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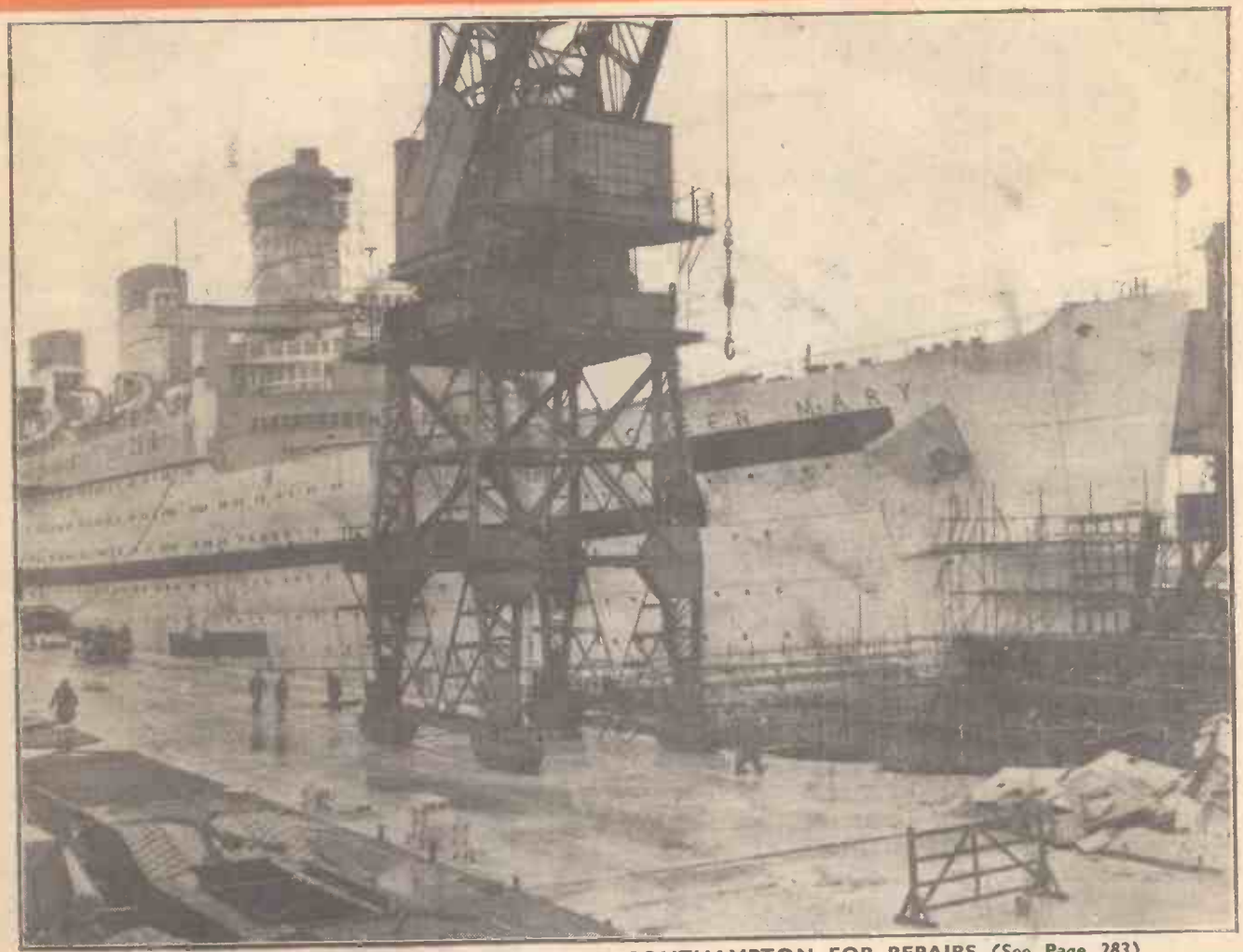
NEWNES

9D

PRACTICAL MECHANICS

EDITOR : F. J. CAMM

MAY—JUNE 1947



THE "QUEEN MARY" IN DRY DOCK AT SOUTHAMPTON FOR REPAIRS (See Page 283)

PRINCIPAL CONTENTS

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

Editor: F. J. CAMM

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FAIR COMMENT—BY THE EDITOR

Television Developments

THE discovery by a Kent firm of a new system of mirrors for the cinema projection of television has brought measurably nearer the day when every cinema will be able to flash on to the screen the current television programmes. The system was shown at the recent B.I.F. One of the difficulties barring the widespread use of television in cinemas has been the problem of producing at an economical price a mirror system which will pick up the image from the cathode-ray tube of the television receiver and flash it on the screen without loss of illumination and definition. Such a system is, of course, already in existence, but it is much too expensive for anything except the very large and prosperous cinemas. The new system brings the cost down to a few hundred pounds as compared with the thousands required at present.

The difference between the present and the new system is in the mirror. The lens system has an aperture of f/07, and has only spherical surfaces, greatly simplifying its manufacture and reducing cost. It is claimed that it produces a clearer image on the screen without distortion.

The type demonstrated at the B.I.F. takes 3½in. projection cathode-ray tube and gives a 7½in. magnification. It has a focal ratio of f/08 and provides clear, bright pictures from relatively weak cathode-ray pictures.

It is suitable for domestic television receivers.

The lenses are of plastic which, of course, are cheaper to manufacture than the ordinary type made of glass.

The Present Position of Television

LORD HANKEY'S Television Committee Report, published as long ago as March, 1945, made specific recommendations for the development of television. The main proposals were that television transmissions should be resumed from Alexandra Palace on the pre-war standards, that these transmissions be extended to provincial centres with all possible speed, that research should be encouraged to continue without interruption, and should be put into service side by side with the existing 405-line system in such a way as to merge one system into the other without rendering useless the 405-line sets purchased by the public in the intervening period, and that a Television Advisory Committee should be set up to be responsible for and to supervise the development of the service.

The report was accepted by Parliament in September, 1945, and the Advisory Committee was set up under the chairmanship of Mr. Garro-Jones (now Baron Trefgarne of Cleddau).

After having been shut down for nearly seven years the service recommenced on June 7th, 1946, and it operates on the same basic standards as before the war but with improvements in brightness, clarity and reliability.

The next step is the extension of the system to the provinces. The first provincial station is planned for the Birmingham area, and Manchester and Glasgow may follow, but the establishment of the Birmingham Station has been delayed because of economic and industrial difficulties.

Mr. Burke, speaking in the House of Commons on January 23rd, stated that the Government were anxious that the service should be put into operation at the earliest moment, and mentioned the difficulties of carrying the coaxial cable from London to Birmingham and of getting a site for the amplifying station. Arrangements have been made to run a two-way link between London and Birmingham so that programmes can be sent in either direction, either by cable or by radio link, which will serve equally well for 405-line and for 1,000-line definition—even for colour when commercially possible. Readers should remember, however, that it is not the intention to supersede the present system for many years, and we have the assurance of the Postmaster-General that the public need have no hesitation in acquiring 405-line television receivers.

The picture quality of the new sets is a great improvement over pre-war receivers.

The Passing of Henry Ford

HENRY FORD brought the pleasures of motoring within the means of all, and he also made conditions of employment such that workers had sufficient leisure to travel inexpensively.

Like Edison, he was a titanic worker, and whilst the hours of employment of his employees were being steadily reduced he continued to work over 12 hours a day almost up to his death, and disproved the theory that work kills.

It is not true to say, as so many have done, that he invented mass-production. That had been invented many years before Ford by Whitworth and other Englishmen, but Ford was quick to apply those methods to the rapid production of automobiles. The original Ford car cost in this country about £120 at the start of the present century, and although it became a music hall joke (it is possible that these jokes were mass-produced also in the Ford factory) it speedily achieved a reputation for reliability and for the promptitude with which the manufacturers serviced it; Ford it was who insisted that every Ford agent should carry an adequate stock of spare parts and give a 24-hour service.

In those early days of motoring there were few cars which could claim to be reliable, and there was a glorious uncertainty when one sallied forth as to whether one would arrive or proceed home by rail or coach.

Petrol was 10d. a gallon, and garages had hardly come into existence. When a car broke down, as it frequently did, one called at the local blacksmiths, and had the part repaired. British cars at that time were not made from interchangeable parts. Each car was individually made and fitted and spare parts had to be made or the old part repaired.

With the Ford car, however, complete interchangeability with every part had been secured. Ford, therefore, virtually created the spare part system and caused the garage industry to come into being. The British and the French were the pioneers of the motor industry, and we in this country concentrated on quality rather than quantity.

To-day British cars are the best in the world, and our spares service is second to none. It must be admitted, however, that Ford showed the way.

He was inspired to enter the automobile market by an article in *The World of Science* of 1888. In the book on Ford's life his biographer says:

"While working for the Flower Bros., Henry made the acquaintance of a brass finisher, Samuel Townsend, who had come from England not long before. In his trunk he had brought a magazine called *The World of Science*, which he lent to Ford. It described the invention of a German doctor, Nicolaus A. Otto, of an internal combustion engine that only recently had been patented and licensed for manufacture in the United States. Henry pondered long and earnestly over the article; it made a profound impression on his mind.

"The discovery of such an engine was as exciting to the mechanically minded youth of 1879 as television and stratospheric flights have been to youths of more modern generations."

Thus passes another pioneer whose name will be inscribed on the wall of the scientific Valhalla alongside the names of Edison, Newton, Röntgen, Graham Bell, Marconi, Wilbur Wright, and those other pioneers who collectively have made life to-day so packed with interest, even though it may be more strenuous.

The Biopticon

Particulars of the New Natura-stereo Process of Twin-vision Kine-photography

By GREGORY BARNES

THE 100 per cent. perfect stereoscopic film has arrived!

Since films began, inventors and scientists have wrestled with the problem of cinematic stereoscopy—unsuccessfully. Now that it has been perfected, the three-dimensional film is going to revolutionise the world film industry.

The new invention, acclaimed by top-ranking British film technicians, will be in the studios and probably in full production before this issue goes to press.

But for the war, stereoscopic films would to-day be as commonplace as Technicolor. The experimental stages of the new process were passed in 1938, but production of the apparatus, which began the following year, was held up by the war. This year, films have been made with the completed apparatus, and have passed with flying colours exhaustive tests, which have failed to produce any weak spots, or to shatter any of the remarkable claims made for the process.

Invented by Mr. T. Maxwell-Harvey, the "Biopticon" natura-stereo process of twin-vision kine-photography produces convincingly natural stereoscopic films without any modification or addition to existing apparatus.

The descriptive title of the process, "natura-stereo," is derived from two of its characteristics—the third dimension of depth, or *stereo*, and "environment displacement," or the *natural* movement of environment in relation to itself, which has never been possible with "flat" films nor achieved in earlier stereoscopic efforts.

The Biopticon, a precision machine 5ft. in height, covers a floor area approximately 5ft. by 4ft. Powered by a ½ h.p. 12 volt motor, it provides a floating base for the standard studio camera, which is oscillated between positions approximating to those of the two human eyes.

The action is "the complete external control of the parallax of the optic directional of the camera from zero to infinity. It presents to each eye, either singly (as in the case of a one-eyed person) or simultaneously, a pair of pictures so placed on the film—and ultimately on the screen—as to produce stereoscopic vision, as seen by a normal person in everyday life."

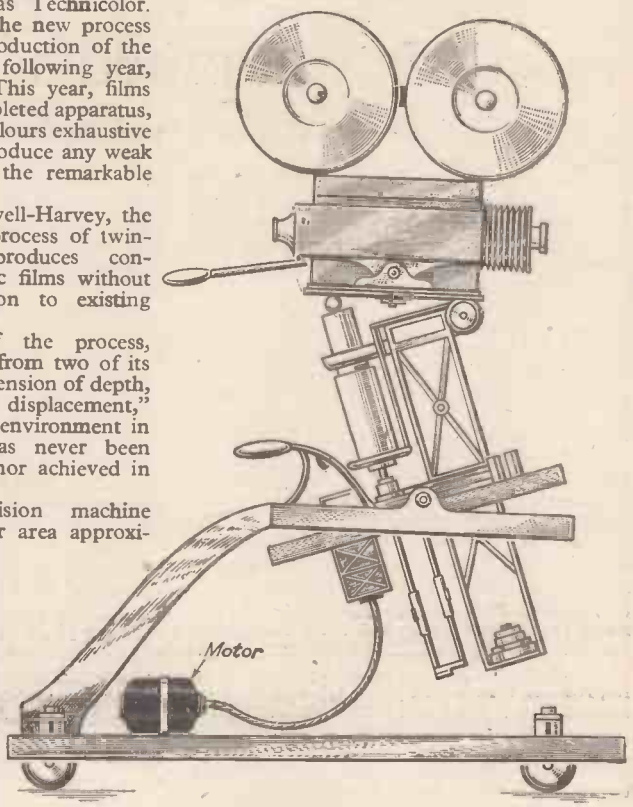
New Photographic Quality

A short demonstration film, made in Regent's Park, and recently shown to leading British film chiefs, reveals an amazing new photographic quality. Images are sharp at all distances, with true depth and perspective, and without distortion. The sharp definition of the picture and the reduced projection current which the process demands have banished from the screen the twin evils of eye-strain and screen-glare.

During the demonstration, a newly-processed American film, considered to be of a good standard, was run on a second projector, and shots of each film, were screened alternately, with a projection current of 25 amps for the American and 7.2 amps for the three-dimensional film. The contrast between the two was startling, and experts declared themselves frankly amazed at the superiority of the Biopticon pictures in every respect.

This demonstration film fully supports the inventor's claims that his process produces the finest photography possible, with total elimination of film grain, and the complete correction of all distortion.

In bringing the stereoscopic film to perfection, Mr. Maxwell-Harvey has removed many of the inherent faults of the two-dimensional film. Characters now appear actually to move nearer to, or away from, the camera, instead of merely growing larger or smaller; a road or path on the screen does apparently wind away into the rear of the scene, instead of progressing from the bottom of the screen *upwards*; the legs of figures in the picture do not flicker as they walk or run, as they do, infinitesimally, but quite perceptibly, in "flat" films; and there is a convincing realism about the pictures, giving the impression that one is looking through an open french window at the scene outside.



Side view of the Biopticon

Production Advantages

Many production advantages are claimed for the Biopticon also. In addition to the projector current saving of 70 per cent. it is estimated that production time will be cut by 10 per cent., and studio lighting by 80 per cent., with the new process.

The film's fine detail and faithful reproduction at all distances cut out focusing retakes, lining up for the camera, etc., and save studio floor time.

The extreme depth of focus all over the picture makes "back-lighting" unnecessary, and enables ceilings to be used on any set. The figure of 80 per cent. is the estimate of a famous British director of the proportion of studio lighting used for "backlighting" to separate artists from their backgrounds.

The total estimated saving in production costs—10 per cent. to 15 per cent.—will more than cover the cost of hire of the Biopticon apparatus, and royalties, so that the true cost of the process is nil.

Biopticon improves both sound and colour, by putting them in a more natural perspective, besides making more light available for colour purposes. In the cinema, the reduced projector current provides a reserve of 100 per cent. to 140 per cent. of light for colour (or smoke or fog), while on the sets at least 30 per cent. more light is made available.

At present, efforts to project each successive picture-frame on the screen in *exactly* the same position as the one before it, result in a "soft," out-of-focus effect. Fine detail, especially in the distance, is obliterated.

"Separation Displacement"

The success of the new process depends essentially on each picture occupying a position on the screen *different* from the preceding one. This "separation displacement," necessary for the stereoscopic effect, automatically corrects distortion by reproducing a sharply-defined picture in correct perspective.

At the same time, film grain is completely eliminated, making possible the use of any speed of film and any development in the processing.

The operation of the Biopticon is simple. The cameraman uses the camera in the orthodox manner, and controls the Biopticon range of ten grades of stereoscopic relief by a single dial. He selects the required grade on the dial and it is automatically incorporated in the film.

When trick photography or stunts are required, the ten-grade range offers more scope than any other process.

Mr. Maxwell-Harvey predicts that the "art photographer" will come back into his own, bringing to the screen the light and shade effects, and the quality, of the Old Masters. A whole new range of artistic effects, denied to "flat" films, will be opened up as the possibilities of the new medium are appreciated.

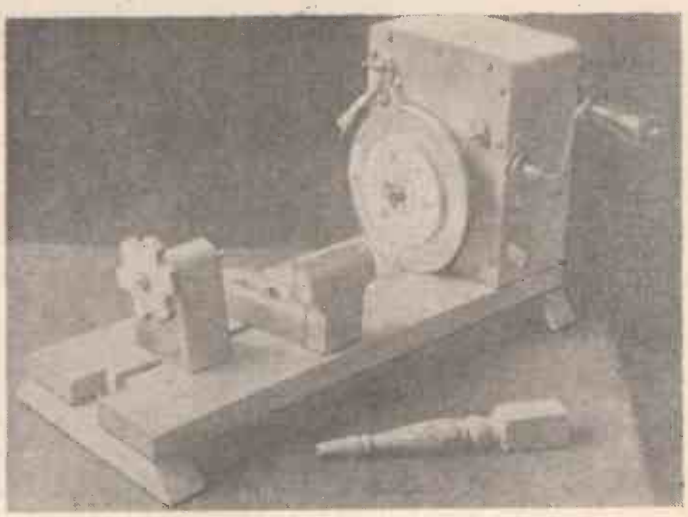
This Lancashire kine-expert can claim over 50 years' experience of professional photography, and for 40 years has been engaged on kine-research work. Among his other inventions are a continuous-exposure rotary cine-camera and projector; a seven-colour process costing no more than ordinary filming; and an oblique studio background projector and screen.

But, valuable as these inventions are, none is as important, or as revolutionary as the Biopticon, which has been described by a leading British film technician as "the biggest thing since talkies!"

A Novel Wood-turning Lathe

Constructional Details of a Small, Practical Wood-turning Lathe Operated by a Cheap Gramophone Motor

By R. J. CHAMBERLAIN



The simple wood-turning lathe, with a specimen of work turned on it.

HAVING a cheap "Ace" portable gramophone operated by a single-spring motor, the writer often wondered what he could do with it. The motor could not take the "drag" of some of the louder passages in orchestral records. It slowed up considerably at these points, returning to normal speed at the smoother parts of the recordings.

Realising the great power at the centre of the turntable, it occurred to the writer that a small lathe could be operated by the motor spindle if the latter were fitted with a suitable spur (for gripping wood to be turned) and the power augmented with a flywheel.

Flywheel? Surely the gramophone motor spindle, with the motor running at full speed, hardly warranted a flywheel? A little further reflection, however, showed that the turntable itself acted as a form of flywheel. Excellent! Retain the turntable as a flywheel. It would also make a good face plate for "fluting" small toy wheels with a gouge.

It was then seen that the diameter of the turntable (10in.) did not fit in nicely with the scheme of things. It was too big—the lathe would be more like a bacon-slicing machine than a miniature lathe of conventional arrangement. Why not reduce the diameter of the turntable and make up the loss of centrifugal force with a "ring" of lead cast in a wooden mould, which could be attached to the plate?

That, briefly, was how the writer managed to convert a useless gramophone motor into a small, useful wood-turning lathe. The lathe needed the winding handle, the speed regulator and stop-start fitting.

What Can Be Turned

It is not every reader, of course, who can make use of, say, a 1/30 h.p. electric motor for driving a small lathe. Some do not have the electric power, particularly in country districts or out-of-the-way places. Others haven't the room for a proper treadle-operated lathe. Moreover, many readers, especially model-makers, only require a small, compact lathe capable of turning model galleon parts, such as dead-eyes, gun barrels, wheels, etc., or the making of turned legs for doll's house furniture built to a scale, possibly, of 1in. to 1ft.

All these things, and many other tiny items not mentioned, can be turned on the clockwork lathe illustrated. One does not need electrical current, or to put in extra work by treadling. With the motor wound up fully and the flywheel revolving at its maximum speed, one can concentrate on the turning independently for several minutes. The heaviest work possible with the lathe is the model kitchen table leg shown at Fig. 9, and considering the source of the power this size of leg is quite good. All turnings, incidentally, are made from lengths of dowel rod, from 1in. diam. to ¼in. diam., but more about the dowelling later on.

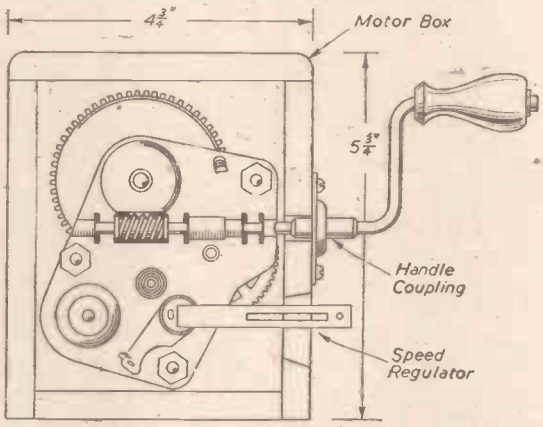


Fig. 1.—Showing how the gramophone motor fits within its wooden box.

The Motor Box

At the moment, the reader will probably be wondering if any kind of spring gramophone motor could be utilised. Any type may be employed, and for preference the motor should have a double spring. Since you may be using a larger and stronger motor, the lathe sizes must be altered accordingly.

Those readers possessing an old "Ace" portable gramophone (it is a type which cost about 30s. in pre-war times!) will be able to proceed on the same lines as the writer, since the motor is sure to be of similar make and size. A good view of the motor is shown in Fig. 1.

The motor must be housed in a box exactly as shown in order that the winding handle is true with the side of the box. The box is made from ½in. or 7/16in. thick deal, with, preferably, 3/16in. thick plywood for the back and front, although plain fretwood would serve. A front and side piece is detailed in Fig. 2. The front is drilled for the motor spindle and its three motor-board bolts, the side piece being checked for the winding coupling and speed regulator in the manner indicated.

When the sides and top and bottom ends of the box are nailed together (use 1in. oval nails), attach the back and front and level off by glass-papering; the top corners may be rounded over. Unscrew the front and fit the motor

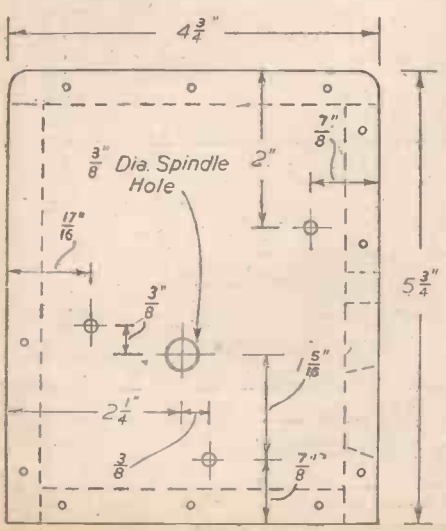


Fig. 2 (left).—Front and side of the motor box.

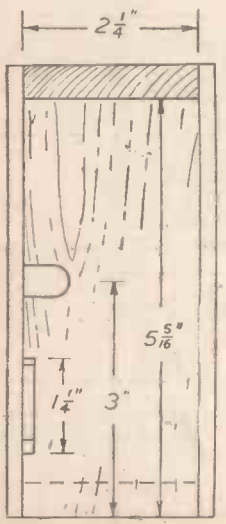
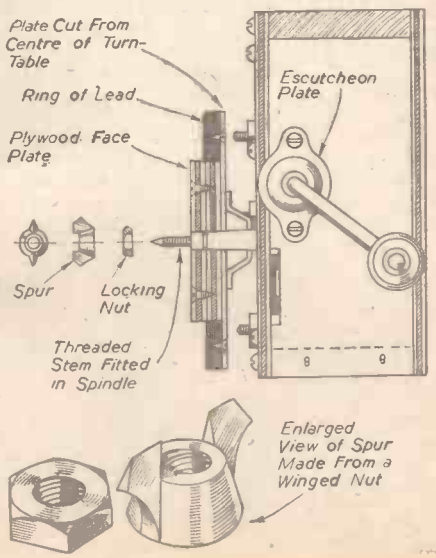


Fig. 3 (right).—Side view of motor box, showing flywheel in section.

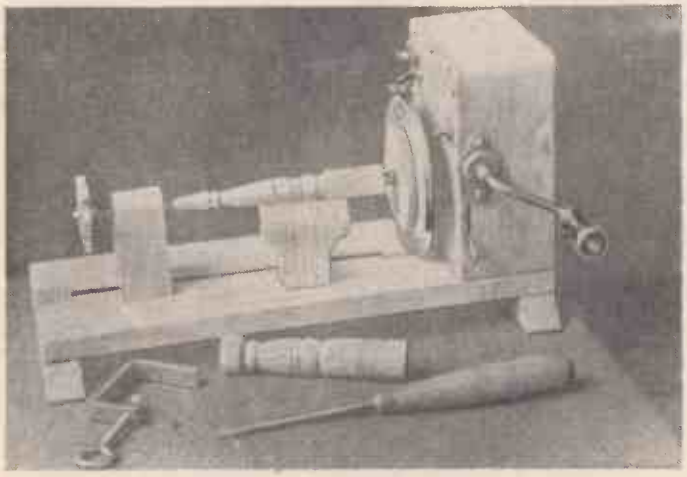


within the box; replace the front to see that the spindle and fixing bolt holes are truly bored.

The Speed Regulator

The speed regulator rod has an extension strip, which is not wanted. Remove this and reduce the length of the regulator so that it projects about ¾in. from the side of the box. You can easily reduce the length by putting a bend in the metal.

Having done this, fit on the front and bolt it to the motor prior to adding the fixing screws, the latter being ½in. by 6 roundhead iron screws.



Another view of the simple lathe.

The Winding Handle

The winding handle requires to be reduced in length. This means removing the threaded stem which screws into the coupling. A fresh thread, however, can be easily formed at the end by means of a fine hacksaw (an "Eclipse" type) and triangular file. Alternatively, a new thread could be cut with a suitable die; but, providing the rough, filed thread gets a firm grip in the coupling, such will suffice.

Another plan is to bend a "crank" near the original threaded end of the handle and dispense altogether with the proper wood handle. If this suggestion is adopted, the metal must be softened (by heating and allowing to cool gradually on cold cinders), otherwise it will snap. Bending is done in a vice or the metal jaws of a sash cramp.

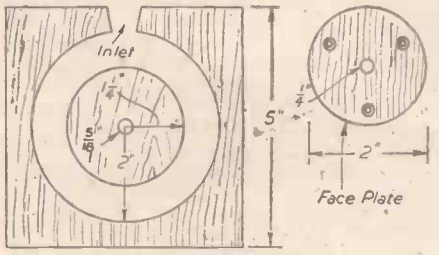
The Flywheel

As stated previously, the flywheel is cut from the centre of the gramophone turntable. A sectional view of the completed wheel is given in Fig. 3. The central part of the turntable, when cut out, makes the proper face plate, but only for the lead weight. The actual face plate is a disc of plywood. This is really a packing piece against which a disc of wood—not more than 2ins. in diameter by ½in. thick—is attached, by a thin washer and winged nut, in fluting toy wheels.

The diameter of the flywheel is 4in. Plug the spindle hole in the turntable with wood and scribe the diameter on the surface of the turntable with compasses. It is being assumed, of course, that the velveteen cover and plated rim has been removed from the turntable.

The plate is best cut away by fitting an "Eclipse" hacksaw blade in a fretsaw hand-frame and cutting the metal much in the same way that wood is fretsawed. The "lugs" on the hacksaw blade will need to be removed and the length of the blade reduced to about 4½in. or 5in. The hacksaw blade mentioned is the small, fine-toothed type fitted in a wire handle frame by spring tension.

The plate is drilled and countersunk for six ⅜in. by 4 flat-headed iron screws, as in Fig. 4. The flywheel proper is a "ring" of lead, which must be cast in a wooden mould. The essential part of the mould is shown in Fig. 4. Mark out the shape on ½in. wood. The "waste" portion is cut out in a complete piece with a fretsaw.



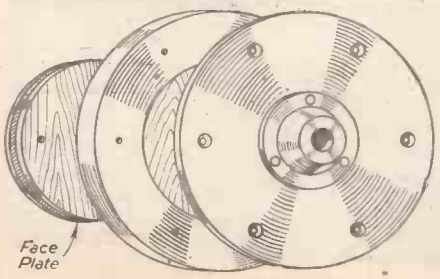


Fig. 4 (left).—Lead ring mould shape, with assembly of flywheel parts.

Fig. 5 (right).—Plan and side view of lathe bed, and details of feet.

Casting the Weight

As soon as the unwanted portion has been cut away it is put back in place again to keep the central disc and outer shape truly in position. These parts are pinned on a scrap piece of wood, then the unwanted portion lifted away. To prevent undue scorching of the wood, smoke and "air bubbles" in the molten lead, the mould needs to be sooted with a candle flame.

Once this has been done a second piece of scrap wood is put on top of the mould to enclose it. In other words, the shape shown in Fig. 4 is "sandwiched" between two plain boards of wood 5in. square by ½in. thick, all being nailed together; no nails must penetrate into the mould shape, of course, nor at the inlet.

Clamp the mould in a vice, with the inlet uppermost. Melt old lead pipe in an empty cocoa tin (a pouring "lip" should be bent in the rim of the tin beforehand). The molten lead must be carefully poured into the mould in a thin, steady stream until full up to the inlet hole. While the lead is burbling in the mould the latter should be "bumped" lightly on the ground to allow smoke and steam to escape. In a few minutes the lead will congeal and grow cold, following which the cast is removed. The central disc must not be taken from the casting.

It is only necessary to trim the ring of lead and drill it for the plate screws. When the plate is attached and any projection of the screw points filed level at the face side, the plywood face plate is attached, using ⅜in. by 4 flathead screws.

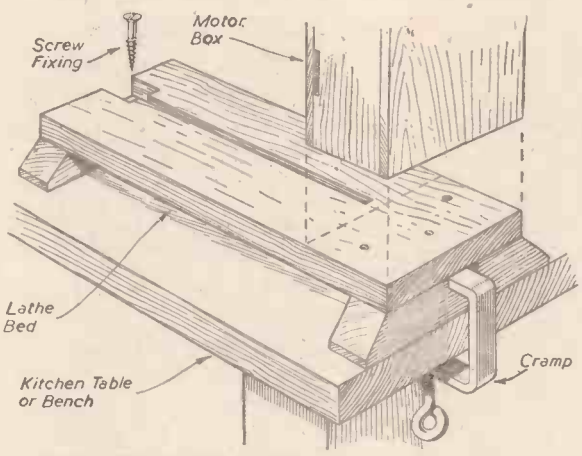


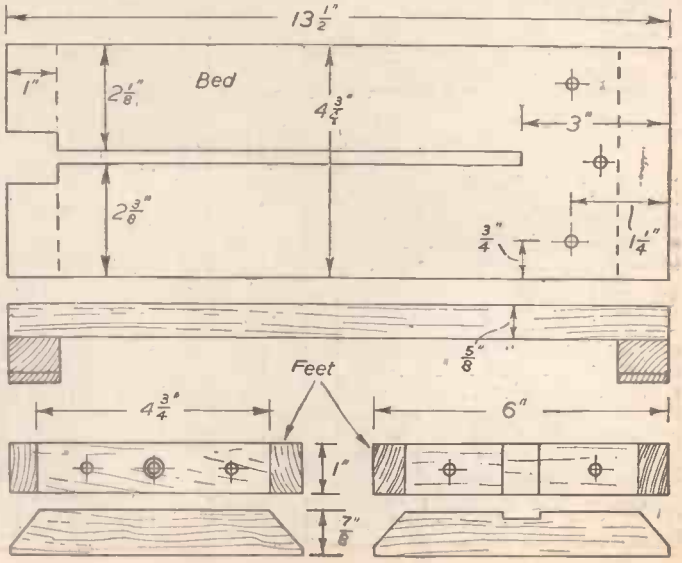
Fig. 6.—How the lathe bed may be attached to a table.

Making the Spur

The making and fitting of the spur to the motor spindle is the only really difficult part of the lathe. Absolute accuracy is desirable. The spur and its threaded stem is made from a 3/16in. machine bolt and a suitable winged nut.

An accurately drilled hole for a piece of the bolt stem is drilled in the end of the spindle. The writer ensured central and vertical accuracy by first "popping" the spindle end with a fretwork drill point, afterwards drilling 1/16in. deep while the motor was allowed to run slowly.

A 1/16in. drill was then fitted in a hand-drill, and, still keeping the motor running



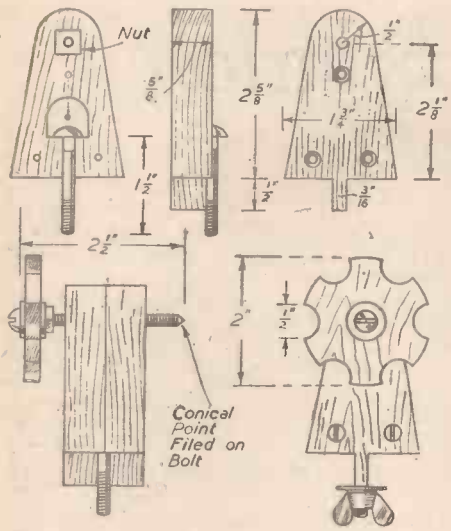


Fig. 7.—Constructional details of the tail-stock.

slowly, the hole was bored to a depth of ½in. The drill bit, naturally, revolved much quicker than the spindle so that it "cut" into the metal easily enough, while the revolving spindle also prevented any tendency for "leaning" to one side.

The 1/16in. hole is enlarged with a 5/32in. drill, the depth remaining ½in. The threaded stem (see Fig. 3) is cut to its length (about 1¼in.) and filed slightly to be a force fit in the spindle hole. A conical point is filed at the opposite end; if the stem shows a tendency to "waver" while the spindle is turning, this waddling can be rectified by bending slightly with pliers the stem in the opposite direction to which it leans.

The spur, as shown in Fig. 3, is filed to shape from a winged nut. To prevent the spur from unwinding itself from its stem a "locking" nut is put on the stem first, then the spur put on and the nut tightened up against it with a spanner.

(*Note.*—In connection with conventional lathes, the driving end, called the "head-stock," is at the left-hand end of the lathe bed, with the tail-stock at the right-hand end. This arrangement is not possible with the clockwork lathe because the gramophone motor spindle revolves in an anti-clockwise direction. Therefore, the driving end had, of necessity, to be placed at the right-hand side of the lathe bed; this, of course, makes no difference to the turning of wood in the lathe.)

The Lathe Bed

The lathe bed consists of a board cut to the size and shape given in Fig. 5 from ⅝in. wood and two feet cut from ¼in. stuff, as depicted. The constructional view (Fig. 6) shows the ends to which the feet are screwed. It is imperative, by the way, that the ¼in. wide slot in the bed is in alignment with the motor spindle centrally when the motor box is screwed upon the bed. A top view of the lathe bed is shown in Fig. 5. The three motor-box fixing screw holes are countersunk at the reverse side for 1in. by 8 flathead screws.

The Tail-stock

The tail-stock consists of two shaped pieces of wood which enclose a 1½in. by 3/16in. coach bolt and nut. The nut is embedded fully in one shape, with the bolt embedded by half of its thickness. A suitable recess for the other half is made in the second shape. One shape is screwed to the other with three 1in. by 6 flathead screws.

Prior to embedding the nut, 3/16in. holes are bored in the shaped pieces (cut from ⅝in. thick wood) for a 2½in. by 3/16in. machine bolt. A hand wheel, for this bolt, is cut to shape from ¼in. plywood; the wheel is permanently attached by means of a couple of washers and a nut, as seen in the side view. A conical point is filed at the end of the bolt. The carriage bolt requires a winged nut and washer for the adjustment of the tail-stock in the lathe bed slot, the washer and winged nut going to the bottom side of the lathe bed.

The Tool Rest

A simple but practical tool rest is formed from the parts shown in Fig. 8, these being glued and affixed together by means of a single screw driven in at one side. A hardwood should be used; the grain of the tool rest runs

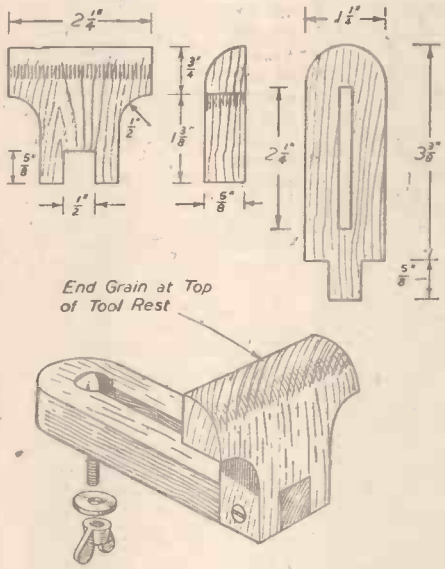


Fig. 8.—The tool rest, and details of the various parts.

upwards, it will be noticed, for strength. The tool rest, like the tail-stock, is adjustable on the lathe bed. A 1½in. by 3/16in. carriage bolt is required, including a washer and winged nut.

Turning a Leg

What may be regarded as a "heavy" leg for, say, a model kitchen table is shown in Fig. 9. Now, when using a proper kind of lathe, one thinks nothing of paring away waste wood with a gouge. Since quite a small, clockwork-operated type is to be used to its maximum capacity, a great deal of unnecessary *slow* "pruning" can be avoided by first paring the leg roughly to its shape with a penknife, as indicated in the drawings.

The paring is done "square" first, then made octagonal. If a set of four model table legs are being contemplated, all four are marked out and "roughed" up, and made ready for finishing on the lathe. The ends of the wood need to be centrally popped and the spur end forced tightly, by hand, against the spur so the ends embed in the end grain, following which the tail-stock is brought up, tightened to the lathe bed, and the handwheel turned to force the conical point against the wood. To facilitate movement and prevent squeaking, a spot of oil should be applied to the tail-stock point.

The single-spring motor is only powerful enough to enable light "trimmings" to be removed at a time. The motor slows up if too much pressure is put upon the cutting tool. The best kind of cutting tool is a keenly sharpened ¼in. bevelled wood chisel. Quite a variety of beads, flutings, grooves, etc., can be cut with this implement.

All turnings should be made from dowel rod, from 1in. diameter to ¼in. diameter. In the case of "squared" legs with turnings in or

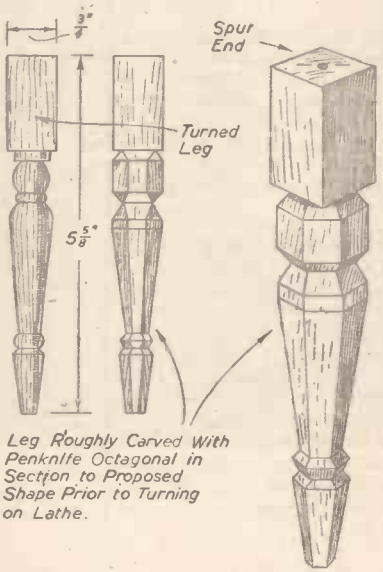


Fig. 9.—Example of the heaviest work possible on the lathe.

about the middle, the dowelling should be planed square and then machined. If the wood is ¾in. square, the shape must be roughly cut with a penknife, as explained.

Deal is not a suitable wood for turning. It splinters badly as soon as the cutting tool loses some of its keenness. When using the chisel, its back must rest on the tool support. Its cutting edge is gently brought forward to the revolving wood to "bite" at parts revolving out of true. It is a mistake to allow the chisel to move in and out with a wobbling piece of wood; this produces an oval-shaped turning.

Increasing Speed

Not content with the normal high speed of the motor, which is somewhat slow, the writer obtained a much higher "free" speed by fitting a spring (coil type) on the spindle of the motor governor. This spring was put between the fixed hub and sliding hub. It served to prevent the centrifugal force from acting too easily on the weighted springs and, consequently, the sliding hub. The reader must be careful not to use a too powerful coil spring; this may cause the governor to revolve too quickly, thereby straining the weighted springs and breaking them.

The Ideal Home Exhibition

A General Survey of the Various Sections

By the MARQUIS of DONEGALL

Cooking by high-frequency current. In this cooker, house current is transformed into radio-frequency current and focused directly upon the food. No heat is wasted, and the cooker remains cold. Food is cooked right through to the centre without the outside burning.

IT is so many years since the last Ideal Home Exhibition at Olympia that I can hardly remember anything about it, let alone whether its layout in any way resembled the present one. Comparison is therefore impossible and perhaps this is just as well as there must have been many articles which, had not six years of war served to dis-accustom us to them, or at any rate to their pre-war quality, would strike us by their absence.

Were we to walk straight from the 1939 Exhibition into that of the 1947 we would probably be surprised at the general deterioration in quality and finish. Fortunately, we can do no such thing; memories are short and, after six years of doing without almost everything, the first impression was one of pleasure at seeing that so many war-vanished products had returned—and more than that, were actually available.

The organisers announced that 75 per cent. of the exhibits were available now and that the rest would shortly be coming along. I tested this out to the best of my ability by inquiring at random all over the Exhibition. In each case the demonstrator was willing to book an order and assured me of delivery within a reasonable time, if not immediately. This was indeed a relief after the infuriating tantalisation of those "Export Only" notices at the "Britain Can Make It" Exhibition.

Coming up the steps from the Addison Road entrance, the first vista of the Grand Hall was certainly impressive and bright. All the stands were white and flat-roofed. As we looked down the wide centre "Avenue" of the Grand Hall, culminating in a broad staircase at the other end, leading up to the first gallery, we got the impression of an eastern bazaar, with its open stalls, that had miraculously been rendered spotlessly clean. The babbling, meandering throng and the voices of the demonstrators striving to make their perorations audible to those interested enhanced this fleeting comparison.

Furnishing and Decoration

The first section of this "Avenue" was devoted to Furnishing and Decoration, spreading out into the subsidiary "streets" and "alley-ways." Here there were furnished rooms to suit all tastes from period to modern including burnproof and stain-proof kitchen furniture. There were Welsh rugs, Oriental carpets, and glassware, I was glad to note.

Next up the "Avenue" came the Radio Section. I do not want to deal in detail, in this article, with mechanical devices, but rather intend to give them the whole of the second and final article.

Suffice it to say that gramophone-radio-television stuff had been produced for view which was apparently not available for the "Britain Can Make It" Exhibition. On the other hand, others which were *not* "export only" in that Exhibition were absent from the Ideal Home. The inference is that this so-called crisis has now delegated them for the enjoyment of our ex-enemies and unfair weather friends only.

I have two specific examples in mind. But I do not wish to be invidious or do possible unconscious harm to those concerned.

Household Services

After the Radio Section (continuing our stroll up the "Avenue"), we came to Household Services. On the left, electricity for the home, solid smokeless fuels and refrigerators. (Most gratifying, the refrigerator situation all over the Exhibition.) Heavens, do we need them? Because when the price soars to £160 at any auction for any form of broken-down refrigerator, things become a bit too extravagant.

On the right of the "Avenue" there was the "Daily Mail's" own stand. Lots of old friends: especially the cartoonists doing their stuff—"Spot," "Phipps," "Moon," and all the rest of the boys.

The Gardens

If we went straight on we came to the Gardens, but we had to walk a little way to the left to find the entrance. The Gardens were one of the two best things in the Exhibition. Owing to the fact that there is an extra charge of a shilling, they are never overcrowded and the effect on the citizen is of suddenly emerging from the toils and tribulations of these over-crowded islands into

A dining-room suite in modern tubular style. One of the exhibits at the Ideal Home Exhibition

peace on earth. Childishly, perhaps, I thought of Alice when she eventually made herself small enough to get the key and go through the tiny door into the Wonderland garden.

In fact, I was inspired to worse verse than usually reaches the printer (and that's saying something!):

"From hues and queues
And busting flues
With every right to 'Sing the Blues,'
How should we flee Llandudno's orders
Save through Lord R's
Herbaceous borders?"

I am not going to be so stupid as to try to describe a garden to you, but what I do think remarkable is that the organisers had managed to get such a variety of flowers and plants—not to mention bulbs and trees—to flower simultaneously and at a given date. The carnations and the "frizzy" tulips alone were worth a visit to the Exhibition.

British Films in Miniature

The second best feature to my mind was the gallery of British films. All the world loves miniature things, whether it be marionettes or microscopic hand-paintings. In this gallery you could see miniature film sets of recent British film successes. There was James Mason in the artist's studio from the film, *Odd Man Out*. We passed on to Stewart Granger in *Captain Boycott*. Perhaps the best of all was a scene from *Take My Life*, in which the detail of the bottles, glasses and furniture had to be seen to be believed. But in picking out this set I do not want to minimise the artistry of the Highland croft in *The Brothers*. This was the only miniature set in which the exterior and approaches to the subject were shown: the thatch, the rugged steps leading from the seashore and the faithfully produced pots and pans of the island of Skye. Once you had seen that set you might as well go out by the unofficial exit, because down the other side of the gallery they had made the sets too big to be miniature and too stunted to be worth the trouble of looking at them. They were neither one thing nor the other.

On the first floor we found the toys and, although certain ingenuity which was given free rein for "export only" in "Britain Can Make It" had had to be sacrificed, there was, at least, something for the youngsters to play with. I may be wrong about the modern child, but I guess that he is fundamentally the same as we were, and that the shabbiest toy is still the most cherished.

I do not want to give the impression that the toys available for the home market were shoddy. They were not, and the whole thing can really be epitomised by taking the hypothetical example of a doll which has everything that it should have except that "for export" its eyes would shut and it would say "Good night" when you put it to bed, whereas for home consumption it just goes to bed quite silently with its eyes open.

You fill the kettle with water, put the tea in the teapot, set the alarm on the clock to the hour at which the tea is required and switch on the current. At the appointed time the alarm sounds, the lamps are lighted, and, hey presto—the kettle is boiling and tea is ready to serve! One of the home gadgets which were on view at the Ideal Home Exhibition.

An instantaneous multi-point gas water heater.

Labour-saving Appliances

As we went round the first floor we came to the Domestic Labour-saving Section. Carpet sweepers—I use it as a generic term to include mechanical and hand-operated—are here again. Model kitchens, which can be bought piecemeal, all-electric half-weight sewing machines and irons that require no flex. There was at least a toaster such as could have been seen for years in the lowliest United States home. Automatic home laundries, and even that greatest horror of modern civilisation, electric chimes that play anything from "Life on the Ocean Wave" to "Abide with me" instead of just ringing the front door-bell in the ordinary way.

Again on the first floor we had the section called "Science Comes Home." Science has, in fact, like most of us, been demobilised, and it is gratifying to see that already a number of top secrets that helped to win the war have been transformed from destructive to creative functions.

I think I am right in saying that it took the equivalent of 17,000 pairs of nylon stockings to make one glider hawser. So nylon is back. Magnesium can be extracted from sea-water and weighs only two-thirds of aluminium. The demonstration of a chair or table made of magnesium and weighed on the scales against a glass of water is "news."

I could go on for ever about this section, but I want to keep the gadgety part of the Exhibition for my second and final article on the subject.

In conclusion, the girls tell me that the Hall of Fashion was not as good as its counterpart was at "Britain Can Make It," but that it was worth the shilling extra which was charged for admission.

British-made Watches

One other thing is that cheap watches are coming back and are being produced, entirely British made, by the American firm that we associated most in this connection in pre-war days.

Altogether, I think that the organisers of the Ideal Home Exhibition deserve immense credit, especially in view of the enormous difficulties they must have encountered through the general mess-up, just at the time that they were putting Olympia into proper shape. It was an excellent thing that, after the frustration of "Britain Can Make It," the citizenry should be shown exactly what it could buy on the home market.

I am not attacking "Britain Can Make It." It was good that people should be shown that our craftsmanship is unimpaired. But it is also good that the Ideal Home Exhibition should have provided a counterpart which said in effect: "Here you are, if you have the money; it's yours for the asking!"

Rocket Propulsion

German Rocket Gliders

By K. W. GATLAND

(*Continued from page 231, April issue*)

A FEW more months of work unhampered by the Allied air offensive and technicians of the German Research Institute for Sailplanes could have produced a rocket-boosted reconnaissance aeroplane.

This was the project DFS.228, a large single-seat glider (Fig. 95), which, during bursts of thrust, was reckoned to achieve speeds up to 560 m.p.h., and be capable of operating over England at heights well beyond the reach of flak and fighters. Its designed ceiling was 15 miles, and from that height the pilot could theoretically observe ground areas within a radius of 300 miles. The machine would thus have been particularly valuable for charting the explosions of flying-bombs and V-2 rockets.

In operation, the DFS.228 would have flown "Mistel" fashion on top of a Dornier Do. 217K, separating at 35,000ft. Its pilot could then more than double his height by firing spasmodic bursts from a bi-fuel rocket in the glider's tail, afterwards resorting to rocket power only if difficulty was experienced in maintaining effective altitude. The amount of propellant in the tanks permitted barely three minutes' sustained thrust, but as the wing loading dropped from 28 to 12lb./sq. ft. as the tanks were drained—and the propellant would be nearly all consumed in the climb to peak altitude—this, coupled with the speed inherited from the rocket, should have resulted in a reasonably flat glide, despite the low air density.

Having reached his ceiling, the pilot could afford to lose half this height before again thrusting the rocket, but by that time he would probably have completed the reconnaissance and be well set into the journey back to base.

The DFS. 228V-1 mounted on its parent aircraft. The two machines were designed to fly together up to an altitude of 35,000 feet, when the glider would release and climb away under its own rocket power.

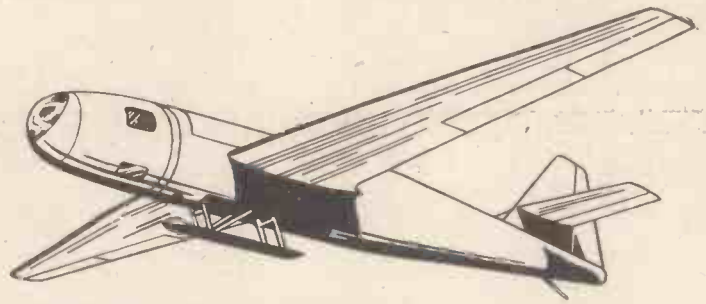


Fig. 95.—The DFS. 228. A ceiling of 15 miles with a top speed of 560 m.p.h. were the figures quoted for this rocket-booster reconnaisance glider.

The specification for the DFS.228 was first issued in 1941, and had the institute not been burdened by work given higher priority this glider might well have figured in the late war. As it was, the machine's development was delayed, and it was not until 1943 that the German Air Ministry gave orders for its immediate production.

Transonic Rocket Gliders

The DFS.228, designed by Dipl. Kracht and his staff, was actually the most advanced of several other rocket and jet-boosted gliders, among them the DFS.346 and DFS.1068, of which there were four versions of the latter. The accompanying table gives such particulars of these aircraft as are available. Each was intended for transonic and supersonic research and followed the same general pattern as the DFS.228; and hence the reason for explaining the reconnaissance glider at this stage.

However, before continuing, it will be as well to mention something of the D.F.S. itself.

Origin of the D.F.S.

The German Research Institute for Sailplanes had its beginnings in the early "twenties"—at the time when Germany, having lost her right to an air force under the terms of the Versailles Treaty, was fast becoming glider conscious. It was not that commercial aircraft were denied under the ruling; the war had evoked widespread interest in aviation, and the country's economic position simply did not leave anything over for the construction of pleasure aircraft. Gliders, however, were different. They could be built by any worthwhile engineer and, above all, could be turned out cheaply.

It was thus that gliding became one of Germany's foremost sports and to serve the needs of glider and sailplane enthusiasts, ever demanding improvements, the Forschungs Institut für Segelflug (Sailplane Research Institute) was founded in 1924.

The tragedy was that the Institute should have laid the foundation for the Luftwaffe, as it surely did, when Hitler saw fit to snub the binding treaty and embarked upon his programme of recreating the German "war machine."

Meanwhile German science was fast perfecting another form of aerial attack, the long-range rocket, which, ludicrous as it was tragic, was no infringement on the terms of the 1918 surrender—organised rocket development started in 1927 (see PRACTICAL MECHANICS, September, 1944, p. 441). It is significant to recall also that at least two rocket-powered gliders had flown before 1930.

Shortly after its formation, the Institute was established at Darmstadt, the name being changed to Deutsche Forschungsanstalt für Segelflug (German Research Institute for Sailplanes), referred to by the letters D.F.S. The original purpose of the group was to investigate, on a sound scientific basis, the aerodynamics and uses of gliders. However, the scope of the Institute was considerably widened in later years, and at the time of its occupation by the Allies it was subdivided into several research sections devoted to specialised studies of flight, both powered and power-less.

In 1939 the D.F.S. was moved to Braunschweig, and then finally, in the summer of 1940, to Ainring, in Upper Bavaria, by which time it had been fully developed as one of Germany's ten major aeronautical research stations.

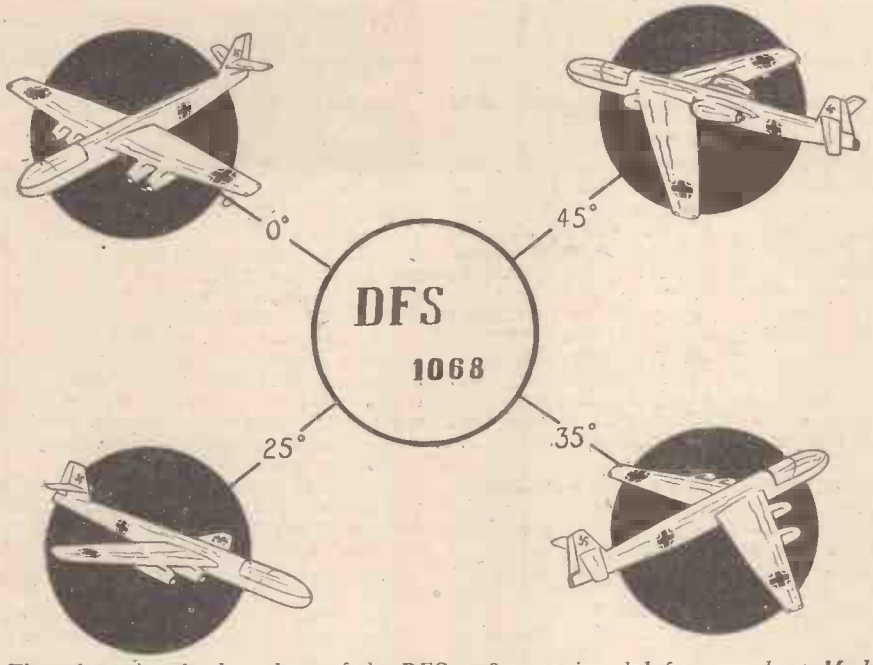
Key Technicians of the Institute

At the head of the D.F.S. "family tree" was Director W. J. O. Georgii (Prof., Dr., Dr. Eng.), formerly professor of flight meteorology and aeronautical research at the Technische Hochschule in Darmstadt; his deputies numbered two, Dipl. Temme on the technical side and Ing. Stamer representing the management.

Each of the ten technical departments had its own leading specialist, as noted in the following list, which will also serve to convey some idea of the institute's increased significance in recent years: (1) Institute for aerodynamics, Prof. Ruden; (2) Institute for glider construction, Dipl. Kracht; (3) institute for flight tests, Ing. Stamer; (4) institute for aeronautical equipment, Prof. Fischel; (5) Institute for physics of the atmosphere, Dr. Höhndorf; (6) department for high frequency, Dr. Folsche; (7) laboratory for special engines, Dr. Eisele; (8) department for engines, Dr. Sänger; (9) photographic section, Dipl. Harth; and (10) central workshop, Ing. Erbskorn.

Administration was in the hands of Herr Rauber.

Needless to say, most if not all of these technicians are now absorbed in various research activities adding to the technological advantage of the United Nations. Among



These four aircraft, descendants of the DFS. 228, were intended for research at Mach numbers between 0.8 and 1.2. Particulars of engines and propellants are given in the accompanying table.

the names that readers may have recognised is that of Dr. Sänger, pioneer rocket engineer and aerodynamicsist. In his book, the Technique of Rocket Flight, published in the days of bi-planes (1931), Sänger set out the fundamentals for a supersonic aircraft, and, as will be gauged from Fig. 50 (PRACTICAL MECHANICS, January 1946, p. 134), time has proved him a no mean prophet. His original research with liquid-fuelled rocket engines at the University of Vienna was none the less amazing; like the V-2 power plant, Sänger's engine of the early 1930s was fuel cooled. It operated on a refined diesel oil and liquid oxygen and was capable of thrusting continuously for periods of anything up to 30 minutes; in those days an unprecedented feat.

There still remains much to be said of Dr. Sänger, especially in his work at the Research Institute for the technique of Rocket Flight at Tauen, where, in 1936, rocket engines of 100 tons thrust were under project along with suitable airframes for withstanding travel at Mach numbers between 3 and 30. When, later, Sänger was incorporated into D.F.S., his main work consisted in developing the Lorin "athodyd" engine.

Beginnings of the Reconnaissance Glider

A complete account of the D.F.S. would fill volumes, and, in any event, by far the greater proportion of the work concerned slow-flight research, which is no concern in this writing. Sufficient to say of the experiments which led up to the rocket-gliders is that by 1940 a newly discovered technique, termed "wave-gliding," was permitting motor-less flights into regions of the sub-stratosphere. A sailplane had been successfully operated up to 38,000ft. in 1939 and, but for the ill-effects of cold and reducing atmospheric pressure on the pilot, it was evident that the machine could have flown still higher. Its flight depended upon rising waves which had been found to occur behind ranges of mountain when certain wind currents were prevalent.

There is a story told in Germany that illustrates vividly the possibilities of "wave-gliding," to say nothing of its hazards. It

Type No.	Description and Purpose	Power Plant	Propellant	Dimensions		Wing Area	Wing Loading		Speed/ Mach No.	Operational Ceiling	Range		Remarks
				length	span		loaded	empty			Safe	Max.	
DFS 54v-1	High-altitude research glider for testing pressure-cabin and emergency escape technique. Experimental prototype of DFS 228v-1	None	None	29ft. 5in.*	65ft. 6in.*			3.4 lb./sq. ft.*					One completed and flown
DFS 228v-1	Reconnaissance glider, rocket-assisted, and similar in general conception to DFS 54v-1	Walter 109/509D rocket unit	T. and C. stoffs	34ft. 7in.	57ft. 6in.	323 lb./sq. ft.	28 lb./sq. ft.	12 lb./sq. ft.	560 m.p.h. (max.)	75,000ft.	460 miles	650 miles	One (at least) completed and successfully tested under glide
DFS 228v-2	Identical to DFS 228v-1 but with couch for prone piloting in lieu of upright seating												One completed but destroyed during air-raid
DFS 332	Rocket-boosted research glider with twin booms, for testing various wing sections at high Reynolds numbers	Two Walter 109/501 rocket units	T. and Z. stoffs with petrol (burnt with liberated O^2)										One partially completed at Ainring
DFS 346	Rocket-boosted glider for transonic and supersonic research at high altitudes. Similar to DFS 228v-2 but with 45 deg. wing sweepback	Walter 109/509D rocket unit	T. and C. stoffs						Between .8 and 2.0	100,000ft.			Under construction by the firm Siebel at Halle
DFS 1068 v-1	Glider with turbo-jet and rocket boosters for transonic and supersonic research at high altitudes—no wing sweepback. (See illustration above)	Four Ju. 004 or four He. SO.11 turbo-jets, plus one Walter 109/509D rocket unit	J-2 (brown coal-oil) and T. and C. stoffs						Between .8 and 1.2	50,000ft.			
DFS 1068 v-2	As DFS 1068v-1 but with 25 deg. wing sweepback	As in DFS 1068v-1, less rocket unit				Almost completed by the firm Wrede during an air-raid			.8 and 1.2	at Freilassing, subsequently destroyed 50,000ft.			
DFS 1068 v-3	As DFS 1068v-1 but with 35 deg. wing sweepback	As in DFS 1068v-1				Partially constructed by the firm Wrede during an air-raid			.8 and 1.2	at Freilassing, subsequently destroyed 50,000ft.			
DFS 1068 v-4	As DFS 1068v-1 but with 45 deg. wing sweepback	As in DFS 1068v-1							.8 and 1.2	50,000ft.			

Figures marked thus: * are unchecked.

Table showing the nine glider projects which the D.F.S. had under development at the time of the surrender.

concerns two pilots of the Horten company who, intent on obtaining some first hand data of the buoying currents which they knew swept up from the Hartz mountains, contrived to ascend with them. Each took a separate Horten tailless glider and, after cutting loose from their respective tow cables, they entered the lower reaches of a rising stream. The immediate result was an unbelievably swift ascent which would have done credit to a high-powered fighter. So great, in fact, was the force at which they were driven that both were left nothing to do but hold their craft steady while each watched his altimeter as the needle rose, clocking thousands of feet altitude.

The aim had been to reach 20,000 feet and, coming up to that level, they set their controls for the long glide back to base—*but there was no response.* With noses pressed hard down and lift spoilers in full operation, the gliders continued to rise unchecked and, try as they may, their pilots could do nothing about it.

The reduced pressure and extreme cold at still greater heights were more than they dare risk and rather than gamble on the gliders becoming freed from the rising currents before they blacked-out and were frozen, the two men took what seemed the logical course and baled out.

One of the machines was flying higher than the other and its pilot was the first to jump. Watched by his companion, he dropped away and despite the freezing temperature, which by that time must have rendered his fingers almost useless, he succeeded in pulling the rip-cord. His parachute was seen to blossom out, but as suddenly as it had arrested his fall, so the vicious air current again took charge and he was blown upward, to be frozen to death somewhere in the sub-stratosphere.

The second pilot was more fortunate. Although he too decided to bale out and was again borne up for some distance when his canopy opened, the rising stream must have carried him near its fringe for at length he slowly began to descend. He lived to tell this remarkable tale, but so severely frostbitten were his hands that one of them had to be amputated. This, of course, is a very sketchy summary of the incident, but it does serve to indicate the nature and extent of the phenomenon.

In these and other tests, German pilots had broken all established altitude records for gliders, but that was incidental; their exploits had been watched with keen interest by the Luftwaffe chiefs.

To the D.F.S. eventually fell the task of designing a special pressure cabin; and thus was born the idea for a true stratosphere glider, and with it the possibility of reconnaissance from heights inaccessible to fighters.

Design Problems

The designers of the DFS.228 had three principal aims: to provide (a) the lightest possible structure, to contain (b) a pressure cabin, and (c) a controllable Walter rocket system.

It should be mentioned that there were two versions of this machine, the first having normal upright seating and the other—the one described—embodying its pilot prone. However, the design was initially built under the type number DFS.54, with which an extensive series of glide tests had been made before constructing the DFS.228V-1. (See the table on page 267).

At first, the incorporation of a pressure cabin in a glider, whilst still retaining in it reasonable soaring qualities, seemed entirely out of the question. There was obviously no use attempting to adapt systems of existing high-altitude aircraft for any one was far too heavy and would have put the wing loading up prohibitively. Thus, entirely original research was called for to achieve the seemingly impossible in providing superlight pressurisation, upon which depended the ultimate success or failure of the entire project.

A consideration of the weights involved in this extra equipment made it clear that a desired wing loading (all fuel gone) of 12lb./sq. ft. was impossible with a wing area of anything less than 300 sq. ft. The final figure worked out at 323 sq. ft. Other leading dimensions were: length, 34ft. 7in., and span, 57ft. 6in.

To assist in keeping the overall weight down to within practicable limits more than usual attention was given to eliminating unnecessary mass in the glider's structure. The bulkheads, stringers and spars were almost entirely fashioned from hardwood, and equipment was reduced to a minimum.

DFS.228V-2—Design of the Fuselage

The fuselage was cylindrical for the greater part of its length, having a rounded nose and a tapered after section.

The nosing housed the pressure cabin and took the form of a two-wall metal cylinder, the ends of which were sealed by a strong rear bulkhead and a moulded "Plexiglas" windscreen. There was no mechanical load whatever imposed upon the shells, the liner serving to withstand pressures within the cabin, whilst the outer skin was relied upon to check external forces. A satisfactory insulation was found in the use of aluminium foil packed into the space between the cabin walls—a similar arrangement now used to limit radiation in certain "prefab" houses.

Accommodation for the pilot was provided by a tubular metal couch attached to the rear bulkhead, on which he lay full length. This was a great improvement over the seating in the sub-type V-1 and, as well as affording better vision, it greatly facilitated the task of pressure sealing. To allow entry into the cabin, the nose—complete with couch—was designed to slide forward a distance of 3ft., and by this means all possible strain was eliminated from the delicate cabin walls.

The prone piloting position naturally involved a rearranged control system. It was necessary to place the rudder pedals at the rear of the couch, whilst a short control column was fixed at the front on the pilot's right, with trimming and throttle controls on his left.

The cabin, because of its light make-up, did not permit internal pressures greater than a figure corresponding to conditions at 26,000ft., and this made a separate oxygen supply essential. It was capable of holding a differential pressure of about 6lb. sq. in., with a loss of only 3 per cent. in 24 hours; the rotating joints through which the control rods emerged were the source of greatest leakage. There being no piston engine (or other suitable power plant) to drive pumps in the pressurisation system, it was necessary to install compressed-air bottles, and a point of interest is that the pilot's breath actively assisted the charging, undergoing a drying process before its reintroduction.

A means of heating was another problem, but this was eventually overcome by providing a tube through which cold, dry air was introduced, with slow-burning cartridges—ignited at frequent intervals—employed to apply heat.

Aft of the cabin in the glider's centre fuselage section, double-skinned with ply. and insulated, contained two Zeiss infra-red cameras; behind them were the C-stoff and T-stoff tanks and pumps and ancillaries which, complete with a single combustion chamber (housed in the rear of the tail), comprised the Walter 109-509D rocket engine. A hinged door extended along the top of the entire centre section, providing a convenient means for servicing the propellant system and cameras.

Housed in the lower part of this section was also a metal landing skid which faired flush with the skin during flight and was extended manually prior to landing.

Wings and Tail

Arrangement of the lifting and stabilising surfaces was orthodox, attachment for the wings being slightly lower than mid-depth of the fuselage, whilst the tail-plane bolted to the single fin a short distance above its root.

The wings were built up on a single laminated wooden spar, with hardwood ribs and ply covering. Two sets of fabric-covered ailerons were provided on each, the inner pair to operate as flaps during the landing approach. There were also lift spoilers, four in all, fitted on both the upper and lower surfaces.

The tail-plane and fin—the former adjustable—were also constructed in wood, with fabric-covered rudder and elevators of conventional design.

Escape from High Altitudes

There was obviously no future in baling out under stratospheric conditions, and the extreme operational ceiling of the DFS.228 demanded more than usual safeguards. A pressure suit had been suggested as a ready means for satisfying both pressurisation and escape problems, but for some reason it was not proceeded with.

It was arranged for the pilot to effect his release by severing his cabin from the aircraft, which he was to accomplish by operating a lever, detonating four explosive bolts. The cabin would fall away nose-first, trailing a small parachute to keep it upright, and thus it was possible to maintain pressurisation until the pilot had descended to a safe altitude. A barometric capsule then set in operation a piston and cylinder—actuated by compressed air—which thrust the couch and transparent nose forwards, at the same time freeing the pilot from his harness.

A static line attached to the cabin opened the pilot's parachute as he jumped clear.

Spreading Out

The Allied air offensive caused the Institute's personnel to disperse, and most of their equipment was found in cellars and barracks at the Ainring airfield, at dispersal laboratories and workshops at Reichenhalle, Feisenderf and in other neighbouring villages. Still more D.F.S. gear was uncovered in farmhouses and castles in the Ainring area.

This policy, however, did not prevent the destruction of some of the group's most treasured projects, including the prototype DFS.228V-2.

(To be continued)

A Mechanical Paradox

A Mechanical Puzzle in Epicyclic Gearing

By F. J. CAMM

THE sun and planet gear as used in the differential of motor-cars is one of the most difficult to explain. Many ingenious mechanisms have been devised around it, and one of the most interesting is the mechanical paradox first devised by Ferguson and used in his tidal clock which shows the time of high and low water, the state of the tides at any time of the day, and the phases of the moon.

My model of this paradox is shown in the photograph and the drawings accompanying this article. It will be seen that it consists of a fixed 60-tooth wheel, an idler pinion which may have any number of teeth, and a cluster of three gears superimposed upon one another, the top one having 61 teeth, the middle one 60 teeth (the same number as in the fixed gear) and the lower gear 59 teeth.

The whole of this assembly is mounted on an arm which can be rotated planetarily about the axis of the fixed 60-tooth gear.

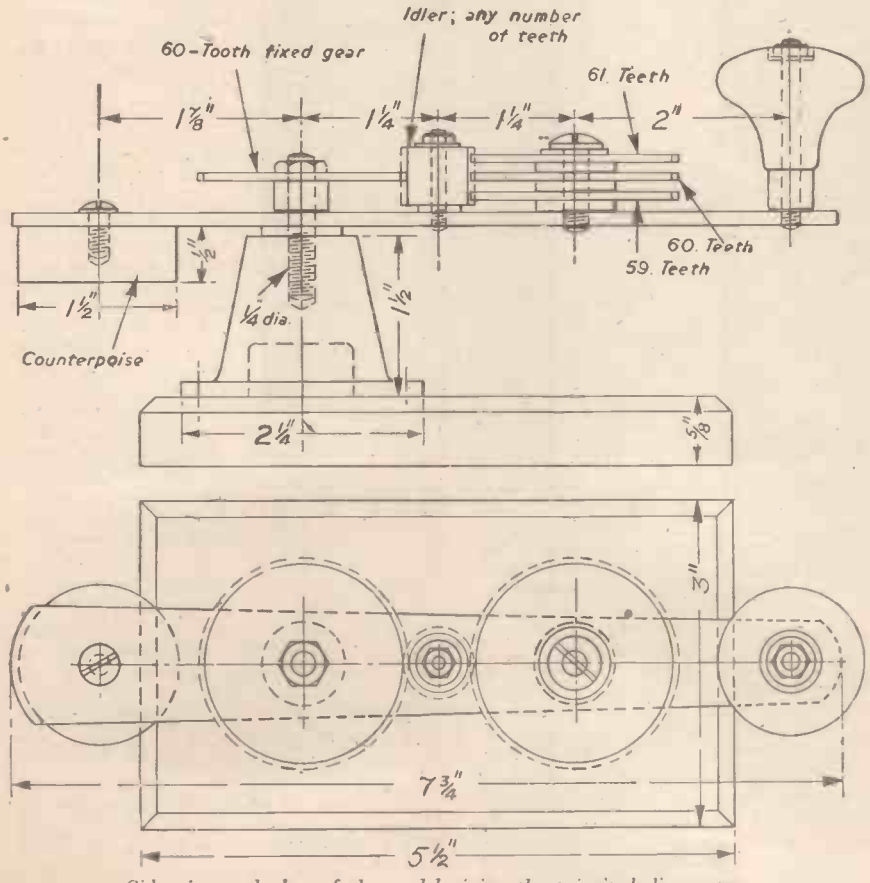
Gears of Equal Diameter

The cluster of three gears are all made of the same outside diameter. Theoretically, of course, this is impossible, but practically one tooth more or less may be cut on a gear blank of the same pitch diameter. This is the principle of the hunting tooth often incorporated in gear mechanisms subject to regular and sudden loads to equalise the wear on the gear teeth.

Any clockmaker who undertakes wheel cutting will cut the gears for you. It will be understood that the fixed gear does not rotate with the arm, so that it does not make any movement whilst the other gears are revolved about the fixed axis.

When the arm is made to revolve about the fixed 60-tooth gear the 61-tooth gear turns slowly in the same direction as the arm, the middle or 60-tooth wheel remains at rest and the lower 59-tooth wheel moves slowly in the reverse direction. This combination at one time formed a very popular mechanical puzzle.

Working model for demonstrating Ferguson's paradox.



Side view and plan of the model giving the principal dimensions.

How it Works

The general result deducible from this paradox is the following:

Let there be a train of three wheels, A, B and C, and let A be a dead wheel greater than C, then the rotation of the arm in a given direction will cause C to rotate in the opposite direction in space; whereas when A is a dead wheel and less than C, the rotation of C will take place in the same direction as that of the arm.

This can be proved mathematically.

Taking the general formula $e=\frac{n-a}{m-a}$, we have in the case of the 61-tooth wheel: $m=0$, and $e=\frac{60}{61}$, which is less than unity.

Therefore $\frac{n-a}{-a}=\frac{60}{61}$

$=61n-61a=-60a$, whence $n=\frac{a}{61}$ and is positive.

For the middle or 60-tooth wheel $e=\frac{60}{60}=1$; therefore, $n-a=-a$, or $n=0$.

For the 59-tooth wheel $e=\frac{60}{59}$, which is greater than unity.

Therefore, $\frac{n-a}{-a}=\frac{60}{59}$

$59n=-60a+59a$, whence $n=-\frac{a}{59}$ and is negative.

In other words, when the arm carrying the movable gears is rotated, the 61-tooth gear moves in one direction, the middle gear does not move at all, and the bottom gear moves in the opposite direction—a mechanical paradox indeed.

The model can be made entirely from brass, and mounted on a wooden base.

How many readers can explain how it works?

Inventions of Interest

Shelter for Plants

GARDENERS will be interested in an improvement in horticultural frames, cloches and similar shelters for plants, which is the subject of an application for a patent in this country.

The new shelter is a structural set easily assembled for erection and readily adaptable for enlargement or extension. Consequently it can be quickly and economically suited to the changing or individual requirements of the horticulturist.

According to this invention, a set of parts for building the framework comprises rods with simple means for adjustment of their length. There is an arrangement for connecting the rods in various angular relations, and members are provided adapted for being supported upon the rods and for carrying and securing the glass or glazing material of the structure.

The connectors may take the form of small blocks of suitable shape, e.g., round or square, and formed in their sides or peripheral edges with a number of holes drilled on lines radiating from their centres. As a result, the rods can be connected with the blocks by screwing at any one of a number of angles. If desired, pivotal arms may be attached to the blocks, and the rods may be connected with the pivotal arms so as to allow the inclination of the rods to be varied as desired.

Bicycle That Folds

FOLDING bicycles are not a novelty. A modified form of a previous invention of this kind has made its advent. The earlier patent related to folding bicycles of the type in which the hinge in each folding tube has a sliding sleeve to hold the parts of the tube in the extended (hinge open) position when moved over the hinge, and to allow of the parts folding when moved away from the hinge.

The invention was characterised in that the sliding sleeve, when over the open hinge, engaged each of the two hinged parts at a point near to and at a point removed from the hinge axis, to resist rocking or wobbling of the parts. The locking means for the sleeve was such as to place the hinge under tension when locked, the parts of the hinge being so shaped that any tendency to separate under such tension was resisted by and caused an increase of the transverse pressure of the sleeve on the hinged parts, and thus further resisted rocking or wobbling of the parts.

The modification consists in the fact that one at least of the hinges (usually the topmost hinge only) comprises two pivot pins carrying or carried by an intermediate link and housed in the respective hinged parts. At the double hinge, when the frame is in the unfolded position, there is contact between the sliding sleeve and the hinged parts near to the remote from the forward pin in the foremost hinged part, and near to and remote from the rearward pin in the rearmost hinged part.

Motor-car Seats

ACCORDING to a new invention, for which a patent in this country has been applied, one or both of the front seats of a motor-car are furnished with arms preferably so fitted as to be foldable upwardly against or into recesses of the upholstery of the seat back.

The inventor remarks that it is important that such arms should be capable of resisting considerable lateral pressure, and his device has been constructed with this aim in view. He has designed that each arm has rigidly secured to it a stout metal strip extending back beyond the pivot axis of the arm and the rear end of the strip.

Collapsible Bed

THE folding bed is obviously at times a very convenient part of household equipment. An improved form of this article of furniture has been submitted to the British Patent Office.

The aim of this device is a construction in which the legs and frame are made of metal rods or tubes. Readily demountable for packing and storage, it is of adequate strength and light weight whilst giving a suitably sprung structure.

The invention consists of a pair of legs for a collapsible or folding bed comprising a metal rod or tube of which the middle part is arranged to rest on the floor. The ends are each bent up and back to lie at an acute angle to the middle part and to cross one another. The frame members are adapted to be engaged by the upper ends of the upturned portions which constitute the legs.

When the arm is turned down, this engages in a notch formed in the under edge of a transverse plate fixed in relation to the seat back. The notch is preferably of taper form, so that the rear end of the strip enters it with a wedging action.

In preparation for Sir Malcolm Campbell's attempt to break the world water speed record of 141.7 m.p.h. established by him in 1939, the de Havilland "Goblin II" gas turbine engine selected by him as the power unit of the re-designed "Blue Bird" underwent tests at Hatfield recently. The illustration shows Sir Malcolm Campbell and the designer of the D.H. engines, Major Halford, during the bench tests of the engine a few weeks ago.

Electrically Heated Clothing

ELECTRICALLY heated clothing and blankets have for some years been keeping folks warm. The heating elements, it is asserted, have usually been formed by asbestos-covered resistance wires arranged in position and secured by sewing or stapling.

Some inventors have now applied for a patent in this country for a variant of this method. In the new instance the heating quality is formed by a lining or backing consisting of non-conducting fabric which has been metallised by electro-deposition.

The inventors of this device state that they have already disclosed a process by which woven or knitted fabrics of cotton or artificial silk, for example, can be metallised by electro-deposition and will still be permeable to air and moisture. If such a fabric be material, as a lining or backing, and means incorporated in clothing or blanketing are provided for connecting it in circuit in the ordinary way, an effective warming element is the result.

It is stated that it has the manifest advantage that garments can be made up by a seamstress in the normal way, treating the conductive fabric as an ordinary lining or backing material, leaving short extensions to permit the necessary electrical connections.

Lighthouse Engineering

The History and Development of Lighthouses and Their Equipment.

By G. W. McARD

(*Continued from page 239, April issue*)

THE design of these optics differs greatly for the fixed and the revolving lights. In the first, the prism is generated about a vertical axis, giving a result such as that shown in Fig. 6, but for the revolving light the prism is generated about a horizontal axis as in Fig. 7.

Referring again to Fig. 5, it will be observed that in place of the earlier metal reflector, or reflectors, which were placed behind the light, a series of prisms—five in all, in this instance—serve instead. These enable the whole of the light, which would otherwise be lost, to be reflected forward through the lens, and it is a striking testimony to the efficiency of their design to note, when standing behind this "mirror," the entire absence of any light ray whatever on that side, regardless of the power of the illuminant. The sizes of the lenses in use vary between limits as wide apart as 108in. and 4in., the largest being known as the Hyper Radial and shown in Fig. 8. This is one of the biggest units made, and was supplied to the Karachi Port Trust for use at Manora Point. In all these lenses the glass rings are moulded carefully in the first place, then ground to very fine limits and finally polished to a degree which must be seen to be properly appreciated.

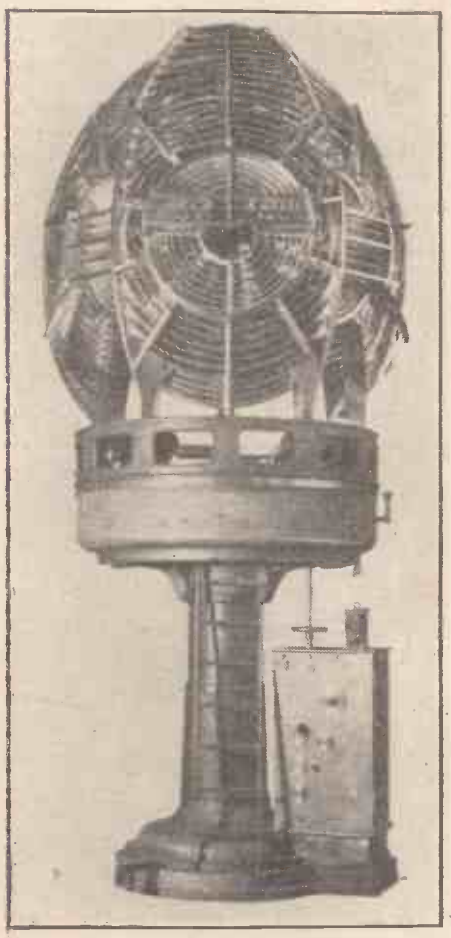


Fig. 7.—Three-one flashing aero-marine revolving optic (2nd order).

Power of Light Beam

The power of the light beam and its range are influenced by several factors. The height of the light above sea level, as well as that of the observer, has a big influence on range, and, of course, the candlepower employed. The beam from St. Catherine's (Isle of Wight) is frequently seen by the keeper of the French lighthouse at Barfleur, near Cherbourg, 60 miles distant, and a ship sailing up—or down—mid-Channel can see both lights at the Lizard and Ushant, in clear weather, though at least 50 miles from each. Another factor of no small moment is that of cloud formation, and under ideal conditions a light may be seen by reflection from the clouds many miles beyond its normal range.

In order to increase the power of the beam, lenses are sometimes superimposed, with a burner at the centre of each, as many as four having been used in some lights (Gallen Head and New Island, Ireland). The Eddystone and Fastnet lights have two, or what is technically termed the bi-form lens, and an excellent example is shown in Fig. 9. The result is a combined beam of double, triple, or quadruple intensity and penetrating power, with a candlepower for the Irish lights referred to of three-quarters of a million. In some cases the light from the main burner is used to "cover" a rocky reef, the light being employed during its traverse of the landward arc, where naturally it is not required. An example is the light at Souter Point, near Sunderland, the light being reflected down the tower and across to the rocks through a low window, using glass prisms as the reflecting agents. Obviously, the quality of the glass employed for all these units and all similar components must be of a very high order, conspicuous for its extreme clearness, durability and hardness.

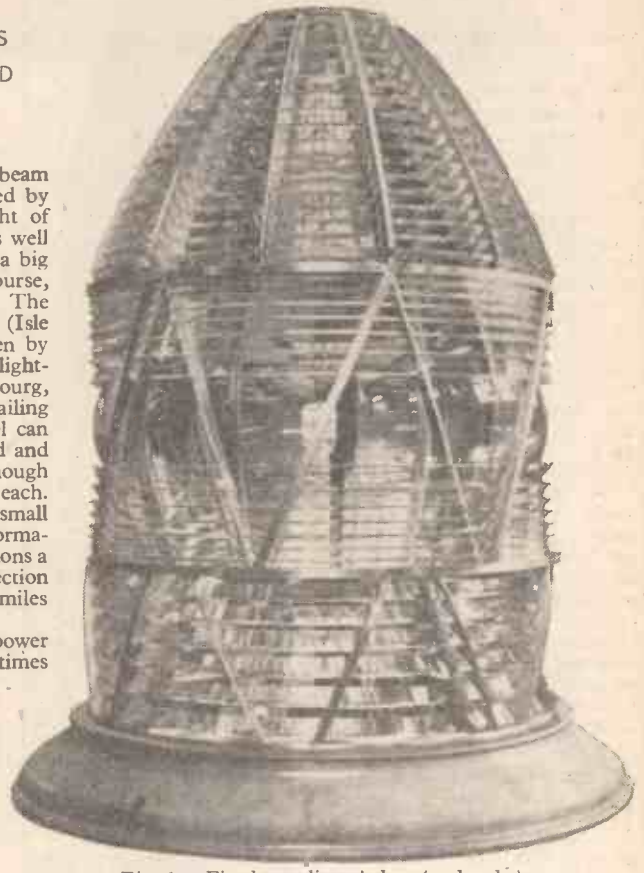


Fig. 6.—Fixed catadioptric lens (2nd order).

"Character" of Lights

Reference has been made earlier in these notes to what experts, as well as seafaring men, speak of as the "character" of the different lights. Most visitors to seaside resorts where one or more lighthouses are situated will have observed the different methods of flashing that are used. St. Mary's Island, about three miles north of the Tyne, has two flashes every 20 seconds. St. Bees Head, on the Cumberland coast, has 24 seconds light; 2 seconds eclipse; 20 seconds light, followed by 2 seconds eclipse, and so on repeated. Flamborough Head has 4 flashes every 15 seconds. The apparatus in the Lizard lighthouse consists of four panels placed at 90 degs. to one another. As the whole makes a complete revolution in 12 seconds the character becomes a single flash every 3 seconds. Some lighthouses—the famous Bell (or Inchcape) Rock, for example—are distinguished by different coloured flashes. That named has red and white alternating lights and employs all the known optical elements, including equi-angular refractor, the reflecting prism, the double reflecting prism and the dioptric mirror. In order to cover for the different intensities of red and white lights, and to equalise their effects in the resulting beams, the focal distances of the red and white optical panels are always subjected to correction.

So throughout the lighthouse world each is known to the sailor by its individuality which informs him, even under foggy conditions, as to his location. The variation obtained by grouping the lenses to obtain two, three or four flashes, as referred to above, followed by an interval of darkness of measurable duration, permits a greatly increased number of characters to be employed.

Automatic Light Valve

At many points a lighthouse may not be justified, yet a warning light is essential. In such a case, as for example, an isolated rock, an automatic light and valve are provided, the light being obtained from an acetylene burner fed from an automatic generator, or from gas cylinders. To economise in the consumption of gas, the valve is closed during daylight hours and re-opened as night falls or darkness gathers before an oncoming storm. This control is automatic and attained by including in the scheme the light valve shown in Fig. 10.

This fitting depends for its operation on the fact that a black body absorbs more light, and, therefore, heat, than a bright body. The valve includes two glass bulbs, one bright and the other black, connected together on the underside by a tube which has been partly filled by some volatile liquid like ether after the air has been completely exhausted from

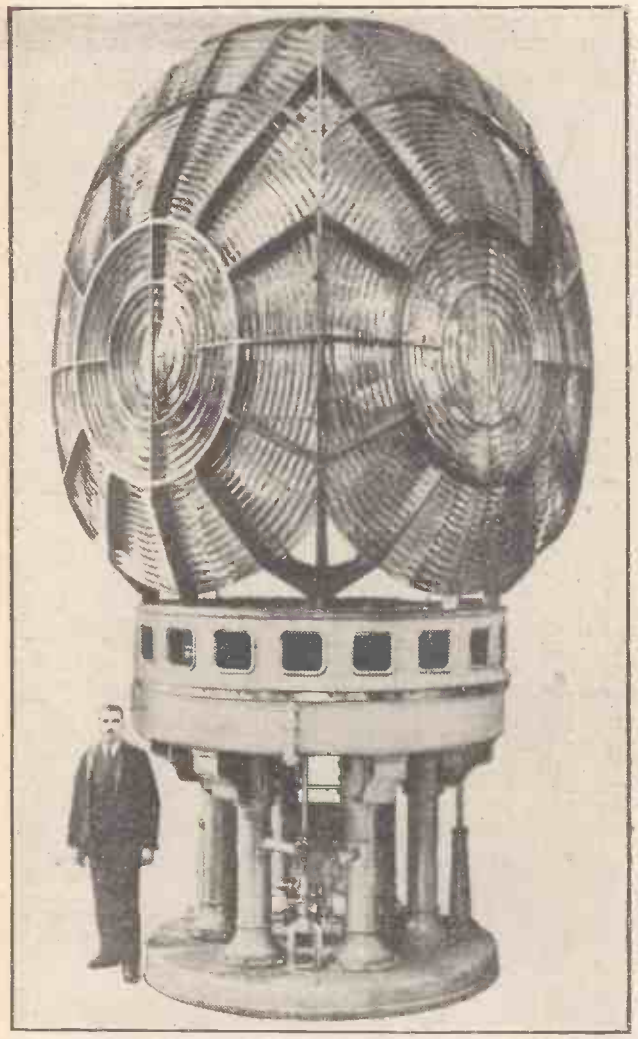


Fig. 8.—Hyper-radial single-flashing revolving optic (Manora lighthouse).

the whole apparatus. Exposure to light raises the temperature of the black bulb above that of the clear bulb, vaporises the ether and, by the increased internal pressure, forces the liquid into the other bulb. The greater weight of the latter now rocks over the carriage on which the bulbs are mounted, and so operates the gas valve (or, in the case of an electrical installation, the switch). When darkness falls the two bulbs attain an even temperature, with the liquid occupying the same level in each, and, being balanced, open the valve (or switch) and so bring on the light again.

From the illustrations already given it will have been realised that many of the revolving light units are of considerable dimensions. Units such as that shown in Fig. 8, have been built weighing from six to 10 tons, and although these were formerly mounted on rollers with a circular track, it was found impossible by that method to attain the necessary speed of rotation. As the result of experiments it became possible by substituting a bath of mercury for the rollers and their track, to reduce the friction considerably, and to obtain higher speeds. Not only so but wider panels could be fitted, thus collecting more light and so projecting a more powerful beam. With the smaller apparatus rendered possible by the employment of electricity for lighting, however, the lens can be rotated on a ball race round a central column, when desired.

Lightships

While on the subject of the mounting it is interesting to consider the floating light, or more correctly termed, the lightship. These vessels are located in dangerous areas such as the vicinity of the Goodwin sands and similar positions, serving to warn vessels of the submerged danger. In the earliest designs the light could not be maintained at a constant height, but rose and fell as the vessel rocked and rolled. In modern designs, however, the light is carried on a pedestal of the ball bearing type, which is mounted in pendulum fashion on a universal pivot, rotation of the light and its optical equipment being provided for by an electric motor within the pendulum and the height of the beam above sea level kept constant.

The Mersey Bar Light vessel has recently undergone a complete refitment, and some of the earlier equipment replaced by more modern apparatus. The original illuminant used, for instance, was petroleum vapour, and this has been superseded by electricity. The optical apparatus was revolved by clockwork mechanism, but now an electric motor mounted upon a constant level arrangement (for the light) of up-to-date design functions instead. The air-driven siren originally provided for fog signalling is replaced by a Diaphone, having a much more powerful signal with a note tuned to F sharp in the base clef, terminating, according to the maker's account, "with a deep grunt." To enable the Diaphone to operate at once if fog settles rapidly on the water, air is kept stored in suitable reservoirs at high pressure, and reduced to 35 psi. for actual use in the instrument. The air is compressed by duplicate alternate-running engine-driven compressor sets which come into operation automatically as and when required. In addition to the Diaphone a radio beacon equipment and a submarine oscillator are provided, an observer on an approaching vessel being able to calculate his distance from the lightship by noting the difference in the time taken for the radio and submarine signals to reach him.

The electric current for the light, the driving motor radio beacon, the half-mile signalling lamp, the fog signalling character mechanism, the domestic lighting on the ship and the refrigerator is supplied on the Mersey Bar lightship by a large battery which is maintained at full charge by duplicate alternate-running engine-driven generating sets. The range of the Diaphone fog signal varies according to weather conditions from a minimum of four miles—under abnormally bad conditions—to as much as 30 miles.

Clock Mechanism

The rotation of the light and its lens, continuously without fail through long winter nights (of approximately 16 hours), night after night, is no mean task to achieve, and in former days was effected most dependably by first class clock mechanism controlled by weights in much the same manner as the old grandfather clock was operated. Generally, the weights have a relatively short fall, but some lighthouses are in service where a fall of 100 feet is still employed; where electricity is now used for the light in such an equipment a small electric motor is provided to wind up the weights. In the modern lighthouse, however, the optic and its light are usually rotated by electric motor and a train of gears, with the clock mechanism held in reserve in case of failure of current or electrical gear.

Where electricity is employed in a lighthouse, a supply is taken wherever possible from the local mains service, and the functioning of the light safeguarded against possible failure by the provision of an independent generating set. This may be controlled manually, semi-automatically or completely automatically, in the second case fewer hands being required, and in the last, none at all, the entire equipment being independent of human attention, the light as well as the generator being switched on by the light valve already described. Where a town's supply is not available, duplicate generating sets which function alternately, are provided, or one set with a battery in reserve to supply the current in the event of the engine-driven generator set failing. The charging of the battery commences automatically when the battery condition indicates a predetermined discharge condition and stops, also automatically, on attaining the fully charged state.

Aid to Aircraft

In these days of high-speed long-distance aircraft, the lighthouse is also required to serve for the direction of these machines in addition to marine traffic. But an aircraft's motion is one of three dimensions instead of two only as for ships, and its pilot must

Fig. 9.—Biform 1st Order single flashing optic (Fastnet lighthouse).

therefore be able to see the light and determine its character when flying over the lighthouse as well as when approaching. The experience gained in lighthouse optics and illumination has been of inestimable value to flying men, enabling efficient beacon and marker lights to be correctly designed and located to facilitate safe landing on a track which may be floodlit also by lamps which owe their design to the lighthouse engineer.

Fog

One enemy before which the most powerful light yet designed falls lamentably short is the dense fog so common around these coasts at certain periods. This has always constituted a formidable problem though numerous ways of combating it have been devised. In early times a gun was placed in the vicinity of the lighthouse and blank rounds fired by a squad of men whenever a ship was known to be in the neighbourhood. This was succeeded at many stations by the ringing of a bell—these varied in weight between 10 and 20 cwts.—the ringing duplicating the light in character as closely as possible. Later attempts to employ the locomotive type of whistle were made but abandoned by British Lighthouse authorities after careful experimentation. The firing of explosive fog signals was the next phase, a charge of gun-cotton in the unit exploding when a pre-arranged height was reached. A fair measure of success was achieved by this method, though not without some little expense. The detonation of gun-cotton is still used for fog signalling in British rock lighthouses, the charge being held by a swinging arm carried on the roof of the tower, and rotated by a handwheel, through gears within the lighthouse. The end of the arm is provided with terminals and linked to an electrical circuit which fires the charge at prescribed intervals of time. The Eddystone, for instance, uses this method, the charge being fired at five minute intervals.

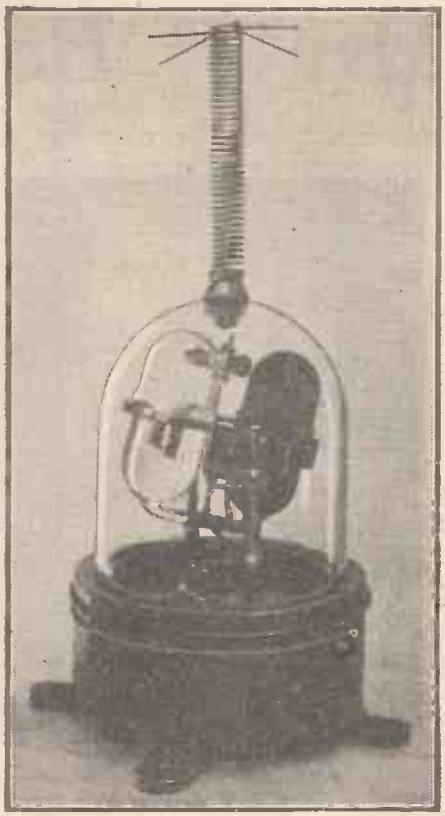


Fig. 10.—"Chance" light valve arranged for electrical operation.

The Foghorn

Next followed the foghorn, the first example being a huge trumpet or horn 3ft. in diameter at its mouth and approximately 17ft. long, a steel reed being fitted in the throat, and compressed air used to produce the sound by vibrating the reed. Later followed the siren having fixed and revolving discs as used to-day by steamships for special signalling purposes. The siren as first produced by Professor Holmes in 1867 was tried out at the Paris Exhibition of that year, and its volume was so enormous that a second blast was prohibited by the authorities! Some lighthouses use an acetylene gun, while perhaps the most effective signal is that obtained from an instrument known as the Diaphone, in which a piston operates within an outer casing. Compressed air enters through a connection in the casing, causing the piston to move rapidly, its movement permitting slits in the piston to pass over similar slits in the casing. The air which escapes via the slits produces a sound which is as remarkable for its purity as for its volume, reports of its reception having been received from places 40 miles distant.

Future Developments!

Now that radar and atomic energy are with us it is impossible to predict what future developments will be made in lighthouse engineering. Radio beacons have been installed already in light stations in many parts of the world, and are doing valuable service in guiding the great ocean liners through restricted channels in the dark as well as through dense fog. By the combination of the three elements, radar, light and sound, ocean and air travel in the not distant future will lose many of its dangers, and foreign travel become as commonplace as a motor trip to-day.

The writer wishes to record his appreciation of the kindness shown by Messrs. Chance Brothers, in placing much valuable material at his disposal, and for the illustrations for Figs. 3 to 10 inclusive.

"Operation Grasshopper"

BRISTOL Beaufort aircraft, famous for the part they played in the defeat of the Axis in Europe and the Far East, are now at war with a new enemy. In Australia the aircraft that wreaked such havoc in shipping strikes against enemy vessels in Northern European, Mediterranean and Pacific waters have been carrying out intensive strikes against swarms of grasshoppers infesting agricultural areas, causing great damage to crops.

War against insects is a far cry from the attacks carried out against heavily defended convoys and ports during the war, but reports of two Beauforts securing a 98 per cent. kill of grasshoppers over an eight mile area reveal that the new campaign is being carried through with the same thoroughness as a wartime operation.

Second in the renowned line of Bristol aircraft developed from the Blenheim, the Beaufort first saw active service in 1940. Produced in large numbers in both Britain and Australia, its ruggedness of construction stood it in good stead in attacks on convoys hugging occupied coastlines, in anti-U-boat patrols far out over the Atlantic, in mine-laying operations on the enemy's doorstep and in numberless onslaughts on Japanese vessels and concentrations in the Pacific.

Warmer weather, stirring the insects to greater activity, brought the Beauforts into "Operation Grasshopper" last autumn. Used in conjunction with hand-spraying and the laying of baits, aerial spraying is proving most effective against heavy infestation and may save Australian agriculturists thousands of pounds.

THE BRISTOL PEGASUS

MAGNIFICENT performances by the Bristol Pegasus-engined Short "C" Class flying boats which operated the U.K.-Durban service for B.O.A.C. until its cancellation last December, are clearly revealed in some impressive statistics received from a B.A.C. engine department in South Africa.

The fleet, based on Durban, comprised 13 flying boats each powered by four Bristol Pegasus XXII engines. None of the aircraft has flown less than 1,000,000 miles and five have each covered more than 2,000,000. These five machines, Castor, Canopus, Caledonia, Cameronia and Carpentaria, have between them flown 10,335,238 miles, the total for the whole fleet being 23,490,013 miles. This astronomical figure is equivalent to each aircraft having flown around the world at the equator rather more than 72 times. The average ground speed was 128 knots or 147 m.p.h.

Flying hours for the 13 boats total 171,406, which corresponds to each machine having remained continuously airborne for 549 days.

Throughout these intensive operations the petrol consumption for each team of four Pegasus engines averaged 130 gallons per hour. This speaks well for the construction and design of the power units, many of which have a total of over 5,000 engine hours to their credit and some as many as 8,000.

The popularity of the Durban flying boat service was such that the announcement last December of its cancellation evoked a storm of protest. The South African public has now won its way to keeping its favourite service and, although the "C" class boats are going into honourable retirement, the service will be maintained by a new product of Bristol and Short teamwork—the fast and comfortable Solent, powered by Bristol Hercules engines.

A front view of the Avro Lincoln Aries II, which is due to start on her first assignment—a four weeks' demonstration tour in the Far East.

The Fantasy of Henry Ford

A Memory of the Mechanic Who Became the World's Richest Man

IT was the whimsical boast of Henry Ford that he had made walking a luxury.

Perhaps there was a certain amount of truth in that famous utterance, for Ford popularised the car and rendered it available to the everyday individual as no one had ever done previously or, indeed, has ever done since.

But it was not this fact alone which made Henry Ford famous. He was a man with immense powers of mind. His colossal directive energies and his phenomenal power of industrial organisation, his almost uncanny social "vision," his forthright determination, his ruthless conquering of difficulties—these, equally as much as his having been the right man in the right field at the right time, brought him ultimate world fame together with accompanying riches of almost fabulous amount.

And when, on the evening of April 7th last, Henry Ford died suddenly from an apoplectic stroke at his home at Dearborn, Michigan, he slipped out of this world as, no doubt, he had always desired to do—quietly, without trouble, pain or prolonged illness, and with his industrial prestige and his personal intellectual powers still undimmed.

Ford was nothing if not a pioneer, and he remained a pioneer until the end, living a detached sort of life, abstemious to a degree, somewhat lonely, philosophical, ever persistently engrossed with matters mechanical, but having little regard for modern inventions of science which do not benefit the human race in general.

The oft-repeated story that Ford was once a very poor man, and that he started his now famous company on a capital of a few pounds only, is sheer nonsense. Although, for a time, the spectre of poverty may, perhaps, have gazed through the window of the original Ford homestead at Dearborn, U.S.A., it certainly never attempted to cross the threshold. And as for the great Ford organisation being started by Henry on a capital of five or ten pounds (or the American equivalent of that sum), well, the fact is that the original Ford Motor Company of 1903 had behind it a capital of a hundred thousand dollars held by thirteen shareholders (surely one of the biggest blows which has ever been given to the "unlucky thirteen" superstition!) and of this capital Henry Ford's personal share amounted to 25,500 dollars.

Henry Ford in his prime.

Irish Father

Ford belonged to a farming family of two sons and three daughters. His father was an Irishman, one William Ford, from Co. Kerry, who took up farming in America in early life and married a certain Mary Litogot, the young daughter of a Dutch farmer who had attained prosperous circumstances in the neighbourhood of Dearborn, Michigan.

The wedding took place in 1862. A year afterwards — on July 20th, 1863 — the first child of these Fords was born. It was a son, and they christened him Henry.

William Ford, the father, increased in prosperity. He lived to be nearly 80 years of age, although his wife died when the family was still young. Thus it was that young Henry found himself motherless at the age of thirteen. He was attending a Scotch Settlement school in the neighbourhood at the time, but in those days youth had not been delivered into the hands of the education-mongers, and Ford's education was mostly obtained in the great University of Life, Self-reliance and Experience being the two main subjects of his training.

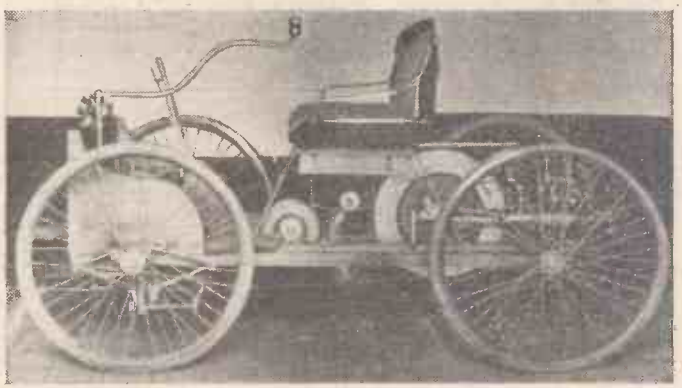
William Ford wanted the growing Henry to be a farmer and to assist him in his work on the land, but Henry just hated farming and although, for a time, he had to submit to some sort of work on the land, his head was full of mechanics and inventions because, as he afterwards said, he was "just born that way."

Before he was sixteen, Henry had gained the reputation of being the foremost clock-repairer for miles around. He used to mend all the old clocks in the countryside and get them all into good running condition. This work he did free of charge and during the evenings after his labour on his father's farm.

It is recorded that at this period the resourceful Henry formed some plan concerning the manufacture of watches in enormous quantities so that they could be sold at half a dollar a time, but the plan was, of course, too immature to materialise. Had things been otherwise, the world might afterwards have been deluged with Ford watches instead of Ford cars.

Henry's First Job

The time came when Henry Ford could no longer stick to farming. He was sixteen years of age then, and he went over to Detroit, some nine miles distant, and got a job in a small machine shop at a wage of two dollars 50 cents a week. During the evenings he picked up an extra income by assisting a local watch repairer.

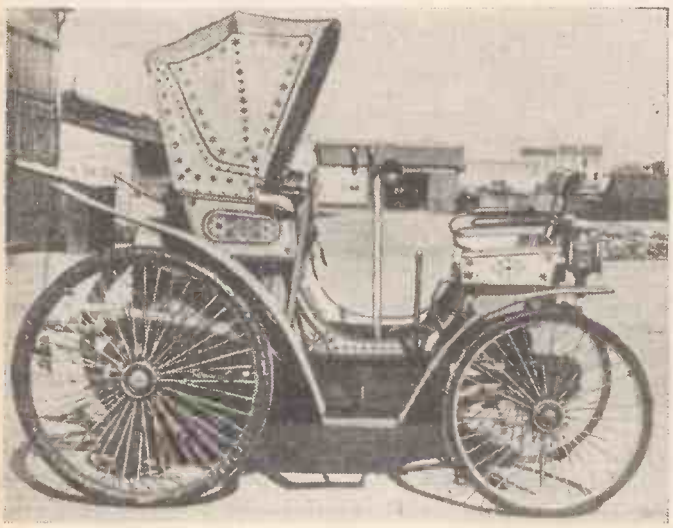


The first Ford car (1893).

Nine months afterwards Ford found his second job. This was with the Detroit Dry Dock Engine Company, a concern which fabricated marine engines. With this enterprise Henry remained a couple of years.

Job No. 3 for the ever-enterprising Ford was as a fitter for the Westinghouse Portable Steam Engine Company, of New York. He went round the farms of his district, selling these small power units, fitting them up and teaching the farmers how to use them.

Two years of this work seem to have decided Henry on setting up on his own in the mechanical line. He returned to his home, refitted his former diminutive workshop and proceeded immediately to develop an idea which had been in his head for some time. It was a notion of constructing a



A strangely designed early car which Henry Ford set out to better.

steam tractor for use on heavy land. Thus came into being Ford's first practical invention, the "Farm Locomotive," as he termed it, but, like countless other inventors, he had endless trouble with the boiler and, in the end, he gave up the enterprise.

Henry's next step was to find employment with the Buckeye Harvester Company in the neighbourhood, a concern which manufactured and erected stationary steam engines for farm use, agricultural implements and the like.

His Marriage

It was whilst he was here that Ford married a local young woman, Miss Clara Bryant, of Greenfield, near Dearborn. The year was 1887—that of Queen Victoria's first Jubilee—and Ford built his own house for himself, not forgetting to provide himself with a suitable workshop at the rear of his house.

It was in this timber-built house that the first notion of the Ford car originated in Henry's head. That was on a sunny summer afternoon in 1889. Henry was lazing the afternoon away, it being too hot to walk about much, and he attempted to sketch out for the benefit of his wife the idea of a single-cylinder steam car which he proposed to build. But the paper on which his sketch was being made proved too small for Henry's ideas, so his wife accommodatingly offered him a large sheet of her music paper, and on this the great design came into being.

One of Ford's early American competitors. A Stevens-Duryea car of 1904. Note the tiller steering.

A corner of Ford's historic engineering museum at Dearborn, Michigan, showing a working Newcomen "atmospheric" engine which Ford transhipped from England.

Ford actually made his steam engine (it had a 2in. bore and a 2in. stroke) and attached it to an old American horse-drawn "buggy," but the contraption refused to work in any other than a spasmodic manner. Again Ford had come up against that everlasting difficulty with regard to getting the necessarily small boiler to steam reliably and efficiently. So, for the second time, Henry relinquished his idea of a steam-driven vehicle.

The failure seems to have preyed on his mind, so much so that we find him giving up his home at Dearborn and going again to Detroit (which ever attracted him as a magnet does a piece of soft iron) and taking for himself a job with the then rising Edison Illuminating Company. It was a good job, and Henry made much of it. Indeed, it lasted him for ten years or so.

The First Ford Car

It was some time in 1891, a couple of years after he had commenced with the Edison organisation, that Ford was attracted by a small slow-speed petrol motor which had found its way from France into Detroit. It appeared to provide the lacking element for the success of his former road carriage schemes. He decided to make such a motor for himself.

The task was a difficult one, for Ford had to do all his work during the evenings after his day's occupation with the Edison Illuminating Company, and, worse still, he had to make the whole thing himself and even, indeed, to manufacture some of the special tools necessary for the job.

It took him a couple of years of hard, spare-time work to get his first petrol engine going. It was a water-cooled model having twin cylinders with a 1⅝in. bore and a 6in. stroke. This he mounted in a chassis which had 28in. wire wheels and solid rubber tyres, the "car" or quadricycle being belt-driven.

How petrol was sold in England when Ford commenced operations. Nests of 1-gallon petrol containers in wooden crates.

In 1893, this, the first Ford car, was acclaimed fit for running. It was tested out in the streets in the small hours of the morning. It ran—for a short distance—quite successfully.

But there were all sorts of undesirable features about Ford car No. 1. It hadn't any reverse gear. Its engine fired erratically. It made a noise like a machine-gun, and it vibrated like a pneumatic drill. The steering was bad, and the whole thing was built far "too high up in the air."

Ford car No. 2 took three years in the building—from 1895 to 1898. But it was an enormous improvement on car No. 1, and it made Henry realise that the probabilities of his earning really big money in the field of car building were much greater than they would be if he remained with the Edison Company. So—against his father's advice and against that of all his acquaintances and friends—he threw up his job with Edison and, getting together a few interested people (including the Mayor of Detroit), he formed the "Detroit Automobile Company" with a capital of 50,000 dollars, one-sixth of the shares being allotted to him as chief engineer of the concern.

The company was not successful. Its capital went in experimental equipment, and, in 1901, it sold out to a local firm of machinery manufacturers. Then came, for a time, another enterprise, the "Henry Ford Company," but, somehow or other, this did not suit its namesake, and he sold himself out of this a year later (in 1902).

The Ford Motor Company

It was in the June of 1903 that the present Ford Motor Company was first organised. As we have previously mentioned, the enterprise started with thirteen shareholders and a capital of 100,000 dollars. Ford was a popular man in and around Detroit. He had little difficulty in influencing the necessary capital.

Indeed, the story of the founding of the Ford Motor Company way back in 1903 forms an epic on its own. None of the original founders—apart from Ford himself—knew anything about petrol-engine manufacture. One of the original shareholders was a clerk in a coal office, another had been associated with a greatly unsuccessful gold-mining enterprise. Two of the founders were lawyers, another was the president of a savings bank, whilst still another was associated with an air-rifle company. A heterogeneous lot, no doubt, but they all

A Ford Model B, manufactured in 1904. One of Henry Ford's earliest commercial successes.

seemed to have great faith in Henry Ford, and it proved to be a faith which was well rewarded.

The newly constituted Ford Motor Company ran into difficulties almost immediately, for it became threatened with proceedings for alleged infringement of some American engine patents. Here again lies an engrossing story of Henry Ford's early fight against a powerful ring of so-called "manufacturers" who had formed a syndicate to corner the American automobile market for themselves. Ford refused to pay tribute—and royalties—to this American syndicate. He joined the French interests, which were headed by the great Panhard-Levassor organisation of Paris.

Eventually Ford won the day, but the legal battle had been a strenuous and enormously prolonged and costly one, lasting from 1903 until 1911. However, the Ford Company never paid a single penny in royalties.

The first of the commercial Fords had a two-cylinder engine and was fitted with a two-speed gear. This was rapidly followed by a car having a four-cylinder engine. Then came a six-cylinder model.

Altogether about 25 different models were produced commercially before it was decided to adopt mass-production methods for car manufacture, thereby keeping down the price to a minimum.

Enter the Conveyor Belt

The principle of the conveyor belt was adopted by Ford for car manufacture in 1913. It was that principle which turned him (already a rich man) into a multi-millionaire. The first Ford factory employed 311 workers, and its first year's output was 1,708 cars. In 1917, when the Ford system of mass production had got well under weigh, Ford had some 41,000 workers in his organisation, and his *daily* output of cars and wagons amounted to approximately 3,000 separate vehicles. Factories had been set up in Trafford Park, Manchester, and at Cork, Eire. Later still, of course, was to come the Ford factory at Dagenham, Essex.

And so the Ford organisation proceeded apace, and from immensity to still greater immensity. Ford, in 1914, ran directly counter to all American economics by instituting a system of profit-sharing with his workers. Not only did he adopt the policy of paying high wages, but he distributed bonuses as well. He maintained an army of social workers to conserve the welfare of his employees and their families.

It looked at one time as though Henry Ford, in the midst of his industrial success, would before long figure in the arena of American politics. In fact, his attainment of the American presidency was for some time mooted. But Ford's cleverness and astuteness enabled him to realise his own limitations. He was not cut out for the career of the active politician. Indeed, he was a pacifist, so much so that when the second World War broke out he refused to manufacture the Rolls-Royce engines which were so necessary to our supremacy in the air. Some readers' memories will be able to go back to the year 1915, when Ford chartered a "Peace Ship" which carried a party of peace advocates to Europe with the aim of "getting the boys out of the trenches before Christmas." It was, however, a Ford enterprise which failed.

Ford the Man

The memory of Henry Ford as a man is of an individual who at all times endeavoured to be just. Never a formally trained engineer himself, he was one of those many people who are "born mechanical." He was shrewd and astute, sometimes hard indeed, but never avaricious. In some matters he was enormously ignorant. He had little use for the arts. To him "history is bunk." Yet he spent—and spent well—much of his riches in setting up historical museums, in acquiring historic buildings and in setting them up for permanent preservation in his own surroundings.

Almost to the end Ford maintained a policy of almost bitter hostility to the trade unions. For years no trade union member could work under his ægis. It was only during the late war that this policy was brought to an abrupt end by a strike in the April of 1941, a strike which only lasted for 10 days, but which involved the stoppage of an enormous amount of work on defence contracts. In the end the unions won, but Ford, of course, was then an old man.

To all accounts Henry Ford, the man of iron, the king of American motordom, was never too easy an individual to get on with. Throughout everything he must have his own undisputed way. The loyalty of his workers, high and low, was to be to him alone. He had necessarily to be the monarch of all he surveyed. A serious clash of wills between the renowned Henry and one of his deputies or subordinates usually resulted in the elimination of the subordinate. In his own sphere he reigned unchallenged.

This, therefore, was the man Ford. History will hardly sum him up as a brilliant inventor. The original Ford car contained no fundamental invention of its maker. Neither have any of its successors. Ford must go down to history essentially as the capable pioneer of a new era of civilisation, as an enormously and a deservedly successful industrialist who, despite his own peculiar methods and his domineering character, gave to the world at large one of the adjuncts of its present-day civilisation and, in so doing, opened up a new industrial epoch.

Such is the memory of Henry Ford, mechanic, pioneer and industrialist. By reason of its astonishing success, his career was almost a fantasy. It is, however, a fantasy which will be difficult to repeat in our present age of State control and of all the restrictions which are part and parcel of it.

The Ford Model K (1906-7). *A 6-cylinder Ford production.*

Small Petrol-driven Generating Plants

Notes on Installation, Wiring and Operation

BY F. G. RAYER

FOR some time a variety of engine-driven electric-light plants, both new and reconditioned ex-Government, have been on the market, and large numbers have been sold. They are very useful for lighting workshops and small houses in areas where the mains are not available, and their price is moderate. Because of this it is intended to give here instructions for installing them, and also details of the best methods of wiring lights, etc., for operation from the plants.

Choosing the Location

The engines run at a fairly high speed and are somewhat noisy. Although silencing can be added, as will be described, it is best to fix the plant in a position some distance from the house. Even if used for a workshop the plant should be outside, or in a separate building. As the 32-volt units (engine and dynamo complete) are only about 2ft. 6in. long and 1ft. 6in. wide, a small shed, or the corner of an existing building, is amply large. Leaving space for batteries and the pulling of the starting cord, 5ft. by 5ft is ample. A brick building with a door will deaden the noise of running.

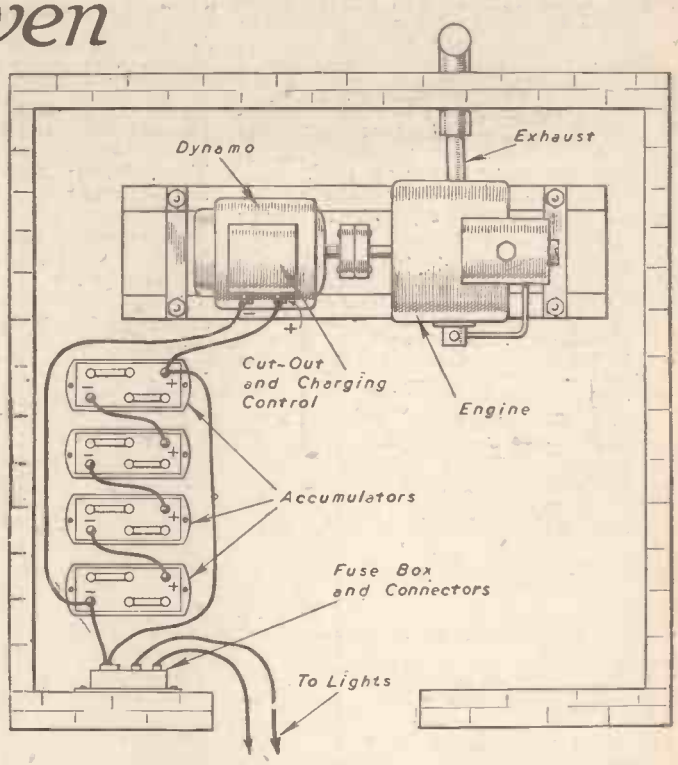


Fig. 1.—A convenient layout for a small generating plant.

In Fig. 1, four 6-volt accumulators are shown. This enables a fair charging rate to be maintained without the engine running at maximum speed, and will give a good light with suitable lamps. Five accumulators, making up 30 volts, may be used if preferred. Car-type batteries of large capacity are quite suitable. The charging rate is adjustable by a field resistance mounted on the dynamo, 8 to 10 amps. being usual.

Mounting the Plant

Both engine and dynamo are fixed to two small metal girders with carrying handles. Mounting these upon wooden beams, as shown in detail in Fig 4, will make a secure fixture and reduce vibration transmitted to the ground. As illustrated, the girders are clamped to two stout lateral pieces by cross strips of metal. For the small plants, pieces 3ft. long will be suitable. These pieces are secured to large bolts set upright in concrete. The bolts should be about 10in. apart, and a piece of timber about 4in. by 4in. is interposed between floor and lateral pieces at each end. This will give a firm fixture.

A reasonable space should be allowed around the engine, the oil filler being at the back. The exhaust should also be arranged in one of the ways mentioned, so that the fumes are not confined to the building.

Electrical Details

The batteries must be connected with the plus of one to the minus of the next, and in the correct polarity to the dynamo (see Fig. 1). Proper battery lugs and a stout gauge of wire are to be preferred. Two leads should then be taken from the batteries to a fuse box mounted on the wall, from which the lines to the house lights are taken.

At this stage it is well worth while to fix a light in the engine shed, either on the wall, or as a portable hand-lamp on a length of flex. This will help in starting, filling with petrol, etc.

Positioning the Units

Fig. 1 shows a convenient layout, enabling accumulators and engine to be easily reached, the starting cord to be pulled, and the exhaust to be taken through the wall. If the original exhaust with its mushroom ending is retained, a hole about 6in. square should be made in the wall directly opposite it. Extending the exhaust with a piece of 1in. piping (this should not be longer than is conveniently necessary) so that it can be taken through the rear wall, will greatly lessen noise inside the shed. If a solid drum about 6in. in diameter, with bottom open, is fixed to the tube, as shown in Fig. 2, this will deflect the exhaust earthwards and further lessen noise. It is also possible to have the engine exhausting into a pit several feet deep, dug in the ground and covered with stone or wood slabs, as is sometimes done with larger plants.

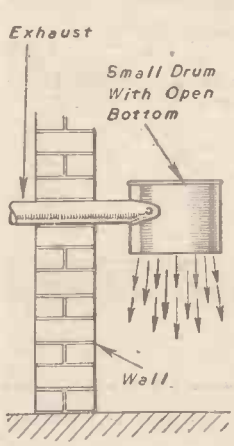


Fig. 2.—A simple silencer.

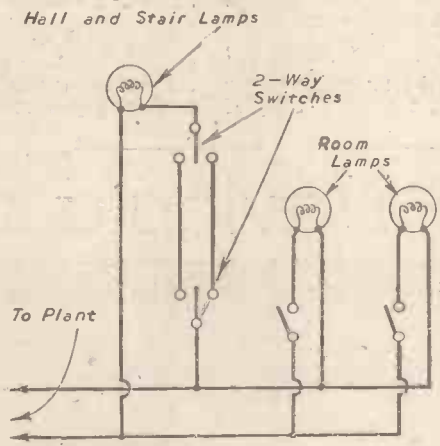


Fig. 3.—Wiring for ordinary, and change-over switching for stair lights.

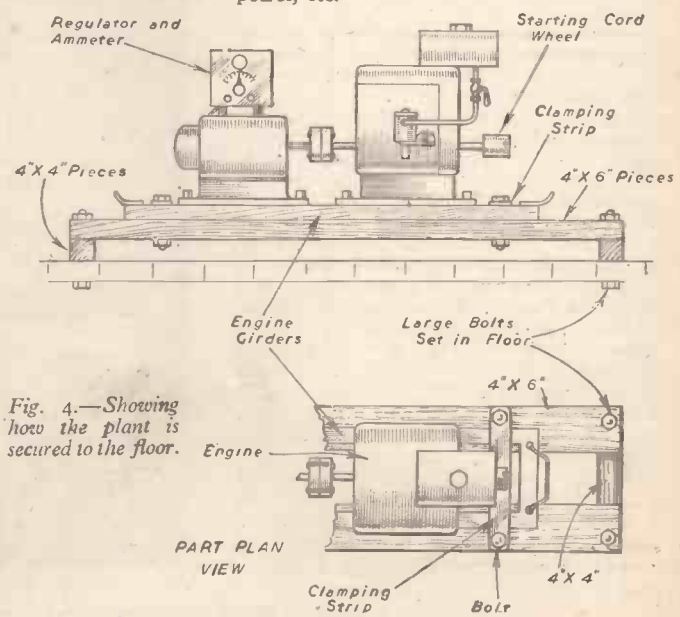


Fig. 4.—Showing how the plant is secured to the floor.

No difficulty should arise in wiring the lamps. Ordinary room and passage lamps are wired as shown in Fig. 3, that is, in parallel with the plant. With stair lights, or lights in long halls, two-way switching is desirable. This enables the lights to be switched on at one point and off at the other, as desired when ascending or descending stairs, etc. This is also shown in Fig. 3. Ordinary two-way switches are used.

The field control on the dynamo enables the charging rate to be adjusted. If four or

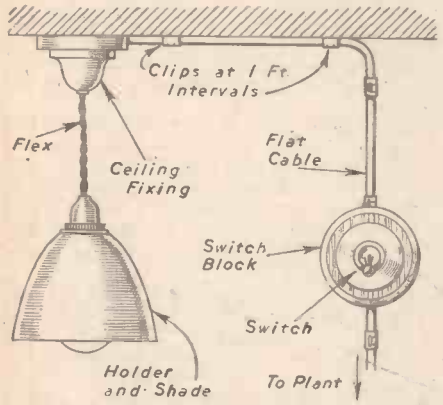


Fig. 5.—Method of fixing the wiring and lighting fittings.

five 6-volt accumulators are in use it will be best to set this at the maximum rate. If desired, the rate may be lowered slightly by reducing the speed of the engine. For car accumulators 8 to 10 amps. is a good figure, but with five accumulators it will be difficult to maintain this when they are well charged.

Practical Aspects

All wiring should be carried out with proper cabling, and fixing clips used at one foot intervals, as in Fig. 5. If the rooms are low, a batten-type holder may be screwed directly to the ceiling, and lamp and shade fixed to it. With higher rooms, the lamp may hang upon a length of twin flex with advantage.

In fitting the switches, the easiest method is first to separate the individual wires of the cable at the appropriate point. One lead is then cut and a switch block, with grooves for the cable, screwed in position. The cut ends are now bared and pulled through holes in the block for connection to the switch. The switch is finally screwed to the block and its cover replaced, as in Fig. 5.

Where appearance is of great importance, it is frequently possible to run the wiring behind skirting-boards, and otherwise keep it from sight.

Charging Small Accumulators

If small batteries (such as these for a wireless receiver) are to be charged, they cannot be connected directly to the plant. They may, however, be connected as in Fig. 6. A terminal board, with two flexible leads, should be fixed at some convenient point. This is wired in series with one or more lamps, and when these lamps are in use the accumulator will be charging. When no accumulator is connected the terminals on the board are shorted.

The charging rate is not important provided it is not too high, as the battery can be left on until charged. If 25-volt lamps are used, one 25-watt lamp will pass 1 amp., and this will be sufficient for a small battery. With a larger battery, the board may be wired so that it is in series with two 25-watt lamps, or one 50-watt lamp. This will give a 2-ampere charging rate. The maximum rate for various batteries is marked upon them; anything *under* this figure may be used if more convenient.

Operating the Plant

The usual procedure is to put a certain quantity of petrol in the tank, start the engine, and leave it running until it stops from lack of fuel. If a period of use shows the accumulators are becoming discharged, then the quantity of petrol is increased slightly. It will soon be found how long the engine will run on a given quantity of petrol, and adjustments made accordingly.

For moderate use, with two lamps on for five or six hours daily, a running period of about one to two hours is ample. It is very desirable to use a hydrometer to check the batteries (which should be kept well filled up with distilled water). If they tend to become discharged, the daily running period of the engine can be increased, or it may be run for a time during daylight when no lights are in use.

When fitting the lamps, it should be remembered that the smaller their wattage the smaller will current consumption be.

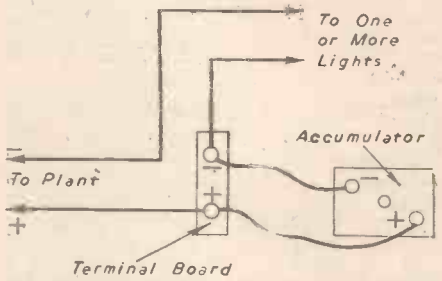


Fig. 6.—Arrangement of connections for charging small accumulators.

Lamps of quite small wattage (15 to 25) are quite suitable for passages, and this enables a really good light to be maintained in living rooms, etc., without overloading the accumulators. During summer the engine should be run occasionally to keep the batteries in good condition.

The plant itself should receive weekly attention, care being taken to maintain the engine oil level, keep dynamo brushes clean and well bedded down, and bearings should not be allowed to become dry. Some ventilation is necessary in the engine-shed, so that the air-blower may provide reasonable cooling.

With attention to these details, the plant can provide long and useful service, with economic operation, and there should be no need for expensive renewals.

Science Aids Navigators

IN present-day shipping, science is playing a great part in providing fool-proof equipment for navigational purposes. At the Sperry Gyroscope Company's works at Brentford, Middlesex, they are busy on gyro-compasses and gyro-pilots for the ships of the world's seafaring nations. Already orders are being executed for Norway, Sweden, Denmark and Portugal.

The gyro-compass derives its north-seeking qualities from a combination of four natural laws, the first and second of which are properties of the gyroscope, the third gravitation, and the fourth the earth's rotation. These natural laws provide a source of directive force for a compass that indicates the True North and does so with a degree of steadiness comparable to that of an object on shore.

Used in conjunction with the gyro-compass, the gyro-pilot was originally developed to serve the single purpose of automatic steering.

In addition to these gyro-compasses and pilots, the Sperry works are to construct the first shore radar installation for the port of Liverpool.

An electronic (magic eye) machine for the dynamic balancing of small gyro rotors for aircraft instruments.

Memoirs of the Metals

Sidelights of Interest on the Metallic Elements, Their Properties and Characteristics

1—Iron. The Foundation of the Industrial Age

MORE than any other metal, iron has brought into being the present age of industry and commercial activity. Without this ubiquitous and even commonplace metal, modern industry could never have materialised in its present form. For iron, and, with it, coal, has underpinned the whole of our industrial structure for the last couple of centuries. There has hardly been a single branch of industrial activity which has not in one way or another been directly or indirectly indebted to the universality of the element iron, commonest of the common metals.

Historians are wont to write about the Iron Age as if it no longer existed. The fact is, however, that all of us are living in a period which is very much the Iron Age, an epoch which, although its beginnings date thousands of years back to the first iron tool-making efforts of mankind, is, at the present time, more firmly established than ever it was previously, and which seems likely to survive into an indefinite and unpredictable future.

Iron was not the first of the metals to be smelted. Copper, brass and tin came before it. But iron, as a metal, was known to primitive man even during the Stone Age. That was because metallic iron comes to our Earth as a constituent of meteors, and it was this strange glistening metal which rapidly turned red on exposure to moist air, after the meteor fragment had been broken up, that attracted these primitive human imaginations and gave rise to legends and fables which have still persisted.

Mention of iron is made frequently in the Bible. The Egyptians, even before the commencement of their stone-written history, utilised metallic iron and were able to smelt it in a crude sort of way.

Perhaps the original home of iron-making lies somewhere in India. It is possible to penetrate very far back into the history of the Hindu civilisations, and to obtain various inklings of a practical knowledge of iron-smelting by certain adepts of those now-forgotten nations.

Unfavourably Regarded

Yet, curiously enough, despite its enormous utility, iron, as a metal, was never favourably regarded by the ancients. It was unsatisfactory stuff, difficult to smelt out of its ores, difficult to melt and uncertain in its properties. Worst of all was its terrible proneness to corrosion. The red demon of rust attacked iron on the slightest provocation and quickly rendered it useless.

The ancient Romans, who knew a lot about the practical aspects of metallic iron and who, it is thought, discovered cast iron through the accident of an overheated, running-over furnace, had a poor opinion of the metal. A useful metal it was, indeed, to them, but all the same it was a sort of unmoral metal. It was with this metal, they said, "that wars, murders and robberies are effected." But to some extent the misdeeds of this metallic element were automatically controlled. "Nature," writes Pliny, a Roman admiral, "in conformity with her usual benevolence, has limited the power of Iron by inflicting upon it the punishment of rusting."

Which comes quaintly as a somewhat ingenious fantasy to the modern engineering technician struggling with the everyday practical problems of rusting and corrosion.

But if iron is made by the gods to suffer for its sins by the mechanism of rusting, it would seem that its punishment does not end there. For, strangely, iron is the only metal which seems to be attackable by certain types of bacteria.

To many of us, it is a strange idea that iron (and even steel) can be and, indeed, often is corroded away through the agencies of living bacteria. Germs are things which we are more usually inclined to associate with unpleasant conditions such as the common cold, influenza, pneumonia and measles. There are, however, certain species of bacteria, notably one strain which rejoices in the name of *Vibrio desulphuricans*, which are capable of actively attacking buried ironwork such as watermains. These bacteria are "anærobic," that is to say, they live out of contact with air and they have the property of being able to reduce the sulphates in heavy soils to free sulphur. For this reason, they are generically known as the "sulphur bacteria."

Iron comes to Earth. A telescopic photograph of a meteorite travelling downwards through the Earth's atmosphere.

Some of them simply corrode ironwork by releasing free sulphur in contact with the iron, so that iron sulphide is rapidly formed. Other types, however, seem to attack the iron directly, but with all these bacteria types the end product is the same—iron sulphide.

Iron is, of course, an indispensable element to all of us. The red colouring matter of our blood—*hæmoglobin*—is an organic compound of iron. Without it, our physiological life-cycle could not proceed. Iron to us, therefore, is as essential as oxygen. So that although we may, if we so desire, despise the common and once untractable iron like the ancient civilisations did, although we may merely regard it as a machinery metal and a tool-making commodity, it still remains, in sober truth, the one metal of our very beings, the metal on which our lives depend.

Pure Iron

Who has seen pure iron, that is to say the completely 100 per cent. metal?

The answer to this is that very few individuals have ever set their eyes on such a metal, for perfectly pure iron is very scarce indeed. It is so extremely difficult to obtain that there have been experienced scientific workers who have averred that absolutely pure iron is totally unknown.

Whether such is really the case or otherwise is a matter of debate. Irons of exceedingly high degrees of purity are obtainable in virtue of the fact that when carbon monoxide gas is passed slowly over heated iron at a temperature of around 80 deg. C., a new gas, iron tetracarbonyl, $Fe(CO)_4$, is formed. This strange iron-containing gas, apart from being highly poisonous, is combustible, and it burns with a yellow flame. When heated, this iron carbonyl gas gives up its iron as a fine grey powder.

You may occasionally have noticed a reddish deposit on the inner side of a lamp glass covering a gas burner. This is actually a deposit of iron oxide, derived from the thermal decomposition of traces of iron carbonyl in the coal gas supply.

Now, the iron powder derived from iron carbonyl gas is extremely pure. It is free from phosphorus and sulphur—a pair of impurities which are nearly always present in metallic iron—and it contains only very minute traces of carbon, oxygen and nitrogen. When sintered in a vacuum for five or six hours at a temperature of about 1,050 deg. C. this "carbonyl iron" can be fashioned into a silvery-white, glistening metal more like a cross between silver and platinum in appearance than like ordinary iron. And, curiously enough, this iron of extreme purity is far more

An early specimen of industrial iron. A portion of a cast-iron cylinder made at the famous Carron iron foundry in Scotland.

resistant to atmospheric rusting than is the normal iron of our everyday lives.

The Problem of Rusting

It is a strange fact that even ordinary iron will not rust in an atmosphere which is perfectly dry. If you take a piece of, say, wrought iron, give it a high degree of polish and then suspend it in an enclosed space over a dish of phosphorus pentoxide or some other material capable of extracting all traces of moisture from air, the metal specimen will not rust. Its lustre will remain for an indefinite period.

One always associates rusting with iron, and the usual "scientific" explanation of this natural process is that the oxygen of the air combines with the iron, forming iron oxide, which is rust. A very simple explanation but, unfortunately, a very erroneous one. Rust is never a simple iron oxide. It is always a mixture of different oxides of iron together with iron hydroxides and iron carbonates. A gloriously complicated mixture, indeed, and one of extreme difficulty to ascertain accurately by chemical analysis.

There is no doubt that traces of carbonic acid gas (carbon dioxide) existing in the air assist in the natural rusting of iron. But moisture must also be present and (according to some scientists, but not to others) traces of acid are essential.

The fact is that the age-long, universal rusting of ferrous metals is a process the mechanism of which has never been clearly and satisfactorily explained. We know a good deal about it, but, unfortunately, not everything concerning it.

But whilst on the subject of iron corrosion, have you ever realised the enormous extent of iron-loss which may annually be written off civilisation's balance sheet in consequence of atmospheric rusting?

The true figure runs into some hundreds of thousands of tons, and this does not take into account the annual loss of iron due to acid attack and other causes. Someone in Germany endeavoured to make a fairly accurate estimate of the annual loss in industrial iron and steelwork due to rusting a year or two before the war. The figure worked out at 125,000 tons! No wonder, if this be true, that the paint industry flourishes!

The great tendency on the part of iron to combine with oxygen and to revert to its normal "combined" state is responsible for the fact that iron very seldom occurs "native." That is to say, that it seldom is found in the metallic state. Some basaltic rocks contain minute amounts of free and uncombined iron, and on one occasion a large mass of metallic iron, weighing some 25 tons, was said to have been located on Disco Island, off the coast of Greenland.

The reason why iron is found uncombined in meteorites is because the metal is usually covered over with a sort of silicate varnish which serves to protect it from oxidation during its fiery flight through our atmosphere.

Commonest of Metals

In its combined state, however, iron is easily one of the commonest of the chemical elements. There is hardly a mineral, scarcely a patch of soil or ash or dust which will not show traces of iron on analysis. And if, as is at times asserted, the central core of our Earth is a gigantic mass of heavily compacted, supercompressed metallic iron of unknown density and temperature—well, then, iron, the universal drudge of the industrial, structural and mechanical worlds, the one-time despised metal cursed by the gods for its behaviour and given the supreme punishment of continual self-destruction under the guise of rusting, becomes the basic element of our planet, a metal which must necessarily be far more plentiful in total amount than all the other metals put together.

Then, of course, iron is magnetic. Why it should be so was a puzzle to the ancients, and it still remains a puzzle to us moderns. A few other metals have magnetic properties, but iron far exceeds them in this respect. Why such should be the case we do not know. But may it not be that the very plentifulness of our Earth's stock of iron coupled with the fact that the Earth itself acts as a huge magnet constitute two facets of the general problem of magnetism and of the magnetic metals?

Iron is undoubtedly the Earth's carrier of magnetism. Who knows, indeed, that this property may not constitute its supreme rôle in the natural order of things, and that its fitness for industrial use at the hands of mankind may comprise but a mere superficial characteristic which is here to-day and gone to-morrow in the illimitable reckoning of Time?

Mathematics as a Pastime—5

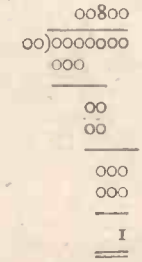
Reasoning It Out

By W. J. WESTON

WHEN you get a result in mathematics you apply logic; much of mathematics is, indeed, away from the figures sometimes supposed to constitute it. It is mathematical reasoning when you deal with a problem like this: "*Is that* 1234 *Gerrard?*" "*Yes, who is calling?*" "*Don't you recognise my voice? My mother is your mother's mother-in-law.*" *What relation to one another are the speakers?*

Your answer that it might be a father and his child, or a father's brother or sister and nephew or niece, is reached by calculation and elimination. So, too, posed with the problem below, you don't figure; you reason. *The water-lentil doubles itself every day; on the first day you have* 1, *on the second day* 2, *on the third day* 4, *and so on. In* 30 *days the pond is covered. How long will it take to cover the pond if you start with two lentils?* Twenty-nine days, you say; for you gain one day only since, in the first instance, you had 2 lentils on the second day.

Give yourself a little practice in this reasoning. Here is a division sum worked out, all the figures except two being hidden by counters. What are the hidden figures?



Your first clue is in the quotient: five figures but only three products. Therefore, you say, there must be two noughts in the quotient, and these can only be to the right and the left of the 8. Then you note that the divisor, being multiplied by 8, gives a two-figure product, but, being multiplied by a hidden number, gives a three-figure product. This hidden multiplier must, therefore, be 9. The divisor cannot be more than 12; for 8 times 13 is 104. It cannot be less than 12; for 9 times 11 is 99. So you have the numbers sought.

Many generations have wrestled with this; will you try a fall? The ancient Greeks, you remember, divided the day into 12 hours, from 6 a.m. to 6 p.m. Well: "Best of clocks," says the Greek philosopher, "how much of the day has gone?" "There remains," replies the very teasing clock, "twice two-thirds of what has gone." *What time was it?*

You had no trouble with that. Since twice two-thirds is one and a third, less than half the day has gone. If we think of the part gone as three-thirds, the part left is four-thirds. Three-sevenths of our day is lost to us; the time, therefore, is $8\frac{4}{7}$ minutes past 11.

Power On Power

"Farmer Giles," he said, "I'll give you this five-pound note if you'll give me two grains of wheat next Monday, four grains the Monday after, and so on for a year." "Done," said Farmer Giles; rarely had such a bargain come his way. As you, having more than a nodding acquaintance with figures, know, however, Farmer Giles had made a losing bargain. He had with light heart undertaken to give more wheat than he could acquire in his limited life.

Indeed, get far from the point origin and the power of a number looms large; quick multiplying has taken place of slow adding. The burden of Farmer Giles grew at first by tiny accretions, at length it became intolerable; 2 becomes 4 after a week, that is, becomes 2^2 (two squared) and 4 becomes 8, or 2^3 (two cubed) in two weeks; it becomes 2^{52} (two raised to the 52nd power) for the last instalment. And, long before this point was reached, logarithms were needed to calculate the too hasty farmer's liabilities. For this last crushing burden the calculation is:

Log: 2: .3010
Log.: 2^{52}: 15.6520
Anti-log of .6520: 4.487

If, therefore, you multiply 4.487 by a number represented by 1, followed by 15 noughts, you have the monstrous number of the ultimate Monday, and the resulting weight, even for that one instalment, is more than all the wheat in Britain.

Well, now tackle this one: *Twelve matches are to be played. How many pool-forms must you fill so as to be sure of having one form with the correct results?* We shall assume, what your football fan will bluntly say is not so, that *win*, *loss*, *draw* are equally likely. Three results are possible for the first match on our list, three also for the second match; and the form with the correct result of the first match is rejected, unless it contains also the second correct result. To ensure that it does so we must append to each of our first results three possible second results. To ensure correctness, if two matches only were played, we need, therefore, 3×3 or 9 forms.

To ensure correctness when 12 results are to be predicted we need 3^{12} forms.

Log 3 is .4771
Log 3^{12} is 5.7252
Anti-log .7252 is 5321

Your number of forms is accordingly 532,100, a good many more than half a million. Not your time, nor your toil, nor your paper supply suffices for such a task.

THE WORLD OF MODELS

A Realistic Model Railway: Model Steam Engine of Unorthodox Design: A Fine Sectional Ship Model Seen at the Shipwrights' Exhibition

By "MOTILUS"

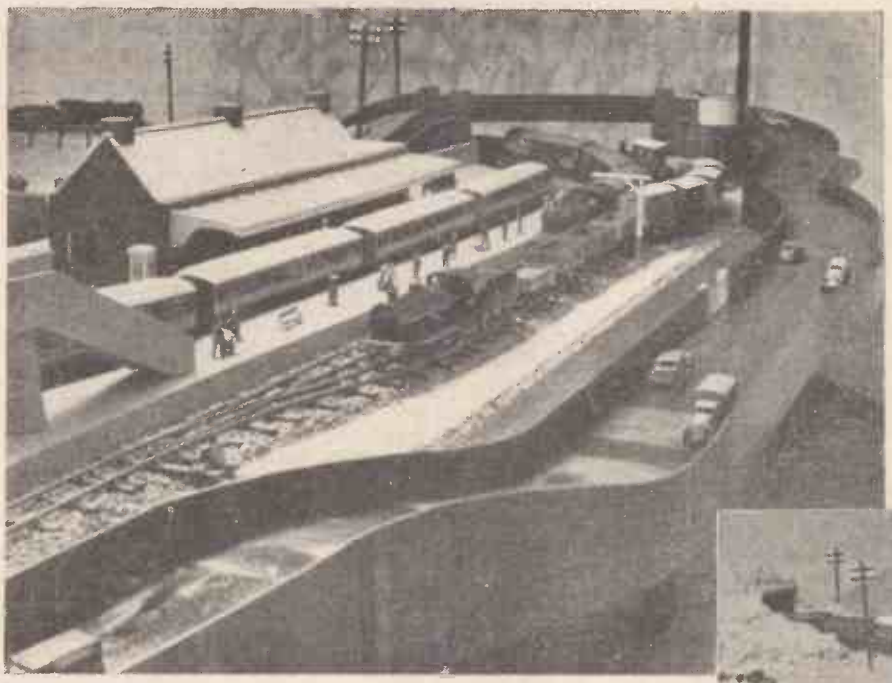


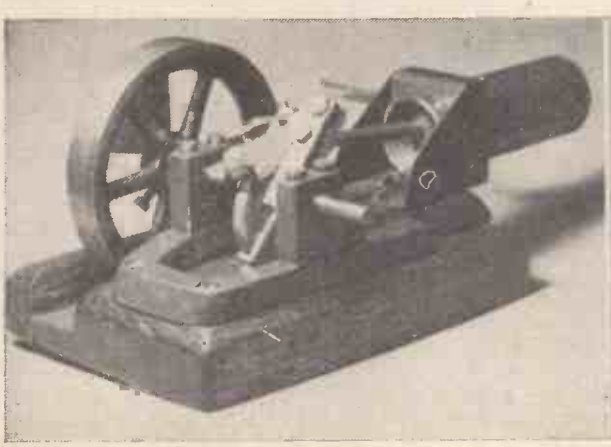
Fig. 1.—A busy scene on the main station of the model railway of Michael Brown, of Chudleigh, Devon, showing the passenger bridge, overbridge and road. The locomotive in the foreground is an 0-6-0 Bassett-Lowke clockwork goods engine.

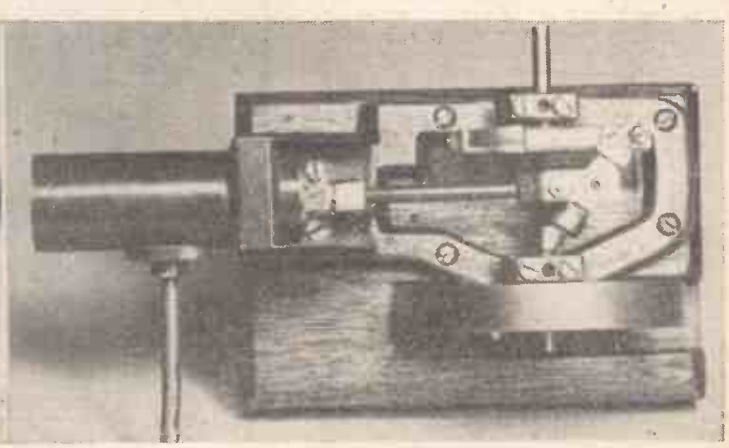
I HAVE often wondered which part of England is the most "model minded," but this is difficult to judge from the number of model clubs in existence. Often a district has many model enthusiasts who never seem to trouble about meeting together as a group or holding annual exhibitions, whereas some centres are formed where model interest starts with a few people forming a club, and then this society gradually develops into an enterprising and rapidly increasing group of members and model fans. Of course, the Americans go much farther than we do in the collaboration of facts and figures of the enthusiastic followers of the hobby—for instance, the American publication "Model Railroader," although it does not cover general model makers but only those interested in model railways, periodically sends out a questionnaire to its readers, asking a set of most comprehensive questions. I am sure our English readers would consider it worse than a Government departmental request to be asked, "How old and how many children? What railways modelled? Means of propulsion? How long interested in the hobby? What other hobbies?" etc., and I am sure that no publication entirely devoted to model making in this country has such a record of their readers and their work.

This thought was forced upon me by the number of letters and interesting descriptions of models which I receive from remote parts of England, where often many keen model makers are working quite alone and without any encouragement from fellow enthusiasts.

In my mail recently I heard from Mr. G. S. Brown, of Newton Abbot, who has built a most comprehensive gauge O railway for his young son, Michael. Plans for the building of the railway were prepared at the beginning of the war when, to quote Mr. Brown, "I was most fortunate to have all the necessary material before the war restrictions came into force, and also I am fortunate in having friends who possess a small, circular saw, a band saw, and a small lathe." Except for the use of these tools and a little help from his kind friends in cutting the materials, Mr. Brown has made

Fig. 2.—A curve on the model railway showing the Bassett-Lowke gauge O steam "Enterprise" in the foreground.





Figs. 3 and 4.—Two views of Mr. John Fellows's model reciprocating steam engine showing the construction and general design.

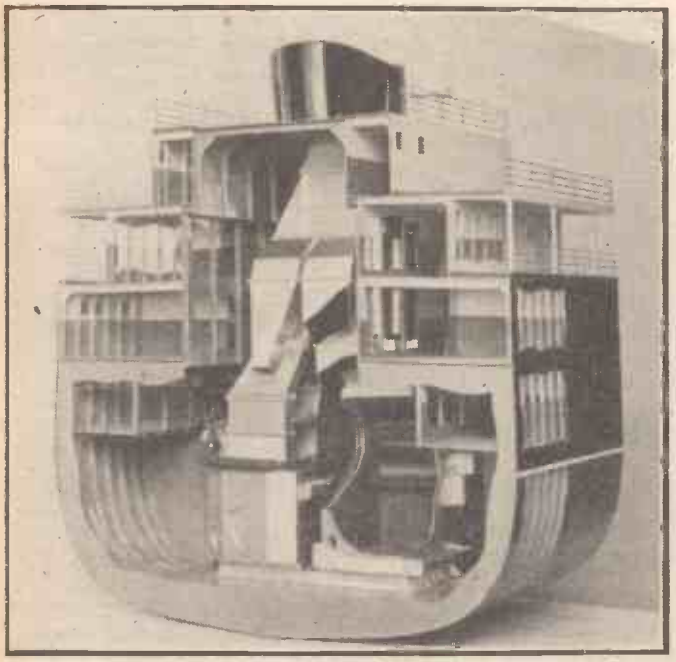


Fig. 5.—The sectional ship model showing the two main John Thompson La Mont Type Marine Boilers installed in a ship now being built by Messrs. Swan, Hunter & Wigham Richardson, Ltd. (By courtesy of Messrs. John Thompson Engineering Co., Ltd., of Wolverhampton.)

everything himself. It was originally intended to build the railway in the garden, but as the Home Guard decided to make a "post" on the site which had been prepared outdoors the whole layout was altered so that it could be constructed indoors. Although the work was commenced during the early days of the war the railway is not yet fully completed, and arrangements are in hand to extend it so that the total track will be approximately 85ft.

Constructional Details

As can be seen from Figs. 1 and 2, the railway lacks nothing in realism, and I am sure that many readers, especially those who are thinking of building or extending their layouts, will be interested to know how this was achieved. All the wood used for the table, etc., was submerged in Cuprinol for six weeks prior to use, and no nails have been used—only brass screws and bolts—and the whole railway could be easily dismantled, although this would certainly be a long job! All railway buildings are of oak, roofed with asbestos, the table bed being of this material also. The tunnel was made by first staking a core of correct radius in clay. This was then covered with plaster of paris, 1½in. thick, and when set the clay was removed, thus resulting in a perfectly shaped lining. Coke was then built into a mound, and over this 56lb. of plaster of paris was poured, and the whole painted with green paint mixed with sawdust. The fence is of oak posts screwed at 3in. intervals to brass "Rufflette" curtain rail, and the whole covered with Purma clay, which dries as hard as stone. The posts were drilled before fitting and are wired with copper wire correctly spaced. The platforms are cut from solid elm, the larger one being 7ft. 6in. long, 10½in. wide, and 1½in. thick. These and the footbridge were given several coats of gold size, and when in a half-dry state sprinkled with cement, and when set the surplus was brushed off. The rolling stock of the railway consists of one "Flying Scotsman," one standard 6-coupled tank, one 0-6-0 goods, one "Enterprise," four scale L.N.E.R. 54ft. coaches, three standard L.N.E.R. coaches, eight steel goods trucks, and eight scale goods trucks in wood—certainly a well-equipped line. I understand that a signalling layout for the railway is being prepared by Messrs. Bassett-Lowke, Ltd., and Mr. Brown is hoping to instal the necessary signals, etc., as soon as these are obtainable.

Model Steam Engine

Now for news of a model of rather an unorthodox design—the result of an effort to build a reciprocating steam engine with only three moving parts — piston, connecting rod, and crankshaft—has come from Mr. John Fellows, of Bewdley, Worcestershire. Although Mr. Fellows, who has been a keen model "fan" for many years, has made several ship and aero models, all of them of a free-lance and experimental nature, his chief interest is in model steam plant. He informs me that he has had no mechanical training other than through the pages of PRACTICAL MECHANICS. The photograph shows his first and only working steam engine model, built to his own design, as it was his opinion that this would give him greater scope to use the limited material and tools at his disposal. His aim was to produce an engine something after the "two-stroke" practice, as that would not involve the construction of any valve gear. However, as he found this was impracticable without using some form of sleeve valve, a compromise was made and the piston and sleeve were constructed in one piece. The engine was made entirely out of scrap and oddments, the only part not made by Mr. Fellows being the flywheel. The model works very well at pressures from 10 to 50lb., the cylinder bore being ¾in. and the stroke 1⅛in. (Figs. 3 and 4).

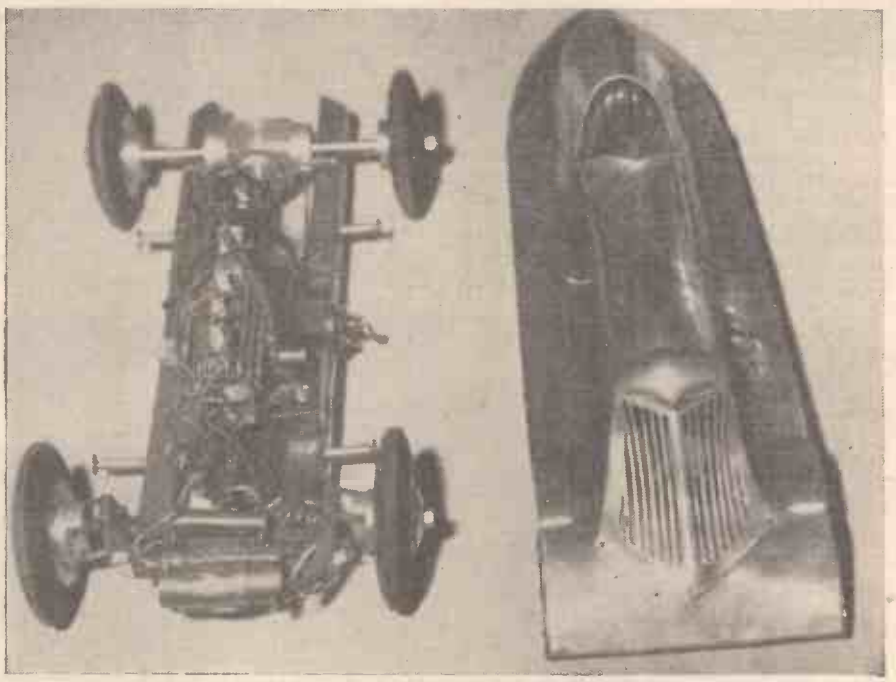
Sectional Ship Model

At the recent Shipwrights' Exhibition, my attention was drawn to an out-of-the-ordinary and interesting model on the stand of Messrs. John Thompson Engineering Co., Ltd., of Wolverhampton. As will be seen from the photograph (Fig. 5) this is a sectional model, showing the two main John Thompson La Mont type marine boilers installed in a ship now being built by Messrs. Swan, Hunter and Wigham Richardson, Ltd., for the Navigation Mixté. These are the first boilers of this type to be installed for marine work in this country. An unusual feature about the model is that apart from the wooden base and the pipe work, the model is constructed entirely of high-grade cardboard. I am informed it was made in nine days by one of the apprentices in the works. However young the apprentice was, I am sure that Messrs. Thompson will find this young man a valuable asset to their staff, as there are certain advantages in being able to have a model made on the premises where the details for the model maker are easily accessible.

British Industries Fair

No doubt many of our readers are well aware that the B.I.F. opens at Olympia on May 5th—and I understand that there will be quite a display of models by some of our best known model firms, as well as some special models built for publicity purposes. Owing to the date of going to press, it is impossible to give further details until a later issue.

A FAST MODEL RACING CAR



This model racing car, which was exhibited at the recent Model Aeroplane Exhibition in London, can travel at 100 miles an hour. It is powered by a miniature 2-stroke 3-in-line petrol engine, and is provided with a spring-loaded clutch.

Letters from Readers

The Orffyreus Wheel

SIR,—It was with much interest that I read in the October issue the account of the Orffyreus wheel. About two years ago the writer had a conversation with a technical relative from Western Australia (who was in charge of degaussing at the time), who averred that something of this kind should be possible, principally that it should be feasible to float weights back to their original level without undue loss of energy or at any rate with some margin to spare.

It probably would, of course, simplify matters if there were such a thing as a ferromagnetic liquid which could be suspended vertically. The electrical engineer referred to, however, would have none of the possibilities of such a thing, and stated it to be against the conservation of energy, etc., and, being busy with other work, I gave the matter little further thought. If the records quoted by you are correct, however, then some would appear to be realities. Your correspondent's explanation may be the correct one. I shall watch any further developments with interest.—E. W. CHAMBERS (Victoria, Australia).

"Are You Wrong?"

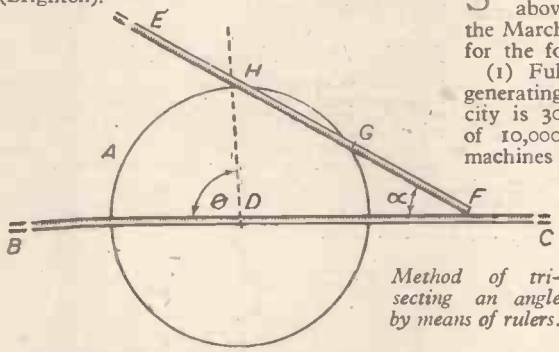
SIR,—I must emphatically disagree with Mr. T. A. Meade in the March issue of PRACTICAL MECHANICS, where he claims the sun puts a fire out because it heats and rarefies the atmospheric oxygen in which it burns.

This is not, because air absorbs almost no radiant heat, therefore it cannot expand much.

Actually, the fire must burn more fiercely, as the sun's rays heat up the burning fuel, so aiding the chemical combination with atmospheric oxygen. This action, however, uses up the fuel more quickly, and so the fire goes out sooner.—P. S. JARVIS (Tenterden).

Trisection of an Angle

SIR,—As an interested reader of PRACTICAL MECHANICS I thought that the enclosed copy of a cutting from *The Engineer*, dated 1918, might be of interest to other readers of your periodical. — K. R. SAILLARD (Brighton).



Method of trisecting an angle by means of rulers.

A is a circle, of which D is the centre. BC is a ruler whose upper edge touches the centre D. Ø is the angle whose trisection is required. EF is a second ruler which has a mark at G, the distance GF being equal to the radius of the circle.

To obtain a trisection of the angle Ø, place the ruler EF along BC so that F is touching BC and point G is on the circumference of circle A. Then the angle $\alpha = \frac{1}{3}\text{Ø}$.

"Glues, Cements and Adhesives"

SIR,—With reference to the article on above subject which appeared in the April issue, there is a slight error on page 227. It is stated that a gum is not soluble in methylated spirit or in turpentine.

Gum tragacanth, gum elemi, gum sandarach, gum benzoin, gum mastic are all soluble (more or less) in meth. spirit or industrial alcohol. Gums dammar, mastic, benzoin, sandarach are all soluble in turpentine. Only the other week I made a very "fine" varnish for the restoration of an oil-painting by dissolving gum mastic in turpentine.—J. F. STIRLING (Preston).

"London's Largest Electricity Plant"

SIR,—My attention has been drawn to the above article which was published in the March issue, and I crave your indulgence for the following remarks:

(1) Fulham is not the largest electricity generating plant in London. Fulham's capacity is 300,000 kW or, with the house set of 10,000 kW, 310,0000 kW gross. The machines there are 60,000 kW each, not 50,000 as stated. Both Battersea, with 340,000 kW, and Barking (in the Metropolitan Police Area), of 540,000 are both larger.

(2) Load shedding from stations inter-connected to the "grid," as Fulham is, cannot be done individually by any one of these stations. It is a collective action taken by all.

(3) Boiler feed pumps are invariably rated as to capacity in pounds per hour, not gallons.

(4) The Met-Vick 66-kW switches are usually called oil-*circuit* (not current) breakers.—N. F. K. FLETCHER (Ilford).

Club Notes

The Society of Model and Experimental Engineers

A MEETING of delegates of the S.M.E.E. and its 16 affiliated clubs was held at St. Ermin's, Westminster, on March 26th, 1947, for the purposes of considering in detail the terms of affiliation and of receiving and discussing suggestions for development of the scheme.

The chairman of the S.M.E.E., in welcoming the delegates, explained that the scheme was originally introduced to help foster clubs and societies by placing at their disposal facilities not available in such societies. It had also been felt that there was need for a central body which could render advice and assistance in many ways to smaller and newly formed societies.

In 1943, when the scheme was first framed, no definite opinion could be formed as to the expense in which the scheme would involve the S.M.E.E., and in view of this it was agreed to charge a basic subscription, plus a charge per capita. In the light of the three years' experience, the council of the S.M.E.E. felt that this fee might well be reduced, and they proposed that the new fees should be as follows:

(1) For societies with a total membership of over 20, £1 1s. per annum; (2) for societies with a membership of 20 or less, 10s. 6d. per annum. The capitation fee to be cancelled.

This proposal was agreed, and it was decided to recommend that the new charges should be retrospective from January 1st, 1947. The existing provisions for use by members of affiliated societies of the library and workshop were approved.

The chairman proposed that three copies of each issue of the S.M.E.E. quarterly *Journal* should be supplied to each affiliated society gratis; further copies to be available at cost price. This was approved.

The Centrix 4-in. Lathe

THE useful wood-turning lathe, shown in the accompanying illustration, is manufactured by Centrix Precision Products, Ltd., Bostel House, West Street, Brighton, Sussex.

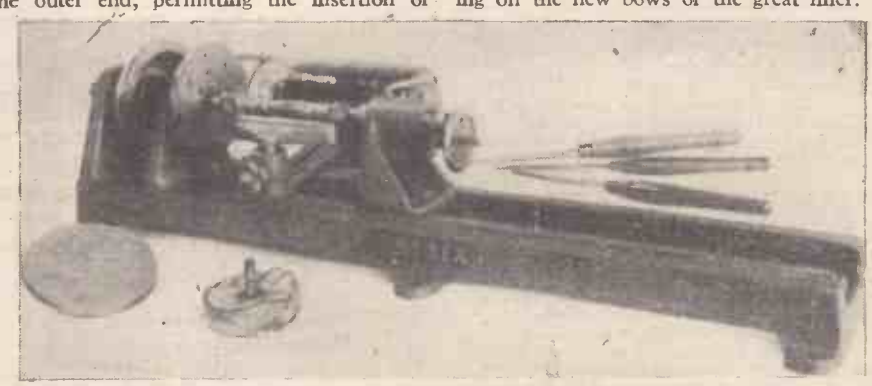
Primarily intended for wood-turners, the lathe can, by the addition of easily mounted attachments, be used for sawing, planing and rebating, grinding, buffing and sanding.

The lathe bed is 8½in. wide, with a distance between centres of 28in. The headstock spindle, as well as the tailstock, contains a No. 1 Morse taper, and, in addition to being hollow, is threaded at the outer end, permitting the insertion of a stub upon which a buffing head or grinding wheel can be mounted.

The saw bench attachment has a table 10in. long by 8in. wide, and is provided with a fence which is fully adjustable to each side of the saw, giving a maximum width of cut of 3½in. The saw, of high-class steel, is 6in. diameter. The lathe can be supplied either with or without a motor, and a folder, giving full particulars and prices of the various accessories and attachments, can be obtained from the manufacturers at the above address.

OUR COVER SUBJECT

THE "Queen Mary" recently went into dry dock at Southampton to receive a thorough overhaul and fit-out to convert her from a troopship to a luxurious passenger liner again. She suffered damage to her bows in a wartime collision in the Atlantic with an escorting cruiser, "Curacao." The illustration shows work proceeding on the new bows of the great liner.



The Centrix 4-in. wood-turning lathe, with motor drive.

QUERIES and ENQUIRIES

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

Cementing Card to Metal

CAN you suggest an adhesive for sticking thin sheets of card, such as ordinary post cards, to metal, such as sheet brass ?

I have tried various glues, but have found that they all strip when the glue has hardened. Some take longer than others, but all come away after a time. I wish to make a permanent job of fixing this type of card to sheet metal.—J. E. Sutherland-Read (Watchet).

A VERY good adhesive for cementing thin card to metal is a 10 per cent. solution of cooking gelatine in water, this being made by dissolving 10 parts of gelatine in 90 parts of water and by adding a few drops of carbolic acid by way of a preservative. The gelatine solution sets to a jelly when cold, and hence must be used hot. The metal must be grease-free and clean, otherwise the solution will not spread evenly. Apply a thin coating of gelatine solution to both metal and card and then bring the two in contact under pressure. Once set, a very good joint is obtained.

The following cement has also been recommended for the same purpose, although we have had no experience of it : 30 parts of gum tragacanth, 120 parts of gum arabic, 500 parts of water. Soak the gums in the water for 24 hours to allow them to swell. Then dissolve by means of gentle heat and stirring. Preserve with carbolic acid. Then add 30 parts of glycerine.

A still further alternative is to use a solution of shellac in methylated spirit. The solution should be thick—almost paste-like. Apply it to both surfaces. Then bring them into contact.

It is always advantageous to roughen the metal surface with sandpaper before applying the cement. This gives a better "keying" surface to the metal.

Aluminium Welding Flux

WOULD you please give me a formula for an aluminium welding flux ? I have laboratory facilities. Where can this flux be obtained made up ?—C. D. Pike (Neath).

SUITABLE fluxes for aluminium welding are the following :

Potassium chloride	.. 45 parts	(by weight)
Sodium chloride	.. 30 ,,	,,
Lithium chloride	.. 15 ,,	,,
Potassium fluoride	.. 7 ,,	,,

Potassium chloride	.. 45 parts	(by weight)
Sodium chloride	.. 30 ,,	,,
Lithium chloride	.. 15 ,,	,,
Sodium fluoride	.. 3 ,,	,,
Sodium thiosulphate (i.e., photographers' "hypo")	3 ,,	,,

Potassium chloride	.. From 10 to 65 parts	(by weight)
Sodium chloride	.. ,, 15 ,, 75 ,,	,,
Cryolite	.. .. ,, 5 ,, 65 ,,	,,

We do not know anyone who would be prepared to make up these formulæ for you. We believe, however, that aluminium welding compositions are obtainable from the following firms :

Messrs. Everitt and Co., Ltd.,
40 Chapel Street, Liverpool, 3.

The Ferroid Supply Co., Ltd.,
1290A, Chester Road, Stretford, Manchester

Alternatively, if you write to the Aluminium Union, Ltd., Bush House, London, W.C.2, you may be able to gain information relating to other suppliers of aluminium fluxes.

"Solidified" Sawdust Floor Covering

COULD you please enlighten me as to how sawdust can be solidified and made suitable for a floor covering surface on top of concrete ? This is required for a kitchen floor and, if necessary, lino can be placed over the sawdust composition.—J. Killin (Plumstead, Cape, S.A.).

SAWDUST can be "solidified" by making it into a paste with glue solution and by placing the mixture in trays or moulds. However, this treatment would not be suitable for a floor, since the surface would rapidly decompose in the presence of moisture.

You are, we think, referring to the well-known magnesite floors which were once very popular.

To make magnesite material, take 1 part of calcined magnesite powder and mix it with ½ part of fine sand and ½ part of sawdust. Mix intimately, and then make the resulting mixture into a paste with a solution made by dissolving 40 parts of magnesium chloride in 60 parts of water. The paste should be fairly stiff and capable of being trowelled like mortar.

Trowel the paste down on to the floor or, better still, on to brown paper laid on the floor, and bring the surface smooth by means of careful working. Allow the floor two days to dry and two extra days to harden. By incorporating a little pigment into the mix before adding the magnesium chloride solution you can colour the floor surface.

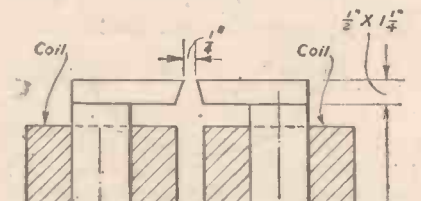
This type of magnesite floor is enduring. It cannot be obtained in this country on account of the present shortage of magnesium compounds, but in South Africa things may be different.

You can also mix sawdust with cement, but apart from this there is no other suitable method of making use of sawdust in the formation of a durable and permanent flooring.

Making Small Permanent Magnets

I WISH to make 32 permanent magnets to the dimensions given in the enclosed diagram (Fig. 1). I would be very grateful if you would give me the following particulars :

What is the most suitable steel for the poles and base ? Would hardened silver steel do ?



I shall make bobbins to slip over the poles. What would be the number of turns and the size of wire I should wind on the bobbins ?

What is the voltage required, and should it be applied intermittently or steadily and for how long ?

I have a small transformer. Is this suitable for supplying the current ?—J. S. Gerrie (Aberdeen).

THE best material to use for the permanent magnets would be special magnet steel, such as Ticonal, as supplied by Mullard Wireless Service Co., Ltd., of Century House, Shaftesbury Avenue, London, W.C.2. We think you would find it best to build up the magnets and then magnetise them in their assembled state by a magnetiser which could be built of soft iron or mild steel to the dimensions given in the diagram (Fig. 2).

Each pole of the magnetiser should be wound with about 3½lbs. of 16 s.w.g. D.C.C. wire, the two coils being connected to create poles of opposite magnetic polarity. For use on a 12-volt D.C. supply the two coils should be connected in series, and will then take 8 to 10 amps. For use on a 6-volt D.C. supply the coils should be connected in parallel, and will then require 16 to 20 amps. The output of a transformer is A.C., which is not suitable for the purpose. A car accumulator would be a convenient source of supply for the magnetiser.

To magnetise your job it should be rested with its poles on the pole pieces of the magnetiser and the current then merely switched on and off a few times. To retain maximum magnetism a soft iron or mild steel "keeper" should be slid across the poles of the job pieces before removal from the magnetiser, the "keeper" being kept across the poles until the job is finally assembled, if possible. The aim is to avoid interrupting the magnetic circuit after magnetisation. For storage the magnetised parts could be kept in pairs with opposite poles in contact to complete the circuit.

Painting on Glass

I DESIRE to paint on glass, tumblers, mirrors, etc. Can you please tell me if special paint is necessary, and is the glass to be painted treated in any way ?

Where can suitable paint be obtained ?—G. Herbert (Cricklewood).

ORDINARY enamel paint can be used on glass provided that the glass is perfectly clean, grease-free and dry. If you do not find any particular paint satisfactory when coated on glass, you can prepare the glass surface beforehand by brushing over the area to be painted a solution made by dissolving 5 parts of gelatine powder (or even size powder) in 95 parts of water. This gelatine solution can also be used for mixing with tube water-colours for making a suitable paint. The resulting colour will be brilliant, but it will not be waterproof, although if the paint, when dry, is brushed over with a solution of formalin it will then become quite waterproof.

Shellac solution, made by dissolving shellac in methylated spirit, can also be used as a waterproof base for mixing dry colours for glass painting. Gum dammar and other similar materials can also be used for the same purpose.

So far as we are aware, paint specially made for glass painting is not commercially obtainable.

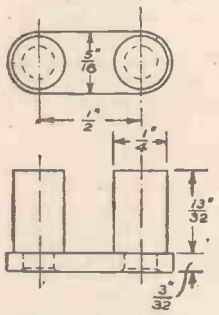


Fig. 1 (above).—Details of small permanent magnet and (Fig. 2) dimensions of magnetiser.—(J. S. Gerrie)

Blueprint Paper

I WISH to produce some small blueprints at home. Could you please give me some information on the following details ?

1. Procedure after drawing has been completed. Exposure and fixing after exposure.

2. An address of a firm from which the materials required can be obtained.—W, F. Nagel (Morden).

IN the blueprint or cyanotype process the drawing to be copied is made in black opaque ink on transparent paper. It is then laid on top of the blueprint paper. The necessary exposure varies somewhat according to the exact composition of the sensitising solution used in the preparation of the paper. About 8 minutes exposure to a good light (not sunlight) is a fair average. After exposure, the paper is merely immersed in water until the exposed portions become a bright blue.

2. Blueprint paper may be obtained through any large photographic dealer, as for example: Messrs. Wallace Heaton, Ltd., New Bond Street, London, W.1.

Dealers in and manufacturers of drawing-office supplies also handle blueprint papers. Such firms are : Messrs. Norton & Gregory, Ltd., Castle Lane, London, S.W.1 ; Yarnall, Ltd., 72, Victoria Street, London, S.W.1 ; Messrs. J. A. Reynolds & Co., Ltd., Stuart House, Edmund Street, Birmingham, 3.

Anhydrous Lanolin : Waterproofing Woollen Garments

CAN you please inform me where to obtain anhydrous lanolin ? Is there a substitute for benzine and where can I obtain it ?

Can you give me a formula for waterproofing woollen garments ?—F. S. Richards (Brixton).

ANHYDROUS lanolin (anhydrous wool fat) can be obtained through any chemical supply house, as for instance: Messrs. Hopkin & Williams, Ltd., 16,

St. Cross Street, Hatton Garden, E.C.1; Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, W.C.2.

Actual manufacturers of this commodity are: Adeps Lanæ, Ltd., 2, Chellow Street, Bradford, Yorks; Croda, Ltd., Rawcliffe Bridge, Goole, Yorks.

Whether or not there is a substitute for benzine depends entirely on the actual use for which it is required. In some instances, petrol, paraffin and white spirit may be employed as benzine substitutes. In other cases these latter liquids cannot be used as substitutes. Hence, you will appreciate that we cannot answer this query precisely unless we know exactly what use you wish to make of the substitute.

A good all-round solvent which is somewhat akin to benzine in its physical properties is "Britsol." This is a product of Greeff Chemicals (Manchester), Ltd., The Royal Exchange, Manchester, 2.

We think you will find it impossible to waterproof woollen garments completely. Woollen fabric, however, may be given a fair degree of rain and moisture resistance by being treated with a metallic salt in combination with tannic acid.

For this purpose, make up the following solution:

Lead acetate	¼ lb.
Common alum	¼ lb.
Tannic acid	¼ lb.
Water	5 gal.

Have the water boiling hot and dissolve the ingredients in the order given. Cool the solution to about 40 deg. C. (i.e., about lukewarm temperature). Immerse the woollen fabric in the solution, and allow it to soak for one hour, with frequent stirrings and turnings-over. Then wring out the garment and let it dry slowly.

Very often, the water-resistance of the treated fabric may be improved by passing it through a soap bath after immersion in the above waterproofing solution. The soap bath is made merely by setting up a strong lather of soap in warm water.

Making Papier Mâché

I AM interested in making papier mâché, and shall be glad if you will inform me of the ingredients and chemicals necessary. Also, can it be made thin enough for use in casting?—L. Barrett (Sutton Coldfield).

THE following is a formula for making papier mâché:

Paper powder	100 parts
Zinc oxide	75 „
Whiting (or colour) ..	25 „

The above is mixed together and then made into a stiff paste with ordinary glue solution. It can be moulded in steel or wooden moulds which have been well lubricated with Vaseline or other grease.

Paper powder may, we believe, be obtained from Messrs. J. Barchem Green, Ltd., Papermakers, Hayle Mill, Maidstone, Kent. Alternatively, you could make a paper "stuff" by shredding old paper and by boiling it in water until the material is reduced to a gelatinous pulp.

Fumigating Old Books

SEVERAL old books have recently come into my possession. Is there any way of fumigating these to get rid of possible germs?

Can books which are slightly mouldy be treated in any way?—G. Grey (Derby).

OLD books do not usually harbour deleterious bacteria. Nevertheless, they may be effectively fumigated in the following manner:

Stack the books loosely in a cupboard (or box) with a close-fitting door or lid. Have at the bottom of the cupboard or box a 60-watt electric bulb on top of which rests a metal can containing ½-1oz. of thymol.

Close the door of the cupboard and switch on the current. The heat of the lamp will melt the thymol crystals and will vaporise them. Thymol vapour is a very powerful antiseptic and germ-killer. Its smell is not objectionable and it does not harm paper.

Allow the current to remain on for about two or three hours. After switching off, leave the cupboard unopened for 12 hours. During this time the operation can be repeated with advantage.

Books which have been "thymolised" in this manner will be quite free from germs, and any smell which is attached to them will quickly disappear.

Thymol costs about 20s. per pound. It may be obtained locally, or from the manufacturers, Messrs. Howards & Sons, Ltd., Stratford, London, E.15.

There are many types of moulds which affect books. They cause all sorts of troubles, from the brown "foxing" of the paper to any actual rotting of the paper. If the mould is growing visibly on the surface of the paper, the best treatment is to dissolve thymol in methylated spirit (exact quantity immaterial) and to wipe the paper with a mop of cotton wool saturated with this solution. Books which are only slightly mouldy or which have become "foxed" are best "thymolised" by the vapour method above described. Camphor may be used in place of thymol.

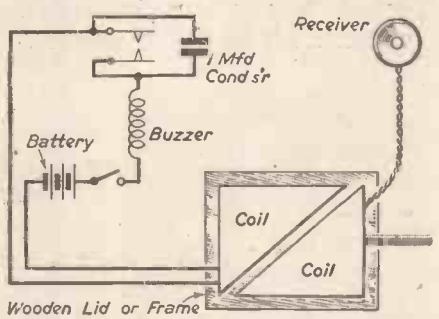
Detecting Underground Mains

CAN you give me any information with regard to an apparatus for detecting underground mains?

I would like to know the theoretical circuit and details of construction, if possible.—J. W. Hughes (York).

WE presume you require the device to detect underground iron or steel mains. You could construct such a device by means of two coils, each having about 4oz. of 22 s.w.g. D.C.C. wire wound on the edge of triangular pieces of wood having the two equal sides about 8in. long. The two coils should be arranged as indicated in the diagram, one coil lying slightly below the other and being provided with an adjusting screw so that the relative position of the two coils can be adjusted. The two coils can be carried in a wooden lid or frame. One coil is connected to a 4½-volt dry battery with high-frequency buzzer and condenser fitted in a suitable case, and connected to the coil by about 6ft. of flexible wire. The other coil is connected to a telephone-receiver of about 4,000 ohms resistance.

The magnetic field strength set up in the first coil by the battery depends on the presence or otherwise of any iron or steel in the vicinity. The voltage induced in the second coil will depend on the number of turns in this coil, the strength of magnetic field linked with these turns and the rate of change of this magnetic



Circuit diagram of apparatus for detecting underground mains.—(J. W. Hughes.)

field; the latter will largely depend on the speed of make-and-break of the buzzer contacts. The two coils are first set so that there is no signal in the receiver, and when this occurs the voltages induced in parts of the second coil are equal and opposite.

The fixture carrying the two coils is then passed over the ground; when passing over ferrous metal the magnetic field of the first coil is diverted from its original position and there will be a resultant voltage induced in the second coil which will cause a buzz in the receiver.

Treating Rough-cast with Distemper

I SHALL be grateful for your advice on the following matter. My house has a rough-cast rendering which is rather dirty, and I wish to colour it with a waterproof cream wash. Can you please inform me how to do this?—J. N. Manchipp (Bristol).

YOUR best plan is to treat the dirty rough-cast rendering with a good oil-bound distemper, applying two or three thin coats in dry weather and allow each coat to dry out thoroughly before applying the succeeding coat.

Distempers contain casein and other materials which are extremely difficult to obtain in the ordinary way at the present time. Their preparation is difficult for an inexperienced person, for which reason we are not enclosing a formula for the making of distemper. We feel sure, however, that any well-known brand of distemper will give you the results which you seek, although, of course, it must be recognised that a distemper used out of doors and exposed to the elements cannot be expected to be permanently waterproof.

Black Enamel for Brass

I WISH to enamel some brass surfaces with good quality black enamel, and would be glad if you will inform me:

(a) What is the best method of preparing the brass to ensure a coating which will not chip off?

(b) What type of black enamel, at present obtainable, do you recommend to give a smooth instrument finish?—F. Hewlett (Devonport).

THE brass must be freed from grease and surface scale by immersion in a warm solution of caustic soda (say, 1 part of caustic soda dissolved in 4 parts of water). There is no commercial cold-applied black enamel which will give the smooth instrument finish which you desire. Such an effect can only be obtained by the use of a special stove enamel which requires oven drying or "stoving" after application. These varnishes are not usually commercially obtainable by retail. They are based upon admixtures of hard bitumen and stearine pitch. Their manufacture is difficult, and they require skill in application. You might be able to obtain a quantity through any good paint shop in Plymouth, but we think that your better plan would be to use a good cold-drying black enamel of the cellulose type. These give very good surfaces, and they should be obtainable locally. If not, apply to either Messrs. Johnson & Co., Ltd., Manufacturing Chemists, Hendon, London, N.W.4, or Messrs. Nobles & Hoare Ltd., 3, Cornwall Road, London, S.E.1.

Wood Filler

CAN you give me the formula of a simple wood filler, to be used to treat wood before using cellulose paint?

Also, can cellulose paint be used over ordinary paint or varnish?—R. G. Kiledath (Hoddesdon).

A WOOD filler for your purpose is the following:

Bleached shellac.. ..	2 lb.
Methylated spirit ..	½ gal.
Barytes (fine powder) ..	10 lb.
Silica (fine powder) ..	5 lb.
Raw linseed oil	½ gal.

Dissolve the shellac in the methylated spirit and add the linseed oil. Mix the barytes and silica together and stir the dry mixture into the shellac varnish. Grind the whole to a paste and adjust the consistency to requirements with additional shellac varnish or barytes-silica mixture. Store in airtight tins.

This material is worked well into the wood and then allowed to dry previous to painting.

If silica and barytes cannot be obtained, whiting may be substituted, but the silica-barytes gives a denser filling mixture.

Cellulose paint (particularly when it contains acetone) tends to soften the hardened film of an oil paint. Hence it is necessary to apply the cellulose paint thinly, and with great care. Softening of the oil paint will be indicated by the formation of wrinkles. Since all cellulose paints do not contain acetone, we cannot condemn their use over oil paint films, but, usually, great care is needed.

Bleaching Polished Mahogany

I HAVE some old, dark french-polished mahogany. Could you please tell me if it is possible to bleach this and, if so, how it could be done? Also, could one apply the same process to veneer?—L. M. Galloway (Chester).

YOU do not mention exactly what area of mahogany you wish to bleach, but, assuming that the area is not extensive, the best process to adopt is the following:

Using the edge of a copper coin, carefully scrape the varnish away. This will necessitate the exercise of much patience, but by this means the varnish can be removed completely without injury to the underlying wood.

After this, dissolve 1 part of caustic soda in 6 parts of water. Make the resulting liquid into a thin paste with slaked lime and spread the paste on the wood surface. Allow it to dry, and then scrub it away, using plenty of water. If the wood is not sufficiently bleached, the process may be repeated. Be quite sure at the end of the process that all traces of the caustic soda are removed with plenty of water. Allow the wood to dry out slowly without any applied heat.

The process is not applicable to veneers, since the moisture would loosen the veneer. Veneers can only have their surface varnish removed by gentle scraping. The bare surface may then be sponged down with strong hydrogen peroxide, after which the wood is placed in the sun to bleach. With care, the process may be repeated two or three times without injury to the veneer, but, of course, an element of risk is always present.

If scraping of the veneer is not possible, a good commercial paint-remover will deal adequately with the unwanted varnish, but it will not effect a bleaching action.

Zinc Plating

I WISH to plate the inside of a can with zinc, the area of which is 60 sq. in. In an effort to do this, with current from a rectifyer (1 amp.) and a saturated solution of zinc sulphate with a zinc anode, I find that the metal deposited is in a crystalline form which is easily brushed off. Could you give me details as to how to obtain a coherent layer of zinc? The can is itself made of zinc, and was well cleaned with dilute acid previous to plating.

Also, could you tell me where to get porous pots (half-pint capacity or less), as I cannot obtain one in my district? Alternatively, could you tell me where to obtain china clay or similar material for making porous pots which could be hardened by heat or left to stand? It would have to withstand acids and alkalis.—G. Swepson (Cheadle Hulme).

THE failure of your electro-zincing is due to the use of the wrong solution and the wrong conditions. The best solution for zinc deposition is:

Zinc sulphate ..	3½lb.
Common salt ..	2 oz.
Boric acid ..	3 oz.
Aluminium sulphate	4 oz.
Dextrine	2 oz.
Water	1 gal.

This solution should be very slightly acid. Hence it is improved if a few drops of sulphuric acid are added to it. Use a zinc cathode of very high purity (such as is obtainable from Messrs. Wm. Canning and Co., Ltd., Great Hampton Street, Birmingham) and, for preference, use an accumulator as a source of current.

The solution should be operated at normal temperature at an E.M.F. of 2-2.5 volts and at a current density of 10 amps. per square foot of plated surface.

An alternative solution is:

Zinc sulphate ..	1½ lb.
Sodium acetate ..	6 oz.
Water	1 gal.

but it is not so good as the former one for normal work.

We believe that you can obtain special ready-made zinc-plating salts from the firm above mentioned.

Possibly, Messrs. Canning will be able to supply you with porous pots. If not, they may be obtained from Messrs. J. W. Towers and Co., Ltd., 44, Chapel Street, Salford, 3.

China clay may be obtained from the same firm, but we fear that you will find it quite impossible to make porous pots on your own, since such a task necessitates the use of a high-temperature muffle furnace.

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

Comments of the Month

By F. J. C.

The Highway Code

FOR once, George Bernard Shaw asks a question! In the April issue of a cycling house journal representing a club of which he has been a member since 1895, he writes: "Is not the Highway Code wrong in instructing pedestrians to walk on the right instead of the left? I am a very ancient cyclist and motorist, living in a district of lanes where the nearest footpaths are miles off. As such I know that it is far more important that the motorist should see the pedestrian than that he or she should see the motorist. Therefore I always walk to the left just as the cars drive. They can avoid and pass me just as they pass each other, and can act quickly and normally; and they have their attention fixed continually on the road and its dangers while pedestrians are wool-gathering."

The editor of the journal concerned emphasises the view of the club that motorists and cyclists alike should accept responsibility for avoiding collision with other road users. This is a refreshing change from the policy this club has hitherto adopted. For years it has advocated the policy that "The onus of responsibility in an accident lies with the driver of the overtaking vehicle." That has been their attitude in the opposition to fitting rear lights. No one could, of course, quarrel with the logic of it. But in other matters concerning accidents it has represented the view that cyclists are haloed saints who should have free licence to do more or less as they like upon the highway, that they should not be subject to any legislation or control, and that in effect they can do no wrong.

In a further comment the journal refers to remarks by the West Bromwich Coroner that children must be taught, as adults are beginning to learn, that motorists are the masters of the road to-day, and pedestrians have got to give way to them.

The club thinks, or at least the editor concerned does, that this policy will lead to the confiscation of the King's Highway by motorists. Utter nonsense! Pedestrians *are not* to be taught to regard themselves as trespassers and to leap for their lives when one of the "masters" approaches.

The time has come when touring clubs may no longer consider themselves the masters of the highway because they happen to have pedalled along it before the motor-car was born.

We agree that motorists have a greater responsibility because they are the drivers of a lethal weapon. Equally we must not be unmindful, as this club and this editor evidently are, of the fact that many accidents *are caused* by cyclists. Often in swerving to miss a careless cyclist the lethal weapon knocks down someone else. The onus of the accident, therefore, is not upon the "potential victim." It is high time that this sort of stupid anti-motoring nonsense ceased and that touring clubs ceased to be political organisations.

What does George B. Shaw know about cycling, anyway? Let him stick to his play-writing last.

Cycle Exports

THE President of the British Cycle and Motor Cycle Manufacturers and Traders Union, Ltd., states that: The achievement of the bicycle and motor cycle industries for 1946 may supply certain of those "precise facts," the lack of which "seriously hinders remedial action," states the Economic Survey for 1947.

The White Paper puts as the target for 1947 an increase in exports to 140 per cent. of 1938. Last year the number of complete bicycles exported had already shot beyond that target to 186 per cent. of the 1938 total. The number of complete motor cycles exported was even higher—270 per cent. of 1938.

It was a record year for the British bicycle industry. We exported 1,752,680 bicycle units (that is to say, complete bicycles and parts of machines representing complete bicycles). While our total output for home and overseas reached 3,093,327 bicycle units, our own target for 1946 had been set as high as 5,000,000. The main reason why our industry did not reach this target was insufficient supplies of steel and other materials. That same shortage, together with lack of fuel, was the primary reason that has compelled us to abandon this year's Bicycle and Motor Cycle Show.

As far, then, as manpower goes, the bicycle and motor cycle industries have clearly demonstrated that a 140 per cent. increase over 1938 is a simple proposition, given the materials to get on with the job. What our workers need is not lectures on production but steel for making bicycles and the necessary component parts.

How Many Cyclists?

A READER asks how many cyclists there are in Great Britain.

During the last 10 years the estimate has been going up and up from 6,000,000 to the 14,000,000 of a Gallup Poll the other day.

A firm fact is the number of bicycle tyres a year bought for replacement. It was 4,700,000 last year. If every cyclist, therefore, bought one new tyre last year, clearly we had 4,700,000 cyclists then. On an average, however, a cyclist will most probably get one new tyre every two years.

The Late Percy Brazendale

IT may be that Percy Brazendale, who died on March 28th, could not be termed a "real" cyclist, but the great thing is that he was essentially sound on all cycling matters, and that he intuitively knew what cyclists wanted. Probably the best example of this intuition was to be seen in the action he took when there was imminent danger of cycle traffic being excluded from the newly constructed road tunnel under the River Mersey. Brazendale, ever sensitive as regards the rights of cyclists, realised the gross unfairness of such exclusion—realised, too, that the prohibition might possibly be used as a precedent elsewhere—and initiated the action which caused the powers that be to change their minds, with the result that cyclists now share with other traffic the right to use a most admirable under-water highway.

Brazendale sat for many years on the Council of the Cyclists' Touring Club and on its various committees. He had passed through the chair of the Council and of the Finance Committee. As honorary secretary of the Liverpool District Association, he revitalised that branch of the club, and when he felt that the time had arrived for yielding up office to a younger man he was elected president, which post he occupied at the time of his death.

Until his retirement some years ago, Brazendale had been engaged in the cotton business in Liverpool. The wide knowledge of men and affairs, as well as of finance, which he gained there stood him in good stead in cycling affairs, and he gave unstintingly to the cause which lay so near to his heart. Indeed, it is true to say that he was prodigal with his gifts. Never very strong, the war years (and particularly the long railway journeys) imposed a heavy strain on him, and his withdrawal from the C.T.C. Council at the end of 1946 prompted his ex-colleagues to place on record their high appreciation of his services.

Two other points deserve mention. Brazendale was one of the earliest recipients of the Sir Alfred Bird Medallion, which is awarded annually to that member of the C.T.C. who is considered to have rendered the most signal service to the organisation during the previous 12 months. It was Brazendale's foresight—and intuition—which restored cycling lectures to high favour—to higher favour than they had ever before enjoyed. His suggestion to our contributor "Wayfarer" that he should provide a lantern lecture for the benefit of the Liverpool D.A. set a new fashion in this type of event and led to the giving of many lectures by various exponents of the platform art. In addition, it brought back the late "Kuklos" to this form of publicising our grand pastime. Thus it is true to say that Brazendale "builded better than he knew." He yielded to none in his devotion to the cycling cause. He was a worker, an enthusiast, and a great showman—always intent on keeping the wheel game in the limelight.

Paragrams

Meant to Get There

IN spite of the recent shocking weather conditions, Mr. G. Garside, of King's Lynn, was so keen on attending the dinner of the National Clarion Cycling Club at Peterborough that he rode all the way from King's Lynn on his tricycle. The next day he returned home by the same means of transport. Prizes and certificates were presented to members by the Mayor of Peterborough.

Boston Agent Ill

MR. F. V. WALKER, cycle agent and repairer, of High Street, Boston, who has been ill for about a month, has been admitted to Boston General Hospital for further medical attention. A report issued three days after his admission on February 10th stated that he was "much about the same." Mr. Walker has been in business in Boston for a number of years.

More Tramlines to Vanish

THE cost of remaking Aylestone Road, Leicester, following the discontinuance of the trams on that route, is estimated to cost some £93,000. For a distance from the centre of the city the lines will be removed but along the remainder of Aylestone Road they will be covered with tarmacadam.

We've Had It !

THE much talked about Humber Bridge looks like remaining a piece of wishful thinking for some time to come, in spite of all the arguments put forward in its favour. Travellers between North Lincolnshire and South Yorkshire will still have to use the ferry service, as the Minister of Transport has told a deputation from Lindsey County Council and Hull Corporation that he cannot authorise the building of the bridge at the present time.

Hard Work

WHEN James Reginald Partridge, a 29-year-old cook, was sentenced to two years' imprisonment at Middlesex Sessions for cycle stealing it was stated by the prosecution that altogether he had stolen 77 machines. "He appears to have been a hard-working bicycle thief," commented the deputy chairman, "and I understand he rode a tandem from London to Blackpool to sell it."

Treat 'em Rough

AN American firm of tyre manufacturers treat sample bicycle tyres which they make in a way that would make any self-respecting cyclist scream. The tyres are each mounted on a special wheel, in sets of about 10, and they are then towed behind a lorry backwards and forwards along dusty roads under the blazing sun. This cruelty to tyres continues until the tyres collapse under the strain and then investigations are made so that tyres can be produced to stand even greater punishment.

White Lines at Speed

A SPECIAL mobile plant, consisting of power spraying unit and compressor mounted on a car chassis, designed by Carl Sohmer, a Tacoma (Washington) engineer, is capable of painting white lines along the roadway at a speed of 25 miles a day. Three men ride on a platform at the rear of the vehicle and while one drives the other two operate the plant.

Cycle Tracks for North Road

KESTEVEN County Council are arranging to carry out a £400,000 Ministry of Transport scheme for the provision of a dual carriageway, cycle tracks and footpaths on that portion of the Great North Road in Lincolnshire from the Rutland boundary to the River Witham, north of Colsterworth, near Grantham. Work will start as soon as possible.

Fenland Club Celebration

IN spite of appalling weather conditions 85 members of the Fenland Road Riding Association and their friends managed to get to the Bell Hotel at Deeping St. James, Lincs, for the annual dinner and presentation of prizes. Roads were so bad that some members had to walk, although one enthusiast, who considered that three wheels were better than two, rode all the way to Deeping St. James from Hertfordshire on his tricycle. The Fenland Road Riding Association is associated with the Fenland Road Records Association and has kept in operation in spite of the dislocation caused by the war. A complete road riding programme was carried out by the association during 1946 and further activities are planned for the coming year.

Italian Brainwave

AN Italian inventor, who considers that a man has more energy to spare than he uses while pedalling the conventional type of bicycle, has produced a cycle which gives work to the rider's arms as well as his legs. The handlebars of this strange machine are pivoted in the centre and the rider has to move them up and down with a pump-handle motion. This handlebar drive transmits power to the front wheel by means of chains which work on chain wheels, one on either side of the front wheel hub. It is to be hoped that the rider, concentrating on his pedalling and pumping, does not forget to steer.

Staveley Wheelers' Annual "Do"

ABOUT 100 members of Staveley Wheelers' Cycling Club and friends were present at the annual tea and prize-giving at Staveley, Chesterfield. Mr. K. Bramall was in the chair, being supported by Mr. H. Spowage, the club secretary, and members of the committee. Members of other Derbyshire cycling clubs were also present.

Cycling on Footpaths

LEICESTERSHIRE COUNTY COUNCIL have decided to make a by-law forbidding cycling on footpaths, whether they adjoin a road or not. At present it is illegal to cycle on footpaths only when they are against a road.

Thanks, Mr. Mayor !

DURING his speech at the annual dinner and prize distribution of Northampton Eleanor Road Cycle Club, the Mayor of Northampton, Councillor P. C. Williams, remarked: "I must say, as chairman of the local Safety First Association and as a motor driver, that I have always experienced the greatest courtesy from members of cycling clubs I have passed on the roads. I admire this greatly, and I call upon you to act as disciples of the road and help us to cut down the number of irresponsible cyclists there are about. By doing so we might save a few more lives."

Jay Walker

CYCLISTS wobbled with a startled look in their eyes and motorists hooted in their usual "get off the road" manner when a swan wandered along the main street at Brigg, Lincs. It had been almost frozen up in the River Ancholme until it changed its temporary home to a spot near a waterfall where the river was less frozen, but hunger eventually forced it to go into the town. It was eventually cornered and given a new home in a shed with some straw and an issue of a bread and milk ration.

Good Progress at Boston

THE best financial year in the club's history was reported at the annual meeting of the Boston Wheelers Cycling Athletic Club, held at the club's headquarters in Pump Square, Boston. Some 36 members were present and plans were considered for the 1947 season. It was decided that the word "Wheelers" should be deleted from the name of the club, which is now to be known as the Boston Cycling and Athletic Club.

Straight Talk

A DEFENDANT at Peterborough Police Court was fined £10 for stealing a cycle and was ordered to pay a further £3 so that it could be put back into the condition it was when stolen. The chairman told the man: "The Bench take a serious view of the stealing of bicycles. It is a practice which has become far too general and it is a very mean kind of thing. A bicycle is to many people a very important part of their lives. It is a means of locomotion whereby they can get to and from their work and this court will do all in its power to see that offenders are dealt with properly."

Off the Road

A NORTHAMPTONSHIRE man claims to have been the victim of one of the strangest incidents of our recent Ice Age weather. He was cycling along the road towards Wellingborough through the snow when his machine suddenly fell from under him. He got up, shook off the snow that covered him and found he had been cycling along the top of a hedge where the snow had drifted and frozen. Unfortunately someone had left a gate open, and that was where he came to grief.

Dangerous Neglect

DURING Huntingdonshire's Road Safety Week the police checked 517 schoolchildren's cycles, and out of that number they found 359 to be defective and in need of repair. Referring to this at the meeting of Huntingdon Standing Joint Committee, the Chief Constable remarked: "It is necessary, in my opinion, for the law to be amended so that it would be an offence to ride a cycle without at least one efficient brake, on the rear wheel."

Three international sprint races were among the interesting events at the Good Friday cycle meeting at Herne Hill. Our illustration shows some of the riders in the Double Devil event.

Around the Wheelworld

By ICARUS

The Golden Book of Cycling

WHEN Albert E. G. Derbyshire, Jock Allison and Marguerite Wilson signed the Golden Book of Cycling at a happy function at the Comedy Restaurant on April 30th, when H. H. England, Editor of *Cycling*, was in the chair, I reflected that it was a great pity that someone had not been inspired about one hundred years ago with the idea of preserving for all time the records of the great riders, the great inventors, and the great supporters of the industry and pastime of cycling.

How nice it would be to have an autographed reference to MacMillan, Cortis, Renouf, Cotterell, Shoreland, to mention but a miscellaneous few of those who have made cycling history.

The Golden Book of Cycling, conceived by our contemporary in 1932, will, however, make good the omission from that year on. For in it is recorded the deeds of all those who have made cycling history, not only in the field of sport but in the sphere of cycling politics and inventions.

On the occasion in question the three I have named were the guests of honour, and in introducing them to a party of 78, Mr. H. H. England reviewed the history of the Golden Book in which are already inscribed many famous names. It is a book bound in vellum, attractively gilt and tooled, and with vellum pages. It is estimated that the book will last for at least 500 years, and within its pages succeeding generations will be able to read of the deeds of those of past generations. The conception of this book is a brilliant idea, and it is not easy to get one's name recorded in it.

The occasion was taken to present to Albert Derbyshire the Bidlake Memorial Plaque for 1946, for his outstanding rides during the year.

Marguerite Wilson was suitably introduced to the guests by Petronella, Jock Allison by Vic Jenner, and Albert Derbyshire by G. H. Stancer. Entertainment was provided by Grace Nevern. Among those present were E. J. Southcott, A. J. Chamberlin, Vic Jenner, B. W. Best, G. Stone, R. W. Coley, W. H. Townsend, G. H. Goodwin, S. M. Vanheems, and other officials of the National Bodies. There was the usual cross-toasting, and when E. J. Southcott asked to be allowed to take wine with the critics of the N.C.U. the whole assembly spontaneously jumped to its feet! A memorable and most enjoyable evening.

The Paris-London Race

THE International Road Cycle Race between Paris and London promoted by the *News Chronicle* will undoubtedly be the major event in the 1947 cycling calendar. It will be contested by teams of 30 drawn from each country, and the 250 miles event will, in effect, be the selection race to determine the choice of the British team of four riders at the World's Championships in August. The teams will be nominated by the Cycling Federation concerned.

After many weeks of negotiation, necessary to reconcile the different rules prevailing abroad, agreement has now been reached with the French organisation, the N.C.U., and by the British purely domestic tribunal, the R.T.T.C., which, of course, has not international recognition. The race will be run in two stages; the start will be from Paris on Whit Sunday, May 25th, and the field will race under French massed-start rules to carry over a distance of 170 miles. The race will be resumed after the riders have crossed the Channel from Folkestone under British Time Trial rules.

The riders will be timed in at Calais, and this time will be added to their performance in the English T.T. section, the rider covering the total of 250 miles in the best time being the winner. The riders, of course, start off one by one in this country at intervals of a minute; and each rider must travel alone without any assistance from any other competitor. The race will culminate in an England versus France match on Whit Monday.

B.L.R.C. Roller Contest Televised

P. BOND of the Polhill R.C. won the league's first Roller Competition at Collins Musical Hall in 34-4/5 secs. for the 480 yards. This event was televised.

The Tour de France

A FRENCH journal has given prominence to an ultimatum issued by the Dutch authorities concerning the Tour de France. It says that leading Dutch cyclists are surprised by the decision of the organisers of the Tour de France to engage half a Dutch team to join a half team of English riders. The Dutch have refused the invitation made to them because the English road racers are inexperienced. Holland demands one Dutch team in the Tour or none at all. It is worthy of note that the "inexperienced" road racers referred to are the N.C.U. possibles.

Rear Lights

MR. G. PAYNE, of the Century Youth Club, asks:

"During the war cyclists were all told that they must have rear lights, and when they got them everybody else seemed quite happy about it and said that at last they could see bicycles quite clearly in the dark.

"Now it is reported that next winter the Minister of Transport proposes to add to the rear light, used right through the blackout, a white patch and red reflector as well.

"Need that be done at this present moment in time? Sheet steel and white paint for mudguards, tinplate and glass for reflectors, must all be in short supply. Why shorten it further on a job which was not thought necessary in wartime, when cyclists were riding with much less light all round them?

"No other group of road users is compelled to use three ways of showing where they are."

The Cycling Ambassador

THE new American Ambassador, Mr. Lewis Douglas, has accepted the invitation of George Wilson, O.B.E., president of the British Cycle and Motor Cycle Traders' Union, Ltd., to accept a bicycle from the British industry, to whose workmanship a striking tribute was recently paid by the National Bicycle Institute of the U.S.A. Sixty British cycle makers are balloting for the honour.

Lighting-up Time

UNTIL October 4th lighting-up time for road vehicles, including cycles, will be from one hour after sunset to one hour before sunrise, instead of from half an hour after sunset to half an hour before sunrise.

Minding Their Bikes

THE Ministry of Transport have approved of an outlay of nearly £20,000 for the better storage of bicycles at railway stations, Mr. Barnes states in reply to a protest by the National Committee on Cycling.

"In 1943," he informs Mr. John Parker, M.P., "we authorised improved storage arrangements at 234 stations, costing about £11,000, and since then new works or extensions on 269 sites have been approved at a cost of nearly £9,000.

"As you will appreciate, in present circumstances the companies cannot do all they would wish, owing to the more urgent calls upon the available labour and materials for essential works, but applications for building licences to enable them to extend storage facilities for bicycles indicate that the need for further improvement is recognised, and are always sympathetically considered in my department."

Before the pupils of the Putney County School for Girls can ride their bicycles to school, it is necessary for them to pass certain road tests, etc., in order to receive a special "licence" which is issued by an appointed committee. In the illustration a policeman from the local station gives some of the pupils the benefit of his knowledge on "safety first."

Wayside Thoughts

Off to Erin

THE news of food shortages in Ireland will probably deter many a tourist from making acquaintance with that uniquely lovely country this season; which is a pity, for Ireland is the next best thing for the individual who yearns for foreign touring. I made my first visit to Ireland at the age of 19, and on and off have been within its shores on many occasions. If I say Irish roads and sign-posting have improved enormously during recent years, it is a fact which I hope will not offend some of my young Irish friends who are inclined to take umbrage at any suggestion that Ireland could possibly be improved! Some of my happiest touring memories are of the south-west, that land of loveliness 'twixt Cork and beyond the Dingle Peninsula, and curiously enough I have nearly always had the luck of golden weather, and when that happens to a wanderer Ireland can be a paradise. I do not pretend to know Ireland—that would take a lifetime of leisure—but I have ridden a bicycle down the east coast to Cork, spent glorious days at Glengarriff and Killarney, and slid round the Dingle and seen the Blasket Islands sit in a sea of sapphire, climbed the O'Connor Pass, along the west coast to Limerick, crossing the Bog of Allen back to Dublin. Wicklow and Wexford, too, and the dear Dublin Hills have I crowded into eight days of hefty riding, and Connemara has charmed me for a full fortnight, for it is a spacious country no man should pass through with urgency. And I've stood on Galway's Bridge and seen salmon by the thousand, crossed an arm of Lough Corrib to Cong, and seen the ruined villages by the shores of Lough Mask, a monument to the horrors of the potato famine of '45. North, too, have I roamed through Donegal and Londonderry, and along that famed Antrim coast road from Cushendal to Belfast, and only the sea roads from Belfast to Dublin have remained outside my orbit; and one day soon I hope to fill that gap and find many more to help complete the charmed circle of Irish beauty and Irish characteristics. That is why I'm sorry that easy conditions of accommodation in Ireland may be upset and feel something of the shortages and frustrations still in being this side of the Irish Sea. Perhaps by the time these notes are in print conditions will have improved over there; I hope so, for it is a great holiday ground and specially so for the cyclist.

What Is the Cost?

WHAT is the average daily cost of straight cycle touring in this country? Candidly, I don't know, for I haven't been on the road from place to place since 1942, and even at that period, in Scotland, three of us were compelled to make a couple of areas our centres, since telephone information gave us the story of over-bookings and scarcity of everything. Before the war some of my young friends said they could tour on ten bob a day, but to be candid I was never able to do this, and my best-kept record was in the July of 1939, when total expenses for three worked out at 13s. 11d. per day, including travel from Birmingham to Dublin and back via Belfast. I thought that rather good at the time, and I think it was, considering we did not deny ourselves the fruits of the earth, and were not trying to "cut the price" beyond picnic lunches with thermos flasks, and that was much more a matter of convenience than expense saving. My touring-from-a-centre holidays during the war and since have certainly been the most expensive cycling trips I have known; but that is not surprising. I should think it needs all of a pound a day to meet the complete expenses of a straight cycling tour, and that is not reckoning such personal items as tobacco, strong liquor and postage stamps. The luckiest people—and I'm glad of it—are the young ones to whom communal life is a lark, for they have the Youth Hostels, and I suppose 50s. a week—if they can secure the accommodation — would see them through handsomely. What a boon that movement has been to the cycle touring community, particularly the youthful ones. Had such an institution been in operation in my young days, I think my knowledge of this lovely land would have been more complete, and that richness added to my memories. But we did not do so badly, for a plain tea was 6d. in the 'nineties, and we lads knew lots of farms and little country inns where supper, bed and breakfast ranged between 2s. 6d. and 4s.; and what suppers and what breakfasts!

Your Own Joys

THE times ahead, however, will be as bright and jolly as those gone, of that I've no doubt. The shorter working hours, the heavier wage packet, holidays with pay—it's going to be a happier world once things have settled down to the new level and a sense of stability returns to the world. We live so close to the news to-day, our hopes and disappointments alternate so rapidly, that we seem to have too little time to mould our lives to an even tenor. But go cycle touring, forego your newspaper and the wireless for a few days, and it is astonishingly delightful to see how easily you get along with the world, and transversely how easily the world wags on without you, which is an excellent cure for egotism. And that is exactly what I should like to see many people do who now imagine they are hard used or individually repressed, to go cycle touring, clean their minds with fresh air, invigorate their bodies with exercise. It is the time of the year when many people are thinking how to use the leisure period coming to them, and I say if it be possible go cycle touring, take to the road with a decent bicycle and a fit body and glory will enter into you. There is no more urgency about cycle journeying than you care to make; it can, if you wish, be almost as idle as the seaside lounge, and I'm not sure that the elimination of haste in any shape or form is not the ideal, for it fills your book of memory with far more pictures than the scuttle from place to place. My ideal companion is the man with a camera, who loves his art as greatly as he loves his country, for then I know my rests will be in delectable places, and the pipe will indeed be one of peace. We shall not do too badly in this epoch-making era, we cyclists, if we can but persuade ourselves that this game of touring is the practical interpretation of the seven league boots of romance.

The Miracle

TALKING of a life's cycling, how easily a habit once formed becomes comfortable and part of one's existence. To-day I should be lost without a bicycle; yet I take the article for granted, and only think about it in the terms of the miraculous when on the summit of some moorland road with great views running to the coloured valleys and the cloud shadows sweeping the heather like the hands of fate darkening the vision for a moment, as so often occurs to our human lives. Then I do sometimes wonder at the magic of the bicycle, this thirty to thirty-five pounds of metal, rubber and leather that gives my muscular energy four times its natural speed so easily and comfortably, and carries my hundred and fifty pounds over 50,000 miles of highway, by-way and track in perfect safety. As a piece of machinery it has no compeer either in the engineering or the personal sense, for I know of nothing in the world of mechanics to approach the wonders it performs, or, in the human sense, anything that can give the owner such a diversity of pleasure or so wide a convenience in travel. And consider its cost. Sometimes I am taken to task when a new bicycle comes home. "What," they say, "another bicycle? Why do you want another to add to your collection?" And invariably my answer is of the soft persuasion that turneth away wrath. "My dear, all my bicycles do not cost half the price of, your car, and nothing comparable to run them." It is wonderful, when you come to appraise the value of the bicycle, particularly when the article is properly used by the good rider, how very much we take as a matter of course, and forget to remember how poor the world would seem to us if the bicycle was not. This is not a matter of sentiment, but of fact, too often a neglected theme in the literature of cycling, for rightly or wrongly I believe that if most of us understood our marvellous good fortune in living during this epoch of cycling and travel interest, we should take greater care of our property, and at least occasionally realise the miracle of it.

Cause of Delays

SOME weeks ago I had lunch with one of the big cycle manufacturers, whose temper had been a trifle ruffled by my gentle criticism on the lack of good bicycles, good equipment and spares. After that meal I walked round the works with my friend and saw the evidence of export output in the hundreds of cases stencilled with the name of every port of the seven seas, awaiting shipment. "That is one reason," he said, "why we cannot get down to the production of the better bicycle in the quantities we desire; here is another." And the other was gap after gap in the ranks of the automatics, waiting for the machinery to come home, machinery that had been on order for over two years, and that had doubled in cost since the order was placed. That is the makers' worry; ours is the waiting. My friend agreed it had been an error to promise users all sorts of improvements in cycle design and construction while the war was still in being: but apparently no one had visualised the tremendous export demand, and the cycle trade, like others, had expected to be busy with improvements, but suddenly found itself involved in a world demand the like of which had never previously been known. Now this is not an apology from maker to rider, but an explanation, and the expression of a desire for the trade to show us what it really can do in design, improvement and equipment during this year of 1947. That it will be difficult to fulfil completely the contract of the better bicycle, I can understand, but the question must have some urgently prior attention very soon. I'm glad to have been given the evidence that the big maker wants to get out of the basis rut and show us the goods that make cyclists and keep them riding right through a lifetime.

Drumming-up Best

THE touring season is only just in, but the conditions in the accommodation world do not seem to show much improvement. I suppose it would be hopeless to expect any great change until rationing of food and household equipment ceases, and much as we may deplore the facts, they are there, and we must face them and make arrangements for centre touring, or on the straight journey from place to place undertake the risk. I am bound to confess the several occasions when I've wandered round a country town trying to find food and a bed, and have been only successful after many visits, have not given me much hope of the quick return of the old and seemingly far-off happy days when we rode into the village and found a welcome at the first call. So I am afraid it will be centre touring with lunch in the bag and a hope for some sort of tea before the return to the resting place for the evening meal. At the moment we are talking of a Scottish trip, four of us, with possibly centres at Garve and Loch Alsh, a primus stove and picnic outfit, ration books and a hope that we may persuade the inhabitants of Caledonia to be kind to the Sassenach. Whether the project will eventuate depends on railway, domesticity and industry, and sometimes the three are difficult to co-ordinate. But there is no doubt that this picnicking business—a meal where and when you will—is not only convenient but great fun when the party is joined in friendship. And it is cheap, the only handicap being the extra luggage weight to be shared by the quartette.

The Merry Campers

IN these memories and suggestions for cycle touring I have left out of count the campers, for never having camped in the sense of carrying the pack by bicycle, I've no personal knowledge of the business. With a car as excess luggage carrier to the cyclist, camping can be luxurious, and I've undertaken this many times with the family party, the only snag being that sometimes the motoring section want to go a trifle farther in the day than I desire to ride. But generally we managed to compromise on that subject before the striking of the over-night site. Cycle camping in anything approaching its modern form and convenience was not introduced until I was into the forties, and by then a man does not easily alter his habits, which means in my case that I put comfort before cost, and imagine I'm no worse a cyclist on that account. I am quite sure, however, that had present-day equipment been available when I was in my twenties, camping would have been to me an undeniable attraction, for it is the last word in the story of cycle exploration, and perhaps for the not-so-old the best adventure. Many times have I seen and talked to cycle campers, when the weather has been kind and when the storms have half wrecked their gear; but I've never yet found one on the field with other than a laugh for all the ventures; though I must admit I know one or two people who, after experiment in expert company, have found the carrying handicap and the 2 a.m. atmosphere of the tented field a little strenuous and trying. But the strength and warm blood of youth counts this as nothing more than part of the game, and there's no doubt the cult of cycle camping will grow, improve and prosper by the very enthusiasm of its advocates. And good luck to them, for it is a clean life and a happy one.

Definitions

A PESSIMIST is a man who looks in both directions before crossing a one-way street.

A battery lamp is a device which functions admirably during the hours of daylight and develops temporarily incurable faults when darkness falls.

A cycling cape is a voluminous (or skimpy) garment which obstructs the movement of the wearer. In its wartime version it will do anything except keep the cyclist dry.

A side-walk is something which is carefully avoided by the people for whose use it is provided.

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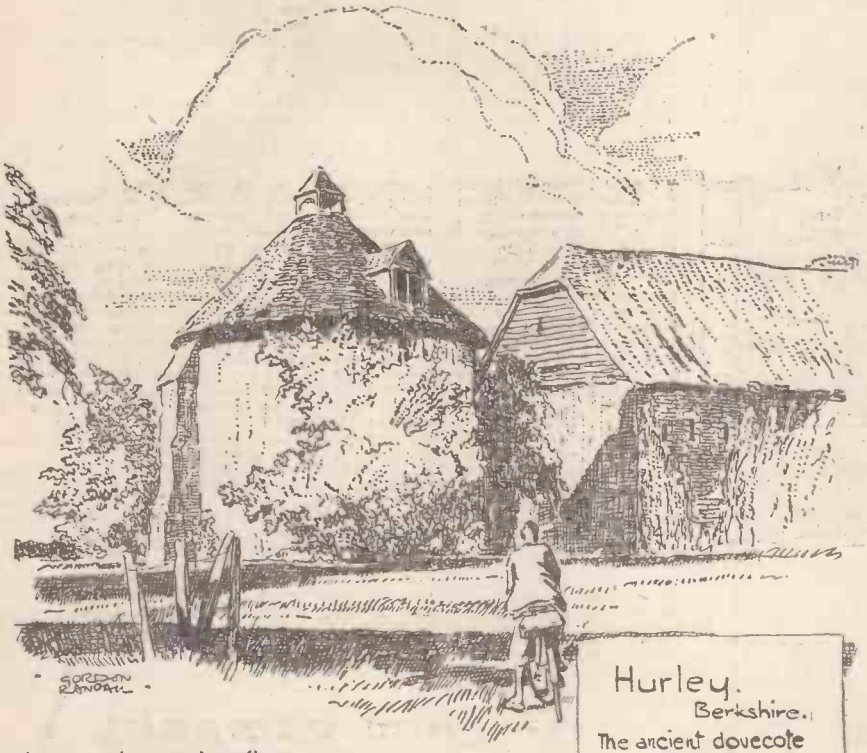
BEST TODAY ★ STILL BETTER TOMORROW

CYCLORAMA

By H. W. ELEY



Hurley. Berkshire.
The ancient dovecote and great barn.

White Patches and Reflectors

THE Minister of Transport has informed the National Committee on Cycling that he is now considering putting into force the regulation making it compulsory for cyclists to carry white patches and red rear reflectors, in addition to rear lights. Now, this very controversial question is, of course, closely bound up with production matters, and the National Committee has rightly pointed out that it is most unlikely that the various parts will be available in adequate quantities for some 12 months or more. It is fatuous to impose any regulations which demand the purchase of parts and devices when those parts and devices are not in supply, and it is to be hoped that the Minister will defer the imposition of this regulation.

"The Raligram"

RECENTLY, my good friend Fred Keller, of the Raleigh organisation, sent me a copy of No. 1 issue of a new Raleigh publication, intended primarily for dealers. It is a bright and very readable little journal, and should form a most excellent link between the Raleigh Company and its immense number of dealer-friends. I am always impressed by the vigour and originality of Raleigh publicity material, and this particular dealer-journal is no exception to the rule. It announces, by the way, that in future all publicity matter will carry a picture of Sir Walter Raleigh . . . and a special statuette has been produced for dealer display. There could be no more appropriate "figure" to represent Raleigh Industries, Ltd., and I gather that apart from the well-known marks of Humber, Rudge, Robin Hood, etc., the gallant figure of Sir Walter will be a connecting link and be associated with all the products of the group.

Does the B.B.C. Neglect Cycling?

THE suggestion was made to me the other day that the B.B.C. did not give anything like sufficient attention or time to the great game of cycling. Well, it is a thought, and when I come to think about it I wonder whether there is not some solid foundation for the complaint. How many talks on cycling have we had? I mean really sound talks by experts. How many accounts—in serial form—of cycling tours? I know that one is on very delicate ground in breathing any criticism of that august body which caters, so well in the main, for the varied tastes of the listening public . . . but cycling is a national concern, and the number of cyclists is to be counted in millions!

Propaganda for the Benevolent Fund

THE "crisis" and the arctic weather, making travelling almost impossible, put a temporary stop to the activities of the committee which is endeavouring to publicise the Motor and Cycle Trades Benevolent Fund, but activities are now being resumed, and various advertising managers who have the fund very much at heart are joining forces with the executive committee of the fund, in a real effort to make it better known and widen its influence. It is a great pity that more people do not realise what the old fund has done in its time, and what an admirable edifice has been reared on the sound foundations laid many years ago by A. J. Wilson . . . "Faed" of blessed memory to the cycling fraternity.

The Fading Glory of May Day

I WAS reminded of it all when I looked at some notes I had made years ago, of a ride in Cheshire, when I had the good fortune to be in Knutsford on May Day . . . in that very Knutsford which is featured in "Cranford." In this old town, May Day used to be celebrated with due pomp and ceremony. Gay colourful processions . . . beribboned horses . . . maypoles carried around by happy children who distributed posies of springtime flowers. I do not know whether the good folk of Knutsford still carry out these ancient ceremonies, but I do deplore the passing of the pageantry which was always associated with the first day of May. For it is a significant day . . . ushering in the sunnier, happy days of spring and summer. In my boyhood days, every carter saw to it that his horse was suitably bedecked with flowers and ribbons, and I fancy that the schoolchildren were granted a half-holiday. But we live in less romantic times, and so many of the old customs, beloved of our forefathers, have been allowed to lapse.

Steel and the Cycle Trade

THE statement by Sir Edmund Crane, about the cutting down of steel supplies to the cycle industry, made sorry reading. It will mean fewer cycles for export, and the news brought a speedy reaction in cycle industry shares. Our production difficulties are not by any means solved. Coal is not the only commodity which we need in greater quantity . . . and every factory manager and executive is worried by the fact that however men and women respond to the call for more intense effort there can be little point in urging to greater effort if the raw materials of the jobs are not available. But there is one commodity we still need—*optimism.*

That "After-Easter" Week-end

IT was the first real spring and sunny week-end for I do not know how long, and how the cycling fraternity revelled in the sunshine and made the most of the opportunity of getting out on the open road! I was out on that sunny Sunday, April 13th, and it was good indeed to see so many riders awheel. The by-pass roads were thronged with cyclists making for the open country, and as I live in North London I had good opportunities of observing the riders, and the riding, on the North Circular Road. The standard of riding was good, and I noticed with much pleasure the careful way in which cyclists travelled. And, leaning against a gate, smoking a pipe, I could not help thinking how untrue are many of the harsh criticisms of cyclists! To hear some motorists talk, one would imagine that every bit of carelessness should be laid at the door of the cyclist!

The English Counties

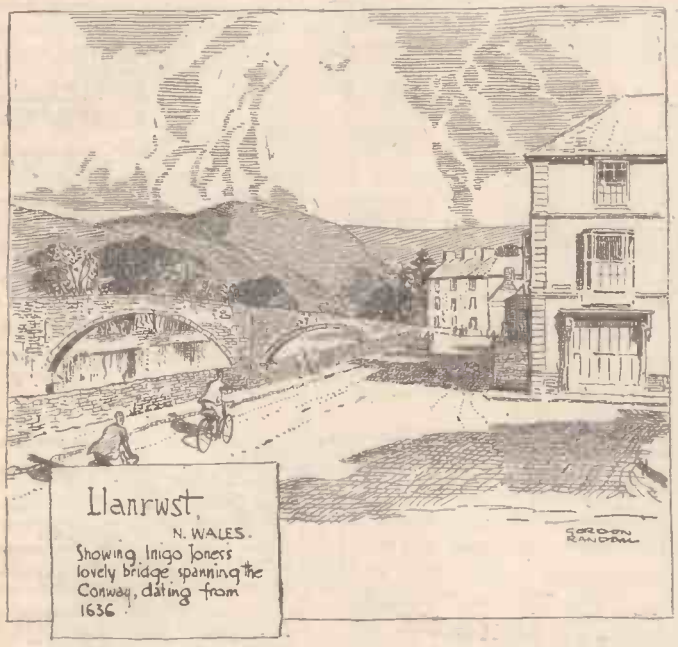
RECENTLY I was asked to recommend a book or books on the counties of England . . . and I unhesitatingly recommend those fine books of the late Arthur Mee . . . in that splendid series, "The King's England." I do not know how many he wrote in the series, but all I have read are wondrous tributes to the essential characteristics, customs, features and attributes of our various counties, and Mee captured the spirit of Devon just as surely as he captured that of Durham and Warwickshire. And . . . there is also that fine book by W. Shears, "English Counties," which gives a wealth of detail about each shire. With these volumes as companions, a tour of our counties is given a new magic and meaning.

The Cycle Thief is Still With Us

YES! he still operates, and finds a fruitful field, merely because so many riders neglect to provide themselves with locks and keys. And yet these are not in particularly short supply! In a world where thieves still abound, and where bikes are precious possessions, it behoves every rider to equip himself with a safety lock.

My Point of View

By "WAYFARER"



The One Safe Line

ON a winter evening I attended, by invitation, the meeting of a Discussion Group which fore-gathers weekly in order to dispose of world affairs. The subject was "Road Safety," and the proceedings were set in motion by a brother-cyclist, a brother-pedestrian, and a motorist. After they had said their respective pieces the matter was thrown open for general debate, a period of two minutes being allowed to each speaker. Seldom has so much utter drivel—lots of it irrelevant—been let loose! As speaker succeeded speaker, I began to see more and more vermilion, and finally I sent my name up to the Chairman, and was dully called upon for my contribution. What I said was pretty frank and corrosive, as it was meant to be, for I am not normally in the habit of wrapping up or watering-down what I have to say, and my remarks were received with obvious delight by the cyclists present.

After the meeting a man came to me and spoke thus: "My daughter, who is a school-teacher in Kent, has to drive a motor-car along dark and narrow lanes with many bends and corners. She tells me that most of the cyclists she encounters—mainly working folk on their way home from toil—ride without rear lamps and are very hard to see, particularly as they wear dark-coloured clothing. She finds the conditions most difficult." That statement was meat and drink to me, and I naturally inquired, first, how his daughter managed to see pedestrians, I believing (in my innocence) that cyclists presented the lesser problem. As expected, the reply to this was that pedestrians would be on the side-walk. "What!" I retorted, "Side-walks in those narrow lanes? Most unlikely, and, even if they existed, it was open to question whether they would be used."

I went on to say that a cyclist was confronted by just the same problem as that experienced by his motoring daughter. I, personally, revelled in those "narrow lanes with many bends and corners," which I considered the safest form of public highway. I knew they were apt to be dark at night; I knew, too, that working-class utility cyclists might not bother about rear-lights. I knew, also, as an active cyclist accounting for hundreds of miles in the dark every year, that pedestrians had to be watched for and that there were obstructions to be anticipated—fallen trees (during stormy weather), milk-churns, cattle, and broken-down motor-cars, for example. There was only one safe line of conduct, I added: Don't rely on somebody else to do something. Be independent. Light your own way and let your speed bear strict relation to the illumination you provide and to your braking power. Don't complain of the darkness, which, after all, is nothing new; don't grumble because people wear dark clothes, as they have a perfect right to do. To suggest anything to the contrary would imply a monstrous interference with the liberty of the subject. Look where you're going, and don't go if you can't see.

Calculation

WALKING home from business the other evening, I witnessed a simple (and, fortunately, not serious) accident which ought to have been avoided. The two streams of traffic in a main road had halted in order to allow some side-road vehicles to emerge. This stoppage conveyed nothing to a motor-cyclist, who dashed into the breach, hit the leading motor-car, which was going at walking-pace, and then crashed into a standing motor-lorry on the other side of the road. Two and two make four. It needed a calculation just as simple as that to show the motor-cyclist that two lines of stationary traffic on a main road meant something. We cyclists may fitly remember this particular truth, too

No, Not Worth It

IT must be conceded that "True Stories (taken from road accident records), No. 1," being a new aspect of the Ministry of Transport series of "Keep death off the road" advertisements, has my full approval. It depicts a cyclist (of the trousered, flying-jacket type) holding on to the back of a motor vehicle. Under the caption "It isn't worth it," the reading matter states that "this lad will long regret that he broke paragraph 66 of the Highway Code. He got five weeks in hospital—and a wrecked bicycle. And it might have been much worse than that." It is probably true to say that the lad was unaware that he was breaking the law—and more than probable that he never reads the cycle press. And quite likely he has never heard of the Highway Code. So the question is: How is this type of "cyclist" to be saved from his folly? What is more important, how is he to be prevented from indulgence in an act of folly which may have unpleasant results for other cyclists? I see no solution of this problem.

Repentance

IN a recently published book called "The River Windrush," by Wilson MacArthur, the story is told of how the author, when in the neighbourhood of Burford, had a serious accident with his camera. His tour was interrupted, but later, borrowing a bicycle, he returned to the river "and for one whole day pedalled, pushed, heaved, dragged, and carried that bicycle on high roads and by-roads and lanes and paths and over fields and through woods and across marshes . . ." And then this:

> It was a salutary experience, after more than two decades of regarding cyclists as natural-born imbeciles and the curse of the roads; I heartily agree that all motorists should be compelled to qualify as cyclists before being allowed to hold driving licences; it would induce a different attitude and probably save the nerves of innumerable cyclists.

The confession is a generous one, and the repentance is obviously made in earnest. Clearly there are two sides to this question of road users, and it is true to say that we cyclists are neither "natural-born imbeciles" nor "the curse of the roads." Thank you, Mr. MacArthur, for these words.

Something More

HAVING referred to one book, let me mention another. The following is extracted from Harold Nicolson's review of L. S. Amery's new autobiography, "In the Rain and the Sun":

> Mountaineering for Mr. Amery has been something more than a fine physical adventure, something more than "an emotional thrill." It was not only health and strength that it gave him; it was not only that it fortified his natural powers of determination and endurance. He found more than detachment: he found serenity.

All of which might equally be written about cycling, in your case and mine. For cycling—so much easier of achievement than mountaineering—is a fine physical adventure, endowing its devotees with health and strength, and fostering determination and endurance. It, too, does provide welcome detachment and precious serenity. Cycling also makes available a plentiful supply of fresh air, but, as no charge is made for this commodity, it seems to be a drug in the market. More's the pity.

The Unintelligentsia

ON a bleak afternoon in the winter I encountered a new example of the colossal ignorance which seems to be the prevailing characteristic with many people. To me it is extraordinary that so little is known and realised about our pastime. On this particular afternoon I came to a farm in Worcestershire which I usually frequent for tea on Saturdays. The conditions of travel had not been easy, thanks to the temperature and the rain, but I had thoroughly enjoyed myself, and I looked forward to an extra reward in the shape of what is really a pre-war tea, taken in a comfortable room.

A party of two boys and two girls formed a half-circle round the fire, and they courteously made room for me, though I explained that I never sit "on top of fires." The spokesman of the party, addressing me as "Sir," asked how far I had come, and he nearly fell into the fire when I told him. After all, it was only twenty miles, and I deprecated any suggestion that this was a feat. It was, indeed, just a commonplace ride. When was I going back—to-morrow? My young friend nearly fell into the fire again when told that I was setting forth after tea, and that my ride home might account for a mileage of 25 or 30. It was incredible to him. There was a time, he said, when he cycled to work, four miles each way, and it "nearly killed him." I informed him, quite frankly, why he had been so often at death's door: it was because he had not troubled to fit himself for the job, and he was probably indifferent as to the sort of bicycle he used. I suggested that it was likely he was pushing about nearly 100 per cent. more bicycle than was necessary. This led him to ask how much my bicycle weighed, and what gears I used.

Fortunately he was now getting acclimatised and was not so prone to fall into the fire. So nothing untoward happened when I said that I used a 63 gear, fixed, though I added, hastily, that when I found a hill difficult to ride up I dismounted and walked, and thus I had available an alternative "gear."

I hope that the enlightenment which was provided during this interesting conversation will not be without value. The man-in-the-street is woefully ignorant on the subject of our pastime, and I always like to do what I can to sweep away this mental blackness, whenever an opportunity comes in my direction. Such people do not read the cycle press, and the daily press—perhaps mercifully!—have long since ceased to cater for the cycling section of their readers, on the principle, no doubt, that our pastime was put on the shelf long years ago. And thus the man-in-the-street—quite an important individual—must wallow in darkness, never realising the strength of the pastime, and never knowing the infinite possibilities in the way of travel which the bicycle possesses.

Perhaps in no way is the wrong opinion of the Common Man (alternative title, borrowed from "1066 And All That") better exemplified than in his attitude to current conditions of travel. All his knowledge of traffic is derived from city streets during the morning and evening rush-hours, and he presumes that those conditions are paralleled everywhere, and at all times. Oh! that people would use their divinely created faculties and go out into the country, there to see for themselves how different are the actual conditions of travel! I say again, as I have often asserted, that the keynote of cycle travel, taken as a whole, is loneliness rather than congestion. By "using my head" in a most elementary way, I can travel for miles and miles on a Saturday and Sunday, within 25 miles of the great city in which I live, without suffering the slightest inconvenience at the hands of other traffic. On the greater part of my normal Sunday afternoon jaunt of 20 or 25 miles, I would be in danger of dropping dead (with amazement) were I to encounter more than half-a-dozen motor cars. Fact!

Accessory After the Fact

AN acquaintance gave me a lift home from town in his car the other day, and I was not ungrateful. I regretted to note, however, that he ignored the one "Halt" sign we had to pass, and that when he came to automatic signals with the red light showing against us he looked round to make sure that there was no other traffic about and then drove on, saying: "I don't see why I should stop." Nobody was endangered by these two illegal acts, but I—an unconscious accessory after the fact—could see no reason for deliberately flouting what are, after all, real safety measures. That way, I believe, will ultimately lead to trouble of one sort or another.

Strange but True, and . . .

AT cricket, the batsman and the wicket-keeper (and others) get down to their respective jobs: the golfer bends to address himself to the ball: the tennis-player flings his arms all over the place: on the bowling-green the players crouch to manipulate their "woods:" footballers are anything but upright. And nobody says a word. But how undignified is the cyclist as he bends over his handlebars!

. . . True but Strange

THE cricketer, in his flannels, passes through the busy street unnoticed: so does the group of footballers. No comment is made regarding the scout-master hurrying to his post of duty: the harrier bounds along and causes no amusement. The man (or woman) intent on horse-riding strolls round to the stables, dressed for the part. Silence reigns. But when the cyclist, in shorts and open-neck shirt, comes along, the man in the street finds the sight screamingly funny. I wonder why it is?

Different Outlook

COMING back from a business journey by car the other evening, I told the young relative who was driving me that we would take a dive into the lanes, and she dutifully turned off the main road at the indicated point. I thought that perhaps she would be interested in the tortuous route which I follow regularly as a cyclist, but disillusionment was my portion, and, five miles ahead, when we were about to cross a highway in order to continue our crooked way, she put her foot down (metaphorically) and her left "flapper" out (actually) and announced that she was going to do the rest of the journey by main road. Poor father was helpless—but he had had "a run for his money"! The difference in outlook is interesting—and understandable.

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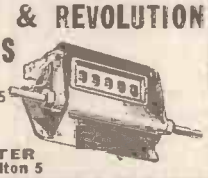

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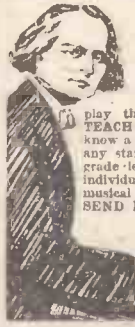

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