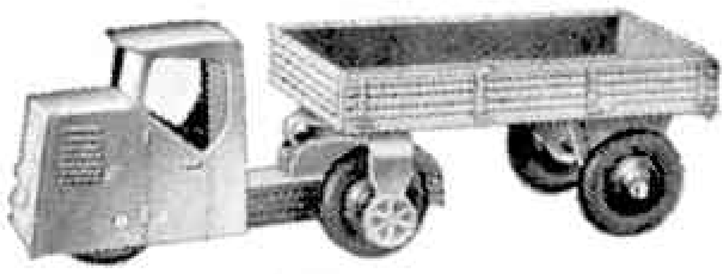
VOL. XXXIII. No. 1 JANUARY 1948

MECCANO MAGAZINE

GAS-TURBINE GOES TO SEA

6d.

DINKY TOYS



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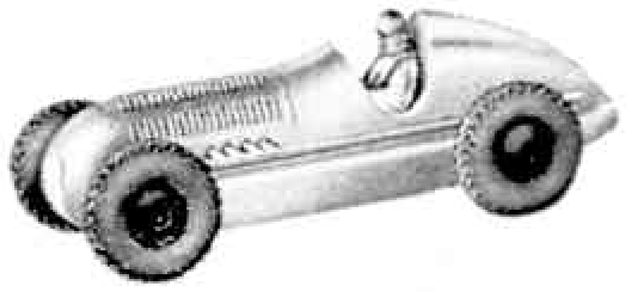

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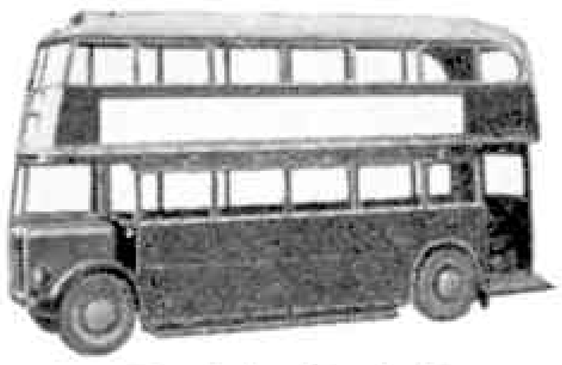

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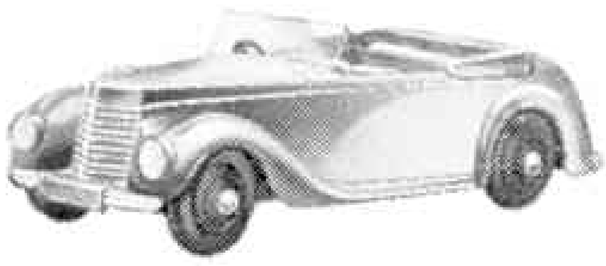

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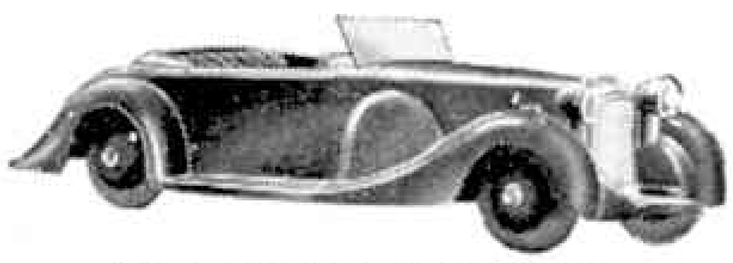

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These wonderful models are similar in style to the famous Dinky Toys, but much larger. The Foden Wagon, for instance, is 7½ in. long, and the Guy Lorry 5¼ in. long. The great amount of accurate detail included gives the models a strikingly realistic appearance.

Dinky Supertoys No. 501 Foden Diesel 8-wheel Wagon
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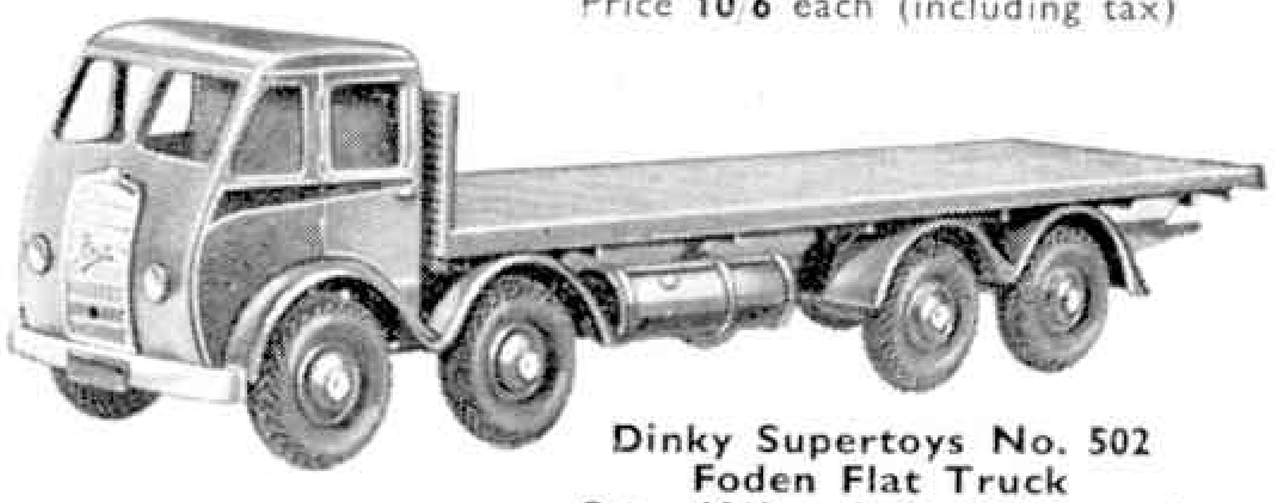

Dinky Supertoys No. 502 Foden Flat Truck
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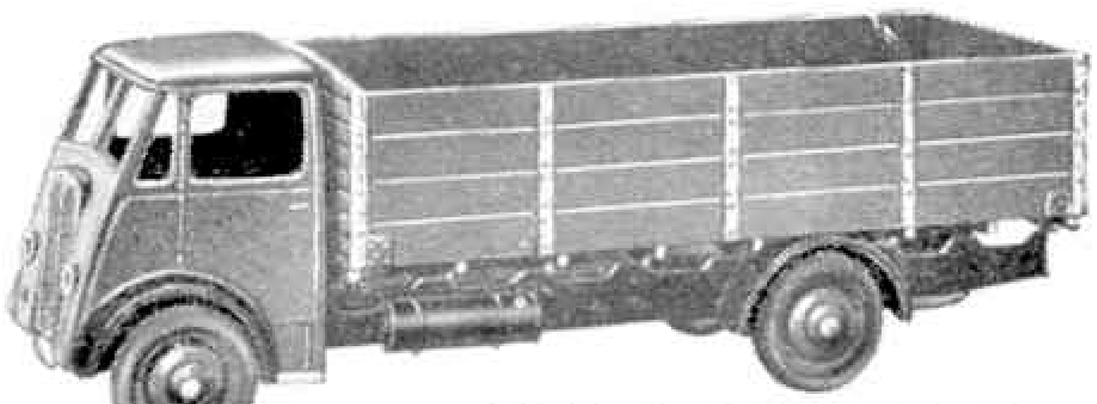

Dinky Supertoys No. 511 Guy 4-ton Lorry
Price **7/6** each (including tax)

MADE IN ENGLAND BY MECCANO LIMITED

A HAPPY NEW YEAR TO EVERY READER—The Editor

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With the Editor

Air and Rail in 1947

The year 1947 has been a great one for aviation. The airspeed record has been raised above the coveted 1,000 km/hr. mark to 650 m.p.h., while a journey round the world has been reduced to a mere 73-hr. trip.

Far more significant than records, however, are the advances made in civil aviation. Air liners such as the Martin 202, the "Solent" flying boat, the "Tudor" and the "Constellation" have brought new standards of comfort, safety and performance to the world's airlines. It is interesting to recall that Anthony Fokker once said "Flying will be here to stay only when it ceases to be an adventure," for every day now scores of quite ordinary folk are flying the Atlantic with little more concern than if they were going by boat.

To those engaged in the aircraft industry, 1947 will be remembered as a year of research—of constant striving for greater speed, range, safety and economy. In Britain, America and France, sinister-looking swept-back wing aircraft have been built in an effort to break through nature's sonic barrier to high-speed flight. As a result of flight-refuelling tests carried out over the Atlantic by B.S.A.A. and Flight Refuelling Ltd., it has been proved possible to treble the payload of airliners on long flights. Greater safety is promised by the flight from Newfoundland to Britain of a radio-controlled "Skymaster," as reported in this issue.

Yes, it has been a great year, and one of which British designers can be proud. We have lost the airspeed record to America. But British engines are still the best in the world and in 1948 our designers will prove that they can produce airframes to match.

There has not been much of outstanding interest in the railway world during the year. Perhaps the most notable feature has been the steady increase in the number of diesel and diesel-electric locomotives. In the United States diesel power seems to be definitely replacing steam for long-distance passenger trains, and the Canadian National Railways have placed orders for two diesel-electric locomotives. At home the use of diesel shunting locomotives has developed considerably, and diesel-electric traction is in prospect for some of the long-distance trains of the L.M.S., L.N.E.R. and S.R. The conversion of steam locomotives to oil burning has continued.

A new system of automatic train control was introduced by the L.M.S. on the Southend line. This system, which dispenses with fogsignalmen, has involved the fitting of special equipment to 183 locomotives. The Southend line was chosen for this development because of its dense traffic and the prevalence of fog on the North Thames Estuary, along which it runs.

This Month's Contents

Oil for Britain

I. The Background. From Well to Refinery

AMONG those who have anything to do with the oil industry, mineral oil is more accurately known as "petroleum."

"Petroleum" is literally, oil from rock. "Oleum" means "oil," and the "petr-" is derived from the Greek "petros" meaning rock, and leads also to the word "petrify" (turn to stone) and the name "Peter." From the earliest history of man until the middle of the last century, petroleum was known and used only where it oozed naturally out of the rocks or was discovered accidentally during drilling for salt. Although petroleum has been known since the earliest recorded times, it was not referred to as "oil." The oil with which Biblical characters anointed their hands and feet, and the many ointments and greases referred to in historical writings, were all derived from animal fats (for example, tallow) or vegetables (for example, palm or coco-nut oil).

Nevertheless, the "pitch" used in caulking Noah's Ark, and the "slime" with which the cradle of Moses in the bullrushes was waterproofed, are probably references to petroleum. There is a reference to its being used at Baku in the 13th century for anointing camels with mange, and it is quite likely that the Sacred Fire at Rome tended by the Vestal Virgins was fed by petroleum.

The history of oil in the modern world began in America. The great oil industry of to-day all started from the time when petroleum was first deliberately produced from the ground to satisfy an existing demand.

The first fully recorded instance of a well sunk specifically to produce petroleum was the famous "Drake Well" drilled at Titusville, Pennsylvania, between the summers of 1858–9.

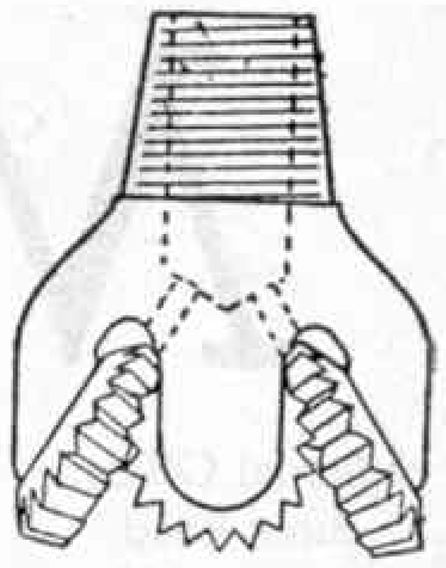


Fig. I. Rock Bit, showing rotary cutters, coarse taper thread for attaching to drilling collar, and passages for mud.

The date 1858 is to the history of oil what the date 1066 is to the history of England. Two New York lawyers, George H. Bissel and Jonathan G. Eveleth, owned some land containing oil springs near Titusville. Bissel sent some of the oil to the professor of chemistry at Yale College to be investigated. On receiving a favourable report, he commissioned "Colonel" Edwin S. Drake—a railroad conductor—to drill a test well. After much difficulty the well was completed in August 1859, and produced 20 barrels of crude oil per day from a depth of 69 ft. 6 in.

In 1859 theoretical knowledge about petroleum was fairly extensive. In 1819 oil from hand-dug pits at Baku had been "refined" by the Russians, who used the products for medical purposes. In England James Young operated the first distillation plant in Derbyshire in 1848. In 1854 petroleum was roughly divided into separate products by Silliman who operated the first "fractional" distillation process at New Haven, U.S.A. At this time almost nothing was known about the origins of petroleum and how it was formed.

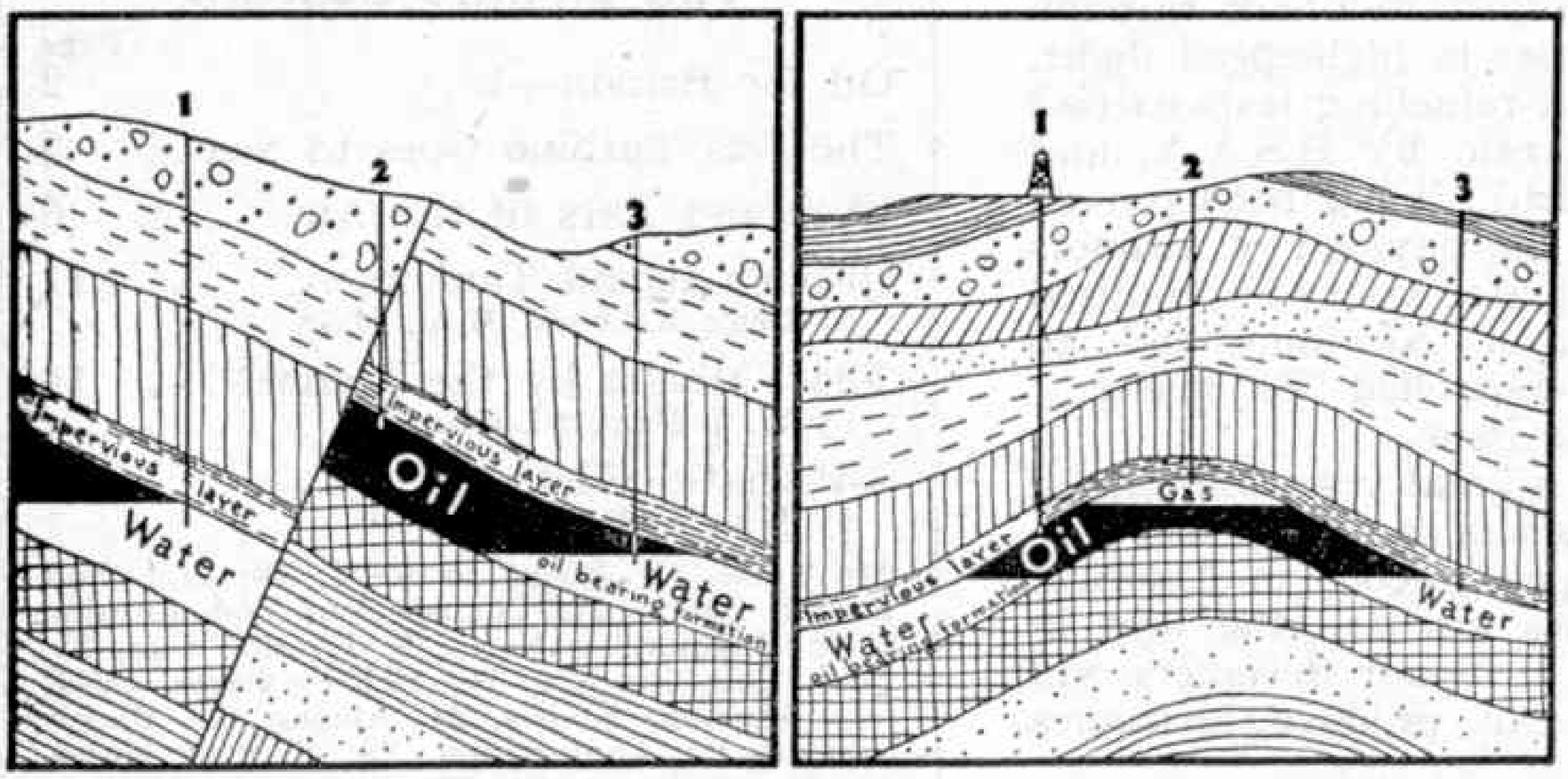


Fig. II. Simplified diagrams of two types of oil bearing formation—(a) the "fault" type, (b) the "anticline" type.

The "crude oil" produced by the Drake Well was roughly distilled, the marketable product being Kerosene. Kerosene is the American and technical term for the familiar paraffin burned in lamps, and it was the success of the Drake kerosene as an illuminant which attracted

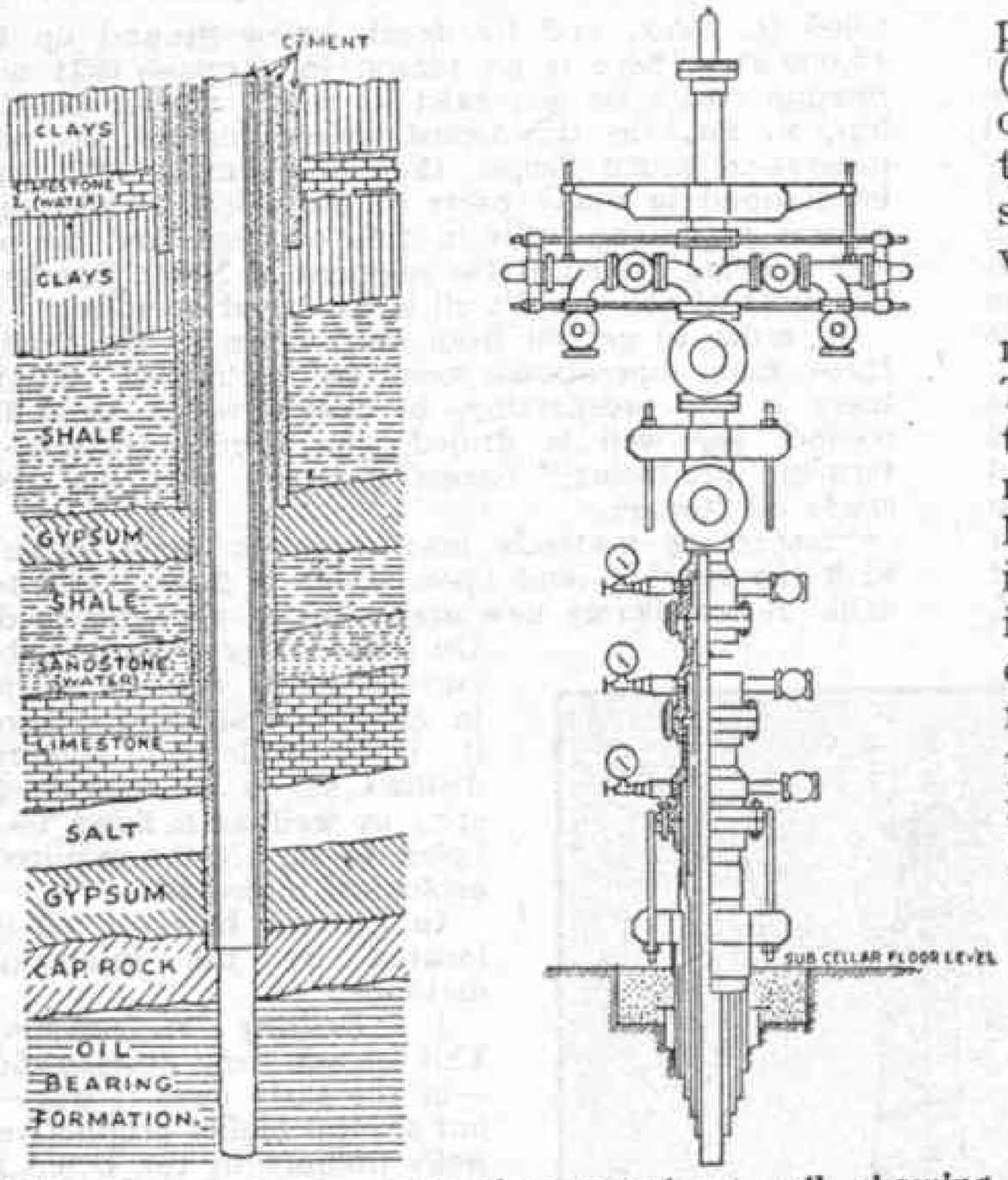


Fig. III. (a) Section through a completed well, showing the well casings cemented in place. (b) The oil control equipment at the head of the well, including (at the top) the "Christmas Tree" or valve manifold.

commercial attention to the possibilities of petroleum and started the rush of prospectors to oil areas. Incidentally, the kerosene of those days was a rather dangerous liquid as it contained the then unknown product—petrol. However, the occasional explosions of the lamps using it do not seem to have hindered its success.

Almost overnight, speculators and prospectors swarmed into the Titusville area, and very soon into any other area where the existence of oil was proved or rumoured. Between 1860 and 1900 extensive oil-producing areas were developed in many states of the U.S.A., in Canada, Russia, Japan and elsewhere.

From the latter half of the 19th century onward, developments in mechanical engineering and petroleum technology progressed side by side. Lubricating oils were derived from crude oil to replace animal oils for lubricating steam engine bearings and cylinder walls. Then the development of the internal combustion engine threw the emphasis on to "gasoline," which was formerly a waste product. "Gasoline" is the American term for "petrol" and should not be confused with petroleum. The demand for crude oil increased rapidly as new uses were found for its products. By 1914 the primary products from crude oil had become essential to our civilisation. These were products such as gasoline (petrol), kerosene (paraffin), gas oil (diesel oil), lubricating oils, cylinder oils and bitumen. Thus, if the production of petroleum had been suddenly stopped, our mechanical life would have come to a creaking halt.

The late 1930s saw yet another development—the secondary petroleum products. These were derived from what were once the waste materials produced during the manufacture of petrol, paraffin and lubricating oils. Such products found important applications in the chemical industries and as replacements for vegetable oils and even soaps. The latest development of oil technology is chemicals from petroleum—new substances with long names and complex formulæ that can be processed to form plastics, synthetic rubbers, drugs, dyestuffs, and whole ranges of entirely new products for the chemical industries. To-day there is hardly any aspect of our lives which is not affected in some way by petroleum products.

Now that we have sketched the history of petroleum to the present day, you will probably ask: "What is petroleum—what is it made of?" "How was it formed?" and "How is it able to

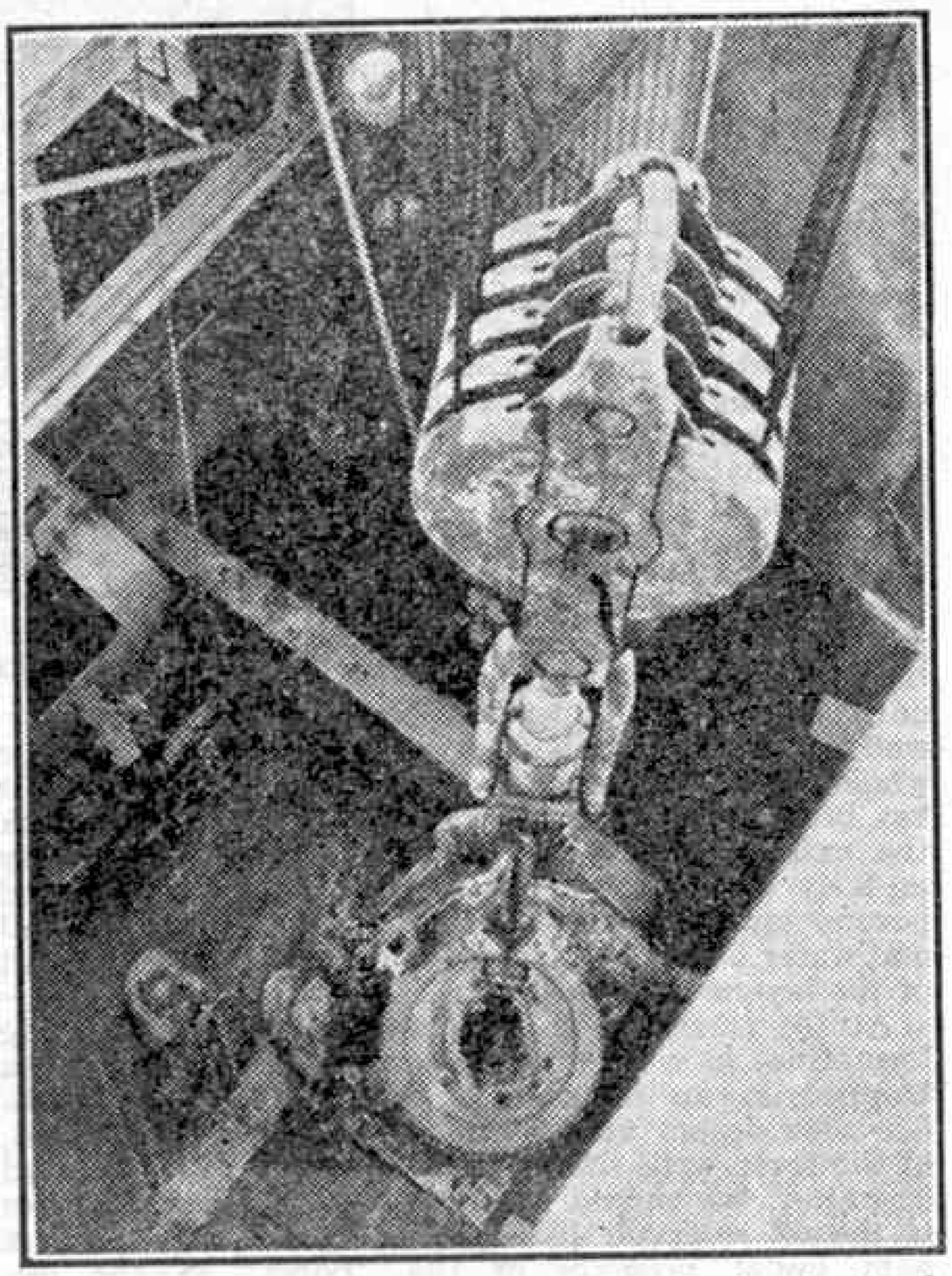


Fig. IV. Drilling for oil at Dalkeith, Scotland. Reading from the centre of the picture to the bottom can be seen: the travelling block, hook, swivel and mud-line, the kelly and the rotary table. The drive chain to the turntable is enclosed in the casing to the left.

provide such a multitude of products?"

To-day we know part of the answer to the first question, "What is petroleum?" Crude oils from different wells are of varying compositions, but all crudes have this in common—they are dark, oily liquids, composed almost entirely of a mixture of hundreds of *hydrocarbons*. A hydrocarbon is a chemical substance whose molecules are built up from atoms of carbon and hydrogen only. We shall have more to say about hydrocarbons in the second article of this series, which is about petroleum refining.

The answer to the second question, "How was the oil formed?" is still the subject of disagreement. As we have seen, crude oil was oozing from the ground in Biblical times, and it certainly had its origin many millions of years ago. One theory states that oil was formed by the action of water under great pressures on deep-buried carbides of iron and nickel. But the more widely accepted opinion is that oil was formed from countless animal and vegetable organisms—sea and land animals, seaweeds, etc.—which, as fossils show, became buried deep in the earth as its surface changed slowly over the prehistoric centuries.

Geological surveys have provided an abundance of detail upon where and how the oil is present under the earth's surface, and any brief presentation of the facts must necessarily be an over-simplification. However, in general, oil is formed in "source rocks," and migrates under shifting pressure to more porous rocks in which it lies trapped under layers of "impervious" rock through which oil cannot seep. The oil is recovered from the porous rock "reservoirs" by drilling. The common characteristic of any subterranean oil reservoir is the existence of a formation providing a non-porous layer of rock all round the oil deposit which prevents the oil becoming dispersed. Two highly-simplified examples of such formations are shown in section in Fig. II.

At (a) is shown the *fault* type of oil-bearing formation; oil has seeped up the porous stratum shown on the right of the diagram until it met an impervious wall caused by the bodily shifting downward of the whole strata during a previous upheaval. Thus, it has become trapped and the wells at 2 and 3 mark the extremities of the productive area. It is very unlikely that there would be any oil in the displaced porous strata on the left of the diagram, but oil and water have been shown, to make the displacement of the layers easier to follow.

At (b) is shown the *anticline* type of oil-bearing formation, in which the upward-seeping oil has been trapped in an inverted dome of impervious rock. Gas also occurs very often in such a structure and, of the three wells shown, 1 will produce oil, 2, gas and 3, water. We should realise that in no circumstances is the oil reservoir like an underground lake—oil is held under pressure in the "pores" of the oil-bearing rock.

There are many other types of oil-bearing rock formation, but we have said enough to give a working picture of how the oil lies in the earth. The oil-bearing rock layer may be anything from 5 to 1,000 ft. thick, and its depth below ground up to 15,000 ft. There is no reason to suppose that oil-bearing strata do not exist at much greater depths but, so far, the downward search for oil has not progressed much deeper than three miles. Oil has been found in many parts of the world. There are several producing wells in this country, and an oil well is being drilled at the moment in North London; but most of the world's oil is produced overseas.

In order to get oil from deep down in the earth, three main operations must be performed. First, there is the prospecting, to decide where to drill; second, the well is drilled; the third operation—termed "producing," covers pumping, pipelines and crude oil storage.

Prospecting methods may vary to some extent with the type of land upon which it is proposed to drill. A completely new area may be aero-surveyed. On the other hand, sub-surface maps can be made in an industrial area, where it is possible to employ disused shafts of coalmines, etc., as well as making test holes, to supply the required geological information.

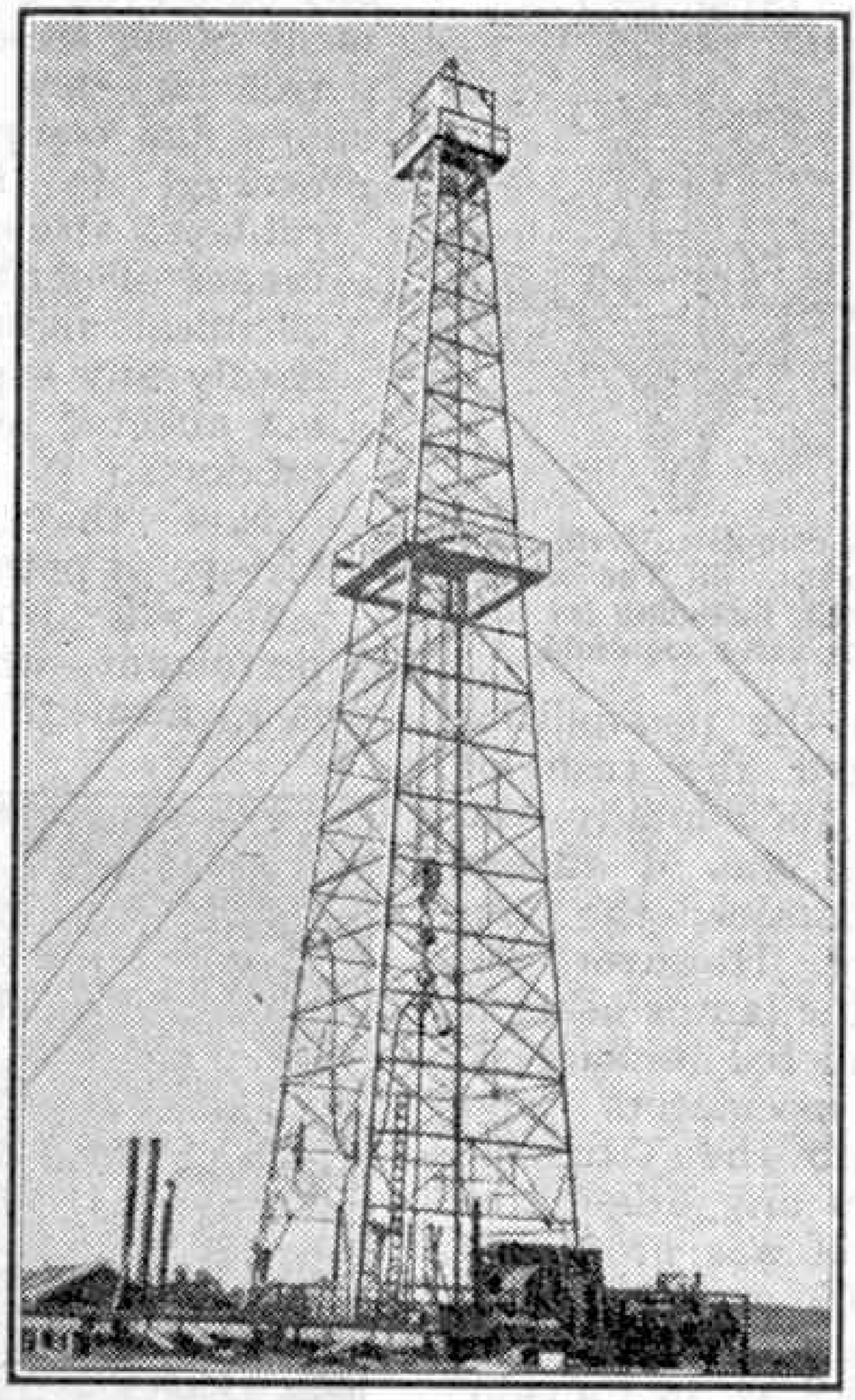


Fig. V. Oil derrick at Morely Reservation, Alberta, Saskatchewan, Canada.

In general, however, oil is located by the following methods.

1. *Drilling at random.* This sounds very unscientific—in the early days it was—but several highly productive wells (mainly in the U.S.A.) have been discovered by this method. In any case, random drilling provides useful geological information for later surveys—provided that the drilling is properly recorded.

2. *Reliance on Surface indications.* In the last century this meant merely drilling near an oil seepage, but to-day the geologist can glean valuable information about underground conditions from careful study of the ground formation of the area.

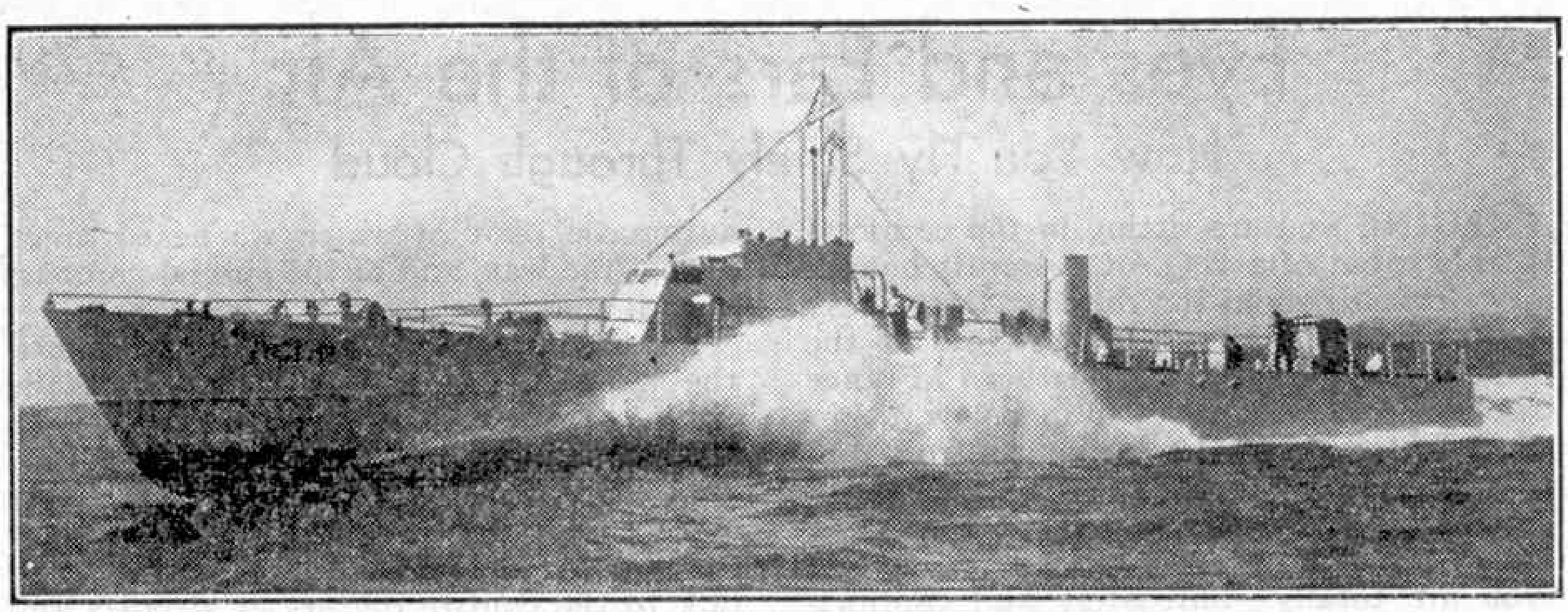
3. *Geological and Geophysical methods.* These cover the production of sub-surface maps from the data supplied by a study of ground formation, test drilling, and the mapping of underground strata by physical methods. The three main physical methods are known as seismic, magnetic and gravitational.

In principle, seismic mapping is done by transmitting underground sound waves from one point and picking them up on a recording machine at another point some miles distant. The recording machine shows the extent of reflection, bending, or speeding up of the sound waves by the rock strata between the recorder and the transmitter. The sound waves are usually sent out by exploding a small dynamite charge underground.

Magnetic mapping records magnetic deposits in the earth by means of an instrument with a highly sensitive magnetic needle.

Gravitational methods make use of the fact that bodies attract each other with a force which depends on their total "mass" and their distance apart. By this principle, very sensitive instruments can record the presence of heavy underground masses.

When all the available details have been mapped and carefully studied, the prospector will have some idea of the underground formation of the area, and he will know which spot (*Continued on page 34*)



"M.G.B. 2009" on her sea trials.

The Gas Turbine Goes to Sea

OUR cover picture this month shows the Admiralty experimental craft "M.G.B. 2009," the first vessel to be propelled by a gas turbine, on her sea trials.

"M.G.B. 2009," designed by Camper and Nicholsons Limited in conjunction with the Admiralty, was built originally as a unit of a flotilla of motor torpedo-boats, the leading particulars of which are: overall length 117 ft., breadth 19 ft. 6 in., mean draught 4 ft. 3 in., and displacement 100 tons.

The vessel concerned was completed early in 1945 as a motor gun-boat with three Packard engines of 1,250 B.H.P. For these trials the central engine was replaced by a gas turbine installation built by Metropolitan-Vickers Electrical Co. Ltd. in connection with the jet propulsion of aircraft. It is important to note, however, that this vessel is not jet propelled; the gas turbine drives a shaft and propeller of the normal type.

The installation was essentially an experimental one, designed to provide practical experience, and there was no thought of setting up speed records with it. It does produce remarkable power for its size and weight, however. It develops 2,500 S.H.P., and its capabilities were fully demonstrated, first in the intensive bench tests to which the whole unit was subjected in the works, and then in the demonstration trials that "M.G.B. 2009" underwent in the Solent at the end of August. With the gas turbine alone in action a speed of about 24 knots can be maintained. There is practically no vibration with the unit, and the boat moved with smooth and easy grace at full power.

The results of the trials promise well for the future of gas turbine propulsion at sea. For this the unit has particular advantages. It has a low weight per horse power, and can be started rapidly and quickly run up to full speed. The power output is controlled by varying the quantity of fuel admitted to the combustion chamber, and in practice it was found that orders from the bridge could be answered promptly and rapidly with complete certainty.

A separate electric motor is used to start the rotor of the gas generator in order to bring the unit into operation and this continues in action after the fuel has been ignited until a speed of about 2,000 r.p.m. is reached, when the plant becomes self-sustaining, that is, capable itself of driving the compressor. At this speed the motor is switched off and the unit accelerates automatically, under the control of a special valve, to what is called the "idling" speed of 3,000 r.p.m., which is the lowest running speed from which it can be accelerated rapidly to full speed. The time required for starting from cold and reaching idling speed is only about 45 sec.

The power turbine driven by the heated gas from the generator has four stages, and both the fixed blades and those of the rotor are made of molybdenum-venadiun steel. The compressor turbine of the gas generator, which is in two stages, has its moving blades made of a special new alloy that is capable of withstanding very high temperatures, and rotates independently of the power turbine. The latter is coupled to the shaft of the central propeller through double helical single reduction gearing.

Eyes and Ears of the Air

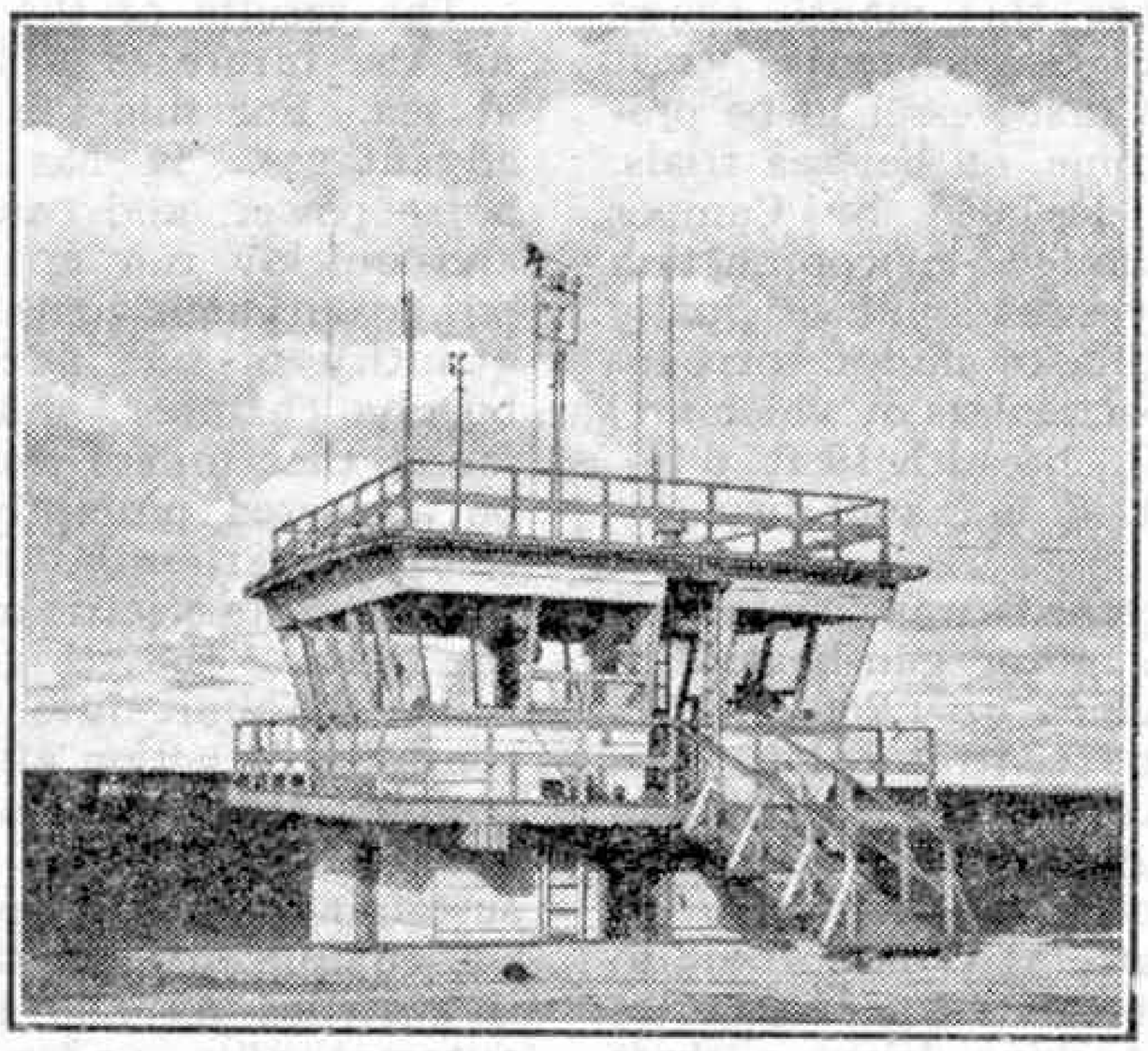
How You Fly Safely Through Cloud

IMAGINE you are sitting in the comfortable cabin of a B.O.A.C. aircraft bound, say, from England for the Far East. Idly you're looking out of the window at the fields and woods of Northern France spread out like a relief map below. Now the Captain pulls back the controls and the aircraft climbs into cloud to gain height in order to avoid hills on the route. Meanwhile, mist blots out your view and you are totally—but safely and comfortably—enclosed in a world of opaque whiteness. It is at this time that the pilot and his crew rely on the aids which modern science provides to make safe your flight through all this cloud some thousands of feet above the earth.

The pilot flies by his instruments, operated by gyroscopes which are no more than a scientific adaptation of the toys we played with as children. You may remember that once you set your toy wheel spinning, the gyroscope would maintain its position at whatever curious angle it was placed. In the aircraft, gyroscopes are set spinning in a vertical and horizontal plane, maintaining indicators in vertical and horizontal directions which do not move as the aircraft turns about them.

The horizontal indicator gives the pilot an "artificial horizon" to replace the one he cannot see through the cloud, and he knows whether he is flying straight and level, losing height or climbing by the related movements of a minute model aeroplane with the "artificial horizon" on the indicator. From other gyroscopic instruments in front of him, the pilot can read also degrees of turn and bank, and these form the basis of "*George*," the automatic pilot of which we heard much during the war, and of the special compass free of magnetic errors.

As the pilot watches his instruments, the radio operator is in touch with the ground—acting as the ears and, to some extent the eyes, of the pilot and navigator. Just as you use the telephone in home or office, so the radio operator and pilot can use their R/T (Radio Telephone) to talk to the control officers at airports and receive from them, for example, information about heights at which to fly to avoid other aircraft, weather reports, directions for landing or take-off and taxi-ing. In fact, instructions such as these were being passed by the control officer to the pilot as your aircraft moved round the airfield before take-off while the steward was making you comfortable.



Atlantic Control Tower. The Control Tower at Gander Airport, Newfoundland, from which directions are given to incoming and outgoing aircraft on the North Atlantic Route.

Remember, too, while you are in your world of whiteness, that by means of an R/T "homer" on an airfield, control officers on the ground can take bearings on the voice of the pilot talking from the aircraft. From these the controller knows the direction of the aircraft and can give the pilot, in return, directions to reach the airfield and come down safely through cloud away from hills which cannot be seen from the air.

At some time or other, you've no doubt been walking on moorlands when a sudden white mist has blotted out everything around you. Your friends are within hailing distance but you can't see them; so you shout and they judge the direction of your voice and shout back instructions—based on the increasing or diminishing strength of your voice as you call—until you rejoin them safely. They have "homed"

"Talking Down" a B.O.A.C. flying boat at Bangkok.

you or "brought you in."

The same idea is employed in "homing" an aircraft, although it is a much more scientific process. You may have noticed that the strength of reception of some radio sets with interior frame aerials can be increased by turning the set *towards*, and the aerial at right angles to, the broadcasting station. It is a development of this idea which enables the ground "homer" station to determine the direction of an aircraft from the voice of the pilot or radio operator talking on the R/T.

This knowledge is reassuring to us in our cloud world, and although we are not yet due to land, similar ground stations help us on our way along the route, using Morse code when we are out of R/T (or voice) range. Just now, if you were allowed on the "flight deck," you would see the wireless operator busily tapping his key. Over the "inter-com," or aircraft house telephone, the navigator has asked for a QTE on Le Bourget airport, Paris. Now what, you may wonder, does QTE mean? Well, with all the different countries, each with their own language, operating air lines, some international "basic language" of the air had to be agreed, and this is known as the "Q" code. It consists of a whole series of questions in combinations of three letters each beginning with "Q," and each meaning the same to, say, French or Dutch aircrew as it does to the British Radio Officer of a B.O.A.C. air liner. "QTE?" therefore means "What is my true bearing from you?"; and, having taken bearings from the aircraft's transmission, Le Bourget is able to give the information and the navigator checks that the aircraft is on the correct course.

The pilot calls for a weather report as he heads southward over France. The wireless operator taps out the message: "QAM?" (What is the weather?), and perhaps the changing note of the engines will tell you that you're climbing through the clouds, as you eat your lunch in comfort; and you emerge into a world of brilliant sunshine carpeted with a seemingly endless flooring of cotton-wool.

Later you fly between two layers of cloud and, unable to take bearings on the sun or check the aircraft's position through the cloud below, the navigator asks the radio officer to get him a "fix." Three widely separated ground stations take bearings on the aircraft's transmission, which are then plotted by a ground controller on a map. Where these bearings cross or "intersect," broadly speaking, is the position of the aircraft. To understand this you have only to remember how searchlights were used during the war. The sound detector, located near the searchlight sites, would pick up the sound of an aircraft. Then searchlight

A B.O.A.C. Radio Officer contacts an airport for landing instructions.

beams for miles around would be lit and, with accurate readings from the detectors, they would intersect each other and form a cone of light around the aircraft. They had, in effect, got a "fix" on it.

The steward comes through with a message from the Captain. You can still see only cloud below but you read: "Over Lyons. Bound for Marignane 'Marseilles.' ETA (estimated time of arrival) 15.50 hours local time." Other unseen aids have been used to bring you to this position. By using his radio compass, the pilot may have "homed" on transmissions sent out from radio beacons on

Radio 'listeners in' keep watch.

the ground in a similar way to the "homing" already described. Or he may have "ridden the range," that is, picked up in his earphones the Morse signals "A" or "N" from ground Radio Range beacons indicating that he was left or right of his correct track, and held his course if he heard the continuous high pitched, or "on course," note.

At some airfields equipment on similar principles may be used to direct the aircraft's correct approach to the runway in conditions of low cloud or poor visibility. The device used may be the Standard Beam Approach (SBA for short), or its newer development the Picao SCS.51, or to give it its full title "The Instrument Landing System approved by the Provisional International Civil Aviation Organisation."

In SBA a combination of Morse signals in the pilot's earphones and visual indicators on his instrument panel tell him whether he is left or right of the correct line of approach. "Marker" beacons at known distances from the runway also transmit high pitched notes as well as flashing light signals. The pilot reads the height of the aircraft from a sensitive altimeter, and starts coming down through the cloud towards the runway in use. He is told by the airfield Control Officer, over the R/T, when it is his turn for landing approach, and is given other information, such as the height of the cloud base.

Radio aids to navigation are installed throughout the Empire air routes. In addition, radar equipment is being shipped overseas and placed along these routes, and indeed is already working at many points. Such words as Rebecca, Eureka, and Babs may be used by the radio operator if you have a chance of talking to him at one of your stopping places, but you'll find he is neither talking Greek—nor of charming ladies! These are radar devices, developed during the war, and being fitted to all B.O.A.C. aircraft as a further aid to approach and landing in low cloud and bad visibility. Rebecca is the equipment in the aircraft and Eureka and Babs are the ground counterparts. For flying boats the equipment is different by name, but it is similar in design and use to Rebecca and Eureka.

If you are interested, you learn that Rebecca in the aircraft has a green translucent screen somewhat similar to a television screen, with a distance scale down the centre. On this screen, sharp light indications from the ground equipment, Eureka, appear. These indications are known as "blips." The ground equipment is quiescent until activated or "triggered" by the aircraft equipment, when it sends out impulses in a predetermined and known direction. These are the "blips," already described, and according to whether they appear left or right of the distance scale, the heading of the aircraft can be altered until the "blips" are centralised and the aircraft's distance from the beacon can be read off from the scale. The pilot and navigator then know their exact position and can "home" on the Eureka beacon if they wish.

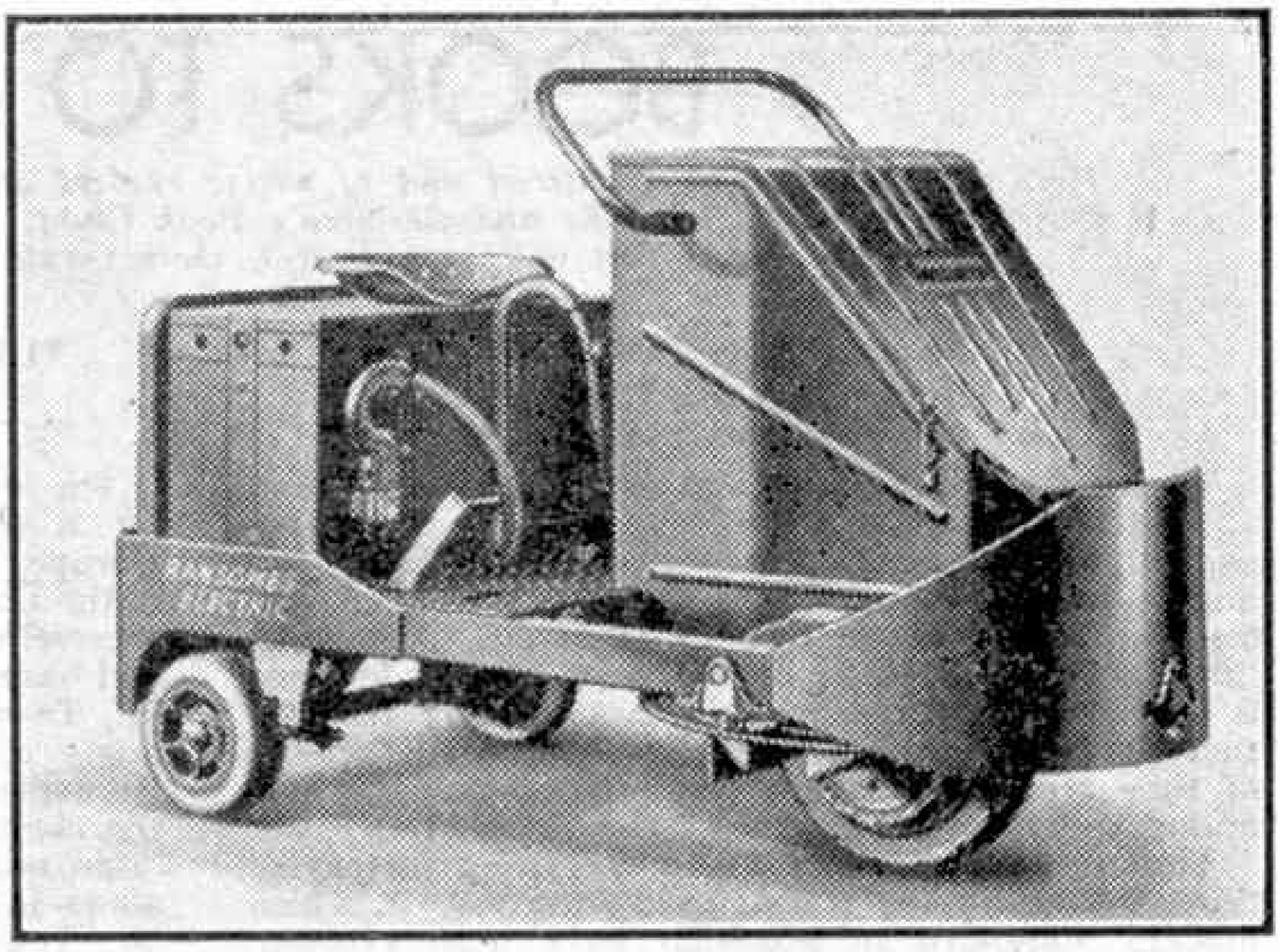
When nearing the airfield, if there is much low cloud (Continued on page 34)

Engineering Notes

Two Useful Electric Vehicles

Two useful industrial vehicles are illustrated on this page. They are an electric crane-truck and an electric tractor, and are two of many different kinds of such vehicles manufactured by Ransomes, Sims and Jefferies Ltd., Ipswich.

The crane truck will lift loads up to ½ ton and can carry loads of 1½ tons. It is exceptionally useful where heavy single pieces of material have to be lifted on to the truck platform and transported, and it can also be used for loading and unloading barrels, sacks, etc., from railway wagons or lorries. The crane obtains its power from an electric battery that also operates the truck motor.

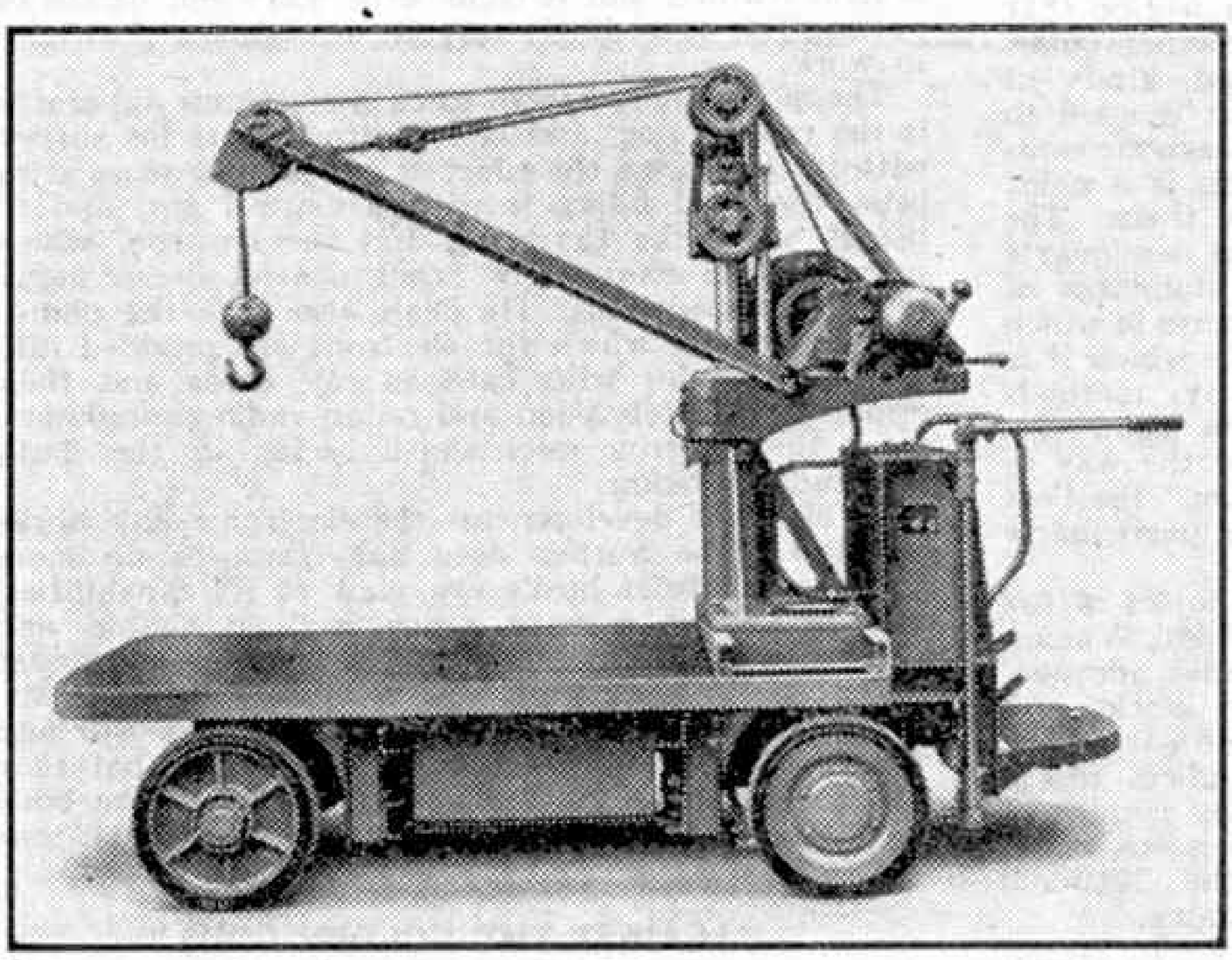


A Ransomes 3-wheel tractor with a normal hauling capacity of 1 ton. One handle only controls steering, braking, etc.

The electric tractor will haul loads up to about 1 ton at a speed of 6 m.p.h. on the level. On really good surfaces loads up to 30 cwt. can be handled. It is designed to have a short turning radius, and this is provided by a turntable front. The tractor hauls one or more trailers, and its low height and width make it suitable for operating along narrow gangways and through the low doorways sometimes met in factory and industrial conditions.

The World's Longest Water Tunnel

The western slopes of the Rocky Mountains in Colorado receive a heavy rainfall, but the eastern side is normally very dry and the lack of sufficient water for irrigation purposes has always been a serious trouble with farmers. After many previous schemes had been considered it was finally decided to bore a tunnel through the mountains to collect the surplus water from the western side and carry it to the dry eastern regions. Work was started in 1940, and the bore was holed through in 1944. Operations are now proceeding on the necessary structures to lead the water from the eastern portal of the tunnel down to the Big Thompson River. The bore is known as the Alva B. Adams tunnel, and is the longest irrigation bore ever driven, being just over 13 miles in length. It is 9 ft. in diameter and will carry 550 cu. ft. of water a second. The water falls 2,900 ft. in its journey, and this drop is to be used to operate seven hydro-electric generating stations that are to be built at the eastern end of the tunnel.



A Ransomes electric crane truck. It is battery driven, and is intended for loading and unloading barrels, sacks, etc., from railway wagons or sidings.

Plastic Decks for Ships

Coloured plastic decking instead of wooden planking has been tried with success on a naval vessel, and it is now proposed to instal some decks of this type on the "*Mauretania*." Plastic decks are fireproof, do not absorb oil and grease and are easily cleaned. The idea was first introduced at the Clyde shipyards.

A Fine Concrete Bridge

A new concrete bridge 1,883 ft. long has been built to connect the inner city of Stockholm with its southern suburbs. It is 105 ft. high and 112 ft. wide, and the centre span is 387 ft. long. Accommodation is provided for two 25 ft. roadways, footpaths and cycle tracks, and there is also a special 25 ft. section for tramway lines. To link up with the bridge there is an extensive system of approach roads, including clover-leaf junctions. In completing the bridge and road system 250,000 sacks of cement and about 3,000 tons of steel were used.

A Novel Sea-Going Exhibition

A novel exhibition of machine tools was recently sent to sea on board the motor vessel "*St. Merriel.*" The exhibition comprised machines such as gear hobbers, presses, grinders, lathes and precision instruments handled by E. H. Jones (Machine Tools) Ltd., London, and its purpose was to enable intending customers in South America to inspect the company's range without having to leave their own country. All the machines forming the exhibit, which filled a large part of the ship's capacity, were power driven, and were accompanied by a staff of experts who were prepared to demonstrate the machines producing actual work.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller.

"BRITISH TIME"

By DONALD DE CARLE
(Crosby Lockwood and Son Ltd. 15/-)

Time is becoming more and more important to us all in this mechanised world, and so this well-written and illustrated book, which deals in a clear and understandable manner with time measurement and distribution, is of interest to everyone. The title, "*British Time*," seems a little strange at first, for time is universal, but its choice is explained by the fact that practically every great advance in the science of time measurement has been the work of British brains and hands.

The author does not set out to write a history of timekeeping, but he traces briefly the way in which modern standards of precision have been evolved. The book then turns to clocks, and gives an outline of their history, a section which is very good indeed, and has some fine illustrations. It is unfortunate that the lever escapement is not included among those shown, for it is perhaps the most famous of all, and one of the greatest British contributions to improved timekeeping. Moreover, it is certainly the most widely used escapement in the world.

The next chapter deals with the Great Westminster Clock, and it is a pity that the chapter is mis-named "*Big Ben*," for this title belongs only to the great bell on which the clock strikes. This is one of the best parts of the whole book, and the illustrations are particularly fine, but the drawing of the gravity escapement is not quite correct.

Electric clocks are next dealt with in a section that covers many types, including the familiar synchronous clocks as well as the most specialised kinds of precision clocks used in observatories. It is good to see that Mr. de Carle points out that a synchronous clock is not really a clock at all, for this is a point not realised by many of those who use them. The very last part of the chapter describes the new quartz crystal clock which is setting up new standards of time measurement. From describing the ways in which time is measured we pass to the ways in which it is sent out to all who need it and early methods of time signalling are explained. Then come the Post Office and B.B.C. time signals, and the way in which the "six pips" are sent to us. "*Tim*," the Post Office Speaking Clock follows, with some particularly good photographs and drawings.

The history of Summer Time is the subject of the next chapter, which describes the work of Mr. William Willett, and his endeavours to get his idea adopted.

The final sections deal with unusual clocks and watches, and with the watch and clock industry, both in the past and the present day. Appendices give a table of the more important inventions connected with timekeeping and show how watches are tested by the Metrology Department of the National Physical Laboratory. There is a useful index.

On the whole, the book is excellent. It is not really large enough to cover all the ground, but it does contain a really remarkable amount of information. There are some errors, examples being that the Clepsydra is described as acting by the flow of water *out* of a vessel, while the illustration shows the water as flowing *in*, and the description of the Shell-Mex clock as a synchronous clock, which it is not. Then, too, the Poles are mentioned in the description of the rotation of the Earth, when the author seems really to mean the Equator. These are small faults, and the work is one that can be read with pleasure and instruction. The illustrations are from an outstanding collection of photographs and drawings.

T. R. ROBINSON.

THE BOOK OF THE "SCHOOLS" CLASS

By S. C. TOWNROE, A.M.I.Mech.E.
(Ian Allan Ltd. 2/-)

The popular S.R. "Schools" engines designed by Mr. R. E. L. Maunsell, the most powerful 4-4-0s in Europe, were introduced to meet the special needs of the London and Hastings route, but have performed successfully on each of the three sections of the S.R. and have proved themselves outstanding in every way. Mr. Townroe knows them well and his story of their origin and performance is an attractive one indeed. He explains the reason for the three series making up the class, and for the modifications, particularly the improved blast arrangements, that Mr. Bulleid has made in them since their designer retired in 1937. Mr. Townroe never becomes too technical, and the youthful enthusiast as well as the more experienced will find equal enjoyment in this particular "School Story."

Copies are obtainable from Ian Allan Ltd., Mail Order Department, 33, Knollys Road, London S.W.16, price 2/2½, including postage.

"THE A.B.C. OF ELECTRONICS"

By E. B. WATTON, A.M.I.E.E., Assoc. A.I.E.E.
(Percival Marshall. 7/6 net)

Electronics is a comparatively new name, introduced to cover a subject that has grown very rapidly in the last 20 years or so, during which it has come out of the laboratory into industry. The electron is its central feature, and it deals with ways and means of putting this exceedingly tiny bit of negative electricity to work.

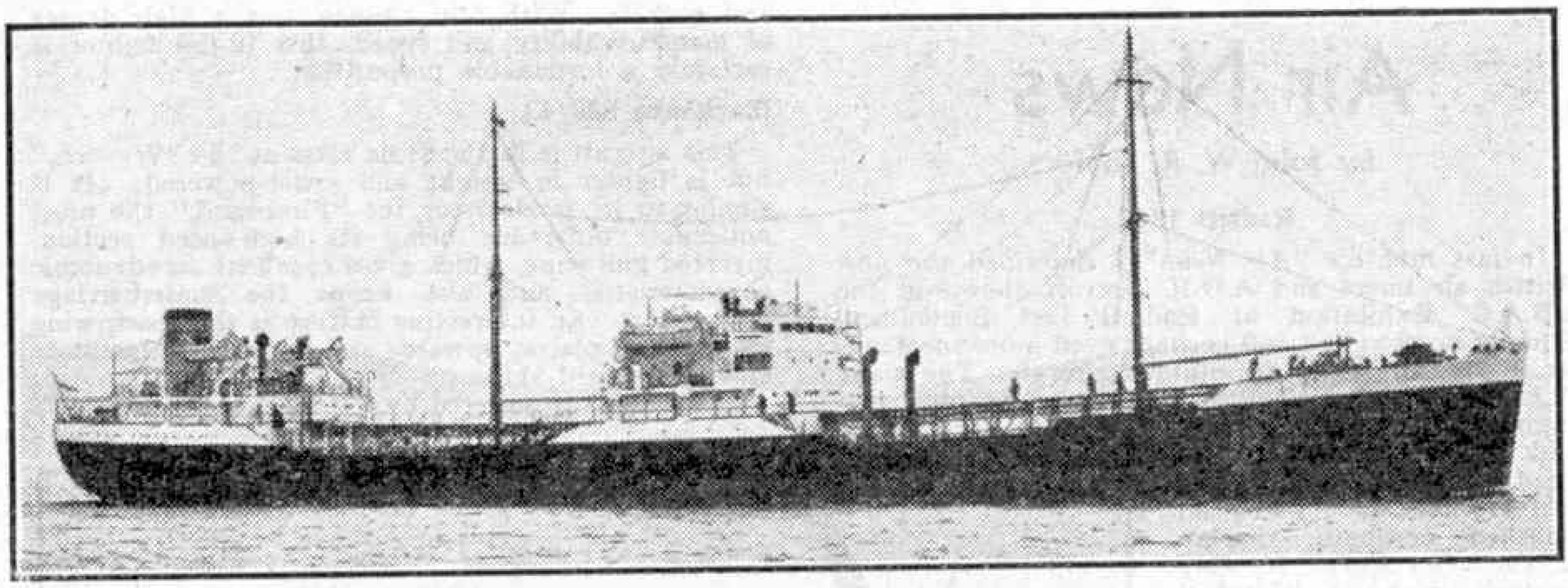
The most widely known piece of electronic apparatus is the radio valve and Mr. Watton starts his survey with it. He shows the effect of introducing more grids into it and of filling it with a neutral gas, and so brings us to the thyratron and the ignitron, which provide such exquisitely exact control in so many industrial operations. He deals also with the photo-electric cell, in which the electrons are prodded into action by light; with cathode ray tubes and their application in television and radar; radio communication; the electron microscope; seeing in the dark, and radio cooking.

In all these developments the electron really works wonders. The author does not claim to do more than give a brief bird's eye view of its capabilities, but he covers a wide range well in simple and attractive style. The modern boy with his knowledge of electricity should be able to absorb all that Mr. Watton has to tell him, and most readers will find this so interesting and thought provoking that they will look eagerly for further information. The book is lavishly provided with diagrams and half-tone illustrations.

"AGAINST THE GOLDEN GODS"

By DAVID GAMMON
(Lutterworth Press. 5/- net)

An explorer who had heard stories of a strange lost land in the unknown interior of New Guinea disappears near the headwaters of the Fly River when trying to find it. A message floated down the river brings some inkling of his survival to the outside world, and his son and two friends set out to rescue him. They have many strange adventures and narrow escapes from hostile natives and other enemies, and earthquakes and volcanic outbursts add to the dangers that have to be overcome. How all the obstacles are surmounted is thrillingly described in this story, which retains its interest to the very end.



Queen's Island Tankers

By Denis Rebbeck, M.A., M.Sc., B.Litt., M.I.N.A.

A LARGE number of oil tankers have been built in the Belfast shipyards during recent years, and one of the latest to come off the slips there is the M.V. "*Lotorium*." This vessel was launched on 30th September 1947, less than seven months after the laying of the keel, and is to the order of the Anglo-Saxon Petroleum Company Ltd. The "*Lotorium*" is a sister ship of the M.V. "*Linga*" shown in the accompanying illustration, which was one of four sisters completed for the same owners since June 1946 by Harland and Wolff Ltd.

This type of vessel is single screw and motor driven, and has the following dimensions:

Length overall .. .. about	446 ft. 0 in.
Length between perpendiculars ..	425 ft. 0 in.
Breadth moulded	54 ft. 3 in.
Depth moulded	31 ft. 0 in.

She is of the usual tanker design, with machinery aft and with forecastle, poop and midship erections, connected by fore and aft gangways. The construction is on the combined transverse and longitudinal system of framing and arranged to meet the highest requirements of Lloyd's for the carriage of Petroleum in bulk.

The hull is divided by longitudinal and transverse bulkheads into 24 oil-carrying compartments, a pump room being arranged between Nos. 3 and 4 tanks and one between Nos. 5 and 6 tanks. Modern equipment is provided for working the vessel, which has four Duplex steam cargo oil pumps, steam cargo winches, steam windlass and steam hydraulic steering gear.

Accommodation for the crew is arranged aft, and for officers, engineers, etc., in deckhouses amidships. Life-saving appliances include four steel lifeboats handled by mechanical davits.

The propelling machinery consists of a Diesel engine of Harland-B. and W. 4-cycle, crosshead type, with six cylinders 650 mm. bore and 1400 mm. stroke, similar to those already installed in a number of tankers for the same owners. Under-piston pressure induction is employed. The cylinder liners, jackets and pistons are cooled by fresh water, and pumps for cylinder and piston cooling, fuel, lubricating oil and sanitary purposes are driven off the engine crankshaft by chain and gear wheels. Starting and manœuvring air is stored in two cylindrical reservoirs, for charging which, one Diesel-driven and one steam-driven compressor are provided.

The auxiliary machinery is steam-driven, steam being generated in an exhaust gas and oil-fired Scotch boiler, of 3,500 sq. ft. heating surface. The auxiliaries include pumps for general service, fuel transfer, boiler feed water, and standby lubricating oil and cooling water; lubricating oil purifier, condenser, feed heater, evaporator, and oil burning installation. A fully equipped engineers' workshop is provided.

The supply for the electrical installation is taken from the two 30 kW. generators, one driven by a steam engine and the other by a Diesel engine. There are approximately 360 lighting points distributed throughout the vessel. There is a loud-speaking telephone installation between the wheelhouse, Chief Engineer, engine room, wireless room and poop. Electrical depth-sounding equipment and Walker's electric log are included in the installation.

Air News

By John W. R. Taylor

Radlett 1947

In last month's "*Air News*" I described the new British air liners and A.O.P. aircraft shown in the S.B.A.C. Exhibition at Radlett last September. Equally outstanding and perhaps even more spectacular in the air were the military aircraft. The giant "Lincoln" bomber climbed effortlessly on only two engines, the "Meteor" IV and "Attacker" flashed overhead at more than 600 m.p.h., Bill Humble gave his usual polished aerobatic display in the "Sea Fury" X, ably backed up by a "Firefly" IV, a "Seafire" 47, a "Brigand" and a "Vampire." All these aircraft have been described in the "*M.M.*," but there were also three new naval aircraft of unusual interest—the "Wyvern," the S28/43 and the "Sturgeon."

Westland "Wyvern"

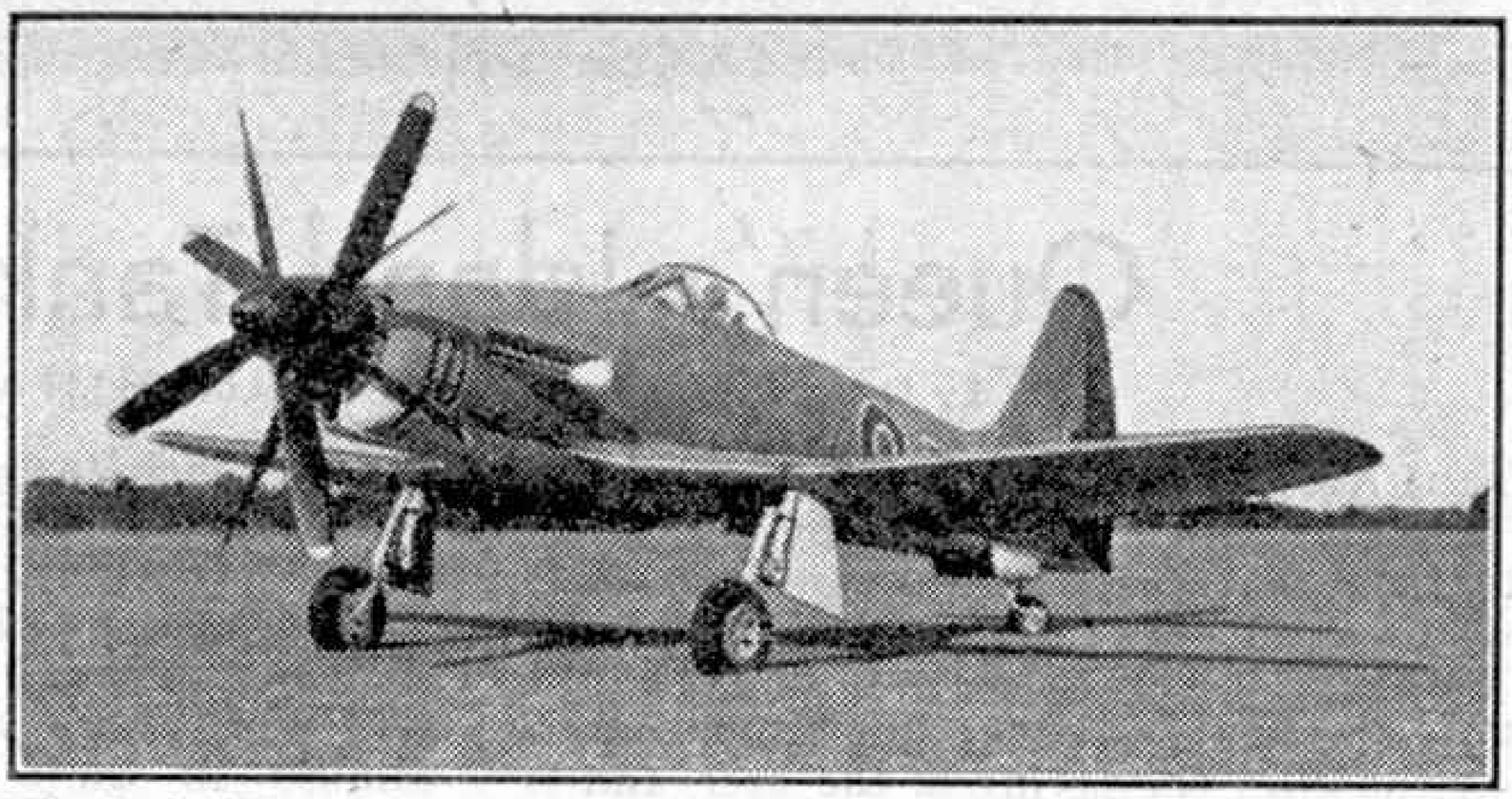
Designed as a naval strike-fighter, the "Wyvern" is the first aircraft to have Britain's most powerful piston engine—the new 3,500 h.p. Rolls-Royce "Eagle." Its designers were faced with the difficult task of producing a single-seat torpedo-fighter to conform with the many specialised requirements of a carrier-based aircraft—folding wings, sturdy undercarriage, ability to fly reasonably slowly under perfect control and the best possible forward view for the pilot—yet performance was not to be sacrificed in any way. High speed, a good range and the ability to carry heavy military loads were "musts." The task was made possible only by the remarkably compact lines of the "Eagle," which gives the "Wyvern" a top speed of 455 m.p.h., but is shallow enough to ensure an exceptional forward view for deck-landing, torpedo-aiming and dive-bombing. It drives an 8-bladed contra-prop, which not only absorbs the vast power of the "Eagle" but also prevents "swing" due to engine torque at take-off, an important consideration for a carrier-based 'plane. The Youngman wing flaps reduce landing speed to well below 100 m.p.h.

The "Wyvern" can carry a 2,000 lb. offensive load, made up of a torpedo or an assortment of bombs and rockets. With four *cannon* and a high degree of manœuvrability and speed, this 10-ton fighter is certainly a formidable proposition.

Blackburn S28/43

This aircraft is in the same class as the "Wyvern," but is lighter in weight and lower-powered. It is similar to its predecessor the "Firebrand," the most noticeable difference being its high-speed section, inverted gull wing, which gives excellent aerodynamic characteristics and also keeps the undercarriage fairly short. An interesting feature is that each wing folds in two places, upwards and inwards, to facilitate stowage aboard ship.

The S28/43 is powered by a 2,840 h.p. "Centaurus" 59 engine, which gives it a top speed of 380 m.p.h. The prototype carries no guns, but two .50 in. machine guns can be fitted in the wings, while two additional guns of up to 37 mm. calibre can be mounted in fairings under the wings. In addition to a torpedo, the S28/43 can carry two 500 lb. bombs and several rockets.

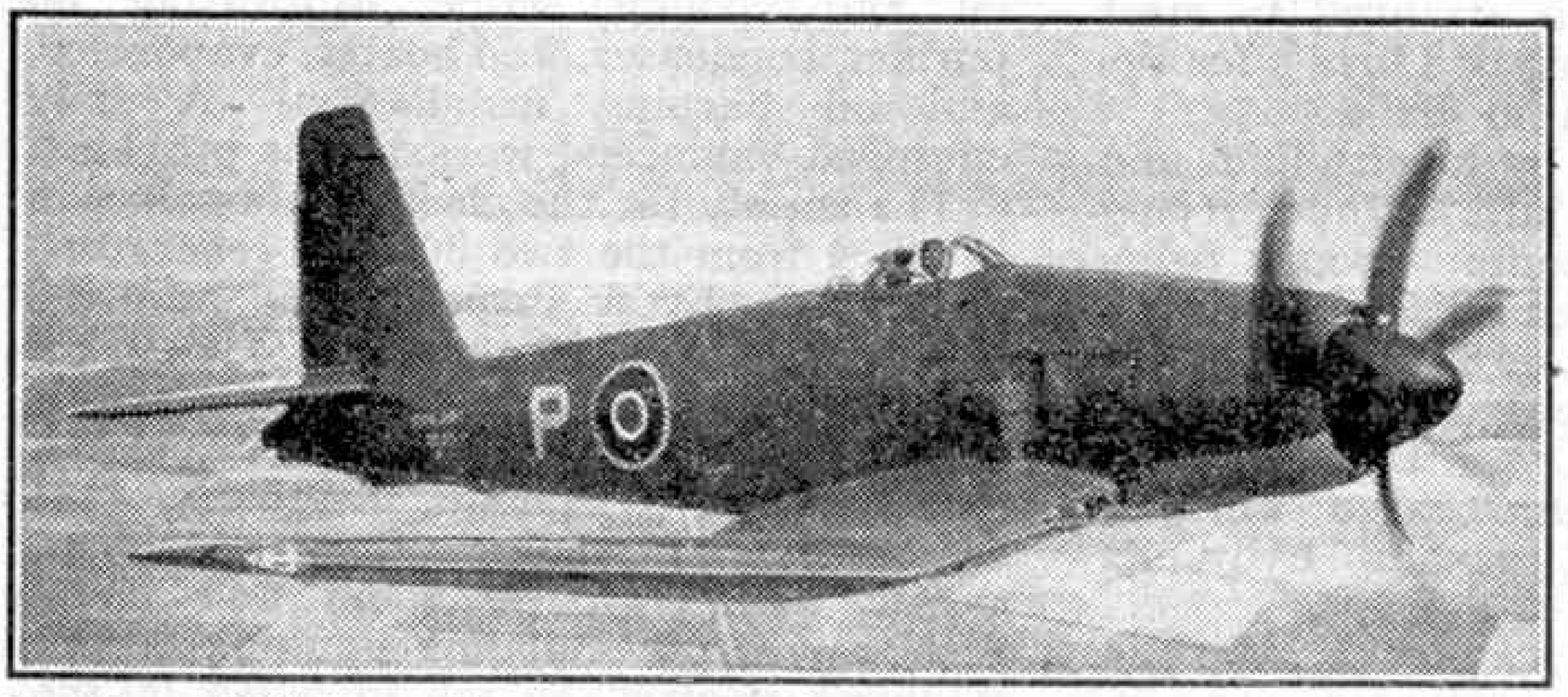


Westland "Wyvern" naval strike-fighter, a new carrier-based aircraft. Photograph by courtesy of Westland Aircraft Ltd.

Short "Sturgeon"

The "Sturgeon" boasts even more propellers than the "Wyvern," its two 1,725 h.p. "Merlin" 140 S engines each driving a 6-bladed contra-prop. The results are as surprising as the machine's appearance, for this 60 ft. span, 10-ton aircraft can fly at 430 m.p.h. and climb at a rate of 4,120 ft. per min. This performance is combined with a range of 1,600 miles.

The "Sturgeon" was originally designed as a three-seat, high-speed, naval photo-reconnaissance aircraft, carrying comprehensive radio and radar equipment, together with a battery of cameras, bombs or depth charges. Unfortunately the necessity to cut naval expenditure in peacetime will prevent it from going into production as an operational type, like so many other promising new aircraft. But several "Sturgeons" are being built for target-towing duties, stripped of military equipment.



Blackburn S28/43, another new naval attacker. The inverted gull wing is well shown in this photograph, which is reproduced by courtesy of Blackburn Aircraft Ltd.

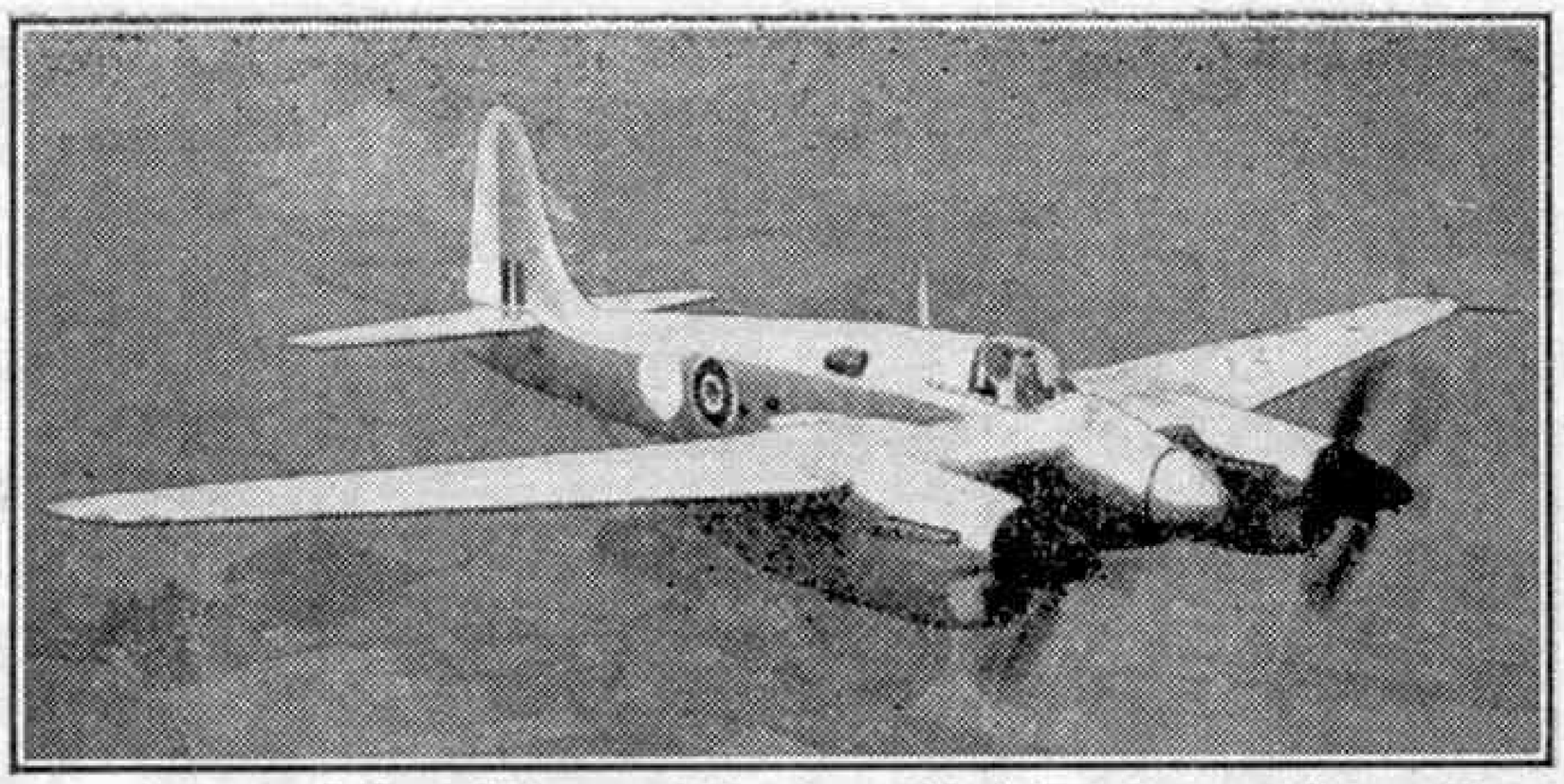
* * *

Technique Film Productions have fitted out a Miles "Aerovan" as a flying film studio. It will be used to take aerial shots of Ulster for a documentary film.

Gust Research

The most serious problem yet encountered in high-altitude flying is the presence of clear-air "gusts," patches of violently turbulent air that arise suddenly at above 25,000 ft. British European Airways, with official assistance, have started an important programme of research into the nature and frequency of these gusts, the first research of its kind ever undertaken in Britain. The results will be of great importance, as B.E.A. hope to introduce high-speed, high-altitude aircraft on their Continental routes in the not-too-distant future.

Two D.H. "Mosquitos" are being used for the experiments. They are equipped with special radio, radar and test instruments, including an accelerometer to measure the response of the aircraft to the gusts. The first flights are being made over the United Kingdom, but the "Mosquitos" will later fly along regular B.E.A. routes to various European capitals.

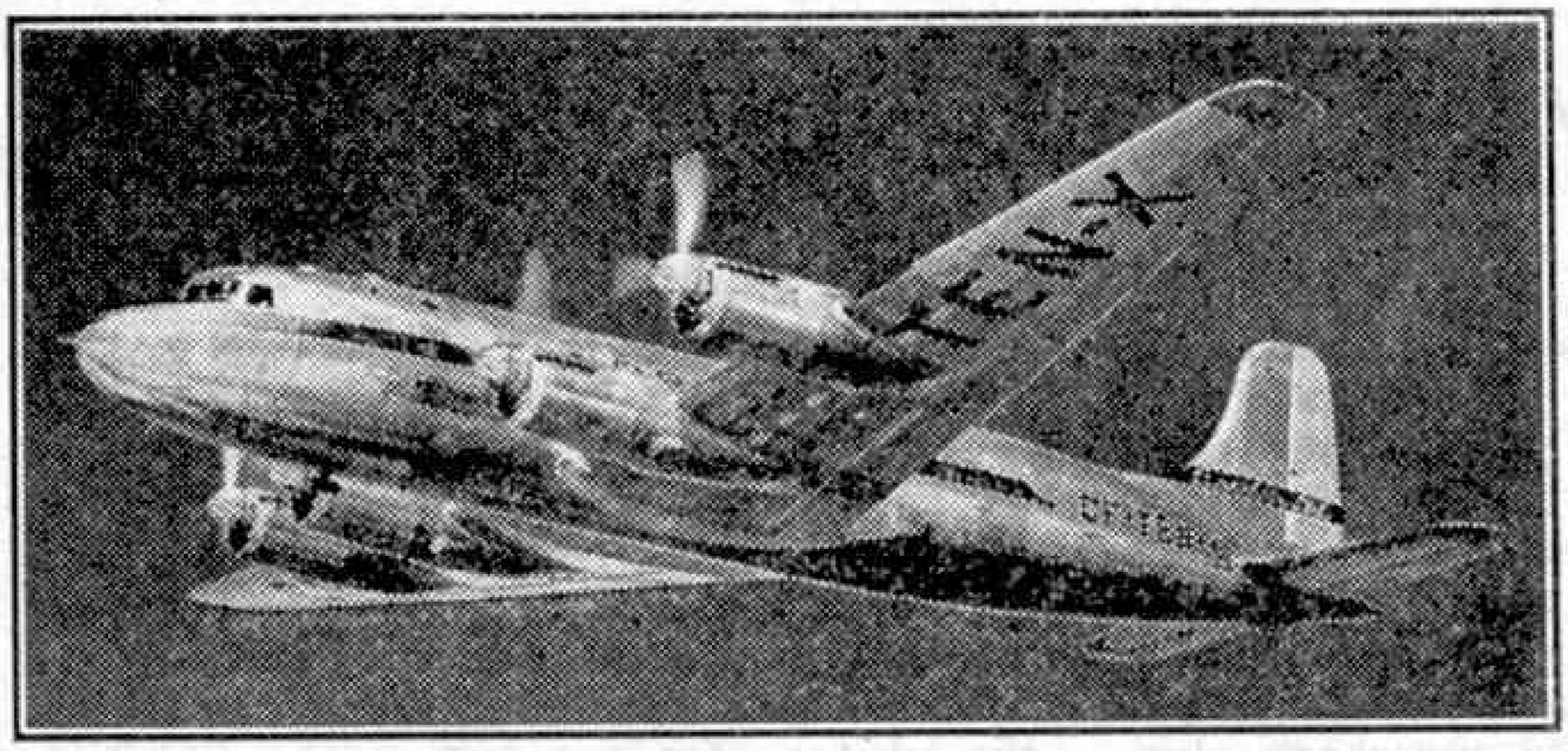


The twin-engined Short "Sturgeon" has two 6-bladed contra-propellers. Photograph "Flight" copyright.

"Merlin"-Powered D.C.4s

One of the finest aircraft in service on the trans-atlantic run is the Canadair DC-4M, a fleet of which is being operated by Trans-Canada Air Lines. In 1943 the Canadian Government announced that T.C.A. would be re-equipped with 4-engined air liners after the war, and a committee of experts was sent to the United States to decide on the type to be used. The choice seemed to lie between the "Skymaster" and "Constellation," and although the "Constellation" was slightly faster, the "Skymaster" appeared more suited to Trans-Canada's requirements. Unfortunately, its engines were not considered suitable for transatlantic operations, and so it was decided to fit experimentally Rolls-Royce "Merlins" instead. T.C.A. had already proved the reliability and efficiency of these engines in their transatlantic "Lancastrians."

The result is the DC-4M, which is being built at Cartierville, Canada, by Canadair Ltd. It carries 36–40 passengers in a pressurised cabin, and has a range of 3,160 miles at 222 m.p.h. at 10,000 ft. Alternatively it can fly 1,000 miles at 319 m.p.h. at 23,000 ft., a very fine performance indeed.



The Douglas DC-4M 40-passenger air liner is fitted with Rolls-Royce "Merlin" engines. Photograph by courtesy of Rolls-Royce Ltd.

British Ejector-Seat

From America comes praise for the Martin-Baker ejector-seat, which is standard equipment on all British jet fighters. About a year ago the U.S. Navy invited the Martin-Baker company to demonstrate the seat at their Philadelphia naval base, and later in various types of high-speed American aircraft. As a result of these demonstrations all ejector-seats built for U.S. high-speed aircraft will have to conform to a specification based on the Martin-Baker design.

Ejection of the crew has been made necessary by the high speeds of jet-propelled aircraft as, otherwise, it would be impossible to leave the 'plane in an emergency without being hurled against the tail unit by the airflow. With the Martin-Baker seat, the pilot first jettisons the cockpit hood and then reaches up and pulls a blind over his face. This action fires a cartridge which ejects the seat, while the blind also protects his face against the air pressure as he hurtles upwards at 60 ft. per sec. Once clear, the pilot is able to discard the seat and open his parachute. Convincing proof of the efficiency of the Martin-Baker seat is that a volunteer has already been ejected from a "Meteor" at a speed of over 500 m.p.h. without any ill effects.

New Jobs for "Seabees"

The Republic "Seabee" has already gained a reputation as an outstanding personal 'plane. But it is more than just that, for day by day new duties are being found for this fine little machine. For instance, three of them are in service with the U.S. Fish and Wildlife Service in Alaska. They fly in extreme climatic conditions over the tundra interior and along 15,000 miles of Alaskan coastline, which is nearly twice as long as that of the entire United States. The "Seabees" operate on wheels or skis from inland bases, according to the season, while for operations off the coast they simply retract their undercarriage and alight alongside any fishing law violator to inspect equipment, check the nature of catches and, when necessary, make arrests. Each "Seabee" does the job of about 20 patrol boats.

Another "Seabee" has been adapted for crop dusting and aerial pest control work. In this role, it can cover a swath from 170 ft. to 300 ft. wide in forest-spraying operations, and one 'plane can eradicate pests such as the tent caterpillar or gipsy moth from 3,000 acres of forest land per day.

"The Valhalla," once an open backyard and now a shrine for "departed spirits of the sea."

"The Valhalla by the Thames"

By W. J. Bassett-Lowke, M.I.Loco.E., F.R.S.A.

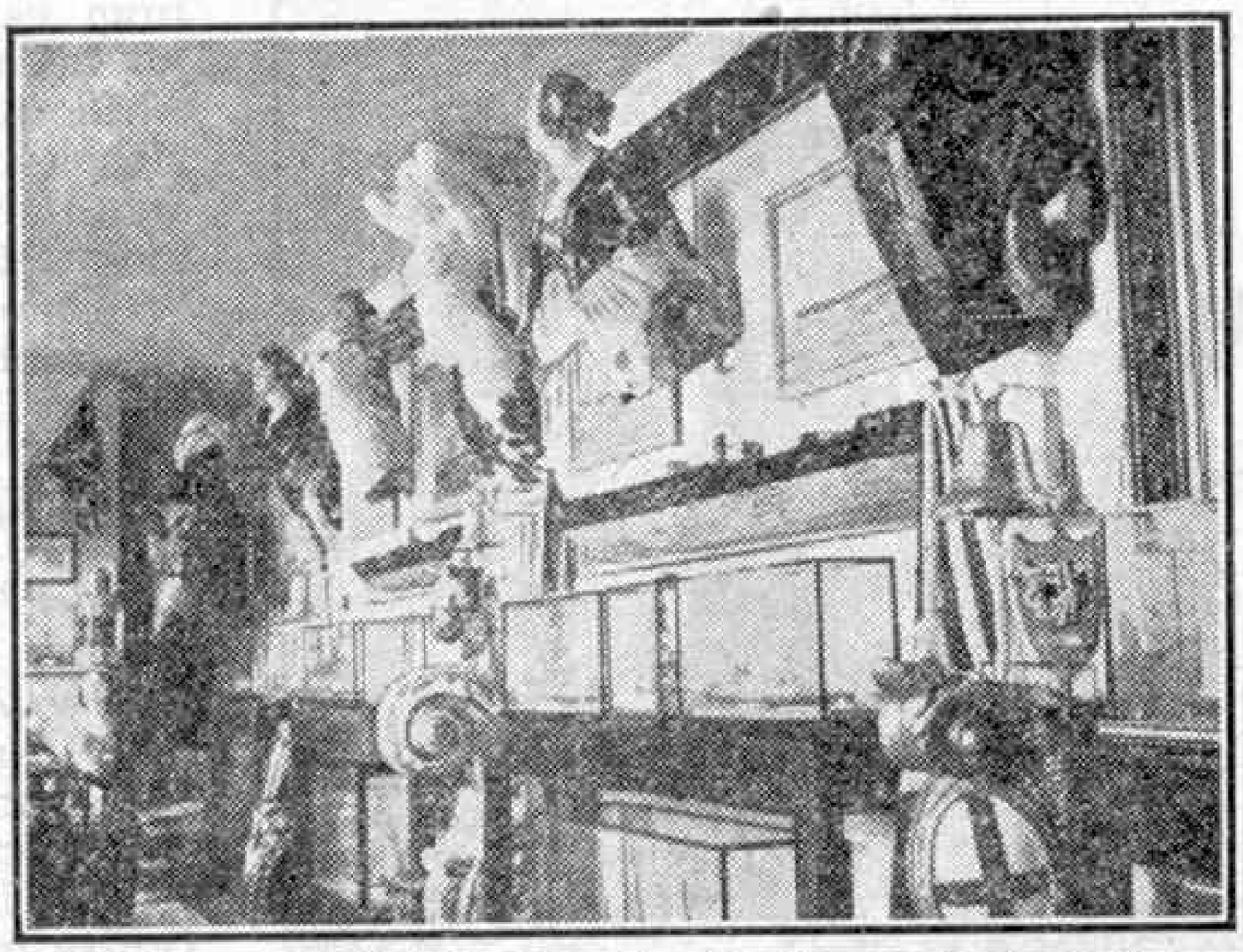
THOSE who go by steamer down the Thames or by rail to Greenwich, in order to visit the famous National Maritime Museum, may not know that further down the Thames, on the Waterfront at Gravesend, there is a private museum at "*The Look Out*," or, as it is sometimes called, "*The Valhalla by the Thames*." Here is a personal collection of old merchant ship figureheads, models, pictures, relics and souvenirs of the sea; all of the Mercantile Marine and mainly connected with ships of London river. The collection is part of the home of "Long John (Cap'n) Silver," and is kept quite apart from the owner's living quarters.

Before introducing you to the exhibits I would like to mention that the general arrangement of the models is to the collector's personal fancy and the layout is quite removed from that of a formal ship museum. I stress this, because it is the means whereby Captain Silver has captured that indefinable atmosphere and spirit of the sea, for the house is not in any way planned as a show-place or for exhibition.

"*The Ship*," as the museum itself is called, is divided into six sections. Entrance is through "The Gangway," a nautical term applied to the front door to conjure up a "salty" frame of mind for the visitor. On our left is the Fo'c's'le, leading to the Half-Deck; below that is the Well-Deck, and next to the Half-Deck is the Quarterdeck. A "Gangway" takes you into the "*Valhalla*," where all the fine figureheads are displayed, and you can go from there up a "companionway" to the Bridge. All the way through there is no scheme for display; relics are just placed where they fit in and are not classified, but arranged to give a pleasing effect.

The entrance to the "*Valhalla*" is through an archway formed from a ship's boat. Here we find the most important feature of the museum, the unique collection of

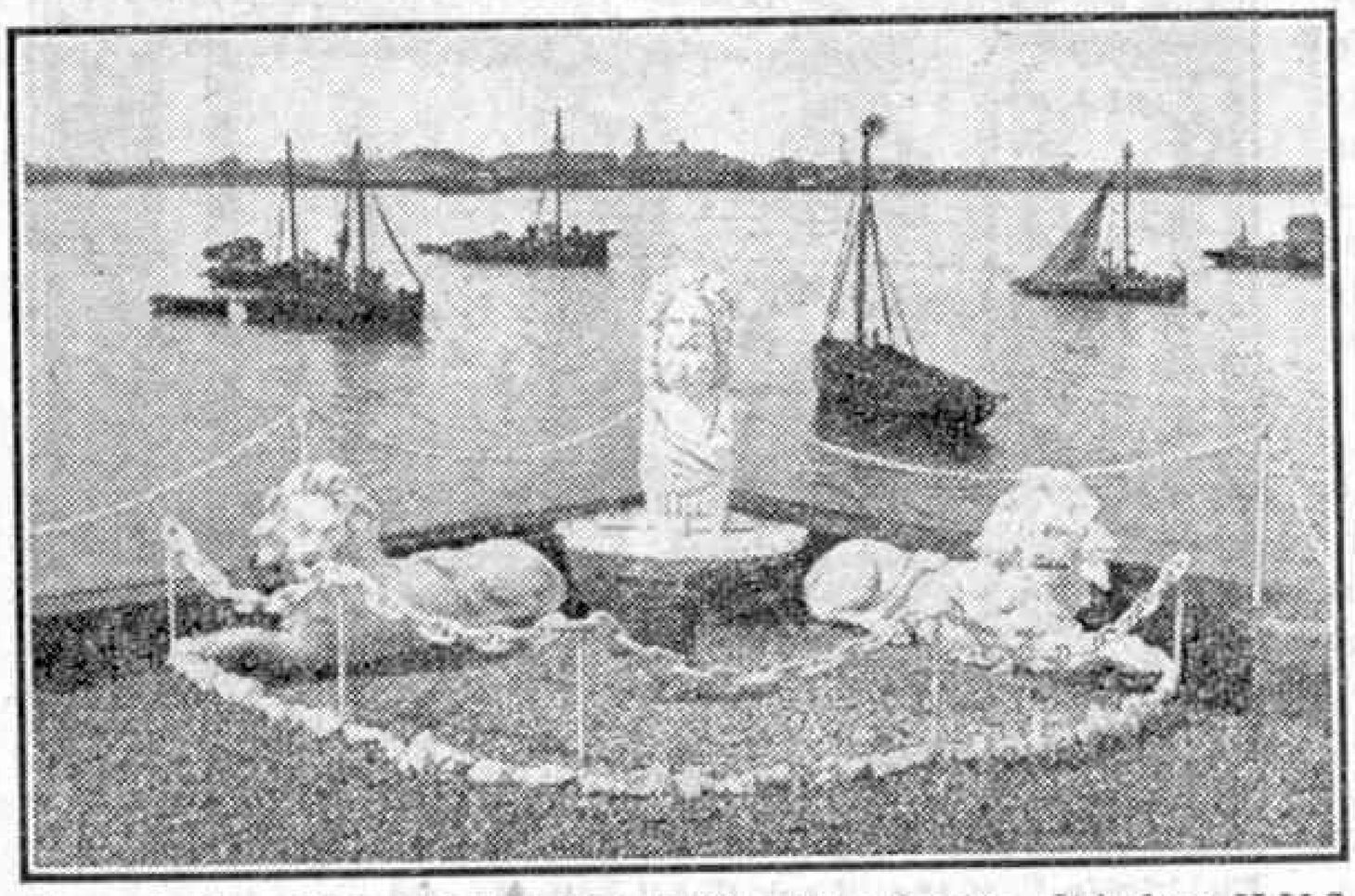
figureheads, eighty-four in all. These represent four centuries of the craftsmanship of carving and forms the largest private collection in existence. The rarest among them is that called the "Golden Cherubs," dated 1663 and reputed to have been carved by Grinling Gibbons; this lovely figurehead once adorned the bows of the piratical frigate owned by John Jacobs. Another beautiful and interesting figure is that of "Elizabeth Fry," carved in 1861. Miss Fry is represented with her Bible, reminding us of her good work among the convicts awaiting transportation.



The "Quarterdeck," looking aft, with its variety of exhibits.

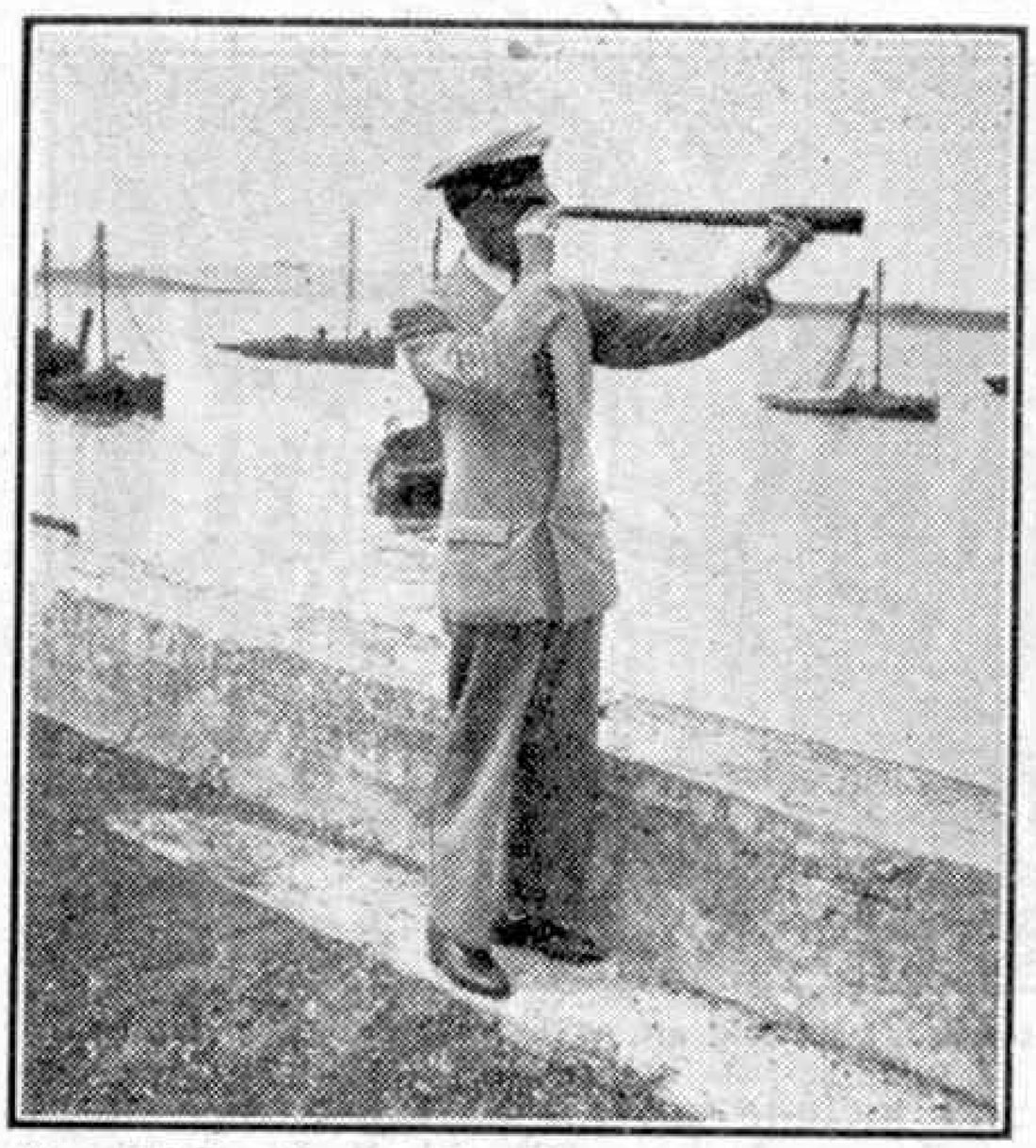
There is a traditional story that when the Princess Alexandra came from Denmark in 1863 to marry the Prince of Wales (who later became Edward VII), she landed on a pier facing the lawns of "The Look Out." In the "*Valhalla*" there is a figurehead from a 292 ton iron screw steamer built that year and named "The Bride" in commemoration of the Royal Marriage. This figure can be seen in the foreground to the left of the "*Valhalla*" photograph. The graceful damsel who presides over the company at the far end of the hall, offering you a flower that remains for ever fresh, came from an old French nitrate ship, "*Helene*," whose history, alas, is lost in obscurity. This is one of the loveliest carvings in the collection, and who knows what rare beauty inspired the creator? The wall models of ships, seen in the "*Valhalla*," were all made by seamen, and include several of the earlier ships of James Baines (Blackball Line); there is also an exceptionally fine specimen of "*La Hogue*" and a good model of the "*Torrens*." The "*Valhalla*," now the home of so many proud beauties, was once an open yard and was covered in by the "ship's company" at "The Look Out," in their spare time.

The origin of some of the figureheads is still unknown, although in the case of many of his treasures Captain Silver knows practically the whole of their history. The figurehead of the "*Diana*," for instance, pictured here, originally belonged to one of the men who helped break up this ship, which, among its many other adventures, had taken part in one of the expeditions sent out in search of Sir John Franklin. In his old age the owner passed the figurehead on to his son, "for luck," and it was the son who parted with it, at the age of 81, to Captain Silver.



The only Naval figurehead in Captain Silver's collection. It is from H.M.S. "Howe," built at Chatham in 1815 and broken up at Sheerness in 1854.

The view of the Quarterdeck shown here includes both known and unknown masterpieces. In the far corner can be seen the Indian figure that once adorned the famous tea clipper "*Lalla Rookh*." On her right is the figurehead of a schooner called "*The Duchess*." The figure next to her is unknown, but the next one is from another schooner, "*Amphitrite*." Then comes another unknown "find." Captain



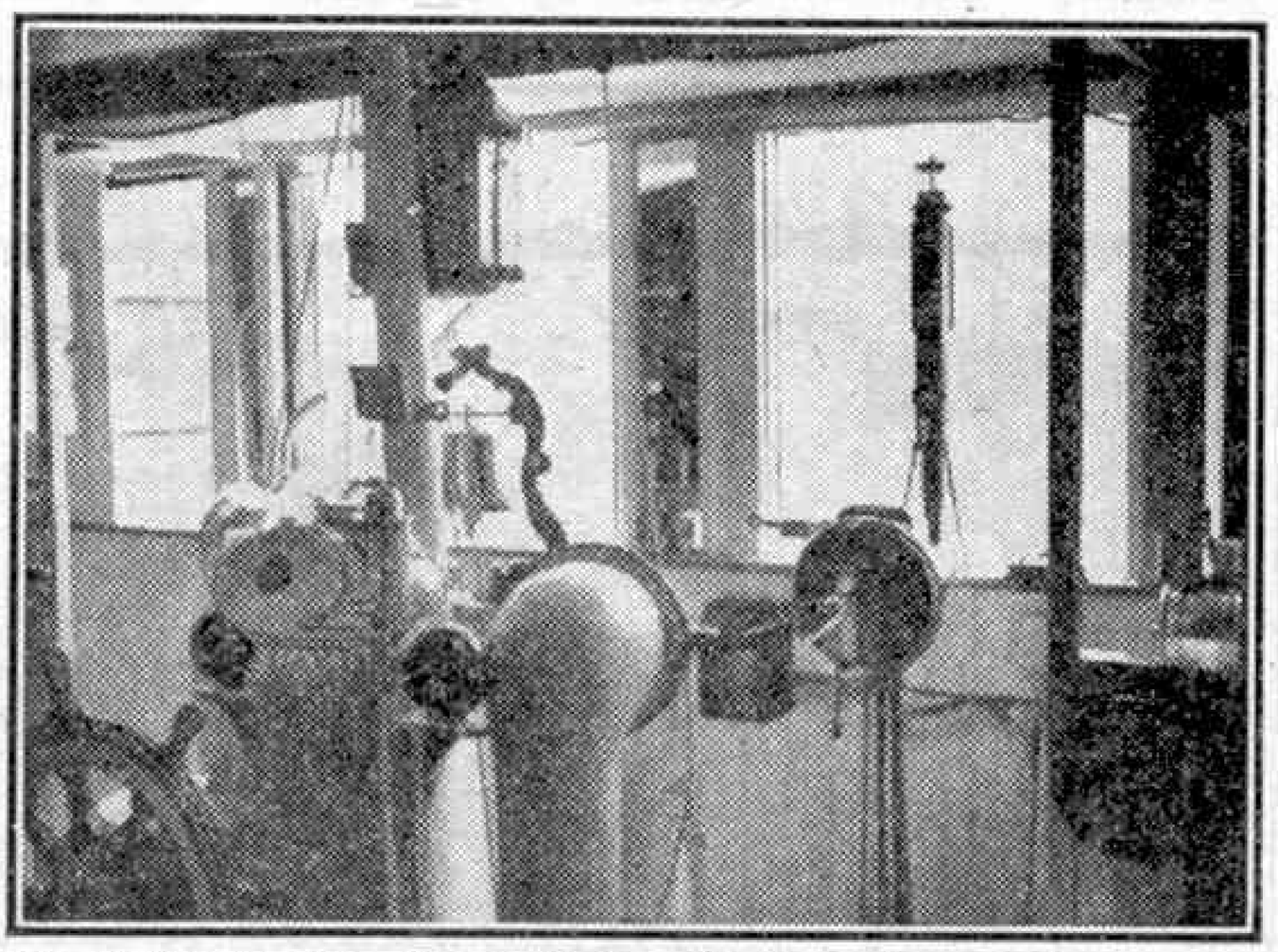
"Long John (Cap'n) Silver" on the "look-out" at "The Look Out"!

Silver is still hopeful that he may trace some of his unidentified pieces, although sometimes, as in the case of the billet or fiddle figureheads, no amount of research work can ever discover the ships they came from.

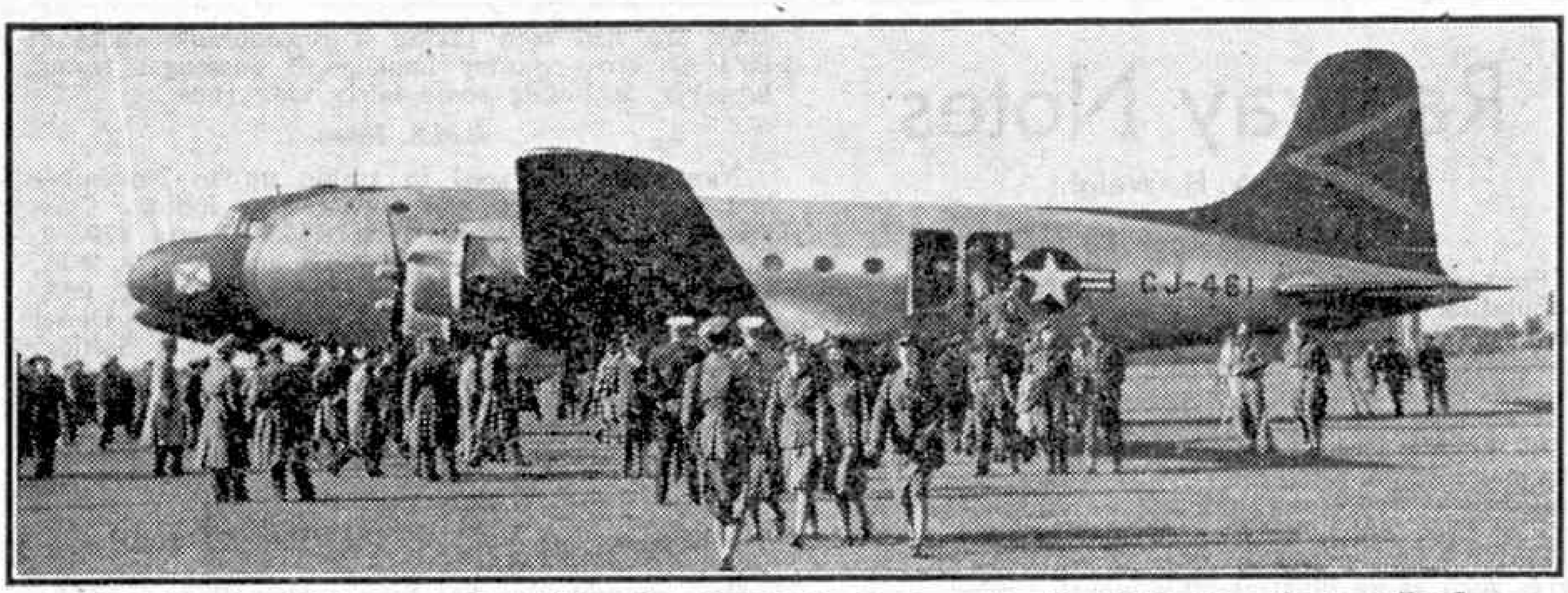
We find, in examining these figureheads, that the quality of carving and design bear little relation to the type of ship for which the figure was destined. Some of the smaller, little-known vessels carried finer figureheads than some of the larger ships with important historical associations. We must also remember, when viewing the carvings, that, although they are not to scale, they are beautifully proportioned, and there is something about them that is lacking in a professional carver's work. Most of the figureheads were made by "square-rigger" men themselves, who had the sea in their blood, and all their work was flavoured with the very essence of the hard, perilous, yet exciting life they led.

We must not miss climbing the companionway up to the Bridge, which, to a landlubber, is the most fascinating part of the museum. All the equipment on the Bridge has "been to sea" and has been used at sea for navigational purposes in its time. The decks have been "laid" by a professional boat-builder and all the fittings came from early steamships. The ventilators, for instance, came from the Port Health Authority's Yacht *"Lady Truscott,"* the Hospital Ship *"Maltese Cross,"* and from an Admiralty Yacht *"Alacrity."* The engine room telegraph came from a Nelson liner, *"Highland Rover,"* as did also the docking telegraph. The binnacle was from a Currie Line vessel, the *"Gordon Castle,"* and the speaking tube, riding light and binocular box all came from a L.N.W. Railway cross-Channel steamer, S.S. *"Violet."* The bell was from that famous Cunard White Star ship, the original *"Mauretania,"* and the bell stand from S.S. *"America."* What a story of shipping adventure they represent! Every conceivable instrument used on a real ship's bridge is erected here. To give added realism, the Bridge looks out over the Thames, nearly opposite Tilbury Floating Docks.

I hope that this brief description of Captain Silver's absorbing collection will be the means of shiploving readers paying a visit to *"The Look Out."* Captain Silver is a splendid and entertaining host to all those who have a fellow feeling for ships of the sea. He is only in residence at *"The Look Out"* during the summer months, and also is a very busy man, so he likes to be forewarned of your visit in order that he may be there to greet you. I always endeavour to pay a visit to Captain Silver one afternoon during the summer months, and the setting of the museum, the Thames at that point and the fascinating company of "Long John" himself, make it one of the most enjoyable afternoons I have to look forward to each year.



The "bridge" of the "Look Out," with its equipment from many famous old steamers.



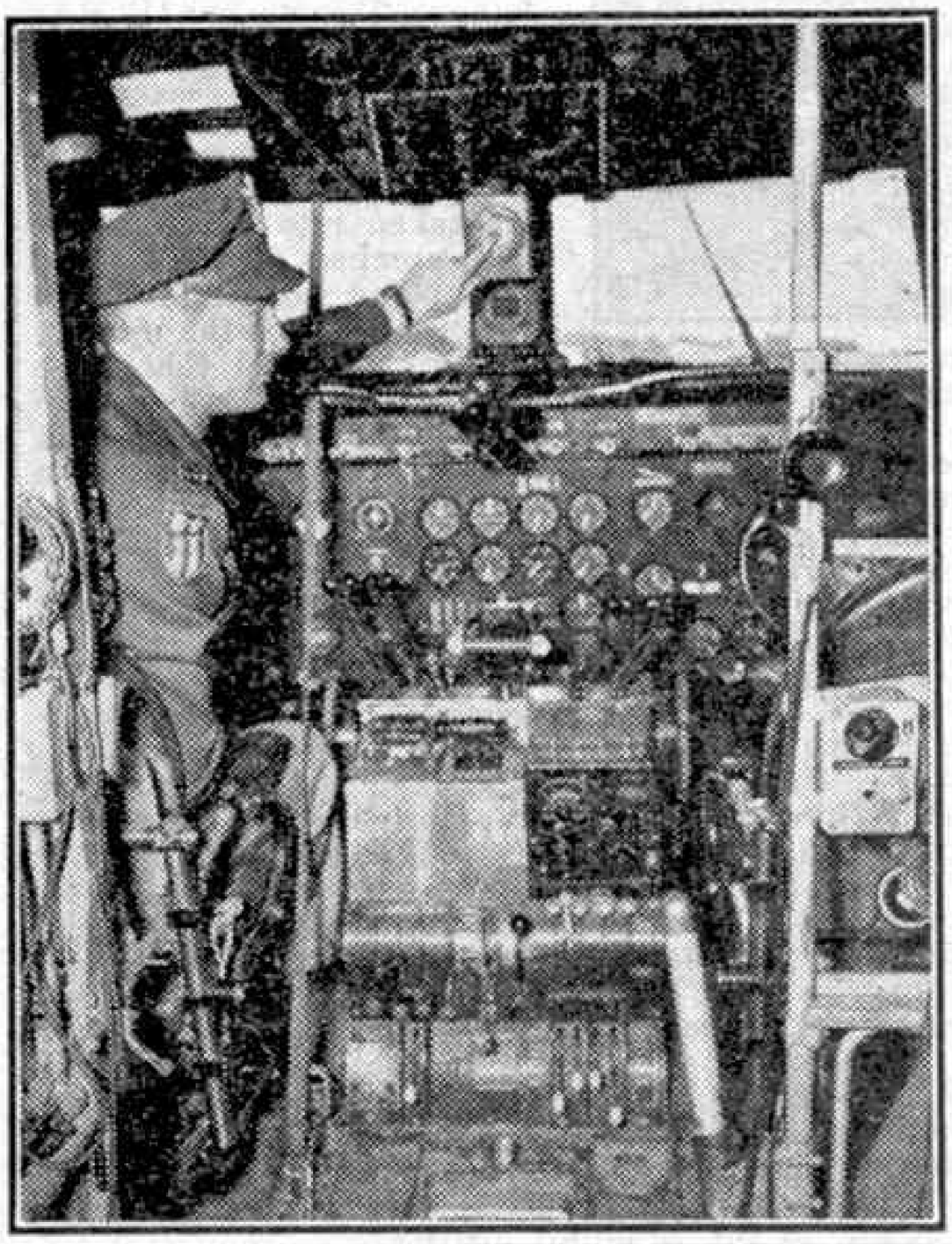
The Douglas C-54 four-engined "Skymaster" at Brize Norton after the flight from Newfoundland.

Automatic Flight

By John W. R. Taylor

LAST September a Douglas C-54 "Skymaster" of the U.S. Army All-Weather Flying Centre, with 14 people aboard, flew 2,400 miles across the Atlantic controlled entirely by radio. The flight marked a most important development in man's conquest of the air and naturally was headline news for days. But the average air traveller can be forgiven for asking "So what? How does it affect my safety and comfort?"

Being quite frank, it does not—yet. It is unlikely that the idea of being shut in an air liner and then whisked off somewhere without a "driver" would appeal very much to any man or woman who had never flown before, and that still means the majority of people. On the other hand, it would be rather comforting to know that if fog or bad weather made a landing hazardous, the pilot could just switch on the radio control and then sit back and leave it to "George," the automatic pilot, to bring the aircraft safely down.



The cockpit of the "Skymaster," with Capt. Wells pointing to the master "start" switch. This switch is surrounded by 12 indicator lights one of which flashes on to denote each sequence of the flight as it occurs.

The "brain" behind the automatic controls of the American C-54 is a Sperry A-12 automatic pilot, which can be controlled by radio beacons on the ground. Before take-off, details of the flight such as the rate-of-climb, course, altitude and position of the radio beacons that will successively control the aircraft during flight are "fed" into the robot controls. Then a master-switch is thrown, after which all operations connected with take-off, flight and landing are performed automatically in their correct sequence. In the case of the recent transatlantic flight the aircraft was controlled first by a radio installation at Stephensville, Newfoundland, then passed over to a U.S. Coast Guard ship in mid-Atlantic which corrected the course, and finally received and brought in to land by a radio beacon on the R.A.F. Station at Brize Norton, near Oxford.

The flight was undoubtedly a very fine achievement, reflecting great credit on the American scientists and airmen who made it possible. Without wishing to belittle the American achievement, however, it is worth recalling that our aviation experts at Farnborough carried out highly successful experiments in radio-controlled, pilotless flight before the war. In addition, the British company Smiths Aircraft Instruments Ltd. have developed a new electric automatic pilot, designated S.E.P.1, which has already proved itself able to hold an aircraft on course better than a human pilot. It is a vast improvement on the old hydraulic auto-pilots, as it cannot "seize up" in an emergency and can be overridden immediately at any time by the human pilot. The S.E.P.1 will be fitted to our new long-range air liners, including the giant "Brabazon," and Smiths point out that, being electric, it could be adapted very easily for complete radio control. It will not normally be used to control the aircraft during take-off and landing.

There is little doubt that these new automatic pilots can do much to eliminate the danger of human error from flying, especially in bad weather conditions. Alternatively, they could bring nearer the day when radio-controlled atom-weapons would be able to blast a city off the map with incredible accuracy! Such is the power for good or evil of modern science.

Railway Notes

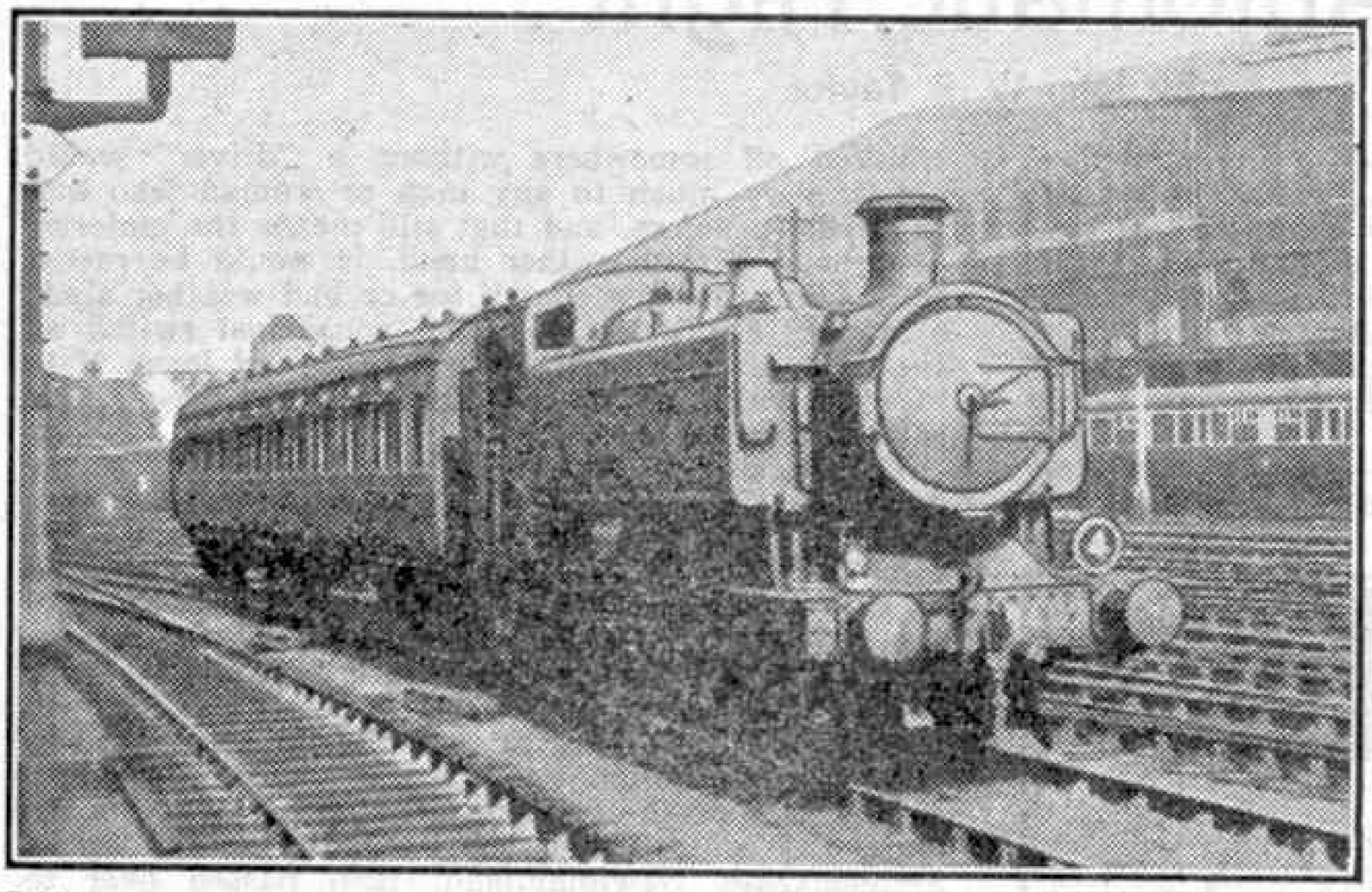
By R. A. H. Weight

The Humbler Tank Engines

For several reasons, such as the average density of population, short hauls, and heavy suburban or local traffic, and the existence of numerous shunting yards, tank locomotives are used to a much greater extent in Great Britain than in many other countries. The L.M.S., L.N.E.R. and G.W.R. each own more than 2,000 engines that carry their own water supplies and have no tenders, the G.W.R. having the largest proportion. Many tank engines have rendered valuable service over long periods, though they receive little publicity, particularly if they are of the humbler types such as we illustrate this month.

There are about 3,000 0–6–0T locomotives in Britain, this being by far the most popular wheel arrangement. Among these, Great Northern "saddle" and Great Western "pannier" tanks have been ubiquitous for more years than most of us can remember, and still are, though no more of the G.N. type have been built by the L.N.E.R. whereas construction of the G.W.R. type has been almost continuous at Swindon. A photograph is reproduced of one of the latest G.W.R. 94xx type, of which details were given in our November 1947 issue. Prominent among the 0–6–0 side tanks of the older style have been the former Great Eastern local passenger and goods locomotives, numerous examples of which have been scattered about the L.N.E.R. system, mainly for freight shunting, although they are also used for branch line operating, as in the case of No. 8492 of class "J67" pictured as running on the Lauder branch in Scotland. There, on account of exceptional weight restrictions, it hauls a tender to provide water supply, as it would be too heavy for the rather frail bridges if its tanks were filled in the ordinary way.

The next most numerous British tank wheel type is the 0–6–2, but in view of the recently celebrated Ashford Works centenary we illustrate a former S.E.C.R. 0–4–4T passenger engine exemplifying a style adopted by many of the old separate railways about 40 to 50 years ago and still in use to a considerable extent on some lines. The "H" tanks on the S.R. work main line empty trains in and out of London termini, having been displaced from suburban passenger duties by electrification. In East Kent they are still seen taking a considerable share of local or cross-country haulage of passenger trains, however, including some fairly long runs.



G.W.R. No. 9407, of the new enlarged 0-6-0T class, on Paddington empty carriage duties. Photograph by G. O. P. Pearce.

L.M.S. News

New engines placed in traffic up to November last were numbered and allocated as follows: Class "5" 4–6–0 mixed traffic Nos. 4758–62 and 4796–7, shed 29A, Perth, and Nos. 4763 and 4798–9, 32A, Inverness; Class "4" 2–6–4T Nos. 2284–90, 26A, Newton Heath; No. 2291, 23C, Southport; Diesel shunter 350 h.p. 0–6–0 Nos. 7127–8, 21A, Saltley, Birmingham.

Of the new 4–6–0s, Nos. 4758–60 and 4763 are fitted with roller bearings. Several of the 48xx series burn oil fuel. Rebuilt 4–6–0 express engines with latest tapered boiler lately seen were No. 6111 "*Royal Fusilier*," of the "Royal Scot" class, and No. 5540 "*Sir Robert Turnbull*," of the "Patriot" class, now "6P."

More renumbering has been taking place to make room for modern classes. The following locomotives have had a prefix 2 added to their previous numbers, increasing these by 20,000: No. 2290, the 0–10–0 banking engine, and the remaining "2F" Midland 0–6–0s numbered between 3000 and 3018. The "3F" Tilbury type Midland 0–6–2Ts recently numbered 2180–93 have become 1980–93. The following "6F" 0–8–0s are re-classified "7F": Nos. 9108, 9229, 9254 and 9282.

Among interesting old locomotives withdrawn are No. 22834, still retaining round-topped fire-box, belonging to the 80-year old Kirtley double-framed 0–6–0 vintage, and No. 14333, the last of the stout and once famous "Dunalastair II" class of 4–4–0 Caledonian express locomotives.

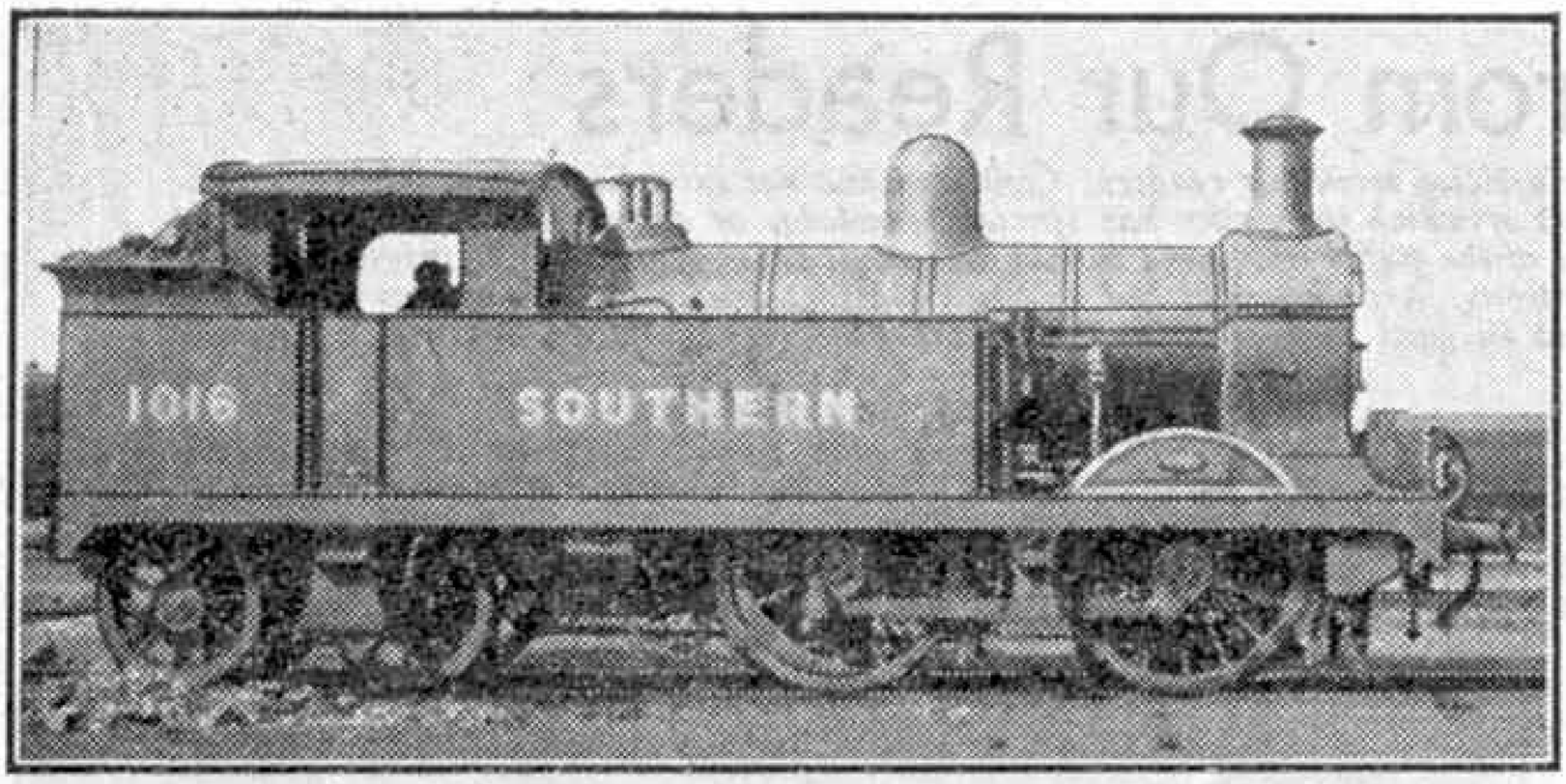
"8F" 2–8–0 freight engines, which have temporarily been L.N.E.R. "06" Nos. 3500–67, are taken into L.M.S. stock with numbers 8705–72. They are being distributed to various parts of the system. We are informed that some of the "Patriots" which have no names when rebuilt will be given some of the old-time famous ones seen on the L.N.W.R. in days gone by.

The "Locomotive Casualty League" for encouraging friendly rivalry among Motive Power Districts in reducing engine failures or casualties has been revived, awards being given on the basis of the best mileage figures without mechanical breakdown. The first five places at the conclusion of the first year were secured by the following districts: Inverness, Rugby, Bletchley, Wellingborough and Bristol. The L.M.S. have some 7,800 locomotives distributed over about 200 depots, with a staff of 45,000.

Owing to the collapse of a bridge under flood conditions on the Leeds-Skipton section of the main line of the Midland Division, interesting diversions of express and other traffic via Ilkley have been taking place recently, with double-heading of "Royal Scot" or other 4–6–0 express locomotives by class "2" 4–4–0s or class "4" 0–6–0s, on account of steep gradients. Engines from the Western and Central Division have passed Ilkley, a reader writes. He has also noted four Caledonian 0–4–4Ts moved from Scotland to the Bradford district.

Great Western Tidings

A 352,000 gallon oil storage tank for heavy fuel oil has been brought into use at Old Oak Common Shed, London. Tanks, pumps and steam heating



S.R. "H" Class 0-4-4T No. 1016, formerly S.E.C.R. No. 16. This engine was one of the two last of the class, and was built at Ashford in 1915. Photograph by A. C. M. Clements.

apparatus to make the oil flow easily are also included in the new installation. Smaller plants are in operation, with others under construction at a number of locomotive depots between Reading, Llanelly and Newton Abbot.

Hostels providing sleeping and dining accommodation for enginemen whose duties require them to take rest away from their home station are provided near the sheds at Landore (Swansea), Tyseley (Birmingham) and Bristol. Brown coal called lignite is being mined in considerable quantities in Devon, near Heathfield, and conveyed by freight trains to the Midlands and elsewhere. The G.W.R. are extending the use of electric vacuum cleaners at their principal carriage sidings.

New engines have been placed in service as follows: Modified "Hall" 4-6-0: Nos. 6971-6, named respectively "*Athelhampton Hall*," "*Beningbrough Hall*," "*Bricklehampton Hall*," "*Bryngwyn Hall*," "*Capesthorne Hall*" and "*Graythwaite Hall*." The first two are shedded at Bath Road, Bristol, the third and fourth at Paddington, and No. 6975 at Oxley. Nameplates added are No. 6928, "*Underley Hall*," No. 6931, "*Aldborough Hall*," and No. 6965 "*Thirlestaine Hall*." New 2-6-2T No. 4159 is at Chester; 0-6-0Ts Nos. 6757-9 are allocated respectively to Severn Tunnel Jn., Cardiff Valleys and Pill. Withdrawn "Bulldog" 4-4-0s are No. 3375 "*Sir Watkin Wynn*," often seen assisting heavy expresses between Newton Abbot and Plymouth, and No. 3399 "*Ottawa*," recently a sprightly performer on the Chester-Birkenhead joint line.

L.N.E.R. Locomotive Developments

New "A2/3" 4-6-2 No. 524 "*Herringbone*" is stationed at York and has recently been sharing the through runs from that city to King's Cross and back with No. 522 "*Straight Deal*," up in the early morning on the mail train or the "*Aberdonian*," returning with the "*Flying Scotsman*" or the 1.0 p.m. midday Scots express.

Among the latest "B1" 4-6-0s noted at work towards the close of last year were Nos. 1232-6, shedded at Stratford, Nos. 1242-5, allocated to Scottish sheds, and Nos. 1246-9 at Doncaster. Of the named Darlington-built series, Nos. 1034-5 are stationed at York, with names "*Chiru*" and "*Pronghorn*" respectively. Those built by the Vulcan Foundry Limited numbered 1140-89, which have electric light fittings, carry white discs for headcode indications by day, and this practice may be extended; it has been usual on the G.E. Section for many years.

Green paint is appearing on more locomotives which have been through shops at Cowlairs Works, Glasgow, including some "K2" 2-6-0s belonging to the Southern Area, we are informed, as well as "Loch" 2-cyl. 2-6-0s and "D11" 4-4-0 engines. We hope next month to include a photograph of one of the smartly painted and maintained green carriage pilot tank locomotives at Newcastle Central.

The purchase of 176 diesel-electric shunting locomotives is contemplated. These will eventually replace a larger number of steam tanks.

News from the Southern System

All the platform faces at Clapham Junction, the "world's busiest railway junction," are being renumbered consecutively 1-17 with new vitreous enamel signs.

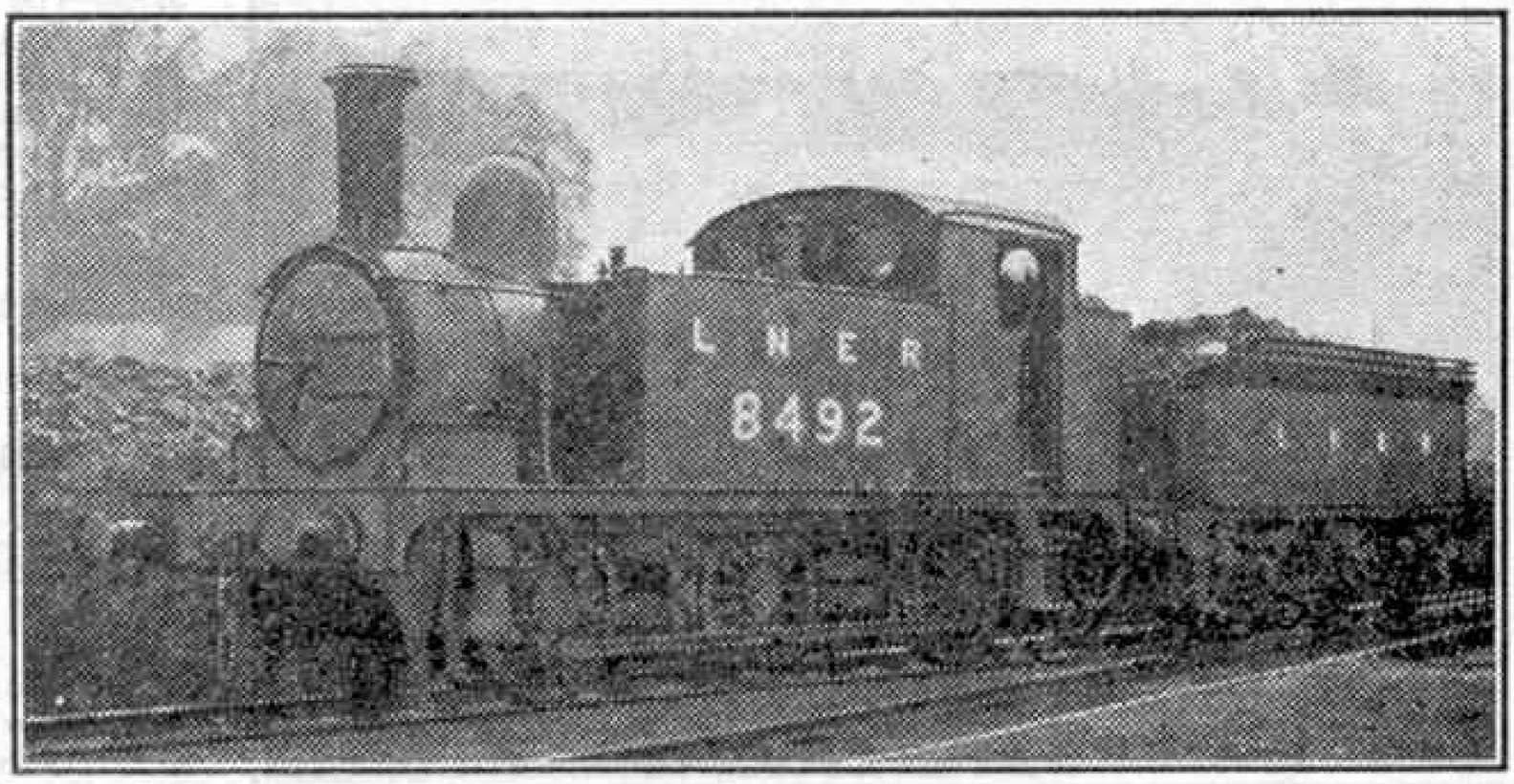
A "Lord Nelson" locomotive with Pullman cars formed the Royal Honeymoon special from Waterloo on 20th November last.

Certain "Merchant Navy" and "West Country" 4-6-2s had special fittings on the smoke deflectors for carrying the "*Devon Belle*" title boards during the summer season. Banking engines along the extremely steep stretches near Ilfracombe and also between Central and St. Davids' Stations in Exeter, included "N" 2-6-0s, "West Countries" out of Ilfracombe, and the "E1" rebuilt 0-6-2Ts familiar at Exeter. "Q1" 0-6-0s Nos. C26-30 were lately allocated to Tonbridge, and "N1" 3-cyl. 2-6-0s No. 1822 and 1876-7 to St. Leonards shed. In each case they are the first of their type to be shedded at those depots.

Brevities

One of the Northern Counties L.M.S. 2-6-0s, No. 100, is reported to be running with a large tender and fitted with new type three-jet burners as an experimental oil burner.

A well-equipped new station has been opened by London Transport at White City, on the Central Line in West London, now being extended to Ruislip.



L.N.E.R. No. 8492, of Class J67, fitted with J36 six-wheeled tender for water supply, as used on the Oxton and Lauder branch of the Waverley route. Photograph by courtesy of the L.N.E.R.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

DONKEYS ON ST. HELENA

On their way back from South Africa the King and Queen called at lonely St. Helena and went for a drive through the island's lovely scenery to the place of Napoleon's imprisonment. The accompanying photograph was taken on the island about 40 years ago. It shows donkeys laden with fodder plodding along one of the chief roads.

Donkeys are also used to this day on the smaller island of Ascension, 760 miles away, the population of which is only 150, and some years ago the breed was much improved by the importation of new Spanish stock. Donkeys remain important beasts of burden throughout the greater part of the territories surrounding the Mediterranean. In Britain a higher stage of material development has caused them to be superseded, but a glance through the pictures of artists working between 1700 and 1850 will show how common the employment of donkeys used to be in our own land.

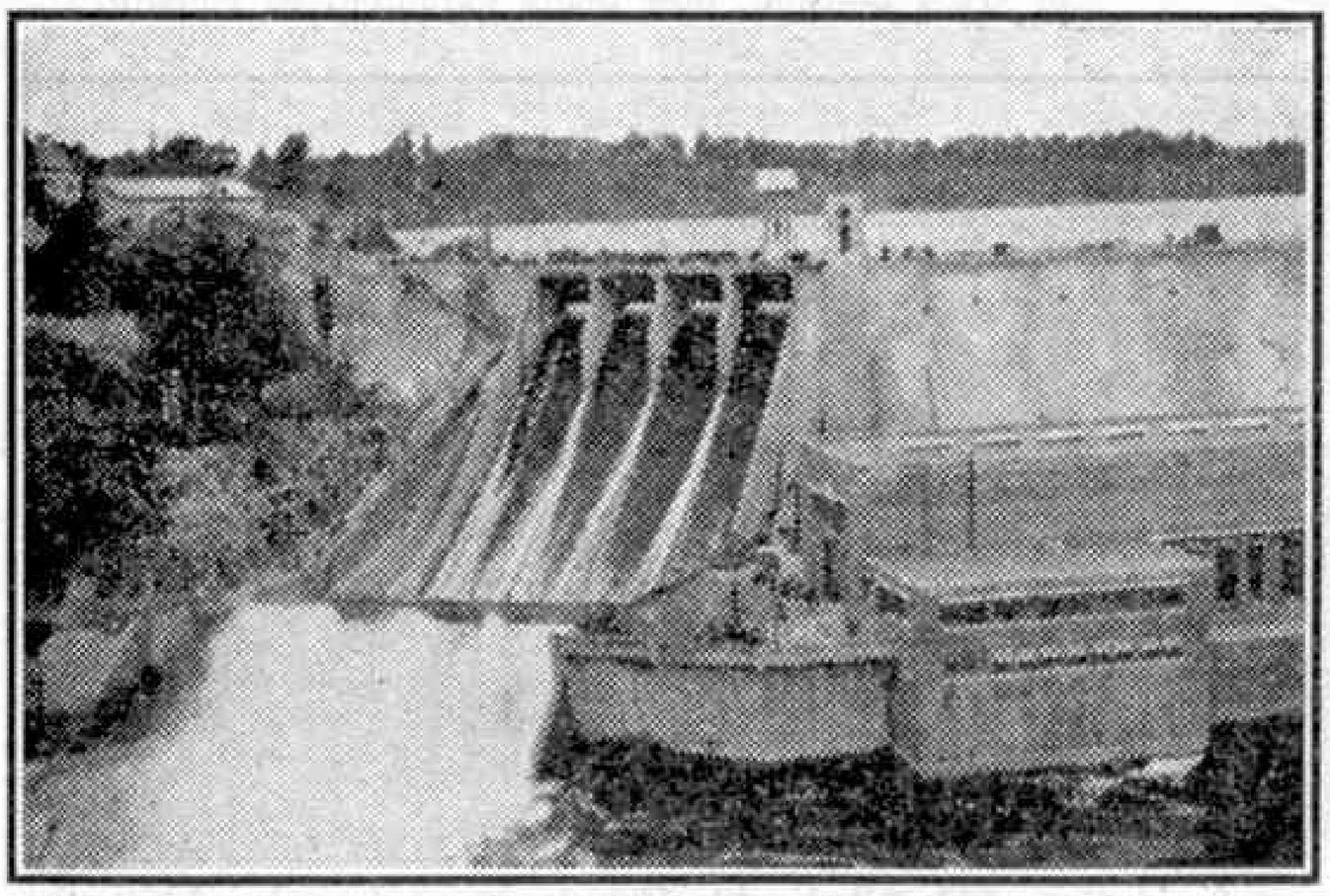
P. Stephens (Kingston-upon-Thames).

Pack donkeys carrying fodder on St. Helena. Photograph by P. Stephens, Kingston-upon-Thames.

THE KARAPIRO DAM

The largest hydro-electric scheme in New Zealand at present is to make more use of the country's longest river, the Waikato, which is the outlet to the sea of Lake Taupo. To the existing stations at Arapuni and Horahora nine stations are to be added, and these will utilise all but 95 ft. of the total 1,172 ft. fall from Taupo to the sea, and generate more than 800,000 kW. Karapiro, the first station in this scheme, is now nearing completion, and with three generators will produce 90,000 kW. The rotor of one of these generators was illustrated in the "*M.M.*" for September 1946.

Work was begun in 1940 with the driving of a great diversion tunnel, but it was not until late in 1943 that water was allowed through this. Cofferdams were then built and the water was pumped from the dam site. Much excavation had to be done before construction could be undertaken. Work then progressed rapidly, the spillway being completed in 1944, and the first sections of the penstocks were placed in position in the dam. The end of the next year saw the completion of the powerhouse building below the dam and the outdoor transformer station structure. Good progress also was made with the pouring of concrete in the arch section of the dam, which is 576 ft. long, vertical cooling slots being left at regular intervals to allow for the cooling and resultant shrinkage of the masses of concrete. Finally in 1946 the arch was raised to its full height and the cooling slots were filled. Core walls at both ends of the dam also were built, running many feet into the hillsides to prevent seepage round the ends of the dam, making the total length 1,400 ft. The dam carries a single width roadway along the top.



The dam and power station at Karapiro, New Zealand. Photograph by K. W. Dey, Hamilton East, New Zealand.

On Easter Friday this year the filling of the lake began with the lowering of the 50-ton gate in the diversion tunnel through which the river had flowed for three and a half years. Although the gate was left partly open to allow water through for the towns down the river, the lake rose 84 ft. to spillway level in just over four days. A special finish on the concrete beneath the gate was necessary to withstand the tremendous scour of the water, which reached a speed of 80 ft. per sec. toward the end. By August of last year the first generator, after undergoing exacting tests, had been linked up with the North Island system and the other two units are expected to be operating shortly. This work, and other hydro-electric schemes that have been planned, are evidence of the New Zealand Government's realisation of the need for electric power.

K. W. Dey (Hamilton East, N.Z.).

Club and Branch News

WITH THE SECRETARY

NOVELTY IN THE CLUB PROGRAMME

The excitements of the Christmas and New Year season, with its Exhibitions, Socials and other novel events, are now approaching their end and Leaders will be looking for ways and means of maintaining the prevailing enthusiasm and turning it to good account. A good plan is to work up a special scheme for model-building, one with something novel in it if at all possible. For instance, if in the past competitions have taken the form of building up selected models more or less at leisure, variety can now be introduced by organising say a "Quick Model-Building Contest," that is one with a time limit so that rapid planning and construction are called for. A competition of this kind is a splendid test, not only of the ingenuity of members, but also of the model-building ability gained in previous Club activities. New games also might be introduced, preferably those suitable for tournaments, and looking through the programme will suggest other changes that will allow for the introduction of friendly rivalry. The great idea is to keep things moving briskly in Club life; members must never be allowed to settle into ruts.

At this time of the year special steps should be taken to make new members feel at home at Club meetings. There are various ways of ensuring this. In small Clubs each recruit can be placed for a time under the special charge of a Senior member. In larger Clubs a special Junior section can be formed, again under the charge of an experienced member acting as Assistant Leader, and special model-building competitions and other events can then be arranged for them. One word of warning is necessary, however. If a Junior Section is formed, meetings for all members of the Club should be arranged from time to time, when young and old members can mix together freely and take part in the same activities.

Presentation of prizes won by members of the Huntingdon M.C. at the display arranged for Huntingdon Regatta week. The Mayor of Huntingdon, Mr. J. H. Harrison, is seen in the centre of our group, with the Mayoress on his right and Mr. J. C. Deaves, Leader, on his left. The prize-winners with their trophies are F. Saddington, Secretary, R. Blowfield, M. Deaves, P. Burton and T. Edwards.

PROPOSED CLUBS

ISLEWORTH—Master D. Shave, 29, Worton Way.
SWANSEA—Master T. Croocock, 6, Haslemere Road, Sketty.
WALLINGTON—Mr. P. Mitchell, 5, Stratton Avenue.
NORWICH—Mr. B. B. Ecker, 57, Prince of Wales Road.
HARPENDEN—Master T. Hastings, 11, Salisbury Avenue.

PROPOSED BRANCHES

BARROW-IN-FURNESS—Mr. G. Blackie, 146, West View Road.
ST. HELENS—Mr. D. Johnson, 129, Kiln Lane.
HOUNSLOW—Master B. Scott, The Homestead, 113, Whiston Road.
ST. ANNES-ON-SEA—Mr. W. R. Potter, 30, Dalton Road.

CLUB NOTES

WEST BYFLEET COUNTY SECONDARY SCHOOL M.C.—This newly-affiliated Club arranged a successful Exhibition. The many exhibits included a Windmill, a Fretwork Machine, a Dockyard Crane and Bridges, Lorries, Battleships and Pit Head Gear, etc., all entries in the Model-Building Exhibition, with a Grandfather Clock, Walschaerts Valve Gear and other exhibition models. H.M. Inspectors visiting the School were pleased with the display, and one of them presented a prize. Club roll: 50. *Secretary:* C. Berry, West Byfleet County Secondary School, West Byfleet.

WORCESTER COLLEGE FOR THE BLIND M.C.—A series of Model-Building Contests is the chief feature of meetings. Members are arranged in four groups, in each of which set Model Contests are organised. Visits to local factories are to be arranged. Club roll: 27. *Joint Secretaries:* K. Peak and M. Griffin, Worcester College for the Blind, Worcester.

PLYMOUTH M.C.—The Club celebrated its 21st Birthday in October. A special issue of the Club Magazine briefly reviewed the Club's history. All Sections continue to be busy, particularly the Hornby Railway Section, which is relaying the track and introducing signalling. Club roll: 50. *Secretary:* D. M. Cunsby, 10, Whitefield Terrace, Lipson, Plymouth.

BRANCH NEWS

RYDAL SCHOOL (COLWYN BAY)—Meetings are held in new quarters, where a good layout is being erected and fitted with colour-light signals. The locomotive stock has been largely increased and a special Exhibition was arranged for Half-Term. *Secretary:* B. B. Heywood, Barbarians, Rydal School, Colwyn Bay, N. Wales.

SHEERNESS—Regular meetings are now being held. In addition to track operations the programme includes Lectures on railway subjects. Gillingham Locomotive Depot has been visited. *Secretary:* J. Fox, 105, Victoria Street, Sheerness.

Among the Model-Builders

By "Spanner"

An Internal Expanding Brake

Readers who specialise in the construction of detailed models of lorries and cars will be interested in the internal expanding brake shown in Fig. 1. Details of this were sent to me by F/Lt. N. C. Ta'Bois, who used it recently in a model of a heavy goods vehicle he has made.

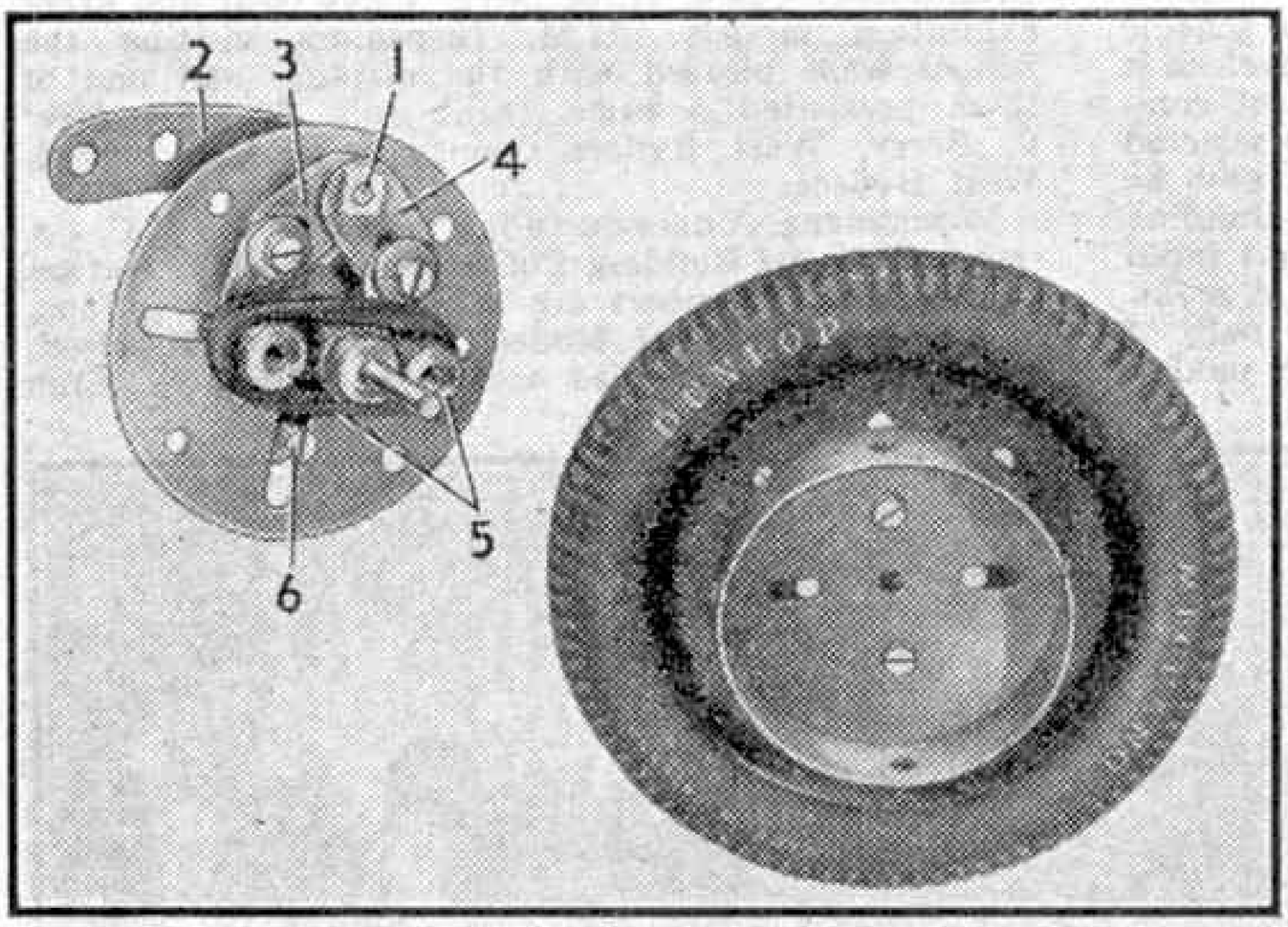


Fig. 1. An internal expanding brake suggested by F/Lt. N. C. Ta'Bois, B.A.O.R.

The brake is built up on a back plate consisting of a Face Plate. Each brake shoe is made by bolting together by their slotted holes two Fishplates. A ½" Bolt 1 is passed through the next to end hole of a Curved Strip 2 and through a slotted hole in the Face Plate. The Curved Strip is spaced from the Face Plate by three Washers.

The Fishplate 3 is spaced from the Face Plate by two Washers, and from the Fishplate 4 by a nut. A second nut is added to grip the Fishplate 4 tightly on the Bolt 1. The Threaded Bosses 5 are fixed to the brake shoes by ½" Bolts, which are passed through the slotted holes of the Face Plate. A 6" Driving Band is looped over the Threaded Bosses to form the friction surfaces.

A Bell Crank is lock-nutted to the end hole of the Curved Strip 2, and to the Face Plate by a Bolt 6. The brake drum is formed by a Boiler End bolted to a 3" Pulley.

The brake is operated by a Rod or Strip attached to the end of the Curved Strip 2.

A Large Eccentric

The Meccano Eccentric (Part No. 130) will be found suitable for use in most cases where an eccentric action is required, but in larger models it may prove to be out of scale with the size of the model. In such cases a larger built-up eccentric is required, and Fig. 2 gives an example of one of these.

A Face Plate is bolted to each side of a Wheel Flange by the ½" Bolt 1. A Bush Wheel is secured to the inner Face Plate by a Threaded Pin. The driving shaft is locked in the Bush Wheel and a Collar 2 presses the Face Plates firmly against the Wheel Flange.

New Uses for Spring Cord

Meccano Spring Cord is intended to provide a strong and efficient driving belt, but many other novel applications have been found for this part, and accompanying illustrations provide a further example of its usefulness. In Figs. 3 and 4 it is used as the outer sheath of a cable-operated remote control unit.

The housing for the control levers is

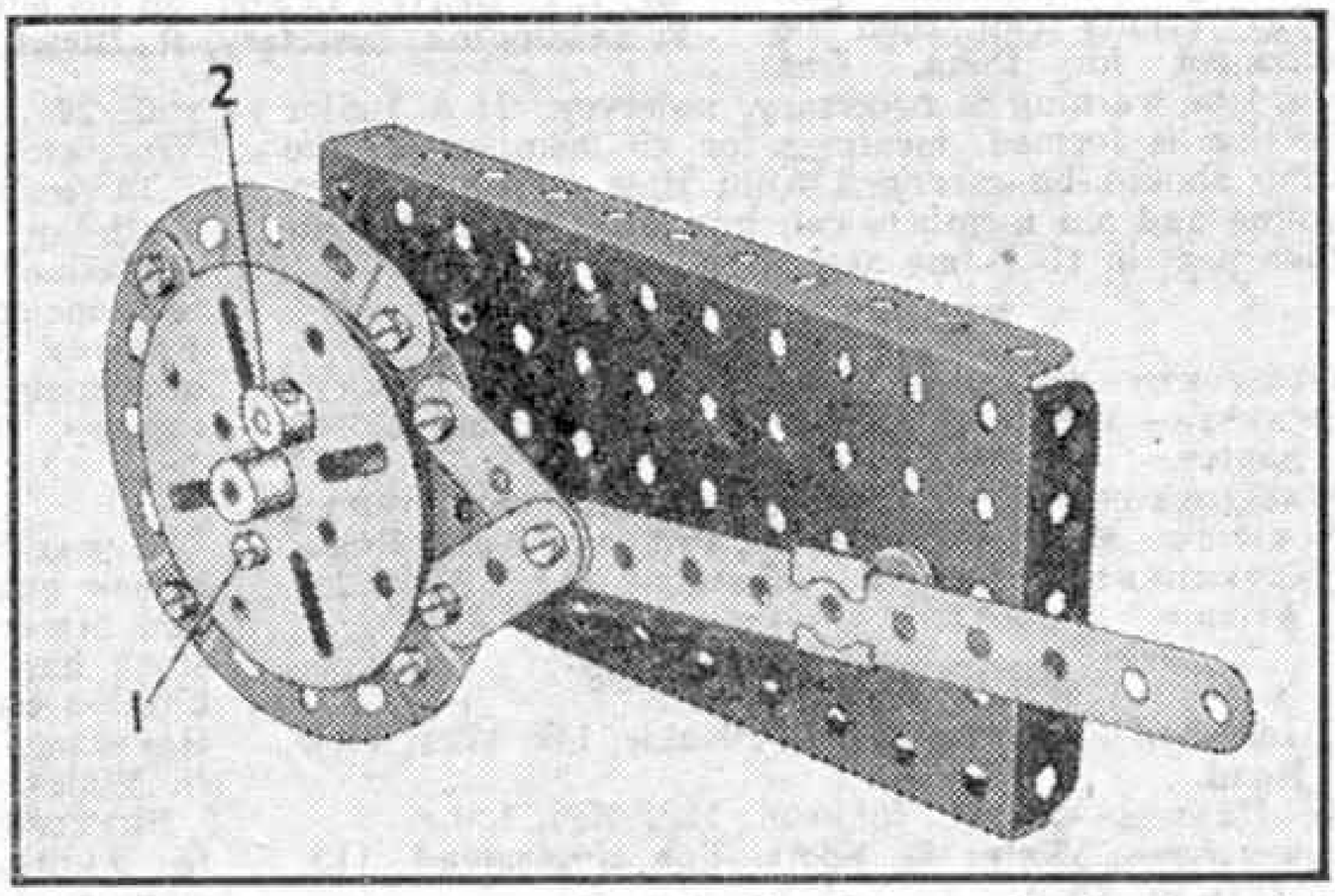


Fig. 2. A built-up eccentric suitable for use in large model stationary engines.

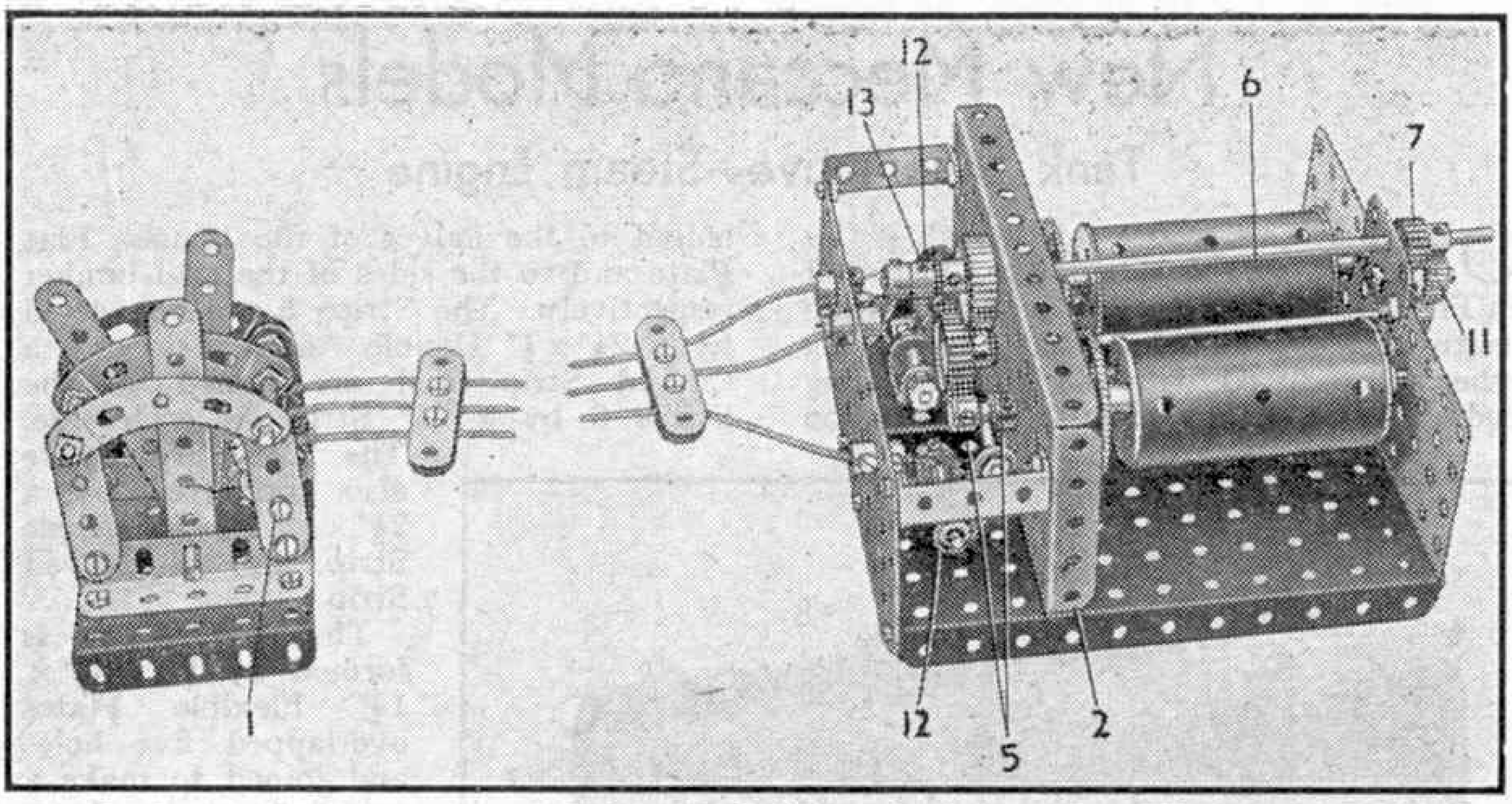


Fig. 3. General view of remote controlled crane winding mechanism complete with control lever frame.

made by bolting two Angle Girders to a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. Two 2″ Strips are attached to each Angle Girder and provide supports for the lever quadrants. The quadrants are formed by three Curved Strips held by nuts on 2″ Screwed Rods. The levers are $3\frac{1}{2}''$ Strips and the ends of the cables are fixed in Collars attached to a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip held by the Bolt 1.

The winding mechanism illustrated in Fig. 4 is made by bolting $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Plates to the ends of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates. A third Flanged Plate 2 is attached to the base and is connected to one of the side-plates by $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

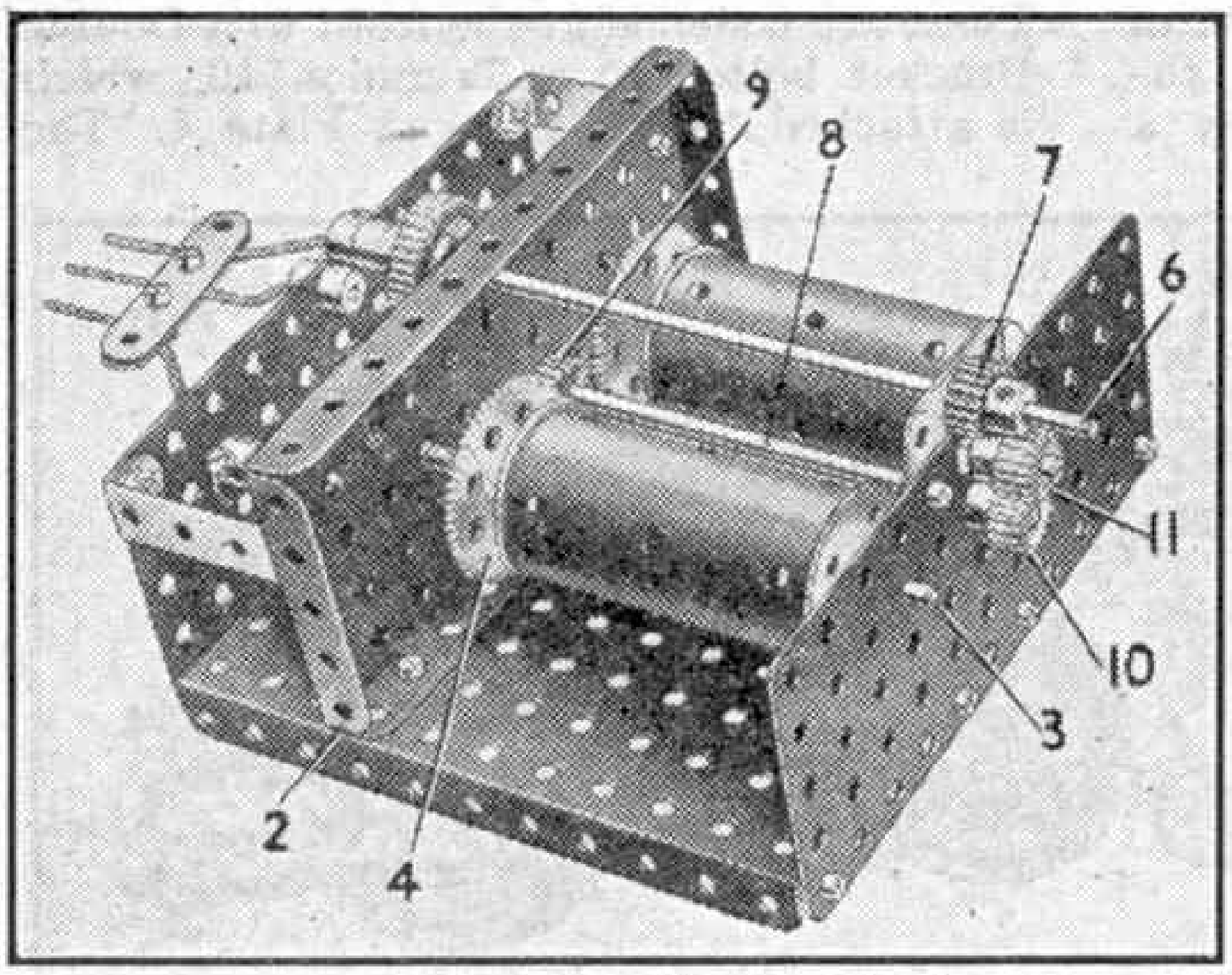


Fig. 4. The crane winding mechanism showing how the control cables are attached.

The winding shafts are identical in construction and consist of 5″ Rods 3 journalled in the side-plate and the Flanged Plate 2. The Rods 3 are each fitted with a 57-teeth Gear 4 and two Collars 5. A Compression Spring is held between the Gear 4 and the Flanged Plate 2.

The drive to the winding drums is taken from a $6\frac{1}{2}''$ Rod 6 mounted in the Flanged Plate 2 and a $1\frac{1}{2}''$ Flat Girder, and it carries a $\frac{1}{2}''$ Pinion 7. A 1″ Gear locked on Rod 6 meshes with a similar Gear on a 5″ Rod 8, which is fitted also with two $\frac{1}{2}''$ Pinions 9 and 10. Reverse drive is obtained through the $\frac{1}{2}''$ Pinions 7, 10 and 11. The Pinion 11 is free to turn on a $\frac{3}{4}''$ Bolt.

The drive to each drum is obtained by sliding the Rod 3 in its bearings so that the Gear 4 is brought into mesh with the Pinion 9. Movement of the Rod is controlled by a Crank 12. The Crank is locked on a $1\frac{1}{2}''$ Rod mounted in a Double Bracket bolted to the base, and is fitted with a Threaded Pin. The Threaded Pin engages between the Collars 5.

Piano wire of a suitable gauge should be used for the core of the cables. One end of the wire is connected to a lever in the control unit and the other end is fixed to Crank 12.

The centre lever reverses the winding drums. The wire is fixed to Collars 13 held freely between other Collars on Rod 6.

New Meccano Models

Tank Locomotive—Steam Engine

OUR first new model this month is the fine 0–4–4 tank locomotive illustrated in Figs. 1 and 2. A particularly interesting feature of the model is that the driving wheels are fitted with working coupling rods. All the parts used in the construction

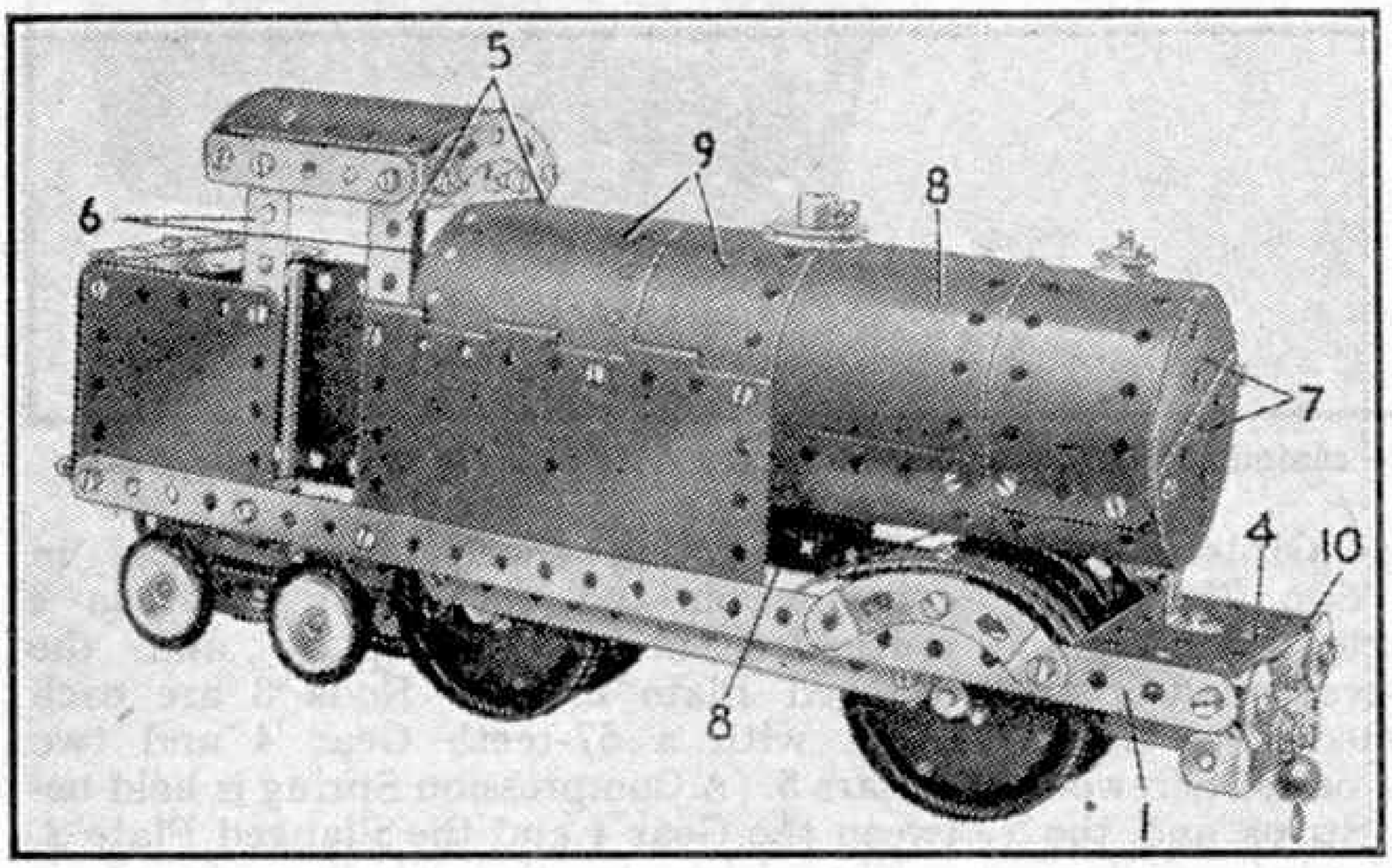


Fig. 1. A model 0-4-4 tank locomotive that can be built from parts in Outfit No. 4.

of the locomotive are contained in a No. 4 Outfit.

The main frames are formed by the 12½" Strips 1. These are joined at the rear by two 2½"×½" Double Angle Strips 2 and 3, and at the front by a 2½"×1½" Flanged Plate 4.

The sides of the coal bunker consist of 2½"×2½" Flexible Plates bolted to the Strips 1, and the rear is formed by a 2½" × 2½" Flexible Plate attached to the Double Angle Strip 2. A 2½"×1½" Flexible Plate is fastened to the top by a Reversed Angle Bracket.

The pin is withdrawn from a Hinged Flat Plate and the separate halves are bolted to the main frames to represent the water tanks. The cab roof is supported by two 3½" Strips 5, and by two 2½" Strips 6. These are bolted to the halves of the Hinged Flat Plate and to the sides of the coal bunker respectively. The Strips 5 are connected by a 2½"×½" Double Angle Strip and a Curved Strip, and are joined to the Strips 6 by a 2½" Strip on each side. The 2½" Strips are also connected by a 2½"×½" Double Angle Strip and a Curved Strip.

The smoke-box is formed by two 5½"×1½" Flexible Plates overlapped five holes and joined to make a complete circle. It is attached to two Semi-Circular Plates 7 by Angle Brackets. Two 5½" × 2½" Flexible Plates 8 are overlapped five holes and bolted together to form a circle, and are fastened to the smoke-box by Fishplates. The boiler is completed by two 4½"×2½" Flexible Plates 9 bolted to the halves of the Hinged Flat Plate. The smoke-box is supported by a Reversed Angle Bracket attached to the Flanged Plate 4.

The driving axles are mounted in an underframe consisting of two 12½" Strips. These are fastened at the front to a Double Bracket bolted to a Trunnion 10, which is attached to the Flanged Plate 4. The

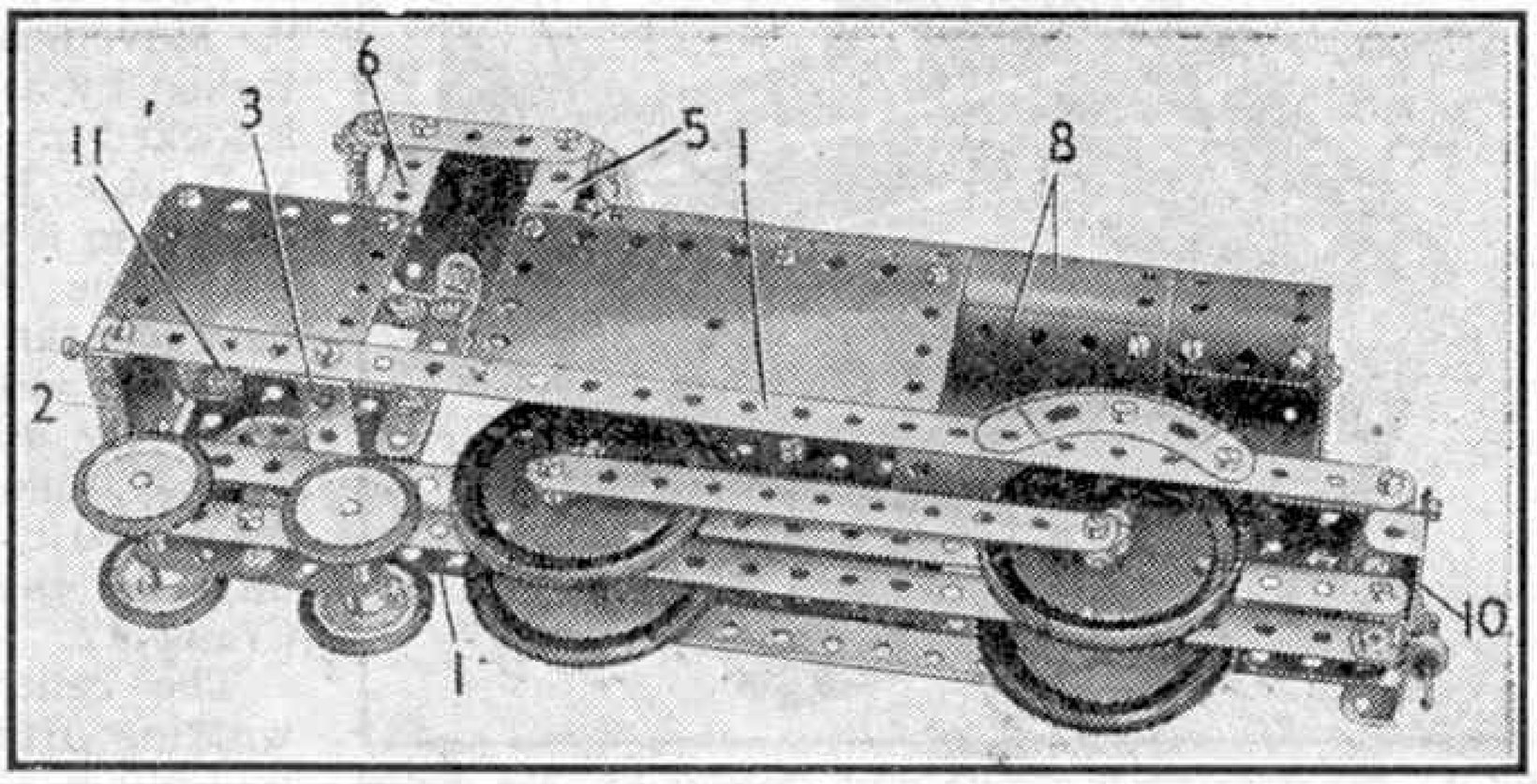


Fig. 2. An underneath view of the tank locomotive showing details of the chassis.

12½" Strips are attached at the rear to a second Double Bracket fastened to the Double Angle Strip 3.

The Road Wheels used to represent the driving wheels of the locomotive are held on 2" Rods mounted in the underframe. An Angle Bracket is locked on each Road Wheel by a Bolt fitted with a nut and screwed into the tapped hole of the boss. The coupling rods are formed by 5½" Strips lock-nutted to the Angle Brackets. Care must be taken that the rods on each side are set at right angles to each other.

The rear bogie is made by bolting two 2½" Strips to a Stepped Bent Strip. Four 1" Pulleys fitted with Rubber Rings are fixed on 1½" Rods journalled in the 2½" Strips. The bogie swivels about a 3½" Rod locked in a Bush Wheel 11, which is bolted to the Double Angle Strip 3. The 3½" Rod is passed through the Stepped Bent Strip and a Spring Clip holds the bogie in position.

The realistic model of a vertical steam engine shown in Fig. 3, makes a fine subject for Outfit No. 2.

The base is a 5½" × 2½" Flanged Plate and the sides consist of 5½" × 1½" and 2½" × 1½" Flexible Plates. The bearings for the crankshaft are provided by Flat Trunnions attached to the base as shown in the illustration. Each half of the crankshaft consists of a 2" Rod, and the webs of the crank are made from two Angle Brackets bolted to the bosses of 1" Pulley Wheels. The connecting rod is represented by a 2½" Strip, and the end of this is pivoted on a ⅜" Bolt used to connect the Angle Brackets of the webs. Three nuts are used on this Bolt and fixed so that the Strip is allowed to turn freely. A Road Wheel and a 1" Pulley are used to transmit the drive and to hold the two Rods of the crankshaft in position.

The framework used to support the cylinder consists of four 5½" Strips, two 2½" Strips, two Trunnions and two 2½" Curved Strips. The 5½" Strips are bolted to the base as shown and their upper ends are connected to the 2½" Strips and Angle Brackets. The Angle Brackets are joined to the Trunnions used for the sides of the framework. A 4½" × 2½" Flexible Plate is curved to form the cylinder and is attached to the framework by two ⅜" Bolts 3, spaced with Washers. The top of the cylinder is a Bush Wheel, and this is held in position by an Angle Bracket 2. An Angle Bracket and Spring Clips connect the piston rod to the connecting rod. The piston rod passes through a Fishplate and a Reversed Angle Bracket fitted to one Trunnion.

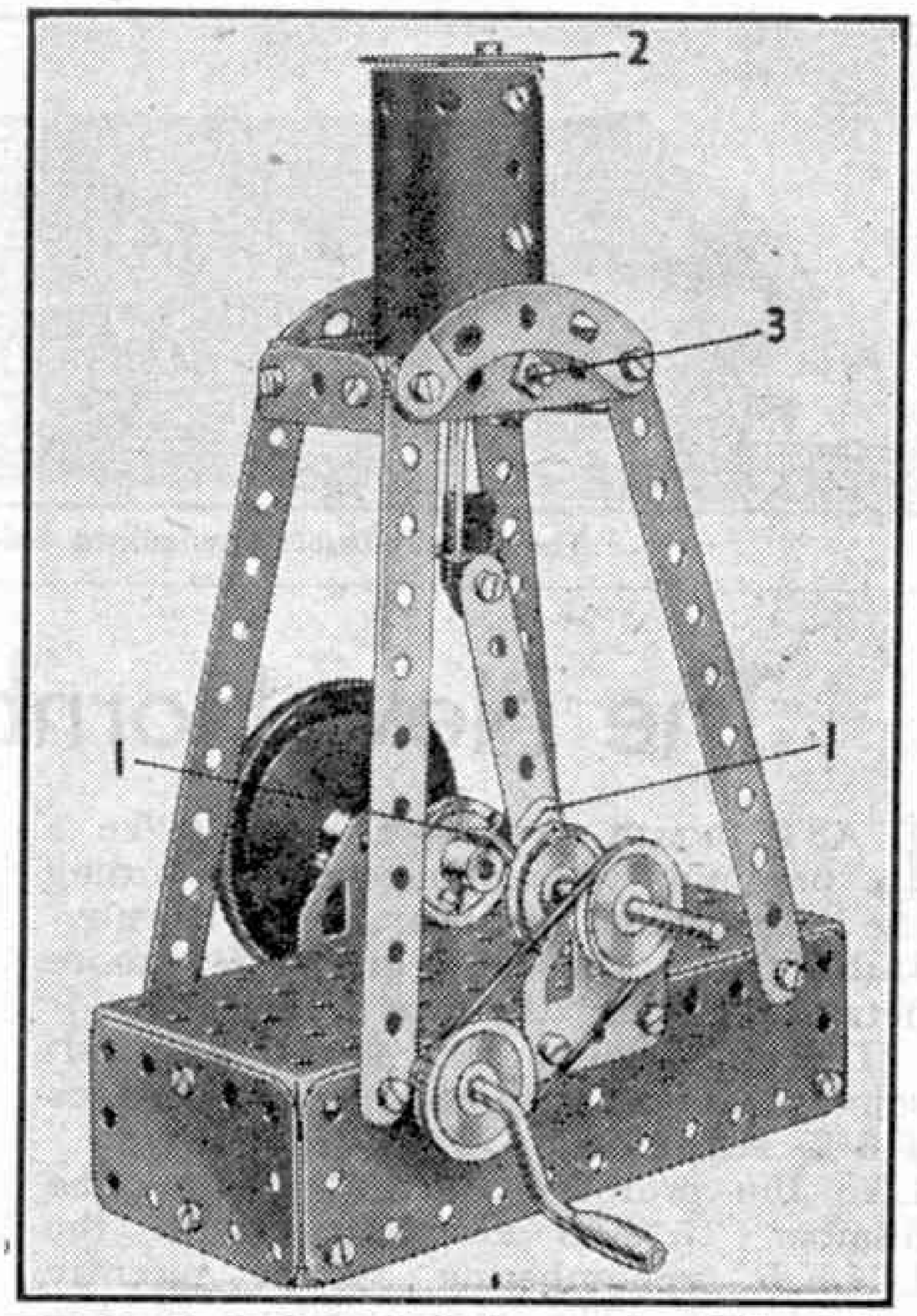


Fig. 3. A simple vertical steam engine designed for construction from Outfit No. 2.

"SIMPLICITY" COMPETITION

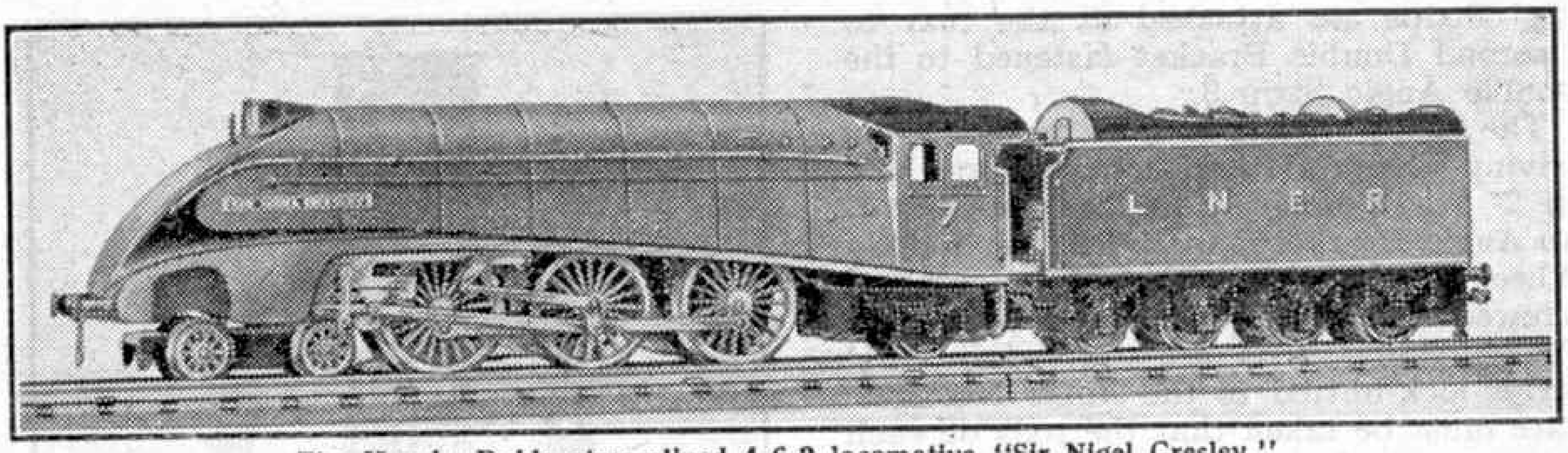
SEND IN YOUR ENTRIES NOW

We wish to remind readers that the "Simplicity" Contest announced in the December issue of the "*M.M.*" is still open and intending competitors who have not yet sent in their entries should do so as soon as possible. Entries will be divided into two Sections as follows: A, for readers of all ages living in the British Isles, and B, for Overseas readers of all ages. The Home Section will close on January 31st, but the Overseas Section will remain open until 31st May.

In this Contest a number of prizes will be awarded to Meccano model-builders who succeed in constructing the most ingenious models with the smallest possible number of parts. The prizes to be awarded are as follows: First, £2/2/–; Second, £1/1/–; Third, 10/6. There will be also a number of consolation awards and Certificates of Merit.

It is of course quite easy to bolt together two or three Strips and a Pulley or two and call the result a crane or a motor car, but such a model is not likely to win a prize in this contest. Competitors should first choose a suitable subject and then build their models with the *smallest number of parts consistent with a realistic effect*. Competitors may use any number or variety of parts that they wish, but the prizes will be awarded to those who succeed in building the most ingenious models from the smallest number of parts.

When the model is completed the competitor should obtain either a photograph or a good drawing of it and then send this to "*Simplicity*" *Model-building Contest, Meccano Ltd., Binns Road, Liverpool 13.*" The actual model must not be sent. The competitor's age, name and full address must be written on the back of each photograph or drawing submitted for consideration.



The Hornby-Dublo streamlined 4-6-2 locomotive "Sir Nigel Gresley."

The New Hornby-Dublo Trains

LAST month we were able to make a preliminary announcement regarding the long-awaited reappearance of Hornby-Dublo trains. We now give a few more details regarding the new train sets.

The upper illustration shows the handsome post-war Dublo version of the famous 4–6–2 streamliner *"Sir Nigel Gresley."* Like the prototype, it now carries the number *"7,"* in accordance with the L.N.E.R. renumbering scheme recently carried out. The most striking change from the pre-war model, however, lies in the cutting away of the sideplates over the driving wheels. This gives quite a new interest to the engine, as the outside valve motion is reproduced very effectively and looks strikingly realistic when the engine is on the run. Return crank, eccentric rod, and expansion link are all provided, each with its characteristic movement, while the busy crosshead moves to and fro, with its attendant combination lever.

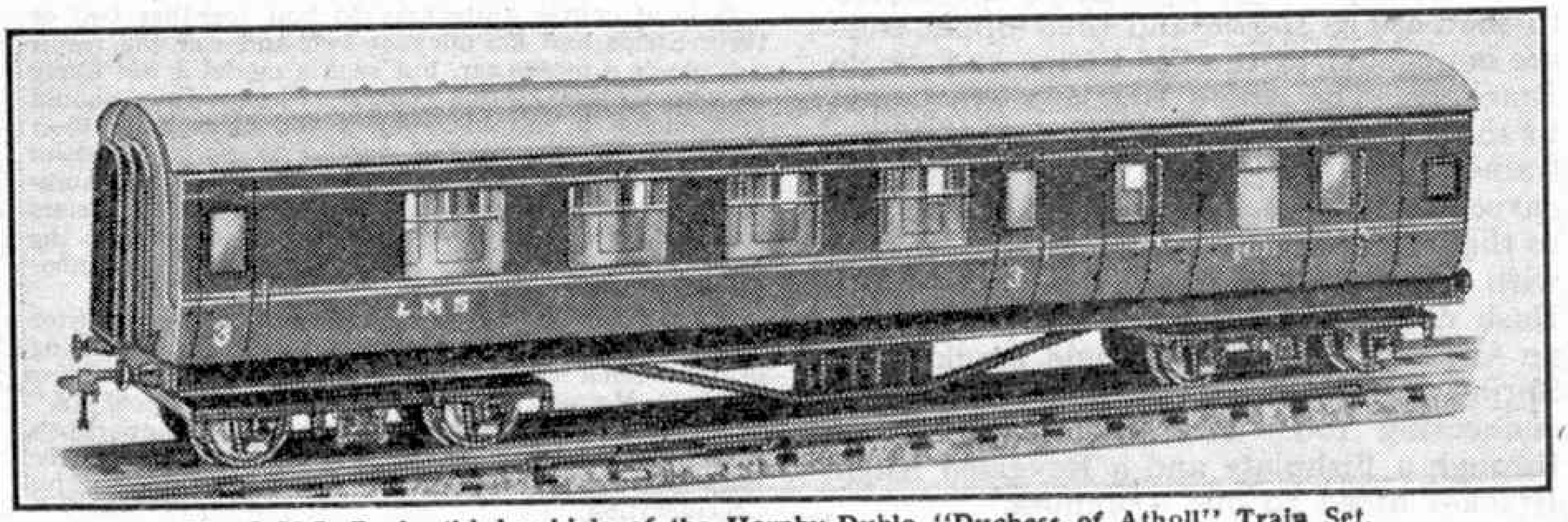
The L.N.E.R. Coaches are now separate vehicles, not articulated as formerly. Each vehicle therefore represents an 8-wheel bogie corridor coach of characteristic Doncaster outline and finish. One is a complete passenger coach and the other is a composite with guard's and luggage accommodation.

The engine of the L.M.S. Passenger Train was illustrated last month. This is the impressive 4–6–2 *"Duchess of Atholl,"* which captures completely the massive air of the real engine and is remarkably complete in detail. The characteristic double chimney is provided and the fittings at footplate level include the lubricators, sand-box fillers and steam-pipe covers that are found on the real thing. Below the footplate are the cylinders and valve chests with their fascinating rods and Walschaerts motion.

The Tender of the "Duchess" is a faithful reproduction of the modern L.M.S. high-sided tender. It is very fully detailed and the coal space has a load of "fuel."

The Coaches are modelled on the familiar L.M.S. standard corridor stock, one of them being a first-third and the other a brake-third with guard's and luggage accommodation. Actual cut-out windows "glazed" with celluloid are provided and there is a corridor partition inside each coach.

The Hornby-Dublo Tank Goods Train has not been changed.



The L.M.S. Brake-third vehicle of the Hornby-Dublo "Duchess of Atholl" Train Set.

An Interesting Hornby Railway

THE "*Launceston and Avondale Railway*" is a Hornby layout so called from the names of the principal towns served by the line. It is owned and operated by Aircraftman (2nd Class) Nial, R.A.F., a keen "*M.M.*" reader and Hornby Train owner who has forwarded the details that appear on this page.

The actual track formation should be of interest to "*M.M.*" readers as it represents a development of the popular oval. Points and sidings have been added with a definite end in view; only too frequently one comes across layouts where points appear to have been introduced merely to make complications. Each of the principal stations forms a self-contained unit for passenger and goods traffic. In addition there is a short branch line that adds considerably to the interest of train operations. All trains are run according to a timetable.

The main traffic on the line is coal, timber and milk, and complete trains are made up specially for the first two. The locomotive employed on these fast goods runs is a Hornby L.M.S. 4–4–2T, which is the most powerful engine on the line. There is no really heavy passenger traffic, so the engine does good work on fast goods and "fitted-van" trains.

Next comes the passenger traffic. Two expresses and two "slow" trains and a branch train are run every hour. For these duties another L.M.S. 4–4–2T is in use, but it is not quite so powerful as that used on fast freight runs. A small 0–4–0T is in charge of the branch line train. The expresses are made up of Hornby No. 2 L.N.E.R. corridors and slow trains are formed of 4-wheeled stock. On the branch line a Pullman bogie coach does duty.

The slow goods trains are invariably worked by a nine-year old Hornby S.R. 4–4–2T which has mellowed down to a very quiet runner. It has seen service on several other layouts before this. There are 28 assorted vehicles, ranging from a bogie bolster Timber Wagon to an American type Caboose, so a variety of trains can be made up.

Actually the best way to know the layout is to imagine yourself reduced in size and take a trip on it! So we arrive on "*Avondale*" station in order to catch the 4.5 p.m. train to "*Launceston.*" We look around the station and find it very cheerful with colourful posters. In the yard opposite our train is being made up and on completion of the shunting it is run into our platform. We find it consists of two Milk Vans next to the engine, a Luggage Van, two No. 1 Special Pullmans and a Passenger Brake Van.

We go off through the tunnel and into the country beyond. Soon we see Launceston Airfield in the distance. Some glistening aircraft are standing on the runway, waiting for passengers from our train. We now find ourselves pulling into "*Launceston*" platform, over the other side of which stands the branch line train ready to go to "*Sherwood.*" The milk churns from our vans are put into the large luggage compartment of the branch train, which then moves off on her short journey.

Behind the station is the freight siding where wagons are being loaded with timber for a fast run to "*Avondale.*" At the end of this siding is an American type Caboose bearing the inscription "*Engineering Dept. L. & A. Rly.*" on it. This is frequently used as part of the work train in relaying operations and looks very realistic indeed. In the yard here also are some Dinky Toy lorries and a Trailer used for the timber brought by road to the siding.

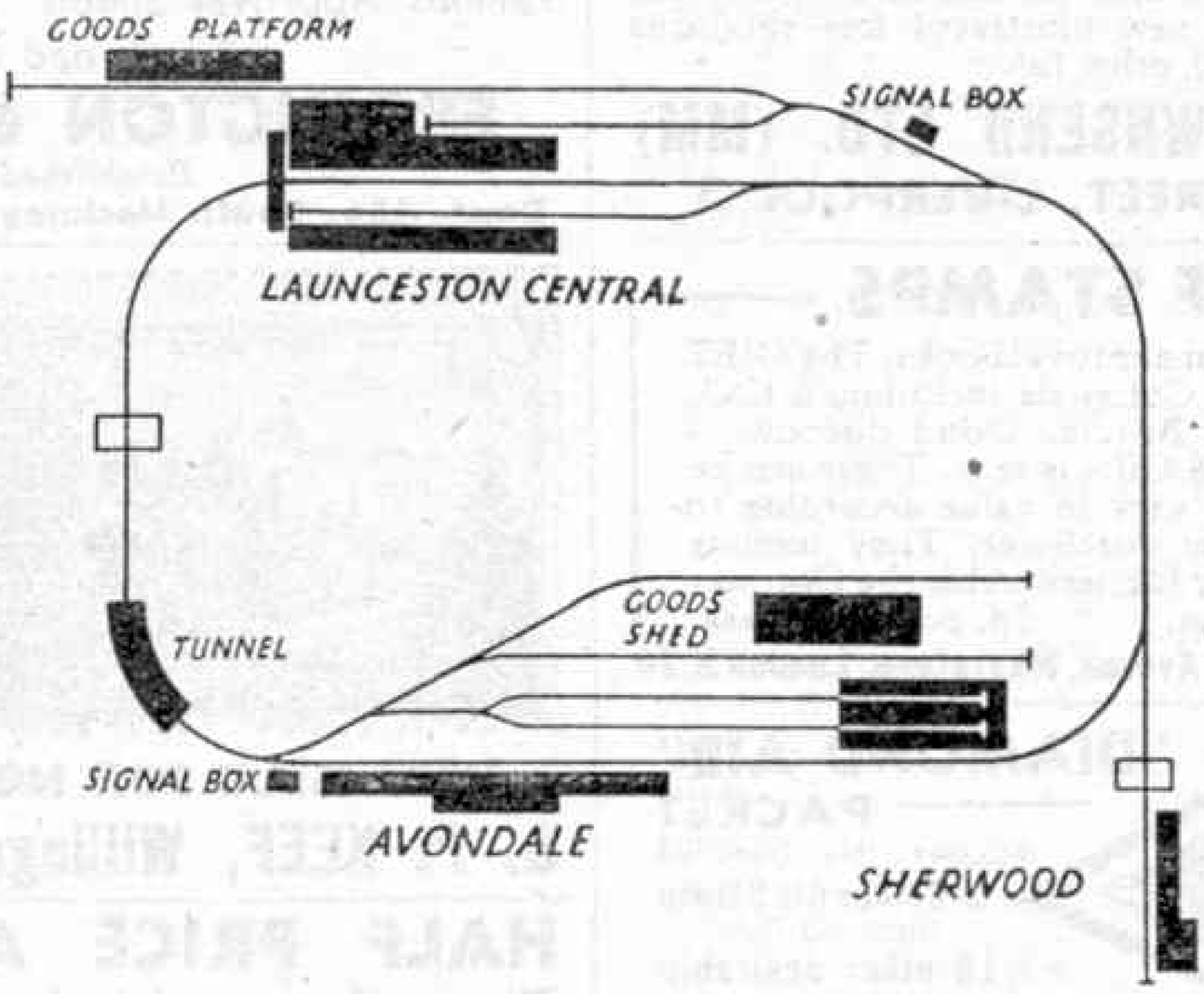


Diagram of the "Launceston and Avondale" layout described on this page.

For other Stamp Advertisements see also pages 30 and xi.

Stamp Collecting

Trinidad and Tobago

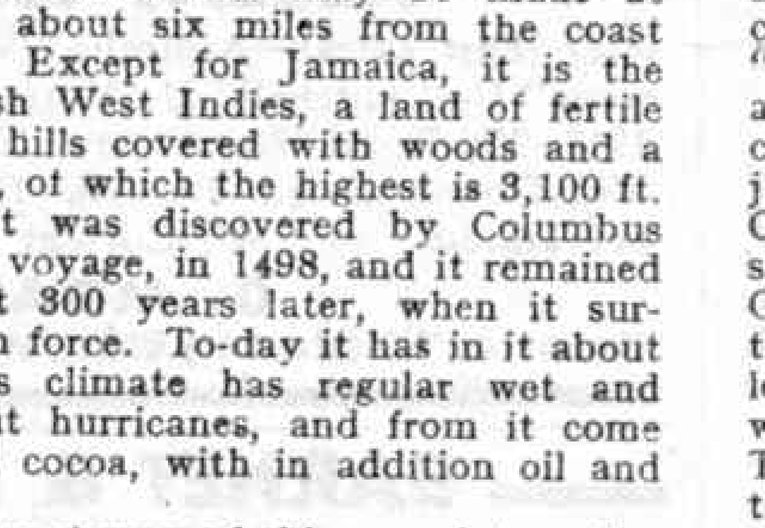
By F. Riley, B.Sc.

THE stamps of British possessions in the West Indies form a really happy hunting ground for the stamp collector who is interested in pictorials. The islands themselves are picturesque, and romance has been associated with them since the days of their discovery by Columbus and other pioneers of the New World. The exploits of English sailors in Elizabethan times and the wild adventures of the pirates of later days have provided excitement for the boys of several generations, who have revelled in the stories of Drake, Hawkins, Raleigh and their successors, and in the many exciting yarns that have been written of pirate days. The West Indies too were the scene of great naval battles of later times, including Rodney's great victory off Dominica, in which he completely shattered a powerful French fleet under Comte de Grasse. The islands have also been associated with Nelson, our greatest naval hero, and a statue erected to his memory in the Barbados has been reproduced on a stamp of those islands.

Approaching the West Indies from the south on our Empire tour our first call may be made at Trinidad, an island about six miles from the coast of South America. Except for Jamaica, it is the largest of the British West Indies, a land of fertile rolling plains, high hills covered with woods and a few mountain peaks, of which the highest is 3,100 ft. above sea level. It was discovered by Columbus himself on his third voyage, in 1498, and it remained Spanish until about 300 years later, when it surrendered to a British force. To-day it has in it about 500,000 people. Its climate has regular wet and dry seasons, without hurricanes, and from it come coconuts, sugar and cocoa, with in addition oil and asphalt.

Turning now to the stamps of this very interesting island, we find that the earliest, issued in 1847, are among the rarities of the collecting world, and it is very unlikely that any of our readers will be able to include specimens in their albums. They are known as the Lady McLeod stamps, and they were issued by David Bryce to pay for the carriage of letters in his steamship "*Lady McLeod*," which traded around the island. The stamps were of 5c. value, blue in colour, and the design showed the vessel itself, with the initials "*L. McL*" underneath.

The Lady McLeod stamps remained current for four years, the next issue appearing in 1851. The design of this was very simple, showing a seated figure of Britannia with the name of the island beneath to distinguish it from similar stamps issued in Barbados and Mauritius. This was the beginning of a long career on Trinidad stamps for the Lady, for except during a brief interlude she remained the chief figure of the island's stamp designs until 1913, when the neighbouring island of Tobago was united with Trinidad for stamp purposes, and after that she continued to appear on the stamps of the two islands for another 10 years or so. In the interval during which Britannia disappeared the head of Queen Victoria was depicted.



Trinidad stamp history is distinguished by a very rare error in the form of a stamp without a value. This was a black on red stamp of 1901, and it is believed that a sheet of the 1d. value of the issue of that year found its way into the Post Office for sale before it was discovered that no value inscription appeared on it. Apparently only nine copies were sold before the error was discovered, and of these six were actually used on letters.

While Britannia was still supreme on the stamps of Trinidad an interesting commemorative appeared. This was in 1898, to celebrate the 400th anniversary of the discovery of the island by Columbus. There was only one value, 2d. in brown and violet, and the landing of Columbus forms the subject of the design of this very interesting stamp.

Britannia's last appearance was in the series of 1922–8, on which she occupied only half the available space, the head of King George V completing the design. The first pictorial series came in 1935, and consisted of nine stamps showing important buildings and various scenes on the island. The lowest value must have provided a little puzzle for many stamp collectors, as the scene on it is described as the "First Boca." The Bocas, of which there are four, are the channels joining the Caribbean sea to the Gulf of Peria, the great inlet on the west coast of Trinidad, on the shore of which are Port of Spain, the capital, and San Fernando, an important port.

Of all these stamps the one that is probably best known to readers, and in many ways is the most interesting, is the 6c. value, which has on it a picture showing the discovery of the Trinidad pitch lake by Sir Walter Raleigh in 1595. The lake is one of the world's natural wonders. It is about a mile in diameter, and is constantly fed with soft pitch from underground sources. It occupies what is thought to be the crater of an extinct volcano. The pitch hardens and solidifies on exposure to the air, so that it can be dug out and carted away in blocks, but holes dug in this way are filled up again in a very short time by fresh pitch. Sir Walter Raleigh used the pitch for caulking the seams of his ships. During last century its value for road making was realised, and to-day Trinidad asphalt is used on a very large scale for this purpose.

This attractive pictorial issue remained current until 1938. A new one then appeared with the same pictorial designs, but with varied values, and a medallion portrait of King George VI inset.

For other Stamp Advertisements see also pages 28 and xi.

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

HERE we are at the threshold of another year. While this is not the place to talk about anything but stamps, a recent stay of three months in Central Europe by the writer has altered his outlook even as far as our great hobby of stamp collecting is concerned, and the lesson to be learned from his trip is that badly off as we may be, we could be in a much worse position.

The stamps of Austria have always been popular in Great Britain, and though this country may be producing a new issue every few months, with little postal necessity, so beautiful are these stamps, and so cheap, that they can hardly help becoming more popular all the time. No doubt some readers will know Austria's capital, Vienna, surely even now the most beautiful and cultured city in the whole world, but if they have not seen it since before the war, they would not like to see it in its present impoverished conditions. All those wide and lovely streets are still there, but gone entirely have the happy and laughing passers by. Everybody shuffles along, with head down and scarcely a smile. Anyone who wishes to retain happy memories of Vienna should not pay another visit yet awhile.

We are illustrating a stamp from the latest magnificent Austrian set; it consists of six values and is issued in aid of Prisoners of War. All collectors are recommended to buy a set. This costs only a few coppers, and for this small sum they are obtaining works of art. Just overlook that they are stamps, and consider them as absolute gems of engraving.

Next we pass on to the adjoining country of Hungary. Fewer will know its capital, Budapest, but it is a treat for tired eyes—if one can afford to buy all the good things seen in the way of eatables. Still, there is a bustle and liveliness in the streets of Budapest that is entirely lacking in Vienna. Moreover the practical Hungarians have set about rebuilding to repair the damage done by the invading Russian army, and given a fair chance, their capital will once more be one of the finest cities on Earth in which to spend a holiday.

Hungary also has been bringing out a lot of attractive stamps, but unlike the gems of Austria quantities in some cases have been limited, and prices high; in consequence the stamps are not entitled to the same patronage as are the issues of their neighbours. Collectors in the U.S.A. were particularly indignant over the stamps that Hungary issued in honour of the late President Roosevelt. Apparently dealers could not get supplies at the usual rates, for only a few sets were placed on sale in the Budapest Post Office, but collectors insisted, for they wanted to complete their sets of Roosevelt issues, and now the stamps are worth several times face value.

Sideline collections are becoming more popular all the time, and many so-called serious collectors are making at least one. Ship stamps are still the most popular, but scenic stamps run them close, and with devotees of the latter the recently issued set of "waterfall" stamps of the Dominican Republic must have been very popular. We are illustrating one of these. While they cost only a few coppers when found, not too many are about.

Many readers no doubt had a chance to see the stamps recently on show in London, Glasgow and Manchester, and they may have picked up some tips about how to arrange their own collections. But did all notice one particular point about the stamps on show—their condition? The average collection cannot compete with these star collections as far as the inclusion of valuable stamps is concerned, but all can emulate them in only selecting fine copies. Don't forget that it isn't the quantity of stamps you have in your collection that counts, but the condition of those stamps. One heavily cancelled or damaged stamp can spoil a whole page, and no collector who really loves his stamps should let his enthusiasm for gathering copies exceed his judgment in regard to condition. The average dealer is tired of seeing poor conditioned stamps offered in collections, and frequently turns down a collection which he would otherwise have bought, if many of the specimens it contained had never been included.

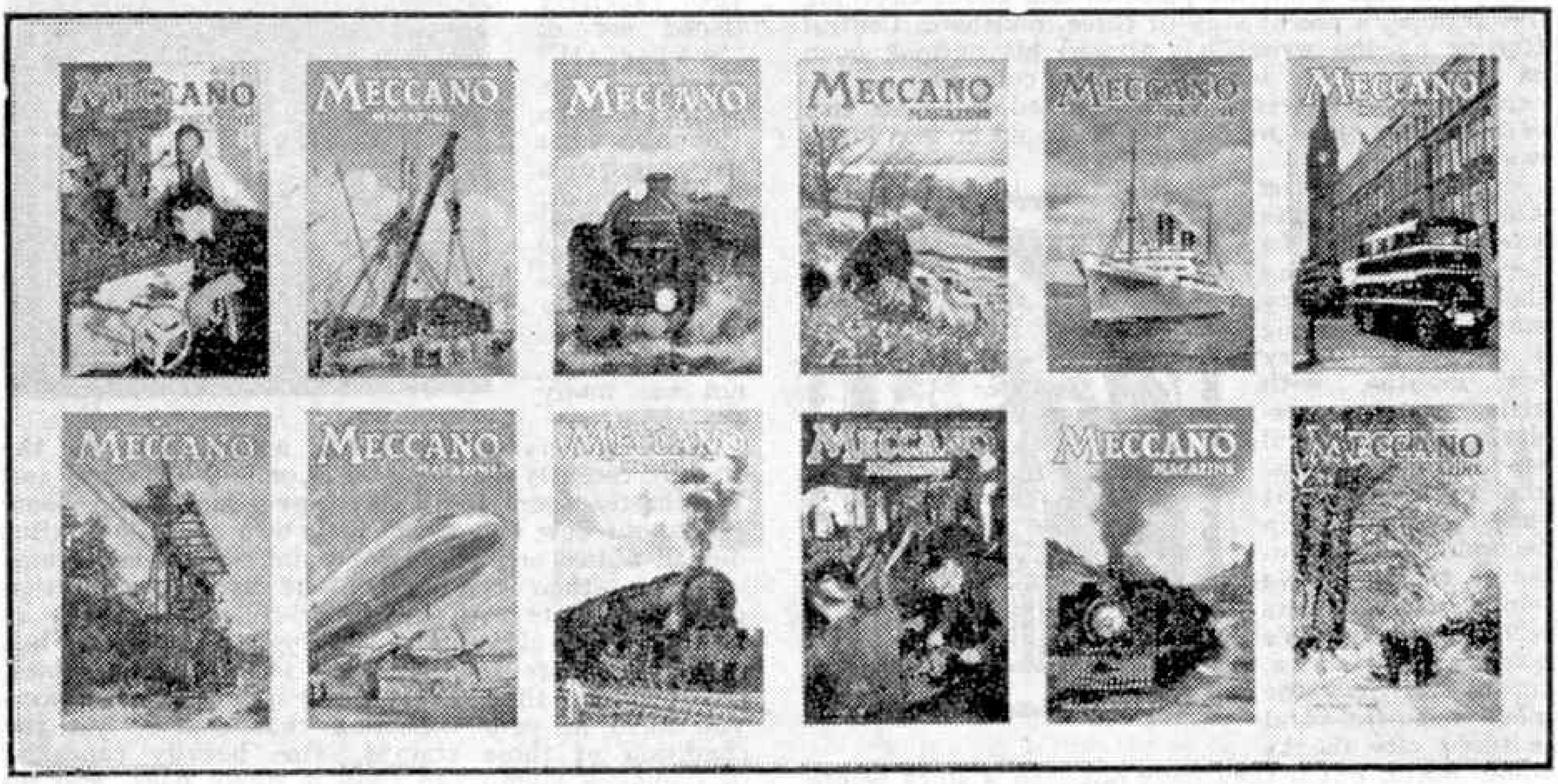
It has been hinted that British colonies in the West Indies region will cease to issue their own stamps and have a joint set, and the West Indian Conference held last October gave point to the rumour. As stamps are about the only paying export of more than one of these islands, however, they will certainly think twice before giving up their lucrative privileges. In the meantime the 10/- and £1 values of Antigua, St. Kitts, Montserrat and Virgin Is. should be secured by collectors who can afford them, just in case they do have the suggested short life.

A collector has asked the writer why Egypt, Iraq and Transjordan still figure in the Colonial section of Gibbons' catalogue, and if they are likely to be removed from there. Expediency is the answer to the first question, and "No" that to the second. It is true that the three countries are no longer parts of the British Empire, but Gibbons do not claim that they are. They keep the countries in this Colonial Section to please the majority of collectors, who would make a fuss if any change were made.

Competitions! Open To All Readers

Prize-winning entries in "M.M." competitions become the property of Meccano Ltd. Unsuccessful entries in photographic, drawing and similar contests will be returned if suitable stamped addressed envelopes or wrappers are enclosed with them.

Which Were the Most Popular Covers in 1947?



Following our usual custom in the first issue of the year we ask readers to tell us which of the covers of the previous year they like best. In order to help them we reproduce the 12 covers concerned in miniature above. These reproductions do not give any idea of the brilliancy and colour of the originals.

All that is necessary for each entrant is to state on a postcard; A, the 1947 cover that he likes best; and B, what he thinks will be the order of popularity as decided by the votes of competitors. The covers must be referred to by the names of the months in which they appeared, but it is not necessary that a competitor's own first choice should appear at the head of his list under the second heading.

The names and addresses of entrants must be written on their postcards, which should be addressed to *"1947 Cover Voting Contest, Meccano Magazine, Binns Road, Liverpool 13."* There will be the usual sections for Home and Overseas readers, with prizes in each of 21/–, 10/6 and 5/– respectively for the best entries. Closing dates: Home Section 28th February; Overseas Section, 31st August.

A Railway Quiz

Questions contests are always popular with *"M.M."* readers, who enjoy the fun they provide and enter eagerly into the hunt for information that is started by questions to which they cannot give an immediate reply.

Here is another competition of this kind. The questions listed below cover a wide range, but all are well within the capacity of all who read their copies of the *"M.M."*

1. What is an "engine in steam?"
2. What is a ground-frame?
3. What is an approach-lighted signal?
4. What is a "Doll"?
5. What was the name of the well-known 2–4–0 locomotive used in the film "Union Pacific"?
6. What is a grease-box wagon?
7. What is a "Bobby"?
8. What is a "Saturated" locomotive?
9. Which classes of engines are known by the following names: "Cauliflower"; "Crab"; "Austin Seven"?
10. Over which railways does the train *"City of San Francisco"* run?

Competitors should make their answers as brief as possible. No elaborate explanations are necessary, but it should be borne in mind that the judges will take neatness and novelty of presentation into account in the event of a tie for any prize.

Entries should be addressed *"January Railway Questions Contest, Meccano Magazine, Binns Road, Liverpool 13."* As usual there will be two sections, for Home and Overseas readers respectively, and in each prizes to the value of 21/–, 15/– and 10/6 will be awarded for the best entries in order of merit. In addition, there will be a number of Consolation Prizes for other meritorious efforts.

The closing date in the Home Section is 28th February, and that in the Overseas Section, 31st August.

January Photographic Contest

This month's photographic contest is the 1st of our 1948 series, and in it, as usual, prizes are offered for the best photographs of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of the print must be stated exactly what the photograph represents. A fancy title may be added if desired.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed *"January Photographic Contest, Meccano Magazine, Binns Road, Liverpool 13."* There will be separate sections for Overseas readers, and in each section prizes of 21/–, 15/– and 10/6 will be awarded. Closing dates: Home Section, 31st January; Overseas Section, 31st July.

Competition Results and Solutions

HOME

JULY 1947 ADVERTISING SLOGANS

1st Prize: C. W. Oyston, Basingstoke. 2nd Prize: Miss T. Saunders, Alvestone. 3rd Prize: G. Taylor, Slough. Consolation Prizes: D. Kemps, Mere; S. Crook, Rushall; S. G. Marker, Plymouth; J. Turner, Oldham.

JULY 1947 AIR-LINES CONTEST

1st Prize: E. J. Sinton, Aberdeen. 2nd Prize: P. J. Fells, Tring. 3rd Prize: R. Raynham, Surbiton. Consolation Prizes: R. G. Steer, Sundridge; B. H. Bunce, Purton; K. Tunstall, Bolton; G. Roberts, Liverpool 11; P. D. Hancock, Edinburgh 9; J. Mason, Newcastle-on-Tyne 2.

AUGUST 1947 "MISSING WORDS" CONTEST

1st Prize: N. S. Raine, Newcastle-on-Tyne 3. 2nd Prize: E. J. Sinton, Aberdeen. 3rd Prize: R. F. Leaver, London E.4. Consolation Prizes: K. F. Howell, London S.E.25; R. T. L. Francis, Leeds 8; J. H. Clegg, Davenport; S. Thornhill, Nottingham.

AUGUST 1947 "QUIZ"

1st Prize: B. J. Holden, Burgess Hill; 2nd Prize: B. E. Timmins, Belbroughton. 3rd Prize: C. E. Wrayford, Bovey Tracey.

AUGUST 1947 PHOTOGRAPHIC CONTEST

1st Prize, Section A: M. J. Scourfield, Malvern; Section B: D. G. Harris, Sale. 2nd Prize, Section A: S. Kyle, Leighton Buzzard; Section B: R. Wrigley, Clitheroe. 3rd Prize, Section A: P. Wodlan, Teignmouth; Section B: P. F. Chapman, St. Leonards-on-Sea. Consolation Prizes, Section A: J. Norris, Dunkirk; B. Carter, Shipley; H. Edwards, Tunbridge Wells. Section B: D. Williams, Manchester 14; A. C. Ellis, Huddersfield; J. J. Jenkins, Colesford.

OVERSEAS

NOVEMBER 1946 ENGINE CLASS CONTEST

1st Prize: D. J. White, Christchurch N.1, N.Z. 2nd Prize: E. V. Gnanadurai, Trichinopoly, India. 3rd Prize: Pablo Giese, Buenos Aires, Argentina.

NOVEMBER 1946 CROSSWORD CONTEST

1st Prize: T. McGee, Natal, S.A. 2nd Prize: J. S. Manduca, St. Julian's, Malta, G.C. 3rd Prize: H. Foster, Claremont, Western Australia. Consolation Prizes: J. Barton, Hong Kong; B. Maisel, Johannesburg, S.A.; G. W. Longley, Walmer, S.A.

DECEMBER 1946 JIG-SAW CONTEST

1st Prize: W. Attwood, P.O. Wynberg, Cape, S.A. 2nd Prize: I. D. Maffey, Christchurch, N.Z. 3rd Prize: S. F. Noble, Invercargill, N.Z. Consolation Prizes: K. S. Cross, Salisbury, S.A.; A. Newbald, Auckland, N.Z.; M. R. McGregor, Christchurch, N.Z.

DECEMBER 1946 RAILWAY-QUIZ

1st Prize: H. Garnett, Sydney, Australia. 2nd Prize: J. A. Markham, Windsor, Canada. 3rd Prize: E. V. Gnanadurai, Trichinopoly, India.

DECEMBER 1946 PHOTOGRAPHIC CONTEST

1st Prize, Section A: A. L. Rowlands, Georgetown, British Guiana. Section B: B. Pott, P.O. Trelawney, S.A. 2nd Prize, Section A: R. T. London, Adelaide, Australia. Section B: R. W. Wilson, Grahamstown, S.A. Consolation Prize: J. F. Petrie, Invercargill, N.Z.

JANUARY 1947 COVER VOTING CONTEST

1st Prize: J. A. Barton, Hong Kong. 2nd Prize: D. J. Clain, Cape Town, S.A. 3rd Prize: R. McGregor, Christchurch, N.Z. Consolation Prize: J. Cresswell, Opotiki, N.Z.

JANUARY 1947 PHOTOGRAPHIC CONTEST

1st Prize, Section A: N. Tasker, East Malvern, S.E.5, Australia; Section B: T. Thompson, Port Nollath, S.A. Second Prize, Section A: B. C. Shepperd, Havana, Cuba; Section B: B. Taylor, Ivanhoe N.21, Australia. Consolation Prizes: R. Lederer, Oranjezicht, S.A.; J. McCoy, Ta-Xbiex, Malta, G.C.; J. G. Holdaway, Marlborough, N.Z.

FEBRUARY 1947 DRAWING CONTEST

1st Prize: G. T. Dey, Hamilton East, N.Z. 2nd Prize: G. Y. de Yong, Leiden, Holland. 3rd Prize: C. J. Chambers, Durban, S.A. Consolation Prize: L. R. Dickson, Pretoria, S.A.

FEBRUARY 1947 SIGNALLING CONTEST

1st Prize: I. T. G. Johnstone, Wellington, C.1, N.Z. 2nd Prize: 2282439 A.C.2 Fossey, R.A.F., Palisadoes, B.W.I. 3rd Prize: L. R. Dickson, Pretoria, S.A. Consolation Prize: G. Barber, Melbourne, Australia.

FEBRUARY 1947 PHOTOGRAPHIC CONTEST

1st Prize, Section A: P. Milne, Hawkes' Bay, N.Z.; Section B: N. H. Simpson, Naples, Italy. 2nd Prize, Section A: Jos. M. Demanuele, St. Julian's, Malta, G.C.; Section B: B. Skelton, Madras, India. Consolation Prizes: R. Edge, Johannesburg, S.A.; N. MacDougall, Victoria, Canada.

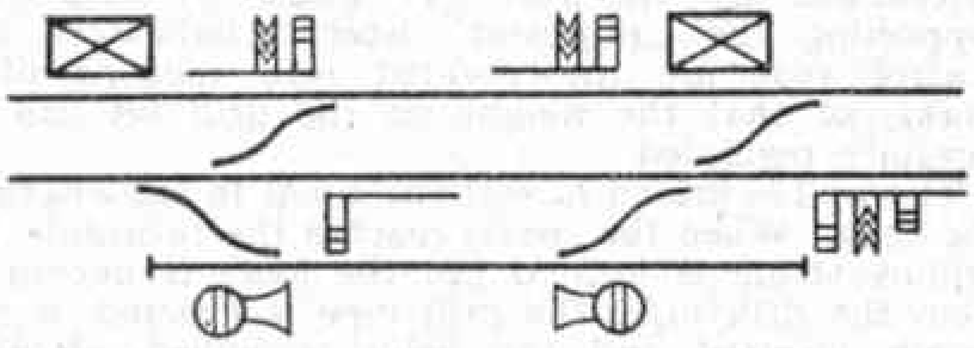
SOLUTIONS

JANUARY 1947 COVER VOTING CONTEST

1st, August; 2nd, July; 3rd, October; 4th, November; 5th, March; 6th, April; 7th, January; 8th, September; 9th, February; 10th, May; 11th, December; 12th, June.

JANUARY 1947 TUNNELS COMPETITION

Gildersome L.M.S., Whiteball G.W.R., Queensbury L.N.E.R., Midford L.M.S., Sydenham S.R., Strood S.R., Rhondda G.W.R., Cowburn L.M.S., Toadmoor L.M.S., Catesby L.N.E.R., Shugborough L.M.S., Sallwood S.R., Hadley Wood L.N.E.R., Parsons Rock G.W.R.



February 1947 Signalling Contest Solution.

MARCH 1947 WAGONS CONTEST

Balgonie, Felinfran, Dunkerton, Gedling, Haunchwood, Wilson Line, Lochgelly, Ansley Hall, Sutton-Heath, Pioneers, Modern Transport, Moira, Hulton, Dutton Massey, Hurst Nelson, Fleetwood Fish.

APRIL 1947 HIDDEN NAMES CONTEST

Forth (Bridge), Blackwall (Tunnel), Mersey (Tunnel), Panama (Canal), Severn (Tunnel), Tower (Bridge), Menai (Bridge), Norris (Dam), Corinth (Canal), Cascade (Dam).

MAY 1947 STATION CONTEST

Star Crossing L.M.S., Hope L.M.S., Greenfield L.M.S., Burnt Mill L.N.E.R., Deadwater L.N.E.R., Steele Road L.N.E.R., Seven Kings L.N.E.R., Epping L.N.E.R., Trench Halt G.W.R., Four Crosses G.W.R., Bugle G.W.R., Sandwich S.R., Ovenden L.N.E.R., Broome L.M.S., Flint L.M.S., Sandhills L.M.S., Upholland L.M.S., Five Mile House L.N.E.R.

Oil for Britain—(*Continued from page 4*)

appears to be most favourable for trial drilling.

There are two methods of sinking a well, the "cable-tool" method and the rotary mud flush method. The cable-tool method—first used by the Chinese some two thousand years ago for brine-drilling, when they reached depths of 3,000 ft.—is now becoming obsolete. The equipment is similar in principle (though not in construction) to that used for pile-driving; the drilling bit is driven into the ground by constant raising and releasing, so that it penetrates under the force of its own impact.

Rotary mud flush drilling is the more normal practice and we will consider this in greater detail.

When drilling is in progress the set-up will be as follows. Over the hole is erected a derrick some 130 ft. high. At the top is fitted a crown block, capable of suspending a load of about 300 tons. Over the crown block passes a cable, which supports the "drilling-string"; this cable is anchored to a hoist drum so that the whole of the drilling string can be raised and lowered by the normal block and tackle system. The hoist, cable, crown block, and sheave are termed the "draw works." The sheave, or travelling block, supports the drilling string by means of a heavy roller bearing swivel, which forms also a hollow running joint. From top to bottom the drilling string consists of (1) a hollow square bar (the "kelly") about 40 ft. long coupled to (2) the "drill pipe," which is usually in 30 ft. lengths and of a diameter of from 3½ in. to 6½ in. according to the depth the well has reached, see Fig. 3 (a). Then come (3) the "drilling collars," which are much heavier gauge hollow steel bars, each 20 to 30 ft. long and up to four in number, and finally (4) the drilling bit (of which a typical example for rock drilling is shown in Fig. I). The whole of the drilling string may weigh anything up to 150 tons, depending on the depth of the drilling. The various units are coupled by special coarse-taper threads and form a continuous hollow tube.

Liquid mud is pumped through the swivel down the tube and, emerging through the bit, displaces and carries to the surface the debris formed by the drilling. The hollow square bar, or kelly, passes through a square hole in the "rotary turn-table" which is rotated by a steam or diesel engine; in this way the whole of the drilling string rotates and penetrates the ground under part of its own weight, determined by the rate of release by the hoist supporting the equipment. Special indicators and control gear are incorporated into modern draw works, so that the weight on the drill bit can be carefully regulated.

The well is drilled in sections equal to the length of the kelly. When the swivel reaches the turntable, the drilling string is hoisted up, the kelly is uncoupled from the drill pipe, the drill pipe is lowered, a new length inserted and the kelly recoupled. Drilling then proceeds as before. Speed of rotation varies, according to conditions, from 30 to as much as 500 r.p.m. Weight on the bit varies from 2 to 8 tons.

The mud, pumped to the swivel by reciprocating pumps, is recovered as it issues, together with the drilled rock, from the well, filtered and used again.

Before drilling begins, the oil well will be designed in accordance with the strata through which it has to pass, to have a series of decreasing diameters. The finished well will have the appearance shown in Fig. 3 (a). Drilling therefore proceeds in a series of stages. When the depth of any given stage is reached, the drilling string is withdrawn altogether and "drill-casing"—rather lighter gauge steel tube—is inserted and cemented in. This is achieved by pumping cement down the centre tube. When the cement reaches the bottom, the pumping pressure forces it back up the outside of the tube. When the required amount has been forced in, mud is pumped down to expel the cement from the inside of the centre tube.

Drilling is then started again, using a new bit, of a diameter small enough to pass through the casing which has been cemented in.

Most people have seen pictures of a "gusher" and have obtained the impression that the oil always lies in the subterranean reservoirs under enormous pressures. This is often the case, but not always. In any event, a "gusher" is a dangerous and wasteful business and, with modern methods of drilling, it is generally possible to avoid it. If the driller expects to encounter oil under pressure, special arrangements are made to "bring the well in" under control by fixing an arrangement of valves—known as a "Christmas Tree"—to the top of the drill castings already in place. See Fig. 3 (b).

The foregoing description may give the impression that drilling is rather a complicated affair, but in fact drilling is an even more difficult and involved process than has been described above. Every kind of mishap may occur. The hole may run crooked, or "cave in" at the bottom of the drilling string; sections of the string may break, or cutters on the drilling bit may come adrift and have to be "fished" up before drilling can continue. Even when the oil-bearing layer is reached, a number of operations may have to be performed before oil can be produced.

When the well is "producing," the oil may flow from it naturally by virtue of gas or water pressure underground, or it may require to be pumped up. In the first case, the last stages of drilling are performed through the "Christmas Tree," so that, should the oil start to flow while the drilling string is out, the well can be "turned off" by closing the valve through which the string passes when drilling.

As delivered from the well the oil may contain gas in solution, in which case it will be pumped to vessels where the gas separates and is drawn off for use. The crude oil is then transferred to storage tanks from which it will be pumped by pipeline to refineries or to coastal depots ("tank farms") for loading on to ocean-going tankers. The tankers carrying crude oil deliver it to refineries in the areas where the refined products are used.

In our next issue we shall describe a refinery in an industrial area of Britain. Here we shall see how this mysterious substance called petroleum is transformed into the valuable products which oil the mechanism of our modern civilisation.

Figs. I and III are reproduced by courtesy of the Institute of Petroleum and Figs. IV and V by courtesy of the National Supply Corporation and Fox Photos.

Eyes and Ears of the Air—(*Continued from page 8*)

about and visibility is poor, Babs may be called in to help. Babs, short name for Beam Approach Beacon System, is sited on the airfield opposite the approach end of the runway, and also sends out impulses which appear on the Rebecca screen as dots if the aircraft is to the left of its correct line of approach, and dashes if it is to the right. If it is "on course" a steady "blip" is seen and distance from the runway may be read off the distance scale.

These, then, are some of the aids available on your B.O.A.C. flight—the eyes and ears of the air. There are others, all, to some extent, developments of principles already described, and, as you continue on your journey to the Far East you imagine the pilot and radio officer talking to the control tower or listening to signals indicating they are flying "on course," and you are re-assured to know that, although on stages of your journey you may be out of sight of the ground, you are not out of touch.

For the information in this article and for the illustrations we are indebted to the British Overseas Airways Corporation.

"GREAT NORTHERN LOCOMOTIVES 1847-1947"

Readers of "*Railway Notes*" will be glad to hear that Mr. R. A. H. Weight's new book, "*Great Northern Locomotives 1847-1947*," is now on sale. It may be had from Mr. R. A. H. Weight, 198, St. Helens Road, Hastings, price 4/10 including postage.

Fireside Fun

"Does the orchestra get extra rations before concerts, mama?" asked the small boy at a concert.

"No dear, why?"

"It says on the programme that the concert will be given by a full orchestra."

* * * *

"I see you are advertising for a man to retail canaries."

"Yes. Are you applying for the job?"

"Oh, no. I just want to ask how the canaries lost them."

* * * *

"Bill went to the colonies to make his fortune."

"And what is he worth to-day?"

"£25. At least, that's what the police are offering for him."

* * * *

Don: "If the clock struck thirteen what time would it be?"

John: "Time to mend it."

* * * *

Bobby: "My teacher has never seen a horse."

Ma: "Hasn't she?"

Bobby: "No. I drew one and she asked me what it was."

* * * *

Joe: "Would you like to buy this pen-knife?"

Jock: "What's wrong with it?"

Joe: "Nothing."

Jock: "Then what are you selling it for?"

Joe: "Nothing."

Jock: "Right! I'll buy it at that price!"

* * * *

"But I told you to buy a sponge. Where is it?"

"I never saw any good ones."

"What was wrong with them?"

"Oh, they were all full of holes."

* * * *

"Here, waiter, there's a fly in the soup."

"Sorry, sir, but it won't drink much."

* * * *

THIS MONTH'S HOWLER

Climate lasts all the time. Weather is only for a few days.

* * * *

"What do I want to be when I grow up? Are you kidding?" Courtesy Editor, "Louisville and Nashville Railroad Employees' Magazine," U.S.A.

BRAIN TEASERS

SCORE A CENTURY

Can you arrange the figures from 1 to 9 in such a manner that they form an addition sum giving 100 as the result? The addition must be straightforward, but fractions are allowed.

* * * *

DOES IT GET IN THE WAY?

The diagram below represents a magic square, that is one in which the rows, columns and diagonals add up to the same total. In this magic square all the figures from 0, 1, 2, etc. up to 9 occur and each of these is represented here by a letter.

C	CE	CB	B
CU	R	L	N
A	CD	CC	E
CM	M	U	CR

Find the numbers represented by these letters and so complete the magic square. When you have done this you will find that the letters in order give the name of an English county. Which is it?

* * * *

NUMBER OFF THE PARTS

Here is another interesting puzzle in which the letters of the alphabet represent numbers, A being 1, B 2, C 3, and so on. The asterisks in the lines following this represent the letters making up the names of certain Meccano Parts, and when the appropriate numbers are substituted for the letters the totals are those given on the right. What Meccano Parts are represented?

**** ***** 69
****** ******* ***** 238
****** 61
****** **** 123
******* ***** 144
**** *** 79

S.W.C.

* * * *

SOUNDS IMPOSSIBLE

With six make nine, half of which is four.

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

Each of the men taking part in the share out in our first puzzle last month receives £50. There are only two of them; if there had been more the puzzle would have read "If £100 were to be divided *among* a certain number of men . . . ." Half of 2 and 2 is 3. The rule in mixtures of this kind is to work out the multiplications first, and then carry out the additions.

The numbers multiplied together in our second puzzle last month are 3,718 and 314, giving a product of 116,752. The key word that does not quite fit is EDINBURGH; the last letter of this name does not appear in the puzzle.

The nine world champion boxing classes and weights are: Fly Weight, 8 st.; Bantam Weight, 8 st. 6 lb.; Feather Weight, 9 st.; Light Weight, 9 st. 7 lb.; Welter Weight, 10st. 7 lb.; Middle Weight, 11 st. 6 lb.; Cruiser Weight; Light-Heavy Weight, 12st. 7 lb. Heavy Weight, any weight.

BACK NUMBERS OF THE "*M.M.*"

A few copies of each of the following back numbers of the "*M.M.*" are available for disposal. The cost is 8d. each, including postage, etc., and early application is advisable. Orders should be sent to Publishing Department, "*Meccano Magazine*," Binns Road, Liverpool 13, and should be accompanied by the necessary remittances.

1943, October; 1945, December; 1946, January, July, October; 1947, January, February, April, May, July, August, September, October, November and December.

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READERS' SALES AND WANTS

SALES

400 "Hotspurs," "Wizards," "Champions" and other Boy's periodicals; few Boys' Books; 2½d. stamp for details.—T. W. Olle, "Westleigh," Carlton Road, Boston, Lincs.

No. 9 Meccano plus extras; gold paint scratched; few parts missing; offers? Also Frog, Penguin, Barracuda, Tempest Kits; Mosquito, Spitfire, Hellcat, finished; 1/40th Avro Avian, Frog 45 diesel model (no engine), Korda World's Record Holding Rubber model complete. Cheap. Sell separately.—L. Bray, 72, Cloister Road, London N.W.2.

565 Foreign, 522 Empire Stamps (Catalogued £9-7-6); Two large Albums; S.G. 1944 World Catalogue; Perforation Gauge, etc., and Book on Stamp Collecting; all in perfect condition. Offers above £9.—K. Simpson, "Port-ny-Chee," Pondre Avenue, Prestatyn, North Wales.

About 1,200 Stamps in Wanderer Album (£4); and "Meccano Magazines," January 1942-December 1945. —R. A. Yates, 44, Coed Onn Road, Flint.

Gauge 0 high-grade Track, 4 ft. radius; One Circle and 9 ft. Straight Non-electric, One Circle and 6 ft. Straight; also Points R. and L. electrified; 30/- the lot. One Circle and 30 ft. Straight Bowman Rails and sundry Hornby Rails and Points; Hornby Locos.; Clockwork 0-4-0 L.M.S. Tank, 15/-; Electric Riviera "Blue" with Tender, £3. Also Bowman Steam Loco. and Tender, and various Railway Accessories. "K" model Speed Boat, Clockwork, 2 ft. long. 18 in. handmade Yacht.—Glennie-Smith, 97, Lexham Gardens, London W.8.

To sell whole or in pieces, 50 1/72 scale Solid Model Aeroplanes; 100 1/72 scale Plans; several 1/72 scale Ships. For details—Michael Bickmore, Yardley Court, Tonbridge, Kent.

"Railway Wonders of the World" Part 1 for £1:—K. A. Hurt, "Cranmoor," North Wingfield, Chesterfield.

WANTS

"A Romany in the Country"; "A Romany on the Trail"; "Out with Romany by Moor and Dale"; Meccano Manuals 7-8-9-10 and Super-Model Leaflets.—W. Tilsley, 42, Edward Street, Redditch, Worcs.

Urgently: Meccano 6 volt Reversing Electric Motor No. E6; also Meccano Collars.—Spence, 15, Denham-green Place, Edinburgh 5.

Meccano Parts: Gears, Pinions, Sprockets, Chain, Collars, Couplings, etc. Will consider bulk. State price.—D. Plunkett, "Rose Cottage," Tudwick Road, Tiptree, Nr. Colchester, Essex.

Hornby Dublo Engine in good condition. Will buy small amount Rails, etc., if owner wishes to dispose together. Please write full details.—Horley, Bruce House, Stowe, Buckingham.

Gauge 0 Electric Rails, Points, Crossings. Must be in good condition. Good price given.—G. Maxwell, 3, Helmdon Close, Liverpool 11.

Hornby Electric: Engine Shed, Level Crossing, Curved Rails. Also Buffers and Guard's Van. State price.—Maltby, "Aubigny," Reigate Road, Epsom Downs.

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