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EDITOR : F. J. CAMM

JANUARY 1952

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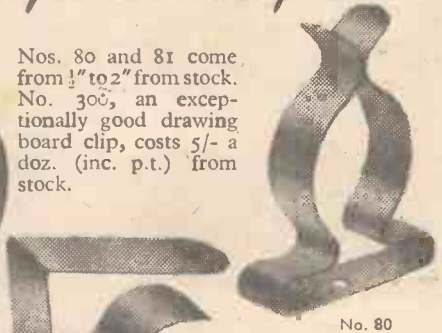

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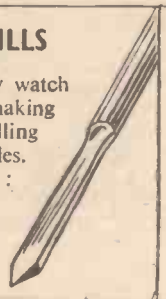

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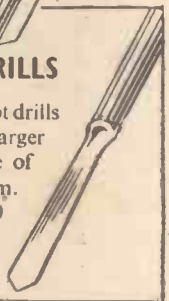

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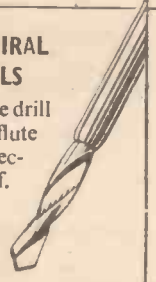

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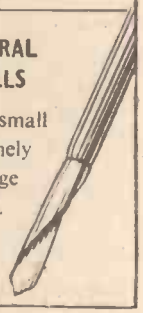

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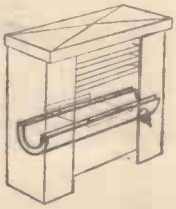

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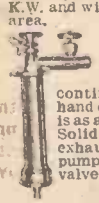

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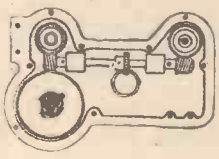

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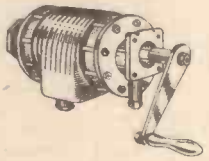

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PRACTICAL MECHANICS

EDITOR F. J. CAMM

JANUARY, 1952
VOL. XIX. No. 217

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

FAIR COMMENT By The Editor

Craftsmanship and Incentive

A prominent member of the late Government, at a recent meeting, uttered some words which are worthy of wider publicity than they received. He said: "The best incentive of all is service. All great patriots, all great scientists and artists, all craftsmen, and, in fact, men and women of all kinds, have always known that, and have long been guided by it. If we cannot ensure that our society rewards the useful a lot better than it rewards the socially unjustifiably useless, useful citizens, managers and professional men, as well as rank and file workers, will be discouraged, and will actually lose efficiency."

It is a fact that the nation which shows the greatest degree of enterprise, which assiduously applies itself to discovery and invention, cannot be conquered and must survive as a great Power. It cannot be said that this country has always rewarded its most useful citizens. Taxation to-day is at such a high level that there is a risk that enterprising people will feel that the incentive, if any, is too small a reward for the effort involved.

An individual, of course, cannot reap where he has not sown. Almost every day I receive letters from ingenious readers who have conceived an idea, invented a new piece of apparatus, or made something which they wish to market. It is a deplorable fact but none the less true that the State during the past 50 years has steadily destroyed the encouragement for any man to exploit the fruit of his own brain.

The position at the Patent Office is a sufficient deterrent. It takes a year or more from the filing of a specification before the patent is granted, presuming that the official search has not discovered inventions which have anticipated. Once the patent is granted, patent fees are on a rising scale for 16 years. Foreign patents have to be taken out to prevent unscrupulous manufacturers in other countries from pirating the invention. This, plus the tooling up costs, the purchase of raw materials, and the large sums of money which must be spent in other ways before goods actually reach the market cause many a good invention to be still-born.

SELLING AN INVENTION

IT is practically impossible to sell an invention to an existing manufacturing concern for any considerable sum of money. It might be asked: Why bother about a patent at all? Why not proceed with manufacture without it? That would be a policy fraught with danger. The possession of a patent, whilst it is not a complete protection against an action for infringement, is some sort of a safeguard and until it is challenged in the Courts its owner is considered in law the proprietor of the invention which the patent is intended to protect.

Many patents have been set aside in the Law Courts, and a poor man could be utterly ruined. If you have not large sums of money at present the development of an invention by an individual seems scarcely worthwhile. The only way of making money out of an invention is, of course, to develop it yourself if you are able to find sufficient backing, otherwise, if you can interest a manufacturer, you must accept a royalty. Even then you may not make much money if the manufacturer concerned does not energetically exploit the patent. That is why I always advise readers in these circumstances to insist upon a minimum annual royalty for the full term of the contract.

Presuming, however, that large sums are made, taxation at the present level takes most of it back. So when Mr. Morrison was paying lip service to the need for rewarding the useful citizen for his fruitful productivities, it would have carried more weight had he provided some tangible evidence that the State proposed to back it up.

This is a question which transcends all political issues and parties. It is a matter of national concern, and we hope that the Government will take heed.

It is idle for any Government to encourage enterprise and then to regard the enterprising person as one to be penalised by high taxation.

There are many problems which beset Governments which could be solved by a nation-wide appeal for their solution with the promise of financial reward for those whose inventions are adopted.

MODEL OF MacMILLAN'S BICYCLE

AS announced elsewhere in this issue, next month we shall be describing the construction of an accurate working scale model of the first rear-driven bicycle made by Kirkpatrick MacMillan in 1839. This machine has become famous and the centenary of its invention was celebrated in 1939 by the formation of the Centenary Road Club, whose members are chiefly drawn from bicycle manufacturers. There were no chains, ball bearings, or chain wheels in those days. The readers interested in bicycles will, undoubtedly, wish to make one of these attractive models, the first authentic details of the prototype of which will appear with the article next month.

The only machine in existence is a replica of MacMillan's machine in the Science Museum, at Kensington. Drawings of it have hitherto not existed.

THE B.R.M.

I AM sorry that the B.R.M. car, which showed such promise, has been so disappointing in its results. Bearing in mind that British prestige in automobile racing was at stake it would appear that the wrong method has been adopted. No private undertaking can expect to have available the personnel and the factory equipment necessary for a vast and expensive venture of this sort.

It would have been wiser perhaps had all of the motor firms interested in motor racing collaborated in the production of the B.R.M. instead of leaving it to the enthusiastic development of private individuals.—F. J. C.

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MAKING A Cycle Trailer

Constructional Details of a Strong and Serviceable Outfit

By J. H. LONG

THE construction of the child's cycle trailer described in this article was undertaken only after due study of the advantages and disadvantages of the trailer and those of the more conventional sidecar.

A trailer is simply attached to a cycle and when unhitched its two wheeled mobility facilitates easy handling. It is thus practicable to employ any one of a number of cycles for towing, an interchange being simply and quickly effected. Further, by using the tow-bar as a handle one has to hand a most serviceable pram.

Another point worthy of note is that the load due to a trailer is applied in line with the frame of the cycle and cannot therefore cause "side drag" or other stresses, which might well be harmful to the frame of a lightweight machine—as could be the case on attaching a home-made sidecar.

Safety Precautions

The foregoing features, however, must not be adopted at the expense of safety, and so the possibilities of overturning and of breaking adrift have had to be reckoned with and adequately guarded against. Overturning is taken care of in a design productive of a very low centre of gravity—manifest in the wide wheelbase and low slung coach—while breaking adrift is rendered well nigh impossible by a method of doubly securing the tow-bar to the saddle pillar of the towing cycle.

During stringent tests on the completed trailer, all attempts to cause overturning failed and were resisted with what appeared to be ample margin, and in over two years' service on the roads there has never been cause for anxiety in this respect.

Comfort and Appearance

The illustration (Fig. 1) shows the well-balanced car-like lines embodying a design giving complete protection from the weather. Plenty of headroom allows a waterproof hood to be fitted, if desired, but in order to dispel the fear of feeling "closed in" very ample windows of Perspex have been provided. The interior is furnished with a high backed, lightweight upholstered chair. It is detachable to allow access to stowage space in the rear and, incidentally, provides a comfortable wayside seat.

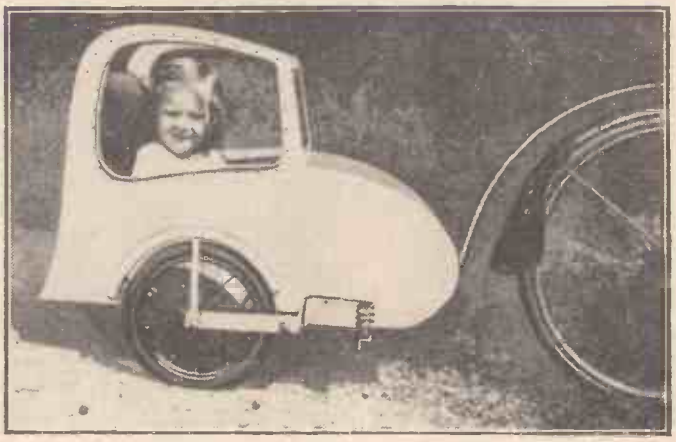


Fig. 1.—The completed trailer in use.

A simple and well-known principle of independent wheel springing gives good riding qualities at all speeds.

Simple Construction

The trailer was designed for construction by any handyman. Lathe-work and welding are avoided, and no sheet metal panel is bent in more than one plane. Tinned mild steel sheet (20 s.w.g.) was used in the original trailer in order that the seams might be sweated together, dispensing with rivets for the sake of appearance, but if there is no objection to rivets, sheet aluminium or aluminium alloy could be substituted—and with a saving in weight.

Coachwork

The outline of the side of the coach on a background of squares is given in Fig. 2. If a piece of white ceiling paper is pasted on to the sheet metal and marked off in 2in. squares, then by using these as a guide the outline can be accurately reproduced. It will be seen that the overall length of the coach is 2ft. 11in. and the height 1ft. 11½in.

After cutting out, the serrations are bent over at right angles to form the seams—in different directions for each side of the coach. A tip which makes for neatness is to leave a small gap in the roots of the "V" cuts forming the serration, otherwise, when they are turned, unsightly kinks are likely to appear at these points. To impart a finished appearance to the window spaces the writer sweated ⅛in. diameter iron wire around the periphery of each side opening while the windscreen was framed in ⅜in. × ⅛in. brass strip. An alternative method, of advantage where the coach work is in aluminium or similar metal would be to substitute the iron wire and brass strip with ⅜in. half round aluminium strip.

The text, however, deals with the former, but there should be no difficulty here. The front and apron is shown in Fig. 3, while

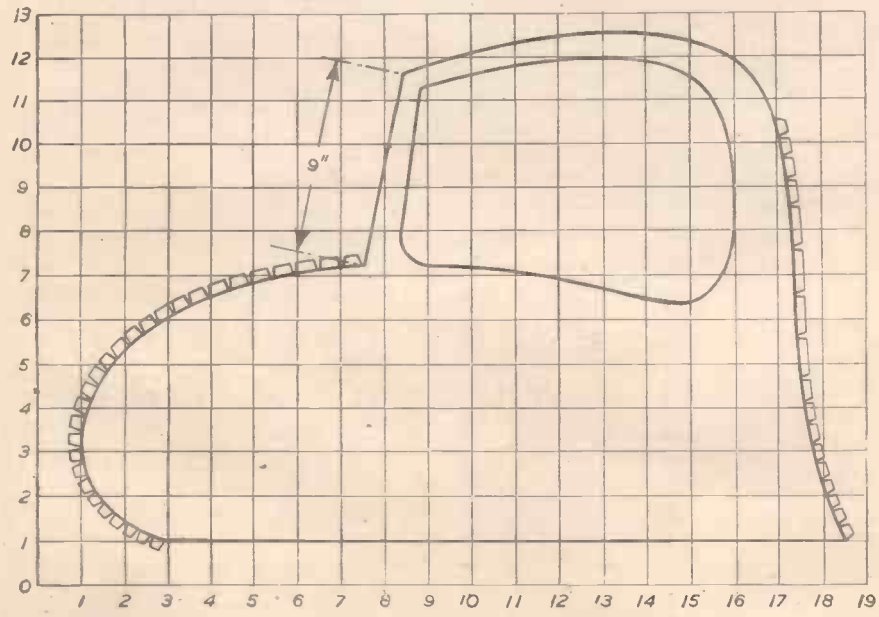


Fig. 2.—One side of the coach drawn to scale on a background of 2in. squares.

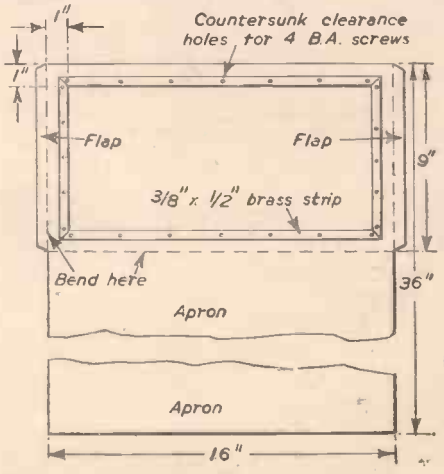


Fig. 3.—Dimensions of coach front and apron.

the rear panel (not shown) is rectangular in shape, measuring 1ft. 8½in. by 1ft. 4in. When the four panels comprising the coachwork are being sweated together, the rear panel should be so positioned that its lower edge projects 1in. below the corresponding edges of the two sides. Then later, when the floor and its framework have been inserted, this edge together with the bottom edge of the apron can be bent over, drilled, and fastened to the framework with wood screws (see Fig. 6).

Windscreen and Side Windows

The method of fitting the windscreen and side windows is shown in Fig. 4. They are fitted on the inside of the coach and secured from the outside with 4B.A. brass screws—just long enough to engage the full thickness of the Perspex without standing proud, and spaced about 2in. apart.

To cover up sharp edges and to impart rigidity, the Perspex is trimmed flush with the top of the coachwork, and in fixing the two side windows it is ensured that they will be kept in close contact with the exposed edges by arranging that the uppermost screws follow the outline of the coach rather than that of the window opening. The windscreen and windows should be cemented in position with a liberal application of a thick creamy mixture of putty and paint of the same colour as the interior finishing coat.

Framework and Floor

In Fig. 5 is shown the floor framework which is constructed of hardwood, well jointed, glued and screwed together. The floor, of three-plywood, slopes downwards from front to rear. It is screwed to the recessed cross-piece and to the flange formed by the tin-plate strip of "L" section which is in turn screwed to the inner sides of the framework, as in Fig. 7. The insertion of the framework (floor fitted) in the bottom of the coach is illustrated in the underside view, Fig. 6.

Wheels and Suspension

Based on the simple lever principle (see Fig. 8) the load on the wheel spindle creates a moment about the pivot which is counterbalanced by an opposite moment due to the reaction of the compression spring attached to the fork extension. The strength of the springs determine the riding qualities. If they are too weak there may be a tendency to undue swaying over uneven road surfaces, but on the other hand springs which are too strong will lack sufficient resilience for reasonable comfort. A dealer in motor cycle spares will be able to supply the springs. They are made from 3/16in. diameter steel wound into a coil of 1½in. diameter with a normal uncompressed length of 3in. and consisting of five turns finished off in eyes at both ends to take fixing bolts.

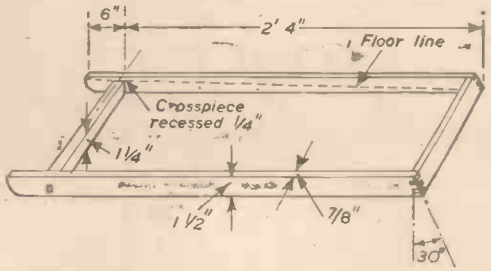


Fig. 5.—Showing the construction of the floor framework.

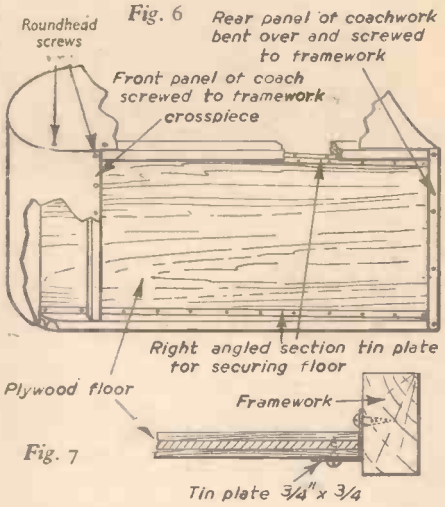


Fig. 6

Fig. 7

Figs. 6 and 7.—Underside of coach-chassis and detail of floor fixing.

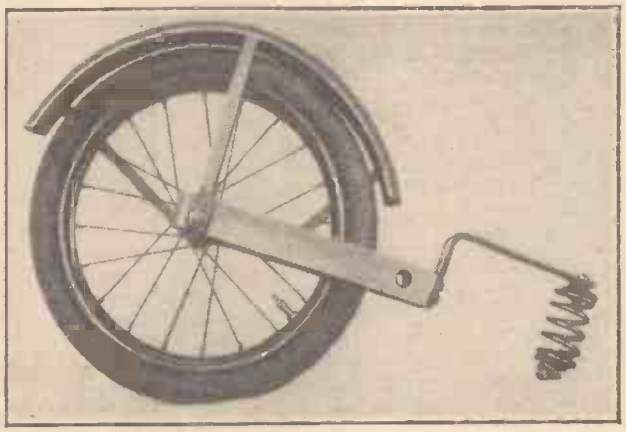


Fig. 8a.—Wheel assembly.

Fixing the Mudguards

The mudguards should be very firmly fixed to the wheel forks since they are subjected to the full vibration of the wheels (see Fig. 8a).

(To be continued.)

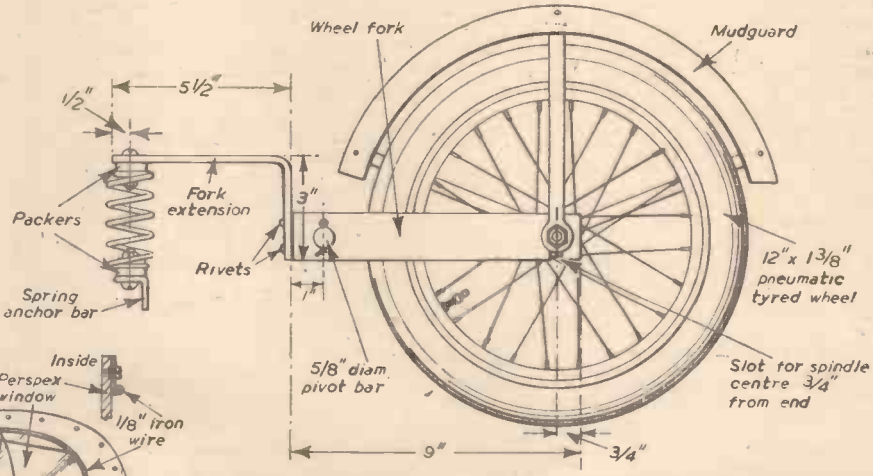


Fig. 8.—Details of the wheel assembly and fork extension.

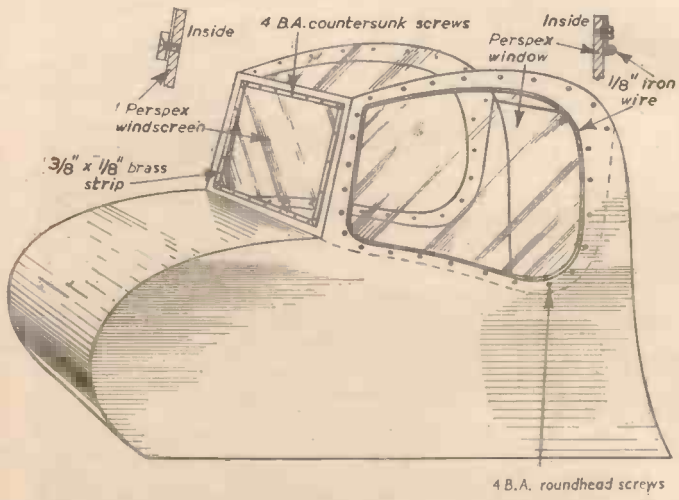


Fig. 4.—Perspective view of coach, showing the "Perspex" side windows and windscreen.

A Synchronised Flashgun

An Easily-made Unit for the Amateur Photographer

By D. GREENALL

MANY amateur photographers are deterred from flash work not merely through the expense of the actual flashbulbs, but by the cost of the necessary synchronised flashgun, especially when they are not in possession of a modern camera with a synchronised shutter.

Flash work can be divided into two classes for most amateurs—open flash and slow speed synchronised flash. Open flash needs only an ordinary torch fitted with a suitable adaptor to take the flashbulb, but has the drawback that only subjects containing no movement can be attempted. When subjects with movement are tried, even at slow shutter speeds, some means must be found to ensure that the flashbulb is fired during the short period in which the shutter is open. This requires a form of switch to synchronise flash and shutter, and provided that speeds above 1/25th second are not used, a suitable switch can be made by the average handyman without much difficulty.

The synchronised flashgun described here was made at low cost using materials easily obtainable, and will give results equal to commercial articles at two or three times the cost. It consists of a battery case taking two or three U.2 cells, an adaptor to take whichever type of flashbulb it is intended to use, a reflector, and a simple switch which is connected to the camera release socket by means of a flexible cable release. The battery case and reflector are joined to the camera by a short rigid bar upon which the synchronising switch is mounted. This ensures that the cable release remains in a constant curve which is essential for consistent accuracy of timing.

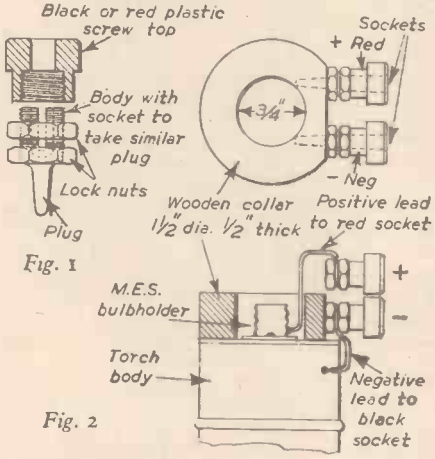
The Battery Case

A suitable torch can be purchased quite cheaply at the local chain stores, the best type being those in which the bulb holder is mounted on the body of the torch. The focusing head, if fitted, is removed, leaving the M.E.S bulb holder in position at the top of the battery case. In flash work it is important that the batteries should possess sufficient power to fire the flashbulb, even when part-used, so that a 3 or 4½ volt battery torch should be bought if possible. If the standard U.2 type of battery case is used, the special high amperage batteries for flash work made by G.E.C. can be fitted.

Rear view of the flashgun.

Wiring

The next step is to fit two sockets to the battery case from which the switch leads are taken. Wander plugs are used for this purpose of the combined socket and plug type, as shown in Fig. 1. A wooden collar is made, shaped as in Fig. 2, 1½in. in diameter and ½in. thick. A ¾in. diameter hole is cut in the centre of the collar and two more holes ⅛in. in diameter drilled in the straight side at right angles to the centre hole. These are to take the wander plugs which are pressed home and secured by a touch of adhesive, leaving the socket portion protruding from the collar. A short wire is now soldered to the battery case and connected to one plug. A second wire is soldered to the base of the bulb holder and connected to the other plug. It is important to ensure that these two wires do not touch, as a short circuit between them will fire the bulb.



Figs. 1 and 2.—Details of the combined plug and socket, wooden collar, and connections.

Adaptors

Finally, the adaptor to take the flashbulb is screwed home securing the collar in position. For amateur use the small flashbulbs with A.S.C.C. caps (i.e., single centre contact car type caps) are probably the most suitable, so a M.E.S. to A.S.C.C. adaptor is chosen. If, however, the more powerful bulbs with E.S. caps are used, then an M.E.S. to E.S. adaptor can be fitted equally as well.

The Reflector

The final stage in completing the flashgun itself is the reflector. In the case of the one illustrated, a conveniently shaped 6in. diameter aluminium lid was utilised. A circular hole 1¾in. in diameter was cut near one edge to allow the adaptor and bulb to pass through, and a strip of aluminium 1in. wide by 5in. long bolted to the back of the reflector. At the other end of this strip a Terry's 1in. spring tool clip is bolted, the end of the strip being bent round the clip as shown in Fig. 3 to keep the reflector support at right angles to the clip.

Front view of the flashgun ready for use.

Where a ready-made reflector is not available one can be made by cutting a 6in. diameter circle of sheet aluminium. A segment is cut away and the two edges brought together, forming a shallow conical reflector. The support strip is then bolted through these two edges and the spring clip attached as before.

The reflector is now attached to the battery case by means of the spring clip and the flashgun part of the apparatus is complete. Those who do not wish to attempt synchronised flashwork before they have mastered open flash need proceed no further for the present, as the flashgun in its present form

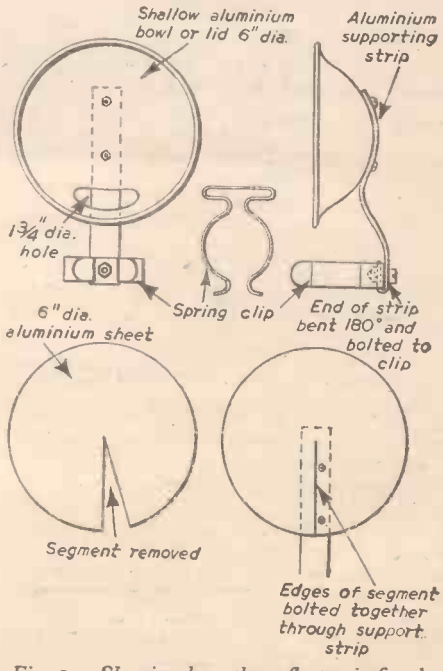


Fig. 3.—Showing how the reflector is fitted.

is quite suitable for open flash work. One advantage of this particular form of construction is that no alterations are made to the body of the torch, the gun can be used for open flash work by means of the torch switch, and the torch can always be reverted to its original function without difficulty.

The Synchronising Switch

Construction of the switch can best be followed by reference to Fig. 4. It consists of two strips of plywood, hinged at one end and carrying the shutter cable release at the other, secured in the lower portion by the small metal strip "A." The upper portion carries a bolt "B" screwed directly into the plywood to which is attached one lead from the battery. To the lower piece of plywood is bolted a strip of springy brass or steel "C" to which the other battery lead is connected. This is so positioned that when the hinged part is depressed, bolt "B" meets the spring contact "C" and closes the circuit, at the same time depressing the cable release and operating the shutter. Fine adjustment when synchronising is made by screwing "B" in or out as required.

Camera Bar

All that now remains to be done is to provide a means of connecting the flashgun and switch to the camera. A camera bar is made from a brass strip ¼in. thick by ¾in. wide, of a length suited to the camera in use. The synchronising switch is bolted to the bar between the gun and camera. A ¼in. bolt is passed through the screw-cap on the base of the torch to secure the flashgun to the camera bar. A good solid washer should be fitted to the inner side as the thin metal of the cap will not otherwise stand the strain. A standard camera case retaining screw is used to secure the camera by means of its tripod bush.

The two leads from the switch are fitted with wander plugs at their farther ends and plugged direct into the sockets on the battery case.

Synchronising the Flashgun

Before attempting to synchronise the flashgun it is necessary to understand the characteristics of modern flashbulbs. A flashbulb consists of a glass bulb containing a quantity of metallic filling in the form of either very thin foil or very fine wire. In the centre is a filament to which is attached a small quantity of explosive paste known as the "primer." When current from the battery is passed through the filament the "primer" is exploded and the metallic filling ignited, producing a brilliant flash. This sequence from closing the electrical circuit to the bulb reaching its peak brilliance takes 1/50th second for most bulbs (Speed Midget excepted), plus another 1/50th second for the flash to drop from peak brilliance to zero. Thus, if we use a shutter speed of 1/25th second and arrange for the closing of the

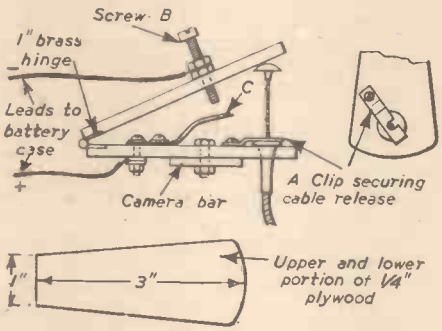


Fig. 4.—Details of the synchronising switch.

electrical circuit and the opening of the shutter to coincide, we can be reasonably sure of getting the whole of the flash.

To synchronise the flashgun first assemble the complete apparatus, inserting an ordinary torch bulb in the battery case. Next set the shutter to "bulb" and adjust the length of screw "B" on the switch so that the bulb lights when the shutter blades are just opening. Now set the shutter at 1/25th second, remove the back of the camera and stand facing a mirror. Look into the back of the camera and press the switch, when the flash of the torch bulb should be seen during the brief interval when the shutter is open. If the flash is not seen it means that the switch is closing the circuit a fraction of a second late, so the adjusting screw "B" should be screwed in a turn or two. The final test is to use a flashbulb, but in practice it will be found easy enough to synchronise the gun using this method.

Use of the Gun—Open Flash

The simplest way to use a flashgun is the open flash method, in which no attempt is made to synchronise the gun with the camera shutter. The procedure is to put the camera on a tripod and set the shutter at "bulb." After preliminary focusing, etc., the shutter is opened, the flash fired and shutter closed, all in quick succession so that existing lighting does not have time to take effect on the film and thus increase the exposure. Open flash is usually restricted to still life subjects or posed set-ups with no movement. It has the advantage of simplicity and uses the full duration of the flash. Moreover, the flashgun can be held in the hand and the direction of the lighting thus altered to suit the subject. When the gun is attached to the camera one is restricted to frontal lighting, which is rather flat in effect.

Synchro-flash

When the flashgun is synchronised to the shutter the scope of the camera is increased greatly and can include subjects normally tackled by the amateur with the aid of photofloods, with the advantage that instantaneous exposures can be made with ease of children and animals indoors, and other subjects in situations where it is impossible or dangerous to set up photofloods. When using the flashgun care should be taken to depress the switch smoothly and quickly, as undue slowness in operating it may result in the flash firing before or after the shutter.

Types of Flashbulb

The following bulbs are among those most suitable for amateur use. They are powerful enough for normal subjects at medium distances and are not unduly expensive.

Philips		
P.F.14	1s. 1d. each	A.S.C.C. Cap.
P.F.25	1s. 4d. each	
P.F.56	1s. 8d. each	E.S. Cap.
G.E.C.		
Speed Midget	1s. 3d. each	A.S.C.C. Cap.
G.E. No. 5	1s. 1d. each	

Items of Interest

Robot Air Squadron

IT is reported that the American Air Force is forming an operational squadron of robot bombers, called Matadors. These radio-controlled aircraft have been designed to do the work of conventional light tactical bombers. Similar in appearance to piloted 'planes, they will be launched from ramps and guided to their targets by radar.

New British Jet Research Aircraft

IT was recently announced by Handley Page Ltd. that a new jet-powered prototype research aircraft, the "H.P.88," designed in collaboration with, and constructed by Blackburn and General Aircraft Ltd. at Brough, has successfully completed its first test flight. This new high-speed aircraft has an experimental Handley Page wing, and is powered by a Rolls-Royce "Nene" turbo-jet engine. On its initial flight the aircraft was flown by Blackburn test pilot, Mr. G. R. I. Parker, D.F.C., A.F.C., D.S.M.

Diesel-electric Power Unit

A NEW power unit incorporates a high-powered main line locomotive engine, 1,200 b.h.p. at 600 r.p.m., eight-cylinder "Vee" engine, type "H.S.T.Vee 8." This new traction unit is identical with those ordered for the largest diesel-engined locomotive contract so far placed in this country, namely, for 48 locomotives for the Western Australian Government Railways. The unit was on show at the recent Engineering, Marine and Welding Exhibition at Olympia.

Side view of the new jet research aircraft.

A "Free"-pendulum Electric Clock

Constructional Details of a Novel Electric Timepiece

By J. M. AUST

(*Concluded from page 96, December issue.*)

THE impulse relay is illustrated in Fig. 11.

It is quite simple in operation but it is essential to use care and precision in its construction, since its working is synchronised with the pendulum.

Referring to Fig. 11, a rocker arm (1) pivoted at (2) is carried between two sheet brass supporting plates (3), the backplate only being shown. At its lower end the arm carries a soft iron armature (4), and at its upper end a gathering pawl (5) consisting of a piece of .010in. steel soldered to the top of the arm and at right-angles thereto, as shown. The armature (4) is riveted to a lug on the bottom of the arm.

Also pivoted between the plates is a 15-tooth wheel (6) being an escape wheel from the movement of a small balance clock. A piece of .010in. steel (7) is arranged to form a back-stop bearing on the wheel. A return spring (8) is fixed at its lower end to one of the supporting plates (the one shown) so that its upper end bears upon the top of the rocker arm. Two 6BA screws (9) held in brackets soldered to the plate shown are arranged so that the movement of the arm can be regulated to enable the gathering pawl (5) to gather one tooth of the wheel (6) at each stroke and, on its return by the spring (8), to propel the wheel one tooth past the back-stop (7) in an anti-clockwise direction.

Contact Arms

Soldered at right-angles to the spindle of the wheel (6) is a piece of 12-gauge brass wire (10) ½in. in length, at the outer end of which is soldered a silver contact (11), as shown, rounded off and polished smooth. It will be seen that the contact revolves with the wheel (6). A second silver contact (12), carried at the end of a piece of fine watch mainspring, about ⅛in. wide is fixed by means of a small insulating block to the front plate so that at one point during each evolution of the wheel (6) the contact (11) brushes against and passes the fixed contact (12) as the wheel is rotated by the returning pawl (5).

The position of the arm (10) in relation to the teeth of the escape wheel is immaterial, since the proper contacting position of (11) and (12) can be obtained by adjusting the position of the block holding the spring of contact (12), viz., immediately prior to contact being made, contact (11) should be carried to within about 1/16in. of the contact face of (12), i.e. on the return of the rocker arm (1).

On propulsion of the next tooth forward, contact (11) should be carried on to *and past* contact (12), making contact therewith en route, its position at the end of that stroke being out of contact with (12). Note that the whole operation, i.e., the "make and break" of contacts (11) and (12) is done during the propulsion of *one tooth* of the wheel (6). The length of the arm (10) is sufficient to give contact (11) enough motion for this to be done. An electro-magnet (13) is placed between the plates so that when energised it attracts the armature (4).

Sheet brass, No. 16 gauge, can be used for the plates (3) and the rocker arm (1). The escape wheel (6) with its arbor, as taken from a clock movement, can be pivoted between the plates, and a similar arbor can be used to carry the rocker arm. The distance between the plates will therefore depend on the length of these arbors, which should not be too short since the magnet (13) has to be inserted between the plates. The outside diameter of the wheel (6) is ½in. The return spring (8) is a piece of watch mainspring about 3/32in. wide and should be strong enough to propel the teeth of the wheel (6) past the back-stop (7), which is sprung lightly on to the wheel as also is the gathering pawl. Care should be taken to see that there is no loose movement of the wheel (6), the teeth being propelled accurately one at a time.

Impulse Relay Magnet

The magnet (13) is wound with No. 30 S.W.G. enamelled copper wire. The armature (4) should not touch the core of the magnet when the latter is energised as magnetic hysteresis may interfere with it and delay the return of the rocker arm.

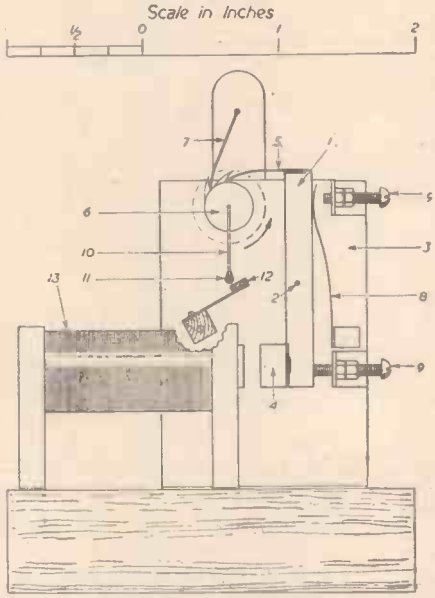


Fig. 11.—Impulse relay (near-side plate removed).

The supporting plates can be soldered to a baseplate and the whole movement mounted on a wood base about 3in. × 2in. × ½in. Two sets of terminals, one for the contacts of the movement and one for the magnet, are secured to the wood base and the required connections made thereto. Note that contact (11) is "earthed" to the frame. A bracket to support the movement is screwed to the back-board of the clock behind the dial position.

This completes the pendulum and the mechanism used in maintaining its arc.

The Electric Circuits

The positive and negative terminals of the photo-cell are connected directly with the moving coil of the micro-ammeter. Experiment will show which connections operate the needle in the required direction.

The contacts of the micro-ammeter movement are connected in series with a two-volt hand-lamp battery and the *coils* of the Siemens relay.

The contacts of the Siemens relay are connected in series with the terminals of the electro-magnet (13) Fig. 11 and a supply sufficient to operate this magnet so that it attracts the armature (4) Fig. 11.

The contacts of the impulse relay are connected in series with the impulse magnet (6) Fig. 1 and a supply of about 60 volts at ½ amp., preferably D.C.

It should be noted that a variable rheostat must be connected in series in the last circuit so that the strength of the impulse and hence the pendulum's arc may be regulated.

Operation

Assuming that the pendulum is at rest and that the light (11) Fig. 1 is on. In this position the shutter obscures light from the photo-cell plate.

The pendulum is now swung gently to the left, carrying the shutter with it. In so doing the aperture is opened and light falls on the plate which then generates a current sufficient to swing the needle of the micro-ammeter movement over so that the contacts of the movement complete the circuit through the coils of the Siemens relay. The contacts of the latter are then closed and complete the circuit through the magnet of the impulse relay, whereupon the pawl (5), Fig. 11, gathers one tooth of the wheel (6).

This is the position when the pendulum reaches the extremity of its left-hand swing. On its return and at a point before it reaches dead-centre the shutter sufficiently obscures light from the photo-cell to allow the circuits to be opened and the returning pawl of the impulse relay propels the wheel one tooth forward.

Now, if the pendulum is rated so that it is of second's length, it will be seen that this series of operations will take place 30 times per minute and, as the wheel (6) has 15 teeth, it will, therefore, make a complete revolution *twice* per minute. It follows, therefore, that the contact (11) will also revolve twice per minute and will meet and pass contact (12) twice per minute, energising the magnet below the pendulum armature in so doing.

It is important to note carefully the following points:—

(a) The moment of release of the rocker arm depends upon the moment at which the photo-cell plate is sufficiently obscured to release the electric circuits.

(b) At this moment, contacts (11) and (12) meet and the impulse magnet below the pendulum is momentarily energised. The pendulum armature should then be overlapping the left-hand edge of the magnet cores by about 1/16th of an inch.

(c) It follows that these positions can be obtained by adjusting the position of the shutter on its arm. The best position can be obtained by moving the pendulum by hand slowly from left to right and observing the point at which the impulse is given to the magnet below. If the impulse is too early the shutter should be moved to the left and vice-versa.

The best position of the impulse magnet is with the centre of its poles about ⅛in. to the right of the dead centre line of the pendulum. The object of this is to avoid a direct downward pull on the pendulum. A momentary sideways pull on the armature is all that is required to maintain its arc, and on no account should the impulse be sufficient to shake the pendulum. Care should be taken to see that the armature and magnet poles are at right angles to the plane of the pendulum's oscillation.

The photo-cell remains obscured whilst the pendulum swings to the right.

A point to note is that, once properly adjusted, the pendulum itself controls the

mechanism and the impulse is, therefore, given at the correct moment each time. In other words, the impulse cannot be given to the pendulum until it is in the correct position to receive it.

The Dial Movement

The movement is a standard half-minute impulse dial movement which requires an electric impulse at half-minute intervals, and this can be obtained by using the pendulum impulse circuit in the following manner :—

The coils of a Siemens relay, resistance about 70 ohms, are connected in parallel with the terminals of the impulse magnet at the bottom of the clock. The contacts of the relay are connected in series with a dry battery of about 12 volts, and the terminals of the dial movement which is then operated when the impulse magnet is energised every half-minute.

The dial is made from thick white card, 8in. in diameter, with Roman numerals. The dial movement is already provided with two 6BA holes for fixing the dial thereto. If the dial is made from thin sheet metal it can be secured to the movement direct with 6BA screws. If, however, card is used for the dial, it will be necessary to make a dial plate, 8in. in diameter, to place behind the dial card; both are then screwed to the movement, as above.

The dial is supported between the sides of the clock case by means of lugs or brackets soldered to each side of the dial plate, and these slide into metal clips screwed to the sides of the case in the appropriate position. In this way the dial and movement can be removed easily. The leads to the movement should be long enough to allow the dial to be removed and should terminate in small wire pins or "wander plugs," so that they can be readily inserted in the clip terminals of the movement. The leads are fixed at the top of the clock so that they do not fall when the dial is removed.

Switching Arrangement

A switch can be inserted in the dial movement circuit so that the dial movement may be stopped if so desired. A further refinement can be added whereby the dial movement is switched into parallel circuit with the terminals of the magnet of the impulse relay. The movement then receives an impulse 30 times per minute, enabling the hands to be advanced at the rate of 15 minutes in one minute.

The switch for this arrangement can be seen on the right-hand side of the pendulum in the accompanying photographic illustration.

Clock Case

A suitable case for the clock can be built up on to the back-board, using ⅜in. wood about 6in. in width, with a glass panel door, etc., as shown.

It might be wondered why a voltage of 12 is given for the dial movement when these movements normally work from 3-4 volts. The reason for this is that it was found that, owing to the very short period of the impulse, 4 volts were insufficient. A proper response was obtained by increasing the voltage.

Also, it will be found advisable to connect a .1 mfd. condenser, preferably a non-inductive resistance, across the *contacts* of the Siemens relay to damp sparking.

Finally, it should be added that the clock is somewhat unorthodox; the writer does not know of a similar one having been made. The data given are those designed by the writer. Possibly, those who undertake to make the clock will be able to improve on the details or design.

A Tool-post Grinder

How to Make a Precision Tool for the Model Engineer

By W. BROWN

THE easiest and certainly the cheapest way for model engineers to acquire equipment is to make it. Although a precision grinding spindle seems rather an ambitious project, the design described here was evolved with the object of producing such a precision job with the minimum of trouble and at a low cost. To avoid excessive turning, most of the larger parts are machined from standard sizes of mild steel pipe and, including the bearings, the total cost is under twenty shillings.

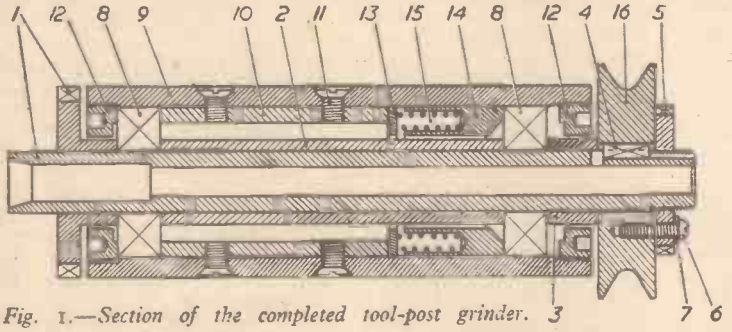


Fig. 1.—Section of the completed tool-post grinder.

Design

As shown in Fig. 1, the design comprises a spindle assembly 1 mounted on two journal-thrust bearings 8 and built into an outer casing 9. A fixed sleeve 10 locates the wheel end bearing and a thrust ring 14 in conjunction with springs 15 exerts a predetermined pressure on the drive end bearing so as to compensate for wear and eliminate chatter. The drive is by ¼in. diameter belt to the pulley 16, and the spindle will accommodate up to a 3in. diameter wheel ½in. wide for external grinding, the wheel being fitted direct to the spindle nose and held in place by the drawbolt and washer shown in Fig. 2. For internal grinding, ready mounted wheels are used, these being held by the spring collet and drawbolt shown in Fig. 3. The mounting of the spindle on the lathe has been omitted, but the best method is to use a split cradle bolted to the T-slot of the cross-slide, the lower half of the cradle being of such a height that the spindle centre coincides with the lathe centres. The drive can be from a layshaft, using a large wooden pulley, or from a small motor mounted behind the lathe. The use of round belting allows ample traverse without risk of the belt coming off.

Construction of the Spindle

This is made from ¼in. bore M.S. pipe with a nominal O.D. of .55in. After clearing the bore to accept a ¼in. diameter rod, the outside is rough turned to 33/64in. and the wheel flange rough turned and bored to be a light tap-on fit on the spindle. This flange is then brazed or silver soldered in position and the complete spindle returned to the lathe for finish turning between centres to the sizes given, the end being threaded at the same time. A ⅛in. hole is drilled as shown and the keyway cut from the saddle so as to break into this hole. The spindle is then accurately chucked and the 5/16in. diameter counterbore and 20 deg. taper added. These must be concentric with the outside diameter (Fig. 5).

List of Components

Part No.	Component	Material	No. Off
1	Spindle Assembly	¼in. M.S. Pipe	1
2	Spacing Sleeve	¼in. M.S. Pipe	1
3	Spacing Collar	¼in. M.S. Pipe	1
4	Key	Cast Steel	1
5	Lock Ring	M.S.	1
6	Lock Screw	—	1
7	Spring Washer	—	1
8	Bearing L J T ¼	—	2
9	Outer Casing	1¼in. M.S. Pipe	1
10	Inner Sleeve	1in. M.S. Pipe	1
11	Screw 3/16in. B.S.F. Countersunk	M.S.	4
12	Bearing Cap	M.S.	2
13	Thrust Washer 1/16in. thick	M.S.	1
14	Thrust Ring	M.S.	1
15	Spring (see Notes)	S.S.	6
16	Pulley	Aluminium	1
17	Wheel Washer	M.S.	1
18	Drawbolt	M.S.	1
19	Washer	M.S.	1
20	Nut ¼in. B.S.F.	M.S.	3
21	Collets ¼in., 5/32in., 3/16in.	Silver Steel	1 each
22	Drawbolt	M.S.	1

Fig. 2.—Draw-bolt and washer.

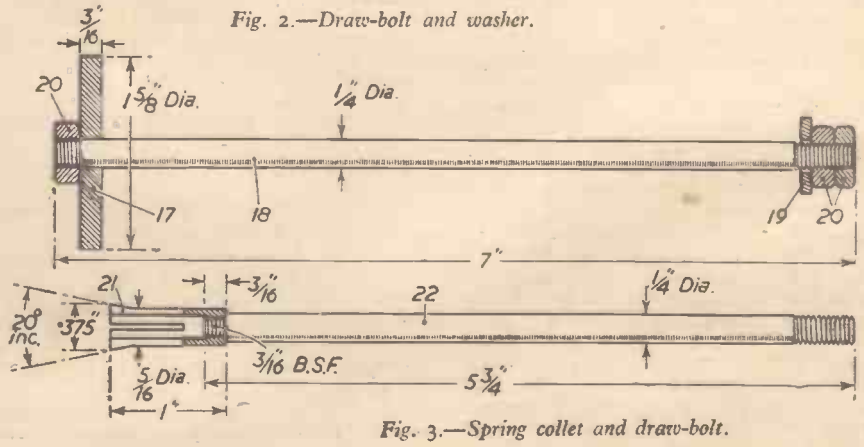


Fig. 3.—Spring collet and draw-bolt.

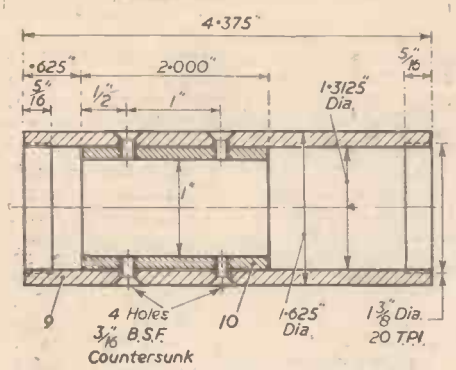


Fig. 4.—Section of the outer casing and inner sleeve.

Spacing Sleeve and Collar

These are made from ½in. M.S. pipe, the bore being cleared to a slide fit on the spindle and reduced on the outside to ¾in. diameter. The length of the sleeve is important (Fig. 6).

Casing and Inner Sleeve

The casing is made from 1¼in. M.S. pipe, the outside diameter of which is 1.69in. Care is required in turning the bore, as this *must* be a good fit on the outer races. A good stout tool bar should be used and the finishing cuts should be very light to avoid spring. The bearings can be used as a gauge, and they must be a tightish slide fit in the bore. The outside diameter is then turned to size, the end squared and the piece parted off to the correct length. Finally the two ends are threaded. Next, the inner sleeve is made from 1in. M.S. pipe, with the outside diameter turned to a slide fit in the casing and then parted off accurately to length. The bore need not be touched (Fig. 4).

Thrust Ring

This is made from a short length of 1⅜in. M.S. bar and to avoid break-through it will be found that it is best to square the ends first, and then mark off and drill the six 11/64in. diameter holes (Fig. 8). The depth of these is important, as it controls the degree of preloading of the bearings. The part can then be re-chucked and the holes checked that they are running true. The centre hole is then drilled and bored to size, after which the component is reversed, faced to length and the chamfer added to the bore. The piece is then mounted on a mandrel and the outside diameter finish turned to exactly the same size as the inner sleeve, i.e., a slide fit in the outer casing.

Preloading

The published rating of the L J T ½ bearings at 4,000 r.p.m. is 125lb. each for radial loading. Assuming that 25-30lb. is utilised for preloading as a thrust load this leaves 100lb. per bearing for radial load, and for intermittent use this is ample for the purpose in mind. To obtain this pressure care should be taken that the long spacing sleeve, the inner sleeve and thrust ring are made accurately to length and that the depth of each of the six holes in the latter component is to size and uniform. This leaves a space of 9/16in. for the springs in their compressed condition. The springs are made from .028in. diameter piano wire with a bore of ·1 in. A continuous length can be made, winding at 20 turns per inch., and it will be found that when cut in lengths of a shade over ⅜in. and the ends ground to give an overall length of exactly ¾in. the rating will be in the neighbourhood of 28lbs./inch deflection. This gives a total deflection of 1⅛ in. for the six springs, so giving a shade over 30lb. preloading. The success of the spindle depends on the preloading, and a little time spent on getting this right is well worth while. A further point to watch is that the springs are a free fit in their holes.

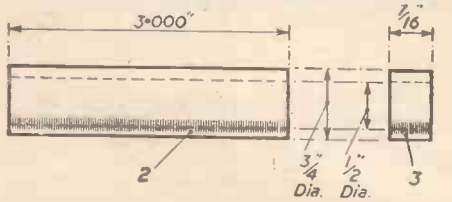


Fig. 6.—Spacing sleeve and collar.

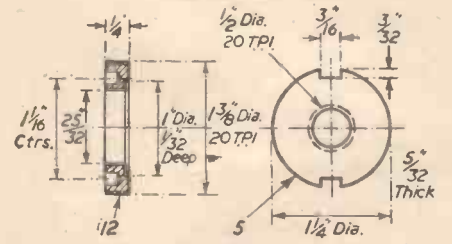


Fig. 7.—Details of bearing cap and lock ring.

Assembly

The other parts present no problems, and when these are made assembly can begin. First fit the inner sleeve so that it is exactly ⅛ in. from one end of the casing. Drill and tap a 3/16in. hole at one of the positions shown and fit a temporary screw. The remaining three holes are drilled, countersunk and tapped, care being taken that the countersinking is deep enough to let the screw heads sink below the surface. The temporary screw is now removed and the hole countersunk for the last screw. Finally, *three* of these screws are locked by stabbing the casing metal into the screw slot. The fourth screw is left free and suitably marked as this is used for recharging with oil when required. The bearing is now fitted to this end and secured by its bearing cap. This can be locked in place by two or three centre pops on the thread junction. The thrust washer, thrust ring and springs are now inserted from the open end and the spindle from the opposite end. Next follow with the spacing sleeve, bearing and collar, finally screwing the bearing cap into the casing until it is flush with the end. This cap should be locked by centre pops as before. The pulley, key and lock ring are next fitted and the whole unit tightened up with C-spanners. Lastly, the lock ring (Fig. 7), and pulley are drilled and tapped ⅛in. deep to take a ⅛ in. BSF round head screw fitted with a spring lock-washer. This completes the assembly of the spindle unit.

Drawbolts and Collets

For securing wheels for external grinding a 7in. length of ¼in. diameter M.S. is threaded both ends, as shown. The single nut holding the wheel washer should be brazed or riveted in place. For wheels thinner than ¼in. packing washers will be required but ¼in. wide wheels are recommended. Two locknuts should *always* be used to prevent the wheel coming loose.

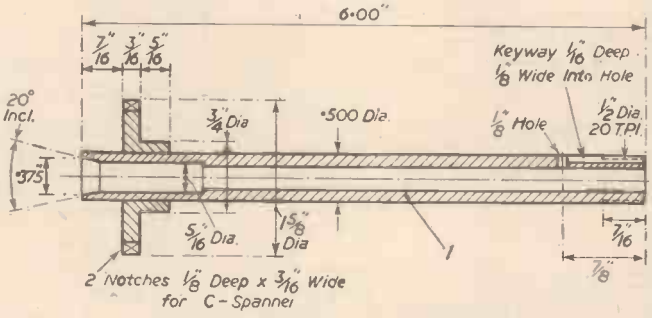


Fig. 5.—Section of spindle assembly.

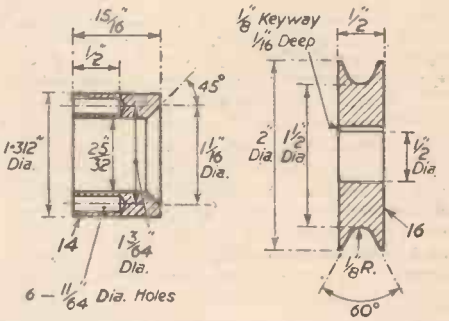


Fig. 8.—Sections of thrust ring and pulley.

For internal wheels the collets shown in Fig. 3 are required and these should be made from silver steel, hardened and tempered to a full blue. Three sizes should be made to accommodate ¼in., 5/32in. and 3/16in. diameter shanks, as these are common sizes. The same drawbolt will do for all three collets and once again two lock-nuts should be used.

Lubrication

Any light machine oil is quite suitable, and in oiling it is better to err on the generous side. No provision is made for exclusion of dirt other than the close fit of the bearing caps on the spindle, and the oil helps to form a seal. A few annular grooves in the bore of these caps can be added as a refinement, and this helps in excluding dirt from the bearings by providing an additional oil seal.

A small PUNCHING PRESS

Constructional Details of a Handy Tool for the Workbench

By W. A. THORPE

THE press shown in the accompanying illustrations will punch cleanly with a ¼in. punch through 1/32in. mild steel or .090 alloy.

The construction of the press is a fairly simple matter provided access to a lathe and drilling machine is available. The welding can be done by a local garage. The base is made from a piece of channel iron of the dimensions given in Fig. 4. Nothing is tied down to rigid sizes and proportions can be varied to suit taste and material available. The design of the press provides for quite a reasonable amount of leverage and versatility.

Welding the Body

The first operation is to get the 1½in. square mild steel welded to the piece of

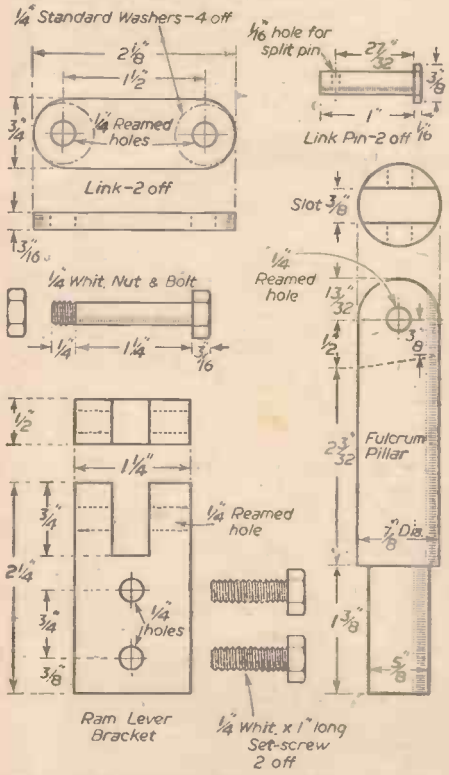


Fig. 2.—Details of the ram lever bracket, fulcrum pillar, and links and pins.

1½in. round which has been well chamfered to allow plenty of surface for the weld, as indicated in Fig. 1. The ¾in. tapped hole can be drilled in the lathe whilst facing up the ends, or can be drilled in a drilling machine. The ⅞in. reamed hole for the ram (Fig. 5) must be bored or drilled truly square with the bolting-down face. The ¾in. diameter hole can be drilled and chamfered at the top. The chamfer stops the spring jamming up; all other holes can be put in except the two ¼in. tapped holes on the front, which are marked off from the ram-lever bracket. The fulcrum pillar, shown in Fig. 2, can be made next. The ¾in. diameter stem should be a nice fit into the body. The slot might

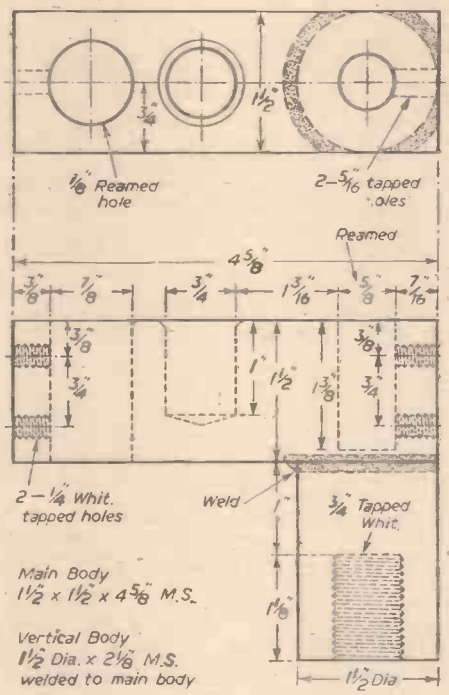
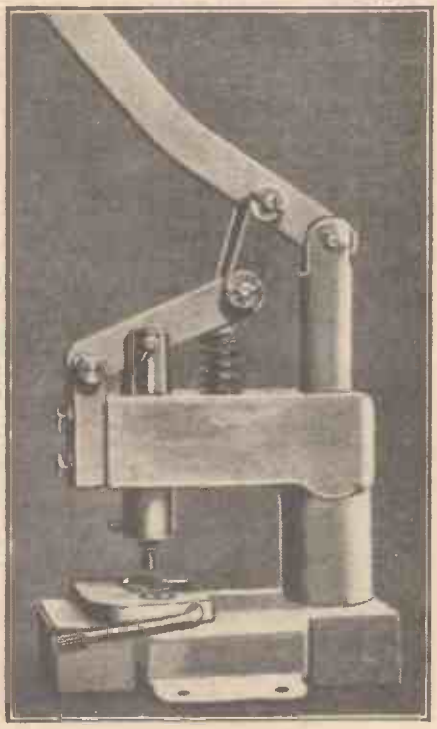


Fig. 1.—Plan and side view of the body.



Side view of the completed press.

appear a rather stiff proposition, but it can be made without difficulty. First, drill a ⅛in. hole 3/16in. down from the centre of the ¼in. hole and at right angles to it; then saw down to reach the bottom of the hole, and proceed to file out the slot as shown in the drawing. All the other slots can be formed in the same manner; the diagrams of links and pins are self-explanatory. The

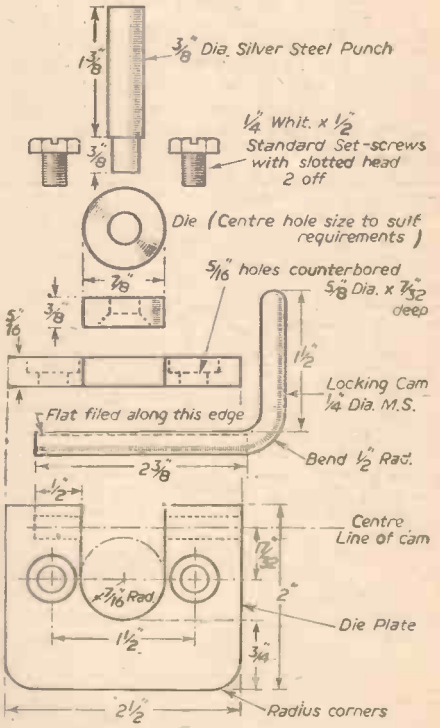


Fig. 3.—Details of the die plate, locking cam, dies and punch. Note the flat which is filed along the inside edge of the cam.

position of the spring dolly should be marked off whilst the lever is in position on the body.

Die Plate

The die plate (Fig. 3) is the next step, and, as can be seen, is of simple construction. The reason for the two counterbored holes is to allow for alignment with the punch should any slight inaccuracy occur on the punch or die. The cam rod needs a little explanation. The idea is to provide for easy removal of the die from the plate. First, bend the rod as shown and then file a flat on the inside edge of the rod so that when the rod is inserted in the die-plate with a die in

position it just clears the die. Then round off the top edge of the flat, when it will be found that a slight pressure on the rod will lock the die tightly in position. Details of the lever, which is made from ¾in. by ⅜in. mild steel, are given in Fig. 6. The punches and dies can be made to suit requirements.

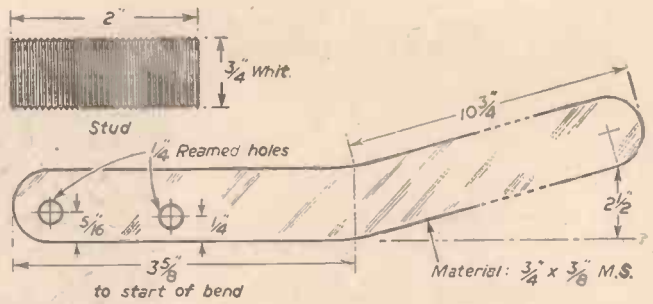


Fig. 6.—Dimensions of main lever and details of stud for fixing the body to the base.

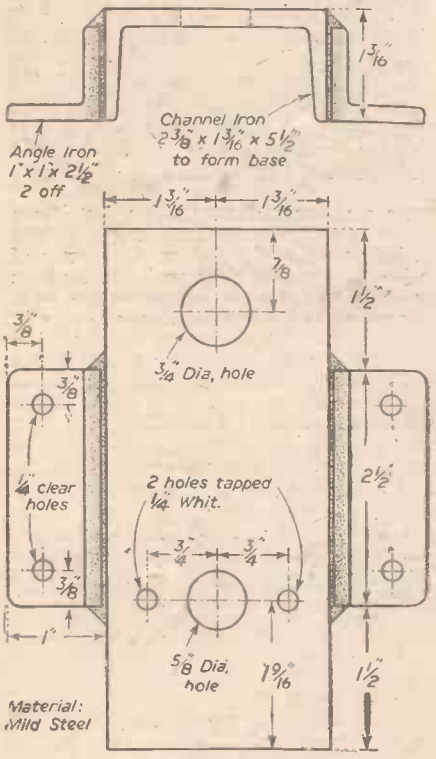
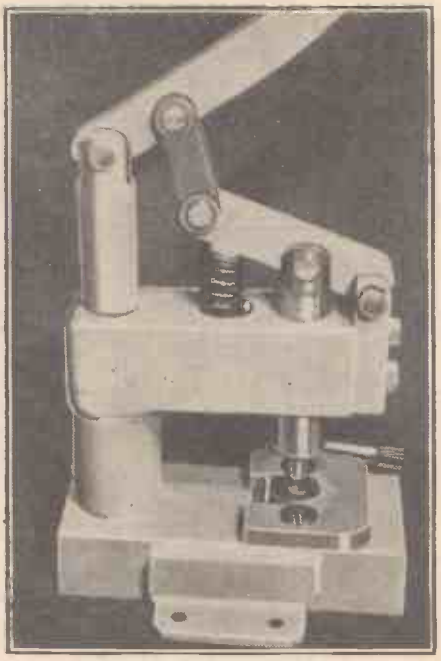


Fig. 4.—End view and plan of base.



Another view of the completed press.

Finishing

The finished press can be painted a grey colour and fitted with plastic knobs on the lever ends which greatly improve the appearance. Finally, a little care should be spent in fitting the parts together, as loose holes in links and levers loses part of the effective stroke, which of necessity is on the small side.

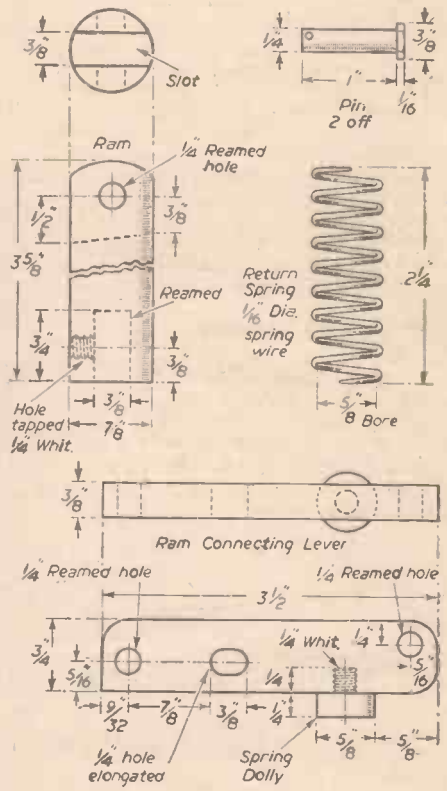
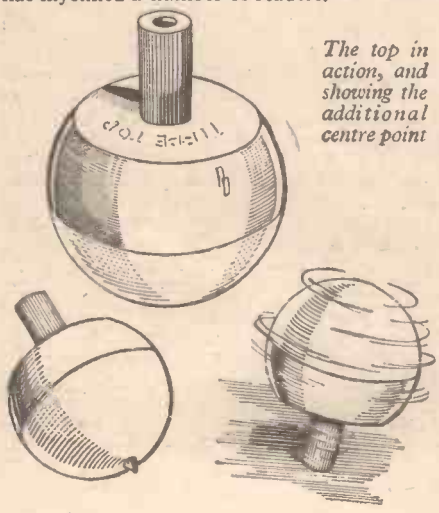


Fig. 5.—Details of ram, connecting lever and spring.

The Tipsy Top

THE top shown in the diagram, which recently came on to the market, is spun like an ordinary top and it acts like one until its speed begins to drop, when it will turn completely over and spin on its peg. This has mystified a number of readers.



The top in action, and showing the additional centre point

The vendors are unable to explain the mystery. There is no point on which the top can revolve and so when it is spun it also rocks from side to side, and this creates a force which at a certain point in its gyration will invert it.

If a small point is inserted at the exact centre of the hemispherical base the top will spin without inverting itself. That is the answer to the problem.

Speed of Light

EXPERIMENTS carried out at the National Physical Laboratory have shown that the figure normally accepted for the speed of light was inaccurate by eleven miles a second. The apparatus used in the experiments were on show recently at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

The exhibit consisted of a cavity resonator in which a radio wave is reflected backwards and forwards between the two ends. When the time of travel between the ends equals the time interval between successive waves, they build up to an electrical resonance which can be detected with very high precision. Visitors were able to do this themselves.

The time of travel is about one ten-thousand-millionth of a second (1/10,000,000,000). This means that the waves follow one another at a frequency of 10 thousand million per second, and it is necessary to measure this frequency with an accuracy better than one part in a million.

The dimensions of the resonator had to be accurate to one hundred-thousandth of an inch, and the Metrology Division of the N.P.L. had to devise new techniques to give the required accuracy of measurement.

An Electrically-driven Lawn Mower

The Simple Adaptation of a Roller Lawn Mower for Electrical Operation

By T. H. R.

A WELL-KEPT lawn is a mixed blessing, as unfortunately it has to be cut! With the price of commercial power-driven machines so high, the average householder resigns himself each week-end to the harrowing task of cutting the grass with an ordinary hand-driven machine. For readers wishing to avoid this, this article has been written.

Assuming the reader possesses a standard type of roller lawn mower, its conversion as here described to an electrically-driven machine can be effected with very little labour, and at a cost which should not exceed about seven pounds.

Scope of the Machine

In this adaptation, the motor is arranged to turn the cutting cylinder only, and is not intended to propel the mower along, as this would involve a larger motor, and also the provision of a clutch to facilitate turning corners.

In addition to the mower, the following parts are required:—

One ¾ h.p. electric motor, 1,425 r.p.m., to suit mains voltage.

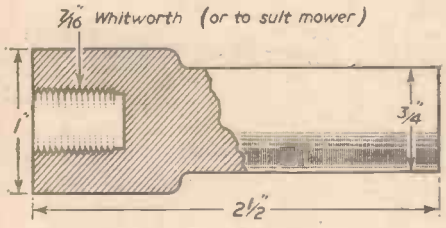


Fig. 1.—Spindle extension.

Length as required of 5-amp. 3-core rubber-covered cable.

Metal cased 5-amp. 3-pin switched-socket box.

Three 3-pin 5-amp. plugs.

One 3-pin 5-amp. socket.

Two 3in. diam. "V" pulleys for ¾in. spindles.

One leather "V" belt of suitable length.

Lengths of 1in. x 1in. angle iron.

Special spindle piece (see below).

Mechanical Adaptation

The spindle extension is shown in Fig. 1, and is turned from a piece of 1in. diam. mild steel rod. If the reader is not in possession of a lathe, most garages will turn this piece at a small cost.

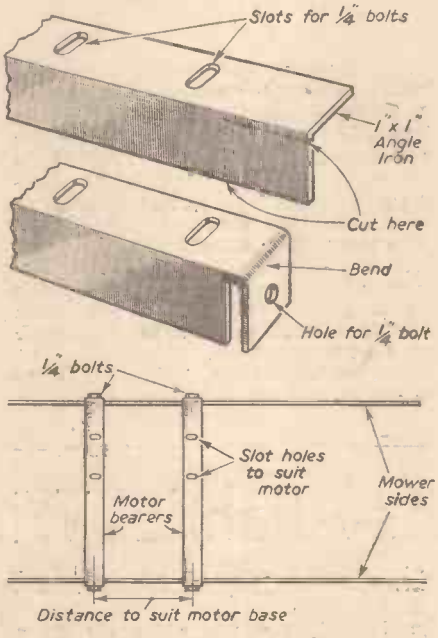


Fig. 2.—Mounting brackets for motor.

The nut from the right hand end (facing the direction in which the mower travels) of the cutting cylinder is removed, and this extension piece screwed on instead. One of the pulleys is then placed on the spindle.

The next step is to disengage the roller from the cutting cylinder, and as most machines have three cog wheels under the cover plate, this can be done simply by removing the centre cog.

The motor should now be bolted to the 1in. x 1in. angle irons which are cut and bent as shown in Fig. 2. Before drilling the side

The mower in use.

supports on the actual mower, the belt should be slipped over the pulleys, and, holding the motor in position with the belt tight, the holes should be marked on the mower supports, which can subsequently be drilled. Final adjustments of belt tension can be made by moving the motor in the slots in the angle irons. The motor should be kept as low down as possible by using a short belt.

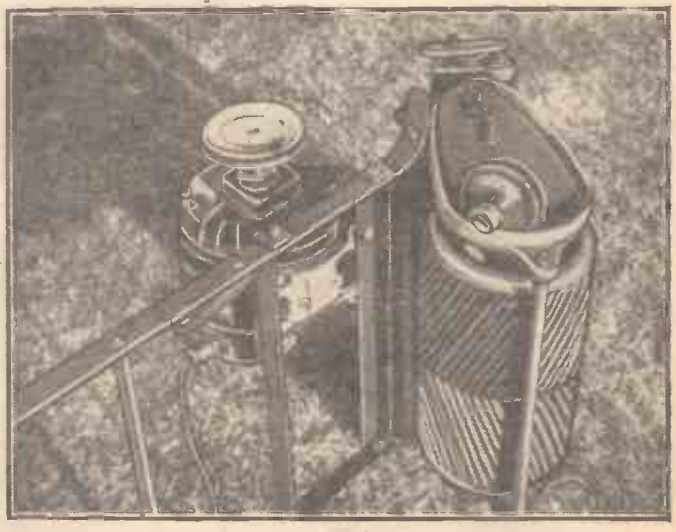
Finally, a hole should be cut in the cover plate to take the spindle extension and the plate screwed back into position.

Electrical Wiring

Fig. 3 shows the wiring circuit. A sufficient length of three-core cable for the lawn in question is fitted with a 3-pin plug for the house end and a 3-pin "on-line" socket for the mower end. If difficulty is experienced in obtaining the latter, an ordinary wall-fitting socket may be used, screwed to a disc of 5-ply wood. It is a good idea to construct a winding drum for the cable if its length extends over a hundred feet.

The 3-pin switched-socket box is bolted to the machine handle in a position where the switch can be reached conveni-

General arrangement of motor and driving belt.



View showing motor mounting, extension spindle and pulley.

ently. From the switch box a short length of cable terminating in a 3-pin plug connects to the main cable. The last few inches of the main cable should be wound with cord and a loop formed for attaching to a hook on the machine, thus preventing strain on the plug.

Connection is made to the motor by another 3-pin plug, which fits into the switched-socket box.

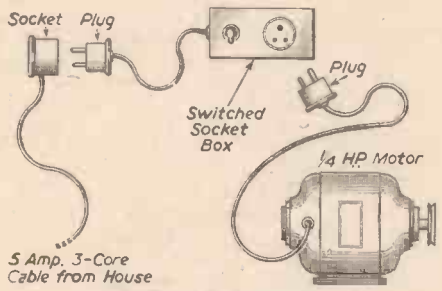


Fig. 3.—Wiring connections.

This system of wiring is considered essential in the interests of safety. Occasionally it is necessary to handle the blades when adjusting clearances or removing wads of grass, and at these times the lead from the motor should always be unplugged at the switch-box, thus completely isolating the motor. If this is not done, a faulty switch or an accidental knock may result in severe injury.

It is essential to securely earth the third wire in the cable at both motor and switch-box, making sure that the bolted contacts are bright and clean.

At the house end the connection should be made to a 5-amp. lighting circuit, bringing an earth wire, if one is not present, from the steel conduit on the power circuit. Alternatively, a power point may be used, through a 5-amp. fused switch.

Care should be taken that the line wire and not the neutral is connected through the switch at the mower. The price of 5-amp., 3-core, rubber-covered cable is about 1s. 3d. per yard, but the writer obtained on the surplus market some at a considerably lower cost. It is strongly recommended that good quality cable be used, that it be well dried after being wet, and is periodically examined for faults.

Method of Operation

It might be thought that the trailing wire would often become entangled with the machine, and that the danger of cutting the cable would be considerable; but by adopting a regular system of procedure, neither of these troubles need arise.

The secret lies in arranging the cable prior to starting. Fig. 4 shows in full line how this should be done; the dotted line indicates the direction of progress. With this system the cable will follow down and across the lawn quite automatically.

When turning at the end of a row, always step over the cable. In other words, the operator and not the machine should cross the cable.

Finally, a word about speed. Probably 90 per cent. of the work in pushing a hand mower is consumed in turning the cutting blades; when this is done by motor it is possible to push the machine across the grass at a considerably greater speed. For this reason, with the pulley sizes as given above, the cutting cylinder is arranged to rotate more quickly than is usually the case. It is therefore advisable to make quite certain that there are no stones on the lawn, otherwise the cutter blades may be broken. If it is considered that the cylinder is revolving too rapidly, its speed can be reduced by putting a smaller pulley on the motor.

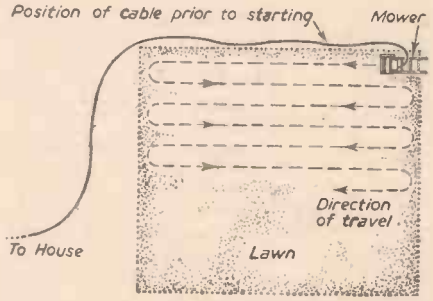


Fig. 4.—Diagram indicating direction of travel when using the mower.

The First Trans-Atlantic Wireless Signal

The Fiftieth Anniversary of Marconi's Triumph

ON Wednesday, December 12th, last year, Marconi's Wireless Telegraph Co. Ltd. celebrated the fiftieth anniversary of the first spanning of the Atlantic Ocean by wireless. This great feat occurred only four years after Marconi had first demonstrated, to the G.P.O. authorities, that it was possible to pass intelligence between two places only a few yards apart using only the ether as a medium.

Since that time the science of wireless has progressed rapidly until, to-day, it plays a major part in our lives. No other invention has so influenced man's social and commercial life; high-speed communication, navigational and safety aids, radio, radar and television, all now being accepted as an integral and necessary part of our existence and administration.

All this really started when Marconi, and the earliest members of the famous company he founded, decided that the radiation of wireless waves was not limited to short ranges but could be propagated over long distances. In order to prove the theory they decided to send signals from England to Newfoundland.

Despite the scepticism of others Marconi was confident that his experiment would be successful. His unswerving faith and determination infected the engineers and helpers he had gathered around him and plans were prepared for the passing of wireless signals from England to the New World.

Poldhu, in Cornwall, was the choice for the erection of the transmitting station, a station which was to be a hundred times more powerful than any previously erected.

Major Set-backs

There were minor and major set-backs; one, the wrecking by a storm of their first aerial array of twenty 210ft. masts, would have daunted most people but the group who then comprised the Marconi Company set off on another tack and erected a fan-shaped aerial 150ft. high.

Marconi, with two of his engineers, Kemp and Paget, arrived in Newfoundland and here they received help and encouragement from the (then) Governor, Sir Cavendish Boyle, and the Prime Minister, Sir Robert Bond. A room in the Barracks Hospital, on Signal Hill, St. John's, was placed at their disposal.

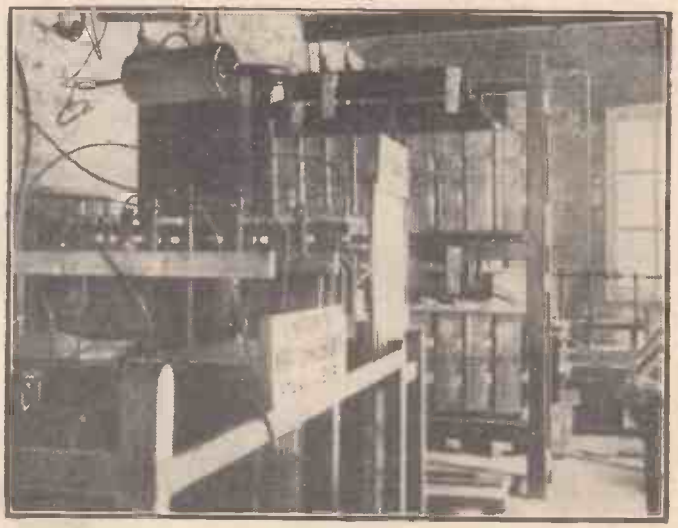
Aerial Failure

Here, again, aerial trouble was encountered for their first attempt to raise as long an aerial as possible, by means of a balloon, was ruined when high winds carried the balloon away.

Speed was now of great urgency for a schedule of transmission had already been arranged and it was imperative that the receiving station was functioning perfectly, in time. The next attempt to raise an aerial on Thursday, December 12th—this time on a kite—also failed. Once again an untimely wind carried the elevator away. Determinedly, relentlessly, another kite was sent up . . . it held.

The Final Stage

The next stage was, perhaps, the hardest of all, the silent watch on the ether, earphones clamped on heads; straining to hear, and then three dots, the Morse code signal for the letter "S." This was the prearranged signal. The Atlantic had been spanned by wireless and the Marconi Company had started what was to become a vast network of wireless covering the whole world.



Some of the early apparatus at the Poldhu Wireless Station. The banks of condensers are carried in metal containers in the wooden rack. On the extreme right is the spark gap, used in sending the first Trans-Atlantic signals on the 12th December, 1901.

Studies in Electricity and Magnetism

Inductance : Voltage Dropping : Condensers and Capacity

Inductance of a Field Magnet

Suppose the field magnet system of a generator sets up a total flux of one million lines of force; that the total turns on the shunt winding is 1,000; and that the field current is 0.5 ampere.

The inductance can be estimated from these three figures—flux, turns, and steady current. For,

$$L \text{ (in Henries)} = \frac{\text{Total flux} \times \text{turns}}{\text{Current} \times 10^8}$$

$$= \text{flux-turns } \textit{per ampere} \div 10^8.$$

If flux × turns per ampere $= 10^8$, we have $10^8 \div 10^8 = 1$H. An inductance of one Henry corresponds with 100 million "flux-turns per ampere," i.e., if the current is changed at a rate of one ampere per second, one volt will be self-induced.

Observe, however, that the above formula makes no use of *rate of change* of the current. The "current" stands simply for its *steady* value, in amperes.

For the field system, the total flux is 10^6 lines, and

$$L = \frac{10^6 \times 10^3}{0.5 \times 10^8} = 20\text{H}.$$

If we switched-off the field current in 0.01 sec., the rate of change would be 0.5/0.01 = 50 amperes per sec., and the

Self-induced E.M.F. = L × rate of change of current.

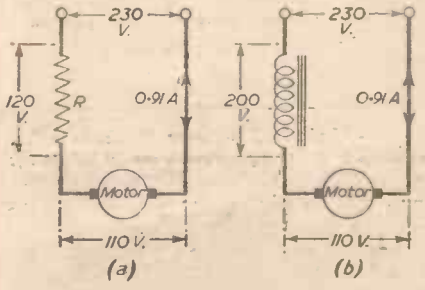
$$= 20 \times 50 = 1{,}000\text{v}.$$

In a previous article we defined the ratio L/R as the inductive *time-constant*. If the resistance of this shunt winding was 100 ohms, L/R = 0.2 sec.—on applying a voltage to the shunt, the current will take one-fifth second to grow to about 60 per cent. of its final steady value.

This particular field system has only a moderately high inductance, but it is seen that a small time-delay is introduced which may be important in the working of certain control devices.

Inductance in A.C. Circuits

The time-delay has far-reaching consequencies in A.C. circuits.



We have a voltage wave that is varying and alternating rapidly at, say, 50 cycles per sec. The voltage goes through a complete cycle in 1/50th sec., or grows from zero to maximum (a ¼-cycle) in 1/200th sec.

If a large inductance is connected across the mains, the current too will alternate at 50 cycles/sec., but it cannot keep step with the voltage. When the current is growing, a back e.m.f. opposes its growth; when it is falling away, the magnetic field will cut the turns in the opposite direction, inducing an e.m.f. which tries to keep the current "going."

In fact, the mains voltage will be opposed *all the time* by a back e.m.f. (Fig. 6a) of the same waveform as the voltage, but 180 deg. out of phase.

In the case of a pure inductance—having no resistance—the current-wave will be

(*Concluded from page 99, December issue.*)

delayed a full ¼-cycle (Fig. 6b): it falls 90 deg. out of step with the voltage. This has interesting results.

"Wattless Power"

Since there is no resistance, no heat will be generated, so volts × amperes cannot express *true power* dissipated as heat.

There is no power *dissipated*. All the energy goes to building up a magnetic field, and is returned into the circuit when the field collapses.

Being a ¼-cycle out of step, the current is said to be purely "wattless." If you connected a *pure* inductance across the mains, you would find that the electricity meter does not register any energy consumption, even though a low inductance would take a large current.

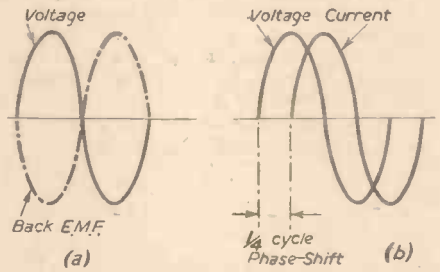


Fig. 6.—Effect of pure inductance in delaying the current a ¼-cycle in an A.C. circuit. An alternating back E.M.F. (a) is generated, equal and opposite to the supply voltage at all instants.

In every actual coil, however, there is some resistance. The current will not lag by as much as 90 deg., but somewhat less—enough to make up for the true power dissipated as heat. The fact that an inductance of low resistance dissipates but small power makes it economical for A.C. voltage-dropping.

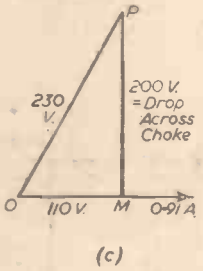


Fig. 7.—Simple illustration of the use of an inductance for A.C. voltage-dropping—considering only the true power *for a small 110 v. A.C. motor, i.e., the power-factor of the motor, is assumed to be unity.*

Reactive Voltage Dropping

Let us consider a small A.C. motor, 110v., requiring, say, 100 watts of true power, i.e., an in-phase current of 100/110 = 0.91 ampere. We want to run this off a 230v. supply.

If we employed a resistance (Fig. 7a) for dropping, we have to get rid of 230 − 110 = 120v., and, at 0.91A, the resistance required is 120/0.91 = 132 ohms. The power dissipated (i.e., wasted) will be 120v. × 0.91A = 109 watts—which is more than the power taken by the motor.

An alternative is to use a transformer or auto-transformer, or a series choke. As for the resistance, we require a choke having a certain ohmic value—*reactive* ohms. But since the resistance of this can be quite low, little power will be wasted; volts are "dropped" because they are annulled by an equal and opposite back e.m.f.—e.m.f. of self-induction.

This choke is substituted for resistance in Fig. 7b. We must be careful with our calculations here. The drop across the choke is at 90 deg. to the current, so we must not write 230 − 110 = 120v. The relations are those of a right-angled triangle (Fig. 7c), the 230v. being represented by the hypotenuse OP. The required drop in the choke will be (to a suitable scale) the length of the perpendicular PM, or by vector arithmetic:

Volts to be dropped $= \sqrt{230\text{v.}^2 - 110\text{v.}^2}$

$$= 100\sqrt{4.08}$$

$$= 200\text{v. approx.}$$

Then, with a current of 0.91A (we take no account in this article of reactive current taken by the motor), the choke must be of 200/0.91 = 220 (reactive) ohms.

The inductance may then be found by the A.C. formula: Inductive reactance = $2\pi \times$ frequency × L, where L = Henries. In this case,

$$L = 220/2\pi f = 220/314 = 0.7\text{H}.$$

Since the current is varying during each cycle, design of iron-cored A.C. inductances is not quite straightforward, but the above principles will suggest how to make a very rough estimate of the turns required, for a given flux and core size, i.e., to provide 0.7×10^8 flux-turns per ampere.

If the resistance can be kept low, reactive methods are much more economical than resistance-dropping, but have the disadvantage of lowering the power-factor.

While wattless currents do no useful work (other than to provide essential magnetic fields), the supply cables, transformers, etc., must be large enough to carry the total current—wattless and wattful. Extra charges, on a kVA. basis, are generally made if the power-factor of an installation is below a stipulated figure.

Condensers and Capacity

Little has been said in these articles regarding *electric fields* and the laws of electrostatics—an important but neglected subject these days, which is covered very fully in textbooks of electricity and magnetism.

Space will permit of only a bare outline of condensers. Any two conductors separated by an *insulating* space, or "dielectric" (which may be air, or vacuum), possess electrostatic *capacity*.

What does that mean? We can understand the capacity of a glass jar or a tank, but electricity is not a thing which can be measured out in so many pints or gallons. Yet it is true to say: the larger the electrical capacity between a pair of conductors or plates, the greater the *quantity of electricity* (Q) that must be "poured" in (to use a loose descriptive term) to give rise to a potential-difference (V) in volts.

Electric "quantity" (Q) is expressed in *coulombs*. It is a definite quantity, numerically equal to 6.29×10^{18} electrons! A much larger unit of quantity is the *ampere-hour*, already briefly mentioned = amperes × hours. Coulombs = amperes × *seconds* = ampere-hours × 3,600, i.e., there are 3,600 coulombs in 1AH.

Unusual Transp

Including a Double-rail Track Up a Cathedral Spire

Fig. 1.—Railway on Salisbury Cathedral spire (J. W. Gray & Son).

IN these days of fast rail transport, one's ideas tend to regard the movement of passengers and goods as occurring along a pair of rails over more or less level country. The undulatory character of the ground to be traversed, however, was one of the problems which faced the pioneers of the many narrow-gauge lines now operating successfully in different parts of the world, and the further desire to economise in track width and operating costs was a powerful factor in the minds of those engineers who designed the various monorail systems. In the notes which follow, the reader can trace the influence of the normal method of rail transport in securing like benefits under vastly different conditions of operation.

A striking example occurs in the restoration of the lovely spire of Salisbury Cathedral, which for some years past has shown signs of grave deterioration through stress of weather and ferrous metal corrosion. To preserve the spire—and, incidentally, the whole Cathedral from the damage that would ensue if the spire collapsed—it has become necessary to rebuild completely the topmost 20ft., and to restore extensively the next 25-35ft. The height of the spire is approximately 400ft. above ground level, and as the original oak internal scaffolding still remains, with which the early builders erected the spire, the problem of transport for the material required in the rebuilding process was solved by laying a double-rail track for approximately 120ft. up the spire, as seen in photographs Figs. 1 and 2. (To the left of the track in Fig. 1 may be seen the ladder used by the steeplejacks.) It is thought that this is the first occasion when a railway has been used for work under such hazardous conditions.

Fig. 2.—Showing the track up the spire (J. W. Gray & Son).

The track consists of two parallel lengths of 3in. x 1½in. rolled steel channels in approximately 10ft. lengths, with 2in. x ⅜in. flat mild steel sleepers at 3ft. centres, each section of the track having fishplate joints with C.S.K. screws and nuts. The track was supported and held clear of the spire by hardwood blocks—see also Fig. 3 which shows the skip on its way up with material—with long galvanised iron bolts securing sleepers and blocks to the inside face of the spire.

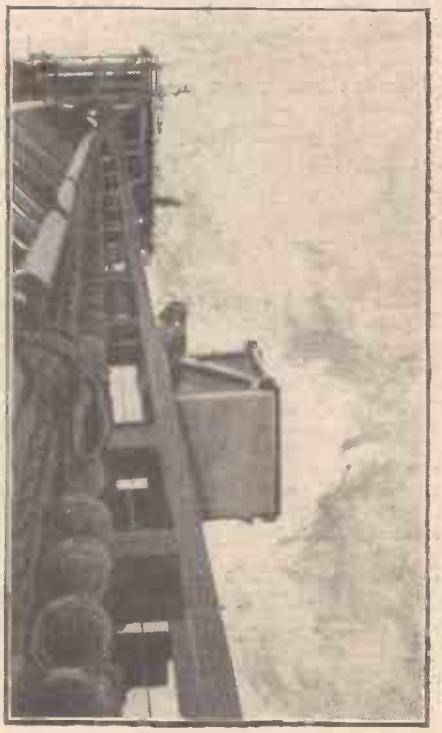


Fig. 3.—Method of securing track to spire, with trolley going up (J. W. Gray & Son).

The skip, or trolley, which runs along the track was supported on wheels having ball bearings and controlled by a galvanised high-tensile steel wire rope secured at its upper end to a 5 cwt. electric hoist motor. To safeguard against fracture of the cable, spring loaded safety cams were fitted, the movement of these forcing serrated steel teeth into the sides of the track and so holding the trolley rigid to the rails. Fig. 4 gives a view of the trolley from above, and affords some idea of its great height above the Cathedral grounds.

Before leaving this example of rail transport, it is interesting to contrast the forces in play on the track and on the hauling medium with those which occur on a normal rail gradient. In the latter, adhesion is always the important factor, but in the foregoing case adhesion is practically non-existent. With the spire height of approximately 190ft. and base of 45ft., the "gradient" of the line is approximately 8 in 1, as measured by ordinary standards, and the load

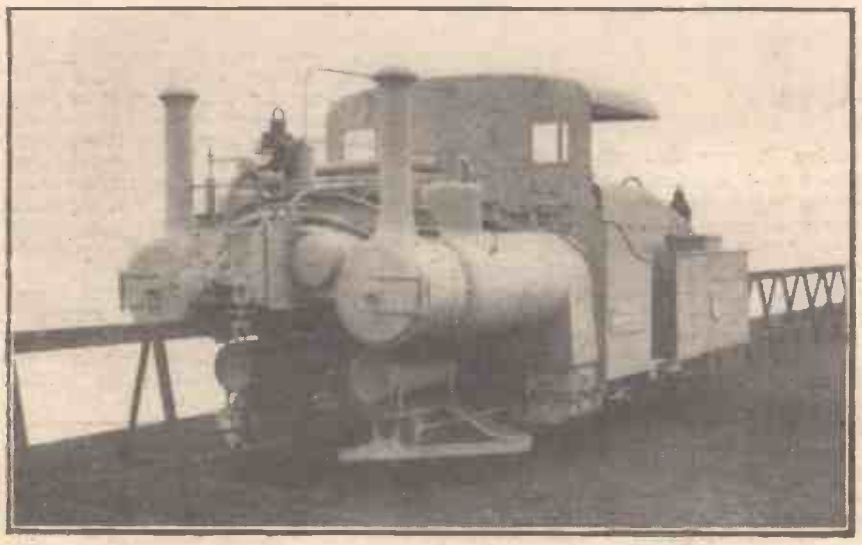


Fig. 5.—Loco for Lartigue monorail system (Hunslet Engine Co.).

ort Systems

By G. W. McARD, A.M.I.Mech.E.

therefore hangs almost entirely on the cable —or the safety device !

Monorail System

In the late 19th century many designs of monorail vehicles were produced in the anticipation of obtaining high speed transport (120 m.p.h.) and an absence of any risk of derailment. In the illustration, Fig. 5, is shown one of the locomotives built by

Fig. 4.—View of trolley, looking downwards (J. W. Gray & Son).

the Hunslet Engine Co. for the Lartigue system in which the C.G. of the vehicle was approximately level with the rail surface. Although called a monorail system, these units actually used three rails, i.e., two guide rails and a single main carrying rail, and do not appear to have achieved any great success. In fact, serious problems arose through the lack of reasonably equal loading in the pannier type coach and wagon stock, and the despatch yard had some tricky problems to solve.

Uniline System

A method which more truly deserves the name monorail is that shown in the illustrations, Figs. 6 and 7, and known as the Uniline system. This has been designed for operation in extensive areas under development where no further use might be found ultimately for a railway of orthodox design, and where heavy mineral loads call for transport over relatively rough and hilly country with moderate-sized power units.

As will be seen, the power unit itself follows modern diesel shunting locomotive practice except for the wheels which carry large-size pneumatic tyres. The locomotive is of the 2-4-2 type, and hauls its train of vehicles on a narrow track or roadbed of concrete approximately 3ft. wide, in the centre of which is mounted a single rail for guiding purposes only. Rollers with vertical axes are mounted at the leading and trailing axle centres of all vehicles and, engaging with the centre rail, serve to guide the complete train to its destination. Switches and crossings are provided where necessary, and as the drive has the advantage of a rubber-to-concrete engagement, the normal factor of adhesion obtainable is around 0.8 instead of 0.2 for steel wheels and rails. A further gain is in the reduced demand which such a scheme makes on steel supplies, this being around 25 per cent. only of that used for the ordinary two-rail track. Fig. 8 is an end view of the arrangement of the guide rail and pulleys.

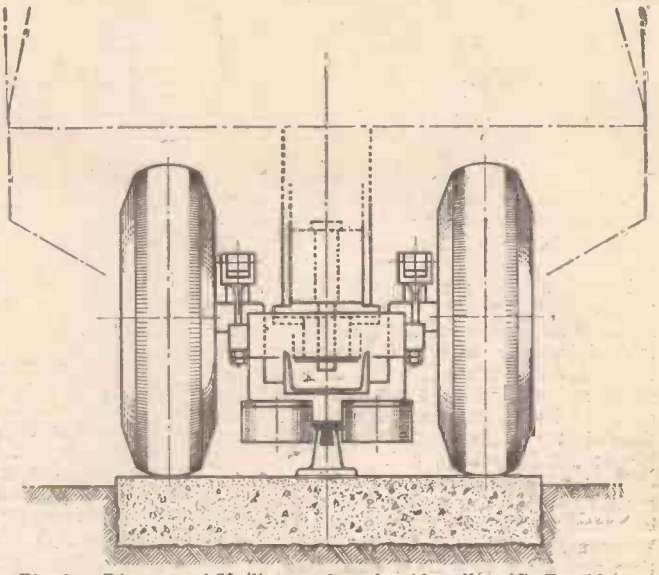


Fig. 8.—Diagram of Uniline track and guide rollers (J. Brockhouse & Co.).

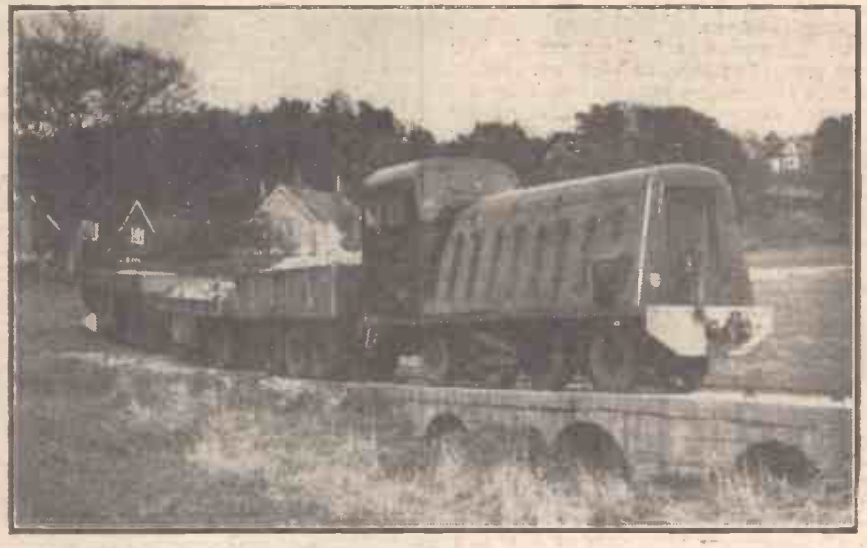


Fig. 6.—Uniline system of transport (J. Brockhouse & Co.).

Fig. 7.—Rear view of Uniline train (J. Brockhouse & Co.).

The Mechanics of Bull-fighting

What Goes on in a Modern Bull-ring, and Details of the Equipment Used

By THE MARQUIS OF DONEGALL

FEW tourists who spend ten shillings of their £100 to sample the Spanish national "sport" realise that an enormous industry lies behind the blood and sand of the bull-ring.

Behind all the glamour which sends the tourist away slightly sick at the defenceless horses being prodded, though very seldom injured in these days, and rather sorry for the bull whose doom is sealed in a blaze of glory rather than in the ignominy of the slaughter-house, only a few realise that in the industry at least three hundred thousand people are fully employed.

First of all there is the raising of the specially bred thoroughbred bulls. The best are traditionally those of the Duke of Veraguas, but he sold his bull-ranch some time ago for a very large sum.

Bulls of the Veraguas calibre depend in value on the age of the bull: a two-year-old about £100, a three-year-old £150, and a four-year-old £300.

It is impossible to find out exactly how many people live from bull-fighting. First, there are the ranches, then the architects and masons who are building bull-rings all the time, either in localities which have none or replacing arenas which have become too small not only for the inevitable increasing populations of a Catholic country, but also because the popularity of bull-fighting is increasing in spite of the astounding growth of professional football in Spain.

Apart from these, a large number of magazines, with their critics, are devoted entirely to bull-fighting. The bull-fighters themselves are what we would call a trade union. A top matador receives from £1,500 to £4,000 at the current rate of exchange for his afternoon's work—if he gets away with it. One has to remember that in the matador's career only about half the stars have died outside the ring. This is rather interesting psychologically because they mostly go on for a number of years after they have become the idol of the public; but sooner or later they seem to get over-confident and they meet the one bull of their career that just decides not to play the game the way they expect him to do. A classic example was, of course, Manolete, who caught it in the end and for whom the whole of Spain went into mourning.

The Swords

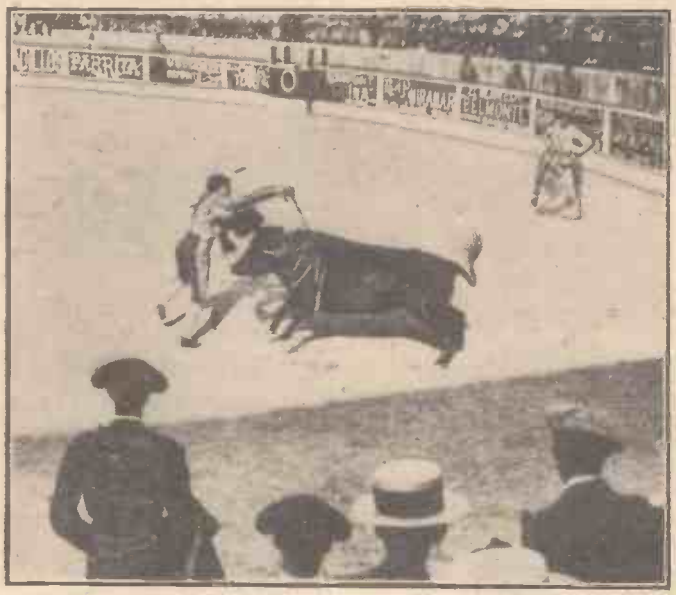
Let us now get down to real mechanics. The swords which the matadors use are made exclusively in Valencia. This may appear to be a paradox because, as every one knows, Toledo has been as famed as Sheffield for its blades for considerably more centuries. But, apparently, making swords and brewing Guinness have in common that it is the local water that does the trick.

A first-class sword costs about £30. The cheaper ones have no groove whereas the expensive ones have three grooves, and the theory that they are more deadly has long been exploded. An ungrooved sword weighs over a pound, whereas the three-grooved sword weighs less than half-a-pound.

Apart from the sword with which the matador attempts to make the kill in one thrust between the bull's shoulder blades, there is another kind with which he gives, if necessary, the *coup de grâce*. This has a cross-bar 4in. from the sword's point to prevent it entering farther. It is only used if the bull is practically dead but standing up through reflex muscle action. Otherwise, the *coup de grâce* is given to the recumbent bull by an assistant with a short dagger 10in.-long of lancet-shape.

The Picador

We now come to the picador—the chap on the horse. He has a lance about 9ft. long, the pointed end of which is rather like a ski-stick, meaning that it has a round piece of wood to prevent the lance entering the bull's neck more than 2in. The whole lance is made of beechwood. The object of the presence of the picador and his horse in the bull-ring is that the effect of trying to lift the horse weakens the neck muscles and lowers the position of the bull's head without which it would be impossible for the matador to make the kill with his sword.



A matador about to make the kill.

For years before the 1914-18 war my mother and a certain Señor Julia, O.B.E., one of the founders of the Spanish R.S.P.C.A., worked to get some protection for these worn-out old slaughter-house horses which are, unfortunately, an essential to the very existence of a bull-fight. But it was not until Spain's benevolent dictator, Primo de Rivera, came in during the 'twenties that I had an interview with him and showed him some photographs taken of a new protection for the horses which the French Government, being rather in the position of our Government about cock-fighting to-day, had insisted should be used if bull-fighting in France was to continue at all.

The "Peto"

Among Primo de Rivera's many reforms, such as the reorganising of the telegraph and telephone system under American guidance and the reorganisation of the railways and their stations, the making of tap-water potable all over Spain and many others; probably the one for which animal lovers will remember him best was the introduction of the "peto" or shield for the horses in the bull-ring. He was fortunate enough to have at the back of him Queen Ena, an Englishwoman.

The "peto" is a 1in.-thick layer of cotton padding. It goes along the whole of the port side of the horse, and unless an unfortunate accident occurs the bull's horns cannot get through it. Occasional accidents do happen, but it is by no means in the picador's interest if they do, because he is not protected in any way more than the horse on the starboard side. Certainly, thought has advanced, because, on the only occasion that I have ever seen an injured horse about to be gored, they got the bull away and killed the horse immediately—a very different story from what used to go on 28 years ago.

The picador's armour is quite simple. It only has to protect his right foot and leg up to half-way up his thigh. This used to be made of steel, but is now made of duralamin. If the picador falls off he is in the same position as a knight in armour or a turtle on its back—he can only crawl around in the sand and hope that the cape-waving toreros will divert the attention of the bull from him and his mount. Mostly they do, but as they are naturally more interested in the man than in the mount, that is where the accidents sometimes happen.

The Bull-fighter's Dress

Now we come to the bull-fighter's dress. He wears cotton stockings underneath heavy artificial-silk stockings. Before the age of cellulose these were woven in Valencia and, as a consequence, the Valencian workshop has now gone out of business with the necessary stockings being dealt with by the vast Barcelona textile industry. One interesting point is that when a bull-fighter is in mourning his stockings have to have black clocks instead of rose coloured.

His dress costs £150, but in the old days it cost far more, being of pure silk, with embroideries in gold and tinsel, and always with the risk that there is no knowing whether it will last a day or a whole season. In the last bull-fight I saw before leaving Spain a few months ago, it was certain that one matador would never wear his glamorous-looking pair of breeches again.

Formerly dark colours prevailed, but now they go in for turquoise blue, Nile green and light rose. The hats are extremely difficult to make and must be the most expensive men's headwear in the world. However, Spain does quite a good export trade to Central and Southern America where the paraphernalia of bull-fighting is exclusively Spanish.

The first infliction that the bull receives is when, having been kept in the dark for some five hours, the "mayoral"—the chap who has accompanied him from his breeding ranch—leans over and sticks an arrow through the skin of his neck with, for

example, the silk ribbon of red and white of the Duke of Veraguas, just before he charges into the ring.

The "Banderilla"

The only thing that we have not dealt with is the "banderilla." This is a stick about 3ft. long, made of light wood, and its business end finishes in a harpoon-point. In the sequence of the fight there is, first, the bull entering the ring, secondly, its being played by the cape-waving toreros, thirdly, the tiring of the bull's neck against the horse, fourthly, the "banderilleros" who plant these sticks on either side of the bull's vertebrae at the neck. Sometimes the matador elects to do this himself, and that is considered an extra good show.

Occasionally a super-intelligent or completely moronic bull will refuse to play. In this case the "banderillas" are encased in a sort of carton which lets loose half-a-dozen firecrackers. Contrary to common belief, these firecrackers are not exploded in the bull's inside but are merely for the purpose of making a noise which, it is hoped, may goad him into action.

To many people it is a splendid spectacle, and although it is true that the bull has no chance unless he completely refuses to play, and is led out by a cow to the slaughter house, it is equally true that a bull-fighter's life is by no means enviable. As to the horses, I consider it quite amazing that the Spanish people should ever have accepted the Peto-shield at all after centuries of horse goring. Thought moves quickly these days and there may come a time when the picador will be mounted on a mechanical horse which will achieve the only object of the presence of horses in the bullring—the lowering of the bull's head through exhaustion of his neck muscles. We can only hope that this may come to pass.

How to Rewire a Car

Making Up a New Loom and the Use of Sleeving

By W. TOPPING

MANY people who normally think nothing of carrying out household electrical repairs and wiring fight shy of rewiring a car. Yet, providing the job is attempted in easy stages, no serious difficulty need be experienced, especially if the correct wiring loom for the car is available.

Correct preparation, as always, ensures success in this type of work, and the first thing to do is to try to obtain a ready-made loom. This may be bought from a car electrical agency, or, possibly, from the makers of the car. A complete wiring diagram for the car should also be obtained.

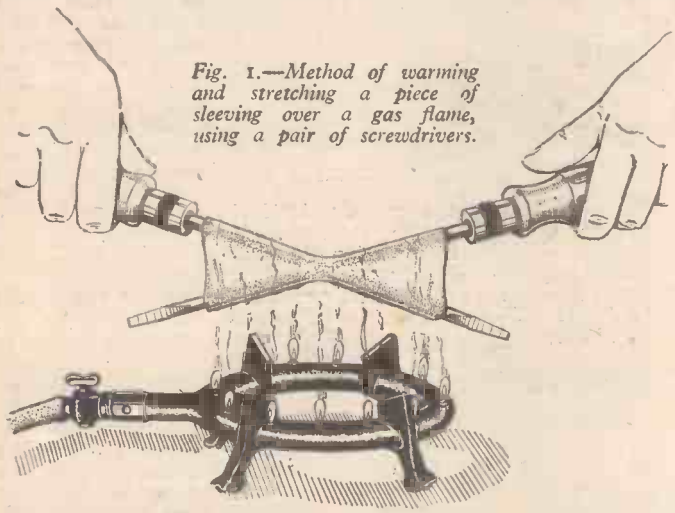


Fig. 1.—Method of warming and stretching a piece of sleeving over a gas flame, using a pair of screwdrivers.

A new loom is invariably made up with different coloured cables, and on the wiring diagram these are indicated as numbers, with a key beneath, thus obviating difficulty in tracing circuits.

For a start, the old loom should be stripped from the car, notes or sketches being made of the general lay-out of the main and auxiliary harness.

Fitting a New Loom

Then the new loom can be installed. Make sure that it is adequately clipped to the chassis or body of the car, and that no possible chafing of wires will occur from any moving or hot parts.

It is as well to remember that most cars use the frame or body of the vehicle as an "earth" or return to the battery, so that any items of equipment on the car that make bad electrical contact with the frame should be checked and, if necessary, cleaned.

It is an entirely different matter, however, if a ready-made loom is not available. The rewire becomes automatically a longer job, for a loom must be specially made up.

The loose-cable method is fairly satisfactory, but it is infinitely preferable to make up a loom in compact runs properly sleeved. If a wiring diagram of the car is unobtainable, it is helpful to make a rough sketch of the circuits to be used. Then the various lengths, such as dashboard to lamps, junction box to dynamo, etc., must be measured by running a single length of cable along the proposed route along the framework. As far as possible keep all wires together inside large-diameter sleeving. It is helpful if the old loom is preserved as much as possible in one piece, then it can be used as a pattern.

Drawing the Cables

Draw the cables through the sleeving with a strong steel wire soldered on to the ends of three or four cables at a time, and use sleeving that is large enough to accommodate all the cables with ease.

Branching-off, where two or three wires are required to branch away from the main harness, can be achieved neatly by drawing the wires that are required to branch off up to the position where they are intended to leave the main loom. Slit the large sleeving at this position and prise the cables out. Then pull them through until the required length is obtained. A short length of sleeving should now be cut of the same diameter as the main sleeving. Warm the short length over a flame, stretching it with two screwdrivers as shown in Fig 1. When the sleeving is hot and expanded it will slide over the main sleeving easily. Slip it up to where the wires branch from the slit and ease it over the join, covering the slit. When the short length cools it contracts, forming a permanent seal over the branch. (See Fig. 2.)

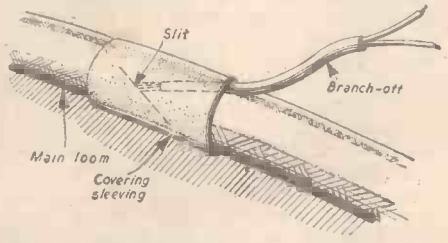


Fig. 2.—Using sleeving for covering the joint of a branch-off with the main loom.

Fitting Terminals

Such branches-off may be used for the dynamo leads, coil, petrol pump and lamp feeds, etc. Where terminals are fitted, a small length of small-diameter sleeving should be slipped down the cable first. The terminal should then be soldered on. After the solder has cooled, the piece of sleeving can be moved up to cover the join at the terminal. This gives a neat effect, and is also a more satisfactory electrical job. (See Fig. 3.)

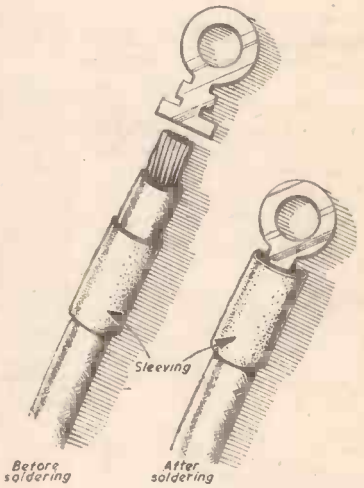
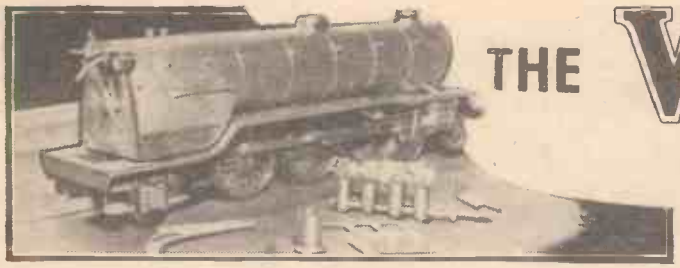


Fig. 3.—Using sleeving for finishing terminal ends.

It may be necessary to make up a loom in two or three pieces, but, where possible, junction boxes should be used in preference to snap connectors. Normally, however, it is possible to make up a loom in two pieces only; one being the dashboard to front lamps, dynamo, cut-out, etc., and the other for the tail lamp, stoplamp, fuel tank unit (often forgotten, by the way !) and any other items fixed to the rear of the car.

Any wiring in the interior of the car is done with loose single-cable lengths, extra protection being unnecessary.

A word of warning—use only the correct cable when rewiring, which is a 70/36 size varnished cable. If the above hints are carried out a very satisfactory job will result.



THE WORLD OF MODELS

Model Railway Activity in Lucerne : Scale Models in Pretoria : Scenic Backgrounds.

By "MOTILUS"

MANY readers will remember my previous accounts of the activities of the brothers Brast in Lucerne, Switzerland. When not attending to their garage business, their chief hobby interest is still their 7¼in.-gauge passenger-carrying model railway on which they run British-style model steam locomotives, all built by the brothers and one or two friends (Fig. 1).

The Brast brothers have now moved the whole model railway to a new and better site about two miles from the centre of Lucerne. It is alongside the main road and only just across the road is the popular Lucerne Lido where numerous visitors to the town, as well as residents, come to spend carefree leisure hours, and the miniature passenger-railway is now an added attraction for their entertainment.

I visited Lucerne last September and was able to take a few photographs of the railway on its new site. The work of re-building the railway has meant that there was no time for making new locomotives, but the three steam models these Swiss enthusiasts have already built are still working very well: a "King George V," "Royal Scot" and "Flying Scotsman."

Fig. 1.—Keen workers on the "Brast model railway" near Lucerne pause long enough for a snapshot to be taken while they group round one of their British-pattern model steam locomotives in between runs.

Scale Models in Pretoria

Readers will, I know, be interested to hear of enthusiasm for scale models in Pretoria, South Africa. A correspondent, Mr. J. Goodenough, of Pretoria, has written to tell me of the formation of a Northern Transvaal Models Club. This club held their first exhibition in 1951, when Mr. Goodenough exhibited his excellent gauge 0 model railway layout (Fig. 2), and from the photographs he has sent me it can be seen that this railway is most comprehensive already, although further extensions are planned.

Mr. Goodenough was awarded a silver medal for his display, which caused quite a stir among visitors to the exhibition, and no doubt inspired others with ideas for model railways of their own. I expect the whole exhibition that the club organised will result in some lively enthusiasm for the model hobby generally in this part of South Africa.

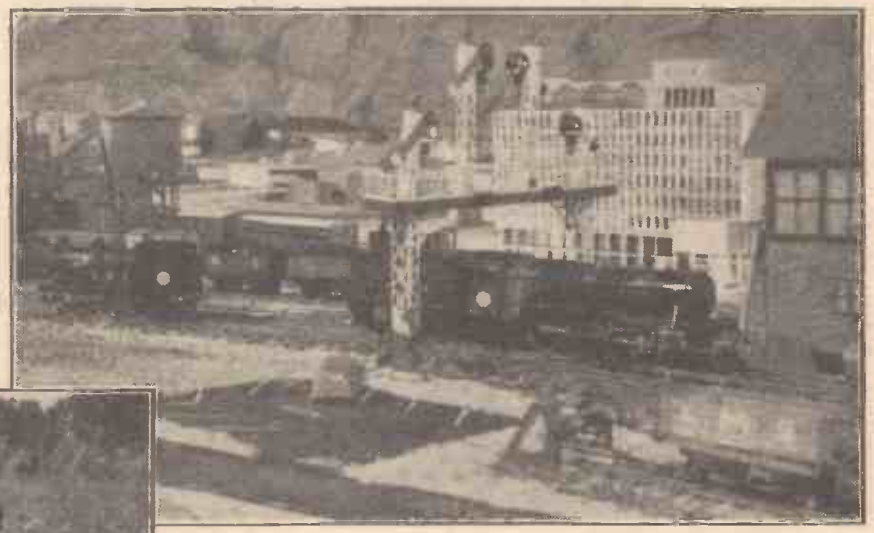


Fig. 2. — Mr. J. Goodenough's Gauge O, electrically - controlled model railway, shown at the Northern Transvaal Models Club Exhibition.

Mr. Goodenough's railway is all-electrically controlled. So far most of the locomotives and rolling stock have come from England, so that the railway itself is in the style of British Railways. The locomotives running during the exhibition were made in Northampton, and comprised two 4-4-0 compounds, two 6-coupled tanks and four Pacific type "Flying Scotsman" locomotives,

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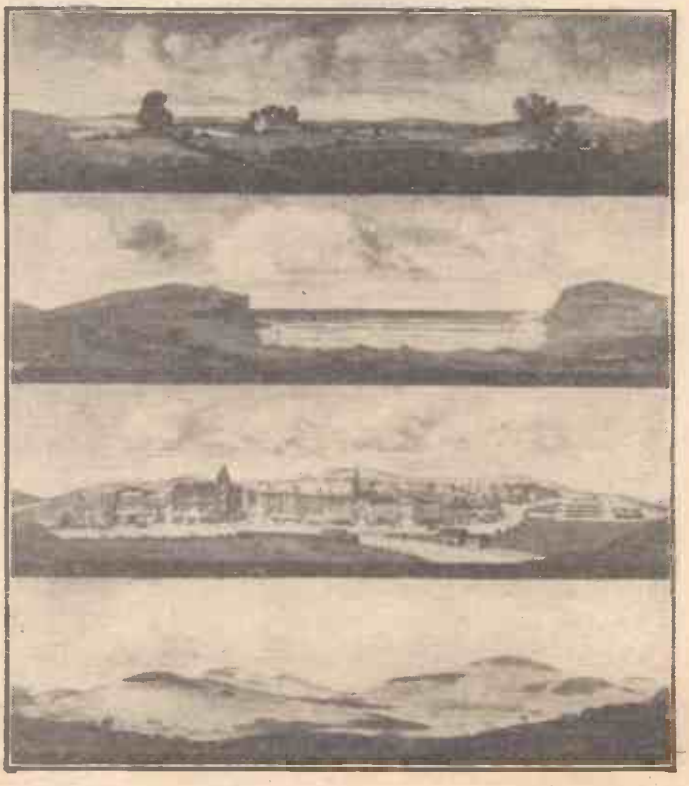
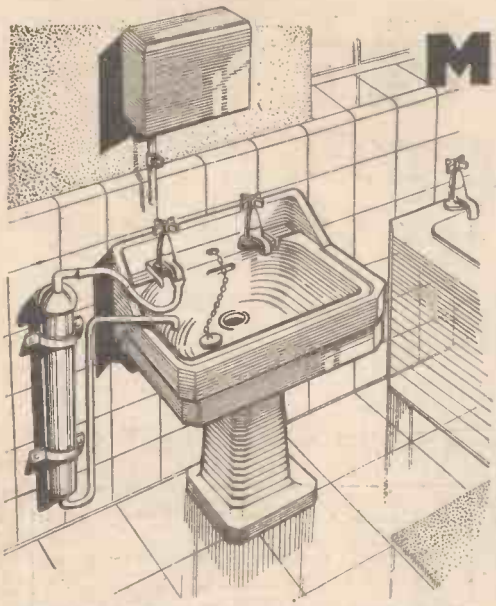


Fig. 3. — An untouched, black and white photograph of the four, coloured, printed scenic strips that comprise the set for a model railway background. The four scenes can be arranged in any sequence.



Making a WATER SOFTENER

By F. G. BUNNEY

Constructional Details of a Small Apparatus for Domestic Use. With Notes on Water Softening

THIS article is intended to help those wishing to construct a simple and efficient domestic water softener.

In the first place, it is strange that so few people know the benefit to be obtained and the money which can be saved by installing a water softener. There are many makes of these on the market, but they are dear, and usually complicated with change-over valves, etc.

The whole subject of water softening being such an absorbing one, a few general elementary remarks on the subject are given before commencing to explain the construction of a small water softener.

Hardness of Water

Water which will not readily lather with soap is said to be hard.

The amount of soap the water will destroy before producing a lather determines the degrees in hardness. For every degree of hardness in a tank of 500 gallons of water, 1lb. of soap is wasted before a lather is produced.

Thus, if water contains 16 degrees of hardness (the usual average), 16lb. of soap would be wasted before a lather could be produced for every 500 gallons of water used.

Not only does soft water save soap, but if water of zero hardness is used only half the usual quantity of tea, coffee, cocoa, etc., normally used with hard water is necessary. Thus it will be seen that an efficient household softener soon saves its cost.

The trouble of fur and mud in kettles, radiators, etc., with its consequent loss of efficiency is entirely eliminated with zero water. Water is rendered hard by its contact with, and consequent absorption of, the mineral salts, etc., peculiar to each district.

The most common are calcium and magnesium ; calcium carbonate ($CaCO_3$) or chalk is a very common cause of hardness.

There are two methods of removing the calcium and magnesium:

(1) By adding lime and soda in the correct proportions. This precipitates the $CaCO_3$, which is then removed from the softener as sludge, and is a method mostly used for manufacturing purposes.

(2) By passing the water through a substance which has the property of absorbing the $CaCO_3$ until it becomes saturated. This is called a base-exchange method and is largely used for domestic softeners, and was the method adopted by the writer.

The material used can be obtained from most large manufacturing chemists, and the amount used by the writer was 7lb. All substances used as a base-exchange material get saturated with hardness until they cannot soften any more water. But they have the property of becoming regenerated when a solution of sodium chloride (common salt) is passed through them—a simple process.

It will now be seen that the *size* of the softener decides the amount of water it will soften before it requires to be regenerated.

A Small Softener

Thus, if a softener containing 7lb. of

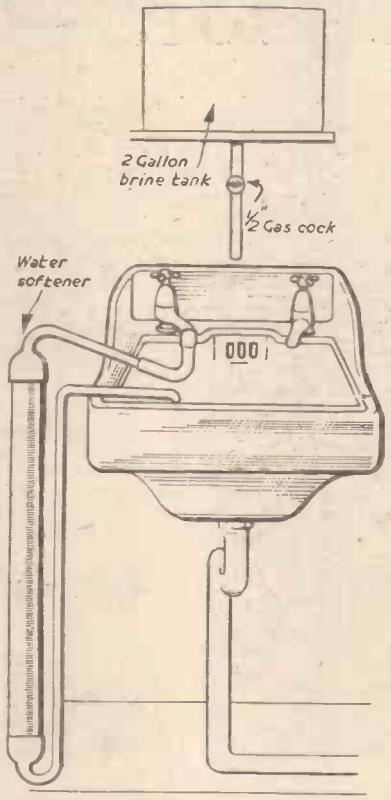


Fig. 1.—General arrangement of the apparatus.

base-exchange material would soften 150 gallons of water, one holding 56lb. would soften 1,200 gallons before requiring regeneration. The softener made by the writer held 7lb. of "Doucil" and was constructed of a 4ft. 6in. length of 3in. water pipe, and its general arrangement is as shown in Fig. 1.

A reducing socket, 3in. to ½in., was fitted to each end, and a rubber connection taken from the cold-water tap to inlet. A piece of copper gauze, 1/16in. mesh, was fitted in both sockets, as shown in Fig. 2, to keep the material in place during use, and to prevent it getting washed away during regeneration.

A point to remember in construction is to keep the outlet from the softener higher than, or on the same level as, the inlet.

If it is placed lower, when the tap is turned off, the water will still flow until it empties softener to outlet level.

Owing to the slight resistance the base-exchange material gives to the water under the usual water pressure, it may be necessary to strengthen the rubber tube to prevent bursting. This was accomplished by armouring with wire. The total number of gallons of water softened before regeneration was necessary was found to be 150 gallons, and the operation took one hour.

Regenerating Solution

Regeneration is accomplished by making a brine solution of 1lb. of ordinary household salt dissolved in 2 gallons of water. A brine tank, as shown, is placed on a shelf immediately above softener.

It should be remarked here that this amount is necessary for regenerating 7lb. of this base-exchage material only.

If a larger softener was constructed, holding 14lb., then the brine mixture would be 2lb. of salt to 4 gallons of water, and so on. It is generally accepted that it is better to regenerate in the opposite direction to the flow of water through the softener. To do that, all that is necessary in this case is to take off rubber connection from inlet and refix on outlet, and connect on the brine tank pipe and turn on tap. This should be just opened sufficiently to let brine mixture pass through softener in half an hour. Then 2 gallons of water should be put into brine tank to follow on with at the same rate.

The rubber tube is then put back on cold tap, as before, and softener back-flushed out until all brine is washed out. The softener is then ready again to soften another 150 gallons.

After the initial expense entailed in making and erecting the softener, the only cost of operation is the salt for regeneration. This worked out at one penny for every 150 gallons of water softened.

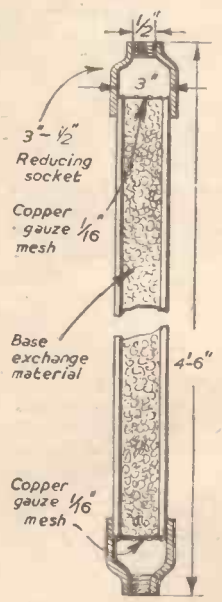


Fig. 2.—Section of the softening tube.

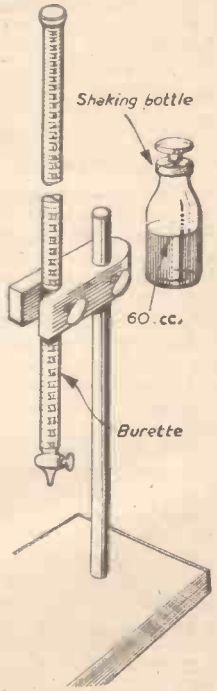


Fig. 3.—Method of testing water for hardness.

The hardness of the water supply used by the writer is 22 degrees, and by simply passing it through this softener it comes out at zero.

Should the water supply be less than 22 degrees, then a corresponding larger amount of water can be softened before regeneration is necessary.

Testing Water for Hardness

As previously mentioned, the amount of soap water will destroy before producing a lather determines the hardness.

Testing is accomplished by means of a burette, which is graduated in cubic centimetres (see Fig. 3).

The burette, a ½-litre bottle of soap solution and the shaking-bottle, can be obtained from The British Drug House, City Road, London. The shaking-bottle should be marked at 60 cubic centimetres.

To test water, fill the shaking-bottle to the mark.

Fill burette with soap solution to mark O. Add soap solution to water 1 cubic centimetre at a time and shake vigorously. When a lather is obtained which will last five minutes, read the burette. The number of cubic centimetres of soap taken, less one, is the degree of hardness.

Thus, when water is at zero hardness, one cubic centimetre only of soap solution is necessary to produce a lather.

The following data were collected during a test made with this softener. The hardness of the water used was 22 degrees, and the whole 180 gallons of water was passed through softener in one hour :—

No. of gallons passed through softener	Degrees of hardness of water leaving softener
25	Zero
50	Zero
75	Zero
100	Zero
125	0.5
150	1.0
160	2.0
170	3.0
180	4.0

In conclusion, I would mention that these practical results which I have obtained can, with experience, be further improved upon.

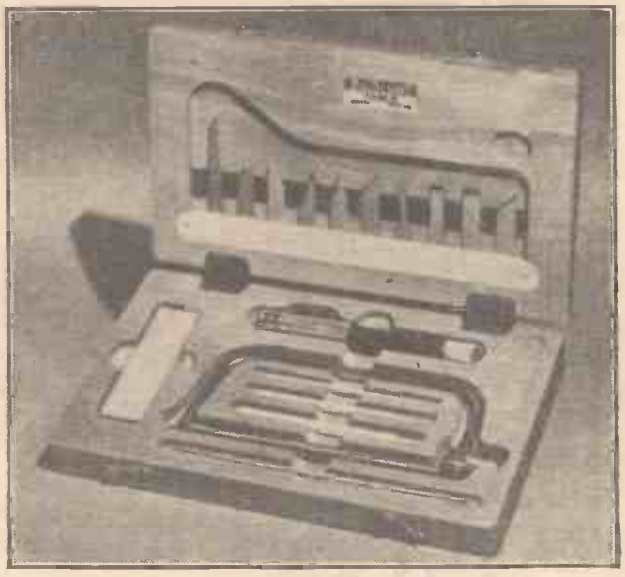
Trade Notes

A Review of the Latest Appliances, Tools and Accessories

New Multicraft Kits

TWO new boxed kits of specialised hobby and craft tools have just made their appearance on the market. They are the Multicraft "Cadet" and the Multicraft "Major" kits, offered by the manufacturers of the well-known Multicraft precision cutter.

Since this all-British designed and made knife was first offered on the home market over two years ago, the makers have added a number of useful new blades and accessories. The knife itself is complete with four individually shaped blades which are safely housed inside the handle. They are firmly locked into the patented, tapering chuck. The blades are manufactured from finest Sheffield carbon steel, and can be constantly ground and honed, which ensures them a very long life. Replacements are also available cheaply.



Multicraft "Major" tool kit.

The new accessories, which fit into the same knife handle, include a set of three chisels (M.5 ⅛in., M.6 ¼in. and M.7 ⅜in.); a 2in.-long saw-tooth blade (M.8), and a set of three Abrafile round files (M.9 ⅛in., M.10 3/16in. and M.11 ¼in.), each 3in. long. An ingenious new tool has been added in a saw frame which screws into the knife handle after removing the chuck. This comes complete with a standard 6in. hacksaw blade and a 6in. Abrafile tension saw blade, for cutting wood, metals, ivory, plastics, etc.

The new kits embrace a complete range of tools and blades, with many duplicates. The "Cadet" kit is housed in an attractive plywood case, with a particularly novel and practical method of holding the blades ready for service. The "Major" kit is supplied in an attractive solid beechwood presentation case, with routed sections to hold all the items.

The same manufacturers are also marketing a novel sanding block with continuous sandpaper bands in three grades of surface. The bands are changed, or tightened, by a simple mechanism using a coin, or key, which enables every inch of the bands to be used as they get worn by moving them round the block and reapplying the tension. The shape offers various radii and a sponge-rubber cushioned portion to meet the needs of all classes of work. Further particulars may be obtained from Multicraft Tools, 29, Bolsover Street, London, W.1.

British Motor-cycles of 1952

STONE AND COX, LTD., 44, Fleet Street, London, E.C.4, have just issued the second edition of "British Motor Cycles of the Year," in which particulars are given of all motor-cycles, small and large, of British manufacture or British assembly, power units for bicycles, and also three-wheelers. There are illustrations of over 110 models. The book, which runs to 160 pages, is divided into five sections: 1 Auto-cycles and Lightweight Models; 2, Power Units for Bicycles; 3, Standard Touring Models; 4, Racing and Competition Models; 5, Three-wheelers. A supplement at the end of the book contains current prices as at November, 1951, and details of the latest new models. The book, which is priced at 3s. 6d. net, is obtainable from the publisher at the above address for 3s. 9d. post free.

Miniature Ball Bearings

WE have received a copy of the new edition of the B.M.B. English catalogue of miniature ball and roller bearings, issued by Miniature Bearings, Ltd., 192, Sloane Street, London, S.W.1. Compared with the 1949 edition, the principal changes are precision steel balls of chrome steel, hardened and polished; precision steel rollers; sealed ball bearings; and sealed self-aligning angular contact ball bearings. These bearings are supplied in a variety of types suitable for such applications as electrical or mechanical measuring apparatus; electric motors; sewing machines; model aeroplane motors; magnetos; dental apparatus; and pocket dynamos. Further particulars can be obtained from the above address.

Freezing Temperature of Fire Extinguisher Solution

SIR,—With reference to the letter and answer appearing under the above heading in your September issue.

As pointed out in the Fire Protection Association's Technical Booklet No. 6—Portable Fire Extinguishing Appliances—soda/acid type extinguishers should not be subjected to temperatures below 40 deg. F.

The reason for the above recommendation is that the amount of sodium bicarbonate which water can absorb is limited by the temperature, and if the temperature of a saturated solution falls, some of the bicarbonate will be precipitated, thus detrimentally affecting the performance and efficiency of the extinguisher.

It is also recommended in the booklet, under "Care and Maintenance," that these extinguishers be inspected once a year and that 20 per cent. should be tested by discharge each year in rotation so that every extinguisher is discharged at least once every five years. It is a mistake to suppose that they will remain in good condition indefinitely. Our experience of them contradicts this view.

Finally, it is not strictly correct to say that both the vessel containing the acid and the vessel containing the sodium bicarbonate are sealed. The acid bottle certainly is sealed in the "strike the knob" type, but, although the portion of the outer container above the water line in which the gas pressure is effective when the extinguisher is operated is sealed by the solution, the container itself is an open vessel.—W. H. TUCKEY (Fire Protection Association, London, E.C.4).

Using Neon Lamp for Testing

SIR,—The latter part of the query from D. Cash (Cambridge) dealt with on page 70 of your November issue, may possibly be concerned with the "relaxation oscillations" which can be produced in a neon lamp by connecting it to a direct current supply of 170 volts or more with an ohmic resistance, and a condenser in shunt—or in series.

Depending on the values of resistance and capacity in the circuit the lamp can be made to flash at regular intervals over a wide range of frequencies, from one every 20 minutes or thereabouts down to a sequence of flashes too rapid to count. The interval between flashes is closely proportional to the product of the resistance and capacity, so that two given capacities could be compared by counting the rapidity of flashing when each in turn is used in the circuit.

The action depends on the fact that if a potential of about 170 volts is applied between two electrodes in neon gas, the gas becomes conducting and luminous, and remains luminous while the potential is reduced, until about 140 volts is reached, when it becomes dark again. When the circuit described is closed the condenser first becomes gradually charged through the resistance until the voltage across the lamp reaches the "striking" value. The lamp then strikes, and while it glows it gradually discharges the condenser, until the voltage falls to the "extinction" value. The cycle then starts afresh.

The mathematical theory of relaxation oscillations was first given by B. van der Pol in the *Philosophical Magazine* of November, 1926, page 978.—W. HALL (Dublin).

Grinding Twist Drills

SIR,—Referring to the article "Twist Drill Maintenance" in the November issue, Mr. C. W. Tinson asserts that "any device needing rotation of the drill through 180 deg. to reset it for grinding the opposite side should be rejected."

Jigs of the kind he condemns do not do a bad job if properly handled, and are undoubtedly more reliable than freehand grinding within the range of their capacity. Generally they are not available for drills less than ¼in. diameter.

It might be objected that the clamps described, being bevelled at 40 deg., allow as much as 9 deg. steepening of the slope of one point cutting edge compared with the other honed to 31 deg.

I have myself designed a turnover device for drills of the smaller diameters, but do not release the drill from its clamp, the opposing

A 1/16in. drill (under a magnifying glass) and held in a pin chuck.

station being registered by a dividing plate, as in dividing heads. The accompanying photograph shows the result obtained on a 1/16in. diameter drill.—W. D. ARNOT (Bedminster).

Rotation But Not "Centrifugal" Force

SIR,—It is difficult to see how "Centrifugal Force" has been used throughout the ages when there is no such thing. The word "centrifugal" means "flying from the centre," so that if there were a "centrifugal force" acting on the people on the rotor (described in the November issue), there would have to be some force urging them to go outwards from the centre. The only force acting on the person is one *inwards*, trying to urge them *towards* the centre. They themselves may be exerting an *outward* force on the rotor, but the writer of this letter is not concerned with the forces on the rotor.

The people who use this phrase have a completely wrong idea of the nature of the problem and are misleading others as well. They are, therefore, far from practical, since practice and theory should pay equal regard to truth. The person inside the rotor would by nature continue along the line AB. This is called the law of inertia, i.e., the tendency to persist in an action (or lack of one). He does not do so because the force F is trying to make him move towards the centre—the result, therefore, is that he will move round with the bowl. (Diagram A.)

It will be seen from this that there is no outward force (i.e., along OA) acting on the

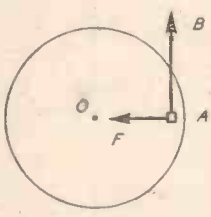


Diagram A.

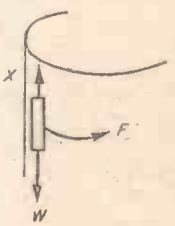


Diagram B.

man and, therefore, there is no "centrifugal force."

The problem should be solved as follows:

X is the frictional force. (Diagram B.)

W is the weight of the person.

F is the force urging him towards the centre.

Since the person does not slip down, X=W.

By the laws of friction $\frac{X}{F}=\frac{100}{168}$ (using the given numbers).

By the laws of rotation $F=\frac{W}{32}\left(\frac{\pi N}{30}\right)^2 R$

Where N = number of revs. per min.
R = radius of rotor.
π = $3^1/_7$ (approximately).

Combining these equations we have:

$N=\sqrt{\frac{32\times900\times F}{\pi^2\times W\times R}}=25$ approximately.

—T. A. GROCOCK (Bishop's Stortford).

A Camera Curiosity

SIR,—In the article on the above subject which appeared in the August issue, your contributor mentions Professor Piazzi Smyth. He was most certainly an innovator and deserves every credit for his pioneer work. Unfortunately, in my copy of his book, the old-time silver print illustrations have almost faded out and are now valueless as photographs.

It is, however, remarkable that the ordinary amateur photographer should have allowed himself to be "led up the garden path" by camera manufacturers, etc., for a period of over one hundred years, into a general tacit acceptance of the one-eyed type of camera, as a complete piece of photographic apparatus.

It is indeed strange that educated persons, who would rightly regard the loss of one eye as a serious calamity, are nevertheless quite content to look around the world with (photographically speaking) *one eye shut*, and then fail to realise why their pictorial results achieved at so much cost with expensive equipment are, as a rule, so grievously disappointing.

A normal photograph taken with an inexpensive stereoscopic camera fitted with a pair of single achromatic lenses, with apertures no larger than *f*.16, is far superior to

anything the finest "*Leica*" or "*Contax*" can produce, inasmuch as the stereo-camera takes the complete picture as seen by both the *right* and *left* eyes of the observer.

A stereoscopic photograph seen through the stereo-viewer reproduces the actual scene in three-dimensional perspective. No other type of camera, however expensive, can do this. —G. E. W. HICKS (Kyrenia, Cyprus).

Earth Fault Risks

SIR,—With reference to the article entitled, "Earth Fault Risks," by J. L. Watts, appearing in your November issue, I wish to point out two statements which are misleading. In Fig. 1, one of the phase connections is labelled neutral.

On page 61, column three, it is stated that the full load current of a 15 h.p. 400-volt, three-phase motor, is about 38 amps. The normal current taken by motors of present-day design is approximately 21.5 amps. Possibly your contributor has taken the figure of 38 amps from a table relating to single-phase motors.—D. G. BELCHER (Gosforth).

The Author's Reply

SIR,—With reference to the letter from Mr. D. G. Belcher, his remarks are correct, and I must apologise for having overlooked these points. On Fig. 1, the word "Neutral" should appear on the line going down from the "Three-phase Supply Plant" to the "Earth Connection."

Re column three of page 61, the full load current will be about 21.5 amps so that the excess current trips may be set at about 30 amps, instead of 50 amps. In order to allow 30 amps earth leakage current the maximum resistance of the earthing circuit must be limited to 230÷30=7.67 ohms.—J. L. WATTS.

THE WORLD OF MODELS

(*Continued from page 134*)

all of which ran throughout the six-day exhibition without a hitch, during which time they travelled approximately eighty miles!

The majority of the station buildings and other model buildings that make the railway so interesting are in South African style, and so is the mountainous scenic background that towers behind.

Scenic Backgrounds

All model railway owners who have practised their hobby for a number of years will remember the introduction of realistic, printed scenic backgrounds for OO and O gauge layouts, in pre-war days. A coloured, scenic background certainly enhances any model railway, but not all owners feel they have sufficient artistic talent to design and make their own. So for those who enjoy pushing the levers but who are not so happy pushing a paint-brush it will be good news that they can now once more obtain printed scenic backgrounds suitable for their OO or O gauge railways.

A well-known model railway manufacturing company have recently produced a new series of printed scenic strips, available in sets of four strips (Fig. 3). These depict four varied English country scenes: a small provincial town, a pastoral scene, sea and cliffs, and the fourth shows hilly, moorland country. The four sheets may be used in any sequence, so that they can be placed to suit the railway layout. Each strip measures about 3ft. long by 9in. high. Full particulars can be obtained from Messrs. Bassett-Lowke, Ltd., Northampton, or from their London branch.

Club Reports

Harrow and Wembley Section of Model Engineers

ON Thursday, November 22nd, the society held its annual dinner at the Headstone Hotel, North Harrow, and about eighty members and friends were present.

Mr. Conway, engineering officer of Harrow Schools, proposed the toast to the Society and its well-being, and success for the future. In reply, our chairman, Mr. F. Sedcole, expressed appreciation for the society's welfare and mentioned the importance of having a social side to such a society. He also extended thanks to the ladies who had given their help during the year. Mr. Ryan then toasted the ladies and also expressed his appreciation of their kindness and assistance.

Mrs. Sedcole, our chairman's wife, presented the cups to the prizewinners of our recent annual exhibition. Some of the prize-winning models were on show during the evening.

The rest of the evening was very enjoyably spent with party games, competitions, etc. Congratulations are due to Mr. S. R. Emery who was responsible for the organisation.

The winter programme is well under way and we all look forward to some very interesting lectures, etc.—Hon. Sec., C. E. SALMON, 11, Brook Drive, Harrow.

The Peterborough Model Engineering Society

ON Friday, November 23rd, at the invitation of the National Gas Board, members saw an interesting film, "Asphalte Paves the Way," by courtesy of Messrs. Esso Petroleum Co. Ltd.; another film showed, *inter alia*, the use of this firm's products in relation to model engineering.

The next meeting will be, subject to confirmation, a visit to Peterborough Gas Works, date and time to be announced later.

Further details and membership conditions from Hon. Sec., MR. R. H. SMITH, 31, New Road, Woodston, Peterborough.

Books Reviewed

Thrills and Spills. By Eric Leyland. Published by Ward, Lock & Co., Ltd. 160 pages. Price 8s. 6d. net.

THIS is the book for the modern boy who takes an interest in all sports connected with speed and action. In this book he can relive the thrilling episodes of the Dirt-Track Speedway; Gliding; Motor Racing Track; Motor Cycle Trial; Racing Bicycle Track, and Ice Rink. The book not only gives inside information on these sports and the star personalities connected with them, but also some thrilling stories. The book is illustrated with 80 vivid action drawings and four colour plates.

The Villiers Engine. By B. E. Browning. Published by C. Arthur Pearson, Ltd. 186 pages. Price 6s. net.

THIS handbook, which is a second edition, is one of the Motor Cycle Maintenance and Repair Series, and is a practical guide covering all Villiers engines from 1913 to the latest models. The general care and maintenance of the engine is fully explained. The first chapter deals with the cycle of operations of the two-stroke engine, and other chapters are devoted to overhaul and servicing; lubrication systems; the flywheel magneto; electric lighting systems; the Villiers carburettor; autocycle engines, and engine-gear units. The book, which also includes a handy fault-finding chart and an index, is illustrated with numerous half-tones and line drawings.

The Lightweight Motorcycle Handbook. By Bernal Osborne. Published by Temple Press, Ltd. 136 pages. Price 5s. net.

THIS handbook is intended as a guide for those whose business or pleasure transport depends on the efficient working of the lightweight two-stroke motorcycle engine, including cyclemotors. Such power units also include those fitted into lightweight motorcycle frames. The book deals fully with such subjects as decarbonising, renovation of the power unit, the electrical side, and transmission topics. The book is well illustrated with line drawings and diagrams.

"When you make your next Flying Saucer I would suggest you dispense with the cup, AND THE TEA!"

QUERIES and ENQUIRIES

A stamped, addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 32 (THE CYCLIST), must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Time Lag in Photocells

IS the lead-sulphide photo-conductive cell the same in principle as the selenium photocell, and has it a similar time lag ?—J. McQuaid, (Enniskillen).

IN a general way, the lead-sulphide photocell (and other cells like it, such as the copper oxide cell) is similar in principle to the ordinary selenium cell. Both classes of cell alter in electrical resistance under variations of illumination and darkness, but the selenium cells are much more reliable. Cells of the lead-sulphide class invariably have a time lag, but this is not constant, being at a minimum when the cell is freshly prepared and increasing with the age of the cell. The time lag of these cells depends, also, on the precise physical character of the cell, and of the layer of lead sulphide or other sensitive material which is used therein. Usually, the time lags of such cells are greater than that of a good selenium cell.

Adhesive for Rubber Floor Covering

I WISH to make sufficient of an adhesive compound to securely hold 20 sq. yds. of 1/16in. rubber covering to a planed but bare board floor. The floor will be subject to daily scrubbing so the adhesive should not be water soluble.

I have a number of car tubes that could perhaps be used for liquefaction, and shall be grateful for any advice you can give me.—J. W. Holliday (Okehampton).

YOU cannot utilise old rubber tubes to make any serviceable rubber solution or adhesive, since the scrap rubber would have to be masticated in a specially designed rubber mill. That is mainly the reason why all amateur attempts to make rubber solutions fail.

Your best plan will be to use a bituminous solution or paint. Give the floor surface a thin coating of this paint. Then apply a thin coating to the underside of the rubber coating. Let both surfaces dry. Then recoat the surfaces and bring them together under firm pressure—preferably using a roller of some description. The rubber flooring will now lie flat and its adhesive will readily resist water.

You should be able to obtain bitumen solution locally, or else in Tavistock or Plymouth. If not, apply to Wailes Dove Bitumastic, Ltd., Collingwood Buildings, Newcastle-on-Tyne. This firm, we believe, makes a solution specially for the above purpose.

Tinting Sea Shells

CAN you give me any information concerning the tinting of sea shells various colours, and where I could purchase the necessary dyes ?—J. W. Hancock (York).

SEA shells are most difficult to dye or to tint evenly. In our opinion, the best treatment for them is as follows :

Thoroughly clean the shells and render them as white as possible by soap-and-water scrubbing. Then immerse them overnight in a solution made by dissolving 3 parts of tannic acid in 97 parts of water. After this, allow the shells to dry without rinsing. Then immerse them in a cold solution of 5 parts dye in 95 parts of water. Gradually heat the dye solution to near boiling point during one hour. Retain it at that temperature for another 10 minutes. Then allow it to cool, and finally remove the shells and give them a short rinse in cold water. All this time the shells should be kept on the move in order to avoid their becoming dyed unevenly.

For the above purpose use only aniline dyes of the "basic" class, such as methylene blue, brilliant green, magenta, methyl violet, saffranine (yellow), etc. These can be purchased, price about 2s. per oz., from most dealers in laboratory chemicals, such as Messrs. Reynolds and Branson, Ltd., of Leeds, or Messrs. Vicsons, Ltd., 148, Pinner Road, Harrow, Middx.

Some of the ordinary household dyes (but not all) are amenable to the above use.

Galvanising Steel Tubing

I MANUFACTURE tubular steel gates, and wish to galvanise them after they are made. Can you give particulars of the best method and the plant required ?

Also, what is the cost of galvanising 1 sq. ft. of steel ?—P. Lowther (Ross-on-Wye).

THE galvanising of iron and steel is an enormous subject, and it forms the basis of a very large industry in this country. Without special plant, knowledge, skill and experience, you could not possibly hope to compete commercially with even the smallest of the existing galvanising firms.

In general, there are two methods of galvanising, viz. :

(a) Hot-dipping. In this method the steel or iron material, after acid-dipping is mechanically lowered into a bath of molten zinc which is covered with a layer of flux. The metal sheet is then withdrawn, rinsed and dried.

(b) Electro-zincing. Here the zinc is electrolytically deposited on the steel or iron surface.

There are advantages in both methods, but you would find the electrolytical method the simpler of the two. All you would require would be an acid-dipping tank for the pre-treatment of the tubular steel, and electrolytical or "deposition" vat, and a vat for rinsing the work, plus, of course, the necessary supply of controlled direct current.

If you would care to write to any of the following firms: Messrs. Wm. Canning and Co., Ltd., Great Hampden Street, Birmingham; Messrs. R. Cruickshank, Ltd., Camden Street, Birmingham, 1; Messrs. Grauer and Weil, Ltd., 3/4, Hardwick Street, London, E.C.1; Messrs. Holykem, Ltd., Hockley Hill, Birmingham; mentioning your aims and giving some idea of the amount of material which you would have at any given time, you will receive information respecting the fitting-up of a complete plant for electro-zincing. You will find such plant far simpler to operate than any process of hot-dipping.

It is absolutely impossible to quote the cost of electro-galvanising 1 sq. ft. of steel or iron. On the face of things, such cost might seem very low, possibly a penny or so, but various factors have to be taken into consideration, such as labour charges, electrical charges, overheads, capital cost of plant, and so on. These must all be assessed before an accurate costing can be worked out.

We would advise you in the first place to submit your scheme to one or other of the above makers of electrolytic and electrodeposition plant and to take their information and advice into consideration.

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.

Bakelite Varnish

I AM building a skeleton-type processing drum and should like to know what paint will be suitable for painting both drum and tank to withstand chemical action of developers and fixers, and other photographic solutions. The materials to be painted include, tin, brass, wood and iron.

If there is a ready-made paint, from where is it obtainable ?—J. Bonell (Nottingham).

IN our opinion, there is no paint which will permanently withstand the action of photographic developers and fixers. That is why parts subjected to the action of these solutions should be made in stainless steel, monel metal, plastic material, vulcanite or porcelain, slate, glass, etc.

The best advice we can offer is that you use a bakelite varnish impregnated with a pure titanium oxide (white) pigment. This should give you maximum resistance to these solutions. Titanium oxide in commercial grades can be obtained from British Titan Products Co., Ltd., Coppergate, Yorks, and bakelite varnishes from Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1. Possibly, the latter firm will be able to tell you whether you can get a ready-made bakelite paint pigmented with titanium oxide. If not, try either Messrs. Nobles and Hoare, Ltd., 3, Cromwell Road, London, S.E.1, or Messrs. Pinchin, Johnson, Ltd., General Buildings, Aldwych, London, W.C.2.

Papier Maché ; Gold Paint

(1) WHEN pulping old newspapers would the addition of caustic soda reduce them to a fine pulp ? If not, can you advise me of an agent that would do so ? The resulting pulp would have to be handled by children, so the agent would have to be harmless to the skin.

(2) Can I mix a cement with the pulp so that the models "set" instead of having to dry out hard ?

(3) Could you tell me the makers of "Oro" gold paint ?—J. D. Williams (Teignmouth).

(1) THE addition of caustic soda, even in small amount, to the water used for pulping paper would very definitely increase the rate of pulping. This material, however, is very difficult to get rid of, a task which requires persistent washing of the pulp. Since you say that the pulp is to be used by school-children, we would definitely advise you not to use the caustic soda treatment. Traces of the caustic might easily be conveyed to the children's mouths, with rather bad consequences.

In place of caustic soda, use a little ordinary washing soda, which is not caustic and which is more easily removed by washing. For its success, the simple pulping which you describe ought to be more of a mechanical than a chemical process. Which means that greater reliance ought to be placed on fine shredding, beating and tearing, etc., of the paper than on the addition of chemical disintegrating agents to the water.

(2) Ordinary Portland cement can be mixed with the pulp, although not very satisfactorily, since the drying rate is irregular and there is a great tendency to distortion in the finished material. Ordinarily, the pulp should be mixed with glue water (hot)—say 1 part of glue in 20 parts of water—and then allowed to set. We realise, however, that the handling of gluey material by children might be very undesirable. We suggest, therefore, that the paper pulp should be incorporated with a mixture of approximately equal parts of Portland cement and some fine filler, such as china clay, kieselguhr, whiting, brick-dust, stone dust, powdered asbestos or any similar fine inert material which is available. You will probably have to make a few experiments in order to obtain the right proportions of any given materials.

(3) We believe that the gold paint which you mention is made by Messrs. Johnson and Bloy, Ltd., Metana House, Hind Court, Fleet Street, London, E.C.4, who are specialists in these metallic printing and writing inks. From this firm you can also obtain at very reasonable rates "gold" powders in various hues and in very fine grindings, which, mixed with gum water, can be converted into inks and water-colour paints as required. In our opinion, it is preferable, in a school, to purchase the dry "gold" powder and to make it up whenever it should be required.

Other suppliers of gold paints are : Messrs. Reeves and Sons, Ltd., 18, Ashwin Street, London, E.8; C. Roberson and Co., Ltd., 71, Parkway, London, N.W.1; Messrs. J. Bryce Smith, Ltd., 117, Hampstead Road, London, N.W.1; and Messrs. T. N. Lawrence and Son, 7, Red Lion Court, Fleet Street, London, E.C.4.

Dark Stain for Floors

I BELIEVE a dark stain for floors can be manufactured from a suitable mixture of lamp-black, shellac and methylated spirit. Can you please confirm this and give the percentage of each element or, alternatively, suggest another suitable mixture ?—G. H. Bridgland (Bath).

A VERY serviceable dark stain for floorboards can be produced by the use of lampblack, drop black or carbon black. The procedure is simple enough.

Make a 50-50 mixture of boiled linseed oil and paraffin. Work into this a small proportion of one of the above blacks. The black will not dissolve in the oil, so that the liquid will have to be kept shaken. Remove all varnish from the floorboards, and brush them over with the above mixture, preferably applied hot. Let the boards dry out well. Then polish them with beeswax in the usual way. This will give you a semi-gloss floor which, with repolishing now and again, will remain in good condition for 20 years or more.

Do not use too much of the black in the mixture, otherwise it will tend to rub off when the floor is dry.

Another black polish is composed of 1 part of shellac dissolved in 1½ parts of methylated spirit. When all the shellac has dissolved, sufficient black should be worked in to colour the medium black. This is wiped or brushed on to the floor. Note that the black is of itself quite insoluble in the medium, being only held in suspension therein. Hence, it does not act as a dye or a stain which is transparent. In order to make a transparent black stain or a semi-transparent one, you must make up a shellac solution in methylated spirit and then add a little black spirit-soluble dye, which you should be able to obtain from your local decorators' or colour merchants.

Dyeing Carbon-tetrachloride and White Spirit Mixture.

I WOULD be glad to know of a dye to colour a mixture of carbon-tetrachloride and paraffin oil (or white spirit) to a dark green colour.

I have tried unsuccessfully artists' oil colours.

In my researches I placed in a clear glass bottle some water. Into that I poured a mixture of carbon-tetrachloride and paraffin oil, coloured, and of such proportions that it just sinks to the bottom of the bottle. Now I want it to withstand some shaking up and then settle out again.

In practice the colours seem to get disintegrated some of it sinking to the bottom like a powder, leaving parts of the carbon-tetrachloride-paraffin mixture nearly clear.

I would also like to ask if there is any means of causing the water part of it to come crystal clear after the shaking in a shorter time than about two weeks as it seems to take now.—A. J. Bacon (Twickenham).

YOUR whole trouble is due to the fact that not every dye which is soluble in water is soluble in paraffin and/or carbon-tetrachloride. Furthermore, artists' oil colours are *not* dyes. They consist of insoluble pigments ground up with oil and sometimes with waxes and other media. Hence, although the oil and waxes dissolve in your carbon-tetrachloride-paraffin mixture, the pigment does not. It remains insoluble and either sinks to the bottom of the liquid or remains suspended therein, producing, as you say, the effect of "disintegration" of the colour.

You will at once solve the difficulty by employing a dye which is soluble in the paraffin. Any oil-soluble or wax-soluble dye will serve for this purpose. There are, for example, the well-known "Waxoline" series of dyes manufactured by I.C.I., Ltd. There are various other oil-soluble dyes, which you will be able to obtain from any London chemical suppliers, as, for example, Messrs. Griffin and Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2, or Messrs. A. Gallenkamp and Co., Ltd., 17-29, Sun Street, Finsbury Square, London, E.C.2. Any of these dyes will colour the paraffin and the carbon-tetrachloride, giving a perfectly transparent liquid without any "disintegration" or sediment, but they will not colour the water, since these dyes are insoluble in water. On the other hand, water soluble dyes will not usually colour oils, such as paraffin.

If you shake up water and paraffin together, the two liquids will separate very rapidly. When carbon-tetrachloride is present it tends to form an emulsion which does not separate so quickly, and which, as you mention, may take a long time to do so. Furthermore, particularly in the presence of strong light, carbon-tetrachloride is rather apt to be decomposed a little by the water, forming traces of hydrochloric acid therein. All these changes influence the rate of separation of the mixture, and there is nothing which you can do about it. If, however, you confine yourself to paraffin and water you will not have any trouble in this respect.

We note that you do not tell us the proportions of paraffin, water and carbon-tetrachloride which you use. The more carbon-tetrachloride there is present the greater the non-separating trouble may tend to become.

Painting Over Creosote

AS I have mistakenly creosoted some wood I wondered if you could help me on the following points:

(1) Is there any paint I could purchase or make up that can be painted on to creosote without discolouring, or at least stop the creosote so that I can apply a finishing coat of paint?

(2) If hardboard were nailed to it would the creosote produce an oily patch inside and eventually penetrate right through to the outside, which would be painted?

(3) If the inside of the hardboard were painted and allowed to become thoroughly dry before fixing, would this arrest the action of the creosote?

(4) Does creosote dry off in time?

(5) Could you please suggest treatment or cure?—A. Holdsworth (Thornton Heath).

YOU do not say whether the creosoted woodwork is of small or large dimensions. If it is a small article a few days' soaking in a weak solution of caustic soda (say 1 part in 8 of water) will remove the creosote, so that, after washing and slow drying, you will be able to paint directly on to the wood in the normal way. Larger areas can also be treated by scrubbing with this solution, and subsequent thorough washing.

In fact, it is advisable to give any heavily creosoted area of woodwork this type of treatment, always provided that the caustic solution can be thoroughly washed away afterwards.

If the creosote stain still remains after the wood has thoroughly dried out, give the surface a coating of aluminium paint, on top of which place a thin layer of shellac varnish. Follow this up with another thin aluminium paint layer, and another thin shellac varnish layer. Let the whole harden properly, and then apply the ordinary surface paint of your choice. A wood surface will have to be very heavily creosoted for it to project a creosote stain through those protecting layers. Always, if possible, apply the caustic soda treatment first. It means that you will have so much less absorbed creosote to contend with. Do not let the caustic solution come into contact with any glued joints (including plywood edges), since it has a strong solubilising and destructive action on the glue.

If you apply such treatment carefully there will be no need for you to fit a new hardwood surface to the woodwork in question.

Creosote does dry out of woodwork in time, but it is a process which takes years, and the creosote always leaves a certain amount of non-volatile residue in the wood.

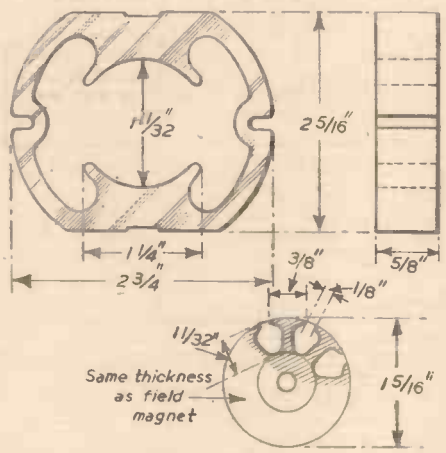
Windings for Small Motor

I HAVE the field magnet and armature stampings for a small electric motor, as shown in the accompanying diagrams, and shall be glad if you will explain how to wind this motor for use on 230 volt A.C. mains, 50 cycles, single phase.

The armature has eight slots and the commutator 24 segments. The field and armature are laminated and the motor is not enclosed.

I would like the motor to have sufficient power to drive a sewing machine. What type of resistance should I use for slow running?—J. H. Hammond (Slough).

THE motor is rather small for use on 230 volt mains, but will probably be satisfactory if carefully wound. It is, however, doubtful if the motor will be capable of driving a sewing machine, unless the latter happens to be a very light and easy-running machine.



Field magnet and armature-stampings for a small electric motor.

Each field pole could have 300 turns of 35 s.w.g. enamelled wire, the two coils being connected in series with each other so as to create poles of opposite magnetic polarity, and in series with the armature. The armature could have eight coils with a coil span from slots one to four, etc.; each coil having 330 turns of 39 s.w.g. enamelled wire with loops brought out from the coil at 110 and 220 turns. With the armature placed so that slots one and four are equidistant from the centre of one pole face, number the commutator segments which then lie under the nearest brush, numbers two and three. All numbering is considered clockwise at the commutator end. Connect the start of the coil in slots one and four to segment one, the first loop to segment two, second loop to three, and finish of the coil to segment four. Connect the start of the coil in slots two and five to segment four, first loop to five, second loop to six, finish of the coil to segment seven, and so on.

The control resistance should be capable of carrying 0.4 amps. and should have a resistance of about 350 ohms.

Etching on Glass

I AM etching designs on glass by means of taking prints from an engraved copper plate.

The method I use is to spread an acid paste consisting of hydrofluoric acid, ammonium bifluoride, barium sulphate, and gum tragacanth with water on to the copper plate with a palette knife. After scraping the surplus paste from the plate with the knife, I then take a print from the plate with pottery tissue as in the litho process. This print is then lightly stuck on the glass to prevent distorting the design and left for about one minute, after which the print is removed and a matt etched design remains.

These prints have to be used as soon as they are made because they dry quickly and they do not attack the glass. I have tried moistening them when they are dry but the etching is only faint and inconsistent.

Is there any way to make these prints so that they could be dried, stored and then used at a later date, either by the litho process or by a transfer printing process?—D. A. Seaton (S.W.2).

YOU will be able to get over the rapid-drying trouble by replacing the water of the acid paste with a mixture of water and glycerine, but we cannot tell you the best proportions to use. This will be a matter for experiment, but, at a considered guess, we should say two parts water, one part glycerine, by volume.

Glycerine is a very hygroscopic substance, and any preparation containing a substantial amount of it will not dry. Hence, you will be able to control the drying-rate of your acid paste by adjusting the amount of glycerine in the water which you use for making the paste. Since you will not be using any greater quantity of actual liquid, you will not be reducing the "strength" of the corrosive paste.

Hydrofluoric acid is a volatile substance. Its presence in the paste is essential for the "biting" action on the glass.

Now, if you spread the paste on any tissue or other surface and allow it to dry, the hydrofluoric acid goes off, and, as a result, the dry preparation, even when wetted again, loses much of its corrosiveness. It is, therefore, you see, rather impossible to preserve the paste or the pasted tissue by drying, and then render it again corrosive by wetting. The hydrofluoric acid, the vital material of the process, has gone, and all the wetting in the world will not bring it back to the paste again.

It is mainly for this reason that the paste must be used whilst it is still wet, for, under those conditions, it will still contain a proportion of the hydrofluoric acid.

Paste for Wallpaper: Size Solution

CAN you recommend an adhesive that would stick a thick wallpaper of the brown panelled relief kind to a plastered wall, and hold it there?

Further, would size make a good base for painting a wall and prevent the paint from peeling due to dampness caused by rain or steam? I understand that white lead would serve this purpose, but apart from being expensive it is difficult to obtain.—J. Garner (Salford).

THERE is nothing better than a home-made flour paste for sticking wallpapers to any reasonable surface. A good recipe is the following:

Make two quarts of flour into a stiff batter with cold water. Then gradually stir into it three gallons of boiling water. Allow the mixture to stand a few hours before using. The addition of glue size will make this paste more sticky, but, on the other hand, it is liable to contract in drying, thus causing the paper to crack and to wrinkle up at its edges. The addition of a tablespoonful of Venice turpentine to the above paste has been recommended to give it extra sticking power. Venice turpentine is not ordinary turps. It is a special variety, and is almost honey-like in consistency.

If the wall is at all porous, it should be brushed over with a hot solution of size (one part size, 10 parts water). This will be absorbed by the wall and will bind the loose particles together. It will not, however, keep damp at bay. After the sized wall has dried out, it is a good thing to brush it over again with a mixture of equal parts of formalin and water. The formalin acts on the size and renders it insoluble in water, thereby enabling it better to resist damp. A damp wall, however, should have its causes removed, if possible, after a careful investigation. White lead is not suitable for this type of wall treatment. There are many proprietary substances which can be used for treating damp walls: Most of them are merely solutions of various waxes. You can make such a solution for yourself by dissolving ordinary candle wax in hot paraffin. This, when absorbed into the plaster of a wall, will go far towards keeping damp at bay, but the waxed surface renders it difficult to secure good adhesion of wallpaper.

You will be able to obtain size, formalin and any other decorators' materials from Messrs. James Beard, Ltd., 16, Great Ancoats Street, Manchester.

Dyeing and Waterproofing a Cotton Garment

I HAVE just bought an Army hooded smock (ex-Government stock) which would make an ideal wind jacket for ski-ing.

It is made of light, close-woven cotton cloth like gaberdine. I wish to dye it and then render it shower-proof.

Can you advise me regarding a solution to use in order to render this garment more water-resistant? At present it will only keep out slight showers.—G. H. Kyan (Petts Wood).

WE presume that you will use an ordinary household dye in order to colour the smock. If, as you say, the garment is of cotton cloth, you should not have any trouble in the dyeing process, although the fabric may tend to shrink a little.

In order to render the garment more water-resistant, after the dyeing and subsequent rinsing of the garment immerse it in a quantity of very soapy water. After half an hour's immersion, withdraw it, wring it lightly, and then immerse it in a solution of alum (five parts alum, 95 parts of water). Let it stay in this solution for one hour with frequent stirring. Then, without rinsing, pass the material through a roller and hang it out to dry.

The action of this process will be to form an insoluble aluminium soap within the fibres of the material, and this will resist water very considerably. Any more stringent processes of waterproofing would only result in the material losing its soft, wearable character, and would render it rough to the touch, and stiff and unpleasant to wear.

SIGNPOSTS IN CYCLING HISTORY

No 3

To Brighton on a "Bone-shaker"

The man who fitted pedals to the front axle of a hobby-horse was the man who invented the "bone-shaker". Just who this man was has never been proved conclusively but it seems most likely that the idea came from a Frenchman, Pierre Michaux, in 1861. In November 1868, Rowley B. Turner brought a Michaux "Velocipede" to England. In 1869 various English makers were selling copies of it, and it was on machines of this type that Turner, John Mayall and Charles Spencer made their historic ride to Brighton.

The three pioneers set off from London on Feb. 19th, 1869, and Mayall—who had earlier attempted the ride, and failed—reached Brighton in 16 hours. "The Times", whose reporter followed the trio to Crawley in the comparative comfort of a pair-horse carriage, described the ride as "An Extraordinary Velocipede Feat". It certainly was . . .

ISSUED BY **DUNLOP** *— MAKERS OF THE FIRST PNEUMATIC BICYCLE TYRE*

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Comments of the Month

HERNE HILL—NO CLUB PROMOTERS

By F. J. C.

THE N.C.U., in a laconic statement to the Press, says that it proposes to employ a full-time promoter to run meetings at Herne Hill and generally to manage the track. In a letter to all clubs which hitherto have promoted Herne Hill events, the Union says that it is proposed that the new promoter shall be responsible for all promotions at Herne Hill, but the extent to which this decision can be implemented cannot be decided until the appointment of a track promoter has been made.

The object behind this move would appear to be to convert loss into profit. Since the N.C.U. took over the Herne Hill track it has lost on its events. If it hopes by monopolising Herne Hill events to make a profit, it will certainly have to vastly improve the quality of its programmes, the nature of its events, and the volume of its publicity.

With a declining membership it may be difficult for the N.C.U. to carry out its plans efficiently because of its diminishing revenue.

The attendances at the Saturday afternoon meetings at Herne Hill have been steadily falling. This should be an indication that the style of event is not wanted to-day. Indeed, it is doubtful whether any style of track racing can provide a gate large enough to make its promotion worth while.

It is no use living in the past. The days of Shoreland, Bidlake, Edge, and others, the days when races could be subsidised by firms manufacturing patent foods such as the Cuca Cocoa people who put up the famous Cuca Cup, and the days of cycling giants are over. In any case, there are far too many events.

The cycling public is probably heartily sick of the internal disputes between the R.T.T.C., the N.C.U., and the B.L.R.C. Naturally, cyclists interested in sport are split into factions. Those violently anti-N.C.U. are not likely to support N.C.U. events at Herne Hill. The dissident bodies, offsprings of the N.C.U., have now become more powerful than the body from which they sprang. In general it may be said that sporting cyclists take their sport too seriously. There is far too much control, far too much talking, far too many jealousies, far too many personal feelings.

Lip service is paid to the desire for unity, but when the parties do meet they go over the same old ground and tear one another to pieces. It has become an internecine conflict, and if it is allowed to continue these three bodies will destroy themselves.

We see no solution to it short of getting rid of the people who have promoted this bitterness all these years. These old men of the movement who consider that they have become the proprietors of cycling, year in and year out plug their same silly last-century views and think they can control a modern generation of cyclists and administer the quack nostrums of the past.

We are certain that if the three bodies concerned were strong enough to eliminate from positions of authority all those known to have promoted bitterness, irrespective of their years of service to the movement, and replace them with some younger and more reasonable executives, agreement would undoubtedly be found and the strife would cease. For ourselves we are determined to see that no more raw deals are handed out by any of them, and we shall relentlessly watch those who carry on this dangerous policy.

MACMILLAN'S BICYCLE

THE model of the first rear-driven bicycle which was constructed by Kirkpatrick MacMillan in Courthills, in Scotland, in 1839, is completed. It will be fully illustrated and described in next month's issue. We have been engaged on this model for some time. It is built to a scale of 1½in. to the foot, and is to scale in every particular. The wooden wheels are built up with separate felloes, dowelled, with mortised and tenoned spokes, shrunk-on metal tyres, twist-grip operated brake for the rear wheel, keyed-on cranks to the rear wheel, and, of course, it is a working model.

Before its construction could be commenced, drawings of the copy of the machine, which is in the Science Museum at Kensington, had to be prepared. As far as we have been able to trace, this is the first time that a set of drawings of the machine has been prepared, and the first time a model of it has been made.

It may be remembered that the credit for the production of the first rear-driver was accorded in the first place by the cycling historian, H. H. Griffin, to Gavin Dalziell, but later researches compelled Dalziell to admit that MacMillan had preceded him by many years.

The eventual fate of MacMillan's machine is not known, nor is it known with exactitude who built the copy of it which is in the Science Museum. We have presented the latter with a set of drawings. It is unlikely that MacMillan worked to any preconceived design. It is apparent that he created the details as he went along, as is seen from the fact that the front fork stem is inclined at a different angle to the front forks, which indicates that after he made them he had to set them forward to clear the backbone.

He had an æsthetic eye, for the shape of that backbone with its suggestion of a sleek racehorse in flight could not have been arrived at accidentally. He must have spent a considerable time chalking it out on the smithy floor to have arrived at those pleasing curves. The smithy floor was, and in many cases still is, the blacksmith's drawing-board!

Kilnsey Crag,
The famous Yorkshire landmark in Upper Wharfedale.

The "Berini" unit hails from Holland and has several distinctive features.

THE CYCLE SHOW

A Review of the New Cycles and Components at Earls Court

By R. L. JEFFERSON

MR. J. S. MACLAY, the new Minister of Transport, officially opened the third post-war Cycle and Motor Cycle Show at Earls Court on November 10th. Once again the show had been arranged so that it would take in two Saturdays, so as to give a chance to view the exhibits to those unable to spare the time during the working week.

There was no show last year and this one had, in consequence, been looked forward to with greater eagerness. Although prices of other commodities have risen sharply during the past two years, cycles and accessories do not share in the general rise: they are on an average only a few shillings more than they were in 1949.

Cycles

On the Armstrong stand, the "Continental North Road" attracted me, It has a "Cyclo" four-speed gear and a double chainwheel giving a choice of eight gears, "531" tubing is used in the make-up of the frame structure. This tubing is also used for all the Continental and "Moth" lightweights.

A machine that will delight the tourist was shown by B.S.A. on Stand No. 43. It is the "Ideal Tourist," and was developed from opinions expressed by prominent members of the Cyclists' Touring Club. It is complete in every detail, even down to pannier bags, and I particularly liked the finish of Oxford blue enamel with double gold lining. As an indication of the prosperity of the cycle trade in general and the B.S.A. company in particular, their trading profit last year was £2,109,922 as against £1,125,859 for the year before.

The Dunelt Cycle Co. were showing their products for the first time since the war. The "Dart" model on Stand No. 88 was the highlight; the lugs are neatly patterned and well filed down, the tubing is the well-known "531," and 3/16in. head bearings are fitted. The latter is a feature I should like to see generally adopted by the trade to the most neglected and hardest-used bearing on a bicycle. The "Dart" at £18 19s. 1d. was very good value indeed.

Stand No. 71, occupied by Elswick Hopper, was a blaze of colour. On the Elswick "Avenger" and Hopper "Vampire" clubman models, red, green, or mauve finishes are optional and the seat tubes have a newly-designed chevron transfer incorporating the respective trademarks in the centre. A very attractive coloured embossed nameplate is affixed to the head tube, completing a machine to delight the heart of the clubman.

On Stand No. 35 R. O. Harrison had one of the most expensive machines at the show: this was "The Criterion of all our endeavours." It has a full flamboyant finish on polished plating, the fittings are nearly all alloy, Dunlop Ultralite tyres are fitted, and a four- or five-speed 3/32in. chain gear completes one of the most attractive machines at the Show. The retail price in lugged form is £51 3s. 8d.; a welded model with the same specification is sold for £48 8s. 2d.

The very large stand occupied by Hercules was even more colourful than at the last Show, and for those interested in the technical aspect of cycle construction the photo-elastic polaroscope showed them how the Hercules engineers subject cycle components and frames to stresses far beyond the limits to which these parts are put in normal use.

The cycles exhibited are the most representative in the company's history. The already well established "Kestrel" is available now with 23in. frame and 27in. high-pressure wheels and tyres.

Two new models in the sports range were shown, a massed-start model, the "Maestro," and a track cycle, the "Lapwing." The "Maestro" has a four-speed "Cyclo Benelux" gear, Dunlop high-pressure rims on Bayliss-Wiley hubs, Ultralite tyres, G. B. alloy brakes, and a Mansfield Ormonde saddle. The head and seat angles are 72 deg. parallel, the frame is made up in A. and P. Super-Kromo tubing and the price is £34 complete, tax paid.

The Lapwing model has a wheelbase of 39in., Dunlop No. 3 tubulars on sprint rims, B. H. "Solite" hubs, 1in. pitch transmission, and a Mansfield Ormonde sprint saddle. This frame is also made up in A. and P. Kromo, the head angle is 73 deg. and the seat 72 deg., and retail price is £33.

A young lady of whom we shall all be hearing a lot in the near future was on the Hercules stand. Mrs. Eileen Sheridan was greeting cyclists and dealers; she will ride for Hercules in record attempts next season.

Hetchins, of Seven Sisters Road, Tottenham, has long been famed for elaborate lugwork. This was exemplified on Stand No. 30, where were shown various models of complete cycles and frames. The frames ranged from £14 10s. 0d. upwards and complete machines ranged from £36 5s. 10d. upwards. The lugwork of the "Magnum Bonum" model was in particular most elaborate.

Stand No. 28 was occupied by W. F. Holdsworth, of Beckenham, Kent: here we saw for the first time a feminine counterpart of the popular "Cyclone" frame which has sold in such large numbers since the last show.

The "Typhoon" has a very good specification; the frame structure is made up of butted "531" tubes, including fork blades, and chain and seat stays, a Brooks B17 saddle, Dunlop high pressure tyres and a Williams C34 chainwheel and cranks complete a machine, at a basic price of £27 19s. 8d., that represents very good value. The firm's well known "Allez" accessories were again much in evidence.

On Stand No. 79 the James Cycle Co. had a brave display of sporting and utility cycles. The "Olympic Ace" held pride of place with its "531" frame, high-pressure rims and tyres and B. H. "Airlite" hubs.

Of particular interest on this stand was the "Sprite" juvenile cycle retailing at £8 12s. 8d. The frame is a single-tubed brazed structure with a low bracket, 16in. Dunlop cushion tyres, waterproof saddle and a choice of maroon or royal blue enamel.

I was attracted to Stand No. 44 by the new Phillips "Springlite" cycle. In this design the entire rear triangle swivels around the centre line of the bottom bracket, but brake position is not affected and any type of hub or chain gear can be fitted. The moving parts of the shock absorber and the bottom bracket pivots are all provided with pressure gun lubrication and replaceable bearings.

Two stands, Nos. 41 and 49, were occupied by Raleigh Industries Ltd., and these provided displays of Raleigh, Humber, Rudge and Robin Hood cycles. The area occupied by these stands was no less than 2,000 square feet.

Among the new models, were the Raleigh Super Lenton, the Rudge Aero special, and the Humber Streak. The finishes were either electric blue flamboyant or orange lustre and 27in. high-pressure wheels and tyres were fitted, also "Maes" alloy bends on a 2½in. steel stem, alloy hooded lever brakes and a Brooks B15 saddle. The price of £20 19s. 6d. is most reasonable.

Raleighs are doing good work with their "Silver Knight" Road Safety Scheme for children, and a knight in very shiny armour was mounted on a rotating tricycle. This display attracted almost as much attention as one of the actual track machines used by double World Champion Reg Harris.

The Royal Enfield stand was notable for "Unitized" frame construction, which is an electronic welding process. On the "Firefly" de luxe model, the frame was constructed of "531" tubing and Endrick rims and Sprite tyres were fitted. A Bayliss-Wiley oilbath bottom bracket unit was included and a choice of red, blue, or green finish was available at £17 2s. 3d. This new model was the lowest-priced cycle in the "Unitized" range.

The new Phillips spring frame with shock absorber.

Two new models were presented on Stand No. 68 by the Sun Cycle and Fittings Co., the "Soleil D'Or" and the "Sid Patterson"—the latter model is of course named after the Australian professional cyclist now riding for the company, and a Sid Patterson model with all the features this rider favours was on show. Sun also supply frames to the trade.

Auxiliary Motor Units

At the 1949 Cycle Show there were no auxiliary motors displayed; this year no fewer than ten firms were showing these little units, some of them being most ingenious.

On Stand No. 60 we had the "Berini" unit from Holland, in which the cylinder is inverted and the whole unit is very compact, weighing only 15½lb. complete. There are only three moving parts—piston, crankshaft, and connecting-rod.

The "Bantomoto" auxiliary unit has direct drive to the rear wheel; it has a 40 c.c. engine of compact design. The speed of this model, the Mark 1, is between 5 and 17 m.p.h.

A last-minute arrival at this stand was the Mark 2 unit fitted with clutch-operated gearbox, giving two speeds and a neutral position. The speeds (on the level) are from 8 m.p.h. to 24 m.p.h. I examined this gearbox in some detail as the stand attendant had the cover removed, and it struck me as a robust unit and very well made. It operates on the epicyclic principle.

Belt-driven Unit

On Stand No. 57 the British Salmson Engineering Co. were showing the "Cyclaid." This is a belt-driven unit in which the belt pulley attaches to the rear-wheel spokes, and the unit is sprung on a long adjustable coil spring; a twist-grip throttle control is a very desirable feature.

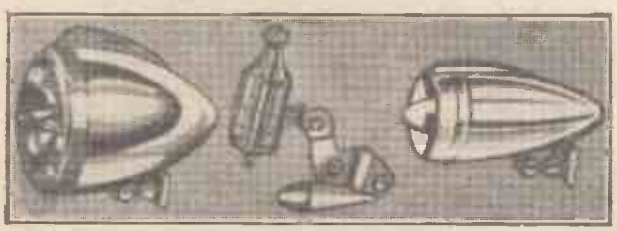
A four-stroke two-speed model was shown by "Cucciola" on the stand of Britax, Ltd. The unit is mounted below the bottom bracket, the drive is by chain, the gearbox is of the pre-selector type, dynamo lighting is built in, and the weight of this complete unit is 17½lb. and the price is £40.

On Stand No. 56 the "Cyclemaster" unit was shown, and the latest model has an "Eadie" coaster hub as standard equipment, the unit being sold complete as a wheel with a 26in. × 1½in. tyre. On this stand a sectional engine gave visitors a good idea of the working of the unit; there was also a display stand of components in exploded form.

Stand No. 58 was occupied by the beautifully made "Mosquito" unit, and there were several standard makes of British bicycles to which this unit was fitted. The engine is mounted below the bottom bracket, the drive is by means of a large-diameter ribbed roller, and a gear reduction of two-to-one gives a minimum speed of 4 m.p.h. The engine capacity is 38 c.c., weight 15lb. approximately, and the price £27 10s. complete. This unit was fully described in a recent issue of PRACTICAL MECHANICS.

On Stand No. 61 Messrs. Sinclair, Goddard & Co. were showing the very compact "Power Pak" units, which were exhibited twice at the Festival of Britain recently. The 1952 49 c.c. "Power Pak" unit has a newly designed petrol tank of over half-gallon capacity, a driving roller of material claimed to be almost everlasting, and a new non-flood carburettor which is not affected by rough roads. The main bearings are situated directly over the tyre and thus take the full driving load. The magneto, carburettor, sparking-plug and silencer are immediately accessible and are unaffected by weather conditions.

Over 5,000 of these units have been sold by dealers throughout the country. Some of the opinions of these dealers were displayed on the stand.



The new Lucas King range. Left to right: Major headlamp, dynamo and sports headlamp.

Accessories

A very welcome exhibit was that of B. & T. (Essex), Ltd., who were showing two new lines of celluloid mudguards at competitive prices. The "Meteor" is 2¼in. wide and sells at 11s. 10d. with reflector and 11s. in plain form, while the "Vampire," a racing guard of 2⅛in. width and centrally ribbed, retailed at 12s. 4d. with reflector and 11s. 6d. without.

Leather of the butthide variety was the dominant note on the stand of J. B. Brooks & Co., the well-known saddle firm. The re-introduction of the B17 champion Swallow will be welcomed by legions of keen sporting cyclists; the saddle top is cut away for easy leg action and cool riding, and the dimensions are 11½in. × 6in. × 3in. All the other well-known Champion range were displayed and attracted discriminating cyclists of all types.

The old-established firm of Constrictor, as always, came up with some new lines. One was a hub with steel barrel and alloy flanges, this being a double-sided hub for chaingear and fixed or freewheel. There is also a new alloy rim, the "Mamba," and a new steel pedal, the "Viper." The well-known and long-established Conloy products in rims for wired-on tyres, including the Conloy "Asp" and "Boaloy," were again on view and proved as popular as ever.

The biggest novelty on the "Cyclo" stand was the fitting of a three-speed "Benelux" gear to a "Perry" coaster hub on a standard light roadster bicycle. All the other well-known "Cyclo" lines were again presented, not the least interesting being the tool display which so facilitates the repairers' work.

The commanding stand occupied by Dunlops was notable for a new tourist Sprite cycle cover. The walls of this cover are in plain grey rubber, whilst the casing is stouter than hitherto; the liveliness of the cover remains as before. In the tubular tyre range Dunlops introduce a massed-start tubular, the No. 5; this has a very stout casing, a ribbed centre tread and file-pattern sides. The tread centre is of black carbon rubber and should wear very well; it is moulded on to a translucent rubber base. Detailed improvements have taken place in the established range of Dunlop tubulars, the No. 0 has been slightly increased in size and has a new non-skid tread—this tyre is primarily designed for steeply banked tracks. The No. 1, a slightly heavier type than the No. 0, also has a non-skid tread. The tubulars known as Nos. 2, 3, 4, 5 and 7 are supplied with waterproof side walls.

The latest introduction by Firestone tyres was the "Power Drive" oversize cover in 26in. × 1⅜in. size. It has a wide flat tread which minimises the risk of skidding and, at the same time, transmits the maximum power from the roller. A De Luxe edition of this cover is made up of compounded material to give maximum wear.

A neat feature on the G.B. stand was a finger adjustment built into the brake lever hood, this enables cable adjustment to be made with the thumb and finger.

Stand No. 95 was occupied by John Bull; they were featuring the New Service tyre, which, as is by now well known, was the cover used by the riders on the 5,000 mile journey to Lapland and back. The covers are of pure rubber in sizes 26in. × 1⅜in., 26in. × 1½in. and 28in. × 1½in. Wally Summers, the leader of the trip, was on the stand to greet cyclists and explain the merits of the covers. The ever-popular John Bull racing rollers were also helping to bring the new cover to the attention of cyclists and dealers.

On the Michelin stand, No. 96, we saw a new high-pressure cover known as the "25." Fast cornering is assured by the herringbone grooving on the tread and the walls are thin and skin-sided ensuring a fast and safe tyre.

An "exploded" view of the "Power Pak", showing the bearing arrangement of the motor.

The "foundations," as it were, of many modern cycles were on view at Stand 98, which was occupied by the Reynolds Tube Co. There were shown specimens of the well-known "531" tubing in both plain and butted form. A new line in handlebar bends and stems, known as the "Franco-Belge," was shown, available either in "531" steel or light alloy.

A striking display was that by Sturmey-Archer on Stand No. 42. The central attraction was an enormous demonstration of the principles of the epicyclic gear, so long an established feature of these world-famous hubs. In addition, there was a demonstration of the production of alternating current in the Dynohub. All the firm's well-known models of hubs were again displayed together with a very efficient trigger control.

Lucas Lamps

Stand Nos. 100 to 103 inclusive were occupied by the very old-established firm of Joseph Lucas, Ltd. In addition to the already well-known lines the firm had an entirely new range of dynamo sets. These were the "King Major," "King Minor" and "King Sports." The dynamo unit is common to all three sets and in the CO33A model, rated at 6 volts, 3.3 watts. The rear lamp is incorporated in the dynamo and is of a pleasing shade of grey plastic with a detachable red transparent lens of wide visibility.

The switches of all three headlamps are of neat streamlined design incorporated into the locking clamp of the lenses. The "King Major" has a 4in. lens of concentric design with a chromium-plated bulb shield. The twin-bulb headlamp is of the car-type, the lens giving a wide range of visibility. There is a standby battery for use when the cycle is stationary. This set retails at £2 7s. 6d. in chromium-plated finish and £2 5s. in silver finish. The "King Minor" has a headlamp of 2¼in. diameter and employs a single bulb which gives an intense spot beam effect. Of interest to the lightweight enthusiast is the "King Sports," with a headlamp of the long streamlined shape so popular with clubmen. It is of 2¼in. diameter and retails for £1 18s. 6d. in chromium finish and £1 16s. 9d. in silver finish.

In the space at my disposal it is impossible to do justice to the great British cycle industry, for great it is, not only in quantity but most definitely in quality.

In all, a good show and one emphasising the firm foundations on which the British cycle industry rests.

Around the Wheelworld

By ICARUS

Pedestrian's Duty to Take Care

IT is often said that a pedestrian cannot commit any traffic offence on the road, but the Judicial Committee of the Privy Council a few months ago had to consider the problem whether a pedestrian owes a duty to other users of the road. The Committee decided that he does, and so once and for all doubts on the matter are dispelled.

The essence of the statement is that when two parties are so moving in relation to one another as to involve risk of collision each owes to the other a duty to move with due care. This is true whether they are both in control of vehicles or both proceeding on foot, or whether one is on foot and the other controlling a moving vehicle. Viscount Simon, who delivered the judgment, said : "If this were not so the individual on foot could never be sued by the owner of a vehicle or damage caused by his want of care in crossing the road. Instances may easily occur, for example, if the individual's rashness causes the vehicle to pull up so suddenly as to damage his mechanism or results in following traffic running into it, or indeed in physical damage to the vehicle itself by contact with the individual.

"When a man steps from the kerb into the roadway he owes a duty to traffic which is approaching him, to exercise due care."

Animals on the Road

ANOTHER legal point of interest concerns damage caused by animals straying on to the highway. We have all seen straying sheep, cows and horses which endanger traffic. In the event of a collision with such animals can the driver or the rider obtain redress from the owner of the peripatetic animal ? The chance of getting compensation from the owner of the animal is so remote as to be negligible. The law in regard to fencing has not altered with the advent of swiftly moving vehicles along the roads. To point out the absence of a fence or the dilapidation of a fence is not a defence in itself. There is no obligation on a landowner to put up a fence at all.

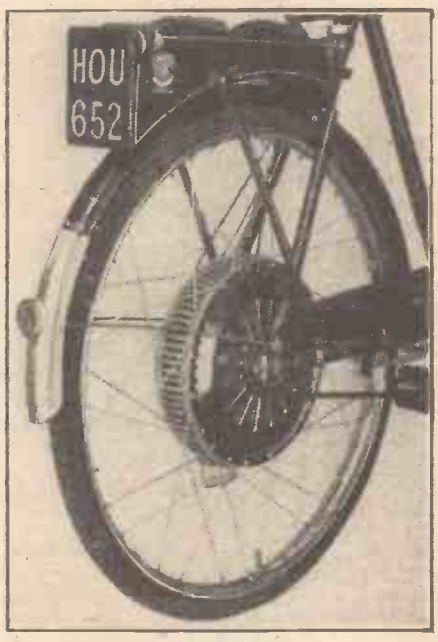
The cyclist and the motorist are wholly dependent upon themselves for their security during their journeys. Fences are put up largely to keep trespassers off and to prevent loss. It was not with solicitude for passing travellers that farmers erected fences. Fences were put up possibly to keep his cattle on his own land. That was so before the days of road travel and it is still so. In other words the farmer owes no legal duty to passing road-farers. Even proof that the farmer was negligent would avail an injured person nothing.

The B.L.R.C. 10 Years Old

THE annual general meeting of the British League of Racing Cyclists, which took place on December 9th, was the occasion for celebrating the tenth birthday of its existence. It was in 1942 that a small body of cyclists organised the first road race under League rules. As a result of this event 21 riders were suspended for life (please laugh, dear reader!) by the National Cyclists' Union. These suspended riders were the nucleus of the B.L.R.C. It has yeen a thorny yet succesful ten years. Gradually the League is winning over its opponents and even the N.C.U. is wallowing between the Scylla of Mass Start and the Charybdis of eating its own words. The opposition to League events has, of course, had a stimulating effect upon it.

The rapidly falling membership of the N.C.U. shows that the opposition to the opposition is gaining momentum. The League has made every gesture. It has offered to affiliate. It has proposed agreements which would ensure the continuity of all the organisations concerned. Owing to the great success of the Tour of Britain the N.C.U. quickly published its sub-committee's report on road racing, which advocated a programme of events in opposition to the League. As the chairman said in his speech this amazing *volte face* brought forth a Ministry of Transport edict to the effect that a further increase in road racing would be frowned upon and possibly legislated against.

If the Ministry has in mind the excellent record of the B.L.R.C. compared with the number of fatal accidents during events organised by those bodies that have for so long complained of the danger of the League style of events, together with the blood baths on closed circuit races, a great service has been rendered to sport, and such edict possibly ensures that the ten years of the trial and error of the B.L.R.C. will not be repeated by other cycling organisations.



Power wheel manufactured by Tube Investments Ltd.

Newcastle N.C.U. Resign En Bloc

THE whole of the N.C.U. Newcastle centre executive committee has resigned as a result of a letter received from N.C.U. headquarters stating that the racing and records committee had confirmed the R.T.T.C. North-east District Committee's suspension of three Barnesbuty C.C. members for participating in a reliability trial organised by the N.C.U. Newcastle centre.

This event was held last summer, and after it some of the competitors received notices requiring them to appear before the R.T.T.C. committee. The centre committee argues that this was an arbitrary act and prejudiced the issue by making an example of certain riders. They also complained that their committee had been denied a hearing. By accepting the R.T.T.C. decision it is considered that the racing and records committee has lowered the prestige of the Union, and has allowed its function to be usurped by another body.

A New Power Wheel

I WAS interested to see at the recent show the latest addition to the motorised bicycle industry—the power wheel manufactured by Tube Investments Ltd. This is a complete unit mounted in the centre of the rear wheel and breaks away from existing design by using a rotary engine. The engine is a 2-stroke, and cooling is assisted, of course, by the rotary motion.

This engine hub has an enclosed gear transmission multi-plate clutch. The only additional fitments are the combined luggage carrier and petrol tank and the handlebar controls.

The unit, of course, needs a special rim, but it fits any standard or sports frame without alteration. The engine is a 40 c.c., developing .7 h.p. at 3,600 r.p.m. It is claimed that petrol consumption is between 220 and 300 m.p.g., and that the speed is 25 miles an hour.

The road to Ilam, Staffordshire. Below the steep hill lies the famous fishing inn, the Izaak Walton. To the right rise Bunster and Ilam Tops.

Autumn Sunshine.

A picturesque corner by the old village church of GATCOMBE. Isle of Wight

Wayside Thoughts

By F. J. URRY

The Better Method

AT the fall of the year the old rider who has tried to take advantage of his leisure time to add a trifle to his total cycling mileage is usually a fit man and ready to face the more rigorous conditions of late autumn and winter, when the loud October skies are with us, to be followed by the early frosts. It is just another reason why we should make the best of our riding time by seeking every opportunity to be out and about while we need not use up too much of the lamplight on the long way home. I remember last year going a short touring holiday with a friend of mine, and after enjoying a very broken weather-week of riding—and it certainly was broken—he said it was the best "free" holiday he had had for years. He 'phoned me a few days ago to ask if we could do a similar journey saying he believed that active break of last year set him up for the winter; a very nice compliment to cycling, and one which would not be paid by the majority of folk when about half the mileage we made was sprinkled with rain. I shall have to see what we can do about it for there are other people to be considered on the holiday list. In this matter how selfish we are: everybody else's holidays, if they are not of your party, are a nuisance, and how glad you are to see them return to work! It is, I suppose, partly the result of having no spares these days; even one away adds a trifle to other people's burdens, and we are inclined to resent it. So I am now making all the use I can of the remaining "long evenings" of the year, extending the home journey to a round of between 20 and 30 miles and drifting home just before or just after lighting-up time. In that I am fortunate, for my bicycle is my daily mode of travel, so I'm always equipped to make use of a slack afternoon, or if the day is beautiful, call it one.

How Folk Forget

SOMETIMES my friends say to me when I meet them returning from one of these jaunts, "Don't you ever get tired of cycling?" Tired in the physical sense, of course I do; not weary, but just comfortably tired and glad to know a meal will be ready for me, a smoke, a read, and a comfy bed. There is time for all things. But tired of playing the cycling game, no. There is so much variation in it, so much to suit the mood, so much to see when all the familiar places differ by the touch of wind and weather. The cycling-fit individual who gets tired of the cycling game is, in my opinion, persuaded out of it by his friends under the mental pressure that it is out of date, and while good for the young people, is too strenuous for the elderly. What nonsense; yet sure enough such arguments have a very important impact on the minds of men after they have passed beyond the fifty mark. It is not true as far as the good cyclist goes; I can understand the casual rider finding the pastime "hard work" if or when he assays to ride a day of thirty to fifty miles without any previous practice and probably on an unsuitable bicycle. That is why I say to the growing oldsters, don't give up cycling, but allow yourself to use it more easily so you can enjoy it with all the old quiet surprise if not the old speed and distance. I am doing this and I know, nor am I altogether regretting the passing of strenuous youth, for no one expects me to ride rapidly or cram too many miles into the day's journey. I am taking cycling now like the reading of a well-loved book, and as I turn the corners on my wanderings and note the changes and remember the old days and their adventures, it is like living again the more hectic days of my youth. This mode of cycling need not preclude a man from motoring if he so desires; why should it? As a matter of fact, if he remains a cyclist he will discover, as I have, that motoring possesses speed and ease, but little else worth while in comparison with cycling.

The Big Changes

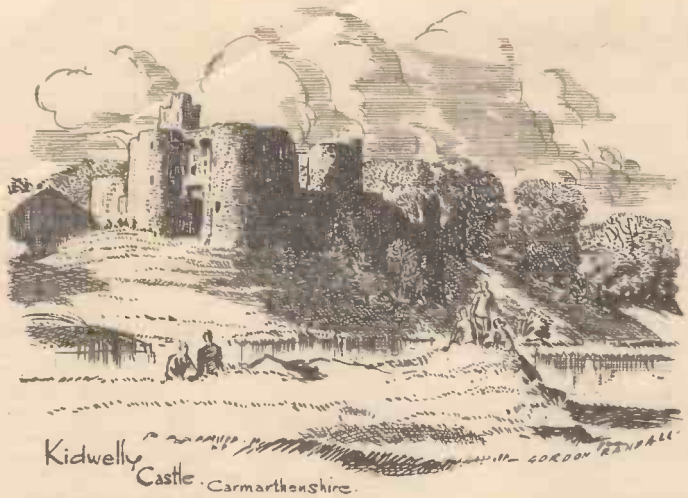
NATURALLY I have not arrived at such conclusions without going through the process of a lifelong's experience. There was a time in my youth when everybody who could afford it (how times have changed) rode a bicycle; there were no cars. Then when they did appear, mostly manned by adventurous wheelfolk, the very class who cursed them as the devil's playthings are now the type of folk who clutter up our town streets with their private buses. The drift from cycling to cars was slow, and only in the last 20-25 years has it taken the big, upward curve. Like other people, I tried out the new mode of travel, having an indulgent parent, but I soon tired, for while it could take you long distances it seemed always to be in a hurry, and at the end of the day left you with that unsatisfied feeling following bodily idleness. So I went back to a bicycle—indeed, I never left it—and my opinion of motoring as a method of country wandering has never altered, and probably never will now. I do not disdain it, but merely prefer to ride, and only use the car when time is urgent or the distance too great for my muscular comfort. Probably I get more real quiet pleasure from my cycling than ever; it is difficult to assess, because while some of the youthful fun has departed, it has been replaced by a serenity of outlook and a contentment of easy roaming that were not prominent in the riding of my younger years. The folk who say cycling is only for the young and active are merely excusing their own inabilities, or so it seems to me; they have gone beyond it because they wanted to or were persuaded to, and in that matter I have been lucky, for my people, if they have not always encouraged me to ride, have never tried to turn me into a motorist.

The Way to Assess It

RIDING to town every day, an out and home journey of about sixteen miles, I think I know something of the traffic conditions. That they have become more dangerously intricate the last two years is a verdict to which I would agree, and most of the danger undoubtedly arises from impatience. If road experts want to assess traffic faults in an honest manner, then in my judgment the way of undertaking such a job should be by bicycle. No doubt our pan-jams will smile at such a suggestion, but I know it to be correct, and if they are traffic experts, as they like to believe themselves, they should know it, too. You see so much more of the behaviour of road users from the saddle of a bicycle, because the rider goes slowly enough to absorb, to witness the faults of all types of wayfarer, and perhaps more than anything else the intolerant impatience practised, impatience which, more often than not, destroys manners, gains nothing and leaves the individual practising it as well as the victim of his rudeness, out of temper with himself and humanity at large. It seems to me it is a dreadful thing to contemplate the accident list of the road and realise that at least half of the trouble would be cured by the simple practice of good manners. For be it understood that bad manners in one person begets the same conduct in another until it becomes a sort of competition who can best "get away with it." I see this kind of conduct most days of the week, and the more I see it the greater I hate it; yet no one has yet suggested a solution to the problem. It is peculiar, to say the least of it, that our civilisation is based on decent conduct, to observe the rules self-imposed, to avoid offence to other folk, and the breaking of that fine institution in the matter of road manners by so many people is to be gravely deplored.

It is Worth It

NOT long ago I was out with the dawn, having broken the desire to turn over and go to sleep again with the mistaken thought that a little more bed was better than all the fresh air. But when breakfast has been put away and you wheel into the quiet air which seems to be painted with the dawn tints of a lovely morning, you wonder why the spell of sleep on such days is not more frequently broken. I went by lanes to a rendezvous to see a sporting event, and came to my appointed spot in time to see a fine, upstanding young man cover the imposed "50" (with a couple of halt signs in it) inside two hours. One is almost glad at such moments to know this fierce riding for the old inhabitant of the game is over, and in thinking so is the more impressed and refreshed to see how the new generation of speed cyclists have made foolish the old time returns of my day, when "evens" counted a first-class ride. It was a morning well spent, a lovely stroll through the still clear air, a jolly renewal of old acquaintance and to crown it a performance in athletics worthy of the boy who accomplished it. Before most of the world had rubbed the sleep from their eyes I had a second breakfast—and very good, too—and then skirted twenty miles round the lanes on the way home for lunch. And after lunch—well, I'm afraid I didn't know much about it until the tea bell; that's the penalty the ancients pay for loss of sweet slumber, but it is a very pleasant penalty.



Kidwelly Castle, Carmarthenshire.

The great Castle founded in the eleventh century.

CYCLORAMA

By H. W. ELEY

To Greet a New Year

WHAT better way to greet a New Year than to ride out to an English village and enjoy the January countryside? True, my village in Derbyshire where I toasted 1951 in an ancient inn, was a somewhat grey and grim place . . . but the bells of the church were pealing merrily, and, appropriately, the name of the inn was "Three Bells." I sipped ale with a buxom landlady who was still young enough to make New Year resolutions, and who had vowed, as the old year ticked out its last minutes, to give up cigarette smoking! Now this is a common enough resolution, and often broken as quickly as made . . . so, when the green days of spring are here I shall ride again to this inn and see whether my cheery hostess has kept her vow! The raindrops dripped from the trees as I rode down the lanes, but a robin sang sweetly from a farm gate, and towards noon the sun shone and the raindrops glistened like jewels on the bare hedges. A good New Year's Day . . . and from my heart I greeted all cyclists everywhere. Good riding throughout 1952!

Cycle Exports Record

IN 1951, Britain exported the record total of £20,309,055 worth of cycles and motor-cycles. Malaya, India, British West Africa and Brazil bought most of the 1,817,150 cycles, and Australia, U.S.A. and Canada most of the 64,954 motor cycles. This is good going, and a fine tribute to the enterprise and efficiency of the British cycle industry. Here is a manufacturing field in which Britain excels, and it is good to think that all over the world, cyclists regard "British made" as the hall-mark of high quality and the passport to good riding.

A Famous Forge

ONE of my correspondents who writes me regularly about his tours and trips sends me an interesting note about some riding he did recently in Nottinghamshire—where he explored the Dukeries and mused upon the old-time magnificence of Welbeck and Portland and the stately homes of dukes and earls. At Carlton-on-Trent he was fascinated by the famous forge, which has a wooden horseshoe over 12ft. high attached to its stone façade. Tradition has it that it was at this forge that Dick Turpin, on his memorable ride from London to York, halted his mare, "Black Bess," for reshoeing. Maybe this is but a legend, but I recall that when I saw the forge and its giant shoe, I conjured up mental pictures of the immortal Dick and his exploits, and it is no bad thing that the dashing highwayman should be commemorated in this fitting fashion. Incidentally, Nottinghamshire is a good touring shire, and I commend it to riders who are seeking fresh fields and pastures in 1952.

Purchase Tax Anomalies

FEW taxes have been more unpopular than the Purchase Tax, and the Chancellor of the Exchequer will doubtless be approached by many organisations this year with a view to some of its anomalies being removed. The National Committee on Cycling, that body which does much for the industry and for riders, has been informed that when the Chancellor makes his next general review of the Tax and its applications, he will consider the representations made by the Committee regarding touring bags. Cyclists ask that the Tax should at least be reduced from 66⅔ per cent. to 33⅓ per cent., because touring bags are in the same class as the brief cases and school bags from which the Tax has now been wholly removed.

Snow Scene

SOME folks like to see snow only on Christmas cards! Others revel in a countryside covered with a mantle of white, and take joy in watching the virginal flakes swirl from the leaden skies. Here in my Derbyshire, with its peaks and moors, there can be snow in abundance, and lanes can quickly become impassable through drifts. Hard weather . . . yes! but the snow scene has its own beauty, and I know of few finer sights than the snow-clad slopes where the tobogganers run so gaily, and where one can easily imagine that one has been magically transported to Switzerland. Dwellers in this wintry area have garnered wisdom over the long winters, and at the first hint of snow, see that spades are handy for "digging out" operations. And wood-sheds are full of logs, so that when the snow swirls outside on a January night, there might be bright and crackling fires indoors. . . .

Lure of Lichfield

I AM fortunate in living fairly near to ancient Lichfield, that small cathedral city which lies amid green fields almost in the heart of England. It has two twin attractions . . . the beautiful cathedral, and a wealth of historical lore. And how ancient is this small Staffordshire city! It has existed since about the year 300, and at one time (787-803) was the Metropolitan See of the Saxon kingdom of Mercia. The cathedral, so often called "The Lady of Cathedrals" because of its grace and charm, dates back to the thirteenth century. Actually, it is the successor of a seventh century building, and is an edifice of which all England may well be proud. The three graceful spires, known as "The Ladies of the Vale" are a landmark for many miles around, and the truly magnificent West Front contains over one hundred exquisitely carved statues, portraying kings, queens, and bishops of bygone days. Lichfield is the birthplace of Dr. Samuel Johnson, one of the greatest literary figures in history, and compiler of the first full-length English dictionary. Johnson's house still stands in the Market Place, and its numerous exhibits are of great interest to visitors. Lichfield has been the residence of many of the famous . . . David Garrick lived in Westgate; Dr. Erasmus Darwin in Beacon Street; Joseph Addison at the Deanery; and Elias Ashmole lived for a time opposite St. Mary's Church. Riders who find themselves in this ancient and lovable place should not fail to visit the beautiful Stowe Pool, on the edge of which is the Church of St. Chad . . . the first Bishop of Lichfield, who christianised the kingdom of Mercia. Yes! beauty and history, and literature all combine at Lichfield, and the place is one of England's treasures.

Treasures of the Inn

NO institution is more closely woven into English life than the inn . . . whether it be in a green hamlet, a market town or a great city. The inn is a piece of English history; like a thread, it runs through the story of our wars, our sports and pastimes, our rural and urban occupations . . . and in a changing world, the English inn remains true to its old traditions . . . a place for the traveller to greet with joy at the end of his journey, a place for men to congregate and talk, a place for the quiet game of dominoes or "shove-halfpenny"; a place where one may drink ale and smoke a pipe and forget for a while the frets and furies of this modern world. But I wanted to say something about inn treasures; some are rich in old pewter tankards; some have fine collections of "horse brasses;" some have monster pike and bream, and chub, in glass cases in little bar parlours; others have good collections of old sporting prints on the walls of rooms where the ceilings are blackened with the smoke of innumerable pipes—rooms whose rafters have rung with the rollicking choruses of old English songs. In my retirement I have discovered an inn where the collection of horse brasses is particularly fine, and I find joy in chatting to the man who made the collection . . . for he is a "horsey" soul, a son of the stable and harness-room. Yes! there are treasures in the inn. . . .

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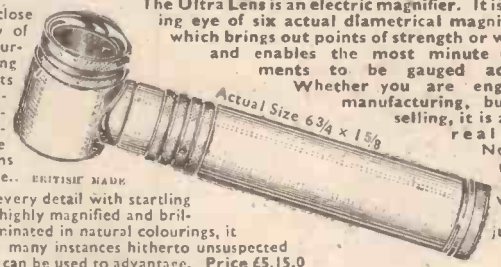

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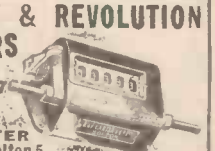

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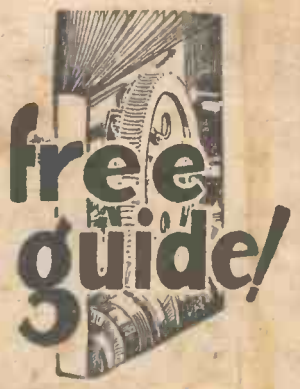

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