

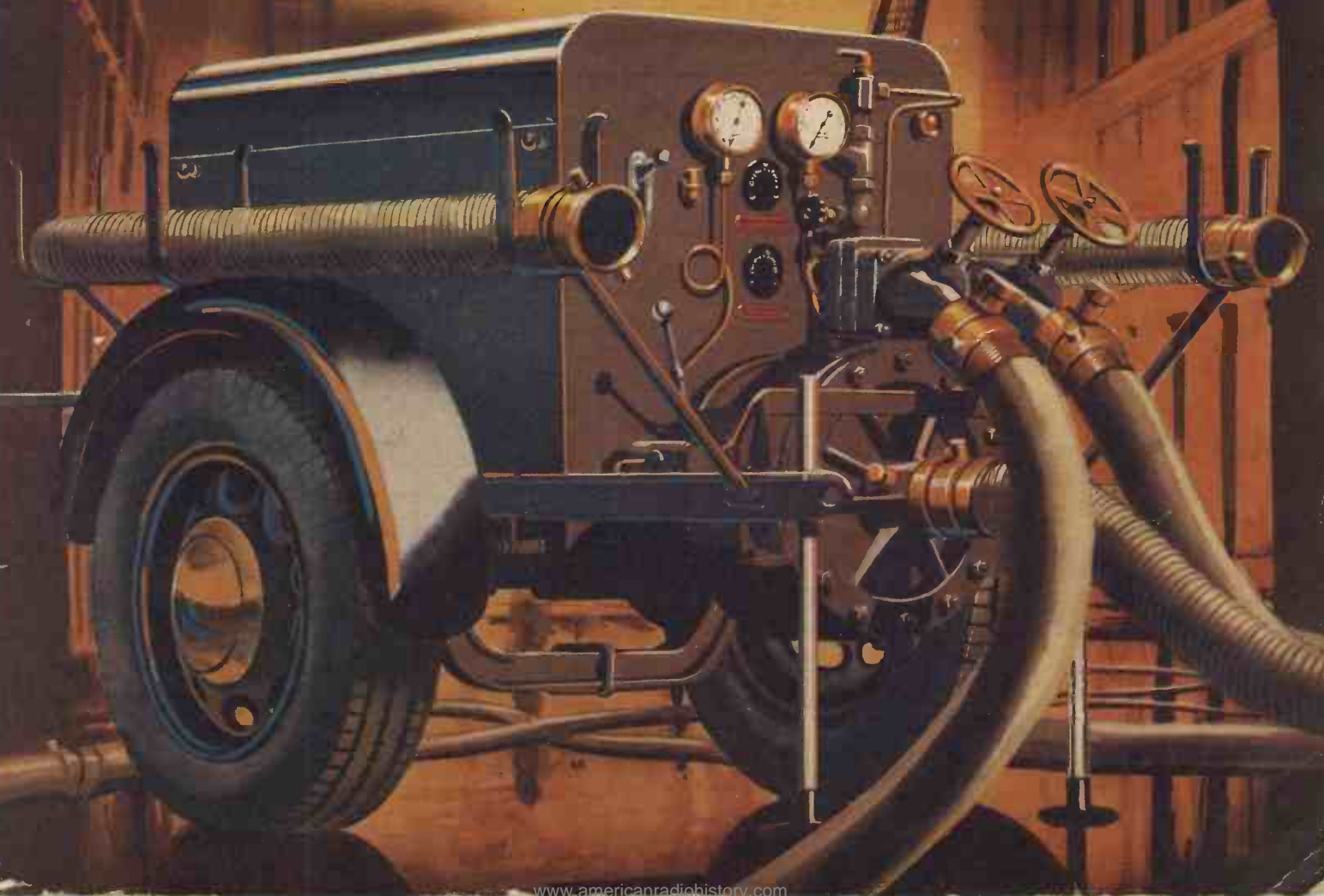
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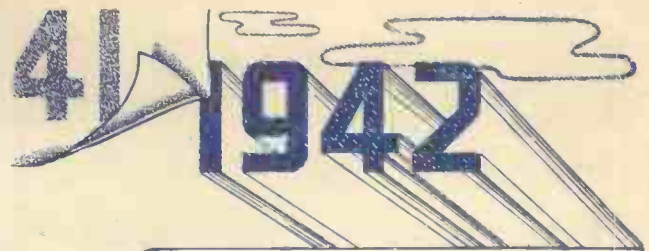
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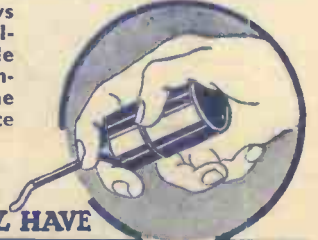


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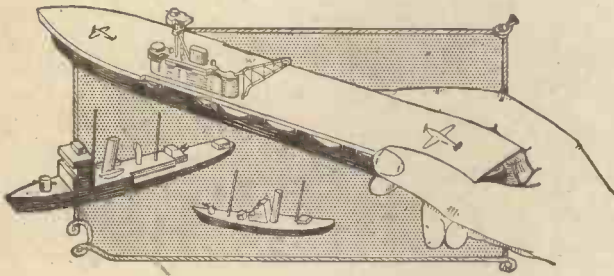
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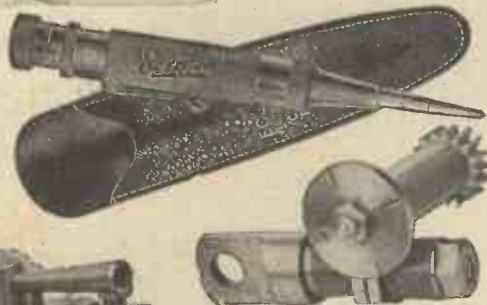
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PRACTICAL MECHANICS

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

Editor: F. J. CAMM

VOL. IX. JANUARY, 1942 No. 100

FAIR COMMENT

BY THE EDITOR

The Training of Technicians

A MOST important paper was recently read before the Royal Society of Arts by Mr. E. M. Rich, C.B.E. Mr. Rich was closely associated with technical education in London for over 35 years and his views therefore are valuable. The *raison d'être* of the paper was that this country had paid insufficient attention to the subject of technical education, and the training of technicians. We all know the result. When war came, there was a shortage of skilled men because the apprenticeship system had fallen into decay, and it had fallen into decay because parents did not see particularly bright prospects for their children in the fields of technical and scientific endeavour. The normal apprenticeship system was for five or seven years. Often a premium was required, whilst the apprentice drew 4s. or 5s. a week for the first year, with yearly increments of 2s. When he "came out of his time," he was expected to spend at least two years as an "improver," after which he would qualify for the full rate paid in the particular trade. Even this varied according to the district. The London Polytechnic has pioneered technical education, and it was enabled to do so because of the philanthropy of Mr. Quintin Hogg, who provided the money for it. Prior to that, the elementary schoolboy left school without any other avenues of education open to him or within his means. Thus, he became a skilled practitioner or artisan without the means of obtaining the theoretical knowledge which would lift him from the workshops to executive positions.

Continuation Classes

SOME attempt was made to remedy this state of affairs when the Board of Educational Institutions commenced continuation classes which scholars could attend in the evenings after leaving school. A nominal sum of 2s. 6d. per session was charged, and instruction was given in most of the arts, crafts and trades, including machine drawing, mathematics, art, English, and commerce. Certificates were issued as the students passed an examination set at the end of each year's course.

The need for technical education arose from the changed conditions of production consequent mainly on the application of steam power to machinery; the principle of division of labour, which in itself was the outcome of mass production, and as I have said earlier, the decay of the apprenticeship system. Existing schools could not provide technical education, and therefore technical schools were created to cater for hands, foremen or

overseers, masters or managers, and research and highly skilled technicians. We agree with Mr. Rich when he says that education has always been regarded by educationists in this country as the Cinderella of the social services, and that technical education until recently has received the least support from the powers that be.

Now there is determination on the part of all concerned that technical education shall be provided with funds to enable it to be developed in this country on a scale comparable with that of foreign countries. We have always been behind U.S.A. and Germany in this respect. Our teachers have never had the space, equipment, nor the facilities of other countries.

Technical Colleges

THE Imperial College, which in 1906 emerged from the fusion of the Central Technical College, the Royal College of Science, and the Royal School of Mines, is far behind Charlottenburg and the Boston Tec. Recognition of the need for technical education by the Government dates from the Technical Institution Act of 1889 and 1891 and the Local Taxation (Customs and Excise) Act 1890. In these Acts the following definition occurred:—"The expression 'technical instruction' shall cover instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employments. It shall not include teaching the practice of any trade or profession." This latter prohibition disappeared in the Education Act of 1902, as did also the limit of a 2d. rate for a higher education. Arising out of a meeting held at the Mansion House in 1886, there was formed the City and Guilds of London Institute for the advancement of technical education. In other parts of the country the Mechanics Institutes, Mason's College, Birmingham, Owen's College, Manchester, and others had been conducting courses of instruction.

By 1892 there were several Poly. Institutes in London. The Education Act of 1902 and the Special Act for London in 1903 had a profound influence on technical education, for they abolished the school boards and made County Councils and County Borough Councils responsible for the co-ordination of all forms of education within their respective areas. This led to the creation of secondary schools, which have done such useful work in past years. There has been considerable overlapping of effort and competition for students between classes run by the Local Authority, by

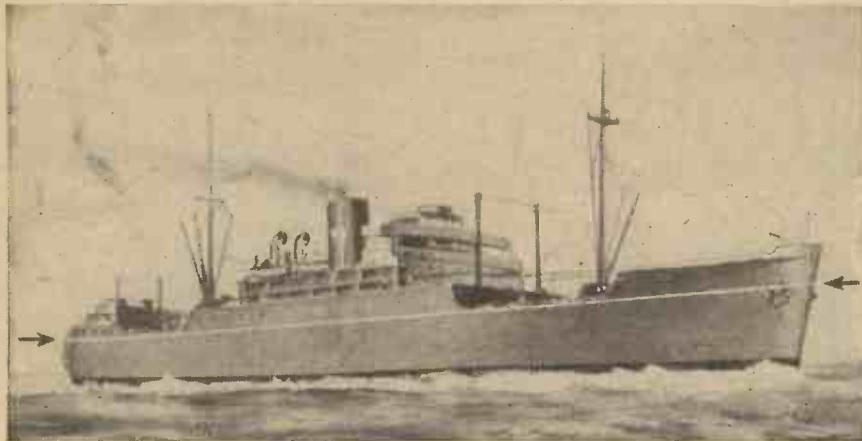
the University, and by the Aided Institutions. A policy was, therefore, pursued of letting these Institutions have a definite objective, and thus there grew up a number of Monotechnics in London such as the School of Photo-engraving, London School of Printing, Cordwainer's College, School of Retail Distribution, Meat Trade School, and so on. This policy of concentration has not, however, gone far enough. For example, there are in London, King's University, Queen Mary's, and Imperial Colleges, all providing day university courses of engineering, and in addition, Battersea and Northampton Polytechnics are doing the same, and another Polytechnic is trying to do it. The travelling facilities in London destroy the case for six Institutions.

Technical Literature

TO-DAY there is no excuse for lack of technical knowledge. Technical literature exists on almost every subject, and there are the technical journals which are playing such an important part in the war effort. The Government as well as industrialists value the work of the technical press, and a tribute to it was paid by Mr. John Pascoe, the Deputy Chairman of British Timken Ltd. He said he was impressed by the way the technical press is doing its important wartime job amid difficult conditions of paper supply and man power. The technical press, he said, is doing very real and vital services to industry. Its work is an essential part of the drive for higher production. It is an essential industry itself. All executives know how valuable it is to get together with fellow technicians. Technical journals stage a conference of the industries they serve once a week or once a month as the case may be. They give us news of the latest results of research and the practical application of new production ideas. In articles we are able to read the views of experts, to talk with whom many an industrialist would willingly journey the length of this country. They abstract the essential points of overseas journals, and save industry an immense amount of time and trouble in so doing. They act as an exchange of information on welfare and other works problems. A technical journalist has to be doubly skilled. He has to be a good journalist to start with, and a responsible one. He must also possess a high degree of technical knowledge covering a large number of industries. It is the technician who in the future will command the good jobs, and it is the technician who will govern.

Under-Sea Warfare

Methods of Combating Acoustic, Magnetic and Ordinary Mines



A ship fitted with a "degaussing" girdle as a protection against the mine

MINES used in the present war can be classified into three distinct types, each having a different method of detonation. First we have the ordinary type of marine mine which is exploded by contact with a ship, secondly the magnetic mine, exploded by a ship passing over it and closing an electric circuit and, finally, the acoustic mine which is detonated by the vibrations set up by the ship's propellers. There are also three methods of laying the mines—by seaplane, submarine, and surface vessels. Seaplanes are used chiefly for laying magnetic and acoustic mines, whilst submarines and surface vessels are used for the ordinary type of mine.

The Ordinary Mine

Taking each type in turn, we first of all have the ordinary marine mine which is spherical in shape and is kept buoyant by means of an air-chamber. It also contains a delicate chemical apparatus for detonating the high-explosive charge. Although these mines vary in size, 650 lb. is about the average weight of a moored mine which contains about 350 lb. of trinitrotoluol (T.N.T.). As will be seen from the illustration, the mine is fitted with a

number of "horns," generally five or six, and each one encloses a chemically filled glass tube. The air-chamber takes up about half the interior. A 5 cwt. metal "sinker" is attached to the mine by means of a steel cable which unwinds as soon as the mine is dropped into the sea. A glance at the illustration showing how these mines are laid, will show that attached to the "sinker" is another short cable with a lead weight on the end. As soon as the lead weight touches the bed of the ocean it automatically checks the pay-out of the mooring cable, thus drawing the mine below the surface of the sea. If the mooring cable should accidentally snap, the mine is made inoperative by reason of a device situated above the mooring tackle.

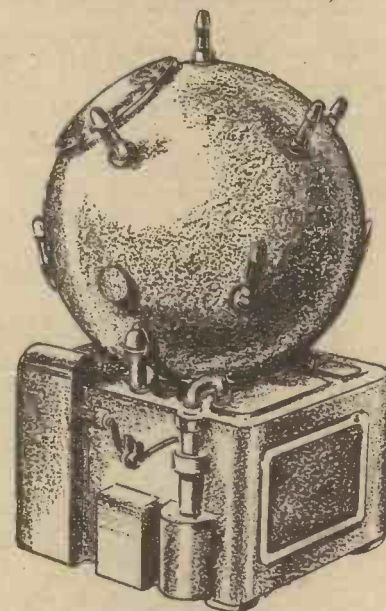
Floating Mines

This type of mine is similar in principle to the one just mentioned. The cable which connects the mine to the sinker, however, is cut and then rejoined with a chemical substance which gradually dissolves in sea-water. The reason for delaying the release of the mine is to enable the mine-layer to get well away from the spot before the mine breaks loose,

which in this case does not become inoperative. Hydrostatic devices are sometimes fitted to mines to keep them under water even after they have come adrift. A moored mine, however, is considered more dangerous than the floating or drifting mine, as waves from an approaching ship have a tendency to push the floating mine from its path.

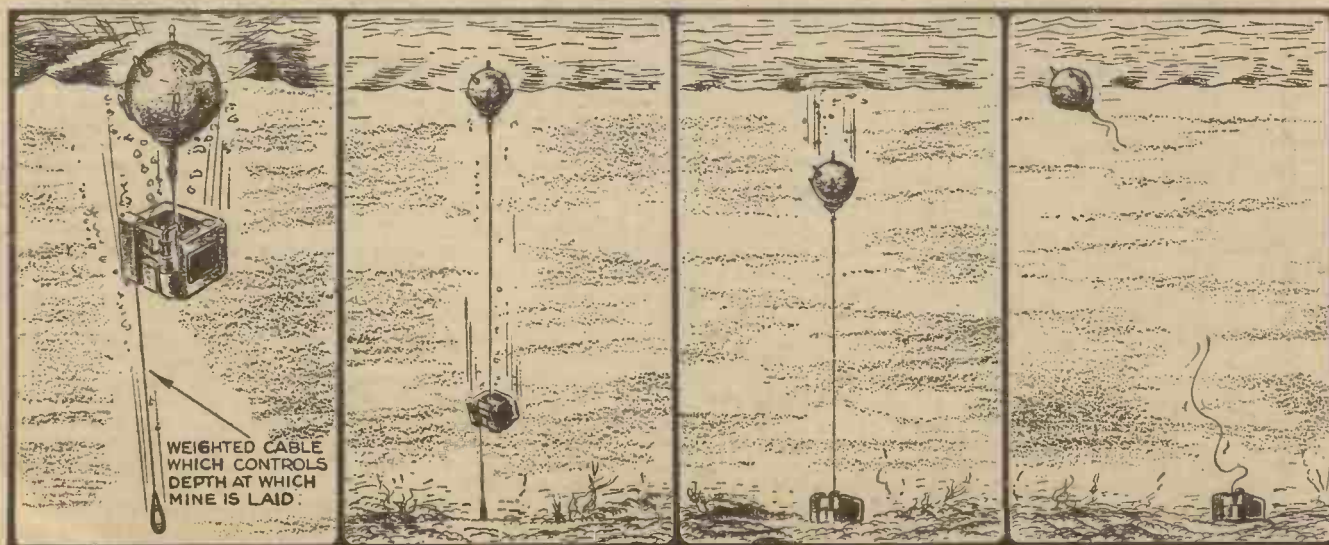
The Magnetic Mine

Although the Germans are credited with the invention of the magnetic mine, it is interesting to note that Sir Fredrick Bowhill, Air-Chief



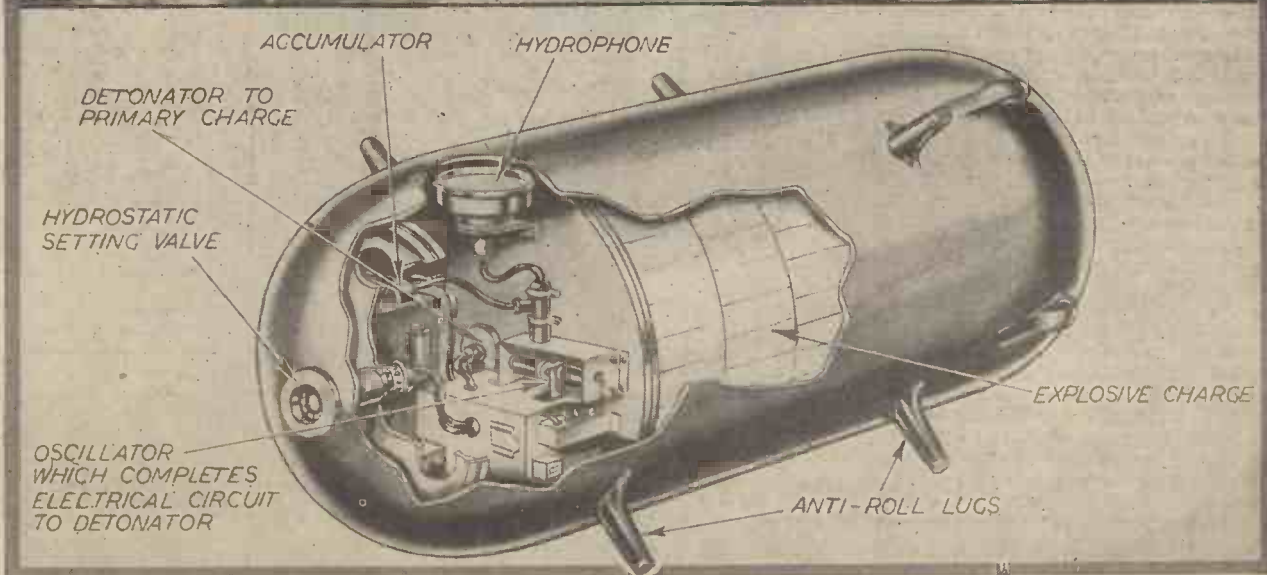
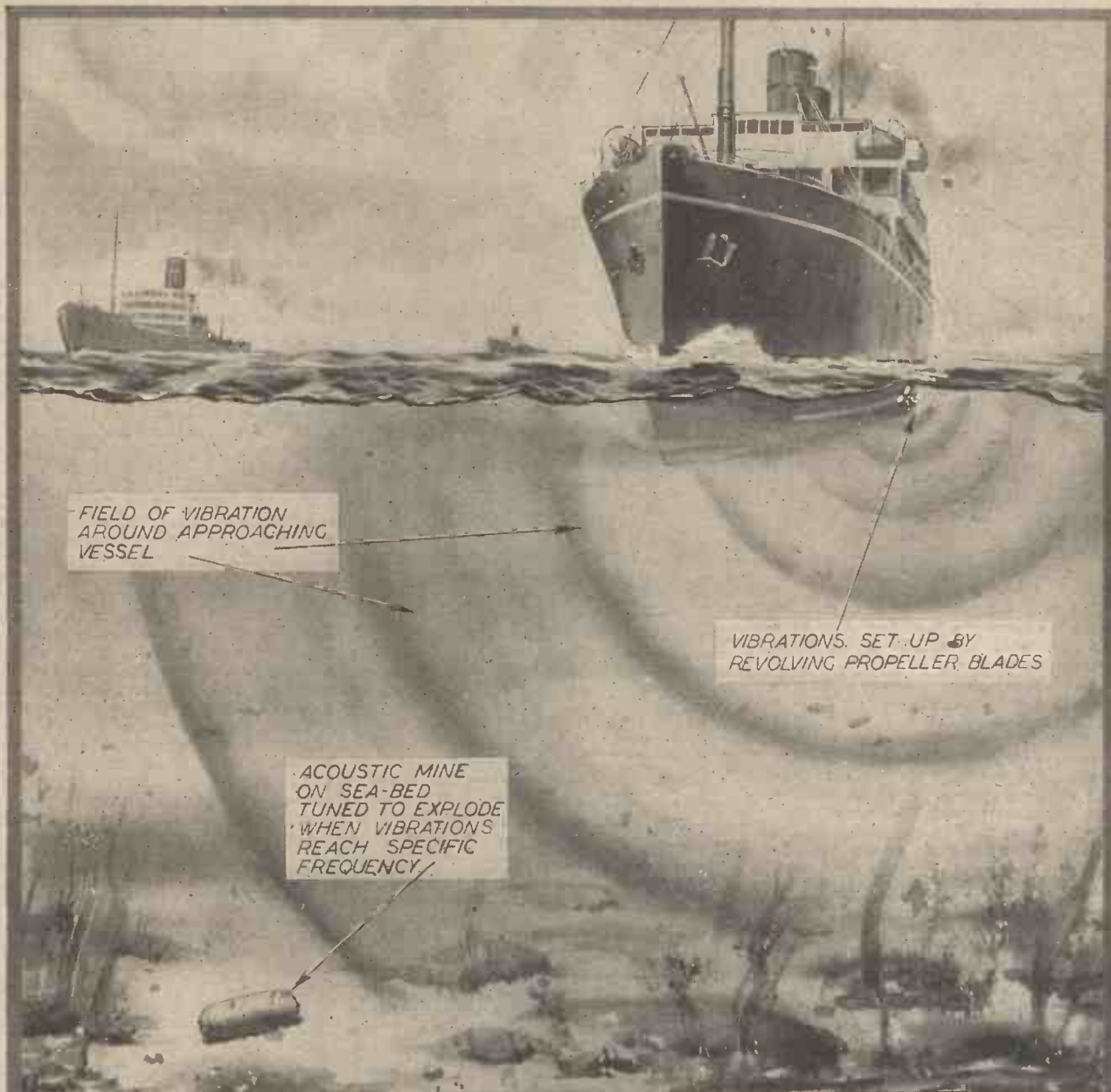
An ordinary marine mine before laying

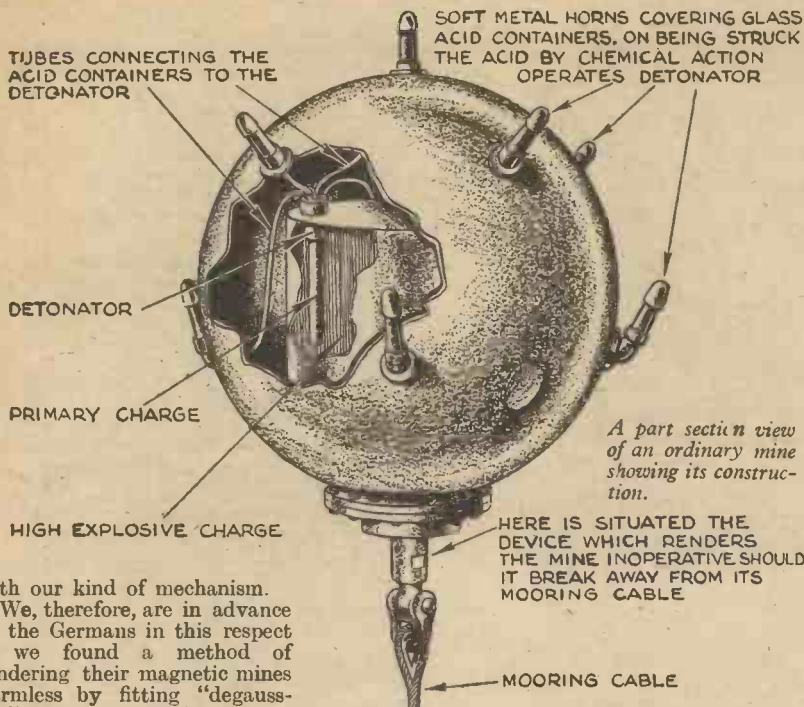
Marshal commanding the Ferry Command, recently stated that the British, and not the Germans, invented magnetic mines. He went on to say that it is we who are now sowing magnetic mines, and so far, the Germans have not yet found a successful method of dealing



Three stages in the laying of an ordinary mine. If the mine accidentally comes adrift as shown on the extreme right, it is automatically rendered inoperative.

THE WORKING OF AN ACOUSTIC MINE





with our kind of mechanism. We, therefore, are in advance of the Germans in this respect as we found a method of rendering their magnetic mines harmless by fitting "degaussing" girdles to our ships.

Reverting to the magnetic mine it will be seen from the illustration that the mine consists of a charge of about 650 lb. of high-explosive, simple electrical equipment and a compact parachute. As this type of mine was dropped from a seaplane, the reason for the parachute is obvious. As soon as the mine is released from the aeroplane, the pointed cowlings automatically opens and releases the parachute. As a result, it is lowered comparatively slowly on the sea. Upon striking the water, the parachute becomes unhitched and the mine sinks to the bed of the ocean. Short legs or horns are fitted to the mine to enable it to lie on an even keel on the bed of the ocean, whilst awaiting the approach of a ship.

How They Are Detonated

The magnetic field of a ship coming within range causes a balanced magnetic needle, similar to the needle of a magnetic compass, to turn on its pivot, thus closing a contact in an electrical circuit. Only a small current passes through that primary circuit, but it is sufficient to actuate a relay which controls the heavier current supplied by a battery to the electrical detonator which explodes the powerful charge. An important point that had to be considered when laying magnetic mines was a method of preventing the mine from accidentally exploding before it reached the sea bed. This danger was avoided by fitting a hydrostatic control to the mine consisting of a piston-type plunger at the end of which is a contact. Another contact is placed in line with this, and the two are included in the circuit of a relay connected in the detonator circuit. Because of this arrangement, the electrical detonator cannot operate until these relay contacts are closed. The hydrostatic control is so arranged that its contacts do not close until the mine has sunk to a depth governed by the loading of the piston plunger.

As stated previously, we devised a method of rendering these mines harmless by demagnetising steel ships of all kinds. The name given to this is known as "degaussing," for in technical circles the gauss is known as a unit of magnetic flux: the strength of a magnetic field is described in terms of the number of gauss.

The Acoustic Mine

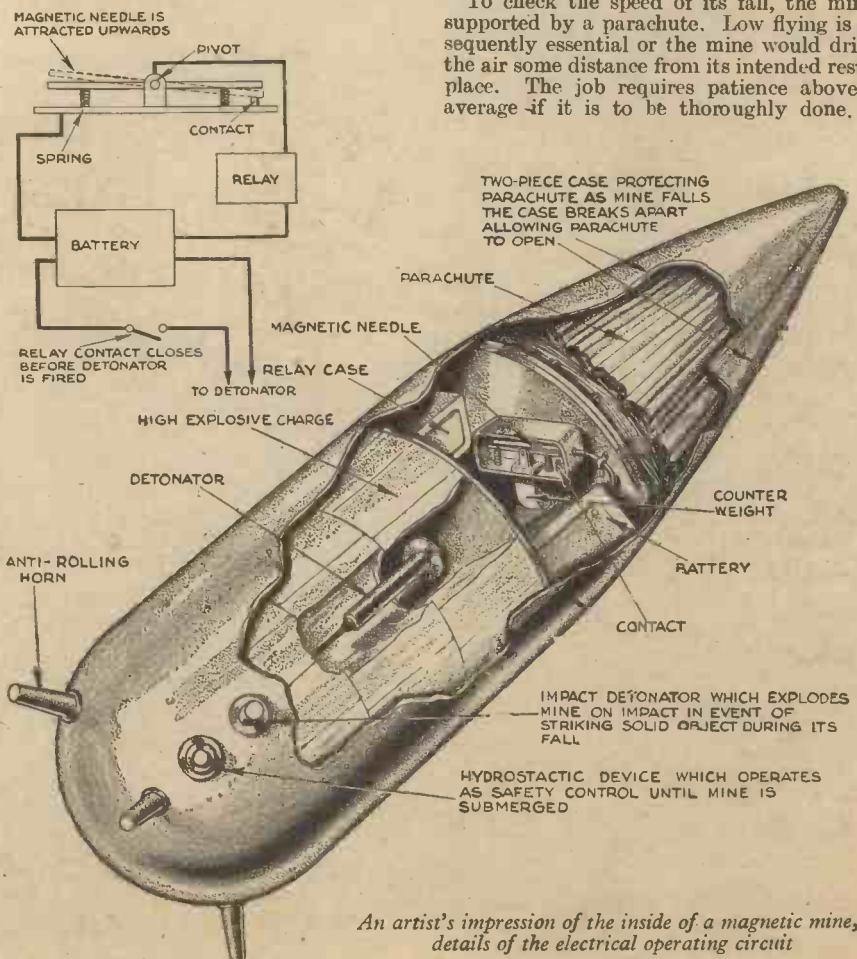
Finally, we come to the acoustic mine, and as with its predecessors, our mining experts have succeeded in neutralising its effect on our shipping. The official explanation of its

method of working is: "A trembler circuit is 'touched off' by the vibrations set up by ship's propellers. When these vibrations reach the required frequency, the mine is exploded." The illustration on page 101 shows our artist's impression of how the mine might work, as the actual working and construction of the mine as used by the enemy is still an official secret. It will be observed that a ship in passing sets up sound waves through the medium of its propellers, which pass through the water and are, in turn, picked up by the hydrophone fitted to the mine. The sound waves are then converted into electrical impulses by the hydrophone, and an electromagnet sends these impulses to a trembler which commences to oscillate between two contacts. When the vibrations reach a certain frequency, the trembler swings right over to the detonator contact and fires the explosive charge contained in the mine. By that time the ship is right over the mine, and thus receives the full force of the explosion. The mine is similar in shape to the magnetic mine, and has anti-roll lugs fitted to it so that the mine will rest on the bed of the ocean the right way up.

Minelaying by Plane

Throughout the year minelaying planes fly over many thousands of miles, in every kind of weather. Over the sea, flying alone, the minelayer makes for his target, a tiny speck off the enemy coast. Perfect navigation is essential. As he nears the coast the pilot picks out the landmarks, pin-pointing his exact position. There is a hawklike dive, a splash as the mine touches the water, and then at full throttle, the aircraft is away again, before the shore batteries can locate him and before fighters in the area can intercept him.

To check the speed of its fall, the mine is supported by a parachute. Low flying is consequently essential or the mine would drift in the air some distance from its intended resting-place. The job requires patience above the average if it is to be thoroughly done.



An artist's impression of the inside of a magnetic mine, and details of the electrical operating circuit



Reversed silhouette—effective in misleading a sea-level observer

Camouflage Technique

A Simple Introduction to this Interesting and Vital Art

By R. H. WARRING

TO hide from danger is a primitive instinct, and one that is readily displayed by animals. One effect of civilisation is to make man feel more secure and thus the need for concealment is not so great, with the result that his dwelling houses, factories, roads, etc., are quite openly displayed. The lower animals still preserve their natural characteristic of blending with their surroundings, because that still remains an essential part of their self-protection.

With the advent of war, even man himself feels once again the necessity of camouflage, or merging into his surroundings in order that he may escape the prevalent dangers. As applied to him, however, it affects chiefly his houses and factories, so vitally necessary at all times, and since these are nearly always of a conspicuous nature, the art of camouflage has been developed as essential. Side by side with this is the detection of camouflage whose most useful weapon is the aerial camera, and a continual war is being waged between the two.

Various Kinds of Camouflage

It is a military necessity to camouflage troops, concentrations of vehicles, etc., important buildings, factories and aerodromes, and the means by which this is accomplished may be subdivided into three groups:—

- (1) Natural camouflage.
- (2) Artificial camouflage.
- (3) Deceptive camouflage.

The first is the best, if practicable, but more generally a system embodying all three is employed.

Natural camouflage is generally applied to small mobile units, such as troops who can station themselves in woods, etc., and road vehicles which draw up under the shelter of overhanging trees. It should be made clear, however, that it is impossible to avoid detection if the object is moving, provided that the observer is keen enough. Aeroplanes are dispersed around the aerodrome when not in use, partly for the reason that a well-directed bomb would not cause damage to more than a few machines and partly because the camouflage employed on the 'planes themselves blends easily into the landscape.

It is dangerous to rely on paint alone as artificial camouflage for ground objects, for whilst it may effectively mislead an observer on the ground, a different picture altogether is obtained from high-flying aircraft. It is found, then, that camouflage is more in the nature of blending textures rather than colours. The following should make this clear.



(a) Shows shadow cast by normal building. Where this cannot be merged into general surroundings a camouflage superstructure may be used to break up outline and give shadow, as at (b).

Colour Contrasts

To the visual observer at a relatively near distance, e.g. low-flying aircraft, colours and colour contrasts are quite clear and thus a good colour scheme which breaks up the outline of the object to be concealed and blends, without contrasting, with the surrounding landscape, is probably adequate. The difficulty in matching the colours is great, however, and local colouring may change within a few miles and also with the time of the day, as the sun's position changes.

At an altitude of a few thousand feet the colour contrast fades out and the whole picture as seen as a number of monochromes. Thus, to remain hidden from high-flying aircraft, the texture of the object must blend naturally with its surroundings.

This is accomplished to a certain extent by using matt finishes, avoiding lustrous paints (as they reflect light), and spraying the paint on is an additional help. It is often desirable to deliberately roughen the surface before applying paint, or, better still, use a form of over-structure to break up the outline of the whole. In this connection the following points should be noted:—

- (1) The outline of the object *must* be broken up so that the silhouette does not immediately give it away.
- (2) The object *must* blend into the landscape, all regular shapes and edges "disappearing," even to painting a picture of the background on the subject, although this is only protection against a "ground" observer.
- (3) "Disruptive" painting may be employed, when contrasting colours are used, breaking up the general outline completely. Something after the style of the "dazzle" painting employed on ships during the last war, although, in modern practice, straight lines are avoided.
- (4) A careful study must be made of the shadows and shadow directions, which obviously change during the day. The painting must blend into the shadows at all times, and the shadows themselves must never be left to appear with straight edges.

(5) If the object to be concealed is relatively small, netting may be employed, festooned with suitably coloured material, branches of



A building merged into the background

trees, etc. The latter are the best, but if natural foliage is employed, it must be remembered that it is liable to wither and change colour and will require renewing periodically. Nets used over guns, etc., must be of sufficient size and shape that they allow freedom of movement of the guns and do not impair their working efficiency.

(6) Avoid regularity, as this is a sure indication of man's handiwork.

Deception is common and may take many forms. Dummy aerodromes, factories, etc., may be constructed to draw the enemy's attention away from vital points. It was used widely during the last war, and is also employed at the present time. Ships have been painted with a "reversed" silhouette so that it would appear at first sight that they are travelling in the opposite direction to that which they really are.

Tell-tale Photographs

However, all camouflage effects are at a great disadvantage when up against the aerial camera. A photograph merely reproduces the general effect in tones of black, grey and white depending upon the reflecting powers of the objects, and thus texture is of paramount importance.

Concrete, roads, stone buildings, etc., show up light, grass and trees dark, and all shadows are accurately reproduced. The skilled observer can learn a lot from a careful study of such photographs, especially a series of the same spot taken at, say, weekly intervals. From these he is able to visualise the type and size of the constructional work going on. Since shadows show building outlines, etc., photographs taken soon after sunrise or nearing sunset are extremely useful in this respect, for shadows are longest then.

Since "suspected" areas, then, are likely to be photographed periodically from enemy aircraft, all new constructional works should be carried out under a camouflage screen if practicable, otherwise the "growth" is conspicuous. The greatest danger is from aerial bombs, and a comprehensive set of photographs of the objective is invaluable to the enemy.

It is the object of camouflage to reduce the usefulness of such photographs, for it is practically impossible to prevent them being taken. A lone reconnaissance aeroplane can sneak over at a great height above the effective range of anti-aircraft fire and speed away again before interceptor fighters can reach it. Photography is now such an advanced science that infra-red "plates" give effective results even in poorish visibility, although for fine detail a relatively low altitude is desirable.

"Black Out"

However, the majority of bombing raids are carried out at night, daylight raids having proved too costly. On a moonless night the perfect camouflage is obviously a "black out," but this cannot be one hundred per cent, unless everything is static. The lights of vehicles, restricted as they are, are still visible to the aerial observer on account of their contrast with the "natural background."

A number of such small lights in a fairly regular line would indicate a busy road or a convoy, and a greater concentration probably a town. Thus, the necessity of minimising road traffic during air raids is realised.

Parachute flares or a bright moon give a "photographic" panorama in which shadows are particularly prominent, and thus the breaking up of the sharp outline of an important building is the best camouflage. Where concentrations of men or material are present, the task of camouflaging is rendered harder, and dispersal or irregularity of disposition should be adopted. A gun battery, for example, is more effectively hidden if the various units are dotted about, seemingly

Shadow shading on aircraft—very effective over the countryside when viewed from above. Weak points are perspex glints in the sun from the cabin coverings.



haphazardly, but intelligently, so that their efficiency is not reduced, making use of such natural cover that is available.

With guns, however, there is an additional factor to contend with. When in action the flashes are visible and, more important still, the blast itself makes a greyish white patch on the ground. This is clearly revealed in aerial photographs and must thus be appreciated and covered after firing, or the position moved.

Aircraft Camouflage

That methods of camouflaging are still changing is readily shown by the various types adopted by aircraft. The first generally adopted scheme in this country was a flat black under-surface with dark earth and green shadow shading on the remainder. This was extremely



Breaking up the outline of a covered lorry

effective when viewed from above and over countryside.

Fighter aircraft were then modified by having an "unbalanced" underbody colouring, one half wing and half fuselage black, the other white, and the author has watched Spitfires "disappear" during certain aerobatics, especially against a light sky. Still another change, and the whole of the under-surfaces were painted light blue—"duck egg blue" being the official nomenclature, which was even more effective.

The Germans appear to have adopted a light blue colouring all over for many of their machines, particularly in the earlier part of the war, which gave a "transparent" effect at great heights. As lessons were learnt, and experience gained, further modifications were made, the R.A.F. still retaining shadow shading, only with the two colours, now dark green and grey and the undersurfaces sea grey. Certain distinguishing marks are carried.

Camouflage for night bombers has always been a problem. Not many years ago the standard scheme was dark green all over, as this was considered to be the most "invisible" over a range of conditions. Even so, when picked up in a searchlight beam the whole aeroplane appeared a "ghostly" white, and people despaired of ever nullifying this.

Non-reflecting Paint

Recently, however, a certain American laboratory has produced a new synthetic flat black "paint" which is almost a perfect non-reflector. It is reputed on good authority that a piece of material covered with this paint was invisible when held in a car's headlights about twenty yards from the observer (and not a "black-out headlight," either).

It is thus significant to note the adoption of an all-black colouring for our night fighters, and bombers, too, have proportionately more "blacking out" than formerly, although the effective range of a searchlight beam is not very great.

Marine aircraft have a slightly different camouflage, a pale blue-green being the German idea at the beginning of the war as blending both with the sea, when viewed from above, and the sky when viewed from below. The British scheme was generally a combination of light grey and a light purple although, again, many modifications have been carried out.

In the Middle East

It has been previously noted that camouflage colours vary according to location, and thus we find in the Middle East lighter colours being used with a predominance of yellows to blend with the sandy landscape. Ships, too, are painted with lighter greys, in fact, the "stronger" the sun, the "weaker" the colours.

It has been revealed that the two German warships, *Gneisenau* and *Scharnhorst*, whilst lying in Brest Harbour, and under repair, were covered with camouflage netting, presumably arranged so as not to interfere or restrict the movement of the workmen, and at the same time rendering them less conspicuous. Attempts were also made to break up the general outline of the hulls with false structures. All this is apparent from an aerial photograph of the docks.

Aerodromes

Aerodromes are quite difficult to hide on account of their large, regularly shaped hangars, concrete runways, and the motley of buildings that are necessary, but it was not unknown in the days when camouflage was first generally introduced, for a pilot being unable to locate his "home" station due to the lack of conspicuous detail. Track marks, however, show up well from the air and the most cunningly hidden section may be revealed by omitting to take into account this factor. A number of well-defined paths caused by cars, lorries, etc., converging upon one point, even if this is so well camouflaged as to be indistinguishable, indicate to the enemy a possible spot of interest and attention.

In general, it can be said that camouflage of a very high order is necessary to deceive the aerial camera, and so it is foolish to rely on it too much for protection. On the other hand, it is extremely necessary in war time, invaluable in fact, but it must be intelligently applied and not consist of a few haphazard coats of "green and brown" paint.

THE MONTH IN THE WORLD OF

Science and Invention



Dr. F. A. Firestone, of New York City, is here seen with the ingenious device which enables him to imitate simultaneously the singing voices of one to ten persons

Welded and Rivetless Tanks

ONE-PIECE welded tanks, designed to give greater protection to crews, have been developed by the United States Army. A study of the battle of France revealed that the heavy casualties were caused among tank crews by shells cutting off the heads of rivets and forcing the body of the rivets into the tank with the force of bullets.

New U.S. Explosive

IT is understood that the United States Army is preparing to produce two new super-explosives. The first, named RDX, is identical to a secret formula used in the British "super bombs" and is the result of years of research by Anglo-American ordnance officials. The second is named "pentolite." Its detonating power has not been divulged.

One Man, Ten Voices

DR. F. A. FIRESTONE has recently perfected a device which enables him to imitate simultaneously the singing voices of one to ten persons. By merely moving the lips in utter silence, a person produces a combination of voices, ranging octaves above and below any human voice, all singing in a harmony that only years of training can produce. The illustration on this page shows the device in operation.

Hunting for Metals

NEARLY 100 test-shafts have been sunk in recent months by the U.S. Bureau of Mines, which is searching for deposits that will make America self-sufficient in supplies of such materials as antimony, tungsten, mercury and manganese.

Aluminium Destroyers

THE U.S.A. Navy Department says it is studying plans for a revolutionary type of destroyer "made of aluminium and believed to be capable of 52 knots." The Navy Department spokesman declined to discuss specifications, but said that no decision had been taken regarding acceptance of the plans.

A Remarkable Alloy

A REMARKABLE new alloy has been produced which permits revolutionary feats of surgical carpentry. It is known as Vitallium, and for the first time in medical history, surgeons have been provided with a metal that can be implanted permanently in the human body. Screws, nails and plates made of this metal and used for repairing fractured bones can now be left in place, where formerly a second operation was necessary to remove them once the bone had knitted together. This new metal has been produced by two Americans R. W. Erdle and C. H. Prange, and is the result of many years of intensive research. Its main constituents are cobalt, chromium and molybdenum.

New A.A. Gun

THE development of a new anti-aircraft gun which has a calibre of 4.7 in. was recently disclosed by Brig.-Gen. G. M. Barnes, Assistant Chief of Ordnance, at the annual meeting of the American Society of Mechanical Engineers.

New Type Glasses

A NEW type of glasses have been developed which permit the near-blind to see for normal work. Like two pairs of glasses held together by rods over an inch apart, they permit more normal perspective than thick-lensed glasses.

The Brain Microtome

IN Georgetown University, Washington, D.C., there exists what is probably the world's most fully equipped brain research institute. Over 5,000 human and animal brains are available together with such important equipment as cameras, projectors, etc. The Institute is under the direction of Dr. Othar Solnitsky, and its findings are open to brain students, surgeons and scientists from all over the world.

In one laboratory a large Vogt-Sartorius brain microtome is used to cut sections of the brain. Such sections are usually cut at a thickness of 50 microns (50/25,000 in.). The brain is placed in a large round central cavity

in the machine and an upper rectangular space is then filled with 70 per cent. alcohol. By rotating a handle, a large brain knife slowly cuts off sections after section until the whole brain is cut. As the section comes off the knife it floats in the alcohol from which it is carefully removed. In this way perfect serial sections are made. Not even one section is lost in the serial cutting of an entire human brain. The object of the research is "Practical use in understanding human conduct, and for application in diagnosis and correction."

New U.S. Warship

IT is claimed that the new kind of American warship which was recently reported launched is the fastest in the world. It has the size and armour protection of a light cruiser, the speed and twice the armament of a super-destroyer. It seems to indicate that a new era in light-warship construction is now well into its stride.

Spot-Welding

A REMARKABLE example of spot welding on a big scale, as regards production, is offered in the works of one of America's larger automobile manufacturers, where 4,000 spot welds per hour are carried out. With a consumption of 1,000 stampings per hour, nearly 50 complete car radiator grills are turned out in that time, or almost one a minute. This feat is accomplished by the use of carefully designed jigs and batteries of automatically operated welding guns. First of all, the jig, which is fitted with guides and locating pins, is loaded with the stampings assembled into a radiator grill. The jig is on rubber wheels and constitutes the lower electrodes, while air-operated clamps on the upper electrodes come down and fix the grill rigidly, after the locating pins have found the holes. The welding completed, the jig automatically releases the grill, and an idea of the efficiency of the whole equipment may be gathered from the fact that a floor space of only five feet by twelve feet is required to deal with a complete unit, including handling.

New Tinning Oils

THE Tin Research Institute has recently carried out tests on alternatives for palm oil and tallow in the hot-tinning process.

Certain oils have been compounded which have excellent stability at high temperatures and considerable freedom from fuming and from fire hazard. Trials of these oils in industrial plants have proved highly successful.

Protection Against Balloon Cables

ENEMY raiders which have been captured in this country have been found to be fitted with special fenders to ward off the balloon barrage cables. That German planes have been so fitted is a tribute to the effectiveness of the balloon barrage and, more important still, they reduce the aircraft's load of bombs and fuel. The German fenders weigh between 600 lb. and 800 lb. and slow down the speed of an aeroplane by about 25 m.p.h. as they cause extra air resistance. There is no novelty about such fenders, as the Royal Flying Corps tried out a similar device as far back as 1917. In an experiment, an English pilot deliberately flew his machine into a balloon cable which caused the aircraft to be thrown into a spin. The fender, however, protected it and the pilot managed to get his machine out of the spin, and effect a normal landing.

Practical Mechanics

How to make a Reliable Electric Clock from Standard every room in the house.

The basis of the present clock is the movement of an ordinary cheap alarm, and by means of the addition of a few simple fittings easily made it is converted into the pendulum-operated clock shown in the blue print and in the drawings. It operates from a Leclanche cell, and consumes negligible current.

It will be as well to outline the principle underlying the action of the master clock, and

transmitted through the wheel-work to the hands of the clock.

The Vibration of the Pendulum

The scheme for maintaining the vibration of the pendulum is as follows: An ordinary wooden pendulum, equipped with a heavy "bob" U, has a threaded extension terminating in the armature W. Fixed rigidly beneath the armature is an electro-magnet X,

First published in our October, 1938 issue, this article was reprinted in May, 1940. Both issues are now out of print, and in response to numerous requests we have reprinted it again.

so acquaint the reader with the arrangement of the mechanism and purpose of each part.

Fig. 6 shows diagrammatically the complete mechanism and the manner in which the hands receive their motion, whilst the sketch Fig. 1 is intended to give some idea of how the clock will appear when the components have been assembled. The reader can vary the design of the case to suit himself.

Referring to Fig. 6, A, B and C are three wheels mounted on independent arbors, the wheel C rotates once each hour, from whence it follows that the arbor carries the minute hand. Loosely mounted on the same arbor is the "cannon" J, carrying the hour hand, one end of J is attached to the wheel O, receiving motion through two similar wheels L and L and a pinion K; the wheel L is driven by the arbor which carries wheel C. This group of wheels constitutes the "dial wheels."

The wheel C meshes with the pinion which is mounted on the same arbor as the wheel B which meshes with the pinion carried by the arbor to which is secured the ratchet wheel A, driven by the "gravity arm" through the medium of the pawl. The gravity arm is secured to an arbor oscillated by a crutch rod and which is engaged at every alternate swing of the pendulum T. The combined weight of the arm and crutch rod must be adequate to cause the pawl to propel the wheel A whilst returning to their initial position after displacement by the pendulum rod.

Matters are so arranged that when the pendulum swings to the left it displaces the crutch rod and gravity arm in the same direction, simultaneously the pawl is withdrawn and picks up a tooth of the wheel A. The pendulum now commences to swing towards the right, but is now followed up by the crutch rod and arm. The energy stored in the arm is now utilised in driving the wheel A one tooth forward, the movement in turn being

so that the armature just swings clear of the electro-magnet. When, however, the arc of vibration becomes reduced to a predetermined value, a small "finger" or "trailer" Y pivoted to the upper portion of the rod T fails to swing clear of small wedge-shaped block Z attached to a light spring, one end of which is riveted to a bracket, whilst the free end of the spring is equipped with a contact engaging with a stationary contact. On the return swing of the rod T, the finger Y having previously dropped into a nick in the block Z levers down the spring and momentarily the contacts are closed, and the magnet X is energised. When the contacts close, the leading edge of the armature W is just about to pass over the magnet cores, consequently the excitation of X attracts the armature and the pendulum is impeded. An increased arc of vibration of the pendulum results, so that the finger Y is again carried clear of the block Z

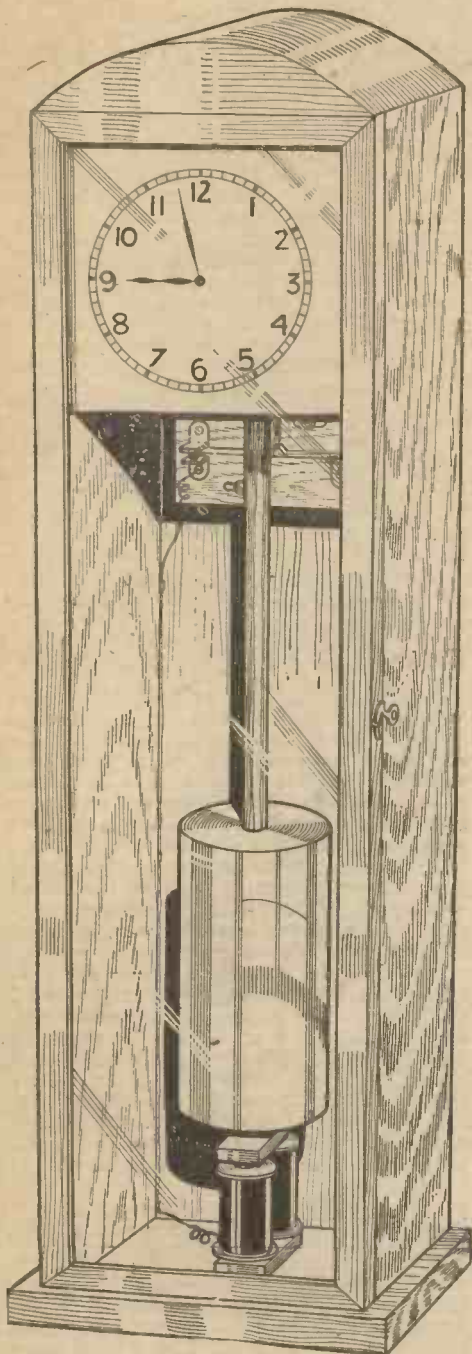


Fig. 1. The finished P.M. electric clock. It may, of course, be housed in a variety of case styles.

ALTHOUGH mains electric clocks have become extremely popular almost to the extent of rendering spring-driven clocks obsolete, at least 50 per cent. of the homes of this country are not wired for electric light and thus an immense market exists for battery-operated devices. This is particularly so in connection with wireless, for official statistics prove that 60 per cent. of the total sales of wireless receivers are for battery-operated sets. We have described several battery-operated clocks in past issues, and those issues have rapidly gone out of print. We have received some thousands of requests for a battery-operated Master Electric Clock which would not only form an electric time-piece complete in itself, but one which would also operate a system of Slave Clocks serving every room of the house.

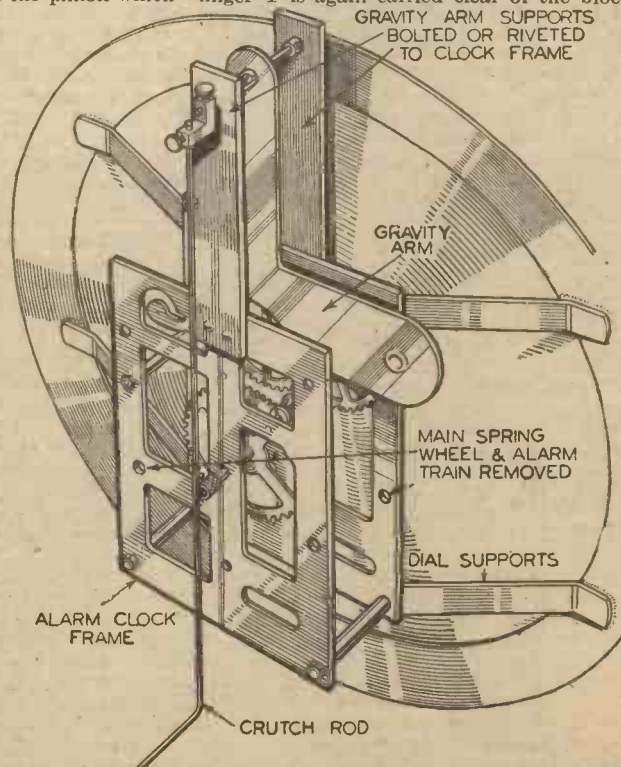


Fig. 2. General view of the assembled clock unit and dial, seen from the rear. The crutch rod is operated by the pendulum.

Master Battery Clock

Parts. It will control a "Slave" Clock System serving (Blueprints are still available.)

for several swings of the pendulum.

Gradually, however, the swing becomes reduced and the finger again fails to clear the block Z, when the contacts are again closed.

This simple means of impulsing the pendulum is automatic in action and economical as far as current consumption is concerned, and two or three quart Leclanche cells should run the clock for at least twelve months without any attention whatever.

be drilled through one flange of each bobbin for threading the ends of the coil through.

Now proceed to wind on each bobbin as evenly as possible about 3½ ounces of No. 30 single silk-covered wire; cotton-covered wire may be used if at hand. Be particularly careful not to reverse the direction of winding during the process.

When the coils are wound slip them over the cores, and connect the finishing end

A stout art board dial can be obtained for 1s., post free, from the publishers, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

The Electro-Magnet

The soft iron yoke (Fig. 7) has riveted to it two soft iron cores, the ends of which are shouldered down and are a driving fit in the holes drilled in the yoke.

For securing the electro-magnet in position the yoke is drilled for two counter-sunk screws. Slipped over the cores are the bobbins Fig. 9; on these are wound the magnetising coils.

The bobbins are easily built up from thin brass tube of a size to fit the cores snugly, and are completed by soldering to the ends of the tube brass flanges in which a hole has previously been bored for the insertion of the tube. Before winding on the wire wrap a couple of turns of notepaper around the tubes, and well brush with shellac varnish. To insulate the flanges, cut some discs of paper, of course cutting the centre of the disc for the tube; cut through one side so that the discs can be placed on the bobbin, and then well brush with varnish. A couple of small holes may

of one coil with the starting end of the other. The two remaining ends of the coils should now be connected to a couple of dry cells, or Leclanche cells, to ascertain if there are any breaks in the wire; also to check the pull of the magnet with a piece of soft iron. (Fig. 8.)

Assuming the test is satisfactory, finish off the coils with a coat of some insulating varnish, and to give a pleasing appearance the coils may be covered with a piece of black velvet.

The Suspension Bracket

Two pieces of steel or brass, E and F, Fig. 13, are bent at right angles and drilled with two holes for attachment to the back-board. Inserted between E and F is a distance piece H, a shade thinner than the thickness of the brass at X, Fig. 3. After truing up the sides of E and F coming against the piece H, the whole is drilled and riveted together, ensuring that the top and bottom edges of the bracket are square and

parallel. Carefully cut a V notch in the top edge of E and F to receive the suspension pin Q. If necessary file out the checks of the bracket until the brass blocks of the suspension spring are a snug fit, and will permit the pin Q to rest in the notches.

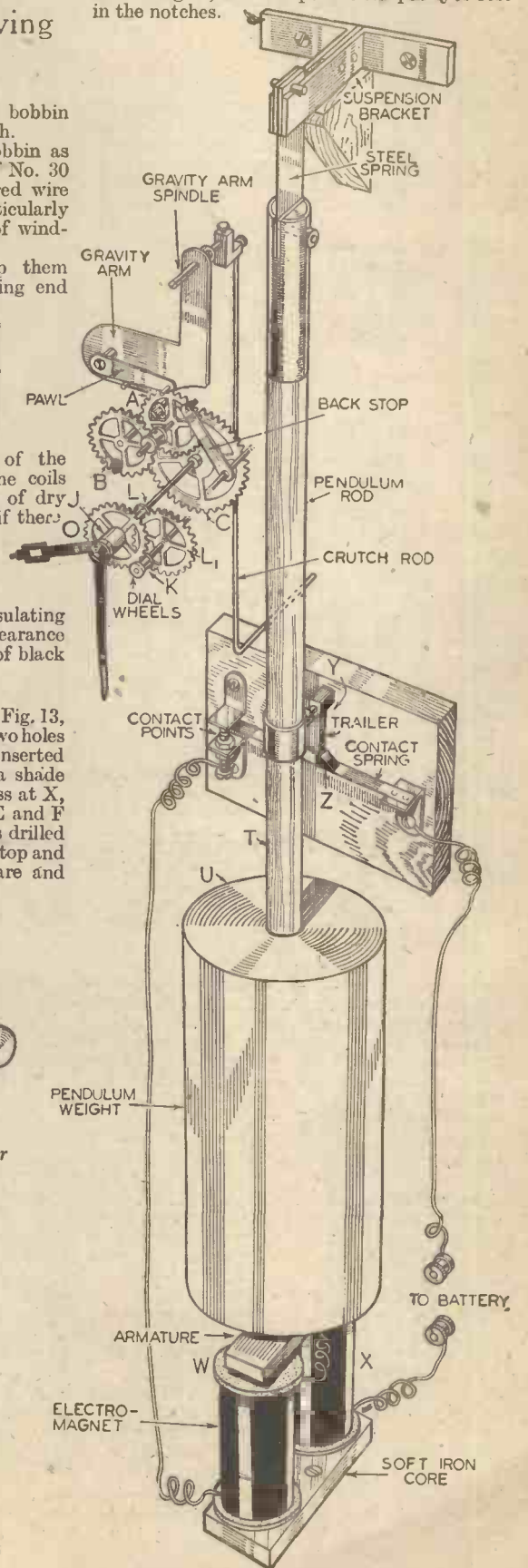


Fig. 6. General layout of the electric clock.

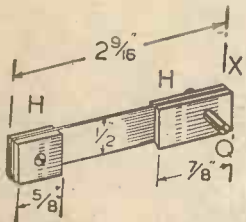


Fig. 3. Pendulum suspension spring

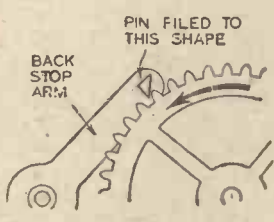


Fig. 4. Back stop or detent

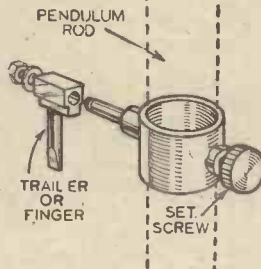


Fig. 5. Pendulum trailer

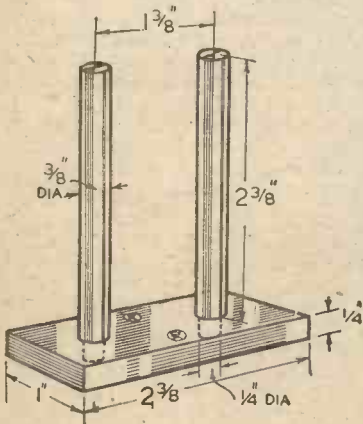


Fig. 7. The magnet core.

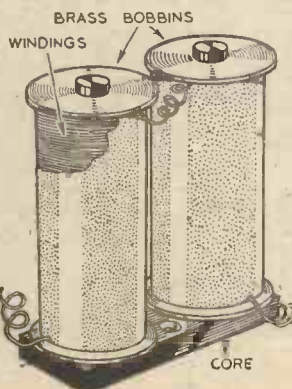


Fig. 8. The complete electro-magnet.

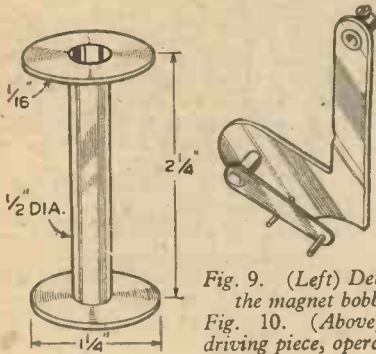
Armature

For the armature (Fig. 11) use a piece of soft iron. A centrally drilled hole is tapped to suit the screwed rod attached to the end of the pendulum rod, and is locked in position by a nut. It is as well to anneal the iron by allowing it to remain in the fire overnight.

The Pendulum

The pendulum is built up; a main portion P consists of a piece of half-inch wooden curtain rod, the ends being fitted into pieces of brass tube, A and B (see blueprint).

The tube A is closed at one end with a piece of brass rod, slotted to receive the suspension spring S, a small bolt and nut being the means



of attachment. The rod is reduced to fit into the tube and a couple of small holes are drilled through the whole to receive rivets made from soft wire.

The tube B is attached to the rod in a similar manner, but before attachment a quarter-inch brass collar (or nut filed down) is driven into the end of the tube and soldered; screwed into the collar is a piece of threaded rod T, to carry the timing nut and the armature L. Sliding freely over B is the bob M, which should weigh from 10 to 15 lbs. and may be of iron or lead.

Fig. 3 shows the method of attaching the suspension spring to the brass chocks by small rivets.

Use steel ribbons or "feeler" blade steel for the spring, which should be from 3/1,000 in. to 5/1,000 in. in thickness.

The ends of the spring should be a good fit in the suspension bracket and the end of the pendulum respectively; the upper end of the spring has a pin Q that normally rests in the notches of the bracket. The length of the pendulum is measured from the bottom of the bracket to the centre of the bob; any slight error in length is easily corrected by altering the position of the bob by means of the timing nut.

Trailer or Finger

A piece of steel wire D is flattened at one end, the other end is driven into and soldered to the block B; the latter has a hole drilled at right angles to D to take the pin carried by the pendulum fitting.

The whole fitting should be as light as possible; to reduce wear, the flattened end of the wire D should be filed to a point and hardened.

To support the finger, the special fitting (Fig. 5) will have to be built up. This consists of a piece of thick tube to fit the pendulum rod T freely, and on opposite sides of the tube are soldered the bosses A and B; these are drilled and tapped to receive respectively the milled screw S and the pin P.

The screw S provides for adjustment of the finger up and down the pendulum rod relative to the contact-maker.

The Wheelwork

To reduce the amount of work and the tediousness of building up the wheelwork, necessitating the correct pitching of the holes for the pivots of the various arbors, it is pro-

posed to utilise the movement of an alarm or other clock.

If the movement has a seconds hand, remove all the wheels in the alarm train, then remove the "balance wheel" and "escapement"; after that, the large wheel carrying the main spring of the going train.

If a 3/4 seconds pendulum is used, its length will be 22 in., and the number of teeth in the ratchet wheel will be 40, since a 3/4 seconds pendulum makes 80 swings per minute. On the other hand, if a long or seconds pendulum is preferred, with a length of 39.12 in., the ratchet wheel will have 30 teeth. Frequently, on counting the number of teeth on the highest driven wheel of a movement, they will number 40, which is suitable for a 3/4 seconds pendulum.

In this case it is not absolutely necessary to substitute a ratchet wheel of 40 teeth, but the driving pawl will have to be carefully shaped to fit the teeth of wheel. If it is decided to replace the wheel by a ratchet wheel with either 30 or 40 teeth, a piece of sheet brass may be used in its construction.

The length of the pendulum will not affect the other details of the clock, which can now be considered in detail.

The Frames

To support the arbor carrying the gravity arm it will be necessary to rivet or bolt to the frames two brass strips K. These are tied together at the upper ends by a length of 2BA threaded rod F; a piece of tube slipped over the rod serves as a distance piece when the nuts are screwed up. Viewing the movement from the back, it will be advisable to remove the top right-hand pillar originally fitted for keeping the frames the correct distance apart.

Holes are drilled in the strips K to take the gravity arm arbor O.

On account of clock frames varying in size, it may become necessary to modify slightly the dimensions given in the blueprint, but no great difficulty will be experienced.

The Gravity Arm

This component is readily made from a piece of sheet brass, and should be of ample proportions to have the required weight to propel the ratchet wheel.

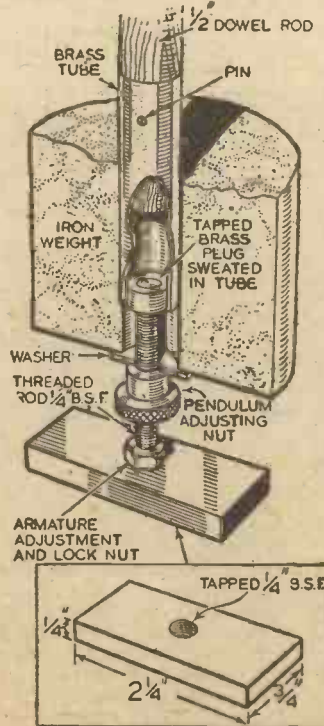


Fig. 11. Details of the pendulum and armature.

A projection Q on the lower end of N carries the pawl R, engaging with the teeth of the wheel W, whilst its upper end is fitted with a bush to suit the arbor O. On account of the clock frames varying in size, the dimensions on the gravity arm can only be given approximately; the constructor can modify this to suit his special requirements.

The pawl is built up from a brass strip R, mounted on and soldered to a piece of thick tube T, to act as a bush, which in turn oscillates on the pin P projecting from Q.

A pin V, riveted to the outer end of R, engages the teeth of the ratchet wheel; the pin should be filed to suit the shape of the teeth.

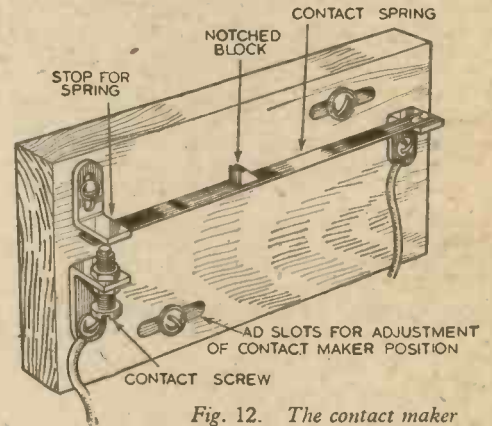


Fig. 12. The contact maker

To prevent the pawl from dropping and picking up more than one tooth when withdrawn by the pendulum, a pin Z may be set in the arm on which the pawl may temporarily rest.

The back stop M can be manufactured in much the same way.

Contact Maker

The device takes the form of a light spring, riveted at one end to a brass bracket screwed to a wooden or ebonite base B. The free end of the spring is provided with a contact G, engaging with an adjustable contact H, carried by the bracket I.

To restrict the play of the spring, an adjustable stop V is introduced; thin strips of leather, etc., may be glued to it to silence the action when the spring is released.

The spring should not be too stiff, otherwise in depressing it a lot of unnecessary work will be thrown on the pendulum.

Crutch Rod Details

Riveted or otherwise mounted on the spring is a small wedge-shaped block M; the latter has a small nick cut at one end for the entry of the point of the finger.

The baseboard B should be provided with slotted holes for adjusting purposes.

The connecting link between wheelwork and pendulum is the crutch rod (Fig. 2). To render the rod adjustable up and down the pendulum as well as on the gravity arm arbor O, a small fitting B will suit all requirements. This part is cut from a block of brass and has two holes drilled at right angles to take the arbor A and the lever L respectively; tapped holes receive set screws S for locking purposes.

Hands and Dial

The design of the hands and the dial are left to the constructor's taste; the former should be fairly light and correctly fitted to the movement. The dial may be of cardboard, brass, etc., and about 7 in. across; suitable dials may, however, be purchased for a few pence, although there is no reason why it should not be home-produced.

There are various ways of mounting the dial (obtainable from us for 1s.); one is shown in

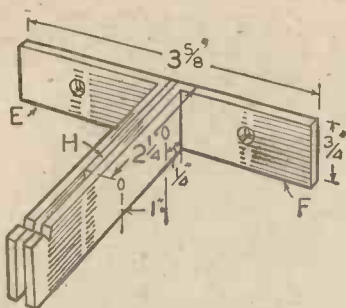


Fig. 13. The pendulum bracket.

Fig. 2, which shows the dial secured in position by metal brackets soldered to the clock unit. **Mounting and Wheelwork, etc.**

All the components are erected on a substantial backboard, so that the whole may ultimately be placed in a suitable case; the batteries may also be housed in the bottom of the case. The clock frame is attached with brackets to the backboard.

The backboard should have drawn on it a centre line, and is then hung up or set so that the line is truly vertical. Screw the pendulum suspension bracket to the top of the board so that the pendulum hangs in front of the line on the board. Next place the electro-magnet in position so that the cores are central with and about 1/16th in. below the armature; the gap can be reduced to a minimum later by packing up the magnet with a piece of cardboard. The magnet is best supported by a bracket or shelf.

The position of the contact-breaker is found by experiment, mounting its baseboard a little above the mid-position of the pendulum rod. The rod should hang vertically at the time and the board set so that the nick in the steel block is on the left of the finger.

Now lower the finger attachment on the pendulum until the former is about 1/16th in. below the block. A little experimenting will be necessary to get the best results, raising the finger may be necessary if the spring is depressed more than, say, 1/32 in.

Readers' Work

Since the constructional details of this clock were first published, several readers have built it. Recently, we received from two of these



A "P.M." Master Battery Clock made by A. E. Damen.

readers the following interesting letters. The first one is from A. E. Damen, of Southampton, who writes as follows:—

"I am enclosing a photograph of an Electric

Master Clock which I have constructed with the aid of *Practical Mechanics* articles and blueprint.

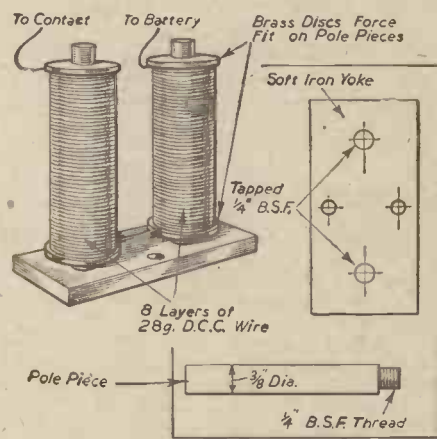
I find the clock is a perfect timekeeper and very reliable; it gave me great pleasure in constructing it."

B. J. Frost, of Hitchin, sends the following notes regarding the coils for the electro-magnet. He writes:—

"Over a year ago I made up the *Practical Mechanics* Master Battery Clock, but until recently I have not been able to get sufficient pull on the magnet to give the pendulum more than two or three free swings without an impulse.

Since making up this clock, I have experimented with many different windings, etc., and have at last overcome the difficulty by using coils as shown in the accompanying sketches.

Another point which greatly improves the timing for the slave clocks is by removing the seconds wheel from its shaft, and reversing it so that the part of the shaft, which usually



Details of electro-magnet of B. J. Frost's electric clock.

protrudes through the clock face projects through back of clock frame, to which can be soldered a much longer contact wire. This eliminates the trouble caused by wire taking too long to pass over the contact screw."

Items of Interest

Return of the Rush

AN old Hebrew seer has stated, "Is there any thing whereof it may be said, 'See, this is new?' It hath been already of old time which was before us."

This is certainly true of many inventions. However, although the main idea be not new, there may often be some added feature which differentiates it from what has preceded it.

A current example of this is a covering for floors which has been devised by an Irish doctor. He has produced soft, fleecy carpets from ordinary bulrushes. It will be remembered that rushes were used by our forebears long ago as a floor covering for their rude dwellings.

Dry Work

THE harvest of hay and corn is over, as far as those crops in this country are concerned. But, in good time for next year's harvest, there will be available a method of drying crops, which is the subject of an application to the British Patent Office. It is not unrelated to the method of intensive drying employed in

laundries, which makes those establishments independent of the alfresco clothes line.

The new process consists of building the crop outside drying frames, covering it with a tent-like cowl having an outlet adjustable in size, and blowing hot air from a portable generator into the crop.

This process reduces artificially the weight and moisture content of a crop as a preliminary to natural air drying by means of a crop-drying frame.

Bombs in Batches

THE rapid production of munitions is imperative at the present juncture in the history of our country. To expedite this production is the chief object of an improved method of hardening and tempering armour-piercing projectiles, including bombs. The process for this purpose, the inventor remarks, consists of a series of heating and cooling operations carried out in definite sequence at prearranged and strictly controlled temperatures. Hitherto, he affirms, this process has been characterised by the disadvantage that

it has been necessary to apply it to single projectiles—that is, one at a time. The treatment of projectiles individually has the drawback that it restricts the production capacity of the plant. To remedy the previous slow output, the inventor has devised a method which enables the projectiles to be submitted in batches to the successive heating and cooling operations.

Straight Ruler

THE marked roadway is a feature of the black-out, and a machine to facilitate the marking of the white line is a familiar object. An improved marker is now on the way, a complete specification relating to this device having been accepted by the British Patent Office.

Like its forerunner, the new marker has a mobile body portion on wheels, but its characteristic feature is a guiding arrangement. The latter, which extends sideways, is adapted to engage with the kerb. Owing to the guiding means, the marked line will run parallel with the path.

Our Busy Inventors

To Fight the Flames

APPARATUS specially useful for dealing with fire occurring during or immediately after the refuelling of aircraft is the subject of an application for a patent in this country.

The refuelling in question is normally carried out by means of a hose passing from a tanker aeroplane to a coupling in the tank of a receiver aeroplane. If the coupling should break and there should be an electric discharge, then a spark might occur at the gap between the components of the coupling, causing ignition of the petrol vapour.

In such an emergency, the vicinity of the fracture is automatically flooded with fire-preventing or extinguishing chemicals such as methyl bromide, carbon dioxide, nitrogen or carbon tetrachloride.

Non-Flam Curtain

IN these days, or rather nights, when the incendiary bomb may become active again, any method of obstructing the ravages of fire is peculiarly appropriate. A fireproof curtain which recently made its advent is certainly worthy of consideration.

This fire-resisting curtain is manufactured by weaving thin metallic strips, which are used both as warp and weft. These strips are woven together as closely as possible, so that minimum sized apertures exist between the warp and weft.

The weave may be of any simple kind, such as plain or twill. The curtain will function in a manner resembling that of a miner's safety lamp. It will prevent a flame on one side igniting even an inflammable gas on the other side.

Universal Languages

MORE than one attempt has been made to invent a universal language. In 1879 a continental clergyman, named Schleyer, produced what was christened Volapuk, which has a vocabulary of about 15,000 words, most of which are monosyllables. This, however, has been superseded by Esperanto, which is an artificial, international auxiliary language devised by Dr. Zamenhof, a Polish oculist, and published in 1887, when he was only twenty-eight years of age. The grammar and spelling are reduced to the simplest and easiest form. It is claimed for this language that it is now the chief universal tongue. And it is officially recognised as a telegraphic language.

English Simplified

I AM moved to refer to these invented languages by the fact that what is known as Basic English has recently occupied a considerable amount of public attention. Its prominence is due to the publication of the New Testament in this simplified English.

Basic English, which includes only 850 words, has for one of its objects a quick and easy way of teaching our native tongue to foreigners. It is maintained that it can be learned in a fraction of the time that it takes to acquire a standard second language.

From a utilitarian point of view, Basic English has much to commend it. Time and effort will be saved, but on the other side it may be contended that this simple language does not develop the muscles of the mind as is the case when a foreign language is acquired

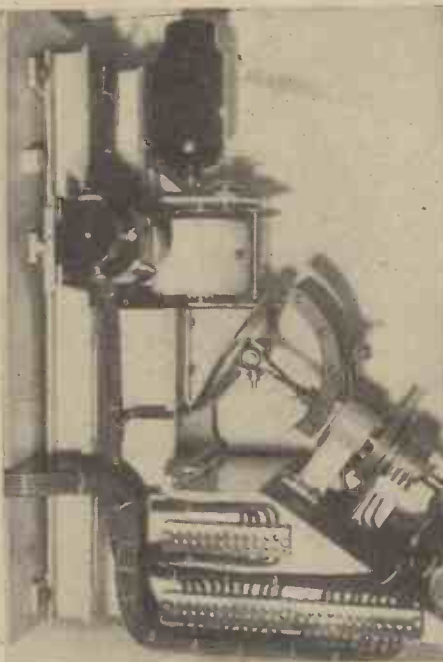
By "Dynamo"

in its full strength. There is in the latter practice a reflex action on the mental powers by the overcoming of the difficulties.

The information on this page is specially supplied to "Practical Mechanics" by Messrs. Hughes & Young, Patent Agents of 7 Stone Buildings, Lincoln's Inn, London, W.C.2, who will be pleased to send free to readers mentioning this paper a copy of their hand-book, "How to Patent an Invention."

Razor Blade Holder

AN inventor has set himself the task of producing an improved box for holding a number of safety razor blades, made in such



The small automatic telescope which controls the movements of the giant dome and telescope of Mt. Palomar Observatory.

a way that they can be conveniently removed without endangering one's fingers. According to his specification, the inventor's aims include economical fabrication, rapid assembly, minimum weight and bulk, sturdy construction, uniform operation and attractive appearance. These qualities should constitute an ideal razor blade dispenser. At the present juncture, the problem is to discover blades to dispense.

Warming-Pan's Successor

WITH the coming of winter, warming apparatus is seasonable, and a new kind of electric blanket will be welcomed, especially by invalids. This blanket is fitted with copper heating wires. A small control box enables one to select the amount of heat desired. And that standard is maintained by means of a thermostat, so that whatever be the temperature of the room, the bed retains an equal heat. The blanket is stated to weigh only 5 lb.

Bandage and Gas Mask

THERE has been devised a surgical bandage of the type known as a field dressing.

The object of the inventor has been to provide a light surgical dressing suitable for use as a temporary expedient. Should a gas mask be missing or damaged, the bandage may also be used as a protection against poison gas. The device includes a pad attached to a web. The pad is impregnated with suitable chemicals.

Armour v. Projectiles

IN the brave days of old, armour was worn by knights and soldiers. To-day, although proposals to shield the person of the soldier are occasionally made, the protective method is usually adopted in the case of vessels of war and tanks.

An invention, for which a patent in this country has been applied, embodies improvements in protective armouring. The object is to deflect an oncoming projectile and also wholly or partly to absorb the kinetic energy, so as to avoid harmful effect on the war vessel or machine.

The armouring is composed of two or more banks or layers, each consisting of parallel, spaced, flexible and tensioned members, such as bars, ropes or wires mounted in a frame and with or without rotatable roller coverings.

Counting-House Machinery

IN the modern counting-house, the clerk may almost be described as a mechanic, since mechanism pervades the office. For example, I observe among the accepted applications for patents in this country one relating to a machine for sorting record cards.

During the present century inventors have been very busy improving office methods. The typewriter has superseded the pen of the Victorian correspondence clerk. The loose-leaf ledger has generally ousted its firmly-bound predecessor. And the card index has proved a boon and a blessing to the office and the library.

The Great "Eye" of Palomar

IN the greatest job of precision work the world has ever known, scientists of the California Institute of Technology, constructors of the giant Mt. Palomar Observatory, are shaping metal and crystal to measurements that will come out in tens of thousandths of an inch, and even millionths of an inch, in preparation for the time when the now remote depths of space are brought within the scope of the human eye—through the giant lens of Mt. Palomar. A tiny 3-foot robot telescope will control the accurate movement of the dome and of the telescope. The 1,650,000 ton telescope and dome are so huge and tricky to handle that this mechanism was developed to assure absolute unison. See illustration on this page.

Illuminating Umbrella

TO the same family of inventions as the walking stick and torch for black-out aids, is an umbrella having a battery and bulb. It is maintained that this convenient alliance can be secured with a minimum of alteration to the umbrella, and without interfering with its normal operation.

Mounted in the hollow handle of a solid stick is a battery, while the other end of the stick houses a lamp.

How Flowmeters Work

The Principle of Operation of Various Types of Meter Manufactured by Elliott Brothers, (London), Ltd., for Steam, Water, Air and Gases

(Concluded from page 69, December 1941 issue.)



Fig. 9. Indicating Ring Balance meter.

WHEN working with low initial pipe pressures it is essential that any instrument fixed in the pipe line should not cause any appreciable loss of head in the pipe line. Owing to its great sensitivity and accuracy with very low operating pressures, the Ring Balance is ideal for the measurement of gas flows by means of a restriction such as a Venturi section or an orifice plate (see Fig. 8).

Indicating Ring Balance Meter

In this meter, shown in Fig. 9, the Ring Balance drum is fitted in a circular case, 12 inches in diameter. The drum operates the pointer through a suitable cam conversion gear, giving the pointer a full scale deflectional movement of 270 degrees with a scale length of about 24 inches. The bold marking and clearness of the dial make it very easy to read at a distance.

Recording Ring Balance Meter

The Ring Balance is fitted in a circular case, 12 inches in diameter (Fig. 10), similar to the indicator, but here the drum operates a pen through a suitable cam conversion gear, the pointer moving over a circular chart on which the record is traced. The chart is 12 inches in diameter, enabling the record to be made to a useful width of 4 1/4 inches (120 mm.). By means of the cam the deflections of the pen arm are directly proportional to the rate of flow. The chart is normally driven by a hand-wound, spring-driven clock, or by a synchronous electric motor. The charts are double-sided and decimally divided and intended for daily changing. Charts, specially calibrated or for different chart speeds, can be provided if required.

An alternative instrument is also available in which the record is made on a continuous chart, 6 inches in width, having rectangular co-ordinates.

Integrator

An integrating mechanism of the five-figure cyclometer type can be added to either the Indicating or Recording Meter, in an additional small case attached to the main instrument. This is normally provided with a hand-wound, spring-driven clockwork but, as previously described, a synchronously-driven type can be supplied for the purpose.

Working Pressures and Ranges

The pressure range is limited by the diameter of the balance drum and the specific gravity of the liquids used. The construction of the drum also depends on the working pressure. Three types are made for different conditions and each has three different maximum

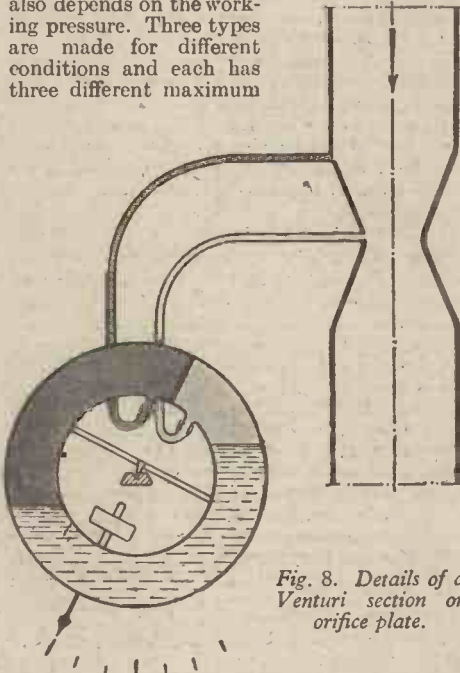


Fig. 8. Details of a Venturi section or orifice plate.

differential pressures as table below.

The differential pressure range of any one instrument can be easily changed by merely altering the counterweight. The Ring Balance may also be used for the very accurate measurement of pressures and draught.

Electrical Transmission

Any of the instruments mentioned may be fitted with special transmitting equipment, enabling the readings to be transmitted to a

distance. A number of different combinations and arrangements are possible by use of this system, and suitable schemes will be prepared on receipt of particulars of the required conditions.

Orifice Plates and Venturi Tubes

To operate the foregoing instruments, a differential pressure corresponding to the flow must be available. This can be produced by various means, the simplest being the plain orifice plate. This consists of a plate of stainless steel or Monel metal, depending on the working conditions, having a thickness of about 1/4 inch. It is placed between flanges on a pipe line, fitting closely up to the flange bolts. A hole is cut in the disc, calculated to give the required differential pressure at maximum flow in the pipe. This hole is made slightly counter-sunk on the downstream side, but is sharply edged on the upstream face. The positive and negative pressure tapings are then drilled into the pipe, or into bosses specially welded for the purpose, at either side of the orifice plate and in the appropriate position as indicated in the diagram, Fig. 1.

Whilst it is obvious that an orifice plate must offer some obstruction to the flow, the effect is not nearly so considerable as may at first appear. The plate is designed to give the maximum pressure difference required by the meter for full flow. With the float type meters the highest differential pressure required is 6 metres water column or about 8 1/2 lbs. per sq. in. At 50 per cent. full flow, however, this pressure falls to 2 1/2 lbs. Moreover, as will be seen in the diagram, this pressure due to the obstruction of the plate is partly regained downstream beyond the plate; in fact, it is usual to obtain a regain of pressure head averaging about 50 per cent. of the measuring differential with a plain orifice plate, depending on the ratio of orifice to pipe diameter. The



Fig. 10 (above) Recording Ring Balance Meter.



Fig. 11 (right) Interior of Recording Ring Balance Meter.

Type	Max. Working Pressure	Differential Pressure (in millimetres of water)			Construction
		(a)	(b)	(c)	
Low Pressure	7 lbs. per square inch	36	81	144	Sheet brass. Water filled.
Medium Pressure	30 lbs. per square inch	500	1000	2000	
High Pressure	150 lbs. per square inch	500	1000	2000	

average overall loss of pressure, therefore, arising out of the use of the orifice is extremely small and in the majority of cases quite negligible.

Certain cases do arise, however, when even this small loss of head is objectionable, particularly where the initial working pressure is low, as in water mains, etc. In these circumstances it is desirable to use a Venturi tube. This consists of a length of pipe specially shaped to correspond to the stream lines produced by the restriction. With the orifice plate a certain amount of loss of head is due to turbulence beyond the plate. In the Venturi tube, this is prevented by gradually increasing the area of the tube beyond the restriction until the cross section reaches that of the pipe once again.

The overall loss of head due to this pressure measuring device is only about 10 per cent. of the measuring head, as against about 50 per cent. with an orifice.

The length of complete Venturi tube varies according to the diameter of the pipe line in which it is fitted and may amount to several feet. The body of the tube is usually of cast-iron or steel, with the throat made of bronze or stainless steel according to the working pressure and temperature.

The installation of Venturi tubes or orifices requires considerable care in order to ensure that accurate readings may be obtained. Eddies in the neighbourhood of the fitting must be avoided at all costs. For this reason it is necessary for a short straight length of pipe to be installed before a Venturi tube, and for an orifice plate there must be straight pipe for at least 5 diameters before and 3 to 5 diameters after the orifice plate, with no sharp bends, steam traps, T-pieces, etc., to cause eddying.

Stop Valves, Condensers, and Connecting Pipes
When measuring steam flow by means of

pressure difference, the pressures are conveyed to the meter by means of water in suitable connecting tubes. In order to avoid any possibility of error due to differences of level of the water in the two pipes, a common datum level is obtained by fitting condensers adjacent to the orifice. One condenser is connected through a stop valve to each pressure connecting pipe and communicates directly to the live steam at the tapping points.

The exposed surface of these condensers ensures that the steam entering them is condensed to water, and they are so arranged that a constant level of water in them is always maintained. For water-metering, of course, no condensers are necessary.

The stop valves are placed on the side of the condensers remote from the steam pipe. With this arrangement the condensers always remain full of water in the event of it being necessary at any time to shut the valves for removal of the instrument. In addition, the valves themselves are not exposed to live steam as in other makes of steam meters, and are therefore not called upon to withstand such arduous conditions. The condensers are made of solid drawn welded steel capable of withstanding modern high pressures and temperatures.

The small pressure transmission pipes may be of copper or steel. These should be installed at a slight slope (at least 1 inch in 1 ft.) from the condensers to the meter, so that any air in the system may rise to the condensers and pass away in the main pipe. If the meter must be installed above the pipe then air release cocks are fitted, enabling the accumulated air to be released at suitable intervals.

Accuracy and Tolerances

The accuracy of a flowmeter is dependent upon many factors and it is not always possible to forecast the probable figures without

knowing all the circumstances and features of the installation. The accuracy of the meter itself, considered as a U-tube for measuring differential pressure, is something which may be defined and checked and is usually given at about 1 per cent. of full scale reading. The accuracy, however, of the whole equipment, including the orifice plate or Venturi tube, considered as a flowmeter, is dependent upon the fluid in the pipe, the relative sizes of orifice and pipe, the actual rate of flow and the working pressure and temperature.

Provided, however, that all the working conditions are maintained in accordance with those for which the instruments are designed, the average accuracy is about 2 per cent. over the range from full scale down to one-seventh full flow and about 4 per cent. below this.

Advantages

Among the advantages of the Float Type Meter are the following:—

Measuring mechanism completely separated from high pressure.

Movements of mercury column transmitted to measuring mechanism by magnetic coupling without friction.

Possess highest accuracy; give constant and true readings; operate with absolute reliability.

Large bold scales, easily read from a distance, and distant transmission of readings can be arranged if desired.

The chief advantages of the Ring Balance Meter are:—

Extremely accurate for low pressure measurements.

Operates with very small loss of head.

No moving parts in pipe line.

Range can be easily altered, and the meters are fitted with dustproof and splashproof cases.

Manganese Steel Rail Crossings

THE accompanying illustration shows a very heavily used junction in the suburban area covered by the Southern Railway, and when



A busy railway junction in which the crossings are of manganese steel

it became necessary to renew this junction, the opportunity was taken to make the crossings in cast manganese steel, which lasts three or four times as long as ordinary rail steel, owing to its particularly hard nature. At this junction the sub-soil is a soft clay material, and constant attention was previously required to keep the track in good

condition as the clay underneath became soft and puddled in wet weather.

A layer of coarse granite powder about six inches thick was, therefore, laid over the top of the clay, and although there was constant rain for six or seven weeks immediately following the completion of the work, no further trouble has been experienced.

Manganese steel has been used at another busy junction point on the Southern Railway, where approximately 2,000 trains a day pass.

Our Conjuring Book Offer

It is a remarkable thing how the mechanically minded who have interested themselves in conjuring, have been successful. The original Maskelyne, for example, was interested in watches before he invented new types of locks, and eventually some of the cleverest illusions.

Our conjuring series by Norman Hunter was immensely popular with *Practical Mechanics* readers, too—and that is why everyone will be pleased with the special offer we make this month. One of the finest—and certainly the most comprehensive—work on conjuring is "Modern Conjuring for Amateurs," published by the book section of this company.

Talking to the book publisher recently, he showed me a copy, and you will be pleased to hear that I have been able to secure a thousand copies for readers at half price.

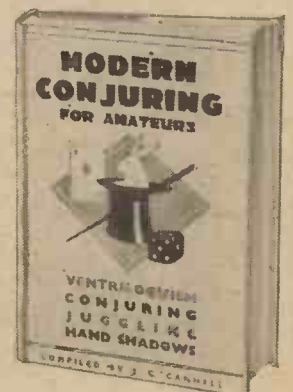
The work runs to nearly 350 pages, is nicely printed and illustrated, and well bound. It covers not only conjuring—including the work of some of the most brilliant exponents of magic—but ventriloquism, hand shadows, and juggling.

The tricks range from the simplest to the

more advanced. All have been selected for their cleverness—and most can be performed with "property" found about the house.

The work has been compiled by a vice-president of the Magicians' Club, and at half price presents a special opportunity. Only 1,000 copies are available, so send your order at once.

In the shops the book sells for 6s. It is yours for 3s. plus 6d. postage (3s. 6d. in all). Send your postal order to Book Department (P.M.), George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2.



PHOTOGRAPHY

Picture Making by Enlarging

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

(Continued from page 78, December 1941 issue.)

In the last issue we had under consideration the removal or remedying of the common blemishes which amateurs sometimes find on their negatives and which, if allowed to remain, will spoil their efforts to produce a perfect print. Before we can leave the work on negatives we must also deal with them as regards their printing value, for while the subject may be one full of "pictorial" value, yet through a slight mistake in the exposure, or development, there is not that true gradation in the negative, and on making the first shot at an enlarged print, we are dis-

satisfied, give it a second application, or a third if necessary.

Be sure not to overlap the sides of the part you are dyeing, but if you do happen to make this mistake, then clean your brush, and with clean water brush over the fringe or border where you have trespassed; the water will soak up the dye. A trial strip of paper exposed over this part of the negative should show that you have improved its printing value.

I strongly recommend you to experiment with this dodge, for you will find it very useful in many ways; there are times when you can improve the effect of distance or background in your pictures by applying a weak wash of the dye.

On some negatives you may be troubled with just the reverse, a part being almost impossible to print; it is too dense, yet by transmitted light you can see detail which you must get on your print if it is going to be satisfactory. Local reduction is the remedy.

Reducing

Place the negative in the retouching desk and with a pad of soft material rub, very gently, a small spot of Globe Polish over the dense portion. This is the greasy nature of the polish makes the film slightly more transparent; be quite certain there is no grit in the polish or on the pad. Should you find that the treatment is not sufficient, then the knife must be called into action. You must only use this by a scraping action, and again very gently, otherwise you will find a series of scratches, so be patient, and try a few experiments first before you attempt to scrape your selected film.

Retouching is, of course, very useful, but to do this successfully requires skill, instruction, and much practice, but it is possible with the aid of suitable pencils to do some very useful work of a helpful character on certain parts of a negative. I can only give in this article one or two hints concerning this process. Before using the pencil it is necessary to apply a medium to the part to be retouched, using a soft rag in a circular action, for giving a "tooth" for the pencil. The pencil work is in the form of tiny "wave" markings; straight lines must be avoided, and you must train or guide the point of the pencil so that it does

not go over a marking. Keep the markings as close to each other as is possible; only continual practice can make you proficient at this work. There is another type of retouching work which will help you to improve some of your films; I will term it "broad" retouching. This can be easily accomplished by those who use plates; pour over the back of the negative some Matt Varnish—do not use this varnish near a naked light, it is inflammable—it quickly dries, leaving a matt surface on which you can use a little powdered charcoal worked on with a stump; its advantages are that it holds back the printing of thin parts to allow the highlights to print, but the varnish must be scraped away from the highlights of the negative. A negative known as a "baldhead," i.e. with a blank sky, can be varnished to make it possible to work in some clouds.

Selection of Printing Paper

Most of you will remember the chapter on bromide printing, and how I referred to the use of different grades or surfaces of paper for getting certain effects, such as a fairly vigorous grade for a soft negative or a soft grade for a negative of a contrasty or hard type, but for most of your collection, it is possible to use a normal grade and get good results; this advice was particularly for those who were making contact prints, and had not reached the enlarging stage.

The use of a paper most suitable for the negative is a point which every pictorialist must study if he or she is desirous of obtaining the best possible result. I know no better help than to examine the work at an exhibition, and also the specimen prints which the manufacturers use on their showcards. By doing this you will be able to select three or four grades which will fill your needs admirably; do not overstock your cupboard with "ump-teen" varieties, as this will only lead to confused ideas, and very likely much disappointment.

What I do want to emphasise at this stage is the fact that "hardness" in your picture should be avoided, as this is needed only for special work where strong contrasts are wanted. Those of my readers who had the good fortune



A typical "baldhead" photograph.

appointed because some parts have printed too deeply and appear far too heavy.

Retouching

Assuming that the fault is not too pronounced it is possible, with care, to improve the film by local treatment, such as an application of a thin coating of dye over the parts which have to be held back in the printing. The articles required for this work include a small bottle of Johnsons Negative Dye, one or two fine camel-hair brushes—get good ones for this work—a retouching knife, retouching leads, a charcoal stick and stump, and, if you can afford one, a small retouching desk, which will facilitate the work considerably.

The work is not difficult, but it does call for a fair amount of care and a steady hand. The trouble with most beginners is that they are too anxious to get the work done, with the result that they apply the dye too lavishly. The dye is black, and will dilute to a very pale grey with water; it is best applied by means of a series of "washes." Take a spot of the dye on the smallest of your brushes, and then dip the brush into one of those saucers which are included in sets of photo tints and in which there are a few drops of water. Now try this for depth of colour, first on a piece of paper to see whether it is too deep, if it is, add a few more drops of water; place the negative on a piece of glass, or in the retouching desk, and carefully brush the solution on that part of the negative which is so thin that it prints too quickly; now let it dry, examine the image, and if you think that it has not received



A useful cloudscape.

to visit the two London exhibitions, the R.P.S. and the Salon, will recollect that the great majority of the prints were on paper which gave a soft, and what could almost be described as a "gentle" impression to the eye, so that your mind was able to take in the whole of the subject without being irritated by a "blob" of heavy black or clear white.

Pictorial Softness

Apart from the selection of a suitable paper, there are other means for attaining this pictorial softness in the actual manipulation. Some workers adopt the method of focussing their picture on to the easel to pin point sharpness, but before making the exposure they slightly readjust the lens so that the image loses the pin-point sharpness, and has just a suggestion of being out of focus. Care must be taken not to overdo this, or the results will be far from satisfactory.

The method I have used from time to time is what is termed screening. After the image has been sharply focussed, a piece of "bolting" silk or butter muslin is drawn tightly across the lens, and the exposure is then made through this material. A third method of which I have heard but never tried, is the placing of a glass or film coated with a thin matt varnish between the negative and the lens of the enlarger. With each of these care must be taken to avoid too much softness which tends to fuzziness.

Combination Printing

This is a bona-fide dodge which is recognised and permitted, and many of you will find it a most interesting means of obtaining excellent results. As the name implies, it is the use of more than one negative in the making of a picture, and it is best explained by taking a simple example, one that is common in everyone's collection.

On one of those cloudless days in our

summer holidays we are apt to make exposures of a landscape or seascape, and when these are printed we realise that we have added to our "baldheads," the result being that there is only white paper at the top of the print. Such a negative is, by itself, hopeless for enlarging. Perhaps during that same holiday you had a day when there were some very charming clouds in the sky, and you may have exposed one or more films on these, or perhaps managed to get some negatives where the clouds formed or filled most of the film. One of these combined with one of the others should give you what is required.

Focus the landscape on to the easel, and having selected how much of it is needed to make your picture, make a pencil mark indicating how far up the sheet of paper this part of the picture will come, and remove this film from the frame and insert the one of the clouds. This will require adjusting until the cloud effect you desire is just on the line where the landscape finishes. If you are satisfied that the combination is going to please you, then cut two pieces of black or brown paper, one to cover the section where the clouds will be printed, the other piece for the landscape section. Place the one over the bromide portion of the bromide sheet when you have placed it in position, and make the exposure; remove the piece of black paper, and put the

other piece over the cloud portion of the picture. Take the cloud film out of the carrier, replace with the landscape negative, and make the necessary exposure; then place the sheet of bromide in the developer. If the exposures were calculated correctly, and the screens of brown or black paper were accurately cut and affixed, you should have, not a "baldhead,"



A combination print from the negatives of the two prints shown on the preceding page

but a complete "picture."

The accompanying illustrations will help you to understand this process, and incidentally let you into another secret; in the complete picture you will notice the horizon or line between the sky and landscape, which gives a good effect of sea, and is the result of not fitting the screen papers accurately to cover the two sections during the exposures.

Thermometers for Cooking Ovens

An Unbreakable and Visible Dial Design

MERCURY and glass thermometers used for all types, both of domestic and large-scale cooking ovens, have a number of well-known disadvantages, chiefly that they are easily broken and, therefore, costly for all the year round performance, and that the temperature can only be read with difficulty and inconvenience.

An important advance in this field is the special dial thermometer made by the British Rototherm Co. Ltd., Merton Abbey, London, S.W. 19, almost entirely constructed of metal and practically unbreakable, with a relatively large metal dial, of any desired size, generally 2½ in. for domestic ovens, and 4 in. or 7 in. for large institution and industrial ovens. The

thermometer is fixed in the oven door, with a pointer moving over a scale, which can be read easily from a considerable distance.

For ordinary use the scale is graduated in, say, 25 degrees F. divisions, within the range of, say, 200-550 degrees F., and also into four main sections, "slow," "moderate," "hot," and "very hot," but if required, the dial can be sub-divided to a much greater degree. A short stem connects to the dial and projects through the door into the cooking space, and the annual breakages and replacement cost is reduced enormously compared with the glass and mercury thermometers generally supplied.

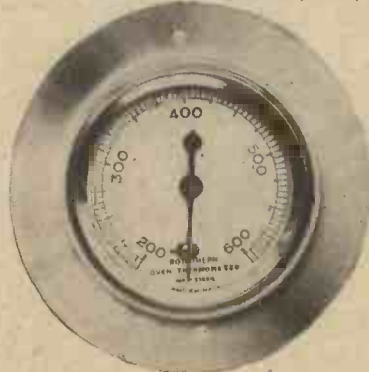
Bi-Metal Principle

The principle of "Rototherm" thermometers, available in a variety of sizes and types suitable for all kinds of domestic and technical uses within a temperature range of about minus 60 degrees F. to plus 1050 degrees F., consists, it may be remembered, in using the expansion and contraction of a bi-metal nickel-iron alloy strip made into a short and sturdy close, unbroken, multihelical coil, which is wound in the form of a series of continuous (unbroken) coils of different diameter, and alternately opposite "pitch" one inside the other.

This difficult operation is carried out by the use of special precision machines, patented and made by the firm, so that a comparatively long length of strip is formed into a short inner coil, then another coil of reverse pitch wound over, followed by a third coil of the same pitch as the first coil, and so on, which neutralises all the horizontal movement. For cooking oven equipment, a 4-coil element is generally used, and the pointer, which is carried on the "free floating" principle, without bearings, moves over a graduated dial which has a substantial die-cast aluminium bezel screwed on to the metal body with a sealed plate glass front. The readings are extremely accurate, to 1 in. of the total scale, while ease of reading a relatively large dial with a pointer is another important advantage, since the narrow thread of the ordinary mercury thermometer, and the tiny figures on the stem are almost invisible.



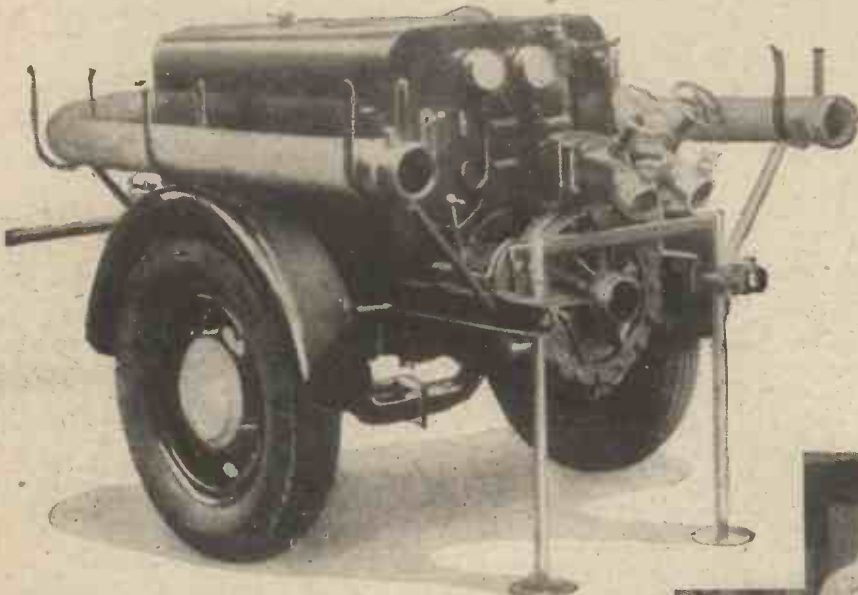
A "Rototherm" bi-metal coil dial thermometer fitted to an electric oven



"Rototherm" oven thermometer with 2½ in. dial, and range of 200-600 degrees F.

Fire Fighting in War

How Engineers maintain an Adequate Supply of Water for Fire Fighting Purposes and Details of the Trailer Pumps



One of the latest Merryweather trailer turbine fire pumps.

NOW that many towns have suffered air attack by fire and explosion, it is possible to review certain aspects of the emergency measures taken to combat fires caused by enemy action. The first and most important item to be considered is an adequate supply of water. In normal times water resources were more than adequate to cover the gravest fire risks, but when the present war became imminent, water engineers were faced with grave problems and immediate steps were taken for the provision of supplementary water supplies, and for the maintenance of existing ones.

Should dislocation or destruction of pumping stations, filtration plant or storage tanks take place, emergency plant, installed as standby, is brought into use. Pumping plant in particular, duplicating normal station equipment, but installed at remote sites, is invaluable.

Temporary breakdown of electricity supply

is not unknown during air attack, and although re-establishment of supply is invariably achieved in incredibly short spaces of time, the availability of prime movers other than electric motors, is of great importance. The regular fire engine and the trailer pump, of which more will be said later, are, of course, well to the fore in many emergency pumping

various sections in the case of rupture. All valves are maintained in working order and none are left in a doubtful condition. The position of all valves are clearly indicated on the surface. Several of the leading water authorities have purchased power-driven operating machines, by means of which large sluice valves can be closed as rapidly as hydraulic conditions permit. Such a machine is shown on this page. It is made by Glenfield and Kennedy, Ltd., of Kilmarnock, and is in effect a mobile power valve headstock, with petrol engine drive, suitable for coupling to existing underground sluice valves up to, in the present instance, 36 in. diameter.

Emergency Repairs

Emergency repair fittings for water mains are carried out by most authorities. These fittings which are also made by the above firm,



A motor-operated machine for quickly opening large sluice valves in an emergency.

and relay operations, but diesel engine units are also used. Also, air lift pumps, supplied with air by ordinary road compressors, serve to raise water from wells. Effective deployment of personnel and transport with adequate telephone facilities, are essential.

Water Mains

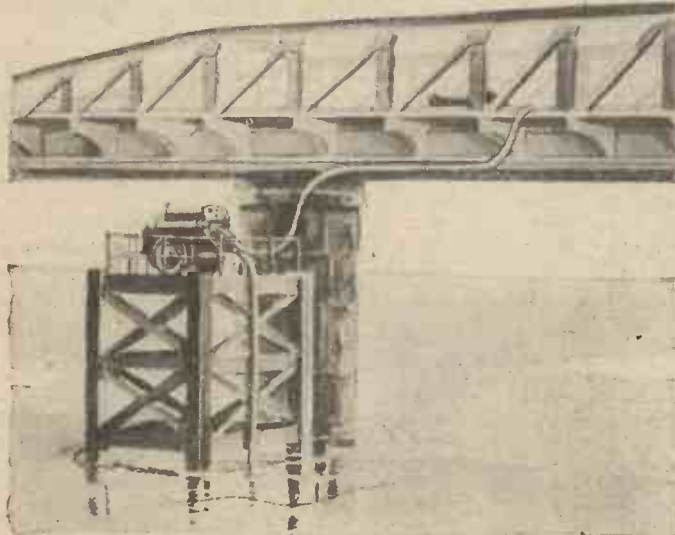
Interconnection of mains, including the formation of ring mains, is of great importance in making available alternative routes for the water. Extensive interconnection is combined with the installation of such additional sluice valves as are necessary for the isolation of

include stoppers for broken ends which enable the mains to be kept charged right up to the points of damage. They also enable craters to be bridged and local water supplies to be drawn off as required.

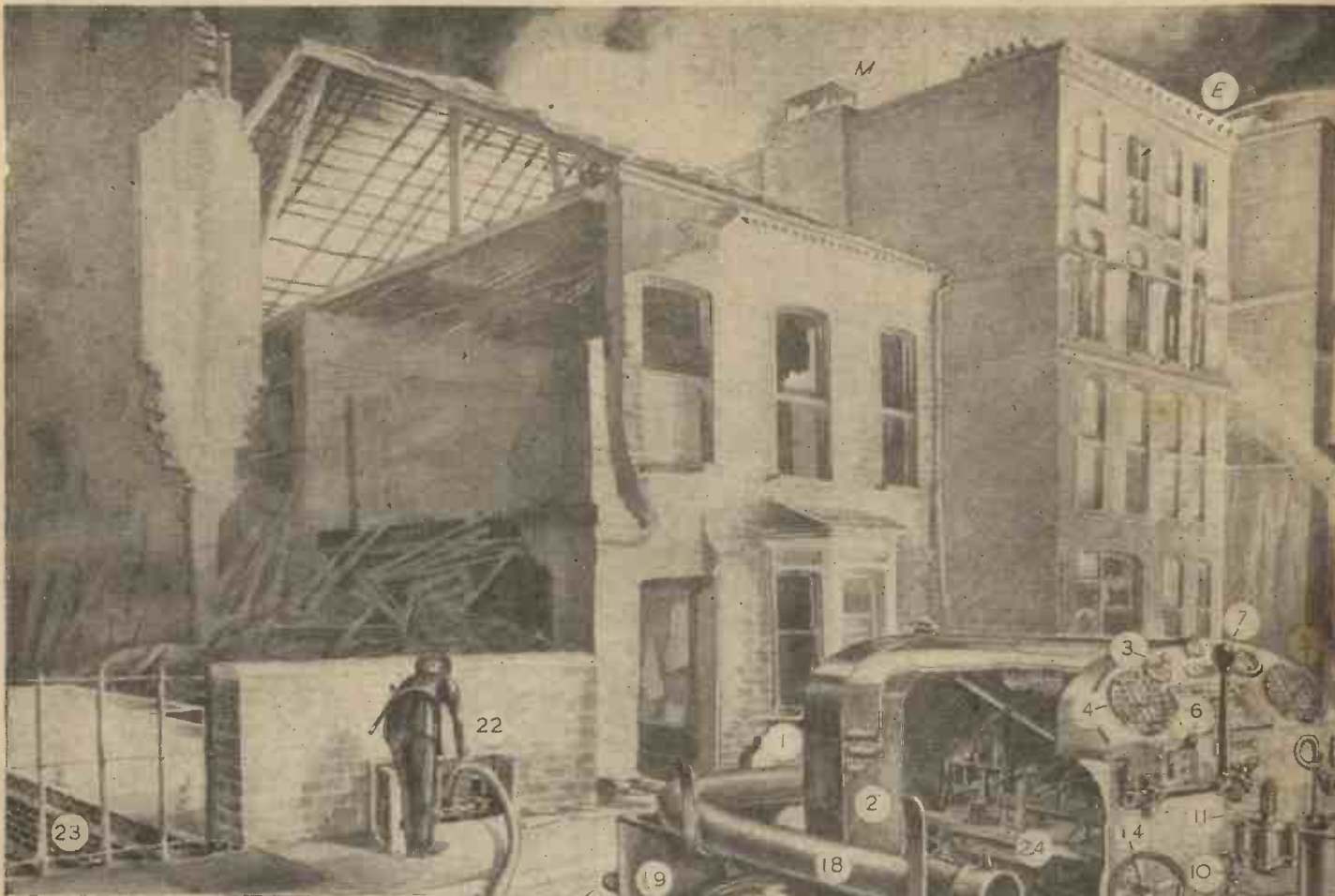
Supplementary Water Supplies

Apart from the supplementary water supplies for fire fighting which, in some districts, can be taken from the sea, from rivers, canals, ponds, swimming pools and similar sources, areas of high risk are provided with water reservoirs consisting of pressed steel tanks or canvas dams at ground level. Another plan adopted in some localities is to use the basements of buildings which have become untenable. Concreting of suitable basements is limited to that necessary to ensure structural stability, and watertightness can be obtained by the application of mastic asphalt to the interior surfaces. The Ministry of Home Security has provided recently a sum of about £4,000,000 for the construction of works for supplementary water supplies for fire fighting.

After a heavy raid a large number of mains



Using mobile pumps as relays for getting low-level river water to the required height.



FIGHTING THE FIRE

Key to Illustration

- A Crew A stationed at entrance to side street and providing a water curtain to prevent fire from spreading to adjoining building.
- B Crew B stationed in main road and providing a water curtain on the south end of the building to prevent fire affecting operations in the thoroughfare.
- C Crew C operating water tower to attack the seat of the fire, which is at present on the second floor in the north end of the building.
- D Crew D operating water tower to reach the rear inside of the building inaccessible from the back of the building due to the collapse of an adjacent warehouse.
- E Crew E situated on the roof of the next building north of the burning property, taking advantage of the wind direction to assist Crew C.
- F Three trailer pumps with a total delivery capacity of six hoses, supplying the Crews A, B, C, D, E & F with water from a portable canvas reservoir, fed by two high-power pumps from a river a quarter of a mile away.
This has become necessary as other fires in the district have drawn the total output from hydrants to feed the hoses.
- G Crew F fighting the fire on the opposite side of the road and assisted by the portable monitor (H) used because of the intense heat at this point.
- K The hoses attacking the fires in this area are fed from a further series of pumps shown here.
- L Canvas reservoir.
- M Firewatcher's lookout.
- P Water tower directed on to roof fire.

may be broken and volumes of water running to waste. The first thing is to check the waste. Valves are closed as necessary and broken ends of mains stopped. One of the greatest difficulties is to get at a damaged main in a bombed building or to a valve buried under debris. Where the task is too formidable for rapid action the section has to be isolated until the main can be cut off. In some cases escaping water can be trapped in improvised sumps and used directly for fire fighting.

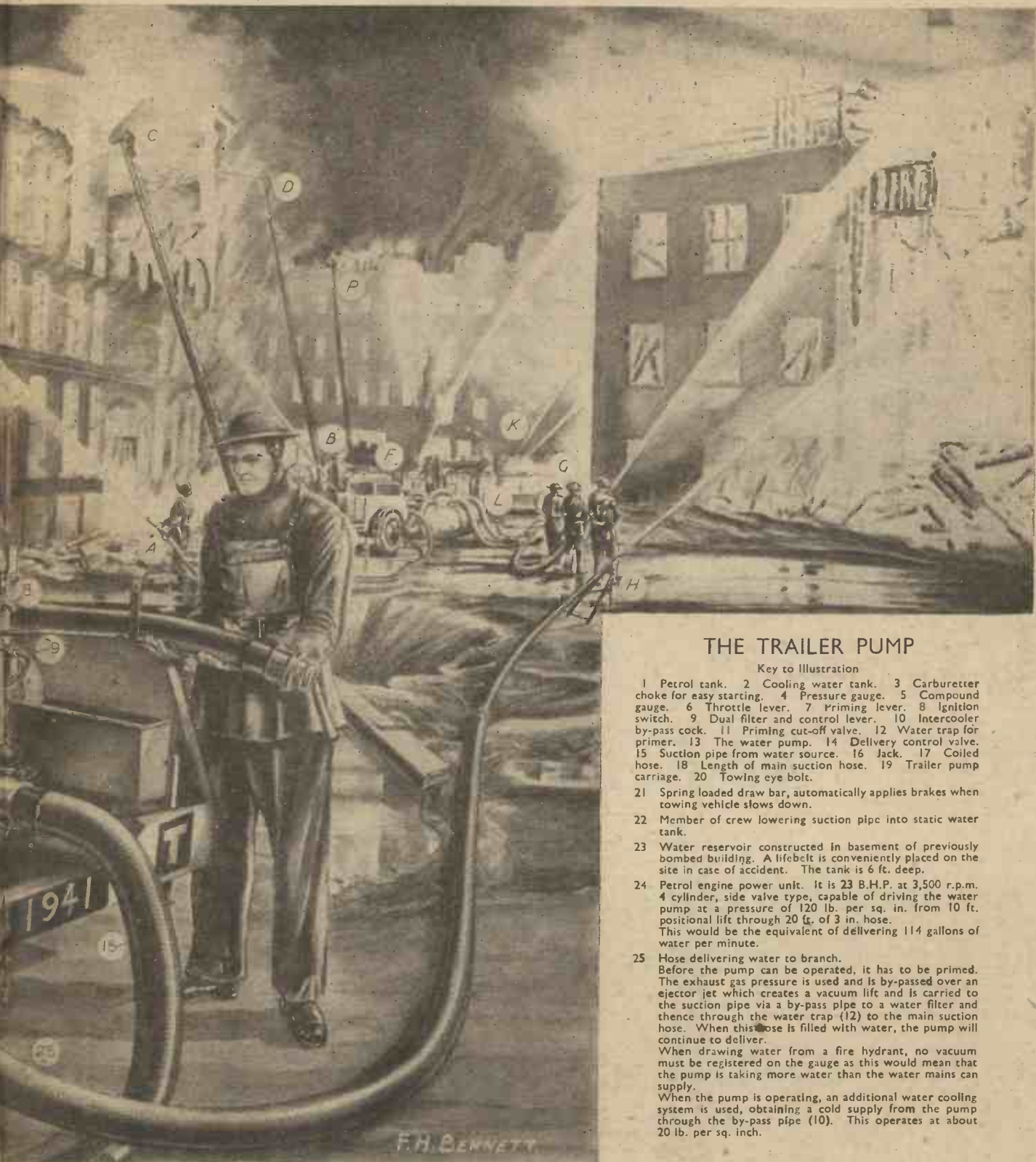
Maintenance of supply involves the effective

utilisation of whatever standby and emergency equipment can be usefully employed, as soon as the major waste from the system has been reduced. It may be necessary then to adjust valves at various points in the distribution network to ensure that the best use is made of all available pressure supplies for fire fighting. The needs of the fire services, are, of course, placed before all other considerations. Auxiliary water supplies are brought into use at once, and where the water authority can take steps for the replenishment of these supplies, such

steps should immediately be taken.

Trailer Fire Pumps

A considerable amount of equipment is used by the fire services in fighting fires, one of the most important being the trailer fire pump, a descriptive drawing of which appears in the illustration above. Merryweather & Sons were the pioneers of these pumps, which they introduced in 1921, and they have since supplied hundreds of these machines to public and private fire brigades in all parts of the world.



THE TRAILER PUMP

Key to Illustration

- 1 Petrol tank. 2 Cooling water tank. 3 Carburetter choke for easy starting. 4 Pressure gauge. 5 Compound gauge. 6 Throttle lever. 7 Priming lever. 8 Ignition switch. 9 Dual filter and control lever. 10 Intercooler by-pass cock. 11 Priming cut-off valve. 12 Water trap for primer. 13 The water pump. 14 Delivery control valve. 15 Suction pipe from water source. 16 Jack. 17 Coiled hose. 18 Length of main suction hose. 19 Trailer pump carriage. 20 Towing eye bolt.
- 21 Spring loaded draw bar, automatically applies brakes when towing vehicle slows down.
- 22 Member of crew lowering suction pipe into static water tank.
- 23 Water reservoir constructed in basement of previously bombed building. A lifebelt is conveniently placed on the site in case of accident. The tank is 6 ft. deep.
- 24 Petrol engine power unit. It is 23 B.H.P. at 3,500 r.p.m. 4 cylinder, side valve type, capable of driving the water pump at a pressure of 120 lb. per sq. in. from 10 ft. positional lift through 20 ft. of 3 in. hose. This would be the equivalent of delivering 114 gallons of water per minute.
- 25 Hose delivering water to branch. Before the pump can be operated, it has to be primed. The exhaust gas pressure is used and is by-passed over an ejector jet which creates a vacuum lift and is carried to the suction pipe via a by-pass pipe to a water filter and thence through the water trap (12) to the main suction hose. When this hose is filled with water, the pump will continue to deliver. When drawing water from a fire hydrant, no vacuum must be registered on the gauge as this would mean that the pump is taking more water than the water mains can supply. When the pump is operating, an additional water cooling system is used, obtaining a cold supply from the pump through the by-pass pipe (10). This operates at about 20 lb. per sq. inch.

The illustration on page 115 shows one of the latest Merryweather trailer turbine fire pumps and machines of this type have been supplied to local authorities, public utility services, and important commercial undertakings. The machine has a petrol motor engine, and the turbine fire pump is aligned on a steel frame, the whole being mounted on two steel disc wheels fitted with pneumatic tyres. Springs are provided between the frame and axle. The six cylinder petrol motor capable of developing 60 h.p., is of modern design,

complete with sparking plugs and leads, ignition switch, magneto oil pressure gauge, carburetter, exhaust manifold, silencer, and starting handle.

The cooling system comprises a tank with suitable pipes to the water jackets, and this tank provides a supply of water enabling the engine to be started up and run for short periods without the supply from the pump. When the pump is working, the tank can be kept overflowing from the main pump, the temperature of the overflow being regulated

by a valve provided for this purpose.

Engine Protection

The engine is protected by a weatherproof metal cover which also houses the petrol and water tanks. Removable side panels are provided for inspection and adjustment of the engine. The pump is of the centrifugal type having an impeller chamber of superlumin. The impeller is of gunmetal and the spindle of stainless steel. The pump spindle has a flexible coupling attached to the transmission



A fire guard tackling an incendiary bomb.

gear from the petrol motor. The efficient exhausting device provided for priming the suction hose and pump casing is put into operation by means of a small hand lever. The pump, which is coupled direct to the petrol motor, is fitted with two delivery outlets each controlled by a separate valve. The pumps are capable of delivering a considerable number of gallons of water at high pressure.

The struts for rigidity when pumping comprise substantial steel bars arranged to be lowered and secured by means of hand levers. At the fore end of the towing bar is a specially designed fitting for the strut. The cross bar for man-handling is also of steel, and each arm of the bar is arranged to fold back to the carriage frame when travelling. An over-run type brake with a hand lever is carried behind the towing eye. The machine is finished in high-class fire engine style. The equipment of the machine includes:—One 15 ft. length of india-rubber suction hose with gunmetal coupling screws, copper suction strainer; basket strainer, two copper branch pipes with three gunmetal nozzles, electric tail lamp, set of spanners, wrenches, etc.

It is not possible within the scope of this article to include a description of all the equipment used by the fire services in combating fires, but it can be said that it is extremely efficient and capable of subduing the fiercest of fires.

Fire Bombs

One of the chief causes of fires is, of course, the thermite bomb, or incendiary, as it is generally called. The various methods of tackling these before they have time to set fire to a building have been described in these pages from time to time. Stirrup pumps and sand are generally used, not forgetting hand fire extinguishers, of which I propose to give a few details. It is well known that many types of hand fire extinguisher depend upon the basic principle of using carbon dioxide, which

smothers the fire by displacing the air necessary for combustion.

Two of the general principles used, for example, are "soda-acid," that is, a solution of soda ash into which a bottle of vitriol is broken, and "foam," which is a vast aggregation of small bubbles filled with carbon dioxide gas. In some cases also, liquefied carbon dioxide is used, giving a jet of gas, as in power stations, for example, with a battery of gas cylinders connected by pipes to the danger points.

The latest scientific principles in this field, however, which are being used in effective fashion to fight the thermite incendiary bomb are well represented by the "R.S.Q." machine, a production of the Nuswift Engineering Co., Ltd., in which only water and compressed carbon dioxide gas are employed, the latter being contained in a seamless copper container with a brazed bronze head, fixed inside at the top. An illustration of one of these extinguishers in use is shown on this page.

Pressing down a knob device a knife edge perforates a small soft copper seal at the top of the container, releasing the compressed carbon dioxide gas, which partly dissolves in the water, and results at once in a high pressure jet, about 30 feet in length, discharging through

is a non-conductor of electricity, and safe up to at least 25,000 volts, so there is no danger of receiving a shock when dealing with electric equipment. For the same reason the nozzle tip cannot be stopped up by solids resulting from evaporation, whilst there is no corrosion, all these being well-known troubles of many types of hand extinguisher.

The construction also is of particularly high-grade character, including Admiralty bronze pressings, for example, instead of castings, being guaranteed for 10 years.

Extensive Test

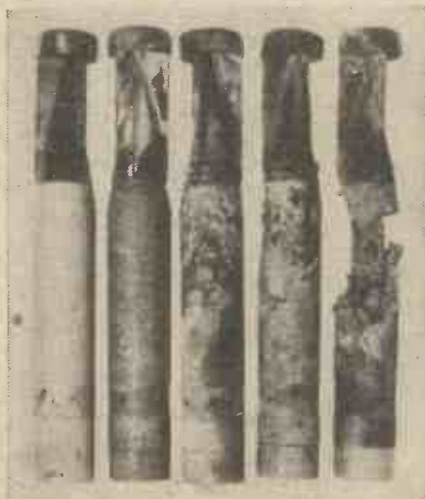
In this connection a hermetically sealed copper container taken from stock, when tested to destruction by hydraulic pressure did not yield until the pressure was over 1,350 lb. per sq. in., when the seal broke, after bulging had commenced at 700 lb. Further, the design is such that almost every drop of water is discharged, while the jet can be stopped at any time, thus conserving the contents for extinguishing systematically and rapidly any small local smouldering portions after the main fire has been extinguished. In operation either a spray or a jet can be produced at the nozzle by thumb control, while recharging is carried out in about 30 seconds by refilling with water and inserting a fresh sealed container of



"R.S.Q." standard 2-gallon machine with flexible hose and nozzle.

an internal dip tube. The jet also is completely harmless, and therefore can be directed upon human beings, while other advantages are that it is intensely cold, because of the compressed gas, and since there are no salts in solution it

carbon dioxide. A high-pressure, finely atomised jet of this description is found to be very effective in extinguishing the main combustion of the incendiary bomb, that is the electron-metal casing, as well as oil fires that have spread out, including the oil bomb.



Four German thermite bombs extinguished with such rapidity by the "R.S.Q." apparatus that the structure is still almost intact; on the extreme left for comparison is an unignited bomb.



Fire fighting equipment for tackling incendiary bomb before it causes a serious conflagration.

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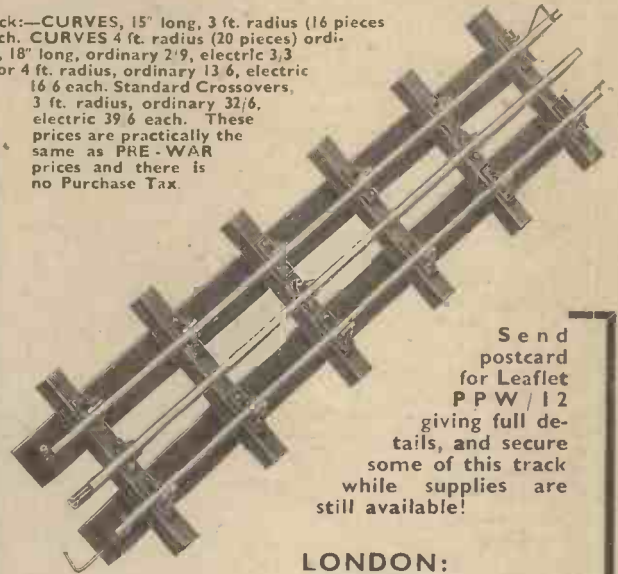
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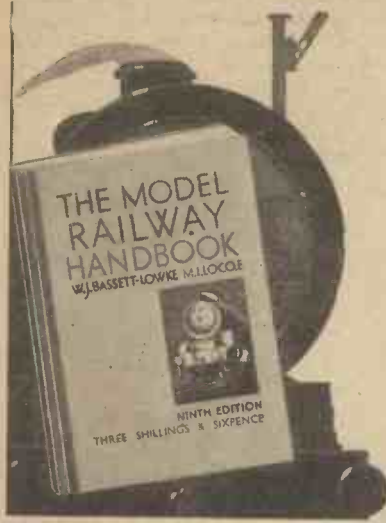
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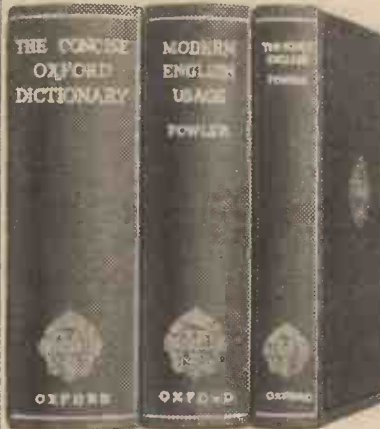
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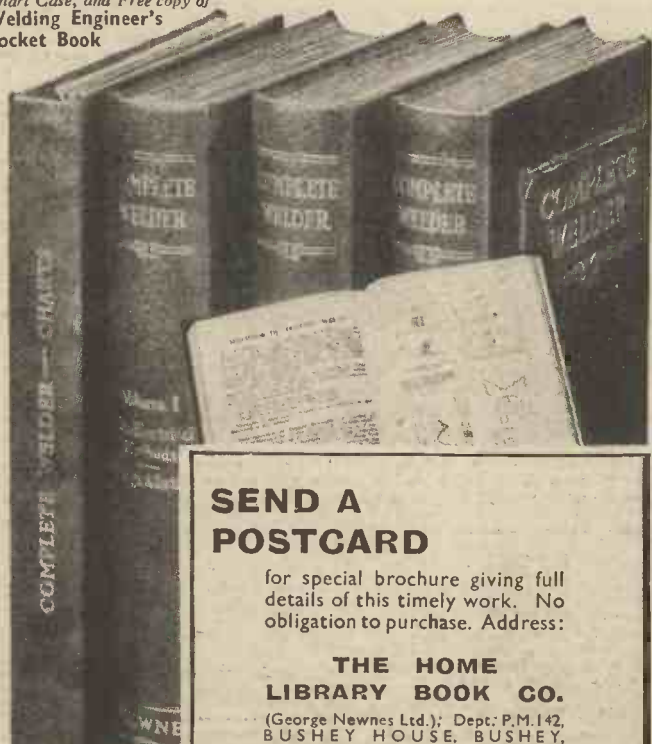
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The Avro Manchester aircraft now in service with Bomber Command of the R.A.F.

The World of Aviation

Filming Propellers : The Avro Manchester : New Landing Device : Typhoons and Whirlwinds : Fighter Plane Technique

Filming Propellers

PROPELLERS of high speed bombers are tested at Dayton, Ohio, with an oscillograph, which translates mechanical vibrations into electric impulses and records them on sensitised film.

The Avro Manchester

MUCH has appeared in the daily papers recently regarding the Avro Manchester twin-engined bomber. Although details of the plane have only just been published, it has been in service since the beginning of November 1940. It is considered the fastest twin-engined plane in the world and is powered by two Rolls-Royce Vulture engines. The machine is heavily armed, having a four-gun turret in the tail, a two-gun turret on top of the fuselage, and also in the nose. Of all-metal stressed skin construction, the Manchester normally carries a crew of seven. The 24-cylinder X-type aero-motors are in effect two R.R. Peregrines fitted one on top of the other. The machine has a wing span of 90 ft. 1 in., is 70 ft. in length and 19 ft. 6 in. in height. It carries one of the heaviest bomb loads. Other figures such as weight and performance have not yet been released.

New Landing Device

AN illustration on this page shows a new type of plane wheel in which a landing device is installed. It is the invention of C. H. Rogers, who is also shown in the picture. In his hand is a hub cap which protects and fits over the landing device. Rogers' idea is based on the fact that if the wheels are spinning when the plane is landing, the machine will make contact with the earth with a decreased jar. After working in his laboratory for three years, Rogers developed an apparatus which automatically sets aeroplane wheels spinning at whatever speed will gear them to that of the "flying ground" beneath the landing plane. Weighing only 24 lb., the device is powered with a 2 h.p. hydraulic motor, in which high compression fluid is the motive force. Bad landings cause sparks to fly from the tyres, and sometimes the tyres are ripped apart. Tyres last only a few trips, and if Rogers' invention

operates as claimed, it will prove a great tyre and cost saver, as well as a safety device.

Typhoons and Whirlwinds

BRITAIN is now using two new tank destroying planes, one of which has the heaviest fire power of any single-seater fighter plane in the world. They are the Typhoon and the Whirlwind. The Whirlwind is a twin-engined fighter, whilst the Typhoon is a long-range single-seat fighter which is a successor to the Hurricane. The Typhoon is a Hawker product designed by Mr. Sydney Camm. This is the first time that these two planes have been mentioned in official reports.

New Welding Process

MR. PAUL H. MERRIMAN, chief electrical engineer for the Glenn Martin Company, said recently that further development of aluminium welding processes might make possible a production in the United States of

1,000 planes a day. He said, "I can visualise a machine into which the various parts of a plane can be placed, and one half of the plane completed by the pushing of a button. Sixty spot welds could be installed in the time it now takes to instal one rivet."

Fighter Plane Technique

THE higher speeds attained by the new fighter aircraft do not bother our fighter pilots. The speeding-up process over the past few years has been comparatively gradual as more horse-power has been extracted from existing motors, or new motors and improved airscrews came into use. Consequently, pilots have been able gradually to adapt their flying technique to the new conditions of high-speed flight.

Higher ceilings have presented their own set of problems—human as well as mechanical. The latest Me. 109 probably has a ceiling of about 41,000 feet—nearly eight miles. Without giving details of what new British fighters can achieve it is obvious that the R.A.F. is not likely to concede to the enemy an advantage in height to offset the other advantages British fighters have so far maintained. Above 33-39,000 feet, air crews suffer a good deal of discomfort, even with oxygen. Additional aids and technique become necessary to enable fighters to operate with the fullest control.

Of the various developments in fighter performance, longer ranges, perhaps more than any other, have affected the technique of our fighter pilots. Increased ranges have given a new significance to the science of air navigation. When they operated only within a comparatively small area the fighter pilots got to know almost every yard of their territory. Fighter crews of the future will have to become as expert in finding their way about unfamiliar ground as are the "bomber boys." And they may meet weather which requires "blind" flying over considerable distances.

Navigation is, of course, taught to all who fly—fighters bombers or reconnaissance. But with the short range fighters of yesterday it had not become the almost second nature which it is with the pilots who have habitually covered much longer distances. Already the new breed of fighters, those who fly and fight by night, have acquired the new technique. The "day boys" are fast acquiring it.



Charles H. Rogers, inventor, with a plane wheel in which his landing device is installed. (See accompanying paragraph.)

THE WORLD

Some More Fine

a very fine model traction engine built to "Model Engineer," designed by Mr. Newton, also an episcope by the same member; a super-detail N.E.R. B12, and some scale model wagons by Mr. K. Leeming; a model 18-lever interlocking frame, and a model colour-light gantry by Mr. B. Gubbins, a model colour-light bracket signal, and a free-lance model rail-car by Mr. B. J. Favell, a pair of model Block Telegraph Instruments, and a pair of model electric train staff instruments. A large number of blueprints and drawings were also exhibited, and club members gave several demonstrations of running on their layout, which was described in our November issue.

Miniature Railway in Switzerland

News still continues to reach us from neutral countries like America and Switzerland, and a letter has recently arrived from Mr. Hugo Hurlimann, president of the Schweizerische Eisenbahn Amateur Klub (Swiss Amateur Railway Club) of Zurich, which indicates he has safely received his copy of Mr. W. J. Bassett-Lowke's new Model Railway Handbook.

Mr. Hurlimann encloses some interesting photographs of the new miniature railway of the Brothers Brast, of Brugg. He says: "Those three rail fans work on live steam like no one in Switzerland. It didn't take them more than a year to finish their 'Royal Scot,' and they sure did a perfect job. Soon they

will start a third engine, this time, perhaps, it will be the 'Flying Scotsman' of the L.N.E.R."

The Brast Brothers have a garage at Lucerne, and when Mr. Bassett-Lowke last visited Switzerland, they were at work on their first model of a 1½-inch scale 4-4-0 L.M.S. George V from B-L castings, and the pictures prove it to be a magnificent example of Swiss model engineering from English designs and prototype.



A 3½-in. gauge "Miss Ten to Eight"—N.E.R. 4-4-0, No. 750. Built by Mr. J. T. Meredith of Coventry.

THE New Year always calls for Resolutions, but never in the history of our time was the New Year so full of hopes and uncertainties. The restriction in the use of metals for toy making—I suppose some models come in this category—has put out of action for the present all commercial production, but this does not prevent the amateur continuing with his favourite hobby.

The quantity of material required for model making, compared with the interest of the work, is infinitesimal, and I am sure all lovers of the craft will find sufficient material to hand—even if it is from some second-hand dealer in metal—to keep the life blood of the hobby flowing.

A Fine 3½-in. Gauge Model Loco.

The Rugby Model Railway and Engineering Society, whom I mentioned in a recent article, have now produced their first Club Review. They say: "This publication is something of an experiment. It is the result of a year-old desire for a Club Magazine, which should inform members and friends of the Club's activities!"

One of the members, Mr. Brian Favell, sends some interesting details of a 3½-in. gauge "Miss Ten to Eight," a N.E.R. 4-4-0 No. 750 designed by L.B.S.C., and built by Mr. J. T. Meredith, of Coventry. The model is his first attempt at loco-building. It has two inside cylinders with slide-valves operated by full Joy gear. The lubrication is attended to by a mechanical lubricator situated between the frames just behind the front buffer-beam, and operated from one of the valve spindles. The bogie is fully sprung and equalised, and the driving wheels are also sprung. The boiler is of the coal-fired locomotive type working at 100 lbs. per square inch, and is of all-brazed construction. The feed is attended to by an injector, with an emergency hand-pump in the tender. There is no axle-driven pump. The cab fittings comprise regulator, blower stop-valve, injector stop valve, whistle valve, water gauge, pressure gauge, and a screw reverse. The tender is noteworthy in that it is fitted with working leaf springs.

The biggest test load that has been tried to date is three adults, and it starts this load easily and without a sign of slipping, and although it is a short non-continuous run it makes steam all the time. The owner is fully

confident that on a level continuous track it would haul eight people.

Here is Mr. Meredith's report on a day's running:—

"We raised steam in 12 minutes, then, hauling from 11 o'clock till dinner time, we



A bit of old England in the heart of Switzerland—the model 7½-in. gauge "Royal Scot," built by Brast Brothers, from Bassett-Lowke castings.

banked up and she stood in steam for an hour with very little attention. Then she went on working till 9.15 at night! 10½ hours in steam without cleaning the ashpan, but when we did it we found it was filled level with the firebars!"

The Rugby Model Railway Club is one of the enterprising model clubs who have held an exhibition this Christmas. It took place on their premises between December 15th and December 20th, and among the exhibits were



A good load on a Swiss model railway—the little locomotive with a big pull.

OF MODELS—By "MOTILUS"

Examples of Model Railway Work

Visitors to Bassett-Lowke's London shop in Holborn can see one of these 7½ in. gauge "Royal Scot" models on show, completed at their Northampton works shortly before the outbreak of war.

Model Railway System in Canada.

And here are some excellent photographs from a Canadian who owns a British type railway. He is John A. Markham, of 2261 Moy Avenue, Windsor, Ontario, and here, in his own words, is the story of his interest in model railways:—

"The first impression I had of a railway was rather painful. When a small boy of five, I was taken by my mother along with my sisters and brothers to St. Anne's by the Sea, in Lancashire. I can distinctly remember seeing the small colourful train drawn into the station and how excited I was, but our nursemaid who accompanied us accidentally slammed the coach door on my thumb! During my holiday at St. Anne's I can remember walking up the beach to Blackpool and seeing a fine 15 in. gauge passenger-carrying miniature railroad operating at an amusement park at the seaside.

Next year one of my aunts provided my brothers and I with a small toy train outfit. It was an O.O. gauge, consisting of a station and a very small oval of track, a small engine and three little open cars. I had a good deal of fun with this small train, and it received quite rough usage.

In 1910 my father decided to immigrate to Canada. We arrived at Boston, where I was very surprised at the immense American engines on a railway near the dock. My father, who is a minister, first located in New Brunswick, Canada. There was an old abandoned railway to the village of Harvey where we dwelt. It ran along a dyke over marshland, and there was one railway bridge still in good repair. There was only one engine left on this railway. It was very old, about 1870, with large balloon stack, and was housed in a dilapidated brick building down near the river. I used to love to climb up into the cab and ring the bell. However, in 1914 this old engine was sold for scrap iron, the rails were

all removed from the sleepers, and the nearest railway to us then was three miles away in the town of Albert. It was only 45 miles long and was called the Albert and Salisbury Railroad. The train was very slow and rocked from side to side like a boat on rough water. It was made up of a few freight cars and two or three old passenger coaches. It has now been taken over by the Canadian National System.

My next toy train was a small push or pull locomotive and tender combined, by the T. Eaton Company store at Toronto. When I was sixteen, I left home to make my own living, and I did not have the chance



The 1941 Model Railway Terminal of Mr. John A. Markham's railway at Windsor, Ontario. Left to right:—"Royal Scot", 'Brighton Pullman', 'Princess Elizabeth' on the 'Night Scot', 'Cock o' the North' on the Queen of Scots Pullman, 'Duchess of Montrose' on the London Aberdeen Postal, 'Golden Arrow', beside the C.P.R. streamliner 'The Royal York.'



A striking snap of the "Flying Scotsman" on Mr. Markham's up-to-date layout.



Trains on the track—beginning from foreground—"Duchess of Montrose," 'Royal Scot,' 'County of Bedford,' 'Suburban York,' and 'S.R. Schools class'

to pursue my interest in model railways until some years later when I married. Some time afterwards I decided to start the fascinating hobby of miniature railways in earnest. I purchased a small American toy train made by the Lionel Corporation of New York, with a large oval of track and two switches for sidings. The locomotive was black, and there were five orange passenger coaches. After amusing myself with this train for two or three years I decided that I would like to have a railway on more scale proportions. I also wanted British trains, as I have always liked the smooth and colourful appearance of the British locomotive.

I sent to Bassett-Lowke, Ltd., for a Model Railway Catalogue.

Constructional Work

In a few years I moved to a home of my own, and I took over about half of the basement for the miniature railroad. I built a stand about three feet above the concrete floor, size approximately 24 ft. by 7 feet, with an addition of 7 ft. by 5 ft. for the terminal. I built the stand of 1 in. planed timber supported by 2 in. by 2 in. supports. I purchased from England some steel rails on wood sleepers and I obtained from the United States some of the Lionel Corporation's scale model track, which is steel rail on steel sleepers, together with several remote control switches, and a large girder bridge which was built for me by a bridge engineer. This bridge is very similar to the New York Central bridge over the Niagara River near Niagara Falls.

I have the following trains running now:—The Royal Scot train (7 L.M.S. coaches and one Bassett-Lowke Royal Scot, d.c. electric), the Flying Scotsman (5 L.N.E.R. coaches and one Bassett-Lowke Flying Scotsman locomotive d.c. electric), one French State Railway train, a Queen of Scots Pullman train, the Southern Belle, and two fine American trains. I also have the L.M.S. Pacific locomotive, 'Princess Elizabeth,' with which I sometimes head my L.M.S. express.

I also have made several gauge 'O' live steam engines—I have two 4-4-0's, two 4-6-0's and two 2-6-0's, and it is great fun preparing these for the road. It is a real thrill to see these engines get away under their own steam, and I have a separate track system for them which is constructed of solid steel rails laid over wooden sleepers.

Scale Model of Irish Mail Train

My 'piece de resistance' is, I think, my scale model made by Bassett-Lowke, Ltd., of the Irish mail train. This consists of non-streamlined Duchess of Montrose, L.M.S. Pacific engine, and four Royal Mail L.M.S. Post Office mail vans. This fine train will exchange the mail at speed, it will pick up the mail bag from the standard at the side of the track, and at the same time drop off a bag of mail into the ground net.

Running Cars on Coal Gas

Some of the Problems Connected with the Simple Conversion of Vehicles to Operate on Low-Pressure Town Gas

By E. A. C. Chamberlain, Ph.D., D.I.C.

(Concluded from p. 72, December 1941 issue)

TAKING as an example a bag of 250 cub. ft. capacity on a vehicle 12 ft. long, the frontal cross-section will be 21 sq. ft. The horse-power required to overcome the resistance offered by this area at speeds up to 60 m.p.h. in still air is given by the curve (Fig. 6). It is obvious that this energy expenditure will be modified by atmospheric wind conditions and by the fact that the bag does not offer a plane surface and will rapidly become deflated at the front. It is clear, however, that apart from the disadvantages already mentioned of boxing-in the front of the crate, such a procedure involves a permanent wind resistance not diminished by the collapse of the bag. This resistance will not only be serious when operating on gas, when the power output of the engine is already lower than on petrol, but will also react on performance and consumption with petrol.

Gas Connections

It is not always realised that high gas rates are involved when a conversion is made; for example, an engine developing 20 h.p. requires between 500 to 600 cub. ft. of gas an hour. It is essential that the pressure at the carburettor shall not fall appreciably, or the carburettor will be starved; for this reason adequate size connections must always be made. It is suggested that the internal diameter of all connections should not be less than 1½ in. right up to the main cock on the inlet of the carburettor.

Filling Valve

Fig. 7 shows the valve approved by the Industrial Gas Centres Committee to be mounted on all vehicles fitted with gas bags. The connection to the bag is made at A; filling takes place through the screw connection B, and the non-return valve C; D is the outlet to the carburettor. By adopting this valve as standard throughout the country it is possible to refill the bag at any filling station without difficulties arising owing to different pipe sizes.

Gas Meter

Though not part of the vehicle equipment, it should be recorded that a special positive displacement meter has been designed for use at filling stations, having a large dial calibrated in 100 cub. ft. with a pointer making one complete revolution per 100 cub. ft. At the back of the meter a standard recording unit is



A private car with a gas bag and trailer for supplying coal gas. Mr. Barton, the inventor of this gas system, which was used during the last war, is seen on the extreme left.

fixed. The meter has a capacity of 2,000 cub. ft. per hour, so that a 250 cub. ft. bag can be filled in seven and a half minutes. A meter of this type can be seen in Fig. 3.

Gas Bag Fabrics

When conversions were first undertaken, the choice of the gas bag material was left to the bag manufacturers. During the past 12 months, however, it has been possible to devise tests, the results of which are confirmed by practical experience, and it is now possible to indicate what type of material will give the best service. Before any tests on fabrics were undertaken, enquiries were made of the British Standards Institution, the British Rubber Manufacturers' Research Association, the Cotton Research Association, and the Manchester Chamber of Commerce Testing House about agreed methods of test applicable to this problem. The only relevant B.S. specification appears to be B.S.S. 2F.41/1930.

which deals with rubber-proofed materials for aircraft and describes a hydrogen permeability test. This test is designed for balloon fabrics, and is not directly applicable to gas bags. Moreover, it involves a gravimetric test, and is therefore slow. The British Rubber Research Association gave useful advice on mechanical tests, and suggested that natural ageing by exposure to weather was better than artificial methods, such as irradiation by ultra-violet light. The Cotton Research Association was not able to suggest a complete abrasion test, but from the information given a test has been devised. The test methods adopted as standard are as follows:—

(1) *Tensile Strength*.—Specimens are first conditioned for 12 hours preceding the test at 65° F. to 70° F., 65 to 70 per cent. R.H., then extended at a constant rate of 12 in./min.

(2) *Tearing*.—Specimens conditioned as before are placed in the tensile testing machine and a small nick made in the edge of the material, the load at a constant extension rate of 12 in./min. is then measured. The test is made in two directions at right-angles.

(3) *Abrasion*.—A 1-in. strip is held over a stationary former and abraded by a 13-oz. grey cotton canvas of unsized yarn, under a load of 0.5 lb. The traverse is 1,260 in./min., and a total traverse of 28,000 in. is made, changing the abrasive material every 7,000 in.

Where samples have different surfaces the coarser surface is tested. After abrasion the samples are conditioned as in test 1 and the tensile strength once more measured.

(4) *Stripping*.—The time to strip 1 in. on a 1-in. wide specimen and a constant load of 4 lb. is measured.

(5) *Weathering*.—Samples are exposed for one month (720 hours) held by wooden pegs on a cord suspended on the roof of Watson House. After weathering they are given vista

Table of Gas Bag Tests

Vehicle	H.P.	Type o. crate	Capacity cub. ft.	Miles per fill	Miles per 300 cub. ft.
Ford saloon	8	Box	170	23	40.6
Morris saloon	8	Collapsible	150	15	30.0
Ford van	8	Box	180	25	41.5
Austin saloon	10	Box	220	21.6	30.0
Austin saloon	12	Box	210	18.9	27.0
Morris van	12	Box	240	20	25.0
Morris van	14	Collapsible	270	20	22.2
Austin saloon	18	Meta ^l tube	190	13	20.5
Bedford van	18	Collapsible	500	17	10.2
Ford van	24	Box	470	21	13.4
Studebaker saloon	27	Box	500	22.5	13.5
Dennis	30	Box	280	9	9.6
Thornycroft	35	Box	500	19	11.4

inspection, tensile strength stripping and permeability tests.

(6) *Permeability*.—The apparatus developed for this test is shown in Fig. 8; its object is to determine the pressure decay curve under constant volume conditions. The measurement is made by clamping over the open end of the cell a specimen of the fabric. Constant volume conditions are ensured, supporting the fabric with a sheet of perforated metal, the two being separated by a sheet of "Aertex" material to allow free outward diffusion. The seal between the fabric and the cell is made with lanolin, and the valves used are all neoprene seated with flat faces. The whole cell is heavily built, and has a water jacket to increase the thermal capacity and eliminate the effect of small temperature variations in the test room, which is itself thermostatically controlled. Pressure drop, afterwards corrected for barometric variations, is read on a single column gauge using mineral sperm oil as the indicating liquid. Commercial hydrogen is used for the tests, this being drawn straight from a cylinder. The use of coal gas would have brought in complications owing to changes in gas quality, but check tests have been made. Two typical curves (Fig. 9) are given showing (A) a typical diffusion pressure decay curve, and (B) a discharge curve when the rubber has been broken by weathering. The results of tests are expressed as loss in cub. ft. per 100 sq. ft./hour.

Calculation of Permeability from Test Readings

- V = Total volume of the cell, including pressure gauge connections, etc.
 - A = Exposed area of fabric.
 - X = Rate of escape cub. ft./100 sq. ft./hour.
 - dp/dt = Slope of the pressure decay curve, taken at the reference pressure of 1 in., p measured in in. w.g., t = time in hours.
 - P = Atmospheric pressure in in. w.g.
- $$\text{Then } X = \frac{100V dp}{A.P. dt}$$

Test Results

In general, the test after weathering provides the best guide as to the suitability of a material; and it may be said that a material after weathering should have a permeability not greater than $X=0.1$ cub. ft./100 sq. ft./hr., and the tensile strength should not have fallen below 40 lb. per sq. in. width in either direction.

It has been found that the most satisfactory materials are those having a rubber layer sandwiched between cotton fabric material. Calendered materials are unsatisfactory, since they tend to peel and crack. Single-proof materials can be satisfactory, provided that the rubber is applied to a thoroughly scoured surface of a suitable backing material such as double weft and warp Wigan, or heavy duck. A vulcanised rubber-proof is superior in wearing qualities to a pure rubber-proof. When making the bag, all seams should be double sewn and taped. The proofing must be on the inside of the bag in contact with the gas.

Two typical test results are given: No. 1, a satisfactory material; and No. 8, a reject.

Swelling

Final tests to determine the effect of contact with town gas on the fabrics have not been decided upon. Preliminary results obtained by hanging samples in a continuous gas steam indicate that weathering is a more important factor in fabric deterioration.

Vehicle Performance on Gas

Engine performance on town gas has already been discussed, and the influence of the gas container and auxiliary equipment has been indicated; besides these factors there are the

to an American six-cylinder 26-h.p. saloon car, it can be asserted that, provided a vehicle is in a reasonably good mechanical condition, satisfactory results after conversion can be achieved. It must be realised, however, that marked peculiarities in design call for special attention when carrying out a conversion, and it is hoped that these notes have provided a guide to the factors that must be considered. As an indication of the results which may be expected after conversion two test results of our own are given in detail: one of a Morris 12/4 delivery van, and the other of an Austin

Test on Morris 12/4 Van

Acceleration and Performance	Petrol—gas bag full	Gas
Test hill, 1 in 13	2nd gear	2nd gear
Acceleration, 0-25 m.p.h. .. .	9.3 secs.	12.3 secs.
Maximum speed, North, South .. .	40 m.p.h.	38 m.p.h.
Maximum speed, South, North .. .	41 m.p.h.	41 m.p.h.
Mean speed	40.5 m.p.h.	39.5 m.p.h.
Consumption	20 m.p.g.	19 miles/250 cub. ft.
Cruising speed	30-35 m.p.h.	28-32 m.p.h.

Test on Austin 10 Saloon. Engine—4-cylinder Austin. Sparking plugs—Lodge C.14. Carburettor—G.L.C. No. 1. fitted into air intake of Zenith down-draught petrol carburettor. Bag capacity—220 cub. ft. Crate—Low box type.

Acceleration and Performance	Petrol (Bag full)	Gas
Test hill, 1 in 13	2nd gear	2nd gear
Acceleration, 0-25 m.p.h. .. .	14 secs.	14.6 secs.
Maximum speed, North, South .. .	48 m.p.h.	45 m.p.h.
Maximum speed, South, North .. .	39 m.p.h.	32 m.p.h.
Mean speed	43.5 m.p.h.	38.5 m.p.h.
Consumption	28-30 m.p.g.	21-22 miles/220 cub. ft.
Cruising speed	30-35 m.p.h.	30 m.p.h.

The following independent test was made at Brooklands on a Standard 14 h.p. car;—Engine—4-cylinder Standard. Sparking plugs—K.L.G., F.70X. Carburettor—G.L.C. No. 1, tee fitting into induction manifold Solex petrol carburettor. Bag capacity—200 cub. ft. Crate—Walsh collapsible.

Acceleration and Performance	Petrol. Container inflated	Gas
Test hill, 1 in 4	1st gear	1st gear
Acceleration, 10-30 m.p.h. .. .	9.4 secs.	14.2 secs.
Maximum speed	66 m.p.h.	55 m.p.h.
Consumption	18 m.p.g.	18 miles/200 cub. ft.

host of details in design that give rise to the individuality of the many makes of vehicle on the roads to-day. It is these last considerations which necessitate individual treatment for each conversion. From experience on many types of private and commercial vehicles ranging from a two-cylinder two-stroke delivery van

10/4 saloon.

Test on Morris 12/4 Van No. 917

Engine—4-cylinder Morris. Sparking plugs—Champion L.10, 15/1,000-in. gap. Carburettor—G.L.C. No. 1, fitted into S.U. petrol carburettor air inlet. Bag capacity—250 cub. ft. Crate—Low box type.

The following analysis for which the author has to thank Mr. V. H. Prodham, manager of the Transport Section of the Gas Light and Coke Co., is given as an illustration of the average performance before and after conversion of a fleet of light delivery vans.

Morris 12/4 Vans Operating on Express Delivery Service

Number of vans converted—25.
Estimated cost per conversion—£32.
Total mileage all vehicles before and after conversion per month—26,000.

Description	Material No. 1. Rubber sandwich Wigan	Material No. 8. Single ply calendered
Weight of 1 sq. yd.	1.72 lb.	0.76 lb.
Tensile strength before weathering lb./in. width	88 (W) 76 (A)	51 (W) 42 (A)
Tensile strength after weathering lb./in. width	88 (W) 71 (A)	38 (W) 36 (A)
Permeability after weathering cub. ft./100 sq. ft./hour	0.052	1.43
Reduction in tensile strength after abrasion	2.5% (W) 12% (A)	23% (W) Nil (A)
Stripping time to strip 1 in., 1 in. wide	105 secs.	5 secs.

Average mileage per month per vehicle—1,040.

Average petrol consumption per vehicle per month before conversion—43 galls.

Average gas consumption per vehicle per month after conversion—67 therms.

To the end of July, 1940, the following vehicles have been converted:—

- 32 light vans.
- 2 lorries below 2 tons.
- 7 lorries above 2 tons.
- 26 private cars up to 10 h.p.
- 3 private cars above 10 h.p.

Total gas consumption, all vehicles, per month, 695,000 cub. ft.

Total petrol consumption prior to conversion, per month, 2,513 galls.

Total gas consumption all vehicles, January-

June, 1940, 2,105,323 cub. ft. Assuming 300 cub. ft. of gas is equivalent to 1 gallon of petrol, the total saving of petrol in six months has been 7,000 galls.

Ministry of Transport Regulations

It should be noted that the Ministry of Transport have drawn up regulations governing the use of gas as a motor fuel (21). A discussion of these regulations is outside the scope of the present article, but anyone considering the use of gas for this purpose should make themselves familiar with them.

Final Conclusions

The data in this article has been obtained during the last 12 months, and naturally

progress has been rapid during this period. Improvements are continually being made to equipment, and even better results may be expected. The figures quoted, however, do show that the low-pressure gas system can be applied to almost any petrol vehicle with every chance of success. The limited mileage obviously does not permit of touring, but for town work the operating radius is adequate, especially as the number of gas-filling stations is rapidly increasing. In London there are already (July, 1940) over 80 of these filling points, so that there should be no difficulty in using gas entirely when in town. For delivery work such as required by laundries and bakeries the system not only solves the problem of limited petrol supplies but can actually show an appreciable saving in running costs.

Making a Perspectograph

An Easily-made Instrument for Copying Drawings, and Other Objects.

By S. J. GARRATT

A PERSPECTOGRAPH is a simple optical device which can be of great assistance to an artist in copying drawings, etc., and it is not as well known as its utility merits. It can also be used for preparing illustrations from the actual articles, in which case correct perspective, frequently a difficulty for an amateur artist, can be readily obtained.

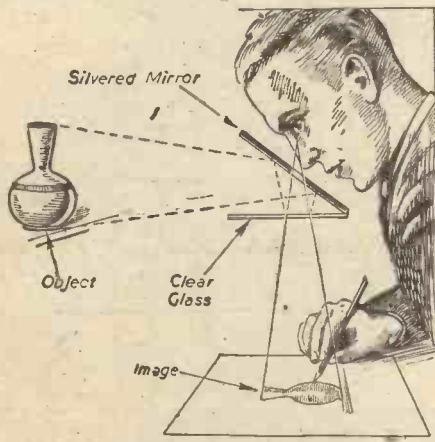


Fig. 1. Showing how the perspectograph is used.

Principle of Operation

The principle on which the apparatus works will be apparent from the diagram (Fig. 1). The "copy" is arranged in an upright position on an easel, opposite to the mirror. On looking through the small hole in the mirror the eye sees an image of the object reflected by the plain glass and the mirror, and this image appears to be flat on the table directly beneath the eye-hole, as shown in the illustration. A piece of paper may, therefore, be placed in position where the image appears and an accurate drawing can be made by following the shapes with a pen or pencil. As the eye can see through the plain glass at the same time as it sees the reflected image, the pencil and the image are both visible together, and the details can be followed by the pencil point quite easily.

For amateur construction wood is probably the most convenient material.

Construction

Fig. 2 shows the framework complete. The dimensions are given as some indication of the size, and need not be adhered to exactly. To make the whole thing stand firmly, a thick

piece of lead should be screwed underneath the base and the lead should be covered with baize fixed with adhesive. This prevents the lead from marking papers, etc., on which it may stand.

The triangular pieces which hold the glass and mirror are shown separately in Fig. 3. These, of course, should be made as a pair, i.e. one right hand and one left hand. Screw the end piece on to the horizontal support first, then space the second triangle far enough away so that it holds the glass com-

fortably in the horizontal grooves. Fix it in this position, and put a small screw or tack at the end of the grooves to stop the glass from sliding out.

The size of the plain glass should be 3 in. by 3 in. and the mirror 3 in. by 3 1/2 in.

The mirror should then be slid into the slanting groove, with the back uppermost, until it rests on the plain glass, then fix it with a screw or tack as before.

Next scrape a small hole on the back of the mirror so as to leave a spot of clear glass about 3/8 in. diameter. This forms the "eye-hole." It should be approximately central.

A simple easel will be required to hold the drawing which is to be copied, and a suggestion for making it is shown in Fig. 4. The clips are just flat pieces of wood held in place by rubber bands.

Illumination

The illumination of the original drawing, and the copy will both need some attention to obtain best results. If there is too much light on the drawing and not enough on the copy, it will be difficult, or impossible, to see the pencil and vice versa, if there is too much light on the copy and not enough on the original drawing, the image will be too faint, or perhaps not visible at all. All that is necessary is to adjust the position of the light source until a satisfactory result is obtained.

The size of the new drawing can be made large or small as required, by placing the original drawing nearer to or farther from the mirror. The farther away the drawing is placed, the smaller will be the copy.

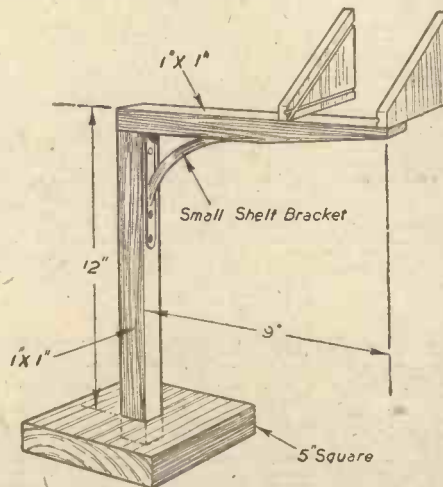


Fig. 2. The completed framework.

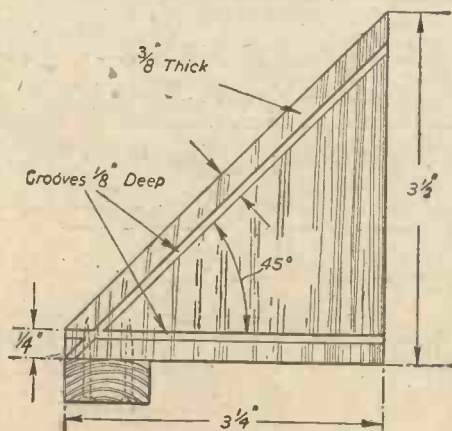


Fig. 3. One of the triangular-shaped pieces for holding the mirror and glass.

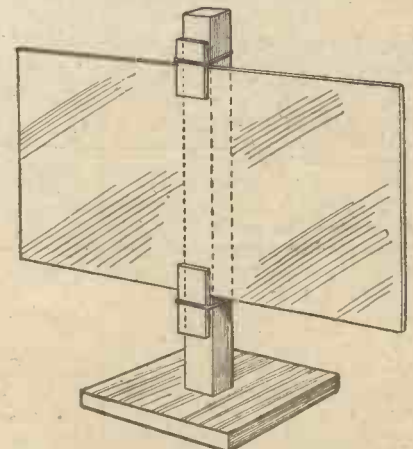


Fig. 4. Easel for holding the drawing to be copied.



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A stamped addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on this page 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.

Infra-Red Photography

I SHALL be grateful if you would tell me the exact proportion of chemicals used in the formation of emulsion for infra-red photography, and also the necessary ingredients for fixing same on plate, and if the emulsion can be bought?

Failing this, perhaps you can suggest a book that will give me the information required?—S. V. Pinner (Edgware).

THE special chemical used in the manufacture of infra-red sensitive photographic emulsions is one of a number of blue dyestuffs, each of which is exceedingly costly. Such dyes are the following: Dicyanine, Dicyanine A, Neocyanine and Kryptocyanine.

We do not think that you will find it possible to obtain any of these dyes (even at the pre-war rate of about £3 per gram), but, nevertheless, you can make enquiries to their manufacturers, Ilford, Ltd., Ilford; or Kodak, Ltd., Kingsway, London, W.C.2.

Usually, the dyestuff is incorporated in the plate or film emulsion, and this emulsion cannot be purchased separately, as you suggest. You can, however, infra-red sensitise a medium-speed plate by bathing it for two or three minutes in a 1 in 10,000 solution of Dicyanine or Dicyanine A. Afterwards, the plate is dried in the dark, and exposed within an hour or two of its treatment.

You are no doubt aware of the fact that specially-sensitised infra-red plates can ordinarily be obtained from any of the above-mentioned firms, or their stockists, and we would suggest that the acquisition of a packet of these plates would constitute your best means of making a number of infra-red photographs. With such plates, you would, of course, require to use a special infra-red colour filter in conjunction with your camera lens. Such screens or filters are also normally obtainable from either of the above firms.

(2) There are several books on infra-red technique and photography. About the most suitable for your requirements is:—*Infra-Red Photography*, by S. O. Rawlings (3s. 6d. net). Another book of interest is:—*Photography by Infra-Red*, by W. Clark (Chapman & Hall, 2s. net).

Ultra-Violet Radiation

I DESIRE to construct an ultra-violet ray lamp. I do not consider a carbon-arc will be sufficiently powerful for my purpose, and would like details of the quartz mercury vapour type. Can you recommend a good make of quartz mercury arc tube, costing about £5, and furnish me with circuit to operate the tube on an A.C. supply of 200v. 50 cycles?

Please include details of transformer required, and any other components needed.—A. Driver (Torquay).

THERE are three main types of ultra-violet apparatus used for the practice of actinotherapy, but only those emitting wave lengths ranging between 4,000 to 1,800 Angstrom units are serviceable, as the shorter rays are absorbed too much by the atmosphere. Generally speaking, the longer wave lengths are regarded

as the most valuable for their tonic effect, and the shorter waves for local treatment of such conditions as tuberculosis, open wounds, etc. The three types of lamps mostly in use are (1) the mercury vapour arc, (2) the carbon arc, and (3) the tungsten arc. The evacuated type of mercury vapour lamp is the most popular and consists of an exhausted quartz tube in which is enclosed a small quantity of mercury. Two electrodes sealed into the walls of the tube enable a current to be passed through it. After first switching on, the burner is tilted so that the mercury runs along the tube and makes contact with both electrodes. This volatilises some of the mercury and when the tube is returned to its normal position, the gap between the electrodes becomes bridged over with mercury vapour, forming an arc. It is a useful type of lamp for small rooms as it emits no fumes. The apparatus is fragile, however, and needs great care in handling. The current consumption is about 3 amperes at 200 volts, and it can be used either on direct or alternating current in conjunction with a series resistance or transformer. It is unlikely that you will be able to obtain a thoroughly reliable article at the low price mentioned, which is about one-third of the usual list price even of the smallest model.

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You might, however, apply to W. Watson & Sons, Ltd., Sunic House, 43-47 Parker Street, Kingsway, London, W.C.2, and ask for quotations.

Re-winding a Dynamotor

I HAVE a 12-volt 400-watt Dynamotor. The armature has 29 slots and 29 commutator bars, and the diameter of the commutator is 2 ins. How can I rewind to give 50 volts 6/7 amps, and to run at slow speed? Could I fit a 58-bar commutator to get results? The machine is a 4-pole one.—Geo. D. Elliot (Castlefin).

WHEN rewinding a 12-volt 400-watt dynamotor to operate as a generator for an output of 50 volts 7 amperes, there will be no need to make any constructional alterations, or to fit a 58-bar commutator as suggested. In the absence of any details as to armature diameter and length, slot dimensions, or size of the four field poles, it can only be recommended that the armature is rewound with the maximum number of turns that can be got in the slots using No. 19 S.W.G. d.c.c. copper, copying the existing span of the coils and their connection pitch to the commutator. The fields will require about 6 lbs. of No. 22 d.c.c. for the four coils, all joined in series, and shunt connected to the armature. Brushes of "EG" grade carbon will be suitable.

Motor-Operating on Low Voltage

WHAT are the possible results of trying to drive a 250-volt motor (as found in a suction carpet sweeper) from a 50-volt set of car batteries (i.e. four 12-volt batteries)?

Why are car batteries rarely used in house electric light plants? They are made for much harder use on cars, stand bigger strains, and get much vibration. Glass cells smell, throw spray, and collect dust.—P. Loftus (Sark).

TO attempt running a 250-volt vacuum cleaner motor from a voltage of 50 or under would merely result in the motor refusing to turn at all, or at the best the power it could develop would be quite negligible. Approximately it would take only one-fifth of its normal current, and develop about one-twentieth of its rated output in horsepower. A slight improvement might result by connecting the two field coils in parallel and then in series with the armature, but even then the performance would be altogether unsatisfactory.

Car batteries can be used for house lighting plants, but in almost every way are less satisfactory than the standard glass cells. It is a great advantage to be able to inspect the condition of the plates through the glass sides of the cells, hydrometer readings can be taken more easily, and the condition of gassing freely observed. Above all, the lifetime of the sections in a standard lighting battery would be far higher than that of the average car battery which have the plates purposely made very thin in order to be able to withstand the high rates of discharge called for when "motoring" the engine on starting up. The ampere-hour capacity is consequently far less than that of sections built up with thick plates. The "smell" referred to with glass cells is merely due to the presence of acid spray thrown off during the charge, and is just as much present with car batteries, being inseparable from the fact of gas being given off during the chemical changes taking place.

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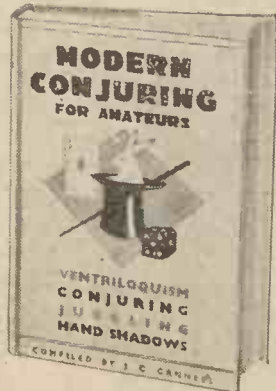
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VOL. X

JANUARY, 1942

No. 239

Comments of the Month

By F. J. C

A Club for Cyclists?

IN the September issue of this journal we drew attention to the fact that in the late 'nineties there existed in London The Cyclists' Club, where cyclists could call for luncheons and dinners at moderate fees. There was a library, reading room, room for committee meetings, and it was intended to provide cyclists with a meeting place in the Metropolis along the lines now adopted by the R.A.C. It was a social organisation, and did not exist as a Road Club.

We made the suggestion that in view of the many thousands of cyclists who come to London or who reside in the Metropolis and its environs, it was time that the idea was revived. The Club was ahead of its time in 1890, but there is no reason why it should not succeed to-day. Of course, such a club could not be started in the war owing to difficulties created by food rationing, and the absence of many important cyclists. Such a club properly promoted after the war would, in our view, be enormously successful, and it would do a great deal to raise the status of cycling generally. It needs to be promoted on bold lines, and must not be parochial in its outlook, nor should the rules be such as to exclude without adequate investigation. In Golf and other Clubs it is necessary for an intending member to be proposed and seconded. It is not necessary for him to be unanimously approved by the selecting committee; usually there is a clause that two or more blackballs exclude from membership. This allows for the presence on the committee of some person not well disposed towards the applicant and who will naturally vote against his election. Under a unanimous rule it is unlikely that the membership would expand, for there is always the possibility that someone on the committee will oppose the applicant's membership. There is always the member who threatens to resign if so-and-so is elected. In point of fact, every member of a club should be subject to election; even the founders of the club. This effectively gets rid of any suggestion of proprietorship, and makes membership fair for all.

The Club which we have in mind would rent premises and charge a reasonable fee for membership. It would undertake catering. It would support the pastime, co-operate with existing organisations, and with the trade. It is not too soon to be thinking about it; it could, in fact, become a parent organisation, non-partisan, if necessary acting as arbiter. The executive would need to be drawn from

those dissociated with the trade, the sport and the pastime.

It may be, of course, that the existing organisations could provide valuable help in making such a club a success. They could, for example, introduce some scheme of affiliation where membership of one body carries with it associate membership of the new club.

The whole country is talking of post-war plans, and of building anew. The cycling world must fall into line and reconstruct itself according to the new democratic order which it is hoped will be created immediately after the war.

Road Trials and the War

IN view of the new conditions created by the abolition of block reservation of men, and the intention of the Minister of Labour to replace skilled men by women, club officials are provided with the pretty problem of whether they should run their club events and Opens next year. There are those who feel that it is unpatriotic in wartime to carry on cycling sport, because the conditions have changed since the war started. Two years ago when the war was opening there was a general tendency to cancel events, and even the R.T.T.C. gave a lead in this direction. After the first shocks of the European cataclysm had subsided, clubs regained their sangfroid, and reinstated events during the second year of the war which they had cancelled in the first.

Now it is apparent that sooner or later everyone from the age of 18 to 50 or more will be caught up in the toils of war, caught up to the extent that they must shun delights and live laborious days. Cyclists under such a scheme will have little time to train, and little time to give to the organisation of road events. It is, of course, a matter for individual clubs. Some may be more fortunately situated than others, and be able to carry on some skeleton programme. It is very obvious that most clubs planning for 1942 must take into consideration the diminished membership with which they will be confronted when the 1942 season opens at Easter of this year.

It is customary for clubs to hold committee meetings and annual general meetings to fix their programmes for the ensuing year. Many by this time will have already done so. It is unlikely that those who have already fixed programmes will be able to carry them out, although we trust that this will not be the case. We know from our correspondence that

clubs are thinking along these lines, but it is impossible for the R.T.T.C. or anyone else to give them a lead. Clubs must be left to work out their own salvation, and to act in accordance with their own analysis of the trend of events. It is natural for clubs to wish to carry on, but as one club secretary put it to us in a letter the other day, they did not wish to give the impression that whilst their members were out fighting those at home were taking the war lightly. There have been many conflicting arguments on this point. The Government itself in the early days of the war said that it did not wish to interfere unduly with legitimate recreation. It was a good thing to cycle, or to indulge in other branches of sport to keep fit, and to take the mind off the war. The war has spread, and will spread even further, as it seems to be doing at the moment of going to press. It is very evident that every individual up to the age of 51 and over the age of 18, and every woman between the ages of 18 and 40, married or single, will be engaged in the war effort during 1942.

The clubs, therefore, find themselves on the horns of a dilemma; they want to do the right thing from the point of view of the country, and also they feel they have a duty to keep their clubs together whilst their members are at the front. We have been asked by many clubs to give them a lead. We are unable to do so, any more than the governing bodies can do so. Each club must decide its policy according to its own particular circumstances. We do know, however, that there is a feeling among older cyclists, who themselves have lived through many previous wars, that open events should not be run during the war. We do not necessarily concur in this view; we merely pass it along for what it is worth. We may add that at the moment of going to press, it is the intention of the R.T.T.C. to have a date-fixing conference, and they have not expressed any disapproval of the policy of carrying on road sport.

The Conscientious Objector

CLUBS have also been confronted with the problem of the conscientious objector, but whilst the laws of the country recognise conscientious objectors, it is difficult for clubs to exclude them from opens. In this connection it is a matter concerning which a ruling should be obtained from the R.T.T.C. Until this body gives that ruling it is hardly a domestic matter for individual clubs.



To maintain contact with outlying districts in the event of a breakdown in the telephone or telegraph service there has been organised in West Sussex a Civil Defence Messenger Service of relays of cyclists. The illustration shows a girl cyclist arriving in a West Sussex village and handing over the message to the next rider. They cover five miles on each stretch.

Preserving Little Switzerland

FURTHER steps have been taken by the National Trust to preserve the area lying between its estates at Box Hill and White Hill and forming part of the Little Switzerland Valley. This attractive district had been for some time threatened with building development.

New Secretary for R.R.A.S.

JOHN MACFARLANE, secretary of the Road Records Association of Scotland, has been called-up to the R.A.F. The emergency committee of the Association, consisting of Messrs. Herd, Tait, and Rattray, has met and appointed Robert Mackie as secretary. Mr. Mackie, who has been closely connected in recent years with record attempts, was bombed-out during the March blitz on Clydeside, but letters addressed c/o Harold Briercroft, 16 Scotstoun Street, Glasgow, W. 4, will reach him.

Hertfordshire Clubman in Scotland

K. E. ("JIM") CLUFF, formerly secretary of the K. Nomads (Hitchin) C.C. and also a member of the North London R.T.T.C. Committee, is at present serving in Scotland as Quartermaster-sergeant-major with a Royal Artillery unit.

Parcels to Club Members

EVERY serving member of the Ealing C.C.—and there are now 29—have received parcels of acceptable goods from club members.

Theft of Cycles

ROBERT JAMES BROWNLEY, a 27-year-old chef, who was sent to prison for fifteen months, admitted the theft of 74 cycles from various parts of the Metropolitan Police area.

"Guest" Membership Scheme

ADDISCOMBE C.C. have instituted a "guest" membership scheme for duration. It is open to men of H.M. Forces who are stationed in the South London area for more than short periods.

Poly. C.C.'s "Gazette"

POLYTECHNIC Cycling Club's "gazette" has reached its fiftieth year of publication. The first number appeared in February 1901 and the present editor, "Joe" Blake, has edited no fewer than 104 consecutive issues.

Clubman Passes On

WITH the death of L. Margreaves, who was serving with the Pioneer Corps, the Glen C.C. have lost a valued member.

North London Club's Activities

L. J. MURPHY and M. S. Edmonds are upholding the traditions of the Finsbury Park C.C. in grand style. Another old-established North London club, which is also to the fore, is the Crouch Hill, whose member, A. C. Ellis, has a number of sterling rides to his credit.

Clubmen in Services

BILL CRITCHLEY and Cliff Lamb of the Manchester Wheelers, are in the R.A.F., and Frank Young is another of this famous club's members to join the Royal Navy.

Brighton Club as Rendezvous

BRIGHTON Excelsior C.C. still manage to keep their club room open, and they offer it as a rendezvous for any clubman on leave in the area. The club room is 47 Grand Parade, Brighton, and it is open Tuesday evenings.

Crack Rider as Pilot

A. E. MARTIN, Portsmouth North End crack rider, is training to be a pilot. Stationed in Yorkshire, he finds his cycle very handy.

Scottish Rider's Loss in Air Raid

R. W. SCOTT, West of Scotland Clarion, who is attached to an A.F.S. station, has lost his home in an air raid, and all the awards he had won over a period of some seven years of successful road riding. He sustained slight injuries in the raid.

N.C.U. Essex Centre

THE Essex Centre of the National Cyclists Union has been re-formed.

Hostels Open Again

SEVERAL popular youth hostels in England and Wales have recently re-opened for the use of members. They include Derwent Hall, in Derbyshire; Week Hostel, Dartington, Devon; and the Old Mill, Clun, Shropshire.

Arran Takes Up Cycling

ARRAN, the island in the Firth of Clyde, which is such a place of summer residence for West of Scotland people, has gone bicycle-minded. 'Bus services have been cut down, so that cycling has become more popular on the island than ever before.

Tyres Unrationed

THERE is no intention of rationing tyres in the near future, according to a recent statement of the Parliamentary Secretary to the Board of Trade.

Gas-Mask Cycling in the U.S.S.R.

SOVIET cyclists often ride long distances in their gas masks, it is reported from Russia.

National Trust Activity

IN the past twelve months, the National Trust has acquired new holdings covering 10,000 acres in nineteen counties.

Second-Hand Prices Soaring

PRICES of second-hand bicycles are soaring in some parts of the country. An Edinburgh firm, for instance, is offering up to £8 for second-hand machines. These are reconditioned and sold.

Bells to Mussert

MUSSERT, the Dutch Quisling, was recently rung down by hundreds of bicycle bells, when he tried to speak at Haarlem. The bells were only quelled after half an hour's effort by S.S. men.

Rough on the Teachers!

RUBBER is becoming so short in Naziland that, according to a South German paper, bicycles must not be used for inessential short journeys. Young children, for instance, must not use them for short journeys to school. Teachers who allow pupils to use bicycles unnecessarily will themselves be prevented from buying tyres.

Electric Bicycles Now

"ELECTRIC bicycles" have arrived in America and in Sweden. Driven by wet accumulators, they weigh 200 lbs. and can attain 20 m.p.h.

Two Scots Hostels Re-Open

TWO of the East of Scotland's most popular youth hostels have re-opened for use. They are situated at Blackness Castle, near Linlithgow, and Lindores, in Fifehire.

Prompt Action Saves Hostel Shilling

PROMPT action by the Y.H.A., London Regional Group, and the Y.H.A. National Executive has scotched a move by the Lakeland Regional Group to increase the hostels' overnight charge from one shilling to 1s. 3d.

Presentation to Timekeeper

ON the occasion of his marriage, Ernest Worrall, a timekeeper to the Mid-Scotland T.T.A., was presented with a token of regard by the Association. Mr. Worrall is one of the best-known bicycle makers and repairers in Lanarkshire, and is a member of the Hamilton C.C.

Another Clubman Missing

Sgt. J. CLAGUE, Viking Wheelers, who did much in the organisation of the Isle of Man T.T. races for cyclists, is reported "missing." He was serving in the Middle East.

N.C.U. Enrollers

SINCE the Clubmen's Associate Scheme was put into operation a few weeks ago, so well have the enrollers responded that they have beaten the makers of the Badges, and it will, therefore, be some days before the awards can be made.

It is interesting to note that in the three weeks this scheme has been working, the Eastern Counties Centre alone by their Club Enrollers have made more Associates in three weeks than the whole of the country had for the corresponding period for 1940.

Temporary Change of Address

IN view of the important confidential character of the work of the Bicycle and Motor Cycle War Export Groups and the Traders Union involving the preparation of vital statistics of a character not easily replaceable and which are constantly in use, it has been decided to transfer the work of these organisations for the time being to Camden House, 201 Warwick Road, Kenilworth, Warwick. Telephone: 385-386 Kenilworth. Telegraphic Address: "Union, Kenilworth," until further notice.

Paragrams

Poly. Rider's Marriage

JERRY BURGESS, famed Poly. rider, was married to Miss Joan Clark recently. Best man was Burgess's former tandem partner, Lou Pond.

Young Rider Wins D.F.M.

WELL, known in racing circles and a very keen time-trialist, Sgt. Observer Peter Wise, Unity C.C., has been awarded the D.F.M. He is twenty years of age.

R.R.A.'s New Secretary

THE new secretary of the Road Records Association of Scotland is Robert Mackie, c/o 16 Scotstoun Street, Glasgow, W. 4. The former secretary, John Macfarlane, is with the R.A.F.

Poly. Sprinter in R.N.

DAVE RICKETTS, Polytechnic sprinter, is with the Royal Navy.

Clubmen in German Prison Camp

JACK LEE, in pre-war days a keen Lancashire clubman and youth-hostel enthusiast, has written a Glasgow friend from a German prison camp to say he is fit and well, and has as a prison companion a Dundee youth hosteller!

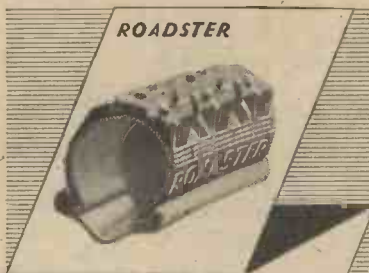
Tandem Partners Married

G. W. SKEVINGTON, Bedfordshire Road Club, and G. Miss Joan Lincoln, his tandem partner, have married. Best man was the club's former secretary, S. G. Williams.

Track Rider's Release from Army

RAY HICKS, the famous track rider who enlisted in the early days of the war, and who recently returned from serving in Iceland, has obtained his release from the Army so that his services as a surveyor may be used on constructional work for the Government.

"Most miles



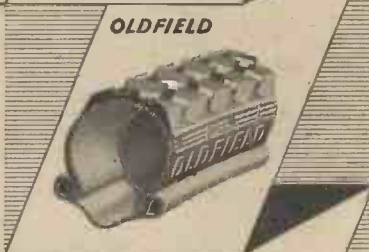
The deep rugged tread of the Firestone Roadster gives greater safety and mileage. Underneath are cords of the finest quality, giving extra strength and flexibility. Sizes 28 x 1½, 26 x 1½, 26 x 1¾.
TUBE 2/7. COVER 7/2

per shilling"



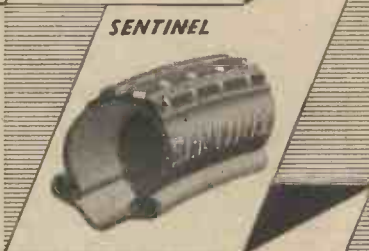
The Firestone Sports tyre is designed for speed with extra safety. Its lightweight is achieved by extra fine quality—ensuring flexibility and liveliness and great strength. Sizes 26 x 1½, 26 x 1¾, red or black.
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This deep rugged tyre is renowned for its substantial saving in first cost, yet giving wonderful mileage and safety. Sizes 28 x 1½, 26 x 1½, 26 x 1¾, 26 x 1¼.
TUBE 1/10. COVER 4/5

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High quality at a wonderfully low price, only made possible by the experience and skill of Firestone Tyre engineers. Sizes 28 x 1½, 26 x 1¾, black only. 26 x 1¾, 26 x 1¼, red or black.
TUBE 1/7. COVER 3/6

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With a deep tread of Sports tyre design and cord fabric impregnated with extra rubber, the Firestone 26 x 1¾ Tandem tyre has extra strength and liveliness, perfectly balanced.
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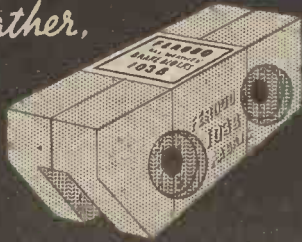
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Cyclists' Pilgrimage

N.º 1



Five and a half miles north-west of Coventry, home of the cycling industry, lies the Warwickshire village of Meriden. Here, amid sylvan surroundings, in the very heart of England, is the simple obelisk erected to the memory of cyclists who died in the Great War of 1914-18. Touring cyclists from all over the Kingdom journey to this spot to pay tribute to those of their great fraternity who gave their lives for their country.



This plaque marks the house at 26 May Street, Belfast, where in 1887-8 John Boyd DUNLOP carried out the experiments which led to his epoch-making invention of the first practicable pneumatic tyre, thereby revolutionising road mechanical transport.

11/319



A view of Midhurst, looking south

Around the Wheelworld

By ICARUS

The Charlotteville Dinner

THE annual Charlotteville Dinner, one of the important events in the social calendar of the cycling world, took place on Wednesday, November 26th, at Ye Abbot's Kitchen, Guildford. It was well up to pre-war vintage, and indicates what I have said on other occasions that the Charlotteville has established itself as one of the great clubs, largely due not only to the splendid and unremitting enthusiasm of one of its leading lights, Vic Jenner, himself a racing cyclist of no mean order, but also to the teamwork and the abnegation of the members themselves; the Charlotteville seems free from the petty intrigues, cliques, and factions, which seem to insinuate their insidious tentacles into the foundations of some other clubs.

The Dinner was excellent in spite of Lord Woolton. The President, Mr. E. F. Mitchell, was in the Chair, and there were over 50 members and guests. The toast of the Charlotteville Cycling Club was proposed by Mr. W. J. Mills, who, in a neatly contrived speech, reviewed the important part which the club had played in cycling history and drew attention to the achievements of individual members. The responses came from Mrs. E. M. Little, and D. E. Eldridge. The former has undertaken the task of writing a monthly service letter to members on Active Service, in which she reviews the news provided from other members who write to her, as well as including the details of the Club's activities. This is an idea which other clubs might usefully copy. She mentioned that over 40 members of the Charlotteville were in His Majesty's Forces. The toast of our guests was wittily proposed by Vic Jenner, and he spared none! The responses came from Mr. S. R. Forrest, of the Velma R.C., and from Mr. S. H. Reynolds, a journalist employed on the local paper. The speeches were interspersed by good entertainment provided by Mr. Frank Wood, Mr. George Fawcett, with Mr. Stan Slough at the piano. The toast of the Chairman concluded a successful and merry evening, another milestone along the road of successful cycling clubdom.

Appeal to Club Secretaries

T. F. D. MILLER, of 61 Montague Square, London, W.1, is anxious to get into touch with cycling clubs in the London area. He particularly requires volunteers living in the Marylebone, Paddington, St. John's Wood, and Euston districts, who might like to join the Signal Section of the Home Guard.

Tights and Coupons

THE Board of Trade has informed the Road Time Trials Council that it has not been found possible to waive the surrender of coupons in respect of tights for cycle road sport. In a letter to the National Secretary, the Board of Trade pointed out that the shortage of cloth made strict economy essential, and under the circumstances no concession of the type suggested can be made.

Increase in N.C.U. Membership

DURING September and October, 1,500 new members joined the N.C.U. This is the reward for the intensive recruiting campaign upon which the Union embarked some months ago, with the energetic secretary, Mr. Chamberlin, as the spearpoint of the campaign. It appears that most of these recruits have been gathered into the ranks of the N.C.U. from utility cyclists. The Union encourages its own members to persuade others to join.

Date Fixing Conference

IT is urged that there should be early publication of the 1942 Sporting Calendar, for this will help clubs, riders, and officials to lay their plans well in advance. Very few clubs have a surfeit of assistance, and thus they require longer time. In some cases the annual date fixing conference is to be suspended, and it is pointed out that district committees should be able to lay their plans for the new season without the formality of conferring with

representatives of the promoting clubs. In other words, there is no need to wait for an annual general meeting during the war.

Cyclist's Head Lights

BY the time you read this (owing to the Christmas holidays, this issue goes to press much earlier than usual), cyclists may be permitted to use an improved form of head light which is the subject of experiment at the moment of going to press. The present head light is inadequate and the experiments are directed to finding some means of giving a longer and broader beam. Already there have been modifications to the law regarding rear lights.

I am glad to see that motorists having now become accustomed to driving with masked head lights are appreciating the absence of glare. They are now permitted to use two masked head lights, and this seems to provide adequate lighting, even in the black-out. Many accidents were caused by the glare of the headlamps of oncoming cars, and it seems possible that when peace returns, the masks will be made compulsory. Even if not made compulsory, motorists may still retain them.

Recklessness on the Roads

ROAD deaths in Great Britain last August numbered 720. This is three less than a year ago, and the first monthly total since September, 1940, to show a reduction compared with the corresponding month of the previous year. The August figures bring the death roll on the roads for the second year of war up to 10,000, which compares with 8,400 in the first year, and a pre-war annual average of 6,500. Of the 18,000 who have thus lost their lives on the roads since the outbreak of hostilities, 2,400 were motor cyclists, 2,800 pedal cyclists, and 10,000 pedestrians, including some 2,000 children.

Simultaneously with the publication of the latest monthly return, the Ministry of War Transport and the Ministry of Information inaugurated to-day an intensive road safety campaign which will be continued throughout the winter. The campaign will be directed to all classes of road users and is based on a close study of the wartime figures.

The decision to address the appeal for co-operation to all road users gains point from a significant change in the incidence of accidents. In the first year of war the problem was mainly one of more accidents to adult pedestrians. Figures for drivers and adult pedal cyclists even went down.

In the second year of war, although total fatalities have increased, the increase is occurring mostly among other classes. The following figures represent the increases compared with the previous year:—"Other persons" (including passengers, and people boarding and alighting) from vehicles, 483; motor cyclists, 452; child pedestrians, 412; adult pedal cyclists, 242. The present problem thus relates to all classes of road users.

There is another significant feature in the figures published during the past few months.

In April of this year the practice was resumed of recording the numbers of injured as well as killed. The result showed that such numbers were substantially (almost 25 per cent.) below those of pre-war years. Road accidents are thus fewer but more deadly than they were before

the war. This is attributed partly to an increase of recklessness on the roads due to the general tendency to disregard the ordinary risks of everyday life. Other possible explanations are:—

- (a) the heavier character of traffic;
- (b) higher rates of speed;
- (c) deterioration in the standard of driving;
- (d) less supervision by the police owing to an increase in other duties; and
- (e) strain on repair services.

In addition to the above causes, it is probable that black-out conditions have greatly increased accidents of the completely unexpected type which are more serious in their consequences.

Measures to counteract these tendencies are already being taken. They include intensification of police supervision whenever possible, some mitigation of the black-out, particularly by the recent decision to allow two masked headlamps, and special attention to vehicle maintenance. Other measures are being examined by a committee, consisting of representatives of the Government Departments concerned and of the Royal Society for the Prevention of Accidents, under the Chairmanship of Col. the Rt. Hon. J. J. Llewellyn, M.P.

The fullest possible use will be made of the methods of propaganda and publicity supplemented by special instruction for school children.

Bath Road Club Dinner

THE Bath Road Club adopted the present-day plan of holding a luncheon instead of a meal at later hours, called a "Dinner." Saturday, December 6th, was the date, and this always pleasant festival took place at that popular restaurant, the Holborn. Quite fifty sat down to an excellent repast. That old-timer, Vanheems, was in the chair, and he was given a hearty welcome as he sat down. To get over the difficulty of catering restrictions, no meat appeared on the Menu, and the fish, a splendid turbot, pleased everyone. The usual greetings went round the room, table No. 1 toasting Table No. 2, and so on, so that one could see that all were enjoying the function. After the chairman had given the toast of the King, and permission had been given to smoke, Mr. W. J. Mills (*The Bicycle*) proposed the toast of the Club. He mentioned the names of many, and gave them a roasting, making everyone chuckle at his humorous remarks. There being no music nor songs—rather a happy way of getting through the business quickly—it was not very long before the Hon. Sec. said a few words, stating that the Club, although so hard hit by the war, had had a good season. He said that the Club's principal event, the celebrated Bath Road Hundred, had been carried out with the usual success. The winner was presented with the Cup amidst cheers. Others came up to the chair and were presented with their trophies. The visitors and the Press received a note of welcome, and the proposer assured them all how much pleasure it gave to the Club to see them once more at the luncheon. The respondent to the toast reviewed the history of the Bath Road "100." How the first contest in 1890 was won by a member who, on a safety beat the next man riding an ordinary by 23 minutes—thus showing that the safety was faster than the penny-farthing! By the way, only seven men finished in this event.

Another old-timer, R. U. Trevor (Editor of the *Bath Road News* for some years), occupied the attention of all, as he glibly went through all the good points of the excellent chairman—Mr. Vanheems. Beardwood and W. G. James sat in the vice-chairs, and round the room were representatives of various clubs, all well known in cycling circles, such as Montague Holbein, D. Gawman (the winner of the Bath Road 100), D. Perrin, W. Frankum, H. W. Bartlett, Dudley Daymond, Claud Butler, V. Jenner, W. Hinds, Bath Road Smith (Life Member), etc. J. Burden Barnes, the popular president, was unable to be present, as just now he is not enjoying very good health.—C.A.S.



Two Editors confer. Here is Mr. Percival Marshall, Editor of the "Model Engineer," Executive of the Periodical Trade Press and Weekly Newspaper Proprietors' Association, and Mr. F. J. Camm



WINTER IN THE HIGHLANDS

Top: Looking towards Crianlarich from the road that leads north to Dalmailly and Fort William. The great slopes of Ben More (3843 ft.) and Stobinian are seen in the background. Right: The Brig-o'-Turk in the Trossachs, the famous little bridge near Loch Achray, in its winter setting.



Memories and Hopes

IT seems a curious time of the year to talk about cycling, yet I think it is a subject much discussed by riders round the confort of the fire. Not that there are many young folk left at the home fires these days; but then, touring is not confined to ages, and many an individual (who has probably given up cycling) is happy to talk of past adventures along the road and compare notes with the moderns. And how frequently it happens we have to unfold the maps to verify a route or check the height of a pass; and when that occurs how seldom the maps are stowed away until the titles in towns and countries they bear have been thoroughly discussed. People who have no interest in maps—and I am afraid they are a majority—have no conception of the memories they evoke, the visions they conjure, and the little adventures they re-establish. I spent a recent evening in this manner, littering the carpet with maps and photographs, recollecting the meals we bought and the inns where we slept, and finally expressing the hope these journeys would continue when this worst of wars had ended; I wonder if they will? Personally, I think so, for all this present upheaval is surely making people conscious of the loveliness of their country as never before, will surely give them an urge to see the places from whence their war comrades came, and lift patriotism to that higher plane where beauty enchants and the peace of its perfection is profound. That may be an older man's notion, yet I feel there is a simulacrum of truth in it, if only for the reason that some reaction to all this violence will be necessary if we are to remain respectably sane.

A Winter Campaign

IN talking over this question of touring with my companion on that particular evening, we referred once more to the possibility of a winter journey when peace returns. It is a subject we have often discussed before, but have always come to the conclusion that as our holiday days are limited we could not afford to risk those precious moments amid the storms of winter. Perhaps, as we are growing old and grey, we may be allowed a trifle more leisure in which to indulge our fancy; anyhow, we are hoping for that condition to arrive, and then we could go and watch the great storms sweep along the Pembroke coast, the rollers come ashore on Chesil Beach or Blackgang Chine, or see the great moors under light snow sparkling in the sunshine. Only on the rarest occasions has it been my good fortune to see the ocean really angry, and then I have literally been awe-struck. Most of us, I imagine, are mainly confined to our home radius in winter, despite the many attractive days the season presents. The increasing popularity of Christmas tours just prior to the outbreak of war seems to suggest there are numerous cyclists who can find full enjoyment in winter touring; and often enough many of us have looked at a wild place and tried to picture it under the stress of winter storm. Yes, one day I hope to go to the places where "the sea is landward pouring" in full fury, not as an adventurer roughing it, but as a sightseer, well fed and protected, fulfilling a desire that has long been dominant within me. But I shall need a jolly companion to while away the long evenings.

More Elders

PROBABLY you have noticed the increasing number of elderly riders on the roads, grey-headed folk using the bicycle for both pleasure and utility. As a daily rider I have been specially struck with the return to popularity

of the "humble" bicycle, and it augurs well for the pastime in the future, because people are finding the shortage of petrol does not impose the handicaps of anchorage; they can still roam and enjoy the journeying, even though the miles are limited. The wonder to me is

WAYSIDE THOUGHTS

By F. J. URRY

That the numbers of elderly folk on bicycles do not increase more rapidly than is the case, and I am of the opinion the reason is mainly concerned with a notion that cycling is dangerous. As a matter of fact, it is far safer for the careful age, than that somewhat reckless adventure we call youth, for when people have reached discretion they travel circumspectly, and are seldom in a hurry to unake ground when it involves an element of risk. The modern machine with the low bracket (10½ in. from the ground) is a very safe vehicle to ride as compared with the high bracket type (12 in. from ground) of pre-1914; and with modern brakes, control has been greatly simplified. These points are well worth noting to those returnees who seek to bestride an old-fashioned machine they have dug up out of the cellar, and after trial, wonder why it is awkward and cumbersome. It is out-moded and unsuitable to modern traffic conditions; and actually is a pointed reply to those folk who are apt to say the bicycle has not altered in its essentials since the beginning of the century. A good saddle, a low gear, as little bicycle as possible, and an easy riding position are the main essentials an elderly individual needs for easy cycling, and then, once they are fairly fit, forty or fifty miles in a day is very comfortably within their orbit.

Try It Out Properly

I AM perfectly aware it is only the few among the millions of elderly folk who believe these recommendations and are prepared to try them out, and even those few, in numerous instances, think they know more of their cycling needs than I do. That may sound egotistical, but at least it is true that I am an elderly cyclist, and have learned the lesson of easy riding during fifty years of regularity, and if I am not competent to say a word on this subject, then all my experience is worthless. How frequently I meet the remark from an old friend, "I wish I had kept up my cycling." Well, there is no reason why you should not return and find as great, or greater joy in the pastime, than ever. It is merely a question of fitting yourself for the game, and the first approach to such condition is to eradicate from your mind the feeling that you are slipping down the social scale. That is a little bit of snobbery you may not admit, but it exists in millions of minds, and has been encouraged by the ever obvious ostentation of the car. Rid yourself of that, take a month to ride yourself in, seek the advice of a regular cyclist and take it—or at least give it a trial—and I guarantee the average healthy individual will have found a new form of pleasure and convenience, particularly valuable in these war times when change and quiet peaceful wandering is an antidote to worry and anxiety. The cost of cycling—if you are fortunate enough to find the right machine—is

still astonishingly low, and the pleasure to the fairly fit and properly mounted rider, correspondingly high: and I tell you frankly that a game combining such virtues is worth more than a passing nod of acquaintance; it is worth getting fit to enjoy to the full, and thus adding to life's leisure a travel aspect that has no bounds to its beauty.

The Ease Of It

LET me take as example a recent personal experience. A friend asked me to guide him a day's ride on the last Sunday of October. "Not too far," he said, "but I can do 60 comfortably." So by laneways we went to Pershore, starting soon after nine o'clock and riding through a pearly atmosphere, splashed with the vivid colours of autumn in decay. At the tiny village of Kington, near the Lenches, we drank a cup of tea, arrived at the Angel at Pershore in time for lunch, and were ready for it; and then for an hour or more on the return journey lazily, drifted through Crophorne, crossed the Avon by Fladbury, and so through Rous Lench and Inkberrow, came home by the Ridgeway, Redditch, and the cross lanes to the main Stratford-Birmingham road, where we parted company each to our roof-tree a couple of miles away. That run collected 66 miles between 9 a.m. and 6 p.m., delightful miles, unhurried, yet active with healthy observation; and it may be worthy of note that our combined ages were 119 years. That performance is nothing to brag about, as indeed few pleasantly peaceful cycling journeys are; but it was a little holiday happily spent amid Warwickshire and Worcestershire lanes that hundreds of thousands of elderly folk could emulate with benefit to their outlook and their health.

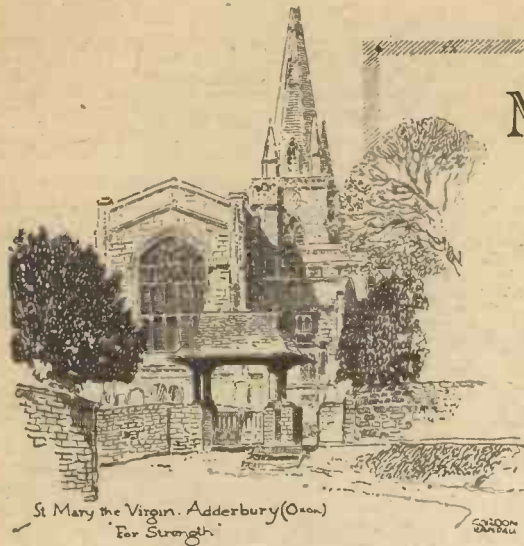
The Cost To-Day

I HAVE just bought a bicycle for a young friend of mine, the best model of a famous make, and the invoice figure is £17 9s. 10d., of which £3 9s. 2d. is Purchase Tax. That makes you sit up and think, though I must confess the boy for whom this machine was made is delighted with it, and the high figure of cost has had no effect on that appreciation. At the moment he is earning good money, says he has waited years for this chance to fulfil his desire to own the best, and now says he will start saving to buy war certificates. "It's like this," he said, "in a couple of years or less I shall be involved in this fight: now I have

a trifle of leisure and I want to use it in the best way; maybe I'll never have the chance again of so thoroughly understanding the country I shall fight for." And it was this point of view that won over his parents and made me his condutor. The mention of this figure of cost revives memories of the price of bicycles at the end of the last war. I paid £16 (and there was no Purchase Tax) for a very indifferent machine with a famous transfer, and that was supposed to be a special price. Our big makers have told us that whatever happens, quality will be sustained, and I sincerely hope that self-imposed condition will be kept, for many a good reputation was smirched in the years between 1918-21 because makers thought anything would do. On the other hand, I hope the general public will not be hood-winked by "bargains," for without a genuine reputation printed on the transfer, it is risky to-day to invest in a machine that can be labelled cheap. Prices will rise still higher as supplies get shorter, but if quality is maintained, that does not matter overmuch, providing the price is fair.

Ways of Answering

THERE are various methods by which people answer your enquiries as to whether the way you are travelling is correct for So-and-so. In Ireland where—usually—a question is replied to literally, you get "It is, sorr!" or "It is not, sorr!" with, occasionally, as a change, a bluff "On straight!" The negative piece of information quoted is supplemented only if you put the further obvious question. (Once I asked a peasant whether it was possible to obtain a meal in the neighbourhood through which I was travelling, and his reply was "It is, sorr!" Having literally given me all the information for which I asked, he readily amplified it in response to a further question.) Sometimes, by way of variant, the reply to your enquiry is "Noine molles," or "Four molles—Irish." For perhaps obvious reasons (I being one who adores touring in Ireland), I prefer any of those replies to the frequent "home" method which consists of a confused mass of "lefts" and "rights," accompanied by arm exercise—frequently enough the left arm being used to indicate a right-hand turn, and vice versa. But perhaps the "best" answer you can get to an enquiry is the good-natured (if ridiculous) offer to provide you with personal convoy. Example: One very dark night as I was cycling through an unfamiliar village in a hurry to reach my destination, I paused to enquire the way of an old couple who had just descended from a bus. I appreciated the good intentions and the kindness contained in the reply: "We're going that way if you care to walk with us." I didn't care, not having the time to spare, and, having received a general direction, I thanked my friends and rode on.



St. Mary the Virgin, Adderbury (Oxon)
For Strength

My Point of View

BY "WAYFARER"

To cap Mr. Churchill's sound advice, somebody produced a remark of the late Joseph Chamberlain: "I have never seen the good of giving in. If you don't give in, something always happens." That is pretty sound, too. In two words, the meaning is: Stick it!

Difficult Days

THE foregoing leads me to suggest that it would be futile to ignore the fact that certain difficulties exist in connection with our pastime: it would be no less foolish to exaggerate them. I have never tried to hide the fact in question, because, if people are led to think that our pastime is all plain sailing, they will be liable to "kick a brick," and one manifestly renders them a disservice by pretending that "everything in the garden is lovely," always. At the same time, I feel that, if the difficulties are tackled in the proper spirit, they need not be taken too seriously: they certainly should not deter cyclists from accepting their risks—and from coming up for another basinful.

Two recent Saturdays provided me with samples of those difficulties. The first was penetrating cold, and, at the end of 23 miles, I was glad to find a nice fire at the house where I called for tea. Despite thick gauntlet gloves, nobody would have suggested that my hands were sultry, or that my body was red-hot. The ride home, with the wind, made some amends for the discomfort and difficulty of the outward journey. On the second of the occasions referred to, the weather was genial enough for the first half of a 24-mile outward ride, and then the rain commenced . . . and continued. As I sat at tea, it was obvious that I had booked for a bit of bother, for the light wind which had helped me a little during the afternoon strengthened, and was soon blowing half-gale. Into that moist tumult I had to make my way, and home was duly reached—slightly wet and blown about—at a gait which averaged a paltry eight miles an hour. What did it matter? Just nothing at all!

On these two occasions—as on many more in the past (and no doubt the experience will recur)—I was but obtaining my share of the difficulties inherent in and

inseparable from cycling, in return for a vastly greater proportion of days and experiences providing unalloyed pleasure. So I, for one, accept whatever troubles the gods may send, knowing that, on balance, I am "quids in." Besides, the difficult days have their moral, and their lesson: they help us to endure; they help us to cultivate the will to conquer: they give us the joy of triumph. Thus adversity can be a very useful tonic.

Misconception

ON a recent wet Saturday, when a special job of work balked me in going for my usual ride, a lady friend sought to comfort me by remarking: "Well, never mind: the roads would have been very skiddy!" I looked at her in amazement and repudiated the theory, adding that wet roads were not of necessity skiddy. On the other hand, I found them safe and fast. In any case, the tendency for the modern road is to dry very quickly, and it is remarkable how soon all evidence of a deluge disappears. Curious, I thought afterwards, this survival of the idea that wet surfaces cause skidding. To my mind, the thought is just about as wise as that which finds expression in the hope that "you won't have any punctures." In practice, you don't—or I don't!

Not so Old as all That!

I MUST tell you this before it fades from my memory. At the moment of writing, I have just completed a six-day tour which yielded me—absolutely without trying—an average of 84 miles a day. On the penultimate day I put up at a very nice roadside boarding-house in Berkshire. While awaiting supper, I heard a semi-whispered colloquy as to the number for whom a meal was being prepared, and I gathered that there were Mr. and Mrs. Blank, Miss Dash, "and the old gentleman." Of course, the people who were doing the whispering didn't know that "the old gentleman" had just cycled 90 miles on a sweltering day over the hilly Cotswolds and along the foothills (also undulating) of the Berkshire Downs, and that he had been considerably handicapped in the process by an attack of hay-fever—the second in 63½ years! He really doesn't consider himself all that old!

Associate Enrollers

THE N.C.U. Associated Enrollers Scheme is making excellent progress, but there is still room for many more hundreds of Enrollers. So far this year, 124 members are acting as Associate Enrollers in various parts of the country, the star enroller being Mr. E. Lawrence, of Nottingham, who tops the list this year with 730 members. Mr. Lipson, of Liverpool, has 100, whilst the average for enrollers up and down the country is between 40 and 50 each. The well-known racing man has enrolled 30 members in less than three weeks. Any N.C.U. member, man or woman, wishing to act as an Associate Enroller should get into touch with The Secretary, National Cyclists' Union, 35 Doughty Street, London, W.C.1. Telephone: LARKWOOD 4368.

Notes of a Highwayman

By Leonard Ellis

The Disappearing Countryside

THE old proverb might very easily be reversed, and we could say with a great deal of truth that "it's a mighty good wind that blows nobody harm." In other words, the great compensations of so-called progress must inevitably be offset against disappointments and the disappearance of those old-fashioned things for which we have so much affection in retrospect. This is particularly noticeable in the modernisation of our countryside. It is all very well to sweep away our slums and build grand new wide roads edged with magnificent blocks of flats. But this process is carried on until we sweep away lovely old villages and replace them with modern highways and up-to-date housing estates. It is true that "swept" is probably too "sweeping." I do not think that we should tolerate the wholesale removal of all the things we love, but the actual process is so insidious and so gradual that we are apt to wake up every few years and realise with a shock that things have changed. We find that the old rural charm has gone for ever and that we are compelled to seek for the surviving reminders wedged between the sixpenny stores and somebody's fisheries. Like Staple Inn, in Holborn, the old village pub stands like a jewel in a grotesque modern setting.

London's Modern Dormitories

IN and around London the process has been remarkably swift and overwhelming. It is only a year or two ago that in cycling club circles we spoke of Ruislip village as being one of the surviving bits of rural Middlesex. It was then quite true. On the northern side of the village was the perfect vista—an old-fashioned inn, quaint almshouses, the old flint church and even the village pump. Alas! the inn has gone; the pump has given way to a traffic island. The church and the old houses remain, but they are lost in their incongruous surroundings. Even the most forgiving would not to-day regard Ruislip as a rural



The Queen's Head, Pinner

village, although it still has its history and many points of considerable interest. A mile or two away lies Pinner, another of the charming spots of old Middlesex. Here, again, the modernisation bogey has been stalking the land, and although his devastation is not so complete as at Ruislip, he is gradually making a thorough job of it. By virtue of its dominating position, the church still commands the landscape, and the old houses still standing contrive to give the High Street a real old-world look. Even to-day there is a suggestion of Dunster in Pinner High Street, with the lovely old Queen's Head Hotel, the sloping roadway and the church in the trees crowning the scene.

The Charm of Pinner

THE modernisation of the London dormitories has been so rapid that many guide books are already so hopelessly out of date that they must be quite bewildering to a newcomer. In spite of all this, much of the old stuff is there to be found and enjoyed. Pinner dates back many centuries and was, in fact, granted a weekly market and two fairs by Edward the Third. The church dates back to 1321, and the Queen's Head Hotel, bearing the date 1705, is of Queen Anne's time. In the churchyard is buried one of the longest-lived men of this country—a William Skenselby, who died at the age of 113 years. There is a very curious monument in Pinner churchyard, although it is by no means certain that the true story is known. The tomb is a tall, ugly structure, now mercifully clothed in ivy. Several feet above the ground there is a stone projection shaped like a coffin. Some say that this is the grave of William London who lived and died with the obsession that his heirs would continue to prosper while his body remained above ground. Another version is that the tomb was built by John Claudius Loudon in memory of his parents. This man seems to have been dogged by cruel ill-luck all his life, during which he became in turn landscape gardener and writer. Not far from Pinner we have actually an old rille in the form of Grimes Dyke, supposed to be some sort of earthwork or boundary. Pinner has many more claims to fame, not the least among which may be mentioned that Governor Holwell, one of the few survivors of the Black Hole of Calcutta, lived at Pinner Place, and that Lord Lytton wrote "Eugene Aram" in an old cottage in Pinner Wood.

News from the Clubs

Sgt. D. A. Rydér

SGT. D. A. RYDER, R.A.F.V.R., Coastal Command, a promising 21-year-old member of the Southgate Cycling Club, has been killed in action.

Highgate Annual Dinner

"ONE of the early loves of my life," is how Sir Charles McCrea, president of the Highgate Cycling Club since 1903, described the club at its annual dinner which was attended by over 70 members and friends.

Southgate Cycling Club

AT the 49th annual prize distribution and third war-time reunion of Southgate Cycling Club, Mr. A. T. Green, presiding over 65 members and friends, it was revealed that fifty members were serving in H.M. Forces, Civil Defence Units and the Home Guard. Absent friends were remembered by a pre-arranged toast.

Cycling Clubs for Forces

THE Army Council has been asked to include cycling as an Army sport and to allow the formation of clubs similar to those in the Royal Air Force.

Wings for Jack Keen

INCLUDING the former time-trial secretary, Jack Keen, who has gained his wings in Canada as a pilot, Finsbury Park C.C. now has thirty active members in various branches of the Services.

L. J. Murphy

L. J. MURPHY, eighteen-year-old member of the Finsbury Park Cycling Club, has won his club's current championship with times of 1.4.45 (25 miles), 2.12.7 (50 miles), and 4.43.48 (100 miles). W. H. D. Rees, of similar age, is the runner-up.

Swindon Wheelers

SWINDON Wheelers are mourning the passing of their past and founder president, Ald. T. C. Newman, J.P., who always showed a practical interest in the club's activities.

New Clubroom

BRODSWORTH Road Club have taken over the old Doncaster Paragon clubroom and are equipping it as a gymnasium.

Death of Two Veterans

YORKSHIRE cyclists regret the death of two veteran riders of the Yorkshire Road Club, T. J. Rodgers, of Leeds, and C. Hall, of Seaton Ross, Yorkshire.

In the Navy

DORRIE FIRTH, one of the Northumberland and Durham enthusiastic C.T.C. members, is now with the Royal Navy.

Welsh Time-keeper

CHAIRMAN of the Welsh Roads Records Association and of the District Council of the R.T.T.C., Harry J. Saunders, appreciated time-keeper of Cardiff, has joined the Royal Air Force.

Killed in Air Crash

A MEMBER of a well-known cycling family, Joe Reid, Rutherford, Lanarkshire, and a member of the Caledonian C.C., has been killed in an air crash.

Bedfordshire R.C.

DESPITE the loss of 35 members who have joined H.M. Forces (five of whom are known to be overseas), Bedfordshire Road Club have had an excellent season.

Wolverhampton C.C.

DESPITE many difficulties, Wolverhampton City Cycling Club report an excellent season's work and an increase in membership of over 200 per cent.

Hill Climbs

THE competitive season died hard, club hill climbs lingered long into December and quite a few are scheduled for January. Map reading competitions, too, are still very popular.

Harry Aspinall

A YORKSHIRE N.C.U. official, Harry Aspinall, now in the Army, writes with delight of a sight he saw in a port south of the Equator—Europeans riding hand-built machines and a general store displaying ultra-modern machines, including an exceptionally attractive track mount.

Training Instructor

SGT. TOMMY WETHERHEAD, Yorkshire Road Club, is a physical training inspector in the Shetland Islands!

Found on Battlefield

ALBERT PUGH, Kingsdale C.C., who was with the British Forces in Tobruk, found on the battlefield after the Italians had fled, a photograph of the Italian crack, Emilio Ugge. The print found a home in the club's photograph album.

Invasion Cyclists

GLASGOW is raising a corps of invasion cyclists to act with the Home Guard. They will act as dispatch riders.

Last To Go

GEORGE WILSON, the last remaining civilian member of the Tottenham Paragon C.C., has been called for service with the Royal Air Force.

Club Champion

RON GRIMES is University C.C. current club champion, with an average speed of 22.454 miles an hour for 175 miles. R. L. Lagen, is runner-up. The two riders have broken four club records between them during the season.

100 Members

LEICESTER SECTION of the Clarion have topped the 100 membership mark for the first time in their history. Of the 104 members, twenty are serving with H.M. Forces.

Club Handbook

GOMERSHAL Open Road Club marked the passing of its majority by the publication of an interesting handbook, giving details of its 21 years' activity.

A Broken Arm

K. YARDLEY secretary of the Northern section of the Tricycle Association, broke an arm as the result of a fall while cycling. In future he intends to stick to three wheels!



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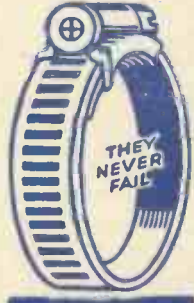
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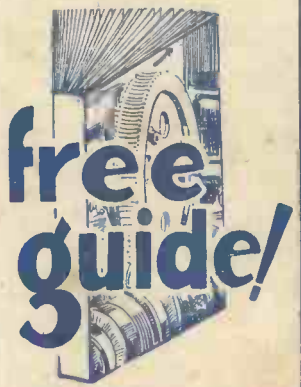
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