VOL. XLII No. 6 JUNE 1957

MECCANO MAGAZINE

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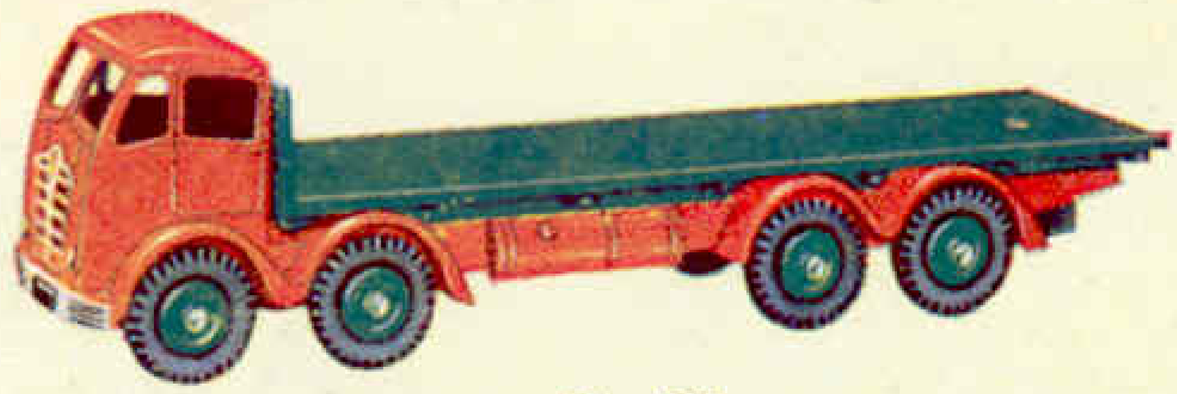

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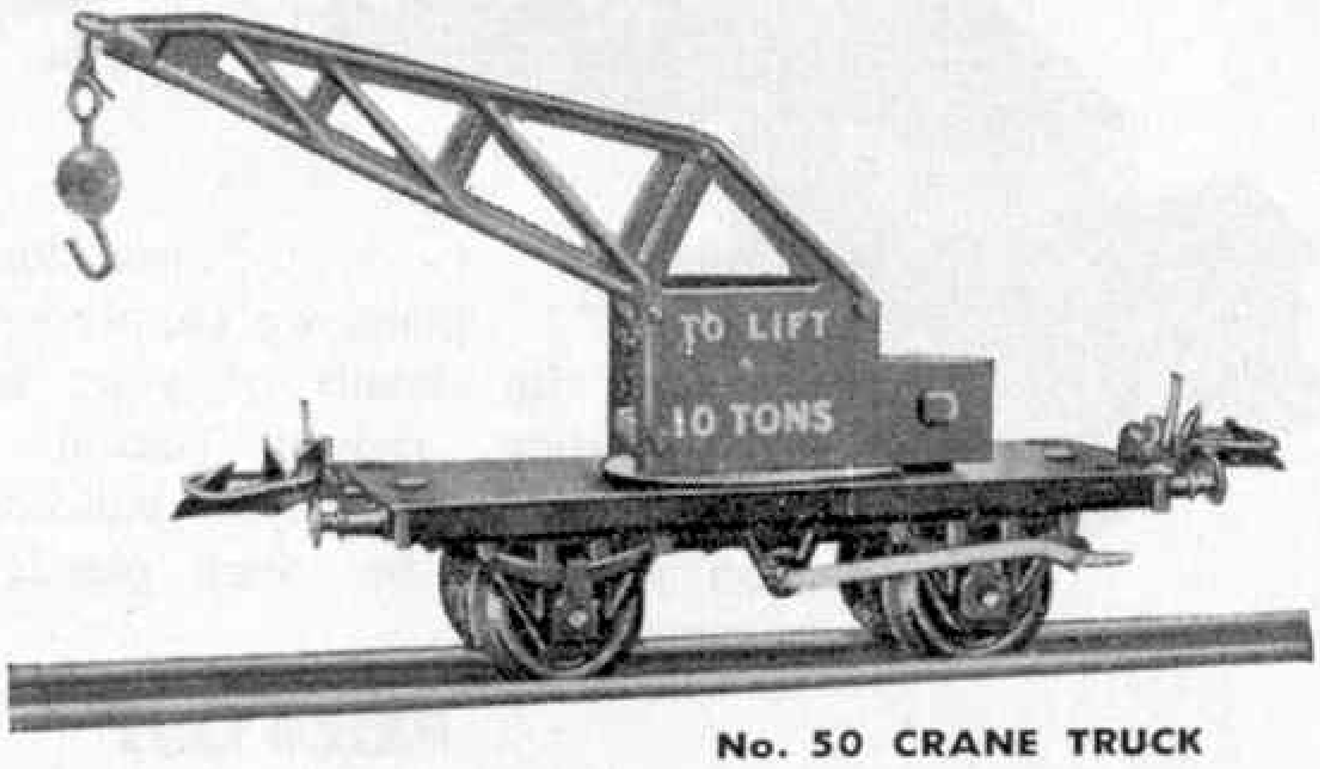

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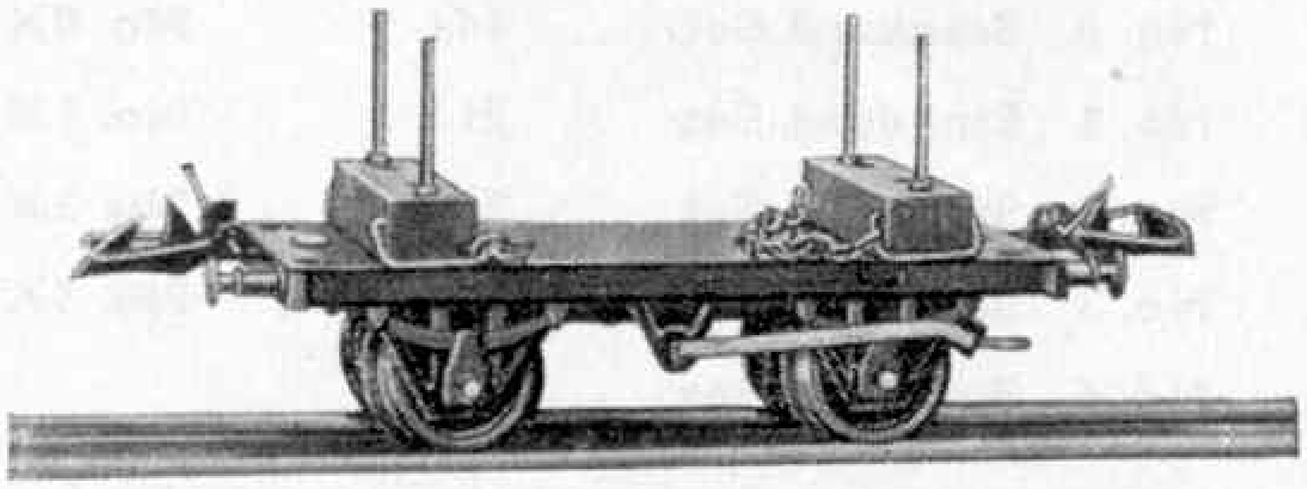

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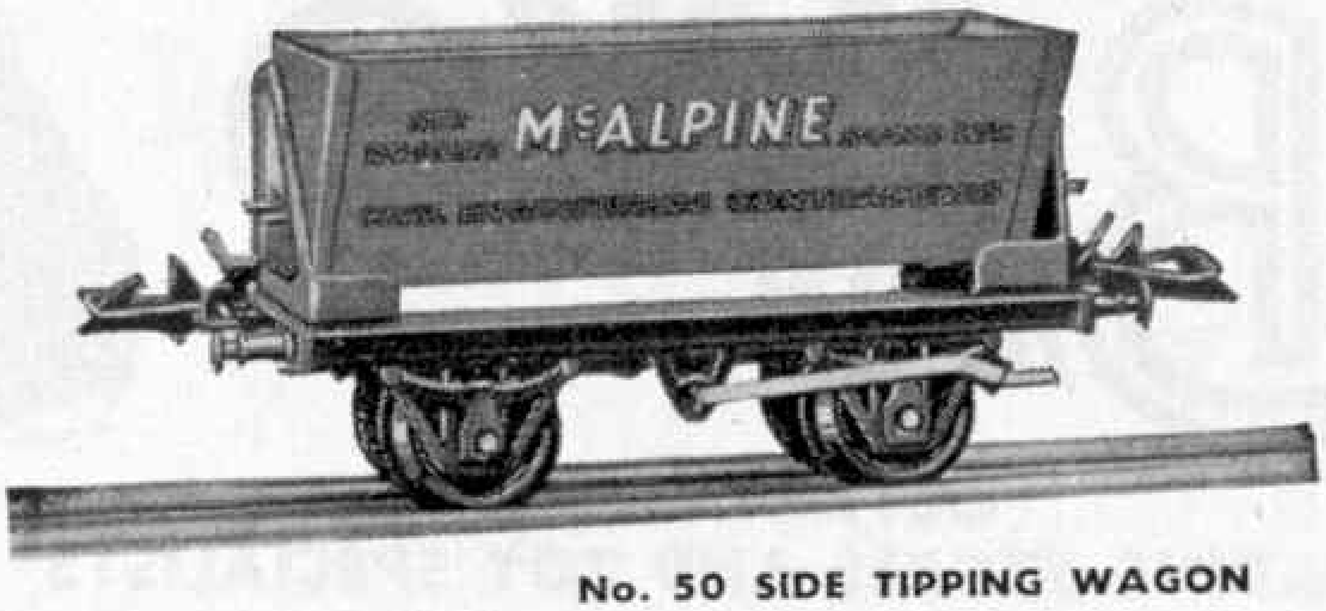

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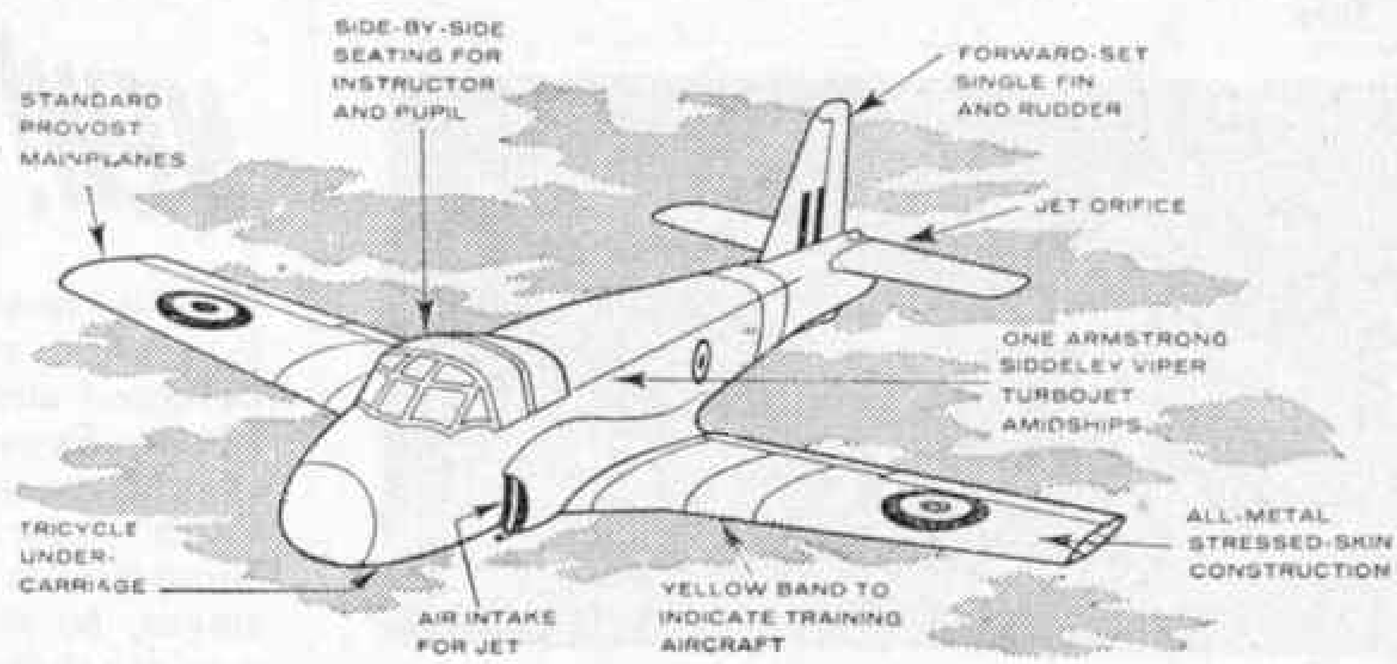

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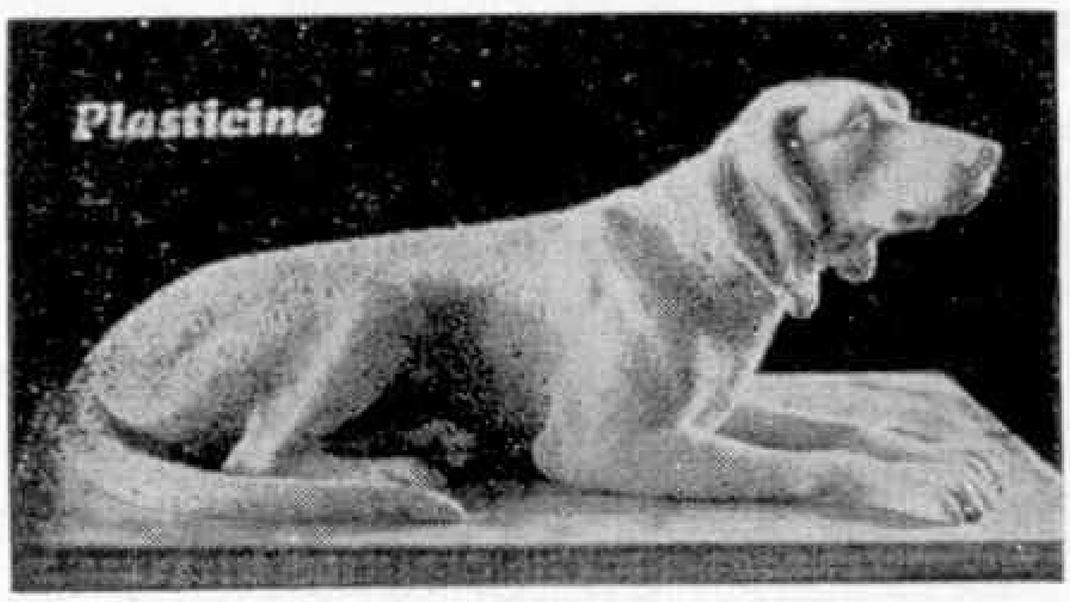

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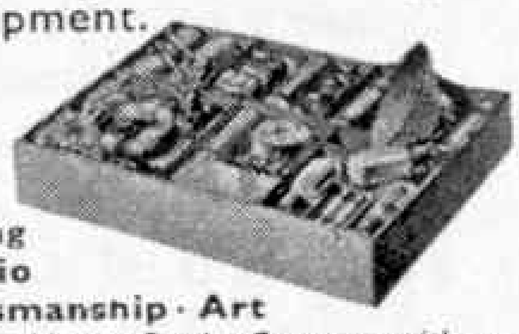

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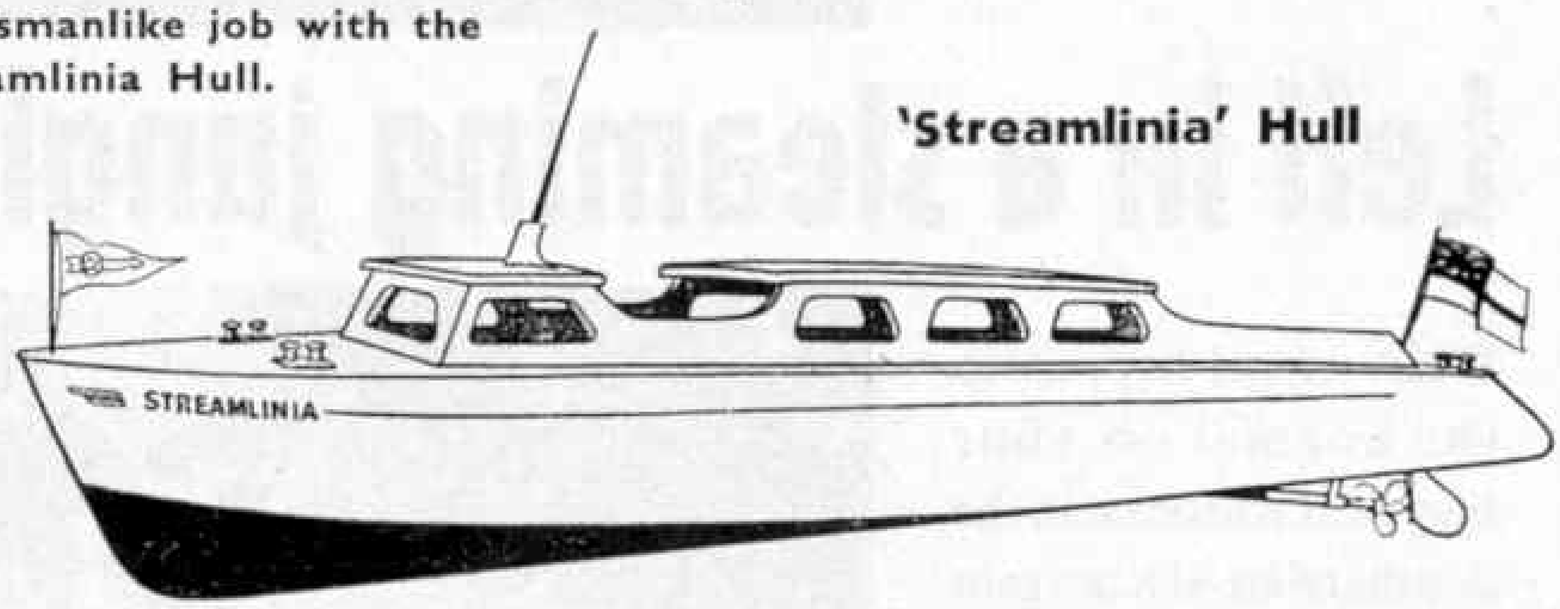

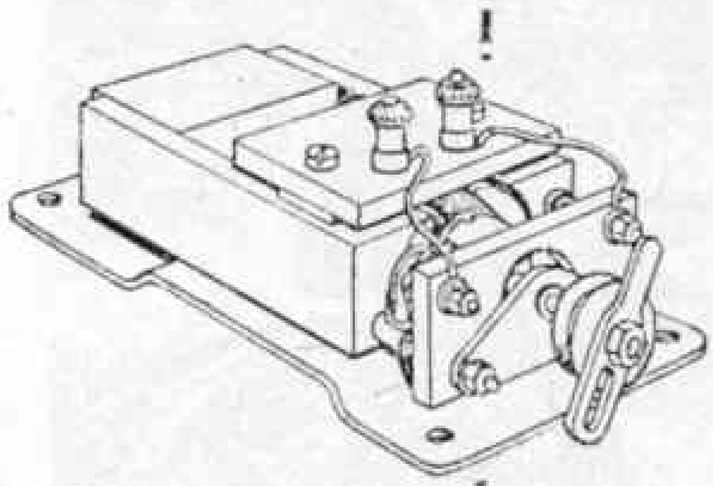

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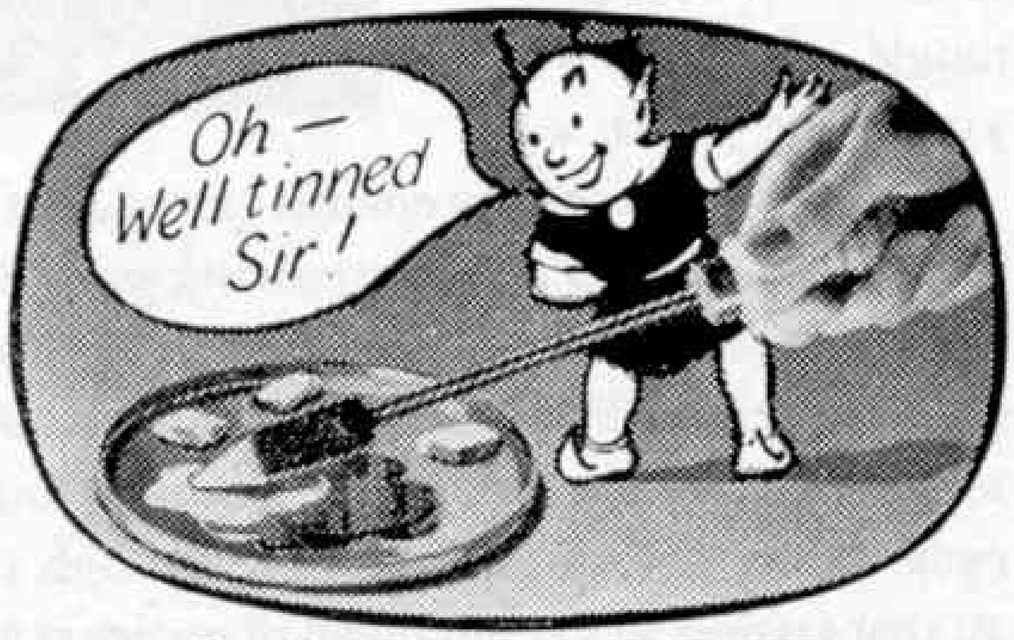

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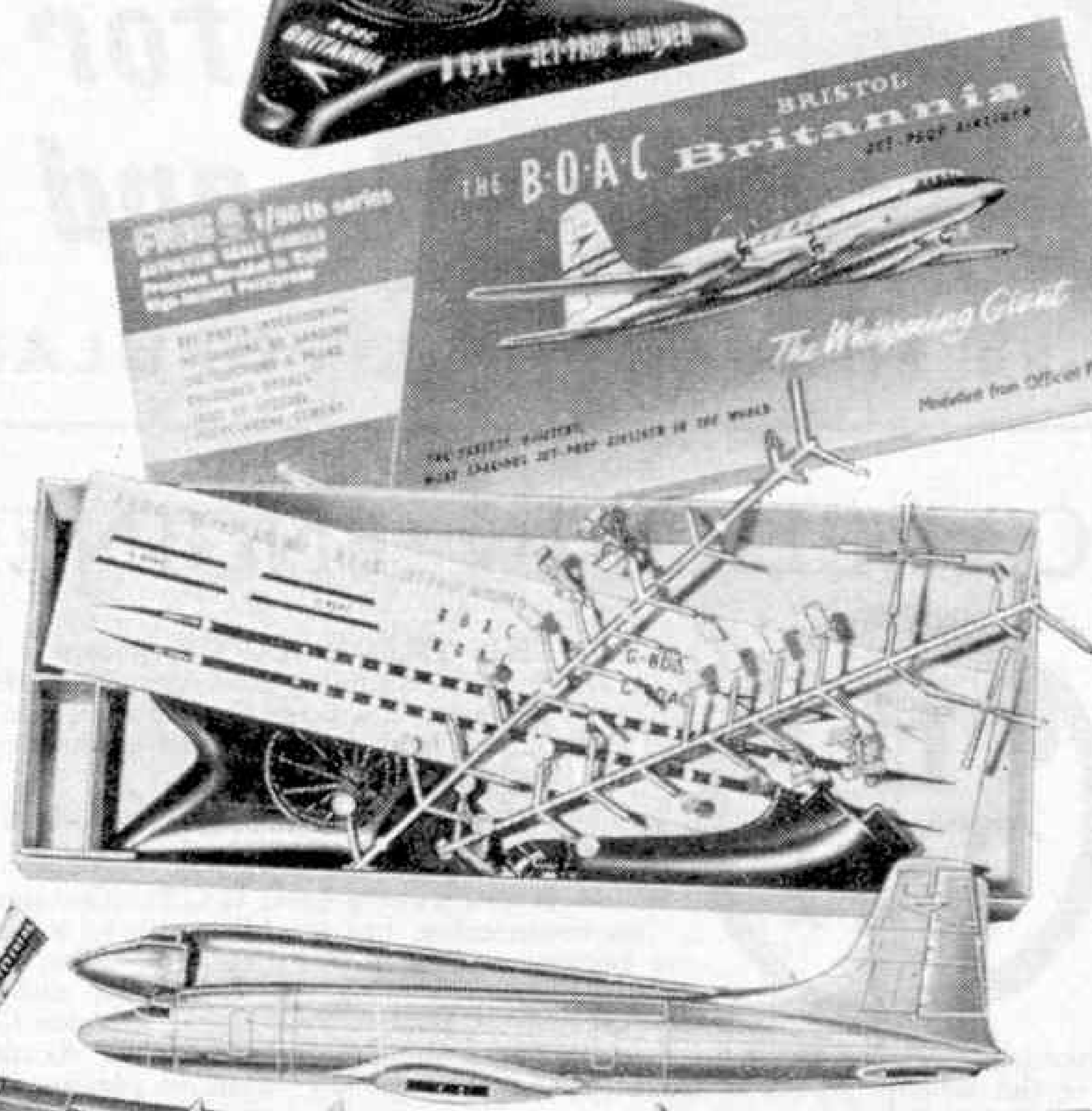

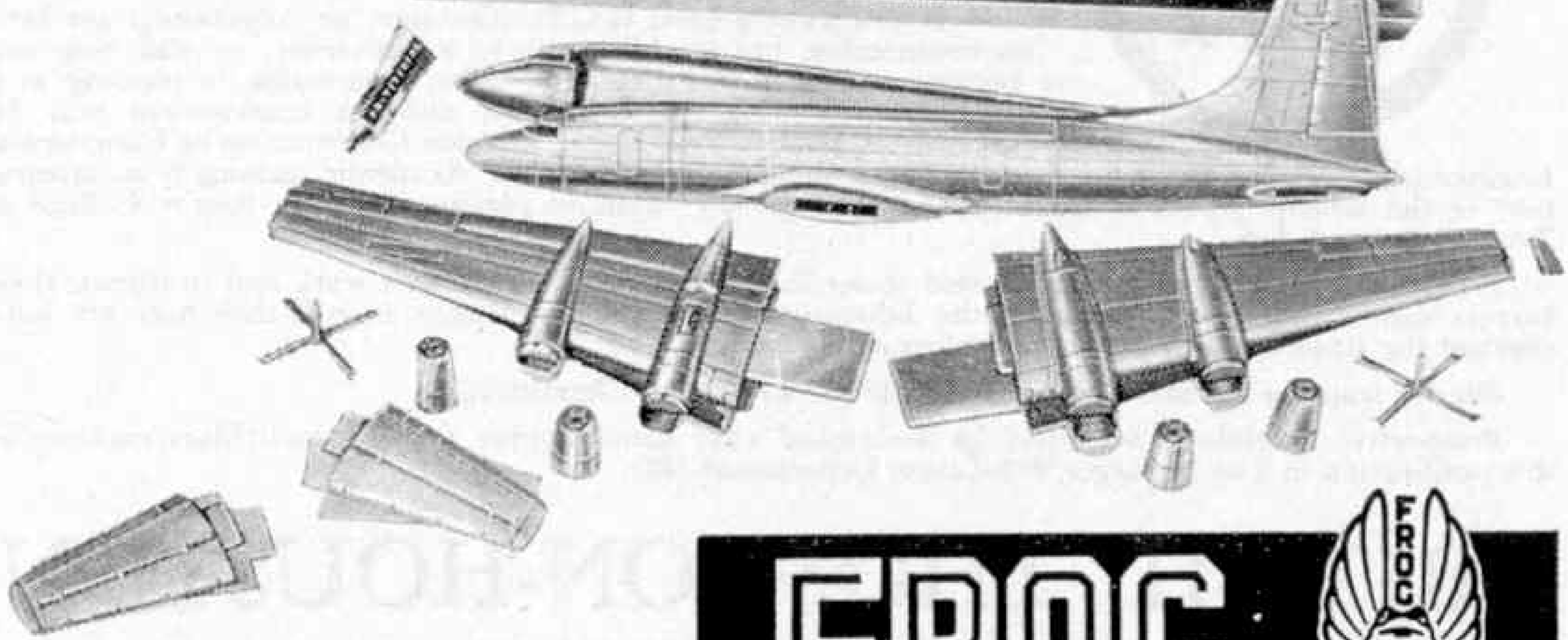

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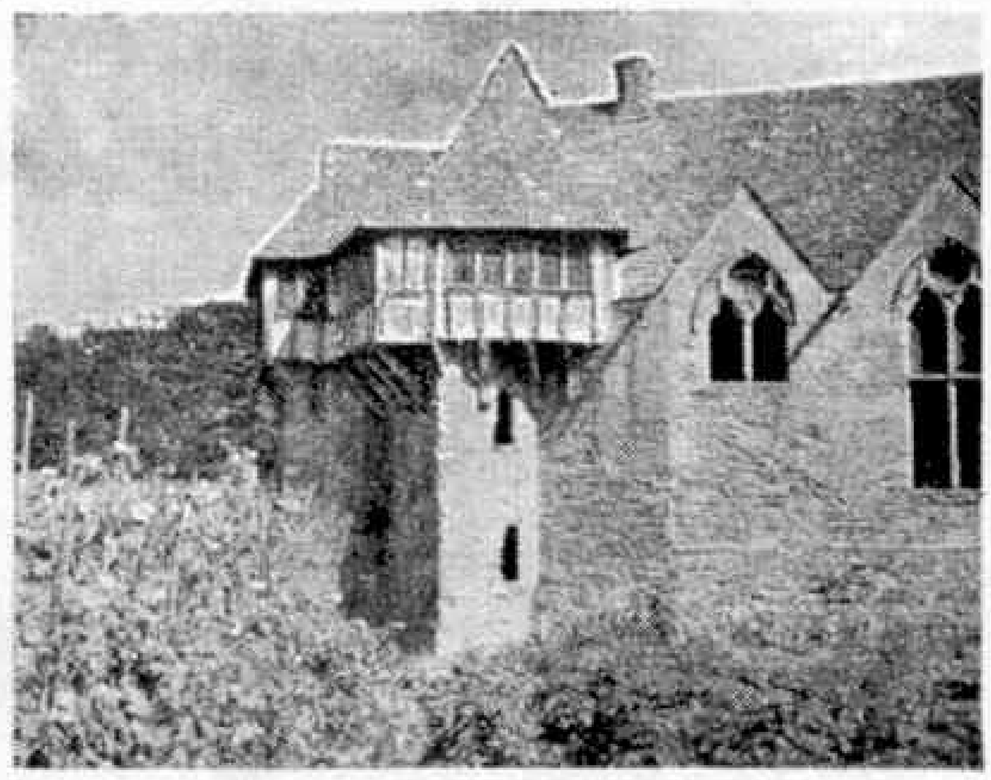

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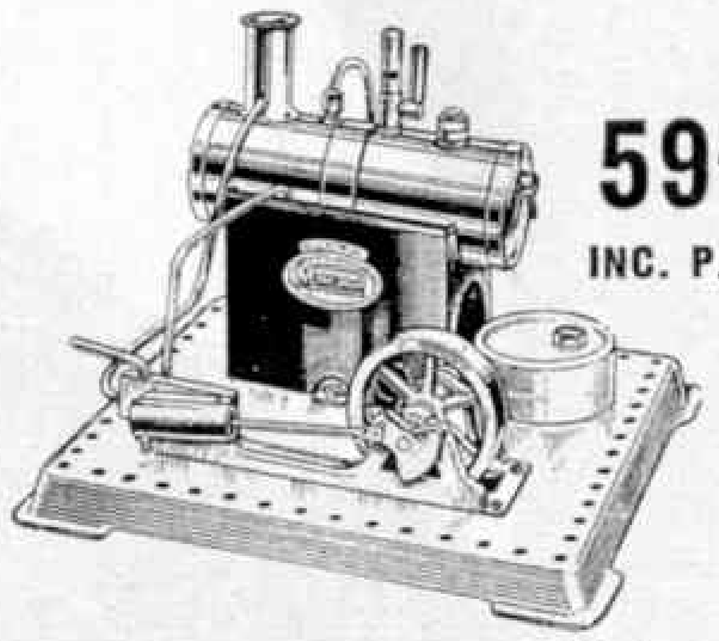

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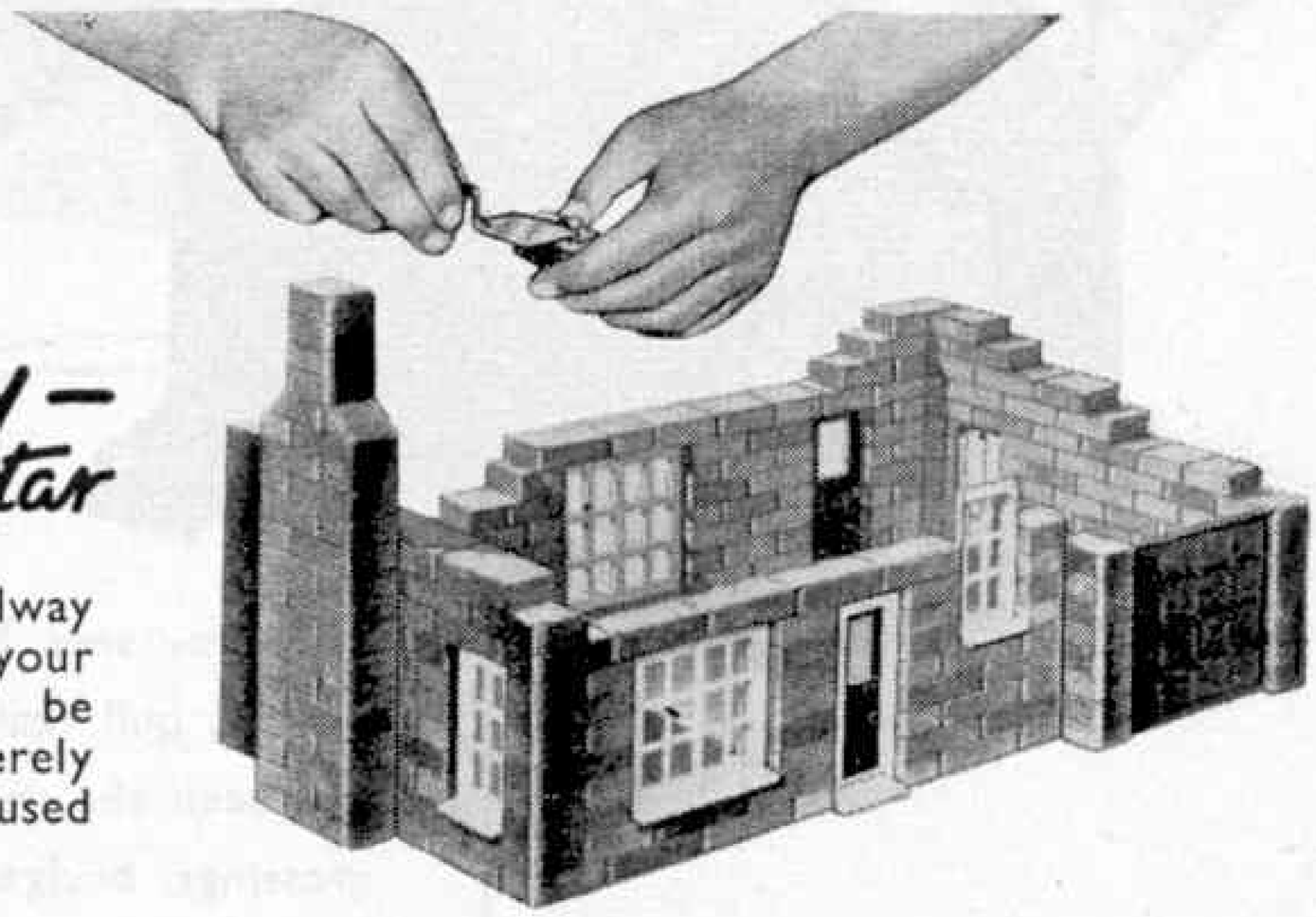

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Next Month: "THUNDERBIRDS." By John W. R. Taylor

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool 13
England

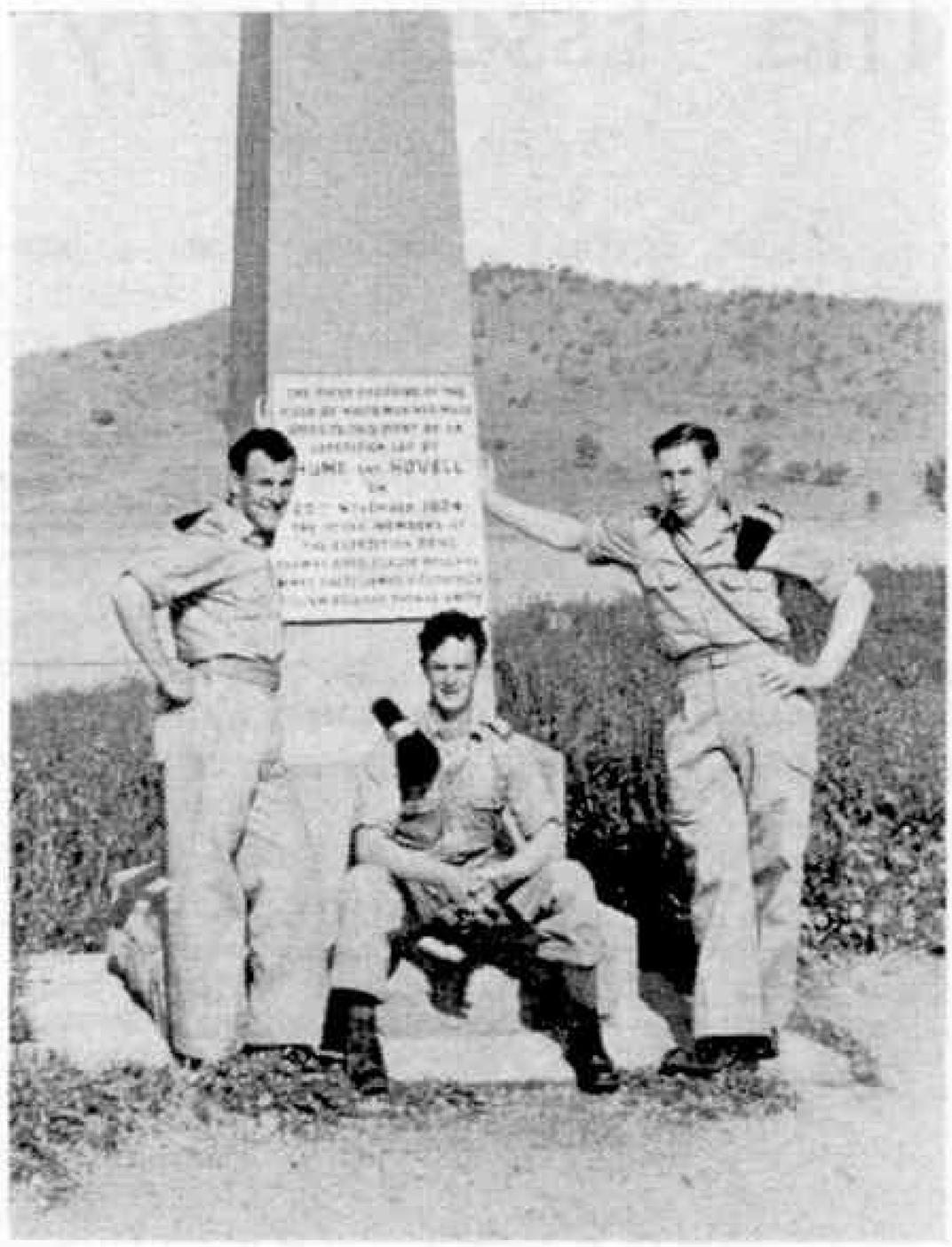
EDITOR : FRANK RILEY, B.Sc.

Vol. XLII
No. 6
June 1957

Space for Memorials

Many monuments have been erected as a tribute to explorers who penetrated into unknown regions. The picture on this page is an excellent example. The column shown in it celebrates the first crossing by white men of the Murray River, in Australia, by the expedition led by two famous Australian explorers, Alexander Hume and W. H. Hovell. It gives the date when this first crossing was made, 28th November, 1824, and records the names of the other members of the party.

All of these memorials are interesting, for behind almost every one is a story of perseverance and enterprise that has led in time to the creation of new and thriving communities. Surveying unknown lands to-day is not the difficult matter it was at the time when Hume and Hovell crossed the Murray River, thanks to the coming of the aeroplane and other means of transport. But there is still empty space for more memorials on earth, notably in the Antarctic, and there will be vast regions of space in which to erect columns and obelisks when man reaches the Moon and the planets that we are beginning to think we can attain!

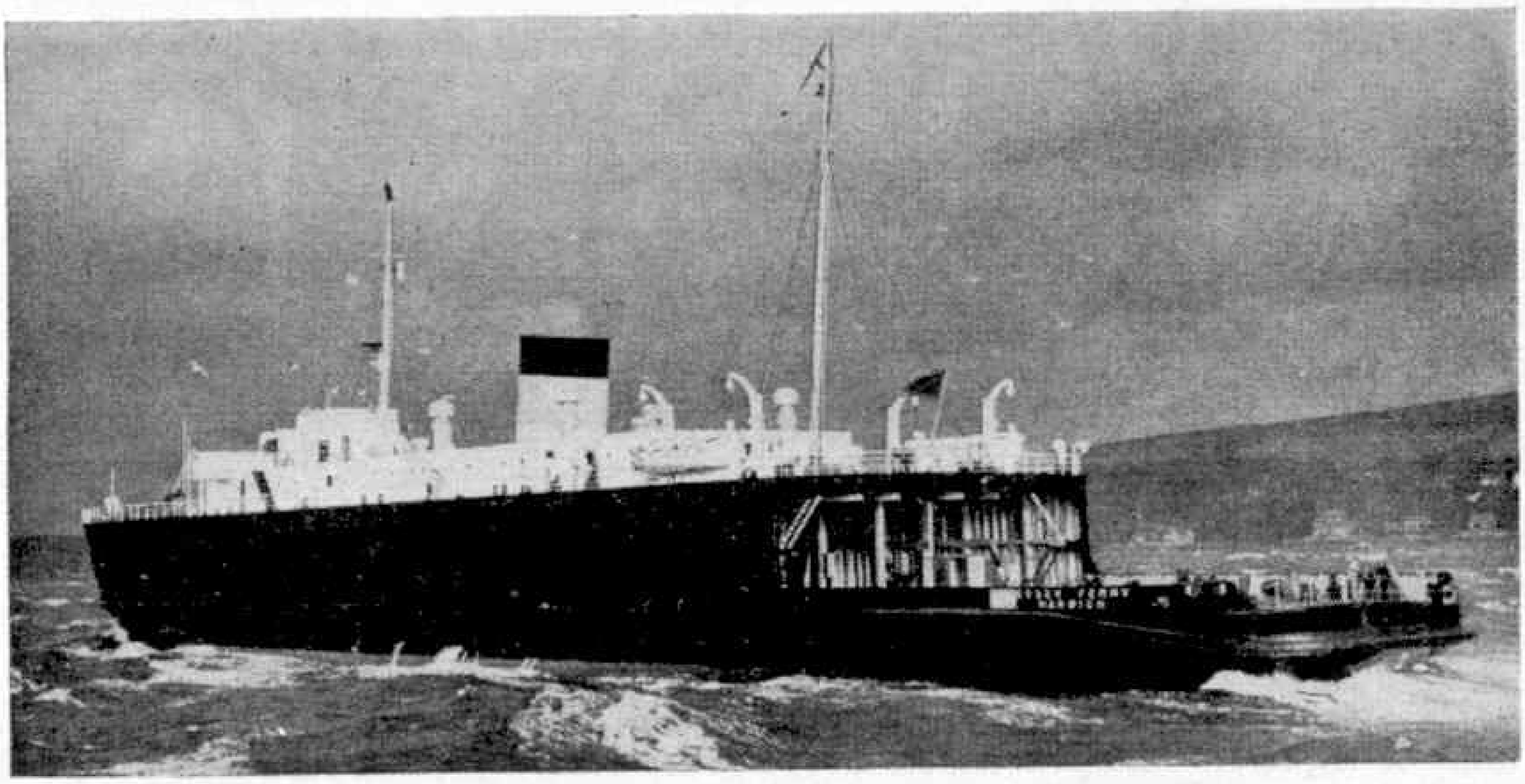


The column celebrating the first crossing by white men of the Murray River, with three "M.M." enthusiasts alongside. Photograph by Jon Ketelhohn, Melbourne.

But let us come back to earth, and see what next month's *M.M.* will bring. One of the contributions to that issue will be concerned with the International Geophysical Year, which begins in July, and in which our knowledge of Antarctica, an immense continent three times the size of Europe, will be very greatly increased. Another article will be concerned with Waverley Station, Edinburgh, and with the new diesel trains now linking that city with Glasgow. The cover will show one of these trains leaving the West end of Waverley Station.

There will be other items of varied character, including one explaining the curious results of the railway hobby of naming locomotives and another describing the Monkey Hole. What is this? Well, although it has a funny name, it serves a very useful purpose that will be made clear in the July Magazine.

The Editor



The "Essex Ferry"

By the Editor

THE first train ferry in Great Britain was run by the former North British Railway Company and carried loaded railway wagons across the Firth of Forth, from Granton to Burntisland. It began operations as long ago as 1860, but it faded away after the building of the Forth Bridge, the crossing of which was much easier and quicker, and far more comfortable, than that on the often stormy waters of the Firth. The idea was revived during the first World War, when a vast amount of heavy traffic across the English Channel had to be dealt with. This led to the building of an entirely new port at Richborough, in Kent, and the construction of three vessels specially designed to carry railway wagons, their decks being fitted with rails for this purpose.

The vessel seen in the illustration at the head of the page is the newest of the three train ferries that carry goods trains between Harwich and Zeebrugge. She is the 3,242-ton British Railways motor vessel "Essex Ferry," and her picture is reproduced from a B.R. Eastern Region official photograph.

After the war ended the three train ferry vessels were used to establish a service between Harwich and Zeebrugge, and this service has continued ever since, except during the war years. It actually began in 1924, and 10 years later it was taken over by the London and North Eastern Railway. Today it is run by the Eastern Region of British Railways.

The development of this ferry under railway control has been very interesting. The three vessels with which it started were again used for war work during the second World War, and in it two of them were destroyed, so that there was only one available when the time came, in August 1946, to reintroduce the service. This meant that replacements were necessary. The first came in 1947, when a more modern vessel named *Suffolk Ferry* was brought into service, and this was followed four years later by a similar vessel, the *Norfolk Ferry*.

In the meantime it had become clear that it would be necessary to replace the remaining original vessel, Train Ferry No. 1, which had undergone many years of strenuous employment. When the service was resumed in 1946, she had been given the name *Essex Ferry*, and it was now decided to build a new vessel. This was to be given the same name. The older vessel became *Essex Ferry II* and has since been broken up.

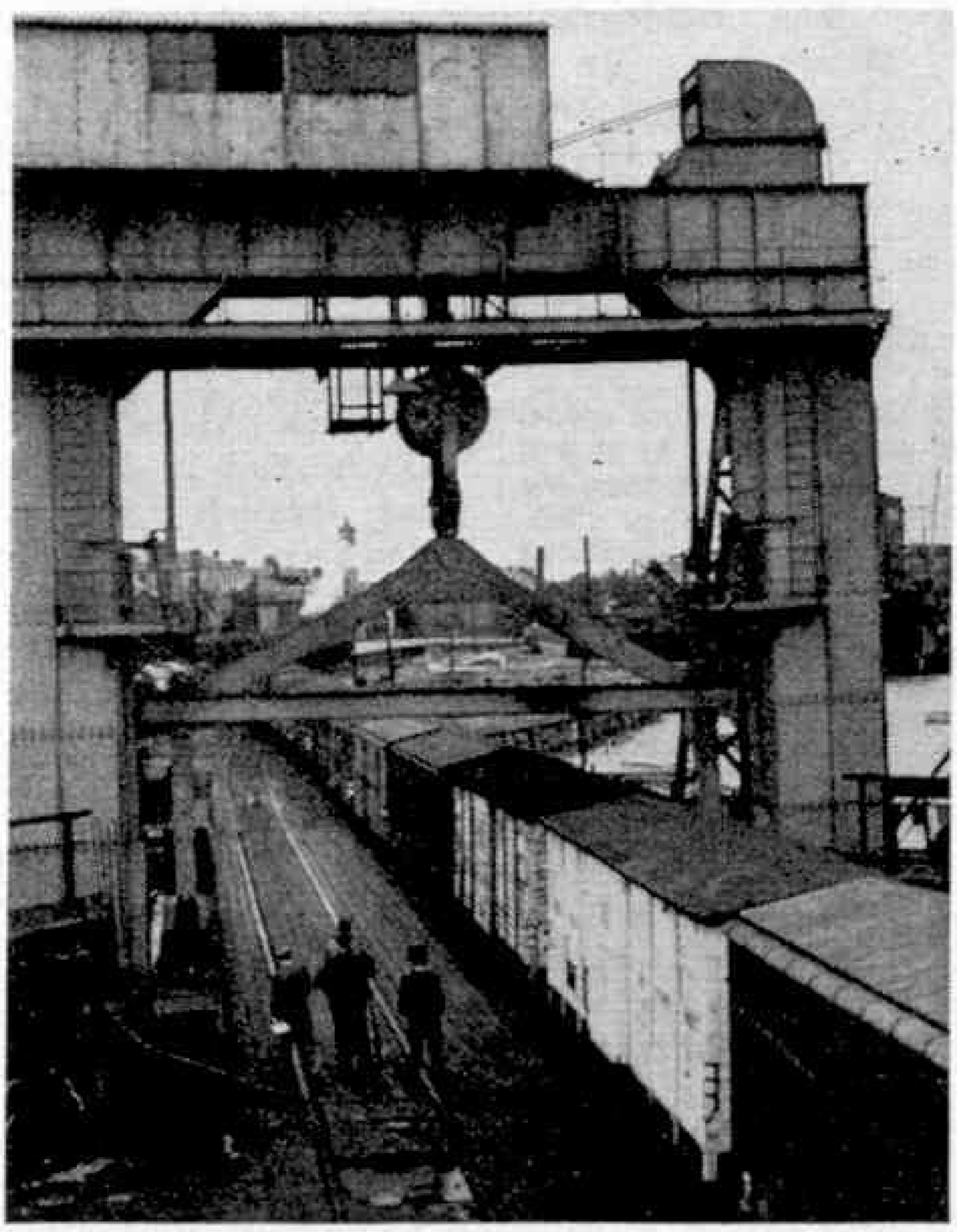
Thus the *Essex Ferry* of today completes a trio of valuable train ferries that carry goods of all kinds directly between Great Britain and the continent without removing them from the railway wagons in which they reach the ports. She was built by

John Brown and Co. (Clydebank) Ltd., and launched at their Clydebank yard on 27th October of last year.

Our cover this month, in the preparation of which the builders of the vessel have kindly co-operated, shows her in the yard at Clydebank where she was built, ready for the moment when she would take to the water. On it she is seen flying the house flag of her builders, with the house flag of her owners, British Railways, at the stern. She underwent her trials in January of this year, and sailed from Harwich to Zeebrugge on her maiden voyage in the evening of 15th January.

The "Essex Ferry" in the Clyde after her launch in October last year from the yard of her builders, John Brown and Co. (Clydebank) Ltd., to whom we are indebted for this illustration, and also for the photograph on which our cover this month was based.

The *Essex Ferry* is slightly larger than her predecessor the *Norfolk Ferry*, her gross tonnage being 3,242. She is 380 ft. long between perpendiculars, her moulded breadth is 58 ft. 6 in., and her depth to the upper deck is 35 ft. 6 in. A glance at the illustration of the vessel on the opposite page shows how her car deck projects beyond the upper deck towards the stern.



This picture shows the approach hoist at Harwich, with a train of wagons being shunted aboard m.v. "Norfolk Ferry," a sister vessel of the "Essex Ferry." B.R. Eastern Region official photograph.

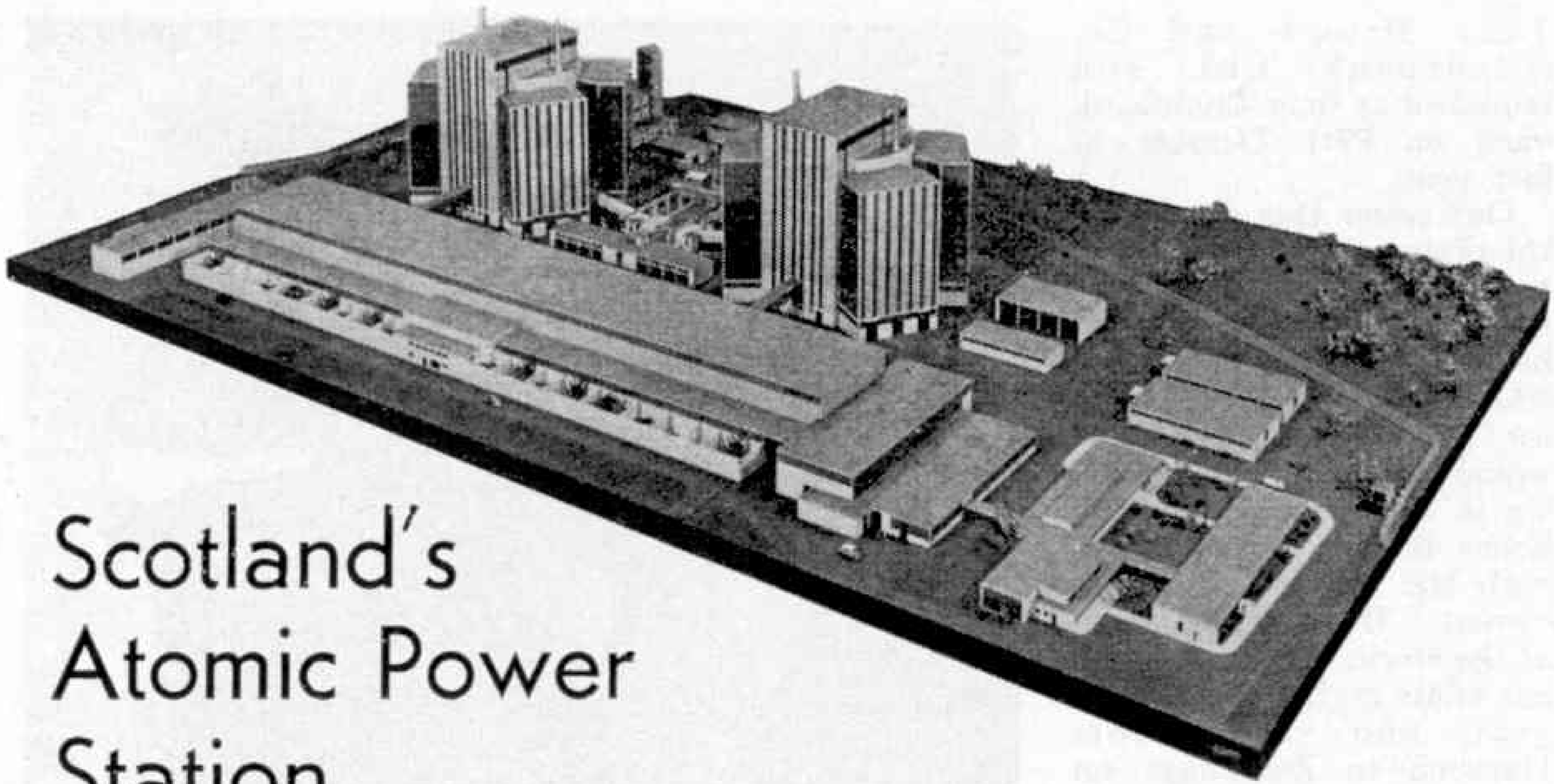
She has a draught of about 12 ft., and is powered by means of two Sulzer diesel engines with a combined output of 3,200 h.p. Her twin screws give her a service speed of about 13½ knots.

On the train deck there are four rail tracks, with a total combined length of about 1,132 ft. This is sufficient to give accommodation for 36 to 38 international rail service wagons. The two outer tracks total about 438 ft. and the inner lines, in the middle of the ship, have a combined length of 694 ft. The four tracks converge into two at the stern, where connection is made with the shore tracks when the vessel is being loaded or unloaded. Lcomotives are not allowed on the vessel, wagons being shunted on to the train deck, or hauled off it, with three or four extra wagons between them and the locomotive. Electric capstans are provided for use in warping the vessel stern first into its terminals, and these also can be used for hauling wagons on or off the vessel.

There is electrically-operated gear over all four tracks for handling cargo, and with it containers from wagons can be transferred to or from the deck of the vessel.

The service provides for the through operation of railway vehicles between

(*Continued on page 314*)



Scotland's Atomic Power Station

By the Editor

IT is now some time since the opening of the pioneer atomic power plant at Calder Hall, in Cumberland, described in the *M.M.* for November last. The Central Electricity Authority plan to build a further 19 stations of this type, and the tenders for three of these have already been placed. One of these is to be built on a site in Essex, and a second at Berkeley, in Gloucestershire. The third is to be erected in Scotland by the G.E.C. Simon-Carves Atomic Energy Group for the South of Scotland Electricity Board.

It is claimed that this Scottish station will be the largest in the world when it is completed. It will send out between five and six million units of electricity to consumers every day, and the saving of coal its use will bring about will amount to at least a million tons a year.

At the moment of writing it is uncertain where it will be built. The site proposed for it is at Hunterston, on the coast of Ayrshire, but this will not be settled finally until a public enquiry has been held.

Wherever it is built the new power station will have the general appearance shown in the picture at the head of this page. It will have two nuclear reactors, as the units in which the energy produced by atomic fission is developed are known. In the picture these can be seen towards the left rear of the site on which the power station is to be built. Each is 180 ft. high. The turbine hall, which is 700 ft. long, is in front of them.

The reactor buildings are enormous structures. In each the reactor core structure, its central feature, weighs nearly 2,000 tons. It is a gigantic pile of graphite bricks and tiles built up in the form of a block with 28 faces or sides, so that it is almost a cylinder. Associated with it are eight steam raising units, in which the heat developed in it will be transferred to water, and the total weight will be 70,000 tons. These structures will be supported on thick concrete rafts.

The picture at the head of the page shows a model of Scotland's first atomic power station as it will appear when completed. It is expected that the station will begin to yield power in 1960 or 1961. It is to be constructed for the South of Scotland Electricity Board by the G.E.C.-Simon Carves Atomic Energy Group, to whom I am indebted for the illustrations to this article.

Within the enormous mass of graphite bricks and tiles in each of the two reactor cores there will be 3,288 vertical channels for the charges of pure natural uranium metal to be used. This contains about 0.7 per cent. of U235, the form of uranium that actually undergoes fission. The charge will be in the form of fuel elements consisting of cylindrical rods 2 ft. long and rather more than an inch in diameter, weighing nearly 17 pounds, contained in cans made of magnesium alloy. Ten of these fuel elements stacked in a column

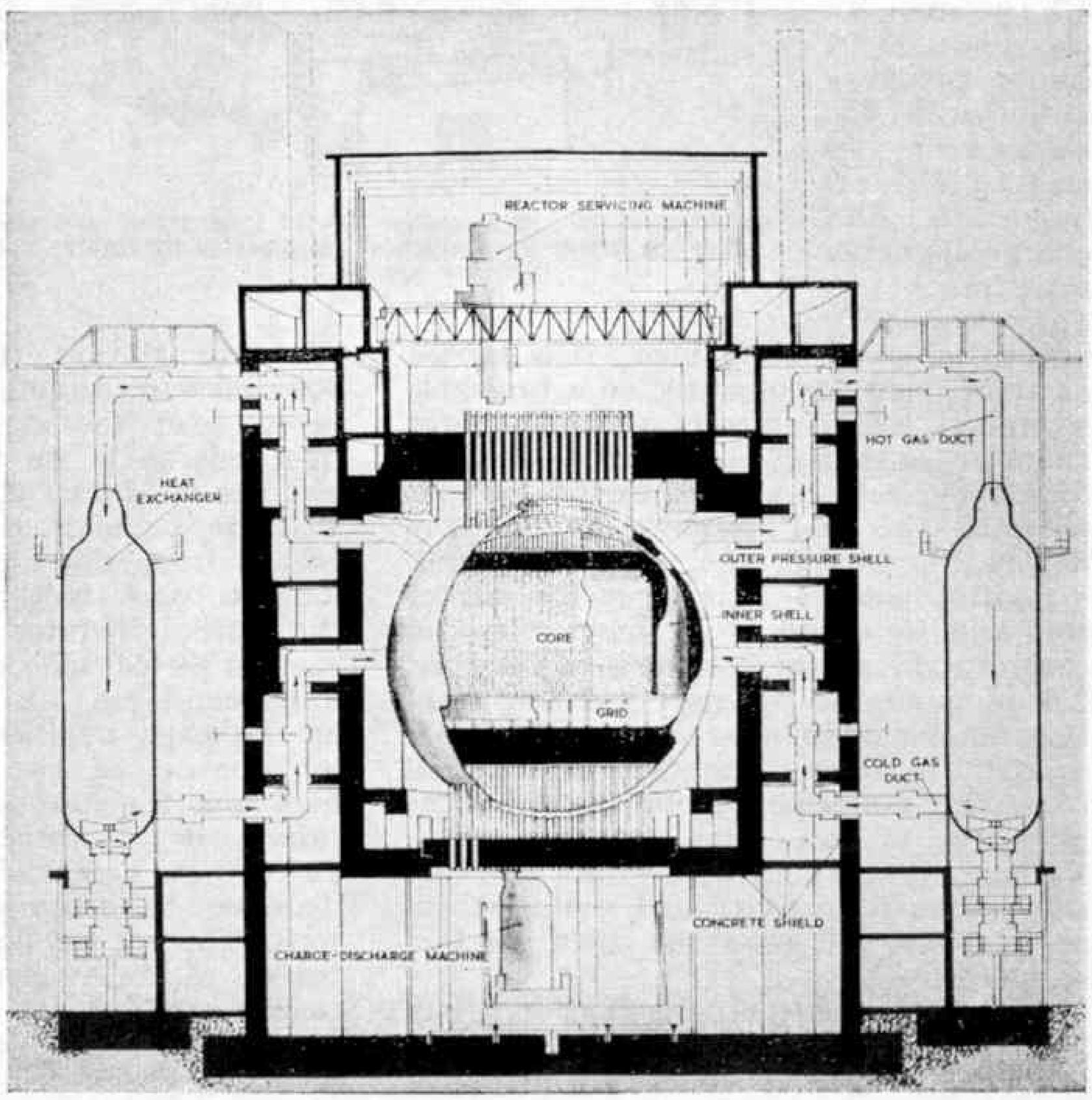
constitute the charge for each vertical channel, and the total weight of the metal to be used in each reactor will be 250 tons.

One reason for packing the uranium into the reactor in this manner is to make it easy to charge and discharge the fuel elements. The G.E.C. have developed a special method for their support, to prevent distortion of the lower elements by the weight of those above them. In this each canned fuel element is individually supported in a graphite tube by means of non-metallic spiders, or arms, and the graphite tubes will be held centrally in the main channels by means of small graphite lugs. The smooth outside surfaces of the graphite cylinders will not damage the main channels so readily by abrasion during charging and discharging operations as would be the case if the fuel elements themselves had to be handled.

The reactor core, with its charge of 250 tons of uranium, will rest on support plates on a steel grid, which in turn will be supported on a steel skirt. The grid will be formed of a large number of steel boiler plates, some 7 ft. in depth, arranged in egg-box fashion, with a thick steel top plate. On top of the grid structure there will be a further series of thick steel plates, which actually will provide an accurately levelled surface for the erection of the core structure when the station is being constructed.

The core itself will be surrounded by an inner shell in the form of a cylinder with a domed top and open at its lower end. This will be made of relatively thin mild steel boiler plate, and will itself be completely enclosed in a spherical pressure vessel 70 ft. in diameter, made of a special type of steel. This will be welded on the site from plates 3 in. thick. The special steel has been chosen because it will withstand the high pressure of the gas that will pass through it, and will not "creep," or become deformed, at the operating temperature, which will be 450 deg. F.

When the station is in operation the heat developed in the central core will be carried away by a stream of the gas carbon dioxide passing through it under a pressure of 150 lb. per sq. in. The greatest precaution will be taken to ensure that the pressure vessel through which it passes is gas-tight. All the main seam welds will be examined by X-rays halfway through the operation, and again when it is completed, in order

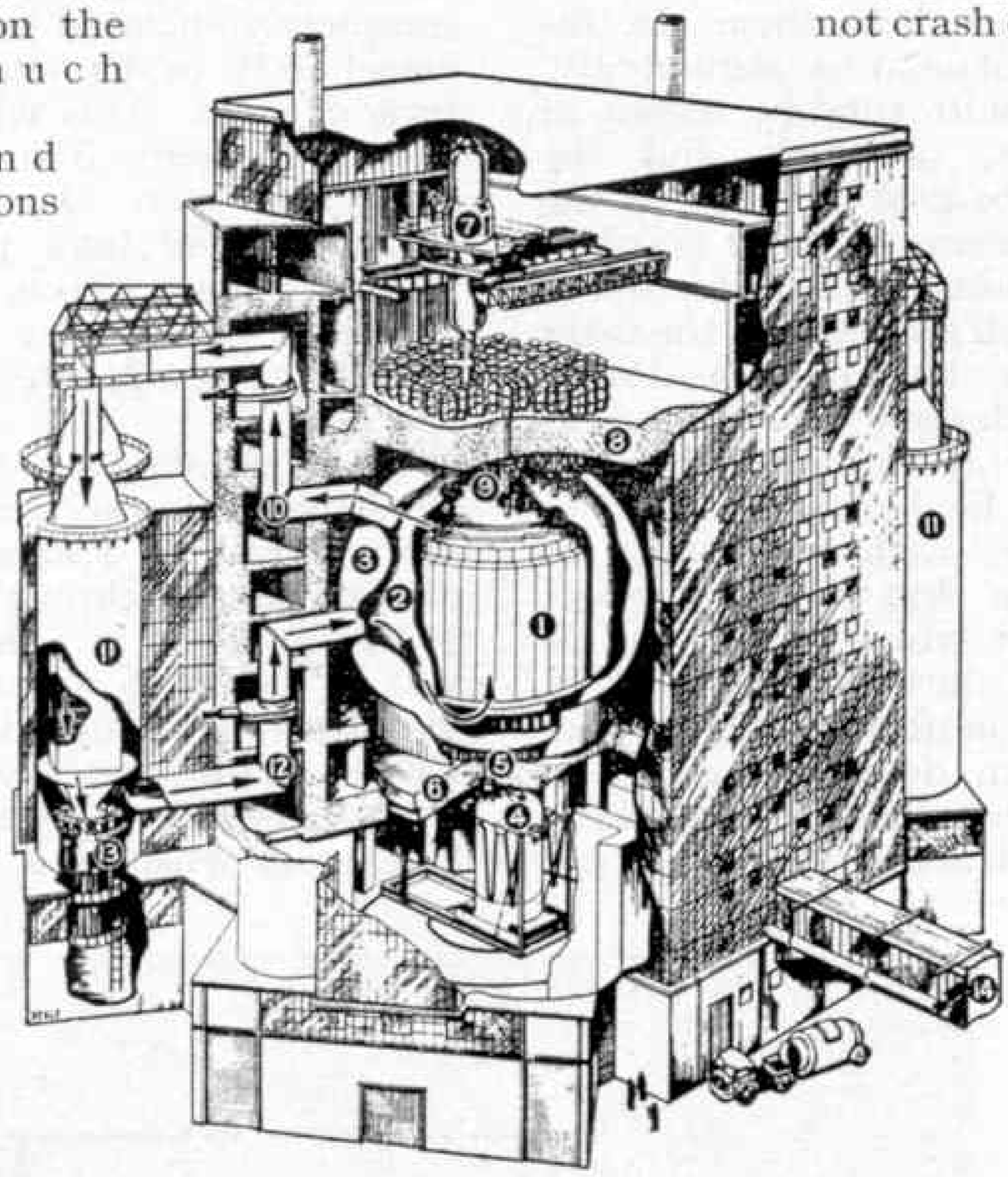


A sectional diagram of one of the reactor buildings. The arrows show the direction of flow of the gas carrying heat away from the core.

to be absolutely certain that the welds are complete.

This is not all that goes to the making of the heart of an atomic power station. The steel cylinder and pressure vessel in turn are surrounded by an immense concrete shield to prevent the escape of radiation. At the base of the reactor this shield is 6 ft. thick, increased at the sides to 9 ft. and on the roof to as much as 10 ft. 6 in.

Charging and discharging operations are to be carried out by a machine working in a shielded chamber below the reactor. The movements will be remotely controlled from a room in the reactor building, where the position of the machine can be seen exactly on a television screen. They can be carried out under pressure and while the reactor is actually in operation. The charge-discharge machine is approximately cylindrical and is 30 ft. high. It is carried on tracks that are mounted on a turntable spanning the diameter of the charge chamber, so that its nozzle can be brought directly beneath any of the fixed tubes that continue the fuel channels in the core downward through the supporting grid.



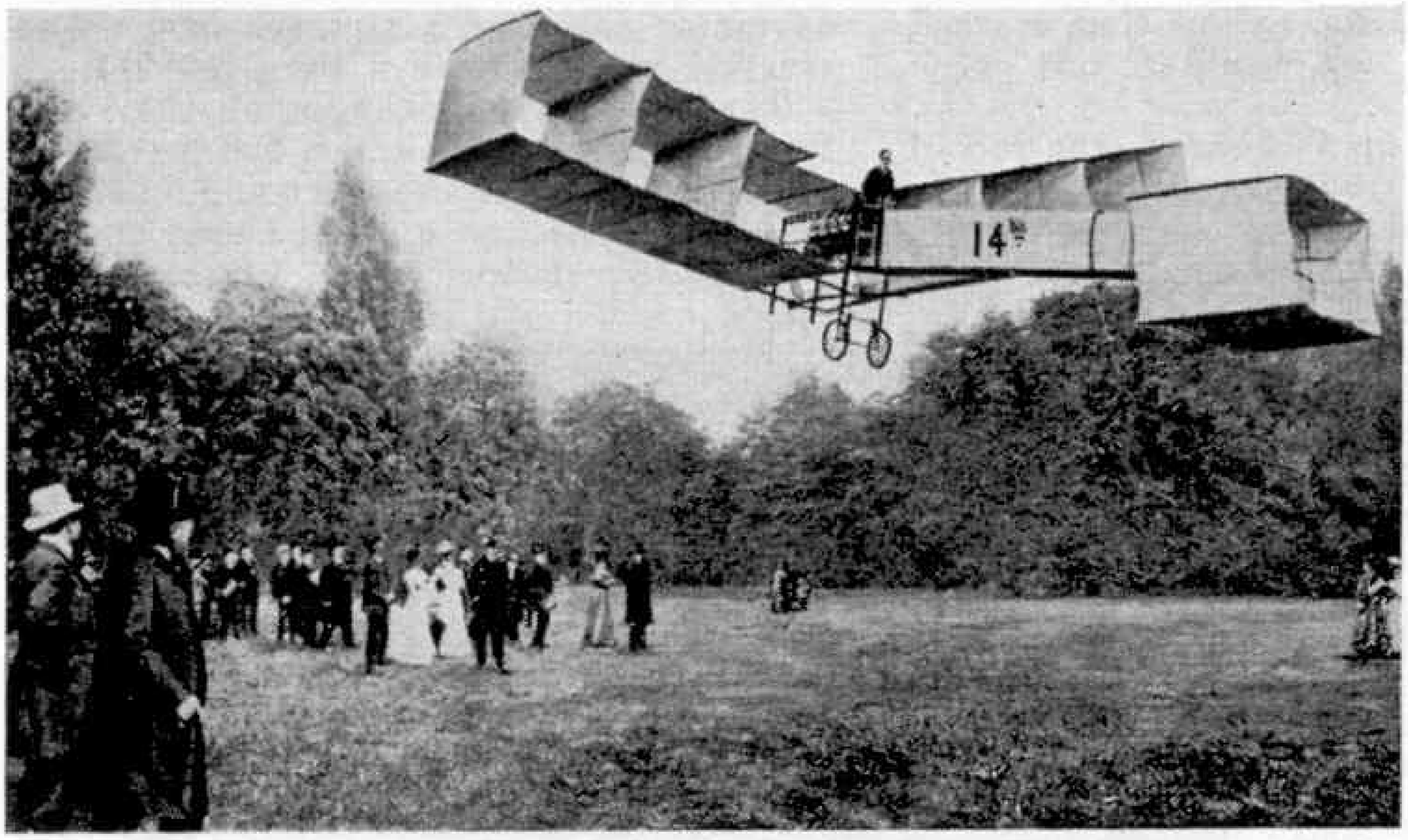
A cut-away view of a reactor. On the lower right, numbered 14, is the bridge over which steam pipes to the turbine hall are led.

Control over the working of the reactor core will be exercised by moving special control rods in other channels in the core, 208 in number. The rods will consist of thin sheaths of stainless steel in which is a specially developed lightweight material containing the element boron, which has the property of absorbing the neutrons. Pushing more tubes down into the core will reduce its activity and pulling them up out of it will allow the chain reaction to speed up.

A complete control rod is 21 ft. long and 2 in. in diameter. Each will be supported by a flexible stainless steel wire rope wound on a conically shaped drum driven by a permanent magnet motor, and they will be moved in and out of the core as required by applying the necessary current supply to the motor. In an emergency, cutting off the power supply for the controlling motors will cause all of them to fall into the core under gravity. An interesting point is that if this happened they would not crash down to the bottoms of the channels. Instead their speed would be automatically decreased, to make the final drop slowly and without damage.

I have already mentioned the carbon dioxide that will circulate through the reactors under pressure. It will pass upward through the fuel channels in the core, where it will become heated, and then through ducts to the steam raising units, which are disposed in pairs around each reactor.

In the 16 units of the complete station there will be about 300 miles of tubing. After losing much of its heat the carbon dioxide will be pumped back to the reactor by an electrically driven 2,200 h.p. blower, so that its circulation will be continuous. Steam from the units will pass to the long turbine hall, which will contain the turbo-generator sets, six of them, each of 60,000 kW. capacity. Two of the units employed are seen in the diagram on this page, numbered 11. Each consists in principle of two water tube boilers, high and low pressure respectively, contained in a vertical cylindrical shell 73 ft. 6 in. high and 19 ft. 6 in. internal diameter. The complete shell weighs 210 tons. The hot gas flows downwards across banks of tube elements to raise the temperature of the water in them, its temperature falling from about 750 deg. F to 400 deg. F.



An impression of Santos-Dumont's triumphant flight on 12th November, 1906. Picture Post Library.

Fastest on Wings

The Story of the World Air Speed Record

By John W. R. Taylor

IN Paris just over 50 years ago, on 12th November, 1906, a dapper little Brazilian named Alberto Santos-Dumont clambered aboard a strange-looking tail-first aeroplane, took off amid gasps of astonishment and admiration from the assembled crowd and set up the first official world air speed record of 25.7 m.p.h. In doing it, he persuaded his frail wood and canvas aircraft to stay in the air long enough to cover a distance of 240 yards, which was further than anyone else had flown in a powered aeroplane in Europe at that time.

Today the record stands at 1,132 m.p.h. —forty-four times the speed achieved by Santos-Dumont. In setting it up, Peter Twiss was airborne for some 25 min. and passed through the sound barrier four times. The Rolls-Royce Avon turbojet of his Fairey Delta 2 research aircraft developed the equivalent of about 36,000 h.p., compared with the 50 h.p. Antoinette piston engine fitted in Santos-Dumont's biplane.

There is probably no better indication than this of the tremendous progress made by aviation in half a century, because the air speed record has seldom been raised by freak, specially-built aeroplanes.

Much of the credit for this must go to an organisation known as the *Federation Aeronautique Internationale* (the F.A.I.), which was set up in Paris in October 1905 to promote co-operation between all nations interested in flying and to supervise record attempts. Since then, no record has been regarded as official unless it was timed by representatives of the F.A.I.—usually members of the national aero club of the country in which the attempt is made—and unless the rules laid down by the F.A.I. were observed fully.

All that was required of Santos-Dumont in 1906 was that he should not cheat by flying downhill and should have his aircraft under reasonable control. But by 1909 aeroplanes, engines and piloting skill had all improved so much that it became possible to time the records over "closed circuit" courses, which means that the aircraft had to turn and come back to their starting point. This was obviously much more fair, as it meant that pilots could no longer rely on a good hefty tail-wind to put up their speed, because it became a head-wind during part of the flight.

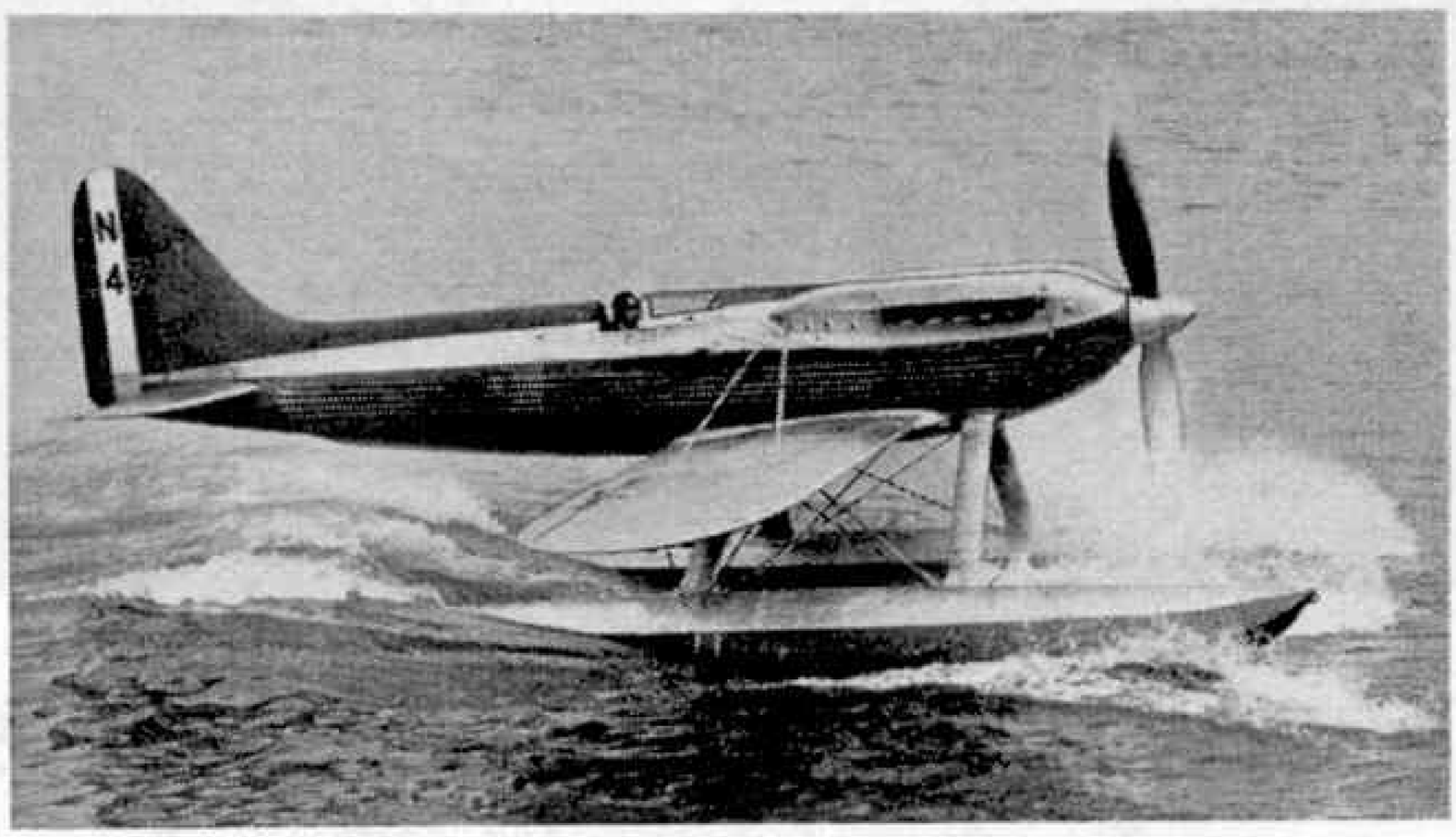
Records are always measured by the metric system, which is considered more truly international, and the early speed records from 1909 onwards were usually timed over closed circuits of, say, 10, 20 or 30 km. Glenn Curtiss brought one of his biplanes over from America to France for the world's first flying meeting at Rheims in August 1909, and thrilled the spectators

by racing around the pylons that marked the course at a new world record speed of 43.35 m.p.h.

As it was set up in France, the record was credited to that country for many years, until the F.A.I. agreed that records should go to the pilot personally and to his homeland. Not that this made much difference at first to the speed record because, except for Curtiss, it was held only by Frenchmen from 1907 to 1922. Such was the leadership of French aviation at the time of pilots like Farman, Bleriot, Nieuport and Jules Vedrines, who beat his own record six times during 1912 in Deperdussin monoplanes, and became the first man ever to fly at 100 m.p.h.

The return to favour of the biplane in 1913-14 is all the more difficult to understand when one realises that from the autumn of 1909 until the outbreak of war in 1914 the speed record was held only by monoplanes. Of these, the Deperdussin in which Maurice Prevost reached 126.7 m.p.h. in September 1913 was outstanding, with a streamlined propeller spinner and fuselage that would hardly look old-fashioned even today. Nevertheless, aircraft were still not so fast as motor cars, for a German driver had reached 141 m.p.h. in a Benz in 1911.

The 1914-18 war changed all that, and by the time it ended aircraft had become so much faster that top speeds could no longer be achieved around a small closed circuit. The F.A.I. decided that future record attempts would consist of two flights, in opposite directions, over a straight course one kilometre (about two-thirds of a mile) long, without any landing between runs, and that the aircraft would have to make two demonstration landings before the attempt, to prove that it was a practical, safe machine.



Supermarine S.6 in which Squadron Ldr. Orlebar set up a world speed record of 357.74 m.p.h. on 12th September, 1929. The world famous Spitfire fighter was developed from this series of seaplanes. Illustration by courtesy of "Flight."

Still the record stayed in France, and Sadi Lecointe became the first man to fly at 200 m.p.h., in a Nieuport-Delage biplane in September 1921.

The year 1923 brought two big changes almost simultaneously. The speed record became the average of two runs in each direction over a longer, 3 km. course, to ensure more accurate timing, and it crossed the Atlantic when Brig. Gen. "Billy" Mitchell of the U.S. Army Air Corps averaged 222.9 m.p.h. in a Curtiss biplane.

Mitchell was a fiery prophet of air power, who believed aerial bombing had made navies old-fashioned and useless. To prove this point, he sank several old German and American battleships with his big

The famous all-red Hawker Hunter in which Neville Duke achieved 777.627 m.p.h. on 7th September, 1953.

twin-engined Martin bombers; but his verbal attacks on the U.S. Navy led to a court-martial and he was suspended from duty.

His teachings and enthusiasm created an intense rivalry between U.S. Army and Navy pilots that led to some exciting speed duels in the 1920's, and when World War II proved many of his beliefs right he was restored to service with the rank of Major General and awarded the Congressional Medal of Honour, America's V.C. But he was dead by then!

The aircraft that enabled American Army and Navy pilots to battle so successfully for the record in 1922-23 were Curtiss biplanes fitted with the revolutionary new Curtiss D.12 water-cooled "in-line" engine. Unlike the usual radial and rotary engines, the D.12 could be streamlined into the fuselage from a pointed nose spinner, and when Sir Richard Fairey imported some D.12s for his Fox bombers these aircraft became so neat and fast that they raised the speed of R.A.F. day bombers by 50 m.p.h. in one jump.

Air Forces in many countries were quick to learn from this lesson. New techniques in airframe design and new engines developed for racing aircraft could obviously lead to better fighters and bombers. So first America, then Italy and Britain, began to build special seaplanes at high cost for what were then the most important and exciting of all aviation races, the contests for the Schneider Trophy.

The huge floats needed by these seaplanes cut down their speed considerably, but runways ashore were few and rough and it was considered safer to operate very fast aircraft from large clear stretches of water.

So, from 1927 until 1939, the world speed record was held by seaplanes designed for the Schneider Trophy contests. Major de Bernardi of Italy became the first man to fly at 300 m.p.h., in a Macchi M.52 seaplane in March 1928. In September 1929 Sq. Ldr. Orlebar, flying a Supermarine S.6, brought the record to Britain for the first time with an average of 357.7 m.p.h.; and two years later Flt. Lt. Stainforth exceeded 400 m.p.h. for the first time, with a record of 407 m.p.h. in a Supermarine S.6B. In addition, Flt. Lt. (now Air Chief Marshal Sir) John Boothman won the Schneider Trophy outright in another S.6B.

After Warrant Officer Agello of Italy raised the record to 440 m.p.h. in a Macchi M.C.72 seaplane in 1934, it remained unbeaten for five years, until Fritz Wendel of Germany achieved 469.25 m.p.h. in a much-redesigned version of the Messerschmitt Me.109 fighter. Since then the record has never been held by a seaplane.

Wendel's speed represented an increase of only 29 m.p.h. in five years and it began to look as if aeroplanes had reached the limit of their performance. Then came World War II and the first jet-'planes. Within three months of the end of the war, a splendid new record of 606 m.p.h. was set up by Group Capt. Wilson of the R.A.F. in a Gloster Meteor.

In August, 1955, Col. Horace Hanes set up the first supersonic speed record, 822 m.p.h., in this F-100C Super Sabre.

For the first time the public realised the possibilities of the new power of jet-propulsion, for the record had never before taken such a jump. The F.A.I. realised too that its rules would soon have to be changed because aircraft were not allowed to fly higher than 100 m. (328 ft.) during their runs over the measured 3 km. course, to ensure accurate timing and to prevent unfair diving to increase speed. At over 600 m.p.h. it was not easy to judge height so precisely.

As speeds rose even higher, the difficulties and dangers increased, because aircraft

(Continued on page 314)

A down Hastings express headed by Schools 4-4-0 No. 30931 "King's Canterbury" passes Tonbridge Junction. Photograph by R. F. Roberts.

Railway Notes

By R. A. H. Weight

"Schools" Class Locomotive Performance

Two years ago, in a special *M.M.* article, I paid tribute on the occasion of their Silver Jubilee to those monarchs of the 4-4-0 world, the S.R. 5P 3-cylindered Schools, introduced in 1930. Though they will be supplanted partially this year on one of their principal regular routes, that between London and Hastings by way of Tonbridge-Tunbridge Wells, they will doubtless continue to render good service while steam passenger trains run on other lines in Kent and elsewhere. There are severe gradients and other hindrances besetting London-Hastings trains, as many readers will be aware. Summarised details follow of some typical time gaining runs recorded by myself or friends when the power and flexibility of the locomotives were demonstrated by able drivers and firemen stationed at Bricklayers Arms or St. Leonards.

With the fully loaded 5.6 p.m. from Cannon Street, 11 on including Pullman buffet car, No. 30907 *Dulwich*, a green St. Leonards engine frequently on that duty, made some excellent speeds up the steep climbs, and a downhill maximum of 80 m.p.h. was quickly attained where there was a chance. A long severe slowing through Sevenoaks had to be observed, but the first stop at Tunbridge Wells was reached with half a minute to spare on what often appears a tight schedule. Time was also gained between stops beyond.

With a similar 370-380 ton express in the opposite direction, *Epsom* and *King's Wimbledon* were both masters of the situation, having taken on passengers from the coast at Hastings, St. Leonards-on-Sea and Crowhurst, then filled up at Wadhurst and Tunbridge Wells, though signal checks through the congested South London area caused a slightly late arrival.

With lighter trains, lively performances recently have included a net gain of 4½ min. with the 9-coach 1.2 p.m. from Cannon Street as far as Crowhurst, 56½ miles, with two stops. There were nasty slowings from signals and for track repairs on the sharp rise through the London suburbs. Speeds between London and Tonbridge varied between 24 and 84 m.p.h., and 40 was attained on the tough climb from Tonbridge to Tunbridge Wells, with a maximum of 75 further south near Stonegate. The engine was No. 30934 *St. Lawrence*.

After delays on the main line with the same 310-ton train, *Repton* vigorously secured a gain of over 4 min. during a 23-mile start-to-stop run over pretty hills from Tunbridge Wells to Crowhurst, the junction for Bexhill. So did *Rugby* with 300 tons when I was aboard the 3.25 p.m. Saturday fast train from Charing Cross on a peak holiday travel day. With a lighter load on the slower Monday - Friday version of this service, *Cheltenham* suffered an uphill engineering slack but made the 20¼-mile from London Bridge to Sevenoaks stop in 27 min. compared with 29 allowed, seizing the only opportunity for sprinting in the last few miles by accelerating rapidly to 78 m.p.h.

Enginemen stationed at St. Leonards figured in other good efforts on the heavy 6.3 p.m. from Cannon Street and the 7.25 from Charing Cross, and on others each way with *Charterhouse* and *St. Paul's*, for example. Though a light Pacific is usually assigned to haulage of the *Man of Kent* expresses between London and Ramsgate via Dover, Schools sometimes fill the breach admirably still, as on a recent occasion when *Downside* gave a stirring performance with well over 300 tons, having time in hand on the 4.15 fastest train down to Folkestone. Other duties on Kent coast main lines continue to be performed by them.

Pioneer Diesel Electric Trains

The first multiple unit 6-coach diesel-electric main line passenger sets in Britain enter regular service on the London-Hastings route this month upon the introduction of summer time-tables. Trial and training journeys and some passenger runs are taking place at the time of writing. According to announced plans, more than half of the increased number of journeys will be operated by the new sets this year, in some cases running as two-coupled, making 12-coach trains for whole or part run. Next year all will be diesel-electric. Thus are the Schools being displaced!

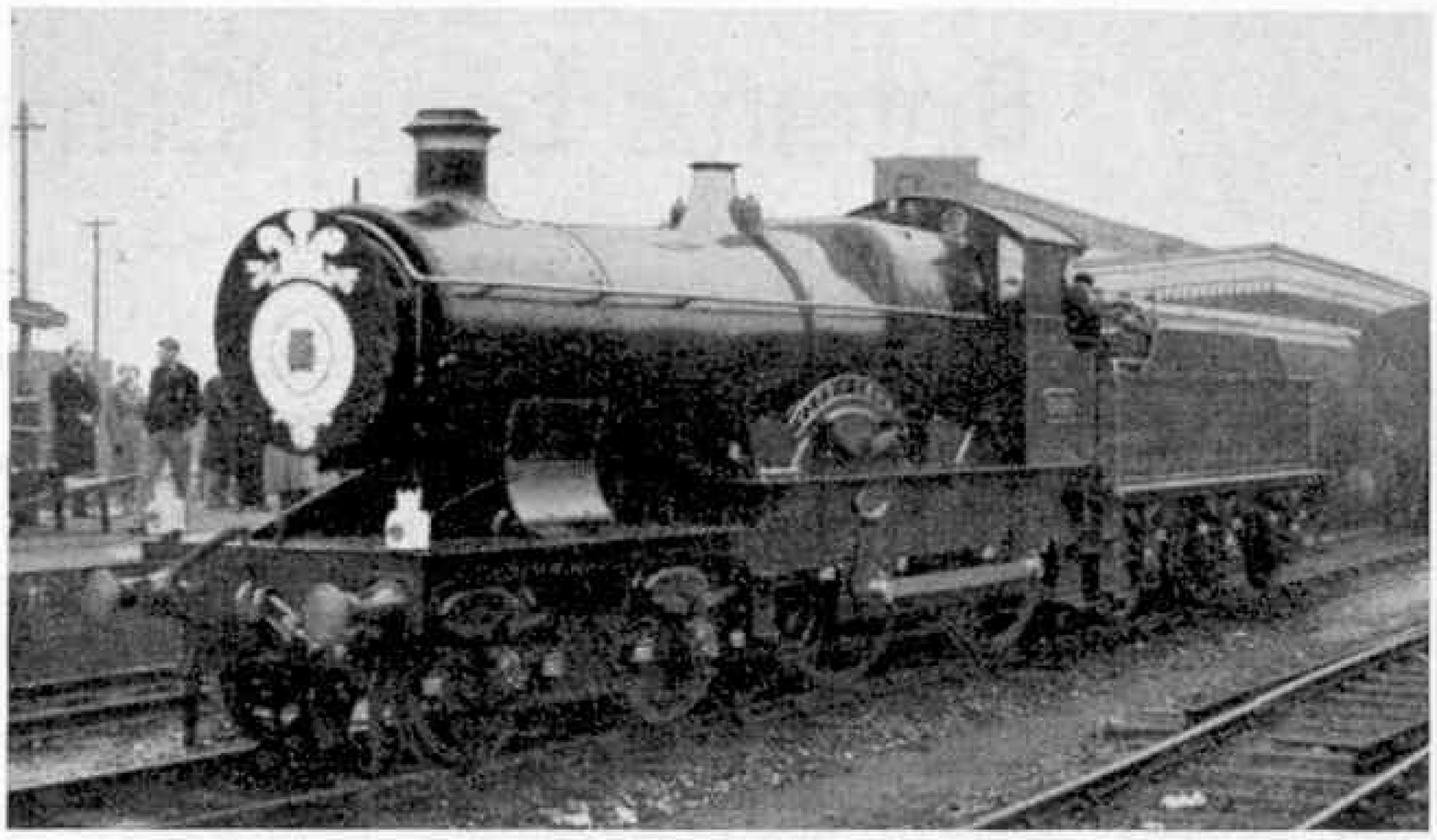
The tracks to Hastings from the main line junction at Tonbridge are not included in current electrification schemes, as on account of narrow tunnels standard rolling stock and equipment could not be used. The new diesel trains are narrower than usual, but well provided and powered to provide quick acceleration, with the highest practicable speeds on quicker timings.

B.R. Order for 100 Electric Locomotives

Contracts have been placed with four well known English firms for the construction of 60 complete main line electric locomotives, and motors and driving equipment for 40 others being constructed in British Railways workshops. They will be of the 3,300 h.p. Bo-Bo type with eight wheels and will have driving cabs at each end. They will operate on the 25,000 volts, 50-cycle A.C. system with overhead pantographs, to be standardised for a number of lines when electrified. Direct current traction will be employed, with the necessary transformers and rectifiers on

the locomotives. Germanium type rectifiers may be fitted on some by the British Thomson-Houston Company.

All but 20 will be type A, designed to haul express passenger trains of substantial length at speeds up to 100 m.p.h. or freight and mineral ones doubly as heavy at 55 m.p.h. The remainder will be of type B, with a different gear ratio, to be used for heavy mixed traffic duty with an 80 m.p.h. maximum, though capable of taking mineral trains weighing up to 1,250 tons at 55 m.p.h. Delivery is expected to begin next year.



The restored G.W.R. 4-4-0 locomotive "City of Truro," bearing its original number 3440, waiting at Wolverhampton for an enthusiasts' special. Photograph by R. Webster.

Triumph and Disaster at Cannon Street!

Work on the extensive remodelling of Cannon Street station S.R., close to the heart of the city of London had progressed sufficiently by early spring this year to enable a number of longer, 10-coach suburban electric trains to be worked in and out at peak hours daily, thus providing considerably more seating accommodation and providing a rosier outlook for many thousands of regular travellers generally.

Alas! During an April night, the electric signal box controlling all signals and points at the terminus, also along its approach tracks over the bridge crossing the River Thames was destroyed by fire with much associated wiring and gear. Hand signalling had to be resorted to, many trains were curtailed or diverted and it will be some time before normal operation can be resumed and full services handled.

Locomotives in the News

New locomotives have been added to stock and allocated as follows. Class 9 2-10-0 Nos. 92094-6, 38B, Annesley shed, Nottingham, and 92123-6, 15A, Wellingborough; B.R. 4-6-0s Class 5 Nos. 73147-8, 65B, St. Rollox, Glasgow, and 73164-5, 50A, York; Class 4, Nos. 75056-7, to 16A, Nottingham and 15C, Leicester, respectively; Class 4 2-6-0s Nos. 76082-3, 24D, Lower Darwen; and Class 2 2-6-2T No. 84020, built at Darlington; to 74A, Ashford, Kent, with others following.

Diesel-mechanical shunting engines lately completed include No. 11165, to 41A, Darnall, Sheffield, and No. 11186, 40A, Lincoln.

V4 2-6-2 No. 61700 *Bantam Cock*, one of two light mixed traffic locomotives built in 1941 for Scottish service by the L.N.E.R., has been withdrawn. Owing to war conditions the type was not developed.

No. 54469, depicted in one of this month's illustrations, belongs to the still fairly numerous Pickersgill design of former Caledonian 4-4-0 express engines built round about 1916-20. There are a few of the older and once famous Dunalastair type in service also.

Britannia Pacific No. 70044, on removal of Westinghouse brake pump, has received its name *Earl Haig*. No. 70043 will probably be similarly dealt with. The brake gear was used during express freight trials.

The code numbers for Skipton, Hellifield, Lancaster, Midland sheds are now 24G, H, and J respectively.

A Miscellany of Recent Developments

Two new motor ferry ships have been placed in service to carry passengers and other W.R. traffic across the River Dart, connecting the railway terminus at Kingswear, Devon, with Dartmouth.

The presence of strong springs of water necessitates powerful pumps continuously at work near each end of the 4¼ mile Severn Tunnel. The old steam gear that has provided power for these since 1886 is to be preserved in No. 1 Pump House on account of historic interest. Meanwhile a very efficient electric installation will provide propulsion for the future, as well as operating the big tunnel ventilating fan.

An all-concrete footbridge over 600 ft. long, consisting of five spans crossing five running lines and 22 sidings, has been completed near Scunthorpe station, Lincs. Considerable industrial development in the neighbourhood has resulted in much increased traffic.

The opening of a new ticket office at Glasgow Central Station has followed closely on a new station lighting installation and the provision of new refreshment and enquiry facilities.

Summer in the Highlands. A former Caledonian 4-4-0, B.R. No. 54469, on a Blair Atholl to Perth train, near Killiecrankie Viaduct. Photograph by J. C. W. Halliday.

Britain's Local Climates

By David Bowen, F.R.Met.S.

"CHANGEABLE" is perhaps the most general one-word verdict on the British climate. Sceptics go a little further than this and remark that it has not changed since Roman days, when it was "foggy, raw and damp." To geographers it remains "cool temperate."

But none of these descriptions points out what is one of its most important features. For it is not just one climate, nor a combination of one or two, but of an infinite number of "local" ones. Or so it seems as—each year—our scientists carry out further investigations in this field. If we travel in any one direction, there is no guarantee of a gradual change from one regional or local climate to another. We might well experience five local climates during the first fifty miles, and then enter another stretch of the same length where the conditions are almost uniform.

All this is not to say that we can now ignore some of the old "rules" about our climate; for example, that western districts are mildest in winter and that East Coast areas are the driest in the country. But these are only general guides. When we apply them we must take into account whether a particular district is hilly or flat, or whether it is partly or wholly rural or industrial, what are its soil and vegetation. These and various other factors all affect local climate and the quality of the air.

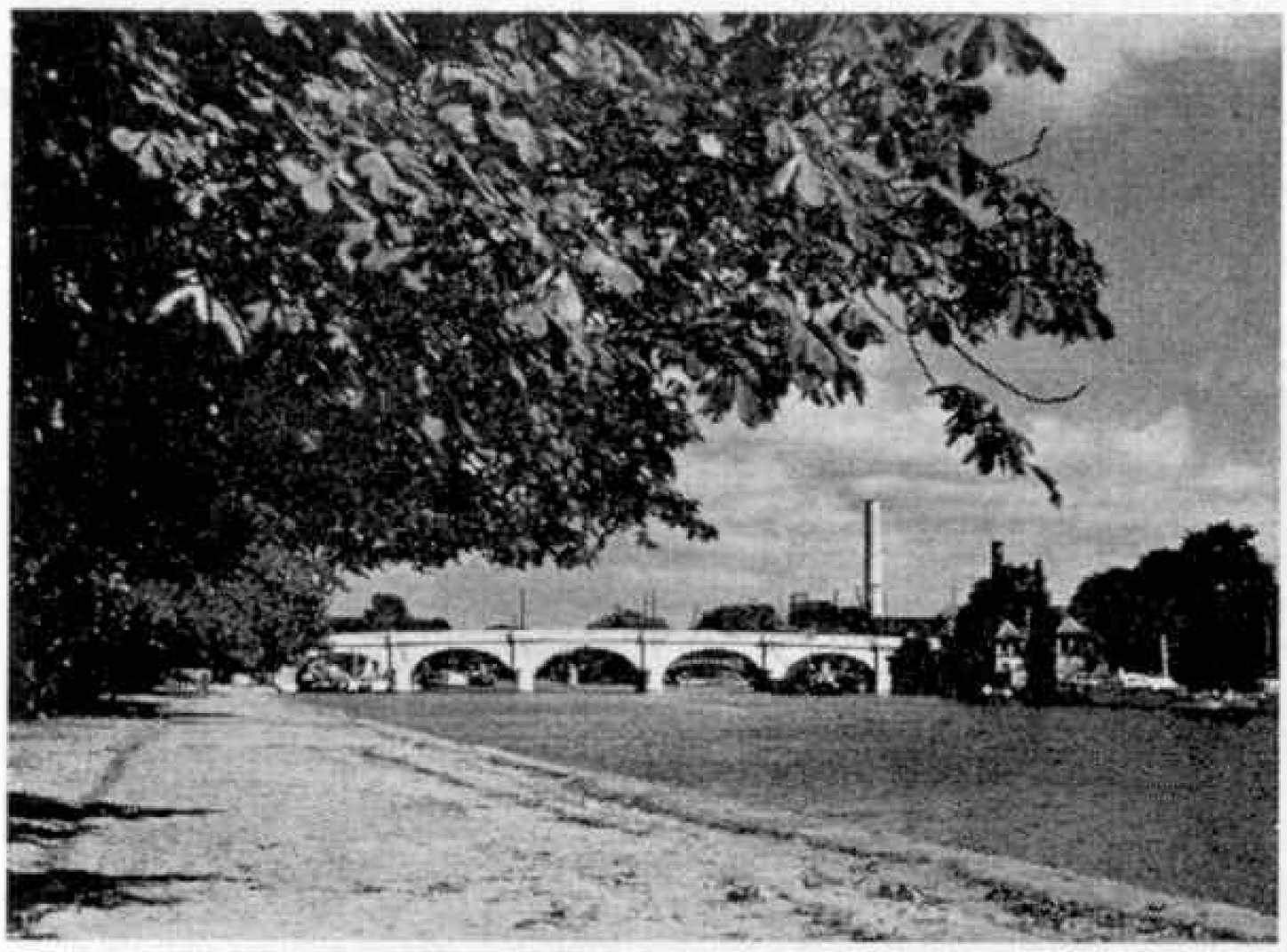
As a result, when we study the official records or carry out our own research, we shall be prepared for what may at first seem highly improbable. To quote only a few records, Lerwick, in the Shetlands, is a far warmer place in winter than Cambridge, and the average winter night temperature in the Orkneys and Shetlands is almost the same as it is along the South Coast of England. Manchester, although situated in a damp region, has only between one-sixth and one-third of the rainfall of North Wales or the Lake District.

Daylight affects sunshine, of which the average daily duration in December is a mere half an hour in the Shetlands, increasing to between one and a half and two hours along the south coast of England. The increase is small enough, but the ratio is significant. In June the expectancy is five and a half hours in the extreme north, and seven and a half hours along the South Coast generally.

The buildings of a local region are often a useful guide to its climate. These tiled Surrey cottages point to a kindly influence.

We are reminded time and again by the popular Press of the existence of that warm ocean current, the Gulf Stream, which flows on a regular course from Florida to the far north of Scandinavia. This keeps us, we are told, mild in winter, and not too hot in summer. Its effect, however, so far as Britain is concerned, is generally overestimated, for the presence of a large ocean to the west of us is quite sufficient to prevent extreme temperatures from occurring, provided always that the wind direction remains oceanic.

In winter, when the ocean is much warmer than the land, due to its ability to retain heat, prevailing south-westerly



Where there is water the local climate is milder and damper. This view shows Kingston Bridge, on the Thames.

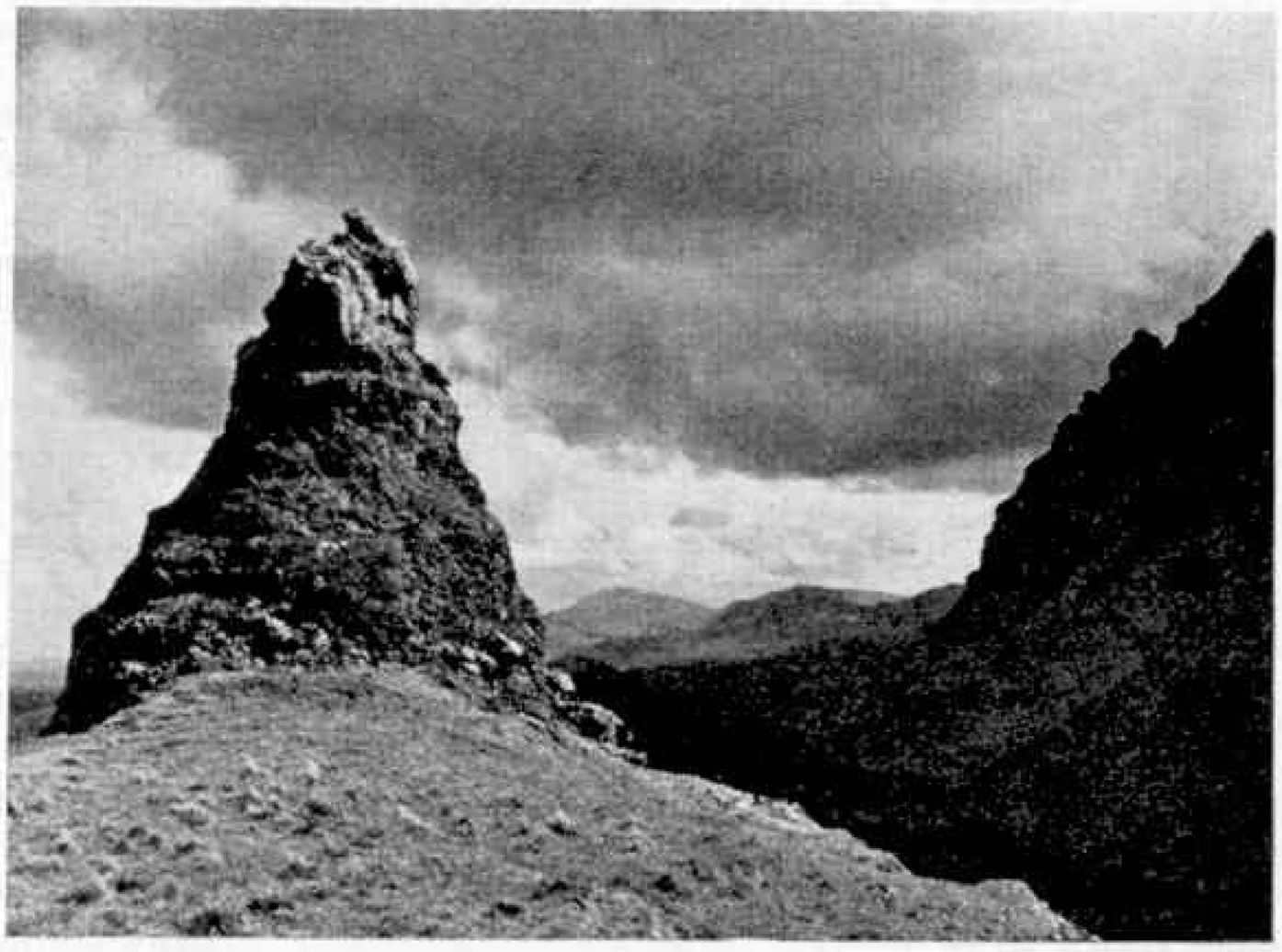
winds will give mild weather, particularly in Cornwall, Devon, and the west coasts of Scotland and Wales. Temperatures decrease, as a rule, towards the north-east, although there is a belt of almost uniformly low winter temperatures in the 50-mile coastal region between the Thames and the Moray Firth. July average temperatures range from 54 degrees in the Shetlands to 62 degrees in South-east England.

Our cloud and rainfall distribution is more complex, and it often varies less from season to season than it does from place to place. Actual rainfall amounts are highest in the West and lowest in the East, but a mistake all too often made in the past, and even occasionally today, is to judge the climate of a region by its rainfall amounts without taking into account, at the same time, the number of days on which rain can be expected to occur, and in what conditions the rain is either continuous or intermittent and is likely to exceed more than a few hours at a stretch. Except only in mountainous regions facing the prevailing wind, there are more hours every year of bright sunshine than of rainfall in almost every district of Britain!

A fact of interest to those who are lucky enough to live where they like, is that in winter there are nearly as many rainy days in the East as in the West, while in summer and autumn there are approximately 25 per cent. more in the West.

But eastern districts have a very much drier air, even allowing for those cloudier days when the winds bring in an unpleasant fog from the North Sea. It rises to become low cloud as it travels inland and may eventually thin out to let the sun break through. To the Scots this is "haar," but, farther south, off the coasts of Yorkshire and Lincolnshire, it is called "sea-roke" by the local fishermen.

According mainly to the combination of the air's temperature and humidity, local climates generally fall into one of three main categories: "bracing," "sedative" (relaxing) or, half-way between, "tonic." Eastern districts are very bracing, particularly the more exposed ones, while the sheltered valleys and bays of the West, together with the low-lying inland spas, are relaxing. In mild but exposed parts of the West, such as the north coasts of Devon and Cornwall, the local climates are mainly tonic.



A stormy day in the Isle of Skye. Western coasts facing the prevailing wind have the highest rainfalls in Great Britain.

Invalids and all who suffer with high blood pressure feel better in the more relaxing types of climate, since the bracing airs of the East, and also of the higher inland resorts, make the body work faster than it would do otherwise. But a bracing

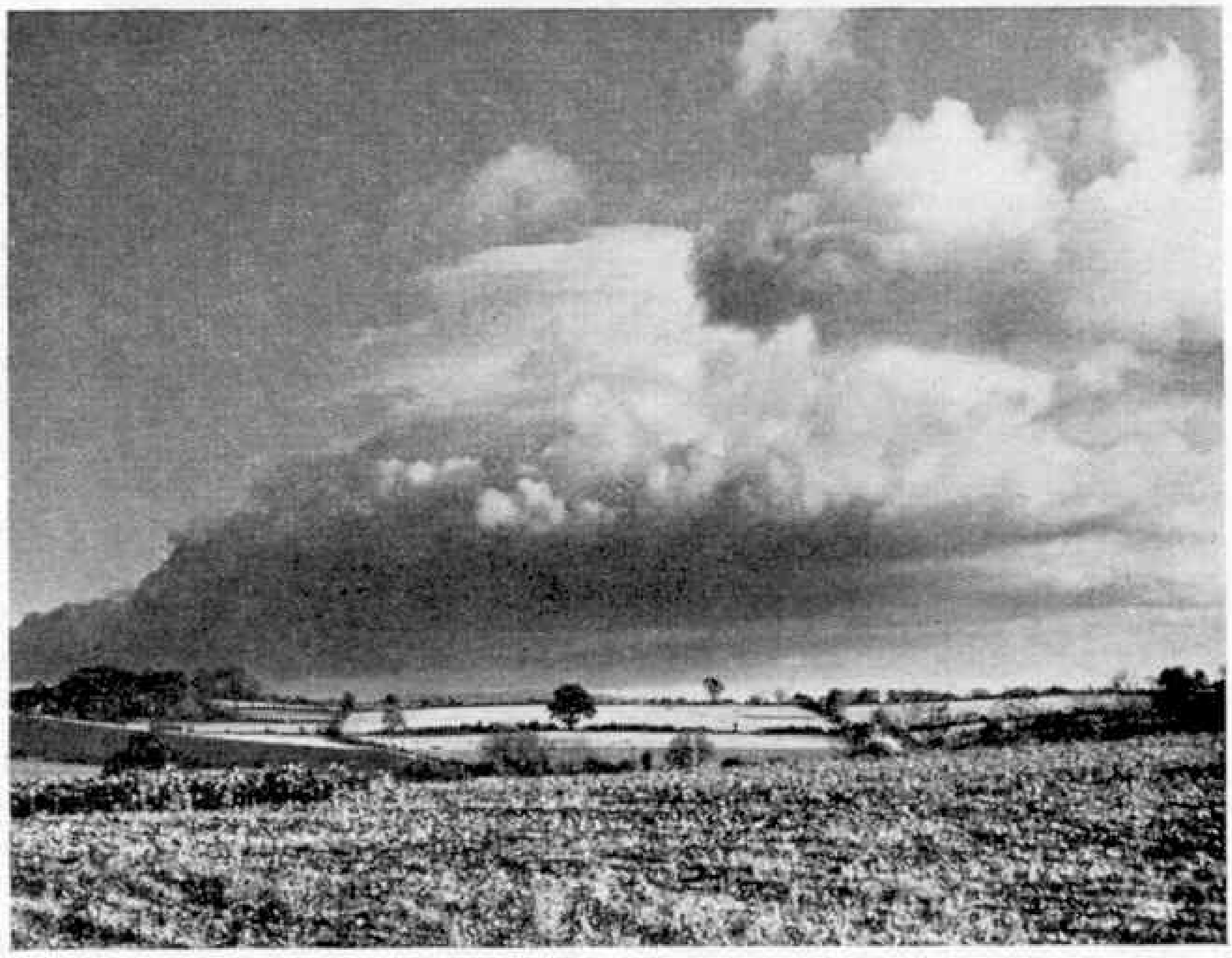
resort is fine for "brain-fag." Schoolboys, after examinations, and normally active but tired City businessmen do very well on it. One of our most bracing inland resorts is Harrogate, high in the West Riding of Yorkshire, while Hampstead, rising modestly from the London plain, has similar but less marked qualities.

In southern and western areas there is an abundance of local climates. To take Surrey alone, Kingston, in the flat Thames valley, is mild and fairly relaxing, while Haslemere, with its hilly surroundings, is bracing.

What is also important to the climate of any district, apart from its latitude and height, is the influence of neighbouring local climates. An isolated hilly region is colder than the plain below, as the temperature falls roughly one degree Fahrenheit for every 300 ft. rise. But on clear cold nights chilled air will gravitate from higher to lower ground, sometimes in the form of a slight breeze and now and again as a fair wind. This explains why valleys are generally so frosty. They are most prone to frost if they are well removed from the mild influence of the ocean and are cup-shaped, so that the cold air-flow is prevented from passing *through* them. The valley of Rickmansworth is a good example of this.

High ground unsheltered from the prevailing winds can be equally unpleasant. In this case the hills cause the rain-bearing winds to rise higher than they would do otherwise, with the result that there is a greater chilling of the air, more condensation and more rain.

The country is somewhat colder and windier than the town, for in it less artificial heat is being released, and there are fewer wind-breaks. But it is healthier always, provided that it is not immediately down wind from an industrial region, and on the same level. To live in the country between, for example, Glasgow and Edinburgh, may well mean having to put up with a smoky urban climate without the normal urban advantages of big towns. Air pollution, however, is seldom very great to the windward side of a town. Kew, seven miles west of London, enjoys air that is more than twice as clear as it is in the central area, while Rothamsted, 22 miles north-west, is more than three times as clear.



This is the helm cloud, as it sweeps off the Pennines near Cross Fell. It is caused by a gusty north east wind blowing down the western slope of the Crossfell Range.

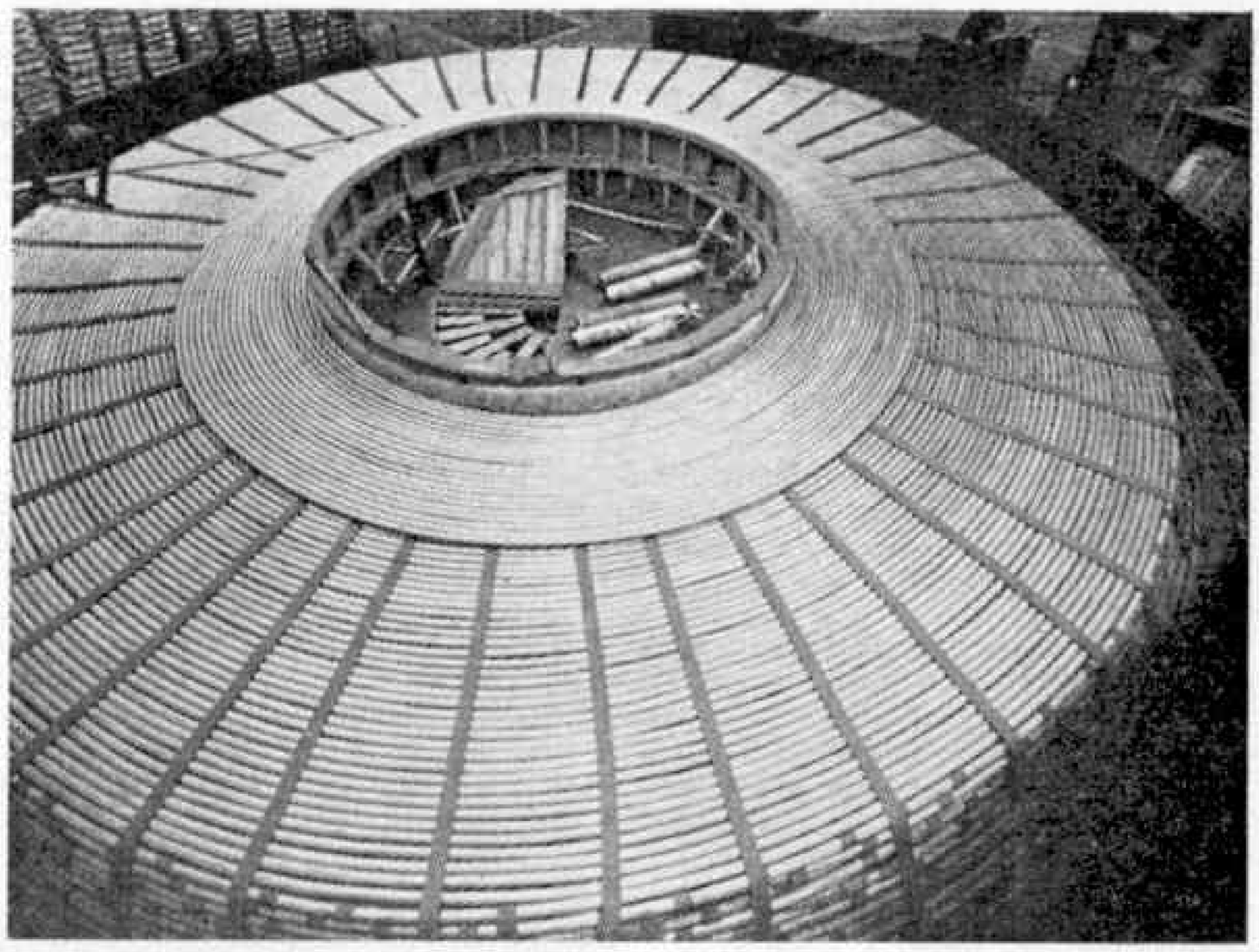
Daily variations of climate must also be considered. Inland and a number of eastern districts have greater daily temperature variations than most western ones, particularly in the spring and autumn. And in normally quiet weather southern coastal resorts have the smallest temperature ranges of all, due to the influence of land and sea breezes, onshore during the afternoon and offshore at night.

Britain's most thundery regions lie between Yorkshire and Lincolnshire. But, again, much depends upon the season. During the autumn, but at no other time, the Lake District and the hilly south-western regions are the most thundery. If we are allergic to snow, we should avoid hilly country and keep as far south as possible. South and south-west coasts have very few snowy days in an average year.

As yet, we are still perplexed by some of the features of local climate; it seems to be impossible to account for everything that takes place. But this is a splendid challenge to enquiring minds, aided perhaps by a few simple weather instruments. The scope is infinite, for even a garden has its own miniature climate.

Giant Turntables

Cables Made in 16-Mile Lengths



A lead-sheathed cable 16 miles long coiled on a 47-ft. turntable during manufacture by British Insulated Callender's (Submarine Cables) Ltd.

A NEW power cable to Vancouver Island from the mainland of British Columbia was officially brought into service in September last, and is proving of immense value in meeting the Island's ever increasing demands for electrical energy.

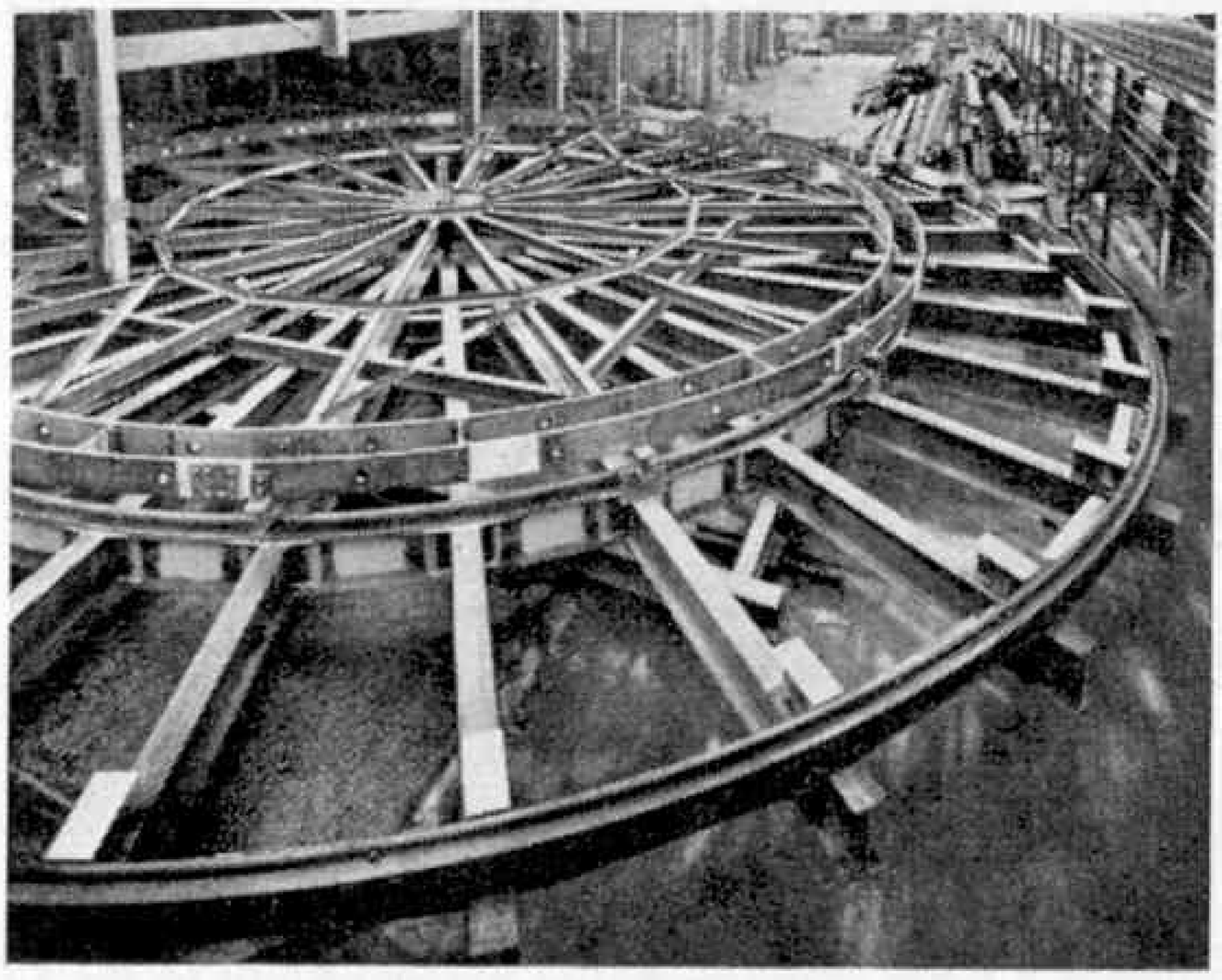
This outstanding example of British-Canadian joint enterprise involved the manufacture of some 91 miles of single-core submarine cable, to carry a higher power—120 MVA—and operate at a higher voltage—138 kV—than any other similar installation in existence. This cable, worth about £1,000,000, was made by the British Insulated Callender's Cables Group. Its manufacture was begun in March 1955, and was completed a year later, several weeks ahead of schedule.

Of first importance among the considerations affecting the design of the cable, and the method of its manufacture, was the desirability of avoiding joints. Two submarine crossings were involved. The longer of these, across the Strait of Georgia, was approximately 16 miles, and special plant was required to produce the lengths of cable required to cover this distance continuously.

Among the major items of this specially built plant were two large turntables, on which the 16-mile lengths were coiled between successive operations. These turntables were 24 ft. and 47 ft. in diameter. They were provided with reversible variable speed drive, and were rated for imposed loads of 113 and 460 tons respectively. They were designed and made by Sovex Ltd., Erith, makers of mechanical handling equipment.

As may well be imagined, the successful production of these items was not without problems of its own. For instance, a building stanchion had to be removed to obtain space to assemble the 47 ft. table.

When in actual use, the smaller turntable took the lengths of conductor after the stranding operation, and fed them on for insulation and lead sheathing. The sheathed cable was then received by the larger table, and passed on again for reinforcing and armouring. Finally the completed cable, weighing 3,800 tons, was stored in a specially constructed coiling-down shed ready for transfer to the cableship.



Assembling the 47-ft. turntable at the works of Sovex Ltd., Erith, to whom we are indebted for our two pictures.

Air News

By John W. R. Taylor

Some Scanner!

The helicopter that appears to have swallowed a flying saucer in the illustration on this page is actually the latest version of the twin-engined Sikorsky HR2S-1, which is in production for the U.S. Navy and Marine Corps.

In place of the usual sideways-opening nose-loading doors, it carries an enormous radar scanner that rotates inside the fibreglass blister under its cockpit. The idea is that it can hover, or fly slowly, high above the fleet at sea, or shore bases, to detect the approach of enemy ships or aircraft long before they would be picked up by radar aerials on the ground. It is therefore known as an early warning radar picket and the letter "W" is added to the end of its designation.

A standard HR2S-1, without scanner, holds the international speed record for helicopters with an average of 162.7 m.p.h. in two runs over a 3 km. straight course. It is powered by two 2,100 h.p. Pratt & Whitney R-2800 piston engines, which drive a five-bladed rotor with a diameter of 72 ft., and carries 26 passengers.

HR2S-1W Explained

Readers often ask why U.S. military aircraft have such strange and lengthy designations. The U.S. Air Force system is fairly straightforward, because the F-104B, for example, is the 104th type of fighter (F) ordered since this designation system started and the letter "B" shows that it is the second variant of this design, equivalent to a British Mark 2 version.

U.S. Navy designations are more complex, because they include the name of the aircraft's maker. The HR2S-1W is therefore the second type (2) of transport (R) helicopter (H) built by Sikorsky (S) for the U.S. Navy. The figure "1" shows that it is the first production version of the HR2S and the "W" indicates that it has been fitted with special early warning radar equipment.

The latest version of the American Sikorsky HR2S-1 helicopter has a large radar scanner that is housed in the conspicuous "blister" seen under the cockpit.

B.A.S. Buy another Airline

The British Aviation Services Group have taken over Dragon Airways Ltd., a privately-owned airline with a network of routes linking Newcastle with Norway, Holland, Germany and Northern Ireland. The name of the company has been changed to Silver City (Northern) Aviation Ltd.

Canberras Still Selling

Although it is now eight years since the prototype English Electric Canberra made its first flight, this aircraft is still one of the most popular and formidable tactical bombers in the world, and orders for it are so great that Short Bros. and Harland at Belfast are helping to build the latest Mark 9 photo-reconnaissance version.

Latest order is for more than £3½ million worth of Canberra Mk. 4 trainers and Mk. 8 bombers for Venezuela, which is already flying the earlier Mk. 2 bomber. It follows a £20 million order for 54 Mk. 8 bombers, 6 Mk. 4 trainers and 8 Mk. 7 photo-reconnaissance Canberras from the Government of India, which is the biggest ever placed for British military aircraft by a country outside the NATO group.

India decided to re-equip her air force with Canberras despite the fact that the Russians offered Ilyushin Il-28 jet bombers at lower cost.

B.E.A. plan Helicopter Services

British European Airways have announced that they hope to start regular helicopter services in 1960 with the Bristol 192C, a 16-passenger civil version of the twin-rotor Bristol 192 ordered by the R.A.F. This confirms the Corporation's promise to resume helicopter services as soon as reliable twin-engined machines became available, because single-engined helicopters are not considered safe enough for scheduled service.

Powered by two 1,650 h.p. Napier Gazelle turbines, the 192C will cruise at 138 m.p.h. It may not operate at a profit, but B.E.A. hope in due course to follow on with the larger, more economical Westland Westminster or Fairey Rotodyne.

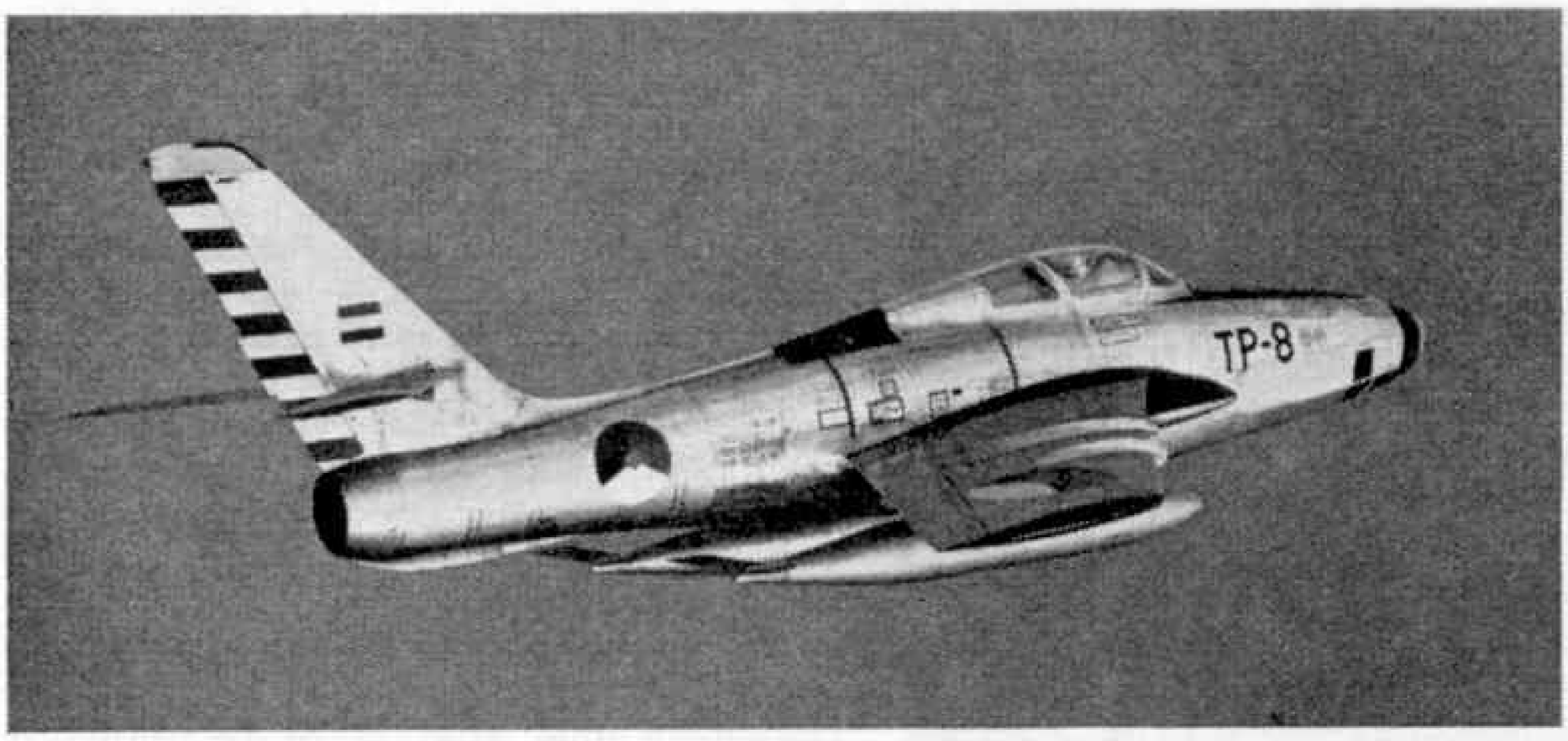
Penguins' 15,000 Miles Air Journey

Four king penguins have been flown 15,000 miles from their Antarctic home to Amsterdam, then across the Atlantic to New York and on to Colorado Springs.

Although they travelled through some very hot places, they did not feel any discomfort because Air Express International personnel, sent along to take care of them, kept them supplied with large blocks of ice and hand-fed them at regular intervals with fresh raw fish.

* * * *

The British Gliding Association stated recently that glider flights over Britain during 1956 totalled 20,912 hours, made up of 164,629 separate flights. Of this total, a high proportion was contributed by the Air Training Corps and R.A.F. and Navy pilots, but over 30 private clubs are members of the B.G.A.



One of the Republic Thunderflash RF-84F photo-reconnaissance aircraft of the Royal Netherlands Air Force.

Dutch Thunderflash

Although we seldom hear much about it, the Royal Netherlands Air Force is a highly-trained part of our European NATO air defence force, equipped with up-to-the-minute aircraft such as the Hunter—built in Holland by Fokker—Republic RF-84-F Thunderflash, and F-86K Sabre all-weather fighters built in Italy by Fiat.

The particularly good picture above of one of its RF-84Fs shows well the red, white, blue and orange Dutch national markings, camera windows in the nose and the two big underwing fuel tanks carried by Thunderflashes for long-range photo-reconnaissance missions.

Warning to Whales

The men of Norfolk Island, 930 miles north-east of Sydney, Australia, many of whom are descendants of the famous *Mutiny on the Bounty* crew, decided some time ago to add whaling to their occupations, as a change from fruit farming. Being airminded, they had a complete whaling plant flown out to them from Norway.

Over-the-Counter Spares

Typical of the way Britain's engine-makers are helping the export drive is the "spares" service set up by Rolls-Royce, whose engines have been chosen for over 500 of the jet-age air liners now in service or on order.

All that operators of air liners like the Rolls-Royce Dart-powered Viscount have to do when they need a spare part is to apply to the nearest depot at London Airport, Montreal or Sydney, and get what they want over-the-counter. This is a great help, because in the past engine-makers have expected airlines to buy large stocks of spares that might never be needed, but which had to be available quickly in case of need.

Sidewinder Demonstrated

One of the most important air-to-air guided missiles used by the U.S. Navy is the Philco/Martin Sidewinder, named after a particularly unpleasant desert-dwelling rattlesnake. In the illustration below the Sidewinder is seen in position under the wings of a Grumman Cougar jet fighter. It is a very simple and comparatively cheap weapon, with an infra-red head that "homes" on to the hot exhaust of other aircraft.

In a recent demonstration at China Lake, in California, the pilot of a U.S. Navy Demon fighter knocked down an unmanned target aircraft with the first Sidewinder that he fired at it. Impressed by such successes, the U.S.A.F. also has adopted the weapon.

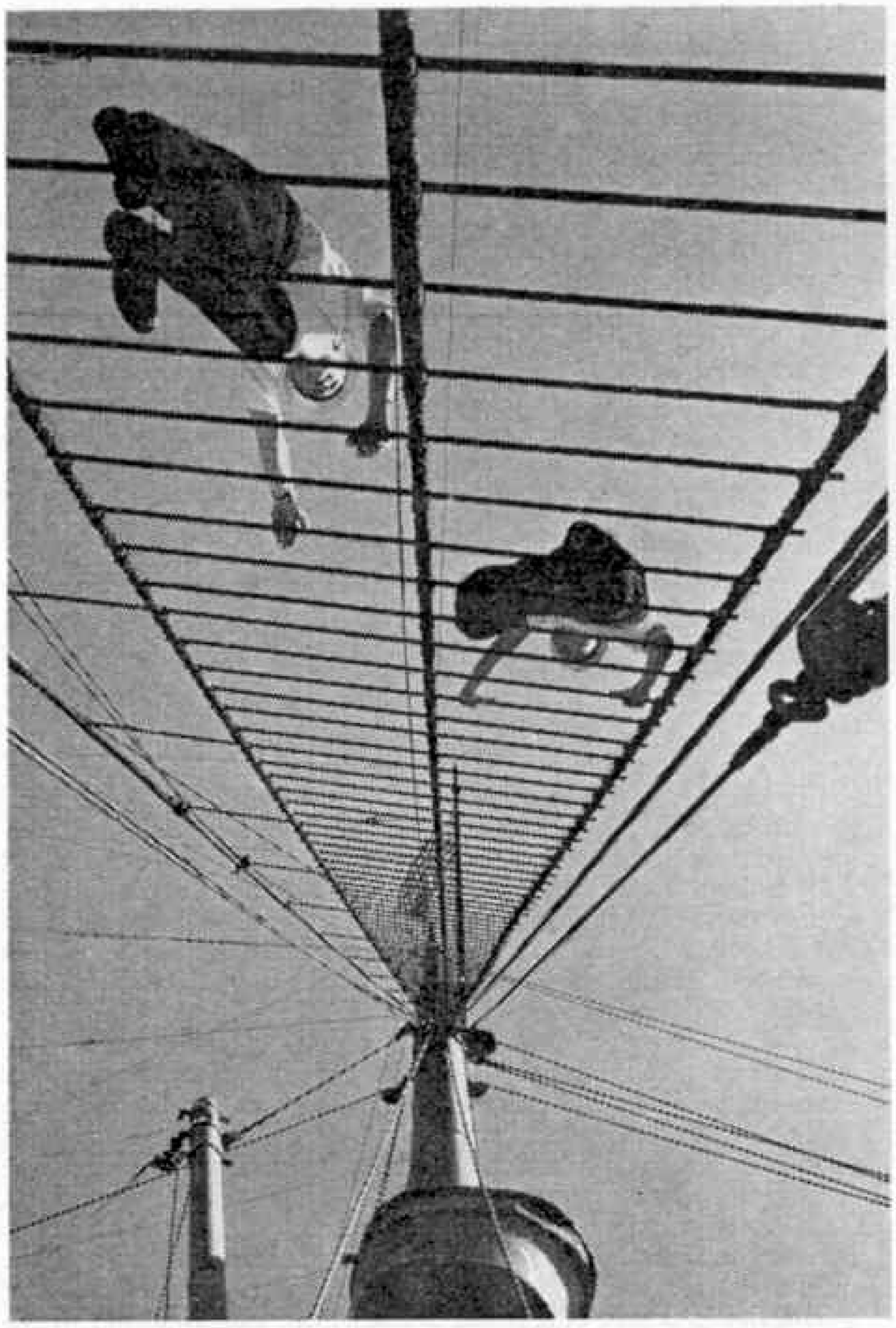
New Job for Helicopters

Following successful trials, Fison-Airwork Ltd. have been given a contract for large-scale spraying of banana trees in Jamaica to combat banana leaf spot. Previously, it was believed that the leaves were too delicate to withstand the downwash from a helicopter rotor, and the spraying was done from the ground, either through pipelines or by men carrying "knapsack" spray-gear on their backs.

Under the new contract, Fison-Airwork will spray with pure orchard oil an initial area of well over 6,000 acres 17 times during the course of a year. To do the work they have bought two more Hiller 12-C helicopters and one Piper Super Cub lightplane, so increasing their total fleet—including that of associated companies overseas—to 30 aircraft.

They are now carrying out further experimental spraying in the British Cameroons, another important banana-growing area.

Philco/Martin Sidewinder air-to-air guided missiles, fitted under a Grumman Cougar jet fighter. Official U. S. Navy photograph.



Not a gymnastic exercise, but sailors climbing the shrouds and ratlines on the foremast of the "Mauretania." Cunard Line photograph.

Shipping Notes

AT the head of the opposite page is a picture of the tanker *British Industry*. She was the first of a series of 32,000 tons deadweight vessels now being constructed for the B. P. Tanker Company. The vessel was built at the Clydebank Shipyard of John Brown and Co. (Clydebank) Ltd. and was launched in October of last year. Another example of this series is *British Glory*, the first of two sister ships from the Barrow yard of Vickers Armstrongs Ltd., which was launched on 1st February of this year.

The vessels of this series are driven by high pressure, high temperature turbine engines. They have an overall length of about 665 ft., and a length between perpendiculars of 630 ft. Their breadth moulded is 85 ft. 6 in., and the moulded depth 46 ft. 8 in. Their summer draught is 32 ft. and their sea speed 15½ knots.

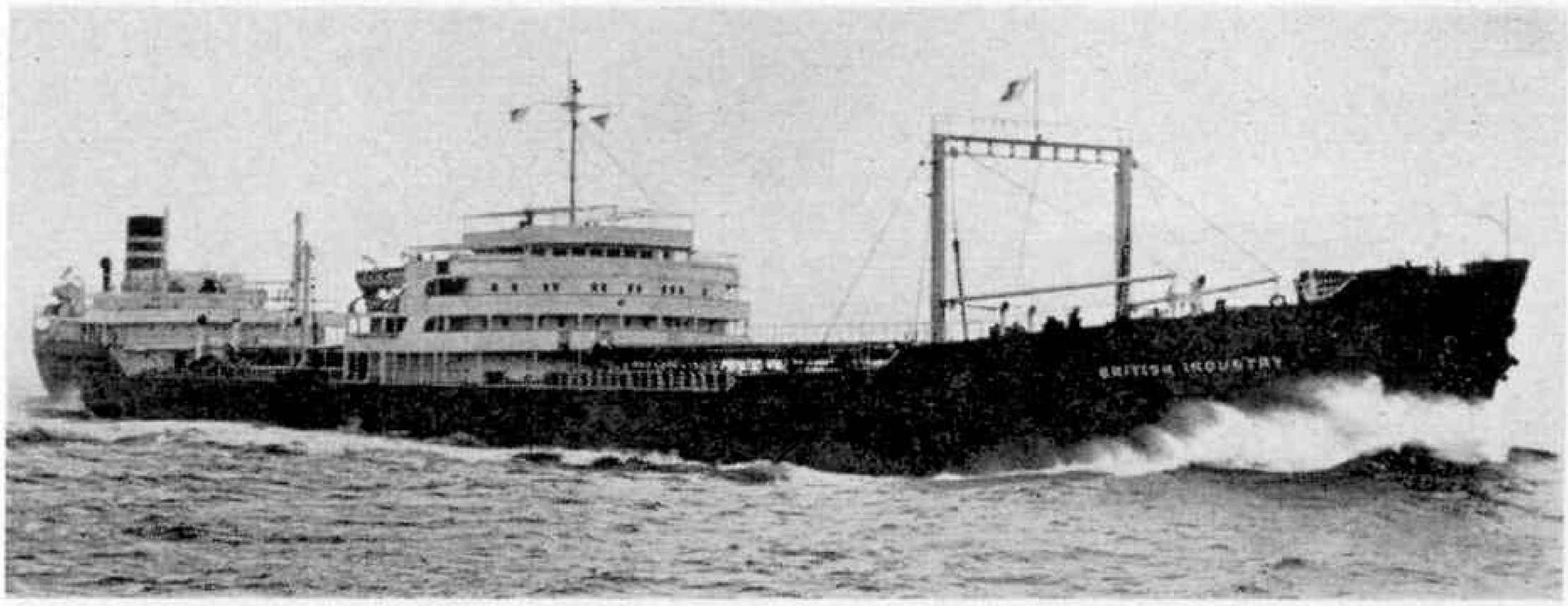
The picture of *British Industry* is an excellent one that gives some idea of her speed. It was actually taken while her capacity for speed was being tested off the Isle of Arran, Scotland, the well-known testing course that is so often used for speed trials, marks on the shore giving the measured distance over which a vessel passes for this purpose. Shortly after completing her speed trials *British Industry* began her maiden voyage to the Persian Gulf by way of the Cape of Good Hope.

A vessel that promises to be of unusual interest is a new Peninsular and Oriental passenger liner that is to be built by Harland and Wolff Ltd., Belfast. The chief reason for this interest is that she will be the largest passenger vessel to be constructed in Great Britain since the appearance of the *Queen Elizabeth*. That famous vessel was of 83,673 tons gross. The new P. & O. liner will not be so large as either of the famous Queens, which of course are outstanding in every respect, but she will be sufficiently impressive with her planned tonnage of 45,000.

The new liner will be fitted with propelling machinery of 85,000 shaft horse power that will give the most powerful turbo-electric drive installed in any British vessel. The reliability of this form of propulsion has been proved in such P. & O. liners as the *Strathaird* and *Strathnaver*. These vessels were commissioned over a quarter of a century ago and are expected to give satisfactory service for several more years.

The two propulsion turbines to be fitted will be uni-directional single-cylinder units developed from land machines made by the British Thomson-Houston Company for power stations in which fuel economy and reliability are of the greatest importance. The employment of electric drive will allow for driving both propellers of the vessel from one power unit when reduced speeds are required, a form of working that will be economical. Reversing will be carried out electrically, and the full power available ahead will also be available astern for rapid manœuvring.

A further point of special interest will be the placing of her engine room aft. This leaves the space amidships clear for passenger accommodation.



The B.P. Tanker Company's 32,000 tons oil tanker "British Industry" on her speed trials off the Isle of Arran, prior to her maiden voyage to the Persian Gulf via the Cape of Good Hope.

Now we turn to smaller, but very interesting vessels. The lower illustration on this page shows the first of three fast passenger launches, each of which is powered by two Napier "Deltic" diesel engines. This engine has not previously been put to commercial use afloat, as it was on the Admiralty secret list until fairly recently and was fitted only in naval vessels.

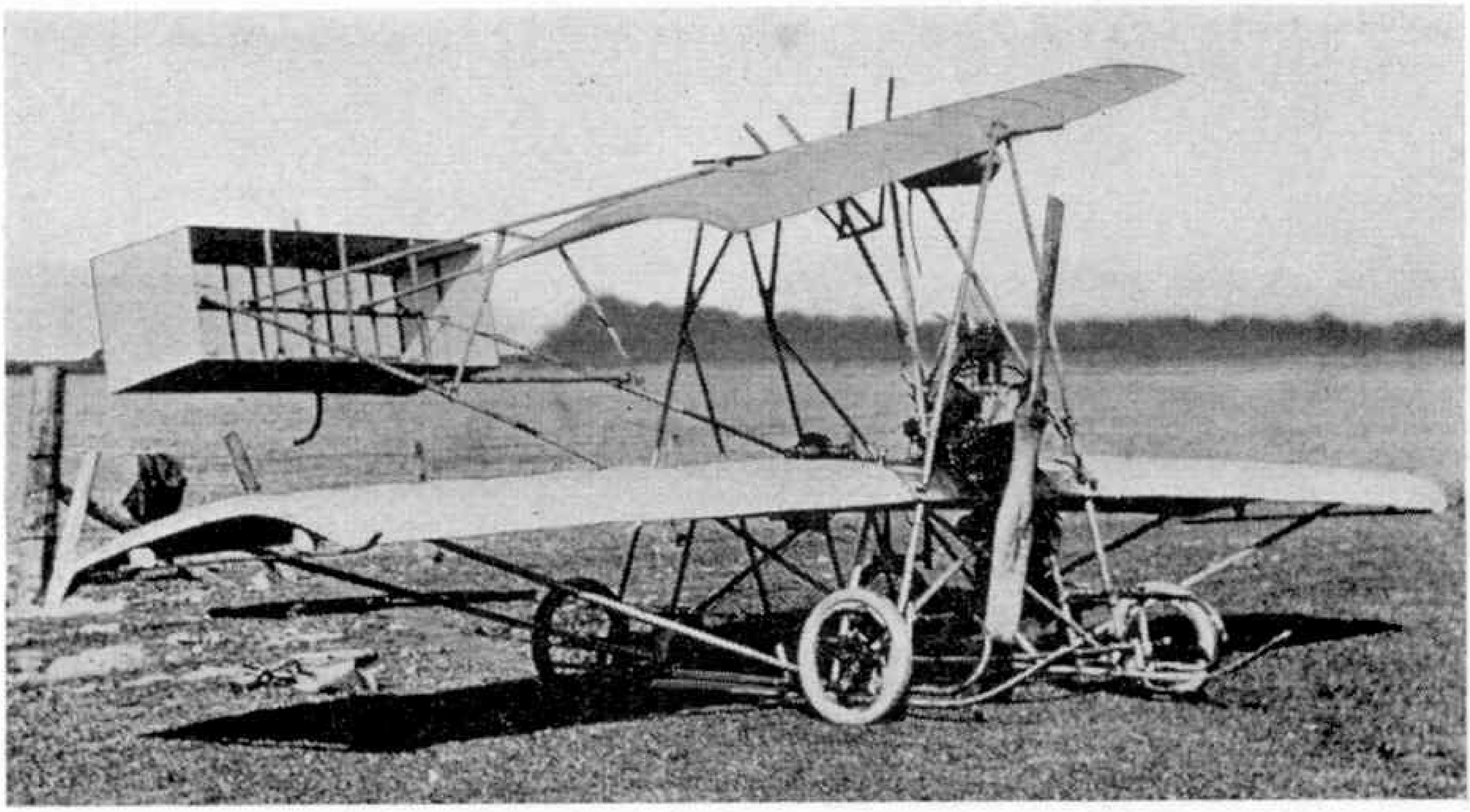
The three vessels are products of John I. Thornycroft and Co. Ltd. Their owners are the Shell Company of Venezuela, and they are intended to operate on Lake Maracaibo, an 8,000 square mile stretch of water where the Shell Company is conducting large scale marine drilling operations, which indeed extend some 40 miles out from the shore. It is necessary to transport engineers and drilling staff by water to the drilling rigs that have been erected in the waters of the lake, and naturally the time spent in this has to be kept to a minimum. For this reason the three launches have been given engines that will provide for a speed of over 30 knots, so that they are much faster than any other craft at present in use for this purpose. They will carry up to 45 passengers.

These vessels, which set a new standard for fast commercial craft, are 68 ft. 3 in. long, 17 ft. 5 in. in breadth and 9 ft. 4 in. in moulded depth, their draught being approximately 5 ft. 6 in. Each of the two 9-cylinder opposed piston two-stroke cycle marine engines, fitted with ahead and astern reduction gear-box, drives a separate screw. In temperate latitudes they are of 865 shaft horse power, but in the conditions prevailing in Maracaibo they are rated at 825 shaft horse power.

Spare engines will be available to allow a quick change to be made in any one of the craft when a routine overhaul becomes necessary. Thus no launch need be out of service for more than a few hours, and a continuous night and day ferry service between shore and drilling rigs is assured.

A special feature of the launches is the positioning of the wheelhouse, which is well forward to give the lookout personnel the best possible position in the constant watch they have to keep for floating driftwood.

The first of three 68 ft. passenger launches built by Thornycroft, Southampton, for the Shell Company of Venezuela, Her two "Deltic" engines give her a speed of 31 knots.



The First "Flying Scot"

Did He Fly Before The Wrights?

By J. F. Riley

EVERY boy who is interested in aeronautics knows that the first recognised flight of a heavier than air machine took place on 17th December, 1903, when the Wright brothers flew their powered glider over the sands at Kitty Hawk Bay in the United States of America. Yet not one in a million has heard of Preston Watson, a Scotsman, who came near—some think very near—to sharing the achievement of Orville and Wilbur Wright.

Preston Watson was born in 1880 and at an early age declared that one day men would fly like birds. Preston and his brother, James, were the sons of a Dundee merchant, and though Preston later became a fine athlete he never lost his interest in flight. Drawing on his observations on the flight of birds, he argued that a gliding bird turns in the air by dipping one wing by means of its muscles and allowing the opposite wing to lift.

All Preston's machines embodied this basic idea. A rigid monoplane was fitted with a second, smaller upper plane—sometimes called a "parasol plane"—which could be tilted or rocked independently to either side by the pilot and so cause the machine to bank to right or left. This structurally sound method of control was much simpler than that of the Wrights, who twisted, or warped, the wings on their plane, and later it earned for Watson a French award for improved stability in an aircraft. With his method, he was able to dispense with a movable rudder to correct side-slip. The tail of the plane was fashioned like a box kite, and this also helped to support the machine in the air.

Preston Watson was a pioneer of flight in the early years of the century. This article gives some details of his achievements, and at the head of the page is a picture of the second aeroplane he built, which made use of a method of control he invented.

Preston Watson began his experiments by building a full scale glider on the lines described above, and he attempted to fly it, first near Dundee, and later on the lonely banks of the river Tay near Errol, now appropriately enough the site of an R.A.F. aerodrome.

A very interesting point was that since he was attempting gliding flight from level ground, Watson had to provide some form of assisted take-off, and his device must have been the first to be used for this purpose. His glider sat in a wooden

cradle or on skids, which could slide freely on planks lubricated with lard or graphite. A rope hooked under the glider led forward to a pulley, then back under the plane, round another pulley and finally up and over the branch of a tall tree. On the end of this rope hung two 56 lb. weights and an anvil borrowed from a nearby smithy. On releasing a catch under his seat the pilot caused the weights to fall, and so propelled his machine for a short distance into the air. There are those still living who remember the crash of the falling weights as Preston Watson made his first hops around the year 1903!

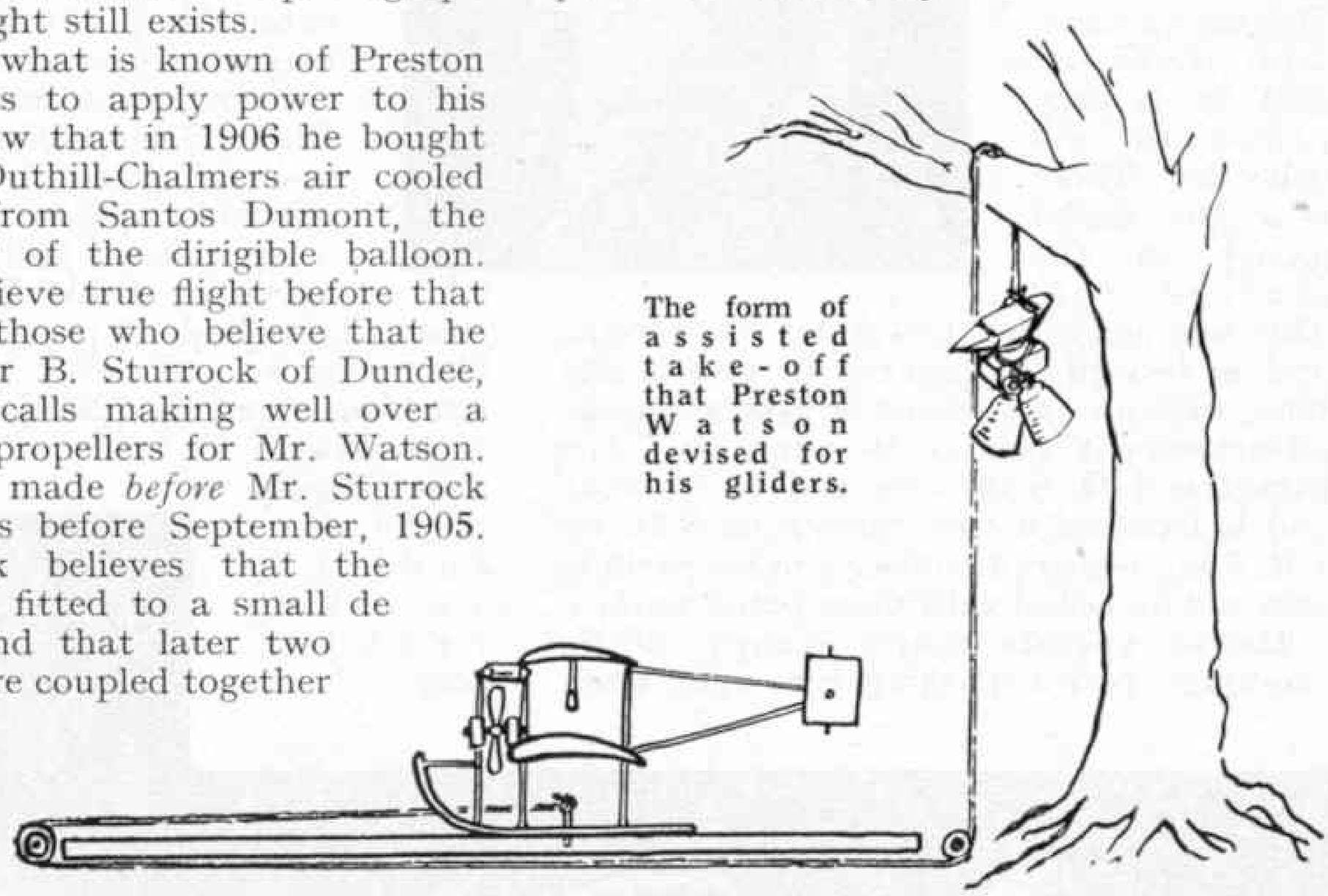
Watson's next difficulty was that which confronted every would-be aeroplane builder of the day—to obtain an engine light enough yet powerful enough to drive his plane. And here lies the mystery of the date on which it can be said with certainty that Preston Watson first flew. The Wrights, it will be recalled, found it necessary to design and build their own motor to achieve this end. The photograph of their first flight still exists.

Now here is what is known of Preston Watson's efforts to apply power to his glider. We know that in 1906 he bought a 10–14 h.p. Duthill-Chalmers air cooled petrol engine from Santos Dumont, the French pioneer of the dirigible balloon. But did he achieve true flight before that date? Among those who believe that he did is Mr. Kerr B. Sturrock of Dundee, who vividly recalls making well over a dozen wooden propellers for Mr. Watson. These were all made *before* Mr. Sturrock married, that is before September, 1905.

Mr. Sturrock believes that the propellers were fitted to a small de Dion motor, and that later two such motors were coupled together on the plane. The first propellers were of oak or yellow pine. They were soon fractured, and then Mr. Sturrock tried shaping them from laminated sheets of ⅝-in. Australian walnut, each sheet being laid with its grain at a different angle from that of the one before it. This was so successful that it remained the method of choice for propellers generally until wood was replaced by the special alloys that became available during the first world war.

Mr. Sturrock's information does not tell us exactly when Mr. Watson first flew, even for so short a time as the Wrights in their early flights. But there is also evidence from agricultural workers who are still living that they heard and saw Mr. Watson's first plane making short flights over the fields near Errol in the years 1903–4. These were obtained with the aid of a single tractor type propeller and the catapult take-off I have already described. If this evidence can be relied upon in regard to dates, it is clear that Watson had flown about the time of the Wright's first powered flight, if not before.

Encouraged by the success of his early experiments, and by the news from France and America that others, too, were at last beginning to lift their machines into the air, Mr. Watson built two further planes, similar to his original design but with improvements. His second had a wheeled undercarriage and was powered with a three-cylinder 30 h.p. Humber engine. In his third plane a 60/70 h.p. Anzani engine was used. These planes were often seen in flight in the years immediately before the first world war. When this broke out Watson, now 34 years of age, volunteered for service with the newly formed Royal Naval Air Service, and it was said of him by his instructor that he never had a better pupil. Barely two months after obtaining his commission he lost his life when the service plane that he was piloting exploded in mid-air.



The form of assisted take-off that Preston Watson devised for his gliders.

That Watson deserves to be recognised as a pioneer is certain, and whatever may have been the exact date of his first flight, he was the first "Flying Scot."

HAVE YOU JOINED YET?

THE DINKY TOYS CLUB

Founder and President : ROLAND G. HORNBY

THE Dinky Toys array in the picture at the foot of this page is really grand, and it is easy to see by the look on the face of David Mountford, of Great Barr, Birmingham, who owns it, that he is very proud of his collection. There is a fine model garage in the picture too. This was made for David by his parents and is beautifully painted in cream and blue, with an assortment of typical garage advertisement posters to adorn it. The garage is 1 ft. 9 in. long and 10 in. wide and is fixed on a base measuring 3 ft. by 1 ft. 7 in., which provides room for parking cars and an island with three petrol pumps.

David spends many happy hours "serving" petrol, parking cars and, when the occasion arises, carrying out tyre repairs and other activities of a busy garage.

The soldier laddie in the upper picture is another Dinky Club member, C. S. Essex, Exeter, who sent me a copy of a little Dinky News Magazine he has prepared for circulation among his friends. I would like to take this opportunity to congratulate this enterprising boy and to wish his magazine every success.

Now just a few words to any Dinky Toys collectors who have not yet joined the Club. Why not make up your mind to become a member? Just write to the Secretary, Dinky Toys Club, Binns Road, Liverpool 13, enclosing a Postal Order for 1/- to cover the cost of the handsome enamelled Badge and Certificate of Membership, which will be sent to you by return post.

MECCANO MAGAZINE

Junior Section

HERE on the right is an easy way of climbing up to a second floor window. The mechanical arm shown in the picture is owned by the Corporation of Blackpool, and possibly some of you may see it if you visit Blackpool during the summer season. In the picture it is shown in use by workmen fitting lighting decorations, and it will be very handy when the time comes round for the famous Blackpool illuminations. The picture is reproduced from a photograph sent me by R. Drake, of Low Moor, Bradford.

A tower of this kind of course has many other uses, and a similar mobile platform is in use at the Cardon Refinery of the Shell Company of Venezuela. It is known as a Simon Hydraulic Platform, and is made by Simon Engineering (Midlands) Ltd., Dublin. It has a turntable base, and the two booms linked above it are folded or opened by hydraulic rams. The platform can be extended at a speed of more than 40 ft. a minute to any desired working position up to a maximum height of 40 ft. and a reach of 25 ft. It can be controlled from the platform or from the ground, and will be used for maintenance of refinery units and overhead electrical installations.

The lower picture on the page, from a photograph by N. Ash, shows a comedy item that appeared at the last American National Aircraft Show, at Oklahoma City. It is a Sikorsky H-19D helicopter disguised, of all things, as a clown! It must have been a startling sight.

Easy Model-Building

Spanner's Special Section for Juniors

Fine Models for Outfits Nos. 0 and 2

A MODERN engineering workshop contains many machines that make splendid subjects for Meccano models. Some of these machines can be modelled very easily with even a small Outfit, and the engineer's vertical drilling machine that forms the subject of our first model this month is an excellent example. The model can be built with parts in a No. 0 Outfit and it is shown in Fig. 1. The drill shaft can be raised or lowered by moving a lever, and the model is driven by a *Magic* Clockwork Motor bolted to the base.

The base of the model is a 5½″ × 2½″ Flanged Plate, and to this you should bolt two Trunnions that support 5½″ Strips 1. Fix a 2½″ Strip 2 to the upper end of each of the Strips 1, and bolt a 2½″ × ½″ Double Angle Strip 3 to each of the Strips 2. Now bolt together the lugs of the Double Angle Strips, and use the bolts to fix in place two Fishplates. These Fishplates serve as bearings for the drill shaft, which is a 3½″ Rod 4 fitted with a 1″ Pulley 5, two Washers and two Spring Clips 6.

The drill table is a Flat Trunnion 7 and to this you should bolt an Angle Bracket. Fix the Angle Bracket to another Angle Bracket attached to one of the Strips 1.

The next step is to attach a *Magic* Clockwork Motor to the base. Bolt the Motor by one of its lugs to the Flanged Plate, and fix it to an Angle Bracket attached to the rear flange of the Plate. Pass a length of cord round the Motor pulley, over a 2″ Rod 8 and round Pulley 5. Now tie the ends of the cord together to make an endless driving belt. To support the Rod 8 you must fix two Fishplates to the Strips 2, and use Spring Clips to hold the Rod in place.

The drill shaft can be raised or lowered by means of a lever 9. This lever is a 2½″ Stepped Curved Strip lock-nutted to one of the Strips 1, and a ⅜″ Bolt is held in it by two nuts. The head of the Bolt should be arranged between the Washers and the Spring Clips 6 on the Rod 4. A list of the Parts required is given at the end of this article.

Outfit No. 2 contains all the parts required to build the Elevated Jib Crane shown in Fig. 2.

The tower that supports the crane is made by bolting two 2½″ Strips 1 to Fishplates fixed to the sides of a 5½″ × 2½″ Flanged Plate, and then fixing two 2½″ × ½″ Double Angle Strips 2 in place. A 2½″ × 1½″ Flexible Plate, edged by a 2½″ Stepped Curved Strip, is bolted to the lugs of the Double Angle Strips, and

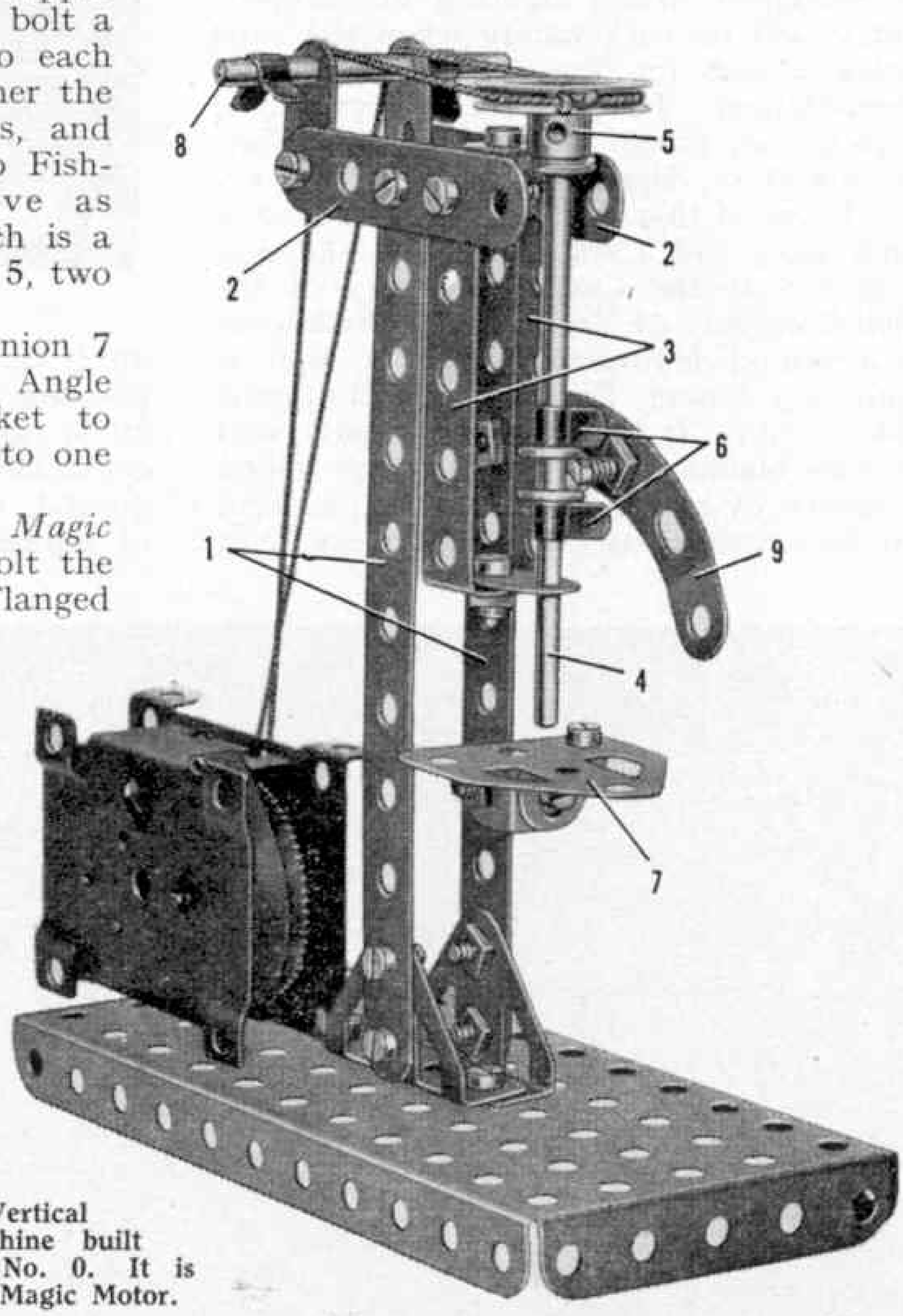


Fig. 1. A Vertical Drilling Machine built from Outfit No. 0. It is fitted with a Magic Motor.

similar parts are attached to Angle Brackets supported by the Strips 1. The two Flexible Plates are bolted together to complete the tower.

To make the crane cab you should fix two Trunnions to a Bush Wheel, and use these to support two 2½″ Strips 3 on each side. Bolt Flat Trunnions to the rear ends of the Strips 3, and fix an Angle Bracket to each Flat Trunnion. You should open out the Angle Brackets slightly, and use them to support the roof, which is a 1 11/16″ radius Curved Plate fitted with two Angle Brackets 4.

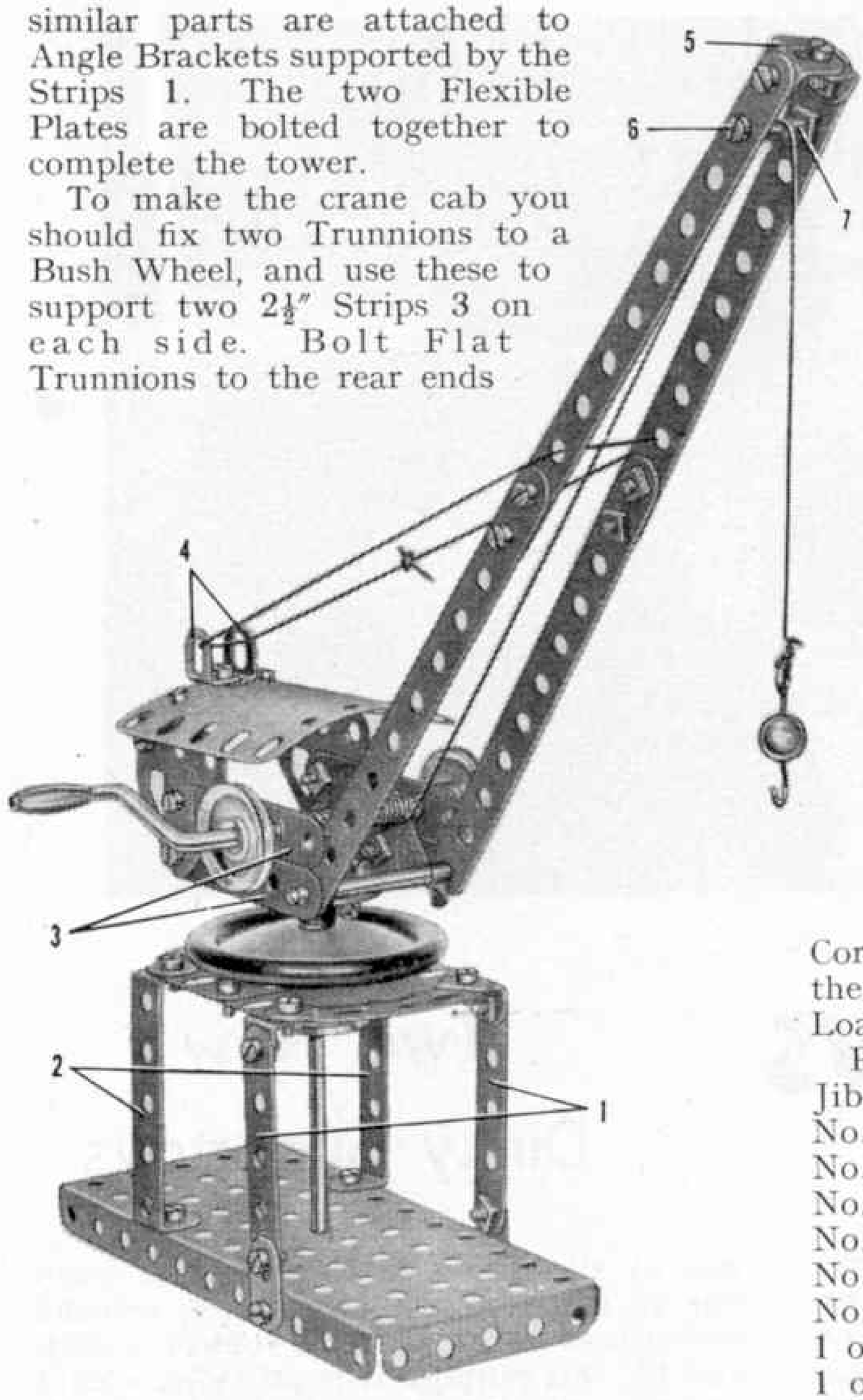


Fig. 2. All the parts required to build this Elevated Jib Crane are contained in Outfit No. 2.

For each side of the jib you require two 5½″ Strips overlapped two holes and bolted together. Connect the sides by a U-shaped bracket 5 made from two Angle Brackets, and pivot the jib on a 2″ Rod mounted in the lower pair of the Strips 3. Support the jib in the position shown by Cord passed through its sides and through the Angle Brackets 4. Pass a bolt 6 through one side of the jib and fix it in place by a nut, then fix a ⅜″ Bolt 7 in the other side so that the ends of the two bolts are pressed together.

To mount the cab and the jib on the tower you should fix a 3½″ Rod in the Bush Wheel. Pass the Rod through the Flexible Plates and the Flanged Plate, and use a 1″ Pulley to hold it in place. Pass a Crank Handle through the sides of the cab, using two 1″ Pulleys to hold it in position. Tie a length of Cord to the Crank Handle, pass it over the bolts 6 and 7, and fasten a small Loaded Hook to the Cord.

Parts required to build the Elevated Jib Crane: 4 of No. 2; 6 of No. 5; 2 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 17; 1 of No. 19g; 3 of No. 22; 1 of No. 24; 2 of No. 35; 38 of No. 37a; 36 of No. 37b; 4 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 1 of No. 187; 2 of No. 188; 1 of No. 200.

Parts required to build the Drilling Machine: 2 of No. 2; 2 of No. 5; 4 of No. 10; 3 of No. 12; 1 of No. 16; 1 of No. 17; 1 of No. 22; 4 of No. 35; 22 of No. 37a; 18 of No. 37b; 3 of No. 38; 2 of No. 48a; 1 of No. 52; 1 of No. 90a; 2 of No. 111c; 2 of No. 126; 1 of No. 126a; 1 *Magic* Clockwork Motor.

The World's Greatest Crack

The latest news about the Earth is that its crust has a tremendous crack or break in it. This starts somewhere in Northern Asia and curves round in the Arctic Circle to pass right down the Atlantic Ocean. There it carries on round the Indian Ocean and up the Pacific to end in Alaska. And the great crack has a branch that enters the Arabian Sea and joins up with the Rift Valley trench in East Africa. Its length must be about 45,000 miles, and this enormous trench is about 20 miles wide.

Much of the world's volcanic activity is concentrated along the line of this enormous crack in its crust, through which molten rock from the centre of the Earth itself can escape in volcanic eruptions. This activity seems to suggest that the cracking is a continuous process. Fortunately it is not very likely that it will ever end in the splitting of the Earth, and indeed some millions of years hence the immense rift may close up as the Earth cools down and contracts.

DINKY NEWS

Two New Dinky Supertoys

By **THE TOYMAN**

THE introduction of a new Dinky Supertoy is always a popular event, so that this month, when I have two attractive Supertoys to bring to your notice, the additions are sure of an enthusiastic welcome. The models are No. 661, Recovery Tractor, and No. 919 Guy Van "Golden Shred."

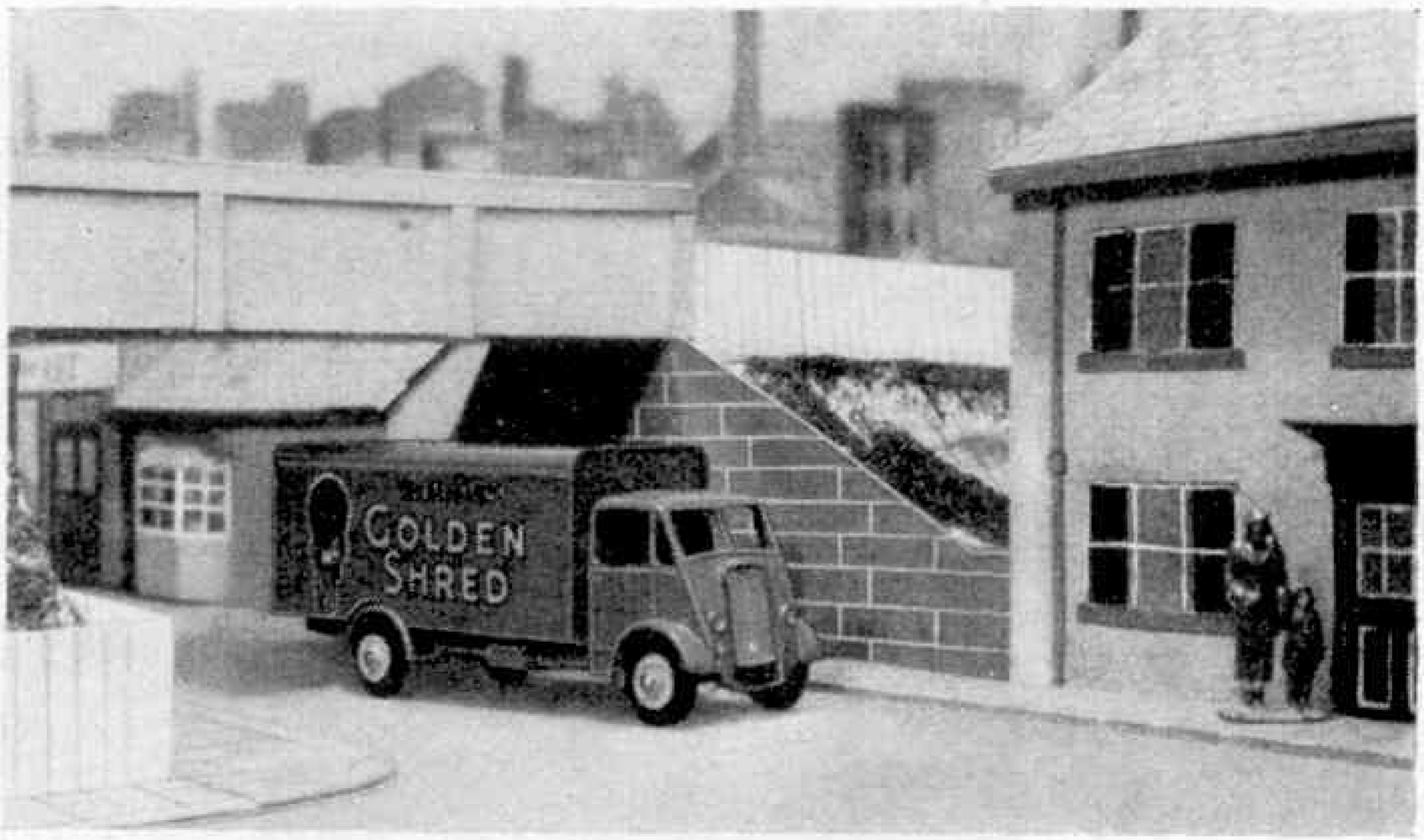
The Recovery Tractor is first on my list, and two pictures of this splendid model are shown on these pages. One of them is a close-up of the Recovery Tractor that shows the superb details included in the model; the other is a special scene I arranged to demonstrate just how effective the Recovery Tractor can be in games and play schemes with other models in the Army series.

A narrow escape! The new Dinky Supertoys Recovery Tractor, No. 661, lifts an Army Covered Wagon to safety after an accident.

The original of the model is a Scammell 10-ton Recovery Tractor. It is an exceptionally powerful vehicle, with a six-speed gear-box and six-wheel drive, and there is room for two passengers as well as the driver in the cab. Its main role is the recovery of wheeled vehicles and armoured cars up to 10 tons in weight, and for this purpose it is provided with a powerful winch and a power-operated jib.

Scammell vehicles are noted for their strength and ruggedness, and the original of our model is no exception. In every line its appearance suggests power and strength, and the new Dinky Supertoy has captured the impression of its prototype exactly. The model is fully detailed, with a working crane controlled by a neat handle that projects from one side of the body. A simple ratchet device is fitted to the winding shaft to prevent the hoisting cord from unwinding when the ratchet is engaged. The ratchet can be released to allow the load hook to be lowered.

As usual the model is finished in service green, and a miniature driver is seated in the cab. A point of special interest is the unit transfers applied to the model. In



A novel setting for Dinky Supertoys No. 919, Guy Van "Golden Shred," in a realistic street layout.

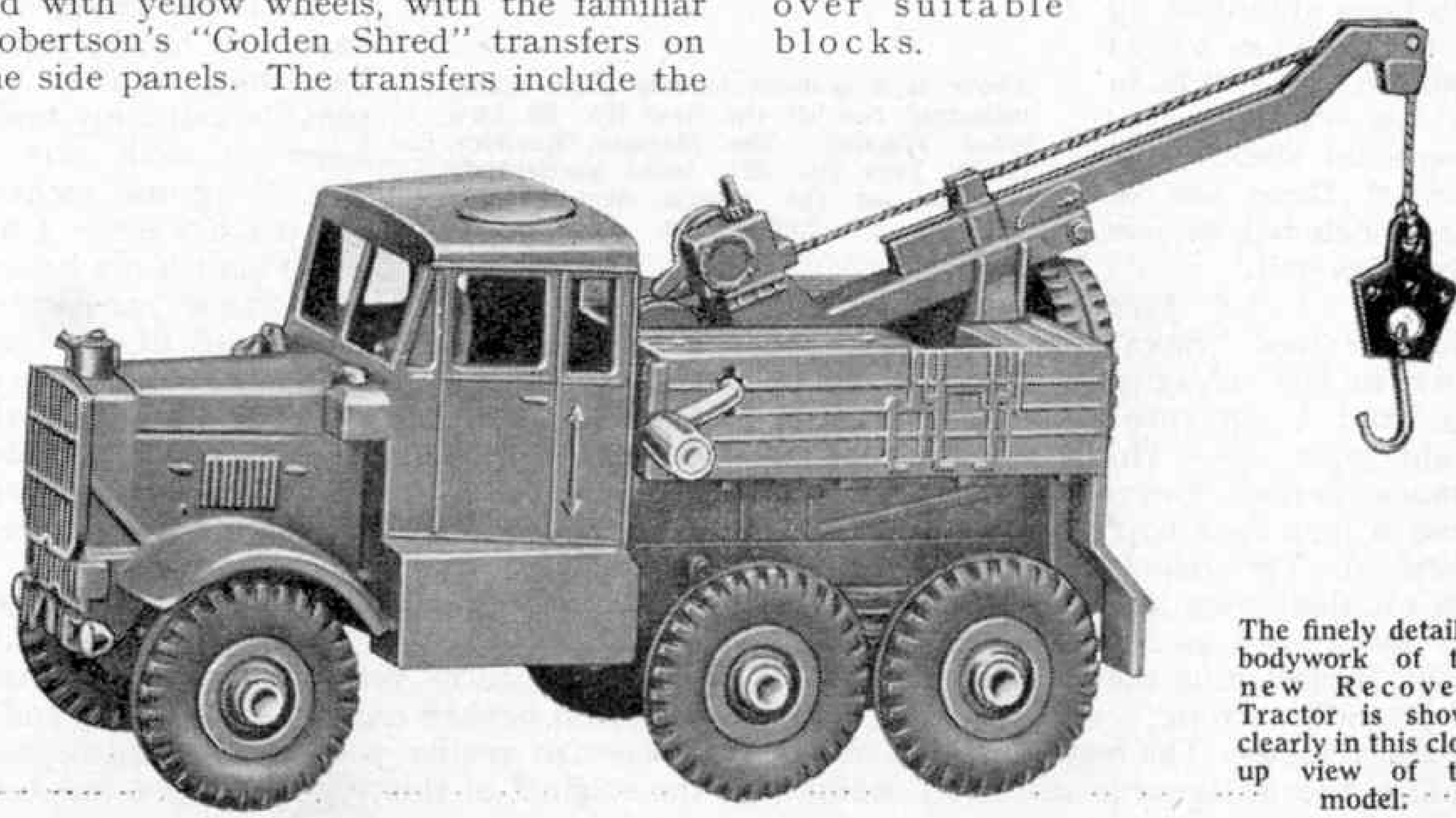
the British Army, nowadays most vehicle recovery work is carried out by R.E.M.E., or the Royal Electrical and Mechanical Engineers. In accordance with actual practice, the new Dinky Supertoy carries the appropriate R.E.M.E. sign at the front and rear.

The special scene I arranged for the Recovery Tractor shows just one of the ways in which the new model can be used in Dinky Toys games. The scene represents a low stone bridge carrying a road over a small stream or culvert. Evidently the road is rather slippery, for an Army Covered Wagon has skidded and is perched precariously with one wheel overhanging the parapet of the bridge. The Recovery Tractor has backed up as closely as possible to the stranded vehicle, and is engaged in lifting it back on the road. This is a typical example of the many exciting games than can be arranged with the new model.

The second addition this month is another version of the popular Guy Van, which is now available finished in bright red with yellow wheels, with the familiar Robertson's "Golden Shred" transfers on the side panels. The transfers include the well known Golliwog symbol associated with Robertson's products. The model is listed as Dinky Supertoys No. 919, Guy Van "Golden Shred."

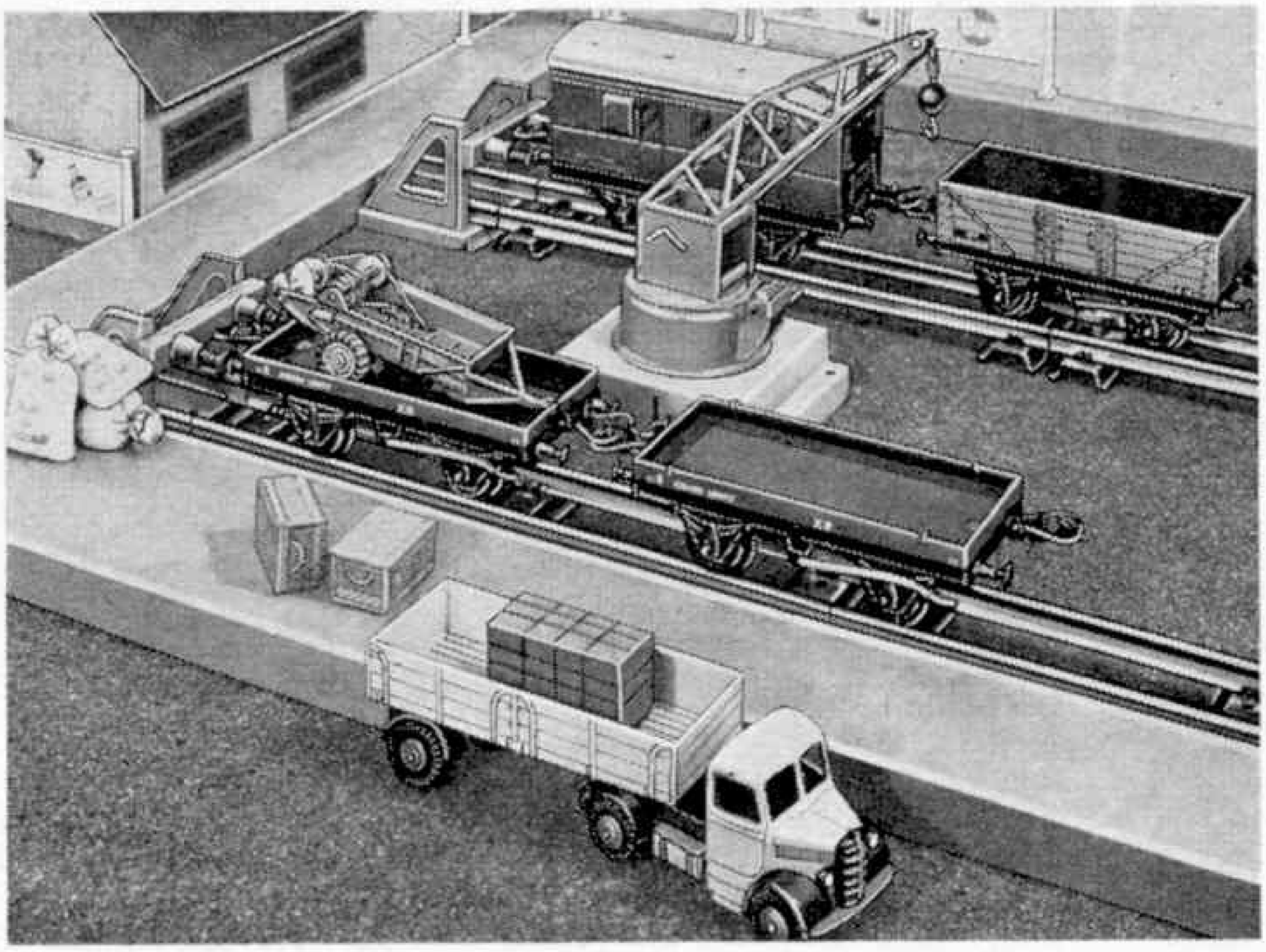
My picture of the Golden Shred Van shows it passing under a bridge in a Dinky Toys street layout. I have noticed in pictures sent to me that most of the layouts are flat, with all the streets and buildings on the same level. In real life most towns have hilly areas and places where a road passes under or over a railway line. These variations in height add interest to a Dinky Toys scene, and it is surprising how they improve the realistic effect of a layout.

A simple embankment of the kind shown in my picture, with a bridge spanning the road, can be made easily by laying cloth or paper over suitable blocks.



The finely detailed bodywork of the new Recovery Tractor is shown clearly in this close up view of the model.

"Tommy Dodd" writes about



Some Wagons You Will Like

I EXPECT that you will want me to say something about several new items of Hornby Rolling Stock now making their appearance. It is always pleasing to have new things to talk about, particularly when they are as attractive as the items shown in our pictures.

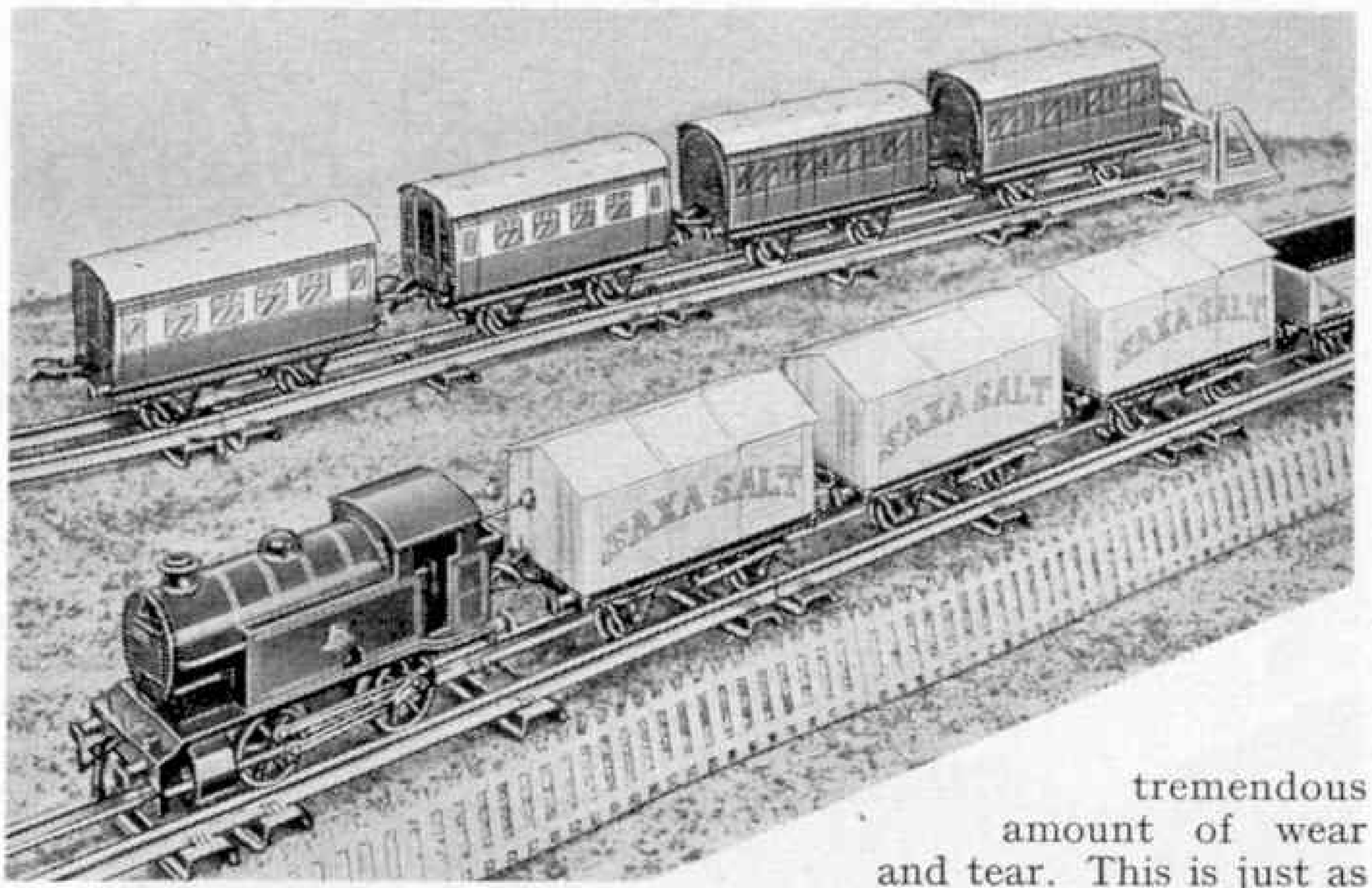
The new and redesigned vehicles are all of goods types. As the goods vehicles that have been standard up to now are still available, and will be in use on very many layouts for some time, some of these are of course included in our pictures as well.

Above is a realistic loading bank scene, including two of the new No. 50 Low Sided Wagons. The Manure Spreader, Dinky Toys No. 321, looks particularly effective on the vehicle next to the Buffer Stop.

Several of the attractive new "Saxa" Salt Wagons are shown in the upper picture on the next page, and I am sure they have already caught your eye. This fine introduction includes various improvements that are giving a new look to Hornby goods stock in general. The vehicles concerned form a class on their own and for easy reference they are known as No. 50 Goods Rolling Stock. In designing them the aim has been to provide strong, well-designed and realistic vehicles. The base, which of course includes the axleguards or wheel frames, has been given special attention, and a big step forward has been made in providing this with die-cast ends, with each buffer beam and its buffers cast in one piece and attached to the base itself. This arrangement makes for strength, and the casting is specially recessed to accommodate the shank of the automatic coupling, which is firmly attached by a solid rivet.

In re-designing the base the opportunity has been taken to provide a dummy brake lever on each side of the Wagons, which improves the appearance of the new vehicles tremendously. The inner end of the lever is attached to a hanger of the usual shape about the centre of the sole-bar, while the outer end of the handle fits in a slotted projection that represents the usual rack for the brake lever that is found on real vehicles.

Turning again to the "Saxa" Salt Wagon for a moment, this provides a new outline among Hornby vehicles. Its fairly high sides and peaked roof are distinctive, and it is easy to realise why among railwaymen the original of this type of wagon has been



Salt traffic can now be handled on Hornby Railways by means of the new No. 50 "Saxa" Salt Wagon.

given the nickname of *cottage*. The peaked roof of the Hornby representative includes a lifting door, so that you can load it if you wish.

The sides and ends are fully detailed, for the Salt Wagon has printed tinplate bodywork. This has made it possible to represent all the features seen on the actual wagons, the planked construction, the corner plates, the strapping and the characteristic doors. The Wagon is finished in the real "Saxa" colours, with bold lettering in red on a striking orange-yellow ground. The base of the wagon of course is black, and a grey roof completes a very smart turnout.

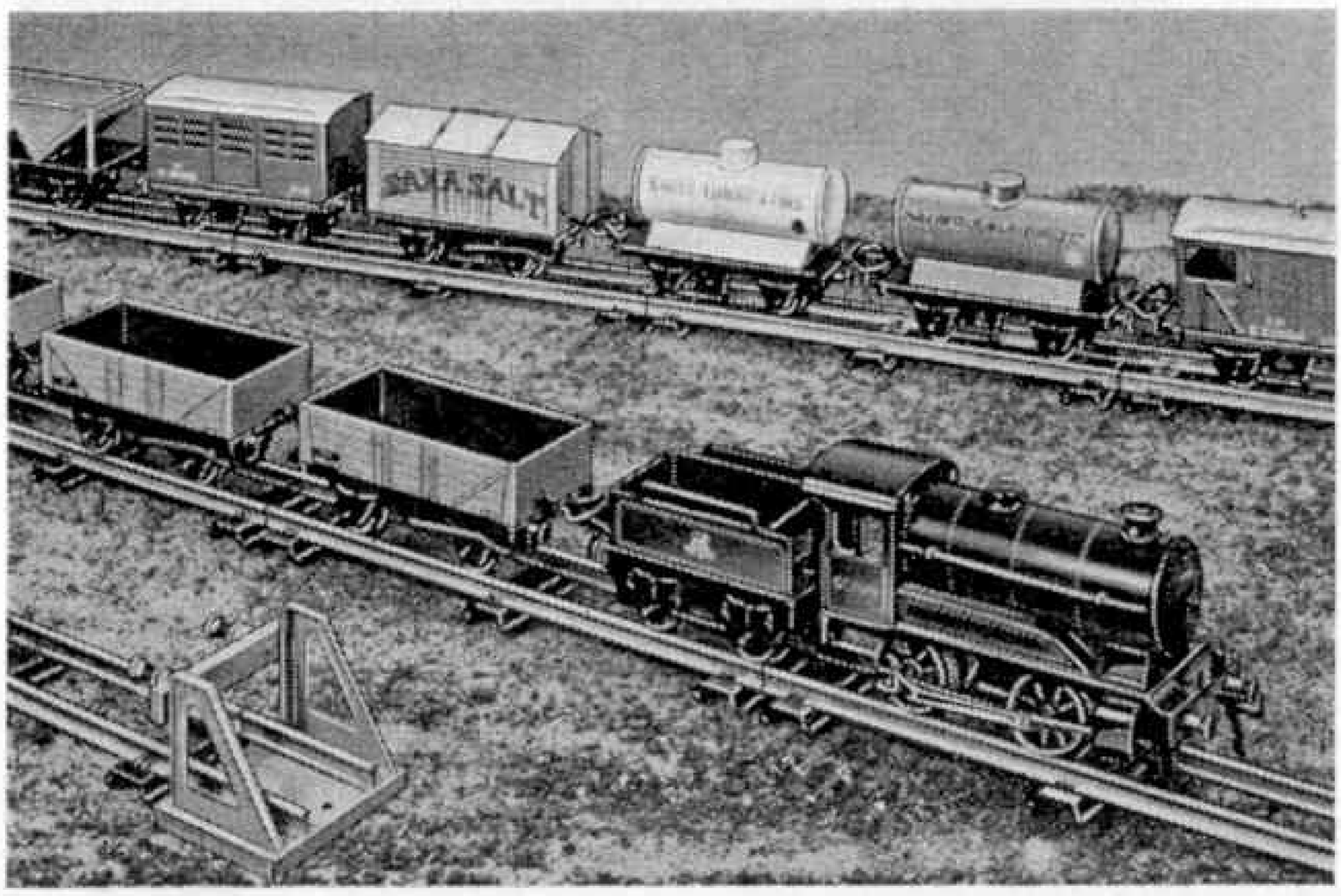
Of the No. 50 vehicles so far available, the ordinary Wagon and the Low-Sided Wagon can be considered next. These appear in two of the illustrations on these pages and you will notice that the bodywork of the Open Wagon follows the standard B.R. style. The pressed metal ends of the real vehicle are well represented in the tinprinted design. The improved form of construction in the Hornby No. 50 Wagon has given us a vehicle that will stand a tremendous amount of wear and tear. This is just as it should be, because the real wagons on which it is based have to.

The No. 50 Low Sided Wagon is of course rather plain in design, but the tinprint finish makes it possible to include characteristic lettering and marking, including the code name *Lowfit*, which means "Low Sided Wagon fitted with Automatic Brakes." Such real vehicles are suited to express working and distinguished by their bauxite colouring and special lettering *XP*.

Although the bodies of many of the No. 50 vehicles are tinprinted, the familiar sprayed finish is still used for those types to which it is specially suited. For instance, the familiar Side Tipping Wagon is finished in this way, but it incorporates a new and improved base that I mentioned earlier.

The Lumber Wagon deserves special mention, because in a sense it replaces not only the earlier type of Lumber Wagon, but the Timber Wagon as well. In future, timber traffic on the Hornby Railway will be dealt with only by the No. 50 Lumber Wagon, with its characteristic cross bolsters and vertical stanchions.

There are other changes that I can tell you about too, later.



While older and newer vehicles form the background, the No. 50 Locomotive hurries by with a train of new No. 50 Wagons.

Of General Interest

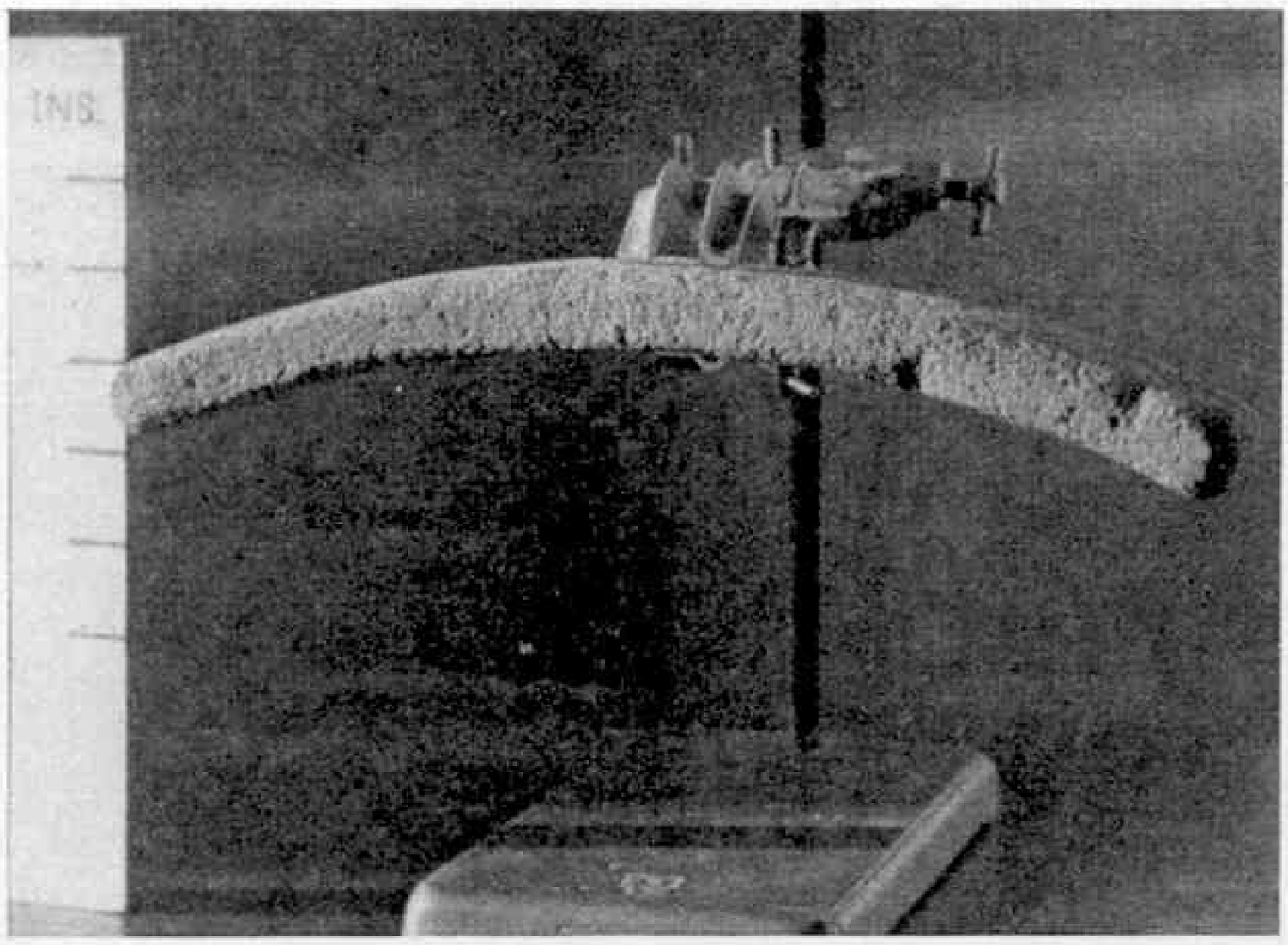
Tall floodlighting towers in the Chelsea Football Club's ground at Stamford Bridge. Photograph by courtesy of the General Electric Co. Ltd.

THE 1956-7 football year has just come to an end, but there will still be interest in the scene shown in the above picture of the ground of the Chelsea F.C. at Stamford Bridge. The slender steel towers you will recognise at once as those of the Club's floodlighting scheme. This cost £35,000.

A peculiarity of the scheme is that the floodlights are at the back of the main terraces and behind the stands, so that they are 200 ft. from the edge of the playing area. This has been done to avoid obstructing the view of spectators at daylight matches, and to allow for future extensions to the stands and terraces. It is their distance from the playing area that has made it necessary to erect towers 170 ft. in height, almost that of the statue of Lord Nelson above Trafalgar Square.

Have you ever seen a bar of stone that can be bent backward and forward? One is shown in the lower picture on this page, a piece of sandstone that bends as easily as a slab of clay under its own weight, sagging about an inch at the free end. Trying to bend it more than this is useless, however. It is then truly "as firm as a rock."

The specimen shown was found in Punjab, India. It is a coarse pink sandstone, normal except for its amazing flexibility. It is thought that the tiny crystals composing it can move, one against the other, but as they are hexagonal in shape they do this only until the edges of one crystal bear on the faces of those around it. Whatever the explanation may be, there can be no doubt that some rocks at least are not always quite as firm as we imagine!



A bar of sandstone that is flexible and bends under its own weight. Photograph by K. W. Bean, Horley, Surrey.

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.

Posted 10,290 Feet High

I have a post card that was posted on the summit of the Gornergrat last summer. This mountain is near Zermatt, in southern Switzerland, not far from the Italian border. Its height is 3,136 metres or about 10,290 feet above sea level. So it was posted at a greater height than that of the post box on Mt. Kosciusko referred to in the March *M.M.* Zermatt is at the head of the valley of the river Visp, and is about 5,000 feet above sea level. There is only one narrow unsurfaced road up the valley and the principal means of transport is the railway, which is of metre gauge. The rack system is used on some sections of the line, the gradients of which are in parts as high as 1 in 8.

The post mark of a card posted on the Gornergrat, in Switzerland, shows that it was posted at a height of about 10,290 ft. above sea level. The card was sent in by P. R. Stoker, Ruislip.

When I made the journey an avalanche had cut the line below Zermatt and passengers had to walk three miles up to the village. On the way I saw great boulders crashing down the mountain sides, raising huge clouds of dust.

From Zermatt I ascended the Gornergrat by the slow-travelling rack railway. The ascent can be made quite easily on foot in the summer months, but it takes about four hours. The railway passes a waterfall and there are magnificent views nearly all the way, particularly of the Matterhorn. On the day I went up the summit was at first enveloped in mist, but later this lifted, revealing a wonderful panorama of the Pennine Alps, with an enormous glacier and a small lake surrounded by snow.

On the summit of the Gornergrat are an hotel and the railway station, where post cards and stamps are sold and mail can be posted in the letter box. I believe telephone calls can also be made. Post cards sold at the summit are stamped with the height and the name of the summit, as can be seen in the accompanying photograph of part of my card.

P. R. STOKER (Ruislip).

An Ancient Cornish Inscription

While on holiday in Cornwall, I went on a coach ride to Boscastle. At a place called St. Clear the coach stopped and we were able to examine two ancient stones that were erected upon the death of a former King of Cornwall during the 7th century A.D.

The smaller of these stones is seen in the accompanying picture. It has an inscription, the translation of which reads: *King Doniert ordered this for his people.*

ANDREW COX (Southfleet).

King Doniert's Stone, in Cornwall. Photograph by Andrew Cox, Southfleet.

A Giant Transformer's Journey

By the Editor

THIS is the story of the movement of an electric transformer weighing 130 tons from the works of C. A. Parsons and Co. Ltd., Newcastle Upon Tyne, where it was made, to the power station at Ferrybridge, in Yorkshire, where it was to go into service.

The distance from Newcastle to Ferrybridge by road or rail is about 100 miles. But the transformer could not be sent by rail, as it was far too large to go through the tunnels and under the bridges on the lines over which it would have to pass; nor was it possible to take it by road, over any reasonably direct route, because of weak bridges over which it would have had to pass. So, after careful study of the problem, it was in the end decided that the best way was to load it into a coasting vessel, in which it was to travel round the north of Scotland to the docks at Liverpool, and then to take it by road across the Pennines to Ferrybridge. So the transformer travelled about 900 miles instead of the 100 that a direct line would have involved.

The journey about which this article is written was made by sea and land from Newcastle to Ferrybridge, a roundabout trip of about 900 miles. The direct route would have been one of only about 100 miles, but the transformer could not follow it either by road or by rail. The picture above shows it being lifted out of the small coaster in which it made the first part of its journey, from Newcastle to Liverpool.

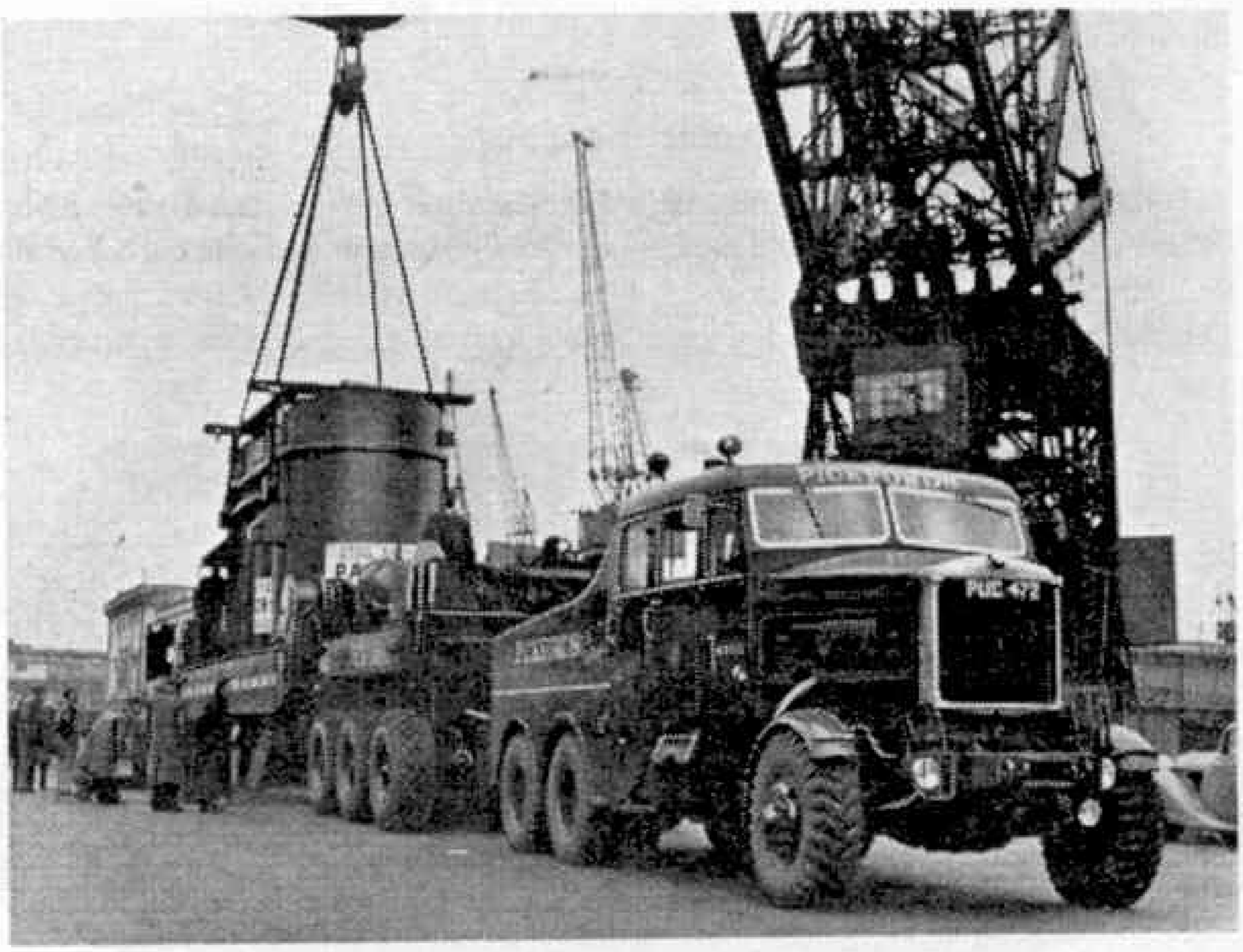
It seems extraordinary that such a roundabout journey should be necessary. The size and weight of the transformer brought this about. Those who see giant loads slowly making their way along our roads, particularly motorists, often complain and argue that enormous objects such as this transformer should not be sent in one piece, but should be transported in parts. But the present trend is to the use of large plant units in order to keep down costs. When it can be done large items are broken down into sections that can be more easily handled, but in many cases it would be far too expensive to do this. For example, to re-erect and test on the Ferrybridge site a large transformer such as this one that travelled round the north of Scotland would have involved the manufacturer in building and equipping there what would have been almost a separate works.

To begin its journey the transformer was taken down to Newcastle docks and loaded in the coaster, the name of which is the *Moray Firth*. This part of the long trip ended in the Gladstone Dock, Liverpool, on a cold and murky day last December. The forward hatch covers of the coaster were removed, to reveal the

transformer, the only cargo she carried, and the lifting gear was secured in place. The stevedore in charge assured himself that the jib of the great floating crane that was to lift the transformer was plumb over the load, and then gave a signal to the operator in the glass-fronted cabin of the crane, 60 ft. above. Slowly the transformer rose from the floor of the hold, its gentle swing checked by men on the guy ropes. It came steadily upward through the hatch, with only inches to spare, and was brought to rest 20 minutes later on the massive side members of the 24-wheel trailer that had been waiting for it on the quayside.

The rest of the journey provided onlookers on the roads followed from Liverpool to Ferrybridge with the remarkable spectacle seen in the lower picture on this page. The carrier on which the transformer rested was hauled by one of the latest Scammell Constructor 6-wheel drive heavy duty tractors, and behind it were two more of these powerful units, which are fitted with diesel engines of 185 b.h.p. The entire train weighed 250 tons.

This road transport was undertaken by Pickfords' Heavy Haulage Service, a division of British Road Services. Pickfords have about 250 heavy Scammell lorries, 100 of which are for loads of 45 tons or over. Their connection with Scammell Lorries Ltd. extends as far back as 1927, when Pickfords took delivery of the first Scammell articulated low-loading vehicle, a semi-trailer with detachable rear axles.



The transformer lowered on to the carrier on which it travelled by road to Ferrybridge.

A milestone in world transport was reached only two years later when Scammells supplied the first vehicles ever produced with a payload capacity of 100 tons. These incidentally are still in regular use by Pickfords, in transporting locomotives from the North British Locomotive Works at Glasgow to the docks for shipment to various parts of the world.

The road train assembled at Liverpool was an excellent example of the specialised equipment that Pickfords have available for heavy work of this kind. The transformer carrier (Continued on page 314)

The cavalcade on the road, with one tractor hauling and two in the rear.

Among the Model-Builders

By "Spanner"

A Gear Drive Roller Bearing

One of the problems in the design of large roller bearing units for model cranes is to provide a neat and positive drive to operate the slewing movement of the model. Mr. C. Cohen, a keen model-builder who lives in Cape Town, S.A., wrote recently and sent details of a novel arrangement, built entirely with standard parts, that solves the problem very effectively.

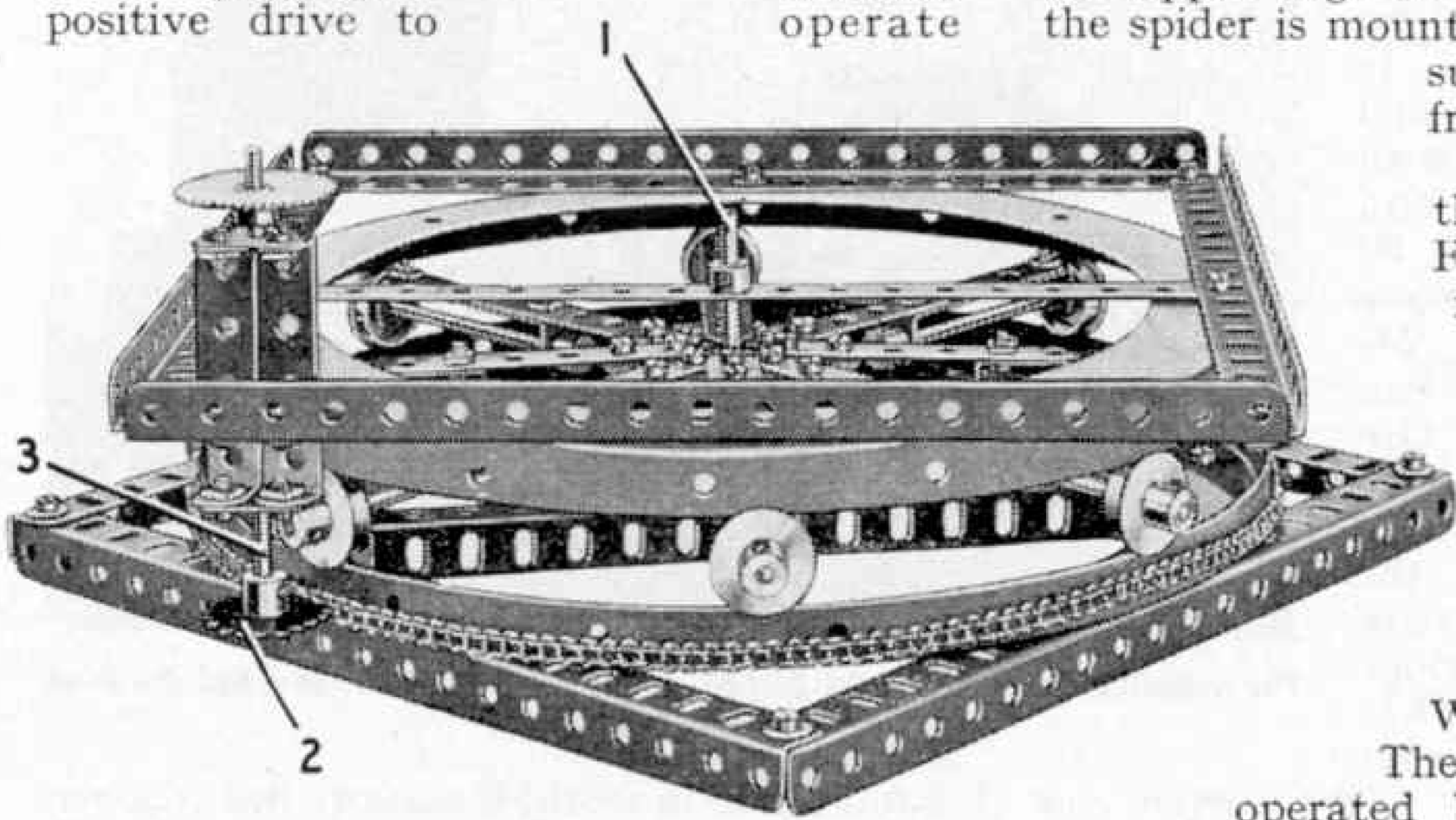


Fig. 1. A built up roller bearing unit in which provision is made for operating the slewing movement of a model crane. It was designed by Mr. C. Cohen, Cape Town, South Africa.

I have built up a roller bearing unit incorporating the driving arrangement designed by Mr. Cohen, and the mechanism is illustrated in Figs. 1 and 3.

The lower member of the bearing is a Flanged Ring bolted firmly to a solid framework of Angle Girders. A length of Sprocket Chain is placed round the rim of the Flanged Ring and its ends are joined together so that it fits tightly in place.

The "spider" carrying the rollers is shown separately in Fig. 3. Eight $4\frac{1}{2}''$ Strips are bolted radially to a Face Plate, and each Strip is fitted with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The Double Angle Strips support $3\frac{1}{2}''$ Rods, each of which carries a $\frac{3}{4}''$ Flanged Wheel and is held in place by a Collar. The Flanged Wheels are arranged to run on the upper edge of the Flanged Ring, and the spider is mounted on a vertical Rod 1 supported in the base frame.

The upper member of the bearing is a second Flanged Ring, and this is bolted to the superstructure to be rotated. A $9\frac{1}{2}''$ Strip bolted across the Flanged Ring is passed over the Rod 1 and the Flanged Ring rests on the $\frac{3}{4}''$ Flanged Wheels.

The slewing mechanism is operated by a Sprocket Wheel that engages the links of the Sprocket Chain passed round the lower Flanged Ring. In the example illustrated, a 1" Sprocket 2 is fixed on a Rod 3, which is mounted in 1" Triangular Plates. The Triangular Plates are fixed to the lugs of two Double Brackets and two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips bolted to one of the Girders of the superstructure.

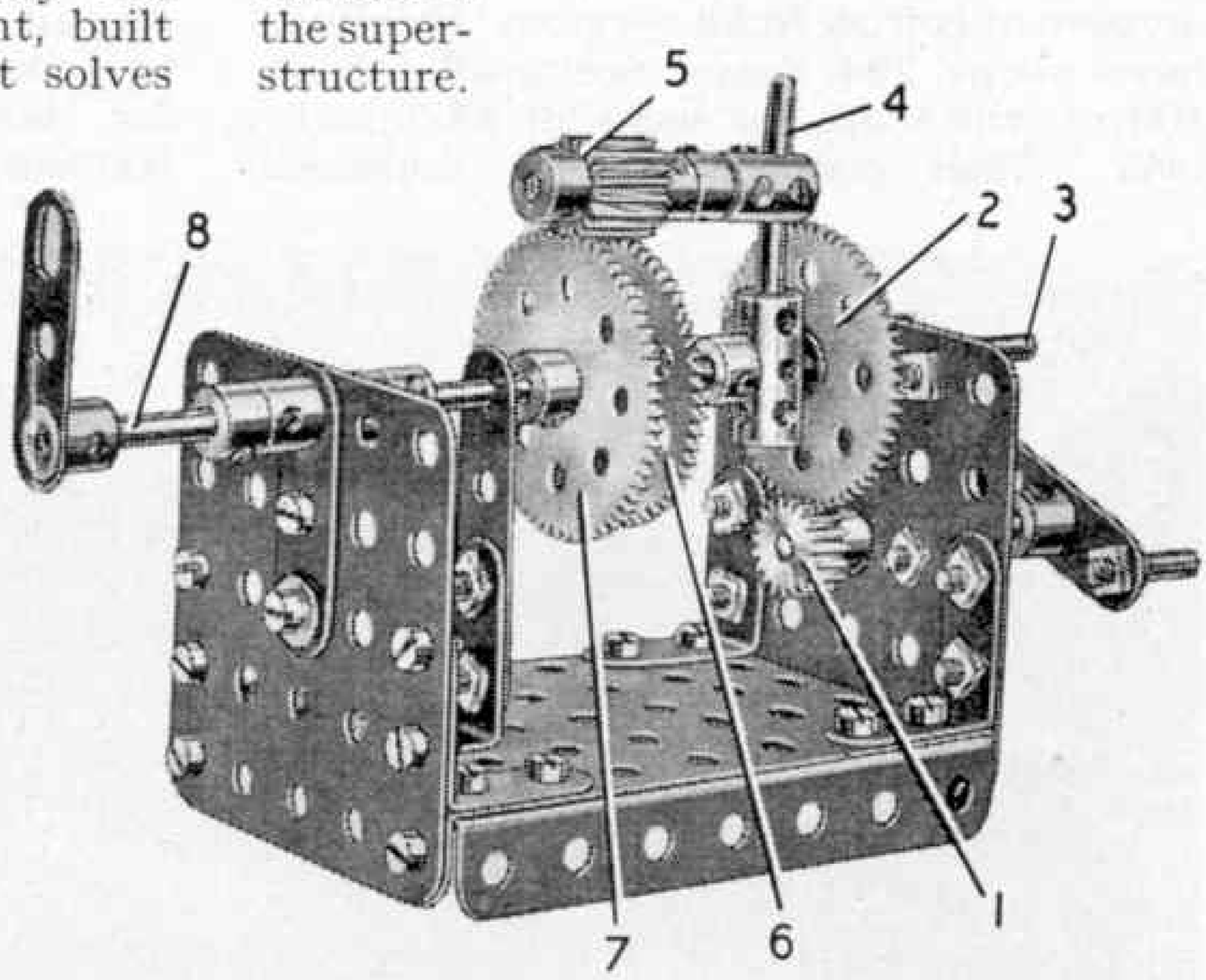
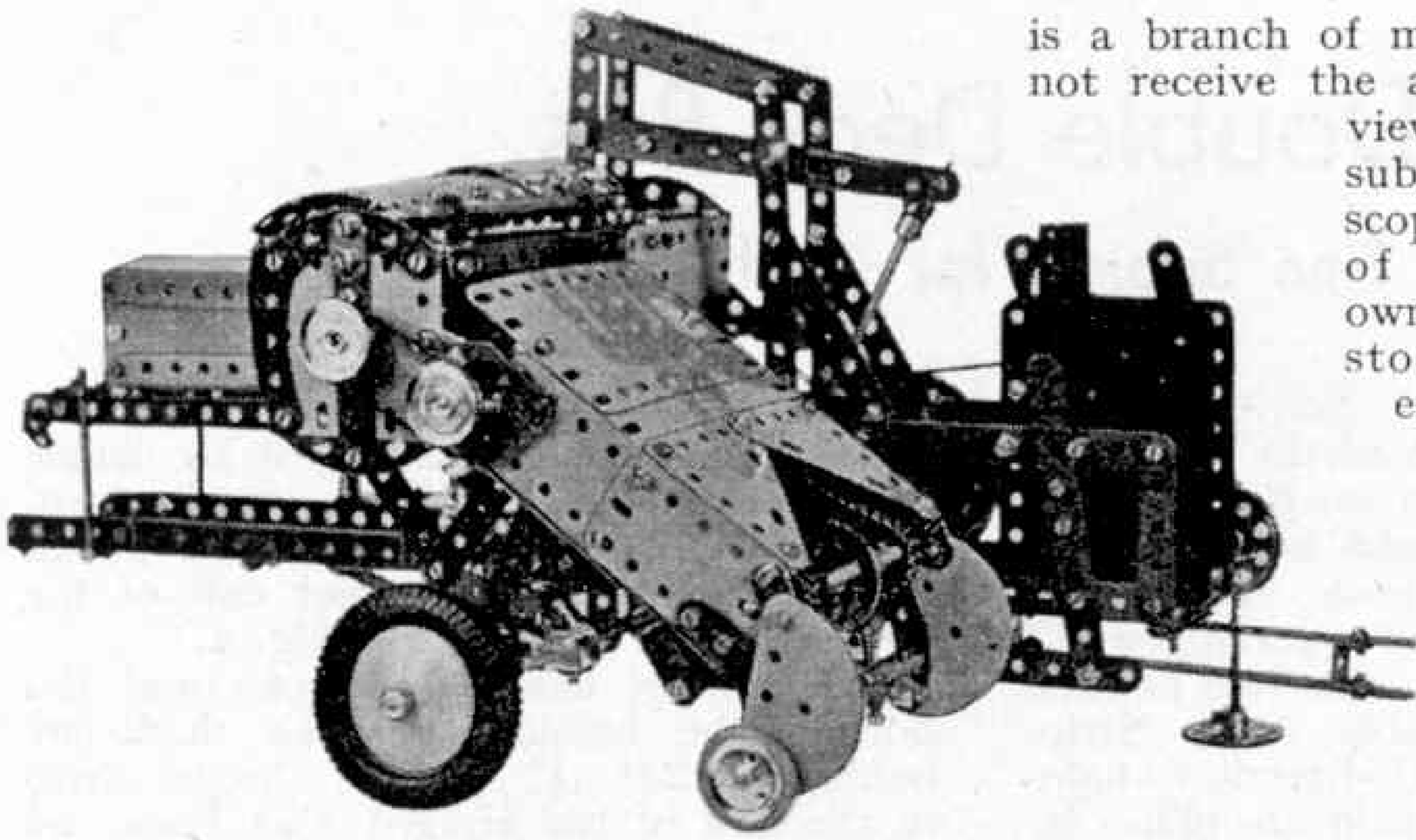


Fig. 2. A compact form of epicyclic gearing giving a total reduction ratio of 60:1. It is specially suitable for use in Meccano clocks.



This agricultural pick-up baler is an example of model-building by 10-years old John Gartell, Yenston, Somerset.

60:1 Reduction Ratio

The mechanism shown in Fig. 2 is a form of epicyclic gearing, and in conjunction with a 3:1 reduction ratio the epicyclic mechanism provides an overall ratio of 60:1 in a small space. The arrangement is of particular value in model clocks, as it enables a compact drive of the correct ratio to be fitted between the minute and a seconds hand.

A ½″ Pinion 1 on the input shaft drives a 57-tooth Gear 2, which is loosely mounted on a Rod 3 fixed in a Double Arm Crank bolted to the framework. A Coupling is attached by an Angle Bracket to the Gear 2, and supports a 1½″ Rod 4 that carries a Short Coupling. Another 1½″ Rod is fixed in the Short Coupling and on it a ½″ diameter, ½″ face Pinion 5 is mounted freely between Collars.

A 57-tooth Gear 6 is fixed on Rod 3, which extends partly into the boss of a 60-tooth Gear 7 fixed on the output shaft 8. The Rod 4 is arranged at a slight angle, so that Pinion 5 meshes accurately with the Gears 6 and 7.

A Model Pick-up Baler

I have on many occasions in the past illustrated models of various kinds of agricultural machines, as I feel that this is a branch of model-building that does not receive the attention it deserves in view of the many attractive subjects it covers and the scope there is in this kind of model-building for owners of only moderate stocks of Meccano. An excellent example of this came to my notice recently in the shape of a pick-up baler, built from a No. 8 Outfit and a few extra parts, by John Gartell, Yenston, Somerset. The model is shown in the upper illustration on this page. John is only 10 years of age, but as he lives on a farm, naturally he has special interest in agricultural machinery, and possibly first-hand experience of it. At any rate, he seems to be quite familiar with the details of these machines, and his attempt to reproduce a Massey Harris 701 type Pick-up Baler reflects considerable credit on his model-building ability.

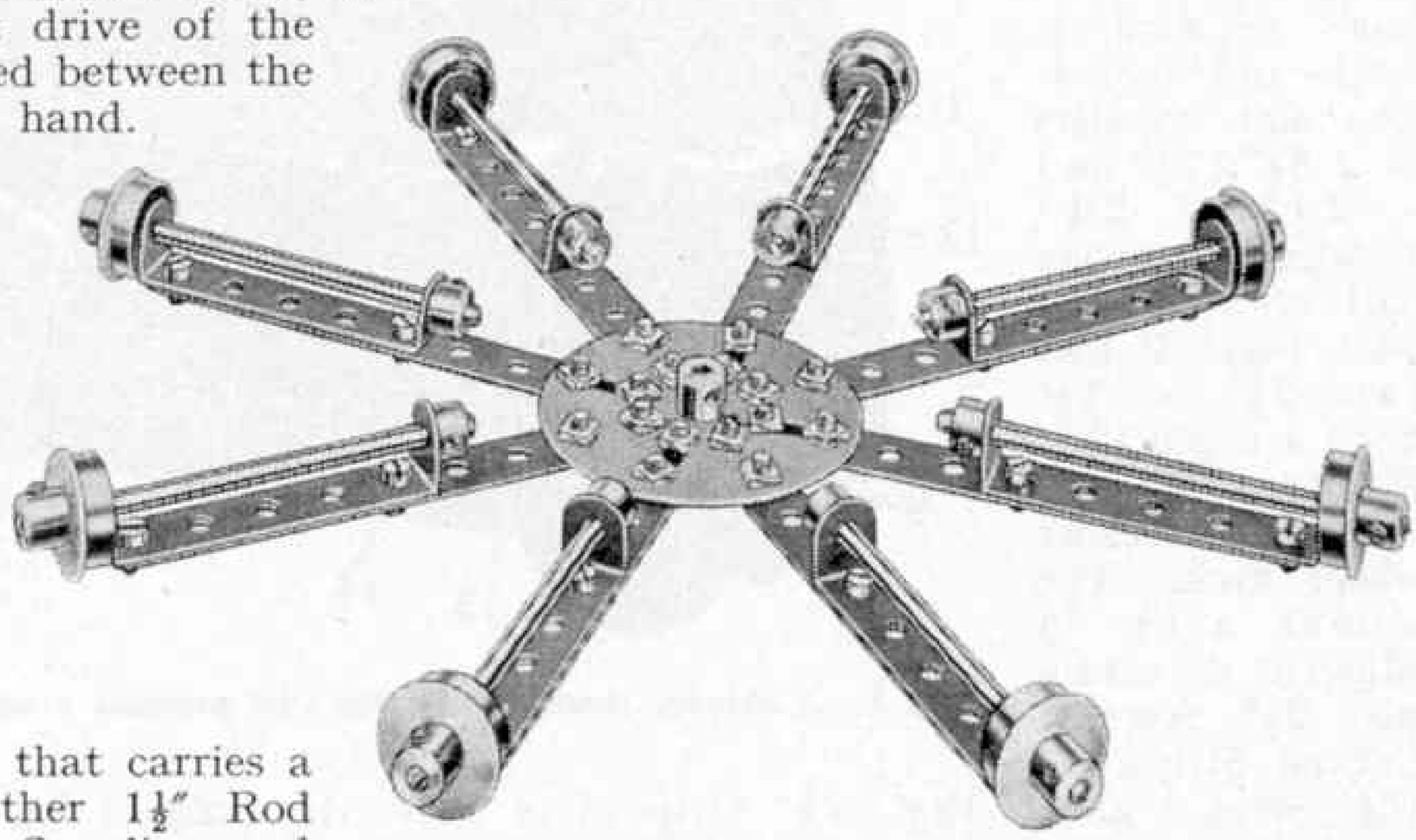


Fig. 3. The "spider" of the roller bearing unit shown in Fig. 1 on the opposite page.

A Novel Use for the Rod with Keyway

A novel use for the new Meccano Rod with Keyway (Part No. 230) has been suggested by Mr. J. Williams, Haverfordwest. He has utilised the slotted keyway of the part as a means of passing a feed wire through the centre of a roller bearing to carry electric current to a motor mounted on a rotating superstructure supported by the bearing.

Double Deck Bus

A Fine Subject for Outfit No. 6

FOR owners of Outfit No. 6, or one larger, we have designed the attractive Double Deck Bus shown on this and the opposite page. The chassis is formed by two built-up girders, each made from two 12½″ Angle Girders overlapped 17 holes. These girders are connected at each end by a 2½″ × ½″ Double Angle Strip. The rear axle is mounted directly in holes in the chassis and is held in place by Spring Clips. The front axle is supported in Fishplates that cover the slotted holes in the chassis members, and Collars are used to hold the axle in position.

The side of the lower saloon seen in Fig. 2 is assembled on a 12½″ Strip and a 5½″ Strip overlapped five holes to form a made up strip 1. The side consists of a 5½″ × 2½″ and a 2½″ × 2½″ Flexible Plate, one half of a Hinged Flat Plate 2 and two 2½″ × 1½″ Triangular Flexible Plates 3 over the rear wheel arch. The wheel arch is edged as shown by two 2½″ Stepped Curved Strips. A 12½″ Strip 5 and a 12½″ × 2½″ Strip Plate are bolted to the upper edge of Plate 2 and to a 5½″ Strip 4 at the front. The Strip Plate is extended forward by a 3″ Strip 6 and a 2½″ × 1½″ Flexible Plate.

The side shown in Fig. 1 is similar to the one already described, except that the half of the Hinged Flat Plate 2 is omitted and strip 1 is replaced by a strip 7. Strip 7 consists of a 12½″ and a 5½″ Strip overlapped nine holes. The sides are connected at the front by the other half of the Hinged Flat Plate, which is attached to Angle Brackets bolted to strips 1 and 7, and by a 4½″ × 2½″ Flexible Plate edged by two 2½″ Strips 8 and attached to the Strips 6 by Angle Brackets. A built-up strip, made from a 3½″ and a 1½″ Strip, is bolted at an angle as shown to the front end of the Strip 6 on the side seen in Fig. 1.

The side of the driver's cab and the side of the bonnet are each made by bolting a 2½″ × ½″ Double Angle Strip to the half of the Hinged Flat Plate, by fixing a 2½″ × 2″ Triangular Flexible Plate to the strip 1 or the strip 7, and by attaching a 2½″ × ½″ Double Angle Strip 9 and a 2½″ Curved Strip to an Angle Bracket bolted to the half of the Hinged Flat Plate.

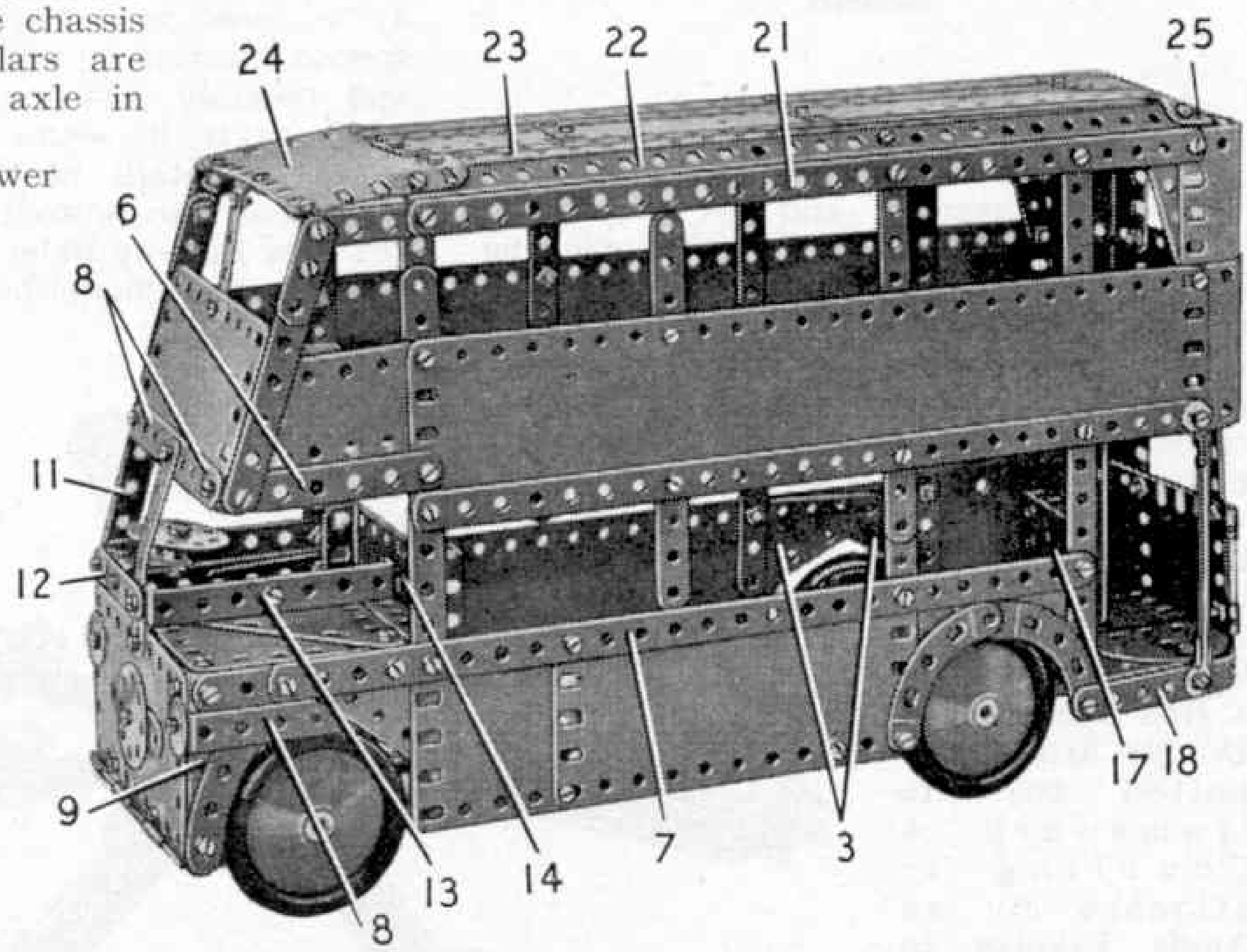


Fig. 1. A shapely Double Deck Bus that provides a new subject for Outfit No. 6.

The side of the driver's cab is extended upward by a 3½″ Strip 10, and a built-up strip 11 made from a 5½″ and a 1½″ Strip, is bolted in place. A 2½″ Strip 12 is fixed to an Angle Bracket attached to the front end of Strip 10, and is connected to the Strips 8 by a 2½″ Strip. Strip 12 supports a 3½″ × ½″ Double Angle Strip 13. The top of the bonnet is filled in by two 2½″ × 2½″ Triangular Flexible Plates

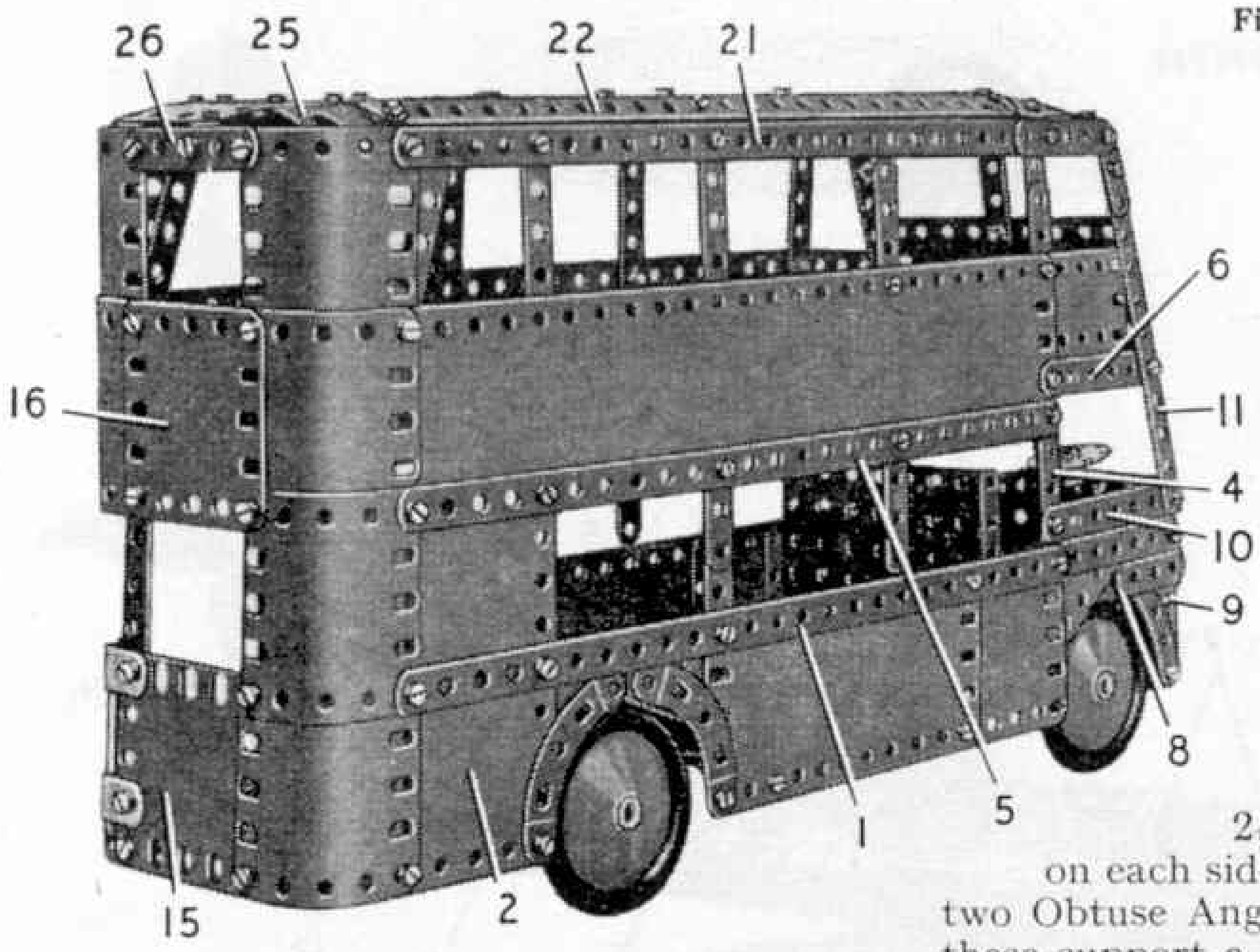


Fig. 2. The off-side and rear of the Double Deck Bus.

arranged as shown and supported by Angle Brackets. A $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 14 is bolted to Double Angle Strip 13 and to strip 7. The radiator is represented by a Wheel Disc and a $2\frac{1}{2}''$ Strip, and the headlights are $\frac{3}{4}''$ Washers. The steering wheel is a Bush Wheel on a Pivot Bolt, which is fixed to a $1'' \times 1''$ Angle Bracket bolted to the front of the cab.

The back of the body is made by bolting two $1\frac{11}{16}''$ radius Curved Plates and two U-section Curved Plates to the side shown in Fig. 2. The U-section Curved Plates should be opened out slightly. The Curved Plates support two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates 15 and 16 connected by a $2\frac{1}{2}''$ Strip. Plate 15 is bolted to the rear of the chassis, and Plate 16 is connected to the side seen in Fig. 1 by two curved $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The handrails are Rods held in Rod and Strip Connectors and Right Angle Rod and Strip Connectors. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 17 is fixed to an Angle Bracket bolted to the strip 7, and a $2\frac{1}{2}''$ Strip 18 is connected to the rear of the body by a Formed Slotted Strip. The floor at the rear consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates fixed to the chassis and two Semi-Circular Plates 19 attached to Strip 18 by an Angle Bracket. A $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 20 is bolted by its flange to the chassis.

A $12\frac{1}{2}''$ Strip 21 extended forward by a $2\frac{1}{2}''$ Strip is fixed in position on each side. To each of the Strips 21 two Obtuse Angle Brackets are fixed, and these support a $12\frac{1}{2}''$ Strip 22 and another Obtuse Angle Bracket that carries a $12\frac{1}{2}''$ Strip 23. A $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 24 is bolted to the Obtuse Angle Brackets and to Angle Brackets at the front. Two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 25 are fixed to the rear ends of the Strips 22 and 23, and are connected to a $2\frac{1}{2}''$ Strip 26 by an Angle Bracket. The roof is completed by two $12\frac{1}{2}''$ Strips and three $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to Plates 24 and 25.

The window frames of the model are formed by $5\frac{1}{2}''$ Strips, $2\frac{1}{2}''$ Strips and $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

Parts required to build the Double Deck Bus: 12 of No. 1; 14 of No. 2; 4 of No. 3; 2 of No. 4; 12 of No. 5; 2 of No. 6a; 4 of No. 8; 5 of No. 10; 14 of No. 12; 1 of No. 12a; 8 of No. 12c; 2 of No. 15b; 1 of No. 16; 1 of No. 17; 1 of No. 24; 1 of No. 24a; 2 of No. 35; 132 of No. 37a; 130 of No. 37b; 2 of No. 38; 2 of No. 38d; 8 of No. 48a; 2 of No. 48b; 1 of No. 51; 2 of No. 53; 2 of No. 59; 2 of No. 90; 4 of No. 90a; 2 of No. 111c; 2 of No. 126; 1 of No. 147b; 4 of No. 187; 4 of No. 188; 3 of No. 189; 6 of No. 190; 2 of No. 191; 4 of No. 192; 2 of No. 197; 1 of No. 198; 2 of No. 199; 2 of No. 200; 2 of No. 212; 2 of No. 212a; 2 of No. 214; 1 of No. 215; 4 of No. 221; 2 of No. 222; 2 of No. 223.

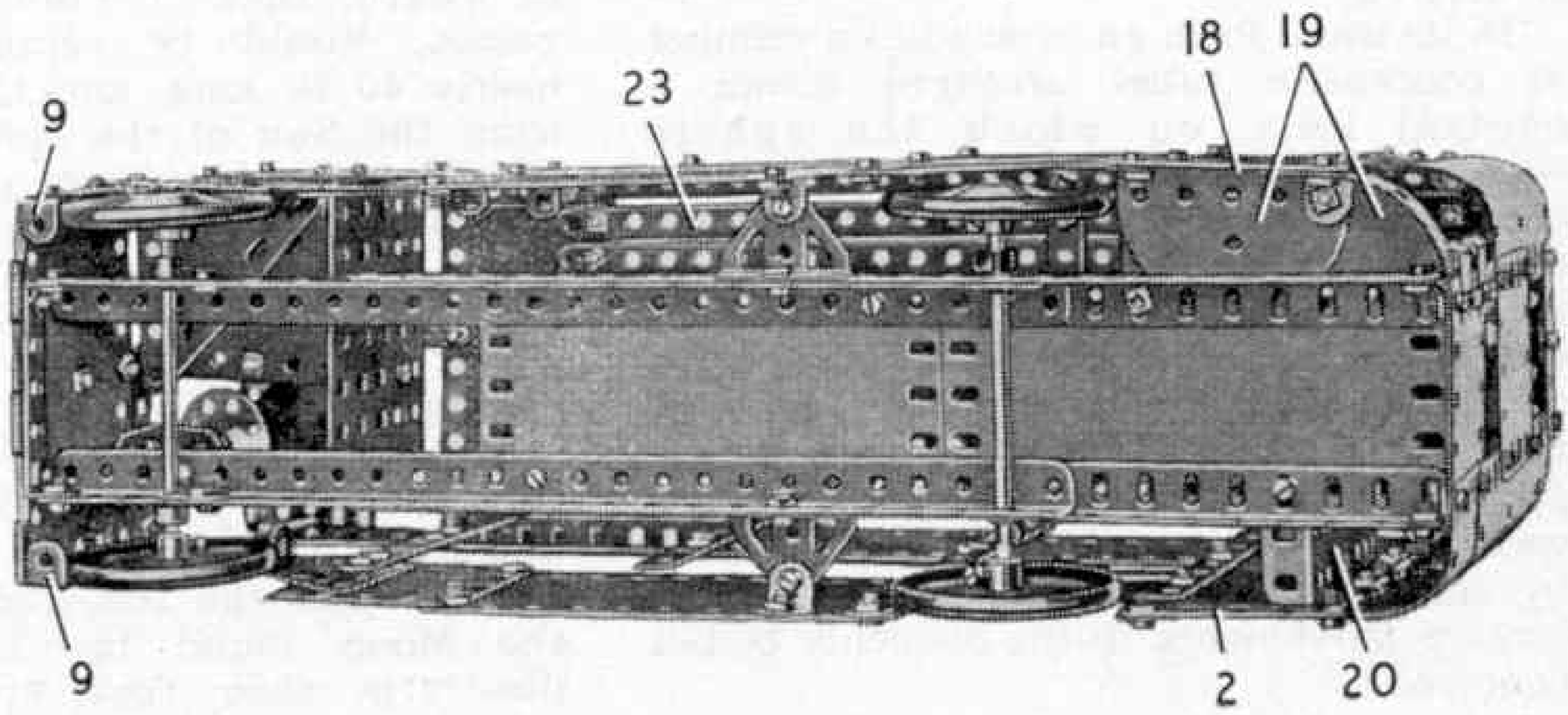
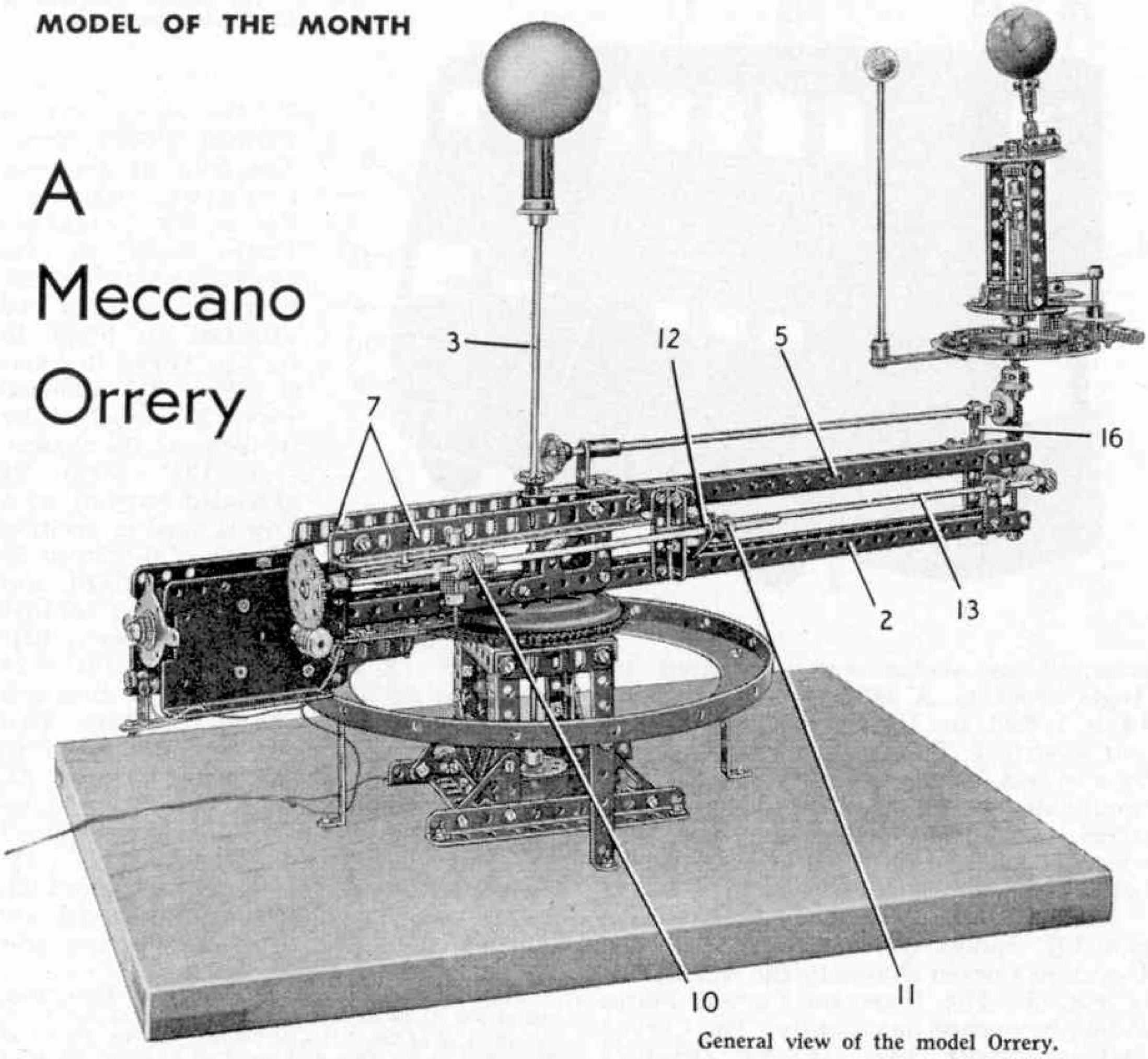


Fig. 3. The Bus seen from underneath.

MODEL OF THE MONTH

A Meccano Orrery



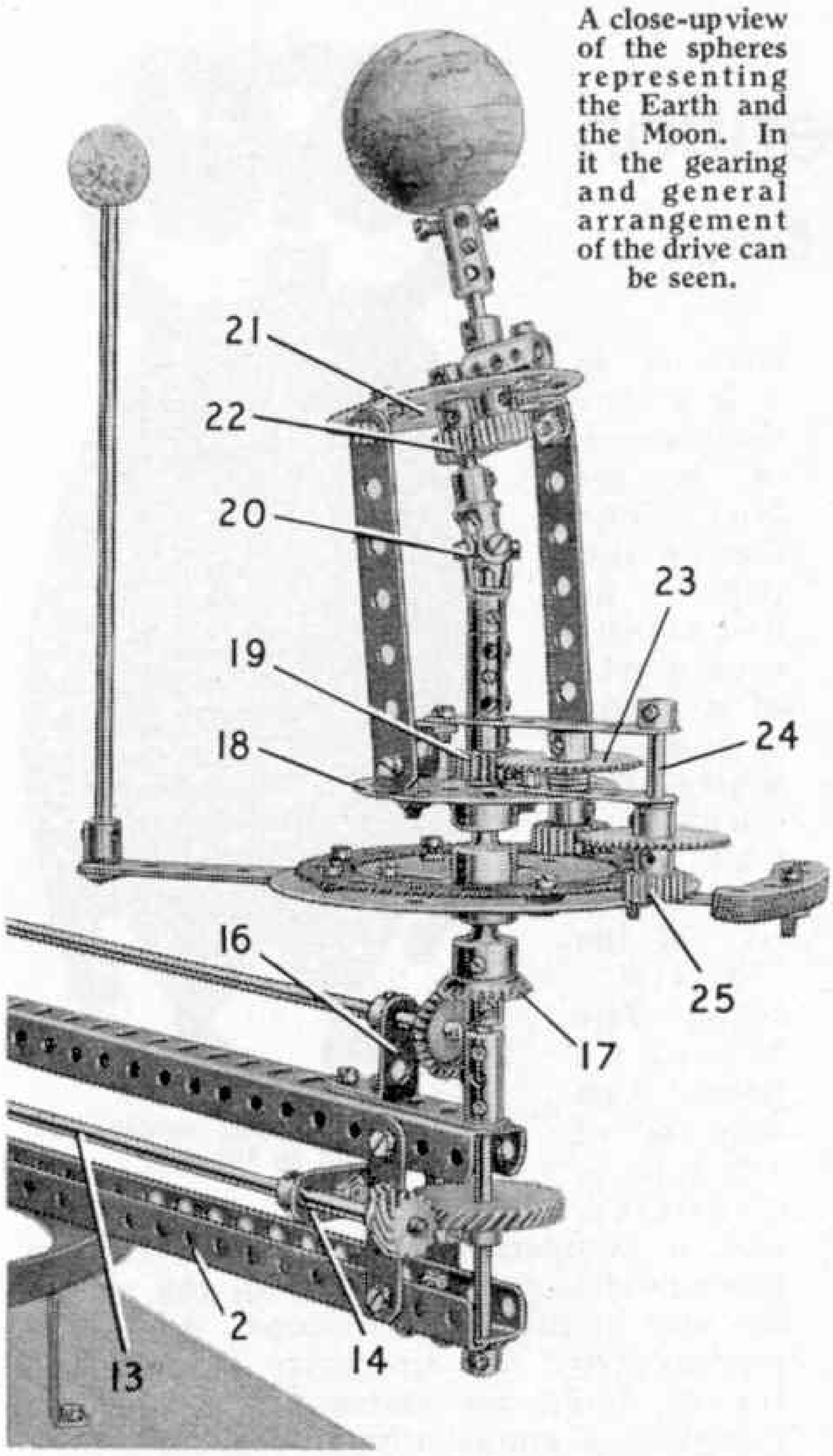
General view of the model Orrery.

AN Orrery is an astronomical instrument of great interest that illustrates the motion of the planets about the Sun, and the operation of the moons of the planets. The earliest instrument of this kind seems to have been made in 1715 for the Earl of Orrery, from whose title its name is derived.

In its usual form an orrery has a number of concentric tubes arranged round a central axis, on which the sphere representing the Sun is mounted. On the upper ends of these tubes, mounted at different levels so as not to interfere with each other, are radial rods of various lengths, on the outer ends of which spheres of various sizes are mounted to represent the planets, and similar arrangements apply to their satellites. The lower end of each of the concentric tubes is driven by means of gearing so as to give the correct movements of the heavenly bodies concerned.

In a Meccano model it is impossible to keep exactly to scale because of the immense range of distances involved. This is easily seen when we realise that if in a model the distance of the Earth from the Sun is represented by a rod 1 ft. in length, that of Pluto, the outermost planet, would be represented by one nearly 40 ft. long, and then the distance from the Sun of the sphere representing Mercury, the innermost planet, would be only 4½ inches. For this reason the present model is restricted to the movements of the Sun, Earth and Moon. To include more would require very complicated gearing.

Thus the Orrery we have chosen as the subject for the June "Model of the Month" demonstrates the annual journeys of the Earth round the Sun and of its satellite the Moon round the Earth, and also illustrates their rotations. It is based



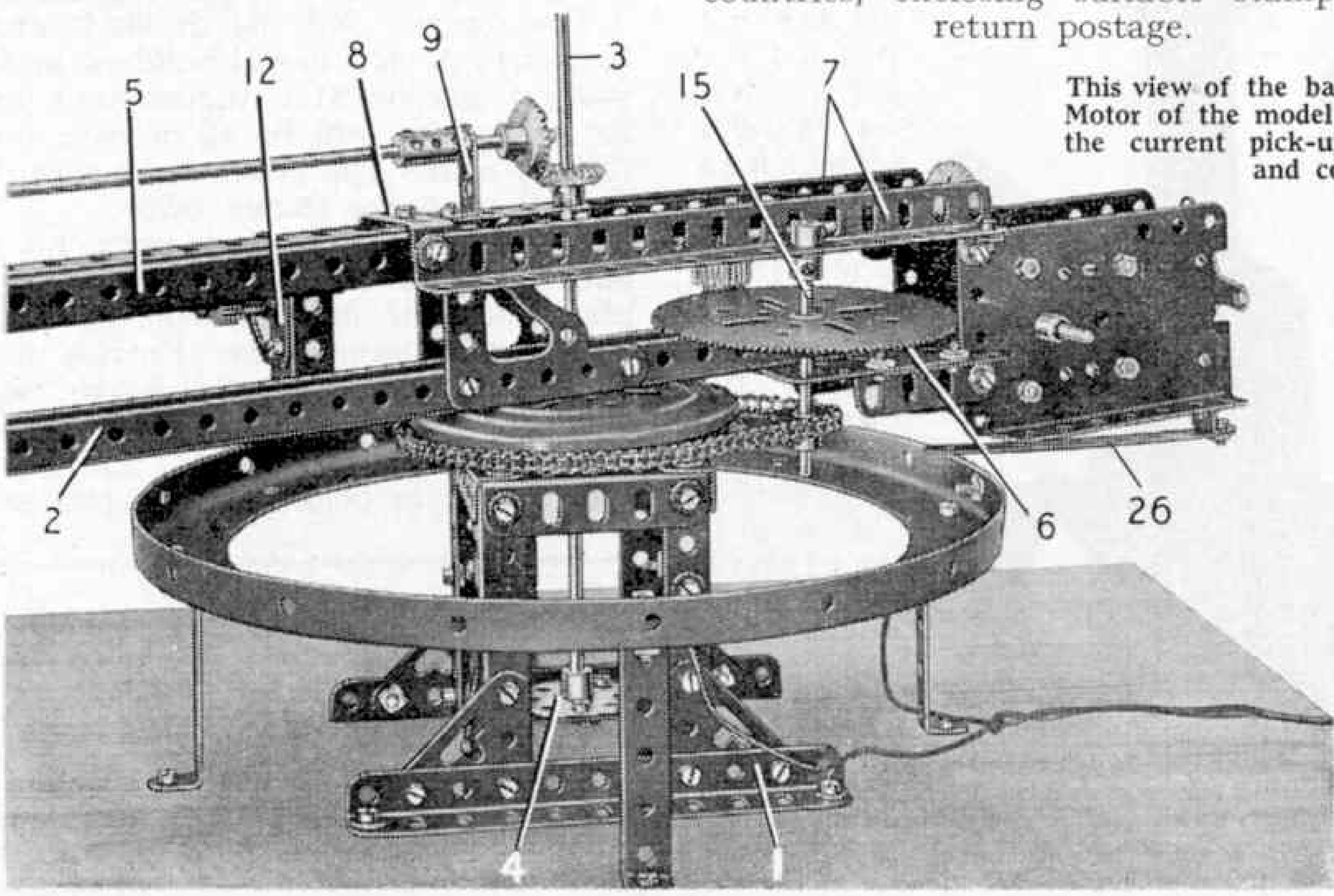
A close-up view of the spheres representing the Earth and the Moon. In it the gearing and general arrangement of the drive can be seen.

on a model entered by Mr. de Beer, Leader of the Cape Peninsula Meccano Club, in a recent model-building Competition. The gearing ensures that the Earth rotates round the Sun in the same time that it takes to rotate upon its own axis 365 times, while the Moon makes 13 revolutions round the Earth in the same period. The Moon always presents the same face to the Earth, and the axis of the latter body is so inclined that there is an angle of 23½ degrees between the plane of its equator and that in which it rotates round the Sun.

Suitable spheres or balls to represent the Sun, Earth and Moon may be obtained quite easily, and no trouble should be met in securing them to their respective shafts. The appearance of the model will be enhanced if the globes representing the Earth and Moon are painted to show or suggest the markings on the surfaces. That representing the Sun also could be painted bright yellow.

The model is driven by a Meccano Motor mounted on the end of the main revolving arm, current being collected by a shoe in contact with a pick-up ring.

Full instructions and a list of the parts required to build the Meccano Orrery can be obtained by writing to the Editor, enclosing a 2d. stamp for postage. Readers in Canada, Australia, New Zealand, South Africa, United States of America and Ceylon can obtain instructions for the *current* "Model of the Month" by writing to the main Meccano Agents for those countries, enclosing suitable stamps for return postage.



This view of the base and Motor of the model shows the current pick-up ring and collector shoe.

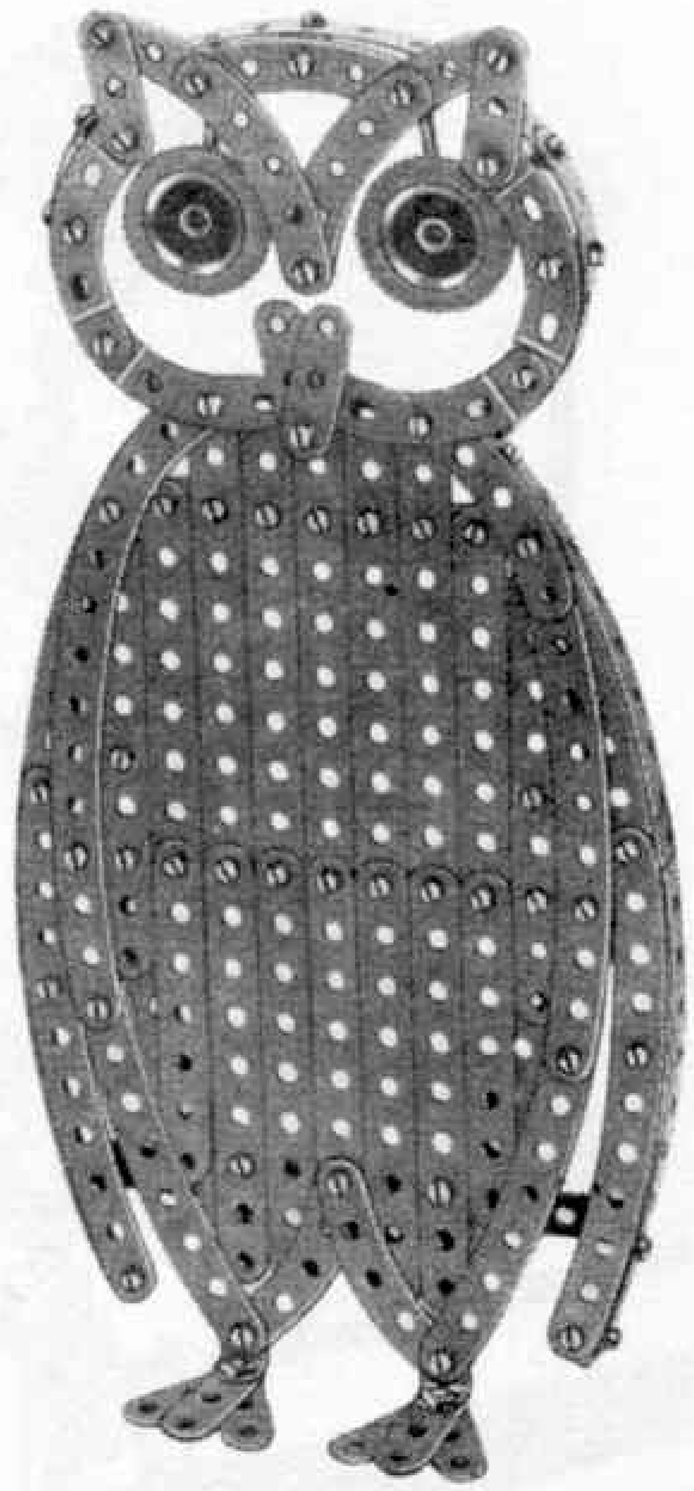
Summertime Competition

Prizes for Model Birds and Beasts

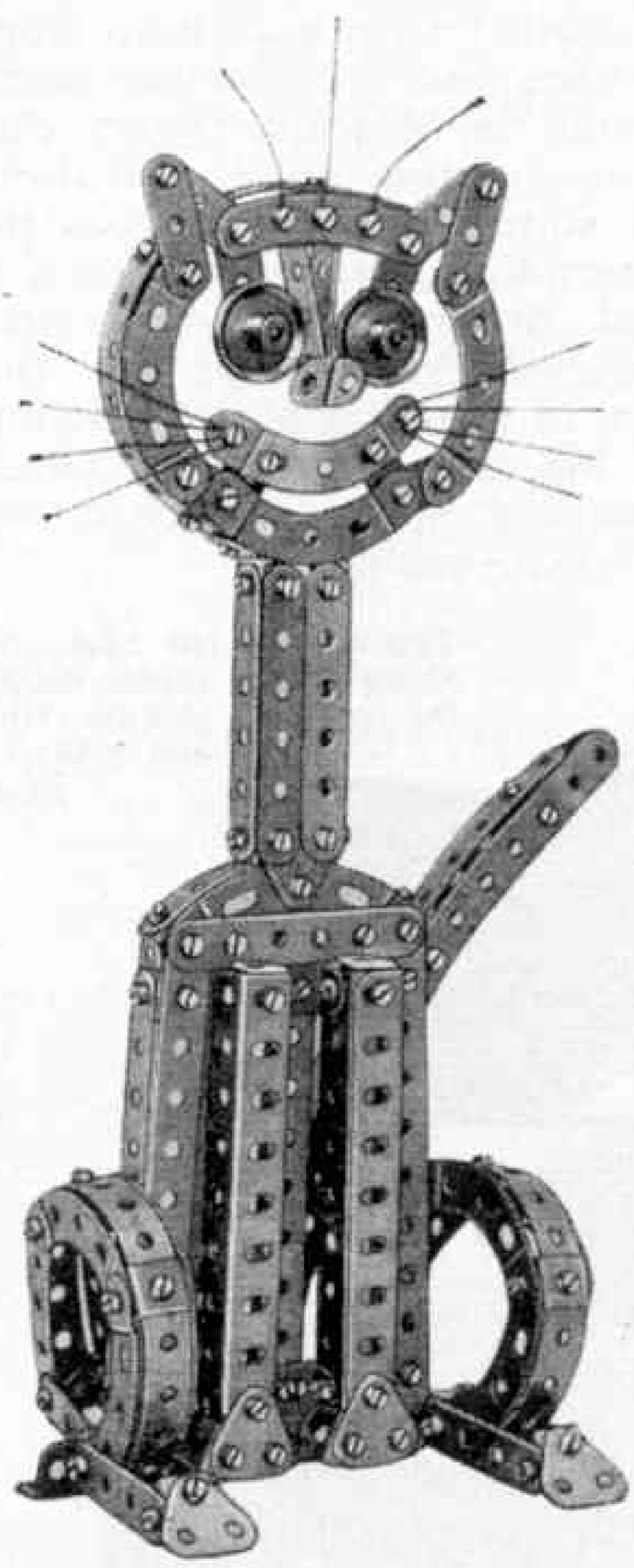
REMARKABLY life-like models of birds and animals can be constructed from Meccano parts, as the two amusing examples on this page show, and a particularly useful feature is that remarkable realism can be achieved using very few parts. A model of this type can be built up in quite a short time and the pastime is therefore just the thing for short spells indoors during the summer months. Then most of us like to spend as much time as possible out in the open air, but rain does sometimes interrupt our normal summer pastimes.

It is to provide an interesting and amusing occupation for the model-builder during these spells that this Contest has been arranged. In order to take part in it competitors should make models of any birds, beasts, fish or any other creature they like, and then obtain either photographs or good sketches of them. Neither photographs nor drawings need be the competitors' own work.

Competitors may build their models either solid, that is in three dimensions, or in the flat. The Owl on this page is an excellent example of a "flat" model, while the Cheshire Cat is a representative of the "solid" type. The Meccano parts used may be of any type or quantity, and a competitor may submit two or more models provided that all the entries are sent in the same envelope. And don't forget—strive for simplicity rather than try to build an elaborate model, and introduce a comic note if you can.



A well-proportioned model Owl, built in the flat.



"The Cheshire Cat." One of the many attractive and realistic entries submitted in a previous "Birds and Beasts" Competition.

The Contest will be divided into two Sections: A, for model-builders under 12 years of age on 31st August next, and B, for those who will be 12 or over on 31st August next. The prizes to be awarded in each Section are shown below.

Each competitor must write his name and full address on the back of each photograph or drawing sent in, with his age on the closing date. Entries must be addressed to *"Birds and Beasts" Model-Building Competition, Meccano Limited, Binns Road, Liverpool 13*, and must be received on or before 31st August next.

THE PRIZES

The following prizes will be awarded in each of the Sections A and B.

	£	s.	d.
First Prize, Cheque for	4	4	0
Second Prize, Cheque for ..	2	2	0
Third Prize, Cheque for	1	1	0
Ten Prizes, each of		10	0
Ten Prizes, each of		5	0

Club and Branch News

WITH THE SECRETARY

ENLARGING THE HORIZON

I was very pleased to hear from the Secretary of the H.R.C. Branch at Droylsden Littlemoss Boys' County Secondary School that during their recent Model Railway Exhibition some very useful contacts with other schools clubs were made. These contacts are being followed up by arranging a series of exchange visits with those clubs.

Here is an excellent idea, one that is in line with what I have many times recommended on this page. Such exchanges enlarge Club horizons by giving members an insight into the model-building and varied activities of other clubs, which must be of benefit to the Clubs or Branches concerned in every possible way. And they certainly have the splendid effect of increasing the world's store of friendliness, if only in a minor degree.

PROPOSED MECCANO CLUB

PENSHURST—Mr. H. G. Rogers, Swaylands School, Penshurst, Kent.

CLUB NOTES

LAUNCESTON M.C.—The third annual Exhibition, held in St. Mary's Hall, was the biggest and best to date, and reflected the enthusiasm of the members. There was a fine display of Meccano models, many of them working, an extensive Hornby-Dublo layout in continuous operation, a Meccano constructed electric train, an impressive array of model aircraft, and other attractive exhibits. Club roll: 40. *Secretary:* R. Thorne, Hill Barn, St. Stephens, Launceston, Cornwall.

AUSTRALIA

FREMANTLE AND DISTRICT M.C.—The year began with two new members being enrolled. There has been considerable model-building, and models under construction at the time of writing include a fork lift truck, demonstration car chassis, electric locomotive and several dockside cranes. Interest in model cars has been heightened by the Leader, Mr. J. Hamersley, donating £3 as a prize for the best and fastest racing car—within certain specifications—built during the year. *Secretary:* J. Yeomans, 46 Clayton Street, East Fremantle, Western Australia.

SOUTH AFRICA

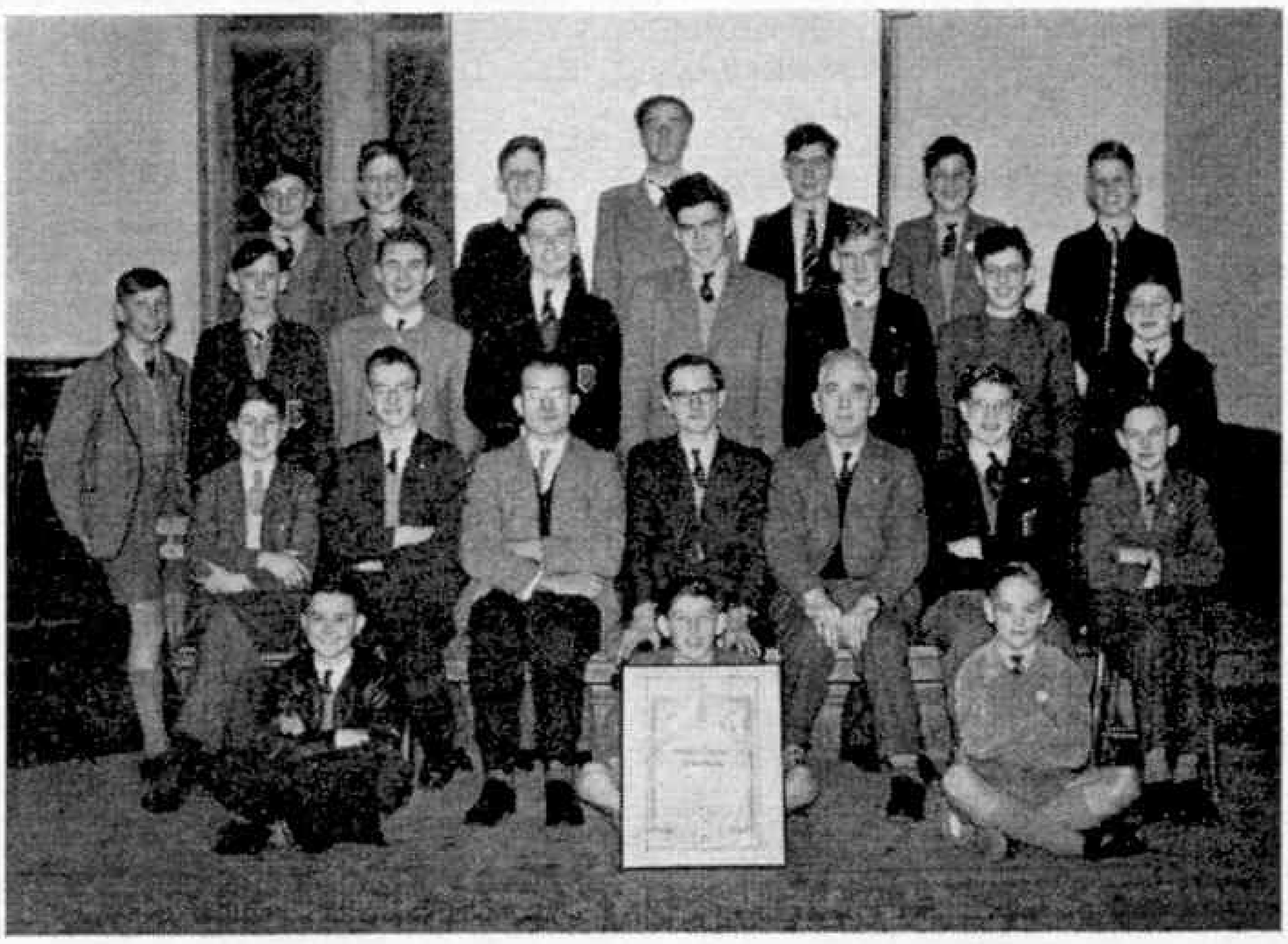
CAPE PENINSULA M.C.—Early this year a party of members visited the Cape Town docks, and the ship Morgenster berthed there. A most interesting time was spent on the ship's bridge, where the radar screen was operated specially for them, and the party were then shown round the engine room by one of the ship's engineers. After welcome refreshments in the lounge, the party returned ashore, very pleased with their visit. The tour was arranged by the shipping company's local agent. Club roll: 27. *Secretary:* P. B. Simpson, "Sherwood," Newlands Road, Claremont, Cape Peninsula, South Africa.

BRANCH NEWS

LIVERPOOL INSTITUTE MODELS SOCIETY — A successful Exhibition has been held. The Hornby-Dublo layout was in continuous operation, and other modelling activities represented included aircraft and marine construction, as well as Meccano model-building. A working tramway and a monorail system with a suspended passenger car were other interesting items. *Secretary:* Mr. G. L. Craig, 33 Annesley Road, Aigburth, Liverpool 17.

DROYLSDEN LITTLEMOSS BOYS' COUNTY SECONDARY SCHOOL—The Model Railway Exhibition was a great success, and the 3,000 or so visitors included model railway enthusiasts from as far as 20 miles distant. Some useful contacts were made with other school clubs visiting the Exhibition. *Secretary:* Mr. J. Lawton, Droylsden Littlemoss Boys' County Secondary School, Cryer Street, Droylsden.

HALE END—Much "elbow grease" has been expended in dismantling, repairing and strengthening the layout baseboard. A scheme has been evolved by which a definite sum will be set aside each week toward railway development, and by this means it is hoped to be able to build up a substantial layout. *Secretary:* A. L. Coe, 463 Hale End Road, Highams Park, London E.4.



Officials and members of the Launceston M.C. Mr. B. Tunbridge, is seated in the centre, with his co-Leader Mr. A. Bawden immediately on his left. Next to Mr. Bawden is R. Thorne, the very able Secretary. Although this Club is only a few years old it has already established a reputation for the excellence of its Exhibitions.

HORNBY RAILWAY COMPANY

By the Secretary

What's New?

YOU will remember we finished our chat last month by referring to local or pick-up freight trains. Well, just recently there has been added to the Hornby-Dublo system a simple Goods Train Set providing just the components that you want for starting things off. Probably some of you have seen this EDG16 Goods Train Set already, but in any case I expect that a note about it will be of interest.

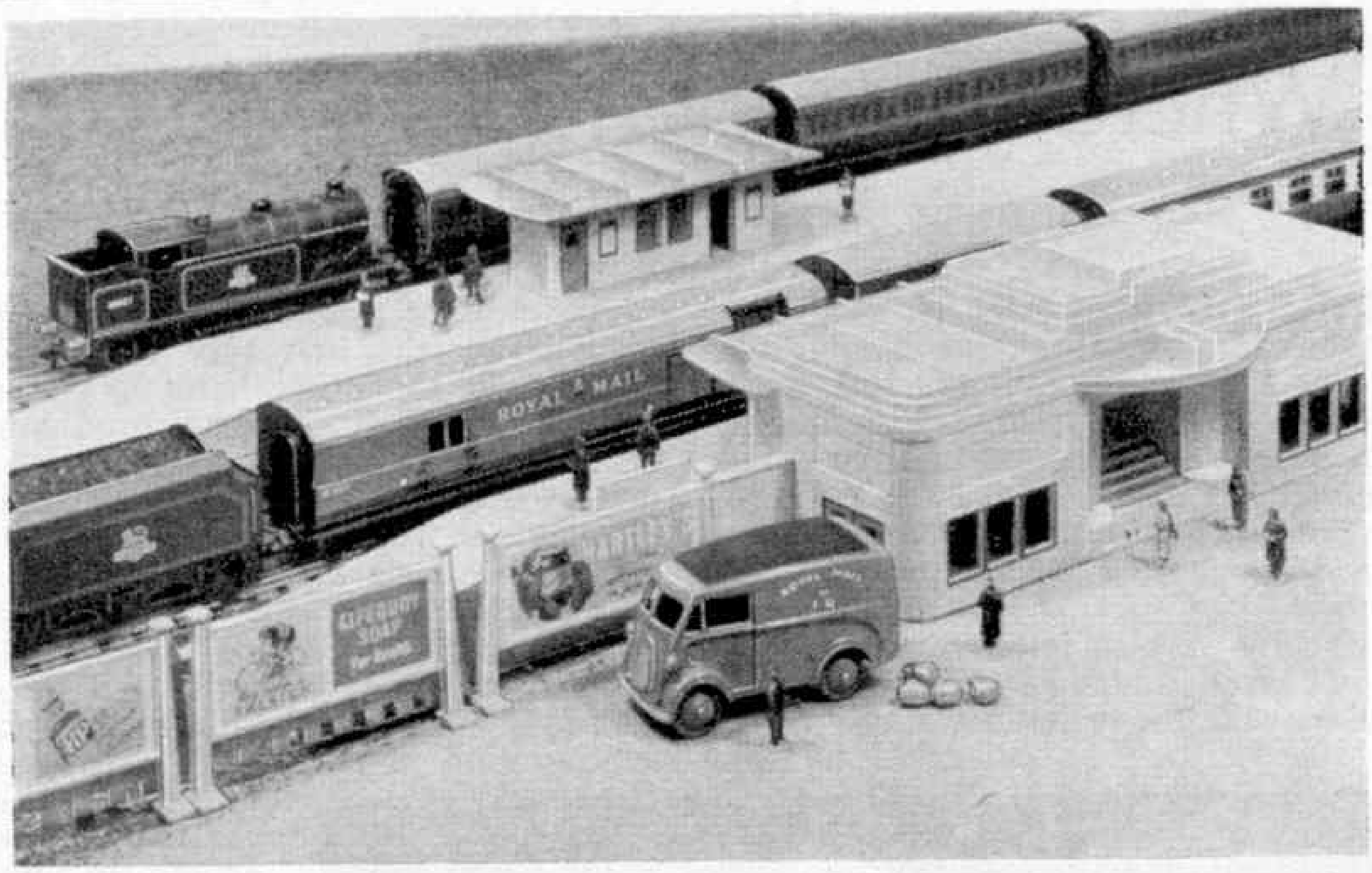
The well tried and popular Hornby-Dublo EDL17 Locomotive is included in the Set, and there are two standard Open Wagons and a Goods Brake Van. This simple make-up, together with a slight modification of the rail contents, results in quite a favourable price, and this I am sure will appeal to those who are about to begin the splendid Hornby-Dublo hobby. The rails provided form an oval track. So the railway can start off in the simplest way, but I am sure that none of those who begin with this attractive Train Set will lose any time in adding to it.

I have learned from your letters that the addition to the Hornby-Dublo range of the T.P.O. Mail Van Set components as separate items has resulted in a great increase in postal business on many Hornby-Dublo layouts. I am not surprised, for it is great fun to run a *Special Mail*. The picture above shows a train of this kind, with the T.P.O. net extended ready to take up the Mail Bag suspended from the lineside standard.

Above, the Hornby-Dublo "Special Mail" passes the Lineside Apparatus. You cannot see the Mail Bag, which has just landed in the lineside "net," but the Bag to be picked up by the train is hanging ready on the standard.

Where there are two T.P.O. Vans coupled together like those shown in this illustration, both of them can discharge mail into the lineside receiver if the operator keeps the push button Switch pressed down while they pass the apparatus. But only one Van, the leading one, will be able to take up a Mail Bag. In such circumstances you may arrange to operate the individual vans on alternate circuits of the track. Nice timing with the push button Switch will be needed for this. It is not at all a bad plan to have the assistance of someone else to act as the postman on duty at the lineside. The fun can be even greater if a road motor service is developed to work in connection with the T.P.O. mail services on the railway.

Here is a chance to use very effectively the Royal Mail Van, Dinky Toys No. 260, and driving this and seeing to the Lineside Apparatus will be just the job for younger members of the staff. This Dinky Toys vehicle may look too big, for its type, for some of your layouts, but real Royal Mail motor vans vary in size, so you can suppose that your Dinky Toy is one of the bigger ones. In any case, it



Postal business is a feature of the traffic at this station on a Hornby-Dublo layout. The connecting road service is provided by the Royal Mail Van, Dinky Toys No. 260, waiting outside the Station.

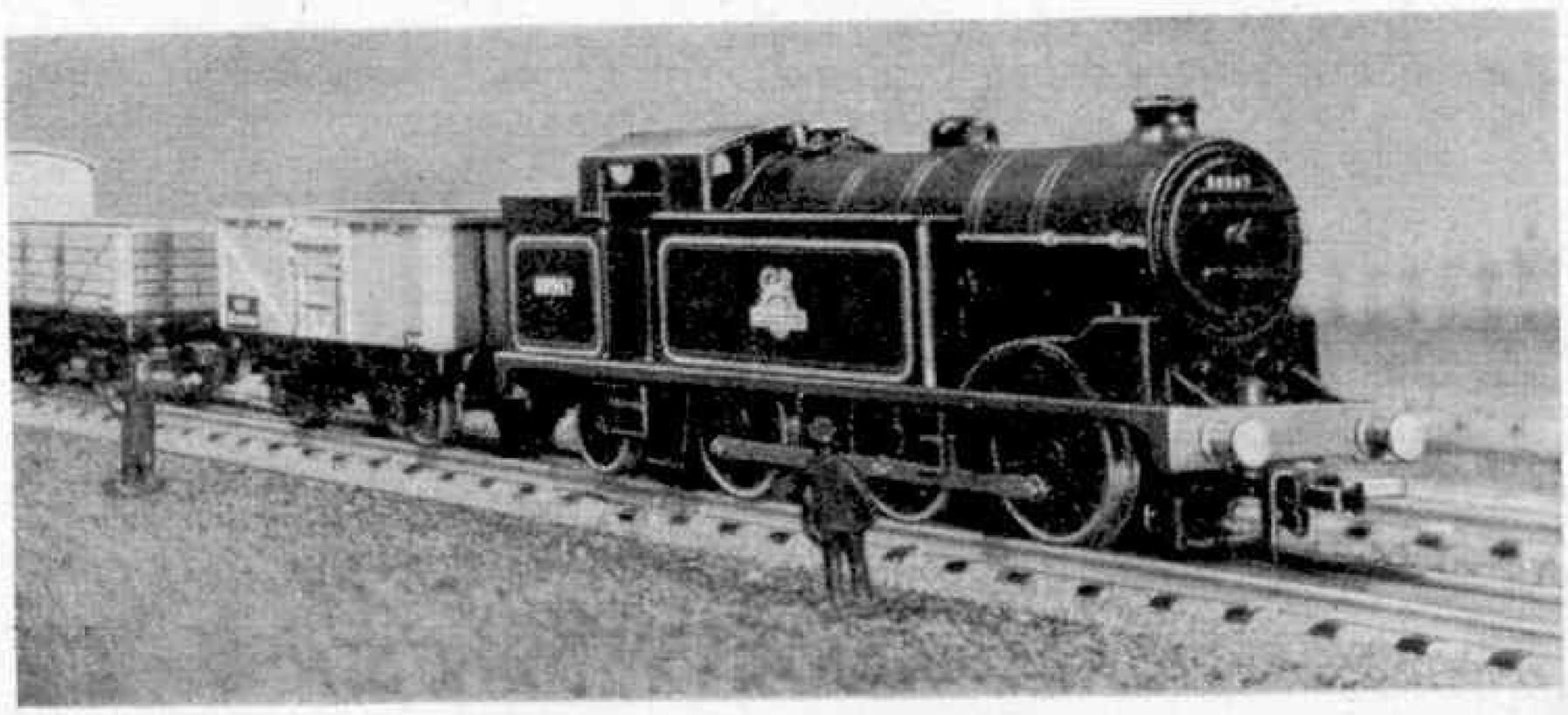
looks quite convincing drawn up outside the Station as you see it in one of my pictures.

You cannot actually load the Mail Bags into this Van, but the "driver" can always hold them in his hand while they are supposed to be on their way by road.

Apart from the exchange of mails at the lineside apparatus, a great deal of mail traffic is handled at station stops. So don't think that your Hornby-Dublo Mail train must not stop, or at any rate, need not call at intermediate stations in the course of its long run. It should stop now and again, and you can imagine a great deal of postal activity on the platform for a brief spell, followed by the departure of the train once more; and a little later the road Mail Van or Vans can be driven smartly away.

Many of you have written to me about the T.P.O. Mail Van Set, its components and their use. I must make it quite clear, again, that the power supply by which the T.P.O. is operated *must* be quite separate from that used for train driving. Another point is that the train should be run at a nice steady speed. The position of the lineside apparatus needs a little thought. From the track point of view, the lineside apparatus must have a straight section of at least a Straight Half Rail at each end.

One or two other points have been raised in correspondence, and I hope to deal with these later on.



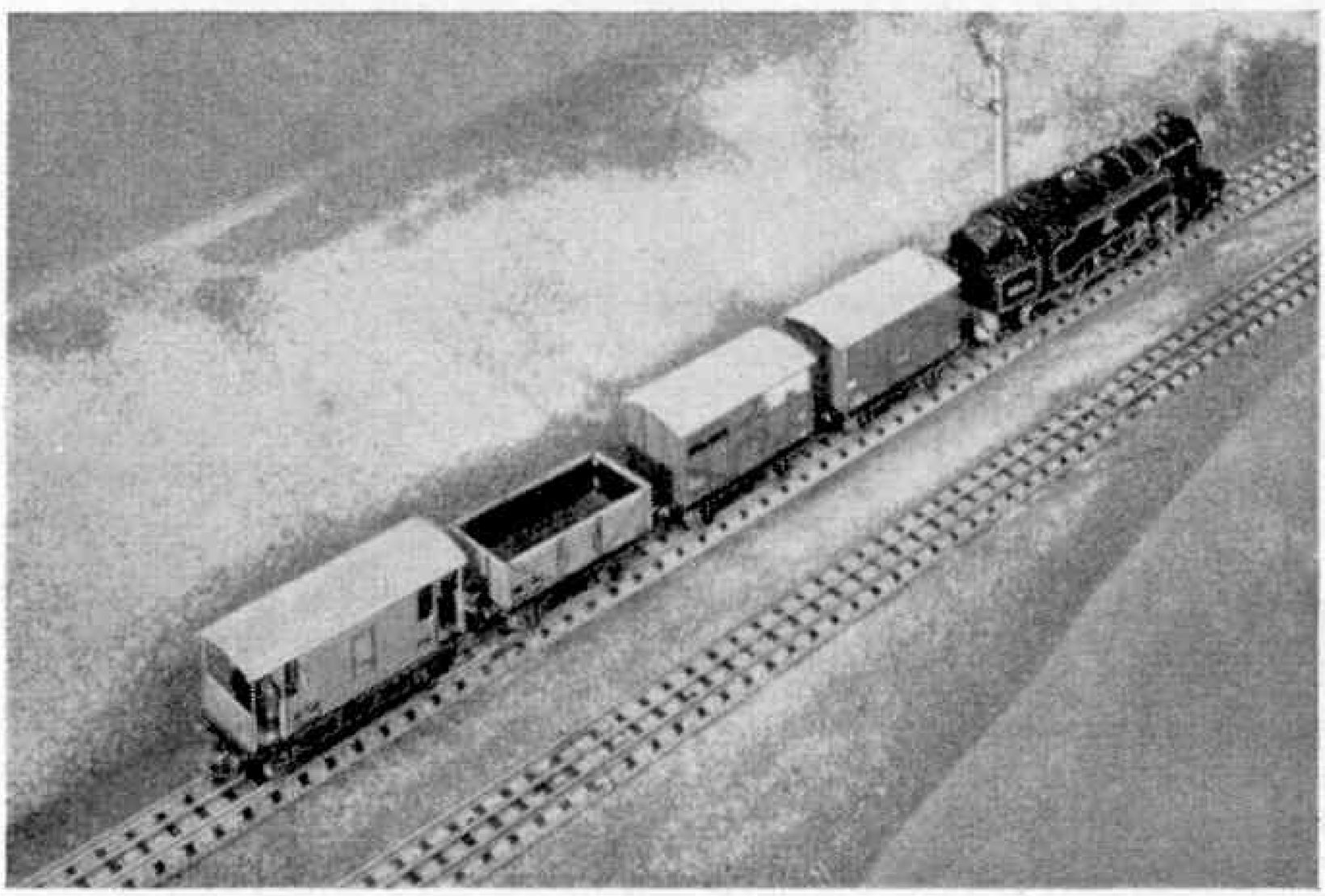
"Back Up" is the instruction from the Shunter, as the Hornby-Dublo 0-6-2 Tank pushes the Mineral Wagon towards some other vehicles to be coupled up.

Where Does the Railway Run?

Lineside Topics in Hornby-Dublo

ALTHOUGH some Hornby-Dublo layouts are operated quite happily by their owners in perfectly plain surroundings on a simple baseboard, there is little doubt that many more enthusiasts take the view that things are made much more realistic if the railway has some town or country to run through and so appears to "go somewhere."

It is really easy to improve the simple type of layout board, and even the enthusiast who has to put his trains away when running is over can readily provide some lineside and other items to improve the general scene. With permanent systems there is practically no limit to the scope of the surrounding effects, and during past months the pages of the *M.M.* have included many pictures of Hornby-Dublo railways in which special attention has been given to the realistic presentation of the railway as a whole.



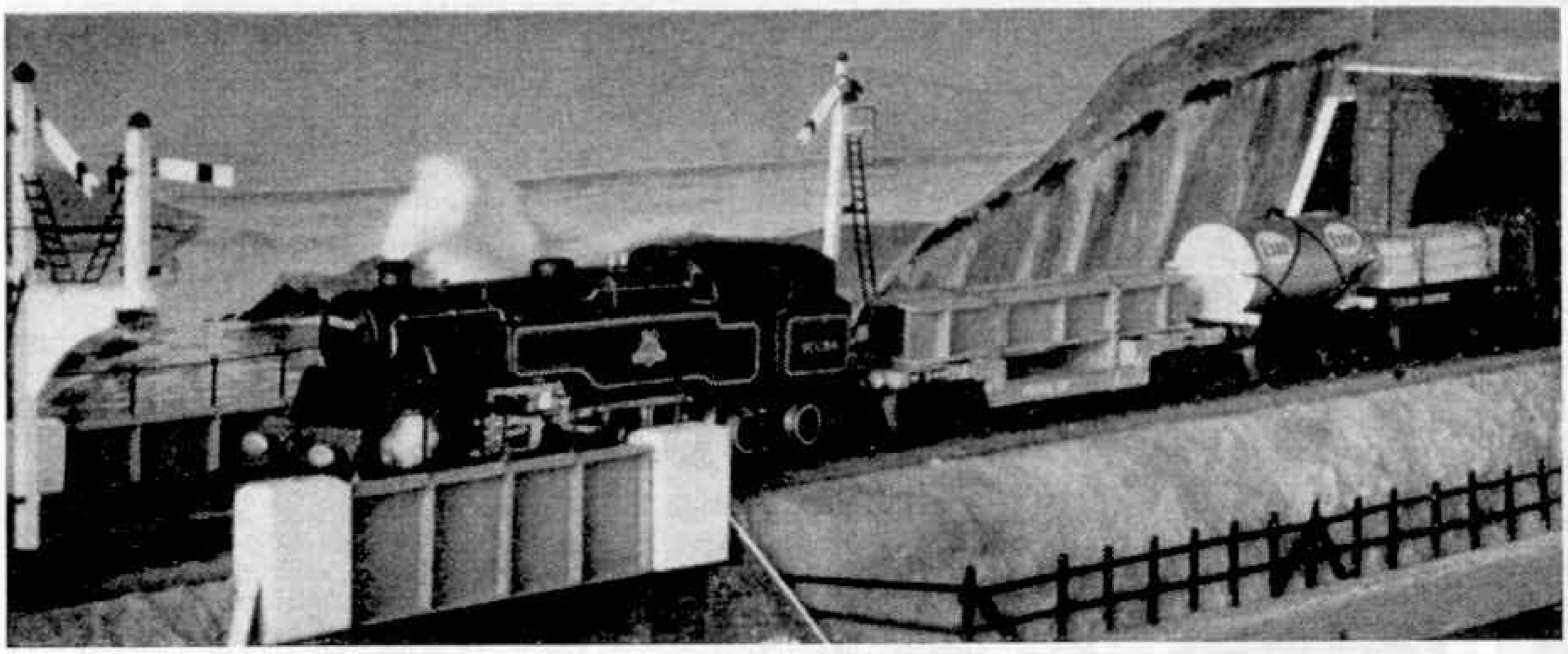
A short goods train in charge of a Hornby-Dublo 2-6-4T makes its way through a cutting. Evidently the railway runs through chalky ground at this point.

Now let us see what the home-worker can do to improve his layout in this respect. The first thing is to get away from the stark appearance a plain timber or composition baseboard presents. Paint is quite effective and where a baseboard has to stand a good deal of handling, in setting up and in removal for storage purposes when running is over perhaps, it is probably the best type of surface to apply. On the other hand, good effects follow the use of sand, coloured sawdust or one or other of the surfacing or ballast materials for miniature railways that can be had at many hobby shops, fixing whatever is used with a suitable adhesive. Any material of this kind should be carefully applied, and surplus should be removed before the board is put into use.

Simple walls or background scenes, and individual buildings, can be carried out quite effectively, and here you can get useful ideas by looking out during a railway journey, or better still perhaps, examining railway pictures, in which railway scenes are already reduced in scale so that their effect can be better judged.

Embankments give a real air to model railways, and almost every miniature railway engineer has his own favourite method of making them. Whatever the covering material may be, it is usual to provide a framework knocked up with rough lengths of wood. Those who go in for really permanent structures can cover this with wire mesh, over which suitable modelling material, such as plaster of good quality, can be laid. But you can get convincing results with such simple material as ordinary newspaper, or perhaps brown paper, well pasted and crumpled—rather a messy business—before being laid over the prepared framework. Paint, sawdust, sand and small stones can be used to dress up this apparently unpromising material when it is dry and set.

A lot can be done with cardboard and wood strip, and in this direction one of our readers, Mr. R. K. Battson, some of



A section of line incorporating various items of cardboard modelling and scenic background. This is the work of R. K. Battson, whose notes are incorporated in the accompanying article.

whose work you see in the upper picture on this page, has obtained some really splendid results. On this layout the girders on the Well Wagon and those of the bridge, also the bridge retaining walls, the tunnel mouths, the fencing and all the signals except the actual posts, have a convincingly solid air—and all are made largely of cardboard.

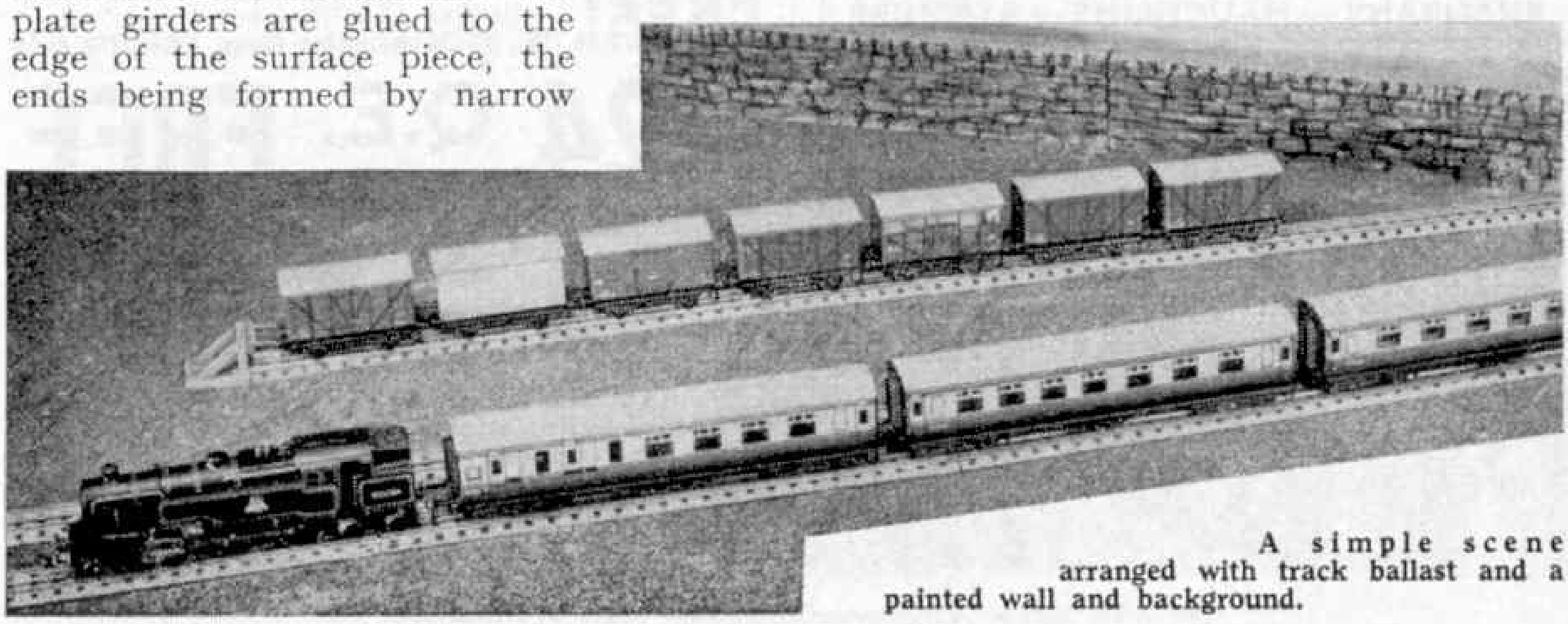
"Cardboard is simple and clean in working," says this enthusiast. "It requires no costly tools. A steel straight-edge and a stiff-backed razor blade will do all you want—but mind your fingers!" Quite right.

"The girder work consists entirely of strips of varying widths, glued up with Durofix, which is clean and quick-setting, and afterwards painted either flat grey or red oxide. The bridge, the track surface of the embankment, and the sides (except for the actual bridge opening) are of ½ in. wood, afterwards covered with water-coloured medical lint. The plate girders are glued to the edge of the surface piece, the ends being formed by narrow wood blocks painted to represent concrete.

"The brick walling is cut from sheet card, on which the lines of the brickwork are scribed with the straight-edge and a divider point, the vertical joints being impressed with an ⅛ in. chisel. A good 'mixed brick' effect is then applied by washing over a fairly strong mix of Vandyke Brown poster colour, and while still wet, dropping in patches of vermilion, blue and green. A little practice on this work is advisable on scrap card, but the result, which, of course, dries matt, can be very convincing, and much superior to brick papers, which are apt to be monotonous in their colouring.

"The tunnel mouths are treated in the same way, the curve of the arch being cut with a fine-toothed fretsaw. The face can be improved with brick piers and string course in scribed strip card, and a coping strip of white card, slightly dirtied, added to finish off the construction. Do not omit the smoke effects above the tracks which should be added to dilute black when the rest of the work is dry."

Well, there are some useful hints that will no doubt be applied by many of you.



A simple scene arranged with track ballast and a painted wall and background.

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For other Stamp Advertisements see also pages 312 and xviii

Stamp Collectors' Corner

By F. E. Metcalfe

STAMPS AS AN INVESTMENT

ONE hears quite a lot about the investment possibilities of postage stamps nowadays, more perhaps than was the case in the earlier days of the hobby. This is not because modern collectors are more mercenary than the old timers, as is so often claimed, but simply because collectors spend so much more on their hobby than formerly.

We hear about Penny Blacks costing sixpence each, and Cape Triangulars a shilling, in the good old days. This is perfectly true, for the writer of these lines has actually bought good copies at these figures. Alas, it is those who boast about getting these stamps so cheaply, and also grumble about collectors today going in for the more recent issues, who have forced prices for the classics up so much that those who can afford them must study the financial angle.

A collector of today is not satisfied with the grubby damaged specimens that were accepted previously with the same enthusiasm as perfect copies, and here I would like to interpolate a word or two before I go any further into the question of stamps as an investment.

Whatever doubts one may have about the investment possibilities of stamps, there is not the slightest doubt that there is no future for anything but the best. In other words bad copies are bad buys, and cannot be anything else. This is the great lesson that all would-be collectors must learn thoroughly.

If by a good investment, it is meant that a collection should show an actual profit when sold, it can be stated without more ado that stamps will rarely show a profit in cash alone. Why should they? But if one adds the pleasure that a well-formed collection can give to the credit side of the deal, then if reasonable care has been taken as to prices paid, etc., there will be little to grumble about.

Unfortunately there are a number of collectors who do expect to have the whole of their cake, after having eaten a good wedge of it in the way of enjoyment. These will always feel that they spent a lot more on their stamps than they ever got back. It is perhaps a pity that those who think like this ever collect at all, for they will only reap disappointment.

Since the modern collector spends more on his stamps than he can afford to throw away, he is fully entitled to consider the possible resale value of what he buys, and to him I would now like to address a few comments.

The older issues, which cost sums that bear no relation to face value, are likely to show a loss, unless you can wait a number of years before selling or know how to pick out the good things.

Generally speaking, the old classics in superb condition gradually increase in value all the time. But stamps have to rise an awful lot before a dealer will pay you more for them than he charged you, for his profit margin has to be considerable. The rise indeed must be much greater than that expected for modern stamps, where the face value plays a part in the price. That is why I contend that modern stamps are more likely to prove a good investment than the older issues.

To illustrate what I mean, let us consider British Commonwealth stamps of the present reign. Most of these are current, so you can buy at current rates. This means that you pay about 20 per cent. over the face value. If you want to sell soon after you have bought, the dealer can pay you face value if he needs the stamps. If he doesn't, it should not be difficult to find a collector who will pay face, if the stamps are in perfect condition. So at the worst the loss is not large.

But suppose you continue collecting. One stamp after another will then go obsolete, and with reasonable luck you will at least get your original outlay back. So you will have had your fun for nothing. Collections of modern mint colonials do go at under face at times, but even so the loss is nothing near as large as it would have been if the older stamps had been bought, and then sold soon after purchase.

I consider the stamps of the present reign the best investment, with those of the K.G. VI period a good second. Those who formed their collections of the latter issues a few years ago, while some of the better stamps were current, have little to grumble about. And those who get in on the ground floor of the Queen's stamps will probably do as well later on. But don't buy stamps today and expect to sell them tomorrow at a better price. Dealers would not sell to you if that was going to be the case!

Do not think that I am against the older issues. As a matter of fact, having lived for a number of years in South America, I formed an affection for the early issues of Argentina and Uruguay, and still retain that liking. But in spite of my thorough knowledge of the Rivadavias, Diligencies, etc., I would not expect to buy now and sell tomorrow at a profit. On the other hand, I would stand a much better chance of cutting my loss if I had gone in for the British Commonwealth issues of the present period, for the reasons already given.

And now let me sum up. Do not expect to buy any stamps with any certainty that they will sell for a higher price than you gave. Some may, but others will show a loss. Better to try and curb the investment complex, and only buy what you can well afford. Take care of your stamps. Limit your field, remembering that poor copies are dear at any price.

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For other Stamp Advertisements see also pages 310 and xviii

Stamp Gossip

THOSE OVERPRINTS

WHETHER collectors like overprinted stamps or not, those who go in for Q.E. II issues have had to take plenty of notice of them recently, for there have been all kinds of changes. The Tudor Crown has given way to St. Edward's Crown in the watermark; Tangier has closed down, after a useful life of a hundred years, and has celebrated this by overprinting the complete current set of our own British stamps; and to crown it all we have had a new set altogether, for fifteen current Great Britain stamps from ½d. to 10/– have been overprinted *Qater*, the name of a district in the Persian Gulf.

In addition, the anna values of the other Persian Gulf territories, such as Bahrain, have been changed to the new coinage of India, which now has *naye paise* instead of *pies* and *annas*. A hundred of these funny sounding things make a rupee.

The point of this is that most of the stamps that have been changed recently can still be obtained at very little over face value. So now is the time to fill those blanks, if you have any, for I think that one day these stamps will be quite hard to obtain, and that will mean higher prices than those prevailing today.

TRINIDAD 1c./2c. PROVISIONAL

There must be a lot of *M.M.* readers who were interested in the news that late in December Trinidad, claiming to be short of 1c. stamps owing to a supposed delay in the arrival of the plane bringing supplies, surcharged over half a million of the 2c. stamps to make up the shortage. The new printing arrived the day the provisionals were put on sale, so less than a fifth of the total number overprinted were allowed to be sold.

These stamps are now selling at anything up to ten shillings each, and as the overprint is a very simple printing job, I am sorry to have to report that forgeries are already on the market.

These forgeries can be detected by experts, but the ordinary collector could be deceived, so a word of warning. If you collect Q.E. II stamps in general, or Trinidad in particular, you will want to buy a copy. Take great care that you go only to a good dealer. That is the only way to be certain that you have got a genuine overprint.

FINE DESIGNS

A reader has written to tell me that he is not particularly interested in stamps as stamps, but is very keen about the designs of some of them. He added that some remarks of mine about the beautiful designs of many countries had made him more keen than ever, and that now he was making several collections, each dealing with a special subject.

In other words, he is collecting thematically, or topically, as they say more nicely, but not quite correctly, in the U.S.A. He said he would like to see illustrated one of the very fine Austrian stamps, to show other readers how attractive these stamps are. Well, I have picked one that I consider a beauty. There are more like it. Austria is a fine country to collect.

THE COLONIES

Another reader wrote to say that he was tired of reading British stamp papers that pay so much attention to our own Colonial stamps, but have little to say about the much more beautiful issues of colonial France. He asked if I could give them a few words.

I have often referred to these stamps, for I too am greatly attracted by many of the designs. If our stamp magazines refer a lot to British Colonial stamps, it is because they are so much more popular here than any others. Still, to satisfy my correspondent, I have asked the Editor to illustrate a fine French stamp that among other things shows date palms, which are romantic enough, and a windmill that is not. But the stamp is a nice one, isn't it?

ISRAEL

It seems that this tight little country cannot keep out of the news. But however hard put to it may be, it continues to turn out some of the most beautifully designed stamps in the world. As a quiet tip, the stamps of few countries are more popular.

The stamp illustrated here is one that was issued in April to commemorate the Ninth Anniversary of the Proclamation of Israel. It is printed in a beautiful blue and black, and is a gem.

For those who want to take up Israel stamps there is a fine catalogue, the Mosden Catalogue, which I thoroughly recommend. It is the work of those who understand these stamps. Your dealer will be able to get you a copy. And the Israel Post Office also issues a catalogue. To get a copy of this from the Jerusalem Post Office, you have to send five reply coupons, which you can buy at your own post office.

THE MONTH'S TIP

Many collectors got a set of the 1956 Health stamps of New Zealand when they came out towards the end of last year. One value, the 1½d.+½d. (C.W. No. H38) appeared in a deep reddish brown. Later some of a very much darker shade appeared, a dark sepia. These will be catalogued H38a, and as few dealers knew anything about them until they were off sale, this dark stamp looks like being scarce. Check up which one you have and then take a look round for the other shade. When you find it tuck it in your album and forget it for the time being.

The "Essex Ferry"—(*Continued from page 267*)

Great Britain and all parts of the continent of Europe, with the exception of Russia and Spain. It is particularly useful for large pieces of machinery and also for fragile articles, while perishable goods can travel throughout under refrigeration, as no intermediate loading or unloading is required.

Accommodation for the officers and crew is on the upper deck, where there is also provision for 12 passengers, the maximum number that can be carried in a cargo vessel. There are 26 lifeboats, carried at the after end of the boat deck, and in addition to the equipment for radio the *Essex Ferry* is fitted with an echo sounder, a Decca Navigator and radar.

Fastest on Wings—(*Continued from page 273*)

were getting nearer and nearer to the so-called sound barrier which could cause buffeting and even loss of control.

From 1947 for several years the record stayed in America, raised by a succession of U.S.A.F. and U.S. Navy jets, of which some were standard fighter aircraft, flying with their full load of guns and ammunition. The limit was reached in October, 1953, when Lt.-Col. Everest flew an F-100 Super Sabre at 755 m.p.h., within a fraction of the speed of sound. The F.A.I. revised its rules, permitting speed records at any height provided they could be timed with great accuracy by using radar and photographic apparatus, at which Col. Horace Hanes set up the first supersonic speed record of 822 m.p.h. in another Super Sabre at a height of about 35,000 ft.

His record lasted from August 1955 to March 1956, when Peter Twiss became the first man to set up a record of over 1,000 m.p.h., and raised the world air speed record by the unprecedented margin of 310 m.p.h. in one go.

Britain has now held this greatest of all records for more than a year, which is a very long time in these days of rapid progress. That it has not been beaten shows just how difficult it is to beat, for only an aeroplane with exceptionally fine controllability, a superbly clean design and the ability to fly fast for long periods can satisfy the F.A.I. rules which keep away the freaks, however spectacular they may be in other respects.

A Giant Transformer's Journey—

(*Continued from page 297*)

was built by Cranes, and is of a type that has been described and illustrated on several occasions in the *M.M.* Its main frame consists of two girders, connected to a 12-wheeled bogie at each end by a swan-neck, and the height and width can be adjusted to suit the many types of loads for which it is used. If necessary, the girders can be disconnected from the bogies and lowered to the road in order to ease the operations of loading or unloading the giant pieces of machinery carried. In spite of the length of the vehicle, the two bogies automatically steer through the same path, but there is a steering wheel at the back for use when necessary.

For the information in this article, and for the illustrations, I am indebted to the Editor of *The Leyland Journal*.

STEAM TRACTION ENGINE RALLY AT REMPSTONE

In recent years Steam Traction Engine Rallies have become popular summer events, and the one organised at Rempstone in 1956 by Mr. J. T. Beeby was the largest in the country in respect of the number of traction engines that took part. This year's Rally there—to be held on Saturday and Sunday, 29th and 30th June—will be even more ambitious and, it is hoped, will include several steam traction engines never seen at Rallies before. Among the engines will be some very interesting showman's types which have not been on exhibition for years.

On both days the Rally will begin at 2.0 p.m. On the Saturday, in addition to the various races in which the engines will compete, there will be agricultural demonstrations by compound and single cylinder traction engines. Other attractions will be displays of veteran motor cars and motor cycles, and a models display in a large tent. On the Sunday the Rally will open with a short Church service, with Fair organ accompaniment. Admission charges are 2/- Saturday, 1/6 on Sunday. Proceeds less expenses are for the aid of the blind in Nottingham.

Camping facilities are available. Details from Mr. J. T. Beeby, Steam Plough Works, Wymeswold Road, Rempstone, nr. Loughborough, Leics.

"THE RAILWAYMEN'S YEAR BOOK"

(Railway Publications Ltd., 5/-)

This Year Book for 1957 is a useful publication intended principally for reference by railwaymen—and railway women—themselves. Its contents are extremely varied and do not by any means include simply masses of statistics although there are numerous interesting figures and tables included in it. Railway facts as well are dealt with, and there are particulars of the various professional and other organisations that cater for the needs of the railway staff generally.

The enthusiast outside the railway service will find in the book plenty of the type of information that he likes, and there is no lack of illustrations.

"ABC CIVIL AIRCRAFT MARKINGS"

By John W. R. Taylor
(Ian Allan, price 2/6)

This new edition follows the same pattern as in previous years, except that the overseas airline fleet lists have been extended to include aircraft due for delivery during this year, even though the registrations are not yet available. The lists are arranged in alphabetical order of registrations, and the overseas section includes airline fleets in over 30 different countries. The data given in the lists has been completely revised and brought up to date, and all the 60 excellent half-tone illustrations are new.

WHERE IS SUTTON COLDFIELD?

The answer is easy. It is in Warwickshire, and the Scout Jamboree in August will be held there, and not in Wales, as stated in *Stamp Gossip* of the May *M.M.* So I apologise for the error and thank all those readers who wrote to me in shocked reproof.

The Editor.

THIS MONTH'S SPECIAL ARTICLES

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Fireside Fun

"Quiet room on top for those finishing off their home-work."
(Reproduced by courtesy of "The Leyland Journal").

Teacher: "You shouldn't talk like that to your playmate, Johnnie. Have you ever thought of heaping coals of fire on his head?"
Johnnie: "No teacher, I haven't, but it's a peach of an idea!"

* * * *

Ron: "I weighed 9½ lb. when I was born."
John: "I weighed 8½ lb."
Ron.: "Ha, ha, I weighed more than you."
John: "Oh well, you're older."

* * * *

Railway Porter (to referee at village football match): "Gimme my whistle back quick. The three-ten is waiting to go out!"

* * * *

Tim: "I hadn't been talking to the fellow for more than five minutes when he called me a fool."
Jim: "What caused the delay?"

* * * *

Teacher: "Really, Dan, your handwriting gets worse all the time."
Dan: "Well sir, if I wrote any clearer, you'd be finding fault with my spelling."

* * * *

Feeling sorry for one of his older inmates, who never received any callers on visiting day, the prison warden summoned the man to his office.
"Ben," he said kindly, "I notice you never get any callers. Don't you have any friends?"
"Sure," replied Ben, "but they're all in here."

* * * *

"Do you know why I am going to punish you, Arthur?"
"No Dad. Why?"
"Because you hit a boy smaller than yourself."
"Oh, I thought perhaps it was because I'm smaller than you."

* * * *

First cannibal: "Am I late for dinner?"
Second cannibal: "Yes, everybody's eaten."

* * * *

Explorer's wife (accepting her husband's helmet and gun, which had been found in the jungle): "Poor Henry! Something he disagreed with ate him."

Adolphus: "What do you think would go well with my purple and green socks?"
Timothy: "Hip boots."

* * * *

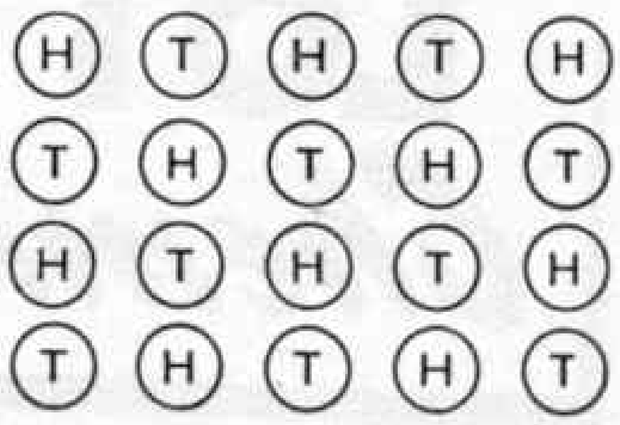
BRAIN TEASERS

WHAT NAME?

What six lettered name leaves eleven when two are taken from each end.

* * * *

HEADS AND TAILS



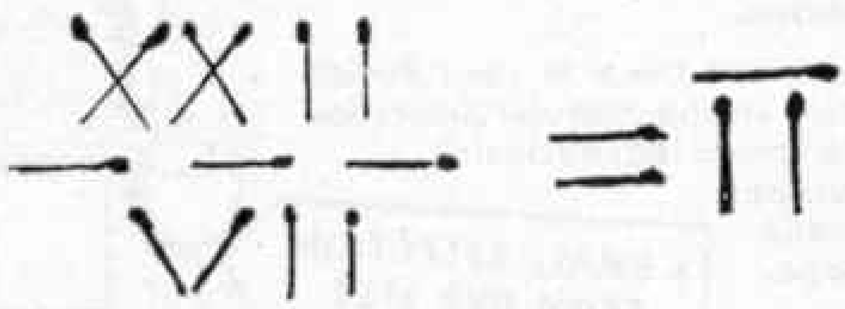
Arrange 20 coins head and tail upward alternately in four rows of five as shown. The problem is to rearrange them *in one move* so that each of the four rows consists either of all heads or of all tails. The operation involves several coins, but the changes of position are to be carried out in one continuous move. No coin is to be reversed.

* * * *

ANSWERS TO LAST MONTH'S PUZZLES

A Match Puzzle

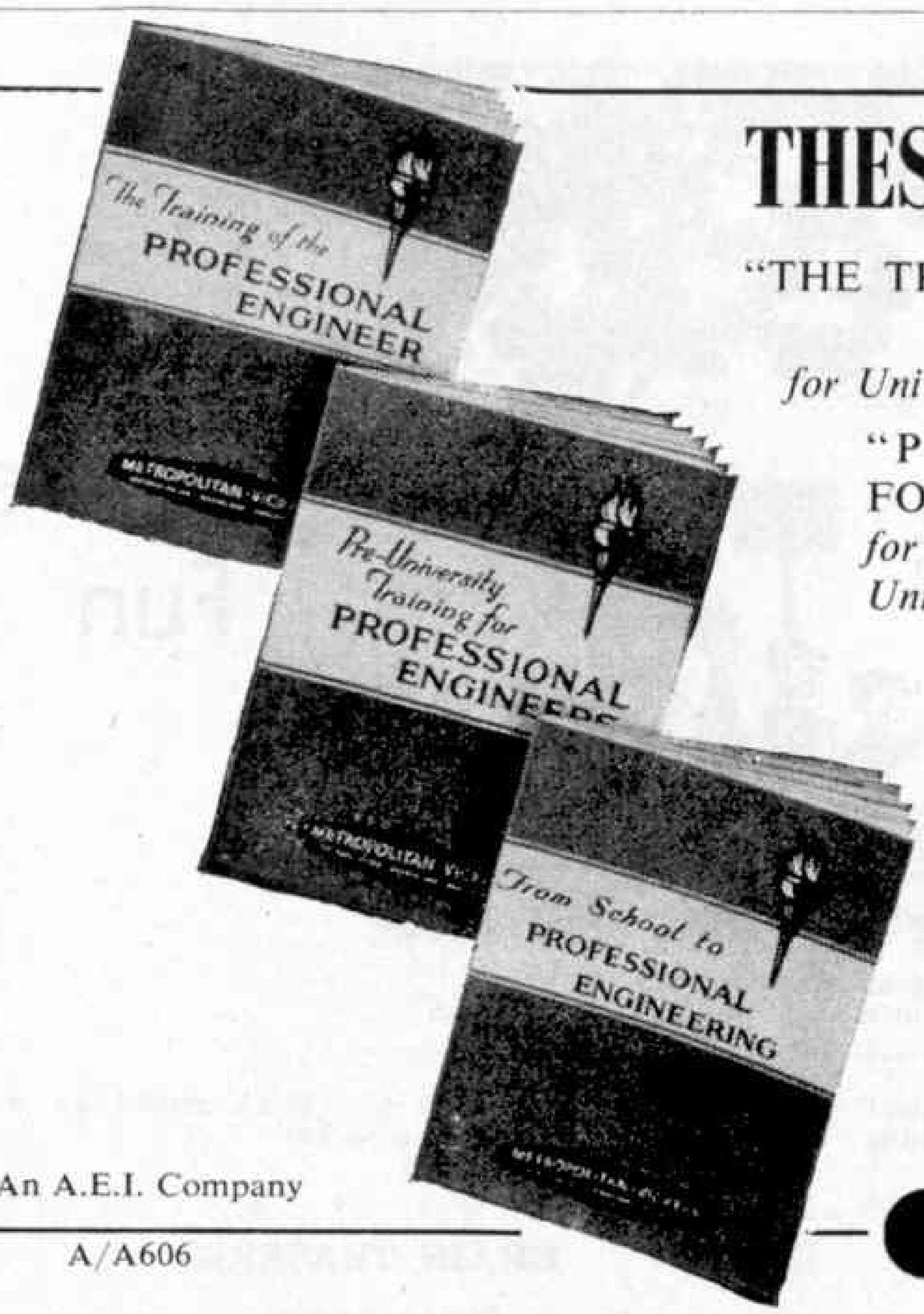
The solution to this intriguing match puzzle is shown in the sketch below.



* * * *

Name the Animal

The name of the animal is OX. The "X" is half the number 20 in Roman numerals.



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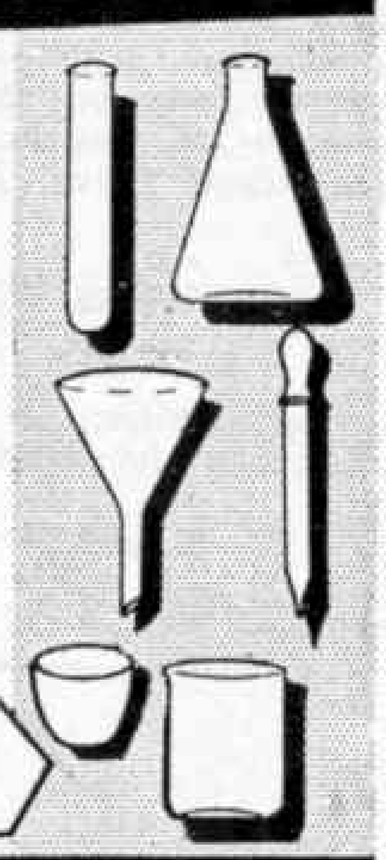

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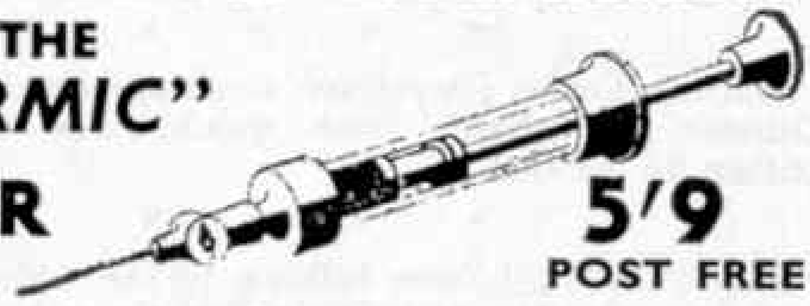

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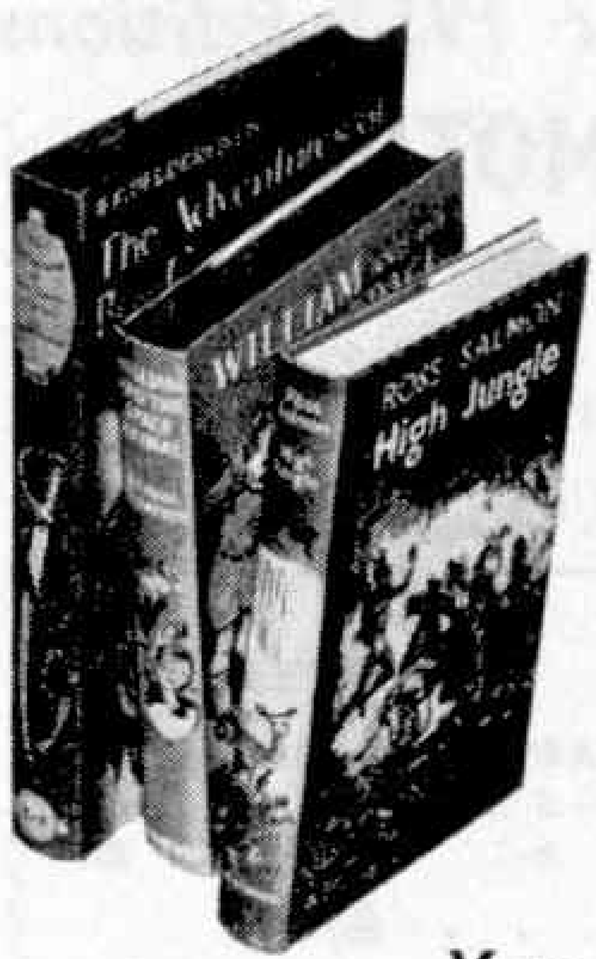

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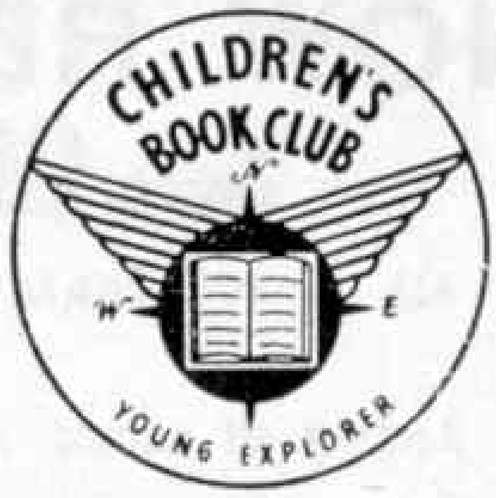

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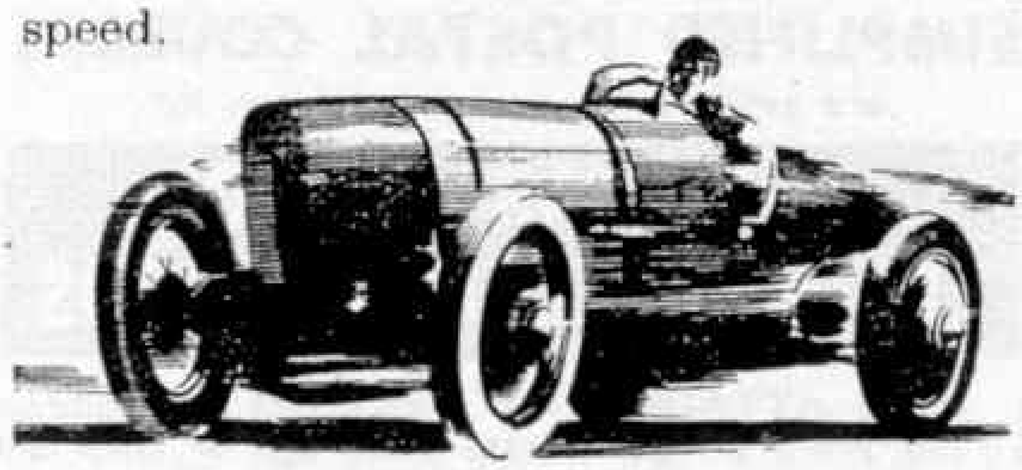

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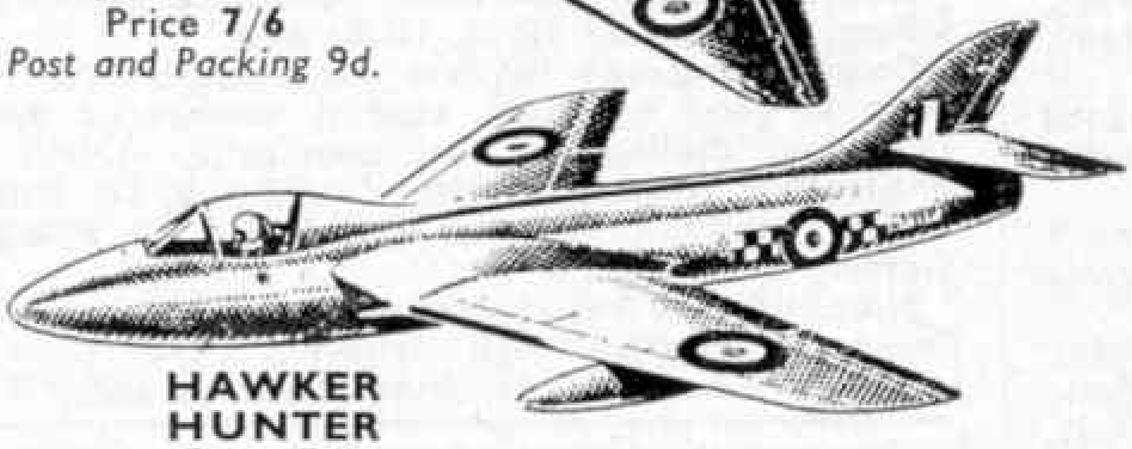

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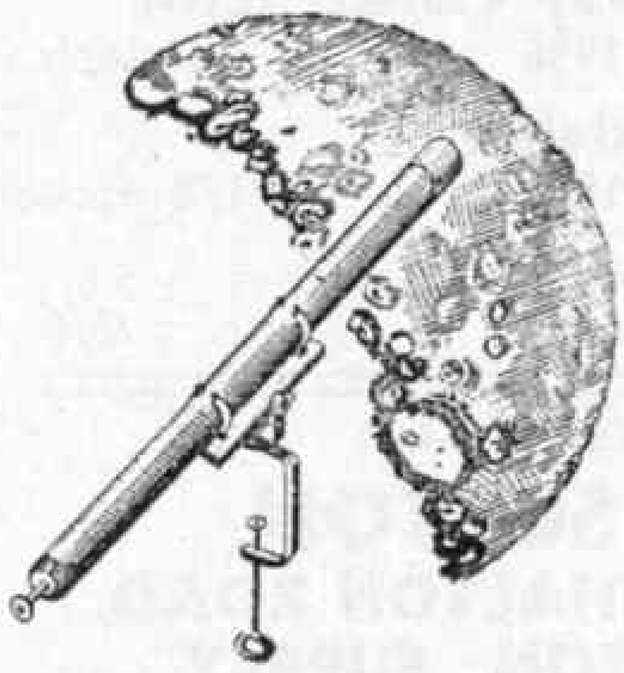

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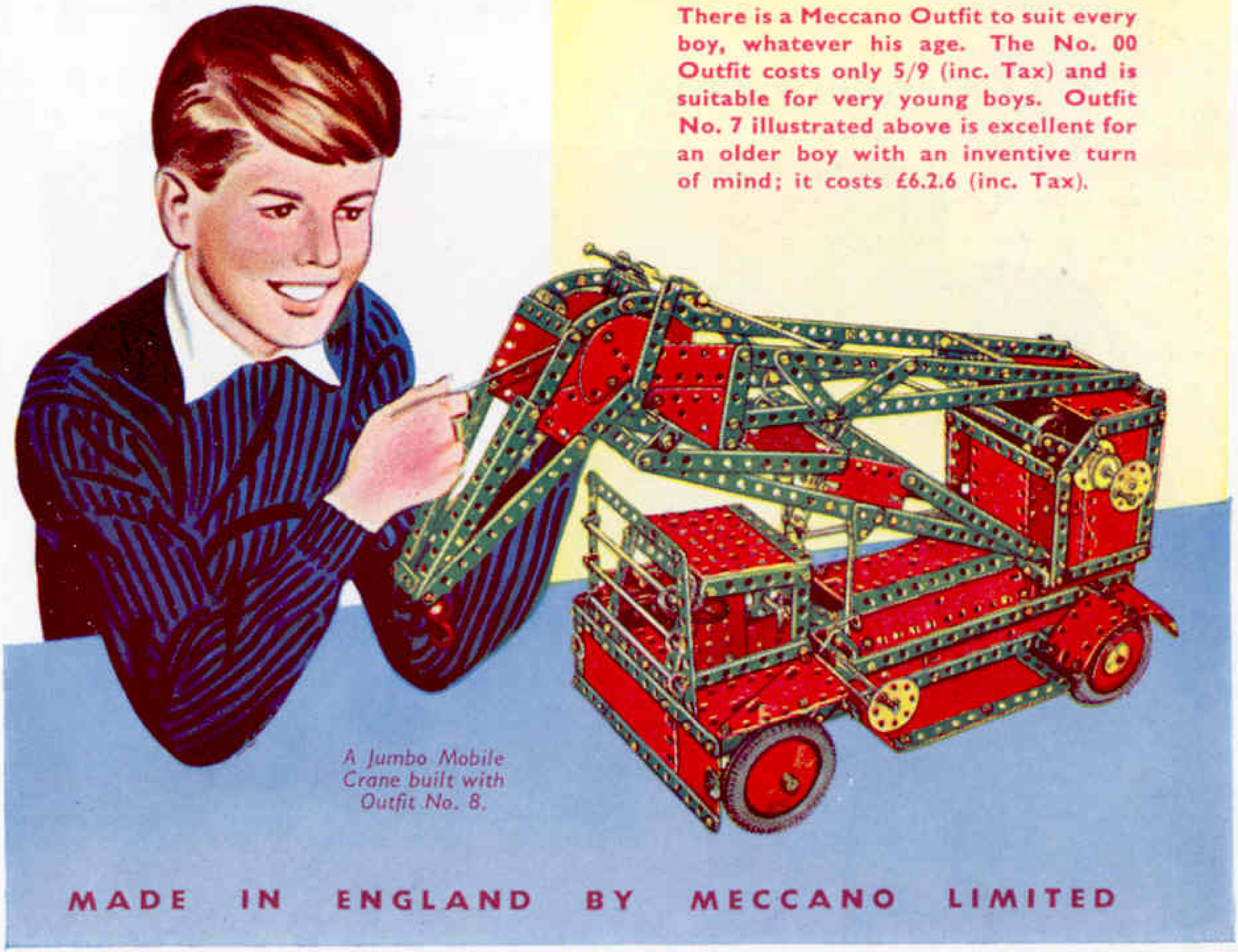

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MODEL OF THE MONTH

MECCANO ORRERY

Illustrated in the June 1957 issue of the "Meccano Magazine."

Construction of the Base

Two vertical $3\frac{1}{2}$" Angle Girders are bolted to a $5\frac{1}{2}$" Angle Girder 1 to form each side of the base. The $3\frac{1}{2}$" Angle Girders are braced by $1\frac{1}{2}$" Corner Brackets, and they are connected at their upper ends by a $2\frac{1}{2}$" Angle Girder. The sides of the base are connected by four $3\frac{1}{2}$" Angle Girders and the structure is braced by $2\frac{1}{2}$" Strips. A Toothed Disc from a Ball Thrust Race is fixed to the top of the base. The complete assembly is bolted to a suitable baseboard.

Assembly of the Rotating Arm

Two $18\frac{1}{2}$" Angle Girders are bolted together to form a channel girder 2, and this is fixed to the Flanged Disc of a Ball Thrust Race. The Flanged Disc and the Toothed Disc fixed to the base are then arranged with the Ball Cage between them, and an $11\frac{1}{2}$" Rod 3 is passed through the assembly. The lower end of this Rod is fixed in a Bush Wheel 4 bolted to two $2\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips attached to the base. A Collar is fixed on the Rod 3 to hold together the sections of the Ball Thrust Race.

Two $12\frac{1}{2}$" Angle Girders are connected to form a channel girder 5, and this is supported by two 2" Strips and two Corner Gussets bolted to the girder 2. A $2\frac{1}{2}$" x $2\frac{1}{2}$" Flat Plate 6 is fixed to one end of girder 2, and two 2" Angle Girders are bolted to the edges of the Flat Plate. An E20R(S) Electric Motor is fixed to the projecting ends of the 2" Angle Girders. A $7\frac{1}{2}$" Angle Girder 7 is connected to each side-plate of the Motor by an Angle Bracket, and is bolted to a $1\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip 8 fixed to the girder 5. The bolt securing the Double Angle Strip supports also a 1" x 1" Angle Bracket 9, and a $2\frac{1}{2}$" Strip passed over the Rod 3.

The Rod 3 is used to support the ball representing the sun.

Arrangement of the Main Drive

A Worm on the Motor armature shaft engages a 57-tooth Gear on an $11\frac{1}{2}$" Rod that carries also a Worm 10 and a $\frac{1}{2}$" Pinion 11. The $11\frac{1}{2}$" Rod is supported in a 1" x 1" Angle Bracket bolted to the Motor side-plate and connected to the Girder 7 on the same side by a Fishplate, and in a Flat Trunnion 12 bolted to a 2" Angle Girder. An $11\frac{1}{2}$" Rod 13 supported in the Flat Trunnion and in a Fishplate bolted to a 1" x $\frac{1}{2}$" Angle Bracket 14, carries a $\frac{1}{2}$" Pinion that meshes with the Pinion 11.

The Worm 10 drives a $\frac{3}{4}$" Pinion on a Rod mounted in the Flat Plate 6 and one of the Girders 7. A $\frac{1}{2}$" Pinion on the same Rod meshes with a $3\frac{1}{2}$" Gear on a Rod 15, which carries a $\frac{3}{4}$" Sprocket. The Sprocket is connected by Chain to the Toothed Disc of the Ball Thrust Race.

The Drive to the Earth

A $\frac{1}{2}$" Helical Gear on the end of Rod 13 drives a $1\frac{1}{2}$" Helical Gear

on a $6\frac{1}{2}$" Rod, which is mounted in a $1\frac{1}{2}$" and a $2\frac{1}{2}$" Strip bolted to the girders 2 and 5. The bolts fixing the $2\frac{1}{2}$" Strip secure also a 1" x 1" Angle Bracket 16.

The $6\frac{1}{2}$" Rod is fitted with a Coupling and a Collar, then an assembly formed by a $\frac{7}{8}$" Bevel Gear 17 fixed in a Socket Coupling, another Socket Coupling connected to the first by a Short Coupling, and a Face Plate 18 held in the upper Socket Coupling. Before the upper Socket Coupling is fixed on the Short Coupling, a 4" Circular Plate is passed over the Short Coupling so that the Circular Plate is able to rotate freely. The complete assembly of the Socket Couplings, the Bevel Gear and the Face Plate must be free to rotate on the $6\frac{1}{2}$" Rod. A $\frac{3}{4}$" Pinion 19 and a Coupling can now be fixed on the $6\frac{1}{2}$" Rod, and a Universal Coupling 20 is connected to the Coupling by a 1" Rod.

A Face Plate 21 is connected by Angle Brackets to $3\frac{1}{2}$" Strips, which are attached to Angle Brackets bolted to the Face Plate 18. A $1\frac{1}{2}$" Rod is passed through the boss of the Face Plate 21, is fitted with a $\frac{1}{2}$" Pinion 22, and is fixed in the Universal Coupling 20. Pinion 22 engages a $\frac{1}{2}$" Pinion on a $1\frac{1}{2}$" Rod mounted in a Coupling attached to Face Plate 21 by a $\frac{1}{2}$" Bolt. The upper end of the $1\frac{1}{2}$" Rod carries a Coupling used to support the globe representing the earth.

An $11\frac{1}{2}$" Rod is extended by a $1\frac{1}{2}$" Rod connected by a Coupling, and these Rods are mounted in the Angle Brackets 9 and 16. A $\frac{7}{8}$" Bevel Gear is fixed on the $1\frac{1}{2}$" Rod and meshes with a similar Bevel Gear fixed on the Rod 3. A $\frac{7}{8}$" Bevel Gear fixed on the end of the $11\frac{1}{2}$" Rod engages the Bevel Gear 17.

The Drive to the Moon

A Gear Ring is attached to the 4" Circular Plate but is spaced from it by a nut on each bolt. The arm supporting the Rod carrying the ball representing the moon is formed by three $3\frac{1}{2}$" Strips. These are bolted to the Circular Plate and they carry a Rod Socket. The arm is counter-balanced by eight $2\frac{1}{2}$" Curved Strips attached to a 2" Strip, which is bolted to the Circular Plate directly opposite to the arm.

A 2" Strip is bolted to the Face Plate 18, and a 3" Strip is placed on the $6\frac{1}{2}$" Rod between Pinion 19 and the Coupling above it. The 3" Strip is connected to the Face Plate 18 by a $\frac{1}{2}$" Reversed Angle Bracket. Pinion 19 drives a 50-tooth Gear 23 on a 1" Rod, which carries also a $\frac{3}{4}$" Pinion arranged below the Face Plate 18. This Pinion drives a 50-tooth Gear on a Rod 24, mounted in the 2" and the 3" Strips, and a $\frac{1}{2}$" Pinion 25 on the same Rod engages the Gear Ring.

Details of the Current Supply

A length of wire is attached to one terminal of the E20R(S) Electric Motor, and is connected to one of the Girders 7 by a bolt, so that the terminal is "earthed" to the frame of the model.

Four $2\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips are bolted to a Flanged Ring, and these are attached to the baseboard as shown. The Flanged Ring must be arranged so that the Rod 3 is located at the exact centre. A 1" x $\frac{1}{2}$" Angle Bracket is fixed on the second terminal of the Motor, and a $4\frac{1}{2}$" Strip 26 bolted to the Angle Bracket presses against the Flanged Ring. The enamel should be removed from the end of the Strip and from the edge of the Flanged Ring to ensure good electrical contact. One wire from the source of current-supply is connected to the Flanged Ring and the other is bolted to the base that supports the rotating arm.

PARTS REQUIRED

1 of No. 2A	2 of No. 18a	1 of No. 94
5 " " 3	2 " " 18b	1 " " 96a
1 " " 4	1 " " 20b	2 " " 108
6 " " 5	1 " " 24	2 " " 109
4 " " 6	3 " " 25	1 " " 111a
1 " " 6a	6 " " 26	12 " " 111c
2 " " 7a	2 " " 27	1 " " 125
2 " " 8	1 " " 27a	1 " " 126a
2 " " 8b	1 " " 27b	4 " " 133
2 " " 9	4 " " 30	1 " " 140
8 " " 9b	2 " " 32	1 " " 146a
2 " " 9d	110 " " 37a	1 " " 163
3 " " 9e	90 " " 37b	1 " " 167b
2 " " 10	34 " " 38	1 " " 168
6 " " 12	1 " " 48	2 " " 171
3 " " 12a	6 " " 48a	1 " " 179
2 " " 12b	10 " " 59	1 " " 180
4 " " 13	5 " " 63	1 " " 211a
2 " " 14	1 " " 63d	1 " " 211b
1 " " 16b	1 " " 72	1 E20R(S) Electric Motor.
3 " " 17	8 " " 90	