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PRACTICAL MECHANICS

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EDITOR: F. J. CAMM

JULY 1950

REPAIRING DAMAGED WINGS
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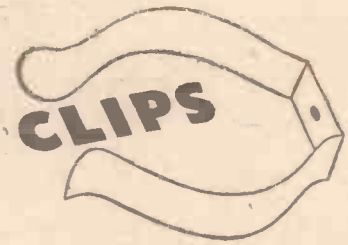

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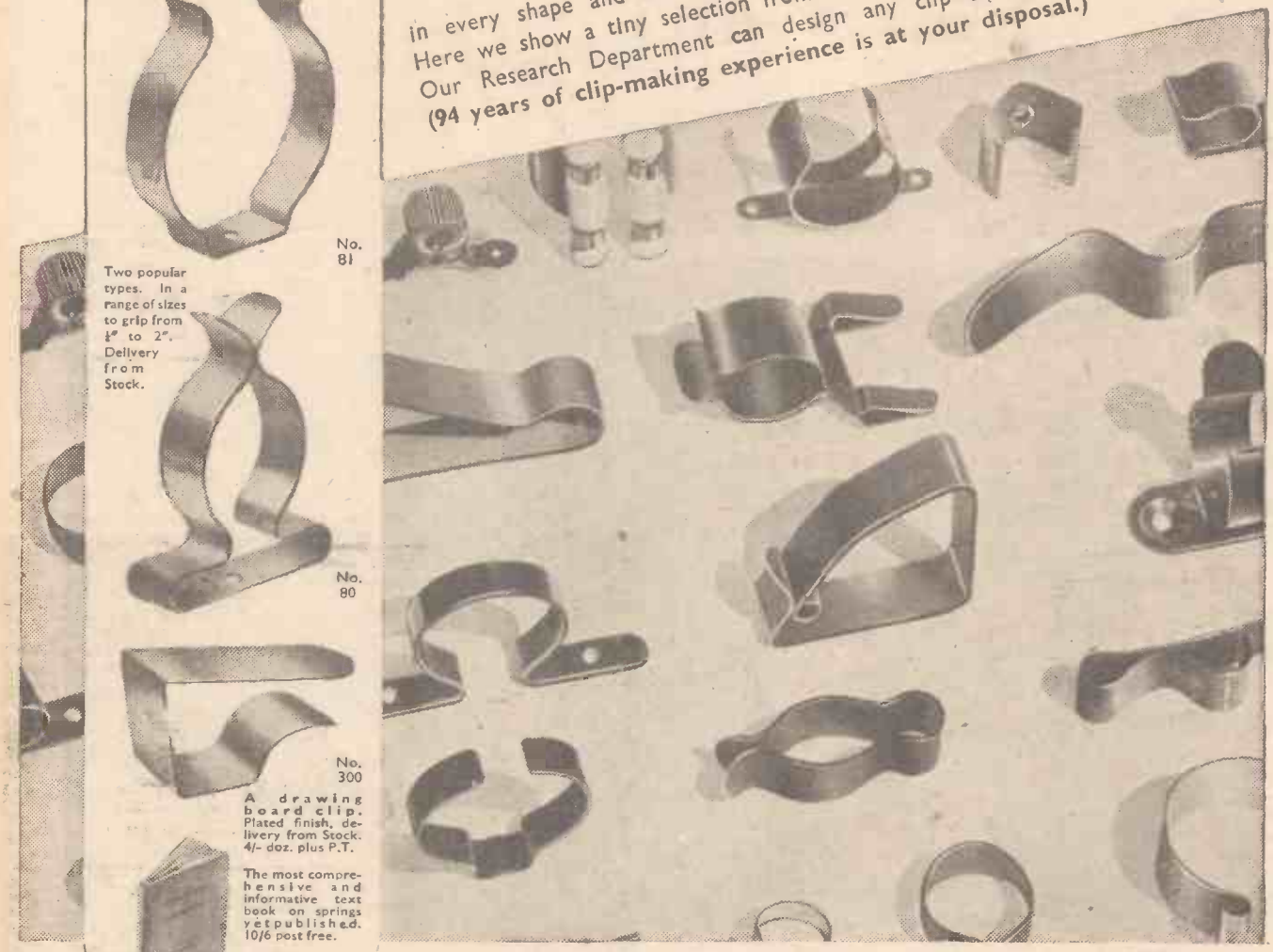

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PRACTICAL MECHANICS

EDITOR F. J. CAMM

JULY, 1950
VOL. XVII. No. 201

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

FAIR COMMENT — By The Editor

Who Discovered Atomic Energy?

ALTHOUGH Atomic energy has been very much in the limelight since the bombing of Hiroshima and Nagasaki, it is by no means a new scientific subject, for experiments have been going on in various parts of the world for more than 100 years. Now that it has reached the stage where it is more than a possibility, the question arises as to who discovered atomic energy; for it is important that honour should be accorded to the nation which started the ball rolling.

For many centuries scientists have endeavoured to discover methods of transmuting the elements. The alchemists endeavoured to find methods of changing the atomic structure of base metals, and to turn them into gold, in other words, methods of making one element into another. Mendeleef discovered the periodic law of atomic structures and graded the elements in the order of valency. His table showed that there was a common order and gaps in this order indicated that there were missing links, most of which have since been discovered, Plutonium being the latest. The elements arranged according to their atomic numbers start off with Hydrogen, which is No. 1, and in numerical order there follow: Helium, Lithium, Beryllium, Boron, Carbon, Nitrogen, Oxygen, Fluorine, Neon, Sodium, Magnesium, Aluminium, Silicon, Phosphorus, Sulphur, Chlorine, Argon, Potassium, Calcium, Scandium, Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Gallium, Germanium, Arsenic, Selenium, Bromine, Krypton, Rubidium, Strontium, Yttrium, Zirconium, Niobium, Molybdenum, Ruthenium, Rhodium, Palladium, Silver, Cadmium, Indium, Tin, Antimony, Tellurium, Iodine, Xenon, Caesium, Barium, Lanthanum, Cerium, Praseodymium, Neodymium, Samarium, Europium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutecium, Hafnium, Tantalum, Tungsten, Osmium, Iridium, Platinum, Gold, Mercury, Thallium, Lead, Bismuth, Polonium, Niton, Radium, Thorium, Protoactinium and Uranium.

These elements may be arranged in order of valence or valency, which is a property possessed by elements or radicals of combining with or replacing other elements or radicals in definite and constant proportions. Thus valency is the degree of this property, commonly indicated by the number of monad elements, represented by Hydrogen, with which the Atom or Radical can combine or which it can replace. It, of course, varies with different elements. Thus Hydrogen has a valence of 1 and is called a monad; Oxygen has a valence of 2 and is called a dyad; Bismuth has a valence of 3 and is called a triad; Carbon has a valence of 4 and is called a tetrad. Certain elements have more than one valence; tin, iron and sulphur, for example. Rearranging the elements we find that they group themselves into Monovalents, Divalents, Trivalents, Tetravalents, Pentavalents, Hexavalents, etc.

It is not surprising that various countries are claiming the credit for atomic energy, but investigation will show that beyond all doubt it is due to Great Britain alone. It was John Doulton, an Englishman, who first expounded the idea of atomic structure of matter, but it was the work of Clerk Maxwell, who towards the end of the last century propounded the mathematical basis for the theory of high-speed particles emitted by atoms, which really set the scientific world to work. J. J. Thomson, in 1898, carried the work of Maxwell further by propounding the idea that the atom was made up of electrons. Later Professor Einstein produced the equation relating mass to energy, already dealt with in this journal, and it is upon this equation, first published in 1905, that the principle of atomic energy rests. It was not until the end of the first world war that Lord Rutherford, at the Cavendish Laboratory, Cambridge, conducted his famous experiments in splitting the atom. From these points, and from results of the work of these men, international scientists were able to get busy. They did not, however, originate atomic energy, and the credit must go to Englishmen.

THE I.C. ENGINE INDUSTRY

THE productivity team from the British Internal Combustion Engine Industry, which was engaged on a mission of enquiry in the U.S.A. last October and November recently issued its report, which is unanimous. It points to important differences between the markets supplied by the industries of the two countries and the effects these differences have on industrial techniques and output. It recognises the "very considerably" higher productivity attained in the U.S. and examines the underlying reasons. It makes a number of important recommendations which include a revision of the wage structure of the industry, the application of time-study as a means to efficient labour utilisation and a protection to the worker, the payment of "the rate for the job," and the reconsideration of the apprenticeship system "and all that this implies to a skilled trade."

There is criticism of the availability of machine tools, particularly high production and special purpose machines, and the Report suggests that the effects on this country of exporting a high proportion of the output of the machine tool industry should be examined. Should the machine tool industry be expanded? Again, considering that there is a "bottle neck" in the supply of solid steel forged crankshafts for larger engines, the Report asks how far would the acquisition and control of a suitable forging plant by the Internal Combustion Engine Industry help to overcome the difficulty.

Other recommendations concern technical methods, financial incentives to producers, the mechanical handling of materials, the training of supervisory staff, the interchange of information on production methods, and the examination of all practices which hamper output.

The British Internal Combustion Engine Industry is an important exporting industry; 90 per cent. of its production goes abroad. In the U.S.A. 90 per cent. of the industry's output is for consumption at home. The requirements of the American home market include variations of type and specification, but nevertheless users' demands enable batch quantities of engines to be larger than would be economical in Britain. Demand is also more predictable in America. In most cases the works visited in America had surplus machinery as a consequence of high tooling up for war-time production and they can obtain new machine tools now within a very short time. In this country, the Report says, the machine tool industry, because of its export target, is sending abroad more than one-third of its total output and can only quote long forward delivery dates. In America standard machine tools can be had within thirty days, and specials within six months. In Britain the diesel engine manufacturers have to wait for from eighteen months to three years.

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PENCIL COMPETITION RESULTS

The mechanical pencil competition which I set in the February issue produced a very large entry indeed, and many of the competitors went to the trouble of submitting prototypes with their design. Some of the competitors failed to follow the requirements, which were that designs must be original, the action must be propelling and expelling, but not necessary repelling, the leads must be at least two inches in length, and it must be possible to use all of the lead up to the last ½in., and the entire mechanism must be detachable. Many of the designs submitted were merely replicas of standard mechanisms, and so they had to be rejected on that score, for one of the requirements was that designs had to be original. It has taken some time to judge all of the entries, but the final result is as follows:—

1st Prize, £20: L. W. Killeen, Esq., 18, Ludlow Road, Alum Rock, Birmingham, 8.

2nd Prize, £10: C. Williams, Esq., 69, Wootton Crescent, St. Annes, Bristol, 4.

3rd Prize, £5: B. C. Cuffley, Esq., 4, Ridgemount, Essenwood Road, Durban, Natal, S.A.

4th Prize, £4: H. B. Munro, Esq., 828, College Road, Erdington, Birmingham, 22C.

Repairing Damaged Wings

Removing Dents and Repairing Cracks : Special and Makeshift Tools : Touching-up the Paint

WHEN dealing with a damaged wing it is necessary first to decide whether or not to remove it from the car. Some mechanics claim that the work can be done more easily by leaving the wing in place, because of the valuable support provided by its attachment to the body of the car. Whether to remove it or not depends chiefly on what tools are available.

If a set of wing restorers of the roller type illustrated in Fig. 1 is to be used, quite large dents can be worked out with the wing in position. If, however, the worker has to rely on a mallet and a few wooden blocks it will often be found easier when dealing with large dents to remove the wing entirely and beat it out from the inside while resting it on a firm smooth support, such as a metal sheet laid on a solid wooden bench, as shown in Fig. 2. If the wing is very badly crumpled it is essential to remove it, and in that case the owner will probably prefer to leave the work to a professional panel beater.

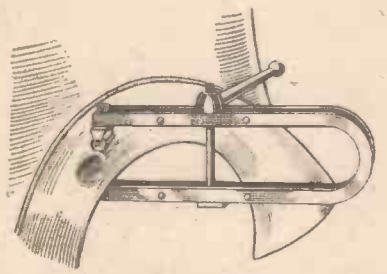


Fig. 1.—A special dent-removing tool which consists of an adjustable frame and two rollers. The rollers, which are interchangeable, are made in various contours.

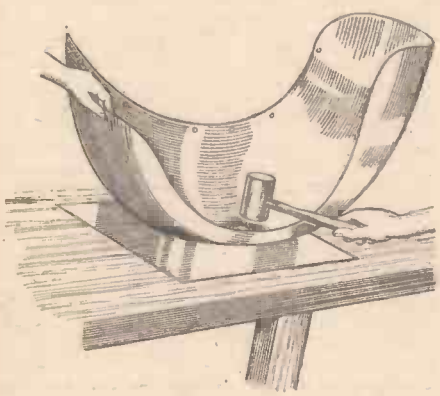


Fig. 2.—A method of dealing with dents when the wing has been removed. The dents can be beaten out on the bench.

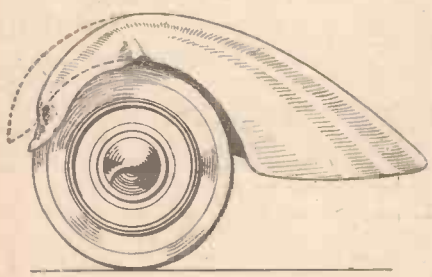


Fig. 3.—Typical form of mudguard damage. The tip of the wing has been pushed in, so kinking the side.

Simple Tools

As an example of what can be done with simple tools, let us take the case of a damaged front wing such as is shown in Fig. 3. The tip of the wing has been pushed in, at the same time receiving a dent or two at the point of contact. Pushing in the front has made the side bulge out, and a slight kink has appeared at the edge.

An easy and well-known method of restoring the front of the wing to its original position, as shown by the broken lines, consists of raising the wing tip by means of a jack. A piece of wood is interposed between the top of the jack and the wing to prevent damage. The jack is gradually raised, while at the same time the side of the wing is pushed in. With light-gauge metal this operation may quite easily be performed by grasping the wing with both hands, as shown in Fig. 4. The combined work of raising the tip and pushing back the side of the wing will restore its general shape, leaving just the dent or dents at the front and the kink at the side to be removed.

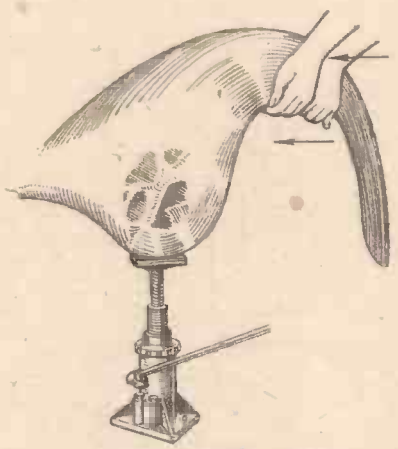


Fig. 4.—To restore the general shape of the wing the tip is raised with a jack while at the same time the side is pressed in with the hands.

Fig. 5.—A shaped wooden block used as a "dolly" while beating out a dent from inside the wing.

Using Shaped Wooden Blocks

If dent-removing tools are not available two shaped blocks of hardwood can be used for taking out dents with the wing in position. One of these blocks should be finished roughly to the shape of a half-barrel, while the other should have one surface slightly concave so that it fits approximately the convex curve of the wing. The use of these two blocks is illustrated in Figs. 5, 6 and 7. In Fig. 5 the concave block is shown being used for the removal of the dent in front of the wing, while in Fig. 6, the other block is being used under the wing to obtain support for hammering out the kink at the side. Having removed the main indentations the remaining small irregularities may be hammered out with a hammer and "dolly," as shown in Fig. 8. If no dollies or swages are available, a good substitute in working out kinks in the rather difficult area near the channel of the wing is an improvised swage made from a large sawn-off tyre lever. One method of using it is illustrated in Fig. 9.

Cracks Should be Welded

One of the chief difficulties encountered by the amateur panel beater is the straightening of the channel which runs along the edge. If this kinks badly it is difficult to straighten it out without removing the wing, and even then care is needed or the metal may buckle and crack.

If a crack occurs or if the channel breaks away from the wing it will have to be welded. A small welding job like this is quite inexpensive and can be carried out by any local welder, usually without removal of the wing.

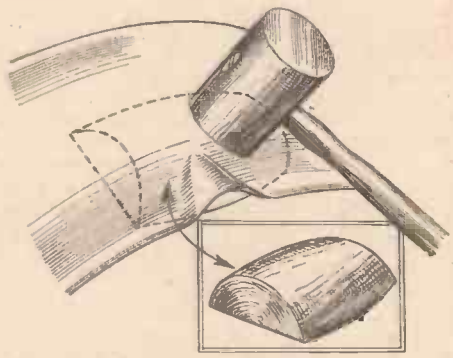


Fig. 6.—Using a barrel-shaped block of wood to remove a kink at the side of the wing.

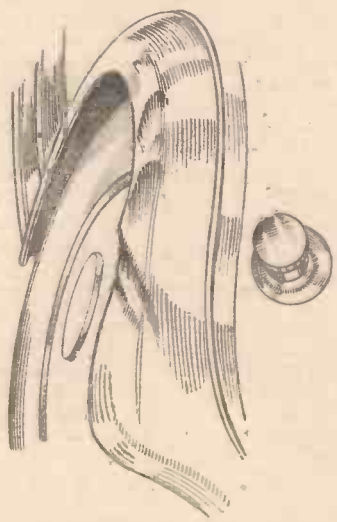


Fig. 7.—A series of dents along the edge of the wing necessitates the use of the shaped wooden blocks.

This gutter or channel, besides trapping water and mud helps to strengthen the edge of the wing. But once it is buckled it is correspondingly difficult to straighten. Often the channel is merely a turned-in flange, and if the wing has been repeatedly bent a crack may commence from the edge and extend upward, as shown in Fig. 10.

This is without question a job for the welder. Repairing the crack by riveting on a patch is unsatisfactory because it is unsightly and soon works loose. The welder can build up the joint so that it is actually stronger than the surrounding metal. Any metal standing proud can be filed down before re-enamelling and small irregularities on the surface may be filled up.

One of the best tools for repairing a crumpled wing consists of a set of steel rollers of different shapes and sizes The rollers are carried by a frame rather like a large pair of fire tongs. Kinks and dents are literally rolled out by moving the tool

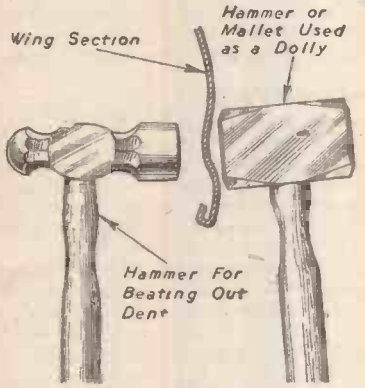


Fig. 8.—For the removal of small dents a hammer and a copper mallet can be used.

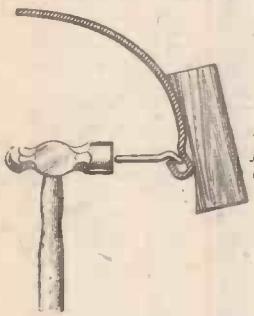


Fig. 9.—Using a sawn-off tyre lever for removing a kink or dent near the mudguard channel.

backward and forward over the damaged area.

The method of using this is shown in Figs. 11 and 12. First a convex and a flat roller are used to make the initial reduction in the dent to be removed. The rollers are passed backward and forward over the damaged place as shown in Fig. 11, at the same time gradually tightening the

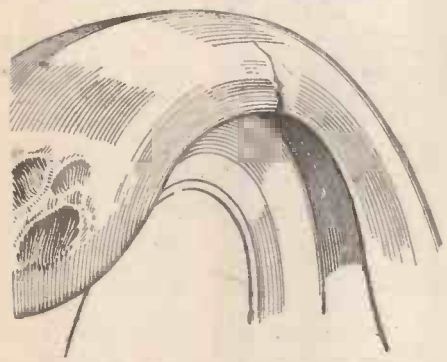


Fig. 10.—Cracks such as this should be welded. A local welder will often do the job without the wing being removed from the car.

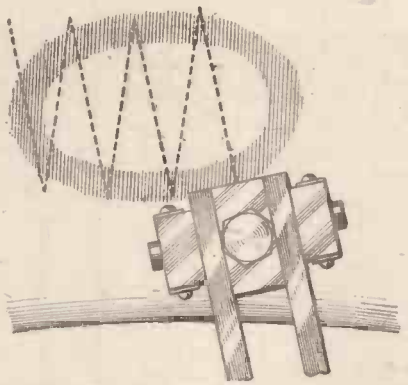


Fig. 11.—The method to be adopted when rolling out a dent with a special dent-removing tool. The broken line shows the path of the rollers.

arms as the dent flattens out. The final swaging of the surface may be carried out by fitting a lower convex roller and an upper roller that is slightly concave to conform to the final surface curve required.

Wing Irons

Although the average owner-driver would not consider the expense of a "Denterazer" outfit justified by the occasional use to which it might be put, there are other tools as, for instance, a pair of wing irons such as those illustrated in Fig. 13, which might be worth while. The irons are shown being used to straighten the edge of the wing. The U-shaped end of the lower iron may be used to hold the wing in position while the local kink is being pulled out, or, alternatively, it may be used for bending the edge of the wing inward. By manipulating the two irons as shown they will be found very versatile.

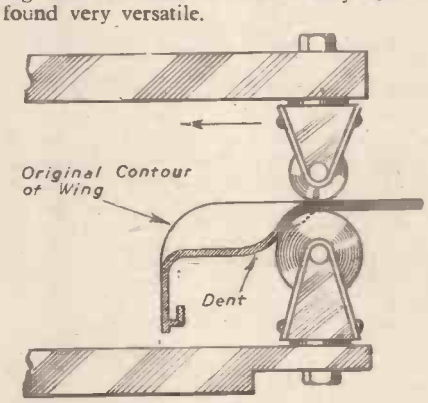


Fig. 12.—Using a special tool to roll out a dent near the edge of the mudguard.

Incidentally, where only moderate leverage is necessary, a large adjustable wrench may be used as an improvised wing iron, as shown in Fig. 14.

In the case of most wing repairs it will be necessary to remove the road wheel when beating out a wing, and care should be taken to ensure that the chassis is adequately supported. It is safer, for instance, to place a pile of stout wooden blocks under the axle than to rely on the support of the small jack. Naturally, the handbrake should be on, so as to avoid any chance of the car rolling off the block during the process of wing straightening.

If the wing is badly buckled or awkward to get at, or for some reason it is thought advisable to remove it, time and temper may often be saved by shearing off the bolts, which secure it to the body, with a cold chisel, or, alternatively, cutting them off with special bolt croppers. New bolts are then fitted when reassembling. It often pays to use this method instead of endeavouring to remove the rusted nuts by unscrewing them.

Re-enamelling a Wing

After straightening a wing, the enamel will need to be renewed. With care the damaged part may be sprayed without re-enamelling the whole wing. The method

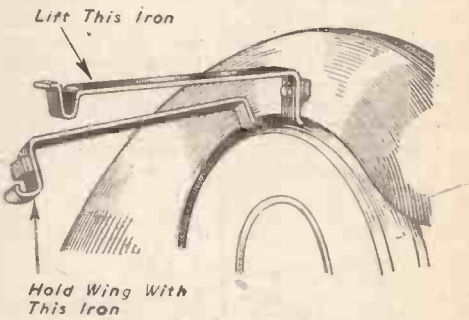


Fig. 13.—A useful pair of wing irons. One iron is shown in position for pulling the edge of the wing outward, while the other is used for steadying purposes.

of procedure is as follows: fill up any little irregularities with cellulose stopper and allow this is become dry and hard before applying a further coat. Rub down the stopped surface with "wet and dry" or

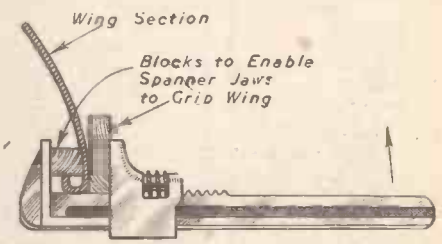


Fig. 14.—A large adjustable wrench and blocks of wood can often be used as a substitute for a wing iron.

some similar abrasive paper, and then spray on a coat of primer before finishing with one or two coats of cellulose, the first coat being confined strictly to the limits of the prepared area, the other being allowed to extend a little beyond so as to graduate the new finish into the existing enamel. The final surface will have to be polished with the usual cellulose-polishing compound.

If spray apparatus is not available, a good job can be made with special brushing cellulose enamels.

The Mobile Telephone

A Brief Account of This System in America, and How it is Linked Up with the Television Network

By THE MARQUIS OF DONEGALL

ONE of the things that interested me most in my tour of the Bell System in Chicago last year was the Mobile Telephone Service. This was inaugurated in St. Louis in June, 1946. Twelve months later the Bell companies were handling some 10,000 calls per week to and from more than 1,400 vehicles and also watercraft in 39 mobile service areas. This service tripled during its second year, and to-day more than 6,600 mobile units of all types are placing and receiving about 50,000 calls per week in 135 different areas. The service is now available in many of the major cities and along more than 4,000 miles of main highways throughout the United States.

The first car-to-car long-distance telephone call was made from Houston, Texas, to St. Louis in 1946. I should estimate that that is a distance of about 800 miles, without measuring it on the map. It was on March 15th, 1949, that this mobile service was introduced to the railways, on the Pennsylvania Railroad between New York and Pittsburgh.

Two frequency ranges are used to provide the service. The 152-162 megacycle band, designed by Federal Communications Commission for use in furnishing service in and around cities, and the 30-44 megacycle band, used to provide service along inter-city highways and adjacent waterways.

Two Main Parts

A mobile system has two main parts:

(1) A 250-watt transmitter, with antennæ located as high as practicable above buildings and other obstructions. Associated with this main transmitter, which has a range of from 25 to 30 miles, are one or more auxiliary receivers located about the area in satellite fashion so that signals from the relatively low-powered transmitters of the equipped vehicles can be picked up at all times. In highway service these auxiliary receivers are usually located along the highway which is being served. The main transmitter and receivers are connected by wire with the telephone central office.

(2) The mobile equipment, consisting of a transmitter of from 20 to 25 watts output, receiver, antenna, control unit and telephone handset. The transmitter and receiver are generally installed in the boot of a car or in any suitable place on a lorry, boat or other vehicle. The single antenna for both sending and receiving is located outside as high as possible. The control unit, attached beneath the instrument panel, contains a bell and two signal lamps, one indicating when the set is turned on, the other lighting when the bell rings. Its cradle holds the telephone, which has a "push-to-talk" button for switching from receiving to transmitting. A selective signalling device associated with the receiver allows the signalling of only that particular mobile unit.

I saw these mobile service calls being handled at a special switchboard in one of the Chicago exchanges. A person who wants to make a call to a vehicle or other mobile unit from his home or office asks for "long distance." He is then put through to the mobile service operator and gives this operator the telephone number of the vehicle that he wants to call. The operator then gets on to the mobile unit by radio, dialling the call number. The radio signal flashes the lamp and rings the bell in the vehicle, the occupant picks up his telephone and the conversation can then continue. The occupant's voice travels back by radio to the nearest auxiliary receiver, thence by wire to the caller. If the call is unanswered, the lamp remains lighted, so that when the occupant returns he will know that he has been called.

Conversely, when you place a call from a mobile unit, the occupant simply picks up his telephone and presses the "push-to-talk" button on the handset to signal the mobile service operator. He gives her the number he wants and she puts through the call.

In general there are three classes of mobile service. The first is a general two-way telephone service providing for voice communication between any equipped mobile unit and any other telephone connected to the general telephone network, or between any two equipped units. The second is a two-way dispatch service which provides for communication between the subscriber's office and specified mobile units. The third is a one-way signalling device to notify the operator of a unit that he should comply with some pre-arranged instruction.

Cost of Calls and Installation

The cost of a three-minute general service message is about three shillings, depending on the location of the land-telephone in the mobile service area. On long-distance calls the regular person-to-person day rate applies with a minimum charge of about three and sixpence.

The cost of the equipment can be paid for either by the telephone company or by the customer. If the company furnishes the installation it costs about £8 and the rental is £5 10s. a month for two-way equipment. Then they also have a monthly minimum message charge of about £3. The installation and rental charges for one-way signalling equipment is half that for two-way equipment, and the minimum monthly message charge is 30s.

Naturally, the service is mostly used by commercial firms, public utilities, contractors, Government departments, doctors, taxis, boat operators and similar types of organisation. Personally I think it would be extremely annoying to have the telephone in one's car because I like to have privacy when I am in it. I do see, however, that a service lorry, which has been dispatched to a place, can, if called on the telephone, avoid coming back the whole way to receive instructions and possibly might pick up another load in the vicinity in which it has deposited its original cargo.

The same, of course, applies to taxis, and this is in general service in most parts of the United States; but operated by the taxi companies, and not by the Bell Telephone System through its central exchange.

Television in U.S.

The latest position is that Bell Telephone System's East Coast and Mid-Western inter-city television transmission networks have joined hands, thus bringing the network television to an enormous potential audience —a fourth of the continent's population in and around the 14 major American cities.

The linking of New York with Chicago, Boston and St. Louis for television purposes is, of course, done by co-axial cable. Those I saw were about as big around as a man's wrist, and usually enclosed eight coppered tubes about the size of a pencil. Each co-axial tube carries high-frequency electrical signals which can transmit hundreds of telephone conversations or one television programme. One can imagine the job they had burying co-axial cable through great distances of timberland, rivers, boulders and mountain ranges.

At the present time the East Coast—Boston, New York, Philadelphia, Baltimore, Washington, Richmond—are linked up through Pittsburg as far as Milwaukee, Chicago and St. Louis. On the West Coast the television system will be based on a connection between Los Angeles and San Francisco and eventually linked up with the Middle-West, thus providing a television network throughout the American Continent. The other system, apart from co-axial cable, is radio-relay.

Television has created a new language which is entirely new to me. In fact, Mr. H. L. Mencken, a great authority on the American language, has published a glossary of this new "patois." For instance, technicians working in television control rooms *see* noise; they do not *hear* it. By "noise" they mean the kind of interference in a picture which makes it look as though the background were boiling.

"Pigeons" are another kind of "noise." These are the irregular white spots that flash sporadically across the screen, usually in flocks. "Ghosts" are very unwelcome They are also known as echoes. "Ghosts" are the shadowy off-set images occasionally seen in a television picture. These ghostly images sometimes develop when signals are reflected from obstructions, like hills or buildings near the television transmitter, the receiving set, or somewhere in between. "Blooming" has nothing to do with flowers or good health, but is used to describe the white flaring effect seen at spots of excessive brightness in pictures—sun shining on a piece of glass or photographer's flash-bulbs.

Television technicians talked to me about what I thought was "sink"; but it is apparently spelled "sync," and is short for synchronising pulse. "Sync" is what keeps the television camera and the receiving set in step, or synchronised. If the "sync" is not operating properly an effect known as "tearing" can result. Then strips of the television picture appear to come loose, as though a strong wind were trying to blow them off the screen or the centre of the picture may appear to slide rapidly up or down the frame.

"Clampers" sound as though they were something in the line of clothes-pegs—but not in television slang. By means of a quick-acting electronic beam, "clampers" adjust the brightness of the television picture about 15,000 times each second, thus maintaining certain shadow effects which might otherwise cause trouble.

"Blacker than black" seems impossible, but the television technician will explain to you that, when they examine the electrical make-up of television pictures, some components correspond to the dark parts of the picture and some to the light parts. Other components examined are even farther down the electrical scale of voltages than absolute pitch-black and are called "Blacker than black."

These are just a few of the terms that they taught me, and it may well be that our technicians here have learned this peculiar new language.

Synthetic Resin Glues

Some Data on their Use and Application in the Home Workshop

By D. N. BUTTREY, M.Sc.

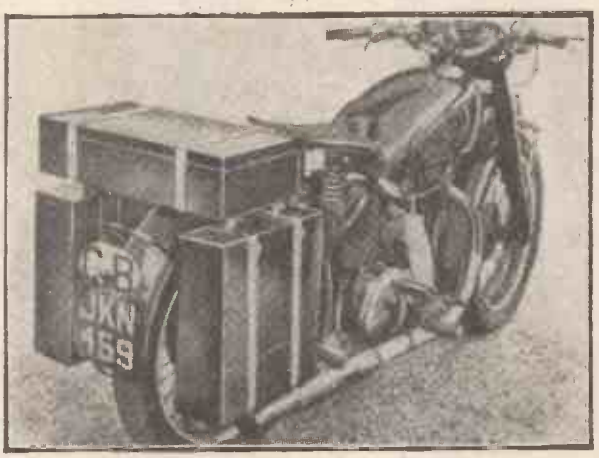
SYNTHETIC resin glues, based on phenolic and urea resins, have been used on a wide scale in recent years in the plywood industry, and have found extensive application in aircraft construction, dinghy and small boat fabrication and numerous other assemblies. In spite of this, little use appears to have been made of such glues in the home workshop, and their outstanding gluing properties and versatility are comparatively unknown.

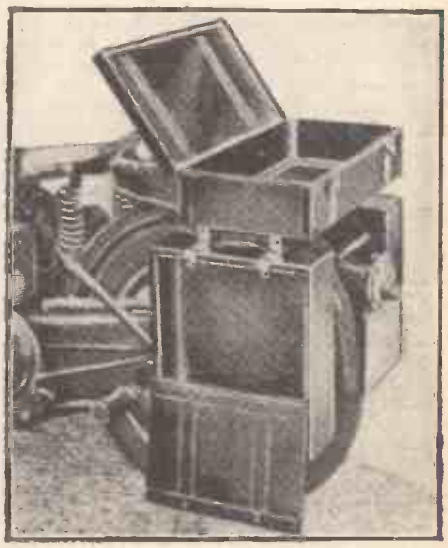
For Wood Assembly.—The synthetic resin glues are supplied in syrup form, having the constituency of thin treacle. The phenolic glues are yellow-brown in colour and the urea glues water-white. As sold such glues will store, in a cool place, for approximately 3 months, thickening slowly, but once the glue has become too viscous to spread it cannot be thinned again.

With the glue is an accelerator or hardener, usually an acid or potential acid, and before use this accelerator is mixed with the glue in the proportion of 10-20 per cent. accelerator to 100 per cent. glue, the exact amount depending on the particular brand of glue used. Once mixed, the glue thickens more rapidly and sets in some 2-3 hours. At normal room temperatures the glue is hard after about 12-24 hours, or at 100°C. after 5-10 minutes. Once the glue is hard it becomes resistant to heat, water and bacteria. The phenolic glues show higher water resistance than the ureas, and glued test-pieces may be submerged for prolonged periods in boiling water without appreciable deterioration of glue strength. In fact, after such treatment the glue remains the strongest part of the assembly. In all cases, dry or wet, fractures of the piece results in wood tearing without any parting of the glue line.

Use of Synthetic Resin Glues.—Before applying, the glue and accelerator are mixed according to the exact proportions given by the manufacturer. If a large quantity is to be mixed in one vessel, a water-jacketed container for cooling is advisable. Alternatively, the container may be stood in cold water. This prevents the glue from setting too rapidly in the pot. A glass jar makes a satisfactory container and the mixing is best done with a glass rod; iron pots should be avoided as they are liable to be attacked by the acid accelerator. When mixed the glue is ready for application.

Cold Setting.—The glue is spread over the wood surfaces to be bonded in a thin layer, by means of a glass rod. For bigger applications a roller spreader can be used. The wood pieces are then clamped or held together mechanically and put aside for setting. At ordinary room temperatures the assembly may be handled after about eight hours, and after 24 hours may be subjected to any machining or finishing operations. Clamp pressures of 50-100lb. per sq. inch are ideal.





"Craven" pannier equipment of laminated plastic sheet bonded to a wooden framework with a phenolic glue. This equipment has had thousands of miles testing on Continental roads with no deterioration. (By courtesy of Ken Craven.)

Hot Setting.—If an oven is available, rapid setting of the glue is possible. The clamped assembly can be placed in the oven for about 15 minutes at 100°C., after which the glue will be completely hard. Other temperatures can be used and optimum times at each temperature rapidly determined by experiment, but temperatures of above 120°C. are inadvisable.

Alternatively, if a small hand-press is available, with heated platens, 5-10 minutes at 100°C. and 100lb. per sq. inch pressure will give satisfactory hardening. For thicker assemblies a longer time may be necessary to allow for heat conduction.

Bonding Strength.—It is difficult to relate the glueing strengths of synthetic resin glues to those of the more common animal and fish glues. Perhaps a side by side comparison will illustrate the differences most clearly.

	Synthetic Resin Glues.	*Animal and Fish Glues.*
Method of Hardening	Chemical, with almost no shrinking, resulting in a hard, continuous glue line.	By drying out of water, with subsequent shrinking, resulting often in a crazed or cracked glue line.
Bonding Strength ..	With all types of wood bonds the glue line is the strongest feature of the assembly. Stress on the product results in wood tearing, but the glue line and area surrounding it remain intact.	Invariably the glue line is the weakest link in the assembly, and stress on the product results in parting at the glue line.
Effect of Age	Field tests show little reduction of bond strength even after years. There is no bacteria or fungoid attack.	The glue tends to embrittle with age and is often attacked by bacteria or mould growths.
Effect of Water ..	The phenolic glues will stand prolonged immersion in cold or boiling water, and still remain stronger than the wood. The urea glues are slightly less water resistant, but will stand prolonged immersion in cold water.	The glue rapidly disintegrates in water and pieces separate.
Gap-filling	Because of low shrinkage during hardening and ageing, gaps of ⅛in. or more can be filled with the phenolic glues. Such filled gaps are still stronger than the wood. The ureas are reasonably good gap fillers.	Shrinking during drying and ageing causes gap-filled joints to craze and crack on the glue line, with consequent weakening of the joint.

Applications of Synthetic Resin Glues.—The synthetic resin glues will replace animal, fish and other glues in all wood gluing operations, at the same time giving far higher bonding strengths. The writer has made a large multi-partitioned bookcase, using no screws or joints, but bonding completely with a phenolic resin glue; the finished assembly has a strength and rigidity never before obtained with more conventional fabricating methods.

In model aircraft and boat building the field performance of such glues more than justifies their initial higher cost. Already,

in the fabrication of sailing dinghies the synthetic resin glues have been used to produce a laminated wood construction extraordinarily light and clean in design. The strength and endurance of the glues make possible the fabrication of curved and complex fabrications from laminated wood veneers.

Of particular interest, too, is the bonding of other materials such as laminated plastic to wood. This can be done satisfactorily with the phenolic glues, giving constructions capable of withstanding considerable stresses.

Metal Glues

Recently, glues based on phenolic resins in combination with other synthetic resins have been developed for bonding metal to itself, wood, glass, etc. Such glues can be obtained as a viscous resin solution which, when spread over the surfaces to be bonded, rapidly dries to a thin, non-tacky film. Once dry, the pieces may be put aside for several days, if desired, before glueing. Before application the metal surfaces should be degreased and, preferably, pickled, although this is not absolutely necessary.

Glueing Methods

For glueing metals, heat is necessary to harden the resin component of the glue. The pieces to be bonded, already coated as described above and allowed to dry in the air, are then clamped together and heated for about 30 minutes at 150°C. or for a longer period at lower temperatures. Alternatively, if a hand-press is available, with heated platens, the pieces may be held in this for a time depending on the thicknesses of the pieces to be joined. Pressures of 50-100lb. per sq. inch are ideal.

When the pieces have cooled after the glue has hardened high bonding strengths result. With moderate heat afterwards there is no serious drop in the glue strength. Shear strengths of up to ·1 ton per sq. inch are obtainable between metal pieces using these glues.

With such glues wood may be bonded to metal to give bonds stronger than the wood, and special adhesives will allow glass bonds of high strength.

The advantages of such glues to the modeller and home constructor are obvious. Difficult fabrication problems can be overcome without the use of unsightly mechanical fixing devices, and, too, some satisfaction can be gained from the application of more unusual constructional methods.

Adhesives for Plastic Fabrication

Many modellers and home mechanics use plastics in fabrications and assemblies. In applying these materials, glueing is often done without full knowledge of the various types of adhesives most suitable for different plastics, and the following brief list should be of value in improving the manipulator's technique in sticking such materials.

Celluloid.—Celluloid, usually handled as transparent sheet, is easily recognised by its inflammability. It is stuck readily by moistening with acetone until it swells and becomes tacky and then pressing firmly together the surfaces to be bonded. A little butyl or amyl acetate, or even ethyl acetate, added to the acetone prevents "blooming" of the celluloid, and for body celluloid scrap may be dissolved in the solvent mixture.

Cellulose Acetate.—Also generally used as transparent sheet, cellulose acetate burns less readily than celluloid but chars as it burns. It can be stuck with acetone containing a little ethyl lactate or diacetone alcohol to stop "blooming," and again, by dissolving cellulose acetate scrap in the solvent mixture, body is given to the cement.

Perspex.—Perspex is differentiated from cellulose acetate by its greater clarity and the fact that when burnt it has a characteristic pungent odour and shows almost no charring. Perspex is readily cemented with chloroform or other chlorinated solvent. Alternatively, glacial acetic acid can be used, but this requires care. Another method is to use the monomer of Perspex (methyl methacrylate) to which is added about 1 per cent. benzoyl peroxide, which sticks by reacting (or polymerizing as it is called) to the polymer, Perspex.

P.V.C.—P.V.C. in the form of flexible "plastic" sheet and tubing is increasing in popularity as a home workshop material. It is excessively difficult to cement, but if the surfaces are moistened with cyclohexanone, then clamped and heated to 100°C for 15-30 minutes, good bonds result. Alternatively, the material can be directly welded, using a heated knife blade or a hot-gas gun. The hot blade method is the most useful for most simple applications, and the technique is readily learnt. Proprietary cements for P.V.C. are marketed which give fair adhesion, but for the best results welding is recommended.

Phenolic Mouldings.—Phenolic mouldings, of the Bakelite type, are best glued with a phenolic synthetic resin glue as described earlier. This also applies to laminated plastic sheet and Catalin cast resin.

Styrene.—Styrene, properly called polystyrene, is now being used on a wide scale. It can be identified by the somewhat "tinny" noise it makes when dropped, and it is readily cemented by the use of a solvent such as ethyl acetate. It dissolves in many solvents, and experiment will show the most suitable solvent for the application in mind.

In every case of plastic fabrication, if it is possible to identify the material before use, better results can always be obtained by using the correct adhesive.

The Law About Patents

6.—Rightful Owner

By W. J. WESTON

ALL agree that an inventor should enjoy the fruits of his genius and his labour, that he is the rightful owner of the patent. It may be that another usurps his place. But, if you keep in mind the motive prompting the patent privilege, not in this country only but wherever patents are granted, you will think the law not unreasonable in the matter. That motive is this: Patent rights are an award not for the invention but for its disclosure so that, after the temporary monopoly given by the patent, the public can make use of it.

A New Invention

Well, British patent law declares him to be the first and true inventor who first lodges a request for patent rights, the request being supported by such a description of the novelty as will enable the Patent Office to determine whether or not a new invention has been submitted for examination. That request is disclosure beyond doubt; and he that makes the disclosure gets the patent. This is so though common language calls him a supplanter of the first and true inventor. Certainly, a patent may be revoked on the ground "that it was irregularly obtained"; but this "irregularly obtained" does not include a forestalling at the Patent Office.

Secret Working

The reason is sound. He that keeps his invention secret neither asks for nor is entitled to patent rights. Perhaps he has weighed the matter and reckons that retention of his secret will pay him better than a patent. The old guilds of craftsmen did, indeed, frown upon public disclosure of the secrets of their craft; their tight discipline over their members would have prevented a patent application. Even to-day an invention may be secretly worked on a commercial scale before an application for patent rights is made; fear that the secret has been spread abroad may occasion the application. Such prior working is, however, a ground for revocation of a patent granted.

Previous Publication

Previous publication destroys the novelty on which the patent is based; but this is not to be understood rigidly and narrowly. There has been a printed description of the novelty so as to make possible its use by others. Or the invention has been shown in a public exhibition. Neither need be destructive of novelty. It may be that the description was made long ago, never led to practical results, and is not a part of public knowledge. Under our law it is only when a patent specification has been filed less that fifty years ago that it destroys novelty. We have, too, the sensible rule that a publication without the knowledge of the inventor is not fatal to novelty, so long as the inventor, after learning of the publication, acts promptly and makes his application. And, as regards public exhibitions, where these are under the Board of Trade's certificate, disclosure there does not destroy the novelty that justifies the grant.

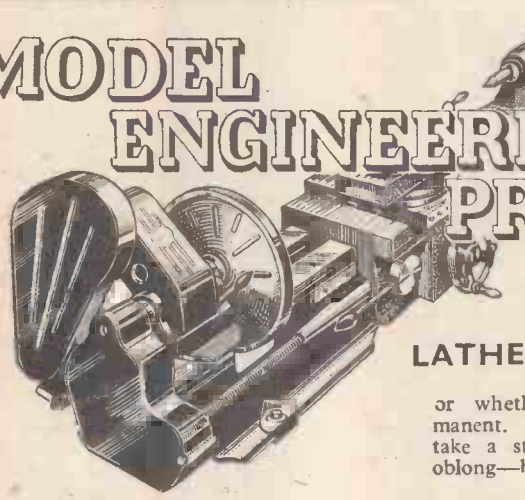
First and True Inventor

You will enjoy the reading of this incisive piece of prose in which the Master of the Rolls (in *Plimpton* v. *Malcomson*, Ch., 1876) expounds the matter: "Suppose there were two people, actual inventors, in this country who invented the same thing simultaneously: could either be said to be the first and true inventor? It was decided that the man who first took out the patent was the first and true inventor. Then there was another point. If the man who took out the patent was not, in popular language, the first and true inventor, because somebody had invented it before, but had not taken out a patent for it, would he still, in law, be the first and true inventor? It was decided that he would, provided the invention of the first inventor had been kept secret, or, without being actually kept secret, had not been made known in such a way as to become part of the common knowledge or of the public stock of information. Therefore, in that sense also, there was a person who was legally the first and true inventor, although, in common language, he was not, because one or more persons had invented it before him, but had not sufficiently disclosed it."

13th Article of a New Series

MODEL ENGINEERING PRACTICE

by J. J. Camm



LATHE WORK (*Continued*)

Screw-cutting

THIS is effected by feeding the slide-rest at a specified rate in relation to the speed of the spindle, so causing the tool to cut a spiral of the required pitch along the piece. The rest moves by means of a screw (the lead screw) which rotates at a suitable speed through the intervention of change-wheels driven from the spindle. In an ordinary lathe the turner controls the stopping of the traverse, the slight feeding in for another pass, and so on until the thread has been cut to the required depth, but automatic lathes function without attention for cutting any sort of long or short screws. Internal threads are cut with a tool projecting from the rest; the component fits in a chuck, and the procedure is similar to that for turning parts held between centres.

Standard Tools

A considerable number of shapes occur for tools, but a few standard ones are sufficient for ordinary use, these being illustrated in the June issue. Some are simple, others must be right- and left-hand. The disadvantage of solid tools is the cost of the steel and the trouble incurred when the end breaks. Therefore, a good many styles of holders are made to take short pieces of tool held by a screw or wedge. The essential difference in types is whether the front rake is embodied permanently when the bit is put in the hole or whether the top rake angle is permanent. For general use a holder ought to take a standard section—round, square or oblong—but many designs hold a special section, for convenience of cutting certain formations or obtaining a non-slip grip on the bit. Boring holders fit in a split block clamped on the rest. A multiplicity of tool-holders is employed in the rapid production lathes of all sorts, and automatics.

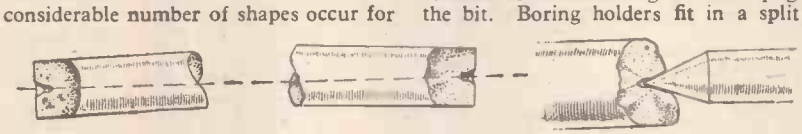


Fig. 7.—Showing lack of alignment between centres when the bar is not true.

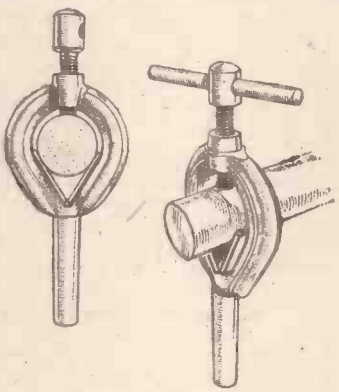


Fig. 6.—The carrier.

The Height of a Lathe

A lathe is specified by the height of centres, or "swing," in American practice; that is, the diameter turned. To deal with flywheels, pulleys, rods, and so on which will not swing over the bed, a gap is cast in front of the head-stock. There are two types of gap, one of moderate width, but filled by a gap-piece over which the saddle slides to give it support when working close to the chuck. In wood-turning lathes large objects can be swung by having a face-plate to go on the tail end of the spindle; a floor-stand carries the hand-rest or slide-rest.

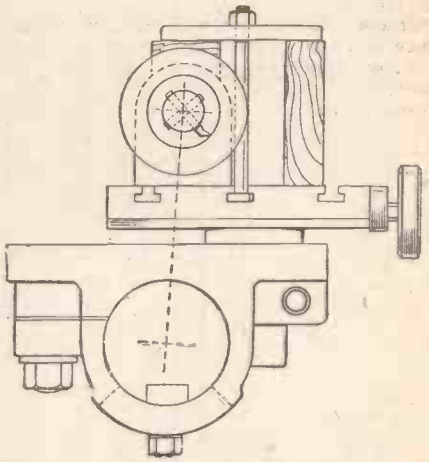


Fig. 5.—A cylinder adjusted for height on a bar-bed 4in. lathe by swivelling the saddle around the bed and setting over the cross slide.

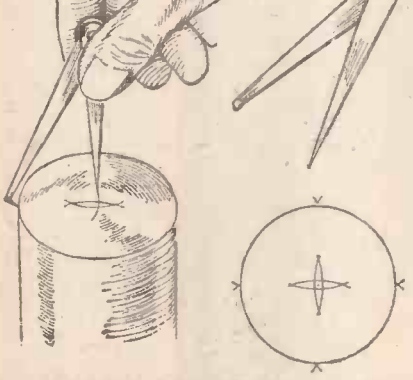
The cast girder form of bed is important, because it must guide and maintain the truth of movement of the slide-rest or saddle, and keep the loose head or poppet in line against the effects of wear. English practice has usually been to have a flat-topped bed with vee or square guiding edges, but many are now constructed with the American vee-tops, which should wear down equally without dependence on the edges for control.

The problem of keeping the loose head true is often solved by employing separate vees for it, thereby avoiding ill effects of wear of the saddle, which destroys the alignment of the vees; or an inside edge not rubbed by the saddle acts as control. Flat-topped beds in many instances possess a "narrow-guide" fit to the saddle—that is, the latter makes sliding contact against the front and rear edges only, providing a guide very long in proportion to width.

Alternative Methods of Driving a Lathe

These comprise treadle, belt drive from an overhead shaft, belt drive from an electric motor, or spur gear or chain from the same source of power. Treadles (almost obsolete) have been improved by anti-friction bearings, including those for the main spindle, but as electricity is so readily available, conditions have altered during recent years. Sometimes treadle gear is retained for occasional running, but a motor is fitted as well for main service.

An obvious point in the selection of a lathe concerns whether the headstock has plain pulley for direct drive, or is fitted with back-gears to afford alternative or slower speeds with considerable gain of power, for turning, boring and screw-cutting.



Figs. 8 and 9.—Centring by means of oddlegs.

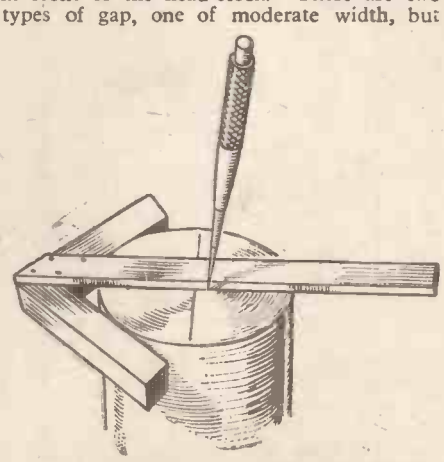


Fig. 10.—Details of the centre square.

Only the lightest classes of metal work can be executed by plain drive.

The Headstock

The casting and construction of a headstock must be strong, so that the casting will not deflect under end pressure applied to the spindle (during boring or facing operations), nor vibrate and affect the truth and finish of work-pieces. The all-important matter of the spindle has always been a subject of controversy; it must run well under load, without heating or scoring, and retain accuracy, otherwise the centre, face-plate and chucks will not remain true. Consequently a cheap lathe is seldom advisable, because the bearings cannot be well made, and the turner will often experience trouble. Hardened steel bushes were formerly the customary style, being coned to fit the tapered necks, and so tend to keep it wearing concentrically. Phosphor-bronze bushes largely have preference nowadays and in many cases the necks are parallel, but the exterior of each bush is coned to draw a taper in the head casting; the bush being split, it contracts concentrically, and thus maintains the spindle in alignment. End thrust needs special care in small lathes, because of the large amount of drilling performed, and it is best to have a ball-bearing washer rather than a plain one, which gives more friction, and is not easy to lubricate. Very light running can be ensured by spending more, and having taper roller bearings which take the end thrust as well and automatically keep the spindle central after wear has occurred. A hollow spindle should always be chosen; a solid one is a handicap, in view of the frequent handling of wire, rods and bars, held in the chuck for turning or filing.

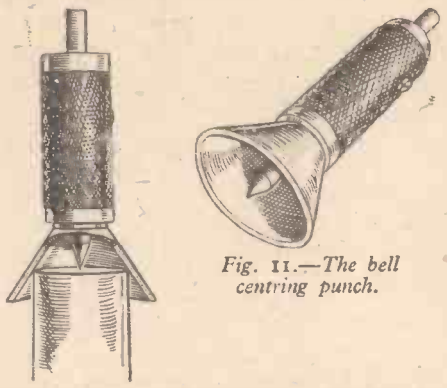


Fig. 11.—The bell centring punch.

Fig. 13.—Centring from the headstock.

The Simplest Lathe

This carries a compound slide-rest bolted to the bed, but this imposes severe limitations, as there are no automatic feeds nor screw-cutting motion, and only small articles can be held for boring. With a saddle sliding along the bed there is scope for bolting cylinders, beds, frames, bases, and rods on the T-slotted top, to be bored and faced by a bar driven between centres, or to be milled; and attachments can be secured to hold work or operate cutters, or grinding wheels. In ordinary saddles height regulation for anything bolted on is made by insertion of packings as necessary, but the Drummond 4in. centre cylindrical-bed lathe has a height adjustment by swivelling the saddle around the bed.

The Self-acting Feed

The self-acting feed of a saddle is produced from the lead-screw, though an objection lies in the wear of the screw thereby, tending to affect its accuracy for screw-cutting. In the smaller lathes this is not a matter of much concern, because simplicity and reasonable cost must be studied, but in larger sizes the screw is reserved for screw-cutting, and the feeds come from a splined shaft operating gears which rack the saddle along, and often also move the cross-slide. As an alternative, the lead-screw may be splined to drive a first-motion gear for the same results, without any serious effect on the threads, although strictly it is better practice to keep them intact. Automatic cross-feed, though omitted in many small lathes, is advantageous not only from the point of view of time-saving, but because it gives better work. The regularity of feed, difficult to imitate by hand movement, supplies even progression and pressure on the tool, hence the surface left is more accurate.

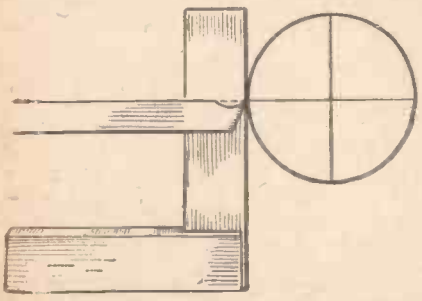


Fig. 15.—Finding centre height by means of a set square.

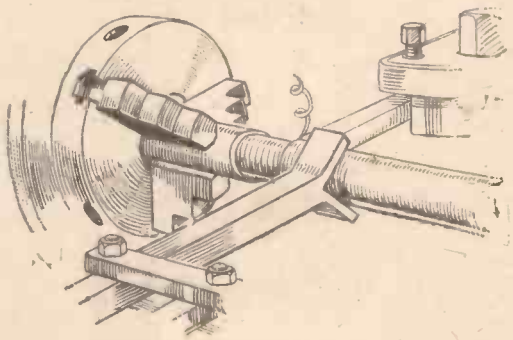


Fig. 16.—The forcing bar.

In a good make of lathe provision is made for addition of power cross-feed at any time.

Lead-screw Operation

A matter of convenience, the mode of actuating the lead-screw or feed-shaft has received greater attention lately. The ordinary way of transmitting the ratio of speed from the spindle to screw or shaft is by loose change wheels, placed on as required. This takes time in selection and fixing though some firms offer an improvement on the usual nut and washer retention. In Britannia practice a knurled sleeve is pressed by a spring against the face of the stud end on which the gear goes. A pin in the sleeve enters alternative holes, either to lock it with the projection in line with the key or at a quarter-turn position, holding the wheel hub from movement.

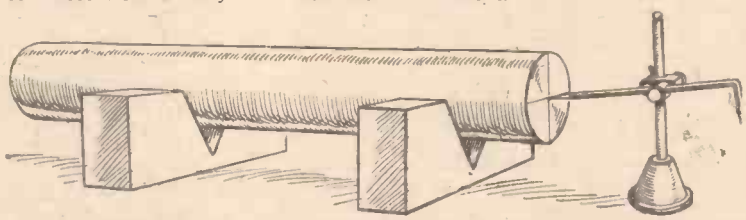


Fig. 12.—Centring by means of the scribing block and the vee-blocks.

In order to avoid frequent changes, several models are built with gear-box selection; by moving a handle to different positions the feed may be instantly altered for any given set-up of change-wheels. The box lies in front of the headstock, affording two or three changes while, at a higher cost, a Norton type box can be had, with handle and selective pinion engaging any of a set of gears supplying twenty-four threads and feeds, or thirty-three in a more elaborate style.

Tool-holding arrangements need careful consideration when choosing a lathe. Years ago, national practice was definitely clear; American makers fitted the round, slotted tool-post to all machines of small and even considerable size, and British firms the four-stud plate with flat clamps. Now many British lathes have the American post, while the single bolt triangular plate, with a fine adjusting screw for height, is also much liked, as is the triangular block which pinches the tool with a pair of screws into a slot. *(To be continued)*

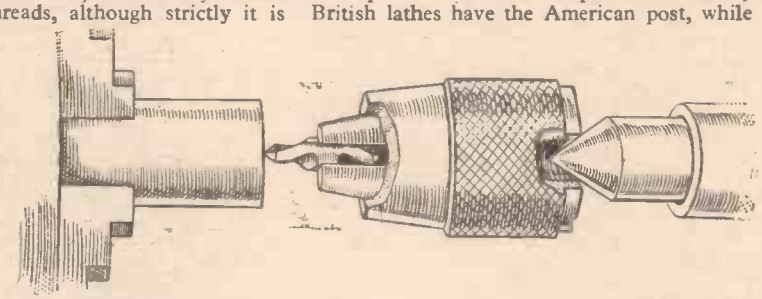


Fig. 14.—Centring from the tailstock.

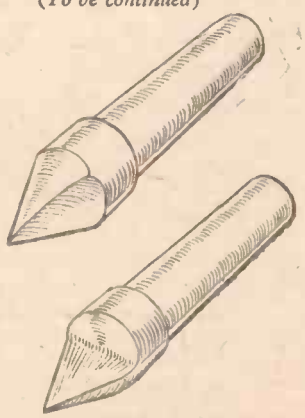


Fig. 17.—Square and half centres.

Our Models Competition

S. G. Cain's Model Vertical Steam Engine which was Awarded First Prize

THIS engine has a bore of 1in. and a stroke of ⅞in.

The cylinder is a casting which was obtained from Stuart Turner before the war, as also were the steam chest and cover, and also the cylinder top cover. These and the flywheel are the only castings used.

The cylinder was mounted on an angle-plate on the faceplate, after marking out, and the valve face faced off. It was then mounted on this face on the angle plate and bored, and the ends faced.

Afterwards it was lapped out with a piece of sheet copper wrapped round a wooden plug and loaded with fine valve grinding paste.

The ports in the valve face were first drilled with a row of holes and then chipped out to shape with small chisels made from ⅛in. square cast steel.

The steam chest was mounted in a four-jaw chuck and faced off both sides, afterwards being mounted on the angle-plate on faceplate and the valve spindle hole drilled and stuffing box bored out.

Stud holes were then drilled and it was used as a jig to drill the holes in the valve face.

Steam chest cover and top cylinder cover were plain turning jobs, and the latter after being drilled was used as a jig to drill the stud holes in the cylinder top.

The bottom cylinder cover is made from 2in. by ½in. mild steel bar. It was mounted in a four-jaw chuck and the hole for piston rod drilled and cylinder spigot turned to fit the bore. It was then reversed in the chuck and the piston-rod hole very carefully centered. The stuffing box was then bored out with a very small boring tool.

Holes for the tops of columns were then drilled.

Piston and valve-rod glands were turned up from a piece of an old scrap valve spindle (gunmetal) about 1in. diameter. These glands are fitted with 1/16th studs and nuts.

The piston was turned from a piece of cast-iron stock. It was rough turned to 1/16in. over size, drilled for piston rod and parted off.

The piston rod, which is a length of 3/16in. rustless steel rod was set up to run true in the four-jaw chuck and the ends shouldered and screwed for piston and cross-head.

While still set up, the piston was put on and secured with a nut and finished to size. It was made so that it just slid freely in the cylinder without shake.

Piston Ring

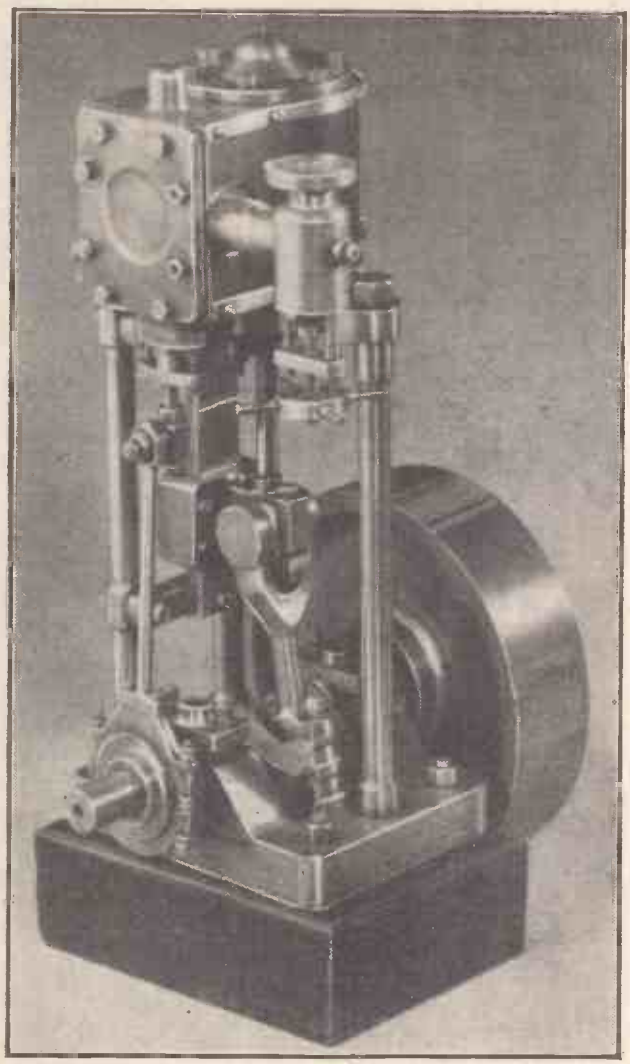
The piston ring was made from a piece of the same cast-iron stock as the piston. This cast-iron stock, by the way, was simply a window weight.

The ring was bored about 1/16in. larger than the bottom of the groove in the piston and turned on the outside 1/16in. larger than the cylinder bore. It was then parted off to correct width and split with a diagonal saw-cut. The gap was widened till it had about the right amount of spring to close it.

A piece of round steel was then chucked and a shoulder turned so that the ring would just close on it. The turned portion was slightly less than the width of ring and the larger portion was turned down about 1/16in. less in diameter than the outside of the ring in the closed position.

It was then drilled and tapped in the centre to take a set-screw.

A cap was turned slightly less than diameter of the ring and drilled for set-screw. The ring was then clamped in this jig in closed position and the outside turned down till the cylinder would just slide on to it. The slide valve was made from a piece of the gunmetal spindle. The cavity was chipped out. The face was first filed and then the valve was placed face down on fine emery cloth on top of a piece of plate glass and rubbed till a good surface was obtained.



General view of Mr. S. G. Cain's model vertical steam engine.

The valve is secured by a rectangular nut in a slot in the back of it, the nut running on a thread on the valve spindle and allowing the valve to seat itself on valve face but without any endwise movement. The valve is set by rotating the valve spindle.

Crankshaft

The crankshaft is made from a piece of 1in. by ½in. mild steel bar. After marking out, it was sawn out roughly to shape except for the piece between the crank webs, which was left in for the time being. Two projections were also left at the ends to form throw-plates for crank-pin centres.

The main journals and shaft were then turned and also the sides of the crank webs. The piece between the crank webs was then drilled and sawn out and the job placed in the lathe on other centres.

The crank-pin and the inside of the webs were then turned.

The gap between webs was then packed, throw-plates sawn off, the job placed on original centres and ends of shaft turned down.

Keyways for flywheel and eccentric sheave were later cut by an end mill, the crankshaft being clamped in the slide rest and traversed across the cutter held in the chuck. This was done, of course, after the valve had been set.

The flywheel was turned up from an old pulley casting I had by me. It was a plain turning job.

After being rough turned it was mounted on a mandrel between centres and finished to size.

Afterwards the keyway was cut with a small square file. A gib-headed key was filed up from a small scrap of flat steel, and fitted.

The bedplate was sawn and filed from a piece of 2in. x ½in. mild steel as also were the bearing pedestals.

The latter were let into rebates cut in the bedplate and secured by countersunk screws from underneath.

They were then drilled and tapped for studs and caps filed up and fitted. The bedplate was then mounted on an angle-plate on the faceplate and holes were bored for main bearing brasses.

The main brasses were made from the same gunmental spindle as the glands. The halves were sweated together and bored. They were then mounted on a mandrel and the outsides turned, afterwards being unsweated and the faces cleaned up.

The connecting-rod was turned up from a piece of ⅞in. square mild steel bar. The jaw was drilled and filed out to shape. The crosshead-pin was made a force fit and squeezed in position in the vice.

The connecting-rod bottom end brasses were also made from slices of the aforementioned gunmetal spindle.

They were marked off, drilled and bolted together, then mounted on an angle-plate and bored. They were then mounted on a mandrel and the sides faced off and bosses formed.

Crosshead

The crosshead is filed up from a piece of cast-iron as it was thought it would have better wearing qualities on the steel guide

than a steel one. The guide bar is a piece of bright mild steel.

Columns were turned up from bright mild steel, as also was the eccentric sheave. The required eccentricity was obtained by altering its position in the four-jaw chuck.

The eccentric strap is cut from pieces of flat mild steel and has brass liners in the bore.

The eccentric rod was turned up from flat mild steel rod.

The steam stop valve is turned from brass bar, the body being built-up and the branch screwed in with a fine thread and sweated. The valve spindle and valve are turned up in one piece with a 45° cone on the valve. The end of the spindle is squared for the hand-wheel, which is secured with a 1/16in. nut.

The cylinder drain cocks were obtained from Bassett Lowke and Company. Blued steel lagging plate was obtained from Stuart Turner and is secured by two brass strips, with eight 10 B.A. screws to each strip.

All the bright mild steel mentioned was obtained from Tyzack's.

The nuts were obtained from the Liverpool Castings and Tool Supply Co.

The engine is intended for driving a centrifugal pump, but the latter has not yet been made.

Possibilities of Ice Engineering

Artificial Floating Landing Grounds and Ice Cities

By Professor A. M. LOW

THE full facts have now been released about one of the most daring and imaginative engineering projects of the war—the aircraft-carrier *Habbakuk*. In 1940 and 1941 it became apparent that a key to keeping open the vital lifeline across the Atlantic was the construction of an "island" in the middle of the ocean on which aircraft could land and refuel. They could thus maintain the anti-U-boat patrol in an area which, when they were based on Britain or America, was outside their useful range.

There was nothing very novel in the idea. Before the war designs and models of an artificial, floating landing-ground, known as a "seadrome," had been prepared. It was proposed that these seadromes should be anchored at intervals in the Atlantic, thus making the crossing by civil air liners possible in short "hops." The seadrome was essentially a platform supported well above the waves which would pass through the structure, leaving the platform steady in the worst storms. It was to be anchored by large mushroom anchors after being towed into position.

The seadrome type of structure was no doubt considered by the military authorities and rejected, probably on the grounds that they would be too vulnerable to attack by submarines and aircraft and that, being stationary, they would be unable to provide the "headwind" which helps landing on an aircraft-carrier. It fact, a type of "seadrome" was evolved and used by the Royal Navy as a device known as "Lilly," a landing strip composed of hexagonal floats ingeniously fitted together so that they were steady enough for an aircraft to land, but flexible enough to take the strains imposed by the waves. This, however, was an emergency water-landing strip, and not suitable for all the year round use in mid-ocean.

Floating Aerodrome

In September, 1942, Mr. Geoffrey Pyke put forward a proposal for a revolutionary floating aerodrome which had none of these disadvantages. The idea was taken up and the work that followed, although it never reached maturity, ranked as one of the most remarkable pieces of research of the war. Mr. Pyke's proposal was for nothing less than a floating island of ice, sufficiently large for aircraft to land, shaped like an aircraft-carrier and able to move about under its own power.

Water expands on freezing and ice floats. But ice offered other advantages as a building material. Blocks of ice are easily "welded" by pressure. The Eskimo's igloo showed that ice had been used as a constructional material for thousands of years. From the Eskimo also the modern engineer learned the added structural strength that could be obtained by mixing the ice with fibrous material. The Eskimo used moss. Modern engineers used wood-pulp, making a mixture of 86 per cent. ice and 14 per cent. wood-pulp which was called Pykrete after the inventor. Once frozen into blocks, this material could be handled like wood or plastic, being machined, sawn and cut to any desired shape. The material has great strength and hardness. In tests, quite thin pieces were shown to be "bullet proof" and the ice aircraft-carrier would have been virtually unsinkable, able to survive bombs and torpedoes.

Numerous tests were carried out and one large scale model of H.M.S. *Habbakuk* was made. The finished aircraft-carrier, its hull built up of Pykrete blocks, with refrigerating pipes running through to keep them frozen in warm waters, would have been 2,000 feet long, 300 feet wide and 200 feet deep. It would have had the enormous displacement of 2,000,000 tons—compared with the 80,000 tons of the largest ships afloat. It would have had resinous insulation, inside and out, and the interior would have been fitted out like an aircraft-carrier with space for planes and crew's quarters. Because of its size, the aircraft using it would not need folding wings as in the case of an orthodox aircraft-carrier. Propulsion would have been by 26 electric motors fitted in nacelles, 13 in each side.

Unfortunately, when all was ready, and when even the building sites and method of construction on wooden rafts had been decided upon, the turn in the tide of the Battle of the Atlantic led to the decision not to proceed with this great project which would have cost eight or ten million pounds. There is every reason to suppose, however, from the tests on the models that H.M.S. *Habbakuk* would have been successful, and it is a pity we could not have had the comments of U-boat commanders and enemy aircraft pilots on this very unorthodox vessel.

It must not be supposed, however, that all this work was wasted. It gave us experience of large-scale refrigeration which will be of great value to engineers. We are apt to think of refrigeration primarily in terms of food preservation, but it has other uses on a large scale. Huge masses of concrete, such as are used in modern dams, have to be refrigerated to prevent unequal expansion during the setting time.

Ice as a Building Material

It also gave experience, for the first time, in the large scale handling of ice as a building material. It has certain advantages, such as lightness and cheapness, which make it possible to consider it for temporary structures even in peacetime. The lightness and strength of an ice-wood pulp mixture might make it possible to contemplate buildings of a size and type not possible with concrete and steel because of weight-strength ratios. For ordinary purposes, however, it is likely that the cost of installing and maintaining permanent refrigerating machinery to prevent the ice melting would render this method quite uneconomic.

It may be another matter when the long-talked-about exploitation of the Antarctic continent begins. We have good reason to believe that in the Antarctic are vast stores of coal, gold and other minerals, and that one day enterprising men will begin to exploit them. H.M.S. *Habbakuk* shows how the buildings and factories necessary might be built—there would be no need to install refrigerating plants to preserve the ice. Ice cities would save the great cost of taking building materials to the Antarctic, and the constant winds of considerable force which make the Antarctic so unpleasant could be harnessed to provide electricity to heat the interior of the structures so that work could proceed in an artificial climate. Atomic energy may, one day, solve all heating problems.

But the chief reason why H.M.S. *Habbakuk* was valuable, although never brought to completion, was because it showed that the spirit of imagination and daring is not dead, and demonstrated that there is no project the modern engineer cannot tackle given the facilities. Achievements of this kind make it abundantly clear that most of the floods, famines and droughts so long entitled "Acts of God" are, in fact, the consequence of the laziness of man.

Midget Mains Transformers—2

Their Design and Construction

By ERIC LOWDON

THE specification of our example was given at the beginning of the article. Here it is again.

Primary input—230 V., 50 cycles.

Secondary Outputs—

(1) 250-0-250 V. 70 milliamps.
(2) 6.3 V., 1.5 amps.
(3) 5.0 V., 2.0 amps.

The first step is to assess the total watts input to the primary. This will be the total of the secondary outputs plus iron and copper losses. As a first approximation the losses can be taken as 15 per cent. of the total output watts. Due to the form factor of the rectified current the H.T. secondary watts referred to the primary will not be the simple product of the current and volts, but will be given by

$$W = \frac{4 \times IV}{3} = \frac{4 \times .070 \times 250}{3} = 23.3 \text{ watts}$$

the remaining secondaries will be

(2) $6.3 \times 1.5 = 9.45$ watts.
(3) $5.0 \times 2.0 = 10.0$ watts.

making a total of 42.75 watts, say 43 watts.

Approximate primary watts input will therefore be

$$43 + 15\% = 49.45 \text{ say } 50 \text{ watts.}$$

The core area can now be estimated

$$A = .15\sqrt{50} = 1.0 \text{ sq. in. approx.}$$

and from this the turns per volt required on the transformer

$$T = \frac{6}{A} = \frac{6}{1} = 6 \text{ turns per volt.}$$

The total turns required on each winding is given by turns per volt × volts across the considered winding thus :—

Total primary turns $6 \times 230 = 1{,}380$.

Total secondary turns

(1) $6 \times 250 \times 2 = 3{,}000$.
(2) $6 \times 6.3 = 38$.
(3) $6 \times 5.0 = 30$.

All the results obtained so far should be noted in the design sheet, but lightly in pencil, for some alteration to the figures will be necessary at a later stage.

Wire Sizes

At this point the wire gauges for the various windings are now chosen on the bases of the current ratings, and not forgetting that we can double the currents given in the tables.

The approximate primary current is calculated from the watts input and the primary volts—

$$I = \frac{50}{230} = .22 \text{ amps approx.}$$

the currents for the remaining secondaries are given in the specification.

Thus chosen wire sizes for each winding are :—

Primary 34 s.w.g.
Secondaries (1) 39 s.w.g.
(2) 22 s.w.g.
(3) 22 s.w.g.

At the same time the turns per inch for each of these wires can be noted in the appropriate place in the sheet remembering, of course, to multiply the table figures by the Winding Factor of .95 thus,

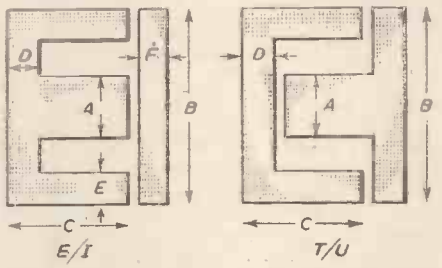
34 s.w.g. enam. $98 \times .95 = 93$ T.P.I.
39 s.w.g. enam. $168 \times .95 = 160$ T.P.I.
22 s.w.g. enam. $33.3 \times .95 = 31.6$ T.P.I.

Laminations

The time has now come to choose a suitable size of lamination. This is a matter of trial and error, the scheme being to make a guess at the size required then check roughly whether the windings will fit into the window space. If the first size chosen is too large or too small then another guess must be made,

(*Continued from page 301, June issue*)

and so on until the correct size is chosen. In practice it is rarely necessary to make more than three choices. Table I gives a list of some laminations suitable for small transformers.



Type No	A	B	C	D	E	F	Pattern
15	5/8	3 1/8	2	1/2	–	–	T/U
24	15/16	3 9/16	2 1/16	7/16	–	–	T/U
25	5/8	2 7/8	1 7/8	3/8	–	–	T/U
26	23/32	2 1/2	1 17/32	13/32	–	–	T/U
29	1	3	2	1/2	1/2	1/2	E/I
32	9/16	2 3/32	1 5/16	9/32	3/8	5/16	E/I
59	7/8	3 1/4	2 1/16	7/16	–	–	T/U
68	19/32	2 7/32	1 35/64	19/64	–	–	T/U
69	13/16	3 3/16	1 27/32	13/32	13/32	13/32	E/I
70	1/2	2 1/16	1 1/2	5/16	5/16	5/16	E/I
80		2 1/2	1 1/2	3/8	3/8	3/8	E/I

Table I.—Some useful lamination sizes, suitable for small transformers, by Magnetic and Electrical Alloys, Ltd.

For this example a No. 29 lamination made by Magnetic and Electrical Alloys Ltd. has been chosen. The length of window, that is the winding length, is 1.5in., but as room must be left at the ends for winding margins or end cheeks on the bobbin, the available space will be less than this. The writer prefers bobbins without end cheeks so 1/8in. is allowed at each end for margins which leaves 1.25in. for the length of layer.

The number of turns per layer is therefore turns per inch times layer length—

Primary $1.25 \times 93 = 116$ turns per layer.

Secondaries

(1) $1.25 \times 160 = 200$ turns per layer.
(2) $1.25 \times 31.6 = 39$ turns per layer.
(3) $1.25 \times 31.6 = 39$ turns per layer.

and the number of layers for each winding will be the turns per layer divided into the total turns as follows :

Primary $\frac{1{,}380}{116} = 12$ layers.

Secondaries

(1) $\frac{3{,}000}{200} = 15$ layers.
(2) $\frac{38}{39} = 1$ layer.
(3) $\frac{38}{39} = 1$ layer.

Winding Depth

A check can now be made on the winding depth to see whether or nor it will fit into the .5in. window depth available in this size of lamination. The depth of copper for each winding will be given by the turns per in. divided into the number of layers.

Primary $\frac{12}{93} = .129$in.

Secondaries

(1) $\frac{15}{160} = .094$in.
(2) $\frac{1}{31.6} = .031$in.
(3) $\frac{1}{31.6} = .031$in.

The total depth of copper is therefore .286in., but there is also the insulation and

DESIGN SHEET

Lamination size No. 29 Window 1½ × ½ Tongue 1in.
Core area 1.0 Magnetic path 5.57 Volume 5.57 Weight 1.6
Flux density 75,000 Watts per lb. 1.0 Total iron loss 1.6

Winding	.. ..	Primary	Sec.	Sec.	Sec
Volts	.. .. ..	230	250 0 250	6.3	5.0
Current	.. ..	.22	.070	1.5	2.0
Watts	.. .. ..	50	23	9.5	10.0
Turns	.. .. ..	1,380	3,000	38	30
Wire	.. .. ..	34	39	22	22
Turns/in.	.. ..	93	160	31.6	31.6
Layer length	.. ..	1.25	1.25	1 25	1.25
Turns/layer	.. ..	116	200	39	39
No. of layers	.. ..	12	15	1	1
Copper depth	.. ..	.129	.094	.0316	.0316
Interleaving	.. ..	.012	.015	—	—
Total depth	.. ..	.141	.109	.0316	.0316
Mean turn	.. ..	4.8	5.68	6.21	6.5
Ohms/yd.	.. ..	.369	1.13	.039	.039
Res. (hot)	.. ..	82	640	.307	.243
Volts drop	.. ..	18	29	.46	.486
Watts loss	.. ..	4.0	1.35	.69	.972

A design sheet like this makes calculations easier.

bobbin thickness to be accounted for. The interleaving paper between layers is chosen for mechanical reasons rather than electrical, for the thinnest of papers will withstand the comparatively small voltage which will be developed between layers. Table 2 gives the ideal thickness of paper to use with the various gauges of wire. The following figures are based on this table.

Primary $12 \times .001\text{in.} = .012\text{in.}$

Secondaries

(1) $15 \times .001\text{in.} = .015\text{in.}$

(2) Nil.

(3) Nil.

We have already discussed how to assess the voltages likely to occur between winding and winding, and winding and core in a transformer. In this case the peak voltage across each half of the H.T. secondary will be $250 \times 1.4 = 350$ volts, and the voltages occurring between the windings will depend to some extent on the order in which they are wound on the bobbin. The highest voltage is that between the 5.0 volt rectifier heater winding and the H.T. secondary, this will be in the region of 700 volts. If however we interpose the 6.3 volt winding, which will normally be at earth potential, between these two it will relieve the strain, for the peak voltage between each of these windings and earth is only 350 volts. Thus from the figures given for paper insulation we can see that .010in. is sufficient between each layer, but as an added precaution we can increase this to .015in. The total for interwinding insulation is therefore $4 \times .015\text{in.} = .060\text{in.}$

Bobbin Construction

To conserve space the bobbin should be constructed from thin but stout material. Leatheroid is ideal for this purpose and .030in. is ample thickness; if .015in. is allowed for clearance between bobbin and core, the total space occupied by the bobbin will be .045in.

The total for insulation and bobbin will therefore be $.045 + .060 + .027 = .132\text{in.}$, and this added to the copper depth gives $.132 + .286 = .418\text{in.}$ This leaves .082in. to take care of the bulge in the winding; .082 works out at about 19 per cent. of .418 and though this is 4 per cent. more than the stipulated minimum of 15 per cent., it is nevertheless quite reasonable, and little would be gained in trying to fill the slight extra space by altering the gauges of wire in the windings.

The next step is to estimate the mean length of turn on each winding. An accurate method of doing this is as follows; first calculate the length round the bobbin. In this case the cross section area of the core is 1.0 sq. in. and the centre limb of the core is 1.0 in. wide, therefore the core must be 1.0in. square, the bobbin is .045in. greater than this on each side $(.045 \times 2)$ the length round the bobbin is thus $4 \times 1.090 = 4.36\text{in.}$ Now add up the thickness of paper and copper from the figures already calculated, from the bobbin to the centre of each winding and multiply each result by 6.28. By adding the answer in each case to the length round the bobbin, the mean length of turn for each winding will result. For example the depth of primary copper and paper is .141in., the depth to the centre of this winding is therefore .070in., thus mean length of primary turn is $6.28 \times .070 + 4.36 = 4.8\text{in.}$

Similarly with the next winding, the depth to the centre is the total depth of primary copper and insulation .141in. plus .015in. interwinding insulation plus half the thickness of the secondary winding (copper and insulation) .109in./2 making a total of .209in., this gives the mean length of H.T. secondary winding as $.209 \times 6.28 + 4.36 = 5.68\text{in.}$ In the same way the remaining windings work out at 6.21 and 6.5 in. respectively.

Resistance of Windings

The resistance of each winding is now found by multiplying together the mean length of turn, the total turns, and the ohms per yard figure as taken from the wire tables, and dividing the answer by 36. This gives the cold resistance of the winding, but we are more interested in the resistance when the transformer is warm under working conditions. This is usually taken as 20 per cent. more than the cold resistance, a figure which is conveniently obtained by dividing by 30 instead of 36.

The resistances of each winding are therefore calculated as follows.

Primary $\dfrac{4.8 \times 1380 \times .369}{30} = 82$ ohms

Secondaries

(1) $\dfrac{5.68 \times 3000 \times 1.13}{30} = 640$ ohms

(2) $\dfrac{6.21 \times 38 \times .039}{30} = .307$ ohms

(3) $\dfrac{6.5 \times 30 \times .039}{30} = .243$ ohms

And the volts drop in each winding is, of course, the product of the winding resistance and the current flowing through it. The effective A.C. current in the H.T. secondary will not, however, be the same as the specified D.C. figure of .070 amps, and should be based on the watts rating calculated for this winding at the beginning of the example, that is the watts divided by the *total* secondary H.T. volts, thus:

$$I = \frac{23}{500} = .46 \text{ milliamps}$$

and the volts drop $Vd = 640 \times .046 = 29$ volts, this being the volts drop across the whole winding, that is to say 15 volts in each half. The volts drop on the remaining windings are worked out in a normal straightforward manner:—

Primary $= 82 \times .22 = 18$ volts

Secondaries

(2) $.307 \times 1.5 = .46$ volts

(3) $.243 \times 2.0 = .48$ volts

These figures multiplied again by the currents in each winding will give us the watts lost, thus:

Primary $18 \times .22 = 4.0$ watts

Secondaries

(1) $29 \times .046 = 1.35$ watts

(2) $.46 \times 1.5 = .69$ watts

(3) $.48 \times 2.0 = .96$ watts

making a total copper loss of 7.00.

Iron Loss

We can now find the iron loss by calculating the weight of core by the method already outlined and multiplying the figure obtained by the watts loss per lb.

The core area is 1.0 sq. in., and the mean magnetic path length works out at 5.57in., the volume of core is therefore $1.0 \times 5.57 = 5.57$ cubic in., and the weight is $5.57 \times .28 = 1.6$lb. approx. The iron loss has already been given as 1.0 watt per lb., therefore, the total iron loss is $1.6 \times 1.0 = 1.6$ watts.

The total iron plus copper loss is, therefore, 9.0 watts approx.

The design sheet should now be completely filled in, and we are now ready to check over the figures and modify them slightly to compensate for volts drop in the winding, etc., but before going further it will be advisable at this point to check the temperature rise of the transformer to ensure that we are within the specified limit of 50° C.

$$T = \frac{20W}{S}(9.4t + H)$$

Wire size S.W.G.	Paper thickness (inches)
11 to 15	.005in.
16 to 20	.003in.
21 to 30	.002in.
31 to 45	.001in.

Table 2.—Ideal thickness of paper for inter-layer insulation.

working out S from the dimensions given in the lamination table we get

$S = 2L\ (d + \pi D)$

$= 2 \times 1.5\ (1.0 + 3.14 \times .5) = 7.7$ sq. in.

the total copper loss we have already found to be 7.00 watts and the total thickness of insulation in the windings adds up to .087in. If we assume that the transformer is to be mounted in the position shown in Fig. 3 (B) H will be 1.5in., thus:

$$T = \frac{20 \times 7.0}{7.7}(9.4 \times .087 + 1.5) = 42°\ \text{C.}$$

this figure is satisfactory so we can carry on with our check of the design sheet.

The first thing to note is that at the beginning of the example we allowed 15 per cent. of the total watts output to account for copper and iron losses, this amounted to approximately 7.0 watts. But as we have already calculated the total loss actually amounts to 9.0 watts, making the total watts input to the transformer 52 instead of 50. This means that the primary current, volts drop, and watts loss, will be slightly greater than first calculated.

If great accuracy is desired the quantities affected may be modified on the basis of the new watts input figure, and in order to illustrate the procedure we will do so in this case.

The primary current now becomes $52/230 = .226$ amps, the volts drop $.226 \times 82 = 18.5$ volts, and the watts loss $18.5 \times .226 = 4.2$ watts. As can be seen the increases are negligible but they may not be so in every case, and this point should always be checked.

Compensating for Volts Drop

It is now necessary to compensate for the volts drop in each winding, and this is done by removing an appropriate number of turns from the primary and adding turns to each of the secondaries. The turns necessary in each case are found by multiplying the turns per volt ratio of the transformer, 6 turns per volt in this case, by the volts drop in each winding, thus:

Number of turns to be taken off the primary are

$18 \times 6.0 = 108$ turns

and turns to be added to each secondary

(1) $29 \times 6.0 = 174$ turns

(2) $.46 \times 6.0 = 2.76$, say 3.0 turns

(3) $.48 \times 6.0 = 2.88$, say 3.0 turns

The total turns for each winding in the design sheet may now be altered to:

Primary, 1,262 turns

Secondaries

(1) 3,174 turns (centre tapped)

(2) 41 turns

(3) 33 turns.

The design is now complete and ready to be translated into the reality of the assembled component. The calculations involved may seem somewhat tedious, but by proceeding in an orderly manner it is surprising how rapidly they can be done. One evening's work should see it through from start to finish.

In conclusion, some readers may ask why large transformers are made at all if they can be reduced to considerably smaller dimensions. It is a fair question.

The disadvantages of the midget component compared with the normal size are mainly:

(1) The efficiency is less, that is to say a greater number of watts must be put into the primary for a given output from the secondaries.

(2) The higher temperature is not desirable in certain types of equipment.

(3) The life may be shorter due to the higher temperature.

Nevertheless the midget transformer will give years of good service in gear where efficiency and temperature are not important.

Finally, if the reader wishes to construct components of normal size, the design procedure outlined in this article still applies, but the materials will be worked at more conservative ratings.

ELEMENTS OF MECHANICS AND MECHANISMS—33

Power Transmission Methods

Other Cam Mechanisms

SOME interesting, though less well-known, cam devices are shown in Figs. 83 to 86. The first one is a face cam mounted on the end of a rotating vertical shaft. In the example shown, two separate cam contours are incorporated on the face of the one disc at the head of the shaft. Bearing on these two cams are two rockers, pivoted at A and B respectively, and each fitted with tiny rollers to reduce friction. As the shaft and cams rotate, so

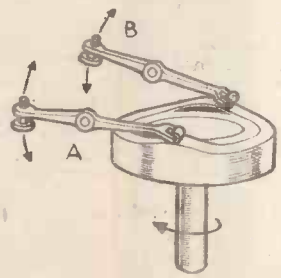


Fig. 83.—Face cam for converting rotary into reciprocating motion.

the two rockers move up and down, thus converting rotary into reciprocating motion.

The heart cam and the drum cam, shown in Figs. 84 and 85 respectively, are both of the positive motion type, no springs being required to make the reciprocating element follow the contour of the cam. They are both designed to convert rotary motion into irregular reciprocating motion.

The device shown in Fig. 86 is somewhat similar to the eccentric belt cam of Fig. 87. It employs a circular eccentric cam, but dispenses altogether with a connecting rod. The circular motion of the camshaft is converted into an irregular backward-and-forward motion by the rotation of the cam within the rectangular-shaped yoke.

The Swash-plate Device

A device which is very similar to a face cam is illustrated in Fig. 87. It is known as a swash plate, and consists of a circular metal disc mounted concentrically on a shaft, but tilted at an angle to its axis. It is sometimes used for operating the valve gear of certain steam-engines where the valve chest is mounted on the top of the cylinders, and the valve works parallel with the axis of the crankshaft. This is illustrated in Fig. 87. As the crankshaft rotates, so the swash plate rocks from side to side and oscillates the lever. The upper end of this lever is attached to the valve spindle by a simple link mechanism which conveys a reciprocating motion to the spindle.

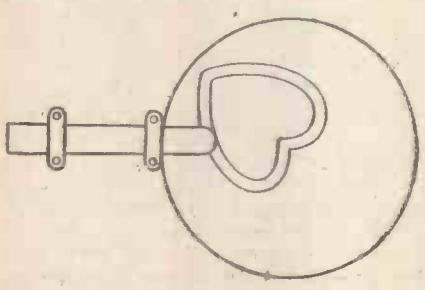


Fig. 84.—Heart cam mechanism.

The swash plate has also been used in place of a crank in both internal-combustion engines and various pump devices. In these mechanisms a number of vertical cylinders are arranged in circular formation with their connecting rods bearing on the surface of a swash plate whose axis is parallel with that of the cylinders. Compared with the orthodox crank this arrangement is somewhat inferior, as considerable friction is introduced at the contact of the connecting rods with a swash plate.

Belts and Pulleys

Gearing may consist of belts and pulleys, shafts, chains, spur wheels, bevel wheels, skew bevels, worms and bevels, and universal joints of many different types. There are, besides, countless associated devices, such as clutches, ratchets, etc.

Fig. 88 shows an ordinary flat-belt drive running over steel pulleys. This system is frequently used to transmit the power from the prime mover (steam-engine, gas-engine, or other type of motor) to the line shaft in factories. Pulleys suitably placed along the line shaft convey the power by means of other belts to small countershafts carrying fast and loose pulleys. By means of a fork-shaped device or "striking gear," the belts can be slid sideways from one pulley to the other. Thus, when a belt is passing over

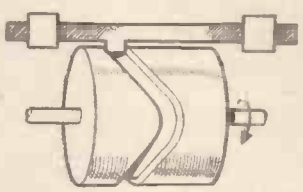


Fig. 85.—Drum cam for converting rotary motion into irregular reciprocating motion.

a fixed pulley, the countershaft revolves and so drives the lathe or other machine to which the countershaft is coupled. When the belt is slid off the fixed pulley on to the adjacent loose one the countershaft naturally stops while the pulley simply revolves round it. In this way a simple means is obtained for stopping and starting the various machines in the shop without stopping the line shaft.

The advantage of flat belts is that they can be used to transmit power when there is a considerable distance between the driving shaft and the driven shaft; no guiding arrangements are required to retain them in position on the pulleys when the shafts are parallel, and if necessary the belts may be crossed to give a reversal of rotation to the driven shaft.

If two shafts are at right angles it is necessary, in order to retain the belt on the pulleys, to arrange the relative positions of the latter as shown in Fig. 89; that is, so that the central line of the belt as it advances towards each pulley is in the diametral plane of the pulley. The direction of rotation is indicated by the arrows on the belt. If the direction is reversed, however, these conditions no longer hold good and the belt leaves the pulleys.

An Efficient Belt

It is interesting to note that there is a certain velocity of a belt at which it is most efficient. Above this optimum speed its percentage efficiency is less. There are many factors contributing to cause this. One of them is the flexibility of the material of which it is composed. The loss of power due to the stiffness of the belt varies inversely as the radius of the pulley and directly as the speed of the revolution.

Another type of belt drive is that shown in Fig. 90. Here the belt is composed of a centre cord or fabric structure embedded in rubber. The belt is wedge-shaped in section and operates on "V" section pulleys. This is an excellent transmitter of power between fairly close centres. The belt rides between the flanges of the pulley, thus the greater the torque the more securely it is gripped, and consequently there is very little slip. Of

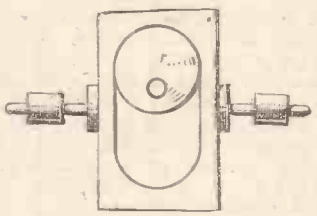


Fig. 86.—Another cam device.

course, if the belt gets worn or is too small for the pulleys, it will then "bottom" in the groove and the sloping slides will no longer grip it.

This type of drive was employed to a great extent on early motor cycles. An important advantage which it had over chain and shaft drives was its flexibility, which absorbed a great deal of the "thump" of the engine and made for smooth running. Its discontinuance for this type of work was due to its comparatively short working life, the need for constant adjustment and its inclination to slip in wet weather, slipping being due to the fact that water acts as a lubricant between the rubber and steel.

Somewhat similar to the "V" belt arrangement is the multiple-fibre rope system, which consists of several turns of rope running over a multiple "V" grooved pulley, as in Fig. 91.

Chains

The advantages of chains over belts and ropes for the transmission of power are numerous, not the least being freedom from

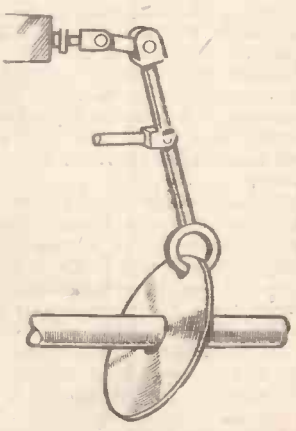


Fig. 87.—Swash plate for operating steam-engine valve gear.

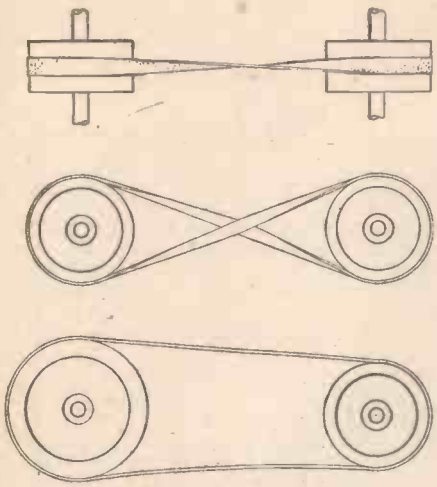


Fig. 88.—Examples of flat belts and pulleys. Reversal of direction of rotation can be obtained by simply shifting the belt.

slip, high running speeds, and imperviousness to heat, cold and moisture. The two principal types are the steel roller chain and the silent chain. Both of these types are of hardened steel parts made to within very fine limits of accuracy. They operate on accurately cut sprocket wheels. Fig. 92 is a view of a section of roller chain, while Fig. 93 shows the silent chain. The silent chain provides a noiseless transmission at high speeds. For this reason it finds one of its chief applications in automobile engines where it is frequently used to transmit the drive from the engine to the camshaft, the magneto and the dynamo. The ideal condition under which to run roller and silent chains is in an enclosed oil bath.

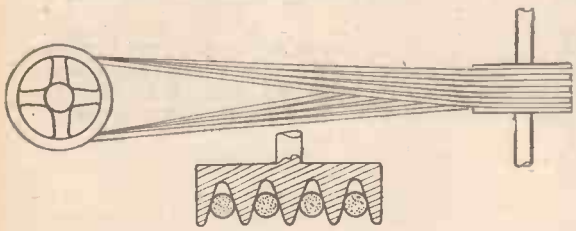


Fig. 91.—Multiple rope drive. Inset, section of pulley with rope.

Ingenious Belt and Chain Tensioners

For efficient operation of belts and chains it is necessary to run them at a certain tension, especially the former where the adhesion of the belt to the pulley is largely dependent on the tension. In this connection several devices have been invented for automatically providing the correct working tension. One of the simplest consists of an idler pulley operated by a spring or weight. In Fig. 94 is shown a weight-controlled idler pulley used in conjunction with a flat belt and also a spring-loaded jockey sprocket for tensioning a roller chain.

The mechanism illustrated in Fig. 95 is an ingenious device which combines a compact gear reduction unit and an automatic belt tensioner. The belt from the source of power drives the pulley, which is fixed to a short spindle. This spindle is supported by a fulcrum arm of link, which is able to rotate about the driven shaft S. Fixed to the other end of the spindle on which the pulley is mounted is a pinion which engages with a gear wheel keyed to the driven shaft. Rotation of the spindles by means of the belt drive and pulley causes the pinion to attempt to make an epicyclic movement round the gear wheel, as shown by the dotted arrow.

This is prevented, however, by the tension of the belt, so that instead of the pinion travelling round the gear wheel it remains in the same position and turns the gear wheel instead. Naturally, if the load is heavy, so that a large turning force is needed to rotate the gear wheel, then the pinion will exert a great force in the direction of the dotted arrow and so put a greater tension on the belt. In other words, the greater the load the greater is the belt tension, which is, of course, as it should be. In this way absolutely automatic belt tension is obtained because the load controls the tension.

Spur Gears and Bevels

The transmission of rotary motion from one shaft to another placed close to it is usually effected by means of gear wheels meshing directly with one another. The gears used between parallel shafts are called spur wheels. Where there is a difference in the size between two engaging spur wheels the smaller is sometimes designated a pinion. When the shafts are at an angle with one another, so that if continued they would meet in a point, the gears are called bevels; or, if the angle between the shafts is exactly 90 deg., they are also known as mitre wheels. When the shafts are at an angle so that if produced they would not meet in a point, then they are called skew bevels.

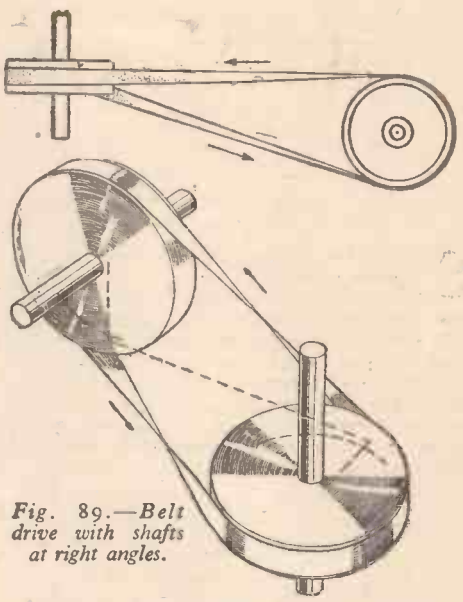


Fig. 89.—Belt drive with shafts at right angles.

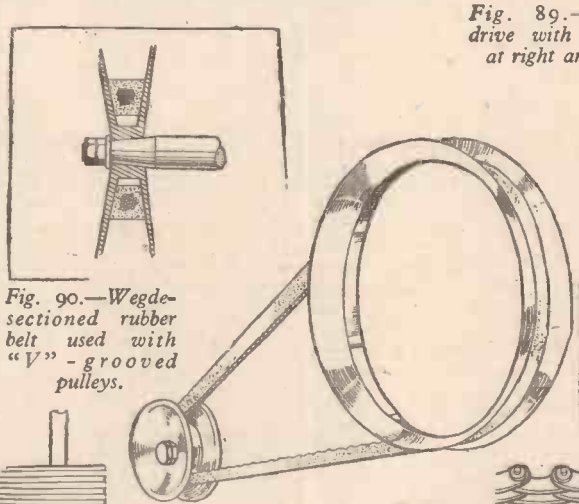


Fig. 90.—Wedge-sectioned rubber belt used with "V"-grooved pulleys.

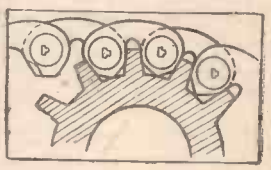


Fig. 93.—Section of "silent" chain. Inset shows how the chain fits the sprocket.

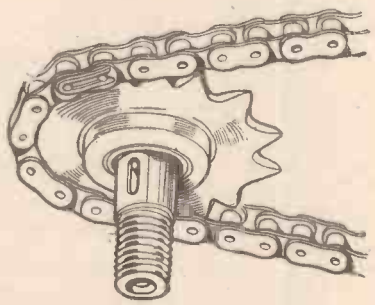


Fig. 92.—Steel roller chain and sprocket.

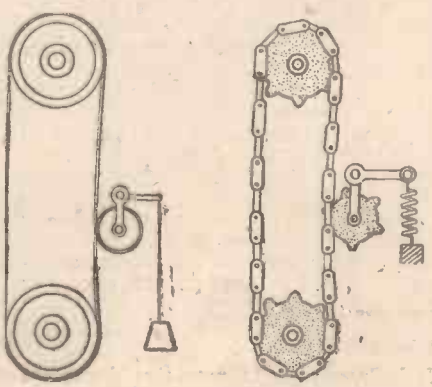


Fig. 94.—Belt and chain tensioning devices.

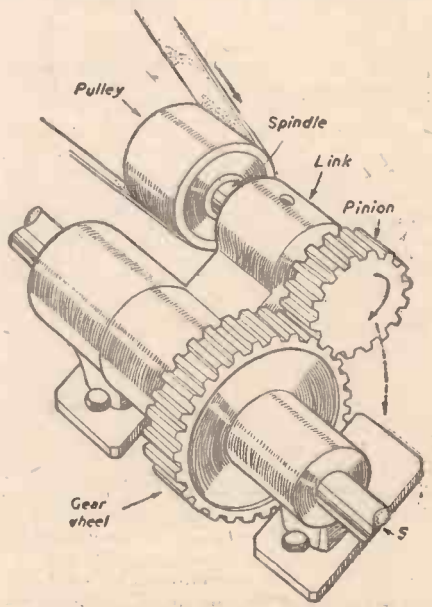


Fig. 95.—Gear reduction unit combining automatic belt tensioning.

A Notable Model Aeroplane

A Replica of the First Wakefield Cup Winner

By E. W. TWINING

IN the issue of PRACTICAL MECHANICS for March, 1949, there appeared, by the invitation of our Editor, an article, from my pen, recalling some reminiscences of the early days of model flying. In that article I gave all the particulars which I could remember of the several competitions in which I flew machines and which competitions culminated in my being the first to win, on July 5th, 1911, the famous Wakefield Gold Challenge Cup. Fortunately, I had preserved a photograph of the machine and this, although the model was taken without its undercarriage, gave a good pictorial view showing what the aeroplane was like.

To some of my older readers I understand that the perusal of my article proved quite nostalgic; there are many who look back with pleasure and longing to those far-off days when we were voyaging in uncharted seas; thirsting for knowledge and new

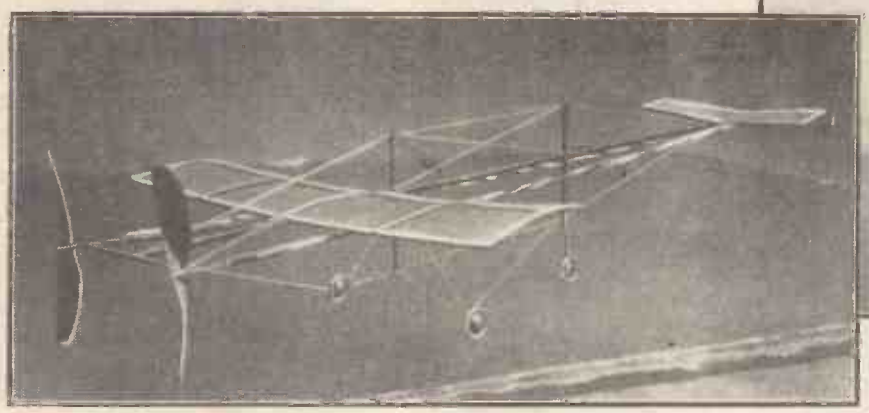


Fig. 1.—Mr. F. J. Camm's model, built in 1920.

experience; constantly making fresh discoveries and helping each other by disseminating our acquired knowledge and results of experiments.

It was in those days that the friendship commenced between Mr. F. J. Camm and myself, which friendship has remained unbroken ever since. Quite recently Mr. Camm discovered, amongst a mass of old papers and aeronautical periodicals, blue-print copies of drawings of mine, made and published after the Wakefield Cup competition; he also found a photograph of a similar machine made from the blue-prints. This aeroplane, made by himself, flew excellently; so well, in fact, that it was eventually lost by way of a finish to a remarkably long flight. It is shown in the reproduction of Mr. Camm's old photograph, Fig. 1.

Modifications

Having discovered the prints Mr. Camm conceived the idea of having an exact replica made of the first Wakefield Cup winner. Neither he nor I were in a position to undertake the construction so Mr. R. T. Howse, of Bristol, a keen aero-modellist of both the old and the modern schools of design, was asked to do so. The machine has now been completed and the result is shown in the photograph, Fig. 2. A comparison of the two pictures will show that there are slight differences between the two models. Mr. Camm's machine, made early in the year 1920 was built strictly in accordance with the blue-prints, but, as a matter of truth, the drawings which I made in 1911, and from which he worked, provided for little modifications or departures from the Wakefield prototype, which I introduced chiefly for reasons of collapsibility in transport. Thus, in order to simplify the removal of the mainplane, the king-post, for bracing wires, was not made to pass through the centre rib of the mainplane but was fixed in the longitudinal spar forward of the wing entering edge. But the new machine, just made by Mr. Howse, is in every respect, excepting one piece of material, a facsimile of the 1911 original-competition model and has been built from an entirely new set of drawings which I prepared last year for the purpose of making the replica.

The data used to enable me to make the new drawings were: the before-mentioned blue-prints, the recorded dimensions, my recollection of details and, most important of all, the original photograph of myself holding the cup winner, to which I referred at the commencement. This photograph was the subject of Fig. 5 in the "Early Days of Flying" article published in the issue for March last year.

Fig. 4.—The author hand-launching the replica.

The first Wakefield competition was for duration of flight after taking off from the ground. This take-off involved, of course, the fitting of an undercarriage which was not on the model in the Fig. 5 photograph because the machine had only just, a few days previously, won the *Model Engineer* challenge cup and had not, at the time of

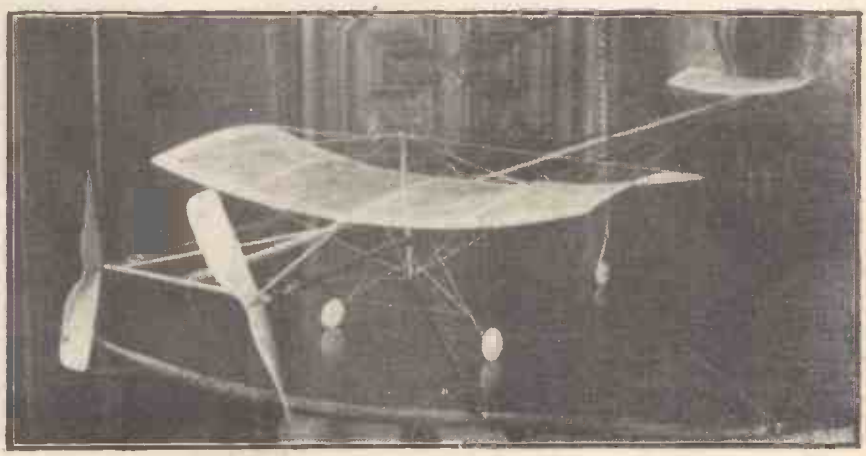


Fig. 2.—The Wakefield replica, built in 1950.

Fig. 3.—Mr. R. T. Howse, the builder of the replica.

photographing, been entered for the Wakefield contest.

Method of Launching

The next illustrations, Figs. 3 and 4, are photographs taken recently, the first, by myself, of Mr. Howse with the replica and ready to let it take off from a runway provided by a very convenient smooth, asphalt footpath which crosses the Durdham Downs, Bristol, and the other, taken by Mr. Howse, of myself, hand-launching in the air.

I now come to what is perhaps the main object of this article, namely, the publication

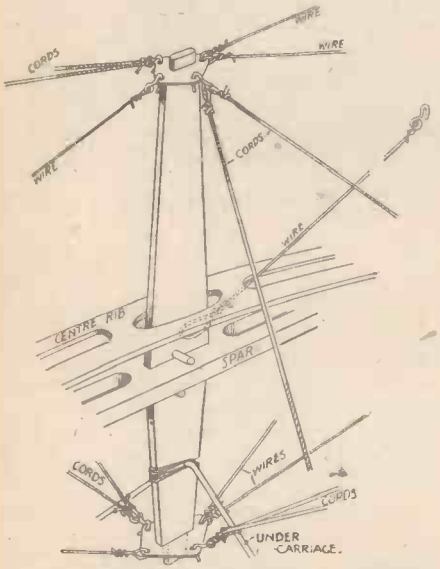


Fig. 8.—Details of the wing kingpost.

of drawings of the Wakefield machine. They represent in full and in every detail the prototype of 1911.

There is no need for me to describe all that will be obvious from the drawings, but I might point out that the machine flies the opposite way round from the modern type of aircraft. This fact will no doubt be inferred from the manner in which the machine is being held for launching in Figs. 3 and 4. In both methods of launching it is a very simple matter to release the twin propellers simultaneously.

The aircraft, as a type, has all the surfaces weight carrying; there is no tail or non-lifting plane. Instead the machine is so designed that the fore-and-aft centre of gravity falls about one inch and a quarter in front of the leading edge of the main-plane and to carry the resulting forward weight a smaller plane is placed at the leading end of the machine and this is set at a little greater angle of incidence than the main wing. The exact incidence angle of the small plane, which is known as the "elevator," is obtained by a variable adjustment. The effect of this arrangement of the weights, proportional to surface areas and incidence angles, is that the machine, when adjusted perfectly, has absolute automatic longitudinal stability and cannot be stalled or go into a stall; neither can it make a bad landing. Automatic lateral stability is, of course, ensured by the dihedral on the main wings.

Slotted Main Spar

In only one detail does the replica, which has just been completed, differ from the prototype of 1911: this difference is in respect to the material of which the longitudinal slotted spar is made. The original was bass, a wood which seems to be unknown now, or at any rate is quite unobtainable; so it was decided that silver spruce should be used as a substitute, although it is a little heavier than bass. Details of the

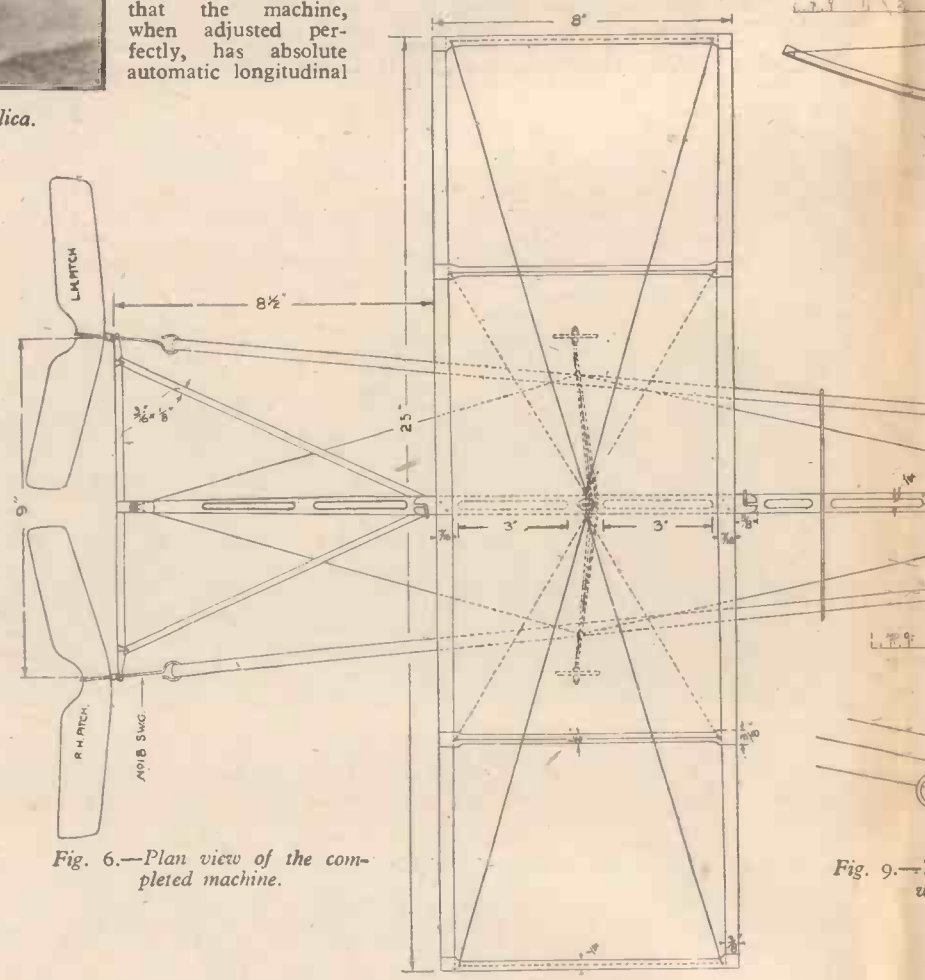
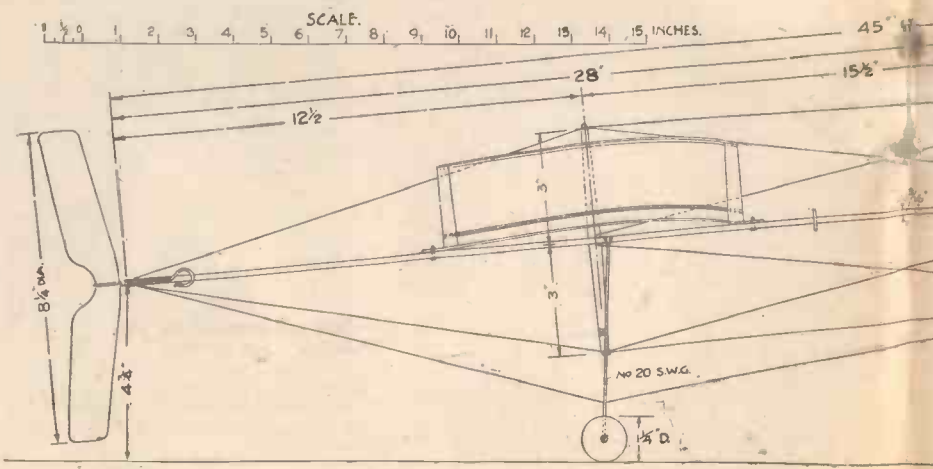


Fig. 6.—Plan view of the completed machine.



cutting out of this spar, together with its length and other measurements, will be found in the side elevation (Fig. 5) and the plan view (Fig. 6).

This latter drawing shows the manner in which it is slotted in order to lighten it. What is not apparent in the drawings is that after the spar is completely finished and before the bracing-wire kingposts are passed through, the wood is given a coat of very thin glue and wrapped around with Jap silk in one strip, laid longitudinally, the join or meeting of the edges of the silk being arranged to come on one of the edges of the spar.

A back elevation of the machine is drawn in Fig. 7; this shows the dihedral of the mainplane and the extent of the rise at each wing tip. It should be noted that this rise, which is the versed sine of the curved dihedral, is the same at both front and back spars of the wings so that there is no angle of incidence in relation to the main longitudinal spar of the machine. The front and back wing spars are a full sixteenth of an inch thick at their centres, gradually reducing towards the tips. The centre rib is also one-sixteenth, but the four other ribs should be planed down to a full thirty-second, or, say, three sixty-fourths of an inch; they will be steamed and bent to the wing camber; all, of course, exactly alike. The whole framework of the plane is made from straight-grained birch; so also are the two kingposts and the propeller crossbar with its two struts.

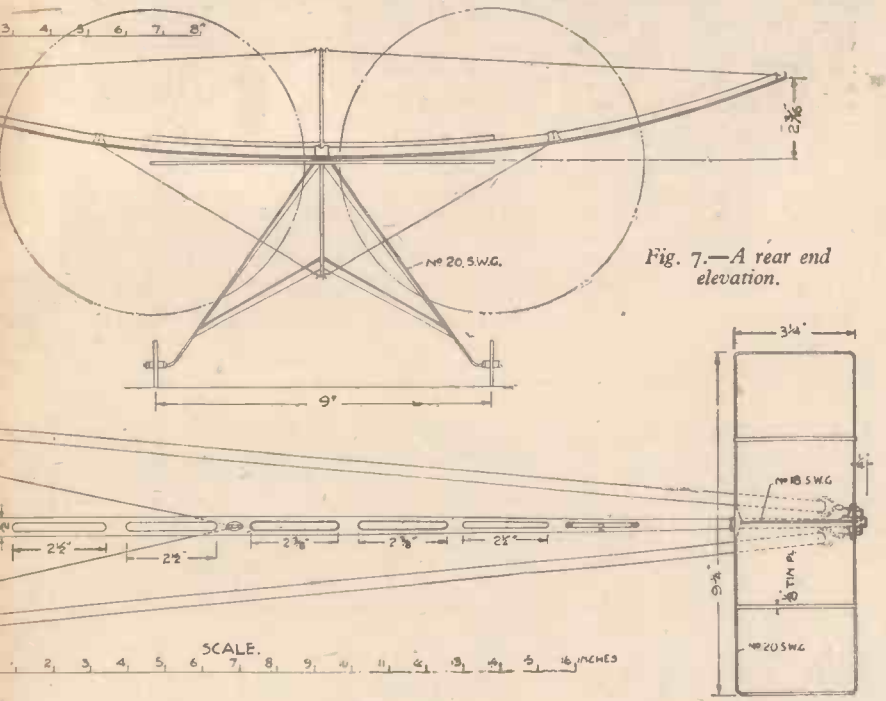
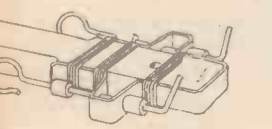


Fig. 7.—A rear end elevation.



The front rubber twin-winding hooks.

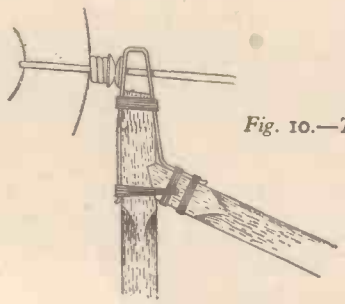


Fig. 10.—The propeller shaft bearing.

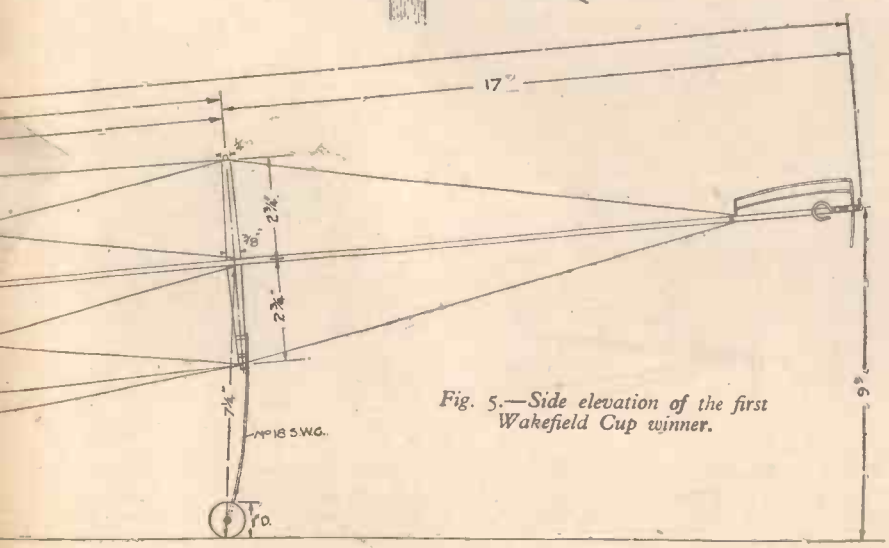


Fig. 5.—Side elevation of the first Wakefield Cup winner.

Kingpost Attachments

In Fig. 8 is shown the whole of the attachments to the wing kingposts and the method of making them. The kingpost should be glued into the spar and pinned above and below, as shown. All the bracing wires, excepting one at the top, are made off on little plates of either tinplate or brass of very thin gauge. The top one must be detachable from the wood in order to provide for the removal and replacement of the mainplane. To render the plate detachable one wire, that from the propeller crossbar end of the spar, must terminate with a bent hook which will engage with a hole in the plate. In the same way the incidence angle-adusting cords of the plane are hooked into the plate. These cords are of fairly fine silk thread; they pass through holes in the wood at the wing tips and are continuous through the wing so that a friction grip, due to the spring of the wing spars, holds the wing tips up to the correct incidence angle. By this means it is possible to adjust the angle so that the incidence on both wing tips is the same. All the steel bracings are of No. 35 gauge music wire.

Fig. 9 shows the rubber hooks at the front end of the machine; both of the bearings for these are formed by the bending of one strip of tin or brass, bound on with tinned iron or copper wire and soldered. In two previous articles in PRACTICAL MECHANICS I have described and illustrated this scheme for winding both of the skeins of rubber at one and the same time, first, in the issue of January, 1934, and again as recently as March, 1950, page 194, where a duplex winder, made by converting an egg whisk, was illustrated.

One end of the propeller crossbar with the propeller shaft bearing and method of attaching one of the struts, is shown in Fig 10. The other end of the strut should be notched into the spar in a similar manner. The binding is done with copper or tinned wire and soldered.

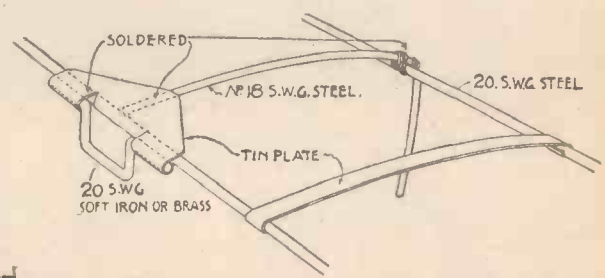


Fig. 11.—Details of centre of elevator.

The frame of the leading plane, or elevator, is made entirely of metal; the outer rectangle, bent from one piece of steel wire of No. 20 S.W.G., is shown in Fig. 11. The centre rib is a little thicker, say, No. 18; this is soldered under a triangular piece of sheet tin or brass, curved to the camber of the plane and bent down over the entering edge wire with a downward projecting piece of about 1¼in. in length. The stem so formed passes through a hole near the nose of the long spar between the front rubber spindles. When this stem is pushed into the hole the stirrup wire—shown under the trailing edge in Fig 11—should press hard down on the spar when the elevator is making its correct angle of incidence. The stem will, if the pressure at the back is great enough, provide a most efficient friction grip in the spar and this grip will give a ready means of adjusting the angle; which angle must be positive to that of the mainplane. The

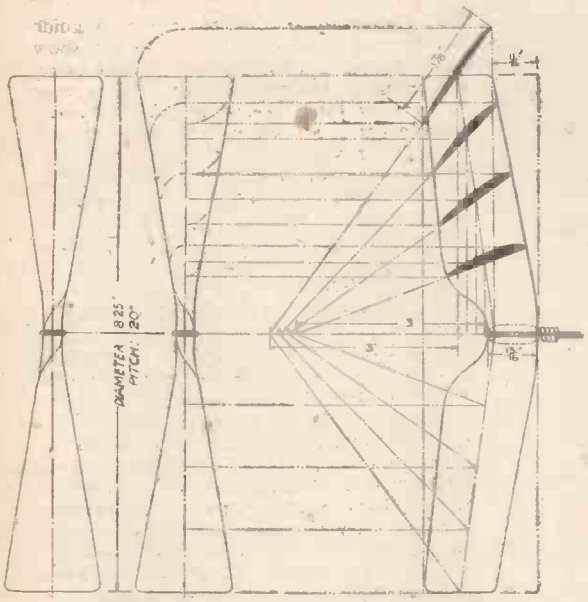


Fig. 12.—The two propellers—right- and left-hand pitch.

adjustment will be a matter for experiment, but will be found to be approximately seven degrees if all the weights and position of the centre of gravity come out right.

Wing Covering

Just what to advise readers to use for covering the wing surfaces I do not quite know. I am assuming that there may be someone who will wish to build another of these Wakefield machines. On the prototype of long ago, I used what was known as Hart's fabric, and was a proofed Japanese silk. When the question of the covering for the replica machine was raised by Mr. Howse I discovered that I had a piece of white Jap silk; pre-war, of course, for Jap silk cannot be bought now, and this piece, which was large enough to cover the main wing, elevator and spar, was used. Mr. Howse put it on the planes unproofed and doped it afterwards.

But as the reader will not feel compelled to make another exact replica, I think the best material to use will be the paper of the kind universally used nowadays for covering fuselages and wings of modern aircraft models.

The wheels of the machine are made up, each of three thicknesses, of Bristol board, the middle one being merely a narrow ring at the periphery; each wheel has a hardwood bush at the centre drilled to make a running fit on the 18 gauge steel wire of the undercarriage.

The propellers are the last item that I need refer to. These, of right-hand and left-hand pitch, are shown, together with the truly helical pitch angles of the blades, in Fig. 12. Whether they are carved from the solid or steamed and bent to shape is not very material, so long as they are light, both exactly alike—although of opposite hand—and both of equal pitch, in all four blades, making the same pitch-angles at all points outward from their centres.

The pitch-angle at the tip of the blade is arrived at thus:

$$\frac{8.25\text{ins. diam.} \times 3.1416 = 26.918\text{ins. circumference}}{20\text{ins. pitch}} = 1.346$$

The angle then is: 1 in 1.346, or for greater accuracy in setting out: 3 inches in 4.038 inches. As a matter of fact I set out the angles in Fig. 12 by using these higher figures.

To finish the propellers they can be cellulosed and french polished, or given a coat of copal or some such hard varnish. The rest of the machine can have a coat of shellac varnish.

The Automatic Doctor!

The Possibilities of an Electron Robot for Prescribing for all Ailments

By A. M. L.

TO-DAY we are very short of doctors. The story of the industrial revolution has been that where there is demand, scientists and engineers have always produced a supply. Will they now supply an automatic doctor to abolish the queues in doctors' waiting rooms and ensure equal treatment for all?

The idea is not nearly so absurd as it may sound. There is already an "almost human" device which clips on to a car and finds out what is wrong with it, more certainly and faster than a skilled mechanic could do it. The human machine, it is true, is vastly more complicated than a motor-car, but it is purely a matter of degree, you merely require a more complex apparatus to "vet" it. There are already in use machines for recording heart beats, blood pressure, "brain waves" and so on. The automatic doctor would simply be a collection of these devices neatly brought together.

One part of the doctor would be delicate photo-electric cells capable of recording the patient's pallor, the colour of his tongue and so on. Another part would measure his blood pressure, another his temperature, while another did a blood count. His heart beats would be recorded and his brain examined by an electro-encephalograph. Possibly the machine would have a typewriter keyboard, the keys carrying, instead of letters, a description of symptoms—headache, backache, nausea, pain after meals, lack of appetite, loss of weight, etc. The patient would be required to press the keys that applied while he swallowed a special meal which would be X-rayed as it went down, with photo-electric cells examining the X-rays.

The "Doctor's" Brain

All the information obtained by these devices would be carried electrically to the "doctor's" brain—an electronic calculating instrument. It would have to be no more complicated than electrical calculators already in use for computing artillery tables or solving problems in atomic physics. The calculator would be set to take into account all the symptoms and reading, and then give a diagnosis—gastric ulcer, influenza, water on the brain, or whatever it might be! Shooting out the appropriate prescription and instructions on a printed card would be simple to arrange.

I am most anxious you should not think I am merely trying to be facetious. We have reached very near to this stage already. During the war I attended an American hospital and I could not have had more kindly treatment. But "mechanisation" was already obvious—I passed before a series of specialists who each "assessed" me for his speciality, and I was then checked for the whole by the "chief." Substitute the cardiographs, pyrometers and the other instruments for the specialists and the electronic calculator for the "chief," and you have the automatic doctor of the future.

Of course an automatic doctor would cost a huge sum—but think how much it would save! It could work 24 hours a day, and would need less than a minute a patient, since everything would be carried out at the speed of light—186,000 miles a second. One automatic doctor could do the work of 50 of the merely human kind, thus releasing them for productive work in the mines or on railway stations where no doubt old-fashioned trade unionists will still be insisting on everything being done by hand in case machines caused unemployment.

No Argument

There would be no arguing with the automatic doctor. If your symptoms showed you were "swinging the lead," it would say so, and you would have to go back to work without argument. You could always say the machine was out of order, but I doubt if the Ministry of Health would admit it—like the gas and electric companies with their meters, the Ministry would permit you to have the machine tested (by their experts) on condition you paid for the test! It would probably be cheaper to admit you weren't really as ill as you felt.

This prospect of a machine measuring the number and distance apart of my spots, the colour of my tongue and the condition of my brain and then shooting out a card saying "A touch of 'flu, two days in bed with mixture 5, three times a day," I find alarming. But it seems to me quite a logical development of State medicine, and the idea of equal treatment for all. There would be no nonsense about some people getting better treatment than others—the automatic doctor diagnosing and prescribing by the best Harley Street standards would be equally available in cities and remote villages.

There is a snag of course. "Every leaf of every tree is different," is the old saying. I think an electronic computor dealing with a few million variables would need a few billion more before it could diagnose and prescribe as well as an old-fashioned family doctor. The old-fashioned family doctor had, perhaps, more brains than skill. But he is psychologically in a far higher category than the mere memory man who knows every book on the subject, but lacks intuition, intellect or understanding—is, in fact, a mere machine. The family doctor knows that every human being is different, and that what cures A may kill B or have no effect on him. That is why the old family doctor does not fit into neat Whitehall pigeon-holes, or flourish on filling forms in triplicate. He may not have the apparatus of a health centre, or the degrees of all the specialists at a hospital—but he has humanity and great knowledge of a subject for which no degree is given—human nature.

The automatic doctor is to me a nightmare—but an inevitability if we continue on our present road. My one hope is that he will never go further than the experimental stage because he will be opposed by the strongest trade union in the world—the doctors.

NEW SERIES

Wood Turning—10

Table and Chair Legs

By FREDERICK JACE

AS with knobs, so with table and chair legs; before commencing work templates and scribing boards should be made to ensure that all of the legs are alike. Square stock is used for turning legs, and in order to ensure that they are all of equal length the template, shown in Fig. 102, should be made. Each is then chucked by means of a prong chuck and tail stock, and then roughed with the roughing gouge. A ⅜in. gouge is used to cut in the square and finally straight down with the point of the chisel, close to the pencil line A (Fig. 104). Next the cylindrical part is turned and the various curved positions marked off to the template indicated in Fig. 105. Rough shaping with the gouge and parting tool is then continued, the finishing operations being indicated by Fig. 103, where B, C, D and E, the various beadings, are turned in that order. The neck between the beads D and E is next turned with the gouge, the curve being turned out from F, using the chisel towards the bead E. The portion G is next turned, followed by the hollows H, and finally the toe, which is turned from J with the gouge. The work should be finished with glass paper before removing from the lathe.

Fig. 106 shows a design for a chair leg which should be turned either in oak or mahogany. The template, the roughed out, and the finished table leg are indicated by Figs. 107, 108 and 109 respectively. It will be seen that the template differs from that previously described, for instead of notches, panel pins are driven into it so that about ⅛in. of each projects. These projections are filed to a sharp point, and when held against the roughed-out leg, scribe lines as a guide for the final turning. Figs. 110 to 112 show some designs for pillars as used in clock cases, what-nots, corner brackets, etc. They may be turned in birch, beech, oak, ash, and occasionally elm. In turning the tenons it will be found convenient to file up from sheet metal a gauge for length and diameter. This will save frequent setting of the calipers. Such a gauge is shown in Fig. 113. Fig. 114 shows a sliding tool which enables gauging to be done whilst turning. In this diagram A is the cutting tool, C the gauge, and B a wing nut permitting the gauge to be slid along the tool for adjustment.

Whenever more than one piece is required of a particular pattern gauges and templates should be prepared beforehand. Not only to secure uniformity but to save time.

In some cases it may be necessary to join up by means of dowel and socket various pieces of wood in order to obtain a blank of the required length. Some pleasing results can be obtained in this way by alternating dark and light wood such as mahogany and American white wood, taking care, however, that each end is of the darker wood.

With very short pieces, say up to 1in. in length, it pays to make a special form cutter if large numbers are required. Thus each piece will be completed with a straight-in cut. This method presupposes that there are no undercuts to the design. If there are, these will have to be turned in separately.

It is not proposed in this article to deal with Jacobean turning, such as is used for modern tables. This will be reserved for a later article.

Sometimes the wood turner is expected to copy a leg from an existing piece of furniture; perhaps one of the legs of a table has become broken, or worm eaten. In such a case it is wise to make a full-size drawing, and to cut a cardboard template to the profile and check this against one of the good legs.

(To be continued)

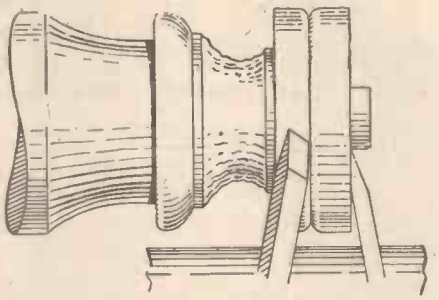


Fig. 100.—Second operation in turning the knobs shown by Fig. 99 given last month.

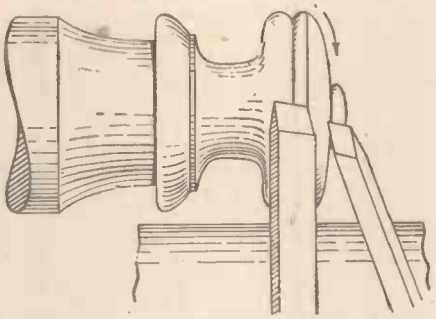


Fig. 101.—The finishing operation.

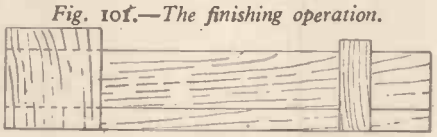


Fig. 102.—An end-squaring template.

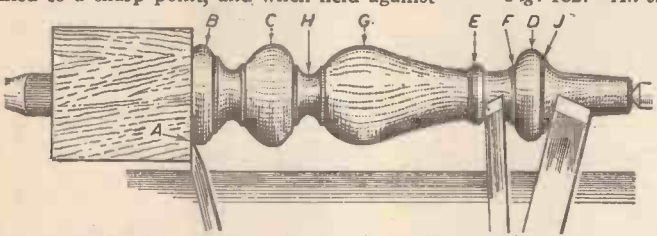
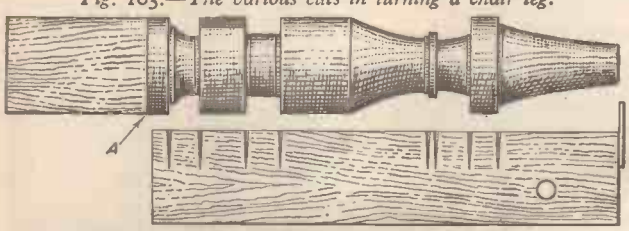


Fig. 103.—The various cuts in turning a chair leg.



Figs. 104-105.—How to set off the various lengths by means of a template.

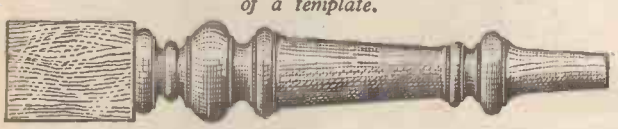


Fig. 106.—Another pattern for a chair leg.

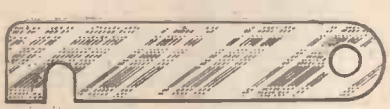


Fig. 113.—Sheet metal gauge for tenons.

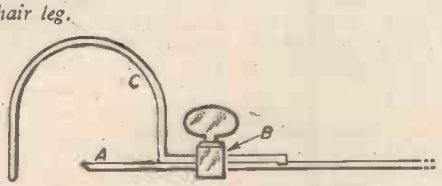
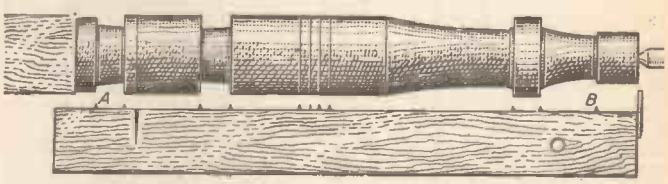
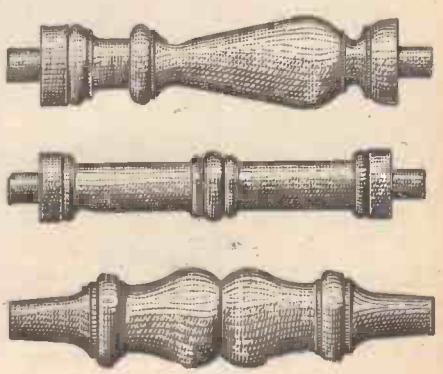


Fig. 114.—A combined tool and diameter gauge.



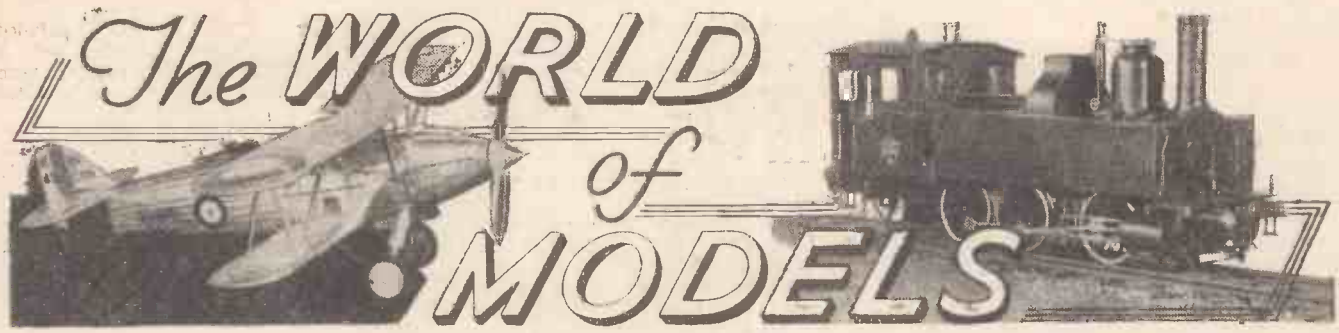
Figs. 107-108.—How to scribe off a table leg, shown in Fig. 109.

Fig. 109.—The finished table leg.



Figs. 110-112.—Designs for small pillars.

The WORLD of MODELS



Model Railway Club Exhibition : Sheffield Models Exhibition : Swiss Industries Fair

By "MOTILUS"

RAILWAY models—from the largest to the smallest, in all possible designs, colours and sizes: and so perennial is their fascination that visitors to the annual Model Railway Club Exhibition in London must always be prepared for huge crowds thronging the Central Hall at Westminster, where the Exhibition was held. Last April this most popular event once more offered its delights to the general public, displaying selections that ranged from old favourites to exhibits showing the latest trends and developments in model railways.

New this year was a special showcase devoted to models for 2 mm. scale railways (9.5 mm. gauge), comprising the work of several small-scale enthusiasts. This included a Highland railway layout as well as a number of individual exhibits, many of them examples of good handicraft, with a surprising amount of detail.

In contrast, the passenger-carrying railway track was as popular as ever, and some hard work was put in by willing helpers both in operation and maintenance.

As in previous years, many of the exhibition model locomotives, wagons and coaches were grouped according to their types, on four stands, representing the four pre-nationalisation railway companies. These stands were well filled with a great variety of models of different scales. Their modern counterpart, British Railways, displayed an attractive scenic model railway, electrically operated. This had been improved since its appearance at last year's Exhibition, and it now includes colour light signals in addition to a number of representative trains, stations, goods yard, lineside buildings and scenic effects.

A further British Railways exhibit was an excellent model of a high-speed track-laying unit to a scale of 7 mm. to 1ft. This model illustrates clearly all the operations involved in the work of track-laying in the shortest possible time. It is a good example of model-making as well as being instructive.

The French Railways again co-operated by sending posters and photographs of French prototype vehicles. In addition they sent a static model of the latest type 241P class steam locomotive, which has been designed and built for the French Railways for hauling express passenger trains over lines with heavy gradients and which has a calculated horse-power of 4,000. The prototype of this locomotive was built at Schneiders, Le Creusot, the first one being finished in May, 1948. The model is 70-mm. gauge.

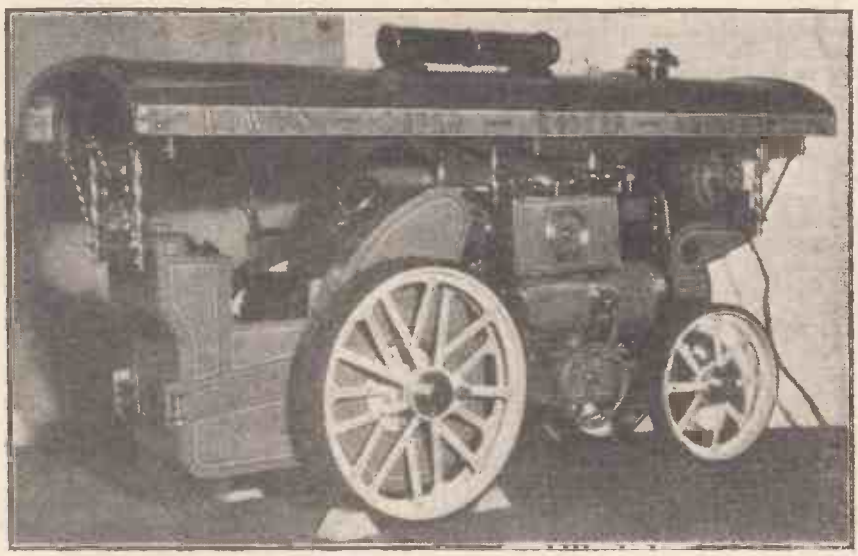


Fig. 3.—Sheffield Models Exhibition. A well-finished model showman's engine. Built by Mr. E. O. Lowe, to a scale of 1½in. to 1ft.

Gauge 1 Models

The Gauge 1 Association had a splendid selection of models on view this year, including locomotives, coaches, wagons, track, etc. I am glad to note that the model trade is taking an interest in this popular gauge again. A leading firm this year have issued Gauge 1 standard dimension diagrams covering not only locomotives but rolling stock, signals, tunnels, bridges and all accessories

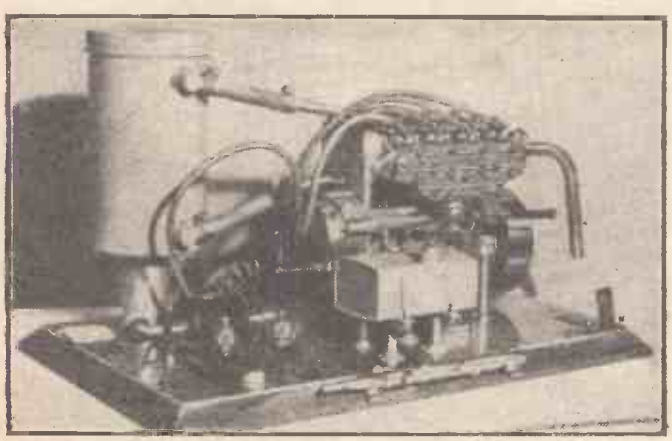


Fig. 1.—Sheffield Model Engineering Exhibition. The President's Cup was awarded to Mr. A. B. Langley for this 5in. long, 15 c.c., four-cylinder petrol engine.

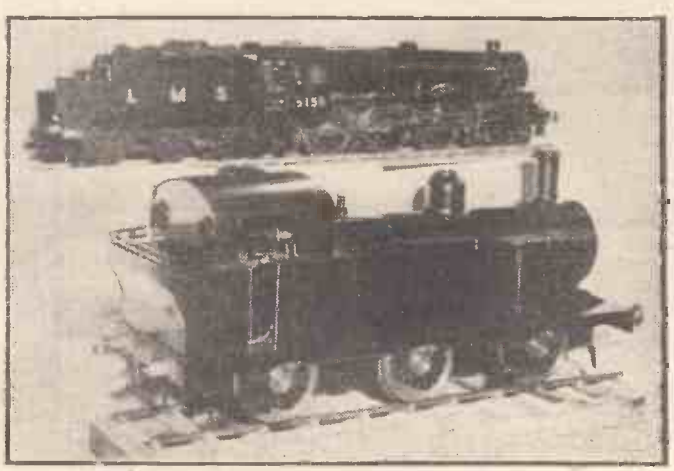


Fig. 2.—Sheffield Models Exhibition : two models for which first prizes were awarded.

Top : Scenic Railway Class : Mr. E. R. Morten's gauge 1 L.M.S. Class 5 locomotive model.

Below : Mr. J. Hibbert's 3½in. gauge L.M.S. 0-6-0 tank locomotive.

connected with a Gauge 1 model railway. In addition, castings and parts are becoming available again for this gauge, which has always been popular for outdoor garden railways.

Among other clubs and societies exhibiting, The Light Railway Transport League showed a small layout with working models. The Ilford and West Essex Model Railway Club also showed examples of their members' work in oo gauge locomotives and rolling stock, and also some excellent lineside buildings and other architectural models in larger scales.

There were many individual exhibits of all kinds. Outstanding among them was the selection of models from the locomotive stud of the K lines and Pantry Dockyard Railway exhibited by Mr. G. P. Keen, president of the Model Railway Club. These lovely models, to a scale of 7 mm. to 1ft. are examples of the fine art that model-making can become.

Fig. 4.—Sheffield Models Exhibition. A fully-detailed model trailer caravan by Mr. L. J. Robinson, built to a scale of 1/6th full size, and first prizewinner in its class.

Many regular visitors to this exhibition will remember the Buckingham Branch Line, 18 mm. gauge model shown by Mr. P. B. Denny at the 1948 exhibition. This year, Mr. Denny displayed his partly finished successor to this model: a portable layout, in the same gauge but considerably larger than its predecessor. For 2-rail electrical operation, this layout, incorporating some of the old Buckingham model, can be erected or packed away in 15 minutes.

Sheffield Models Exhibition

The Sheffield and District Society of Model and Experimental Engineers held their seventh exhibition this year in April. Attendances generally were unfortunately affected by the cold, wet weather experienced at Easter, but no doubt the true model fans did not miss this event, for they are undaunted by wind or rain when bent on "model business."

The usual passenger-track was in use, with service from Mr. R. Kerry's 1in. scale (4¾in. gauge), 2-6-2 L.M.S. tank locomotive, and Mr. N. E. Nicholson's ¾in. scale "Princess Royal." The gauge oo layout, which readers may remember I referred to when commencing on the society's 1948 exhibition in August that year, had been greatly extended by the time of this year's display. This was the result of much hard work by the model railway section of the society and their friends.

Among the prizes this year the Open Championship Cup, the Open Trophy of the Sheffield Ship Model Society and a first prize were all awarded to Mr. D. S. Anthes, for his model of "s.s. *Beaconstreet*, leaving Halifax, 1944." To a scale of 1in. to 16ft. this attractive model was outstanding for its detail work.

Winner of the President's Cup was Mr. A. B. Langley, for his 15 c.c. 4-cylinder petrol engine, "Seal," a model 5in. long, including the flywheel. The building of this model covered a period of about eighteen months, as Mr. Langley was simultaneously engaged with work on a 3½in. gauge passenger-car and a shaper to fit to his lathe.

In the locomotive section, two prizes went to members of the Buxton Society of Model Engineers. First in the scenic railway class was Mr. E. R. Morten's gauge 1 (10 mm. scale), L.M.S. Class 5 locomotive, "Ayrshire Yeomanry." Mr. J. Hibbert won first prize in the passenger-hauling class with his L.M.S. 0-6-0 tank engine, to a scale of ¾in. to 1ft. (3½in. gauge). Mr. Hibbert also had on display a chassis for a similar locomotive to a scale of 1in. to the foot, which he is now building.

A very fine model was a 1½in. scale showman's engine, by Mr. E. O. Lowe. This was working under compressed air throughout the exhibition, with electric lighting under the canopy. Not only the design but also the detail and finish on this model were all that could be desired.

An out-of-the-ordinary model also reaching a high standard was that of a trailer caravan, by Mr. L. J. Robinson. This model was to a scale of 1/6th full size and the interior was complete with slices of bread, ham, salad and other delicacies ready for an appetite sharpened by open-air living! The excellent work on this model won a first prize for Mr. Robinson.

Some interesting and varied work of the late Mr. Arthur Skinner was on view. This included a 2-cylinder oscillating engine and a 7-cylinder oscillating radial engine, both of which have been run long hours at many exhibitions.

In addition to those models illustrated here, there were several other outstanding models which should be mentioned. Among them was a tender for a 4-4-0 Caledonian Dunalastair locomotive, the work of Mr. P. Thompson, who has fitted the model with fully compensated brake gear. In the locomotive section was Mr. R. Kerry's chassis for an L.N.E.R. Class B1, 1in. scale locomotive.

Machine Tools

Machine tools were well represented, including a fine piece of work by Mr. W. A. Milnes, a 2⅜in. centre precision lathe: also a rear tool post for an ML7 lathe, with parting-off, boring and knurling attachments, made by the society's Public Relations Officer, Mr. W. J. Hughes. Mr. Hughes' model was not complete, which is hardly surprising considering the amount of work he does for the society in his official capacity.

Cine projectors are possibly not to be classified as "models": but a good example of craftsmanship was to be found in Mr. K. Walton's standard, 9.5 mm. cine-projector, built to his own design and having a separate control box.

Swiss Industries Fair

The annual Swiss Industries Fair held at Basle always attracts many visitors from all over Europe. It is considered one of the best European fairs for organisation and display and covers all Swiss industries, from wrist watches, textiles and printing to large engineering work.

To the model-maker the toy and model section is of great interest. Nor were we disappointed, for all kinds of toys and models appear annually from mechanical and educational toys to carved wooden miniatures.

In the model railway section this year there were numerous fascinating model railway layouts for gauges 1, 0 and oo. Most of them were for electrical operation, with the Swiss overhead pantograph collector system.

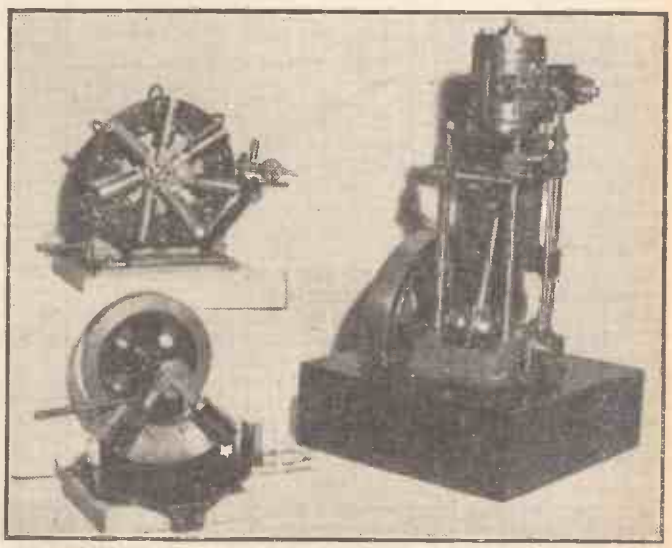


Fig. 5.—Sheffield Models Exhibition.
Top left: seven-cylinder oscillating radial engine, built by the late Mr. Arthur Skinner.
Bottom left: two-cylinder oscillating engine, also by the late Mr. Skinner.
Right: Marine engine built in 1910 by Mr. W. R. G. Thompson, which was reconditioned and fitted with governors in 1938, by Mr. P. Thompson.

Painting Wire Frames

SIR,—In the answer to A. Godfrey (Halifax) in the May issue, on the subject of painting wire frames, there are one or two points on which we should like to comment.

First, we consider that dipping is by far the best method of treatment for this type of article, and provided the user employs a paint which has been formulated by the manufacturer for this purpose he should obtain a satisfactory result free from blobs and runs. It is not easy, however, to use the normal type of household paint for this purpose.

Secondly, the production of a flat paint by diluting a glossy one with an equal volume of thinner will lead to an appreciable loss of opacity, so that the pigment content will also need adjustment.

We make these comments in the hope that they may be of interest, and would add that if any of your readers encounter difficulty in obtaining pigments or special paints we shall be happy to supply them.—MORGANS PAINT PRODUCTS, LTD. (Erith, Kent).

Ex-aircraft Motor Generators

SIR,—Regarding the correspondence about ex-aircraft motor generators, I suggest that these machines are being run as repulsion induction motors. The highest efficiency, therefore, would be obtained by shorting the brushes connecting to both L.T. and H.T. commutators and connecting the mains, as before, to the field. A repulsion induction motor has series characteristics.

Great efficiency is unlikely with these machines, as the laminations will not be insulated from each other, owing to the fact that they were intended to be run from a direct current supply. On an alternating current supply uninsulated laminations act as a heavy section short-circuited turn.

The only way ex-aircraft motor generators could be made to work as synchronous motors would be to replace one of the commutators by slip rings, feed into the armature a suitable direct current, and mechanically start the motor.—JOHN A. ANDREW (Barnsley).

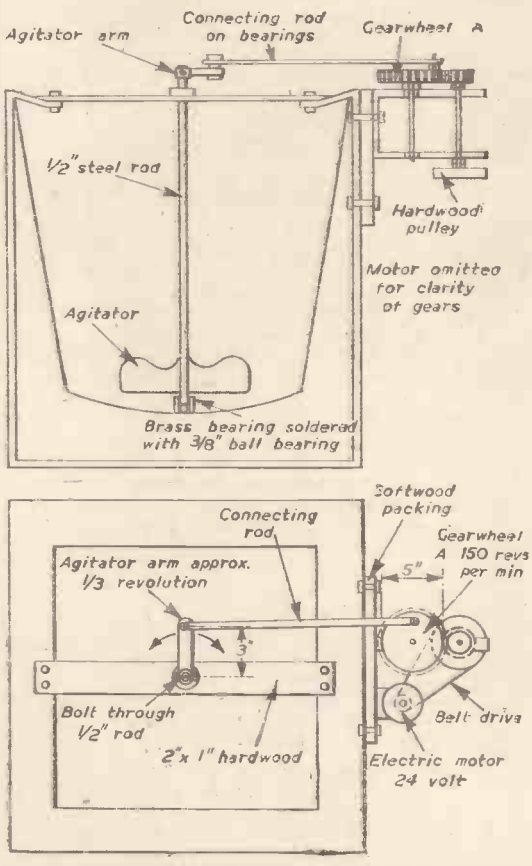
A Converted Hand-washer

SIR,—The following details of my converted hand-washer may interest other readers. All the additional parts of this washer have been made from old junk found in the workshop, and the ball races were taken from an old bombsight head. Ball races are used on every moving part, giving free action to the whole machine. The washer is working quite well and almost up to the commercial equivalent now that all vibration and noise have been silenced.

There are quite a number of different types of hand-washers on the market, in all shapes and sizes, therefore I do not propose to go too much into detail as modification will have to be made for each respective type. Also the gearing will depend upon the revs. of the motor used; this must be brought down to about 150 revs. per minute on gearwheel "A."

The agitator beading on most hand-washers is not made to stand the strain of motorisation, therefore I removed it, together with the lid, and bolted a piece of 2in. by 1in. hardwood across the top of the washer, as in Fig. 2.

To the centre of this I fixed a half-inch ball race which, of course, was in a proper housing and not merely pushed into the hardwood.



Sectional elevation and plan of a converted hand-washer, showing the arrangement of the operating mechanism.

This is for the ¼in. steel rod, the other bearing for it being soldered to the bottom of the boiler.

I used an ordinary brass bearing for this as it is constantly under water, and to take the weight of the rod and the agitator I placed a ⅜in. ball-bearing in it.

The agitator itself is the original and should be fixed as low down the ¼in. shaft as possible.

This only needed drilling out to fit the shaft and making provision for a holding screw.

I first held it with a grub screw, but this tended to slip and I strongly advise anyone making this to drill a hole clean through the shaft, as this is a permanent fixture.

The agitator arm should be fixed in a similar manner, as this seems to have a tendency to slip.

To fix on the ¼in. spindle it is necessary to have a slot rather than a hole because the correct position must be found by trial and error. It will most likely be between two to three inches from the centre of the ¼in. shaft, depending, of course, on the size of gearwheel "A."

The next job was the gearing down to 150 revs. per minute.

Bombsight head gears are not much use for this, so I had to resort to larger gears, which are unsightly, but work without much noise.

I find that a belt drive from a wooden pulley on the motor shaft is best, as gears running at high speed tend to vibrate against the aluminium sides; also it is much easier to slow the gearing down if it is found to be going at excessive speed.

It is better to have gearwheel "A" as large as possible and the one I have in use is 5in. diameter.

This gives a longer pull and thrust movement and allows the agitator arm to have a bigger swing.

Finding the length of the connecting rod proved rather a problem, I utilised a piece of strip wood and by trial and error I found a place where the agitator got ⅓ rev. swing.

This is what most commercial washers have, and is quite satisfactory.

The connecting rod was made from a piece of curtain rail with a ball race fixed at each end.

The whole job took me a fortnight, and most of this time was taken up by alterations after having trials by doing some washing.—R. CLIFTON (Halifax).

An Electric Oven

SIR,—I recently purchased a copy of your publication, PRACTICAL MECHANICS, dated May, 1950, in which there is an article entitled "Making an Electric Oven," by E. N. J. Marguerit.

The construction is entirely of metal sheet, and the insulation between the elements and the inner container consists of two layers of asbestos paper below the element and one layer above it. The insulation between current-carrying studs and the outer case consists of fibre washers, fibre being well known for its hygroscopic properties. No suggestion is made anywhere in the article that the oven should be earthed, and no provision is made for an earth wire.

Under the paragraph "Operation," the constructor is told to connect a length of twisted flex to the junction box. Twisted flex clearly indicates twin flex, as 3-core flexes are almost invariably circular. Having connected the other end of the flex to a power plug, he is then instructed to *turn the switch on* and to adjust the thermostat. The thermostat which he is instructed to use has a live adjusting screw, so that, unless he is using an insulated screwdriver, he will undoubtedly get a shock.

He is also told that the oven is intended for use in a chemical laboratory, where, presumably, it will be situated not far distant from a water tap. As you are aware, over 90 per cent. of the electric supply in the country is now 230 volts, A.C., a voltage which is

responsible for the majority of fatalities which occur every year.

In my opinion such an electric oven is likely to be dangerous.—H. BRIGHT (London, W.C.1).

SIR,—In reply to Mr. H. Bright's letter, I should like to point out the following facts:

1. It seems that two layers of asbestos paper is regarded as an insufficient insulation, but, as the element works at black heat and dissipates only 100 watts, it is actually most satisfactory.

2. With regard to fibre washers, Mr. Bright mentions the outer case, whereas they are actually situated on the *inside case*, and are maintained perfectly dry seeing that the oven is continuously in operation.

3. Mr. Bright foresees a great danger in the "switch on" operation; this forecast is completely unfounded, because there is not a single live connection on the body of the oven. The junction box is insulated, the knob of the switch does not come into contact with the switch terminals and, furthermore, all connections between junction box, switch, lamp-holder, thermostat terminals and element are made with well-insulated wire.

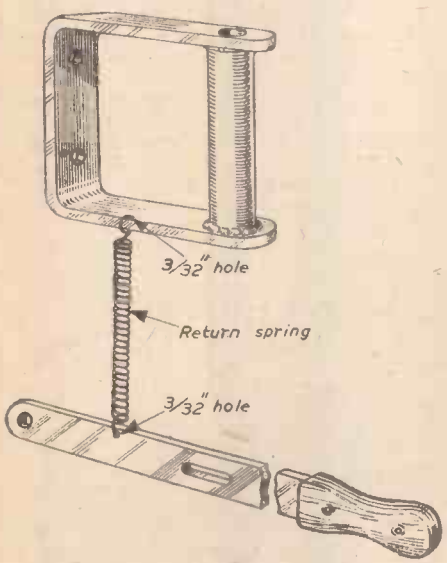
Supposing that the constructor manipulates the thermostat setting screw with an uninsulated screwdriver (a very unlikely thing), *he will not get a shock*, as there are no live connections on the oven body. (For reason see 2.)

4. I do not agree with Mr. Bright's suggestion that ovens are usually kept "not far distant from a water tap." In most laboratories they are put as far away as possible from water taps, in order to prevent water splashing into a moisture determination while it is being taken from the oven to be put into a dessicator.—E. N. J. MARGUERIT (Liverpool).

Drilling Stand Improvement

SIR,—I have constructed the drilling stand described in PRACTICAL MECHANICS of April, 1950, and am pleased to say it is quite successful.

I have incorporated a return spring between the bracket and the handle, as shown in the sketch, which I find a great



A return-spring attachment for a simple drilling stand.

improvement. I have pleasure in passing this information on to other readers. I had thought about a coil spring in between the top of bracket and the breast shield, but, of course, this would limit the travel.—JOHN C. WILD (Whitby).

Phraseology Relating to Animals and Birds

SIR,—The accompanying table of terms which were used in the past, and are sometimes still used, may be of interest to other readers:

A nye of pheasants (a brood).
A paddling of duck (a gathering).
A team of duck (in flight).
A fall of woodcock (a flock).
A skulk of foxes (a troop).
A cete of badgers (a company).
A sounder of swine (a herd).
A singular of boars (a pack).
A pride of lions (a group).
A sege of herons (a flock).
A herd of swans (a large number of swans feeding or travelling together).
A sprig of teal (a flock).
A covert of coots (a flock).
A gaggle of geese (a flock of geese on the water).
A skein of geese (a flock in flight).
A sord or sute of mallard (a flock).
A company of widgeon, a trip of wildfowl (a collection of waterfowl).
A ruch or flight of pochard, a dopping of sheldrakes, a bevy of quails (a flock).
A covey of partridges or grouse (a flock).
A pack of grouse (a gathering of coveys).
A congregation of plovers (a flock).
A walk of snipe (a flock).
A wisp of snipe (a flight).
A building of rooks (a company or rookery).
A murmuration of starlings (a flock).
A cast of hawks, a sleuth of bears, a gang of elk.

—R. PHILLIPS (Pinner).

A Mathematical Puzzle

SIR,—Can anyone explain the following:

$$\frac{7}{6} \times 7 = \frac{7}{6} + 7$$

—A. DELFONT (Redditch).

[Our readers might like to debate this problem, and for their guidance we would inform them that the general formula

$$\frac{n}{n-1} \times n = \frac{n}{n-1} + n.$$

—ED.]

Club Reports

Ilford and West Essex Model Railway Club

AT the annual general meeting of this club held recently, the following officers were elected for the ensuing year:—

President, Mr. J. A. Carter (who was duly invested with the badge of office by the retiring president, Mr. C. T. Standfast); president-elect, Mr. R. L. Riddle; hon. treasurer, Mr. S. H. Gilding; hon. secretary, Mr. E. W. Cornell; hon. librarian, Mr. G. J. A. Baker; together with members of the council which comprises the chairmen of the O, OO, EM and junior sections. The name of Mrs. M. R. Hardy was added to the list of vice-presidents.

The summer programme covering visits to a number of places of interest, lectures on model and full-size railway practice, and a film evening was approved. Hon. secretary, E. W. Cornell, 42, Lincoln Road, Forest Gate, E.7.

Aylesbury and District Society of Model Engineers

A MEETING was held last month at the Society's meeting place, Temple Square, Aylesbury. A full gathering was addressed by Mr. E. T. Westbury, who gave an interesting talk on the use of small lathe attachments, shedding much light on the subject of "setting up," and lathe work in general. This proved to be a subject of universal interest, as was shown by the members' questions afterwards.—Hon. Secretary: N. F. Southerton, Astracot, Buckland Wharf, Aston Clinton, Bucks.

Books Received

Woodwork For Boys. By W. P. Matthew. Published by English Universities Press, Ltd., 96 pages. Price 5/- net.

THIS interesting book is intended as an A B C of woodwork for young beginners. Instructions are given in the use of tools and the construction of various useful articles is described and illustrated. There is also a section on wood finishes. With this book the minimum of tools, and no practical experience, the reader can gain an introduction to practical carpentry.

In the Workshop. By Duplex. Published by Percival Marshall and Co., Ltd., 150 pages. Price 8/6 net.

THIS work is the second of a series presenting in book-form the articles published as a series of articles under the title "In the Workshop." The use of both hand and machine tools for constructing a variety of useful workshop devices is described, as well as making additions to increase the scope of the existing tool equipment. The detailed working instructions, together with numerous drawings and diagrams, serve to make the book a practical workshop guide.

Model Railway Clockwork Mechanisms. By Ernest F. Carter. Published by Percival Marshall and Co., Ltd., 54 pages. Price 3/- net.

THE object of this handbook is to enable the clockwork model railway owner to carry out his own repairs, and make all the necessary running adjustments to the clockwork motors. The various types of spring-driven mechanisms, the various component parts, taking the mechanism apart, repairs and replacements, and hints on designing a layout for clockwork operation, are amongst the subjects dealt with in this useful handbook, which is illustrated with several line drawings.

Southern England (Cycling Touring Guides—No. 6). By Harold Briercliffe. Published by Temple Press Limited, 104 pages. Price 2/6 net.

THIS handy-sized book is arranged in the form of tours and is attractively illustrated by photographic plates and a number of attractive line sketches from the pen of Frank Patterson. For all tourists favouring a tour in the south, it is ideal and includes chapters on the Thames Valley and the Cotswolds, the Isle of Wight, the New Forest, the south coast, and the area between it and London, with an appendix on organisations and maps. As a guide to the best views and places of historic interest, the book should prove of great value.

Trade Notes

A Review of the Latest Appliances, Tools and Accessories

Microid Polishing Aluminas

THE preparation of metal surfaces for examination under the microscope is an art, the technique of which is acquired only as a result of long practice. At no stage in the process is more care essential than at the final polishing stage. Most metallographers agree that polishing should be done on a revolving disc of variable speed, to which is attached a small piece of soft cloth impregnated with polishing powder. Extreme cleanliness is essential, and both the polishing cloths and powders should be chosen with discrimination. Separate cloths should be provided for each different metal or alloy, since discs which have been used for polishing steel, for example, are unfit for use on non-ferrous alloys. The polishing cloth must retain the powder during rotation of the pad, and Selvyt cloth, worn calico, chamois leather, parchment paper and other materials have been used for this purpose.

To meet the problems associated with metallurgical polishing, Messrs. Griffin and Tatlock, of Kemble Street, Kingsway, London, W.C.2, have introduced a complete range of new polishing powders in the dry state, specially prepared for use in the rapid scratch-free polishing of ferrous and non-ferrous metals for metallographic examination. The development of these new microid polishing aluminas has occupied four years of research work, in collaboration with many prominent metallurgical laboratories in this country. Further particulars are given in leaflet G.T. 1386, copies of which are obtainable from the above address.

"Modern Solders" Booklet

THIS handy booklet is directed essentially to manufacturers, sales and technical staffs, and, in addition to containing more than 50 illustrations, graphs and tables, is a complete mine of information to planning and production engineers.

It gives the exact melting points of the various alloys available—tables of standard gauges—tensile and shear strengths, specific gravities and the electrical conductivity of the whole range of Ersin multicore solders. Pages are also devoted to Arax multicore solder, the non-resin, acid-free multicore solders of particular interest to all metal fabricators (except aluminium), with the added advantages of easily removable flux, replacing all soldering fluids; Arax will even solder "blued" steel without pre-cleaning. The booklet has 24 pages packed with every detail, including actual photographs from more than a dozen foreign manufacturers, and explains fully how and why Ersin multicore solder is so well known throughout the world. It is available to all radio, television, electrical and electronic manufacturers, and allied trades, although Multicore Solders Ltd. do ask that, when applying, the firm's letter-head is used. The address is: Multicore Solders Ltd., Mellier House, Albemarle Street, London, W.1.

Pullin Photo-electric Exposure Meter

IT has long been recognised by experienced amateur and professional photographers that in order to produce bright and well-exposed negatives, a reliable exposure meter is necessary.

The Pullin photo-electric exposure meter enables the photographer to give correct exposures under practically all lighting conditions. The meter comprises a highly sensitive electrical measuring instrument and a high quality photo-electric cell which generates a current proportional to the intensity of the light falling upon it. The instrument is very simple to use and has been designed to give quick direct readings. It is light in weight and at the same time very robust in construction; there are no corners and it easily fits into the vest-pocket. It is designed

The Pullin photo-electric exposure meter.

so that it may be worn on the wrist if desired, thus leaving both hands free.

The movement is fully jewelled and there is nothing that can wear out: with reasonable care it will last indefinitely.

The price, complete with lanyard, and inclusive of purchase tax, is £6 17s. 2d.

"Diacam" Rotary Switch

MANUFACTURERS of electrical equipment in the industrial and domestic fields will be interested to learn of a rotary switch known as the "Diacam," made by Craig and Derricott, Ltd., of Royal Works, Sutton Coldfield.

Built on simple lines, it is capable of maintenance, and is arranged to achieve all the advantages inherent in the rotary principle and gang assembly. One outstanding advantage of the "Diacam" is the ability of the operator to advance one of the poles to switch in the no-volt or operating coil circuit

The "Diacam" rotary switch.

of starting equipments. This ensures that the starter may be closed or opened before the main contacts of the "Diacam" are engaged.

The switch is encased in high-grade moulded plastic housings with finger-grip operating handle. The high-pressure self-aligning silver contacts are actuated by cam and roller mechanisms, and give a double break on each pole, and compression springs ensure contact pressure and switch position registration. The quick make action of the switch is rendered independent of the speed of turning by a specially designed free movement device which is incorporated in the handle.

Terminals of a specially patented design are clearly indicated by a number or letter, and can accommodate two 7/.036 conductors. An added feature is the ease with which these terminals can be wired or looped.

"Diacam" switches are available for all standard and most special sequences for panel or base mounting, and are rated at 30 amps. at 250 volts or 15 amps. at 440 volts for use in A.C. circuits only.

New Portass Lathe

THE Portass Lathe and Machine Tool Co. recently issued a folder giving details of the new Portass 4⅜in. Dreadnought sliding, surfacing and screwcutting lathe, which, although primarily intended for toolroom use, is the ideal tool for installation in engineering works, motor garages, technical schools, mobile workshops, public works departments and steamships. A special feature of this lathe is in the arrangement of the headstock in which the back gears are mounted above the mandrel. The pedestal is built up of replaceable sections containing the fast and loose countershaft drive. The pedestal model is equipped with a ½ h.p. motor and push button control with lead-in plug. Other important features include a hollow mandrel to pass ⅞in. bar; cast iron bed of heavy section to admit 25in. between centres; faceplate 8½in. diam.; swing in gap 13in.; and heavy pattern tailstock with 1¼in. square thread barrel and self-ejector for centre and instantaneous clamp device. Further particulars as to prices, etc., are obtainable from the above-mentioned firm.

Television Interference

THE ignition tracks across a television screen are very annoying, particularly when they can be suppressed so easily in most cars. To this end, City Motors, of Oxford, have started a campaign to "clean up television" by circularising all their customers pointing out what an easy matter it is to see that their cars are fitted with suppressors for eliminating interference to television reception. Suitable suppressors are supplied by and will be fitted free at any of City Motors' ten branches in Oxford, Reading and Bicester.

Best British Bargains

TELEPHONES for House and Garage, Office to Works, etc., ex-G.P.O. wall type telephone constructor's parts, comprising walnut box 8in. x 6in. x 3½in., fitted mike, switchhook and contacts, induction coil, condenser connection strip, etc., long magnet bell receiver, and Hand Magneto Generator. **30/-** per pair, plus 5/- carriage and packing. **G.P.O. Candlestick Telephones** with switchhook and contacts and G.P.O. receiver hanging at side, **24/-** per pair, postage 1/6. **Magneto Ringing Table Telephones** with hand-combination telephone and mag. generator, **40/-**.

DIMMER RESISTANCES, enclosed slider type. 500 watt, **40/-** ; 1,000 watt, **70/-** ; 5 K.W., **£7/10/-** ; special 5 K.W. on mobile stand, **£8/10/-**. Variable slider Resistances, open type, 1.2 ohms, 15 amps., **7/6** ; 300 ohms ½ amp., **12/6** ; 4.6 ohms 16 amp., **35/-** ; 60 ohms 2.8 amp., **25/-**.

VALVES. New valves. English and American. Send for special P.M.V. List. Here are a few examples : 6AB7, **6/-** ; 1616, **5/6** ; 2050, **8/6** ; 616, **9/6** ; 807, **7/6**. Special prices for quantities. **Cathode-ray Tubes,** new and crated, **35/-**.

TRANSFORMERS for Television Sets. 3 K.V., E.H.T., 200/250 volts, tapped, H.T. secondary 3,000 volts ; other tappings 250v. 80 m.a., C.T., 5v. 2a., 2v. 1a., 6.3v. 3a., 4v. 1a. **30/-,** carriage 2/6. **Power Transformers.** B.T.H. 200/230/250 volts input, 2 volts 20 amps. and 75 volts 6 amps., with 15 taps output, **45/-,** carriage 5/- ; 230 volts 50 cycles input, 53 volts 15 amp., 6 volts 5 amps., 30/60 volts 1 amp. output, **£4,** carr. 5/-. **Foster** 100-watt, 230v. input, 50v. 2 amp. output, **15/-,** carriage 2/-.

VARIACS. Zenith Variac Transformers, several sizes in stock. Write for List.

WIRELESS CONTROL UNITS, ex-R.A.F. metal box containing Yaxley switch with knob, connection strip fuse and holder, coil sockets and connections, **2/-,** post 1/- ; larger model with two Yaxley switches and pilot lamp **3/-,** post 1/-.

HEADPHONES, ex-W.D., in new condition, sensitive to crystal reception, with headband and cord, **5/-** pair, post 9d. ; single L.R. 'phones with headband and cord, **1/6,** post 6d. ; moving-coil single headphone unit, 4S-ohm coil, **5/-**.

MICROPHONES. Tannoy Hand Mike for outdoor meetings, multi-carbon type in metal case, with handle and neat battery switch, **5/-** ; special matching transformer, 10/6 extra, post 1/-. Transverse current mike for music reproduction, **50/-**. G.P.O. carbon mike in moulded bakelite case, **4/6** ; transformer, **2/-** ; mike insets, **2/-**.

PLUGS AND SOCKETS. G.P.O. Telephone Plugs with cord, **1/-** ; R.A.F. 10-way terminal blocks, bakelite case, 1/- ; G.P.O. connection strips, bakelite, **6d.** each, **4/6** doz.

MULTIPLE CONNECTION STRIPS, ex-G.P.O., solder tags, tele. type, moulded base, 60-way, **3/-**.

VITAVOX H.F. Speaker Units, as new, **40/-**. Horn for same, 3ft. long with flare, 2ft. 8in. x 1ft. 4in., **30/-,** carriage extra. Square Mouth Speaker Horns, 21in., **25/-**. Bell Mouth Speaker Horns, **25/-**.

DYNAMOS, 12 volt, 10/15 amp., C.A.V., shunt, 1,400 r.p.m., **40/-,** carr. **5/-** ; 12 volt 50 amp., 2,500 r.p.m., **£5/10/-** ; 24 volt 30 amp., 3,000 r.p.m., **75/-** ; G.E.C., 12 volt 15 amp., cut-out, **4/6,** post 6d.

TRENCH TRANSMITTERS in canvas-covered box, a bargain for break-up, 12in. x 9in. x 8½in., with ebonite panel fitted 10-way Rotary Stud Switch with laminated brushgear, litz wound variometer coil, coupling, valveholder, folding Morse key, etc., **3/6,** carriage **2/6**. Carriage to N. Ireland, **5/-**.

MAGNETS. 6 volt D.C. Electromagnets, weight 10ozs., lift 4 lbs., **5/-,** post 6d. Alni Disc Magnets, ⅜in. dia., ⅛in. thick, with 3/16in. centre hole in pot with keeper, **3/6.** Swift Levick S.L.S. circular horseshoe magnets, 1⅜in. dia., ⅛in. thick, ⅛in. polar gap-drilled poles, weight 2ozs., lift 3lbs., **2/6.**

MORSE KEY AND BUZZER for practice work. A.M. key on bakelite base with insulated knob, precision made, **2/6** ; G.P.O. twin-coil buzzer, **2/6** ; high-note buzzer in metal case, 2/-. Townsend High-note Wavemeter Buzzer, plat: contacts, **5/-**.

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SWITCHES. Dewar key switches, new 7-pole c.o., **3/6** ; Yaxley 3-pole 3-way, or 1-pole 8-way, **3/-** each ; **Lucas,** 8-way switchbox, **2/6,** post 9d. ; D.P.C.O. toggle switch, **3/-** ; G.P.O. lab. reversing switch, **2/-,** post 6d.

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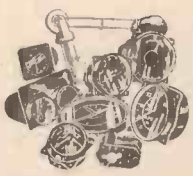

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Weight of parcel is 14lb. *Post free.* **12/6**

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By G.E.C., brand new, 200 to 240 volts A.C., 0.125 amps., with guard. Weight 16 lb., 12 in. sweep, overall diameter 14 in. Complete in all respects, including 3-speed control. Worth £7 each. A.C. only. (Carriage and packing 2/6) **70/-**

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3865	3½	1⅜	—	2	6
3866	4¾	2¼	—	4	6
3867	5½	2 5/16	—	6	0
3868	6¾	2⅜	—	10	0
3869	7¾	3½	—	14	0

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Code No.	*Overall Diam.*	*Boss Diam.*	*Radial Slots*	*Price* s.	d.
	in.	*in.*			
3870	4	1 1/16	8	2	0
3871	5	1⅜	8	3	0
3872	6	1⅞	8	4	0
3873	7	1⅞	8	6	0
3874	8	2¼	8	8	0
3875	9	2½	16	11	0

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QUERIES and ENQUIRIES

A stamped, addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 80 (THE CYCLIST), must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Relief Map Making

I HAVE made a relief map of grade A plaster of Paris, water-coloured it, varnished it with thinned-down Durofix, and then have written in names with black waterproof ink. This is successful, but I need advice as to how to insert rivers and streams (with a mapping pen) in blue. Blue waterproof ink is unsultable.

Any advice you can give will be appreciated.—P. Iliffe (Wigton).

FOR the insertion of rivers in your relief map, dissolve 1 part of gum arabic in about 15 of water. Then work in just sufficient tube water-colour ("artists' colours") to give the correct body to the resulting blue medium. This type of ink will flow satisfactorily from a mapping pen, provided that the latter is scrupulously clean and rust-free. This inking, however, should have been done before the entire map was finally varnished over. If, therefore, the ink does not "lie" well on the surface, you will have to use an ink composed of the varnish which you have employed in which has been ground a quantity of very fine dry blue powder, such as ultramarine, Prussian blue, etc. The choice of these two alternative inks will depend on how the surface of the map "takes" one or the other in fine lines, but the gum arabic ink will run better from the steel pen.

In general, your method of map-making is quite good. You will find your varnish rather expensive, although you do not tell us the type of "thinner" which you have used for making it. A good all-round varnish of the cellulose type is made by dissolving scrap film (celluloid) in a mixture of approximately equal parts of amyl (or butyl) acetate and acetone.

It would also be a good plan to size the plaster surface before doing any work on it in order to render it less absorptive. This is effected by dissolving 1 part of ordinary gelatine in about 25 parts of hot water. Brush the size on hot. It will give the plaster an "eggshell" surface with just enough "tooth" to take any applied ink or colouring. What is more, the ink will be free from any tendency to spread on the surface thus treated, whereas on an unsized plaster surface the ink will often tend to spread, and to give thick lines as it does on blotting paper.

Cementing "Perspex" and Catalin

I HAVE been trying to cement the above materials, like with like, or one with the other, so that the joints do not show a frosted or crystalised effect. I have used chloroform and the makers' adhesives with fairly good results, but no matter how quickly the joining is made a certain amount of "frosting" takes place. This spoils the general appearance. Is there a way of overcoming this trouble? The cement should have similar properties to the sheeting. I am making some small transparent tanks to hold liquids and the cement must have the same resistance to these liquids as the sheeting and not dissolve.—R. Heath (Leeds).

THE only way to make a transparent cement for these plastic materials is to use the material itself as the adhesive. For instance, none of the usual non-aqueous cements, such as cellulose cement, will wet the surface of "Perspex." Hence, such cements will not adhere. You can, however, make an excellent cement for "Perspex" by dissolving the scrap "Perspex" resin, or resin powder, in trichlorethylene, which liquid you will probably be able to obtain from Messrs. Vicson's, Ltd., 148, Pinner Road, Harrow, Middx. You will get a thick, rubbery solution, water white and quite clear. This is smeared on the contacting perspex surfaces, the latter being brought together under firm pressure. A perfectly transparent joint will be effected.

The same adhesive can be used for the catalin resins. If the trouble of the "frosted" joint areas persists, decrease the contact pressure between the jointed surfaces. Between the surfaces the adhesive material must be able to flow sufficiently to form a continuous film, otherwise its sparse film will be broken up and crazed, thereby setting up the objectional "frosted" appearance. We think, therefore, that you will overcome this difficulty by applying just a little more of the adhesive and by decreasing the contact pressure. Allow the joints to dry entirely without heat so that the solvent is not too quickly driven off from the adhesive. This is another cause of the "crazed film" effect, or of "frosting."

Lubricants Pressing for Tiles

I HAVE a tile-making machine and am experimenting in the use of different oils to prevent the face of the tile sticking to the mould after being pressed. Could you tell me what sort of oil to use to prevent this happening, also if ordinary mould oil used commercially would answer the purpose?—S. Crawford (Carrickfergus).

A PLAIN oil is not of much use as a lubricant under the conditions which you outline. A waxy or soapy material gives better results because it does not tend so greatly to seep into the surface of the material.

The following compositions have all been used as pressing lubricants for tile and plaster moulds. They are almost equally good.

(a) Stearic acid dissolved in petrol or paraffin.
(b) Aluminium stearate dissolved in benzene.
(c) Thick aqueous solution of common soap, with or without admixture of dextrine, to form an opaque paste.
(d) Tallow dissolved in paraffin.
(e) Butyl phthalate or butyl stearate (or an admixture of the two).

Readers are asked to note that we have discontinued our electrical query service. Replies that appear in these pages from time to time are old ones, and are published as being of general interest. Will readers requiring information on other subjects please be as brief as possible with their enquiries.

Central Heating for a Bungalow

I SHALL be glad to have your opinion both for and against central heating for a medium-size bungalow. The bungalow has a basement in which the necessary heating apparatus could be installed.

Can you supply me with the names and addresses of a few manufacturers of central heating units?—D. Metford (Tonypandy).

THERE is almost everything in favour of centrally heating a bungalow and very few points against it. The points "against" are: capital expense, running expenses and the very slight additional risk of fire from an overcharged heating stove. The points in favour of central heating are the general warmth of the atmosphere and the complete absence of dampness. The running expenses of central heating are partially compensated by decreased costs of open fires (if any) and by the expense (in cash or in labour) of household cleaning.

As a matter of fact, the ideal is to have very mild central heating and, in very cold weather, to supplement this by means of the usual grate fires. If you eliminate fires altogether and increase the heating intensity, the bungalow may tend to have an over-dry atmosphere. It is, therefore, always best to be satisfied with a mild degree of heating and to augment this by local room fires as and when required.

There are a few British makers of small domestic central heating equipment, addresses of which are given below. Prices tend to be high at the present time, but in our opinion a good central heating system is an excellent investment in general comfort and convenience, and because you have a basement in which the heating boiler could be installed we think that it would be possible to equip your bungalow with apparatus at a minimum of cost.

The required names and addresses are:

Messrs. Chas. P. Kinnell & Co., 65, Southwark Street, London, S.E.1.

Messrs. Musgrave & Co., Ltd., Sardinia House, Kingsway, London, W.C.2.

Messrs. Rosser & Russell, Ltd., Queen's Wharf, Queen Street, Hammersmith, London, W.6.

Messrs. Goodacre, Glover & Butler, Ltd., Phœnix Works, London Road, Nottingham.

Turning, Dyeing and Polishing Ivory

CAN you please inform me at what lathe speed ivory should be turned? Also, what is the method of dyeing and polishing ivory. Can I obtain any literature on the working of ivory generally?—E. M. Ward (Beddington).

TO turn ivory, rough out with a round-nose tool and finish with a flat-faced brass finishing tool or scraper. Run the lathe at only a moderate speed, and take light cuts only.

Ivory has a finer structure than bone and is more flexible. When newly cut it is semi-transparent, but as it dries and seasons it becomes more opaque. New ivory shrinks during its ageing, a fact which should be taken into consideration when working with freshly cut material. By immersing it in dilute phosphoric acid (1 in 3) ivory may be made flexible. When washed and dried it becomes hard again, but when wetted it once more becomes flexible. This process, however, tends to cause yellowing of the ivory, and it is, we think, detrimental to its lasting properties.

Ivory usually takes dyes well without interference with its surface polish. The method is to dissolve 6 parts of aniline dye (by weight) and 6 parts of sodium sulphate (Glauber's salt) in 88 parts of water. The ivory is immersed in this cold dye bath, and the bath is gradually raised to near boiling-point during one hour, retained at that temperature for 5-10 minutes and then allowed to cool down. Afterwards the dyed ivory is removed, well washed and dried with heat.

Ivory is best polished by a medium-soft revolving brush with wet whiting. It is finished off with a soft polishing bob charged with dry whiting or dry putty powder. To polish ivory by hand, make a pad of thick flannel and rub the ivory surface with whiting and water by means of this pad. Finish with a new pad by means of dry whiting or putty powder. If the ivory is yellow or creamy, stand it in a sunny window for several weeks to bleach.

By calcining ivory scrap and dust a very valuable black pigment—"Ivory Black"—is obtained, which on account of its density is much valued as an artists' pigment.

Various books are extant on the collecting of ivories and on ivory objects as works of art, but, unfortunately, so far as we have been able to trace, there are no publications on the manufacture of ivory articles from a technical and/or utilitarian standpoint. We can only suggest that you approach Dryad, Ltd., St. Nicholas Street, Leicester, and inquire whether they include the subject of ivory working among their well-known handicraft publications.

Cleaning Used "X-ray" Plates

I HAVE some used X-ray plates and want to clean them. I have been informed that caustic soda is best for this job but I am not certain about what proportion to use with water, nor whether the water ought to be a definite temperature. Can you please advise me about this? Perhaps you can tell me, too, how to make a solution which will stick two pieces together securely.—Jean Taylor (Glasgow).

WE assume that the "used" X-ray plates are actual negatives. In this case, you will be able to remove the emulsion from them merely by holding each plate under a slow stream of hot water and by scraping the emulsion off with a blunt knife. This will leave the glass quite clean. Simple immersion in hot water will remove the emulsion if you prefer not to employ the scraping method.

A dilute solution of caustic soda can, of course, be used for softening the emulsion, but its use is not really necessary. However, if you elect to use this solution, dissolve 1 part of the caustic soda in about 10 parts of water.

You ask for a solution which will stick two pieces together securely. We assume that you refer to two pieces of glass. If these have to be stuck with a slight overlapping joint, use a solution made by dissolving 15 parts of gelatine (cooking gelatine will suffice) in 85 parts of water. This solution must be used warm, since it will set to a jelly when cold. Smear a little of the solution over each contacting surface, and then bring the two surfaces together with a sliding move-

ment to avoid air bubbles. Put the plates away under light pressure overnight.

Stronger joints can be made by means of the cellulose adhesive of the "Durofix" type. Another perfect clear adhesive is Canada balsam dissolved in benzene or chloroform, but this takes about two or three weeks to set.

Stainless Oil; Welding Transformers; Descaling Iron

WILL you kindly answer the following questions:

1.—Is it possible to make "stainless" oil at home from one of the existing grades?

2.—Are there any plans or books available on the practical construction of welding transformers and, if so, from whom can the wire and stampings be obtained?

3.—Is there any method of removing the scale from black iron bar other and less laborious than the obvious one of scraping?

4.—Ought ironwork to be covered with some special undercoat before applying the desired top colour; if so, which?—R. Carrick (Torquay).

1. YOU cannot make a stainless oil except by heavy bleaching action involving the use of strong sulphuric acid and a complicated process. If you want a white oily liquid for not very exacting purposes, try the medicinal paraffin, which has quite a good body and is perfectly white and stainless.

2. There are no books specially written on transformer construction for welding purposes. Nevertheless, transformer principles and designs are referred to in the following books, which you will find of interest. Possibly, you will be able to obtain these on loan through your county library: L. B. Wilson: Electric Welding. H. B. Swift: Practical Electric Welding. K. Meller: Arc-Welding Handbook. M. H. Potter: Electric Welding. R. C. Stockton: Principles of Electric Welding, Metallic Arc Process. H. J. Lewent: Electric Arc Welding Practice.

You can obtain electrical wire of all kinds from Messrs. Henry Wiggin and Co., Ltd., Wiggin Street, Birmingham, or from London Electric Wire Co. and Smiths, Ltd., 7, Playhouse Yard, Golden Lane, London, E.C.1, but you will not be able to obtain ready-made transformer stampings. These would have to be made to your order.

3. The simplest method of descaling iron bar is to immerse it in a bath of dilute hydrochloric acid of strength 1 in 4. The bath may, with advantage, have a small amount of common soot added to it, say, at the rate of a teaspoonful per gallon of acid solution. This soot regulates the action of the acid and prevents it from becoming too rapid in areas. The bath should, if possible, be used warm.

4. It all depends on what surface colours are applied to the ironwork. Usually, a clean iron article is always best given an undercoat of a grey priming paint or of a red lead paint. When dry, the surface paint or enamel may be applied in one or two coats. Surface paints do not always give perfectly non-porous coats. If, therefore, the surface coat is deficient in this respect, moisture is able to attack the iron surface and to rust it, but this is not possible if the metal has a grey or red lead undercoat.

Producing Smoke for Wind-direction Indicator

CAN you give me a recipe for a mixture which will burn slowly to produce a fine plume of smoke as a wind-direction indicator?—A. N. Sperryn (Sutton Coldfield).

DISSOLVE 15 parts of saltpetre in 85 parts of water. Immerse a length of thin rope in this solution for 24 hours, turning it over frequently. Then, without rinsing, hang the rope out to dry. It will then burn slowly and steadily when ignited, and will give rise to a small amount of grey smoke. If you want the rope to burn more quickly, use a stronger saltpetre solution.

Brown paper similarly treated, and then tightly rolled and compacted into a long thin cylinder or into a shorter "cigar," will give similar results.

Enlarger Lenses: Spherical Lamp Houses

I AM building a photographic enlarger, and shall be glad if you will assist me on the following points:

(1) Is it desirable to use a lens of any particular focal length for enlarging (a) 2½×3½ negatives, (b) ¼ pl. negatives?

(2) Most enlargers on the market, for 2½×3½ negatives and upwards, seem to have a spherical lamphouse body; is this anything to do with spreading the light and assisting even illumination?—L. W. Browne (Ealing).

(1) THE lens used in an enlarger must have a focal length at least equal to the diagonal of the negative which is to be enlarged, that is to say its focal length must equal the length of a line drawn from one corner of the negative to the diagonally opposite corner. Thus, the diagonal of a quarter-plate negative measures 5½in. Hence, for enlarging a quarter-plate negative the lens should have a focal length of at least 5½in. Such a lens would be better with a focal length of 6in., but there is no need to use a lens of greater focal length than this.

(2) The spherical bodies of some enlargers do not really influence their efficiencies although, perhaps, they add to compactness and improves appearance. All you require for a good enlarger is a suitable lens, a negative carrier and a condenser, plus, of course, a suitable illuminant which is capable of being adjusted up and down and backwards and forwards. Using a condenser, a 60-watt electric bulb will be quite sufficient. The lens should be capable of being stopped down in order to sharpen up definition.

Reversing Connections for Electric Motor

I HAVE a 1/3 h.p. induction motor which runs perfectly in the forward motion and is self-starting, but immediately I wire it for reverse motion, the motor is not self-starting in the forward or reverse position. It also hums and has to be started by hand; it then runs well in the forward position. According to the particulars supplied with the motor, the mains are connected to terminals A1 and A2 (Fig. 1). For the reverse the leads have to be removed from terminals A1 and A2 and placed on to two spare terminals T2 and T3 which are connected to the reversing switch. Terminals A1 and A2 are connected to the control switch.—C. W. Pool (Birmingham).

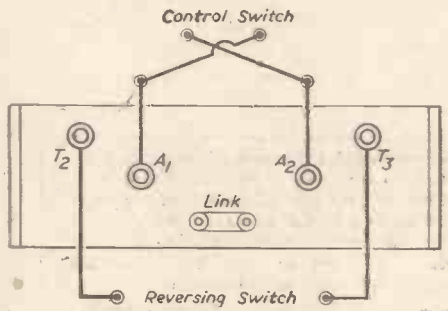
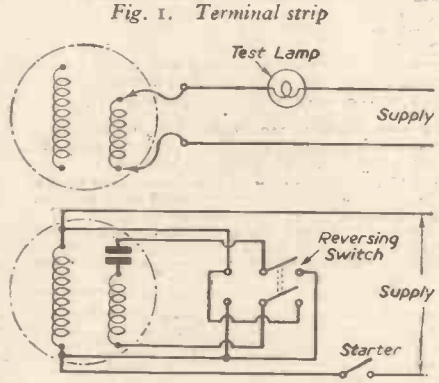


Fig. 1. Terminal strip



Figs 2 & 3. Wiring arrangements for a small electric motor. (C. W. Pool)

IT would seem that your reversing connections are incorrect. We presume this motor is intended for use on one voltage only. In this case it will have a starting winding and a running winding. It is first necessary to find the terminals to which these two windings are connected. You may be able to trace the leads running from the terminal block into the motor. If not, the leads should be disconnected from each other; if this is not the case, and a test lamp used between pairs of leads in turn as indicated in Fig. 2. Use a lamp of low wattage. A light should be obtained when the test leads are connected across two separate pairs of leads, which are connected to the two separate windings. Then connect up with a double-pole two-way switch as shown in Fig. 3.

Testing an Air Cylinder: Cleaning Greenhouse Glass

CAN you please advise me as to a safe method of testing an air cylinder (believed to be a lorry brake cylinder, size 20in. by 10in.) which I want to use as an air receiver for a compressor?

Also, how can I remove black and other weather grime from greenhouse glass? I have tried such things as mild abrasives and even spirits of salt with no effect.—S. Stevenson (Rotherham).

THE only way in which you can test the cylinder adequately for air pressure is to screw into it a connection directly fitted with an air gauge, and to pump air into it up to a predetermined pressure, say, 20, 40, 60 or 100lb./sq. in. The cylinder, if it is in good order, should maintain this pressure for at least 12 hours. If the cylinder under test is held below water, the slightest air leakage will at once be apparent.

If you have not a suitable pump available, a test can be made by connecting the cylinder to one of compressed air, and by releasing the compressed air so that it is able to charge the empty cylinder up to a given pressure.

The condition of your greenhouse glass is due to the gradual deposition of oily, sooty and gritty particles from the atmosphere. To a certain extent, also, these particles have had the effect of eroding the glass—that is, of slightly corroding its surface, so that the particles themselves have been able, as it were, to eat into the glass surface and to embed themselves therein. This is mainly the reason for the glass being very dull on the surface. Very possibly, also, you will find it very rough.

The only treatment is to disolve one part of caustic soda in four parts of hot water. Swab this on to the glass, and then scrape the dirt away. Repeat the process two or three times, each time using weaker caustic soda. The latter will attack the paint of the woodwork and act as a very effective paint stripper. It will also tend to attack the putty. For these reasons, try to confine the caustic solution to the glass areas only. If it gets on other areas, wash it off at once with plenty of water. To apply the caustic solution, use a cloth tied to the end of a wooden rod or stick.

Mild abrasives will not have much effect on the deposited dirt. Even hydrochloric acid (spirits of salt) will have little effect, because the greasy dirt will tend to resist it. The dirt, however, will not resist either caustic soda or soda ash.

If you prefer to use a milder agent, employ a paste of lime. This is put on to the glass and allowed to dry on. Subsequently, it is wetted, and then scraped off with the underlying dirt.

Diesel Oil and Petrol Mixture for Heating Stove

I WISH to mix together light diesel oil and petrol for use as a burning fuel in a vertical-type heating stove which normally uses paraffin. Diesel oil itself is, I find, no use, as the wick chars and the stove goes out. So far as I can ascertain, a mixture of about 12 parts diesel oil and one part petrol is about right, but what I am afraid of is that the petrol may tend to rise to the top and be dangerous after the lamp has been burning for some time. Will you please advise me as to whether this will be the case, or whether the diesel and petrol after being well mixed will remain so.—J. Parker (Thornliebank).

PROVIDED that your diesel oil is of a petroleum nature, it will certainly "mix" with petrol or paraffin and remain permanently in that mixed condition. The petrol (or paraffin) will not separate from the diesel oil proper, and since the petrol will reduce the viscosity or "body" of the diesel oil, the latter will be able to flow better up the wick of the heating stove.

This, unfortunately, does not completely eradicate your difficulties, for the petrol, having a much higher "vapour pressure" (or lower boiling-point) than the diesel oil will tend to evaporate away from the diesel oil. It will also tend to burn away at the wick at the expense of the diesel oil.

Suppose that you start with your heating stove normally full of your chosen mixture of petrol and diesel oil. When the oil supply in the stove has, say, been half utilised, you will find that your original proportions of petrol and diesel oil will no longer be present. It is possible that nearly all the petrol content will have evaporated and selectively "burned out" of the oil, leaving behind the thick, clogging diesel oil in more or less its original condition.

That will be your trouble, but you may be able to overcome it by using paraffin in place of petrol and, also, by increasing the proportion of paraffin in the mixture.

Renovating Light Oak Furniture

HOW can I treat light waxed oak furniture which has faded in patches? It appears to have been exposed to strong sunlight for long periods.—J. W. Canham (Dereham.)

MODERN furniture is almost invariably stained with aniline dyes, mainly with mixtures of Bismarck brown. This dye is notoriously unstable. It fades badly under even moderate light influence, and it is precisely for this reason that your furniture has faded in patches.

There is no remedy. The only treatment which you can apply is to remove the wax polish by rubbing the wood surface with a cloth charged with paraffin or white spirit. After this, remove most of the dye by rubbing the de-polished wood with methylated spirit. You will now have a "raw" wood surface. This should be sandpapered and re-stained either with a spirit dye solution, or by brushing over it a solution of potassium permanganate of appropriate strength. When the wood has dried again, rub the usual wax polish over it, or apply a shellac polish in the usual manner.

If you want a light colour, we advise a fairly weak solution of potassium permanganate, followed by a plain wax polishing. This will give a semi-dull surface which will resist the action of sunlight to a maximum degree.

Flexible Varnish for Patent Leather

CAN you give me a formula for making a flexible varnish, which will not crack, to apply to some old patent leather shoes which have lost their original high polish? The shoes are made of good pre-war leather. They show, of course, the usual creases, which are to be expected, but the uppers are not cracked in any way—and the leather is in good condition.

No shoemaker has been able to supply me with any ready-made preparation with which to treat the shoes.—D. Shoppee (Orpington).

A GOOD dressing for patent leather is a dilute solution of shellac in methylated spirit containing a small proportion of castor oil. The shellac itself gives a brilliant surface but, used alone, it is inclined to crack. The castor oil plasticises the shellac and so obviates the cracking tendency. The correct proportion is about 5 per cent. of castor oil calculated on the weight of the dry shellac. In place of castor oil, dibutyl phthalate may be used.

The strength of the shellac solution should not be more than 10 per cent., i.e., 10 grams of shellac in 90 grams of spirit.

In place of the above you will often find that one of the aqueous dry-bright wax polishes, such as Johnson's "Glo-coat" will give a brilliant finish on smooth leathers after merely being wiped thereon with a soft cloth.

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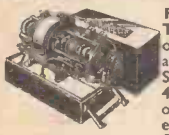

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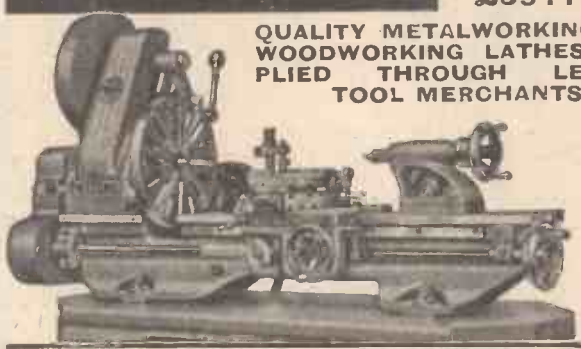

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MAINS TRANSFORMERS, input 200/250v. in steps of 10v. output, 350/0/350v. 300 M/amps., 4v. 8a., 4v. 4a., 6.3v. 6a., 6.3v. 2a., tapped at 2v. (Electronic) at 57/6 each; another same input as above, output 500/350/0/350/500v. 250 M/amps., 5v. tapped at 4v. 4a. twice, 6.3v. tapped at 2v. 2 amps. 67/6 each.

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MAINS TRANSFORMERS, 230v. input, 525/0/525v. 150 M/amps., 6.3v. 5a., 5v. 3a., 55v. 50 M/amps. output, 30/- each; another 12v. 12a. output, 27/6 each.

ALL GOODS SENT ON 7 DAYS' APPROVAL AGAINST CASH. All letters answered. We regret we have no lists available at present. We would be pleased to quote.

THE Cyclist
Editor: F. J. CAMM

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All letters should be addressed to the Editor, "THE CYCLIST," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

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Comments of the Month

By F. J. C.

The Army and the B.L.R.C.

THE A.C.U., which is the Army Cycling Union, and the Army Sports Control Board have banned members of the B.L.R.C. serving in the army from riding in A.C.U. events, and this has stirred up a hornets' nest among the members of the B.L.R.C. This attitude, however, of the army authorities does not mean that they are taking a partisan attitude, but that they are acting to protect army cyclists from being penalised, in view of the known attitude of the N.C.U. and the R.T.T.C. towards the B.L.R.C. The two former bodies have informed the A.C.U. that whilst they would not penalise any of their members who rode as B.L.R.C. members in Service events, they would not accept affiliation from individual army cycling clubs which had B.L.R.C. men amongst their members. This was fully discussed at the first general meeting of the A.C.U. and it was proposed and carried that a rule be made excluding members of organisations which promote mass start events on the road which conflict with the R.T.T.C. and the N.C.U. It was further pointed out that those affected could apply for reinstatement with those two "august" bodies. It was the opinion of the meeting that a club having B.L.R.C. members would have its activities restricted in that it would be barred from affiliation to the R.T.T.C. and the N.C.U. It was thought that many army cyclists would be affected by this ruling. The matter has been further considered, however, and it has been decided that the debarring of B.L.R.C. members is wrong, and an effort is to be made to find a solution to the problem which is acceptable to all concerned.

As usual the matter has been badly handled by the B.L.R.C., one of whose members was present at the War Office on May 9th when the Director of Army Sport Control and the hon. general secretary of the Army Cycling Union discussed the matter. This representative must have known all the foregoing facts, yet proceeded to criticise the matter in a cycling journal. The B.L.R.C. has lost the spirit which animated it in its early days. Its vicious attitude has alienated the support of its best friends, and it has developed, for some unaccountable reason, an anti-Press complex. But it was to the Press that it turned in its early days when it found itself being unfairly attacked by the N.C.U. and R.T.T.C., who adopted underhand and covert methods in order to get mass start racing suppressed. The present writer prepared the famous memorandum which was presented to the Minister of Transport by a deputation of whom the writer was a member. This journal supported mass start racing when the B.L.R.C. had an unpopular Press. Unfortunately, some recalcitrant members managed to oust the more temporate element and gain control of the League, which at the present time is in need of a purge.

It is not difficult, for example, to discern the particular member who framed the rule which reads: "No reports or comments regarding N.E.C. meetings or of annual general meetings shall be published. Such meetings shall decide whether or not any statement shall be issued to the Press and shall determine its contents. Any members publishing or causing to be published unauthorised reports shall be subject to disciplinary action. Members of and/or the representatives of the Press shall be excluded from all meetings and such meetings shall have the power to refuse admission without any reason being stated." This savours very much of the methods of the Ku Klux Klan. For as the Press are barred, the rule means that its own members can be refused admission! It would verily seem that the B.L.R.C. has something to hide, and it must have a curious view of the Press if it believes that representatives are going to wait hat in hand for some approved statement which they are expected to print without comment. The Press believes in forming its own views, and has no intention of printing one-sided views.

The B.L.R.C., of course, likes the Press to be present at its meetings and to report them as well as to take photographs. In view of this, we are communicating with the National Union of Journalists and the Institute of Journalists, acquainting them with this particular rule.

If this new body is conducting its meetings in accord with established practice, and with the same regard for freedom of speech, and of the Press which applies to all other domestic tribunals it should have no fear of Press comment. The rule is obviously intended to stifle comment, which means that the B.L.R.C. expects adverse criticism. What is wanted within the League is an infusion of experienced men, free from spleen and who are accustomed to committee meeting procedure.

The recent resignation of the chairman may, or may not, have some bearing on this matter. The B.L.R.C. only has itself to blame if the Press also makes a rule—to ban reports of all meetings to which it has not been invited.

Police "Interference" with T.T.'s

WHEN we remember the hush-hush methods of running time trials it is rather humorous to learn of a case where a complaint had been received by the police that obstruction had been caused to a coach by the crowd at the finish of a trial. The police issued a friendly warning, that in future events, they should be apprised well in advance so that they could send a man to keep the road clear.

Now the R.T.T.C. prohibits prior publicity on road sport, and it still conducts it by the methods which were necessary in the early part of the present century when the police were openly hostile to cyclists. Those conditions no longer apply, and it is high time that hole-and-corner methods were abolished. The sport would gain considerable prestige by publicity. The R.T.T.C. should not be swayed by the old men of the movement who are living on their memories.

GORDON RANDALL

The Old Bell Inn
East Molesey

Tucked away from the busy main street of this popular Thameside spot – this old inn after careful restoration still retains its charming tumbledown appearance

Paragrams

Follow the Plastic Trail

IMPERIAL CHEMICAL INDUSTRIES, LTD., have produced a new type of "white line" in the form of a plastic strip which is actually stuck to the roads. The strip, which is 4in. wide, is laid in 18in. sections, stuck to the road with a special fixative. There are small glass beads, about a quarter of an inch in diameter, and these show up in the lights of vehicles at night as a continuous sparkling line. The new plastic strip can be laid in any pattern for special cases, as a continuous line, or in 3ft. strips with 9ft. gaps to meet the present regulations.

World's Best Driver?

MR. FRANK HALL, of Broughton Astley, Leics, one of the first men in the district to ride a penny-farthing, for many years in business as a cycle agent, and later a garage and bus proprietor, is challenging the statement that a Leicester motorist, Mr. C. W. Levell, is "the world's best driver" with 32 years on the road without an accident. Mr. Hall, who is 80 years old, claims to have had a driving licence since they were first brought out and says in all his 40 years as a car and bus driver he has never had an accident. He rode with safety during his cycling days, even on his old penny-farthing, and he kept up his good record when he turned to cars and, what is more, he claims that not one of his drivers ever had an accident while with him.

One Way

THE Kesteven (Lincs) County Surveyor has issued his annual report for 1949, which discloses that during the year there were 300 accidents involving personal injury on roads in his area, resulting in the death of 10 people and the injuring of 381. He comments: "It has always surprised me that in this enlightened age learners, whether motor-cyclists or car drivers, are let loose on the public highways before they are experienced and capable of controlling their vehicles. I think it would be a step in the right direction if all learners had to practise off the public roads and pass a preliminary test there before being allowed to drive in and among the public."

Cycling Taxi-drivers

THE pupils at the British Legion school for budding London taxi-drivers, all of whom are ex-Servicemen, find the bicycle indispensable in learning their way about London. Each course lasts nine months and the pupils cover some 30 miles a day through London streets finding their way from point to point; first with the help of a street map and then on their own. This London school trains some 130 taxi-drivers a year, and when they have completed the course the pupils have no trouble in finding the shortest distance between any two given points, although, according to some people, the taxi-driver does not always take the shortest route!

Cheaper Cotter Pins

MESSRS. G. W. S. BURDETT & CO., LTD., engineers, are producing a new automatic machine for turning out cycle crank cotter pins which is believed to be the first machine of its kind in the country. Each machine costs £3,000 to build and is capable of turning out 900 cotter pins an hour. The firm has received orders for several of these machines, and when they are in general use it is expected that the price of cotter pins will fall from about 4½d. each to 1d. each.

The Cycle-plane

PAUL PATRIS, a Belgian sculptor, thinks quite a lot of the bicycle, and also the ordinary aeroplane, and now, with lots of enthusiasm, he has plans for flying a pedal-plane. The machine is of light-weight construction, is designed rather on the lines of the first aircraft, and the propeller is turned by pedalling. Patris claims that the wing surface is sufficiently large to support him in the air without pedalling and when he wishes to land he will just float down to earth with the wind.

Why We Must Wait

SPEAKING at the first annual dinner of the Northampton Branch of the National Association of Cycle Traders, held at the Plough Hotel, Northampton, the chairman, Mr. D. F. Wright, commented on the fact that the cycle manufacturers of Great Britain are at present exporting 200,000 cycles a month, mainly to dollar areas. Consequently, he said, we have to put up with shortages in this country.

Loughborough College Club

THE enthusiastic few who combined earlier this year at Loughborough College, Loughborough, Leics, to form a cycling club, have now become officially the Loughborough College Cycling Club and they have been recognised by the National Cyclists' Union, the Road Trials Council and the Students' Representative Council. The founders of the club were nine racing enthusiasts and at present they form the backbone of the club. Now they are out to increase the club membership and to make their mark in the cycling world.

Keeping the Verges Tidy

SPECIAL implements are now being manufactured for attachment to tractors which will keep the verges of our country roads neat and tidy. There are bulldozer blades for levelling the verges and cutters and mowers for trimming the edges and cutting the grass by the roadside. The weary job of tidying the verges by hand will soon be a thing of the past for, once the verges are in a fair condition, a sixteen-mile stretch, both sides of the road, can be dealt with in a single day.

For Faster Cycling

A GADGET has been brought out by Sherman Industries, of Burbank, California, which they claim increases a cyclist's speed without effort. The attachment consists of two circular discs attached to short arms and the whole attachment is fixed to the rear hub of the cycle. As the cycle moves forward the discs swing out towards the rim of the wheel and it is claimed that after the cycle reaches a speed of 7 miles an hour a higher speed can be reached with the same effort and freewheeling lasts for a longer distance.

No Priority!

A SOLICITOR defending a motorist charged at Leicester City Magistrates' Court with careless driving, submitted that a driver on a major road had no legal right of way over another driver approaching along a side road, and he quoted the comment of a County court judge. "There is no rule in law giving the right of the road to a driver on a major road." However, the magistrates did not agree with the remarks of the learned judge and they convicted the motorist, who had collided with a car on the major road as he was entering the road from a side turning.

Quick Growth

ALTHOUGH it is only a few months since the formation of the Loughborough (Leics) club, Loughborough Wheelers, the club has grown so rapidly that it now has the largest membership of any of the clubs in the town. The old Loughborough Falcon Road Club provided the nucleus of the new club and a full programme of events has been arranged for the coming season. Both hard-riders and potterers are catered for and members can join either section; or both if they wish. President of the new club is Mr. J. M. Smith, who is also hon. secretary.

Road Material from Fens

PROVIDED consent can be obtained from the interested owners of land at Lode Way, Haddenham, Cambs, it is proposed to remove about a thousand tons of top fenland soil and use it for experiments in finding an economic material for keeping road surfaces in good condition. It is considered possible that the organic subsoil of the Fens can be used to provide a hard-wearing road and it is thought that the experiments, which will be carried out at Christchurch, Hants, will prove successful. It all depends on whether the owners of the land will agree to the removal of soil to the depth of a foot and the Isle of Ely County Council are getting into touch with them.

Around the Wheelworld

By ICARUS

Girls' Speedway Team

BARBARA BANNISTER, 16 years of age and full of the vim of youth, has started an all-girl cycle speedway team. There are to be eight riders and two reserves aged between 13 and 16 in this team, and each is subscribing 1s. a week to pay for leather waistcoats and riding boots. They propose to call themselves the Bevington Babes. Although there are many women speedway riders on the Continent, I do not know of any so youthful as these, and my advice to them is to drop the idea, or make the rules such that no girl under the age of 18 can race.

The 1950 Trader Handbook

I HAVE just received a copy of the 44th edition of the Trader Handbook which is a legal, technical and buying guide for the motor, motor cycle and cycle trades. It is published by the Trader Publishing Co., Ltd., at 12s. 6d. There are over 450 pages of valuable information for all engaged in the cycle trade, whether on the manufacturing or selling side. There are sections on trade marks, law, trade names, overhauling, manufacturers' addresses, buyers' guide, and a great deal of technical information. The proprietary names section lists nearly 5,000 items. The directory sections are printed on distinctively tinted papers for ease of reference. The address of the Trader Publishing Co., Ltd., is Dorset House, Stamford Street, London, S.E.1.

Coloured Cycle Accessories

THE flamboyant finishes which most manufacturers feature as far as frames are concerned have not struck any responsive chord in the soul of accessory makers until recently, when the Midland Gear Case Co. introduced a new range of cycle accessories in shades of red, maroon, blue and green. These colours apply to touring bags, carriers, cycle lamp gadgets, trouser bands, clips and dress guards. Personally, I still prefer a black frame gold lined, or a dark green of the shade which Elswick Hopper popularised many years ago. I do not like this modern tendency for multi-coloured bicycles reminiscent of a gipsy's caravan or a circus roundabout. It is pandering to the lowest section of cyclists.

Harris's Second World Record

REG HARRIS has added to his laurels by beating at the Palais de Sports, Brussels, the 1,000 metres standing start record for indoor tracks by 2 2/5ths seconds, thus beating the previous record of 1 minute 9 2/5th seconds held by Van Vliet, and also the unofficial record of 1 minute 8 4/5th seconds by Emile Gosselin, of Belgium. Also riding in Milan he beat his own record for the world outdoor unpaced 1,000 metres by 1/10th second.

Death of R. T. Lang

IT was with sorrow that I learned of the death of R. T. Lang (Robert Turnbull Lang). He died on May 13th, at his home at Hayton, Howmill, Cumberland, aged 79. He was born at Glasgow in 1870, and twenty years later he came to London to edit *Wheeling*, one of the early cycling journals. Later he became head of R. T. Lang, Ltd., Advertising Agents, later joining Sells Ltd., and retiring from Mason-Lang, Ltd., about 15 years ago. He did a great deal of work in developing the modern road sign, and during his retirement wrote The National Road Book which was probably the most complete road book of Great Britain since Leland's famous work of 400 years ago. In gathering material for the 5-volume work he spent about 10 years travelling the roads of this country and visiting almost every town and village. He was a member of the Kent County Council from 1927 to 1934, and was appointed a J.P. in 1911. In 1945/6 he was elected president of the Fellowship of Oldtime Cyclists. For many years he was a fellow of the Royal Geographical Society. He was, in his early days, for many years a keen worker for the N.C.U. and was racing secretary of one of its centres. He, however, resigned from this because of the sham amateurism in cycle sport at that time. He then joined a touring club.

In Lang's day manufacturers were keen to have the names of famous racing cyclists in their advertisements, and a paltry race in some local village would be boldly announced as having been won by some unknown yokel riding somebody's tyres, or who used some brand of split pin, washer, saddle soap, or pump. These riders were of course adequately rewarded and received free bicycles and accessories, sometimes cash in return for the use of their name or for riding under some manufacturer's colours. Those were the days of the pot hunters. The average racing cyclist of that period was anxious to amass a sideboard full of cups, rose bowls, shields, plaques and other bric-a-brac, as well as a large number of medals which he could attach to a silver watchchain of railway coupling proportions. When the sideboard and the watchchain were sufficiently full he would send for the local photographer and pose nonchalantly by the side of the sideboard, elbow supporting chin, left knee slightly bent forward and dangling a cigarette from a receding bottom lip. When the photographs arrived he would post them off to the dozens of cycling journals of the period. Lang fought against this veiled professionalism but without much success, and certainly without any official backing. The N.C.U. at the time were so scared about the attitude of the police towards cyclists that they neglected their real job of seeing that the sport was run for amateurs, and in a clean way. When manufacturers were vieing with one another for wins at the big races, dirty work as well as money was part of the armoury they used. The manager of one pacing team late at night loosened all the handle-bars and draw-bolts of the opposing team to ensure a win. Lang lived in a cycling era which produced a lot of quacks like Colonel Crompton, pseudo-historians like H. W. Bartleet, and frauds such as Tera Hooley and Joseph Pennington. He ran a straight race himself, however, and was one of the few of the period anxious to make cycling a clean sport. The pastime owes much to him.

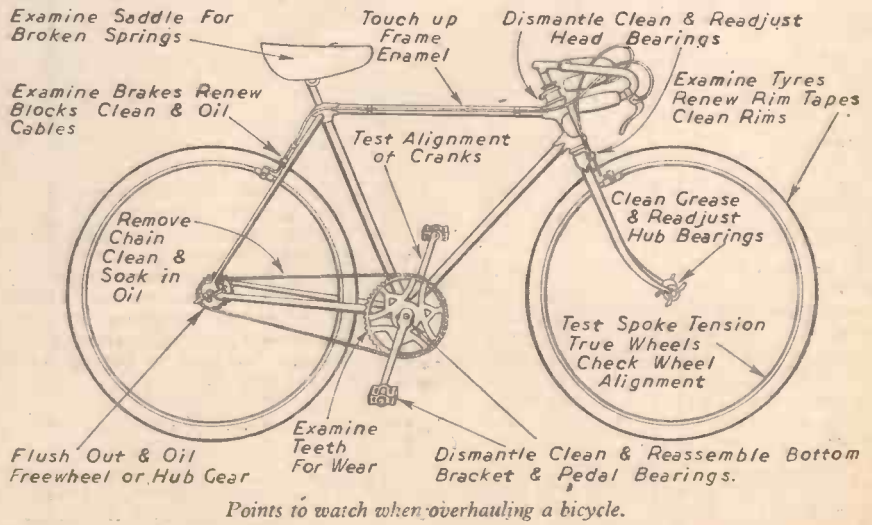
Motorised Bicycles

THE motorised bicycle is developing, a number of new units having been produced within the last four years. The unit, of course, transforms a bicycle into a motor vehicle, and it must, therefore, be licensed and insured as an ordinary motor-cycle. The very first motor-assisted bicycle, if such it could be called, was the Singer in which the motor was built into the rear wheel. There was also the Werner. Most of the early motor-cycles produced up to 1904 were really motor-assisted bicycles. They had unsprung forks, and the engine was clipped on to a standard frame. A two-partition tank was clipped underneath the top tube; one compartment contained the petrol and the other the accumulator and trembler coil.

The motor-assisted bicycle appeals mostly to utility cyclists who use their machines for cycling to and from work, but it also has its uses for those who, for physical reasons, are unable to pedal. The Auto-wheel was one of the earliest of the motor attachments. It consisted of a small tyred wheel mounted to a frame containing the engine, and it was fastened to the rear of the frame.

Gauge for High Pressure Tyres

A PRESSURE gauge for h.p. tyres has been marketed by the Dunlop Rubber Co., Ltd., at 7s. 6d. This enables the tyres to be kept at correct pressure, for under inflation of high pressure tyres has a more devastating effect on them than under inflation of low pressure tyres. The old method of feeling the tyre and judging the pressure in that way is rather hit and miss. No one has yet discovered a gauge which can be used for the ordinary Woods type of valve by direct application to the valve itself. Gauges attached to the base of the pump are not reliable since they measure the pressure required to force the air into the tyre, and are not a measure of the pressure within it.



Points to watch when overhauling a bicycle.

Wayside Thoughts

By F. J URRY

Mountain grandeur at its finest. A view looking towards Brothers Water.

The Way of Success

STRANGE how woefully ignorant many people are in reference to cycling matters. A business man of some note has just left my office. I had not previously met him in person, although our telephone talks had been frequent and long. He admitted surprise to find me in cycling costume with a very muddy bicycle outside my office, and wondered why I selected such "an antiquated mode of travel" (his words). So I told him why I rode a bicycle, that the main reason was because I liked the pastime, while the secondary ones were concerned with health, fitness, freedom, individuality, reason, and tolerance, and he found it very difficult to believe. A man in his late forties, too fat and a little stiff in his movements, he had declined from the athlete of twenty years ago to a middle-age graced only with a little golf. All the rest was car, and even on holidays car and golf, lunch, a sleep, a stroll on the prom, and then another meal. The world follows that ritual too much and finds work for the doctor. People call it pleasure and forget the greatest joy of the human is in the possession of a fit body. Cycling may be cheap in the money sense of the term; as my acquaintance said, it may be common and all the things folk say of a travel mode they dislike, but it is still the richest thing in exercise vouchsafed to mankind. All it needs is the right approach, the right bicycle, and that desire—more or less latent in all of us—to be self-contained to seek beauty as and when we will, free from all the entanglements of this speeding age. There is nothing like a bicycle in the world of machinery, it is a marvel, and there is nothing like cycling in the world of pastime—it is magic made human.

Resurrection

TO-DAY there is magic in the air, for summer is flaunting over the land in all its pied loveliness. Even the journey to town seems different every morning; the gardens are beginning to glow, the trees are a bouquet of colour in their full beauty of leaf, under which the shapely branches are hidden until autumn comes. The people, because the sun shines on them, have wiped away the frown for the time being, and indeed "all's right with the world." You would not think so if you read the daily Press. But come out with me and hear the birds sing and smell the glorious scent of earth where the new furrows are cut, and you'll begin to know life is not all telephone and toil. No man has yet told all this magic; no man ever will, for it resides in the heart as well as in the countryside, in the fit body and the happy mind. Cycling has done all this for me for many years, but the full glory of it has not been tasted yet. I was out with an old friend and we stayed and smoked by a woodland stile, the wind and the sunshine streamed over us, and behind the bird song was the great harping of the trees as they bent to the breeze. We did not say much to each other then, but at lunch an hour or so later he offered the remark that it was the best morning out he had enjoyed for six months. And I had some difficulty in persuading him to come along! Cycling is like that: you wonder why you go for the first mile; you wonder why you don't go more frequently at the tenth. Let it do that to you and you'll be a happy individual with a very special reason for your happiness. Cycling has no shrine, rather the reverse; you must find it, and your worship of it and all it connotes is the measure of your contentment.

Dirty Business

IF you ride, then tyres puncture occasionally, and often enough in inconvenient places and at awkward times. The other morning my front cover picked up a drawing-pin and my first information of the fact came from the tiny click of its head as the wheel passed over the granite setts. It was too late for removal when I dismounted, for the perforating deed had been done, so having arrived I left the machine in the passage near my office until I found an odd ten minutes to give it attention. Actually the removal of the cover, a patch on tube and inside on the fabric did not occupy five minutes, for this was one of the simple repairs with the location of the trouble advertising itself; but the clearing-up process was a job. That is the worst feature of these alloy rims. They are dirty to handle at the best of times, but when the winter mud and road grease has thoroughly mixed itself with the corrosion of the metal, it does leave you in a dirty mess. Personally, I think I like the stainless steel fellow better; it does keep reasonably clean and completely free from rust. You add a little to wheel weight (an important factor in easy cycling) but gain something in resilience, and the steel rim does outlast the bicycle, at least that is my experience. The alloy is certainly a dirty rim when you have to handle it after brake-blocks have assisted natural corrosion, and the stuff sticks to your skin. Yet how seldom this happens to me. This is my first puncture in the year, and because I have repaired it myself I know the job is sound, the cover in its correct position with the tread pattern running truly between the forks. That is why I prefer doing my own repairs as well as my bicycle's lubrications, for this responsibility to the machinery is important, no matter if the mud is the main decoration of the remainder of the article.

Lightening the Ignorance

WHEN a man grows older the erstwhile important things of life (or those he once thought important) tend to fade, and he comes to love his freedom of movement more realistically, and possibly is too much inclined to hug it to himself. Therefore the ride is now more grateful to me than the social function, the doing happier than talking about it. But some weeks ago a function was held in Birmingham under the auspices of the Ministry of Supply (whose officials have been among my working handicaps these last years) and at the last minute the head of that department in this city (who is an old friend) persuaded me to attend. Several dozen colonial and foreign journalists had been touring the area, concentrating their interest mainly on the cycle trade, and the visitors were entertained to dinner by the M.O.S. and the cycle industry were there in volume. These masters and mistresses of the pen had been primed with statistics and bright rows of export figures until possibly they were saturated with quantity, and needed something different. My good friend of the Ministry imagined I could give it to them in a few brief sentences, as a sort of comic relief to the boredom of too much broad detail. They had seen bicycles made, now they heard the reactions of a man who had been riding them for sixty years, and, strange as it may seem to you, these hard-headed scribblers rose to the bait. They didn't believe my simple story; they checked up on it by reference to my trade friends; and then they almost mobbed me to give them details. My own reaction to the experience merely confirms the opinion often expressed that the industry should learn to sell cycling, then the bicycle and the results will be, in the long run, better bicycles, better cyclists, and far more of them.

A Nice Compliment

IT was very good to see *Punch* taking up the value of cycling in a comparatively recent issue, on the theme that Tolstoy, as an old man, learned to ride, and is reported to have said it was the only thing he had completely mastered. The writer of that article in *Punch* knew the pastime, and put his pen on the spot when he said the glamour had been blown out of it because it was common. Is it common? Surely only in the sense that many people use bicycles, but far too few ride them with grace, or obtain from their wonderful acceleration of leg speed a sport and a pastime which contains all the virtues you can name and most of the values that are worth while. Here is a fine thing; but the public, led by the daily Press of the country has, especially in the case of the well-to-do, snobbed them off. It is true, and to be regretted. That great editor, the late C. P. Scott, of the *Manchester Guardian*, was a cyclist all his days, riding a bicycle to his work, and home in the small hours of the morning. Tales of his night adventures still circulate connecting him with the *Guardian*; and one sometimes wonders if his successors, realising this fact, could give a column or so weekly to the great sport and pastime beloved of millions, but sadly lacking the uplift of publicity, which is its due. Coming from such a source how delightfully that great journal could clothe the commonalty of cycling in the garments of desire.

CYCLORAMA

By H. W. ELEY

A Gap in My Bookshelf

ONLY a temporary gap, for I have but loaned a book to a village friend. The book?—none other than "Every Cyclist's Handbook," by F. J. Camm, . . . a volume which I think covers the entire subject of cycling more comprehensively than any book ever published. The author's aim was to "put all that a cyclist should know" between two covers . . . and he succeeded. I have often pored over this volume on a winter's night, and never failed to learn something about the bicycle, cycling, cycling law, foreign touring—and a host of other appropriate subjects. I have made a note that the book is to be returned—for in a long life as a "book-lender" I have, unfortunately, found that borrowers are forgetful folk!

Lure of the North

ALL too often, southern folk tend to ignore the magic of the north. They are apt to concentrate too much on Sussex-by-the-Sea . . . and some of them seem to have an idea that the north is barbaric and unfriendly. To such, I have often talked about the hospitality of Yorkshire folk . . . the stern beauty of Durham and Northumberland, and I have converted more than one to the idea of "giving a miss" to Sussex, and Surrey, and Devon, and seeking new adventure, and new loveliness, in some northern area where the face of England is different, but equally lovely. One such rider has recently written me, and told of a grand tour of Yorkshire . . . commencing at Ilkley and taking him over Bardon and Pocklestones Moors; to Skipton; to Bolton Abbey and all the magical beauty of Wharfedale. For years, this rider "went south" . . . believing that all of England's beauty was concentrated in the soft southern lands. Now, he knows that wide purple-clad moors, where the cry of the curlew is heard, have their enchantment, too; he has found that grey Derbyshire villages, and tors and ravines, have a magic of their own. In a word, he has learned the lesson that in this England of ours there is beauty everywhere; Mother Nature has painted a canvas of kaleidoscopic beauty, and scattered her gems north, south, east and west. . . .

Another Dunlop "Parsons"

MY reference to the sad death of Walter Parsons, the Dunlop Service chief, has brought me a note from an old colleague reminding me that a brother of Walter's is still in the company's service. . . . Dudley, who occupies the position of district manager at Plymouth. I was glad to be reminded of Dudley Parsons, for here is another old Dunlop servant for whom a host of men in the trade have a real affection. Years ago, Dudley Parsons was the Dunlop advertising manager—at Aston Cross—and, in fact, I succeeded him in that office. He has been in Plymouth many years now and must have absorbed the magic of Devon and the ways of the west.

No Locks

LOOKING at some cycle accessories and "bits and pieces" in a local cycle dealer's shop the other day, I observed to my dealer friend that he did not appear to have a cycle lock in stock. "I never get asked for one," he replied . . . and I fell to thinking that I had never seen a cyclist in this village or its vicinity who locked his cycle. Cycle thieves are unknown in these parts; one need have no fears at leaving a machine outside a cottage or an inn; honesty prevails. And I am glad that it is so. In my London days, when out for a spin, I always had my cycle lock with me, and never left my bike unlocked. No! I am not trying to paint the townsman as a villain and the countryman as a saint . . . it is just "one of those things."

Staffordshire Charm

I IMAGINE that in any voting on "England's loveliest county," Staffordshire would not come high in the list. Rather, most folk regard the county as quite uninteresting . . . marred by the Potteries in the north and by the grim Black Country in the south. But between . . . ah! there is a belt of unspoiled lovely country which is well worth exploring. I am on the borders of Staffordshire and Derbyshire . . . and I am constantly finding that some rare scenic gem which I had always imagined was in Derbyshire is actually in Staffordshire . . . parts of enchanting Dovedale are a case in point. And the delightful Manifold Valley and Rudyard Lake, and the pleasing valley of the Churnet. Yes! Staffordshire can boast of much beauty, and this county of Arnold Bennett's "Five Towns" and other novels, should receive more attention from the tourist who loves the English scene.

Market Day

THERE is a new significance about "Market Day" when one dwells in the country and each week has to journey to the near-by town for shopping. And my own market town is pleasant and full of history. Ancient Ashbourne, which knew Doctor Johnson, and through the streets of which Isaak Walton and his friend, Charles Cotton, must surely have strolled and discussed angling and the ways of wily fish, has an old market-place, and each Saturday stalls are there displaying a variety of goods and wares. I love to stroll around that market; I love to see the farm implements displayed outside the ironmongery shops . . . reapers and rakes, and tractors, and hay-loaders, and milk churns and binder twine. . . It is all very countrified and very English. And I always look at the cycles on view, and note the "breeds." There is a shop with a fine display of Raleighs; hard by, an Armstrong machine is offered for sale; then there is the little cycle shop where a range of Hercules is on display. A "Robin Hood" caught my eye the other day . . . so the cyclist has a wide choice. And inns . . . there are several with pleasing names . . . "The Green Man" with its famous straddling signs; the "White Lion," the "George and Dragon," the "White Hart." They fit into the picture and "make" the homely English scene.

Cycles and the Export Drive

I HEARD the other day from an old friend in the cycle trade, and he mentioned that the emphasis in his business was still on export. And he was enthusiastic about the fine way in which the cycle industry has responded to the insistent call for more and more exports. British bikes go out in an increasing stream to the four corners of the world, and the Chancellor is doubtless proud of the achievements of the industry. To send so many machines overseas and to keep up supplies to the home market entails much good work and planning, and the leaders of the industry have done a first-rate job. Here is a field in which British workmanship has always been in the lead, and each cycle sent to an overseas territory is a fine ambassador for Britain.

My Point of View

By "WAYFARER"

Alfriston, Sussex. The old Market Cross Inn and the ancient village cross. The inn was the headquarters of a notorious gang of armed smugglers in the past.

Care Needed

THE need for taking special care when passing along on the inside of a line of traffic is obvious. This is a practice which I have followed for years, and, so long as other road-users leave me the space, I shall continue to do so—despite anything contained to the contrary in the Highway Code. It seems to me to be a form of selfishness—probably unconscious—on the part of drivers as a whole so to dispose of their vehicles as to occupy most of the left-hand side of the road. That being so, then I claim the right to pass (from behind) on either side. No offence in law is committed when the line of traffic is stationary, and this is the state of affairs which I have particularly in mind at the moment. But, as I have indicated, special care is needed, and this point was brought home to me an hour or two ago, at the time of writing, by the action of a man I know to be an expert cyclist. He followed the "inside" plan, but did not use enough care in the process, with the result that his near-side pedal caught the kerb and he was deflected from his course, being jerked into the front of a motor-car which was just about to start. No harm was done, but the warning was a timely one. Take special care!

Dazzle

ONE wonders whether any real attempt is being made to deal with the problem of dazzle, which has been a nuisance to cyclists and to other road-users for many a year. I am not prepared to believe that the problem is insoluble. If, as one sometimes hears, it has been solved, then why are not steps being taken to impose regulations on those who indulge in the dazzling act?

I was reading a few days ago of the case of a motor-cyclist who was blinded by the lights of an oncoming motor-car, with the result that he inadvertently turned into the grass verge and hit a lamp-post with his handlebars. His pillion passenger was thrown off and fatally injured. The coroner's jury, with that profundity of wisdom which afflicts such bodies, expressed the view that the street lamp which was involved in the collision should be set back in line with its neighbours. Thereby, one supposes, there would have been no fatality, but this by no means follows, and it seems to me that, as so often happens, these 12 good men and true have jumped the points. The real remedy is to find, and bring into use, some effective method of neutralising the effects of dazzle. Is it beyond the wit of man to find a cure for an unmitigated nuisance? Personally, I do not believe that it is.

Sign-posting

A SHORT time ago I observed a suggestion that the sign-posting of roads in this country left a great deal to be desired. In my view—and I am not without experience in these matters—the suggestion cannot be maintained. That is not to say that our sign-posting is perfect. Generally speaking, it is pretty good, and I have no doubt that, in the course of time, when money and labour are available, existing faults and deficiencies will be remedied. Probably the condemnation of our sign-posts, to which reference has been made, emanated from a motorist, and maybe he has found it difficult to absorb the information provided while his foot has been pressed down well and truly on the accelerator pedal. He has his remedy. Surely the criticism has not arisen from cyclists, who find our sign-posts satisfactory, and who, in any case, know something about map-reading.

Something Like a Record

DURING a chance meeting with an old acquaintance a few days ago it transpired that he has been cycling to and from business for the long term of 23 years, and that, during that period, he has missed his daily journey on only three occasions. As the distance involved was a fairly substantial one, this appears to me to be something like a record—although, in all probability, it is not! I, myself, cycled to and fro for most of the years of my business life, and I'm "all for it." It is a grand money-saving device—and a time-saver, too, provided a reasonable distance is involved. Moreover, there is a great deal to be said for the avoidance of crowds, with no trains or buses to be missed (or scrambled for), and with fresh air the order of the day. Moreover, the constant readiness of the bicycle is a factor which is by no means negligible. Of course, there are difficulties and discomforts, but surely these are cancelled out—and more than cancelled out—by the unpleasant features inseparable from travel by public transport. Put at its lowest, the bicycle is a money-saver, and the accumulated cash which is not expended on trains and buses usually shows a margin of profit even after an extra pair of nether garments has been purchased to provide for the added wear and tear accruing from the cycling act. To those folks who like to be independent, and who cannot get enough fresh air and exercise, the ever-handy bicycle offers a way of escape.

Commonplace

THE drawing-out of the days is an annual, commonplace occurrence, but what a lot it means to the cyclist, and how he rejoices in the process. I, personally, have lost none of my deep and enduring delight in night-cycling. I enjoy this phase of our pastime and have never been able to obtain too much of it. It possesses a pleasure all its own. And yet, at this time of the year, I revel in the longer days, with their shorter periods for travel in the dark. The drawing-out of the days is a thing full of promise. It means the coming of the spring and the summer: it means that there is greater and ever greater opportunities for cycling: it brings tours "into the picture." And so, while it may appear to be a shade inconsistent, I enjoy the long dark hours of travel in winter, but with spring I welcome with both hands the coming of the light evenings.

Habit

IT is an occasional feature of my modern life that I undertake journeys by motor-car, sometimes for "pleasure," sometimes on business. As regards the "pleasure" expeditions, it is noteworthy how the ingrained habit of a long spell of cycling years asserts itself. To some extent this is automatic. Is there a crooked, secluded way to our destination? If so, we must take that way, regardless of the fact that, of necessity, a motor-car is not very much at home in the lanes and byways. Sooner or later, I am sure to hear the comment: "Not much traffic about here!" or "What a lot of turnings there are!"—or it may be that my driver will voice the not unnatural question: "Where are we getting to?" He (or she) realises in due course whither we are going—or, at any rate, where we have arrived, and surprise is then registered, for the breaking out from a maze of lanes on to a familiar main road, which is hit at a novel angle or an unexpected point, has proved to be a bit of an eye-opener.

Sometimes this habit of mine of seeking the seclusion of the byways earns for me a certain measure of unpopularity from my driver, who, irritated by the relative idleness of his accelerator pedal and by the strain imposed on his brakes, sarcastically inquires whether all main roads have been abolished by Act of Parliament, or by Order in Council, or otherwise. Then, if he is sufficiently insistent, I promise that we shall stick to the 'ard 'igh road for the return journey. Thus we do save a bit of time, and he is able to "let her out," but we miss a lot of the fun which accrues from journeying, even in a motor-car, through a crooked lane complex.

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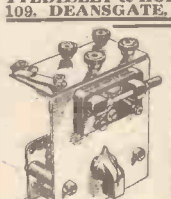

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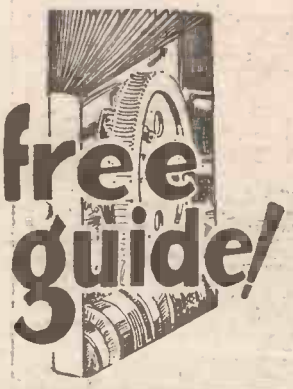

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