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

Editor: F. J. CAMM

VOL. IX. SEPTEMBER, 1942 No. 108

FAIR COMMENT—BY THE EDITOR

New Processes

THE good which arises from the evil of war is the knowledge it creates in an effort to win it. We discover new methods, new materials, new sciences arise, and new opportunities open up, whilst the industries which languish in peace through lack of support (the aircraft industry is a good example) are enabled to develop to an extent which it would require 50 years of private endeavour to attain.

Two of the industries which have come into their own as a result of the war are plastics and welding, and in plastics I am also including the new powder metallurgy, for metals can be treated as plastics, when they are used in a finely divided state prior to moulding, or pressing. Plastics have now been used in almost every branch of industry for parts which were formerly made of wood or metal. Thus, old industries die and Phœnix-like from their ashes arises a new and better one.

Welding, however, has not made quite such rapid progress as it deserves to do. It is significant, however, that an enormous American factory engaged upon the manufacture of tanks has switched over from riveted construction to welded construction. The advantages of welding as applied to ships are already well known, for ships have been employing welded construction for some time. In this country we have been producing all-welded armoured cars since 1939, yet in tanks, which will be required in ever-increasing numbers, welding is confined to certain parts of the superstructure. The German tanks are of welded construction throughout. It is known that as far as armoured cars are concerned welding increases production from 300 per cent. to 400 per cent., using the same man-power and floor space. With riveted construction, the heads of the rivets are likely to fly off when the tank is hit. They would thus act as bullets, and although we need not be too concerned about their effect as miniature projectiles on the enemy, such a happening will have disastrous effect upon the tank itself. Our designers, therefore, should cut out complicated construction calling for accurate drilling jigs, expensive riveting, slow production, and complicated tooling up, and switch over to a system which yields superior results at but a fraction of the cost in time and money.

It is noteworthy that one or two of the Government Departments are alive to the possibilities of welding, for the Ministry of Agriculture and Fisheries has just issued a pamphlet entitled "How Welding can Help the Farmer." In this pamphlet an appeal is made to the farmer not to scrap worn or broken parts. He is invited to take them to the local welder for repair. Even where a part is missing it can often be built up by welding. Farm machines which are standing idle because spare parts are difficult to get can be rendered usable within a very short time by welding. Every industry is using this method, of course, to repair and rebuild machinery parts. There is an Advisory Service on Welding run in conjunction with the Research and Development Department of the Ministry of Supply. The pamphlet to which I have referred illustrates how certain parts can be repaired by welding. Copies of the leaflet are obtainable from The Ministry of Agriculture and Fisheries, St. Anne's-on-Sea, Lancashire.

POST-WAR BUILDING

BEFORE the war the building trades between them erected something like 200,000 houses a year. There was a deficiency of 3,000,000 houses in this country, and the building trade had not caught up with the shortage created by the last war. In fact, the shortage was increasing. Houses are not being built during this war, and so when this war finishes the building trade will be confronted with an even greater demand which their obsolete methods of construction will be quite unable to supply. For, of course, the methods of building houses on the site by laying one small brick upon another small brick, by using wood for nearly one-third of the structure, by placing the water pipes in such a manner that they freeze and burst in winter, and by using plaster for the ceilings which are bound to crack, are methods more reminiscent of the building of Solomon's temple, than the highly scientific twentieth century. The building trade, for some unknown reason, consistently refuses to make use of the new methods, and the new materials which science constantly brings to them.

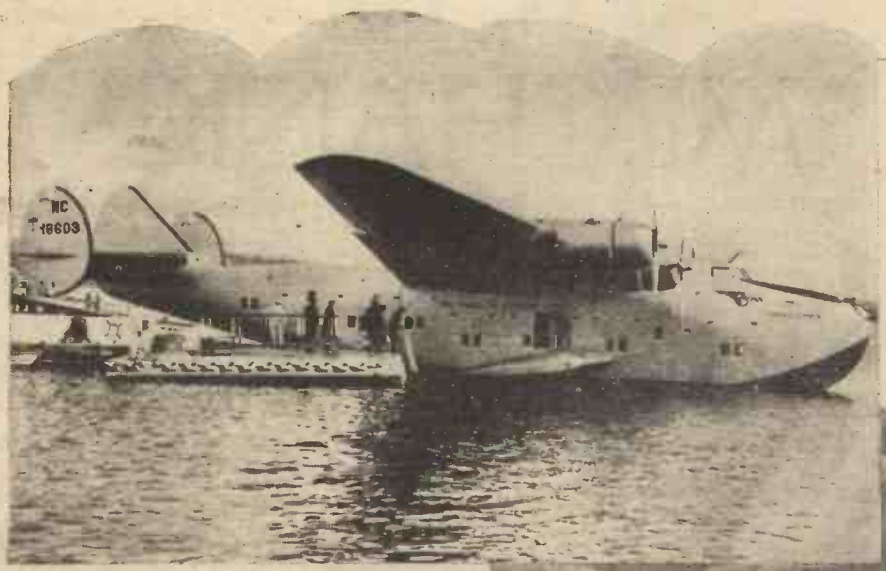
Engineers have come to the rescue; they have formed a Society for Scientific Rehousing, and the houses which they propose to erect will to a large extent be pre-built in the factory—not on the site. The plumbing will be so designed that frozen pipes will be impossible. The ceilings and the floors will be made of new non-cracking plastic materials. Instead of using wood which warps and shrinks, they will use foam flag which does not warp or shrink, nor does it decay. The plumber and his mate will cease to be a music-hall joke, for his craft will be taken over by engineers who will design the houses with just as pleasing an architectural layout but in a more scientific manner than architects seem able to do. The houses will be pre-built in the factory on mass-production lines. They will be designed by engineers and come off the assembly line. Walls will be largely jig erected and taken to the site. Because of this, houses will be more rapidly erected, they will be cheaper and roomier, more pleasant to look at, and require far less attention because of the new paints and finishes which will be used to withstand the weather. Lead base paints are totally unsuited for external woodwork. The new cellulose paints are ideal both for indoor and outdoor finishes. Scratches may easily be made good and the paint applied by means of a spray instead of an old-fashioned brush. The heating of the premises will not be by means of old-fashioned coal fires, with their dirt and smoke; there will be no more plaster. These are but a few of the directions in which post-war building will change. Like upholstery, the building trade has not modernised itself, and within the next 50 years the trade as we now know it will be chiefly occupied in maintaining and repairing the old-fashioned structures with which it has supplied the country.

"SCREW-THREAD MANUAL"

A NEW volume entitled "Screw-Thread Manual" has just been published from the offices of this journal, for 6s., by post for 6s. 6d. It contains 192 pages, and includes almost every known fact, figure and formula relating to screw-threads and methods of producing them. The book contains a great deal of information which has never been published before, whilst the tables deal with every known screw-thread at present in use. The chapters include Screw-Thread Terms; Screw-Thread Forms; Use of Taps and Dies; Machine Taps and Dies; The Use of Die-heads and Chasers; Die-heads and Tappers; Screw-cutting in the Lathe; Thread Milling; Thread Grinding; Thread Rolling; Bolt and Screw Manufacture; Measuring Screw Threads; Measurement by Optical Projection; Extracting Broken Taps; Acro Threads; and Tables.

Air Freighters of

Is there a Limit to the Size of Vessels Supersede Ocean-going Raised by the Writer of This Foresee Future Developments.



The Pan-American "Yankee Clipper." A modern development of the "Clipper III." It accommodates 74 passengers.

IT is not so many years ago since the whole world was thrilled—and many experts confounded—by the first flight across the Atlantic by a heavier-than-air machine. Even before that epoch-making event, many possessing foresight and complete confidence in the future development of aircraft visualised the linking of the five continents by speedy aerial transport. They were, of course, subjected to much derision from the sceptics, not all of whom were laymen, who thought that such possibilities were purely visionary and fantastic. The same school of thought gave scant praise to those intrepid pioneer long-distance fliers who risked their lives to blaze new paths across the world and to prove their faith in the infant of the transport family. To those pioneers the whole world owes much, and it was not until July 6th, 1937, that the untiring labours of the designers and the sacrifices of the aviators—so far as transatlantic crossings were concerned—bore fruit in a practical and active form.

It was on that day that the Imperial Airways flying boat *Caledonia*, and the Pan-American Air Lines *Clipper III*, started a regular two-way mail and passenger service across the Atlantic, and in those flights many saw the realisation of their dreams. The

The "Golden Hind," one of the series of sister flying boats to the "Caledonia." It was built for the London-New York service over the northern route.

Caledonia flew from east to west, and the *Clipper* from west to east, their times being 15 hrs. 3 mins. and 12 hrs. 40 mins. respectively.

If considered solely from the point of view of distances flown, the performances of the two flying boats were not outstanding. They covered 1,933 miles—west to east—and 1,963 miles east to west, whereas the Pan-American Air Lines had been operating on their Pacific run of 2,400 miles for some two years previous. But those concerned with the flights of the *Caledonia* and *Clipper III* were out to prove the possibility of a practical transatlantic air service, and there can be no doubt as to their success.

It is interesting to note at this stage that the British flying boat was only allowed a loading of 45,000lb., which restricted her useful pay load for the trip to 1,000 lb., the great difference being accounted for by her unladen weight of 25,000 lb. and 19,000 lb. for oil and fuel, to which had to be added the weight of crew and food. The payload is a vital matter, if such flights are to become a commercial proposition, and the problems connected with increasing it, while still retaining a wide factor of safety on wing loading, lifting the total load off the water and getting the craft airborne and securing a sufficiently high economical cruising speed are ever before the designers.

Since July, 1937, much has happened in the world of aviation: speed, size, weight and range of aircraft have reached proportions which even in that year would have seemed as fantastic as the ideas of the early enthusiasts. Although prior to 1940, designers

The Pan-American "Clipper III" anchoring at Hythe, to which she had flown from Foynes, Ireland, after her Atlantic crossing.

the Future

Aircraft? Will 500-ton Flying Ships? These are Two Questions Article who Endeavours to

By JOHN TOWERS

and manufacturers of the Five Powers had been competing against each other in the race to achieve maximum progress in aircraft design, their efforts, when considered in the light of the knowledge of to-day, are cast into the shade by the brilliancy of the almost incredible achievements which have been attained under the relentless pressure of war.

Conservative ideas and theories of the past have been ruthlessly but scientifically shattered; progress no longer proceeds along its course in stately academical steps, but outstrips the production bench by leaps and bounds, the length of which only are limited by the speed with which the draughtsman can portray the creations of the minds of the imaginative progressive designers of to-day. Aircraft production has been revolutionised: time and comparative costs have been cut to a mere shadow of their former figures of even three years ago, and new methods of assembly and testing have permitted radical changes to be made in the personnel of the factory as regards craftsmanship, without reducing the overall efficiency of the finished product.

The designers' aims to-day can be classified under two broad headings: there are those covering speed and manœuvrability, and those embracing size and great load-carrying capacity. So far as this article is concerned, the former will be ignored and the latter examined from the point of view of commercial activities rather than war requirements.

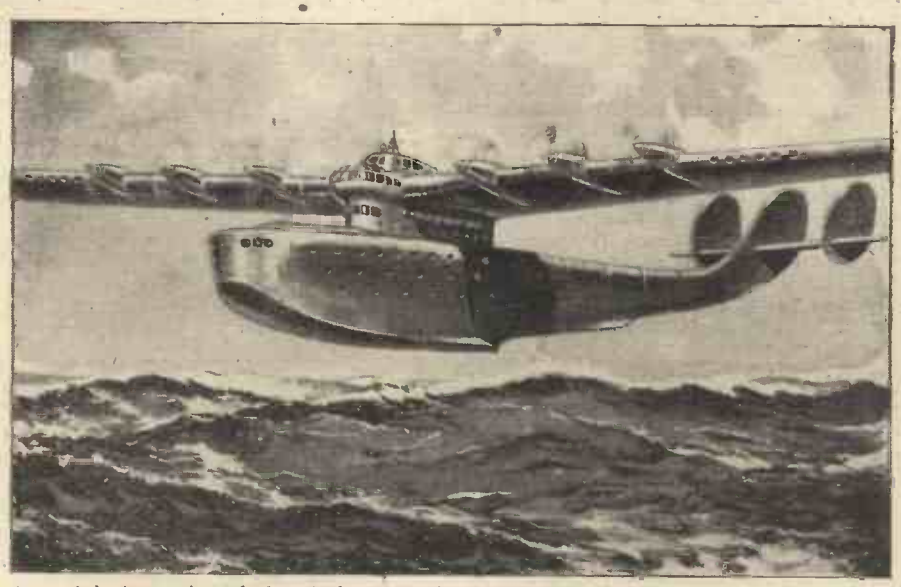
The ever-raging Battle of the Atlantic, with its heavy toll on the shipping of the United Nations, has brought forth a bold suggestion from two leading American shipbuilding experts, Mr. Andrew Higgins, of Louisiana, and Mr. Henry Kaiser, of California. They have advanced a plan for the building of a huge fleet of 70-ton cargo 'planes, which they claim could be in production in six months and reach a maximum output of 5,000 'planes a year. It is also claimed that a fleet of 5,000 of these huge aircraft could land half-a-million equipped men, or the equivalent weight of cargo in England in a single day.

The *Caledonia* was 45,000lb.; the 'planes mentioned above would be 156,800lb. This increase, if we take the *Caledonia* as our basis for comparison, is the result of five years' progress; now that the experts are talking in this bold but not impossible manner, what revelations can we expect in the near future?

Compared with ocean-going cargo ships, the payload of the 70-ton 'plane would appear to be small, but the great increase in speed—with the consequent saving in time—would allow the cargo vessel of the air to make from ten to fifteen trips while the sea-going vessel is making one.

The Kaiser plan is far from fantastic: aircraft already in use or in production provide ample evidence that the limits of size and load-carrying capacity have not been reached; in fact, it would appear that we are on the threshold of a new era of aircraft design and rapidly approaching the time when airborne transport will exceed the most optimistic dreams of the experts of even three years ago.

What—if any—are the limiting factors governing the load and size of the aircraft of the future? Is it wing strength, engines, power required for take-off or general structural problems? Whichever item is put forward as the retarding factor, fresh data comes forward to cause further doubt, though it would seem that wing loading or, in other words, the interconnected problems of structural strength of the wings, weight, shape and size, plus, of course, the known theoretical considerations, form, as it were, the bottle-neck to the designers' ambitions.



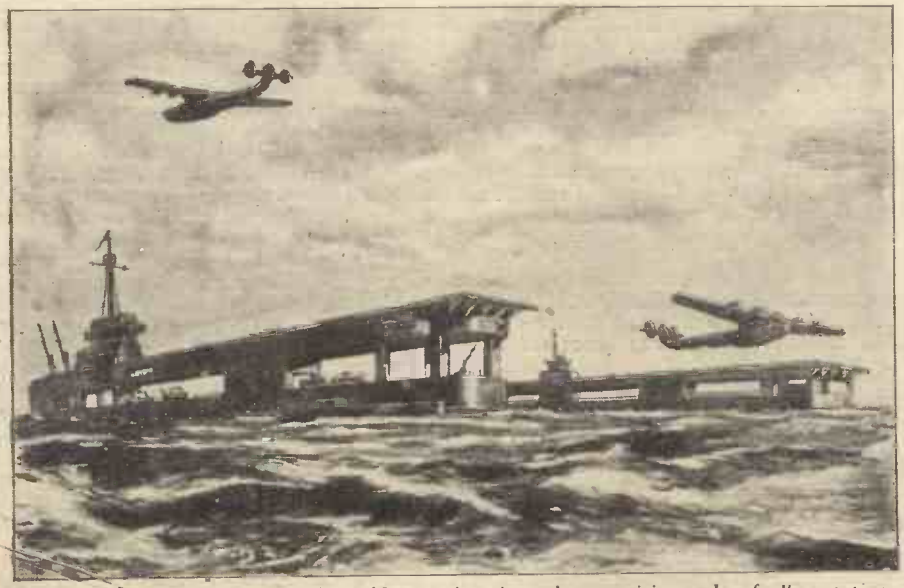
An artist's impression of the air freighter of the future as visualised by the writer of this article. These gigantic craft will ply the new aerial commerce routes at high speeds.

When the American Douglas *B*19 took off with a gross weight of 62½ tons, it lived up to its reputation of then being the heaviest aeroplane to leave the ground. It has a wing span of 212 ft., and is powered with four engines, each of which develop 2,000 h.p. The 'plane weighs 32 tons, and it has—under normal conditions—a range of 7,000 miles. Again, there is the Martin *XPB2M-1*, a huge two-decker flying boat of the 70-ton class, which has a wing span of 200 ft. and is powered with four Wright-Duplex engines of 2,000 h.p. each. It can undertake a trip across the *Atlantic and back*. At the time of the *Caledonia*—with its four Bristol engines of 900 h.p. each—it was thought that it would not be a feasible or economic proposition to construct larger flying-boats, owing to the power required for the take off; therefore, once again progress has overcome what seemed a formidable obstacle.

The Glen Martin company are already preparing, in a practical sense, for an air liner to carry 300 people on a 10-hour trip from New York to Southampton.

With the increase in size of aircraft, progress in engine design and construction must proceed hand in hand. Anyone who has examined or studied the specification of a modern aero-engine would rightly think that it represented the peak of the designers' and engineers' skill. Yet, in spite of these wonderful high-power, intricate and super-precision machines, there are already indications that the scientists and engineers are exploring fresh avenues in their eagerness to find even a more perfect power unit for aircraft.

It can rightly be said that the petrol



One of the floating harbours, which would act as junction points, servicing and re-fuelling stations. They would be located at key points along the transoceanic routes.

internal combustion engine made possible the development of the heavier-than-air machine, but has it had its day? Is it not possible that the scientists and engineers, during their concentrated work through these years of war, might not have touched the fringe of or experimented with some new propelling force for aircraft? Already we know that crude oil is being used successfully, thus eliminating much of the danger of fire and explosion associated with the more volatile spirit; flights have taken place with 'planes driven by hot air or jets, while rocket-propelled craft have passed through some interesting stages; therefore, fantastic and inefficient as these sources of power might seem at the moment, they have entered the realms of possibility by practical demonstrations. Sir Hiram Maxim, during his experimental work with heavier-than-air machines—back in the days of their infancy—designed and constructed a power unit operated by steam. This he fitted into a 'plane of his own design, and although the craft did actually rise off the special railway-like track which formed its runway, Sir Hiram's efforts did not meet with success, and he finally abandoned the idea. This is going back a long way, and in spite of the fact that steam as a motive power for 'planes was ridiculed then, and in the intervening years, we shall yet hear more about it in the future. When it next appears, it will, no doubt, be as revolutionary in design and construction as the modern super-charged I.C. engine of to-day is to the low-powered affair used by the Wright Bros. Reports from Germany indicate that they are carrying out experimental work with a high-power steam engine, which for high altitude or stratosphere flights should possess certain definite advantages, owing to the fact that the boiling point of water is lowered as the altitude increases. Terrific power can be exerted by steam, even with the types of engine in common use to-day, therefore it is highly probable—especially in view of the above reports—that some entirely new system of steam generation and utilisation of its great latent forces will be revealed before many years have passed.

What of the Future?

From the details available, covering both practical and hypothetical designs, one is able, with a little imagination and a reasonable amount of just confidence in the future development of aircraft, to visualise the commerce of the future being handled by fleets of gigantic cargo vessels of the air.

These fleets will carry vast quantities of merchandise, over new commerce routes covering the whole world, at a speed of 15 to 20 times faster than the average ocean-going cargo ship. The size of the vessels will approach dimensions hitherto undreamed of; in fact, as I see them, they will be so large that they will carry two or more fast light 'planes to act as scouts or aerial lifeboats, capable of being launched in mid-air from their parent 'plane.

The 70-ton Martin flying boat mentioned earlier will be superseded by flying vessels of 150 tons, 250 tons and even 500 tons, whose very size and construction will make them, literally, *flying vessels* compared with what we now call flying boats.

Special vessels will be used for perishable foods and fruits, and, by virtue of their high speed, will be able to dispense with the cold storage and attendant problems necessary in sea-going ships. Mails will be delivered across the Atlantic as quickly as a letter travelling from the south of England to Scotland, while air liners will be able to take 500 or more passengers across the Atlantic and back for week-end trips, in less time and with less discomfort than many a train trip across Britain.

The cargo vessels of the air will be designed for speedy loading and safe stowage of the cargo. The fuselage or hull, apart from that devoted to the crew, engines and control, might well be built up with special containers, each of which is so shaped that when they are packed with cargo they lock together to form the upper part of the hull. The system might be likened to the railway containers now used for the transport of goods from door to door, which dispense with intermediate packing and unpacking during transit.

The aerial tug towing a string of heavily ladened gliders, each of which would be released as it arrives over its destination.

The power or propelling units will form part of the huge wings, which will be of such dimensions that the engineers will be able to walk about inside them to attend to their duties. Lighting and air-conditioning plants will form part of the equipment, while navigation will be rendered practically automatic by a highly developed system of beam radio control.

Tugs and Gliders

Other 'planes, smaller in size, but very powerful, will play the part of ocean-going tugs, and serve the same purpose, as it were, in the air. Their chief difference, compared with their sea counterparts, will be their use in the hauling of a number of heavily ladened cargo gliders. Already gliders are being used for the transportation of heavy mechanical war equipment, and some types are fitted with low-powered engines to provide additional control for landing, etc.

The cargo gliders could be used for trans-oceanic voyages, although they would, no doubt, prove more useful for the speedy distribution of cargo from the main flying-vessel ports to overland destinations. They would be loaded for definite areas, and released from the tug 'plane during flight when over their destination.

With power assisted machines, and with the use of a developed rocket-launching system, the gliders will be able to take the air and link themselves to the tug 'plane while the latter is in flight.

Floating Harbours

To serve the purposes of service station, re-fuelling depot, and, possibly, a distribution junction for cargo and passengers, huge floating harbours or docks will be located on the sea at key points along the various aerial commerce routes. These will be an adaptation of an idea put forward some years ago by an American inventor, who saw the need for a floating landing-place for transatlantic 'planes, to allow them to re-fuel, so that they might carry a heavier payload and less reserves of fuel.

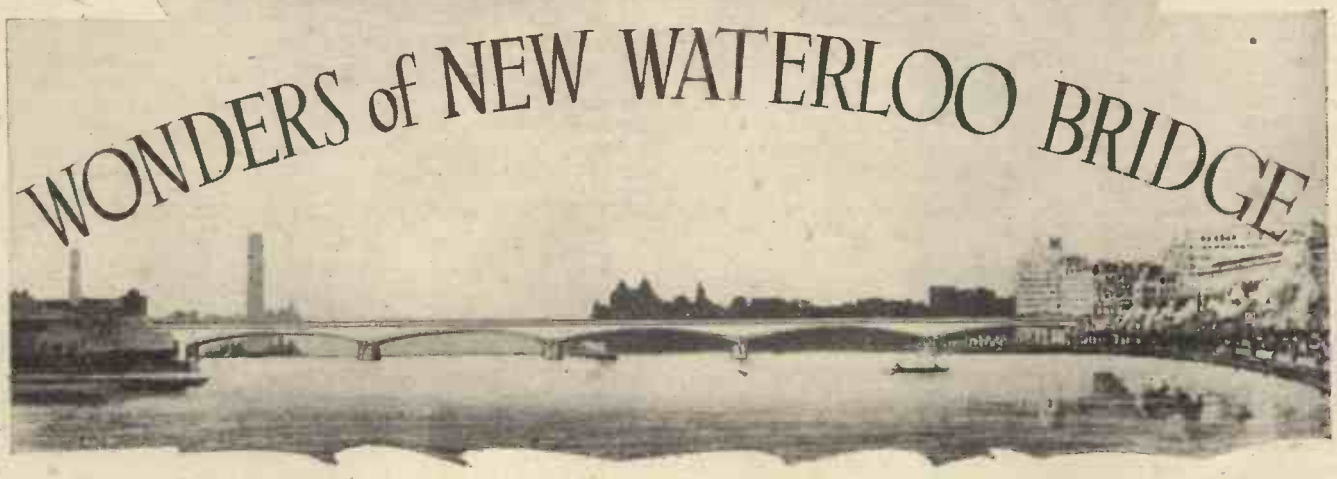
The floating harbours, specially designed to cope with the huge flying vessels, would be equipped with workshops, spares, fuel storage tanks, radio communication, beacons and beam systems. They would also carry several fast 'planes to serve as emergency craft and as links, for passengers, between junction points.

Helicopters

While looking into the future, we must remember that the helicopter principle does offer solutions to problems which have, so far, eluded the designer of the normal type of aircraft. Vertical take off and landing, and the ability to hover, have already been demonstrated but, prior to the war, the machines had not reached the utility stage of the ordinary 'plane. It is interesting to note, however, that the Focke-Achgelir concern of Germany has succeeded in producing a helicopter capable of lifting and transporting a light fighting tank, and, what is even more important, in view of his great contributions to the progress of aviation—that great Russian-American aircraft designer, Igor Sikorsky, has made great progress along similar lines. What, then, can we expect in the future? From the available facts, and the ideas now being put forward by the experts—as visionary as they may seem now to us—it is clear that revolutionary changes are about to take place within the next two years, and one of the changes might well be a heavier-than-air-cum-lighter-than-air machine, which will be propelled and lifted by a combination of helium gas, engines and air tunnels. This sounds fantastic, but the idea has already been described to the American Senate Military Sub-committee by two engineers, Horace Chapman Young and Eric Langlands.

The first non-stop flight across the Atlantic was carried out by two Englishmen, Alcock and Brown, on June 14–15, 1919. This epoch-making event formed a blazing beacon to guide those who followed, and to illuminate the deeds of our indomitable pioneers of the air who, by their unremitting labours and sacrifices, paved the way to such achievements. Our seafaring ancestors sailed the seven seas and made Britain the maritime power of the world; our navigators of the air have emulated them, and the Britain of the future must, therefore, secure and maintain an equivalent position in the power and commerce of the air.

WONDERS of NEW WATERLOO BRIDGE



An architect's drawing of the new Bridge looking towards the West. (By courtesy of the L.C.C.)

London's Latest Bridge, Over Which so much Controversy Raged at One Time, is an Imposing Structure, and Many Interesting Details About it are Here Given

By HAROLD J. SHEPSTONE, F.R.G.S.

IN the new Waterloo Bridge, recently opened to vehicular traffic, London has a modern and imposing structure, one worthy of its unique setting across the Thames in the very heart of the Metropolis. There is something fascinating about the construction of a bridge, compared to which the erection of a building seems a soulless business. There is mystery about it.

Beneath the ever-flowing waters men pit their strength and ingenuity against the forces of Nature. As a result of their skill substantial piers arise above the tide as if by magic. From the piers spring graceful but massive arches of immense strength carrying the roadway by which man and his fast-moving self-propelled vehicles pass quickly and safely from one side of the river to the other.

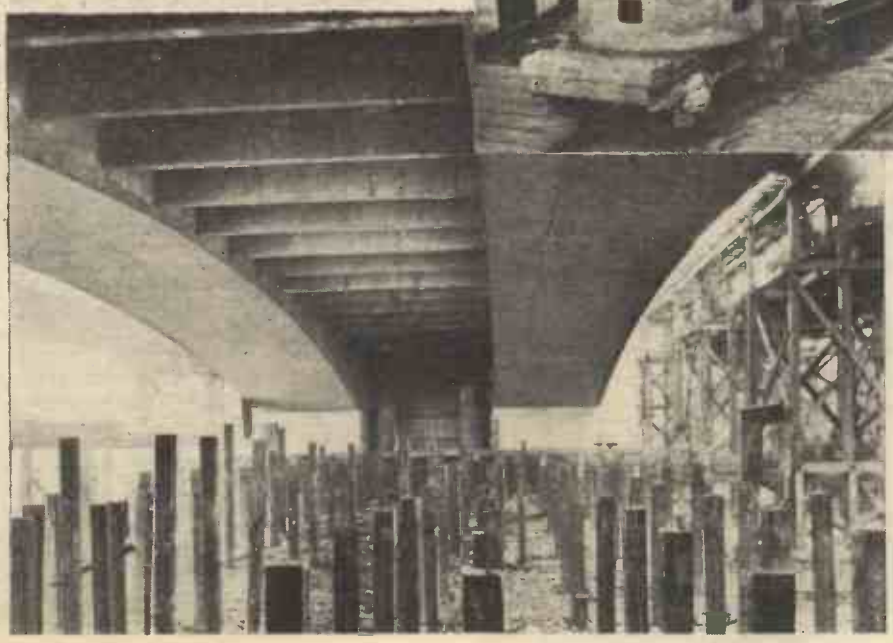
It has been said that the history of the bridge is an index of man's social and mechanical advance. This is true, and is evidenced in the case of the new Waterloo crossing. For years there was a long controversy among politicians, engineers and architects as to whether the old bridge should be reconditioned or an entirely new one built. In the end a new bridge was decided upon.

John Rennie's Masterpiece

Old Waterloo Bridge, built by (not designed by) the contractor John Rennie, had served the public well for just over a century. It won universal praise as a work of art, the great Italian sculptor, Canova, going so far as to call it "the finest bridge in Europe." Built by a private company, it was to have been known as the Strand Bridge. But the battle of Waterloo had just been won, and the name was altered to Waterloo.

Until 1878, when the bridge passed into the hands of the Metropolitan Board of Works, which preceded the London County Council, it was a toll bridge. It narrowly escaped disaster in the first world war of 1914–18, when a German bomb exploded on the bed of the river almost beneath the bridge itself.

In 1923, however, there was a serious subsidence of some of its piers. The bridge was closed for a time in order that the weight on its foundations might be reduced.



(*Above*) *A skip loaded with 1½ tons of concrete being drawn along on an electric truck.*

(*Left*) *The underside of the bridge, showing the twin arches, and the concrete girders joining them.*

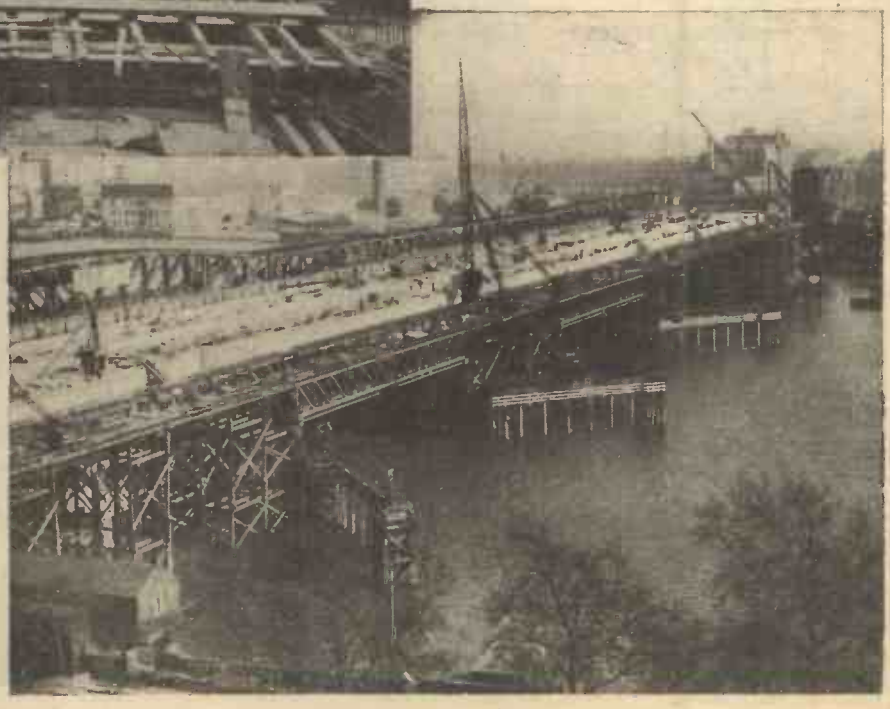
To effect this, part of the heavy stone roadway was replaced by one of wood and a temporary bridge was erected beside the old one. This was no light job, as though only a temporary structure it had to be strong enough to carry modern motor traffic. It consists of massive steel latticed girders carried on great circular caissons sunk deep into the bed of the river.

Dismantling the Old Bridge

It was at this period that considerable discussion arose as to the future of the old Waterloo Bridge. Many experts declared that the structure was worn out and dangerous, and recommended that it be demolished.

A drawing of the northern end of the bridge, showing how the first arch spans the Embankment. (By the courtesy of L.C.C.)

Members of various London societies, anxious to preserve such an historic landmark, took the matter up. They sought the opinion of leading engineers up and down the country, with the result that a scheme was prepared for the widening and strengthening of the bridge structure. Its comparatively slender piers and general lightness was rendered possible by the use of reinforced concrete, and by the balanced cantilever principle of construction which is such a prominent architectural feature of the present age.



Placing the massive reinforced concrete girders in position. (Right) The new bridge nearing completion. Note the service gantry, with its cranes, from which the bridge was built.

at a cost of £650,000. The appearance of further defects subsequently showed this to be an extremely difficult undertaking. Meanwhile, a new County Council had been elected who decided that the old bridge would have to go, and on June 20th, 1934, the sad task of dismantling it began.

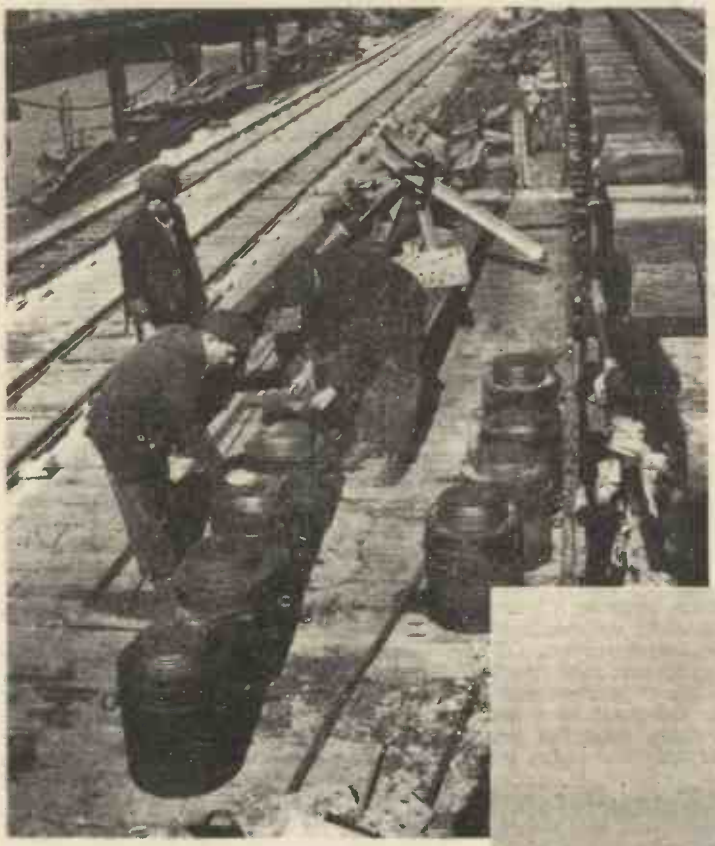
But what kind of bridge should replace Rennie's great masterpiece? It had to be one possessing distinct artistic merit, and in keeping with its surroundings. In the end the design prepared in collaboration with Sir Giles Gilbert Scott, the famous architect, by the engineers, Messrs. Rendel, Palmer and Tritton, and the L.C.C.'s own chief engineer, Mr. (now Sir) T. Peirson Frank, was selected. Though there is a straightforward simplicity about the new bridge, it is really a handsome

Interesting Features

Mr. H. F. Nolans, the resident engineer at the bridge, kindly pointed out to the writer some of its most interesting features. First, of course, came the task of taking down the old bridge. This was no light undertaking. Indeed, at the time of its erection it was the most massive structure of its kind. It is the opinion of many experts that its collapse was partly due to that fact. But Rennie's old masterpiece had won the hearts of many, and balusters and such-like souvenirs from the bridge have gone all over the world, and to-day adorn many a private garden.

In Mr. Nolans's office may be seen many remarkable finds which the workmen in removing the old bridge recovered from beneath the waters of Old Father Thames. They include an ancient cannon ball, a pair of handcuffs, a service rifle (probably jettisoned by a soldier in the last war), an anti-aircraft, shell of the same period, an empty cash-box a pair of leaden dumb-bells, and most interesting of all two nautilus shells belonging to a species that exist only in tropical countries. They were found buried thirty feet deep in the clay of the river bed. The conclusion of many naturalists is that this is proof that at one time Britain enjoyed a tropical climate.

Here it should be borne in mind that the new bridge had to be built in a busy tidal river, subject to currents caused by the curve of the river, and without interfering with the traffic upon it. Work was started upon it in October, 1937, and it was to have been finished by the spring of 1940. But the war intervened and considerably delayed the work. Many of the workmen were called to the colours and there was for a time a shortage of the necessary materials. Then the blitz and the black-out hindered the work. Fortunately the structure escaped serious damage by bombing and the anxious watchers on the bridge knew what it was to wrestle with incendiaries.



The superstructure was built independently of the piers, and transferred to them by jacks, some of which are seen in this illustration.

(Below) The service gantry, showing one of the large cranes in operation. The temporary bridge is seen on the right.

Width of 80 Feet

The new bridge occupies the site of the old one. It has, however, a width of 80 feet against Rennie's 42½ feet. This will allow for six lines of traffic and there are two 11-feet footpaths for pedestrians. There are five arches, whereas the old bridge had nine, and this means additional space for navigation. They appear to be the same size, but actually the three central arches are ten feet longer than those at the shore ends, having a length of 252½ feet.

One of the first things the layman notices about the new structure is that the first span stretches right over the Victoria Embankment into the river. In the old bridge it sprang from the edge of the water. As a result it interrupted the view of the curving river at this point. Not only is a much better view obtained of river and bridge, but there is far more light. The increased width of the bridge made it necessary to divert the tramway subway from the Embankment under Aldwych for a short length in order to bring its entrance immediately under the centre of the bridge. Looking up here one notices the graceful sweeping arches and the immense concrete girders which carry the crown of the bridge joining them. The latter, it may be added, are hollow.

60,000 Tons of Concrete

The bridge was built from a service gantry which is in effect the contractors' working platform. It is a bridge carried on piles close alongside the site of the new crossing. Upon it run the cranes by which the heavy loads are lifted and also the concrete. The material for the concrete came by barge to a wharf a little distance upstream of the bridge, where it was mixed and discharged into skips. Although the concrete in them weighed 1½ tons the skips were easily picked up by the cranes, and dumped on to trucks to be carried where it was wanted. There are some 60,000 tons of concrete in this single structure.

Its great strength lies in the miles and miles of steel bars by which it is reinforced. All told, 6,000 tons of these steel bars were requisitioned. They vary in thickness from that of an ordinary pencil up to a diameter of 2½ inches. The various lengths had to be welded together to an accuracy of one-sixteenth of an inch.

It is rather startling to be told that the immense weight of the bridge is borne by walls within the piers no more than 2½ feet thick and 83 feet long. They were constructed within cofferdams 120 feet long and 27 feet wide. The cofferdams were fashioned of interlocking steel sheet piling 65 feet in length driven 30 feet into the bed of the river. When the water was pumped out the cofferdam was practically dry, only a small pump being necessary to remove any water that might filter into it. Several tons of London clay were then excavated until a solid base was found 20 feet below the bed of the river. The weight-bearing walls rise from a bed of concrete six feet thick. Surrounding them are hollow shells of reinforced concrete 14 feet wide and 106 feet long which protect the walls against blows by shipping.

Supporting Piers

The piers were built up to meet the superstructure, or bridge proper. The latter was constructed quite apart from the piers, and when these had reached the desired height the superstructure which carries the roadway and the footpaths was ingeniously placed upon them by means of jacks. From each pier spring twin arch-shaped girders, one at either end, the two arches being joined by massive reinforced crossbeams.

Under the roadway at the Surrey side of the bridge is a stairway leading down to the river. There is another stairway at the Victoria Embankment end of the bridge. All the material used in the construction of the bridge—steel, timber and material for the concrete—is Empire production. In the foundation stone, which was laid on May 4th, 1939, there were placed copies of six London daily and evening newspapers, three magazines devoted to contemporary fashions, current coins of the realm, postage stamps, and two photographs of the former foundation stone.

High Voltage Through Space

Its Possibilities in Warfare

By K. DOBERER

THREE methods have been proposed up to now for carrying out the idea of supplying high-tension current through the air. The first plan is to make use of the greater conducting power of the more densely ionised upper regions of the air and their diminished resistance to the flow of electric current on account of the rarefaction of the air. The second plan is to make use of the resonance of the surface waves, such as the long waves of wireless. Finally, the third plan is to ionise the air for certain distances, so that it may conduct electricity and pass high voltages through these aerial cables. This third method is apparently the cheapest in practice to-day, and at the same time the most important in a military sense.

In order to carry out the first plan, gigantic preparations would be necessary. It was proposed to erect towers on mountain summits and to carry the radiating aerials still higher by means of captive balloons. Such captive balloons, covered with metal, were employed in Marconi's first experiments on English soil. They were taken into "extremely lofty regions" whereby the radius of the emitter was extended to 15 kilometres. The plans for power transmission naturally had far greater distances in mind. This was to be accomplished by stationing the balloon aerials at a height of 9,000 metres. It has been proved by balloon ascents that at 6,000 metres, the air is a thirty-fold better conductor. This would mean that one could bridge an average of 30 centimetres with every thousand volts of tension. It must be doubted whether such a multiplication of conductivity would ensue at 9,000 metres, so as to attain the necessary range. With the conducting capacity of air again multiplied by one hundred, Tesla's hundred-million-volt dynamo would then be able to send electric power waves over a distance of 3,000 kilometres. This signifies that if the British engineer, Hugh Pollard, proposes to transmit power from North America to Mont Blanc, even these fantastic figures will not suffice, quite apart from the consideration as to which course these accumulations of high voltage might take.

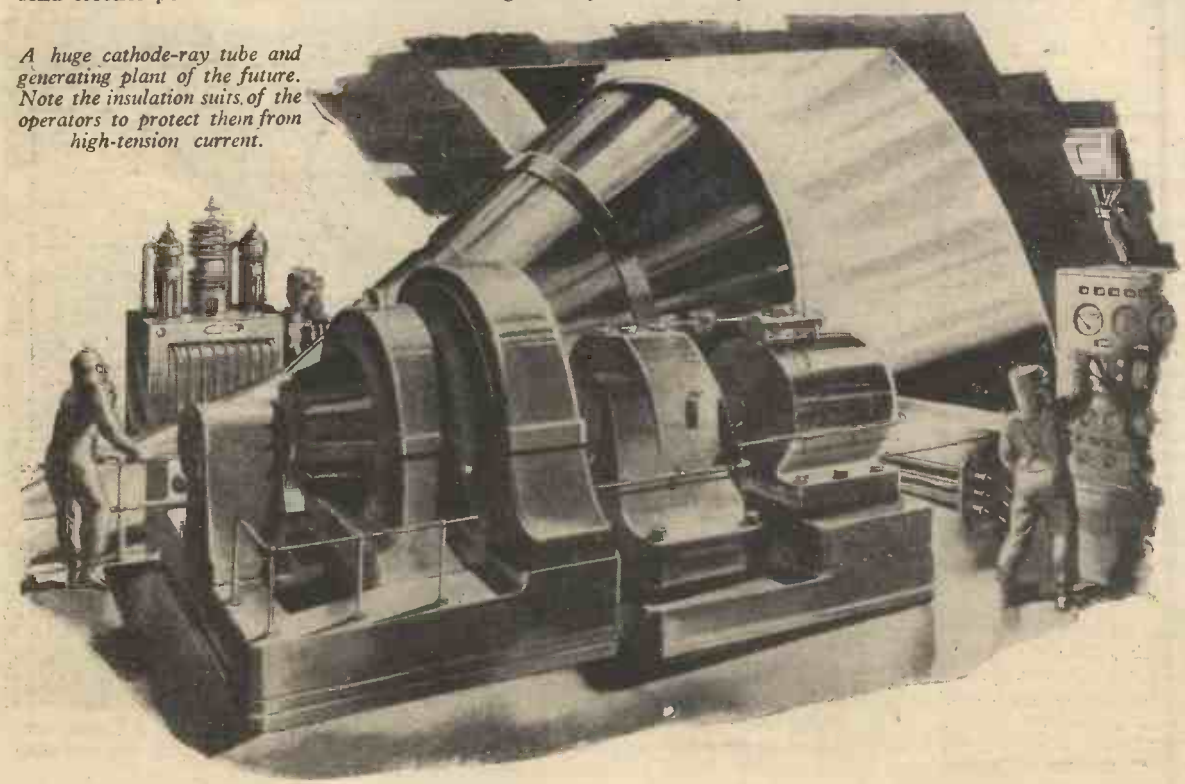
The second plan, to use the resonance of long electric waves, also suffers from the fact that this system does not provide the ability to direct the emitted power. It belongs, therefore, to some far distant future which will have no frontiers in the present sense and in which power will be common property like the air itself. According to this project, a million-kilowatt emitter is to generate a long wave which would swing as a surface wave on the boundary between atmosphere and earth's surface, return upon itself and oscillate in resonance. This method is probably identical in the main with Tesla's new power station, except for the length of the waves.

Cables Made of Air

The system which makes it possible to focus electric energy from one point to a certain other by a cable made of air, provides us with the proper method for a population with sufficient technical knowledge, but insufficient organisation in an epoch in which it is not yet possible to direct electric power free anywhere it may be needed. Even the idea that a properly registered radio listener may take up, from the oscillations whirling through space, as much as he likes, is an illusion. This was made clear by a law-suit round a trick engineered by the members of an association of allotment holders. The members, the only group that until now has organised the reception of wireless electric power, stood before the court in a body. The charge against them, magnified into a huge affair, was that they had stolen some five thousand pounds worth of radio energy from the air. Evidently wireless power was still very expensive in the year 1937. All the accused had their allotments at Billebrook, which lies at the foot of the great wireless station of Hamburg. It is well known that all allotment holders pursue some favourite hobby, and it is no wonder that they did their best at building wireless sets and erecting aerials. It was not long before one of them hit upon the idea that the supercharged electric field immediately in front of the wireless station could do more than produce march music and Hitler speeches; it could also be used to light electric lamps. Since allotment holders always stick together in good fellowship, this discovery led to an era of "power from the air," such as ordinary folk have only thought of as a vision of the distant future. The Billebrook colony began to build a great communal aerial in order to secure the provision of electric light for the whole colony. They connected their lamps and other apparatus with this aerial and were then independent of current supplied in the old-fashioned way by the cables of the Hamburg Electricity Works.

In peace, the general unauthorised use of radiated energy can be forbidden, but it would be impossible to prevent it being used in time of war, if the power were emitted in the vicinity of the front. The enemy could use it as well as ourselves. For military use, therefore, a method is preferable which enables the electric power to be directed through the air only to certain definite points. This idea can be put into practice by means of the "cable made of air."

The fundamental idea of this process is to direct a beam through the atmosphere which, on a certain track, will so supercharge the separate gaseous constituent parts of the air with electricity that they become electric conductors. A sort of tube is formed, through which a powerful current can be passed. High tension is carried along an invisible line as good as by a metal cable.



A huge cathode-ray tube and generating plant of the future. Note the insulation suits of the operators to protect them from high-tension current.

Ultra-short Wave Beam

Attempts are being made to-day to build up such air-cables with protons, positive emanations of matter, and with electrons, negative radiation of matter. The most promising solution would seem to be the production of an air-cable with a beam of ultra-short waves, overlaid with high-frequency high-tension current.

Electron Artillery

A mighty cathode tube eight metres long hums away under high tension of over a million volts. Out of the silver-shining beryllium window surge

the cathode rays, the beams of electrons at a speed of 290,000 kilometres per second. The speed needs only to be increased slightly by raising the tension pressure, and particles of matter, atoms of negative electricity, would on their way begin to transform into the pure power oscillations of the hard gamma rays. The most rapid cathode rays are known as "death rays" because they mean instant death to any small winged creature which may cross their path. Where they strike, the air turns violet. It is ionised and ready to carry high-frequency current like a copper cable.

This mighty tube no longer resembles the luminescent, in coloured light gleaming Geissler tubes from which it sprang. Wilhelm Hittorf would be astounded at the development of these glim-light rays which he discovered. Sir William Crookes, who designated this glow 10 years later at the Royal Society, London, as radiating matter, the fourth aggregate state, could declare enthusiastically that his theory had been proved correct: A condition of matter in which it is no longer solid, or liquid, or gaseous, and in which it is ready to transform itself into incorporeal energy.

When, in Heidelberg, Professor Phillip Lenard cut an opening in the glass of the cathode tube, so as to give the rays free access to the air, they were still weak and thrust through the aluminium plate, stuck over the glass opening to make it airtight, only at a rate of a few thousand kilometres per second.

Cathode-ray Tube Development

During the last 10 years the cathode-ray tubes have been continually enlarged and the voltages increased. Thus, in the year 1935, the speed of the cathode-rays could be increased to 240,000 kilometres per second. The American scientist, Coolidge, had achieved this result by applying a tension of 350,000 volts. He used small nickel plates as windows on the glass tubes. Towards the end of 1935, the chemist, Dr. Thiele, found a way to produce gas-proof graphite foil of some hundredths of a millimetre thickness, using this as improved cathode windows. But the most up-to-date window material seems to be beryllium, which is invulnerable, and chemically more resistant than platinum. The immense tubes in the new Kaiser-Wilhelm Institute of Physics at Berlin–Dahlem, said to propagate the speediest possible cathode-rays, seem to be provided with such windows.

The electrons are thrust out of the most up-to-date tubes at speeds approaching that of light itself. But do they fly far enough to form an ionised cable of air? That is the decisive question. Since the electrons can be diverted by magnets, the beams of electrons might also be concentrated by powerful magnets—there is such a magnet in a Leningrad Institute, capable of attracting a mass of iron weighing 150 tons. Everything, therefore, depends upon the range. But even if it is doubtful whether the cathode-rays alone can achieve a radius of atmospheric ionisation capable of being put to military uses, it is none the less important to investigate all their possibilities. Many kinds of rays, which of themselves promise no results when directed to perform a certain task, might have their full effect when used in combination with others. Thus, every chapter on the military use of rays which must conclude to-day with a query mark is just as important as those which already guarantee certain possibilities.

The Proton Cannon

The note of interrogation which was used in speaking of the range of electrons is still more definite in the case of the short-lived positive electric atoms, the protons, which are also propagated in the cathode tube. They possess a hundredth of the speed of the electrons. One of the most popular of modern scientific charlatans, the Polish engineer Dunikovski, broached the question of the power of these protons in his revelations to the world press, with the result that, even in high military circles among the Great Powers, interest in his work was aroused. In his interviews badly-digested facts are so cleverly associated with the wish dreams certain quarters would be only too glad to welcome as facts, that these people were snared against their will by the clever "bird-catcher."

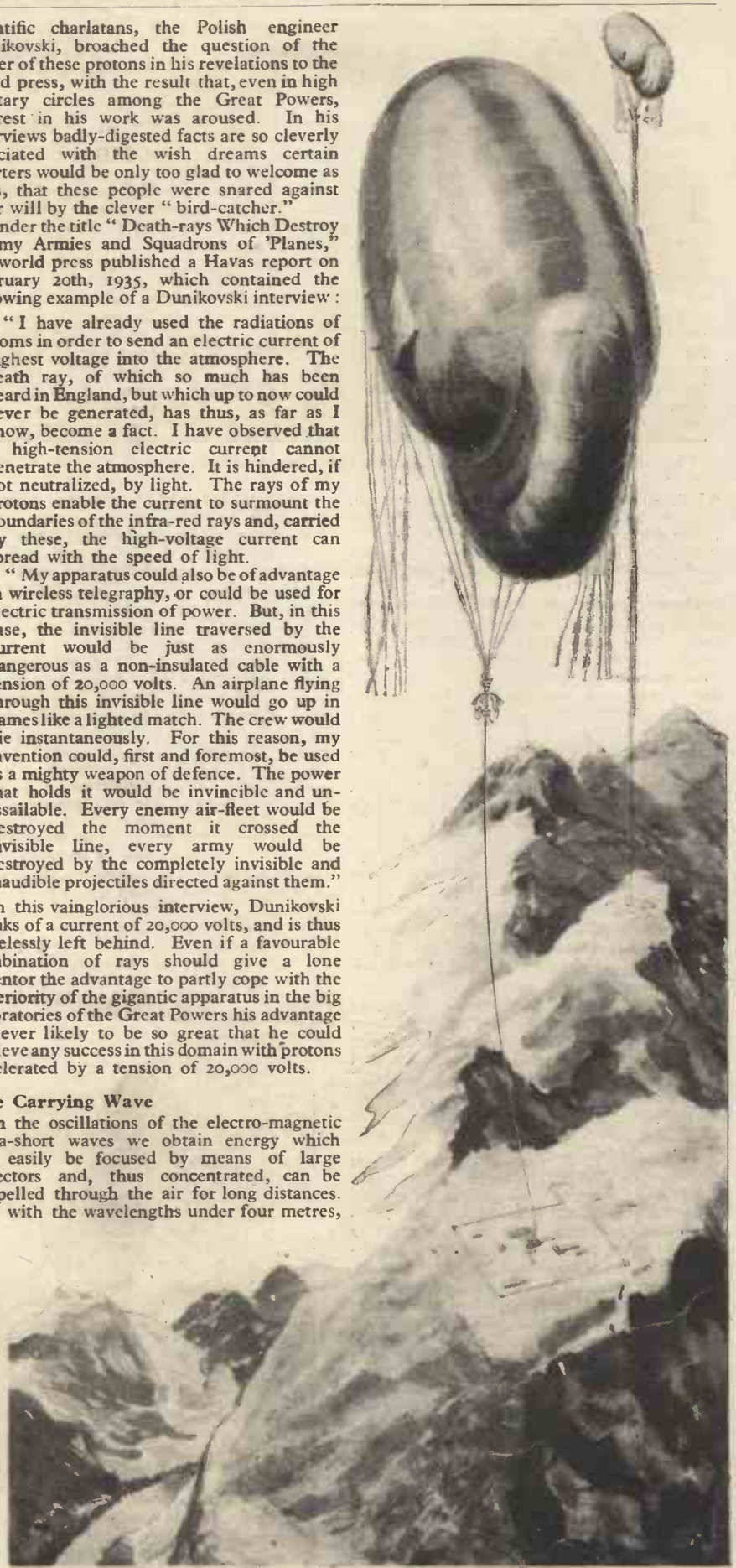
Under the title "Death-rays Which Destroy Enemy Armies and Squadrons of 'Planes," the world press published a Havas report on February 20th, 1935, which contained the following example of a Dunikovski interview:

> "I have already used the radiations of atoms in order to send an electric current of highest voltage into the atmosphere. The death ray, of which so much has been heard in England, but which up to now could never be generated, has thus, as far as I know, become a fact. I have observed that a high-tension electric current cannot penetrate the atmosphere. It is hindered, if not neutralized, by light. The rays of my protons enable the current to surmount the boundaries of the infra-red rays and, carried by these, the high-voltage current can spread with the speed of light.
>
> "My apparatus could also be of advantage in wireless telegraphy, or could be used for electric transmission of power. But, in this case, the invisible line traversed by the current would be just as enormously dangerous as a non-insulated cable with a tension of 20,000 volts. An airplane flying through this invisible line would go up in flames like a lighted match. The crew would die instantaneously. For this reason, my invention could, first and foremost, be used as a mighty weapon of defence. The power that holds it would be invincible and unassailable. Every enemy air-fleet would be destroyed the moment it crossed the invisible line, every army would be destroyed by the completely invisible and inaudible projectiles directed against them."

In this vainglorious interview, Dunikovski speaks of a current of 20,000 volts, and is thus hopelessly left behind. Even if a favourable combination of rays should give a lone inventor the advantage to partly cope with the superiority of the gigantic apparatus in the big laboratories of the Great Powers his advantage is never likely to be so great that he could achieve any success in this domain with protons accelerated by a tension of 20,000 volts.

The Carrying Wave

In the oscillations of the electro-magnetic ultra-short waves we obtain energy which can easily be focused by means of large reflectors and, thus concentrated, can be propelled through the air for long distances. But with the wavelengths under four metres,



A suggested method of supplying high tension current through the air. Towers are erected on mountain summits, and captive balloons are used for carrying the radiating aerials still higher.

" An aeroplane flying through this invisible ray would go up in flames like a lighted match."

which come into question for this purpose, the propagation of quantities of energy exceeding a few watts is extremely difficult.

Nicola Tesla also seems to have concentrated his attention on the same problem. This can be concluded, in addition to other reports, from a sensational patch of news items in American papers during summer, 1934. These news seemed to be based on views given by Tesla himself, or of someone in his confidence, and which have been exaggerated and sensationalised by the press. The items were then copied by the European press in the same style. Thus, the official government organ of a European power reports, on July 12th, 1934:

"New York.—Nicola Tesla, the well-known discoverer of the so-called Tesla currents, made the sensational announcement in an interview that he had invented a new apparatus with which he could relay a new kind of energised ray which would be able to force down aeroplanes at a distance of about 180 miles. The same rays can also be used to destroy human life. In his opinion, these discoveries should make future wars impossible."

Of course, Nicola Tesla expressed this opinion many years ago in a patent application. But, meanwhile, he had long since revised it and declared that wars would never be prevented by new war inventions, but only by the general human progress. Another guess appearing in some papers was equally unauthorised. They declared that Nicola Tesla intended to submit his invention to the Disarmament Conference at Geneva. But Nicola Tesla did not believe in the value of the Geneva institutions. When Andrew Carnegie, in the year 1912, made propaganda for a kind of League of Nations, Nicola Tesla answered him that such leagues could not prevent wars, but were only a means of delivering the weak into the hands of the strong. Nicola Tesla saw a guarantee of peace not in the union of diplomats, but in the unity of the peoples:

> "Peace can only come as a natural consequence of universal enlightenment and the amalgamation of races, and we are still far from this happy state of things."

Thus, already the faulty intellectual construction suffices to prove that the interviews were not genuine or were, at least, interpolated. What Tesla never doubted—and that is the real core of the whole story—is the possibility of despatching a flickering beam of high tension through an atmosphere ionised by a combination of rays, as soon as the technical possibilities could be sufficiently increased.

The Silent Death

Can this cable made of air really be so exactly compared with the cables of copper or aluminium on the steel towers for overland power transmission? It seems far more likely that the space, ionised along the way of the focused beam, will resemble a gigantic long cathode-ray valve, in which air will tremble in violet brilliance. May it be directed towards the skies and, whilst sparking into space, attacking warplanes, or may it be turned to strike downwards to the earth, blowing up munition depots, striking men and war machines—always it will fizzle and glow like St. Elmo's Fire, or strike shatteringly like a flash of lightning.

Notes and News

The "Singing Propeller"

THE problem of the "singing propeller" has been solved by Professor W. Kerr, of the Royal Technical College, Glasgow. This phenomenon was reported in a ship from the United States, the first of its class built for Britain. He discovered that the blade edges had a slight streamlining, and when this was rectified the "singing" stopped.

U.S. Tanker Speed-up

ACCORDING to a recent announcement by the U.S. Navy Department "assembly line" shipbuilding has advanced a stage farther in the United States. At one shipyard one tanker and three-quarters of a second tanker were being built on the same slipway at the same time. The new tankers, of a secret type, are to be launched bow first. As fast as one ship is launched the partly-completed second tanker slides down a bit farther and its pre-fabricated bow is welded on. In the space vacated work starts on a third tanker.

Amphibian Tanks

NEW three-and-a-half ton tanks that can cross rivers are the latest addition to Britain's mechanical armament. These machines, which weigh three-and-a-half tons without the men inside, were recently demonstrated to War Office officials and officers of mechanised units at a Royal Engineers' school in the north. They are really Bren-gun carriers that can plunge into a river, cross to the other side, crawl up the bank, and go straight into action against enemy tanks.

Rivet-Driving Record

IT is reported that while working on a U.S. destroyer at Bath, Maine, a team of four men drove 1,768 rivets in an eight-hour shift, beating the world's record set up by Carl Simmons, whose team drove 1,456 rivets in a shift at Los Angeles.

Worked with Edison

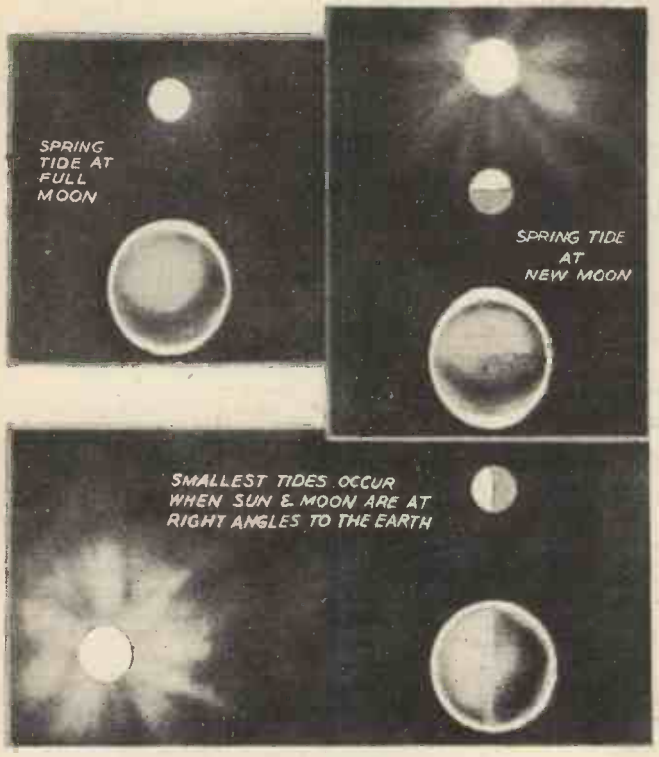
MR. CHARLES BRADBURN, who was associated with Edison, died recently at Tillsonburg, Canada, aged 74. He was credited with the invention of the block system of railway signalling.

A good line up. Young airmen cadets standing to attention in front of their training aircraft during a recent inspection at Randolph Field, Texas. About 200 aeroplanes were lined up for this review.

The Possibilities of Cheap Power

A Subject of Topical Interest

By Professor A. M. LOW



Diagrams indicating the rise and fall of the waters of the rotating Earth due to the pull of the Moon and Sun. The largest, or spring, tides occur when Sun, Moon and Earth are in line, and the smallest, or neap, tides, when Sun and Moon are at right angles.

FOR some time there has been a strenuous attempt in England to develop a scheme for the manufacture, or more properly the generation, of electricity by means of tidal power. "Here we are," say the would-be directors, "living on a little sea-girt island," which sounds very poetical but which, in fact, ought to form the basis of a good solid business at a time when coal prices are soaring, and fuel rationing is an order of the day.

The problem of obtaining power from the sea has been tackled in many ways; all work reasonably well but none are capable of application without the expenditure of huge sums of money. The earliest of all schemes was put forward, I believe, about a century ago when it was suggested that enormous cylinders could be fastened round the coast, so arranged that the waves which dashed against them would drive a piston which, in turn, could be geared to some form of pumping machinery, or even, in later years, to a dynamo.

In effect, this amounted to using, partly the kinetic energy of the waves which struck the moving piston a blow and transferred to it some of their own energy, and partly a method of using the weight of the water which dashed up to fall again into this queer cylinder. The next method, similar from the technical aspect, consisted of the use of a raft which was allowed to float on the surface of the waves and to transfer the rippling action by means of gears to the inevitable dynamo. Not only did the raft ripple like a flag in the process, but it rose as a whole so that as the tide lifted the weight, the raft could also be used in its fall to provide power.

These designs, although ingenious, were not generally successful for a reason which is painfully easy to find. They need a great deal of money, they occupy a great deal of space, and worst of all they are intermittent in their action so that the power must be stored during the "dead" periods. Another unpleasant difficulty which so many designers prefer not to face, is that the use of cranks and levers when exposed to sea-water is extraordinarily unmechanical, lays itself open to wear, and wastes most of the hard-gained power as friction.

Storing Energy

Unfortunately, science has not yet taught us how to store energy in an economical manner, when this energy is in the form of heat or electricity. Coal, petrol and oil are stored energy, but in a chemical state, so that when we require to use them as a source of power they are turned first into heat and then we allow this heat to drive an internal-combustion engine or to raise steam in a boiler. But heat itself, such as comes from the sun, or electricity which could be made spasmodically by tidal rafts, cannot be kept in condensers or anything so simple. It must be turned back again chemically into energy by means of an accumulator, and then released with more chemical changes, more expense, more loss and general inconvenience. This, is, of course, why windmills or turbines are not more universally used.

There is another tidal power plant which has been put into operation in a number of places, and which has the basis of real practical value. It is to allow the tide as it rises to fill a huge basin, usually artificially made by damming some section of a river. On the fall of the tide the water in the basin is allowed to run back again to the sea through some form of hydraulic turbine.

By allowing the reservoir, which costs nothing to fill, to discharge so slowly that there is power available during low tide periods, or by pumping up a certain amount of water to a secondary reservoir, this plan can be used with great success. It is economically impracticable other than in a very few districts where the distance between high and low tide is great and where the natural geological formation exists to permit of building the hydraulic accumulators on a huge scale.

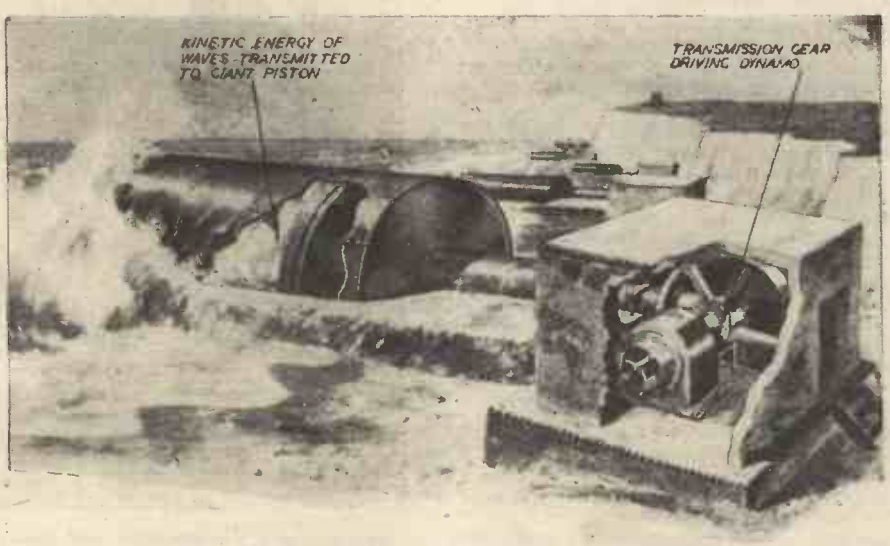
Sunken Shaft Idea

There are also other methods of obtaining so-called natural power, and they are rather more practicable than those which claim to store lightning! I am thinking of the differences in temperature which mean a source of power between sea level and deep sea. This is more practicable than the difference of electric potential, which has also been investigated, between the lower and upper strata of the air. Temperature differences have been considered more than once in the world's search for cheap power, and at the moment investigation is being made into the idea that a very deep shaft might be sunk into the earth down which water could be pumped and raised again as steam. The difficulty is that of conductivity. Although underground rocks may be hot, they do not conduct heat very well, so that unless the boiler chamber was very large its surface might be cooled without external heat being able to penetrate where needed.

Shafts of this type might need to be several miles deep, and at high temperatures it is difficult to see how any human agency could, with our present knowledge, construct these vast underground caverns.

Cheap Fuel!

I have mentioned the words "cheap fuel." I do not wish to discuss the troubles which



An early scheme for utilising the power of the waves along the coast.

are being faced throughout the world, but we have to deal in our country with the fuel problem for motor-cars. Some people are suggesting the use of gas in balloons, but as it requires about 265 cubic feet to replace one gallon of petrol we find that our balloons do not give us more than a few miles' motoring, although they are of unconscionable size and depressing appearance.

Compression cylinders of gas would be far more effective, but England, alas, has no high-compression gas grid, so that except for a few fortunate county councils or large engineering works the provision of cylinders seems mildly unpromising.

Difficulties

We cannot mix paraffin with our fuel because it is wanted elsewhere—butane in cylinders is difficult to purchase, and even if we foolishly defied the law we should find paraffin to be a difficult fuel in the ordinary car on account of the fact that it only vaporised cleanly within a narrow limit of temperature and pressure. It is liable to deposit material in our cylinders which is so hard that we wish we had stayed at home.

To mix alcohol with petrol or benzole is possible, but although it gives a cool engine it really needs a higher compression ratio if it is to be economical, and in any case it is of little use to discuss it, for the sale of alcohol of an industrial type is only permitted at certain hours, and the alcohol which is usually mixed with water for quite a different purpose would be hopelessly expensive. We cannot even mix water with our petrol, although up to 5 per cent. is quite satisfactory if the mixing is made by means of a colloidal mill. The standard grade of pool petrol which is supplied to-day is of such a nature that its burning is very quick indeed. As a natural result our engines must run fast and as they have relatively low compression it is difficult for them to do so if they are to maintain any reasonable degree of volumetric efficiency.

Decomposing Water

The papers are full of suggestions from people who want to decompose water by means of electricity and to use the hydrogen which results, but as they always finish their letters by saying that electricity could comfortably be obtained from the car-lighting dynamo, one can only reply by pointing out that the problem of perpetual motion has not yet been solved.

Electricity from photo-electric cells, thermo-couples and sun-operated boilers is not very practicable. The sun does not always shine, and maintenance costs or convenience make these cunning schemes look small in the face of the most modest internal-combustion engine. Convenient power is important as well as thermal efficiency, even though every motor-car tacitly refuses to acknowledge this fact by using a motor which has no starting torque. A subject highly suggestive of petrol-steam turbines, power by radio and other happy dreams of the future.

The World of Aviation

Rommel's Storch ; The Grumman TBF1 : Empire Central Flying School

Rommel's Storch

SOME interesting points have come to hand concerning the Fieseler Storch monoplane, which was recently shot down in the desert. The 'plane, which is very similar to our Lysander, is not a fighter, and apparently is only used as an "air taxi" for high officers in the German army. Fitted with a 240 h.p. engine, the machine can take off and land on a piece of ground about 50yds. in length, and when in the air it can cruise around at a speed as low as 30 m.p.h. without stalling. Special slots in the leading edge of the wing reduce the stalling speed.

The "Hell-divers"

IT was recently announced in Ottawa that the Fairchild aircraft works, near Montreal, are to build the new Curtiss-Wright dive-bombers, known as the "Hell-divers." They are two-seater monoplanes, and are designed for land or carrier-based operations.

The Grumman TBF1

THE latest American torpedo bomber on active service is the Grumman TBF1 (the Avenger 1), which was in action during the Midway battle, when it scored successes against Japanese warships. It has a short, stumpy fuselage, and the raised cockpit enclosure accommodates a crew of three—the pilot, radio-operator under gunner, and a top rear-gunner in a "bubble" turret. The aircraft carries a 21in. torpedo inside the fuselage, enclosed behind bomb doors under the mid-wing. Alternately, a bomb load of one ton can be carried. Fitted with a 1,600 h.p. Wright Double-row Cyclone engine, the Grumman has a top speed of 270 m.p.h., and a range of 1,400 miles at 215 m.p.h. The aircraft has a length of approximately 34ft. and a span of 46ft.

Mauritius Fighter-bomber Squadron

THE newly named "Mauritius" Squadron of Fighter Command, formed early this year, carried out its first offensive operation from its base in South England 25 days later and followed up with 19 more raids over enemy territory within a month—a remarkable record for a new squadron.

This fighter-bomber squadron has played a large part in the R.A.F.'s non-stop daylight offensive on the Western Front, on many occasions being the "sting in the nose" of fighter sweeps carried out by hundreds of aircraft. Targets have included industrial plants working for the enemy, docks, shipping, railways and airfields. Its most spectacular achievement so far was the bombing of a French shell-turning factory working for the Germans. Eight Hurricane bombers dived from 7,000 to 1,000ft. at 350 m.p.h., and bombs were planted right on the factory, which was extensively damaged.

Empire Central Flying School

REPEAT doses of the thousand-a-night bomber raids and the big day fighter sweeps, mean large-scale production of air crews, and an added strain and responsibility for those "back room boys" of the R.A.F. —the flying instructors of Flying Training Command.

New types of aircraft and new crews involve the inevitable development of new training ideas. Instructional technique dare not lag behind. One sign of the times has been the development of the Central Flying School—the world's most famous Flying School—into an Empire Central Flying School. Here experienced flying instructors from all parts of the Empire now go for an advanced course to pool ideas, and to learn as much as possible about the latest operational requirements.

These graduates of E.C.F.S. will spread their teaching to the Flying Instructors' Schools, which will in their turn pass it on to the various training schools in Flying Training Command. Here, indeed, is a flying instructors' "brains trust" to guarantee that the quality, as well as the quantity, of Britain's air crews of to-morrow shall be maintained.

The crew of a U.S. army Flying Fortress bomber studying their maps before taking off on a raid over enemy territory in the Pacific war area.

The Trend of Turbine Development

The March of Ideas which has Led to the Modern Ultra-efficient, High-speed Turbine

The world's first turbine-equipped vessel, the "Turbinia," built in 1887.

FEW engineers need reminding of the fact that the turbine is fundamentally the oldest of all steam engine types.

The somewhat enigmatical Hero of Alexandria, who lived in the third century B.C., is usually considered to have originated the world's first turbine engine when he described his famous "Æolipile," or whirling sphere, which comprised a hollow metal ball pivoted between two steam pipes projecting from a boiler, and which revolved rapidly on its own axis in virtue of the reactionary force of the steam escaping from two oppositely placed jets.

But very probably this semi-mysterious Alexandrian savant copied the idea of his whirling ball from some much older source, for it is noteworthy that, in his writings, Hero does not actually claim the device as his own invention.

Between Hero's description of this crude steam-power device and the next application of a similar principle came a period of some 17 centuries, for it was not until the new spirit of scientific and mechanical inquiry which took firm root at the beginning of the seventeenth century that the possibility of employing steam power began to be mooted.

In 1629, one Giovanni Branca, an Italian architect and engineer, published, at Rome, a book descriptive of various mechanisms, which he alleged he had either invented or collated from diverse sources. In this book Branca has an illustration showing a mechanism which is operated by means of a steam jet impinging upon vanes set on the periphery of a wheel. Branca, in his book, depicts his device as being used for pounding drugs and minerals. Yet it is doubtful whether Giovanni Branca ever constructed, let alone invented, this particular power device which, clearly, implied another stage of turbine development.

Kempelen's Invention

The reciprocating or "piston-and-cylinder" steam engine was introduced in the eighteenth century, and the world of mechanics seems to have been so taken up with this type of prime mover that it overlooked the importance and significance of steam escaping from a jet or nozzle with a high velocity. One of the few mechanics who did devote a little time to the idea of turning a wheel by means of a jet of steam was Baron von Kempelen, a Hungarian, who is nowadays best known as the constructor of an automaton chess player. Kempelen patented his idea in 1784. The famous chemical investigator, Dr. Joseph Priestley, became interested in Kempelen's idea, so much so that he made the announcement that if Kempelen's claims could be substantiated, Watt's steam engine would be driven out of the field.

James Watt, who claimed (most unjustly) an absolute monopoly of steam power, became alarmed at Kempelen's invention. He did his best to ferret out the details of the steam-jet engine, and even endeavoured to prove its uselessness. Fortunately for Watt, Kempelen had other interests, and he allowed his crude turbine engine to lapse into obscurity.

Richard Trevithick, the Cornish engineer and steam locomotive pioneer, toyed with the notion of driving a vaned wheel by means of a powerful steam jet. But Trevithick was too full of other novel ideas to settle down to the development of this solitary notion. He, too, let the matter lapse in consequence of more pressing pursuits.

First "Compound" Turbine

Perhaps the first practical and determined attempt to design a steam turbine was that carried out by an engineer named Gilman, in 1837. This inventor used the same vaned wheel principle which was put forward by Giovanni Branca in 1629, but instead of attempting to extract all the available energy from the steam by means of a single-vaned wheel, he employed a number of such wheels. The steam, after being partially expanded and after imparting a portion of its energy to the first wheel, passed on to succeeding wheels until all the available energy had been abstracted from the steam. Gilman's invention clearly constituted the world's pioneer "compound" turbine.

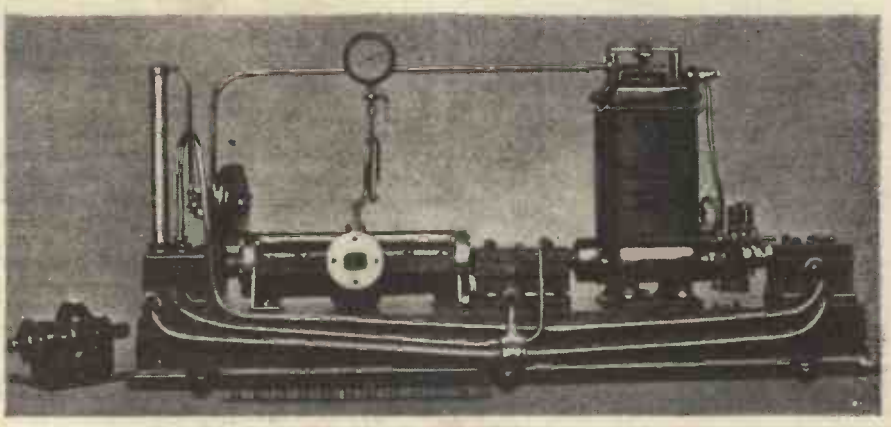
After Gilman came James Pilbrow, who, in 1843, made a turbine in which a portion of the steam's energy was abstracted by a first impulse wheel, after which the steam was turned back by a fixed blade to strike again in the same direction the next impulse wheel, and so on. By having a number of these impulse wheels, Pilbrow managed to build up a practicable turbine. This inventor, indeed, seems to have been the most enthusiastic of all the early turbine devotees. He was the first man to appreciate the importance of steam expanding from a jet with high velocity.

Contemporaneously with James Pilbrow, Robert Wilson, another practical engineer, worked on the same problem. Wilson, in 1848, patented a turbine engine which was similar to that of Pilbrow. In the Wilson engine, however, the blades were fixed to the sides of the impulse wheel in concentrically circular rows, and the steam flowed from the centre of the wheel to the periphery as it expanded, being deflected after passing each row of moving blades by means of a row of blades fixed to the casing of the steam chamber.

The turbines of James Pilbrow and Robert Wilson, however, failed to command practical success in consequence of their lack of working efficiency, coupled with their unreliability, and, although in the ensuing decades several inventors gave their attentions to the subject of the steam turbine or rotary engine it was not until the Hon. Charles Algernon Parsons (1854-1931) devoted himself to the task that the problem of the practicable turbine really became satisfactorily solved.

The Parsons Turbine

When, in the year 1880, Parsons was still a student at the famous Armstrongs' Works at Elswick, Newcastle-upon-Tyne, he became interested in the notion of deriving power from the kinetic energy of an expanding gas. His first idea was to drive a sea-going vessel by means of a jet of compressed air impinging upon the vanes of a propeller. Following this, he conceived the notion of his now



The first Parsons turbine. Built in 1884, it developed 10 b.h.p. at 1,800 r.p.m., and is here shown directly coupled to a bi-polar dynamo of the period.

famous steam turbine upon which he began work in 1884.

Parsons has concentrated the early history of his turbine into a comparatively few words:

"In commencing to work on the steam turbine in 1884, it became clear to me that, in view of the fact that the laws of the flow of steam through orifices under small differences of head were known to correspond closely with those for the flow of water, and that the efficiency of water turbines was known to be from seventy to eighty per cent., the safest course to follow was to adopt the water turbine as the basis of design for the steam turbine. In other words, it seemed to me to be reasonable to suppose that if the total drop of pressure in a steam turbine were to be divided up into a large number of small stages and an elemental turbine like a water turbine were placed at each stage then each individual turbine of the series ought to give an efficiency similar to that of the water turbine, and that a high efficiency for the whole aggregate turbine would result; further, that only a moderate speed of revolution would be necessary to reach the maximum efficiency.

Previous inventors, such as James Pilbrow, had realised that an impulse turbine could only reach maximum efficiency when its impulse wheel revolved at approximately one half of the velocity of the steam. But since this condition usually made it necessary to have the impulse wheel revolving with a speed of about 3,000 r.p.m. the practical difficulties in Pilbrow's time connected with the utilisation of a rotational velocity of this figure rendered the earlier turbines quite impracticable.

Parsons, however, proposed to run his turbine at a considerably lower speed than one half of the velocity of the expanding steam. He constructed a ring of blades fixed on to a rotor which revolved within a stationary cylinder or casing, from the inner sides of which projected inwards rows of blades alternating with the blades of the rotor. Several series of blades were mounted on the one shaft and corresponding blades were provided on the casing of the engine. Steam flowed into the turbine "cylinder" in a direction parallel to the central shaft or axis. It expanded against the first set of turbine blades, the exhaust from these blades being then allowed to expand against the second set of blades, and so on until the steam finally escaped from the casing. The pressure drop between each series of vanes was only small. Consequently, a constant pressure or thrust was maintained through the series, the flow of steam being continuous throughout the turbine.

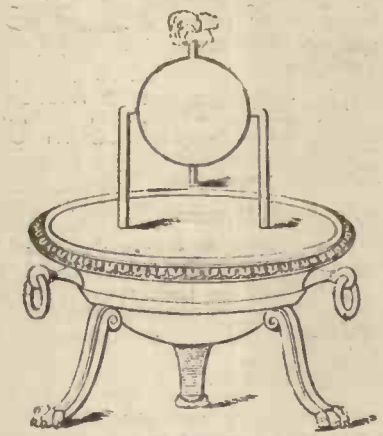
The coming of the commercial dynamo in the '80s of the last century gave Parsons the right opportunity for utilising his turbine, since a dynamo requires to be run continually at a high speed. The newly introduced dynamo of the '80s demanded a rotational speed of about 1,200 r.p.m. This was a very high velocity for an ordinary reciprocating engine, but with the Parsons turbine a speed of more than 10,000 r.p.m. was normally attained, which velocity was far in excess of the requirements of the dynamo.

First Turbo-electric Plant

To get over this difficulty, Parsons designed a new electrical generator capable of being operated at higher speeds, and, coupling this to his turbine, he produced the world's first turbo-electric generating plant in 1884. The generator developed approximately 7.5 kilowatts at 100 volts, and at a speed of 18,000 r.p.m.

In 1888, the Parsons turbine was first installed in a public power station, that of the Newcastle and District Electric Lighting Company.

Parsons was not entirely alone in the fascinating field of turbine invention and design. Another celebrated pioneer was Carl Gustaf Patrik de Laval (1845-1913), a Frenchman. De Laval was originally interested in the construction of a separator for removing cream from milk. Faced with the necessity of getting a high speed of rotation for his

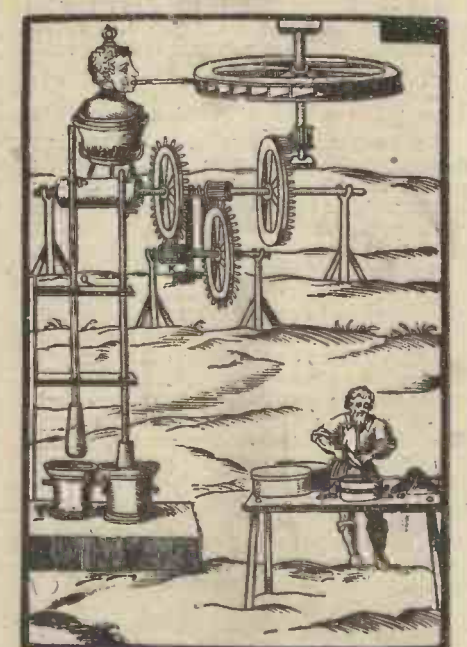


Hero's "æolipile." The first recorded steam engine in history.

cream-separator blades, De Laval conceived the notion of employing a steam jet impinging upon a vaned wheel.

De Laval's Impulse Turbine

From these beginnings De Laval gradually built up a type of impulse turbine in which, by means of a specially designed nozzle, the steam velocity was made to attain the rate of nearly a mile a second. No wheel could be revolved at anything like this enormous velocity without flying to pieces. However,



A reproduction from Branca's book published in 1629, showing his notion of a crude turbine engine.

by a special design, De Laval toned down his impulse turbine until he was able to get its wheel to revolve with a peripheral or edge velocity approaching the speed of a rifle bullet. At this velocity, perfect balancing of the engine parts was essential. Yet, ordinarily speaking, this was found to be impossible. De Laval solved this—his greatest problem of balancing by dint of fixing his impulse wheel in the middle of a long flexible shaft, one end of which is fixed within a plain bearing, the other end being carried in a spherically mounted bearing. At full speed the wheel determines its own rotational axis as does an ordinary spinning top.

The speed of the De Laval turbine was far in excess of all commercial requirements. The inventor, therefore, had invariably to gear the turbine down in the ratio of 10 : 1 by means of helical gears. Thus geared, the turbine was suitable for dynamo driving.

The De Laval turbine still persists, and to-day it constitutes perhaps the best-known of the smaller powered turbines. Since its original invention, many modifications, improvements and refinements have been effected to the turbine, yet basically it remains very much the same in principle as the original invention of De Laval. The efficiency ratio of a De Laval turbine ranges from about 35 per cent. in the smaller sizes up to about 60 per cent. in the larger engines.

Auguste Rateau

Another type of practical turbine is the invention of Auguste Rateau (1863-1930), who was also a Frenchman. Rateau spent much of his life as an engineering teacher and instructor. He took up the turbine in 1896 and patented several improvements on it in the ensuing couple of years. The first Rateau turbine was built in 1898, and first came into engineering prominence when it was exhibited at the Paris Exposition Universelle of 1900. Essentially, the Rateau turbine comprises one of the pressure-compounded impulse type. At each stage of the turbine system Rateau has a set of fixed jets through which the steam is expanded, and with each set of these jets there is provided an impulse wheel which absorbs the kinetic energy or energy of motion of the expanding steam. By expanding the steam in stages, the speed of the turbine is such as corresponds to the pressure drop in the steam at each expansion stage. Hence, the turbine revolves at a slower speed than the De Laval turbine.

The mechanical construction of the Rateau turbine is considerably complicated, but it has been taken up in many countries.

Ljungstrom Turbine

A further type of turbine is that due to Birger Ljungstrom, a Swedish engineer, who was first attracted to the subject of turbines by seeing a De Laval turbine in operation. During an illness which occurred in 1906, Ljungstrom was obliged to give up all active engineering work for a period. During this time he evolved a number of novel ideas concerning turbine construction which he convinced himself were all of practical attainment.

After one year of experimental work, Ljungstrom developed his own turbine design, his first British patent being taken out in 1907, and in the following year (1908) this inventor succeeded in floating a company for the manufacture of his new engines.

At the beginning of 1910 the first Ljungstrom turbine was completed. It developed 500 horse-power, had an efficiency of 68 per cent., and ran at a normal speed of 3,000 r.p.m.

The Ljungstrom turbine, which is a highly complicated machine, operates on the "compound" principle, energy being given up to the main shaft in a series of successive stages. Yet, apart from the period of the Great War, this turbine has been manufactured in several countries, and has been regarded by many experts as a turbine of probably the most advanced of practical designs.

The possibilities of the steam turbine are by no means ended. In some respects this, the oldest of steam-power devices, is even younger than the reciprocating or "piston-and-cylinder" steam engine. The present war will, of necessity, hold up further turbine design for many years.

Our Busy Inventors

By "Dynamo"

Gumming Appliance

THE salvage of paper at the present juncture is a stern necessity. One widely prevalent method is the utilisation of used envelopes by means of a gummed strip. This practice makes apposite the advent of an improved appliance for printing and moistening or gumming paper strips, for which a patent has been applied in this country.

This appliance includes two parts. There is a trough-like lower part which carries the axle for the paper roll, the counter printing roller and the moistening or gumming roller; and there is a bridge-like upper part which carries a guide for the paper strip, the printing roller, the knife for cutting the strips and a counter roller for the moistening or gumming roller.

This, it is maintained, is an improvement upon existing methods which are stated to be cumbersome, so that there cannot be obtained rapidly and simply a ready moistened and printed slip for packing purposes. In the new invention it is asserted that the automatic finishing of the strips is rendered possible by a simple manipulation.

Cigarette Salvage

IN pre-war times it used to be said that a fortune was made from the mustard we left on our plates. The waste of the golden condiment proved to be a gold mine for the manufacturer.

A similar waste has occurred in connection with cigarettes. A "down and out" who haunted the portals of institutions in which smoking was prohibited could easily fill his pipe or roll his cigarettes by salvaging the more than "fag ends" thrown away.

Those smokers who are not guilty of this extravagance may snuff their cigarettes between the thumb and the forefinger; but this method of preserving the cigarette is not a very satisfactory one.

To prevent the waste in question an inventor has conceived a device for extinguishing and preserving a partially smoked cigarette. The device comprises a cigarette holder and a cylindrical casing for containing the same. The holder forms a push fit in the casing, on to the open end of which a cap fits.

In use the cigarette, while still alight, is inserted in the casing. And as the latter when closed by means of the cap is airtight, the cigarette is quickly extinguished and available for relighting.

A clip is provided for securing the device to the pocket.

Cork Tip with Firm Grip

ANOTHER recent invention concerning the cigarette relates to cork tips.

The cork tip consists of a very thin layer of cork which has a paper backing. The tip is attached to the cigarette by an adhesive applied to this paper.

It is pointed out by an inventor that, owing to the surface of the backing being smooth and, in some cases, slightly glazed, difficulty is experienced in securing the proper cohesion between the paper on the cork and that of the cigarette.

He further remarks that the tipping material is in the form of rolls, which contain a considerable length of the material. But if it be found that the tip, after application, does not firmly adhere, it is customary to scrap the whole of the particular roll being used. As a consequence, obviously this causes waste.

To prevent such a disadvantage, the inventor in question has applied for a patent for a cork tip which is formed from a paper-backed strip of cork having its outer surface roughened. This method provides a key for the adhesive.

An Odourless Firelighter

TO facilitate domestic fire-lighting various kinds of firelighters are used, but some of them have an unpleasant odour.

An inventor points out that a number of these firelighters are produced by the impregnation of wood waste or other material with melted or dissolved naphthaline. These firelighters make manifest the great volatility of naphthaline, which emits a strong and disagreeable odour. And during storage there occurs a continual diminution of the efficacy of the firelighters.

This inventor has devised a firelighter consisting of wood waste and naphthaline. He incorporates with the naphthaline a material which is stated to stabilise it against volatilisation.

Showing Dr. J. C. Patrick, a Kansas City chemist, who is credited with the discovery of "Thiokol," a rubber substitute which may help through the "duration," and might eventually supplant natural rubber. This tyre is retreaded with "Thiokol," and has run 4,000 miles.

Pneumatic Razor

IT is asserted that the practice of shaving in the bath has increased lately to a considerable extent. There is at least one drawback associated with this custom. If one drops the razor, it sinks beneath the soapy water and is not easy to recover.

To guard against this contingency there has been designed a safety razor especially for use in the bath. If dropped in the water, it will float.

This razor has a hollow handle formed of a resilient or elastic material capable of being inflated in order to enable the complete razor to float.

Razor Sharpener

IN these days safety-razor blades are becoming scarcer. An easily available effective means of sharpening old ones, at the present juncture, would certainly be a boon to many men.

Among the recent applications for patents in this country is one relating to an apparatus for putting an edge upon a large number of safety-razor blades simultaneously.

The blades are engaged by spindles and caused to move through a circular path between two sets of hones by means of a movable supporting plate, to which an oscillatory movement is imparted by a crank or eccentric mechanism.

Tongs for Bombs

THE incendiary bomb is again the subject of an invention for which a patent in this country has been applied. This time it is an improved means of quickly picking up and depositing the fiery projectile in a safe place.

The contrivance has a long handle, at one end of which are two pairs of jaws, one of which is practically at right angles to the other pair. The operator is enabled by the construction to bring the jaws together so as to grip the bomb between one or the other of the two pairs of jaws according to the position and accessibility of the bomb. And the dangerous missile can then be rapidly and conveniently transported to a place where it will be harmless.

Well-oiled Hair Clipper

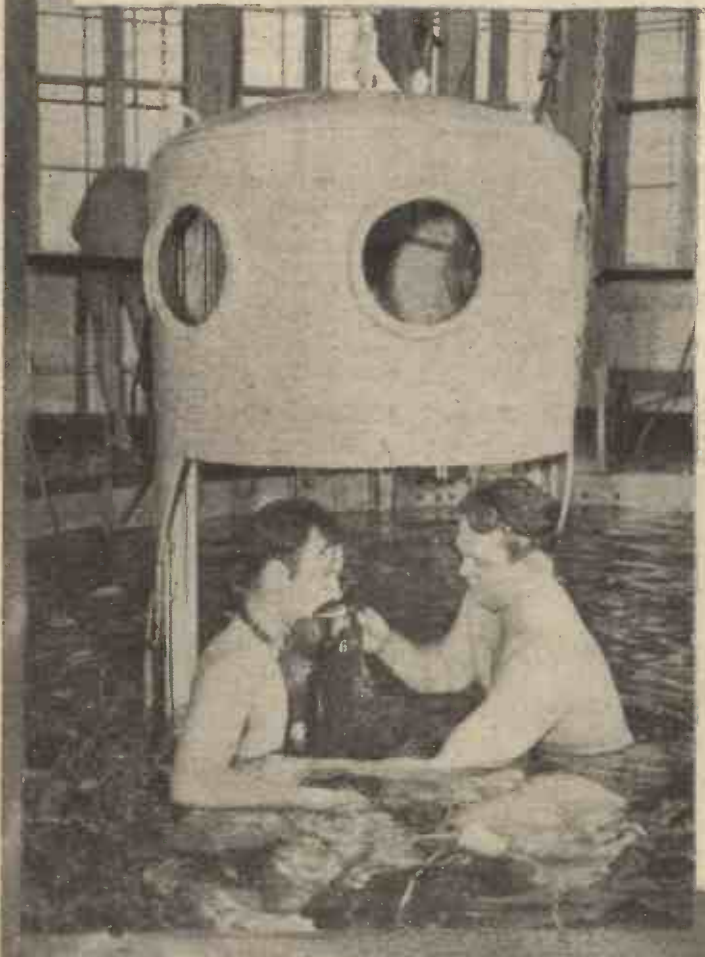
A FAMILIAR object in the hairdresser's saloon is the hair clipper, that Lilliputian lawn mower which quickly cuts the tiny blades of hair on the nape of one's neck.

It appears that this implement requires constant lubrication. This, we are told, is necessary because the hair being cut rapidly absorbs the low viscosity oil customarily used, so that the blades become dry and sticky. Such perpetual lubrication is objectionable because it entails loss of time and also owing to the fact that any excess of oil applied is liable to be imparted to the head of the customer.

An improved hair clipper is the subject of an application accepted by the British Patent Office. The inventor states that this clipper needs lubricating only at four- or five-day intervals, and that it will not transfer oil to the head of the customer.

His idea contemplates a system of oiling whereby the bearing surfaces between the comb and cutter blades will be supplied with oil in such a manner that its flow is from a supply source across the bearing surfaces toward the teeth. With this system the cut hair absorbs only that oil which has passed between these surfaces which it keeps clean, as the spread of the oil is toward the teeth.

(Above) An instructor explaining the working of the Momsen "lung" before the men take their turn in the water bell. (Below) Final adjustments before going down in the water bell.



WHEN a submarine is reported lost, this does not necessarily imply that the entire crew is lost. Escape apparatus provided on submarines to-day is much more efficient than that provided during the last war, when few men ever escaped from a sunken submarine.

A number of different devices for saving life in sunken submarines have been suggested from time to time, many of them, however, proving impracticable.

Many of the submarines of the British Navy are provided with collapsible trunks fitted to special hatches. They are stowed ready for instant use, and when required they are pulled open, the compartment is flooded, trapped air in the trunk is released by the opening of a valve, and the escape hatch is then opened, allowing a man to escape to the surface.

Davis Escape Apparatus

This device, designed by R. H. Davis, which was adopted by the Royal Navy, came into prominence at the time of the pre-war disaster to H.M.S. *Poseidon*, in the China Sea, when half a dozen men made their escape with the aid of the device.

The Davis apparatus consists of a special rubber-and-fabric waistcoat, fitted with a small cylinder of compressed oxygen that can be released and breathed through a pliable tube, one end of which is securely held in front of the user's mouth by means of a strap fastened round the lower part of the face. The outfit also includes nose-clips which clamp over the nostrils of the wearer, and goggles for protecting the eyes. There is also a rubber apron attached to the front of the apparatus, by means of which the user can check his rate of ascent through the water.

Operational Details

To provide means of escape for trapped crews the latest types of British submarines have air-locks built into the vessel. These steel chambers have watertight doors which give access to adjacent compartments in the submarine.

...PING FROM SUBMARINES

A description of the Latest Apparatus for Enabling the Crew Trapped in a Submarine to Escape to the Surface.

At the bottom of the tank, one man emerges from the water bell and ascends to the surface, guided by a knotted rope.

Controls are arranged so that the locks can be operated either from the interior, or from the outside compartments. The men can make their escape without previously flooding the locks.

In case of emergency two men would enter the locks wearing Davis apparatus, close the watertight doors, and flood the locks and release the trapped air. When equalisation of pressure has taken place, the men open the upper hatches and, floating through them, make their way to the surface. The hatches would then be closed, the locks emptied of water, and the next two men to be released would then enter the lock and repeat the operations.

Every rating in the submarine service is taught the use of the Davis apparatus. He first receives instruction in the details and working of the apparatus, and has to wear it from time to time, on board, to get used to the breathing arrangements. Then, with the aid of instructors, he is taught how to use the device under emergency conditions in a large tank, which is provided with air-locks, so as to approach as near as possible the conditions of an actual escape from a submarine.

At one training depot the tank used is of steel, 16ft. in diameter and about the same in depth. At the bottom of the tank is a steel chamber representing a compartment of a submarine, the chamber being entered through a watertight door in the wall of the tank. In case of an emergency, the opening of sluice valves would empty the tank in half a minute.

The Momsen Lung

The latest escape device for trapped submarine men is known as the Momsen lung. This is similar to the Davis apparatus and is held across the chest of the sailor by straps around the body and neck of the wearer.

The accompanying illustrations show various phases in the training of submarine ratings in the use of the Momsen lung apparatus.

Training in Water Tower

For this purpose a steel tower is used containing 50 ft. of water, the top platform of the tower being reached by a spiral staircase outside the tower. On arrival at the operating platform the trainees strip, with the exception of bathing slips. The breathing apparatus is then strapped on and adjusted by the instructor. When ready, the instructor, with one or two pupils at a time, step on to the bottom of a water bell, which is then lowered into the tank. This bell, which provides an air-lock, corresponds to the submarine hatch from which the men may actually have to escape at some future time.

After any necessary final adjustments have been made, the bell and its occupants are slowly lowered to the bottom of the tank. Here the instructor explains how to properly emerge from the bell, and then the men escape from the bell and gradually rise to the surface, feeling their way with the aid of a rope, on which are knots for checking the rate of ascent. The men must make their ascent slowly in order to maintain pressure. In a case of emergency in an actual submarine, these hand-lines would be brought to the surface by means of buoys which would be released for the purpose.

Having reached the surface from a depth of 50ft., the men release the nose clips and the breathing apparatus which has provided them with oxygen while their heads were under water. The nose clips prevent the men from sniffing in water.

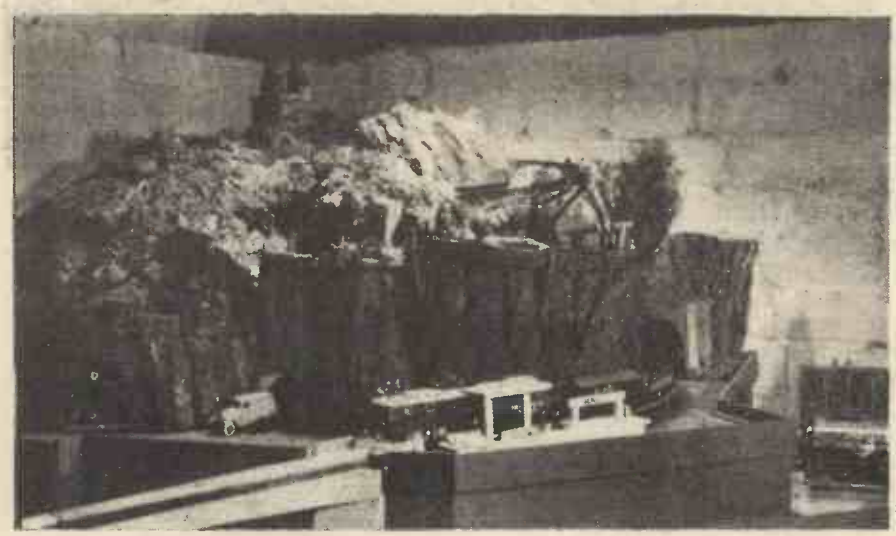
It will be apparent from a perusal of the illustrations that the men who man our submarines have to be tough and cool in an emergency.

The huge steel tower which forms a water tank 50ft. deep. (Below) A Naval rating ascending to the surface, and feeling his way by means of the guide rope.

THE WORLD OF MODELS

By "MOTILUS"

A New Modelling Medium... and Details of How an Amateur Model-maker Helps the War Effort



The mountain railway and roadway on Donal Sankey's model railway. The castle at the summit is entirely modelled in "Pyruma," air-dried to stone-hardness, and painted in poster colours. The mountain sides are natural tree-bark. The plywood roadway is Tiluma-coated to give a rough stone surface.

Modelling with Fire Cement

BEST known in the modelling world of plastic modelling mediums is, I should say, Harbutt's plasticine, but I was glancing through "Sankey Selections," the house organ, "Plan Ahead" number of Messrs. J. H. Sankey and Son, Ltd., of London, and I see that their "Pyruma" putty fire cement has recently come forward as a remarkable medium for models. Originally it was produced for making repairs to broken firebrick linings in fire places, stoves, kitchen boilers and so forth, but its use has been widened amazingly of late, and on the special modelling instruction sheet they have produced I see it is now used for relief maps, military lecture models, architects' models, surgical models, handicraft and school models, and, more interesting to my readers, no doubt, for model ships and furniture, miniature railway buildings, and model cottages.

Mr. Herbert Sankey, head of the firm, is a keen model railway enthusiast, and his son, Donal, evidently follows in father's footsteps. In some of the photographs reproduced here are shown what has been accomplished on Donal's model railway with the aid of Pyruma, and other simple materials.

Realistic Background

The first achievement of father and son in providing "background" for the railway's fine scale models, was a mountain fastness, topped by an ancient castle and surrounded by suitable scenery of woodland and meadow. Not content with making it purely rural, they proceeded to build a mountain railway, rising to the summit, with an alternative motor road.

Down in the lowlands, too, this enterprising company of "Sankey and Son" have been at work and the result—an old-world village (with manor house, working mill and other interesting buildings, including Ye Old Inne) is quite a masterpiece of modelling. The industrial world, too, is not forgotten—one of the illustrations shows a working mine, and the minehead and adjacent rail tracks are very realistic.

"Building" Materials

Now to the practical side—how is it done? "Treebark," says Mr. Sankey, "becomes mountain crag and rock, cupressus twig becomes mountain pine, while the ubiquitous Pyruma produces at will twisted oaken beam, mellow tile, ancient wall or crumbling stonework." Pieces of real rock are included in the landscape and crumpled Cellophane makes an ideal sparkling brook.

The village by the railway, where Pyruma houses, a plywood bridge faced with Tiluma, natural rocks and Cellophane brook come to life with surprising realism.

All the model houses are built of Pyruma Putty Cement, cut or moulded in sections while plastic and baked afterwards before being assembled together by "Tiluma," the non-inflammable jointing cement, another Sankey product, manufactured in tube form.

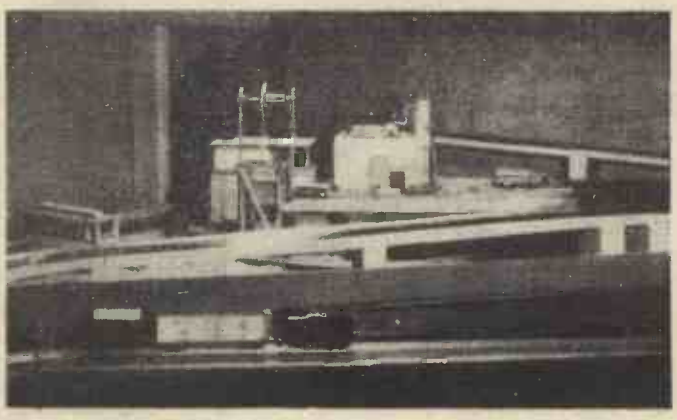
The relief map for military lectures shown on next page is modelled Pyruma putty over a core of sand under linen, and is painted in natural colours after hardening, but most interesting to me personally was the masterpiece of a modelled house or cottage, particularly if made hollow in sections.

No doubt readers would like to know exactly how a "hollow model" cottage is made in Pyruma and Tiluma. First of all you draw and cut out a stiff paper pattern of each section. This will ensure the perfect fitting together of the model itself.

"Hollow" Modelling

Work the Pyruma in the hands for a few moments to improve the plasticity, and then spread it out on an oven sheet (over which has been laid a piece of newspaper which prevents the cement sticking to the sheet) to a thickness of about ⅛in. Now place the paper pattern upon the putty and cut around the outline with a penknife, the blade of which has been moistened slightly with water. Remove the pattern, and, copying the drawing or photograph, score in the stone work with your penknife. Window recesses may be pressed in by the use of rectangular wood dies, and the windows stamped into series of panes by the square end of a match, or a stick cut to shape. Put the completed section into a slow oven for about 30 minutes, or let it bake on the top of a heated boiler, hot water tank or before a fire.

To join up the sections with Tiluma, both surfaces to be united must be spread thinly and held together in position until the Tiluma is set. This setting may be hastened by baking, or can be done instantaneously by running the flame of a gas burner or blow-lamp up the Tiluma joint. Then, when all the sections have been firmly joined, reinforce all the joints by applying a layer of Tiluma to the inner angles.



The minehead—a working model. The two cages actually work, and, from the same motor which drives them is the shaft to the bottom of the mine, which also works the endless cable drawing the little tubs.

Solid Modelling in Pyruma

Where solidity is required in larger scale work, Pyruma can be built up on any hard core, such as a wood block, a piece of rock or stone, etc., provided the first layer is plastered over the wetted surface of the core chosen, and is dried out slowly. Actually, solid modelling in Pyruma is confined mostly to small objects such as ashtrays, inkstands and small scale relief maps. If the solid model cannot be completed at one sitting, the modeller should either store it in a cool place and cover with a piece of well-dampened cloth, or, when commencing work again damp the hardened Pyruma when applying a new layer. One of the properties of this cement is its strong adhesiveness to any slightly dampened surface, including stone, steel or wood. As a third alternative solid models can be completed in definite separate sections, and after hardening the sections can be joined with Tiluma cement.

"Baking" the Model

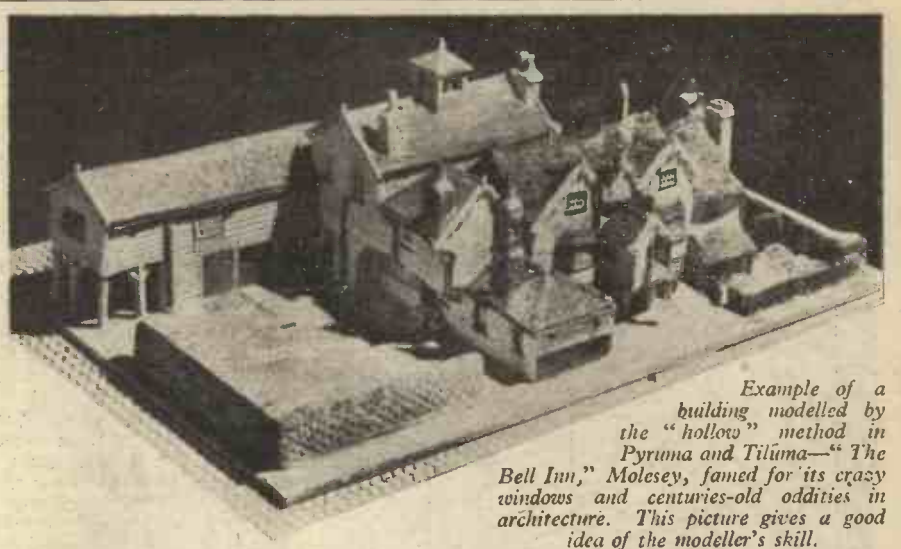
The "golden rule" to remember, whichever type of modelling you choose to do in this plastic cement, is to be sure that your Pyruma is thoroughly dried out and hardened inside as well as out, before applying colour. Then you will prevent efflorescence, or the exuding of a salt powder, often seen on the surface of some house bricks. "Make it and bake it" is the best possible way to treat your Pyruma model, otherwise you should give the material a long air-drying in a warm atmosphere or in the sun. If efflorescence shows after colouring, it can be removed by a rag slightly moistened with linseed oil and will probably not occur again.

In case of any difficulty in obtaining Pyruma, Messrs. Bassett-Lowke, Ltd., are stocking a limited quantity of this material in 1lb. tins at 7½d. and 2lb. tins at 1s., and Tiluma in 7½d. tubes, postage in each case extra. If you would like to see a modelling sheet, write to the editor.

Helping the War Effort

Commercial models for displays to help the war—Warship weeks, War Savings weeks, War Weapons weeks, and so forth—are now absolutely "at a premium," and no more will be made until the piping days of peace, so it is now up to the amateur model maker to do all he can to help in this way.

Some readers may remember reading, a few issues ago, about the fine *Queen Mary* and *Queen Elizabeth* models made and displayed by Mr. Joseph R. L. Aldridge, of Chalfont Villa, Totteridge, High Wycombe, Bucks.



Example of a building modelled by the "hollow" method in Pyruma and Tiluma—"The Bell Inn," Molesey, famed for its crazy windows and centuries-old oddities in architecture. This picture gives a good idea of the modeller's skill.

Relief map for military lectures, modelled in Pyruma Putty Cement over a core of sand under linen. Painted in natural colours after hardening, it represents a battle area 3 miles by 4 miles, with all the features of the landscape.

I have recently heard again from Mr. Aldridge, and the model warship shown in the illustration here is his latest effort.

A few weeks before last Christmas the Commanding Officer of the High Wycombe Naval Cadets wrote to Mr. Aldridge, asking for his help. Subsequently he called, and the help was defined as a "model destroyer." "I asked what was he willing to do towards it," writes Mr. Aldridge, "Would he give me the guns?" and the reply came 'Yes.' My wife, who was present, then said, 'I will give you two.'" So it was settled, and with this short preamble the model maker soon got down to his job.

The hull was made from the mould of the *Queen Mary* (which was described in the May issue), after alterations, and it is 10ft. 6in. long, 18½ in. beam, and is fitted out with 4.7in. naval guns, 3in. quick-firing guns, twin tubes, A.A. gun and searchlight and all breech-loading equipment, lifeboats with davits of correct pattern, and altogether represents a destroyer of 1,640 tons displacement of the Broke (Campbell class). It was wanted very quickly, and only about 10 weeks were spent on its construction.

At a parade of naval cadets, R.A.F., W.A.A.F., and Old Comrades on February 15th, Mr. and Mrs. Aldridge presented the boat and handed the deed of gift to the Commanding Officer. There was a church service, and, in company with other "influential people," Mr. Aldridge took the salute at the march past.

The model collected over £52 for the Warships Week, a fine beginning indeed, and let us hope it will continue to help other institutions in the same way.

The destroyer modelled by Mr. J. R. L. Aldridge, of High Wycombe, which is being exhibited for war charities. "Pounds and Pence are our Defence" is, of course, correct.

Odd Jobs in House and Garden

6.—Fireplace Repairs, Simple Draught Excluder, Furniture Renovating

By "HANDYMAN"

Fig. 1.—Using plastic cement for repairing the back and sides of a fireplace.

AT this time of the year it is a good plan to overhaul fire grates, especially those that have seen service for several years. Cracks in the sides or backs of the grates may be discovered, and these can easily be made good with plastic fire cement, which can be purchased at any ironmonger's shop. Well clean the cracks with a stiff brush, and apply the cement with an old table knife, or a small trowel, as in Fig. 1. Press the cement in firmly, and finish off level with the surrounding surface. Where a large crack has to be made good, small pieces of broken firebrick can be worked in with the cement, which can afterwards be "baked off" by lighting a fire.

Laying a Tiled Hearth

In cases where a cement hearth is badly damaged, it can be made good, and modernised at the same time, by laying a new one of tiles. A hammer and cold chisel will be necessary for removing the top layer of the old cement to a depth equal to the thickness of the tiles and cement used to fix them. Along the front and sides of this space fix an edging of planed hardwood, about 2in. wide, and flush with the floorboards, as shown at A, Fig. 2. Make a "screed," or traversing rule (B) from a piece of wood 2in. wide and ¾in. thick, and notch the ends to a depth slightly less than the thickness of the tiles.

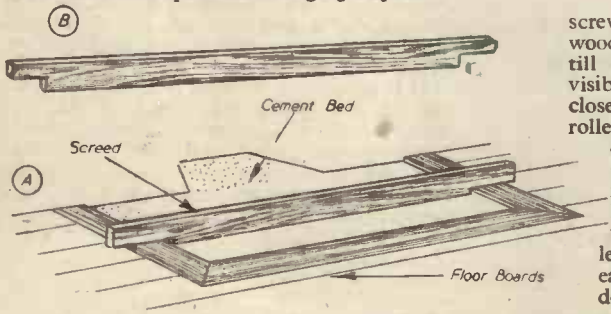


Fig. 2.—Using a "screed" for levelling the cement bed on a hearth.

Before proceeding further the tiles must be at hand. Measure the hearth and after obtaining sufficient tiles to cover it, lay the outer rows in position to make sure that they fit the space. Soak the tiles in water for at least one hour before laying. When ready, mix some Portland cement with water to form a stiff plastic mass. With a brush dipped in water thoroughly damp the surface of the old hearth, spread the cement mixture over it with a trowel, and level it by passing the screed slowly to and fro (while resting on the wood edging), as shown in Fig. 2.

Lay the tiles, as quickly as possible, from the border inwards, as in Fig. 3, and level them with the back of the screed. As the tiles are pressed down sufficient cement will work up in the joints, and any surplus can be wiped away with a damp rag. Allow at least 24 hours to set.

A good bedding for tiles that work loose in front of a fireplace can be made with plaster of Paris and whitening in equal quantities. These ingredients must be powdered finely and well mixed in a dry state; then mix with water to a thick cream, and use like Portland cement.

Simple Draught Excluder

During the winter months an unpleasant draught is often noticeable, coming from underneath a door. This calls for some sort of draught excluder; a simple but effective one can be made from part of a broom-handle and a piece of thick felt or baize. Cut a piece of broom-handle about 2in. shorter than the width of the door between the jambs, and cover it along its entire length with the piece of baize, or felt, as shown in Fig. 4. Fix the edges of the material in place with small flat-headed tacks. In the centre of each end of the wooden roller, bore a hole and screw in two stout round-headed wood-screws (one in each end) till only the plain shank is visible, as indicated at C. Having closed the door, lay the covered roller on the floor against the door—on the outside—and carefully mark the positions for two screw-eyes, which have to be screwed in so that the roller can turn easily when the door is opened or closed.

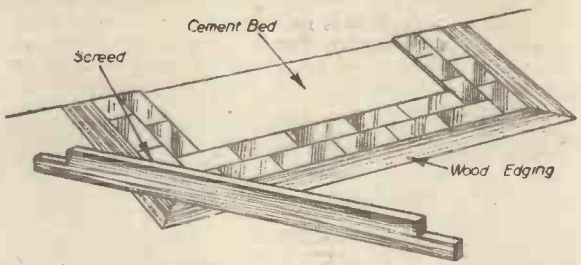


Fig. 3 (Left).—Laying a new tiled hearth.

After the screw-eyes have been screwed into the door, remove the screws at the ends of the roller, put this in place, and then insert the screws again, through the eyes. An end view of the roller fixed in position is given at D.

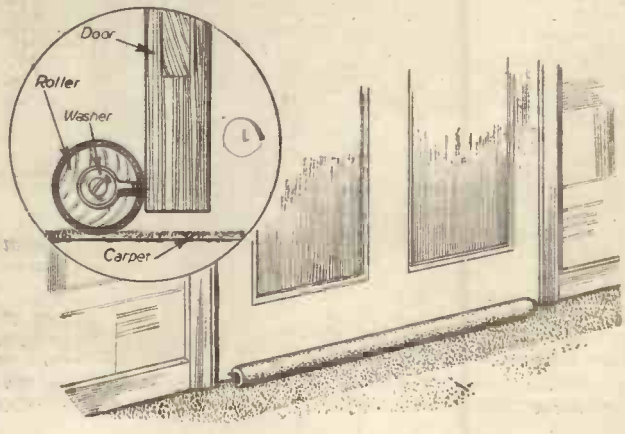


Fig. 5.—The finished draught excluder fitted to the bottom of a door.

The screw shanks will have a certain amount of play in the screw-eyes, and this will allow the roller to ride easily over the carpet or linoleum, when the door is opened or closed. Fig. 5 shows the finished draught-excluder fixed to a door.

Furniture Renovating

There are several furniture renovating jobs that can easily be undertaken by the handyman at home. For instance, a table with a worn and scratched top, and legs minus a good deal of the original polish. First, clean the top and legs with warm water, in which a small piece of soda has been dissolved. Go over it again with clean, warm water, and when quite dry rub down the surface with a piece of fine glasspaper. Remove all dust with a clean piece of rag.

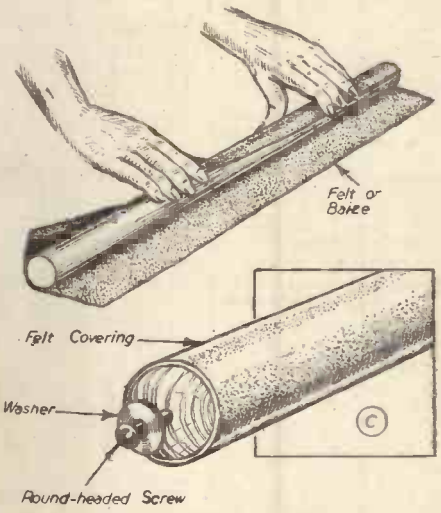


Fig. 4 (Above).—Covering the roller with felt, and detail of one end.

Obtain a bottle of French polish, and make a rubber with a pad of wadding wrapped round with a piece of soft linen, as at E (Fig. 6). Sprinkle a little polish on the pad, and rub it over the table top with small circular move-

ments, as at F. After going over all the surfaces to be treated, allow the polish to harden, and then lightly rub down with fine, worn glasspaper. Dust off, and then repeat the polishing process.

In cases where a bad crack develops in a piece of furniture, it can usually be made good with plastic wood, which can be pressed

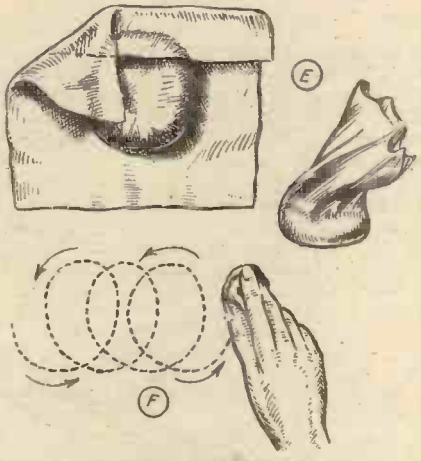


Fig. 6.—Method of making and using a polishing pad.

in with the blade of an old penknife, as in Fig. 7. After the plastic wood has hardened it can be smoothed off level with the surface, and polished or painted.

When kitchen chairs of the Windsor pattern show signs of wear the best way to renovate these is to use a good varnish stain, which stains and varnishes in one operation. It should be applied with a small flat brush. Any shade a little darker than the original colour of the chair can be used. One advantage of varnish stain is that it effectively covers up scratches and other small defects.

Fixing Loose Tiles

When white glazed tiles in a kitchen become loose, they can be securely refixed in place with Keene's cement. Before replacing the tiles, remove from the back faces as much of the old cement as possible, and soak the tiles in water. Mix the cement with a little water, to the consistency of cream, apply a thin layer to the back of one tile and quickly press it in place, as the cement sets rapidly. Treat the other loose tiles in the same way, one at a time. Use just enough new cement to allow the surface of the tiles to lie flush with the surrounding ones

Repairing Linoleum

The linoleum under the legs of a heavy piece of furniture sometimes becomes badly worn, and these worn parts can easily be made good in the following manner. First, take a piece of linoleum of the same pattern and from it cut four pieces slightly larger than the worn parts under the table legs, so that they match up with the pattern. Place a cut-out patch over each worn part and mark round it with a sharp knife. Remove the damaged parts of the lino, cut pieces of thin canvas, slightly larger, and lay them in place where the new patches are to come. Give the canvas a coating of hot glue, fit the new patches in place, and press them down. Place a heavy weight of some sort on each patch, and leave till the glue has set.

Treating Cisterns for Rust

When a boiler or water cistern shows signs of rusting, the following simple treatment will prevent further rusting, and will present a clean surface to the water. Empty the vessel and remove the rust by scraping and scrubbing with a hard brush. Obtain some quick-lime, slake it by splashing water over it, and when it has cooled off, put it in a pail and mix with water to the consistency of cream. Paint the

Fig. 7.—Using plastic wood for filling cracks in furniture.

surface with this, and brush it well in. When quite dry water can be run in the boiler or cistern as usual. It is not harmful to drinking water.

A Turn-table Switch

A Simple and Efficient Component for Various Uses

THE accompanying illustrations show an improved method of operating an electrical contact from a rotatable part, and is designed to give the maximum electrical contact for any desired period of time and frequency with the minimum of effort on the part actuating the contact.

The sketches illustrate the turn-table switch designed to open the contact once per revolution.

Constructional Details

Spindle A (Fig. 1) is mounted on a disc B, which has an indentation or projection D, and operates ball E. A plate C is mounted on the frame and has three holes for balls E and F. The hole for E can be elongated to give an extra quick opening of the contacts. G is a round pivoted disc, free to rotate in the opposite direction to B, and H is the moving contact having a recess for the pivot of G, and is kept lightly pressed against balls E and F by adjustment of spring J. An adjustable screwed contact, K, is also provided.

Spindle A is the operating spindle fixed to disc B, and can take any desired form to suit the manual or power drive applied.

The pressure of the contact is governed by the length of and strength of spring J, which can be designed to give a slight rub on the contacts going on and coming off by setting the spring short and curved. If required for an internal-combustion engine plate C should be allowed slight movement on the frame for variable ignition. Fig. 2 shows a section of the switch with the contact open.

For Slave-clock Control

The turn-table switch is specially suited for operating slave clocks, owing to the small torque that is necessary to give a good electrical contact. For this purpose the disc B can be mounted to the desired spindle, and the

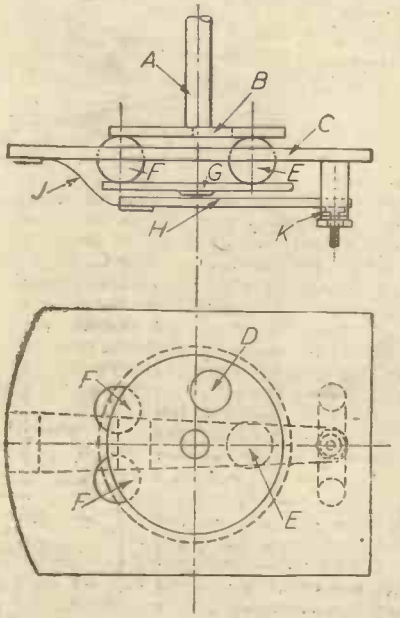


Fig. 1.—Elevation and plan of a simple turn-table switch operated by steel balls and a rotating disc.

disc can have the desired number of indentations or projections.

The switch can be operated by the spindle revolving at the rate of one or one and a half seconds per revolution in a synchronous motor, but the usual spindle to mount the switch on is that which revolves once per minute in a pendulum or synchronous clock. Another way is to mount the switch to the spindle that revolves once per hour, but travels in minute jumps. In this case disc B has 60 projections or indentations, and serves as a retainer, as well as a slave-clock control.

The size of the switch is not important, but 1 in. diameter for one or two projections or indentations, and 2 or 2¼ inch for a 60 projection or indentation disc, is recommended. Unless the switch is also acting as a retainer it is recommended that the hole in C for ball E should be elongated to give a quick opening of the contacts.

If it is desired to insulate the frame from the contacts, the pivot of disc B, and the spring, should be insulated in any desired manner. The pillars supporting the adjustable contact can be insulation material or the adjustable contact can be insulated from the frame in any other desired manner.

C. T. D.

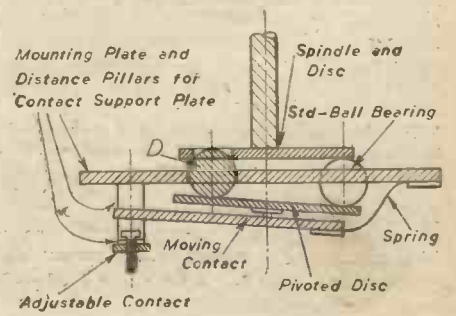


Fig. 2.—Section of the switch with contact open.

PHOTOGRAPHY

Darkroom Technique

How to Construct Serviceable Indoor and Outdoor Darkrooms

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

WHEN an amateur photographer becomes really keen about his hobby, it is quite natural that he should long for the time when he can claim one room in the house and be able to arrange this so that all his photographic work can be completed in it, thus avoiding putting the other members of the household to a lot of inconvenience. Those of you who have followed these articles have perhaps been able to do certain work quite comfortably in the kitchen, or even in the dining-room, when these have been available, but you have doubtless wished that you could go straight to a room and find all the apparatus, measures, dishes and bottles to hand, so that you could get down to the work in a few minutes without the trouble of clearing this, that and the other out of the way, and then having to put them all back again after you have finished your developing or printing.

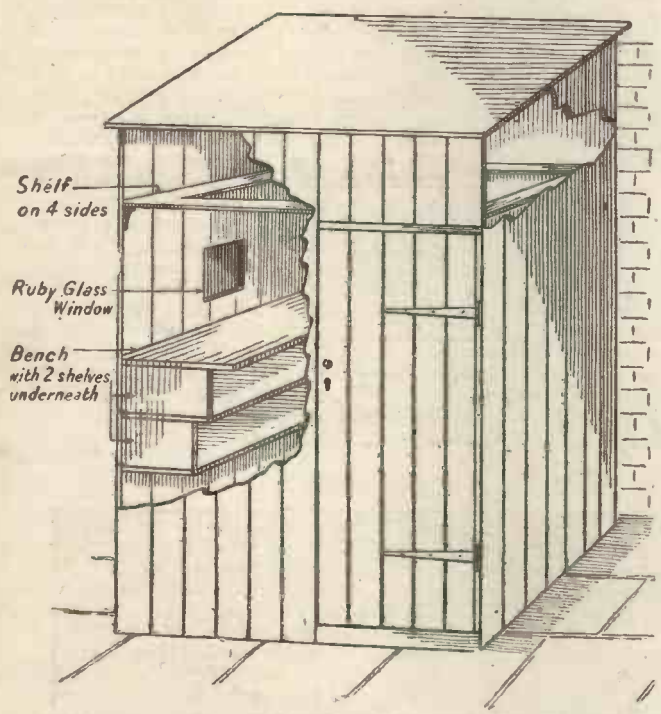


Fig. 1.—An outdoor darkroom, with part of front cut away to show shelving, etc.

In the course of many years' experience of photography it has been my lot to design or construct at least half a dozen different darkrooms for my own use, of all sorts and sizes ranging from a cupboard under the stairs to a room 9ft. by 8ft., from outdoor shed to an attic; and with each of these in mind, knowing their advantages and disadvantages, I will endeavour to put as many of you as possible on the right track for getting a useful place to work in, having in mind also the fact that we must, whether we like it or not, economise in material, such as wood, etc.

A Cupboard Darkroom

Just recently I was shown an empty space in the house of a man who was considering making a darkroom. This space may have been at one time a large store cupboard; it was very lofty so that many shelves could be fixed to the walls; it had a small window let in the wall opposite the door, and about 5ft. to 6ft. from the floor. The depth of the cupboard was 4ft., the width 2ft. 6in. It was of no use for enlarging purposes, but as the owner could do this part of his work quite easily in another room, without creating too much disturbance, he felt that he could utilise this space for most of the other work, and so it was agreed to place two 6in. shelves along one side wall, and, as the door opened outwards, to place the working bench under the window at a height of 3ft. from the ground. The bench was 18in. deep, with a narrow return bench or shelf 8in. deep along the right-hand wall from the bench to the door, and at the same height. Under the bench he built a small rack for dishes and managed to purchase for a few shillings an old cupboard with shelves which, with the aid of a saw and a few nails, was adapted to fill in the remaining space under the bench. There was, of course, no running water supply, but the bathroom was not very far from this cupboard, and he always works with a fairly large and deep dish of clean water at his side. Electric wiring was soon arranged, a bulb (for white light) being suspended from the centre of the ceiling, and red or orange light in the usual lamp which was hung on the wall immediately under the window, and, therefore, just above the developing shelf. The two shelves provided ample room for bottles and measures, while all sensitised material was retained in the cupboard. The wood used throughout the constructing was mostly old case wood on which a plane had been freely used.

Some of you may have a spare cupboard under the stairs with a door opening on to the hall or landing. Carefully take the dimensions of this, and consider them in relation to the darkroom just described; it might be possible to make a fairly satisfactory place in which you could keep your gear always handy for a little developing or printing to be done quickly. My first darkroom was such a cupboard, but as electric light was not available I was compelled to use a paraffin lamp which on one occasion insisted on smoking just while two half plates were in the course of being developed; it was impossible to open the door or to stop the work, so I had to endure the fumes until the plates could be transferred to the fixing bath.

An Outdoor Darkroom

This experience was the cause of my next move; there was no other accommodation in the house and so outdoors it had to be. Match-lining was moderately cheap in those days, and this was used for the walls, the framework consisting of 3in. by 2in. quartering bolted together. The roof consisted of some 1in. planks covered with tarred felt. The dimensions of this shed were 5ft. by 3ft. 6in., with a fall in the roof of 6in. from back to front of the structure. At the back the height was 6ft. 3in., and the front 5ft. 9in. Fig. 1 shows how the internal fittings were arranged. So successful was this shed that it remained in use for seven or eight years as a darkroom, and afterwards it was dismantled and re-erected at another house, but no alterations were called for in the actual arrangement of the fittings. It must be noted that such a shed was not adaptable for enlarging, for in those days the vertical type of enlarger was not known, and this work had to be done elsewhere. Another experience was quite an interesting one because it was in a so-called modern style of house, the third storey of which consisted of a very large room covering the greater part of the house, and out of this was a space leading to a dormer window. This space, which was about 4½ ft. wide and 9ft. long, had walls on the two long sides, the ceiling being tapered off where it joined the walls, but this did not matter for the height was about 7ft. from the floor. The entrance to it was open, so I partially closed this in with a sheet of three-ply supported on a couple of uprights, one of which was against the wall. This plywood sheet served for my easel for copying and enlarging. The width of the ply was 2ft., leaving a space of about 18in. as entrance to the room, and this was effectively covered with a heavy curtain. The fittings consisted of a home-made bench

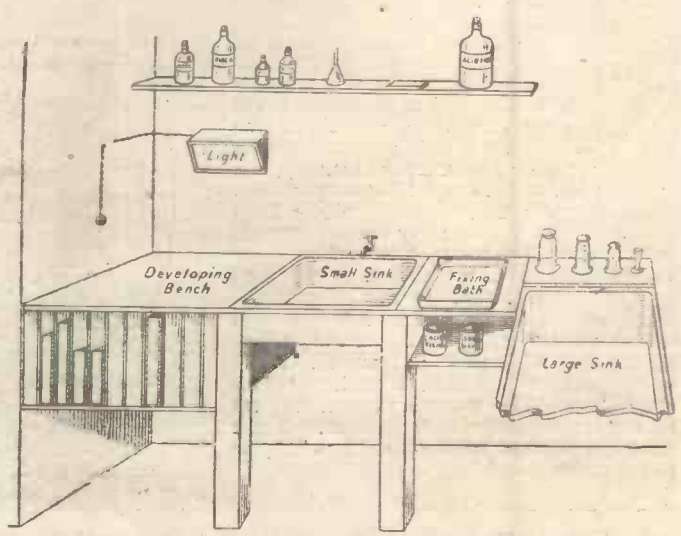


Fig. 2.—One side of a well-arranged darkroom.

6ft. long by 21in. wide, about 3ft. high, and the remaining space at the window end was filled by means of an old deal table which served as the developing bench, with room for a dish 24in. by 18in. As there was no water supply to this floor, all washing of films and prints had to be done in the bathroom on the floor below. The accommodation for storing apparatus and material was on shelves fitted to the supports and legs of the bench, and a useful box-cupboard under the table. Many very enjoyable hours were spent in this room over a period of three years, and some hundreds of films and prints made there. Although of small dimensions, the room provided ample space for working, and as it was very easy to open the window, the room was never stuffy.

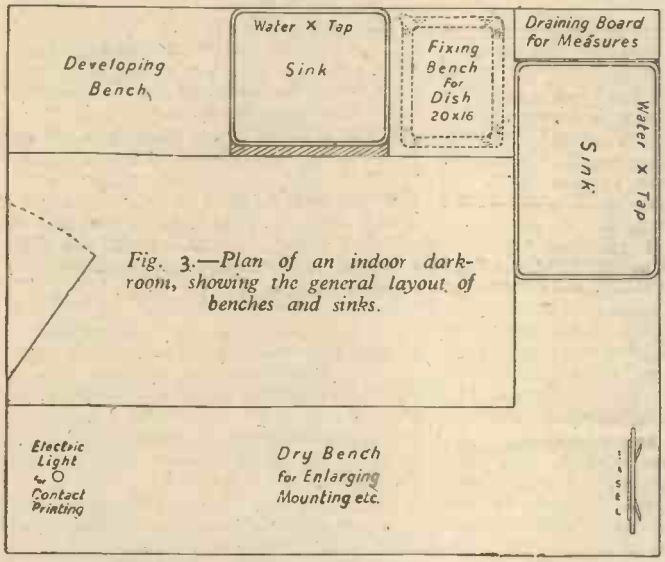


Fig. 3.—Plan of an indoor darkroom, showing the general layout of benches and sinks.

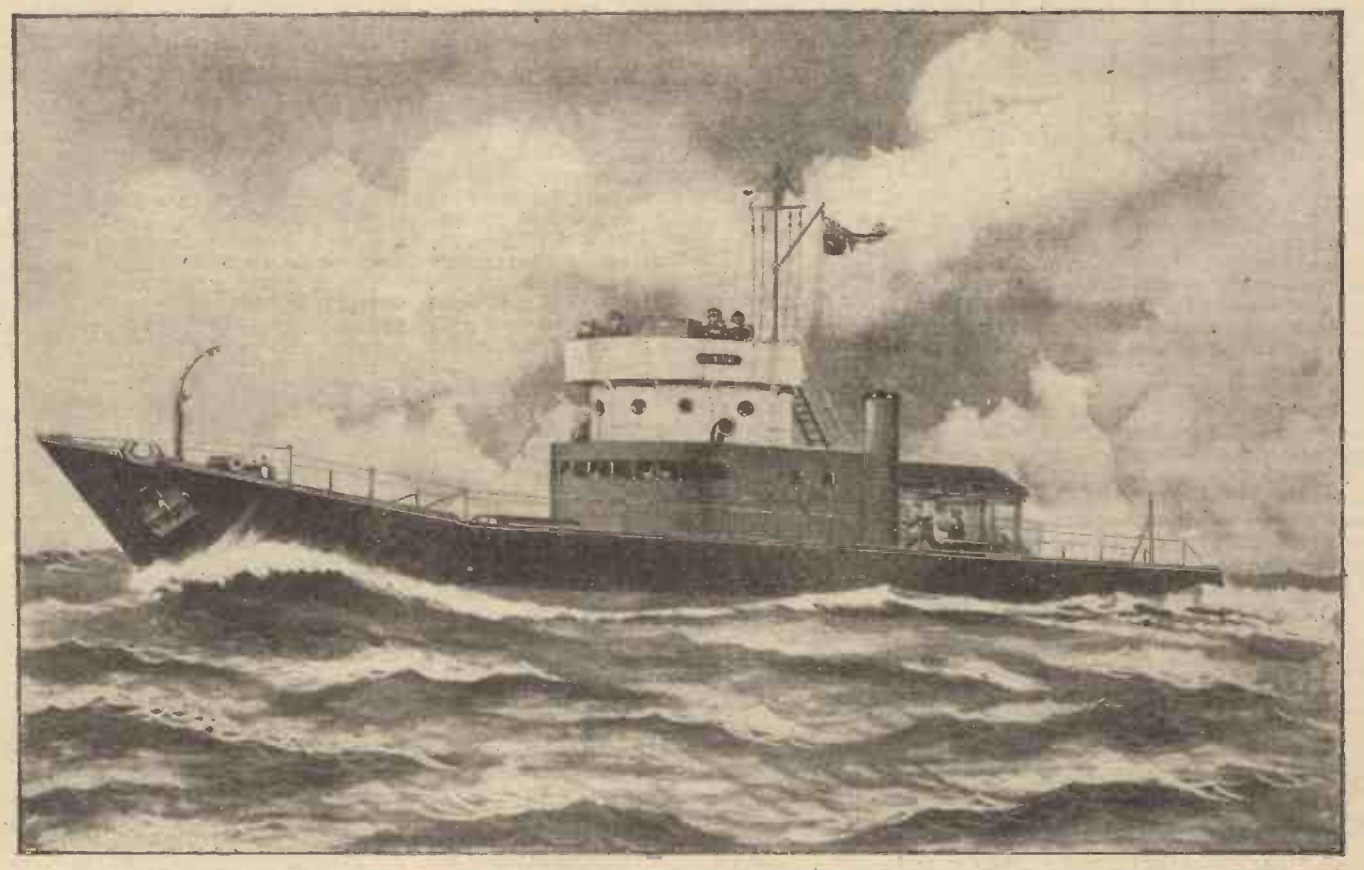
Before giving a description of an ideal darkroom here is a hint or two about the "bathroom" darkroom. Do not leave any stains on the porcelain bath or wash-bowl; it is not only unpleasant, but it is an indication that someone in the family is an amateur photographer who is careless and not clean at his work. Developer stains are not removable if they are allowed to dry on the surface of the bath, especially if they are caused from one of the new type of solutions known as "fine grain." If any person should have the misfortune to spill some of the solution, then it must be mopped up while it is still wet. If you are going to use the bathroom, then why not cover the bath with three-ply covered with American cloth and make a bench of it? The standard bath measures 6ft. by 2½ft. by 2ft. in depth, which makes it rather low, but it is easy to raise this another 6in. by the use of supports under the plywood. One of our most successful regular exhibitors never had any other room than his bathroom in which to do all his picture making, but he left the room spotless after using.

The Ideal Darkroom

I want now to give a full description of the best darkroom I have had or ever likely to have, and which was a great loss to me when the house had to be pulled down to make room for a larger building. There may be some who have got the means and space for constructing a serviceable darkroom, and they cannot do better than follow the general planning shown in the accompanying sketch (Fig. 2). The question of apparatus, apart from sinks, and the amount of money to be spent is for the individual to decide.

The space was originally fitted with a whole series of shelves on three sides, as it had been at some time a store for all sorts of bottles, jars and books and was open at the front. On dismantling, it proved to be 7½ft. across, with a possible depth of 9ft., and height of 10ft. In planning the layout I arranged for a bench to run along the three sides, and this was to be 2ft. in width, thus allowing 3½ft. moving room in the centre, the height of the bench from the floor being 3ft. Water was already laid on on this floor, so I made sure of plenty of washing conveniences. It will be noticed from the plan, Fig. 3, that two sinks were installed, one a fairly large one for enlargements, and a smaller one situated in between the developing and fixing benches. On the other side, and running the whole length of the room, was a bench for doing all "dry" work, such as enlarging, mounting, etc., and underneath the developing bench were racks for storing dishes, and a tub for waste paper, empty cartons, and other items which tend to untidiness. The door was 2ft. 6in. across, and opened inwards, a button being provided on the post inside to prevent anyone on the outside opening the door when work was going on. A ventilation trap over the door with another under the developing bench supplied a current of fresh air.

THE "SEA OTTER"



An 80 ft. model of the United States "Sea Otter" class of cargo vessel of arc-welded construction and intended for use in the Battle of the Atlantic. The full-size vessel has a length of 250 ft., beam of 40 ft., and depth of 21 ft. Further particulars of this remarkable craft are given in our issue for March, 1942.

QUERIES and ENQUIRIES

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

Rewinding a 12-volt Motor

I WAS very interested in the article "Armature Rewinding," in a recent issue, and as I have a C.A.V. 12-volt car starter motor I would like to rewind for 230 volts. Would you please supply me with the number of turns per slot required, also the number of turns for the field windings, which is 4-pole? I have a quantity of 22 s.w.g. d.c.c. wire and would like to know if this would be suitable. If not, please state size, etc.—A. G. Hicks (Ross-on-Wye).

IN order to calculate a suitable winding specification for the above conversion it is first necessary to know the dimensions of the armature and field magnet. The diameter and length of armature core should be given, the number of slots, the number of bars in the commutator, the sectional area of each polepiece, and the winding room on it. Also it is essential to know whether required to run on direct or on alternating current. Many of the low-voltage starter-motors in use make very poor high-voltage motors, partly because of their extremely short rating and inability to give much power without quickly over-heating, and partly owing to the small number of commutator bars, which, although suitable for low voltages, is a bad feature for higher voltages. If required for alternating current the motor is useless unless the fields and yoke ring are laminated throughout.

Acetylene Gas and a Motor Mower

I READ in the June issue of "Practical Mechanics" a paragraph on the use of acetylene gas for a petrol-driven mower. Would it be possible, using apparatus similar to that described, to run a motor-cycle of the 250 c.c. type on acetylene gas? I have some jets of various sizes taken from Primus stoves. Could I use them instead of the Amal jets described? Also, would it be better to insert a filter in the gas lead tube before the carburettor?

If I used apparatus similar to that described, how much carbide would I need, and how long would it last going at an average speed? I have been quoted by a local firm for carbide at 12s. for 28 lb. Is this a reasonable price or could I obtain it cheaper at the address mentioned in the June issue?—Paul Maslin (Hull).

WE are afraid that it will not be an economic scheme to run a motor-cycle on acetylene gas, even if the authorities permitted it. A 250 c.c. engine developing, say, half power, at 5 b.h.p., would require 5lb. of calcium carbide per hour to keep it going, or roughly 2s. 6d. for 40 miles, equivalent to petrol at 5s. a gallon. Replying to your technical queries, Primus stove jets would undoubtedly be too small; we do not think a filter would be necessary as the gas generated is quite clean.

We cannot help you on the question of cost of calcium carbide, but we can say that the price you mention is very reasonable.

Armature Winding

I HAVE an armature from an electric vacuum-cleaner motor, and it appears to be of foreign make. I cannot quite understand the winding. Particulars of the armature are as follows: Length of core, 1 7/16 in.; diameter of core, 1 9/16 in.; number of slots, 11; number of coils, 11; number of turns per coil, 95; number of commutator segments, 22. There were naturally two coil-sides per slot and the wire was .0092 enamelled and single silk covered. I cannot understand the 11 coils tapped to 22 commutator segments, but the coils may possibly be centre-tapped.

I have a supply of the necessary wire and would be pleased if you would inform me of a method of rewinding this armature.—J. M. Robinson (Runcorn).

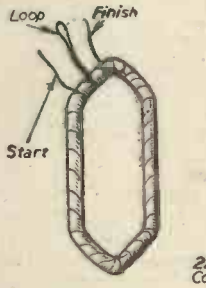


Fig. 1.

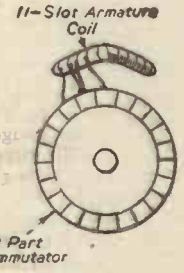


Fig. 2.

Details of coils and connections to commutator.

THE rule to remember in all armature winding problems is that there is always the same number of sections in the winding as there are bars in the commutator, although the sections may be grouped together and tapped up as one, in sets of two, three or even four, for ease of assembly in the slots. For instance, with an 11-slot armature core and a 22-part commutator, there would be 22 sections of armature windings, but they might be tapped up in pairs, making apparently 11 coils in all, each coil with a tapping taken out at the midway position. The finished tapped-up coils would appear as in Fig. 1, but there would be three connecting points, that is one start, one loop or tapping, and one finish, and their connection to the commutator would be as in Fig. 2.

Waterproofing a Concrete Floor

CAN you inform me of a treatment I could use to waterproof the surface of a concrete floor, which has been laid in a room in place of an old tiled floor after the removal of the tiles?

I am afraid the concrete was not quite as good as it might have been, owing to there being insufficient stone dust in the mixture to give a really close face. The floor is covered with linoleum which, after a short period, seems to attract moisture through the concrete, and sweats badly.

I have treated the floor with "Granger's Solution," Grade 1210, allowed it to dry, and then painted the surface with a grey priming paint. After about a week I find the paint has become wet. I have heard of water-glass solution as being a good thing for this, or is there a better method you could recommend?—R. Emmerson (Desford).

IT is always an extremely difficult matter to waterproof an unsatisfactory concrete floor, and, despite the claims of some experts' preparations for this purpose, the results are seldom reliable.

In the first place, however, you may like to experiment with one of the many concrete-waterproofing preparations which are on sale at all paint and decorators' stores. Alternatively, you might care to paint over the floor surface with a bituminous paint, such as "Mariolene" (British Asphalt and Bitumen, Ltd., Preston), but, even in this case, if the accumulation of dampness in the subsoil reaches any intensity, it will, in its rising, merely force off the paint layer or any other applied layer from the concrete surface. Water-glass solution is worse than useless for the job you name, If anything, its use will make the floor damper than ever.

Any lino or other covering applied to the concrete surface only delays the evaporation of water from the surface of the floor. The lino is consequently gradually rotted away, and because the water is unable to evaporate speedily, the lino appears to make the floor damper than usual.

The only radical cure for your trouble is to uplift the whole of the concrete floor and to replace it with a better type of concrete. Or, alternatively, to get your local contractor to lay over the existing concrete floor a 1in. layer of hard flooring asphalt. This, however, is an expensive job, and you would probably not be able to get it done in war-time. We feel, therefore, that, in your case, you must rely upon the efficiency of one or more of the

many proprietary waterproofing liquids which are on sale. These frequently contain casein, which is as good a waterproofer as any.

Electric Welding

I WISH to do some experimenting with electric welding and would be glad to know the simplest method, using house lighting supply, or batteries.—Hugh Norman (Belfast).

NO useful purpose will be served by attempting electric welding with current from small batteries. A minimum of 50 volts would be required, and a discharge capacity of 5 to 30 amperes, according to the scope of work you are experimenting upon. Even from the house mains you would find it an expensive process, as the mains voltage is much too high and would have to be reduced by means of a transformer to 40 volts, and the cost taken at "lighting" rates would be prohibitive. Welding from A.C. is less easily carried out than from D.C., and the usual procedure is to install a motor-driven direct-coupled generator giving a dropping voltage characteristic, to overcome the heavy rush of current due to momentary short-circuiting when striking an arc. Write to the Quasi Arc Company, of Bilston, Staffs, for particulars and prices of equipment. Many training and demonstration centres have been instituted by this company, one or other of which may be within your reach for instructional purposes.

Water-softening Chemicals

CAN you tell me how sodium aluminium silicate is made commercially? Can it be made from water-glass; if not, where can it be obtained? What are the chemical reactions concerned in this lime removal?—R. R. Gosden (Peel).

THE sodium aluminium silicate of commerce is made by the treatment of bauxite or other aluminium residues or ores with sodium silicate. We hardly think that you could imitate this process on the small scale, although you might try boiling up sodium silicate solution with alumina and filtering the reaction mass.

You can, however, procure this material in a form suitable for water softening from Burgess Zeolite Co., Ltd., 68-72, Horseferry Road, London, S.W.1. Also, we believe that Sofnol, Ltd., Greenwich, London, S.E.10, can also supply such material, and they will, we feel sure, be pleased to send you one of their brochures on water softening.

In the zeolite treatment of water for softening purposes, the sodium aluminium silicate (or artificial zeolite) gives up its sodium to the dissolved salts in the water, in exchange for the hardness-forming elements of the water, such as calcium and magnesium. The zeolite material can, after a time, be regenerated by filtering through it a solution of common salt. The chemical reactions involved are complex.

Glazing of Windows

CONCERNING the glazing of windows, will you please tell me if there are any more satisfactory alternatives to linseed oil putty, which, I have repeatedly found, shrinks and deteriorates in summer, leaving windows far from weatherproof? I may mention that I have experimented with a mixture of silver sand, whitening and water-glass solution. This hardens and seems as though it might serve, but its alkaline nature prevents painting.—J. D. Hughes (Harrow).

ANY variety of oil-bound putty will gradually contract with the lapse of time owing to the slow oxidisation and removal of the oil. Putties which do not contain oil have been experimented with for window-glazing purposes but they are not satisfactory.

The following putty contains about 20 per cent. of lead and its degree of shrinkage, even in really hot weather, is only very slight. For this reason we suggest that it may meet your requirements:

Whiting, 125 parts.
White lead, 38 parts.
Ground silica, 12 parts.
Raw linseed oil, 32-35 parts (according to required degree of softness of the putty).
Flour paste, 10 parts.

The flour paste is made up by beating 2lb. flour in one quart of *cold* water and by then pouring this cream into 3 quarts of *boiling* water, and by boiling for five minutes, finally allowing the paste to cool.

Wind-charging Dynamo

I WISH to re-wind a Lucas 12-volt dynamotor of the following dimensions: pole faces (four), 3in. by 2in.; armature diameter 4½in., length 3½in., slots, 43; com. bars, 43. I want to get all the amps. possible at a speed of about 350 revolutions per minute. Dynamo to be wind-driven. Please let me know gauge of wire and number of turns per coil for armature.—Thos. Freeburn (Tyrone).

IT is hardly likely that you will get much of an output at 350 r.p.m. even from an armature of the size you mention, as this speed is at the critical point for self-excitation. It can only be obtained by an extra number of conductors on the armature which, of course, necessitates using a smaller gauge of wire to avoid crowding the winding space, and the smaller the gauge the less the output in current. We suggest you wind the 43 coils with No. 20 s.w.g. special fine d.c.c. copper, wave-connected to the 43-part commutator, using the greatest number of turns per coil that the slots will hold after lining with 12-mil. leatheroid. The coil-span will be the same as that of the poles, that is 90 deg. with a 4-pole field. The rule for finding the correct pitch of armature connections to commutator is to place any one of the armature coils with its two sides at right angles to the centre line of one field pole, and then carry the coil ends down one to the main positive and one to the main negative brush. Having once set the pitch in this manner, the rest of the coils follow on in symmetrical order. Illustrations will be found in "Practical Armature Winding," by A. H. Avery.

Fixing a Commutator

I WISH to procure some insulating moulding powders for fixing the commutator on to the shaft of my electric motor. This is the way it was fixed in the first place, but owing to it burning out the commutator broke away from shaft. Could you advise me as to the best powders to use and where to obtain them?—F. Hodgson (Dartford).

IT seems doubtful if you will be able to remount the commutator on the shaft of the motor, since the segments are usually moulded in as inserts. This process requires a tool to hold the segments, and a press with which to compress the powder to about 1½ tons per sq. in. However, enquiries may be made to the following firms for suitable material: Messrs. De La Rue, Ltd., Walthamstow Avenue, Walthamstow, manufacturers of "Telenduron" bituminous moulding material.

Messrs. I. C. I., Ltd., The Hall, Welwyn, Herts, manufacturers of "Mouldrite" phenol-formaldehyde powders, which are thermo-setting, and, therefore, require "curing" under pressure for a few minutes.

Converting Tent into Tarpaulin Sheet

I HAVE an old tent and I wish to convert it into a tarpaulin sheet for use on a trailer. Could you please help me?—W. D. (Millom).

IT will not be possible for you to convert your old tent fabric into a true tarpaulin sheet, since tarpaulins are made by hot rolling between large pressure rollers; however, you can make a good imitation. Stretch the fabric out on a roughly-made frame and give it a good dressing on both sides with hot plain boiled linseed oil, giving the fabric sufficient of the oil to saturate it, but no more. When the fabric is dry, rub into it (from both sides) a sloppy paste made from boiled linseed oil and ochre or some similar pigment. It is best to incorporate a small percentage of paint "drier" with this paste in order to speed up its rate of drying. Do not add too much of the "drier," however, since if the oil-treated fabric dries too quickly, it will crack. The dressing should take about a week to dry. Finally, it should be rubbed over with finely-powdered ochre in order to remove any surface tackiness.

New Instrument-soldering Iron

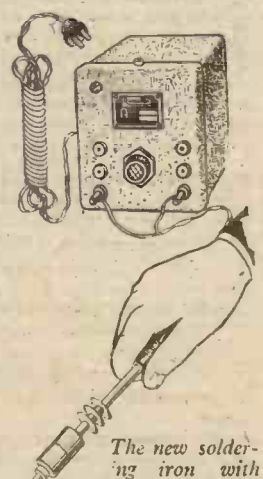
THOUGH many types of soldering irons are available, none has been found suitable for instrument and similar delicate work in confined spaces.

Messrs. Runbaken Electrical Products, 71, Oxford Road, Manchester, 1, have designed one for use in their workshops, and it has proved so successful that they have included it in their range of products. They state it definitely turns out neater work and speeds up production.

Manufacturers of electrical instruments, scientific instruments, etc., will be quick to appreciate its advantages for delicate work. It is accurately made, nicely balanced and well finished. Operation is through the transformer, so that low voltage current is supplied to the heating element, and breakdowns and renewals are unknown.

Specification

Weight, 5oz. approx. (without flex); size overall, 9in.; copper bit, adjustable and detachable (several types available), the standard bit, ⅜in. by ⅛in.; current consumption, 30 watts; handle, bakelite or similar material; cooling, radiating fins fitted to dissipate handle heat; finish, chromium; operation, by transformer, at 12 volts, and under these conditions the element will last indefinitely; transformer models available to operate from 1 to 50 irons, a pilot light being fitted to the transformer. It is suitable for 200/250 volts A.C. or to order. Models for D.C. mains are available. Prices range from £2 10s.-£12 10s.



The new soldering iron with transformer.

THE Cyclist

Editor: F. J. CAMM

VOL. X SEPTEMBER, 1942 No. 247

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

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

Comments of the Month By F. J. C.

The Position of Cycle Retailers

SOME time ago Mr. Oliver Lyttelton, who was then President of the Board of Trade, outlined to representatives of the technical press his scheme for the concentration of industry. It was necessary where particular shops or factories were not working at 100 per cent. capacity to telescope these firms to conserve transport and labour and in others to release labour for the Services. Three factories, for example, in that particular district might be unable to work to full capacity because of staff shortage. By combining the remaining staffs of the three factories one factory would be enabled to work up to its full productive capacity. Much of this concentration has already taken place, even in the case of manufacturers of branded goods with, of course, adequate safeguard for those whose wares were manufactured by secret processes. Much of the concentration has taken place in industries not associated with the war effort.

The principle has been applied to retail shops, and the cycle trade among many other trades will have to face up to the new situation. Materials are in short supply; spares and replacements are supplied on quota; manufacturers are not able to supply in pre-war quantities, and thus many retail shops have been merely ticking over and scarcely making a living. Some have indeed been running at a loss with no hope of being able to run at a profit until the war is ended. This means that some thousands of men (there were about 17,000 retail cycle dealers in the country before the war) have not been fully occupied. In a particular district there may be some dozens of cycle shops all retailing small stocks which could adequately be distributed by one shop, thus relieving the manufacturers of having to make up several parcels, keeping accounts for different firms, releasing men for more important work, and in other ways effecting economies. It may seem hard on those small retail businesses which have to close down, and the Government is alive to this hardship. The proposals of the Retail Trade Committee make it clear that those retailers who voluntarily withdraw from business for the duration of the war will receive compensation at the rate of 5 per cent. on turnover to meet continuing obligations. The payment will be made as long as obligations continue. Payment of compensation at the rate of 5 per cent. will be made in respect of the first £5,000 of turnover to traders who withdraw and have no contractual obligations, the payment being limited to six months only.

The Committee propose a levy of 1 per cent. on turnover on all traders continuing in business. Traders who withdraw will have a certificate giving priority of re-entry into the trade after the war. Those traders whose turnover is below £1,000 per annum are exempt from compulsory participation in the proposed scheme. Of course, at the time of writing the Committee's Report is in the form of recommendations only; whether they will be adopted by the Government is doubtful. Certainly they will not be adopted without considerable modifications and discussion with the representatives of those affected. As we see it, the situation is not likely to improve, for as from August 1st the manufacture and supply of many classes of goods have been prohibited or considerably reduced by the new Control Orders issued by the Board of Trade. All classes of sports goods and accessories, with the exception of clothing and gauntlets, as well as the manufacture of gramophones, gramophone records, and radio gramophones may only be made and supplied by manufacturers under licence. Most of these lines provided profitable side-lines for cycle dealers. The cycle retail business, therefore, is faced with temporary extinction during the war, and if the scheme in some form is not accepted, the retailer may find himself in the position of having to close down for want of stock and trade, and without compensation of any sort. At the same time the Government will remain alive to the needs of maintaining a sufficient number of cycle repair shops, especially in view of the fact that many more thousands of people are now cycling, now that private motoring has ceased.

Report of the Retail Committee

When the Report of the Retail Committee was debated in the House of Commons, the President of the Board of Trade, Mr. Dalton, stated that the opinion among those he had consulted was hostile to the proposals. The National Chamber of Trade was critical of the Report, and carried the war into the enemy's camp by insisting that the problem was not how to facilitate withdrawal from industry but how to keep the small trader in business. This rather suggests the problem of how to produce an egg from a hat without an egg or a hat and even without a conjurer. It was argued that the larger shops were getting a disproportionate share of the available supplies, that they were being too generously treated in the call-up of labour. There has been a formidable ray of opposition among the interests affected by the proposal and the Government must necessarily take account of these expressions of opinion. He said it would be foolish to try to force down the throat of those engaged in the retail trade a scheme to which a considerable number is opposed. He did not share the view that it is practicable in war-time, and probably it is not at any time desirable, to have a thoroughgoing rationalisation of the retail trade so that we have nothing left but multiple shops and chain stores. We agree with that view. The small trader built up the bicycle trade, and the large stores with their somewhat impersonal and disinterested outlook were not slow to cash in on the demand created. The small dealer gives individual attention to his comparatively small group of customers, whereas the multiple store exists chiefly to sell goods.

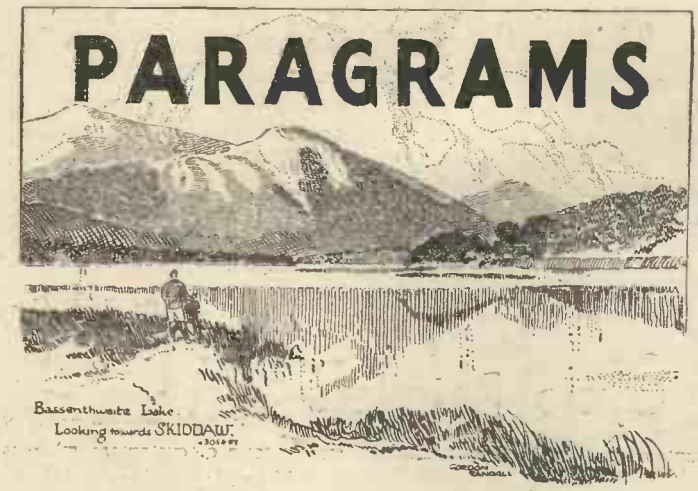
Mass-start Racing

THE N.C.U., having suspended and reinstated with a warning all those riders who took part in the Llangollen-Wolverhampton Race, is now faced with implementing the threat to give full effect to its powers if riders transgressed again. Other mass-start races have been held, and several more are in contemplation. This is a direct challenge to a governing body; it is argued on the one hand that the governing bodies—not only the N.C.U.—have not brought their ideas up to date, and that they still live in the past. The governing bodies on the other hand claim that they are democratic bodies on which clubs have their representation. The clubs, in fact, assisted in the framing of the rules. It is apparent that considerable numbers of riders want mass-start racing, and the main argument against it seems to be that it is not in the best interests of the sport, that it may cause dislocation of traffic, obstruction, endanger life, and that in any case it is illegal. If it is illegal (the point is by no means clear), the Home Office is faced with a dilemma, for mass-start races are being run with the approval and co-operation of the police. Mass-start races could be run by anybody not associated with organised cycling. Someone could start a mass-start race on a course used by time trialists, at the same time as the trial is in progress, and without reference to any governing bodies. If, therefore, the N.C.U. and the R.T.T.C. are to continue to exercise control, they must act firmly, otherwise their authority goes, and other controlling bodies will be set up.

Wood Blocks

THERE are about 500 miles of wood-block roads in this country, but they cause an enormous amount of traffic disruption every time we have a heavy storm. We encountered such a storm towards the end of June, when many of the wood-block roads in the London suburbs were thrown into heaps as a result of the rain. Wood-block roads were first laid in London, I believe, about 30 years ago, and they have always given rise to this trouble, but nothing has been done about it. Yet a slight modification of the design of the block would cure the trouble. If they were made with taper sides the traffic load would tend to lock them together, and they could not move under traffic conditions. Something should be done about this. Buses are stopped, and traffic is diverted when we suffer a heavy rain storm. Until someone complains nothing will be done. The House of Lords Select Committee, of course, recommended that wood-block roads should be abolished, but like so many other reports, recommendations are made, but no notice is taken of them.

PARAGRAMS



Against Cycle-thieving

SPECIAL measures are being taken in Cumberland to track down cycle thieves.

Lord Keith Supports Hostels

ONE of the keenest members of the Scottish Y.H.A. is Lord Keith, the Scottish law lord.

Nazis Requisition Bicycles

MOSCOW sources recently reported that the Germans were confiscating all bicycles in Norway.

Road Warning from Norfolk

THE Norfolk County Surveyor has stated that the present neglect of road maintenance will lead to trouble after the war.

Standard Meal Prices

PRICES of youth hostel meals in most of the hostels in Yorkshire and County Durham have been standardised at rates from 1s. 3d. to 1s. 6d.

Advice from the Bench

WHEN a private was acquitted on a cycle-stealing charge at Bromley (Kent) the magistrate advised the soldier to "forgo his leave and return to the Army" out of the way of temptation.

Coroner Condemns Riding Three Abreast

DURING the inquest on a Billingham cyclist, the deputy coroner drew attention to the danger of cyclists riding three abreast. While riding with two other cyclists the dead man was killed by a passing lorry.

Bicycle in Bushes

AT Hitchin Court recently a boy evacuee was stated to have stolen a bicycle from a local picture-house, and then hidden the machine in some bushes, riding it at night, because he did not wish to take it to his billet.

Famous Inn Still Open

THE famous Cat Hole Inn, at the head of Swaledale, in the North Riding, is still providing accommodation and food for tourists. The inn stands above the village of Keld, and close to Kisdon Force, one of the finest of Yorkshire waterfalls.

Cycle Path for Oxford

THE Samuel Commission, appointed some years ago by the Oxford Preservation Trust, has just recommended that a cycle road and bridge should be made across the River Cherwell to relieve the traffic congestion on Magdalen Bridge.

Progress by National Trust

THE annual report of the National Trust shows that despite the war its work of safeguarding places of interest goes on. The Trust is now a large landowner, in charge of over 100,000 acres of Britain. During last year some 16,000 acres were acquired.

Club Treasurer Marries

TREASURER of the Goldberry C.C. of Kilmarnock, Andrew Aird, has married Helen Cantley of the same club.

Soldiers Steal Bicycles

WHEN two soldiers were charged with stealing two bicycles at Mitcham Police Court, the chairman of the magistrates stated that a lot of bicycle stealing was going on, and the magistrates intended to stop it. The soldiers pleaded guilty and were fined £2 each.

"Halt" Sign Criticised

AT the Biggleswade Court recently, a man who claimed to have cycled in all parts of the country wrote that he had never seen a worse "Halt" sign than one at Stotfold. He added that the sign was overgrown with a hawthorn hedge. Along with two other defendants, the cyclist was fined 10s.

The W.A.A.F.'s Point of View

WHEN a member of the W.A.A.F. and an airman were fined 5s. each at Woburn (Beds) for riding two on a bicycle, the girl protested against trivial prosecutions. She wrote the court to say that when she got on the crossbar of the airman's bicycle a policeman was standing close by, and instead of warning them and saving the court time, he waited until they had gone some distance, and then rode after them.

Menace to "Moving-on" Touring

FROM some parts of the country come reports that a new threat to "moving-on" touring has arisen. The danger comes from one-time cyclists who are now taking their friends and families to catering-houses which formerly reserved accommodation for tourists. Instead of the appointments being available for regular tourists, they have been full during the summer with non-cyclists spending their holidays in the country instead of by the sea.

The Eskdale Railway

THE narrow-gauge railway between Ravenglass and Eskdale, in the Lake District, is at present doing a job of national service. It is to be reopened for passengers, however, at the end of the war, and all the rolling-stock, including the scale-model locomotives, is being kept in condition. The railway is a favourite with tourists who travel along the Westmorland coast, and many cyclists take a day off their machines to travel by it.

New Suffolk Hostel

A NEW youth hostel has been opened at Finningham, eight miles north of Stowmarket, in Suffolk. There is accommodation for six men and four women.

Queues for Bicycles

THE latest queues are for hired bicycles. At Rothesay, the Firth of Clyde resort, there were long queues for such machines during the Glasgow holiday period.

New Road Link for Wales

POST-WAR plans for Wales include a modern arterial road between the North and South, as well as further development of the coast and inland resorts.

Food Problem Solved

MR. HOWARD, warden of Malham (West Riding) youth hostel, has partly solved the hostellers' food problem by growing crops on the hostel land, and on a nearby fellside.

Good Work by a Dealer

A MANCHESTER bicycle dealer who bought a bicycle for 35s., but first examined the identity card of the seller, promptly notified the police when they circularised details of a stolen machine similar to the bicycle. Arising from the dealer's smart work, the thief was traced to Stockport, and was later found guilty at Rochdale of stealing five bicycles in all. The man was sent to prison for a total of nine weeks.

Girl Rider's Weekly Mileage

EILEEN JORDAN, the 20-year-old-cyclist, who has been putting up some wonderful rides (including the women's 25-mile tandem record, with Joyce Dean, of 1h. 6m. 6s.), cycles about 400 miles a week, including daily trips of over 30 miles.

New R.T.T.C. Committeeman

STEVE PONTIN, Finsbury Park C.C., has been elected to fill the vacancy on the R.T.T.C. National Committee, caused by the resignation of W. Frankum, North Road C.C., now in the Army.

Club Champion Passes Over

CLUB champion in 1896-7, A. C. Oram, one of Southgate Cycling Club's vice-presidents, has died.

Deputy Secretary of R.T.T.C.

NATIONAL duties of the R.T.T.C. are being handled by F. A. Beardsmore, 131, Keyham Lane, Leicester, the former secretary having joined the R.A.F.

Club Riders Missing

SERGEANT PILOT JACK KEEN, Finsbury Park C.C. official and well-known time-trialist, is reported missing following a raid over enemy territory. He had been posted with Sergeant Pilot Arthur Lewry, Kingsdale C.C. (who is also missing), from the early stages of his training both in this country and in Canada.

Veteran's Diamond Wedding

W. SHAKESPEARE, of Guildford, who finished third in the Six Day Race in the Agricultural Hall, Islington, in 1880, has celebrated his diamond wedding.

Bath Roaders in Royal Navy

FORMER winner of the Bath Road "100," Ruben Firth is now in the Royal Navy, as is another previous winner—Keith Mosedale.

T.T. Secretary Killed in Action

FOUNDER member and former time-trials secretary of the St. Christopher Catholic C.C. of Leeds, Sergeant Pilot B. Williams has been killed in action.

Scottish Tandem Record

JOE MACRAE and Duncan McCullum, Douglas C.C., made the first Scottish place-to-place record for two years when they beat the existing figures of the Scottish R.R.A. tandem record from Glasgow-Dundee-Glasgow by two minutes. Their time for the 104 miles was 7h. 51m. 6s.

More Missing Clubmen

ALBERT LAXTON, Vegetarian C. and A.C. enthusiast and member of the East Clarion C.C., is reported missing in the Middle East. Another cyclist reported missing in the Middle East is Gunner Clarence Moore, Keighley C.C.

Dave Ricketts Rides Again

FORMER crack member of the Polytechnic, Dave Ricketts, invalided from the Royal Navy, is again in action on the track.

Club Events for Red Cross

ST. NEOTS and District C.C. aim at raising £250 for the Red Cross by means of cycling events. Last year the club raised £120.

Scottish Club Seeks New Members

RECOGNISED as one of Scotland's strongest pre-war club, the Johnstone Wheelers seek new lease of life by the introduction of new members.

New Clubs Join N.C.U.

WITHIN a few weeks 23 new clubs applied to the National Cyclists' Union for affiliation.

Prisoner of War

NEWS is to hand that H. W. Buckingham, one of London's well-known pre-war massed start riders, who was reported missing following a raid over enemy territory, is safe and in Italian hands. He was a sergeant pilot.

Catford Member's Death

CATFORD C.C. mourn the death of Sergeant Air Gunner J. Macmurdie, R.A.F., who lost his life in a flying accident after returning safely from a number of heavy bombing raids over Germany. He is the fifth of 76 serving Catford members to make the supreme sacrifice.

One-armed Rider Award

HIGHGATE C.C. have made a special award to R. Brown, a one-armed rider, who clocked 4h. 56m. in their open "100", but who failed to figure in the prize list.

"Holidays at Home" Events

IN connection with "Holidays at Home" many clubs are promoting grass track events in their areas. Clubs are also arranging evening spins for nondescript cyclists.

Club President Presents Trophy

"IN remembrance of 50 happy years membership" is the apt inscription on a trophy presented to Southgate Cycling Club by G. C. Oram, champion in 1892-3, and former president.

President of F.O.T.C.

THE reigning president of the F.O.T.C. is T. G. Scarfe, secretary of the organisation from 1933 until recently.

"Crack" Rider's Marriage

FORMER Queensbury Road "crack," Jack Shackleton, now serving with the Forces in Scotland, has married Miss Margaret Bradshaw.

Bath Roader's Adventures

PETER COLES WEBB, son of E. C. Coles Webb, well-known Bath Roader, is understood to be interned in Algiers, after some amazing adventure, which included two shipwrecks.

Around the Wheelworld

By ICARUS

The old church at Rudgwick, near Horsham, Sussex.

The Wheelers' Fraternity

HEBERT GOODWIN, who is directing the Special Cyclists' Appeal for the Duke of Gloucester's Red Cross and St. John Fund, tells me that cyclists have started a new drive to help the national war effort, in founding the nation-wide Wheelers' Fraternity in aid of this worthy cause. Every member has to promise to ride his or her cycle whenever it is reasonable to do so, instead of using buses and trams. By this means they will conserve fuel needed for the Services. The founder members are Mrs. Winston Churchill and Sir Stafford Cripps. The Fraternity was, of course, started by Herbert Goodwin, the president of the Pickwick Bicycle Club, which, no longer an active cycling club, is the oldest bicycle club in the world. All members of the Wheelers' Fraternity agree to help each other on the road, and every rider in the country is eligible to join. A letter to the Hon. Secretary, Wheelers' Fraternity, 22, Lancaster Gate, London, W.2, with a postal order for 1s. or more, and a stamped and addressed envelope for reply, will bring a badge and a membership card. All monies go to the Red Cross Cyclists' Fund. Patrons of the Special Cyclist Appeal for the Fund are J. B. Brooks & Co., Ltd.; B.S.A. Cycles; County Chemical Co., Ltd.; Currys, Ltd.; Dunlop Rubber Co., Ltd.; Rudge Whitworth, Ltd.; Raleigh Cycle Co., Ltd. Vice-patrons are: Aberdale Cycle Co.; Bluemel Bros., Ltd.; Enfield Cycle Co., Ltd.; Halford Cycle Co., Ltd.; and Vice-Presidents are: Armstrong Cycles, Ltd.; Belstaff Mnfg. Co., Ltd.; James Grose, Ltd.; Dawes Cycles, Ltd.; and the Norman Cycle Co., Ltd. Clubs can help in this appeal. They can vote an annual subscription from the club funds; they can give Red Cross certificates as awards in their events, and donate the prize values; they can promote outdoor and indoor social fixtures, such as rallies and dances with a Red Cross appeal. Suggestions will be welcomed by the organiser at 26, Burleigh Mansions, Charing Cross Road, London, W.C.2. The Red Cross Sports Committee's Appeal during the war has collected over £180,000 up to December, 1941. Of all the sports which have contributed to this large sum cyclists are almost at the bottom of the list, and it is Mr. Goodwin's intention that they should show up more favourably as a result of the present appeal. Make sure when sending donations to the Fund that you clearly state on the envelope, and on the letter, that the donation is sent in response to the Cyclists' Appeal.

Waterloo Bridge

I WAS one of the first to cross Waterloo Bridge on the first day of its unofficial opening. At the head of the file of traffic was a horse-drawn vehicle driven by a torpid upside-down-pipe-smoking driver. It took nearly six minutes to cross the bridge, which was opened to two lines of traffic only. This was not a very happy augury, and it raises once again the question of horse-drawn traffic on the busy streets of London. The horse may come into its own again during the war, as petrol vehicles are parked for the duration, unless the Government further restrict foodstuff for horses. But that is no reason why they should be permitted at a time when we are told that every second we waste costs lives, to delay road travellers. After all, everyone who is travelling to-day is engaged on essential work. The horse-drawn vehicle, with its leisurely progress, is too vivid a reminder of the mentality of our pre-war politicians, and especially our pre-war Ministers of Transport. In any case, the temporary bridge across the Thames at Waterloo could have been used for one-way traffic of slow-moving vehicles. The incident to which I have referred suggests that our present War Transport Ministry still has its mind back in pre-war days.

More Cyclists Than Ever

WHILST the press has been reporting the presence of large numbers of cyclists on the roads since the parking of cars, I have not noticed any greater number of cyclists along the by-ways—in fact, less. Many tens of thousands of people may now be cycling to and from work, but the deserted by-ways encourages the thought that at week-ends these people do not cycle. During a 40-mile spin the other Saturday afternoon in Surrey a friend and I encountered three. At the teashop we were the only customers. Now a great deal is expected of those who have been driven into the ranks of cycling as a result of the petrol restrictions. I mean that the cycle industry is expecting them to remain as cyclists after the war. If that is the desire, the cycle trade should do something about it now. I have no doubt many of these new cyclists are finding it hard work, partly because they have not cycled for many years, but more probably because they are riding unsuitable bicycles. Cycle dealers, short as they are of stock, and in spite of the efforts to clean up the bicycle trade, still sell any sort of bicycle, whether it is suitable for their customer or not.

The founding of clubs and societies from an idealistic point of view should not be considered as having achieved an end nor be honoured by awards until the end has been achieved. Before the cycle trade can be properly cleaned up it will have to be made more attractive to an intelligent younger generation to enter as a trade. A lot needs to be done in connection with the bicycle itself. In many ways it remains, like the minds of many of the old-timers, back in the 'nineties. Which invites the thought that little will be done until some keen cyclists with more modern ideas enter what we like to consider as a *movement*, the cycling movement. Actually there is no such thing as a cycling movement. A few thousands of people belong to this society or that out of a total of, shall we say, 12,000,000.

Tricycle Records

GEORGE LAWRIE and R. Morford, of the Viking R.C. and the South Western R.C. respectively, created new 12-hour and London to Bath and Back tandem cycle records in one ride, the former by three miles, and the latter by 28 minutes. The new figures for the Bath and Back are 10 hrs. 50 mins. 34 secs., and that for the 12-hour, 232½, thus beating Ferris and Rowell's Bath and Back record of 11 hrs. 18 mins. 19 secs., and the 12 hours of Jonas and del Banco's 229½.

Works Councils

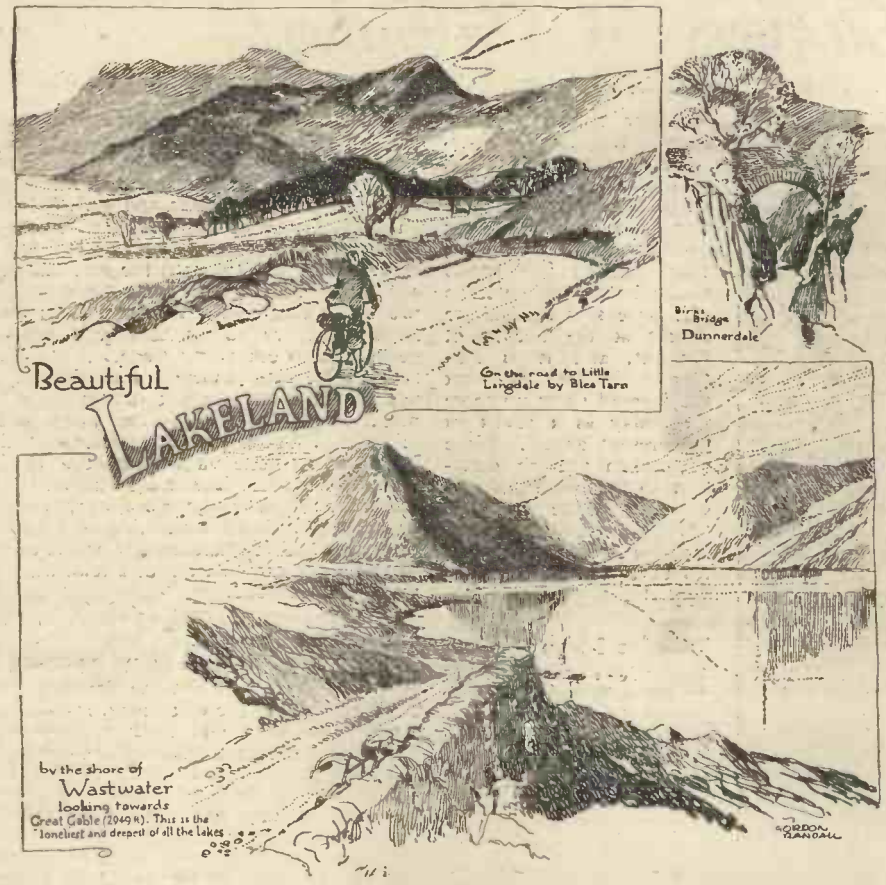
WORKS councils are often thought to be one of the war-time innovations in British industry, but they had actually been in existence for a number of years in some of our leading factories. A works council was started by The Coventry-Eagle Cycle & Motor Co., Ltd., as far back as 1933, at the instigation of Mr. A. Douglas Mayo, the firm's managing-director, who declares that his experience has convinced him of the value of these joint boards of employers and employed. This council, which must have been among the first to be constituted in the cycle and motor trades, has just been reorganised to meet the special needs of present conditions.

Canadian Bicycle Advisory Committee

THE Canadian Munitions and Supply Dept. announced the appointment of a bicycle advisory committee to co-operate with Supplies Controller Alan H. Williamson, in connection with control of bicycles and their place in the Canadian war programme. Since manufacture of automobiles in Canada ceased, as plants were converted to the task of turning out war weapons, demand for bicycles has increased enormously. Rationing of petrol and the shortage of rubber for tyres have also stepped up the demand. Many people who ordinarily drive cars are now seeking to obtain bicycles for travel back and forth between their homes and places where they work.

At the same time manufacture of bicycles has been sharply curtailed to conserve vital metals and to release workers for transfer to essential war industries.

The order issued by Mr. Williamson and approved by R. C. Berkinshaw, chairman of the War-time Industries Control Board, named H. O. Higgins, of Weston, Ont., as chairman. Associated with Mr. Higgins will be V. G. Sayers, of Toronto, and S. Mace, of Waterloo, Quebec.



Cyclorama

By H. W. ELEY

Rubber Supplies

SINCE our rubber supplies were so reduced by the loss of the Malayan plantations, and the Dutch East Indies, I have had many talks with riders about rubber . . . so often called "The Product of a Thousand Uses." And I have been rather amazed at the lack of knowledge of this essential raw material—and its places of cultivation. One good fellow, chatting to me over a welcome tankard of ale in an old inn somewhere near Henley-in-Arden, suggested hopefully that as Malaya had gone, we should doubtless get our rubber from America! The optimistic comment made me smile . . . when I remembered that raw rubber had for years been one of America's "industrial headaches." Before we parted in that old inn, I had been able to impart a little knowledge about world production of raw rubber, and inform my cycling friend that some 340,000 tons came annually from Malaya, and about the same amount from the Dutch Indies. He was suitably impressed—and went away vowing to think out how some alternative material could be used. Actually, I do not suppose that it would be beyond the abilities of our industrial chemists to produce something to take the place of rubber for cycle tyres . . . though I am going to take extra care of my "roadsters" and obey all those simple little hints on care and maintenance which now form the backbone of the advertisements put out by the cycle tyre manufacturers.

Old-time Cycles

MY recent references to famous old-time names of cycles has brought me almost a "fan-mail"—to use a phrase associated with that glittering and glamorous world where stars of the screen have their being. Someone writes to me asking why I did not mention the Raglan, the Cluley, and the Centaur. Well, I was not endeavouring to give a catalogue of names famous in the days of long ago . . . but I am glad to add the foregoing to my little list. All are remembered with affection. All have their honoured place in the great gallery of immortal cycle names. One correspondent, a Centaur enthusiast, sent me a snapshot of himself beside his machine . . . and called attention to his "boater" and long moustaches! Happy memories!

The Weather—and Old Cottages

AS I write these rambling notes, the rain is tumbling down, the skies are grey, and there is a wind blowing which sounds more in keeping with October than the months of summer. But I am not grumbling about the rain . . . my garden needed it badly, and I know that the following sunshine (which will surely come) will "bring on" my peas, and spinach, and carrots, and beet, and parsnips—and all the other good things which grow in that garden which, not so very long ago, was a piece of untilled waste land. To-day, I could almost wish that the Minister of Food himself might see it—so useful a part is it going to play in the great effort to grow more food. And, talking of the weather, I recall that I made a note in my diary recently that there would be a sharp frost in the very near future. I did so because an old countryman, well versed in weather-lore, assured me that I could "bank on" such an occurrence. And you know how often these old weather-prophets are right in their predictions! Well, the night passed without the frost . . . and I shall duly chide that countryman . . . who lives in a cottage in Warwickshire, where he was born nearly eighty years ago; a tumble-down cottage, but very picturesque . . . and though no modern housing reformer would tolerate its remaining, it is a bit of England and the English scene. I admit to being a sentimentalist about old cottages . . . with roses round the door . . . and thatched roofs . . . and little diamond-paned windows. They may be unhealthy, but I do so prefer them to the ugly stucco dwellings erected by the modern builders. But I'm glad we escaped that frost . . . for it would have just played havoc with the young fruit.

Durham Attractions

COAL mining and miners are very much the topic of the day, and a week or so ago I talked with a Durham ex-miner who was doing a little cycling tour round Shakespeare Land. He chatted in interesting fashion about his native Durham and corrected any impression I may ever have had that Durham was nothing but coal and the grime of the collieries. There are, of course, wild and beautiful areas in that county. There is history, too, for Durham Cathedral was built as far back as 1093. Actually the ecclesiastical history of Durham goes farther back than that, for the monks of Lindisfarne selected the place as the site for a religious settlement in A.D. 997. It is doubtful whether any of our cathedrals is placed on a site of greater beauty. Durham is a cathedral of stern and massive grandeur, fitting indeed for that rugged northern land.

At the head of the Great Langdale, in the Lake district.

The Marquess of Queensberry

By C. A. (Bath Road) SMITH

The Marquess of Queensberry and C. A. Smith on a tandem in the 'nineties. This photograph was picked up in hospital lager at Modder Spruit, near Ladysmith, on April 7th, 1900, by G. H. Hiscock.

"THE Sporting Queensberrys," by the Tenth Marquess of Queensberry, is an interesting volume, but curiously enough not a word is said about the Lord Queensberry, and his cycling activities, who, in July, 1894, became a vice-president of the Bath Road Club. At the time of his appointment, introduced to the club by Harry Burr, Sir John Aird, M.P., was president of the Bath Road Club. "Q," as he was known in the club, took an active part in the club's cycling affairs. He attended the runs, did a little boxing, and later competed in the road handicaps. "Q" took the chair at the club's annual dinner in 1895. In proposing the health of the club he remarked that it was his first appearance in the chair since he joined the club. Cycling had become as enjoyable as ever the horse-riding had been to him in his young days.

The question of high and low gears at this period—1896—was being discussed everywhere in cycling circles, and this led to a challenge from C. B. Lawes, later "Sir," the famous sculptor, championing the high gear, to "Q" to race him over a distance of, say, 10 miles. "Q" accepted the challenge, and on February 26th, 1896, the race took place on the Ripley road. Here I must tell you that the police somehow or other got the information that something was on! Just at that time the police were persecuting cyclists all over the country, with Kingston holding the lead. [Disgraceful—ED.] On the morning of the race police were noticed outside the White Lion Hotel at Street Cobham. Now, as the race was to be started just close to the "Hut," it was thought desirable to reach the starting point by stealth. At the back of the "White Lion" is a field, which presented a good means of avoiding notice, so away the party went with the timekeeper (E. A. Powell), making through Chatley to the Ripley road. "Q" was riding a low gear, about 65, and Lawes a high, 84. "Q" had been advised to get off the mark as quickly as possible; this he did and was soon a few yards ahead. He increased his lead every mile. At the turn Lawes changed his mount to one with a lower gear, but it was of no use; "Q" retained his lead and finished quite two minutes before Lawes arrived. As we all knew the police were still waiting for us in Street Cobham, we crawled back to the "White Lion" and chuckled to see the police force waiting. There was nothing they could do, no "furious riding," no nothing! So they eventually issued a summons against Sir Claude de Crespigny and the writer of these lines for riding "to the danger" earlier in the morning down Pains Hill. Sir Claude, never having ridden a cycle, was taken for a spin some hours before the match, and, of course, he could not keep his feet on the pedals of the tandem going down the hill. It so happened that the superintendent and a sergeant were walking down the hill, too. They followed us into the hotel and took particulars of Sir Claude's name and address—and mine! I remember that I had to spell Sir Claude's name, as these poor chaps could not tackle the job! Two witnesses testified that there was no danger to anyone, because there was no one to endanger. But, of course, the Kingston "unpaids" ignored this fact and we were fined 25s. each! So I suppose one may wind up by stating that the police had not altogether wasted their time.

In June, 1896, "Q" was given 16 minutes' start in a club handicap and finished last. In a "50" in September, with one hour's start, he got second place. He had a fall and a puncture, too, in this competition. "Q" reported: "I had a bad fall about 30 miles on the road and rather smashed up my machine. I hurt it more than I did myself, and from that point could get no greater pace out of it than 10 miles an hour!" In 1897 "Q" missed several races, but started in the fourth with 45 minutes' start. He finished seventh, his net time being 3 hours 26 mins. for the 50 miles. Not bad for an old man over 50 years of age! He was always full of pluck and vim and always did his best to ride fast, when occasion required.

I always feel sorry when I think of our parting. He had gone to the Oatlands Park Hotel, and after some days I received a letter from him explaining why he had left. He had come to the conclusion that I was trying to poison him, so he thought it best to clear out! We never met again, and from the letters which are reproduced in "The Sporting Queensberrys" which "Q" wrote to his son, after the Oscar Wilde case, one can see that he was mentally afflicted.

Bicycle Design in 1896

"A BICYCLE or a tricycle is a more or less complex machine," said Professor Archibald Sharp, B.Sc., in 1896 ("Bicycles and Tricycles," Longmans, 1896), "and for a thorough appreciation of the stresses and strains to which it is subjected in ordinary use, and for its efficient design, an extensive knowledge of the mechanical sciences is necessary. Though extensive literature on nearly all other types of machine exists there is, strange to say, very little on the subject of cycle design; periodical cycling literature being almost confined to racing and personal matters. . . . In the present work an attempt is made to give a rational account of the stresses and strains to which the various parts of a cycle are subjected. Only a knowledge of the most elementary portions of algebra, geometry and trigonometry are assumed, while graphical methods of demonstration are used as far as possible. It is hoped that the work will be of use to cycle riders who take an intelligent interest in their machines, and also to those engaged in their manufacture. The present type of rear-driving bicycle is the outcome of about 10 years' practical experience. The old ordinary, with its large front wheel, straight fork and curved backbone, was a model of simplicity of construction, but with the introduction of a smaller driving wheel driven by gearing from the pedals, and the consequent greater complicity of the frame, there was more scope for variation of form of the machine. Accordingly, till a few years ago, a great variety of bicycles were on the market, many of them utterly wanting in scientific design. Out of these the present-day rear-driving bicycle, with diamond frame, extended wheel base, and long socket steering head, the fittest has survived. A better technical education on the part of bicycle manufacturers and their customers might have saved them a great amount of trouble and expense. Two or three years ago, when there seemed a chance of the dwarf front driving bicycle coming into popular favour, the same variety in design of frame was to be seen, and even now with tandem bicycles there are many frames which evince on the part of their designers complete ignorance of mechanical science. If the present work is the means of influencing makers or purchasers to such an extent as to make the sale and manufacture of such mechanical monstrosities in the future more difficult than it has been in the past, the author will regard his labours as having been entirely successful."

Readers should note that the above was written in 1896, nearly 50 years ago, and we have still the same difficulties to contend with! Look at the frames—bicycle and tandem! The latter are far the worse! Even in 1942 one continually notices tandems in trouble with one of the chains off. Now we have to submit to "stamped-out chain-wheels" made of inferior metal, because if the metal was "hard" they could not be stamped out. So "stamped-out wheels" have been adopted by the trade because they are turned out cheaply.

When Professor A. Sharp wrote this book "stamped-out" chain-wheels were unknown, as chain-wheels were then cut out by means of a milling cutter. And we remember when several firms had their own ideas about tooth form, Humber's used to cut their teeth quite straight and the result was the chain had a tendency to mount the wheels. If only the managers of present-day cycle manufacturers would recognise that bicycle gearing is an engineering job, and requires skilful workmen to cut the wheels with milling cutters.

WAYSIDE THOUGHTS

By F. J. URRY

Singleton, Sussex. A corner of this pretty village with its ancient church and old houses.

A Joy to Come

I WAS reminded the other day by a sentence in a letter from a friend of mine in U.S.A., that when this war is over, we in these Islands will have the joy of entertaining many American civilian visitors, and I hope we on our part will also be visitors to the States in ever increasing numbers. Even before the U.S.A. was in the war the notion of "changing places" in the teaching profession had been put into practice, for in the spring of 1940 I happened to be holidaying for a brief period in Somerset and Devon, and met—or was captured by—a bevy of school teachers who had "changed places" with their British sisters for six months. These lassies were riding bicycles over the upended roads of Somerset and Devon, and riding them pretty badly, for apparently no one had taken the trouble to see they were seated correctly, or imbue them with the slightest notion how to care for their property. As it happened I was a trifle useful in repairing a puncture, and during the process listened to their chatter on a dozen subjects mainly concerned with the history of the area, for they had been reading Blackmore's "Lorna Doone" to some purpose, and evidently looked on that romance as gospel truth. When we did get down to cycling topics, "the hard work" bogey immediately cropped up, and as a result my next hour was spent with spanners and adjustments (mainly saddles and bars), alterations which were acclaimed (though I suspect as a return of compliment) on our way to the Oare valley. I never spent a livelier tea-hour than with those seven girls at Marmsmead Farm, and to-day I bless the puncture that made my intrusion to their company so interesting an introduction. Those girls were filled with the joy of life, and when I reached Minehead in the late evening I had added quite a bonnie collection of colloquialisms to my limited vocabulary. The point I want to make, however, is that there is a genuine pleasure in scraping acquaintance with the stranger within our gates, for the change of opinion is good for both of you. And unless I am mistaken the opportunities of breaking down the racial barriers will be multiplied many times when this dread war is over, and all of us who roam should do our part in making the visitor feel happy and familiar during his sojourn in "this green and pleasant land."

I Like Them

HOW lucky are those of us who possess the easy aid of change-speed gears. It seems almost unfair to write of such accessories to comfortable travel during these days when they are not obtainable, and my excuse for doing so is to try and make folk realise they cannot fully enjoy the comforts of moderate cycling, and especially touring, until they have known the value of the change speed. All my bicycles are change speed equipped with similar gear ratios, but not similar makes of gear; for I have the bracket 2-speed, the Cyclo derailleur 3-speed, and the Sturmey-Archer 4-speed in both close and medium ratios. My highest gear is 75in. on a tandem, my lowest 43in. on a 4-speed S.A. medium ratio single, and between these ranges I think I have every combination I can usefully put into practice. The 2-speed bracket gear on the old Sunbeam has been working for 23 years with one change of operating cable; the 3-speed derailleur on the tandem is 14 years old and has had two changes of rear cogs when new chains have been fitted; the other derailleur has only been at work four years, but is now demanding a new set of cogs; and the oldest S.A. 4-speed is well into its second season. I have had no trouble with any of them, mainly I think because I keep them well oiled and properly adjusted so that the changes respond slickly to the movement of the controls. Many people will not take the little trouble to understand the simple adjustment mechanism, particularly of the hub 4-speed models which are so delicately made, and I think that neglect is the main cause of making trouble for owner and manufacturer. Well, the day will come—I hope it is not far distant—when change gears will return to their important place in bicycle equipment, and the cyclist will be a happier wanderer as a result, for next to the invention of the pneumatic tyre the change gear ranks in importance. It has curbed the strength of the wind as a pressure handicap, and made of the long upgrade a cheerful passage, always provided the changes are intelligently used, and the device is not looked upon as a miracle worker to level stiff ascents, which are always better walked. Change gears have added comfort to cycling, and comfort, after more than half a century of riding, is a thing to be desired. That is why I cherish my change-gear bicycles.

A Certain Cure

I SUPPOSE to all of us come moments when we suffer under an attack of "the blues," and perhaps these visitations are more frequent as we grow older, because we have lived long enough to have shed most of our illusions. The news was bad, the day was hot, the works were foul with the smell of oil, tempers were short, and indeed all things seemed to conspire to make the moment of existence most unhappy. If you who read these notes have worked and worried in a factory with the shade temperature over 80 deg., you will know how I felt on that evening. The fellow at the other end of every telephone call seemed to want a bother with me, so I suspect he was not having a very gay time, though I am bound to confess I had no immediate sympathy with him. Just after five o'clock on that evening a man 'phoned to say he would be free in half an hour; would I come for a ride, as he was "fed-up." Here was a temper to match mine, so with a cup of tea and a cake for cargo I joined my friend on the outskirts of the city at 6.15, and, believe it or not, neither of us said a single word of the cares that had infested our working hours. We were free for a few hours, free to wander over the lonely roads into the rich sunshine of the evening and see the bloom on the grain. Where we went and what we did doesn't matter, and I can only speak for myself that when I got home about nine o'clock I was a fit and proper person to return a respectable salute, having recovered a sense of proportion because of those few hours of change and talk, and the mental reaction of looking at this precious land getting ready for its harvest. It was Dr. Bicycle again working the simple miracle of mental and bodily health through the channel of change of occupation and environment. Nothing else could have done it; I should have taken my problems to golf and played badly; and in a car the worries would have throbbed in unison with the engine-beats; while walking would have only kept me on the outer edge of industry. No, the bicycle is best; stick to a bicycle and you have, when occupying its saddle, the cure for many ills.

What the Clubs are Doing

Life in the North

A LOCAL group of the Scottish Y.H.A. has been founded in Morayshire, largely upon the initiative of the Forres Cycling Club.

Kingsbury Enterprise

FOUR members of the Kingsbury C.C. (London) entered two Scottish opens while on tour in the North. The riders were S. E. Slough, T. S. Banton, E. G. Phillips and W. Suttie.

Ayrshire Clubfolk Marry

ANDREW 'AIRD, [treasurer of the Goldberry C.C., of Kilmarnock, married Helen Cantley, of the same club, recently. Both are very well known in West of Scotland club and youth hostel circles.

Scots Clubmen as P.T. Instructors

TWO well-known Scottish speedmen are now physical training instructors. They are "Jock" Martin, of the Douglas C.C., now sergeant in the Army, and John Jamieson, Zenith Wheelers, who is in the R.A.F.

Yorkshire Time Trialists Married

TWO regular competitors in West Riding time trials, T. Leech and Miss E. Smith, both of the Keighley Road Club, have just married. They spent their honeymoon touring in the Yorkshire Dales. Mr. Leech is serving in Britain with the Royal Tank Corps.

Johnstone Wheelers Revive

JOHNSTONE Wheelers, in pre-war days the strongest club in Renfrewshire, have revived and are now carrying out a full social programme. The secretary remains as before, Walter Buchanan, 18, Broomward Drive, Johnstone, near Paisley.

Armour Back to Form

JACK ARMOUR, Fife C.A., last year's fastest 25-miler, celebrated his return to form by winning the Mid-Scotland T.T.A. open 25 with 1hr. 2mins. 11secs., one of the fastest times done in Scotland this season. No fewer than 10 riders beat "1—5" in this event, which had an entry of 70.

Cyclists' War Charity Sports

THE Upper Nithsdale C.C. recently co-operated with other Dumfriesshire sports bodies in running a grass-track meeting at Kirkconnel. A large crowd watched the event, at which T. Edwards, of the Upper Nithsdale C.C., was the leading prizewinner. Proceeds went to local war charities.

Brothers Lead in Scotland

TWO prominent Scottish time trialists and brothers, James and Tom McGuinness, Glasgow Nightingale C.C., filled the first two places in the Hamilton C.C. open 25 with times of 1hr. 3mins. 8 secs. and 1hr. 4mins. 42secs. respectively.

Cumnock Rally Success

THE attendance at this year's annual Cumnock rally, promoted by the West of Scotland Cyclists' Defence Committee, was rather less than last year, some 8,000 persons being present, including 371 campers, which latter figure was only slightly lower than that of 1941. Riders were present from all parts of the country, and were given a civic welcome by Provost Nan Hardie Hughes.

Scottish Record Broken

THE first Scots place-to-place record to be broken for two years was recently passed on to the Scottish R.R.A. for confirmation. J. Macrae and D. McCallum, Douglas C.C., beat the existing Glasgow-Dundee and Back record by 2mins. 23secs. at their first attempt. They covered the 164 miles in 7hrs. 51mins. 6secs., compared with the time of 7hrs. 53 mins. 29 secs. clocked by F. Anderson and H. Keefe in 1936.

"Shake" Earnshaw's Good Turn

"SHAKE" EARNSHAW, in pre-war days a professional rider for the Hercules concern, and now in the R.A.F., recently met Joy Drage, the speedy Bedfordshire Road Club girl, as she was en route for a Yorkshire road event.

Earnshaw, who was on leave, took Mrs. Drage home for lunch, and later put her on the right road for Wetherby where she was bound

My Point of View

BY "WAYFARER"

Potted Wisdom

NOT every flat tyre means a puncture. Therefore, before you get busy with tyre levers and things, test the valve.

Effrontery

IT has been announced that, in the interests of tyre economy, "roads surfaced with flints and loose grit, which cut and eat into tyres, shall be reduced to a minimum." For which Allah be praised. But—mark you!—it takes a great war, costing millions of pounds a day, to turn Authority (with a capital "A") from the error of its ways, and cease making roads that cause trouble.

"Retort Courteous"

GEORGE BERNARD SHAW is reported to have once said that a man on a bicycle is "the most ridiculous sight in the world." The obvious "retort courteous" is that some men do not need to get on a bicycle in order to look ridiculous! But I prefer to offer a more polite answer. Let us look ridiculous, by all means. It is a mighty small price to pay for the blessings bestowed on us by the magical bicycle. Personally, I want to look ridiculous just as often as possible!

Tonic

THE other evening, at the end of a hectic day which had barely allowed me a moment for leaving my office chair, I decided that something would have to be done about it. Reaching home rather late for tea, the idea came to me that there was a letter awaiting despatch to a house some 11 miles away. The opportunity to save 2½d.—at whatever cost in time and effort!—was not to be resisted, though I felt far more inclined to sit down and go to sleep. However, it did not take me long to change from business garments into my best suit, and soon I was speeding towards the country in all the glorious freedom of shorts and open-neck shirt. Some of my problems showed a disposition to accompany me, but I wasn't having any of that, and I quickly outpaced them! What a joy it was to be reasonably clothed and to be rollicking along the open road! What a delight to be obtaining the vigorous exercise which the bicycle can provide! Soon the stuffiness—mental and physical stuffiness—and the incipient headache departed, and I began to feel a new man. Through meeting one or two friends, and also through slightly extending my route, it was rather late when I "docked" at home, and quite a different individual from the one who had trifled with his tea sat down with eagerness to a well-earned supper. Cycling is a grand tonic: try it, and see for yourself. Never mind how tired—how disinclined for riding—you may feel. Change into your glad-rags, and get the bicycle out, and make it serve your purpose, as it will do, so readily and inexpensively.

A Possible Sanctuary

IN these days when we hear so much about stolen bicycles—surely the meanest of all thefts—the experience in a south-country town makes interesting reading. I gather that people cycle into this place, park their machines in a churchyard where a cycle-stand happens to be provided for Sunday use, or in the subway of the railway station, and then incontinently travel to London and back by train, secure in the knowledge that their property will be awaiting them when they return. It seems incredible, but I am assured it is true. Then I was told the other day of a lady who went shopping on her bicycle, in this same apparent sanctuary. At the grocer's shop she stood her machine at the kerb and made her purchases, afterwards walking on to two or three other shops, *and finally walking home.* After lunch she wanted to use her bicycle again, but it was missing from its usual place in the shed. She remembered where she had had it last and went back to the grocer's (it was early-closing day), and there, sure enough, was her machine patiently waiting at the kerb. I suppose that there are few places where you could carry on like that: certainly, in the city where I reside it would be fatal to desert your bicycle in this way; but, as the proverb nearly says, other towns, other manners.

That Utility Bicycle

IT might almost be said—once more—that the bicycle is coming into its own again, especially the utility bicycle. Three recent incidents on the continent of Europe prompt the suggestion. We are told that the attack on the monster Heydrich was made by two men, one of whom "rode away on a bicycle" after throwing his bomb and firing his automatic rifle, while the other man, presumably, forgot that he had come to the scene on a lady's bicycle. At any rate, one was left on the spot. On an earlier occasion, when "a cowardly and vile attack" (sic) by persons using bicycles was made on a German soldier in Paris, a decree was promptly issued forbidding Frenchmen "to ride, or even walk with, bicycles" between certain hours in specified Departments, and it was then recalled that, when a German officer was assassinated in Nantes in the previous October, "bicycles were stated to have been used." The fact of the matter is that the bicycle, with its speed, its quietness and its unobtrusiveness, has become a considerable asset to those curious people who object to invasion, and like to get a bit of their own back on the hated Nazis, who ravage and steal. Then, and much more happily, the Russians in a town behind the German lines were said to be showing rare enterprise by "keeping the local wireless station going by pedalling a stationary bicycle to generate current"! Good for them!

Notes of a Highwayman

By LEONARD ELLIS

Virtue of Necessity

EVEN this horrible war has its uses. Owing to the numerous restrictions imposed upon all and sundry, everybody is being forced back upon the simpler things of life. To-day there are literally thousands of motorists reverting to cycling, and, what is more, many are enjoying it. It is probably very easy for us hard-bitten cyclists to treat them in a superior sort of "told-you-so" attitude, but we must beware of "glass houses" and the inevitable bricks. We also are operating in a similar way, although we may not be so acutely conscious of it as the motorist. So many areas are closed to the public; railway assistance on our long tours is not now so easy; time available is not so generous, and as a consequence we are all cutting our cloth to suit the coat. Touring on the continent is a thing of the past, so that what touring is being done is at home. And those who thought that all the things worth seeing were the other side of the water are now seeing their own country for a change—and they are enjoying it. Similarly those who went gaily off on a 14-day tour, covering, perhaps, a thousand miles in the fortnight are now content, perforce, with something far simpler. These people are being compelled to see something of those hitherto despised lanes near home, and once more they are extracting considerable pleasure in the process.

Towards the Simpler Life

WHO knows where all this might end? Is this perhaps the thin end of the wedge towards the simpler life? So far as I am concerned, it is out of the question to go far from home. It is not easy to take a family on a cycle tour in these days of precarious catering. To leave the family at home means to the average individual inability to enjoy a complete mental rest. So as a happy compromise we toddle about within a few hours of our own doorstep and enjoy it. Mountain ranges and rushing rivers are beyond our reach for the time being, so we stay and examine more leisurely than ever before the quaint old cottages in the nearby villages. Ayot St. Lawrence has always been there, but usually we were in too great a hurry on the main road to step aside and look. Now we find what a delightful little spot it is. Here are quaint old cottages and peaceful charm; black and white architecture strongly reminiscent of the Cheshire and Shropshire villages. We still have plenty of time to spare, so we chat to some of the locals and find that Sir William Parr, brother of the famous Catherine Parr, once lived here. We learn also that a great person even lives there to-day, but we are not sure of which they are prouder.

Hertfordshire Lanes

WE are in the lanes and there is no great inducement to go back to the main road, so we continue wandering from village to hamlet, learning and gleaning little facts that had hitherto been overlooked or even contemptuously ignored. Away through Redbourn on the Watling Street, or A5, there is little remaining of its past importance in Dickens's day as a calling place for coach travellers. It still sits, or rather sprawls, along the road, its old church still stands, but London travellers to Holyhead no longer stop there for breakfast. More lanes bring us into the valley of the Gade. Little and Great Gaddesden give the clues to their location in their names as Gaddesden merely means the "dene" or valley of the Gade. So we continue through the uplands of the north-eastern Chilterns where lie many charming spots and grand views. We see enough in this lazy ramble to realise that in the past we have scurried past all the little things that matter, often grasping the shadow and losing the substance. Here is ample material, within easy reach of everyone's doorstep, to keep us interested, even though present conditions last a long while.

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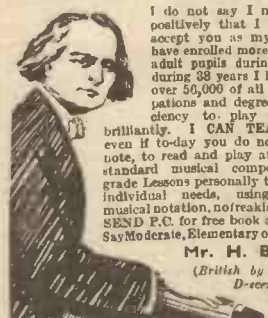

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