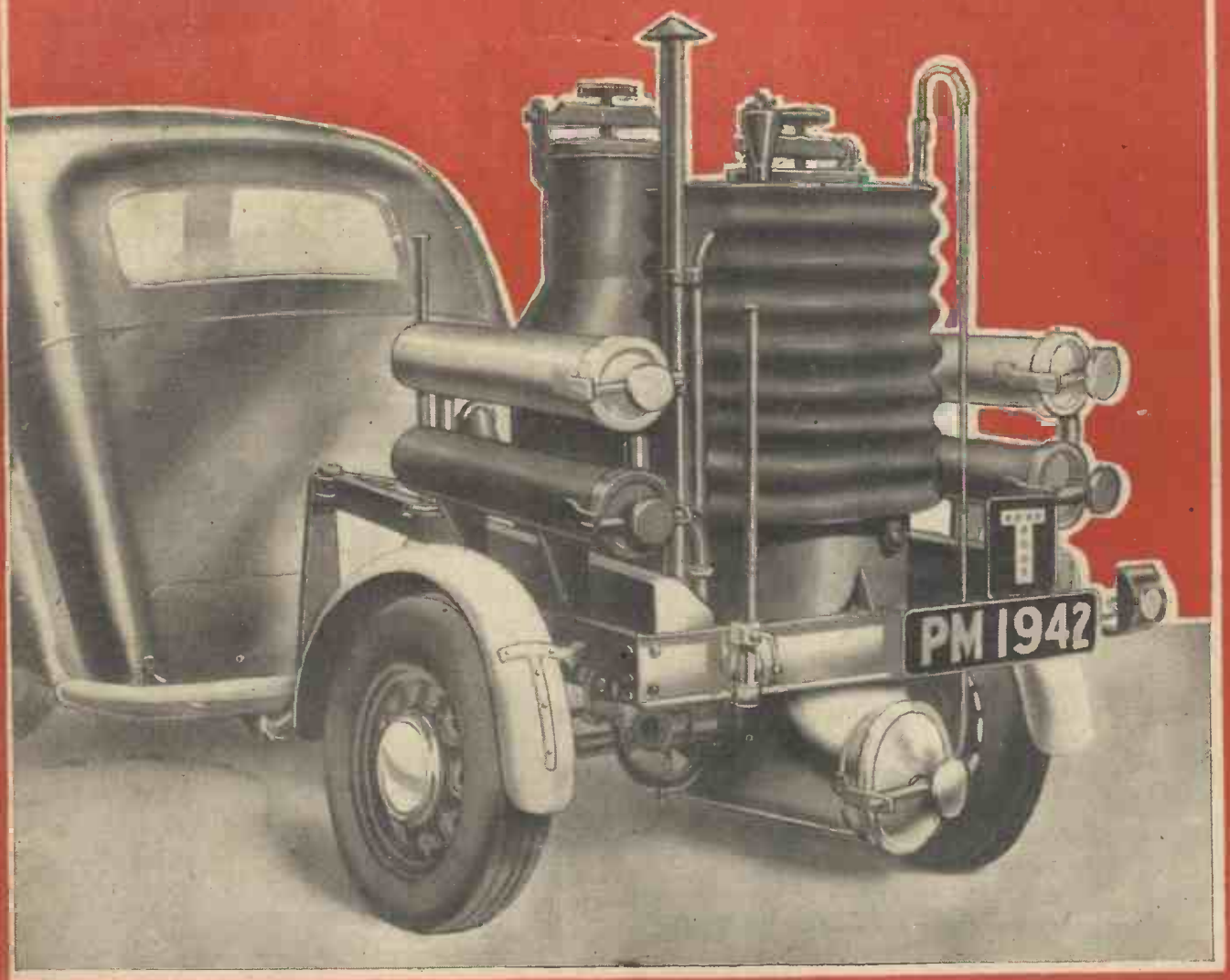
SUBSTITUTES FOR PETROL

9D.

NEWNES

PRACTICAL MECHANICS

JUNE 1942



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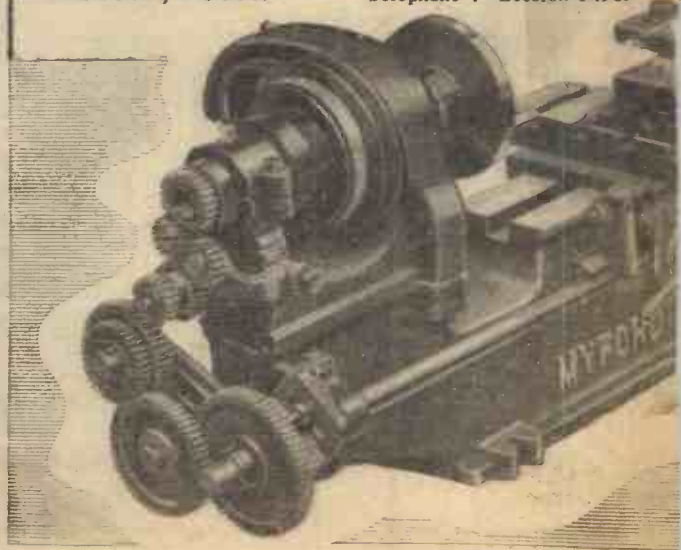

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Owing to the paper shortage "The Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

Editor: F. J. CAMM

VOL. IX. JUNE, 1942 No. 105

FAIR COMMENT — BY THE EDITOR

Position Finding by Reflected Waves

THERE is nothing radically new in the idea of detecting the presence of objects by waves reflected from them. The new science of locating the presence of enemy aircraft by what is now known as Radiolocation is also not new, for the Government, as well as private research workers, have been experimenting with it for very many years. Manufacturers of wireless apparatus have also produced apparatus for the experiments. As is now well known, in Radiolocation a wave is transmitted and is reflected back to a receiver. By ordinary trigonometrical calculations in which the angle and direction of the transmitted wave and the angle and direction of the received wave are main functions, the altitude and direction of the enemy aircraft can be plotted within a very narrow margin of error.

Acoustics and wireless are the two branches of physics which have been responsible for bringing our knowledge of reflected waves from the realm of the laboratory experiment, demonstrating feasibility, to the stage where it is now a practical and applied science.

Sound waves have been used by animals from the beginning of time. A cat can sense the presence of an object in the dark, and so can a bat, which is popularly supposed to be blind. Most of us in the black-out, when visibility is nil, are able to apprehend the presence of a person or object even though we cannot see them. Blind people have the sense developed to a high degree. Although many of them have not thought about the matter nor pondered the reasons, undoubtedly this extra sense is due to waves reflected from objects. Obviously the size of the latter affects the problem. You may not, for example, be able to sense in the dark the presence of a small brick over which you trip. On the other hand, blind people and those who have been blindfolded for purposes of experiment, have entered a room and by the echo of their voice have been able to give accurate descriptions of the length, breadth, and height of the room.

Fresnel's Experiment

ABOUT 110 years ago, Fresnel reduced the matter to mathematics and evolved laws governing it. About 1880, Rayleigh applied the findings of Fresnel to acoustical problems. Briefly, Fresnel discovered that by erecting a board at a reasonable altitude a little distance away from the observer, such board would reflect in the form of an echo notes blown on a whistle or a musical sound. He also found that the intensity of the reflected sound varied according to the distance of the reflecting board as well as upon its size. He found that the ideal size of such a board or target, that is to say, one that reflected the strongest echo, is obtained when a line projected from the observer to the edge of the target exceeds by a quarter wavelength of the sound being transmitted to the target the line drawn to the centre of the target.

From this it will be clear that when the diameter of the reflecting board is reduced, the intensity of the reflected echo will also be reduced, and the zero point, that is to say, the point which will not reflect an echo at all, is found to be when the diameter of the reflecting board equals the wavelength of the transmitted wave.

Another point is that if the reflecting board is increased in diameter, the intensity of the resulting echo will drop. This may seem paradoxical until it is remembered that the passage of the rays to and away from the added area exceeds their path to the central area of the target by a distance equal to half a wavelength. Hence, the waves transmitted to the increased area and to the centre cancel one another out. Put into a formula, the square of the diameter of the reflecting board is equal to twice the product of the wavelength and distance. From this we may be able to perceive why in the black-out we are not able to sense the presence of certain objects.

Take a telegraph pole 6in. in diameter. The formula indicates that the optimum wavelength, assuming that we should require the echo a distance of 3ft. in order to locate the pole, is ½in., which corresponds to a frequency of 26,000 vibrations per second. This is an inaudible frequency, or at least it is not audible to the human ear, although certain animals are known to be able to detect frequencies beyond audio-frequency.

Certain birds emit supersonic waves which enable them to avoid even tiny obstacles.

Position Finding

THERE have been many applications of the principle of position finding by means of electric waves. Perhaps the earliest was the detection of wrecks under the sea or other objects which present a danger to shipping.

A large number of patents have been taken out for methods of producing sound waves under water, and detecting the resultant or reflecting waves by means of submerged microphones. For this purpose it is necessary to have apparatus which will produce a reflected wave at distances of more than a mile, and as the optimum wavelength would be about 1½in., supersonic frequencies are necessary. This, of course, relates to comparatively small submerged objects. When using the method for depth sounding, where the bed of the ocean would be the reflector, waves of almost any frequencies will suit. For this purpose a musical note is employed. The bed of the ocean is an excellent reflector. The note transmitted is a short one, and the time of its transmission and the return of the reflected waves are automatically recorded by the same microphone on a drum of the chronographic type. It is apparent that as we know the velocity of sound in sea water, the depth may be calculated from the time taken for the sound to return to the microphone.

When it is desired to detect the presence of a rock or a wreck, not only the depth but the location must be found, and two methods are available. In one method the transmitter is designed to operate on the same principle as the radio direction finder based on the principle of the Bellini-Tosi aerial. In another system the apparatus for picking up the reflected wave is made directional.

In the first method a beam of sound is radiated over a circular area in a horizontal plane. The application of detection by waves was, as is well known, investigated thoroughly by Hertz, whose work provided the basis for Marconi's experiments. Special mirrors were designed for projecting or reflecting light waves.

The subject is a fascinating one for the experimenter, and there is still plenty of room for those with inventive faculties. Moreover, it is not a subject which requires a vast amount of scientific knowledge.

Our Catalogue of Technical Books

A REMINDER that we shall be glad to send a catalogue of our technical books on Wireless, Workshop Practice, Aircraft Engineering and Electrical Engineering, to any reader who sends a postcard addressed to the Publisher, Book Department, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. New Editions of the Practical Mechanics Handbook (12s. 6d., post free 13s.), and Diesel Vehicles, Operation, Maintenance and Repair (5s., by post 5s. 6d.) have just been issued. New books recently issued are: "Mastering Morse," 1s. (by post 1s. 2d.), and The "Engineer's Vest Pocket Book," 7s. 6d. (by post 8s.). Other vest pocket books in the same series are: "The Radio Engineer's Vest Pocket Book," 3s. 6d. (by post 4s.), and "Wire and Wire Gauges," 3s. 6d. (by post 4s.).

Oil and Air Operated Lifts

Principles of Operation and Installation

By W. J. ROBERTS

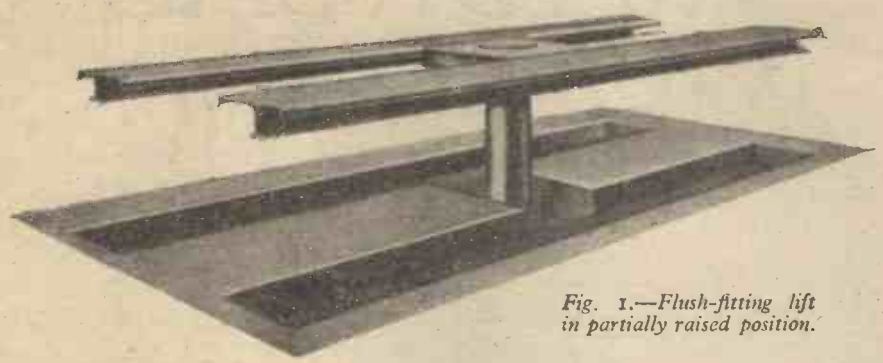


Fig. 1.—Flush-fitting lift in partially raised position.

MANY readers will be familiar with the sight of a car, or lorry, weighing anything between two and eight tons, raised on a ram-type lift for servicing, but comparatively few people have any idea of the construction and operation of this useful piece of equipment. A lift of the hollow ram-type is illustrated in Fig. 1, and a sectional drawing of it in Fig. 2. A further illustration, Fig. 3, shows the oil lock type and, finally, at Fig. 7 is shown the diagrammatic view of a solid or closed ram type.

Operating Principle

Dealing with the former class first, the sectional illustration (Fig. 2) shows the inner details. Air at 150/200 lb. per sq. in. pressure is admitted via the air pipe "A," exerting a pressure on the oil contained in the guide tube "B" inside the hollow ram. This is turn forces the oil up through the central conduit "C" into the hollow head of the ram, the oil being restrained from leakage by the large gland leather "D." The rising pressure in the head can only relieve itself in one direction, i.e. upwards, by pushing on the top plate and thus raising the ram. The tail end of the ram is fitted with a substantial bearing sliding on the outer surface of the oil container, the main bearing "E" being situated in the head and carrying the flange by which the assembly is anchored in situ. The main bearing is finally capped by a wiper gland which just serves to wipe the smooth surface of the sliding column; this gland does not hold pressure, it simply serves to prevent scoring, etc.

Track Assembly

Heavy section plates (approx. ⅛in.) are secured to the ram, suitably spaced to carry I section beams between them; on the outer ends of these, secured by cleats, are the track beams, carrying the track plates; the beams are set out of centre, being more to the outer edge of the track plates than to the inner for the following reason. The heaviest vehicles naturally are those having the widest track and the greatest loads will thus come on the outer edge of the tracks. The track beams being offset in this way ensures equal loading and the small overhang is of sufficient section to withstand the bending load of any badly placed vehicle which may be on the tracks. Several types of superstructure will be found, i.e., flush fitting tracks, sloping ended run-on tracks, and skeleton run-over tracks, depending largely on the class of vehicle mainly using the lift. Tracks of special pattern are not uncommon, the lift being used in this case purely as a lifting medium, and the vehicle being either run off on to a raised set of rails or even, in some instances, on to another floor through which the lift will carry it. With a little thought and care in layout the lift may feed three sets of rails or raised ramps accommodating several vehicles for repairs, etc., whilst the actual lift is still free for other work. This is of particular value where the floor space available is restricted as is so often the case.

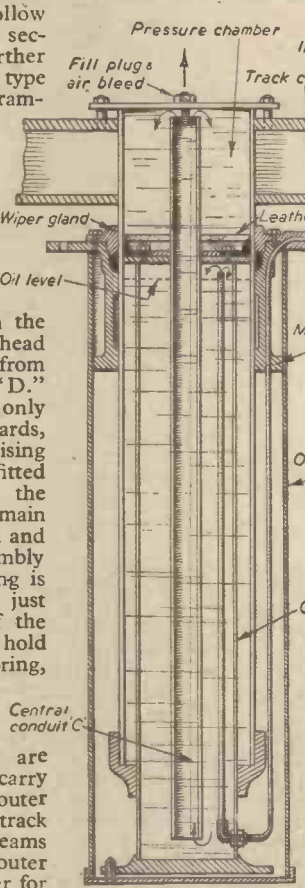


Fig. 2.—Sectional view of a hollow-ram type of lift.

Positive Lock Equipment

Fig. 3 shows a hollow ram lift fitted with an oil lock device, this was developed to overcome the difficulty of the slow dropping of the plain type due to air leakage, contraction due to cooling, etc. In this case the original oil conduit in the centre stops at the bearing ("A"), and is provided with a gland and nut. Inside the oil conduit, and having a smooth oil-tight fit is another tube "B," welded to the detachable top plate "C"; in the side of tube "B" is provided a valve of the plug-cock type operated by a rod passing via a gland to the underside of the track (see "D"). On the lift being raised and the valve closed, it is possible to exhaust all air from the system, and the ram will still be supported by the column of oil trapped in it; opening the valve will, of course, release the oil and the ram will return. The motion may be arrested at any point of either up or down travel. Sudden dropping of the lift is impossible in every case, as the maximum speed of descent is at all times governed by the speed at which oil can be transferred from the pressure side to the reservoir side, the bore of the transfer tube being such that rapid dropping is prevented. After assembly the whole of the underground section is enclosed in a sheet steel case to prevent the chemical action and erosive effects of contact with soil, which in certain cases has been known to be acute. It further serves as a valuable time saver in the event of a change of position, as the outer shell may be left in ground and digging out operations dispensed with. Fig. 4 shows the interior of the pressure chamber with its gland leather and oil tube, and Figs. 5 and 6 show the complete assembly less tracks and the outer casing before installation.

Sealed or Solid Ram Types

So far hollow or container ram types have been dealt with. The sealed ram style, however, is a common installation; in this case the ram proper is either solid in section, or is tubular, and sealed at bottom. Fig. 7 shows the sectional view and internal features of this type of ram. It will be observed that both the reservoir "A" and the ram cylinder "B" are filled with oil to the level indicated. Air is admitted via air line "C" into the top of oil reservoir, forcing oil up pipe "D" through pedal-operated valve "E" into ram cylinder; the ram proper is closed and no oil enters it. It is forced upwards, and, in

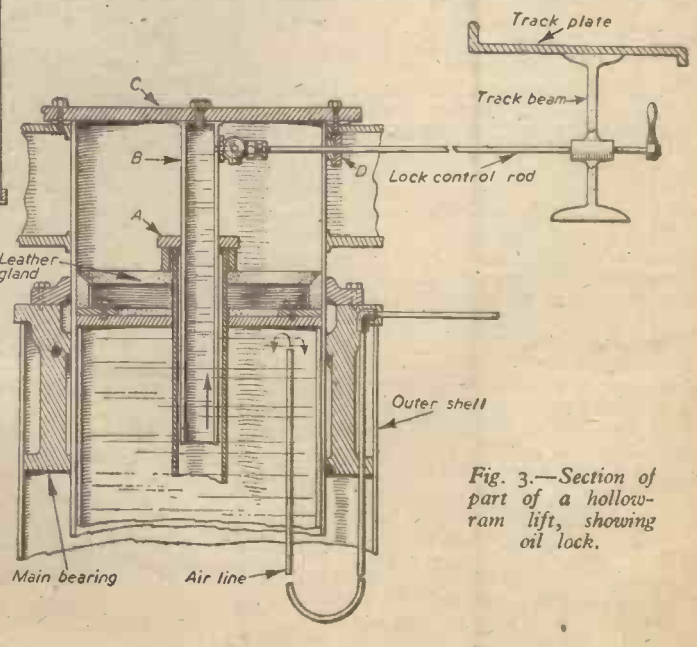


Fig. 3.—Section of part of a hollow-ram lift, showing oil lock.

Fig. 4.—Interior of pressure chamber showing gland leather, oil conduit, and retaining ring for gland leather.

its uppermost position the chamfer, seen on the lower end, engages a similar chamfer of opposite form cut in the lower end of the main bearing. Both the above chamfers are machined and, on meeting, relieve pressure on the main gland in head of main bearing. The main gland in this case is an inverted "U"-shaped leather cup "F" fitted in a recess formed at top of bearing at "G" secured by a ring which forms the cap. When in raised position accidental rotation is impossible, owing to the close fit of the chamfered surfaces, but intentional rotation, if required, can be carried out on up or down travel. A positive lock action is provided by the pedal-controlled valve in the external oil circuit, and owing to the oil circuit being of an external type, both lock valve, fill tube, and oil level indicator tube may be placed at a considerable distance from the main unit; after being raised the pedal valve is closed by foot pressure and all air may be exhausted from the system via the exhaust valve; the lift is then resting on a solid column of oil and will remain up until the pedal valve is depressed to open the circuit again. This valve provides an extremely convenient control, as on both up and down travel the motion may be stopped instantly, and in the case of a remote control the operator is able to see both sides from the control point. A number of variations of this design are to be found, one in particular having identical principles of operation, but having the oil reservoir apart from the ram.

Power Supply

As previously stated, the operating medium from these types is air at 150/200 lb. per sq. in. pressure, the supply being taken from the station air compressor, or in some cases from a separate compressor driven from line shafting. The advantage of the air-oil combination lies in the extreme flexibility of the system in obtaining a lifting power of several tons through the simple calculation of areas and capacities; the working cost has been found to be in the region of one-sixth of a penny for each operation. The amount of air used is so little under average working conditions that one compressor with a capacity of 6.5 cu. ft. per minute, and a tank or receiver of 50 gallons capacity, approx. 18in. by 60in., is ample to maintain service when running intermittently, and at same time supplying air for greasing services, tyre lines and paint spraying.

Fig. 5.—Complete ram assembly, less tracks, prior to being enclosed in its outer case.

Fig. 6.—Complete assembly with track carriers and outer jacket ready for lowering into position.

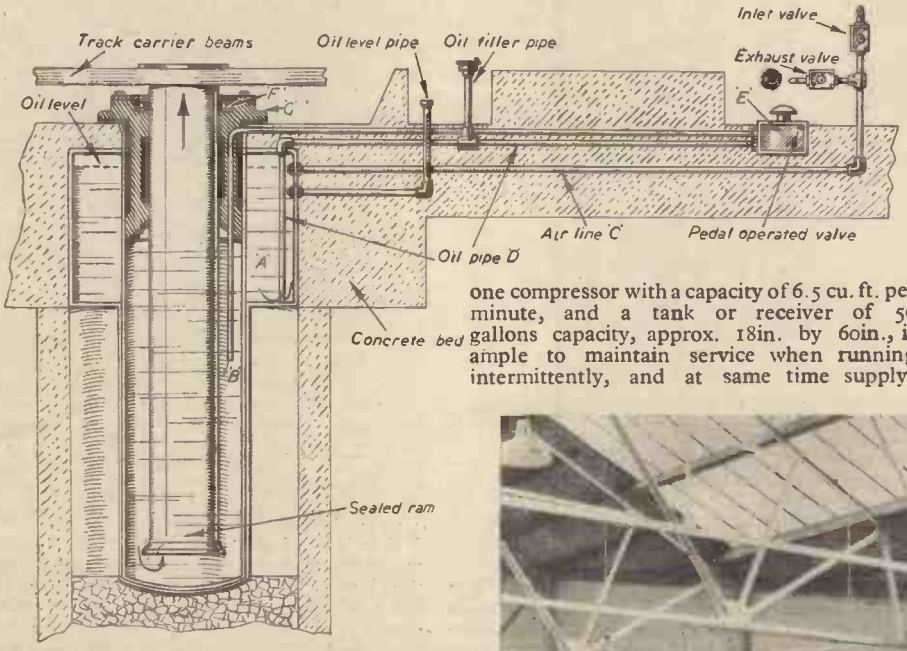


Fig. 7.—Sectional view of a solid or sealed ram type of lift. Oil level, oil filler, inlet and control valves may be at any convenient distance from the unit.

It has also been successfully proved that with the aid of a special oil displacer pump the same design of lift can work up to as high as 20 ton loads.

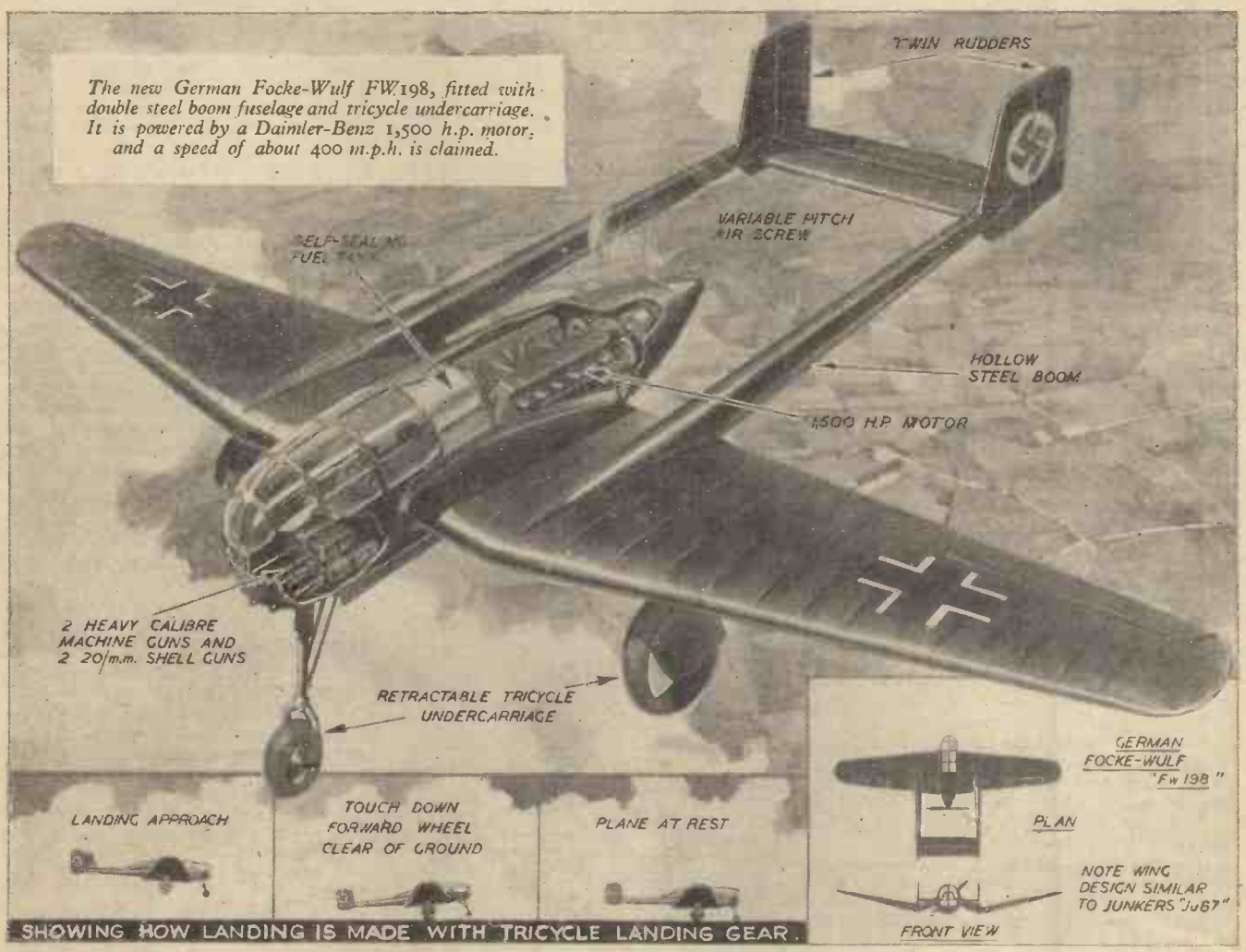
Practical Applications

The vital part these lifts play in the operation of a modern car service station is emphasised by the number which are now in use. Not only do they make it possible for a thorough examination of the chassis to be made in a short period of time, but cleaning, greasing and adjustments can now be carried out in a more efficient manner than was possible in the days of the old sunken inspection pit.

Two types of lifts in use in a service station which utilises modern high-efficiency labour-saving plant.

The World of Aviation

The Focke-Wulf FW 198 : R.A.F.'s Twenty-fourth Birthday : New German Aircraft



R.A.F.'s Twenty-fourth Birthday

TWENTY-FOUR years ago, on April 1st, 1918, the R.A.F. was first officially formed, under the terms of the Air Force (Constitution) Act of 1917. The amalgamation of the R.F.C. and the R.N.A.S., recommended by the Air Organisation Committee under General Smuts, became an accomplished fact. Britain's two air arms were merged into a single fighting Service.

Born in the travail of war, the R.A.F. ended its first year of life as the biggest and most powerful air force in the world. At the time of the Armistice Britain's R.A.F. comprised 188 operational squadrons with a first-line strength of 3,300 aircraft. Altogether the R.A.F. possessed 22,647 aeroplanes, 103 airships, and had a total personnel strength of 291,175, including over 27,000 officers, of whom more than one half were trained pilots.

The Greatest Test

TO-DAY, 24 years old—the age of many of its finest and most experienced pilots and leaders of bomber crews—the R.A.F. faces the greatest test of all. Again grown powerful, with a strength now equalling that of its most powerful enemy, the German Luftwaffe, it is fighting offensively on several air fronts. From the Arctic to the tropics; from the green rollers of the Atlantic to the tropical jungles of the East—the R.A.F. carries the war hard against the Axis aggressors organised for war and plunder.

Always the R.A.F. lived up to the spirit of its proud motto, "Per Ardua ad Astra."

The Luftwaffe's Freak 'Plane

ACCORDING to a recent report from Berlin the Luftwaffe has now in service the first freak aeroplane of the war—the Blohm and Voss 141 reconnaissance monoplane.

For some years the Germans have been experimenting with various types of assymmetrical aircraft, and in this peculiar machine the crew are housed in a nacelle on one side of the engine, instead of having places behind it. The lop-sided tailplane gives the impression that half of it has fallen off, or been shot away. It is stated that the engine is a Bramo Fafnir 1,000 h.p. radial, giving a maximum speed of about 220 m.p.h. Armament consists of cannon and machine-guns, and there is a cone turret in the tail of the nacelle.

Two-motor Day Bombers

R.A.F. Bomber Command have now in operational service the new Douglas Boston III two-motor day bombers. These machines are also in service with the South African Air Force, and in slightly modified form they are used by the United States Army Air Force, in which they are called A-20Bs. They are also in service with Fighter Command, with a modified nose as Douglas Havoc II night fighter-bombers.

New German Aircraft

IT is learned that two more new German aeroplanes are coming into service with the Luftwaffe. The first, the Henschel Hs 129, is a single-seat monoplane close-support fighter-bomber, powered by two 450 h.p. Argus As 410 engines. Its armament consists of two cannon and four machine-guns in the nose. Maximum speed (approx.) 225 m.p.h. at sea level. The other machine is the Messerschmitt Me 210, a two-seater long-range fighter-bomber, which has been developed from the Me 110, but is of greater capacity. The new machine is powered by two 1,450 h.p. Mercedes-Benz DB 603 motors, the maximum speed being about 285 m.p.h. at 18,500 feet. The armament probably consists of two cannon and four machine-guns in the nose, and the carrying capacity is about 4,000 lbs. of bombs.

POINTS ABOUT SCISSORS

IN our issue for May we published an article under the above heading, and inadvertently omitted to give acknowledgment to our contemporary, the "Watchmaker, Jeweller and Silversmith," through whose courtesy we were able to reproduce the illustrations and information given in the article. We have pleasure in hereby giving such acknowledgment.

Substitutes for Petrol

A Brief Survey of the Various Fuels which are Taking the Place of Petrol

By Professor A. M. LOW

THE mixture of the lighter oils from petroleum, which we call "petrol" or motor spirit, is one of the most convenient and efficient sources of power that we can obtain for moving vehicles. But the fact that petroleum can only be drawn from a limited number of places, coupled with the desire of so many countries to be economically self-sufficient in time of war, has greatly stimulated research into the possibilities of other suitable motor fuels with an independent resource. While this research is of comparatively little importance in the long view compared with obtaining the maximum amount of power from natural fuels, it is of considerable interest.

Any explosive mixture is, theoretically speaking, suitable for use in an internal-combustion engine. There is no inherent reason why we should not use dynamite to obtain our explosion. It would have the convenience of occupying comparatively little space. But, on the other hand, it would be exceedingly difficult to control, and the results of combustion would be much more damaging to our steel cylinders than the carbon deposited as the result of the incomplete combustion of petrol-vapour. At the same time, experiments on the use of a solid concentrated fuel are in progress.

Petrol substitutes are very difficult to achieve. Petrol itself is not necessarily the best of fuels, but it scores on the grounds of convenience—for it is easy to store in liquid or solid form, it is distributed with extraordinary efficiency, and it is a simple matter to convert it to heat or mechanical work without the need for great attention to atmospheric conditions. It is clean, and causes very little damage to the average engine.

Solid Explosive Fuel

In practice, the search for a solid explosive fuel is not easy—for a mixture of air and petrol (one gallon of petrol requiring about 1,200 cubic feet of air) is exceedingly powerful. Compared to T.N.T., petrol yields 190 British Thermal Units against 65, while nitroglycerine yields only 32, and dynamite 25. What is more, the rate of burning is more easily controlled than with almost any other allied substance. For these reasons it is not easy to be very optimistic as to the possibilities of a solid explosive fuel for internal-combustion engines. There are many technical difficulties, and it is likely that more progress may be made by the better utilisation of the suitable fuels already employed.

Producer Gas

As a substitute for petrol-vapour, producer gas—the gas made when steam is passed over red-hot carbon—has had considerable success. This gas now makes up a large part of the ordinary coal gas we use for lighting and heating. With air it forms an explosive mixture. For the purpose of driving a motor-car, the gas is made on the car by means of a boiler and red-hot charcoal or wood. The motorist "fills-up" with coal or wood instead of petrol. Essential parts to be added to an internal-combustion engine, using such a gas, are a container in which to vaporise water and heat the charcoal; pipes in which the gas can be cooled; a tank to collect the tar, moisture, or other substances that condense; a filter; and, when high efficiency is required, a supercharger to force the gas into the cylinders. On the other hand, no complicated carburettor is needed, the fuel being manufactured directly in the form of gas. In this system, which was applied to vehicles as long ago as 1912, a fan is usually employed to start the fire.

Stations supplying wood are now to be found in many countries. The wood has to be of a particular type, well dried, while good charcoal or even petrol may be required during the lighting-up process. This starting may require twenty minutes or more, a grave disadvantage compared with the petrol engine, especially in these days when petrols are specially treated to give quick starting from cold. The equivalent of petrol and wood may be taken to be, roughly, 25 lb. of wood for every gallon of petrol. The cost, in Germany, of 25 lb. of wood for motor fuel was about two shillings—but it is difficult to make a comparison between the economic values because of the entirely artificial price of motor fuels due to taxation. Tax was reduced by one-half on wood-burning motor vehicles in Germany, while in Britain a great part of the cost of petrol is represented by the tax. In a free market, wood probably could not compare with petrol for economy and efficiency. Convenience apart, the petrol-motor is considerably cheaper to build.

Fitting a gas-producing unit to a 10 h.p. car. *The complete unit, including fuel, weighs 2½ cwt.*

Charcoal-burning Vehicles

The number of motor vehicles using producer gas in Europe is now estimated at between nine and ten thousand, and the types vary from private cars to taxis and lorries. Signor Mussolini has a charcoal car for his own use. The wood or charcoal-burning vehicle is necessarily more bulky, which means a reduction in the pay-load. The loss may be as much as one-fifth the total pay-load, although it is less in the case of charcoal. There are also advantages in cleaning—but charcoal is comparatively expensive. One consideration which enthusiasts for wood-burning cars have overlooked is the comparatively small amount of fuel available. There are great demands upon wood for many purposes to-day, and a leading authority has calculated that, if all the wood in France were used solely for motor-cars, it would supply fuel for only about one-tenth of those now in use. Much the same would apply to other countries.

Wood used to be obtained from Scandinavia, the United States and other countries—but petrol is more easily carried, is more efficient, and occupies far less space. The conclusion inevitably reached is that the use of wood-or-coal-or-charcoal-burning cars must be regarded as an emergency measure which it would be difficult to maintain under normal conditions, even in countries where coal is abundant. According to a recent report, a Japanese inventor has produced a car running on producer gas obtained from chips of wood, twigs, grass, and anything that may be available, and one was given a vivid picture of the motorist running out of fuel, drawing into the roadside, and putting a handful of grass into his "tank." A simple calculation of the amount of this type of fuel required to run the motor vehicles of Japan suggests that if, in fact, the invention works and is universally adopted, the country will soon begin to look as if a host of locusts passed over it every year.

Compressed Gas Fuels

Compressed gas fuels can be used for motor-cars, and carried in special cylinders. Anyone who recalls the war years of 1914–1918 will remember vehicles with "balloons" burning coal gas; and these have, in fact, made their appearance again in this present war. This has the advantage over producer gas generated on the vehicle that it is clean, quick-starting, and easy to operate, but it is unlikely that the balloon method of storage could be used for long owing to its extreme clumsiness. Light alloy cylinders have been developed which can contain the gas under pressures up to 4,000 lb. to the square inch. Each weighs about 2 cwt. Compared with petrol, such a cylinder of ordinary coal gas is equivalent to less than two gallons—so that the difference in weight is striking. If propane and butane are used, the equivalent is 18 gallons of petrol, because of the higher pressure under which gas can be stored, and their greater efficiency in use. The equivalent of about 200,000 tons of petrol in cylinder-gas is estimated to have

been used in Germany last year, supplying 25,000 vehicles and using ten times that number of storage cylinders. It is usually taken that 265 cubic feet of coal gas is equivalent to one gallon of petrol, but the system is best seen in countries which possess a high pressure of gas "grid," and where restrictions on cylinder weights are not too severe.

Alcohol

Another substitute for petrol is alcohol; this can be obtained from a very wide variety of substances, including potatoes, sugar beet and maize. Applied to standard cars, as distinct from those of the racing class, alcohol is generally mixed with hydrocarbons, for, unless the amount of alcohol is carefully regulated, there would be difficulty in view of the higher compression necessary to obtain maximum efficiency. Varying amounts of alcohol cause differences in the point at which there is a "knock," or in what the engineer would call the "octane" rating. This refers to a comparison between the fuel in use and the results that would be obtained if octane gas was fed to the engine.

But the greatest disadvantage, and the main cause of the temporary reduction in the amount of alcohol consumed as motor fuel, is the fact that the substances from which it is obtained are valuable foodstuffs; to use them to produce alcohol to take the place of imported motor spirit merely necessitates importing more food. Further, alcohol is a basic material in the manufacture of many chemicals required for war, so that there would be a shortage at the very moment when it was most required as a motor fuel.

The best source of a substitute fuel is coal, which is rich in the hydrocarbons required. For many years a certain amount of benzine for mixing with light mineral oils has been obtained from coal by the process of "stripping" the gas with activated carbon. But the amount of fuel collected in this way is very small, only about three gallons for every ton of coal treated. The comparatively new method of hydrogenation, which is really a coal process, gives a much higher yield. The abundant coal supplies in Britain could make this an economic process on a large scale, although there is an astonishing neglect of England's natural resources in this direction.

Ammonia

Other synthetic fuels that have been tried are ammonia and acetylene gas. For use as a fuel the ammonia, vaporised by being released from a cylinder in which it is stored under pressure, is "cracked" into hydrogen and nitrogen by means of a catalyst, with the aid of heat. The exact process is at present secret, but it is reported that, in tests, standard cars have run successfully at over 30 m.p.h. Theoretically, and perhaps also in practice, this fuel would be unsatisfactory for various reasons—such as the low thermal value of "ammonia," the clumsiness of the apparatus, and the high cost of the fuel. Acetylene suffers from the same defect of thermal unsuitability, and, while it might be used in emergency, it does not seem likely that, even if synthetically produced where power is plentiful, such composite fuels are likely to be of great value.

This brief survey of the fuel substitutes for oil only serves to emphasise the remarkable advantages of "petrol." In case of handling, weight for power, cleanliness, safety, and many other points, it is far better than any other liquid. The whole basis of most substitutes, indeed, is not scientific—that is, the desire to obtain greater efficiency or yield of power—but political; the desire to be independent of imports or to encourage a particular industry of value in war-time. There are limitations to the world's reserves of oil, and, although it may be discovered that these limitations are not so serious as has been estimated, there can always come the time when imported oil must be scarce.

Under normal circumstances such difficulties are likely to be postponed for many years by the increasing use of heavy oils in diesel engines and the solution of the fuel problem for moving vehicles. For heavy vehicles, until the time when we can conveniently transmit or store electricity generated in centralised power-stations, some of the solid fuels may prove economical. Coal, or even vegetable dust, can be utilised in compression ignition engines, and it may be taken for practical purposes that the world supply of fuel for this type is virtually unlimited. Historians of the future may well regard the fuel substitutes of the 1920's and 1940's as "freaks" developed by special circumstances, politics, or finance.

The "Cement-gun" Process

The Modern Method of Applying Concrete by Means of Compressed Air

FOR repairing various concrete structures which have deteriorated owing to age, and other conditions, a process known as the "Cement-gun" Process has been used in this country for some time with considerable success. It supersedes the old method of trowelling-on a sand and cement mixture, and places the concrete mixture where required by means of a cement-gun. With the use of this apparatus a sand and cement mixture is impinged into position under air pressure of 30 to 50 lb. per sq. inch. The complete plant comprises an air compressor (Fig. 3), a cement-gun, and the necessary piping for conveying water, air, cement mixture, and a placing nozzle.

The "Cement-gun"

The cement-gun is shown in section in Fig. 4, and it will be seen to have an upper chamber into which the dry sand and cement mixture is fed through a cone door. A second cone door in the base of the upper chamber communicates with a lower chamber containing an air-driven rotary "feeder."

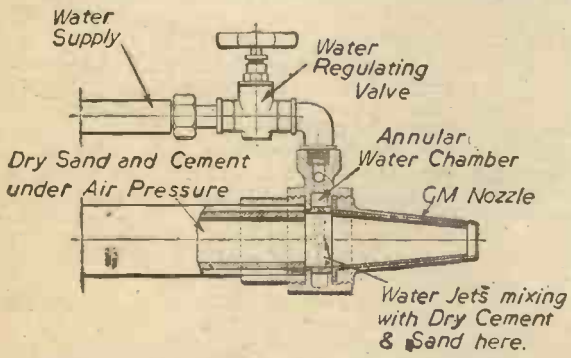


Fig. 1.—Part sectional view of a "Gunite" placing nozzle, showing the water-hose connection.

The latter regulates the flow of dry sand and cement to the material pipe, and a stream of compressed air at about 60 lb. per sq. inch carries the mixture along the pipe to the placing nozzle, which is manipulated by the operator. When the machine is in use, both chambers are first filled with sand and cement, and air pressure turned on to each. As the material is used from the lower compartment, the middle cone door is opened, and a fresh charge falls down from the upper chamber. The middle door is then closed, air pressure is released from the upper chamber through the valve provided for the purpose (Fig. 4), thus allowing the top door to be opened and a new charge of sand and cement introduced into the top chamber. In this way a continuous stream of dry cement mixture is delivered through the material pipe to the placing nozzle, where water under pressure is introduced (usually from an air-pressure tank), through a series of small jets directed towards the centre of the nozzle. The intensity of the jets can be adjusted to suit exactly the amount of water required, and the arrangement ensures a thoroughly uniform mixture. The water is, of course, carried to the nozzle by a separate hose, as clearly shown in Figs. 1 and 2. Wet concrete is thus delivered with considerable force, and with the minimum of water required for setting.

The special sand and cement mixture used in this machine is called "Gunite," and consists of three parts of sand, and one part of rapid hardening cement.

Placing the Concrete Mixture

While the sand and cement mixture is carried to the placing nozzle in a nominally dry condition, it is found in practice that the sand must not be too low in moisture content. Should the sand be in a very dry condition difficulty is found in wetting the mixture on delivery from the placing nozzle, and the loss of material and considerable dust is the result. Should the sand be too wet then the mixture is liable to block the material pipe. The correct consistency of the sand is, however, soon found in practice.

Fig. 2.—"Gunite" being applied to a harbour wall. Note the steel reinforcement.

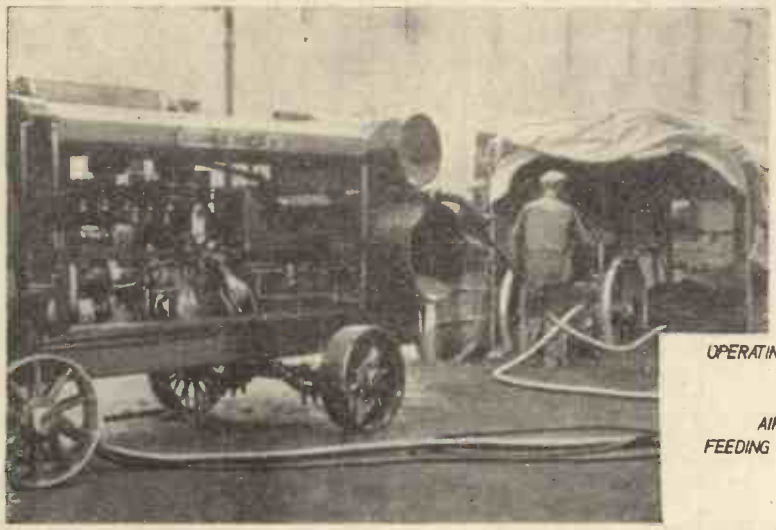


Fig. 3.—A portable Diesel-engine-driven air compressor operating the cement gun seen in the background.

The stream of "Gunite" is applied at right-angles from a distance of 2ft. 6in. to 3ft. in order to minimise the rebound of the "Gunite" mixture.

Reinforcement Mesh

When used for repair work and the reconditioning of brick and concrete structures a reinforcement mesh is usually fitted in order to take up and distribute shrinkage cracks in the "Gunite," and the mesh should receive a coating of concrete about 1½in. thick. A sketch of a stanchion and beam with reinforcement mesh in position ready to receive its coating of "Gunite," is given in Fig. 6.

The maximum thickness of "Gunite" that can be placed at one time is about 1½in. to 2in. In places where a greater thickness is necessary, this should be placed in two layers, each with a mesh enclosed. The type of mesh most suited to large structures is 2½in. to 3in. square, ⅛in. diameter, spot welded at each intersection of wire. It is important when fixing this mesh to maintain lateral continuity, and that it should be tied in suitable places to the existing reinforcement. In the case of plain beams or stanchions, the mesh should be cut and bent suitably to enclose the member, and placed in position in two halves, and the sides should be laced securely down the seams by bending the overlapping parts of the mesh. At the junction of beams, haunches, etc., suitable mesh must be cut and laced to maintain the lateral strength, and suitably attached to the existing reinforcement.

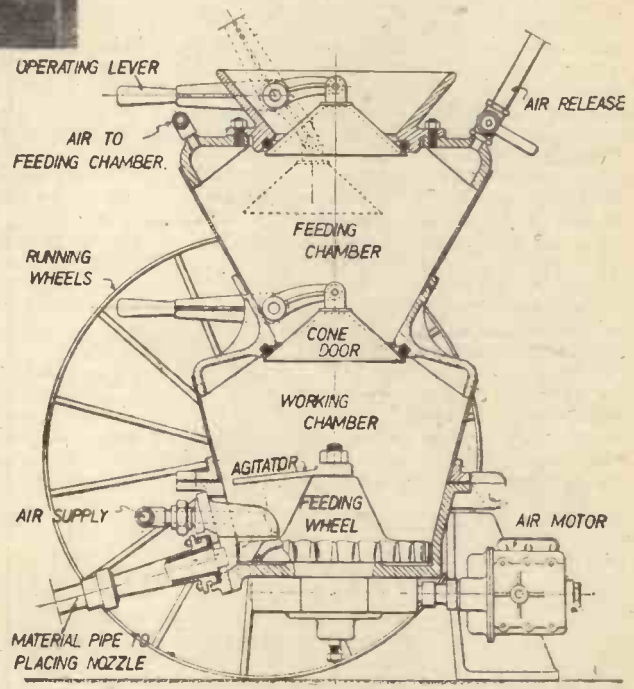


Fig. 4.—Section through the "Cement Gun," showing the internal chambers and connections. Note the air motor, which drives the feeding-wheel for distributing the sand and cement mixture to the outlet pipe.

Compression Tests

Some remarkable figures have been obtained from compression tests on cubes cut from "Gunite" cast slabs. Using a special double-washed sand, and a 3 : 1 mixture, a crushing stress of 10,000 lb. after seven days was obtained. This compares with the usual 3,000 lb. for good concrete after seven days. The grade of sand used has a very considerable bearing on the compressive strength, and in the case of building up concrete members it is essential that the surfaces be first roughened to provide a key for the "Gunite."

Variety of Uses

"Gunite" can be used for a variety of work such as chimney lining, reconditioning sewers, repairing coal and coke hoppers, protection of steel structures, and waterproofing buildings. As an example of its many applications it may be mentioned that "Gunite" was extensively used in connection with the construction of the Mersey Tunnel. The uses were varied but in nearly every case waterproofing was one of the reasons why it was used. Altogether an area approximating twenty-three acres was "Gunited," and the thickness of the concrete coating varied from ¼in. to 4in. The greater proportion of the "Gunite" was reinforced with fabric, but considerable areas were unreinforced.

Another important undertaking was the waterproofing of the upstream face of the Chenderoh Dam, Perak Hydroelectric Power Company, Federated Malay States, with 2in. of reinforced "Gunite." Other important work carried out with "Gunite" includes the waterproofing of water tanks and towers in large installations; reinforcing steel chimneys; lining bunkers at power stations; reconditioning piers and jetties; and re-facing concrete buildings.

The present notes and accompanying illustrations are reproduced by the courtesy of The Cement Gun Co., Ltd., Gunite House, Brentford, Middlesex.

Fig. 5.—A nozzleman shooting "Gunite" for reconditioning pier supports.

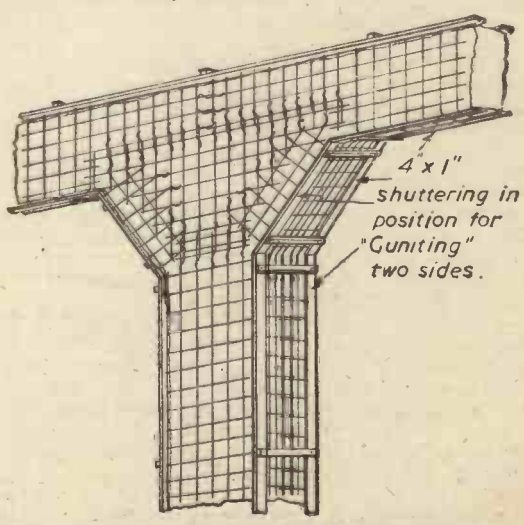


Fig. 6.—Perspective view of a stanchion and beam, showing reinforcing mesh and shuttering in position.

Our Busy Inventors

By "Dynamo"

Copy Without Carbon

IN the last century the method of taking copies of office correspondence was a somewhat laborious process. The office boy, whose job it was to do this work, proceeded to damp with a brush the sheets of tissue paper in the letter book. Written with special ink—a distant relative of treacle—the letter to be copied was inserted in this book. The volume was then placed in a press. Round went the handle, and the result was a more or less clear copy, which at times was painfully blurred.

The advent of the typewriter with its carbon copies caused the old method almost entirely to be superseded. However, possibly some conservative folk still copy the typed letter in the ancient manner.

A patent has recently been applied for in this country for an improved typewriter attachment designed to make copies without the use of carbon paper.

The sheet upon which the letter or manuscript is to be typed is inserted in the customary way; but there is an additional ink ribbon which can be swung out of the writing position. The original sheet is placed under the typewriter ribbon and over the additional ribbon, while the copy sheet is put under the latter.

There is friction roller drive operated from the platen. This is characterised by the fact that the friction rollers are always applied to the platen by spring pressure produced by pre-tensioning of the springs upon mounting the apparatus on the typewriter.

Metallic Fires Put Out

THE incendiary bomb is the target of three fire extinguishers which have been submitted to the British Patent Office. In the case of the first of these, the inventor states that his device is specially concerned with extinguishing what may be termed metallic fires, such as are occasioned by aluminium-iron oxide mixtures, burning magnesium alloys and particularly incendiary bombs in which a self-oxidising mixture containing combustible metal is enclosed in a casing of combustible metal.

The extinguisher in question comprises solid zinc chloride in a container which is qualified to resist the corrosive action of the zinc chloride and also to protect it from the effect of atmospheric moisture.

When placed on the fire this container is adapted to deposit the zinc chloride on the burning metal in practically an undissipated form, in order to produce a smothering flux, and thereby to extinguish the metal.

Telescopic Fire Hose

PRIMARILY also intended for fire-fighting is a liquid discharge appliance. In this contrivance the liquid passes through a number of tubes which can be telescopically extended by hydraulic pressure.

The appliance can be mounted on a trailer vehicle, and, although principally intended for fire-fighting, it can be used for horticultural purposes and for spraying buildings.

The last in this trio of fire-extinguishing apparatus is a hand-operated grab for clutching incendiary bombs.

Interesting Spectacle

AN intriguing invention relating to spectacles is a frame which permits lenses to be removed from in front of the eyes without taking the frame from the face. For lifting the lenses there is a bar which passes through extensions of the rims of the frames and is rotatable therein. The lenses are carried by separate holders, each secured to the bar between the extension of one of the rims.

This device should allow lenses of varying power to be easily adjusted to one frame.

Tough Tennis Ball

THE life of a tennis ball is a mixture of hard knocks, ups and downs, and happy returns. In order to enable it literally to stand the racket, an inventor has produced a ball of the bladderless type, which he contends is especially durable.

His plan consists in impregnating a fabric with natural or artificial rubber latex. The latex in the impregnated fabric is coagulated and out of it is cut suitably shaped patterns. While still wet, these patterns are stamped into hemispherical cups, part of the water being at the same time eliminated.

The cups having been dried, one of them inverted, is superimposed on the other, which is in the normal position. They are then united by means of a layer of vulcanized rubber along their edges. A passage allows the internal and the atmospheric pressures to be equalised.

A dummy, with a head-dress of gaily coloured feathers, in front of the transmitter during Mr. J. L. Baird's recent experiments in stereoscopic television in colour.

Boring Bomb

THE aerial bomb, at the present time, plays a very important rôle in the theatre of war, and much ingenuity has been employed to guarantee that its destructive power attains the maximum amount of devastating effect. There has appeared an improved device relating to bombs of the type fitted with a fuse adapted to detonate the bomb charge at a time subsequent to the moment of impact. The aim of the inventor has been to provide more effective means for enabling the bomb to penetrate thoroughly into the foundation of a building or other target prior to the explosion.

It is customary to fit the base or rear end of aerial bombs with vanes, tending to maintain the bomb axis parallel with the direction of flight. According to the new invention, these vanes are spiral—technically known as helical—in form, and the nose of the bomb is designed to act as a boring tool.

Consequently, during the flight of the bomb towards its target, the helical vanes collaborate with the atmosphere to cause the bomb to rotate about its own axis. As a result, upon impact, the bomb before exploding, will bore its way into the substance of the target.

It is preferable to make the vanes of comparatively fragile material so that, when the bomb strikes the target, they are easily fractured, and, therefore, they do not offer undue resistance to penetration. With this object in view, the union of the vanes with the body of the bomb should be capable of being easily dissolved.

Farm Tractors as Tanks

THERE are in this country a large number of farm tractors, and it is interesting to note that an inventor has devised an arrangement whereby these tractors can be quickly converted into armoured vehicles, should the necessity arise. He applies to the tractor a bullet-proof steel hood which can readily be lowered on to the tractor, and which may easily be removed. The front of the hood is supported by the radiator, while the rear part rests on the rear axle casing.

Unshrinkable Wool

THE besetting sin of wool, when it gets into hot water, is that it has a bad habit of shrinking. There are processes extant for rendering wool unshrinkable; but if it is mixed with cotton or regenerated cellulose, an inventor asserts that, with these methods, the mixed fibre suffers damage. He affirms, however, that he has discovered that, under appropriate conditions, solutions of alkali hydroxides and alcoholates in organic solvents render wool practically unshrinkable. And he has also found that in the case of wool mixed with cotton or cellulose fibre, the treatment proceeds without injury to the mixed fibre.

Coal Substitute

THE rationing of fuel has become a rather perplexing problem. This coincides with the advent of a coal substitute for which a patent has been applied. It is claimed for the new fuel that it makes a hotter and more lasting fire than the heating substances at present on the market.

This fuel consists of paraformaldehyde coupled with a small proportion of hexamine, the addition of the latter being to prevent the melting of the paraformaldehyde.

One way of preparing the fuel is thoroughly to mix some 20lb. of paraformaldehyde powder with about 1lb. of powdered hexamine. The mixture is pressed into tablets or cakes of convenient size.

A Battery-driven Cycle

An Interesting Electrically-propelled Machine

By P. G. BOYD

The completed battery-driven cycle and its designer.

HAVING carried out some experiments with electrically-driven bicycles, I was interested in the article on the subject which was published in the March issue of PRACTICAL MECHANICS. The following particulars and accompanying illustrations of my battery-driven cycle, for which I have taken out a provisional patent, may prove of interest to other readers.

As only about one-fortieth of a horse power, or roughly 20 watts, is ordinarily applied by a cyclist when pedalling on a level road, it occurred to me that it should be possible to travel a considerable distance on one charge of a car-starter battery, say a battery which stores about 500 watt hours of electricity.

An ordinary lightweight bicycle was first selected on which to carry out some preliminary trials. The battery was easily procured, but it was impossible to obtain a motor ideally suited to the job. However, a car-starter motor which gave some promise was finally chosen, and this was mounted over the rear wheel and connected to the rear hub sprocket by chain.

The battery at this stage was slung from the cross bar between the rider's knees. This arrangement was not very satisfactory on account of the weight of the motor, so a front-wheel drive was tried, with the motor in this case mounted directly over the front wheel.

This scheme seemed to have definite possibilities, and was used to try out the gear ratios, speed, mileage and so forth.

Motor Mounting

The next step was to obtain a heavier bicycle of the carrier or messenger type. As this was a new machine it was decided not to make any structural alterations to it. The motor was mounted over the front wheel as before, but the battery was slung on a crate between the front wheel and the pedals, as shown in the accompanying illustrations.

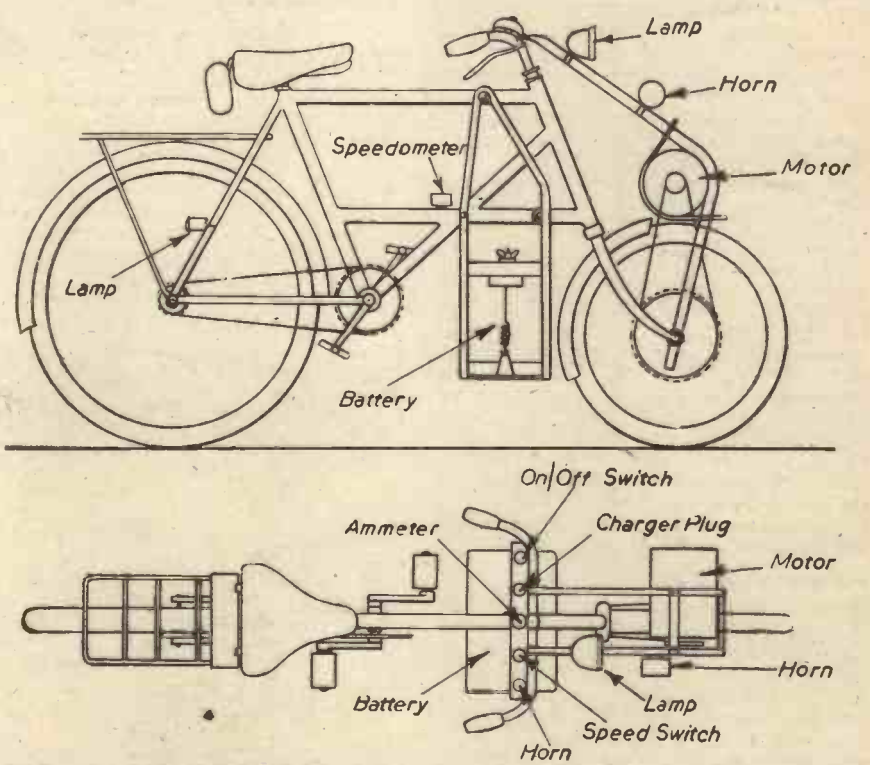
The total weight of the machine is 160 lb. made up of 60 lb. of battery, 30 lb. of motor, and 70 lb. of bicycle and accessories. As now arranged, and with a 12-stone rider, it will do either 17 or 20 miles per hour on a level road, and on one battery charge, its range, without the use of pedals, is 24 and 18 miles respectively for these speeds.

On starting from rest, pedal assistance is given until about walking speed is reached, then the starting switch is closed, and held closed. The bicycle then travels at 17 miles per hour on the level. The 20 mile per hour speed is obtained by throwing over a small switch mounted on the dashboard which alters the motor field connections. Regenerative braking is not provided for recharging the battery going down hill, as this would not be worth while, and would be difficult to arrange together with the free wheel which is of much more advantage.

Battery Charging

The battery is charged at night-time but may be one-third charged say at lunch hour, or it can be replaced by a newly-charged battery in about two minutes. A socket is provided on the dashboard into which the charger can be plugged. The battery is a 12-volt lead-grid type with a capacity of 51 ampere-hours at the 10-hour rate and 22 ampere-hours at the 20-minute rate: one kilowatt-hour of electricity is required to recharge it fully.

The gear reduction ratio is 4 to 1. The diameter of the front wheel is 20 inches, so that the motor speed is 1,340 revolutions per minute for the 20 mile per hour speed. The motor now used is not satisfactory as it is about three times too large and too powerful, and is inefficient electrically on small loads. Otherwise it works well.



Side elevation and plan of the battery-driven cycle, showing the layout of the component parts.

Side view of the cycle ready for the road.

Everything considered, the writer is satisfied that with a suitably designed motor and with a cycle frame slightly altered, the battery-driven pedal cycle has, for short journeys, advantages in simplicity, silence and economy over the light petrol-driven motor cycle, even when petrol is available.

Electrically-driven Bicycle

WITH reference to the article on above subject, which appears in our March

issue, a reader, R. Barham, of Coulsdon, writes as follows:

"I built a small runabout driven by an ordinary car-starter motor and 12-volt accumulator some years ago. The starter-motor was a 6-volt one from a Citroen car. I fitted four terminals to the 12-volt accumulator, thereby providing myself with two batteries, or one active and one reserve battery.

"With reference to the machine described in your March issue, I would suggest the following improvements:

"(1) Earth *one* of the accumulator wires to the cycle frame—no need to use starter wire—a strip of lead 3/16 by 1in. will do, and will be neater.

"(2) The use of a 12-volt accumulator with four terminals making same into two 6-volt batteries. Bridge the middle ones whilst charging.

"(3) Use a 6-volt starter-motor for driving power.

"(4) Leave all the pedalling gear as it is, and have a large sprocket welded to the near side of the hub of the back wheel—this, of course, driven by the motor.

"(5) For charging each night or when required a ⅛ A.C. motor coupled direct to a 12-volt dynamo and charging at 10 amps. should be more reliable than the Nodon valve and transformer idea. These ⅛ h.p. A.C. motors can be picked up for about 50s. and a 12-volt car dynamo for 10s., ammeter and cut-out, say, 10s. This outfit will also charge other folks' accumulators for them, and so help to repay the outlay. It can be run from the house A.C. mains.

"The consumption of one of these ⅛ h.p. motors is very small, and it would be a perfectly reliable outfit.

"I rather think that these electrically-driven bikes will be of great commercial value in the near future, so it will be worth while getting them right. I hope to start constructing one shortly on the lines mentioned.

"One spot of trouble seems to be getting the taxation people to rate the h.p., but they may decide that it is to be taxed by the weight of the whole machine complete."

Rescue Work at Sea

A Brief Description of Various Locating and Other Life-saving Appliances

Manned by the Navy, a fast motor-launch moors alongside a rescue float.

THE perils of the sea have been greatly increased owing to the war, and several newly-invented appliances have already saved hundreds of shipwrecked people.

Rescue Floats and Launches

Now that the R.A.F. are using a "ferry" service of bomber and fighter 'planes, which is in constant action over enemy territory, the air and sea rescue service have organised a wonderful system of rescue floats and launches. The purpose of these craft is to pick up airmen—friend or foes—who have come down into the sea, and the Navy or the R.A.F. are constantly on the alert to pick up these men. By means of their portable dinghies, pilots endeavour to reach the rescue float, where food, clothing and first aid are available, and await there in reasonable comfort until the rescue launch arrives. The launches—one of which is shown in the above illustration—are armed for defence.

Radio Apparatus

A radio transmitter is now carried on all passenger or cargo ships, and when a number of lifeboats put to sea one would have a radio transmitter aboard. By means of radio receivers rescuers can tell shipwrecked persons when to light flares for locating their position. These hand flares are very similar to the Brock's flares as used for pyrotechnic displays in pre-war days. The flares give off an orange-coloured smoke, which can be seen at sea for a distance of 10 to 12 miles. Another handy means of attracting the attention of rescuers is an electric signalling lamp, in the shape of a torch, which is fitted with a long-life battery and a morse tapping key.

Distinctive Sails

To ensure that lifeboats can be easily detected by scouting aircraft or rescue vessels, the lifeboats are provided with sails having distinctive markings. The illustration on the opposite page shows a lifeboat with a sail marked with wide coloured stripes. Some sails have coloured squares, discs, diamond shapes, which show up clearly against the white sail.

Smoke Bombs

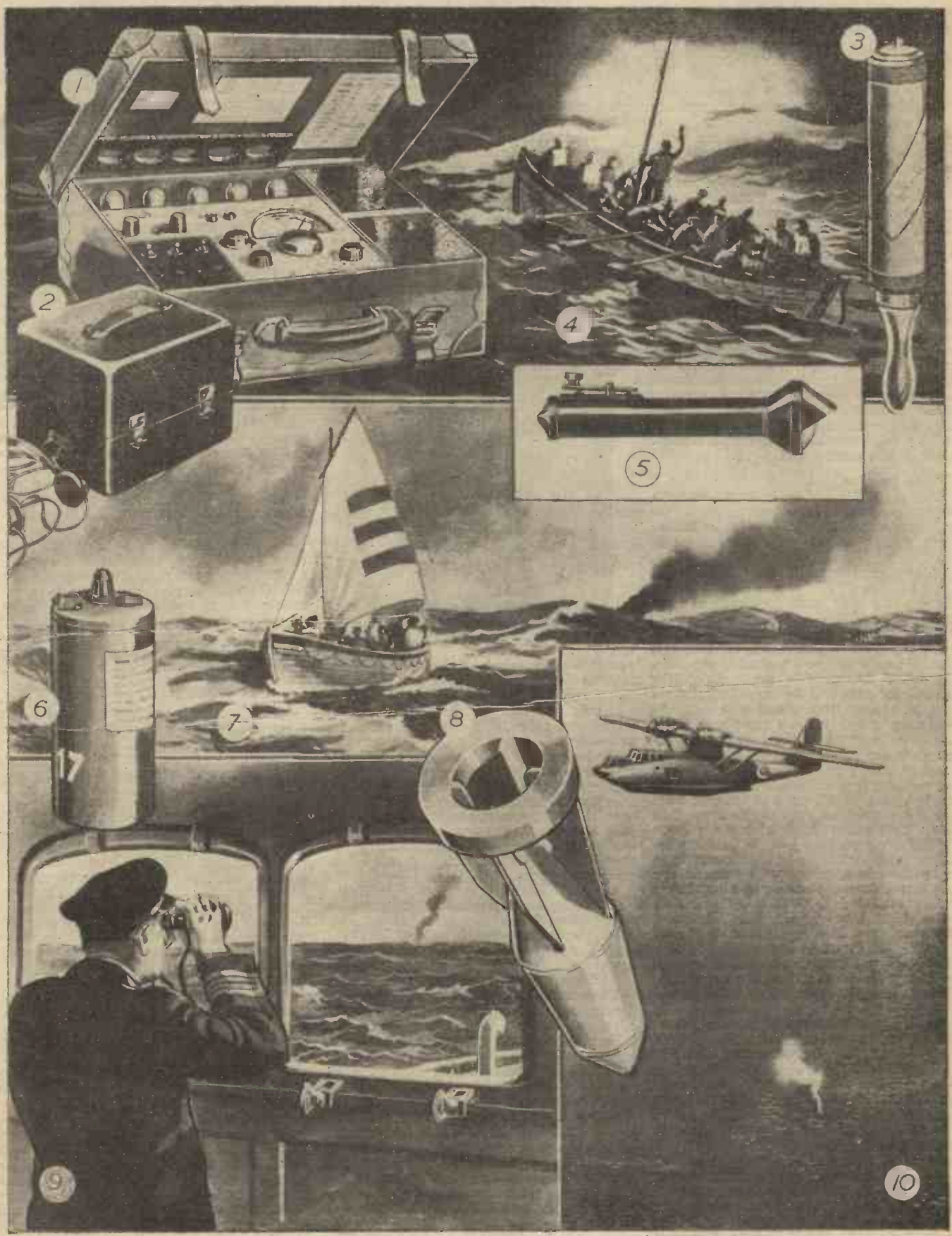
In cases where a boat in distress, or a raft, is observed from a scouting aircraft a smoke bomb is dropped near the spot to indicate the position to rescuers. The trail of smoke given off by these bombs can be seen for several miles, and one of the accompanying illustrations shows a naval officer aboard ship observing a smoke signal on the horizon. It will be understood that with the rise and fall of heavy seas, a boat in a trough would not be seen, even at a comparatively short distance, and it is on such occasions that the smoke bomb renders valuable service.

Many other life-saving devices, in addition to those described, are in use, such as intermittent flashing buoys, and Mae West life-jackets fitted with an electric bulb, which is clipped on the shoulder of the jacket, and lighted by a battery carried in a special pocket. The light helps to guide rescuers at night.

Waterproof Suit

An invention which has been responsible for saving many lives at sea is a special waterproof suit, contrived by a Ministry of War Transport scientist. Looking like the anti-gas suits of Civil Defence workers, it is of bright yellow rubberised material, and consists of trousers combined with overshoes and a hooded jacket. The complete outfit folds up into a small bundle inside the hood, and can be strapped on the back when not in use. The suit is intended for protection of the wearer against rain, wind and cold weather.

LOCATING APPARATUS FOR RESCUE WORK AT SEA



Key to Illustration. 1. Radio Transmitter : 2. Radio Receiver and Headphones : 3. Hand Flare : 4. Showing Hand Flare being used : 5. Electric Signalling Lamp with Morse Key : 6. Smoke Producing Canister : 7. Lifeboat with Distinctively Marked Sail : 8. Smoke Bomb carried by Scouting 'Planes for Position Marking : 9. A Naval Officer investigating a Smoke Signal on the Horizon : 10. A Catalina 'Plane after dropping a Smoke Bomb to Indicate the Position of a Boat or Raft.

PHOTOGRAPHY

Making Lantern Slides

Selection of Negatives, Printing and Developing Explained

By JOHN J. CURTIS, A.R.P.S.

THERE is no better or more interesting way of keeping records of your camera work than by making lantern slides from your best negatives, interesting not only to yourself, but your friends. With these slides you can provide an entertainment by projecting a dozen or two pictures through your lantern or enlarger on to the wall of the lounge or dining-room one evening when you have a small gathering present. Possibly the society of which you are a member would welcome a lantern lecture on that holiday you spent in Scotland or The Lakes.

Should a further reason be required why slides should be made of the best negatives, then I would suggest to those who enter competitions, or send pictures to exhibitions, that it is a great help to put a slide from the particular negative through the enlarger before making a print for, in the large size, it is easier to judge whether the picture is good enough for exhibition and what has got to be "cut off," or which part of the negative gives the best composition.

Simple Process

The making of a slide is by no means a difficult process; it is just as simple as the making of a contact print, but it does call for really good negatives. By this is meant negatives which have the usual good qualities, such as correct exposure and development, and gradation. Also, it is most important that they are free from blemishes, such as scum markings, pin-holes, scratches and similar faults, the reason being that if the negative has a pin-hole or dust spot, for instance, then that hole will be imparted to the slide, and when the slide is put through the lantern that hole will be magnified perhaps sixty or seventy times, and will naturally spoil the picture. It takes some very clever retouching to overcome successfully by after-treatment any such failings on slides, so the moral is, always start with a good negative and see that it is clean and free from dust.

It is as well at this stage to consider what type of negative is required to give a first-class slide. This rather depends on the subject, and for what purpose you are making the slides. If for lecture work, where the pictures are to illustrate beauty spots of a certain district, or the grace and charm of a cathedral's architecture, or even to show off your own abilities as a photographer, then, obviously, they must have the qualities of a perfect negative. If they are simply records of a jolly holiday, or a fortnight's camp, then you can only make the best of what you have got and your audience will not be critical for the pictorial.

There are two grades of lantern plates, slow and fast, the former for obtaining warm tones and the latter for cold tones; both will yield black tones, but where it is desired to produce warm blacks, brown or purple images, then it is the slow grades that must be used. The variation in the speed of the grades is roughly comparable to that of gaslight and bromide papers.

The standard lantern plate is 3¼ by 3¼, but during the last few years, and in order to meet the requirements of miniature camera users, a smaller size has been introduced, namely 2 by 2; they are usually sold in boxes containing one dozen, and placed film to film and wrapped in fours, a point worth remembering in the dark room.

It is necessary to have a dark room, or a room which can be made free from white light, but the work can be done with orange light as used for gaslight or bromide printing. There are two methods by which slides can be made, the first is by contact as with ordinary printing, the other by copying the negative by means of the camera.

Printing

Having selected the negative, it is placed in the printing frame, which must be one of the special size for slide work, or of quarter-plate size, 3¼ by 4¼; therefore, if you are working with a film 3¼ by 2¼ you will place a piece of clean glass in the frame first and then lay the film on this with the emulsion surface

A finished slide neatly masked and spotted.

upwards. Now switch off the white light and turn on the orange, open the box of lantern plates, remove the first one, place it film side downwards on the film in the printing frame, and then fix the back of the frame in position.

Having arrived at this stage you will want to have some idea of the time of exposure required, but as this is governed by at least four factors it would be unwise to state a time here. Let us, however, consider these factors, with the express purpose in mind of standardising this part of the work as much as possible, and on the lines mentioned in previous chapters.

The four factors are:

(1) The grade and speed of the emulsion of the plate.

(2) The density of the negative.

(3) The intensity of the light to be used for exposing.

(4) The distance from the light.

There are others which occur when the development stage is reached, such as strength of solution, and the temperature.

Factors 1, 3 and 4 can be made standards, only to be varied for exceptional negatives, or for obtaining special effects. No. 2 can be partially controlled by the method mentioned in the chapters on printing, i.e., sorting the negatives into three or more groups according to the density of each. When making your first slide it is necessary that this should be in the nature of an experiment, or test, and in order that this should be as systematic and give as much information as possible, let the test be carried out on these lines. The plate is a slow one, the negative is one from the middle group, therefore of normal density, the light is a forty-watt electric bulb, and the distance between the light and the printing frame is 24 in.; these are items which it is intended shall be constant and due notes are made for future reference. It is intended to make four test exposures on the first plate, and the first of these is to be five seconds, then a quarter of the plate is covered by a piece of card and another five seconds is given, then a further quarter is covered and again an exposure of five seconds is given. Finally, a third quarter is covered, leaving only one quarter of the plate uncovered, to which a final five seconds is given. The result will show four strips, the first having had five seconds, the second 10, the third 15, and the last 20 seconds, and somewhere in this series it should be possible to discern the correct exposure. It may happen that a bad miscalculation has occurred, necessitating a further test plate of either more or less exposure, but if the plate should show gross over-exposure, I would suggest not shortening the time, but increasing the distance between light and frame, as it is better to work with an exposure time sufficiently long to give you control, and very short exposures prevent this. On the other hand, if the exposures have been far too short, and the resulting image is much too under-exposed, then keep to the same distance, but increase the times by half as much again or even twice those given for the first plate, but keep to the four strips and double the time for each. Two such experiments should give you a whole lot of information which will enable you to accurately estimate the exposures for the various groups of negatives, and will undoubtedly prevent failures in all your future work in connection with slide making.

Development

The next part of the process which calls for consideration is development, and almost every developer is suitable for lantern plates, but some more so than others, especially for beginners, and as I do not believe in making my dark room a chemical laboratory, I always strive to avoid an accumulation of different developers and bottles. It is right to make trials of others from time to time, especially as one gets more advanced in the work, but at first keep to a possible two developers only.

Those who are doing their own developing of films are probably still using that useful all-round solution, Azol, and I know no reason why this should not be the developer for slides; it is clean working, easily prepared, and the results are without the hardness characteristic of some other developing agents. To use this developer, take ¼ oz. of the concentrated Azol and add 5 oz. of water to it (this is the same strength as for films), place the trial plate in the dish and pour the Azol solution over it. Be careful how you do this, as it is imperative to avoid air-bubbles; remember that the smallest of these will spoil your slide. The development is fairly rapid; the image will show in a few seconds and will grow in density. The plate may require six minutes or longer to develop, depending on the make, but watch the image, and when you think that you have got as much detail in the shadows as is possible, give the plate a rinse under the tap and pass it to the acid-fixing bath. Do not use a plain hypo bath, as the solution does not last as long, and what is of greater importance, the Johnsons acid-fixing cleans and brightens the image.

When the test plate is fixed, give it a good rinse under the tap to remove as much of the fixing as possible.

The Ultimate Energy

Fundamental Facts Concerning Heat, Nature's Vast Energy Store

HEAT is a form of energy. It is, fundamentally, a manifestation of motion, the motion of the atoms and molecules of material things.

If a lump of matter were so made up that its constituent particles were totally incapable of any movement at all, that remarkable substance would remain for ever heatless. It would be at the temperature of absolute zero, which, on our scale of thermometric reckoning, coincides with the "temperature" of minus 273 deg. C. Any material thing which could be cooled down to this "temperature" would be completely devoid of heat. Its constituent particles would be motionless. It would be impossible to make the body any colder for the simple reason that you cannot take anything away from nothing, and that if a substance is completely heatless you cannot make it any colder by removing further amounts of heat from it.

Let us, for a moment, consider a quantity of air enclosed in a container, the air being at ordinary atmospheric temperature. Could we but perceive that mass of air through some sort of super-microscope we should realise that the air was, in reality, made up of a vast number of minute molecular particles, each particle hurling itself here, there and everywhere throughout the available space in the container. Every second any given particle of gas would be seen to collide many times with other gas particles, but without doing any harm to itself or to the other particles, for the particles are collision-proof and, after meeting one another in this violent manner, they at once rebound and fly off at random in other directions.

Constant Motion

A summer swarm of gnats or midges gives us a fairly approximate picture of the ultimate make-up of a gas, a liquid or even a solid, for in all these states of matter the ultimate particles are in constant motion, the only essential difference between the make-up of a gas and that of a liquid and a solid being that in the gas the constituent particles are widest apart, and have a maximum amount of space in which to perform their fantastic gyrations, whilst in the liquid state of matter the particles are closer together, and still closer in the solid state of matter.

What we term "heat" is essentially a manifestation of the motion of these constituent particles of matter. If the particles gyrate at an enhanced speed the material substance which the particles make up becomes hotter, and, conversely, if, by any means, energy is abstracted from the whirling particles so that their rate of gyration is made slower, the substance which they compose becomes colder.

Take the case, for instance, of a solid material such as sulphur. If, by any means, the energies of the constituent particles of this substance are speeded up, their movements become more intense. The particles are endowed with sufficient energy of motion to fly apart more than their usual rate from one another. Consequently, the normally solid sulphur melts and becomes a liquid. If still more energy is added to the flying particles, they become endowed with such velocity that they fly off into any available space and assume the characteristics of gas particles. In other words, the liquid sulphur boils and vaporises.

When, on the contrary, gaseous sulphur has heat abstracted from it, the reverse of these changes takes place. The flying particles lose their energies, their speed of movement becomes slower and slower, and the particles fall closer and closer together. The gaseous sulphur liquefies and eventually solidifies.

By careful experiment, and consequent deduction, it has been possible to determine many interesting facts concerning these flying constituent particles of matter. For instance, it can be shown that at a temperature of 0 deg. C. a single particle of hydrogen gas (weighing three - million - million - million - millionths of a gram) moves with a speed of a little more than a mile a second. Every cubic centimetre of any gas (at 0 deg. C. and under normal atmospheric pressure) contains about twenty-seven million million million moving particles, all of which are moving entirely at random at speeds somewhere in the neighbourhood of a mile a second.

Temperatures

Analagous conditions are present in all gases, liquids and solids, and we, as it were, feel the mass effect of these particle movements when we say that any particular material, substance or object is hot or cold. Our various degrees of hot and cold are therefore simply our physical perceptions of the mass movements of the ultimate particles of which all matter is made up.

We are very apt to take the term "temperature" as an absolute measure of heat. This assumption, however, is not quite correct. Temperature, it is true, expresses the intensity of a body's heat, but it does not give us any indication of the quantity of heat-energy possessed by that substance. Suppose, for instance, we have in separate vessels a pint and a quart of water, both at a temperature of, say, 90 deg. C. At this temperature the average velocities of the moving constituent particles of water will be identical, but there will be more heat energy, more energy of molecular movement, in the quart of water than in the pint of the liquid. Hence, it is clear that, besides measuring the intensity of molecular heat-movement, we must also recognise the factor of heat quantity.

Specific Heat

It takes longer to raise a pound of water to its boiling point (100 deg C.) than it does to heat a pound of metal to the same temperature, provided, of course, that heat energy is supplied at the same rate to both substances. And supposing a car engine to be run with unlubricated pistons, it would take longer for an aluminium piston to reach a given temperature than it would for a cast-iron piston to attain the same temperature. This is because, besides the actual temperature of a body, we have to deal with the idea of the *quantity* of heat energy which has to be put into the body before it can be raised to any given temperature. Different substances have different capacities for the absorption of heat energy, and it is this capacity of a substance for heat which is usually known as its "specific heat."

All liquids have relatively high specific heats. Consequently, they can absorb large amounts of heat energy without rapidly increasing in temperature. It is precisely for this reason that internal-combustion engines are so effectively cooled by a circulating water system. And because water is capable of absorbing large amounts of heat, it is for this reason that we take our hot-water bottles to bed with us on cold nights, since the water, having absorbed a large amount of heat, also gives back its heat to its surroundings over a relatively prolonged period.

Two practical examples of heat-power conversion. An L.M.S. steam locomotive alongside one of their latest Diesel passenger units. Coal versus oil—on which will the prime mover of the future depend?

The energy of which heat is a manifestation is a rather peculiar variety of this entity. In some respects heat is a degraded form of energy. It is certainly the ultimate energy, for all other varieties of energy tend to convert themselves into the energy of heat if they are given a chance to do so.

The energy which you put into the stropping of your razor blade, for instance, appears as heat energy. The razor strop becomes warm, due to the temporary speeding-up of the movements of its constituent particles.

Electrical energy—the swift flowing of a stream of electrons through a conductor—finally dissipates itself as heat. In fact, all forms of energy turn, at last, into heat.

James Prescott Joule, the Manchester amateur physicist of the last century, proved that when he used a definite amount of mechanical energy for churning up a definite amount of water the temperature of the water always rose by a definite amount. By experi-

ments on these lines Joule was able to prove that all the mechanical energy which he had put into his water-churning machine could be accounted for in its conversion into the heat which raised the temperature of the water.

Friction

Probably, of course, any common-sense and experienced individual could have told the scientific Joule that friction invariably produces heat, but Joule proved for the first time that the energy of movement is completely turned into heat by the play of friction. He also brought to science its tremendous generalisation, to wit, that of the "Conservation of Energy," which law states that no energy is ever lost, but that it may be made to undergo changes and conversions from one variety into another.

Light, electricity, motion all constitute varieties of energy. Other forms are "energy of position" (potential energy), chemical energy, radiant energy and so on. Now, most of these different forms of energy can be completely converted into any other energy-form, but, somewhat strangely, our powers of converting heat-energy into other forms of energy are severely and, indeed, tantalisingly limited.

All steam engines and internal-combustion engines function in consequence of their being able to convert heat energy into the energy of mechanical work. Now, all such engines are, fundamentally, contrivances for conveying heat from a body at high temperature to a body at a lower temperature. The greater the difference between the high-temperature and the low-temperature bodies, the greater is the working efficiency of the heat engine.

If the earth were at a uniform temperature of, say, 105 deg. C. (that is, just above the normal boiling-point of water), we should have plenty of steam, but, nevertheless, we should not be able to get a steam engine to work because of the complete absence of a lower temperature.

Thermodynamics

Heat is like water in the following respect: to give rise to useful work, it must descend from high levels to lower levels. If all the world's water were at a uniform level rivers would not flow. Neither would it ever be possible for us to operate a water-wheel. Similarly, if we were unable to take heat from a body at higher temperature and to convey it to a body at lower temperature all forms of heat engines for producing mechanical work would be utterly impossible, for, just as water will not ascend from a lower level to a higher level under its own impetus, so, also, it is just as impossible for heat to be conveyed freely from a substance at low temperature to one at a higher temperature.

The above fact forms the basis of what is known as the "Second Law of Thermodynamics." This law tells us that heat cannot pass from a cooler to a hotter body. It seems a simple, common-sense observation to make into a scientific "law." Nevertheless, it constitutes a scientific generalisation of the utmost importance. Strangely, however, the Second Law of Thermodynamics has never been formally proved. Some scientific thinkers have conjectured that, under given conditions, it might become possible to cause heat to flow freely from a colder to a hotter body. Such a feat, however, would necessitate the gaining of some measure of control on the utterly haphazard and random movements of the molecules of matter—all of which is a mere dream of the future.

As it is, however, we well know that if we put into a heat-insulated chamber a lump of ice and a chunk of red-hot iron, the red-hot iron will not abstract heat from the ice and thereby become hotter. Common experience tells us at once that the ice will absorb heat from the red-hot iron, the heat flowing from high level to low level.

When a heat engine converts heat into mechanical work, the proportion of heat converted is governed by the difference in temperature between the hot and the cold bodies, say, in the case of a steam engine, by the difference between the temperature of the steam and that of the surrounding air. It can be proved that if even a perfect transformation of the available heat into mechanical work took place, the efficiency of a steam engine would be not more than 27 per cent. In practice, however, this ideal percentage is sadly diminished.

Harnessing the heat energy from the sun to a gas-producer. A unique system devised by Otto H. Mohr, of California.

There are only two ways in which we can increase the efficiency of the transformation of heat into mechanical work by means of a heat engine. The first method is to lower the final temperature of the surroundings, which, of course, is quite impracticable. The second method is to increase the initial temperature of the "working substance" in the heat engine. It is for the reason that internal-combustion engines operate between much wider temperature ranges than the steam engine that they are more efficient heat-converters than the latter.

The whole trend of energy dissipation is to bring all forms of energy into the static, but quite useless, condition of energy of "heat of uniform temperature." All the wasted, unutilised energy in the universe ultimately becomes converted into heat energy. And since, like water, heat energy continually tends to form one vast level by flowing out of bodies of high temperature into those of lower temperature, the tendency is for all the heat energy of the universe to accumulate into one enormous reservoir of "heat of uniform temperature."

If the universe ever attained to this condition of uniform temperature, no conversion of heat into mechanical work would ever be possible.

BOOKS RECEIVED

Elementary Mathematics for Engineers. By Sir Ambrose Fleming, M.A., F.R.S. Published by George Newnes, Ltd. 116 pages. Price 7s. 6d. net.

THIS handbook is intended to impart to engineering and electrical engineering students just the practical portions of about ten departments of mathematics which will enable them to read more advanced text-books on the subject, or original papers, and to solve elementary problems. The object of the author has been to deal with just the practical information on various branches of mathematics which are of importance in engineering. Useful mathematical tables are included which will facilitate numerical calculations. In this second edition some additional matter has been included, particularly in the chapters dealing respectively with Vector Algebra and Differential Equations.

Junior Technical Drawing. By H. H. Winstanley. Published by Edward Arnold and Coy. 80 pages. Price 4s. net.

THIS book is specially written for students in Junior Technical Schools, Technical High Schools and similar institutions. Its main object is to present the principles of technical orthographic drawing, and to suggest the application of these principles to the solution of problems in solid geometry and to the making and reading of a working. The work set out in this book is the foundation upon which many important public and university examinations, embracing Engineering, Building and Architecture, are conducted. The many exercises included will provide subjects for the major part of an intensive two-year course, or possibly a three-year course. Single-view drawings of simple parts are included, and isometric and oblique views are used freely. Students for whom this book is intended should find it of great help in their studies.

Your Allergy. By Milton B. Cohen, M.D., and June B. Cohen. Published by The Scientific Book Club. 166 pages. Price 2s. 6d. to members.

ACCORDING to the authors of this work, the term allergy, or altered reactivity, was coined thirty years ago. Only during the past two decades, however, have physicians penetrated the causes of this group of peculiar and dramatic ailments. This book tells the reader all about allergy, what the symptoms are, and its remedies.

Thermionic Valve Circuits. By E. Williams, A.M.I.E.E. Published by Sir Isaac Pitman and Sons, Ltd. 174 pages. Price 12s. 6d. net.

THIS book, which deals with the theory of the operation and design of thermionic valve circuits, is based on a lecture course in Electrical Engineering given by the author in the University of Durham. The book, which assumes a knowledge of alternating current theory and mathematics, should prove particularly suitable for students at universities, technical colleges, and electrical engineers trained in the days before the development of the thermionic valve. The subject matter is well illustrated with line diagrams.

Rust-proofing Iron and Steel

A Survey of the Industrial Processes Most Used at the Present Time

EVERY year, during peace-time, the world's blast furnaces extracted some 72,000,000 tons of metallic iron from its ores, yet it is calculated that approximately one-quarter of that amount of iron was annually lost through the rusting and corrosion of the metal.

The yearly loss of metal through corrosion and rusting was estimated on good authority to be, in value, around £500,000,000. No wonder is it, therefore, that scientists, in normal times, have for a generation been actively engaged in the search for practicable methods of rendering iron and steel, which, taken together, constitute the world's most important metals, immune from the attacks of rust.

Although nothing has yet been discovered which will render iron and steel intrinsically rust-proof, modern industry has not been slow to take advantage of a number of methods which actually do protect these metals from rust and corrosion by imparting to them a rust-resisting skin.

It may appear a strange fact that the best way to protect iron from rusting is to rust it! When a lump of "naked" iron is left exposed to the weather, it rusts with great rapidity, but this rate of rusting is equally rapidly slowed down owing to the protecting effect of the initially formed rust coat.

Bower-Barff Process

It is possible to provide iron or steel with an artificially produced "skin" of rust, and this is actually what is done in the present-day Bower-Barff process, which consists in heating the iron articles to a bright-red heat and by exposing them to a current of superheated steam and afterwards to coal gas. The articles must previously have been made completely rust free by treatment in pickling baths and, if necessary, they must also have been subjected to a degreasing treatment.

The action of the steam on the red-hot iron is to form on it a surface layer of black oxide of iron. Some of the higher oxides of iron are also formed, but these are converted into the black and most stable form of oxide by the coal-gas treatment. If more convenient, producer gas can be used in place of coal gas for this purpose.

Steel and iron articles which have been treated by the Bower-Barff process have a grey or a bluish-grey appearance. The process has been referred to in modern times as one of *inoxidation*, the oxide skin being formed *in situ* on the metal. Inoxidised iron is excessively resistant against the wear and tear of friction and against weathering. It may be filed and actually chiselled without much injury being done to the oxide coating.

The thickness of the oxide layer which is produced on the iron articles depends upon the temperature, time and other factors prevailing during the "inoxidation" of the metal. It is possible to get a rust-proof coating on iron by exposing it to super-heated steam for about five hours at a temperature of only 260 deg. C., but usually the enduring coats of rust-resisting black oxide are only produced at temperatures above red heat.

A similar type of "inoxidation" process is the Gesner process, which was (and may still be) popular in Germany. In the Gesner process a current of petrol vapour is employed as the reducing agent instead of coal gas.

Ward's process also represents another of these inoxidation methods of rust-proofing iron. The iron object is slowly heated and a layer of silicate material is applied to it with a brush or by spraying. After the coating has dried, the object is then strongly heated, whereby the silicate material fuses and a portion of it is absorbed into the pores of the metal. By this method a very dense black coating can be given to the iron surface. Such a coating is highly rust-resistant, and it may be coloured by the addition of certain chemical salts to the silicate material just as ordinary glass is coloured by the incorporation of chemical salts in the siliceous fusion mass.

Coslettising

Perhaps the most popular of the present-day industrial treatments for rendering iron and steel rust-proof are those which provide a hard layer of iron phosphate for the metal.

The earliest and the best-known commercial process of this type is the well-known

The principle of Parkerising. The simple treatment of small iron articles in a phosphate bath.

"Coslettising" process, which was originally patented by Thomas Watts Coslett, an English chemist, in 1907. Coslettising consists essentially in immersing iron objects in a bath of phosphoric acid containing iron phosphate in solution. The bath is heated to near its boiling point and after about half an hour's immersion of the articles the process is complete.

In this manner a slate-grey layer of iron phosphate (and also iron oxide) is formed on the surface of the metal. This layer is exceedingly thin, yet, unlike a paint or a varnish, it is not an applied layer. It exists as an integral part of the metal itself, and, as such, it is not readily removed. The phosphate layer is hard and tough. It does not peel off or scale off. When the metal is bent, the layer bends with it and does not crack. When oiled, the layer acquires a soft, matt-black appearance, but usually coslettised articles are left unoiled, being subsequently stove-enamelled, painted or surface-treated in some other way in order to enhance their surface colour.

Owing to the fact that a coslettised layer is so extremely thin, even finished and machined articles may safely be subjected to this process without any fear of their dimensions altering. The coslettised surface is very slightly rough, which fact enables it to retain a coat of paint, varnish or lacquer much more securely than an ordinary glossy metal surface.

Since the original phosphate bath method of T. W. Coslett was brought out, various detail modifications and improvements have been made to the method. Coslett's later patent (1928) covered the addition of borax and/or boric acid to the phosphate bath, which treatment was found to decrease the immersion time of the articles in the bath.

Parkerising Process

The Coslett process was developed a great deal by the Parker Company, of Detroit, U.S.A. As a result of this company's activities, the parkerising process has been evolved. This, which has the same effect as coslettising, consists in immersing the well-cleaned and degreased iron articles in a bath made by dissolving iron filings in phosphoric acid. This solution is diluted and heated to nearly boiling.

In all respects parkerised articles have properties similar to coslettised objects. The protective skin formed on the surface of the metal is similar in composition and properties, although it may differ somewhat in actual coloration.

The actual thickness of the coslettised and parkerised coatings on iron are usually not more than 0.01 millimetre, and often they are as thin as 0.005 millimetre. The rust-resisting properties of the coatings are very high provided that the iron surface has been thoroughly cleaned and degreased prior to being subjected to the treatment.

Curiously enough, in either of the above treatments, the process bath acts best when it has treated about three batches of articles. For some reason, the baths require some type of "ageing" or maturing before they get into their prime condition.

"Atramentising" is a similar phosphate-coating process of proprietary origin. It requires a diluted solution known as "Atramentol" for its working.

"Bonderising"

The Bonder process—more usually known as "bonderising"—is a modification of the Parker process. Iron articles are parkerised in a phosphate bath containing certain additions of metallic salts (more or less secret). These metals are precipitated in their phosphate form along with the iron phosphate, the combined phosphates forming the surface skin of the metal. The Bonder process is said to operate to completion within six minutes, whereas the original parkerising method took anything from half to three hours.

Another modification of parkerising has been brought out by the Germans. It consists in parkerising an article normally, and in then suspending it for a few minutes in a boiling solution (5 per cent.) of potassium bichromate. This, the "Bichromate process," has not yet been worked in this country on a large scale.

Another class of rust-proofing methods for iron and steel comprises the deposition of zinc or aluminium on such objects by various means. A coating of zinc may be applied to iron or steel by electro-deposition. This process, however, is seldom worked, for the deposited zinc is too porous to be of much lasting service.

Galvanising

Galvanising is, of course, a very old process for the protection of ironwork from rust. Essentially, it consists in the dipping, either

by hand or by machinery, of the iron articles into a bath of molten zinc. The zinc is usually contained in an iron vat and its temperature must be carefully regulated. If the temperature of the zinc is too high it will attack the metalwork of its container, and will alloy too greatly with the articles dipped into it. On the other hand, if the temperature of the zinc is too low, imperfect adhesion of the zinc to the dipped article will result.

The surface of the molten zinc in the dipping vat is always covered over with a layer of flux, this latter comprising a mixture of ammonium chloride (sal ammoniac) and tallow, and sometimes, also, glycerine. Not only does the flux prevent the oxidation of the molten zinc, but it also serves to clean the dipped articles before they actually make contact with the molten zinc.

After being galvanised, the articles are usually wiped down with an asbestos wiper and set aside to cool. An average thickness of coating for a galvanised article is represented by a layer of 1oz. of zinc on 1 square foot of iron surface.

What is known as "galvannealing" is a process which is usually applied to galvanised iron wire, its object being to improve the flexibility of the zinc layer. In this process the galvanised iron wire is passed into a furnace where it is heated to 620 deg. C to 710 deg. C. for approximately a quarter of an hour. By this method, the zinc coating on the wire is more securely bonded to the underlying metal and is imbued with an extra resistance to peeling or scaling on the bending of the wire.

The Schoop Process

An entirely different principle of applying zinc to an iron surface is to be seen in the Schoop metallising process. In this process a wire of zinc is slowly fed into an oxyhydrogen flame through which an air-blast is directed. The zinc is immediately melted and volatised, and it is projected on to the iron article in the form of minute droplets.

The zinc spray is so exceedingly fine and cool that it can be directed on to combustible articles such as paper, fabrics and even lace without injury to them. Hence it is possible to metallise these articles in such a manner.

Some modifications of the original Schoop process employ an electric arc for volatilising the zinc. Furthermore, other metals besides zinc are now able to be volatilised in a similar manner.

Sherardising Process

The well-known sherardising process applies zinc to iron or steel by a different method. In this process the scrupulously clean iron or steel articles are put into a tightly lidded revolving drum in which they are heated with zinc dust to a temperature of about 375 deg. C. (i.e., just before the melting-point of zinc). The zinc at this temperature actually attacks the iron and alloys with it, forming a series of alloys ranging from pure iron at the bottom of the coating to pure zinc at the top of it.

The advantage of sherardising over the galvanising treatments is that it does not increase the dimensions of the treated articles. Hence, even the finest of screw threads may be treated by this method if necessary.

The introduction of sherardising was the result of an accidental discovery. The process is named after Sherard Cowper-Coles, who noted that iron articles which had been packed in zinc dust (which was then considered to be an inert material) and stored in a warm place for some little time, gradually acquired a surface coating of zinc. Commercial sherardising dates from the period 1910-1911, although it is only since the last war that the process has been made the fullest use of.

"Calorising"

A similar process to sherardising is that which is known as "calorising." In the calorising treatment aluminium powder is used in a similar manner to zinc dust for the coating of iron and steelware articles—and, also, for coating brass and copper objects.

Aluminium melts at 659 deg. C., but in the calorising process the iron articles are loosely packed in a drum which is filled with aluminium powder heated to about 900 deg. C. Some aluminium oxide is also placed in the drum, together with a little sal ammoniac. The drum is sealed and hydrogen gas is passed into it to prevent the oxidation of the aluminium. The function of the aluminium oxide is to prevent the bonding together of the droplets of metallic aluminium before making contact with the iron surfaces.

Normally, a calorised surface has a mean thickness of about 0.003in. In prolonged calorising treatments, the coating is rendered thicker in consequence of the aluminium's diffusing deeper into the surface of the iron.

Calorised iron is devoted mainly for service at high temperatures, under which conditions its oxidation resistance is good, since the surface film of metallic aluminium becomes superficially oxidised and inhibits further attack. It has been noted also, that calorised iron is resistant to sulphurous vapours, a fact which makes it of much use in the construction of chemical engineering plant for use in the coke industry, in oil-refining, and in other operations attended by the presence of sulphur fumes.

Filling ladle and moulds in a modern steel works.

"Chromising"

A still more recent rust-proofing process for iron and steel articles is that known as chromising. This is very similar to sherardising. The articles are packed in a drum together with a mixture of aluminium oxide (45 parts) and metallic chromium powder (55 parts). The drum is tightly sealed and it is heated to a temperature of between 1,300 deg. C. and 1,400 deg. C. Hydrogen gas is passed into the drum in order to exclude oxygen.

The chromising process is best applied to wrought iron or mild steel. A very hard and tough surface of metallic chromium is deposited on the articles, which surface can be polished and brought to a great brilliance.

Despite the introduction of all the above modern methods of rust-proofing iron and steel articles, the centuries-old process of tinning still flourishes, since, for certain industries, as for example, the canning trades, good quality tinned plate is essential.

Of recent years, tinning methods have developed and improved considerably. Essentially, the carefully cleaned and degreased iron sheet is dipped either by hand or mechanically into a bath of molten tin on the surface of which floats a layer of zinc chloride to act as a flux and an oxidation preventer. In order to get a more attractive tin coating, the sheets are dipped into a second bath of molten tin, which is covered with a fairly deep layer of thin oil.

The brightness of the tin coating is mainly dependent upon the rate of solidification of the tin layer. If this rate of cooling is too slow, the tin may discolour to a yellow hue. On the other hand, too rapid cooling of the tinned plate may cause a frosty appearance. Hence it will be seen that very careful control on the rate of cooling of the tinned sheets is essential.

When the tinned sheets are not to be used in connection with the canning of foodstuffs, it is permissible to "tin" the iron with a lead-tin alloy, which method, of course, considerably reduces the cost of the finished material.

Previous to all rust-preventing processes, of whatever nature, the iron or steel articles to be treated must be made scrupulously clean and free from all oxide depositions. If this requirement is not attended to, an unsatisfactory coating will be the result and the article will not be rust-proof.

For the degreasing of articles required to be rust-proofed, the principal agents are organic grease solvents, alkali solutions or controlled heat, whereby, in the latter instance, any oil or grease is burnt off the metal surface.

Pickling Bath

After the degreasing of the objects, they are usually pickled in either cold hydrochloric acid or hot sulphuric acid, although several so-called "secret" pickling baths are reputed to give improved results with a minimum of time and trouble in working.

Metal objects which have been thus treated are finally washed and then, if possible, immersed directly in the rust-proofing bath.

It is not easy to indicate whether any particular mode of rust-proofing is better than another. Ordinary galvanised iron, as is well known, will resist rust and corrosion as long as any of the zinc coating remains, the zinc, in this instance, acting as a sacrificial metal and allowing itself to be corroded rather than the iron.

Tin coatings, for most purposes, are less resistant, for the tin acts just the other way and allows itself to remain unoxidised at the expense of the rusting of the iron.

All metal-coating processes necessarily depend for their ultimate success and efficiency upon the resistant nature of the deposited metal.

NEW SERIES

Odd Jobs in House and Garden

3.—Easily-made Appliances for Facilitating Work in the Vegetable Garden

By "HANDYMAN"

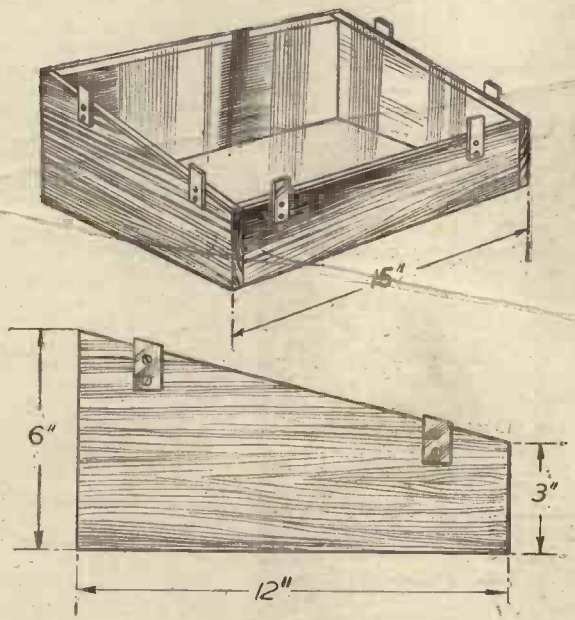
Small Forcing Frame

A GLASS-COVERED forcing frame is particularly useful in a small garden for forcing young plants for early planting out.

To make the small frame illustrated in Figs. 1 and 2 any odd pieces of ½in. wood can be used. Cut the two sides to the dimensions given, and plane the top, back and front edges square. The back of the frame is 13¾in. long and 6in. wide, the front board being the same length, but 3in. wide. Nail the sides to the back and front parts, and then plane the top edges of the latter flush with the inclined top edges of the side pieces, so that the glass will rest level on all four edges.

If made to the measurement given the frame will take a piece of glass measuring 15in. by 12in., but if a slightly smaller or larger piece of glass is available, the measurements of the frame can be altered to suit.

For holding the glass in position cut half a dozen pieces of 1in. by ½in. lath, about 2½in. long, and nail two of these to each side and front, as shown in the sketches. The top end should project about ½in. above the edges of the frame.



Figs. 1 and 2.—Perspective view of a simple forcing frame, and details of one of the sides.

A Weeding Tool

A handy tool for weeding, or for making furrows, can be made as shown in Fig. 3. A piece of iron plate about ⅛in. thick, 4in. wide and 7in. long, is cut with a hacksaw to the shape required, and the tapered edges filed to a bevel. Fix the plate in a slot cut in the end of the handle, using two stout iron screws. Drill two holes in the iron plate for the screws to pass through, and file the ends of the screws flush after they have been driven home tightly.

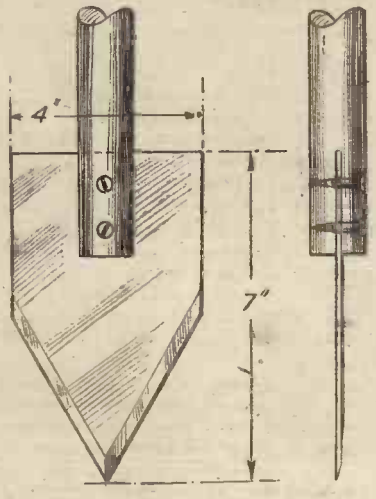


Fig. 3.—Front and side views of an easily-made weeding tool.

For Aerating Lawns

A simple appliance which can be used for aerating a lawn is shown in Fig. 4. Two pieces of wood measuring about 10in. by 4in. will be required, and in one of these bore twelve holes, spaced as shown, to take 4in. French nails. Drive the nails through the wood till the heads are flush with the top surface, and then screw on the other piece of wood, as indicated in the sketch. Fix the top part of the appliance to the end of a stout broom handle by means of a couple of iron angle brackets and screws. In use the tool is tamped over the lawn so that the nails penetrate deeply below the surface of the soil.

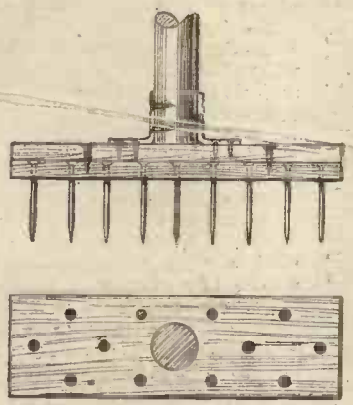


Fig. 4.—Side view and plan of a handy tool for aerating a lawn.

Protector for Seedlings

An effective guard for protecting seedlings from birds, etc. can be made as shown in Fig. 5. The guard consists of two semicircular ends attached to battens, 3ft. long, the whole being covered with string netting. As an alternative, fine mesh chicken wire can be used. Each end-piece, which is 10in. wide and 8in. high, can be cut to shape with a pad-saw. After cutting the slots for the ends of the battens fix them in place with a single nail. Two pieces of 1½in. by ½in. wood, 8in. long, and pointed at one end, are nailed to each semicircular end piece, as shown, to form pegs for pressing into the ground to hold the guard in place. The string, or wire netting, whichever is used, can be fixed to the edges of the end-pieces with wire staples. The netting can also be attached to each batten in one or two places.

This form of protector will be found much more handy than the ordinary pea-guards, which soon get bent out of shape.

A shorter or longer protector can be made by simply varying the length of the battens.

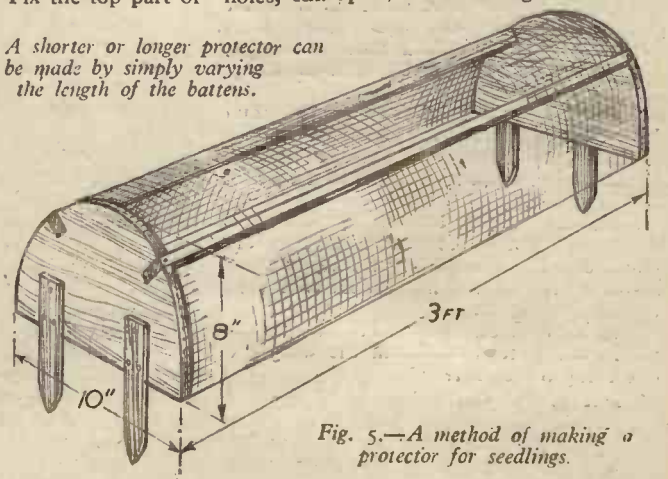


Fig. 5.—A method of making a protector for seedlings.

A Dibber

For planting potatoes, or cabbage plants, a dibber is very useful, and a serviceable one can be made with two pieces cut from an old broom handle. One piece about 8in. and the other 4in. long will be required. Whittle one end of the longer piece to a blunt point, and shape the other end to fit the handle, which is fixed in place with a single screw driven through the centre.

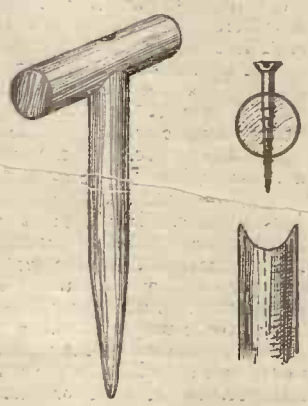


Fig. 6.—A useful dibber made with two pieces of broom handle.

A Simple Grass Rake

A useful light rake for removing grass cuttings or leaves from a lawn can be made as shown in Fig. 7. A piece of hard wood 12in. long, 3½in. wide and ¾in. thick is roughly planed on both sides and edges, and a row of holes, 1in. apart, bored through the middle.

Slightly stagger the holes to avoid splitting the wood, and drive in 4in. wire nails, which must be a tight fit in the holes. Either an ash handle, as used for ordinary garden tools, or an ordinary broom handle of suitable length, can be used. Chisel one end flat for a distance of about 3in. and at a slight angle, as shown in the sketch, and fix it in place with a couple of stout iron screws. The cross-piece which holds the nails can be coated with creosote, or other wood preservative, before use.

Keeping Tools Clean

A handy dodge for keeping gardening tools clean is to have at hand a deep box filled with sand. Provide a cover of some sort to keep the sand dry, and after scraping off the rough earth from the spade or fork, give the tool a vigorous digging in the sand, after which it can be put away and will then be ready for use in a clean and smooth condition.

An Improved Hand-fork

A simple tool that will save a good deal of backache can easily be contrived by taking an ordinary hand-fork and fitting it into the end of a piece of broom-handle, about 3ft. long. With this tool flower beds can be lightly forked over with ease, and the soil can be worked up close to the base of the plants. This implement will also be found useful for weeding flower beds and between rows of vegetable plants, where the ordinary hoe is more liable to damage some of the plants.

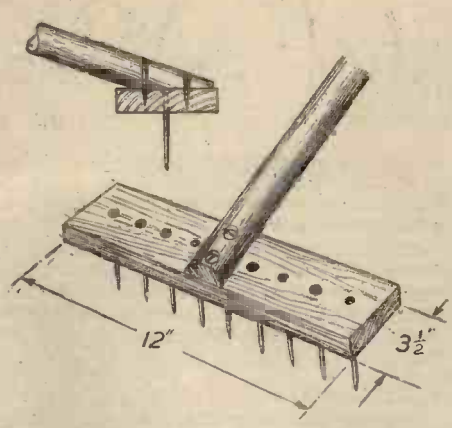


Fig. 7.—A light rake, made as shown, is particularly useful for dealing with grass cuttings or dead leaves.

Improvised Incinerator

A simple but effective incinerator can be made with about 1½yds. of thick wire-netting and three iron rods, or pieces of old gas piping. Bend the wire-netting to the shape of a wide-mouthed cone. Fix the overlapping edges of the netting with thick wire and support the wire cone between the three metal rods, which are driven into the ground. Fasten the cone to the rods so that the mouth of the cone is uppermost, and its bottom point a few inches from the ground, and resting on an inverted flower-pot. In this simple incinerator leaves, dead flowers, and any dry rubbish will easily burn away.

Items of Interest

A Grate Convenience

THE ordinary grate, designed to warm the sitting-room, is not infrequently commandeered to play the rôle of the kitchen stove. There is an adjustable arrangement to enable one to warm a kettle. More than one contrivance has been constructed for this purpose. There is, for instance, the trivet, comprising a plate with legs, fitted to stand on the hearth in front of the grate.

An inventor has set himself the task of overcoming the disadvantages of this and other previous devices. His idea is a support which comprises a pair of pillars and means for attaching these pillars to the grate so as to extend upward from the latter. There is a platform connected with the pillars in such a manner as to be movable from a position in which it is supported by the pillars horizontally over and spaced from the grate, into a vertical position between or alongside the pillars.

Accommodating Carrier

IT is natural that the names of two ladies should appear in a specification relating to the invention of a baby's protective helmet carrier. When not required for its principal purpose, this carrier can be used as a shopping bag. Made of waterproof material, it has a zip fastener and is provided with loops which enable it to be hung upon the handle of a perambulator.

Mechanical Date Indicator

IN spite of the paper shortage, the tear-off calendar, with its daily dose of moral instructions, is still used to indicate the date. Sometimes, however, one forgets to tear off the top leaf.

The consequence of forgetfulness could be prevented by the use of a mechanical date indicator, and an improved device of this type is the subject of an application to the British Patent Office.

This device is primarily intended to be driven by any suitable mechanism, such as a clock, capable of imparting a feeding movement to the indicator mechanism once every twenty-four hours.

The use of a contrivance of this description would reduce to a minimum the danger of one being out of date.

Bomber in Distress

A BRITISH bomber was in distress at night over Yorkshire and its petrol was running out. A centre controller saw by the plots that it would pass a nearer aerodrome than the one it was trying to reach, and, knowing of its petrol shortage, he asked the nearer aerodrome to send up rockets.

The bomber was landed safely and the controller was told by the Bomber Group to which it belonged that it would have been unlikely to have reached the further aerodrome before its petrol ran out.

They Pushed the Aircraft Clear

A POSSIBLE aircraft accident was averted by the prompt action of the entire personnel of a Coastal Command station in Scotland, whose combined man-power was used to move a wrecked machine from the middle of a runway.

Three aircraft were returning from patrol just after dark, their petrol running short. As the first landed, a tyre burst and the aircraft slid to a standstill with its undercarriage buckled beneath a twisted fuselage. Attempts to move the wreck by tractor were unavailing; and all the time the two other aircraft were circling overhead waiting to land, while their remaining petrol was fast disappearing. The ground off the runway was too soft to permit a landing to be made safely.

"Heave"

USING the station loudspeaker, the C.O. ordered every available airman in the camp to go to the runway. They came running from messes, rest-rooms and workshops. Several hundred of them managed to secure a handhold on the aircraft while the station commander directed operations. "When I say 'heave,' heave," he shouted. Gradually the damaged aircraft was lifted, hauled and pushed off the runway. A lamp winked at the two pilots still circling overhead, and one after the other they landed safely.

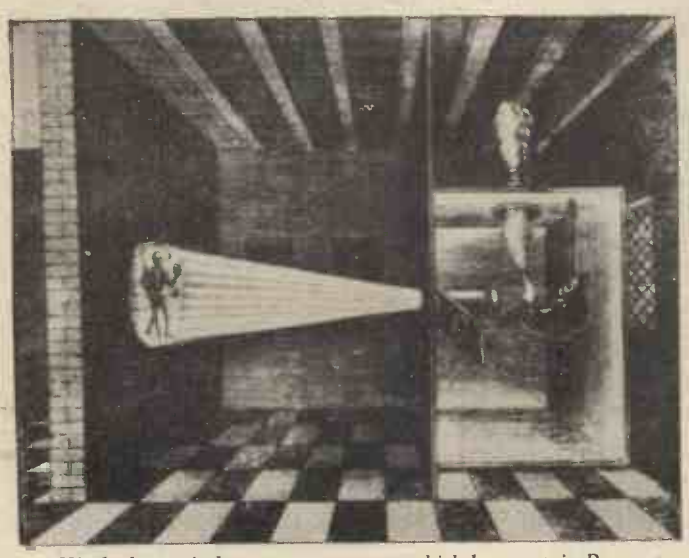
The aircraft carrier "Illustrious" is now in service again after being repaired and refitted in an American dockyard. Our illustration shows a corner of the boiler room with an engineer watching his gauge glasses.

MASTERS OF MECHANICS

No. 75.—The Work of Athanasius Kircher, Optician and Physical Experimenter

ATHANASIUS KIRCHER, the Jesuit philosopher and pioneer scientist, belongs to a romantic age. As physicist, optician, natural historian, mineralogist, metallurgist and, in some respects, even as mechanician, he exercised, both during his lifetime and after his decease, a considerable influence upon these various branches of expanding and developing science.

Father Kircher, as he is usually referred to by the older scientific writers, probably possessed a greater and a more varied stock of scientific knowledge than any of his contemporaries. The fact that he failed to hit upon any of the outstanding discoveries, such as those connected with the power of steam or the elementary principles of electricity or chemistry is, perhaps, consequent upon the enormous range of scientific interests to which, at one time of his career or another, he devoted his masterly powers. If you study too many different subjects, you usually fail to become outstanding in any one of them. That, in the main, was the position of Athanasius Kircher, for, besides dedicating his life to religion, he dabbled in numerous scientific "sidelines," becoming master of many but creator, hardly, of any.



Kircher's magic lantern arrangement which he set up in Rome.

Kircher, however, has at least earned lasting remembrance in the annals of science and mechanics if only in view of the fact that, so far as we can nowadays ascertain, it was his brain which originally conceived the notion of optical projection by means of an illuminating lantern and a simple system of lenses. Kircher, in this respect, figures not merely as the "father of the magic lantern," but also in the rôle of the cinema's grandparent, for clearly the projection principle of the cinematograph is identical with that of the optical projecting lantern.

Early Education

The life history of Father Kircher is a simple one. He was born in 1601 or 1602 (the exact date is disputed) near Fulda, a German town. In Fulda, the Jesuits had a college famous for its learning, and it was at this school that the young Kircher received his early education. He became a novice in the year 1618, at which time he would be about seventeen years of age. During the ensuing years, he prosecuted the long course of philosophical and theological studies upon which he had entered until, finally, he took Holy Orders in the Jesuit Society. From thenceforth, he undertook various teaching posts in Jesuit and other schools, teaching at different times in seminaries and colleges as far apart as Münster, Cologne, Coblenz, Paderhorn, Spires, Mentz and Würtzburg.

The subjects which Kircher taught at the various colleges in which he worked were almost as numerous as the colleges themselves. At Coblenz, for instance, he taught Greek, making himself a specialist in this language, whilst during his stay at Würtzburg, he was professor not only of philosophy and mathematics, but in addition a teacher of Oriental languages, in which latter subject apparently he had an excellent reputation.

In 1631, in consequence of the outbreak of war among the German States, Kircher left his homeland and crossed over to France, settling in one of the colleges of his Society at Avignon. He remained here until 1653, when he set off for Vienna, having been appointed to another professorship in that city. But the Vienna job never actually materialised, for on his way thither from Marseilles he was shipwrecked during the height of a severe storm, narrowly escaping with his life on the Italian shores. Instead of completing his journey to Vienna to take up his new appointment, he ended up, after a complication of circumstances, as a humble teacher of mathematics, mechanics and physics in the Jesuit College at Rome. Here he remained for the rest of his long life, dying there in 1680, in his eightieth year.

It was in Rome that Kircher fully developed his reputation as a scientific writer and an experimentalist. The devotion which he had formerly shown to classics and languages was now given to the various branches of science with which he became acquainted, beginning with mathematics and ending (if it ever did end) by an attempt to explain the constitution of the world.

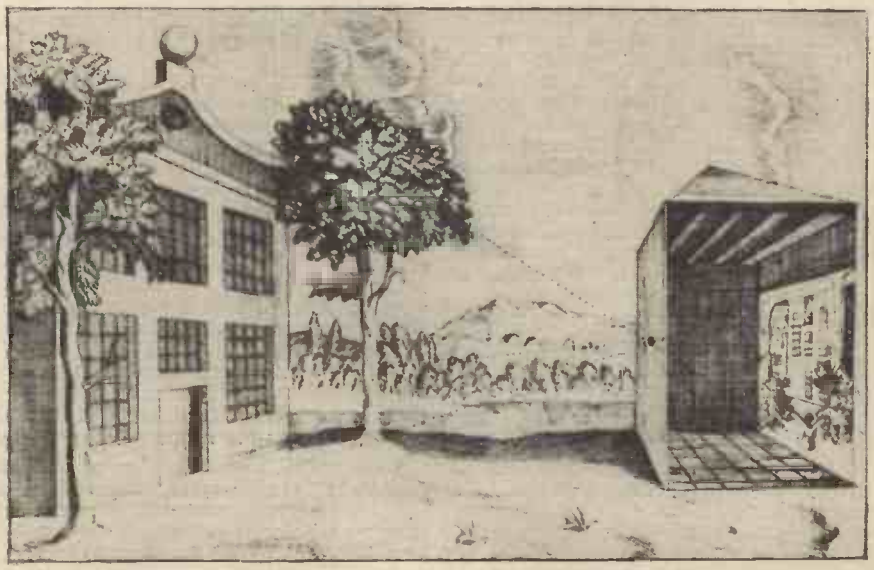
The Optical Lantern

The piece of work for which Athanasius Kircher is best known is, as we have previously pointed out, his invention of the optical lantern. This device has been attributed in principle to various individuals, including Giovanni Baptista della Porta (1545-1615), the famous Neapolitan physician and experimenter, and even to our own Friar Bacon, of England. But Baptista Porta invented the camera obscura, *not* the magic lantern, and whilst it is possible (as some have suggested) that the principle of the present-day optical lantern may have been known to some of the ancient civilisations, such as the Chinese, there is no doubting the fact that in the form or principle in which we moderns know it, the debt for its first introduction is primarily due to Kircher.

Kircher had long been interested in mirrors and lenses, and at one period of his career he spent a considerable amount of time and energy in making various forms of burning-glasses and burning-mirrors.

It may be recollected that the old Greek philosopher, Archimedes, the discoverer of the principle of specific gravity, is said to have set on fire the ships of the Roman fleet when they sought to invade his land. The apparatus with which he achieved this feat is recorded to have consisted of a large framework having attached to it a number of concave mirrors whereby the rays of the sun were made to converge at a distant focus.

Kircher, examining this legend, experimentally erected a wooden frame upon which five mirrors of concave formation were placed. These mirrors brought to a focus the sun's heat rays at a distance of about 100 feet from them, and at that distance they were able to set fire to inflammable materials. A drawing of this system of mirrors will be found in Kircher's interesting book *Ars Magna Lucis et Umbræ* (The Great Art of Light and Shadows).



An early illustration depicting how a lens may act as a projector of outside images.

So intent did Kircher become upon this subject that he made a special journey to Syracuse in company with his pupil, Schott, merely to view the scene of Archimedes' alleged triumph. As a consequence of these investigations, Kircher contended that if the story of the firing of the invading galleys by Archimedes' sun mirrors is a correct one, the ships cannot have been more than thirty yards distant from the mirror apparatus of the famous Greek philosopher.

Refraction Angles of Light

Another of the optical problems which Kircher attacked was the exact measurement of the angles of refraction of light by various substances. He determined the refraction angles of light when passing through glass, water, various oils, air, rock crystal and even wine. Kircher's Tables of refractive indices which he publishes in his *Ars Magna* must have constituted very important information for the early opticians, for although these people had little conception of the true nature of light, they at least understood the character of its refraction, it being, indeed, in consequence of such knowledge that new and vastly improved systems of lenses came into being.

Kircher's original magic lantern comprised a large wooden chamber built into a room, in which chamber was fixed a brass tube containing a projecting lens system. A glass slide was inserted between the lens components and, using a large oil lamp as an illuminant, the pictures painted on the slide were projected on to the wall of a darkened room.

Kircher seems to have caused quite a stir by his invention of the optical projecting lantern. His pictures were mostly of sacred subjects, but now and again he jocularly inserted into his lantern a picture of a fanciful nature.

"Magic Lantern" Entertainments

News of the achievement of Father Kircher in thus displaying his "magical" pictures quickly sped around Rome and the surrounding districts. Before long the learned Jesuit was almost nightly giving lantern displays in a room in the college, to which all the nobles and grandees of the city thronged with great enthusiasm. The world's first "magic lantern" entertainments, which afterwards, particularly in Victorian times, became such a great feature of popular and instructional entertainment, had thus begun.

In Kircher's days, however, the novelty of the lantern show soon died down. After all, there was very little excitement in viewing drawings and caricatures projected on to a whitewashed wall, and, of course, the invention of the photographic lantern slide was still about two hundred years off.

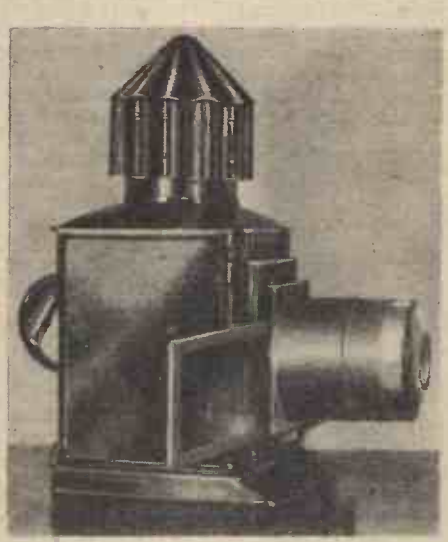
In his optical lantern device, Kircher introduced the use of the reflecting mirror positioned behind the illuminant, which device is still employed in our latest cinema-projecting apparatus. Compared, of course, with our modern arc-lamp illumination for large-scale projection work, Kircher's sole available illuminant was but poor and feeble. It consisted merely of a large oil burner which gave a bright but, nevertheless, a perpetually smoky flame. Perhaps this drawback may also have contributed to the eventual cessation of the Kircher lantern as an instrument of entertainment or even of instruction.

By the employment of an optical system, together with an illuminant consisting of three candles, Kircher was successful in projecting images of solid bodies. He thus appears as the first originator of the present-day epidiascope, although, for various reasons, the original Kircher system of "solid projection" was far too crude and inefficient to serve any useful or scientific purpose.

Another of Kircher's mechanical ideas was his creation of a sort of primitive loud-speaking system. In this respect he plays the rôle of forerunner of the telephone and of the loud-speaker.

The "Speaking Tube"

Kircher's apparatus for this purpose comprised merely a variety of speaking tube or sound-conduit. Its inventor had made an intensive study of sounding-horns and trumpets which he described in a book called *Phonurgia*. Kircher would appear to have reconstructed many of the war horns of the ancients and to have examined their sound-producing powers. By dint of such experiments he got together a large amount of empirical facts and practical evidence on the subject of the conveyance of sound along conduits. The result was the bringing into existence by Kircher of what was known in pre-telephone days as the "speaking tube." This took the form of a long length of hollow tube provided at one end with a mouthpiece and at the opposite end with a similar attachment to which the ear could be held. An individual speaking into the mouthpiece could be heard plainly at the opposite end of the tube several hundreds of yards away.



An early 19th century optical lantern.

Another claimant to the invention of the speaking tube is Sir Samuel Moreland. Nevertheless, a study of the evidence tends to reveal Kircher as the original inventor of this device, with, perhaps, Sir Samuel Moreland as an entirely independent inventor.

Magnifying Sound

Kircher was not satisfied with merely inventing a means of communicating sound and speech over distances. He went a step farther and, by an arrangement of horns and trumpets, he succeeded in actually magnifying sound on the principle of the megaphone. By attaching one or more of these sound-amplifying trumpets to the "receiving" end of one of his speaking-tube systems, he is said to have successfully preached a sermon to an assembly of people situated a couple of miles away.

Curiously enough, although he came very near to it, Kircher never applied the principle of his speaking-tube to the alleviation of defects in hearing. He never hit upon the simple device of the ear-trumpet, which, even in these days of electrical deaf-aids, still persists as a foolproof means of assisting defective hearing.

Of the purely chemical experiments of Kircher nothing can be written here. Suffice it to state that although Kircher had little, if any, fundamental knowledge of chemical science, he had sufficient sense to realise the falsities and the profound absurdities and chicaneries of alchemy, in which so-called science he expressed his greatest disbelief. He wrote a large book called *Mundus Subterraneus* ("Subterranean World") in which he dealt with the nature of ores and minerals, and in which he dubbed the alchemists a "congregation of knaves and impostors" and their science a delusion.

Mundus Subterraneus attained a well-deserved degree of popularity. In consequence, the whole of alchemical Europe rose up against Kircher and denounced him, some alchemists even going so far as to accuse him of wilful misrepresentation. To all such turmoils, however, Kircher turned a deaf ear.

Last Days in Rome

Until the end of his days he went on working in his college at Rome, teaching and experimenting, writing and lecturing. Kircher was a most voluminous and a prolific writer on many subjects. Some of his scientific works, with their quaint characterisations and illustrations, are still worthy of study by the historian of science and mechanics, but, unfortunately, apart from a few English translations, they are all written in Latin, which was, in Kircher's days, the only "learned" language of the time.

Apart from his having left to us the vitally important technical principle of the optical projecting lantern, Athanasius Kircher, measured by the standards of his time, was truly a wonderful and an amazing character.

Aerial Films of Battle Practice

CONSTANT mock-battle practice is one method by which Coastal Command pilots keep themselves in fighting trim. Combat is not the main business of these reconnaissance aircraft, but as aerial scouts, they must always be ready to fight their way out of tight corners.

At a station in Northern Scotland, pilots of Lockheed Hudsons, when not standing ready for operations, are often in the air weaving through intricate manœuvres with Spitfires from a neighbouring aerodrome. These Hudsons have been fitted with the ciné camera gun in the rear turrets, and as the Spitfires also have a camera aligned with their guns, pilots and gunners can later see for themselves what happened.

Weaving all over the sky go the two machines: the Spitfire, faster than the Hudson, having the advantage of manœuvrability. Side attacks, stern shoot-ups and head-on bursts; climbing turns, tight banks, 90-deg. sweeps at such speed that the mind goes dizzy and a black-out begins.

Pressing the "Gun" Button

The Spitfire pilot, when in position, pushes his gun button. But instead of a rush of bullets the camera records his aim. The rear gunner of the Hudson swings frantically round in his hydraulic turret and his ciné camera also ticks his "hits" and "misses."

The Hudsons perform astonishing aerobatics during such mock-battles. They are sometimes thrown about the sky with the abandon of a Hurricane.

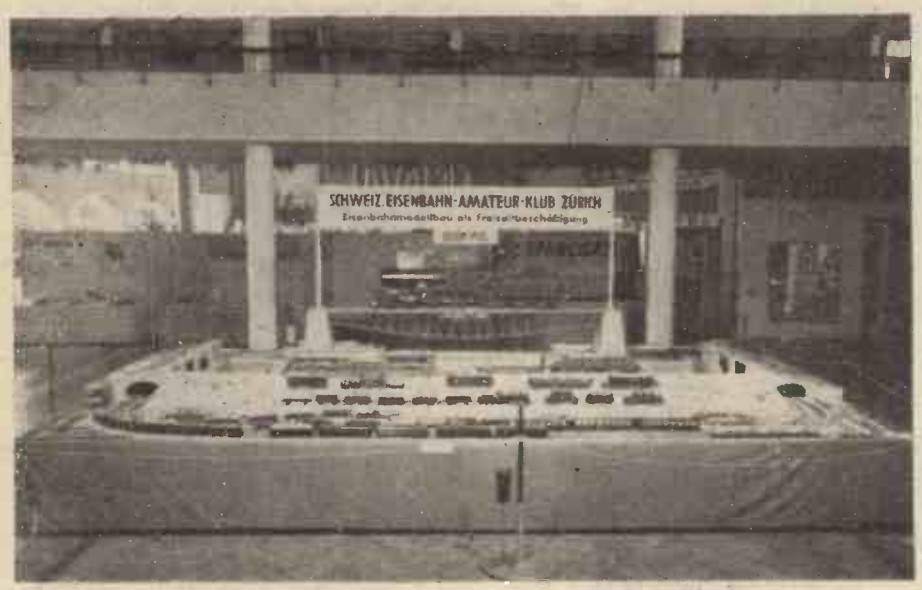
The fighter pilots have nothing but praise for the Hudsons, and say they have their work cut out to out-manœuvre them. There are cases on record of Hudsons having dived at 350 m.p.h., and then maintaining a speed of 300 m.p.h. on coming out of the dive. Of course, these are freak speeds for which the aircraft was never designed, but tight turns at 230 m.p.h. are considered normal.

In this way new fighting tactics are evolved and are practised over and over again until perfect—woe betide the Me. 109 which attacks the Hudson that is perfectly rehearsed in its fighting technique.

THE WORLD OF MODELS

By "MOTILUS"

The "Human Touch" in Models: News Again from Abroad: London "Rendezvous" for the Model World!



A postcard from abroad, showing Swiss modelling in 1942.

Sentimental Model-making

MODEL-MAKING has a sentimental appeal to some people. A man I know, who is a bus driver, had a son who was an officers' steward on H.M.S. *Southampton*. The boy, Douglas Rennie Leeding, was lost with his vessel when she was sunk in the Mediterranean on January 11th, 1941.

You will meet many a sailorman who looks on his ship as a living thing, and surely, when she founders what better place is there for her spirit than with her crew? Something of this may have been in the father's mind when he determined to make, with his own hands, a model of the ship in which his boy was lost.

First of all he asked about a finished model of the *Southampton*, but the one shown him was too small and consequently there was not enough detail for his liking. He was then shown a set of parts for building the *Southampton* at 50ft. to 1in., and, although he had never thought of model-making before, he decided to try it, and in his evenings at home built a replica which has quite an aura of reality about it, as will be seen from the picture.

Mr. Leeding does not claim to be an expert, in fact this was his first really serious attempt at model making and his only reason for wanting it was that his son was on the ship. It has not the finish of the professional craftsman, but certainly portrays the proportions of the ship faithfully and has the general atmosphere and character of it to an unusual degree, a good reward for twenty hours' work by Mr. Leeding.

H.M.S. *Southampton* at the beginning of the war was the last word in British cruiser design. With 9,000 tons displacement, the "Southampton" or "City" class, with their fine lines, raked funnels and tripod masts, are fine waterline model subjects. Each vessel's armament is four triple 6-in. gun turrets, eight 4-in. A.A. guns, machine-guns and torpedo tubes. Each ship also carries two aircraft and you will see one of these amidships on the model.

Swiss Club Meeting

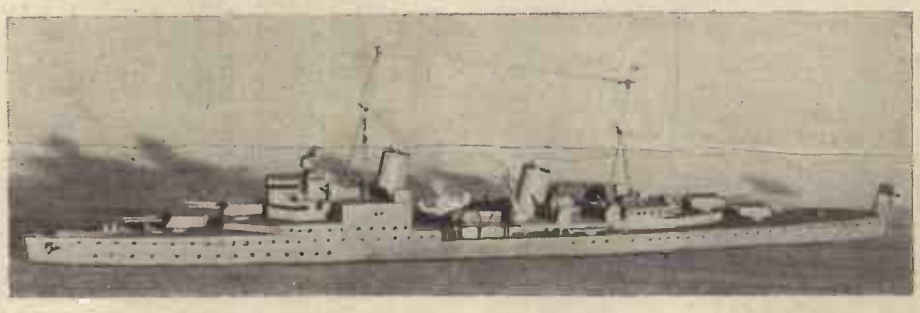
Model news from abroad is scanty in these days, and the slow postal communication between countries at war and those watching the conflict makes correspondence difficult. But we are very pleased to learn that our model friends in Switzerland appear as active as ever, and little affected by the war which rages round this progressive little country of Central Europe.

The Schweiz Eisenbahn-Amateur-Klub of Zurich held their annual meeting in January, 1942, and I have received a greeting card from Walter Siegwart, the president, signed also by twenty fellow members, among whom are many personal friends of mine. As will be seen from the picture postcard, their exhibit at this annual meeting included the 7¼in. gauge L.M.S. *Royal Scot* model, which occupies the place of honour! This locomotive, readers will remember, was made recently by the Brast Brothers, of Lucerne, from Bassett-Lowke drawings and castings supplied just before the outbreak of war.

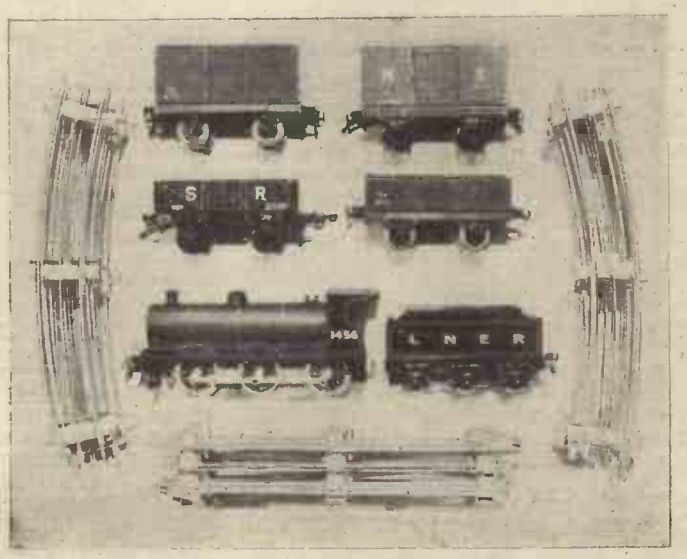
I hear there is a movement on foot in England to have a permanent model-makers' "rendezvous" in some central part of London, where various model tracks would be permanently fixed and where members and friends could meet to discuss their problems, try out their models on the track, and generally use it as a centre for interchange of "news and views"!

Lt.-Colonel J. T. C. Moore-Brabazon, who has been created a peer of the realm, is keenly interested in the project and hopes to be one of its active patrons after the war is over. This reminds me that I heard recently he had become a member of the International Brotherhood of Scale-craft Model Railroad Engineers. This is the American-founded society of which Mr. W. J. Bassett-Lowke was the first British member, and it issues to each member, besides the membership card *and* a tie clip in the form of the earliest American locomotive, a bond of uniform "headgear" in the shape of an American engine-driver's cap!

For those who still wish to make a start in gauge "O" railways or require some additions to their direct current railway, I notice that Bassett-Lowke, Ltd., are offering, while their stocks last, a limited number of sets consisting of an L.N.E.R. 6-coupled goods locomotive and tender (fitted with junior permanent magnet mechanism, 6-8 volts d.c.), four assorted goods vehicles (two open and two



A 50ft. to 1in. model of H.M.S. "Southampton," built by a bus-driver whose son, an officers' steward, was lost with the ship.



The gauge "O" bargain set mentioned in these pages.

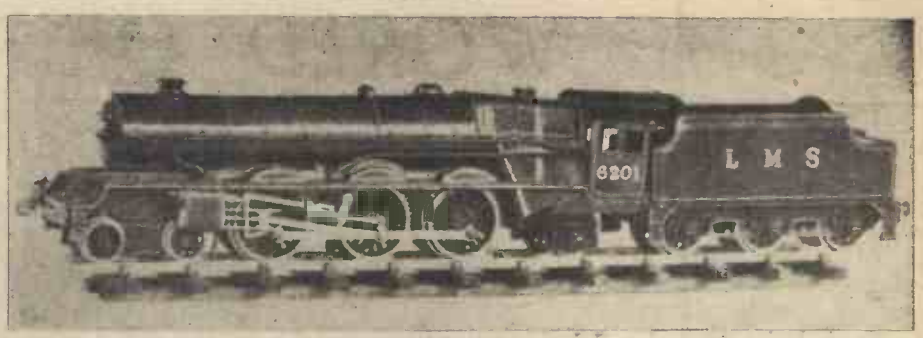
covered), 12 tinplate curved rails (fitted with centre rail, for 4ft. diameter circle), five straight rails and one connecting rail, to complete the oval track. No more material of this kind is being manufactured while the war lasts, and therefore my advice to those interested is to take immediate steps to secure the goods! I believe the price works out at £3 12s. 6d. the set, which is very reasonable indeed as war-time prices go.

The model locomotive works off 6-8 volts d.c., and as rectifiers are no longer available and accumulators not easy to obtain, here is a chance to make use of the car accumulator now that practically all automobiles are "laid up" owing to the petrol restrictions on their use for joy-riding.

If you can't run your car, run your railway instead!

Model of Boat-releasing Gear

In looking over some photographs the other day I came across some of an interesting model illustrating the operation of a special kind of davit. Here is a picture which shows the automatic single-handed operating releasing gear—which is Columbus semi-rotary pattern. The model is shown with a section of the ship's deck at an angle to demonstrate that a boat can be launched under almost any conditions by one man. This model was built as long ago as 1927, but has a topical interest in view of the great sea war now being waged between the Allies and the Axis powers, when the saving of even one man aids the war effort.

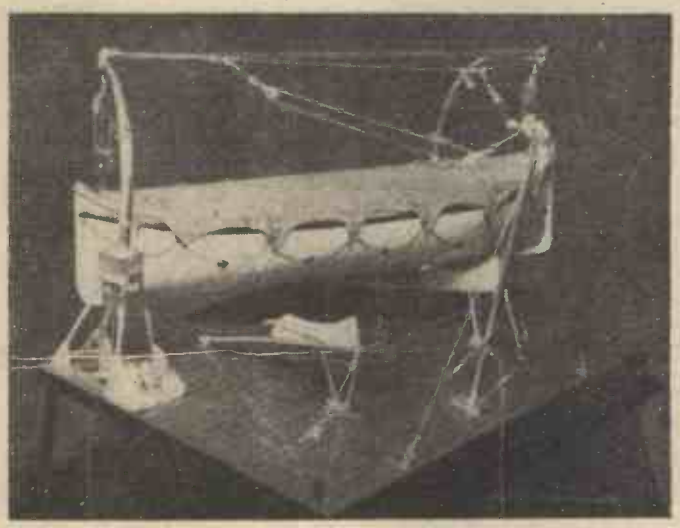


Colonel Croft's "Princess Elizabeth" with certain of the scale modifications he is making on the model.

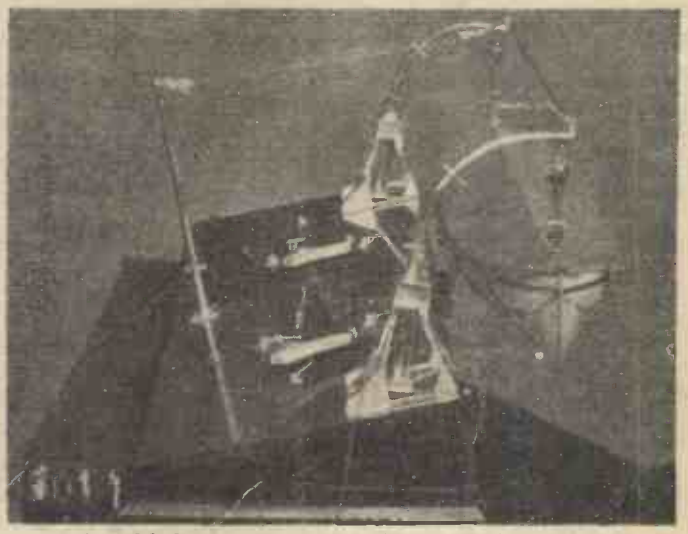
An Improved "O" Gauge Loco

Colonel C. M. Croft, M.I.Mech.E., chief engineer and general manager of the Wandsworth and District Gas Company has been mentioned before in these pages as a model connoisseur. He has recently sent me a photograph of a standard clockwork gauge "O" *Princess Elizabeth* model of which he has made several modifications.

He has fitted the bogies with scale wheels and the locomotive will still take a radius of six feet. He is now adding other small external details and hopes to conjure an almost "glass case museum model" from the standard commercial production.



Columbus semi-rotary automatic single-handed boat-releasing gear.



A model showing the working of this special kind of davit.

The Focke-Wulf 190

MORE and more frequently, in accounts of the air fighting across the Channel, mention is made of encounters with Germany's new fighter, the F.W.190. "F.W." are the initials of the Focke-Wulf concern which produced the big Kurier four-motor commerce raider.

So far in their sweeps, and on bomber escorting raids over enemy occupied territory, British Spitfires have had much the best of these brushes with the F.W.s. This despite the advantage which the Nazis had in operating near their own bases, and with the support of ground defences.

The R.A.F. first ran into the F.W.190 last September, when two radial-engined fighters of an unidentified type were reported shot down. Since then the F.W. has appeared in increasing numbers in the West. From twos and threes they have been met with in batches of at least 30. The type has also been reported in action against the Russians in the East.

What is new about this German fighter? How does it compare with the Nazis' other standard single-seat fighter—the Me.109? More important still, how does it compare with the British Spitfire?

Radial Motor

The first and most obvious point about the F.W.190 is that it has an air-cooled radial motor, instead of the liquid-cooled, in-line type generally chosen for fighter aircraft where speed is a foremost consideration. Apart from any purely mechanical advantages or disadvantages it is obvious that the shape of an in-line engine—with cylinders arranged one behind the other—lends itself to better streamlining than the radial form, where the cylinders are arranged in a circle. For this reason most of the world's fastest short-range fighters—British Spitfires and Hurricanes, American Airacobras, Russian M.I.G.3s, German Me.109s and Italian Macchi 202s all have liquid-cooled, in-line motors.

Only in America has the air-cooled radial continued to find favour on single-seat fighters of recent years; and there a great deal of development went on after other countries more or less dropped the type. One result of American research was the Curtiss Hawk fighter supplied to the French Armée de l'Air, and which, though comparatively slow, did great work against the Nazi Me.109s before France fell.

In reverting to the radial engine for a new fighter to which, judging from their extravagant claims, the Germans at one time pinned a good deal of faith, it would seem that the Luftwaffe have some special object in mind. It has been suggested that their need was for an interceptor with a very rapid rate of climb to contend with the increasing power of British sweeps over occupied territory. But as these sweeps are of comparatively recent date, and it takes a considerable time to design and build a new aircraft, it is certain that the development of the F.W.190 was started much earlier, and with a different object. More probably the outstanding successes which the highly manœuvrable Hawk 75s gained during the Battle of France impressed the Germans with the possibilities of the type.

1,600 h.p. Engine

The engine appears to be a hotted-up version of the B.M.W. 14-cylinder engine, similar to that fitted in the Nazis' new 2-motor bomber, the Do.217E. It probably develops around 1,600 h.p.—which is about 25 per cent. more power than the latest Me.190 is credited with. In general appearance it is not unlike the Messerschmitt; its armament is not very great—less than the latest British Spitfires and Hurricanes.

QUERIES and ENQUIRIES

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

Smoke Candles

I HAVE been trying to make a smoke candle but have not been very successful. I have been using 3 parts coal tar, 3 parts soot, and 2½ parts sodium chlorate. The candle starts off very well, but when it has been burning a short while it appears to give off gas which burns with a roaring flame, and consumes all the smoke. I also tried pot. chlorate instead of sodium with the same result.

Could you please give me an easily obtained formula which will give sufficient smoke to provide good cover ?—Norman Terry (Bromsgrove).

THE trouble in your case seems to be, that you have used too great a proportion of sodium chlorate. Make experiments with a smaller proportion of this salt.

Personally, we are of the opinion that chlorates are too vigorous in their combustible properties for the making of smoke candles, which latter require to be fairly slow burning. If you substituted potassium nitrate (saltpetre) for sodium chlorate in your formula you would, we think, get far more satisfactory results. You might also add a little powdered sulphur (say ½ part) to the mixture. This would tend to regularise combustion. A small amount of zinc dust (¼ part) would also increase the density of the smoke. We fear, however, that you will not be able to obtain this material now, although it is usually obtainable from large firms of laboratory furnishers, as, for example, Messrs. Philip Harris & Co., Ltd., Birmingham, or Messrs. Reynolds and Branson, Leeds.

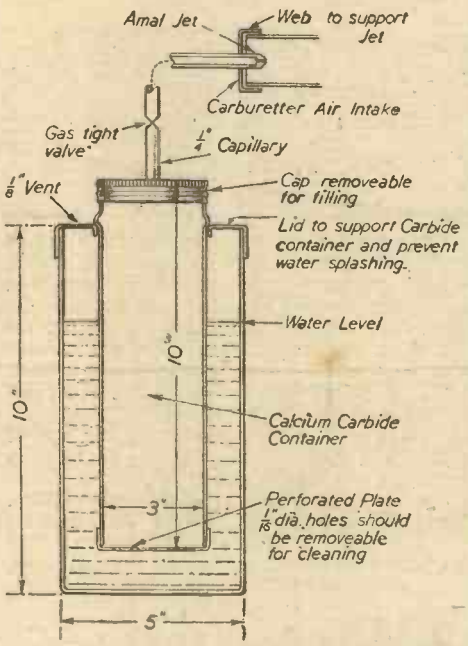
Running Motor on Acetylene Gas

IN the July, 1941, issue of "Practical Mechanics" you published an article on the conversion of a petrol engine to operate on acetylene gas. I have a motor-driven mower fitted with a 98 c.c. two-stroke engine which I should like to convert for operation on acetylene gas. How could I make a suitable container in which to generate the acetylene gas ?

Also, where could I obtain carbide in bulk, and the barrel type acetylene burner ? If you do not think this method is suitable for a mower, could you tell me where I could get a gas bag, etc., to convert it to run on coal gas ?—H. R. Williams (Caister-on-Sea).

YOU should have little difficulty in converting the 98 c.c. two-stroke engine to use acetylene gas provided you are prepared to experiment with the size of jet required for the gas supply to the carburettor. We suggest you should drill and tap the delivery end of the pipe which enters the air intake of the petrol carburettor (see sketch) to take an Amal or similar brass jet; you can then change the jets until you find one which suits your particular engine. The jets can, of course, be drilled, but as the size hole you will require is small, probably about 50 Morse, care must be exercised to get the drilling true.

Regarding the generator, the accompanying sketch shows a simple type that can be made up from scrap material or clean tinned containers, such as paint cans. The dimensions given are intended to be a rough guide as they are by no means critical. It is most important that the control tap at the top of the generating chamber should be a good one, a small needle valve as used in model work would be ideal. The operation of the generator is self-explanatory from the sketch. When the tap is turned on water enters the carbide chamber and gas is generated; as the pressure increases the water is expelled and generation stops.



Sectional view of a simple type of acetylene gas generator made from scrap material.

The working pressure is equivalent to the head of water in the outer chamber, and the device is quite automatic.

As your two-stroke engine has "oil-petrol" lubrication, you must, of course, incorporate an oil drip feed somewhere in the induction system. For bulk supply of calcium carbide Messrs. Shawinigan, Ltd., 113, Foxley Lane, Purley, Surrey, may be able to supply you.

Arc Welding

I AM anxious to construct a small arc-welding outfit using a metal electrode for such welding as motor-car mudguards and valances. The supply available is 200 volts A.C. (50 cycles), single phase. The fuse board in circuit is 15-20 amp. What approximate amperage would be required, say, on a 30- or 50-volt output transformer ? Where can a suitable transformer be obtained ? How are the current or wattage requirements worked out for different size welding plants ?—C. W. Massey (Sheffield).

FOR arc welding it will be found that continuous current gives better results than alternating current, and especially in the case of thin sheet metals. The conversion of alternating to direct current is usually accomplished by installing an induction motor coupled to a direct-current generator. The latter is wound specially to give a dropping voltage characteristic which will limit the current output to about 25 per cent. excess of normal when the electrodes are momentarily short-circuited. Fifty to 70 volts is a normal pressure for the generator, and a 5 kW. plant is about the smallest that will be found satisfactory for welding up to about 16 gauge sheet steel. Each maker has his own equipment of controls and special devices, which differ for individual jobs, and it is advisable to consult the actual manufacturers, such as The Quasi-Arc Welding Co., Ltd., Bilston, Staffs.

Lead Castings

I HAVE made a small mould and core for casting lead toy motor-vans, but have had little success in the casting, as the lead cools off before completing the shape, even though the mould is heated and the lead poured in red hot. I would be obliged if you would explain the actual process used in the manufacture of lead castings, the percentage of alloy in the lead and the best materials of which to make the mould and core ?—H. J. Tharme (Birkenhead).

IT is obvious that your trouble is due to using the wrong alloy, and we suggest 50 per cent. lead, 50 per cent. tin for this purpose. This should give ample fluidity. The moulds can be made of plaster of paris.

Platinum Black

CAN you inform me how to prepare a small quantity of the black oxide of platinum described in your "Dictionary of Metals and Their Alloys" as being very chemically active? I believe it is made to glow by passing the fumes of wood spirit near it.—A. S. Brown (Luton).

THE "black" platinum is not an oxide of platinum, but platinum metal in a very finely-divided state. It is purely on account of this latter fact that "platinum black," as it is usually called, is so highly active.

Platinum black is conveniently prepared by adding a few drops of formalin to a solution of platinum tetrachloride, and by warming the solution. The platinum black will be precipitated, and can be filtered off. Since platinum tetrachloride (in common with all platinum compounds) is highly expensive, we think that, in your case, it would be more satisfactory for you to purchase the platinum black ready prepared.

You could purchase, say, half a gram of this material from Messrs. Johnson, Matthey & Co., Ltd., of Hatton Garden, London, E.C., the price being around 5s.

A slow jet of hydrogen or coal gas directed on to platinum black will cause the latter to glow, and finally to ignite the gas. You should note, however, that only freshly-prepared platinum black possesses this power, and that the material gradually loses this power with age.

Running Cars on Coal Gas

I SHALL be glad to have your advice upon the following points in connection with the use of coal gas as a fuel for automobiles:

(1) Can you supply the name of the makers or suppliers of the G.L.C. carburettor?

(2) As a gas bag is rather unwieldy, on a private car at least, I propose to use the gas compressed in steel bottles; arising from this: (a) What type of decompression chamber would be necessary to reduce the gas to the normal pressure for feeding to the engine? I should like very full data on this point. (b) Would one of the proprietary brands of bottled gas, such as "Calor Gas," be a suitable fuel?

(3) Would it be possible for me to fill the bottles myself from the domestic supply? If so, could a suitable compressor be made from an old motor-cycle engine? Perhaps you could recommend some book on the latter point. What is the maximum safe working pressure in steel bottles of this kind?

(4) Where are the regulations mentioned governing the use of gas as a fuel available? The local police office know nothing of them. In view of the possible cancellation of the basic rate for private cars, I assume that a gas-propelled vehicle would not be affected.—J. W. Fuzzard (Stockport).

(1) The G.L.G. carburettor can be obtained from either of the agents, Grant and West, Ltd., 3, Furlong Road, London, N.7, or Allen Neil, Ltd., 232, Norwood Road, London, S.E.27. The No. 1 is suitable for engines of R.A.C. ratings up to 10 h.p. and the No. 2 up to 30 h.p.

(2) Regarding the proposals made in your second question we are afraid our reply must be discouraging. Gas cylinders are difficult to obtain unless for official purposes, and if you were able to obtain them, their capacity to weight ratio is very low. A standard cylinder, for example, is about 4ft. 7in. long and 7in. diameter, and weighs approximately 100lb.; its capacity is only 100 cubic feet at 120 atmospheres (1,800lb. sq. in.), equivalent to one-third of a gallon of petrol. Compressed gas vehicles (lorries, buses, etc.) are provided with special high-pressure cylinders, usually 200 ats. (3,000lb. sq. in.) and of 300 cubic feet capacity. It is doubtful if you could obtain suitable cylinders at this time. In reply to (a), de-compression from high-pressure cylinders to the carburettor is usually carried out in two stages by means of governors, the first from 3,000lb. to 250lb. sq. in., and the second from 250lb. sq. in. to atmospheric pressure. Suitable governors can be obtained from Bellis and Morcom, Ltd., Ledsin Street Works, Birmingham, or Bryan Donkin Co., Ltd., 3, Victoria Street, London, S.W.1. (b) Bottled gas, which consists chiefly of propane or butane or a mixture of these gases, has a calorific value of about 3,000 B.Th.U. per cubic foot compared with town gas at 500 B.Th.U. per cubic foot. A commercial bottle of butane holds roughly 200 cubic feet of the gas, which is a liquid at 35lb. sq. in. and room temperature; this is equivalent to 4 gallons of petrol. The G.L.C. carburettor would not be suitable for this high calorific value gas as it has not sufficient range of adjustment. A suitable carburettor is the Holtzapfel or Eclipse butane carburettor, which is of American origin. We cannot trace the British agents, but would advise you to approach the bottled gas companies.

(3) The Gas Undertakings Act, 1934, section 25, requires you to give 14 days notice in writing to your gas undertaking if you wish to fit a compressor on any gas supply, domestic or industrial.

It would not be practicable to use bottled gas cylinders for town gas. Their normal working pressure is 30-35lbs. sq. in. and their capacity only 6 cu.ft. of town gas at this pressure, equal to 1/50 gallon of petrol. High-pressure cylinders would require a delivery pressure of at least 120 ats. (1,800lb. sq. in.), and this would not be easy with a single stage compressor. For information on compressor design we suggest you consult: "Ford's Compressor Theory and Practice," published by Constable.

(4) The regulations governing the use of gas as a motor fuel apply to all vehicles making use of the public highways. They can be obtained from H.M. Stationery Office, and they are entitled "Motor Vehicles (Gas Containers) Provisional Regulations, May 15th, 1940; and Amendments Thereto, June 22nd, 1940."

Rewinding D.C. Motor for A.C.

I HAVE a ¼h.p. B.T.H. direct current motor, with a laminated field, compound wound (200-240 volts), and having a speed of 1,600-1,860 r.p.m.

Would it be possible to convert this to an alternating current, 230 v. self-starting motor, without rewinding the armature?—P. N. Greenhalgh (Buxton).

THE ¼ h.p. 200-240-volt direct current motor you refer to can be quite well converted for running on alternating current if the fields are rewound, without altering the armature in any way, and as the fields are fully laminated the motor should be capable of continuous service without giving too high a temperature. For 230 volts 50 cycle circuits the field coils should be rewound with 330 turns of No. 22 s.w.g. d.c.c. copper, each connected in series with one another and with the armature. The speed will, of course, depend upon the load at the time being, and the motor will have the usual "series speed characteristic" developing about ¼ h.p. at 2,000 r.p.m. approximately.

Experiments in Radiography

I WISH to undertake some simple experiments in radiography. I have no facilities for making an induction coil, but could build a Wimshurst machine, and could also "blow" a tube and evacuate it. Would you kindly favour me with answers to the following questions:

(a) Approximately what voltage and milliamperage could I expect from a Wimshurst machine with plates 24in. diameter? I understand that I could improve its performance (by reducing surface leakage) if it was operated with the plates sealed in a chamber of compressed air or CO_2. Is this so? And what would be the running speed?

(b) Would a mercury pump (say, Sprengel's) work well on a bulb about the size of a man's fist? (Or would it be better to connect the tube to a reservoir of boiling mercury and then seal it off?)

(c) Are there any firms handling X-ray apparatus (tubes) for experimenters? And what would be the approximate cost of a fluorescent screen, say, 6in. by 6in.?—B. R. Byrne (Ashford).

THE Wimshurst machine will quite well serve to experiment with provided it is not too small. One with 24in. plates provided with Leyden jar condensers is suitable, and under favourable climatic conditions may give a good thick 3in. to 4in. spark. Assuming spherical discharge terminals of 125 mm. and a barometric pressure of 760 mm. this would represent a spark-over voltage of some 140,000 volts, but the milliamperes could not be closely estimated, as this would largely depend upon the capacity of the condensers. The chief disadvantage of the Wimshurst compared with the high-tension transformer is its slowness of operation, the sparking rate being much less frequent owing to the time lag in charging up the condensers, which makes it impossible to get a continuous picture on the fluorescent screen. The length of spark can certainly be increased by enclosing the whole in an airtight casing and working under compressed air, and many years ago a machine was put on the market so constructed. It was not found a practical success, however, owing to difficulties in maintaining compression and avoiding leakage to the casing. As regards focus tubes, one of 4in. to 6in. diameter would be best suited to the above size of Wimshurst, but you would be well advised not to spend time in attempting to make the tubes yourself; it is entirely a specialist's job, and you may be able to obtain what you want from Cuthbert Andrews & Co., Red Lion Street, Holborn, W.C. A fluorescent screen, on the other hand, is easily and cheaply made at home by brushing thin gum arabic over a sheet of white card (Bristol board), and dusting on it from a muslin bag finest crystallised calcium tungstate while the gum is still tacky. When dry shake off the surplus. The powdered calcium tungstate is useless; it must be finely crystallised. Be careful to guard against dermatitis if you are experimenting with X-ray screens. Thick rubber gloves are essential.

Reducing Speed of a Universal Motor

A Correction

THE diagram illustrating our reply to the query under the above heading in our April issue was, unfortunately, incorrect. The arm of the potentiometer was shown connected to one side of the mains, whereas no such connection should be made. One other point needs stressing. The potentiometer must be capable of carrying the motor current, 1½ amps., plus the current flowing through the potentiometer. A safe rating would, therefore, be 3 amps.

THE Cyclist
Editor: F. J. CAMM
VOL. X JUNE, 1942 No. 244

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

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

Comments of the Month By F. J. C.

The Duke of Gloucester's Red Cross Fund

Special Appeal to Cyclists

A PERUSAL of the minutes of a meeting of the Sports Committee of the Duke of Gloucester's Red Cross Fund is a damning indictment of the cycling community. The latter is perhaps the largest section of the sporting community, for there are twelve million cyclists. Whilst we find that other sports have contributed comparatively large sums to this most laudable object, cycling has produced comparatively little. In this it seems to bear out the experience of other appeals to cyclists on behalf of charity. Even the schemes which have been in operation throughout the country to provide aeroplanes —the Spitfire and Hurricane Funds—have not been well supported by organised cycling.

In the minutes referred to, we find that snooker competitions organised from a local centre raised £2,665; bowls, £2,996; cricket, £2,036; darts, £3,476; golf, £9,549; football, £1,888; billiards and snooker, £8,851; lawn tennis, £5,697; greyhound racing, £8,332; table tennis, £470; swimming, £275; whist, £1,332; racing, £6,721; bridge, £397.

Now, where do we find cycling in this record of effort on behalf of the Red Cross? We must look down the list amongst the less popular pastimes, and even then it is only less conspicuous because it is almost at the bottom of the list. For example, angling produced £73; badminton, £35; croquet, £91; field sport, £64; shooting, £751; and cycling—we are almost ashamed to record it, only £18. This is a state of affairs which ought to be remedied at once. By the time you read this undoubtedly it will have been remedied, for as we go to press we learn that as a result of a special effort, the first £1,000 is now in sight. This has been achieved because the Sportsmen's Committee of the Duke of Gloucester's Red Cross Fund has appointed one prominently associated with cyclists and cycling to organise the appeal.

Special Methods

IT may be that many cyclists have subscribed to the Red Cross through other channels, and are still doing so; but whilst other sports are organising, and very successfully, their own special methods for raising funds, cyclists should follow suit, and demonstrate not only the strength of the cycling movement, but that they are no less generous than the followers of other sports.

Herbert Goodwin is in charge of this cyclists' appeal. He proposes to form an Advisory Committee and invites offers from clubmen and clubwomen who can act on such a committee. We shall be glad to place those interested in touch with him.

During the period of October, 1939, to November, 1941, only £203 odd appeared to the credit of cycling. The organiser has already issued a special appeal to the trade, and others are going out to clubs, associations, and individuals.

Two firms at the moment of going to press have already sent cheques for £250 each, and appear as patrons of the appeal. It is hoped that the whole cycle trade will help to increase the prestige of cycling in this way.

Cycle clubs are, of course, doing much for their own members, for most of them have their own Comforts Funds. Notwithstanding this, every club is asked to send a donation to this special cyclists' appeal. The Red Cross and St. John Fund must help cyclists more than any other, for there are more of them. Every cyclist, whether he belongs to a club or an association, should send a donation, making it quite clear that such is sent in response to the appeal to cyclists. Envelopes should be marked "Cyclists' Appeal," to ensure that the Fund is credited to that account.

Non-starters

COMPARISON with the list of entrants and the actual starters in most inter-club Opens, indicates that there is always a fair proportion of non-starters, and the abbreviation d.n.s. appears far too frequently. In an event where the number of starters is limited, this causes resentment on the part of those whose entries have been declined. In discussing this matter recently with one prominently associated with the sport we made the suggestion that rules should be modified, to give racing secretaries the power to substitute riders at the start of a race and so provide an opportunity for those who remain as spectators when their application has previously been turned down. Nothing can be done this year, but we hope that at the next annual general meeting of the body governing road sport, the rules will be suitably amended, not only to give promoters of Opens this power, but also to impose penalties on those who are persistent offenders.

There have been many cases where a rider enters without the slightest intention of competing and merely with the desire to keep another man out. Such a rider should be suspended for the remainder of the season, for such practice is not only unfair to other riders, but also to promoters of Opens.

Mass-start Racing on the Roads

THE announcement that in the interests of a particular charity a mass-start race on the open road was to be promoted has caused quite a flutter in the dovecotes of cycling politicians. National bodies have nearly always set their face against the mass-start race, and cycling sport is confined, as far as the roads of this country are concerned, to Opens or Road Trials, in which the riders are started at intervals of a minute, and thus really race against the watch rather than against one another. It has been argued for many years that because mass-start racing is popular on the Continent, and especially in France, it would be equally popular over here. We preserve an open mind on the matter, for until the law is changed such will not be permitted in this country as a regular thing. Cycle racing and motor racing on the roads of this country are illegal.

This particular venture on behalf of charity has been ill-fated, however, for the N.C.U. and the R.T.T.C. have banned riders from entering it, and have suspended the promoter. There are still those who intend to push the idea of mass-start racing. Unfortunately, they will need to get the law of the country changed, for the police have no power to grant permission for any race to be held on the roads.

Holidays

LORD LEATHERS, the Minister of War Transport, last month issued a message relating to the Whitsun and summer holidays. He warned the public against making any holiday plans which involved travel, because such plans are contrary to public interest. The many pressing calls on transport for the movement of vital supplies make it essential that no less restrictions on travel shall apply now than applied at Easter and Whitsun. In peace, the summer opens with the Whitsun holiday season, and never have our holidays been more faithfully earned than this year. To-day, however, the call is for "attack." The response to this is so widely echoed and its significance so fully understood that passenger services throughout the summer are to be maintained on a war-time basis. Only such limited number of trains will be provided as can be run without in any way impeding freight or other essential traffic. Only in this way can the transport system be kept clear to meet the requirements of our fighting forces. The overwhelming majority of the public have shown, at Christmas, Easter and Whitsun, that they are determined that no action on their part should impede these movements.

Lord Leathers, however, sets no ban upon cycle travel. In fact, the Government encourages it. Cycling does not impose any strain upon the railways nor upon our supplies of oil. The only oil which a cycle requires is the slight amount required to lubricate its bearings. It is true that there is a rubber shortage, and that cycle tyres may not be so easily obtained as before the war. But a pair of bicycle tyres well looked after will last for some thousands of miles. Periodically they should be examined, slight cuts stopped, and flints removed from the tread. Correct inflation is important, for under-inflation, according to the tyre experts, can increase tyre wear by 30 per cent. The old tyres which have been discarded should be examined anew to see if they can be made useful again.

A familiar corner to all Bath roaders; The Star and Garter Inn and the old building known as "King John's Palace"—Colnbrook Village.

Paragrams

New Club Secretary

A. J. LANCASTER, 97, Sundale Avenue, Selsdon, Surrey, is the new secretary of the Fellowship of Old Kittens. He wants to get in touch with old members of the Catford C.C.

No Aberdeen Opens

THERE is a possibility that there will be no opens in the Aberdeen district this year

Lord Nuffield Joins Cycle Club

LORD NUFFIELD, who started business as a cycle repairer, and later became a local N.C.U. champion, has joined the Pickwick Bicycle Club.

Secretary of F.O.T.C.

J. BRERETON SUMMERS, Catford C.C., is now secretary of the Fellowship of Old Time Cyclists.

Club Secretaries Missing

NEWS is anxiously awaited of T. Connor, former secretary of the Hadrian C.C., who has been reported missing in the Far East. The club's former social secretary, A. F. Binns, has been reported missing following operational duties with the R.A.F.

Club's Jubilee

TODMORDEN C.C. is among the clubs which this year celebrate their jubilees.

Veterans Still Active

TWO members of the Todmorden C.C., R. Stephenson and J. H. Clewer, both of whom were present at the inaugural meeting 50 years ago, still take an interest in its activities.

Clubman's Marriage

A. W. BRUMMELL, crack member of the Vegetarian C.C. and prolific winner of pre-war open events, has married Miss Jean Paul, daughter of the well-known Vegetarian Harry Paul.

Oxford Cyclist's Death

WELL known among Oxford cyclists, Driver Maurice Goddard, for many years popular secretary of the C.T.C. Oxford D.A., has been killed in action.

Club's Gift to Serving Members

THE Carlyle C.C., which has 21 members serving with H.M. Forces and which next year will celebrate its jubilee, distributed gifts to the value of £21 to serving members last year.

President of the F.O.K.W.

"SAILOR" LEONARD COOPER, remembered for some fine rides in Catford "24's" a decade or more ago, has been elected president of the Fellowship of Old Kentish Wheelers.

Well-known Rider Missing

F. BUCKINGHAM, Queen's Park C.C., who just before the war was making a name for himself as a massed start expert, is missing following a raid over Germany. He was a pilot officer.

Fast Road Racer

H. SAMUELS, Southgate C.C., now in his 40th year, and who was club champion in 1924, is now riding faster than ever in road time trials. He recently clocked 1h. 11m. 40s. in the Metropolitan Police C.C. "25" and secured 1st handicap.

Club 52 Years Old

UNIVERSITY C.C. has made a statement to the effect that the club is only 52 years old and not 60, as generally believed.

Clubman Saved from Sinking Ship

G. C. McCAFFREY, St. Christopher Catholic C.C., who is serving with the Royal Navy and was reported missing when his ship was sunk off Java, is known to be safe.

Cyclist Awarded D.F.C.

ACTING-FLIGHT-LT. W. G. BARNES, Charlottesville C.C., has been awarded the D.F.C. for bravery in raids over Germany and enemy-occupied territory.

Veterans Pass Over

ONE of the oldest members of the Sharrow C.C., Richard Loxley, has died. He was 79.

Henry Wilson, a Cumberland pioneer cyclist, has passed over at the age of 91.

New Scots Hostel

A NEW youth hostel is to be opened at Killin, Perthshire, during this summer.

Removing Surcharges

MOVES are afoot to remove the surcharges which have been imposed at some youth hostels.

Lack of Bicycles for Dutch

FREE Dutch sources report that bicycles are so short in Holland that they are being rationed.

U.S.A. Bans New Roads

THE U.S.A. War Production Board has placed a ban on the building of non-essential roads during the war.

Vital Roads

THE Royal Scottish Automobile Club emphasised the need to keep roads in good order in its annual report.

Wild Cats in Argyll

WILD cats are being seen in increasing numbers in Argyllshire, the attractive county on Scotland's west coast.

Standard Bicycles in Italy

ACCORDING to Rome Radio, Italian bicycle makers have been ordered to produce only a standard type of machine.

Armless Cyclist

AT Eire, Pennsylvania, there is an armless cyclist who taught himself to ride after he sustained an accident four years ago.

Forestry on Holiday

YOUTH hostels in Scotland are offering sleeping facilities to cyclists spending their holidays on paid forestry work.

Death of Scottish Pioneer

ANDREW GEORGE RENNIE, a pioneer of Scottish cycling and motoring, has died in Glasgow. He was associated with the trade and pastime for over half a century, and one of the earliest cycle traders in Scotland. A founder member of the Scottish Cyclists' Union, he organised the International World's Championships in Glasgow in 1897, and in 1886 organised the first cycle show in Scotland.

Hostels in the West

SEVEN youth hostels are now open in Devon and Cornwall, and will remain available for the period of the holiday season.

Increased Accommodation

ACCOMMODATION has been increased at several youth hostels, including Cynwyd (North Wales), Sutton Veny (Wilts) and Norleywood (South Coast).

Scots Hostels Handbook

THE Scottish Youth Hostels Association has again issued a handbook. This gives details of all hostels in Scotland which remain open at present.

London Hostels Membership

THE Youth Hostels Association, London Regional Group, had attained a membership of 7,843 at the end of March, compared with 5,447 a year previously.

"Friends of Lleyn"

A SOCIETY called the "Friends of Lleyn" has been founded to watch over the interests of the little-known peninsula of Lleyn, in North Wales.

Border Catering House Open

SHAW'S, "Hazeldean," a C.T.C. appointment well known to Tynesiders and Clydesiders, is still catering. It is situated four miles west of Carlisle, on the Wigton road.

Glasgow Hostel Available

ROOM is again available at Glasgow Youth Hostel, Merrylee Road, where Andrew Davidson, a member of the National Clarion C.C., remains as warden. There are 20 beds at present.

Salford Loses Lights in Black-out

SALFORD, Lancashire, traffic lights have had their screens removed for the duration of Double Summer Time. The lights are extinguished during the black-out period.

Bicycles for Germany

THE Danish and Dutch bicycle industries have had a boom in the last two years, states Kalundborg radio. However, almost the entire production is going to Germany, where cycling has received a big impetus owing to petrol restrictions.

Cycling Propaganda

THE annual handbook of the Youth Hostels Association, which is now available, bears a cover picture showing cyclists as well as the bold caption "A Cycling Holiday This Year."

Rubber Supplies for the U.S.

THE U.S. Government has contracted for the entire Brazilian output of exportable rubber. Negotiations are also going on with other South American States for increased rubber production.

Hobby-horse at Mannheim

A HUNDRED-AND-TWENTY-FIVE-YEAR-OLD hobby-horse is reported to be in use at Mannheim, on the Rhine. It was invented by Freiherr Von Dreiss, and has been brought out because of the present traffic situation.

The North Prepares

NORTHUMBERLAND and Tyneside Regional Group of the Youth Hostels Association has prepared a comprehensive scheme of post-war hostel development in the area, in which existing hostels erected by the Ministry of Agriculture and Fisheries are to be used.

The Pennine Way

THE Pennine Way, the aim of which is to provide a high-level route between the Peak and the Cheviots, was recently the subject of a question in the House of Commons. Rambling and cycling organisations are in favour of the scheme, which was first mooted in 1935.

Restriction on Cycling Children?

THE Scottish Accident Prevention Council, meeting in Cupar, has passed a general resolution that some measure of control over child cyclists should be adopted. A motion that cyclists under 11 years of age should be barred from the highway failed to find support.

Americans Want More

ALTHOUGH the Government of the U.S.A. has arranged to release sufficient material to make three-quarters of a million new bicycles in 1942, the makers and traders believe that they can sell four millions.

Many car depots are going over to cycle sales and servicing.

New Use for Rabbit Skins

RABBIT skins are being used to stuff cycle tyres in Holland, and as a result their prices are soaring. The Dutch are also experimenting with cork tyres and wooden blocks wired on to wheel rims.

French perambulators have cork wheels, and Italy claims that bicycle wheels of wood and iron are a success.

Around the Wheelworld

By ICARUS

Trouble in a Cycling Club

READERS will have read the announcement in last month's issue concerning dissension in a newly formed club, which was formed to provide an informal monthly luncheon meeting for cycling officials and journalists. The chairman, secretary and committee resigned, because of the operation of the rule which stated that membership could only take place by unanimous vote. Now, I am not a member of this club, but I know many of those who are, and it seems that this rule was specially framed, as one member put it, because of the petty jealousies of a few. It is said that the club was formed in a spirit of good fellowship, but it seems difficult to reconcile this with later developments. The chairman and committee in tendering their resignation state that they have "Noted the manner in which well-known cyclists holding administrative posts have been refused admission to the club. . . . The power of exclusion has been used without any justification, and almost frivolously. . . . At first we formed the opinion that applicants for membership were being rejected because there were differences in the interpretation placed by various members upon the rules governing qualification. . . . Our suggested alteration to the rule was first amended by the club and then rejected so that we were left with the original rules. . . . What are we to think when immediately after this decision every applicant for membership is rejected? What is the use of opening the door so wide if it is to be slammed in the face of everybody seeking admission? Obviously the secretary of the club is placed in a very invidious position when he is compelled to write to one well-known cyclist after another telling him that he is deemed unsuitable to take his seat at a club luncheon. It can only end in one of two ways; either the applications for membership will cease entirely, since men of repute and position will not expose themselves to such rebuffs, or, alternatively, the prominent cycling officials who have been rejected by the club will soon be as numerous as those within the circle."

It seems very evident, as one cycling journalist informed us, that the rule was designed not so much to permit certain people to join as to keep certain people out. The committee which was formed from those who attended the original luncheon and thus became founder members, thereby escaping the possibility of the rebuff which the club has administered to others, had a hand in framing the rules, and it is rather Gilbertian that the rule has recoiled.

One cycling journalist who is a member of the club and had threatened to resign comments: "It soon became apparent that certain members desired to keep the club as an exclusive fraternity and reject by means of the too rigid rules governing election all except their personal friends—overlooking the fact that they themselves were only members by reason of attendance at the inaugural and open-to-all meetings. Once it became apparent that any candidate, no matter how high his importance in the cycling world, would be automatically blackballed unless he was also *persona grata* with a small minority, I decided to resign from the club and announced this decision to those who had convened an inaugural meeting. . . . I withdrew my resignation on the understanding that steps would be taken to restore the club to its original function."

Now the club has been remodelled, and election is by majority vote. However, there are many in the cycling world whom I know who will not offer themselves as candidates, and I am one of them. Under the reorganisation numbers will be drawn at each meeting and number 1 will become chairman, whilst number 13 will speak on the subject selected. The new hon. secretary is George Brake, prominently connected with the Bicycle Polo Association.

I still cannot understand why the committee does not change its rules so that election is by invitation of the committee. Such a rule would prevent any possibility of blackballing or rebuff and would save the secretary the invidious task of having to write indicating the rebuff to unsuccessful applicants. If the club is open for prominent cycling officials and prominent cycling journalists, it is hardly fair to expect them to write in a supplicatory manner asking to be permitted to join the club. I am glad that the club has remodelled itself, but it still has not gone far enough. Those responsible for the blackballing are, I understand, still members, and as presumably they were the cause of the dissension it seems possible that even under a rule which decides membership by a majority vote, blackballing may still take place.

There is room for such a club, as I indicated in September last year when I dealt with the Cyclists' Club, which had premises in the centre of London to which members could go every day for lunch. This was towards the end of the last century, but the club failed financially. I pointed out that this club was ahead of its time, but that the time was ripe for the idea to be revived. This attempt at revival has somewhat misfired, but I am hopeful that it will survive its teething troubles, and lay the foundations for the real organisation which I had in mind when I made the suggestion.

Herne Hill

AS briefly announced in the last issue in this feature, the National Cyclists' Union has leased the Herne Hill Track for a period of 21 years from the owners, Dulwich College. This is a good move, and although at the moment of going to press Mr. A. P. Chamberlin, the secretary of the N.C.U.—whose initials appropriately enough describe what he is, A Pedal Cyclist—has not announced plans, I have no doubt that something good is in store. Herne Hill has been the scene of many classic events, particularly in the early days of cycling. Famous cyclists have raced on it, and it is nice to know that for 21 years at least the venue will be available for further events. Cycling can still draw a "gate," provided that the programme is good. The N.C.U., whose main concern is track racing, is the only body which can bring back to this famous track something of the aura which surrounded it three or four decades ago. Of course, during the war little can be done, except in the way of events in aid of charity. I await developments with interest.

An attempt was made just before the war to revive interest in the track by the formation of the London Racing Combine. Unfortunately, the war put a period to its activities, and for over a year the track has not been used. The old lease expired on March 25th, and it was then that the Emergency Committee of the N.C.U. commenced negotiations with the owners.

It was 51 years ago that the first cycle race took place on the track of the London County Cycling and Athletic Club — Herne Hill Track. Formerly most racing had been done on the Crystal Palace track, but owing to the bad design of the latter racing was transferred to the Paddington track, which was opened in 1888. The efforts of George Lacy Hillier, who was greatly interested in the old Crystal Palace track, to get that track rebuilt failed, and it was largely due to his efforts that the Herne Hill Track in Burbage Road was built by W. and J. Peacock, of Brixton—themselves keen cycling enthusiasts. They finished the task in March, 1891, and the first race was held on it on April 15th, 1891. This was a closed meeting; the first open meeting was held on May 23rd, 1891, when a new quarter-mile record was established. The track has not been modified since except that the original 5ft. super-elevation at the banking has been increased. In August, 1893, J. W. Stocks rode 25 miles 160 yards in one hour. This was the first time that the 25 miles had been beaten. But it was the Cuca Cup races, which have previously been dealt with in these columns, which made the track really famous. Such riders as Shorland raced in them.

Cyclorama

By H. W. ELEY

Reminiscences

I AM writing these notes on St. Patrick's Day and on my desk there is a little bunch of shamrock sent by a friend of the old days in Ireland—days when Dublin was familiar with the pomp and ceremony of the Viceregal Lodge and when the uniforms of famous British Regiments added splashes of colour to the streets.

My mind goes back to pleasant cycling tours in which Wicklow and Wexford memories come crowding in of never-to-be-forgotten tours in the Vale of Avoca and the glorious country around Glendalough. Those were days of freedom indeed, when it was an easy matter to take one's cycle over to Ireland and at incredibly low expense do a week or fortnight's touring in a green and romantic land where scenery and customs were as different from those of England as are the scenes and customs of Scandinavia from those of the Balkans.

The sight of the little bunch of moist shamrock reminds me of the legend that this little plant will only grow in Erin's Isle. Whether this is so or not I do not really know, but I do seem to remember ineffective efforts at cultivating the plant in this country. In any case, whether we shall ever be able to take our cycles to Ireland again and indulge in those pleasant leisurely tours through Waterford, Kerry and Clare is all "in the laps of the gods"—or should we say "the god of war"?

Bicycle Receiving More Prominence

As I write everyone is talking of the new petrol restrictions and the inevitable curtailment of motoring in view of war needs. It all means that the bicycle is receiving more prominence than ever, and here in these last few days any amount of ardent motorists have been running around to ascertain the chances of purchasing cycles. The man who never gave up his cycle, even though a shining car was housed in his garage, can afford to smile—he looks upon his mount with still greater affection, and views with equanimity the prospect of pedalling to and from his office or workshop; by the way, talking of cycling to work, I have received quite a volume of testimony to the new health and fitness which comes from the daily ride to and from business. Cycling promotes fitness to such a degree that it is somewhat remarkable that amongst the mass of Government advertising campaigns there has not been one to foster and stimulate cycling as a war-time activity. We are told to "Dig for Victory"; we are beseeched to eat more carrots for health; we are provided with physical jerks over the radio; we are told of the virtues of brown bread over white—we might well be told, I think, to keep on cycling. Perhaps one day we shall see a great National campaign launched to promote the still greater use of the bicycle.

Spoiling the Countryside!

Some pessimist was telling me recently that the fair face of England was being spoiled beyond repair by construction of aerodromes, military camps, defensive obstacles and other evidences of total warfare. I tried to cheer up my pessimistic friend by reminding him that the old country still contained some areas of unspoiled beauty. Even those counties most highly industrialised still retain many charms. I think, for instance, of Staffordshire, so often associated in people's minds with the ugliness of industry. To many the county just means the ugly Pottery towns of the north, and the still more ugly Black Country towns of the south, but between these scarred areas there is a grand and beautiful belt. The whole valley of the Trent country is good for cycling, and it is no bad plan to make the little City of Lichfield one's centre. Lichfield Cathedral is usually known as the Lady of Cathedrals. It may be small, but it can hold its own for beauty of architecture with many of its larger and more impressive sisters. The west front is particularly beautiful and the setting of the Cathedral is appropriate. Riding out from Lichfield one may reach easily some of

Solving the transport problem. A small-holder in Perthshire carrying his "bag" to market with the minimum of expense and worry—by bicycle.

the best Staffordshire scenery. Hoar Cross with its very ornate church, Marchington, Hanbury and Needwood Forest, are all easily accessible. The last named was at one time a forest of tremendous extent where deer roamed and provided sport for Kings. Mutilated the forest may be to-day, but what remains is still beautiful and compares favourably with Sherwood.

Burton-on-Trent

One Staffordshire town of world fame is, of course, Burton-on-Trent—the metropolis of brewing. It is worth a visit if only to see the curious brewery railways which cross the streets. It is an ancient town with some old remains of a Monastery founded by St. Modwen. The Parish Church is dedicated to this Saint, and the town possesses a Grammar School founded in Elizabeth's days. Burton ales can, of course, be obtained everywhere, but there is something rather pleasing in drinking the famous brew in the place where it is produced in such prodigious quantity.

Cycle Traders' Problems

Shopkeeping these days is a difficult business and the cycle trader shares with other traders many war-time problems. From the point of view of selling, difficulties are increased by the lack of window display material. Paper restrictions account for the almost complete disappearance of those colourful display aids with which we were so familiar in peace-time. As far as tyres are concerned the trader has a reduced range to offer and one imagines that as the war proceeds his range will be considerably more contracted. However, cycle tyre manufacturers have for so many years provided products of outstanding merit that one may rest assured that whatever restrictions of types the war may impose, the British cyclist will still be able to obtain a satisfactory all-purpose tyre which will stand up to hard and continuous usage.

Salvaging Old Tyres

The extension of the war to the Far East has brought rubber into the forefront of the national picture. One wonders how many old cycle tyres there are lying in sheds and outhouses throughout the country. While they do not, of course, contain anything like the amount of rubber in a motor tyre, it would seem that their salvage would be a worth while matter. Possibly the Rubber Control will make some effort to get cyclists to hand in old covers in view of the stern necessity of saving rubber and reclaiming it as far as possible.

Cycling Firms' Advertising

Cycles may be difficult to obtain, but there seems to be no diminution in the amount of advertising by the cycle manufacturers in the technical and trade journals. The old familiar and renowned names greet us from the pages of such periodicals, although I notice that some of the firms (Hercules is a case in point) are devoting their advertising space, not to eulogistic statements about their products, but to general messages having bearing on the war effort.

Springtime Joys

The three war winters have been hard indeed. Snow in greater quantities than for many years, and long periods of frost; even the old timers had to keep silent about their memories of bygone winters. Now that April is here, cyclists may look forward to better days. Bombs and battles cannot prevent the sun from shining or the grass from growing, and I look forward to spring-time days when English meadows will be golden again with buttercups. I long for the May-time when each copse or thicket will be a cathedral of bird song. My own cycling has always been linked closely with nature study and the hobbies of the naturalist. From the Warwickshire countryside, which is now my riding area, I shall hope this spring to add to my birds' egg collection and to make fresh observations of the wild life which still flourishes in an industrialised land. To some enthusiasts for the English scene there is, of course, no better county than Warwickshire. Its leafy lanes and picturesque villages are as precious as the more spectacular scenery of Cornwall and the Lake district, and in Warwickshire one is never far from memories of Shakespeare and the characters which peopled Arden.

Places to Visit

Harking back to advertising, there recently appeared some most interesting advertisements featuring the places which should be visited by every cyclist as opportunity occurs. The series featured the Cyclist Memorial at Meriden in the very heart of England, and the Downs Hotel at Hackney, where the one and only Pickwick Bicycle Club was born. It was in the summer of 1870 that this our oldest bicycling club was founded, and it says much for the permanence of the cyclists' enthusiasm that the club still flourishes and that its members, true to the Dickensian tradition, still adopt the names of characters from Pickwick. Another advertisement featured the familiar Anchor Inn at Ripley, and pointed out that cyclists should hold this inn in particular affection. In the '70's when pioneer cyclists were the objects of fun and ridicule, the sisters who kept this inn looked with favour upon the riders, and provided a welcome hospitality at the old tavern.

What the Clubs are Doing

Turner in the South

GEORGE TURNER, the Central Scotland Wheelers crack, is now serving with the Royal Navy, "Somewhere in England." He has already made contact with local club circles, and is continuing to cycle.

Accommodation Available

TIME trials riders using the Stirlingshire course will be pleased to know that overnight accommodation will be available once again this season at Dunblane youth hostel.

No Events at Aberdeen

NO open time trials are to be run this season by the North East of Scotland T.T.A. and its affiliated clubs. Officials of the Association met some weeks ago, but the attendance was so poor that it was decided not to draw up a programme.

Last season the N.E.S.T.T.A. ran off several successful open events.

Certificates to Prizewinners

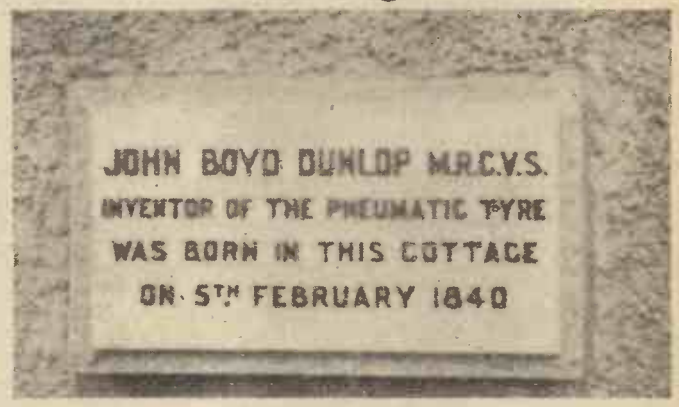
THE West of Scotland Clarion C. and A.C. has decided to charge sixpence entrance fee for its open 25 and open 50 this year, and to award certificates instead of medals.

Lancashire Cyclists in Scotland

PROMINENT Lancashire Clarion members now serving with H.M. Forces in Scotland include Harry Aspden, formerly a member of the R.T.T.C. National Council, and Lew Smith, speedy Manchester time trialist.

Both have made contact with West of Scotland Clarion circles.

The tablet placed on the cottage at Kirkbrae, Dreghorn, Ayrshire, by Mrs. McLintock, daughter of J. B. Dunlop, inventor of the pneumatic tyre.



First Scots Track Meeting

THE Upper Nithsdale C.C., of Kirkconnel, Dumfriesshire, is holding an open track meeting on July 4th, and proceeds are going to war charities.

New Scots Star

GEORGE EDWARDS, Glasgow Nightingale C.C., won the opening time trial of the West of Scotland season, the Gilbertfield 10, with a time of 25 mins. 7 secs., and beat last year's best 25-miler, Jack Armour, Fife C.A., by 49 secs.

Combination in Scotland

AUCHTERDERRAN WHEELERS and the Fife Century R.C. have combined for the duration, and members will in future ride as "Fife C.A."

Ex-Champion Now Secretary

JACK TAYLOR, for three successive pre-war years Scots cycling champion, is the new time trials secretary of the West of Scotland Clarion C. and A.C.

List of 1942 Opens in Scotland

THE Scottish Amateur C.A. list of open dates this season, numbering some 60 events, is in the form of a printed insert for the 1941 edition of the Association's handbook. Copies are obtainable from Alex. Urquhart, 6, Binnie Place, Glasgow, S.E.

Ayrshire Club Revives

THE Loch Doon C.C., of Dalmellington, Ayrshire, has been revived, and has already a membership of over 20.

Random Jottings

Quips

SOMEBODY, writing a letter to *The Times* recently on a farming topic, suggested that "the best weather often occurs at the week-end." We wish it were true!

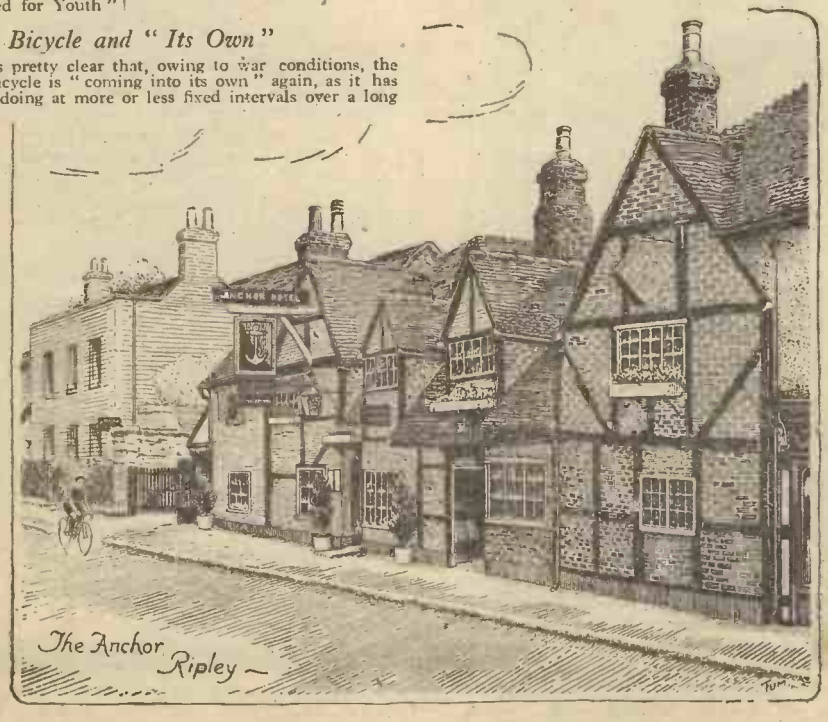
Speaking on the subject of bread the other day, Lord Woolton mentioned certain changes which he was making "with the approach of summer." Well, we hope that the summer will do more than approach, this year!

On this question of bread, the Hon. Treasurer of the Salmon-tin Wobblers, who generally sits at the bottom-end of the tea-table on club runs, writes to say that he is glad to learn of the abolition of white bread in favour of brown. He finds that brown bread does not show the finger-marks after being passed along the table!

Shop-window notice seen recently: "Youth wanted for cycle." An inversion of the more usual: "Cycle wanted for Youth"!

The Bicycle and "Its Own"

IT is pretty clear that, owing to war conditions, the bicycle is "coming into its own" again, as it has been doing at more or less fixed intervals over a long period of years. The fact is that people who have deserted cycling in favour of something which they thought better—and more respectable!—wake up from time to time and discover that the pastime did not come to an end when they withdrew their allegiance, but that, on the other hand, it is going from strength to strength. Thus the bicycle "comes into its own" again! But, seriously, it looks as though the drastic rationing of petrol (if "rationing" is the right word to use!) will set the clock back many years as regards cycling conditions, and that, apart from increased military traffic, such conditions will be very much what they were 40 years ago, improved out of all knowledge by the excellent roads which motorists have generously provided—at the expense of rate-payers as a whole! With the stoppage of pleasure motoring, it will be interesting to watch the reaction of those caterers who, in recent years, having obtained their living (and established a good business) on the custom of cyclists, have tended to "turn up their noses" at such humble fry, preferring motorists—thus practising snobbery and proving their ignorance, because the possession of a motor-car does not of necessity connote either wealth or culture. Thus the bicycle, on "coming into its own," for the umpteenth time, may teach certain caterers a thing or two.



Mountaineering in Miniature

THAT delightful process of crossing the Berwyns with a bicycle retains its vogue, particularly with cyclists in the Midlands and north-west. There are several ways of indulging in this miniature mountaineering. For instance, one can cross from Llansantffraid-Glyn-Ceiriog to Llangollen, or from the same village with a long name to Glyndyfrdwy, a few miles to the west of Llangollen. This latter route includes a fine piece of shelf road. The most popular itinerary, however, is from Llanarmon Dyffryn Ceiriog to either Cynwyd or Llandrillo, in the Dee Valley. The journey can be readily achieved in the reverse direction, but the general opinion appears to be that, owing to the lie of the land, it is better done from east to west, and certainly there is thus less "collar-work." To cyclists who are fond of solitude, and also of long-distance views, the expedition over the Berwyns has much to commend it. It is quite devoid of any real difficulty or of danger, being simply a tramp over a mountain-track (which sometimes tends to become a running stream!), and negotiation of gates and of streams, the latter being sometimes unbridged. Portions of the journey can be ridden. Tandems as well as singles can readily make the trip, but a tricycle would be something of a nuisance. A period of at least 2½ hours should be reserved for a jaunt which is restful and inspiring, and which takes one into a new world.

Joyous Names

OUR contributor "Wayfarer," writes:

"When strolling through suburbia the other Sunday morning with a friend, I encountered a house called 'Aranmore.'" Provocative name! I ejaculated, only to gather from the lack of response from my companion that it meant nothing to him. To me it was a word full of significance, and there was instantly projected on the screen of the mind a lumpy island lying off the coast of County Donegal. If silence then fell upon me, it was because my thoughts were playing truant, and I was far away on my bicycle, lingering on the jetty at Burtonport—gazing over the placid waters of an arm of the Atlantic at the distant earth-mass which obstructed a further view. Later on our stroll, as luck would have it, we came across another house with a provocative name—"Morven." This time I made no audible comment, but a host of pleasant memories trooped through my mind—memories concerning that tumbled peninsula which is attached to the mainland of Scotland by Glen Tarbert. And so, thanks to my abiding devotion to cycle touring—almost the only sort of holiday for which I have any use—I lived happy days over again, and such delectable things as Ardnamurchan, Loch Sunart, Salen, Loch Linnhe, Mull and Loch Shiel passed before my eyes. Joyous names! Joyous places!

Cyclists! WE MUST SAVE RUBBER

HOW TO MAKE YOUR DUNLOP CYCLE TYRES LAST LONGER STILL

INFLATION
Cycle tyres should be inflated hard. If this recommendation is adopted tread wear is reduced to a minimum. The tyre lasts longer, costs you less per mile and the country saves rubber.

FITTING & REMOVING
Carelessness in these operations may cause serious damage to both cover and tube. The use of properly designed levers is strongly recommended. A badly-fitted tyre will wear unevenly and rapidly.

SLOW PUNCTURES
Punctures, however small, should be repaired immediately, otherwise even though the punctured tyre is inflated before each journey, falling pressure will gradually bring about casing fatigue and subsequent failure.

VALVE RUBBER
This does not last indefinitely and should, therefore, be tested with a view to replacement if pressure is being lost.

BRAKING
Brakes should be used as gently as possible except in cases of emergency. Fierce braking wears the tread rubber down several times faster than normal use.

INSPECTION
Inspect the treads of your tyres frequently and remove any embedded stones, etc.

OIL
Oil is harmful to rubber, and tyres should, therefore, be kept free from it. Care should be taken to prevent oil from the hub finding its way down the spokes and being absorbed by the rim tape, which of course is in contact with the tube.

RIM TAPES
Care should be taken to see that the rim tape is fitted centrally, otherwise the tube will be damaged by contact with spoke heads and nipples.

REPAIRS
It is advisable to carry a little solution and a patch or two so that repairs can be effected on the road. Nothing brings about complete destruction of a cycle tyre more quickly than serious under-inflation.

INTERCHANGING
When the tread of the rear wheel tyre shows signs of wear change your tyres over.

MISALIGNMENT
Excessive tread wear results from the wheels running out of line. Feathering of the tread pattern will reveal this condition.

IMPACT
Riding a bicycle over the kerb or into a pothole except at very low speed will often cause a fracture of the casing which usually cannot be satisfactorily repaired.

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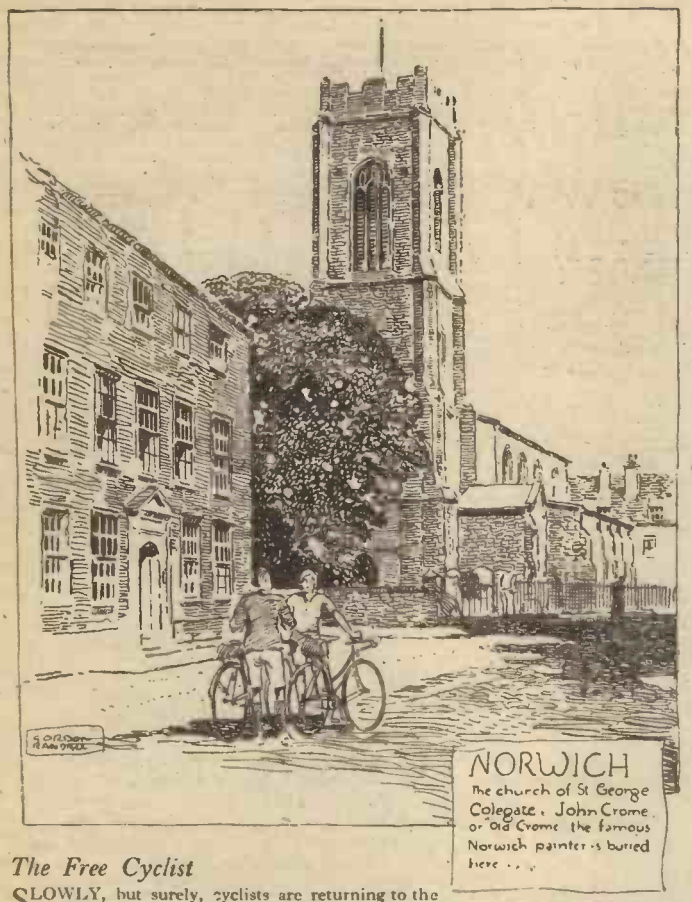


NORWICH
The church of St George Colegate. John Crome or Old Crome the famous Norwich painter is buried here . . .

WAYSIDE THOUGHTS

By F. J. URRY

The Free Cyclist

SLOWLY, but surely, cyclists are returning to the position they occupied prior to the motor era, inasmuch that they are, as will be seen, the only free travel agents on the road. There is a difference, of course, for they now number millions more than was the case in the early days of the present century; and also the fact that the commercial and public transport still goes on. Otherwise, the roads are becoming more and more lonely, and the roaming cyclist is cheered by the fact that his leisure hours are not confined to the immediate vicinity of his home. I regret these restrictions on travel, because they press hardly on many folk whose living depends largely on the stranger within the gates but, as a cyclist, I should be less than human if I failed to try to show you the advantage of the bicycle as a vehicle, with a far wider application than the mere fact of convenience. I have always found great contentment of mind and body in cycling, and my holidays have been occasions for seeing a little more of this lovely land in which we live. Believing that most of my compatriots can—and will—find similar enjoyment and recreation, I naturally think a cycling holiday is the ideal means of finding that sense of rejuvenation so necessary to create in us the work effort to win through to the days of peace with victory; so the following paragraphs are meant for your serious consideration.

The War-time Holiday

THESE are the times when a man or woman, hard at work amid the whirr of machinery, sees as in a dream "the distant dearness of the hill, the secret sweetness of the stream," and longs, with anticipation, for that moment when release from duty will come, and retreat to the abiding peace of the countryside will quickly follow.

But are these dreams immediately realisable? We have come to the point in our war effort when acknowledgment of short breaks for rest and refreshment of the spirit is desirable, if the drive of urgency is to be maintained; for even a nation at war cannot live by work alone. Otherwise Service leave would be a subject for the criticism of diminution rather than a matter to which we all look forward with quiet pleasure for our relatives and ourselves. I know men who boast of never having had a holiday and never wanting one; yet I think their intimate friends would aver the need is patent for the sake of the improvement of their tempers, but the prejudice remains in them as a kind of excuse for what the critic would describe miserly accretions.

The difficulty of finding entertainment for the short holiday—or the long one for the matter of that, but there are no long ones to-day—is mainly concerned with travel, for we have become so used to the car as the means, that the crowded railway is not attractive to take us to those places we once knew, where the amenities of holiday-making were displayed for sale at so much per head, and taking the line of least resistance we enjoyed the moment for what it was worth, discovered nothing new, but revelled in mild excitement and stimulation that evaporated almost as soon as it was over. To-day such places do not exist, and your holiday must be of your own manufacture. And this is good for you if you only knew it.

Let me try to persuade you to a means test in the holiday world of quietude and simplicity. Try cycling. Now do not jump to the reply "that it is all very well for you, a fanatic, but how can you expect me to enjoy cycling?" Well, millions do, and find the joyous adventure vastly entertaining. I know it is common, but then so is walking, and, for the matter of that, so is—or was—motoring. Cycling indeed has suffered by being so common, and its excellent qualities have thereby been overlooked. Yet it is to the land—this lovely land of Britain—what the small yacht is to the summer seas, a vehicle of adventure claiming in full that mild desire of mankind; and withal the complete embodiment of freedom.

But I must refrain from panegyric, or your eye will wander to the more important news of the day, your mind be filled with the moment's crisis, and the holiday forgotten, and I do not want you to forget the holiday—yet, because it is the results of that holiday that will brighten your outlook, stiffen your nerve, and make you understand more poignantly the beautiful country for which you are fighting and working.

You will ask me how to go about this cycling holiday, this adventure on wheels. Most of you have a bicycle or can loan one from a friend, or if you are lucky, buy one. Most of you know an expert cyclist (those curious, but common, fellows who look so happy scooting along the roads at the week-ends); ask him as a favour to overlook the machine you own, loan or buy, to see that it fits you, is geared low (not above 60in. normal), and is seated with a comfortable perch complimentary to your anatomy. These things are important. Take a roomy saddle-bag, fill it with waterproofs, a minimum of clothes (night attire, spare stockings, collars and handkerchiefs, and possibly a spare shirt), a Thermos flask, a slab of chocolate, a packet of biscuits, a piece of cheese, a packet of tea and sugar, and you are ready for the road. You may not need the food, or even the coffee in the Thermos, but it makes you feel comfortable in these times when the wayside inn or catering cottage has nothing to offer just when you most need it.

Then find the companion who is willing to share your adventure. This is not absolutely essential, but it is kindly and appreciative, for lovely things seen through the eyes of a friend are seen twice, and remain a topic for all time. Where should you like to go? Make up your mind of the general direction in which you would wander, buy or borrow the maps of the area and start. Maybe it is Wales—then train to Shrewsbury and invade the Principality via the Highlands of Salop, and don't be in any hurry about the business of riding; let the day dictate the miles rather than the miles measure the day. What does it matter how far you ride? For travel pleasure never was and never will be the distance you roam, but the gift of beauty and freedom that is yours, and of which you retain possession until the end of your holiday term, and remember long after. Perhaps you have never seen the Cotswolds except by way of the Five Miles Drive and Fish Hill, Stow-on-the-Wold and Moreton-in-the-Marsh. Ah! follow the Evenlode, the Windrush and the Colne.

"The gentle Evenlode that makes
Its rushes bend to hear the sound
Of waters mingling in the brakes;
And binds my heart to English ground."

Or you feel a further call and train to Carlisle, from whence in eight miles Scotland is afore ye; yes, that beautiful, lonely and neglected country of Galloway where the sea and the hills, the rivers and the lochs are for ever about you, and a kindly folk who will give you welcome. And the Devon and the Cornish lanes with bits of Somerset are within the compass of the lazy rider with Taunton as the hopping-off ground. Your choice is enormous: the Yorkshire Dales, the Border Country, the Lake District, Northumbria, the Highlands south of the Great Glen, all are calling, and all can offer you simple accommodation as befits a simple roamer.

Here, then, is cruising without the hotel spirit, here are fresh scenes without the guide, here the acceptance of self-sufficiency in adventure without the penalties of roughing it, and over all is beauty and the blood-stirring happiness of exercise. It is all within the scope of every active man and youth, woman and girl; it is merely a question of matching your muscular power with the desires of the day, and taking care that those desires are within the compass of sensibility. Along the road, highway and lane you will still find people to give you of their best for a moderate outlay, and a hundred willing tongues to guide you to such places if you will but wag your own.

Britain is a very friendly bit of earth if you approach it and its folk in the smiling way of inquiry, always remembering that these people you speak to are shy, and that the normal process should be reversed, the guest should put the host at ease.

Go, then, I beg you, and see and savour the land you love; be as fit as you can to go, ride quietly, do not count the miles, for those you cannot travel are there for another day; and I know you will return cheered in spirit, with a sense of satisfaction beyond the power of telling, and possessing a physical fitness which is the natural heritage of the sun, and the wind, and the rain.

Try it, if You are Unlucky

AT the beginning of March a dagger of glass cut a three-quarters of an inch slit clean through a new rear cover, and I was annoyed. Upending the machine, I made a temporary repair to get me to work, and in the dinner hour that same day gave that cut in the cover five stitches with carpet thread, a rubber patch inside, and over it a big canvas patch, and on the outside (after careful cleaning with spirit) a rubber patch as protection against wet. The whole job took me twenty minutes, but I left the outside patch for two hours to get bone dry before applying. Two months later the patch is still adhering, and the tyre retains its shape without any sign of a bulge. Had that tyre been patched without sewing, then its life would have been precarious, for no ordinary repair would have kept it from bulging. I have mentioned this matter of reinforcing a bad cover cut by sewing the edges carefully together with carpet thread on numerous occasions and in numerous places, and most people have laughed at me. Nevertheless I have proven its efficacy over and over again, particularly on tour, when you can seldom replace a badly cut cover with the tyre of your selection. Now that tyres are precious and broken glass on the roads seems to be more common than thorns, this old-fashioned notion of keeping a cover serviceable is worth a trial. But for goodness' sake do the job properly, and do not be in a hurry with the doing. Speed with this kind of repair only leads to disappointment.

A NEW FEATURE

NEWS FROM N.C.U. HEADQUARTERS

INCREASED activity is the keynote of every department of the Union these days. By steadily maintaining its membership at an economic level, and even increasing over the corresponding period of 1941, the Union has been able to reawaken interest in club life, touring, racing, etc.

One of the notable happenings of the last few months is the revival of the Essex Centre. After a period of nearly two years inactivity, D. W. Brunwin, the energetic Brentwood Road Club Time Trialist, has taken over the hon. secretaryship of the Centre. He is supported by a strong and active committee, and at a recent meeting held at the Cat's Inn, Woodham Walter, at which the Secretary of the National Cyclists' Union, A. P. Chamberlin, was present, the members agreed to support an active programme of Time Trials, Club Runs, Path Meetings, etc., and it is gratifying to learn that the Centre has now passed into such vigorous and capable hands.

Herne Hill Track

The National Cyclists' Union has acquired the lease of the famous Herne Hill Track for a period of 21 years. It is early at the moment to say what can be done towards reconditioning, because the track is in a bad state. However, the N.C.U. Emergency Committee are determined to take the most energetic steps to bring the track into use.

Secretaries, Please Note

Secretaries of N.C.U. Centres will shortly be hearing from Headquarters regarding the Ministry of Labour's request to the Union to help factory workers enjoy holidays awheel, and here will be an opportunity for the N.C.U. enthusiasts to "spread the gospel" abroad.

Intending Tourists

Those intending to go for tours this year are urged to make their application to the Union as soon as they can so as to give the members of the staff as much time as possible for the job. An increased membership and a reduced staff make the work much more difficult at Headquarters at the moment, and members and Centre officials alike are asked to help in every possible way.

N.C.U. Stopping Places

Lists of N.C.U. recognised stopping places, in county form, are now available for distribution and these are, of course, free to Private Members and 3d. per County Sheet to Clubmen and Associates of the Union.

Changes of Address

The Union asks club secretaries who are changing their addresses to be sure to advise Headquarters of the Union at 35, Doughty Street, W.C.1.

My Point of View

BY "WAYFARER"

Voice from the Past

IN one of my daily newspapers recently I read a letter signed "A Deaf One," who said that he wondered "how it is that the cycle-rider considers himself lord of the highway." He went on to remark that he was deaf and couldn't hear the cyclist's bell, "but, if I could, I fail to recognise any obligation to budge one inch." In other words, the letter-writer was so insistent on standing up for his rights that he was going the proper way to secure his (funeral) rites. However, there is no need for us to worry. The letter was written and printed 50 years ago: it now reappears as a curio—which it certainly is!

Go To It!

IF your holidays this year are going to be in short supply, as (alas!) they probably will be in my case, then let me suggest the need for thoughtful planning, to the end that not one of the all-too-scanty and precious moments is wasted. My own feeling is that one's object should be to spend as many hours as possible in the open air. I have always been a whale on "the living out-of-doors," and when I make holiday I like to be on the move in good time after breakfast at a reasonable hour; I like to stay out until late at night. When it comes to exercise in the open air, one cannot have too much of a good thing. So I would suggest a real out-of-doors holiday on a bicycle this year. Get out and stay out. Spend morning, noon and night along the road. Whenever possible, have meals in the open; if feasible, sleep in the open. Be free; carry as little luggage as may be; wear as few clothes as possible. Collars should be "verboten." An open-neck shirt is ideal. If you don't possess "shorts," have a pair fashioned out of an old pair of "slacks." Wear a light jacket; go capless. Your scanty holiday should be looked upon as the prize at the end of strenuous months of work—as the preparation for hard toil during the next twelve months. Whether you sit down or stand up to your daily job, whether you work with brain or brawn, don't harbour the idea that the best form of holiday is an idle one. The reverse is the case. Let your holiday be an active one—an intensive one. Above all, let it be spent in the open air; let movement be the watchword. And, without having everything cut and dried, plan sufficiently to ensure that you are never at a loose end. Go to it—and have the time of your life!

Slackening Discipline

TO my way of thinking, it is a great pity that the war has caused a slackening of discipline on the part of road-users in respect of those amenities which have been introduced for the safety and convenience of all, and which, in the absence of co-operation on the part of everybody concerned, add to the dangers of travel. Halt signs and automatic signals were not erected just to ornament the landscape. They have a purpose to perform, and the growing habit of flouting their message adds to the difficulty of the road fraternity as a whole, while definitely (as I have suggested) increasing—and unnecessarily increasing—the risks confronting all of us. It is useless for cyclists to say that motorists are the principal offenders, or for motorists to insist that cyclists are arch-criminals in this matter. The question as to who takes pride of place in infamy is a sheer irrelevancy. My experience tells me that there are offenders in both classes—and I specially deplore the fact that certain cyclists (I have actually ridden with some of them) have elected to place themselves beyond the law. The observance of these road-signs should be a "first charge" on all cyclists, and I feel that we have everything to gain and nothing to lose by playing "cricket." You see, I am jealous of the good name of cyclists, and it is a pity that some of the pedalling brotherhood should deliberately place a weapon in the hands of motorists. A whip with which to scourge us can usually be fashioned—out of nothing!—by the noisy and arrogant section who, through the possession of a motor-car and the purchase of petrol, have become something less than human. Let us not provide our motoring brethren with an excuse for genuine fault-finding. And let us get rid of this slackening in our discipline.

Tooley Street Revived

THE 13 cyclists of Wolverhampton (Staffs) who recently went cap in hand to the Chancellor of the Exchequer and presented him with the sum of £3 2s. 6d. as a voluntary contribution to the national effort, accompanied by an expression of regret that the Budget contained no provision for the taxation of cyclists, remind me of nothing so much as the famous Tailors of Tooley Street—whose measure of authority they have seemingly inherited. One can hardly imagine that the Chancellor will be deluded by these 13 voices crying in the wilderness (e.g., Wolverhampton, Staffs), or that he will retreat from the view, reached by a string of his predecessors, that a tax on cycles would be unjust and not worth while. It is, of course, competent to any cyclist who feels that he is not being sufficiently penalised through the medium of taxation to offer, out of the goodness of his heart (or the softness of his mind!), a present to the national funds, but it is deplorable—or it would be deplorable if any importance attached to the individuals concerned—for the 13 cyclists of Wolverhampton (Staffs) to make a song and dance about their prodigality. Meanwhile, it would be interesting to know what manner of cyclist these 13 folk of Wolverhampton (Staffs) are. What sort of motor-cars do they drive, and how long is it since they pedalled a bicycle? Are they related in any way to the "Cyclist for 40 years" and the "Cycling Enthusiast" who periodically inflict on the world their non-cycling views, through the medium of the daily newspapers? One wonders! I rather think that the optimism of the 13 cyclists of Wolverhampton (Staffs) will not be justified. They express the view that, if publicity is given to their spontaneous offering—their splendid gesture, one might almost say—"many other cyclists may send voluntary contributions."

"Pleasure Days"

A DAILY newspaper advertisement which quotes the unjustifiable injunction of the Minister of Transport, "Please do not travel for pleasure this Easter," makes the extraordinary statement that "Pleasure days are over for the present." I quite agree with the further assertion that our great business is to win the war, but I am perfectly certain that the process of getting on with the war is helped and not hindered by occasional "pleasure days." The matter can be tested. Try working all Saturday afternoon and all Sunday, and see what you feel like on Monday. Then, at the end of the week, take either Saturday afternoon or Sunday off (or both, if you can get 'em) and indulge in "pleasure days"—with a bicycle. I know from experience what the result will be. Not only will you be all the better for getting out into the countryside, but the break from the daily grind is in itself a tonic, helping you infinitely when you get back to your desk or bench. I am certain that, except in the minds (if any) of our Dismal Jimmies "pleasure days" are emphatically *not* "over for the present."

Notes of a Highwayman

By LEONARD ELLIS

Riding with an Object

THE story of King Arthur and his valiant deeds is perhaps as widely known as any of the English classics. It is still a best-seller and is likely to continue. Many cyclists, after reading Stevenson and other writers of the open road, become obsessed with a desire to travel in the footsteps of their heroes. There is a great deal to be said for this type of cycling; it certainly attracts the better class of rider—that is, those with a broader outlook. This style of riding is often called "riding with an object," to distinguish it from the somewhat senseless blinding over the countryside at a speed that precludes the possibility of gaining anything but a thirst, and a larger figure on the cyclometer. I have often said that such a cyclist might as well do his cycling on a home-trainer. The intelligent rider who would follow in the tracks of King Arthur must be patient, and must be prepared to spend a long time and travel many miles.

King Arthur's Sword

IF all the legends are to be believed—and of course they are not—Arthur was a fast worker and a prodigious traveller. When the cyclist has been all over the route he need not settle down and sigh for new worlds to conquer, as the "legend-makers" have been so kind as to provide alternative sites for nearly all the battles, and other incidents, and few places stand alone as undisputed and sole claimants. Everyone knows how Arthur obtained his wonderful sword and how Sir Bedivere flung this sword, called Excalibur, into the dark pool. The precise location of that pool is not accepted without question, but all the claims seem to fail in some small respect. The most popular claimant is Dozmare (Dozmary) Pool, not far from Bodmin. This is wild enough to satisfy nearly all the requirements, but Tennyson suggests that the real pool was near the sea, and Dozmare is a long way from it. The next competitor is Looe Pool, near Porthleven, a delightful little lake separated from the sea by a mere strip of shingle. A third pool claiming to be the actual one is situated in the region of Glastonbury. It is not for the cyclist to worry about all these conflicting claims—let him rather rejoice that legend should provide him wih so many objects for a ride.

Looe Pool from the Bar, near Porthleven.

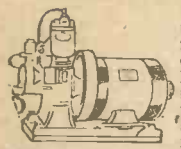
Arthurian Strongholds

WHILE in the neighbourhood we can find many more connections with Arthurian times, one of the most famous, of course, being Tintagel, the ruined stronghold on the Cornish cliffs. Here at least we find something tangible, even if we cannot prove anything. A castle certainly existed here, although the ruins now visible were not in existence in the days of Arthur. Here, of course, he was supposed to have first seen the light of day, but several other places make the same claim, so even after seeing and exploring the glories of Tintagel the cyclist will not give up the chase. About seven miles away there is an old earthwork that has definitely been identified with Damelioc, the fortress held by Gorlois against Uther Pendragon. Cardisham, five miles from Bodmin, is recognised as Caradigan and Kelly Rings, an earthwork near Wadebridge, is closely identified with King Arthur. Camelford has tried hard to be recognised as Camelot, but, alas, there are many stronger claims to this honour, including Cadbury, near Castle Carey.

Comparisons are Odious

TWO things to be avoided in cycling journalism are the comparison of places and the bestowal of the superlative adjective. In the first case, as no two persons have precisely the same preferences for types it is quite impossible to say that one place is better than another. To label anything as the best merely is to state a personal preference. It is safer to broaden the field if one wishes to draw attention to the merits of any particular locality by saying that surely it must rank among the first half-dozen or so. All this leads to a query—which is the most popular touring ground in the British Isles. I have no intention of trying to answer it although I suppose it could be answered statistically by finding out, if possible, the numbers of visitors to each locality. Even this would not be conclusive as the opinions of all the visitors must necessarily be obtained.

ELECTRADIX



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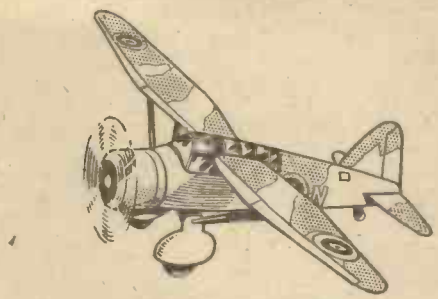

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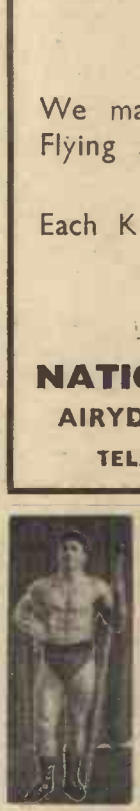

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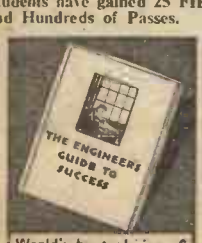

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