonsense. The world is supposed to have received some impulse at the start of its life that caused it to spin, and one day it will stop. Thus, according to the No. 8 hats, this is not perpetual motion. So perpetual motion is non-existent! What on earth is the good of talking about something that never has, does not, and never will, exist. Let us get down to something practical. What I suggested in my previous letter *does* exist, and if something of the sort were accepted, inventors would be encouraged to make machines that, if they could not go on for ever, could go for a long time.

I am afraid I consider a frictionless, self-generating machine beyond the realm of common sense.—C. P. THOMPSON (London, W.14).



(Right).—Diagram representing the dawn of the Cosmos.

(Left).—Mr. A. H. Pafford's curtain arrangement.

Stage Curtains for Village Hall

SIR,—In reply to the query from G. C. Roberts in "Information Sought" in the December issue, regarding the operation of stage curtains for a village hall, the following may be of help.

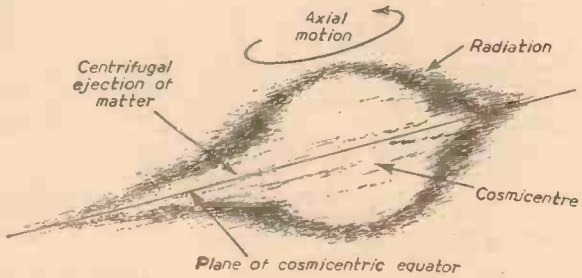
The diagram above is almost self-explanatory. The curtain is hung from bobbins which slide on a track formed of two tubes. The bobbins are strung on an endless cable wound on a drum in the manner shown in the diagram. The two tracks, one for each curtain, are arranged one above and slightly behind the other. The arrangement is similar to that of a cinema curtain.—A. H. PAFFORD (Portsmouth).

Orbital Cosmos

SIR,—In the December issue Mr. Cousins suggests that my theory of an orbital cosmos need not account for the shift towards the red end of the spectrum, as the shift is probably due to a radiation energy loss over the immense distances travelled. If this were the whole story, it would imply a static cosmos which is in contradiction to the Doppler principle of velocities. It cannot be denied that the shift is tied up very closely with the recession of a body—for example, the approaching and receding limbs of our rotating sun. The great velocities signified by the shift, and to which Mr. Cousins objects, must be accepted as approximately correct, if the Doppler principle is to hold. I have expressed doubts as to the validity of certain velocities and directions assessed at great distance, but believe in the principle as applicable to an accelerating and decelerating orbital cosmos.

A static cosmos is completely out of the question. A cosmos viewed as a single unit cannot be relatively static to anything else, as nothing else exists. It follows from this, that only integral parts of the cosmos can be relatively static to *each other*. This demands a stationary condition for every body in existence. Once the slightest movement of a body occurs, the cosmos possesses relative motion. As motion occurs within the solar system and our stellar world as a whole, we must assume that movement prevails throughout the cosmos. If this was not so, our present interpretation of physical laws would collapse.

It is agreed that the *known* cosmos appears spherical in form; but this may be due to the restricted range of present telescopes compared with the depth and width of the cosmic orbital bands. Cosmic dust would also become more prevalent when probing towards the *cosmicentre*, thus obscuring vision. We may assume that herein lies tremendous opportunity for future radio astronomy.



Even though there is at present no direct evidence of the ultimate cosmos being lenticular in form, it is difficult to envisage an orbital cosmos which conforms to any other shape. To postulate a cosmicentre it is reasonable to infer that it possesses axial motion, as no such gigantic centre of energy could be expected to remain quiescent. Given this motion, it becomes highly probable that matter would be flung into orbit round this centre on the plane of the cosmicentric equator. This is in keeping with planetary and galactic systems. For very definite reasons, which cannot be detailed here, the spiral nebulæ would pursue *elliptical* orbits, with the cosmicentre at one of the foci. No truly circular orbit is possible.

I compliment Mr. Cousins on coining the

(*Continued on page* 225)

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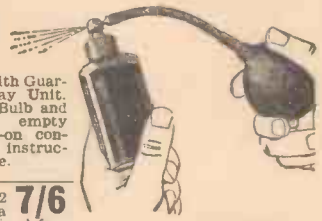

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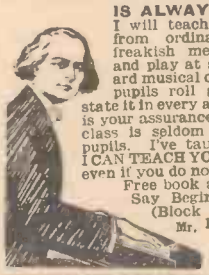

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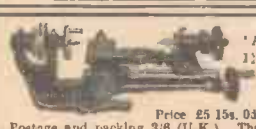

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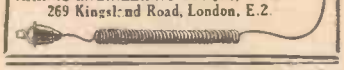

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300 other interesting items, List 1½d.

LETTERS TO THE EDITOR

(*Continued from page 222*)

very appropriate word—*pericosmion*. There remains the aphelic position to be named, which can scarcely be other than *apocosmion*. —WILLIAM ELLWOOD (Hatfield).

Pedal Car Steering

SIR,—The accompanying diagrams illustrate a device which may interest some of your readers.

About twelve months ago I constructed a child's pedal car on the lines of the one described in your October, 1949, issue.

The author's method of steering the car was effected through the use of bevel gears, presumably from an old breast drill. As my model had assumed, through using sheet iron instead of aluminium, a somewhat weighty character, on nearing completion, I rejected the gears I had in my possession as being too heavy. Instead I used the method I describe, which I find after twelve months' usage to be quite satisfactory and obviously much lighter.

The main essential is a good strong V-belt, B. Mine was a car fan-belt, split down the middle with a jack knife, thus providing a spare.

This belt is anchored to the steering arms and passed round the steering column A (a length of ⅝in. conduit tube) and anchored to it at G, as illustrated diagrammatically in Fig. 1.

At F, as shown in Fig. 2, the belt is doubled round the steering arm and the whole lot drilled ¼in. and bolted. Suitable washers are inserted and clipped over the belt to check spreading on tightening.

At G the bolt passes right through the tube and is made as unobtrusive as possible on the underside by limited countersinking, although its protrusion does not greatly impair efficiency. Again a washer is advisable as at F.

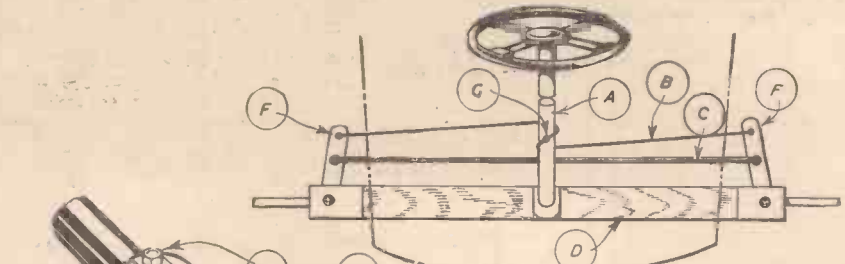


Fig. 1.

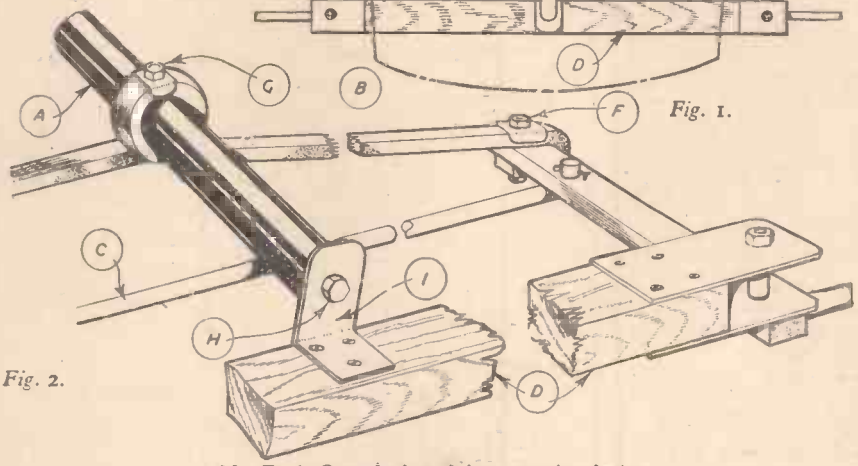


Fig. 2.

Mr. F. A. Crowther's pedal car steering device.

The track rod, C, ensures correct steering-arm positions, of course, and in my case the pivot at H for the steering column is simply an internal brass bush fitted to tube bore and bolted to bracket, I, which, in turn, is screwed to the wooden front axle, D.

The arrangement gives quite a low-geared steering. A certain amount of lost motion in the steering, depending on the tightness of the belt, is unavoidable but not detrimental. —F. A. CROWTHER (Lancs).

"Measuring the Metre": A Correction

With reference to our paragraph entitled: "Measuring the Metre" on page 116 of our issue dated December, 1953, wherein it was stated that: "it was intended the metre should measure one ten-thousandth part of the quarter of the earth's meridian passing through Paris," this should, of course, have read "one ten-millionth" instead of "one ten-thousandth."

BOOKS Received

Pioneer of the Air: The Life and Times of "Col." S. F. Cody. By G. A. Broomfield. 164 pp., 10s. 6d. net. Published by Gale & Polden Ltd., Aldershot.

THIS book, written by one who assisted Cody in his flying experiments and was an intimate friend of both Cody and his family, deals with one of the most colourful characters in British aviation—"Col." S. F. Cody, erroneously referred to by many as Buffalo Bill. The latter was W. F. Cody. Confusion no doubt arose from the fact that Cody, with Kaiser moustache and goatee beard, modelled himself on the famous character bearing the same patronymic.

It is not generally known that S. F. Cody was the first man to fly in England, although Lord Brabazon holds Pilot's Certificate No. 1. The issuing of such certificates came long after men had flown in England. Cody was not, of course, a technician and believed in trial and error. He hated theorists and would not call in mathematicians to calculate stresses on his aircraft. He believed in inverting the plane and loading the underneath wings with bags of sand. Lamentably, it was due to this dislike of theory, engendered by an inferiority complex because he had had little schooling himself, that finally cost him his life when his plane disintegrated in the air.

He had led a most colourful existence and was something of a showman and a poseur. For example, whilst the original W. F. Cody was a colonel, as colonels went in the scratch armies of South America, S. F. Cody certainly was not and the impression is left that he was anxious for the world to *believe* that he was the original Buffalo Bill. He was born in Texas and became a buffalo hunter and a remarkable horseman and crack shot. He was clever with ropes, wrote plays in which he and his family acted, a particularly notable one being "The Klondyke Nugget."

When he came to Europe he became interested in man-lifting kites and demonstrated their use for military observation purposes to the War Office. It was this interest which finally decided him to experiment with aircraft, and here in this book is a very complete, well documented and authenticated account of his life and his work written by one who knew him intimately for many years.

The author has been helped in his biography by the surviving members of Cody's family, who have paid tribute to the accuracy of the work. It is a fascinating book, amply illustrated with photographs and anecdotes. A data sheet giving the important dimensions and specification, together with dates of construction of Cody aircraft, is included. Moreover, the book is very adequately indexed.

Anyone interested in those fascinating early days of flying in this country should read this book and learn of the trials of those early pioneers and the apathy with which they were met by the governments of the day. However, he confounded all his critics by winning the Military Trials at Salisbury Plain in 1912.

Although Cody did not contribute very much to aeronautical science, he is worthy of greater recognition than he received. No monument has been erected to him, as would certainly have been done in other countries, nor has a plaque been affixed to his house. This is a case where the Aeronautical Society should study this book and act.—F. J. C.

Cycling Manual. 23rd Edition. By H. H. England. 180 pp., 3s. 6d. net. Published by Temple Press Ltd.

THE 23rd edition of this well-known manual is presented in a far more attractive and readable form than earlier editions. It is more durably bound, printed on a better quality paper, is freshly illustrated, contains a great amount of new matter and is adequately indexed.

Its chapters include: What is This Cycling? For Old and Young—and Delicate; Right Cycle—Right Position—Right Action; The Girl and the Mother Awheel; Business Riding and Dress; The Cycle Tour; Cycle Camping; Features of a Good Bicycle; Roadster or Lightweight?; Wheels, Chain-line and Gearing; Variable Gearing; Making the Bicycle Move; The Rear Fork-end & Types of Tyres; The Tyre Valve; Brakes; Cycle Lighting; The Saddle; Tandems; Tricycles; Some Rules of the Road; Time Trial Racing on the Road; Track Racing; Massed-start Racing; Training for Racing.

There are useful appendices on: Maintenance, Gear Tables, Railway Rates, Forming a Club, Speed and Record Tables.

Very good value for the money.

QUERIES and ENQUIRIES

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

Papering Over Glossy Paint

I HAVE recently moved into a new property in which the front bedroom has all the walls painted white with a glossy paint. I intend to paper this room, and wish to know if ordinary paste will be successful, or will the paint have to be removed first?—Wm. H. Secker (Deal).

WE see no reason why you should go to the trouble of stripping off the white glossy paint from your bedroom wall in order to apply paper to the latter. You can, if you so desire, wash the gloss paint down with a solution of about 1 part of caustic soda in 15 parts of water, and this treatment will, to a large extent, remove much of the gloss. The same effect could be obtained by a washing down, and particularly by a scrubbing, with hot paraffin. Nevertheless, these treatments are messy and tedious ones and we think you would obtain quite satisfactory results merely by scratch brushing the gloss paint inch by inch over the wall surface. In this way, you would obtain a non-gloss surface which could, if desired, be given a finer texture by rubbing over with sandpaper. To the non-gloss surface thus prepared, the wallpaper should be applied carefully and pressed down firmly after being amply coated with a good heavy-body flour paste. The paper, thus secured, will probably take a longer time than usual to dry out, but once properly dry it will adhere well to the wall and there will be no danger of its "starting" and becoming loose in local areas and of thus becoming more generally detached. We assume, of course, that the wall in question is a normally dry one, otherwise the paper will never remain secure even on the most satisfactorily surfaced of walls.

Blackening Microscope Scale

I HAVE an eye-piece scale (microscope) divisions 80 to 1cm. and the black colouring has disappeared. I have separated the cover glass and would like to know how to blacken the scale again which is engraved on the glass slip.—M. I. Newman (Shanklin).

FIRST clean the glass thoroughly with turpentine, then with methylated spirit and finally with amyl-acetate. Now with a soft camel hair brush apply a coat of dead-black cellulose lacquer covering all of the engraved lines completely. Let the lacquer dry—this will take only a few minutes. It is then necessary to clean off the lacquer from the raised surfaces between the lines. To do this nothing of a soft or fluffy nature can be used—no rags, cloths or blotting paper. The best wiper to use is a piece of clay-surfaced, highly glazed art paper. Lay a piece of this—a page from a good class catalogue or magazine will do—down on glass or other truly flat surface, moisten it slightly with amyl-acetate and rub the engraved scale for a few moments backward and forward at right angles to the lines. There must be no liquid acetate on the surface of the paper; only the vapour is required to soften the lacquer between the lines, and the gentle rubbing will remove it, leaving the lines filled with black.

Removing Acetone Adhesive

COULD you tell me how to get an adhesive off a black velvet dress; the gum smells like acetone.—S. Kebley (London, S.W.19).

IT seems obvious from your letter that the adhesive which you have been using consists of an acetone solution of some natural or synthetic gum, or mixture of these compounds. Hence, you will be able to remove it from the black velvet by wiping over the latter with a clean cloth charged with acetone or, alternatively, by pouring acetone into a deep saucer or shallow basin and by immersing the affected portion of the dress in it, rubbing it gently therein with the finger in order to re-dissolve the adhesive in the acetone.

If the acetone is found to evaporate too quickly it can advantageously contain about 10 per cent. of diacetone alcohol, which will slow down its rate of evaporation. Another good solvent mixture is one of about 30 parts of amyl-acetate and 70 parts of acetone. One or other of these mixtures will remove the adhesive from the velvet material, but bear in mind the fact that all these liquid solvents are very highly inflammable and must, therefore, be treated with great respect and care in the presence of naked lights.

Note carefully that our instructions above apply to a genuine cotton or silk velvet. The modern artificial silk synthetic so-called "velvet" may possibly be injured by any acetone treatment, in which case there is little that can be done apart from gently scrubbing the fabric with hot water and soap.

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.

Silvering Mirror Queries

IN the article on making a mirror for a reflecting telescope in the April, 1948, issue the Brashear Lundins' method of surface silvering is described. I am definitely put off doing this by the caution given; that the explosive silver fulminate may be formed under favourable conditions.

Could you give me the name and address of any firm who would silver such a mirror for me and the approximate cost? Is the method of silvering ordinary plain mirrors (looking-glasses) suitable for surface silvering?—M. Rock (Staffs).

IF the instructions given in the article, "Making a Telescope Reflector," on silvering are followed carefully, a clean, opaque film of silver can be deposited on the glass surface without serious danger from exploding fulminating silver. The warning *must* be given, however, because explosions of ammoniated silver solutions have occurred from time to time; probably the chief danger lies in attempting to store the solutions—on two occasions, in our experience, bottles left in cupboards have been shattered overnight. As has been stressed on numerous occasions in PRACTICAL MECHANICS, glass silvering demands great care over each operation and scrupulous cleanliness; given these qualities, a mirror can be silvered successfully in the kitchen sink, although the operation is better carried out by a chemist in his laboratory.

A far more durable reflecting surface is given to the mirror by aluminising; this is a method of depositing a thin film of aluminium on the surface by evaporating the metal in a vacuum. This is an operation requiring high-vacuum technique and is beyond the scope of the amateur handyman. Several firms will, however, undertake to aluminise amateur's mirrors at quite a reasonable figure: Messrs. C. J. Whilems, Ltd., of Ilford Works, Barking-side, Essex, aluminised a 6in. mirror three years ago for less than £1, although since then prices have no doubt increased a little.

Both flat and concave mirrors are silvered by the same methods.

Bubble Solution

I MADE up the solution given in your October issue in accordance with the directions given, but it did not come up to requirements; it was also thinner than that one purchases ready made. What do you suggest?—C. E. J. Middlemiss (Manchester, 20).

PURCHASE a 20 per cent. solution of Alkyl Sulphate from Irano Products, Ltd., Britannic House, Finsbury Circus, London, E.C.2. This solution is known as "Comprox A." The bubble solution comprises:

1 fluid oz. Comprox A.
1 saltspoon of Cerebos salt.
½ teaspoon glycerine.

(*Continued on page 228*)

Imitation Stained Glass

I WISH to paint a coat of arms on a 4ft. square piece of glass which is to be lit up from the back by electric light to show the colours, as in a stained glass window. The colours on this coat of arms are dark green, gold, brown and black. Can you help me, please ?—S. A. Birch (Leics).

WHERE windows are of ordinary clear glass and such glass is already fixed, it is best to paint on thin tissue paper rendered partly transparent by, and stuck to the glass with, japan gold size ; but, as in your case, where the glass is movable, the paper can be dispensed with and the painting done on the frosted side of ground glass. It is best not to put any paint on smooth, unroughened surfaces.

The paints to use are artists' tube colours, but care must be taken in selecting the tubes, for only *transparent* pigments are permissible for representing the *coloured glasses*. The following is a list of tubes which may be purchased :

Blues : French Ultramarine, Prussian Blue.
Greens : Hookers Green, Viridian.
Yellows : Indian Yellow, Aureolin, Roman Ochre or Raw Sienna.
Reds : Alizarin Crimson, Rose Madder.

Any of the above may be intermixed for obtaining other colours, such as purples and violets, which can be obtained by variations in proportions of Fr. Ultramarine and Crimson.

For Browns : Vandyke Brown, Burnt Sienna.

All these colours are to be mixed and thinned out with japan gold size to such an extent that they are floated on to the glass with soft camel-haired brushes and by this means there will be no brush marks. If one coat does not yield sufficient depth of tone a second or third must be applied, but each coat must be allowed to dry perfectly before putting on another.

The foregoing refers to the colouring of the several pieces of glass which are supposed to make up the window or panel. The painting, which in real stained glass work is fired on, will, in the imitation, be done with a tube colour which is strongly opaque and for this I do not think that any pigment is better than Raw Umber, to which may be added a little Indian Red and a little Lamp Black. All the drawing of outlines should be done with this, adding japan gold size to give a working consistency with perhaps a little turpentine. A fine, long-haired sable pencil will be required for this drawing, which in real stained glass is known as "the tracing." If any shading is required on the heraldic "charges," this should be done, not by painting on, but by stippling, or the paint may be painted on and then shaded off by stippling with the ends of the hairs of a dry brush. The Raw Umber mixture should be used for shading.

Lastly, there are the lead lines to be painted in. These should be drawn about a quarter of an inch wide in dark grey, perfectly opaque paint. In other words, lead colour. A lead line should separate every colour from another and from white and, by the way, any white parts should be varnished over with japan gold size. The only instance in which a colour can be applied not separately "leaded" is in the case of small changes or decoration in yellow which would be, in the case of real work, obtained by "silver staining."

The querist would find it well worth his while to study real stained glass practice. There are two modern works :

"Stained Glass Work," by C. W. Whall.
"The Art and Craft of Stained Glass," by E. W. Twining.

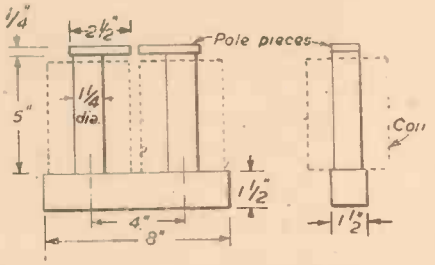
Both published by Pitman.

Making a Magnetiser

I WISH to remagnetise magnets as used in voltmeters and similar instruments. Can you inform me as to how I can make such equipment or be able to purchase same at a reasonable price ? I wish to saturate the magnet and use a de-magnetiser for calibration and "artificial ageing."—C. W. Woods (Westcliff).

A SUITABLE magnetiser could probably be obtained from Messrs. Runbaken Ltd., of Deansgate, Manchester 1, or from Industrial Electrical Co. Ltd., Offord Street Works, Offord Road, Barnsbury, London, N.1.

Alternatively, you could build a magnetiser for use from a car battery as indicated in the sketch below. The parts are made of soft



Magnetiser suitable for use with car battery.

iron or mild steel and are screwed together. The pole pieces may be secured by means of a screw through slots if required, so that the centre distances can be adjusted to the required value to suit the magnets. A coil on each pole should be wound with about 3½ lb. of 16 s.w.g. D.C.C. copper wire, the two coils being connected in series for use from a 12 volt car battery, or in parallel for use from a 6 volt battery. In either case the coils should be connected so that they produce poles of opposite magnetic polarity.

Blower for Ozoniser

IN the July issue of PRACTICAL MECHANICS you described the construction of a Household Ozoniser and I should be glad if you would advise me of the names and types of blowers that would provide the slow air stream necessary.—W. J. Harvey (Bromley).

IN point of fact it is not necessary to induce a stream of air through a domestic ozonising cabinet such as you propose to construct. The slight rise in temperature within the cabinet caused by the brush discharge is sufficient to set up convection currents which will carry the ozone-air mixture into the room. The general air movement continually going on within the room will again disperse the mixture so that every corner is eventually reached. If you still wish to use an air stream, we suggest you buy an air-pump sold for tropical aquaria.

Sight Testing Cabinet Panel

I HAVE been experimenting with new types of panels for my internally illuminated sight testing cabinet which require etching in black on white opal glass. Can you help me with the method generally used for this type of work ?—H. W. Mullard (Witney).

IT is possible to purchase composite opaque glass sheets, either white on black or black on white. You should be able to obtain these from most firms of laboratory furnishers, such as Messrs. Griffin and Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2, Messrs. Townson & Mercer, Ltd., Croydon, Surrey, or Messrs. Philip Harris & Co., Ltd., Birmingham.

The upper sheet (either black or white) is coated with wax on which the characters or figures are then inscribed by means of a stylus. Alternatively, a stencil is laid down on the upper sheet. The actual engraving is done by means of hydrofluoric acid of indefinite strength but of fairly high concentration. Hydrofluoric acid (not fluoric acid, as you state) is allowed to act for any time, according to its concentration, usually from twenty minutes to one hour forms a good average for a substantial acid concentration.

The etched parts are best filled in by means of the black wax which is used by instrument makers and clockmakers for filling in their dials. You can obtain this material fairly cheaply from any firm of clockmaking material supplies such as Messrs. Edward Gray & Son, Ltd., 12-14, Clerkenwell Road, London, E.C.1.

Another way of obtaining the figures on the glass surface is to engrave them by means of an electrical stylus which, as it were, carves them out on the glass surface. The equipment necessary for this process consists of an electrical engraving tool which is operated off the ordinary mains supply. It is not a very expensive article and it has the advantage of obviating the use of the rather dangerous hydrofluoric acid.

Levelling a Floor

I LIVE in an old house which has a cracked and uneven stone floor. I wish to level it off in the cheapest and most efficient way possible, and have tried cement of various mixtures (2-1, 3-1, 4-1) of cement and sand, but they all crumble away. Is it possible to use sawdust with a suitable binding compound ?—R. Farnell (Halifax).

THE best way to level up your stone floor is to lay a 1in. coating of asphalt mastic (black or coloured) on it. This is a rather skilled job for the asphalt would have to be laid hot and floated to a smooth surface whilst in the plastic condition. There are local firms which would do the job for you or supply you with the necessary asphalt.

If you wish to use sawdust in the new flooring composition, make up a mixture of about equal volumes of good quality sawdust and calcined magnesite. Moisten this mixture to mortar-consistency with a solution of 40 parts of magnesium chloride in 60 parts of water. This will give you a cement-like product which will lay readily by means of a steel float or even with the aid of a trowel and which will set hard within about 24 hours, thereby giving the well-known "magnesite" flooring. However, a mixture of 3 parts sharp sand (not sea sand) and 1 part of Portland cement slaked with ordinary water should give quite a satisfactory and lasting cement surface to your floor, provided that it is well keyed down and not allowed to dry out too quickly.

Information Sought

Readers are invited to supply the required information to answer the following query.

W. D. Barker writes : "At one of the pre-war motor shows I saw a device which illuminated a car battery. The battery at first appeared quite normal, but the illumination around it gradually appeared to undergo some slight change and the battery showed all its interior ; all the plates and separators, etc., became visible. The lighting gradually changed again and the battery appeared normal again.

"Could you please describe how this effect is produced ? Is there any book on the subject ? Can suitable materials be obtained for the home constructor ?"

MAIN SWITCHES (Switch fuses). 15 amp. Iron clad, by famous maker. New. 7/6 each, post 1/-.

AUGER TWIST DRILLS. New. ¼in. ⅜in. and ½in., 7 6 set of three, post 9d.

KING DICK RING SPANNERS. Size ⅜in. A.F. and ½in. New. 3/6 each, post 7d.

King Dick Spanners. Size ½in. W.Ring one end open the other, weight 1¼lbs., heavy duty, length 12in. 7/6 each, post 1/-.

"K" LOCKS. Similar standard front door type. Has many improved features. New boxed. Normal retail price 18/9 each. **Our price 7/6** each, post 9d. Three for 20/-, post free.

BATTERIES. 2-volt 16 ampere-hour. Brand new and boxed. Three of these would make good standby for 8 H.P. car. Price 7/6 each, post 2/-. Three for 20/-, carriage 3/6. Real bargain.

KING DICK SPANNERS. ½in. Whitworth. New, heavy duty Ring one end open at the other. Price 7/6, post 1/10.

TRAIN SET TRANSFORMERS. 230 volts input, 2 volts to 30 output at 2 amps., also suitable charging kits. 20/- each, post 1/2.

WHANDA CABLE STRIPPERS. New, has various fittings, different size cables. List price 15/-, our price 5/-, post 7d. 48/- dozen, post 2/-.

GRINDSTONES. GENERAL PURPOSE. New, boxed. Diameter 4½in., grinding surface 1½in. 3/6 each, post 9d. 36/- dozen, carriage 3/6.

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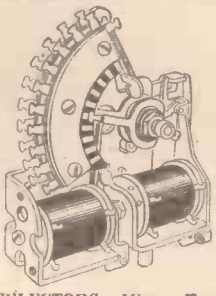

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Editor: F. J. CAMM
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COMMENTS OF THE MONTH By F. J. C.

The Last Cycle Show?

WE were astonished that the *News Chronicle* in its report of the Cycle Show should have printed a statement by what it termed "one of the biggest cycle exhibitors." The statement alleged to have been made by this manufacturer, whose identity is not stated, but who by no stretch of the imagination could be called "one of the biggest cycle exhibitors" runs: "This is the last Cycle Show. From now on it will be all power-assisted bicycles and motor scooters. The bicycle, apart from the racing enthusiast, is finished." It is the duty, of course, of newspapers faithfully to report the results of an interview, and we do not impugn this newspaper on that score. They should, however, in fairness to the cycle industry, or its cycling correspondent should have done, have checked up with the Cycle Manufacturers' Union and ascertained the facts, particularly as in its very next paragraph it says: "The industry isn't too busy looking after British riders to help the export drive. Since the war cycles and motor cycles have brought £200 millions into Britain."

The largest exhibitors of cycles would be B.S.A., Raleigh and J. and J. Phillips, who make for home trade and export hundreds of thousands of bicycles every year. None of these firms made the statement referred to. Readers of the *News Chronicle*, in the absence of any name, might have presumed that the statement came from them and we are happy to give this denial.

Of course, the cycle trade in its interesting career has had its ups and downs. The swing of the industrial pendulum creates booms and slumps. When trade is bad it is not because people have lost interest in cycling. Money may be scarce, and it may be a deliberate policy of the Government to restrict the spending power of the public by means of purchase tax.

Perhaps the best comment on this absurd statement is the announcement by the Council of the British Cycle and Motor Cycle Manufacturers' Union that it has decided to hold a Cycle and Motor Cycle Show next year from November 13th to 20th at Earls Court, London. We think the Manufacturers' Union, which organises an exhibition in the interests of expanding our trade, should impose a restriction on all its exhibitors not to make statements to the Press which are inimical to that very laudable object. We hope they will take heed of these comments.

Signposting of London

WE are glad that the Minister of Transport has accepted recommendations made by a working party, consisting of representatives of Highway Authorities, Police and Motoring Organisations (it is noted that the C.T.C. was not represented; it still, of course, has power to erect notices warning cyclists of "dangerous" hills), which has been considering the better direction signposting of London.

The signposting will be of two kinds "through route" and "local." The through signs, which will be characterised by having a yellow background, will help drivers to find their way into and out of London or to avoid passing through Central London. The through route scheme is based on an inner "ring road" by way of Hyde Park Corner, Elephant and Castle, Tower Bridge and Marylebone Road; an outer circular route embracing the existing North and South Circular Roads and main radial routes leading to the trunk roads.

A feature of the signs will be that greater prominence is given to the place name in relation to the route number. Often more than one place name will be used, e.g. Guildford and Portsmouth for route A.3 and Oxford and South Wales for A.40.

A map prepared by the Minister of Transport and Civil Aviation showing the through routes is already available through booksellers at 4s. It is proposed to have enlarged copies of this erected at points on the periphery of London with directions to assist travellers to find any locality. Smaller copies of the map will also be posted at suitable sites inside London.

At a later date local signs, which will be distinguished from "through" signs by having a blue background, will be erected. These, which will help drivers to find their way to places in the London area, will bear the names of the local districts and mileages. The detailed preparation of this scheme, which will include special signs within the ring road, is still in hand.

Stormy B.L.R.C. A.G.M.

THE annual general meeting of the British League of Racing Cyclists did not, as one might have expected as a result of its satisfactory year's working, take a peaceful routine course. The year 1953 had seen it obtain recognition by the U.C.I. and, therefore, assume a position of priority over the N.C.U. and the R.T.C.C., and another successful Tour. Stormy meetings and clashes of personalities seem inseparable in the cycling movement, and it is particularly deplorable on this occasion when a strong united front should have been presented to all of the other bodies, and to the cycling world in general, that dissension should continue within the ranks of the League and in a more virulent form. No sooner had the meeting started at 10 a.m. when accusations were levelled against the chairman concerning statements he had recently issued to the Press. The Minutes of the previous meeting were hotly debated and a vote of censure on the negotiating committee was proposed but defeated. The bone of contention was the failure of the League to take over all road racing. The League, however, was not in a position to do this in 1953. It had only recently obtained international recognition, and some time must elapse before it can install the machinery for handling such a vast programme. In our view, therefore, it was wise for it to take *festina lente* as its motto—make haste slowly. It would seem that having fought and won its battle, there are those within its ranks who wish to destroy their own Frankenstein. No doubt in time, if the League survives this internecine conflict, it would eventually take over all forms of road racing, including Time Trials. It would simplify matters, both from a national and international point of view.

First, however, the League has to demonstrate that those responsible for guiding its fortunes are tacticians and diplomats. The A.G.M. did not exhibit these very necessary qualities. The League secretary very truly stated that the Ministry of Transport permitted road racing at present, but would reconsider this view if there was friction between the controlling bodies. Another speaker expressed the opinion that if the N.C.U. were allowed to promote as many races as the B.L.R.C. the League would become redundant. Another speaker urged members to let things remain as they are for the time being so that their position could be consolidated, and by increased efficiency prove their right and ability to control road races.

On the question of the tripartite agreement, a proposal calling on the negotiating committee to help form an over-all body consisting of three members each from the League, the R.T.T.C. and the N.C.U. was accepted, such a body to possess a title of its own and to be recognised by the U.C.I. We doubt, however, whether anything useful can emerge from such a proposition, desirable though it may be. Proposals to amalgamate the N.C.U. and the C.T.C. into a sort of condominium have been made for years. Vis-à-vis committees have examined the problem but have failed to reach agreement, each body refusing to submerge its identity to the other. No one could decide who took over which.

However, through the mists engendered by the heat of acrimonious controversy, it would seem that the League will stand by the tripartite agreement, but will continue to seek revisions of it to gain complete control of road racing.

Unfortunately, the agenda contained far too many items for satisfactory discussion in one day and many of the items had to be skipped. This is an unsatisfactory state of affairs which occurs in all the other bodies. It seems to us that when the secretary prepares the A.G.M. a sub-committee should be appointed to whittle down the agenda to reasonable proportions, so that each item can receive adequate discussions. Items known to be unpopular and unlikely to be carried, especially those which are contrary to policy, should be rejected, or referred to Standing Committee so they do not waste time at annual general meetings.

Wayside Thoughts

By F. J. URRY, M.B.E.

Great red sandstone cliffs, the home of innumerable sea birds. The bay lays seven miles from Sidmouth.

Inland Tameness

DURING that Indian summer of October, I spent a week roaming Cornwall. It is many years since I first went riding over the Duchy, and I can remember now how disappointed I was with the inland scenery, bare and battered with old mines, and ghastly heaps of china clay. The coastline, generally speaking, is grand, but the coast roads—the tracks with the coast in view—are few. On occasion I have spent holidays *en famille* in the areas of Newquay, Falmouth, St. Ives, etc., to explore the river valleys on odd days of release from the domestic circle. The beauty of the area is gathered mainly amid the wooded vales, the rivers, and, for a boat-wandering visitor, the magnificent harbour of Falmouth and its environs, but as a cycle-touring ground Cornwall is a trifle disappointing to me because it lacks the sweep, majesty and colour of Devon. Nor would one mistake the entry to that shire, for, almost in a mile, the scene changes, and you feel warmed by the sight of the moors and combes, even if the hill grades increase and much walking is the order of the day.

It was October and there was no difficulty in finding accommodation, but I confess I would not like to make a midsummer visit without having advance sleeping accommodation. From a cycling point of view I think the south-west corner of England is best visited in the spring or the fall, and left to the charabancs during the "season." It was good to see the year burning its beauty amid the bracken and the foliage, a riot of colour and misty visions sun-drenched that alone made the visit worth while. As I grow older I like to seek the quiet spots for my roaming, but I am beginning to wonder now where they are.

The Quiet Places

IT used to be said that the Highlands were remote and made ideal touring ground for the cyclist. They are, but holiday invasion has cancelled that remoteness, and the main roads have become traffic laden of late years. This is all to the good I suppose, but I am afraid that this old cyclist is a very selfish person, who was brought up to visiting Great Britain before the conducted tour became a fashion, and who finds it difficult to accept the present summer conditions of our roads with equanimity. Probably the S.W. corner of Scotland—Galloway—is one of the least modern tourist-travelled areas of Great Britain, and a very lovely district it is, particularly if the little hill roads that wind among those comely valleys are explored.

I like Galloway, for it has fine samples of highland and lowland, sea coast and rivers nicely mixed in its limited area, and always the wanderer is never far from that magnet to humanity, the sea, or the great estuary of the Solway.

The ideal place for cycle touring to-day is Ireland; Ireland off the main holiday routes. Sometimes the roads are rough, sometimes it rains, often you have to carry food to preserve energy, but always the land smiles at you between the showers, and you wonder why anyone leaves those wondrous scenes for city life, even though you know the answer from your own habits and custom. Holidays for the likes of me are becoming a problem of time and place, and maybe, that also happens to other old wanderers who have known and loved the lonely road, the road that now rumbles with traffic and is painted and decorated in an endeavour to curb the too reckless spirits. And yet, for all this nostalgic memory it is good to know so many other folk are more intimate with the beauty of their land, and the paid holiday is a joy to them.

The New Emphasis

AT last year's Cycle Show the emphasis was on the tiny motor help to the bicycle, the "fliffer," that has been growing in popularity among the utilitarian, and has for many years been a feature of cycling on the Continent. The keen cyclists, some utilitarians, clubmen and tourists are inclined to look sideways at the motor-assisted bicycle, and I am bound to say I have a sneaking regard for that view, although I could not give any genuine reason for it except prejudice. We old riders had a similar feeling for the motor-car when it first appeared and we, in the pride of our youth, could leave it grunting awkwardly up any considerable incline. Indeed, the first car to outpace me on a hill was the old twin-cylinder tiller-steering Lanchester—whose designer was a notable cyclist in his day—and wasn't I surprised!

Now I meet or pass on my daily journey to work quite a lot of these little "fliffers" which have given up the ghost, temporarily at any rate, and their owners are wearily pedalling them, presumably to the repair man; and moving quietly along under my own power, I feel slightly superior. I do not know why I should, but there it is. If the utility rider wants help of this kind, he has a perfect right to buy and use it, and who am I to feel a better man with a better method? Yet I do believe the bicycle—the good plain bicycle—is far and away the best travel instrument for a whole and happy man to pedal over his land. It is quiet, it is so enormously reliable, it is comfortable, it is so completely individual that to me it has almost become a part of my make-up, my three-league boots of romance, as it were.

The "Hard Work" Bogy

A GREAT many people to-day think cycling is hard work because they observe young folk bending over handlebars and strenuously urging along their frail vehicles to the limit of their strength. That is cycling for them; the calmer and older advocates of the pastime go unnoticed, they are merely the potterers occupying a little bit of road so quietly and unobtrusively that they are unseen. There are many of them, but there would be many more if folk could be persuaded to try the pastime, not for an hour or a day, but for the month of steady riding needed to become sufficiently fit and saddle-worthy to enjoy the game. That is the point; so many borrow a bicycle which does not fit them, ride too far for a try-out, get saddle-sore and tired, and write cycling down as hard work, and for them—because of ignorance—the description sticks. It is not true, and it never was, even in the old times before air tyres and ball bearings, for the then fit man found his half-hundredweight of iron and solid rubber tyres easier to propel than footing it. What a difference now, what a change in my lifetime! Tyres and gears, saddles and bearings have been improved from the workable to the almost magic, and I make bold to say there is no piece of hard-worked machinery so perfect as the modern bicycle, and no land more delightfully adapted to cycling than these fair islands. What a theme for a crusade!

Handy Desirability

I OFTEN think it is peculiar that the idea of travel is so closely related to distance, as if the farther one went the better would be the scenery. How seldom it turns out like that can only be assessed by the close application of truth to travel experiences; for few of us are prepared to admit disappointment in the chosen holiday area; we are too proud to admit error, yet how frequently we have said: "I'd rather be at home," or "I'm glad to get back." The fact is many of us know the faraway places better than we do our own immediate neighbourhood, yet still yearn to burn up the miles in speed.

Now I contend most areas where men live to work have beautiful stretches of countryside within easy cycling reach, and much of these districts are too little known to the wide wanderer who appears to be obsessed by the need for distance in order to reach beauty. Quiet cycling scores in the day or half-day spent in wandering the little ways of almost any area and knowing how easy it is to get home again. I like to go touring in the full and free sense of the term, which is only possible on special occasions, but I can and do find a constant pleasure amid the lanes of my own countryside.

Around the Wheelworld

By ICARUS

Inferior Bulbs

MY comments on frequent bulb failure seems to have stirred up a hornet's nest, for whilst the Electric Lamp Manufacturers Association insist that there is no drop in quality as compared with pre-war, only one correspondent out of a very large number received supports that statement. I am entitled, therefore, now to ask Elma what they propose to do about it. Bulbs are expensive enough in these expensive days, Mr. R. Williams, of Cambridge, in a reasoned letter admits that caps working loose does occur, but does not think that it is any more frequent now than it ever was. Regarding bulbs blown prematurely, one cause, he says, is that the bulb supplies are usually rated at 2.5 volts, whereas the battery voltage is 3 volts when the battery is new. Allowing for a small drop in battery voltage, on load a 2.5 bulb still tends to be overrun and does not last as long as it should. Precisely. That is the point I made—that bulb manufacturers do not take into consideration all of the factors involved, and that if they did the problem would disappear. Of course, one remedy is to fit a bulb rated at 3.5 volts, but, of course, this means a loss of illumination. It would seem that a 3-volt bulb, if obtainable, would be the answer.

With regard to dynamos, the fact that a bulb is rated at 6 volts does not imply, says my correspondent, that it will light satisfactorily on a 6-volt dynamo. It is not only the voltage but the current rating which must be considered.

When I referred to lack of voltage control I was, of course, referring to *satisfactory* voltage control, as on cars. Some cycle dynamos do incorporate a *form* of voltage control, but owing in some cases to poor workmanship it is often ineffective. A cycle dynamo has a falling voltage characteristic with increased load. Voltage does, however, increase with the speed of rotation. Design, therefore, is such that when the optimum load is applied, for which the dynamo is made, the terminal voltage will not exceed the given voltage, regardless of speed and rotation. Take, for example, a 6v. 3w. dynamo in series with a 6v. 0.5a. bulb. Voltage increases with speed until the terminal voltage reaches 6 volts and the current passing through the bulb and also the dynamo is 0.5 amps. A further increase in speed results in higher voltage being generated and more current tends to flow. However, when the current exceeds 0.5 amps. a voltage drop occurs in the dynamo coil, which means that the further increase in generated E.M.F. is lost in the dynamo itself. Voltage across the bulb will increase slightly, but at a decreasing rate until a maximum is reached—say, 7-7.5 volts.

Since voltage is related to the load, if a 6v. 0.3a. bulb is substituted in the above example, maximum voltage across the bulb will be excessive and the bulb will have a short life.

Regarding the expectation of life table I published for 6-volt bulbs, this, of course, referred to a constant voltage applied for the period tabled, whereas, of course, in practice the average voltage across a dynamo bulb is probably a nominal 6 volts or less with correct bulbs fitted.

I also said that if lamps are not of the same rating, that is of identical filament diameter and resistance, the tail lamp will burn out prematurely. I am aware, of course, that two lamps, one of 4 volts and one of 8 volts, can be run in series on a 12-volt supply, but such an example would not occur in connection with cycle lighting dynamos.

Another reader, Mr. Ernest White, of Ringwood, endorses my comments and encloses a catalogue issued by a certain bulb manufacturer in 1939. I can confirm his comments that such bulbs had extraordinary long life.

Beating 21 M.P.H.

LAST year no fewer than 357 riders beat 21 miles an hour in the B.A.R. contest and therefore qualified for the R.T.T.C. certificate. Top of the list was V. Gibbons (Brentwood R.C.) at 23.578, followed by E. Britton (Yorkshire R.C.), 23.336; K. Whitmarsh (Southampton Wh.), 23.332; C. Horton (Mercury C.C.), 23.146; J. White (Leamington C. & A.C.), 23.095; H. Alford (Exe Valley R.C.), 23.079; D. Keeler (Vegetarian C. & A.C.), 22.982; A. Staje (Huddersfield R.C.), 22.917; D. Marsh (Shaftesbury C.C.), 22.827; D. Moss (Bournemouth Ar. C.C.), 22.794; F. White (Luton Arrow C.C.), 22.774; and R. Spanton (Brentwood R.C.), 22.735.

At the bottom of the list, but creditably, W. Rowley (Warwick C.C.), 21.022.

Twenty-six women did 21 m.p.h. or more starting with Joyce Harris (Apollo C.C.), 22.436; D. Franks (Apollo C.C.), 22.368; G. Tiley (Camberley Wheelers), 22.231; C. Brown (S. Shields Victoria), 21.963; J. Sutherland (Musselburgh R.C.), 21.871; J. Blow (S. Lancashire R.C.), 21.751; J. Simmons (Apollo C.C.), 21.682; D. Hackney (Mephisto C.C.), 21.636; B. Tingey (Harrow & Rickmansworth), 21.634, and O. House (Redhill C.C.), 21.595. At the bottom of the 21 m.p.h. list is M. Hinchcliffe (Monckton C.C.) with an average of 21.000.

Amongst the males the team race was won by the Brentwood Road Club (V. A. Gibbons, R. Spanton, B. L. Shaw), average speed 22.677 m.p.h., with the Yorkshire Road Club second (E. Britton, B. L. Smith, S. Swaine), average speed 22.646, and the Rutland C.C. third (J. C. Leversidge, R. Lockwood, S. Thompson), average speed 22.464.

The women's team race was won by the Apollo C.C. (J. Harris, D. Franks, J. Simmons), average speed 22.162, with the Addiscombe C.C. second (C. Brooker, D. Stratford, B. Perry) at 21.178 m.p.h.

I am not, however, at all happy regarding the formula used for determining these best all-round performances, and I suggest that the time has now come when an expert mathematician, such as Professor W. A. Tuplin, of Manchester University, himself a keen cyclist, should be asked to prepare a formula which more accurately selects the best all-rounder. The present formula has not been arrived at by anyone having a mathematical training, and it is grossly unfair.

The "Eagle Eye" watching B.L.R.C.-N.C.U. moves in 1954. Beware!

CYCLORAMA

By H. W. ELEY

Hollingbourne, Kent.

Fine brick and half-timber in this charming little Kentish village . . . .

"February Fill-dyke"

THIS was the name given to the second month of the year in my boyhood days, and more often than not, February lived up to its nick-name. The rains came, the water gurgled in the ditches and channels by the sides of the lanes; farmers greeted the rain with glee, and hoped that it would be followed by good drying winds in "mad March." Somehow, to-day, the seasons seem to have changed, and as like as not, February will be dry and dusty, and there will be prayers for rain—so topsy-turvy are the seasons in this atomic age! Some old folks attribute the changes to "they atom bombs"—but I hardly think that the scientists agree with that view! But come rain or fine, I shall look forward to many a good ride in February, and maybe I shall find the first shy virginal snowdrops in some green dell by the gorse-covered common.

"The Load of Mischief"

KNOWING my keen interest in inns and inn signs, some of my good correspondents occasionally send me details of quaint and curious names of inns they have come across in their cycle touring. The other day, a rider from "Beechy Bucks" wrote to me about an inn called "The Load of Mischief" and informed me that the sign consisted of a picture of a weary, forlorn-looking man, bearing on his bent shoulders a bird, a monkey, and a woman. The sign bore the legend:

"A monkey, a magpie, and a wife—
Is the truest emblem of strife."

I have certainly not come across this sign before, and I gladly add it to my growing collection of inn signs. Every English county has its quota of the quaint and curious in inn signs, and it is quite a fascinating hobby to look for them, and muse upon their meanings.

Saint Valentine

FEBRUARY brings us St. Valentine's Day, and in recent years there has been quite a remarkable revival of interest in this "saint of lovers," and shop windows are again full of colourful cards, complete with true-lovers' knots, and romantic verses, and ardent vows of fidelity. I like this return to romance in a prosaic age! Greetings cards were never more popular, and there is much to be said for this happy way of cementing friendships and winging kindly messages. The story of Saint Valentine seems wrapped in mystery, but for long years he has been the patron saint of lovers, and his place in the gallery of saints is assured.

In Superstition Land

SUPERSTITION dies hard in the remote countryside, and in my touring of the villages and hamlets of grey Derbyshire I have found that astonishing old beliefs still hold sway; even in this hard and materialistic age it is possible to find plenty of folk who have faith in old tales and legends, and who live in fear of the "Evil Eye." There is an "old crone" in an isolated village with whom I sometimes have a chat about her quaint beliefs, and recently she told me that as a girl she always carried a thistle-apple in her purse as a preventive of tooth-ache, and in her old age she carries a nutmeg suspended from her neck to keep away rheumatism. Her beliefs are not confined to cures for the weaknesses of the flesh; they range over a wide field, including courtship and marriage, birth and death, the weather, and flowers and animals and birds. All manner of strange tales and beliefs I have heard in the tumble-down cottage where this wrinkled-face old woman lives. In the green days of spring last year, when the cuckoo sent out his monotonous note from every tree, this old soul told me that if, when one first hears the cuckoo, the sound comes from the right, it means good luck and prosperity; if from the left, then bad luck will be your lot for a month. The cold scientific mind may dismiss all these fancies as idle tales, but it is hard to shake the belief in them held by the aged folk who have lived their lives in solitude in the heart of the silent countryside. . . .

Enchanting Essex

TO some cyclists, well up in the scenes and topography of this England of ours, Essex is a county flat and devoid of much interest, but to those who know it well, and have eyes to see and understand, Essex has much beauty, and a charm of its own. It is a many-sided county, and to some its name may conjure up pictures of Southend-on-Sea and the rollicking gaiety of a Bank Holiday; to others, Essex may mean the ancient history of Colchester which was, in Roman times, the third most important town in all Britain. The first Roman city was stormed and burnt by the British under the intrepid leadership of Queen Boadicea. When we cycle around Colchester to-day we may still see some remains of those massive walls which the Romans constructed with the idea of withstanding a further surprise attack. Some lovers of Essex hold it dear to their hearts because of the expanse of Epping Forest—beauteous in every season of the year, but, to me, loveliest in autumn, when the trees are putting on the garments of decay, and are all-glorious in browns, and russets and golds. Epping Forest is enchanted country to thousands of East End London folk, offering green glades and leafy glory in the place of the sunless streets of their East End homes.

I never think of Essex without musing upon the ancient rite of the "Dunmow Flitch." It was originally given to the married couple who could declare on oath that they had not repented of their marriage, sleeping or waking, for a year and a day. The custom goes back as far as the year 1244, when the "flitch" was first offered by one Robert Fitzwalter. Essex is rich in romantic and appealing place-names—Stanford-le-Hope, Hatfield Peverel and Tolleshunt D'Arcy come to the mind as being especially lovely. Yes! Essex may possess no rocky gorges or towering crags, but it has its own beauty, and I commend the cyclist to explore its lanes and by-ways.

A Dunlop Veteran Goes Into Retirement

SOME month or two ago I was in correspondence with an old and valued Dunlop friend who has recently gone into retirement after 50 years of notable service with the Dunlop organisation. George Bourne, for many years the company's regional manager at Leeds, responsible for sales in the north region, was a colleague of mine at Aston Cross in 1911. He served the company with great distinction in many positions and for several years represented it in South America. "George" is a genial and lovable soul and he left the old company with the affection and good will of a host of friends. He tells me he does not intend to leave Yorkshire, where he is as popular as Len Hutton himself! A happy retirement George!

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