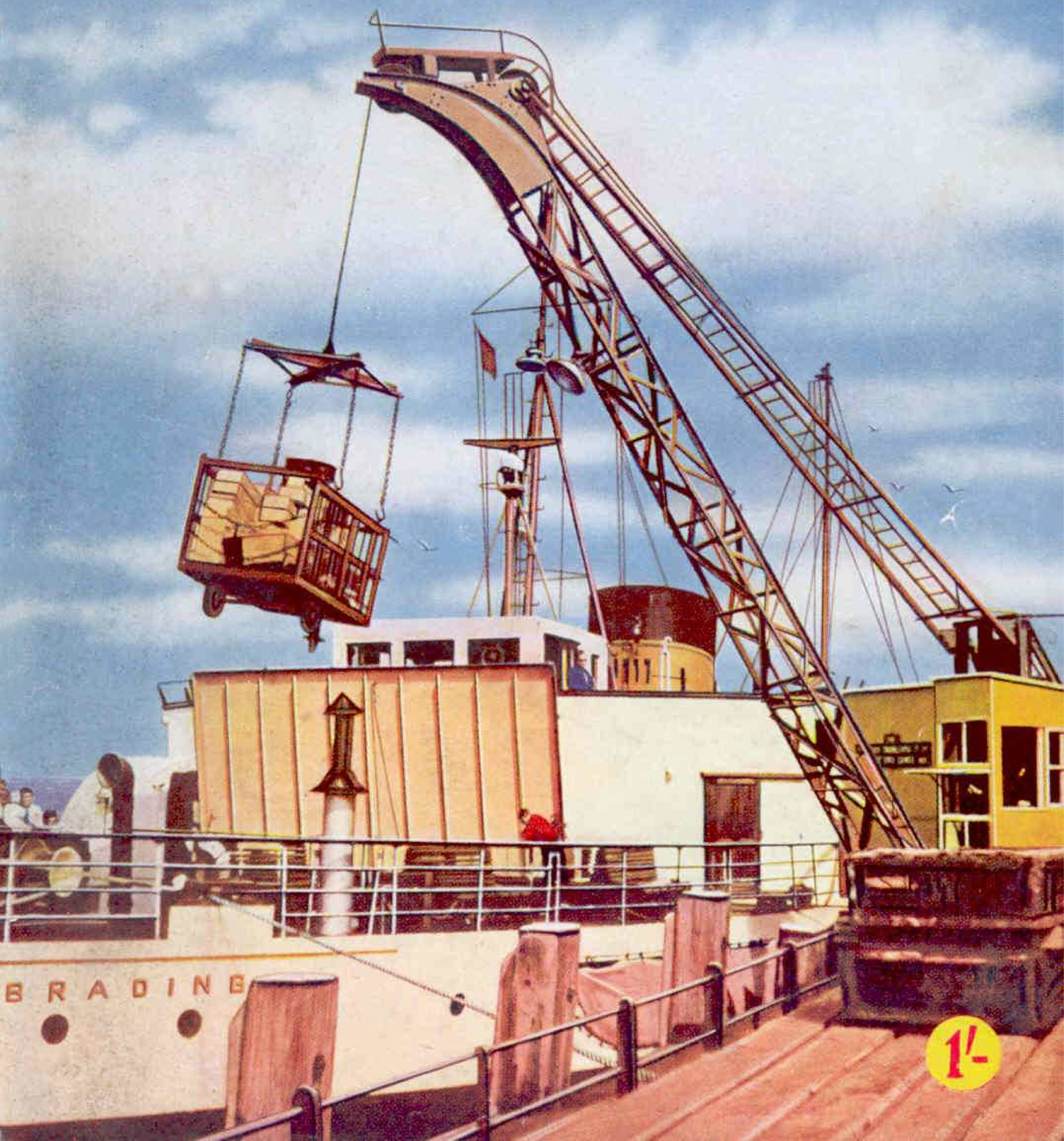
VOL. XLII No. 3 MARCH 1957

MECCANO MAGAZINE



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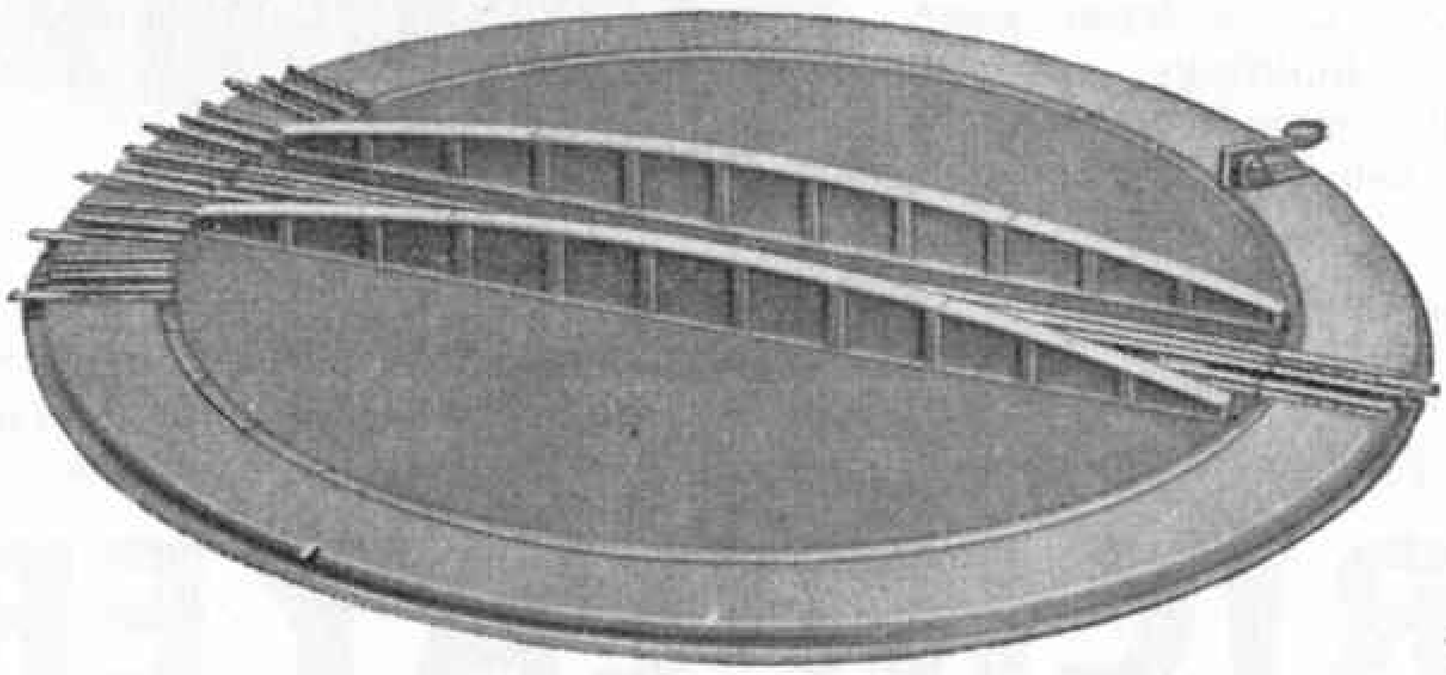

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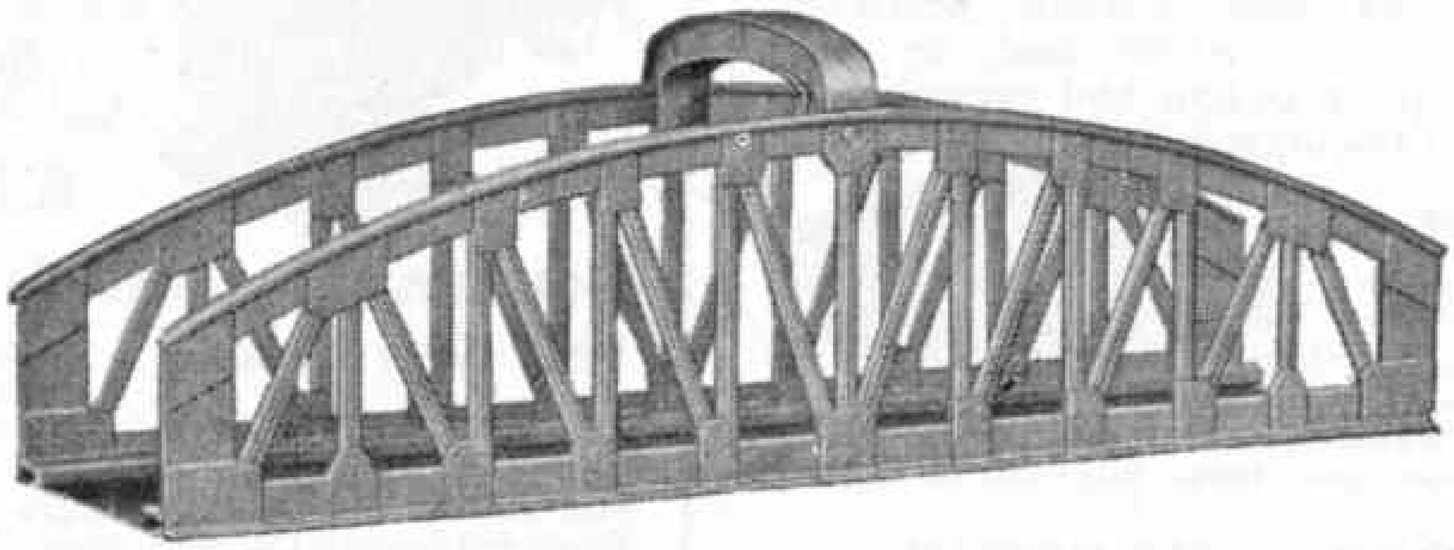

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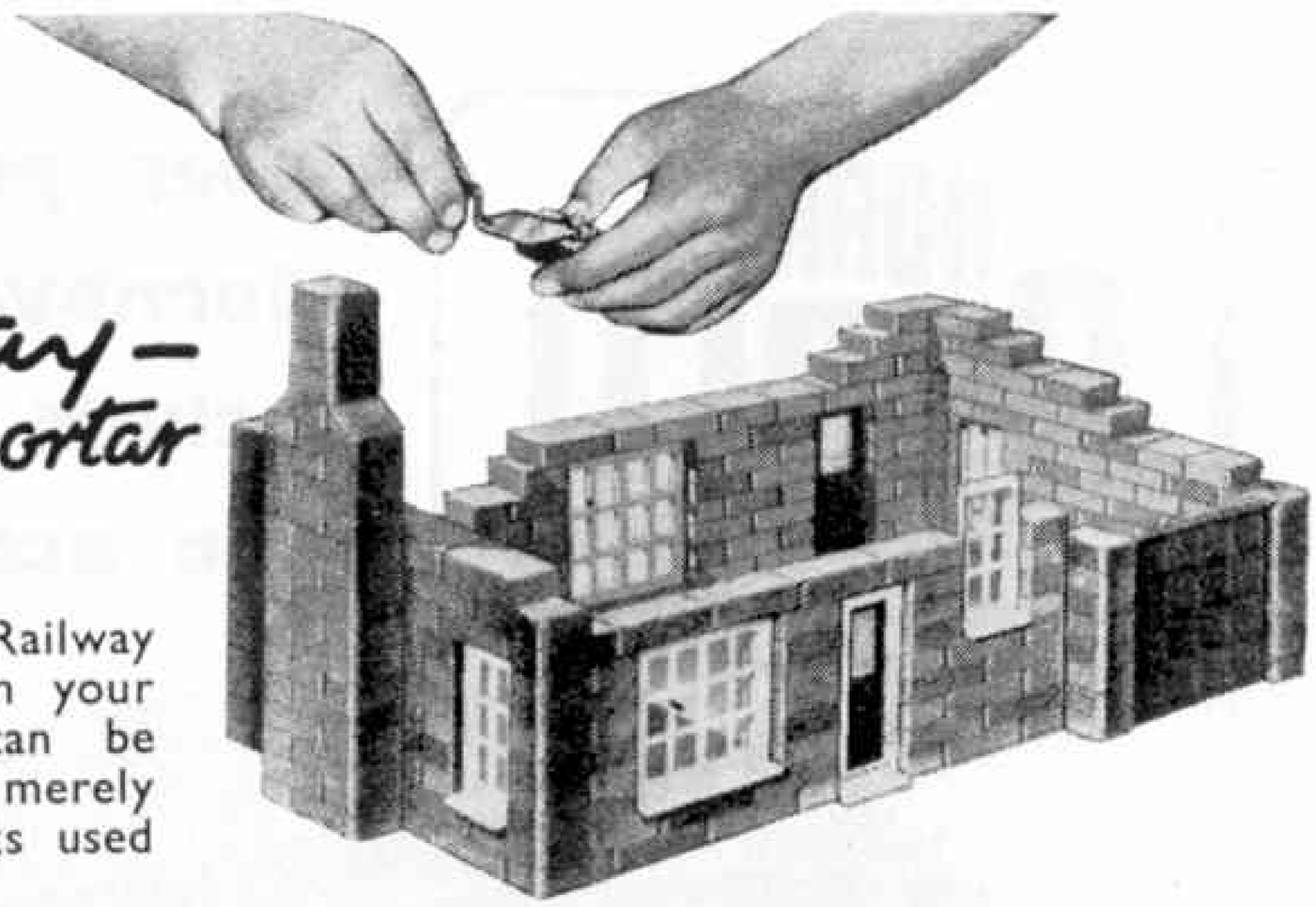

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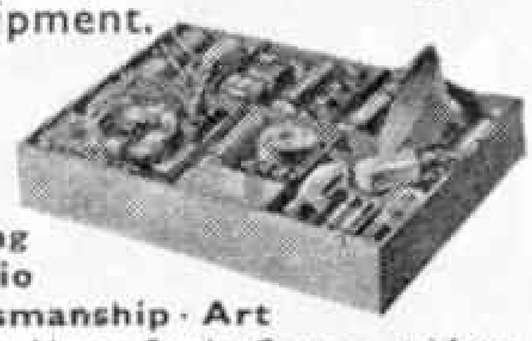

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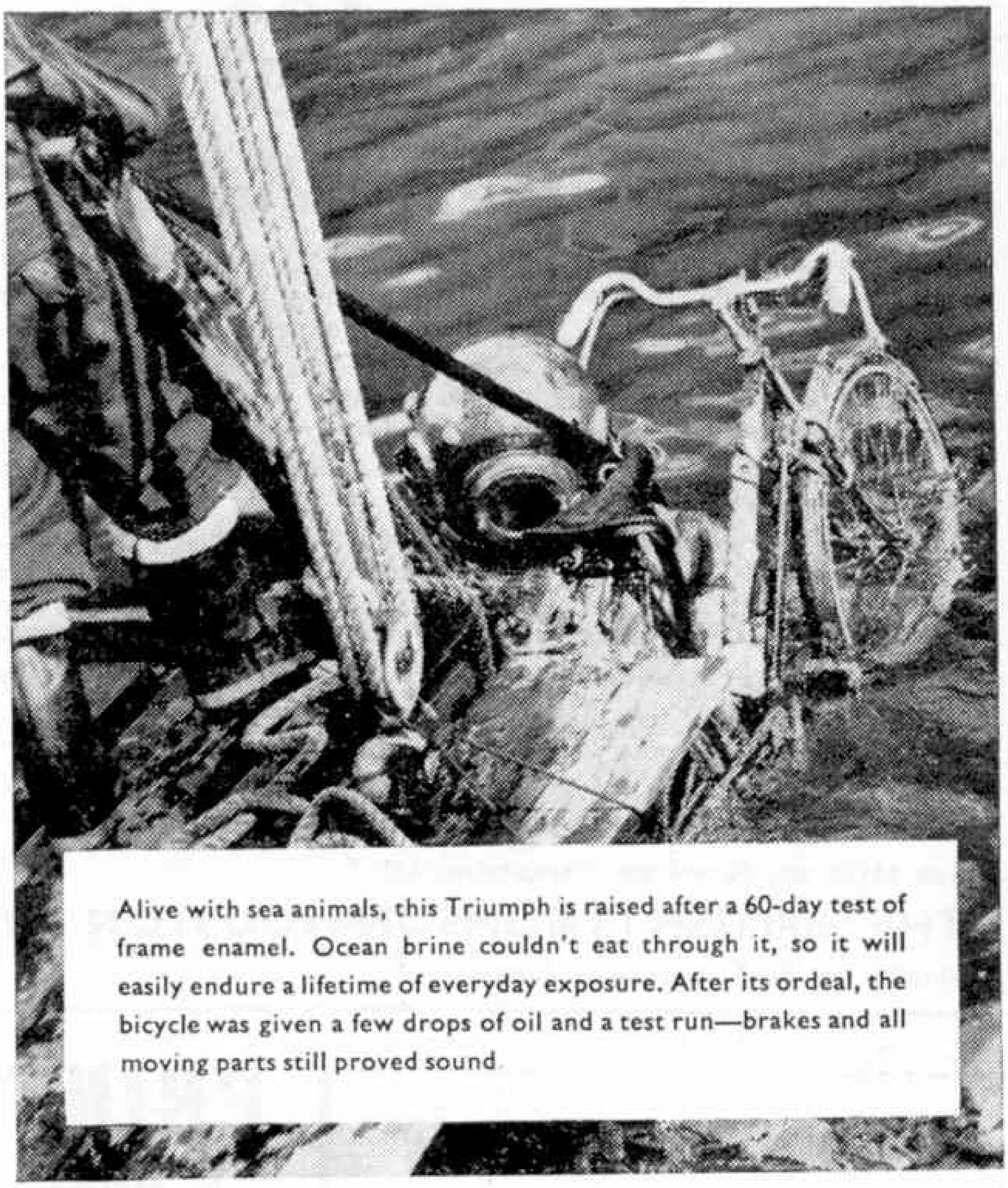

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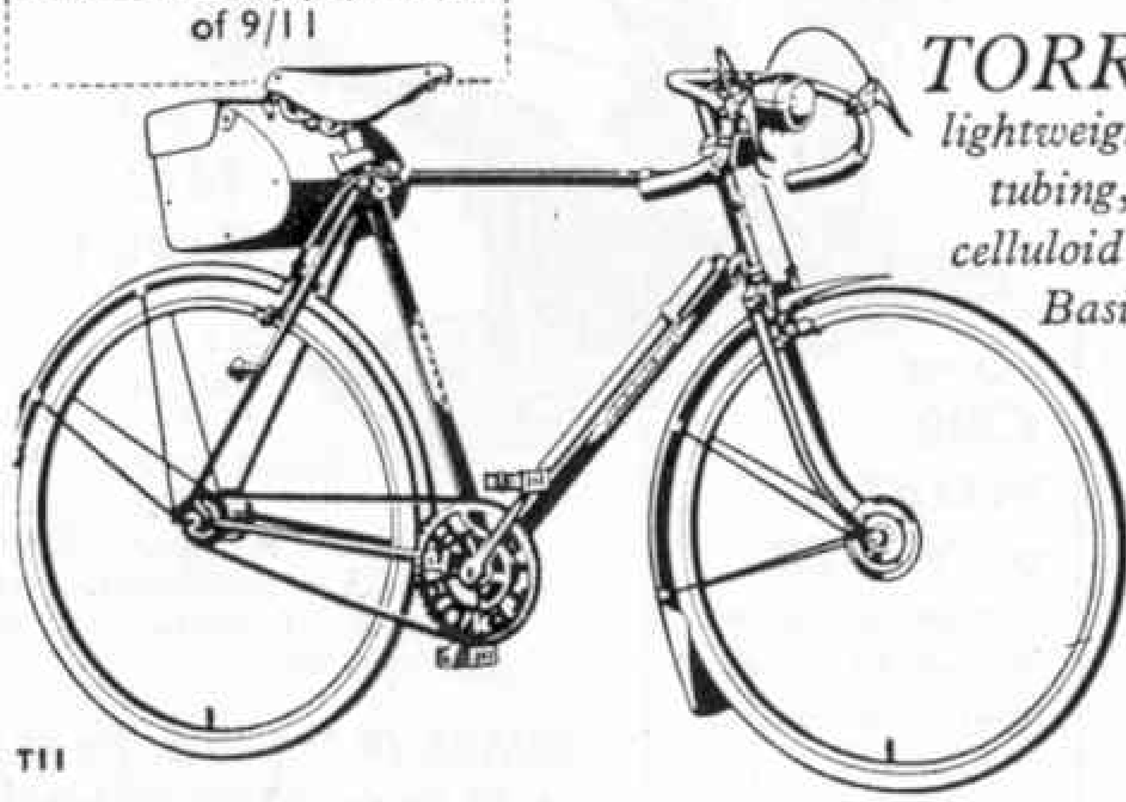

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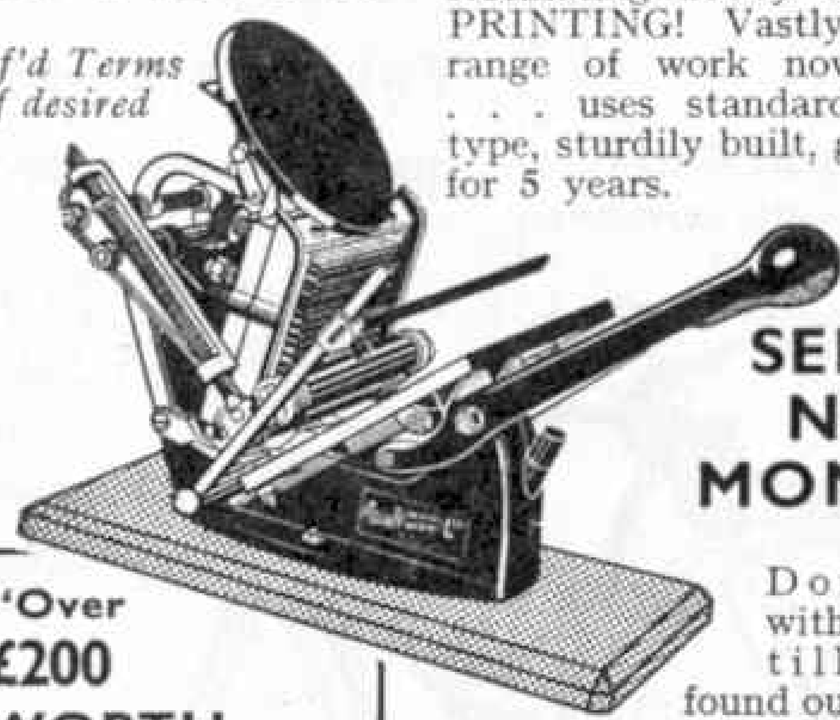

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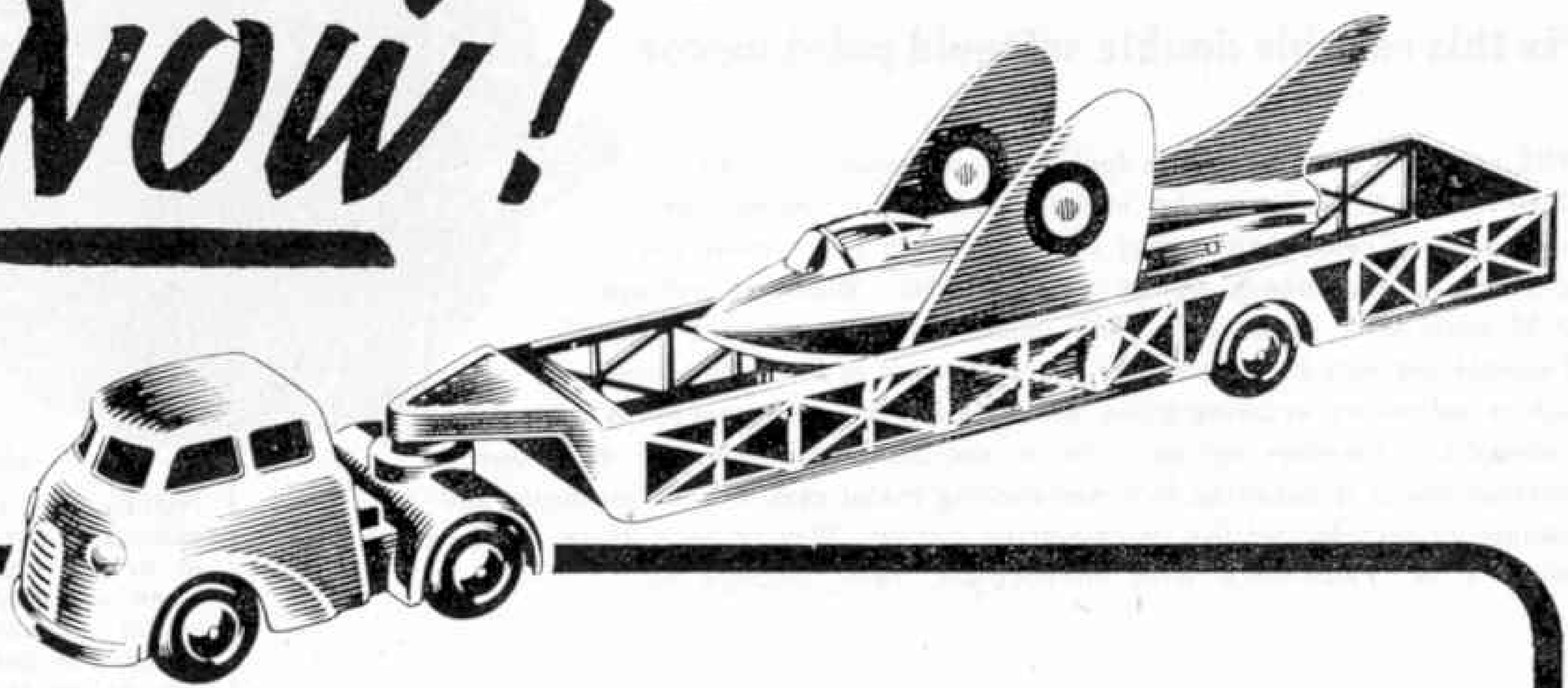

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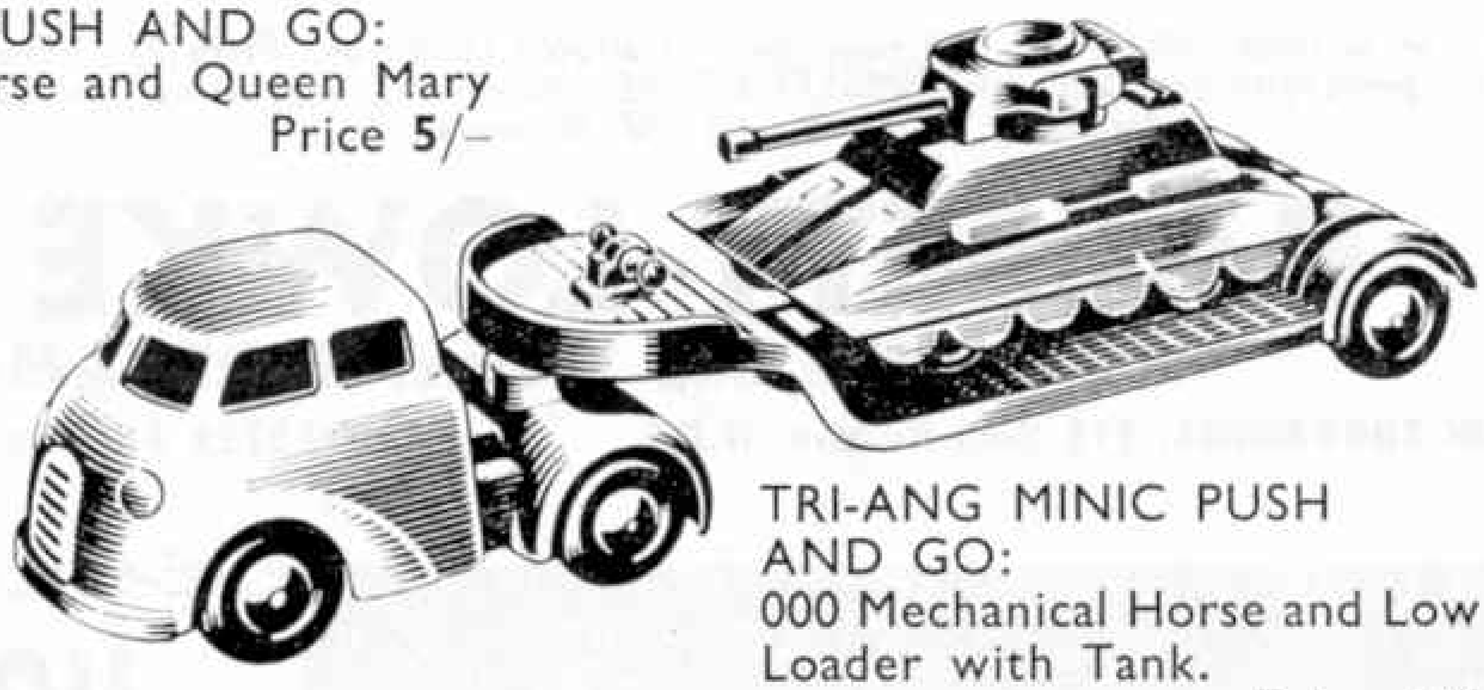

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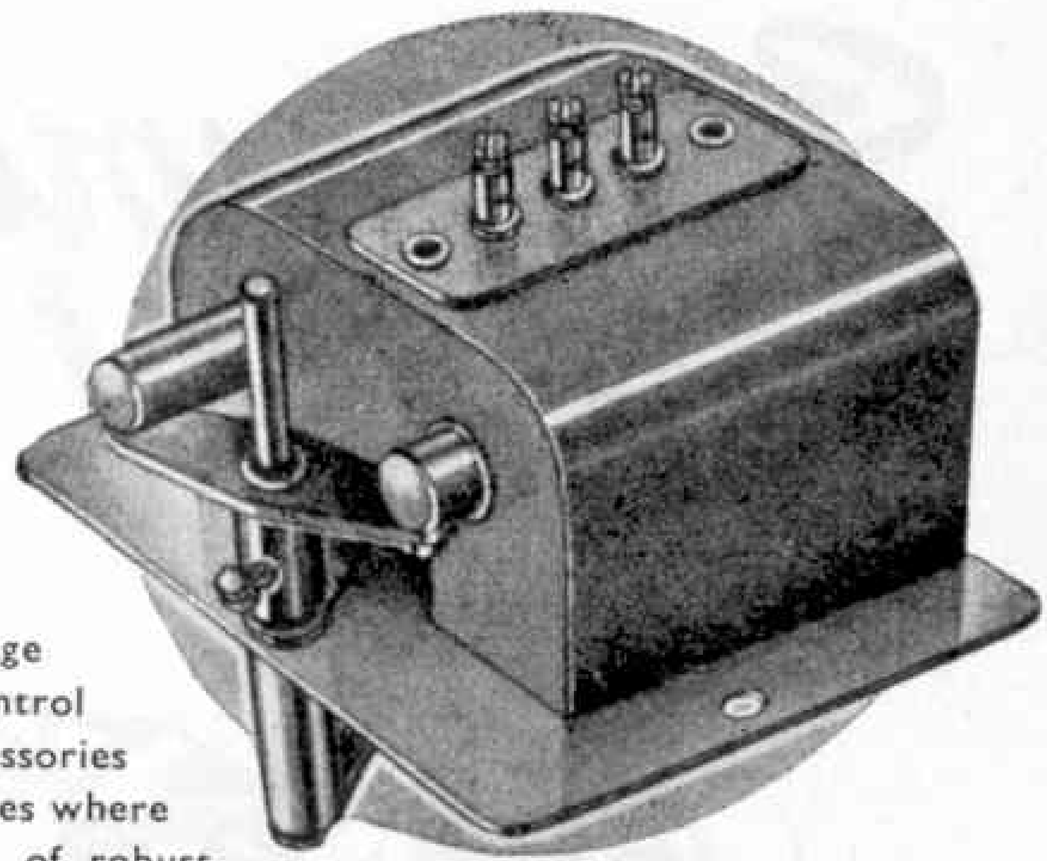

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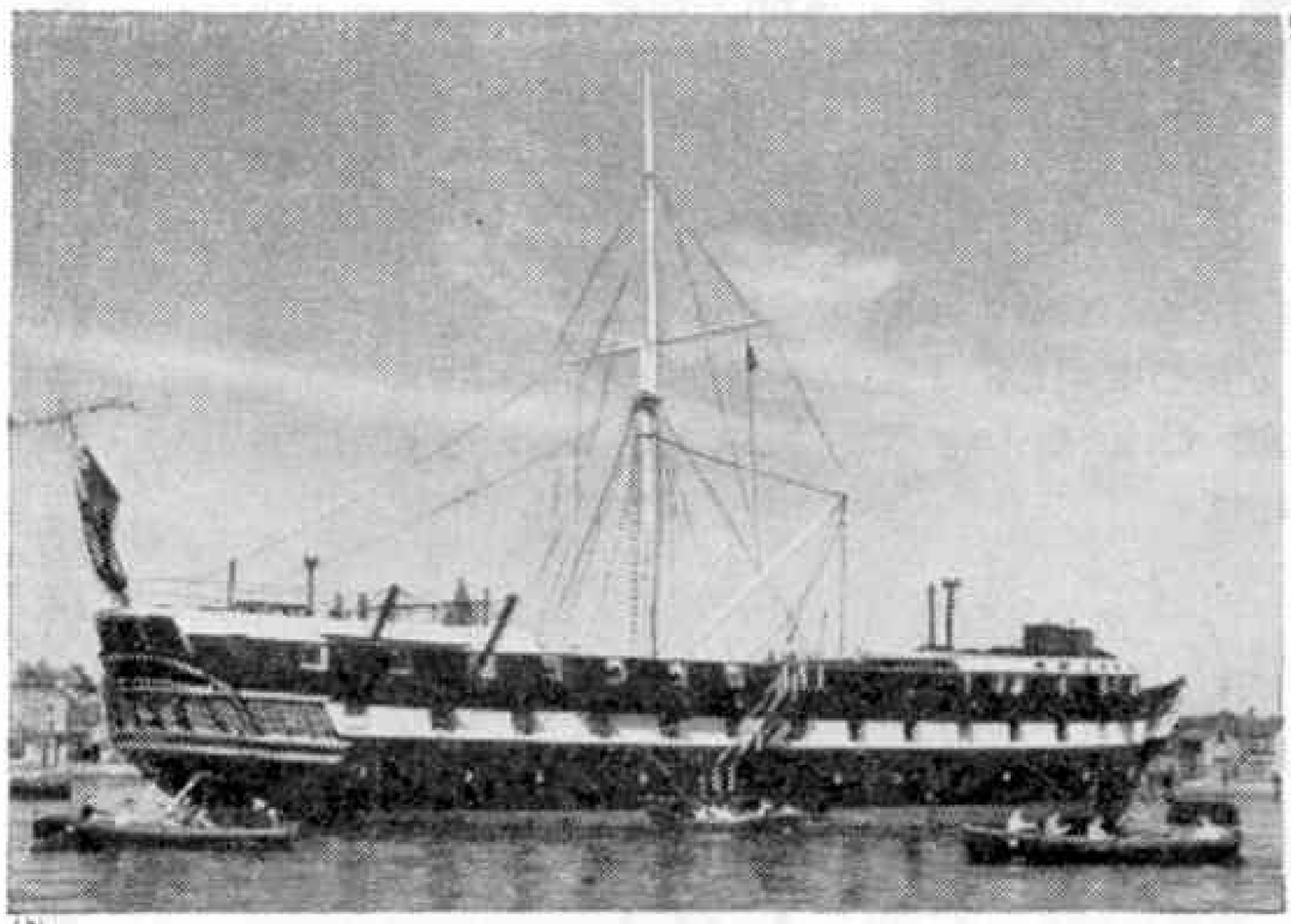

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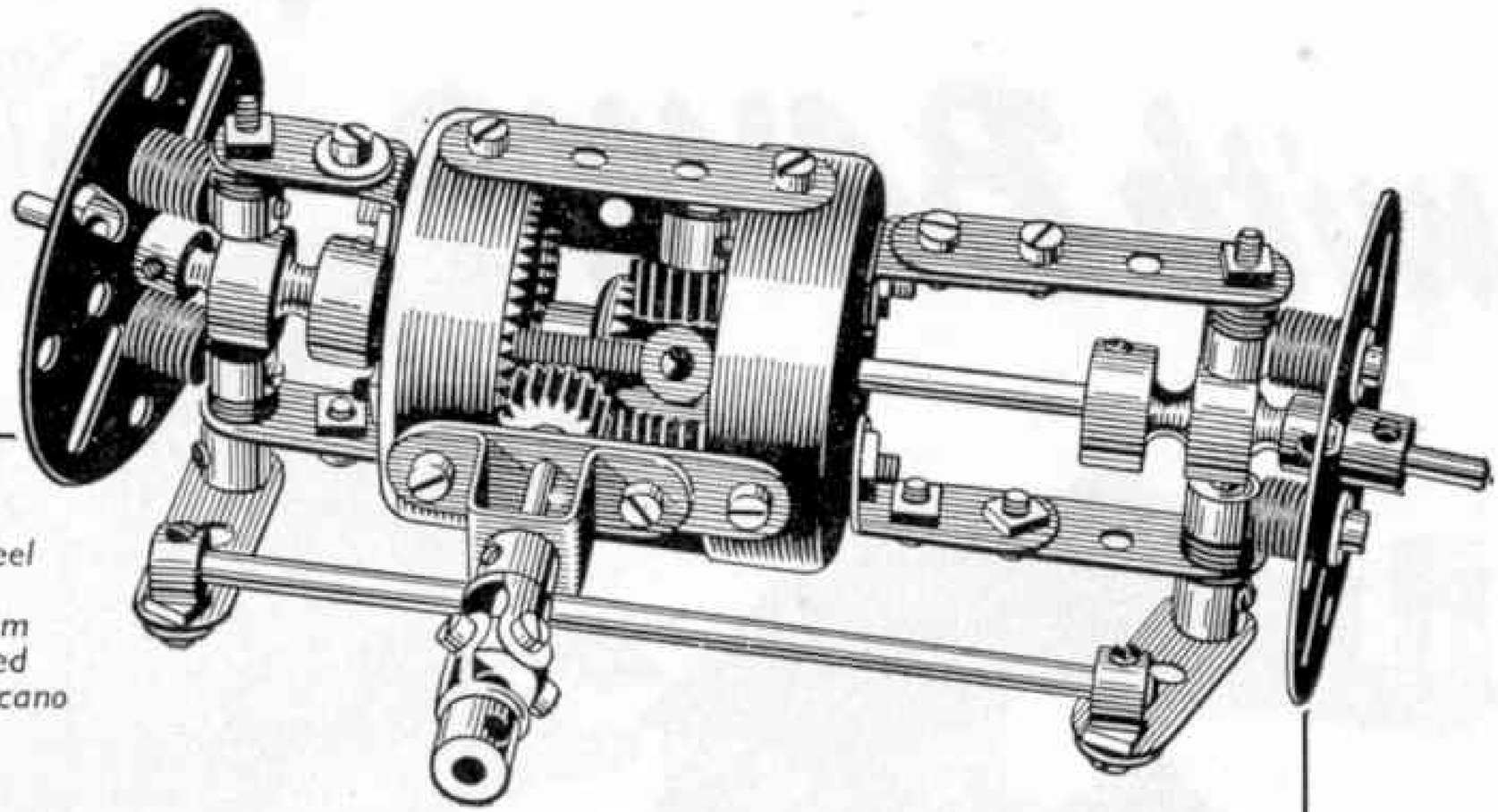
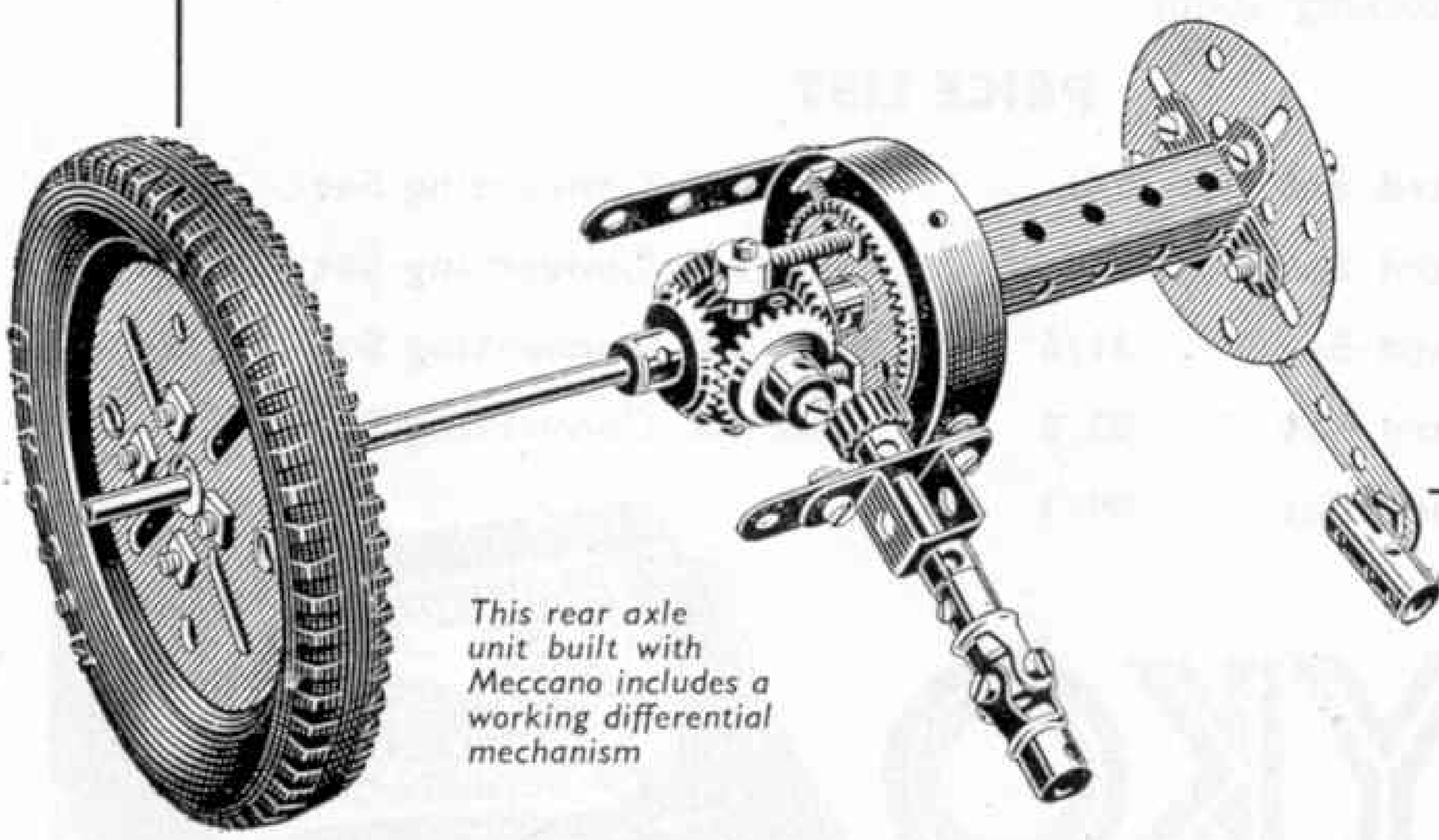


Front wheel drive mechanism reproduced with Meccano parts

Gear mechanisms play a vital role in almost all branches of engineering and particularly in carrying the drive of the engine to the wheel axles of a motor vehicle. All these fascinating mechanisms can be reproduced in Meccano with remarkable accuracy and made to operate just like their real-life counterparts. Two specially fine examples are shown here.



This rear axle unit built with Meccano includes a working differential mechanism

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Next Month: AN AUTOMATIC CAR PARK

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool 13
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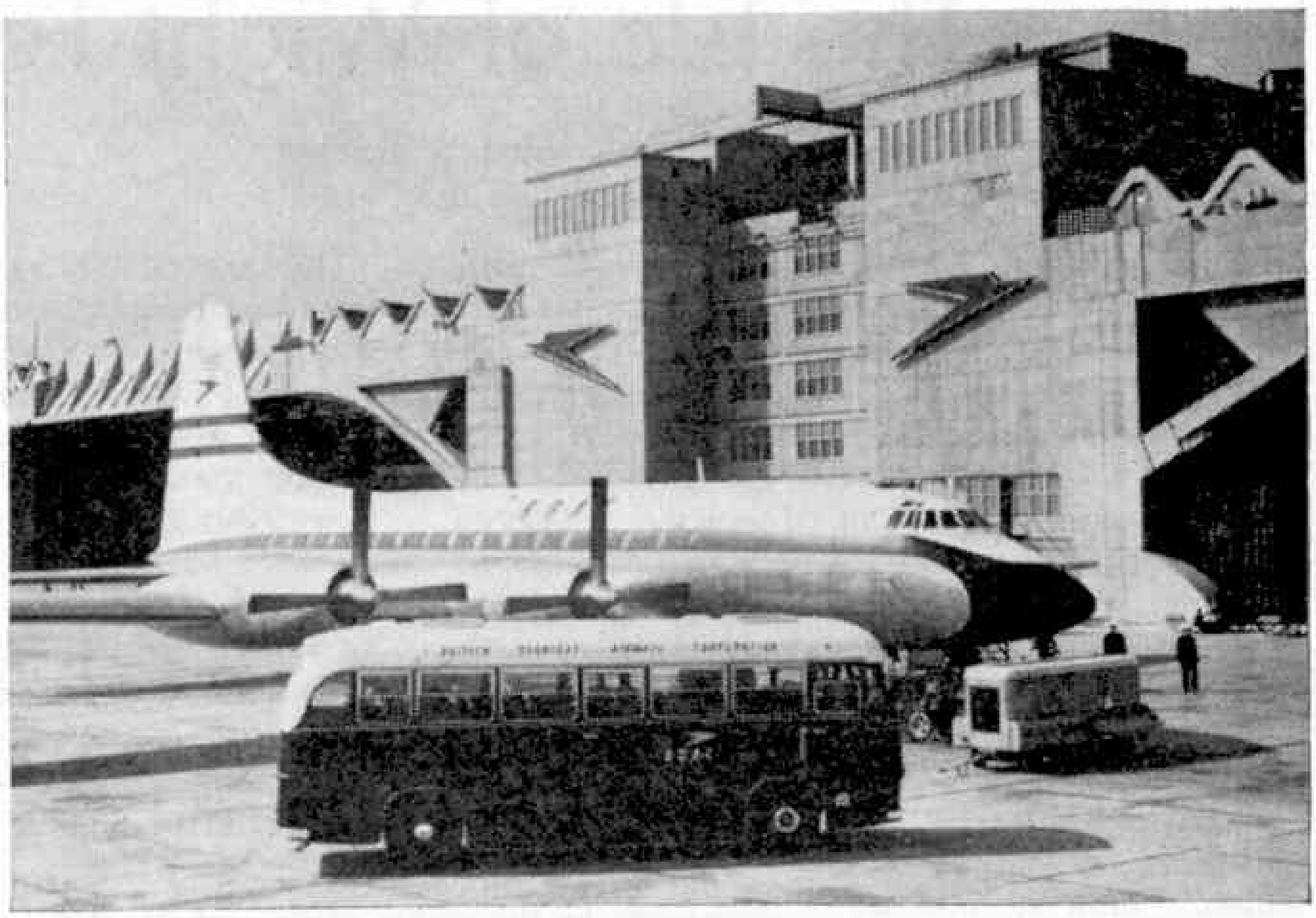
EDITOR : FRANK RILEY, B.Sc.

Vol. XLII
No. 3
March 1957

The "Whispering Giant"

For my picture this month I have chosen one that shows a "Whispering Giant." The Bristol Britannia earned this name in the United States, where it impressed everybody by its comparative silence in flight. It is undoubtedly one of the great air liners, and it is very gratifying to know that a British product takes such a prominent place on the world's airways.

One of my reasons for reproducing the accompanying photograph this month is that in the April *M.M.* there will be a fine article on turboprop and turbojet air liners, in which something will be told of the battle of the airways that is now in progress. The Britannia will figure in this article, with other well-known aircraft.



A B.O.A.C. coach in front of a Bristol Britannia on the servicing apron outside the B.O.A.C. Headquarters Building at London Airport. B.O.A.C. photograph.

I am sure that you all know my second reason for including such a comprehensive picture this month. It is of course the presence in the foreground of the picture of a coach that must be familiar to every reader of the Magazine as the original of a Dinky Toys miniature that has become a great favourite. The latest model of this fine coach has been slightly modified as the result of experience, and it is now fitted with a Rolls-Royce engine.

By way of contrast to the story of the battle of the airways, next month's issue will include a description of one of the latest Canadian Trans-Continental trains. This is the C.P.R. *Canadian,* which is now diesel-hauled on its passage through the wonderful mountainous country of British Columbia. It is remarkable for the domed upper compartment of its observation coach, from which passengers can get entrancing views. We live in an age of increasing air travel, but journeys by rail over such routes as those through the Canadian Rockies are still exciting, with many surprise views, and I am sure that you will enjoy the description of this splendid train.

Then there will be a contribution on ladders up which fish climb. No, this is no circus act, but you will enjoy it.

The Editor

The Isle of Wight Ferry

By I. J. Belcher

THE Isle of Wight is a renowned sun spot, as the records of holiday resorts in the British Isles show, and every year large numbers of holiday makers in search of sunshine and a change of scenery make their way to Portsmouth en route to this attractive island. This of course involves a vast task for the Southern Region of British Railways, which operates the efficient ferry service between Portsmouth and Ryde, in the Isle of Wight.

The passage from the mainland to the island involves a journey of 5¼ sea miles. This is not a great distance, it is true, but when one recalls that on a single Saturday, in August 1955, 67,369 passengers were carried between Ryde and Portsmouth, the importance of a good service cannot be over emphasised. Six passenger vessels are engaged on this service, and are capable of carrying 7,207 passengers between them as well as mail and considerable quantities of cargo, including foodstuffs, milk supplies, etc.

This month's cover shows the busy scene at Ryde pier as cargo is unloaded by crane from the British Railways motor vessel *Brading*, a vessel typical of the ferries engaged on this trip that has capacity for about 1,400 passengers and a crew of 27.

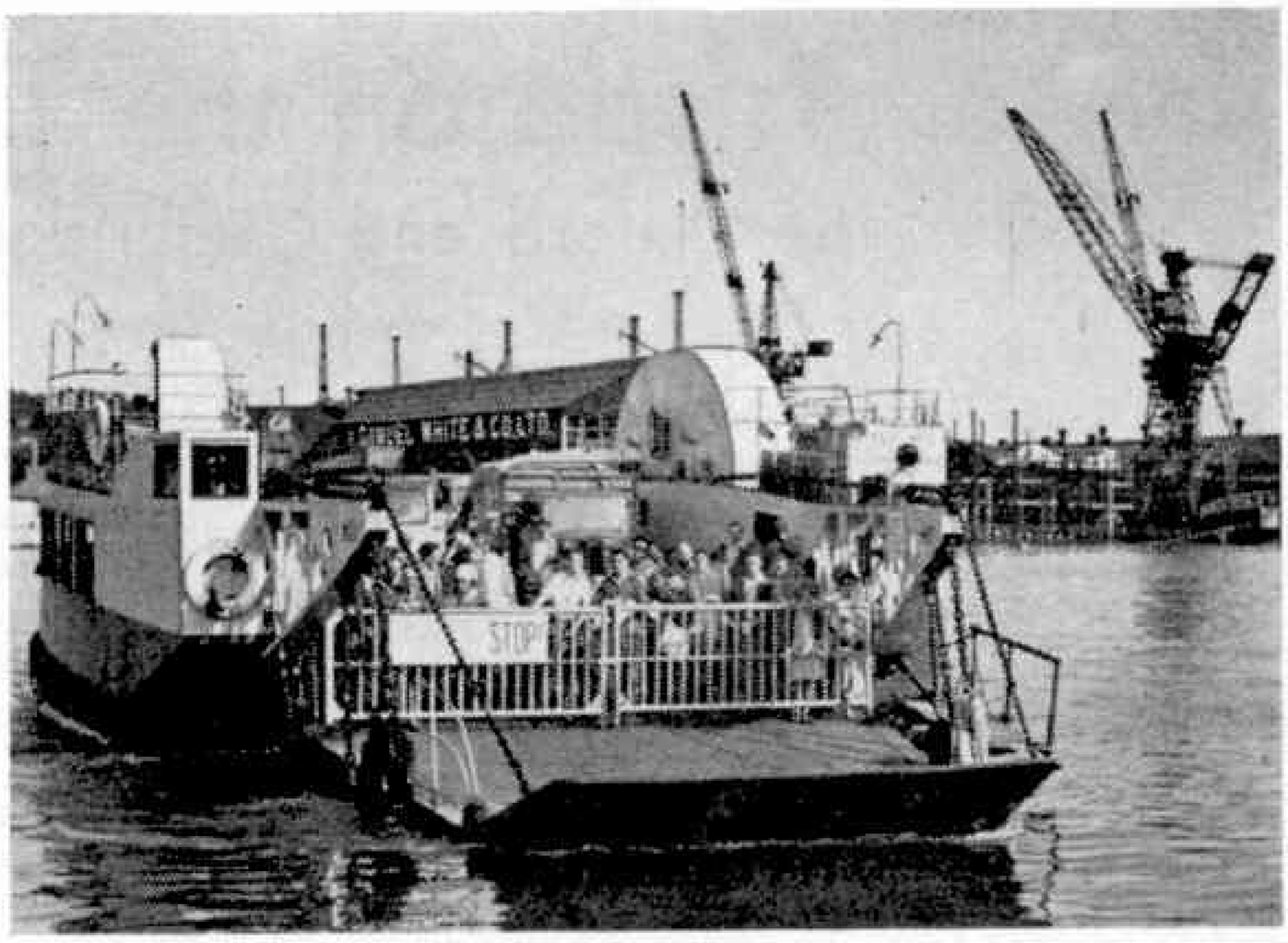
At the head of the page is a picture of the motor ship "Brading," also seen at Ryde, Isle of Wight, on our cover, which is based on a colour photograph by the author of this article. The above illustration is reproduced by courtesy of British Railways, Southern Region.

Details of the vessels on this service will perhaps be of interest, particularly to those who have travelled on them. *Southsea* and *Brading* are twin screw motor vessels with a gross tonnage of 836, having two Sulzer two-stroke 8-cylinder diesel engines developing 950 b.h.p. each. Lighting and power for electric auxiliary machinery, including steering gear and capstans, is provided by three Ruston and Hornsby diesel generators, each of 60 h.p. output. These vessels were built in 1948. *Shanklin*, built in 1951, is similar, but has direct drive on the propeller shaft instead of through an oil-operated gear-box.

Paddle steamers still in service are *Sandown* and *Ryde*, powered by triple expansion steam engines with directly driven paddles. Steam is supplied by a Scotch boiler fired by three coal furnaces. They were built in 1934 and 1937 respectively, and each has a crew of 24. The oldest vessel on the service is the paddle steamer *Whippingham*, built in 1930. She has a compound steam engine with direct drive paddles, with two Scotch boilers each fired by three coal furnaces. All three paddle steamers are fitted with bow rudders.

During the 1939-1945 hostilities a very

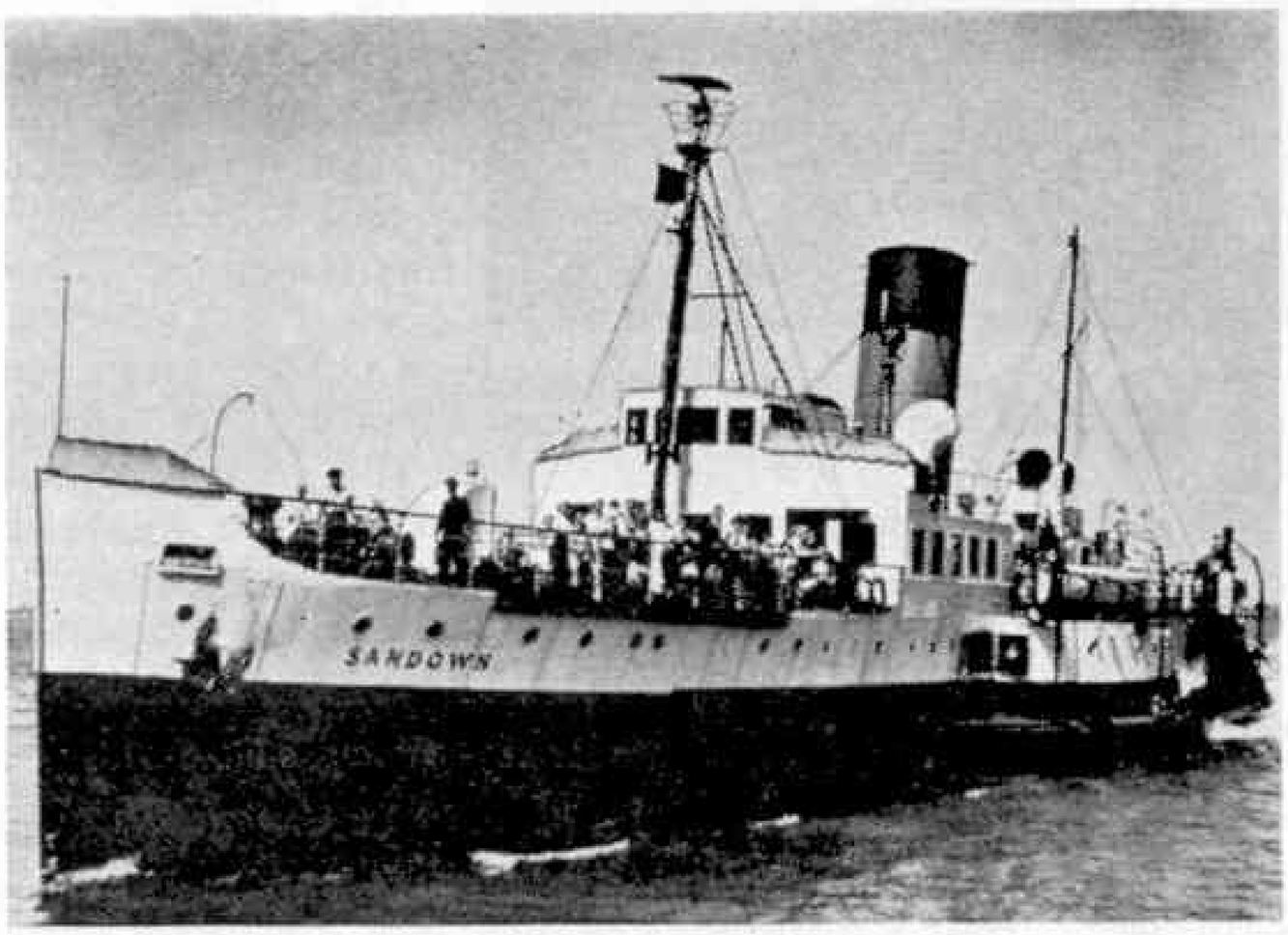
restricted service was operated. The large ferries were requisitioned by the Navy, leaving only smaller craft named *Shanklin* and *Merstone*, both of which have since been sold, and the paddle steamer *Portsdown*, which was unfortunately blown up and lost by an external explosion between Portsmouth and Ryde in September 1941. The paddle steamers *Southsea*, *Whippingham*, *Sandown* and *Ryde* were all engaged on Naval service. The *Southsea* was lost off the North East coast of England in 1941, while the other three played their parts in the historic Dunkirk evacuations, along with two British Railways I.O.W. car ferries *Fishbourne* and *Wootton* and the unfortunate *Portsdown*, which met her end later, as already noted. In May and June 1944 *Merstone* and *Shanklin* were engaged for short periods carrying invasion forces from Portsmouth Harbour to ships anchored at Spithead.



The Cowes-East Cowes ferry or floating bridge approaching Cowes with a full load. The illustrations on this page are from photographs by the author.

To-day's passenger services, maintained throughout the year, operate in almost all weathers. Only during exceptional gales or in dense fog are sailings curtailed. All passenger vessels are fitted with Cossor Radar equipment, but this does not apply to the car ferries, also operated by B.R. (Southern Region) that ply between Portsmouth and Fishbourne, I.O.W. Three ferries are at present engaged on this run, and it was from these vessels of Southern Railway design that the Navy's prow loading landing craft were developed.

It is during the summer season, from early June to the middle of September, that the services are busiest. July and August are the peak months, when the inevitable queues form. On such occasions the accommodation may not be particularly comfortable, owing to crowding, but the duration of the trip is only thirty minutes and travellers are only too pleased to accept any slight inconvenience in order to speed their suit-case burdened voyages. There is usually plenty to be seen on the short trip, including ocean giants passing to and from Southampton docks, among them liners such as *Queen Mary* and *Queen Elizabeth*, and great Naval vessels in Portsmouth harbour.



The B.R. paddle steamer "Sandown" heading for the Isle of Wight.

A ferry worth a mention is that at Cowes, I.O.W. This is not owned by the railways, and is sometimes referred to as a floating bridge. It operates between East Cowes and Cowes at intervals of every few minutes. The fare is, remarkably, still a penny for pedestrians, and pro-rata for cars, heavier lorries and vans, many of which use the ferry in order to avoid the alternative route, which is a long detour around the river by way of Newport, the capital town. East Cowes is a prosperous ship and boat building district. Most of the yachts and sailing boats to be seen racing at Royal Cowes have been built and maintained there.

Tussle on the Thames

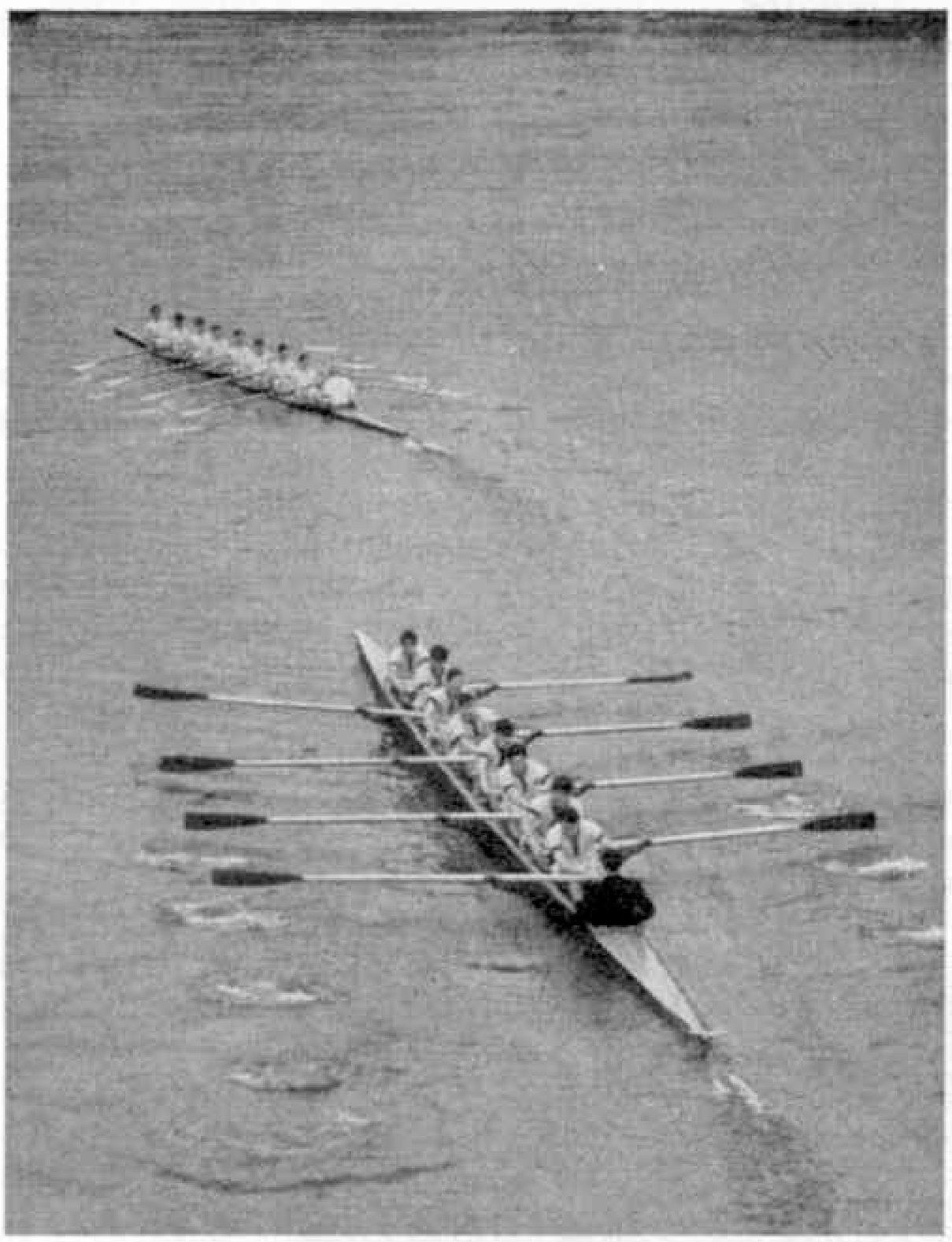
The Oxford and Cambridge Boat Race

By Arthur Gaunt

FOR well over a hundred years Old Father Thames has provided the arena for a contest that nowadays arouses world-wide interest every year. Try to count up forty different languages—and then remember that this is the number of tongues in which the B.B.C. broadcasts news reports and commentaries on the annual Oxford and Cambridge Boat Race, rowed between Putney and Mortlake.

That is ample proof of the international interest in the event today, when the Boat Race ranks as a British institution comparable with the Test Matches and the Derby. It is a little difficult to say just why a rowing race between two small crews on London's river should thrill the whole world, but doubtless one reason is that the spell of the affair has been carried across the globe by countless graduates.

Indeed a list of Boat Race crews and their later achievements shows that many have distinguished themselves in various parts of the world. It is a remarkable fact that the Boat Race has a far better record than most other sporting events for the subsequent achievements of participants. Two who have taken part in the race became Prime Ministers, while others have become famous Churchmen, judges, or sportsmen. An international flavour may be said to have been introduced as far back as 1849, for one of the Cambridge crew in that year, W. H. Waddington, was destined to be elected to the French National Assembly and to serve as Prime Minister of France for a short spell.

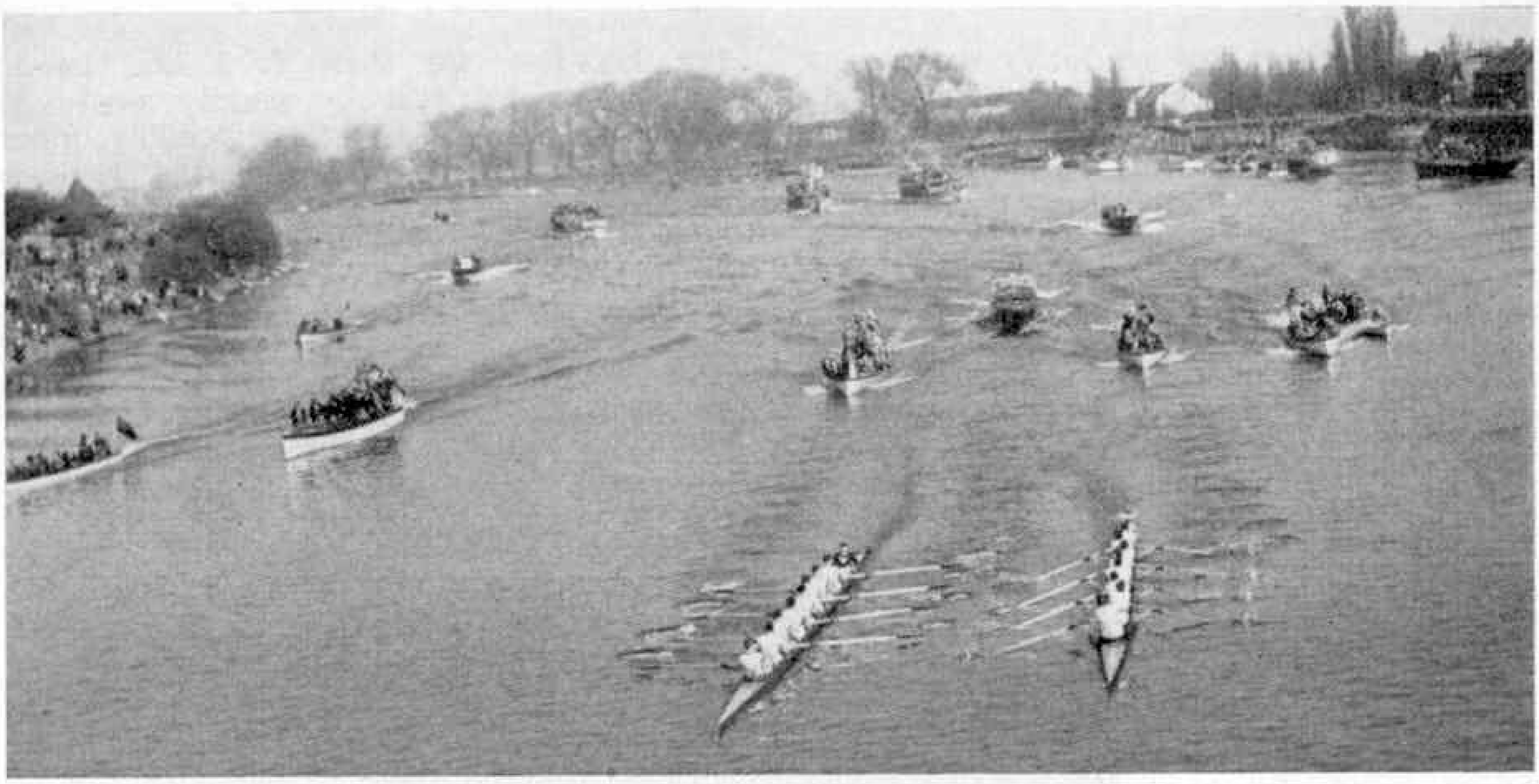


Cambridge lead Oxford by 2½ lengths as the boats shoot Hammersmith Bridge, just under two miles from the start.

Moreover, the Boat Race is not one of those sporting events that began in a small way and developed slowly in the matter of public support. The first 'Varsity Boat Race, in 1829, drew 20,000 spectators—an astonishing number in view of the limited transport facilities in those days.

To get full enjoyment as a spectator you must understand the finer points of the event. The finish is rarely exciting, and a good deal of the thrill lies in realising that the contest is by no means a straight race, in which only stamina and rowing skill will bring success. Since the Boat Race takes place on a tidal stretch, the state of the tide has considerable influence. The wind is another factor that is liable to upset the most careful calculations. A combination of a weak or strong tide, and a light or strong wind, can make as much as five minutes difference for the 4½-mile course.

A strong wind blowing against the tide not only holds back the boats by its own strength, but may also compel them to hug the bank for shelter. It has been found that a difference of only half a mile an hour in the speed of the tide will increase or



The contestants approaching Barnes Bridge in what promises to be a close finish in the 1949 race, the Oxford boat just ahead. Cambridge eventually won by a quarter of a length.

reduce a boat's speed by about one-third of a length every minute, which means roughly seven lengths for the whole course.

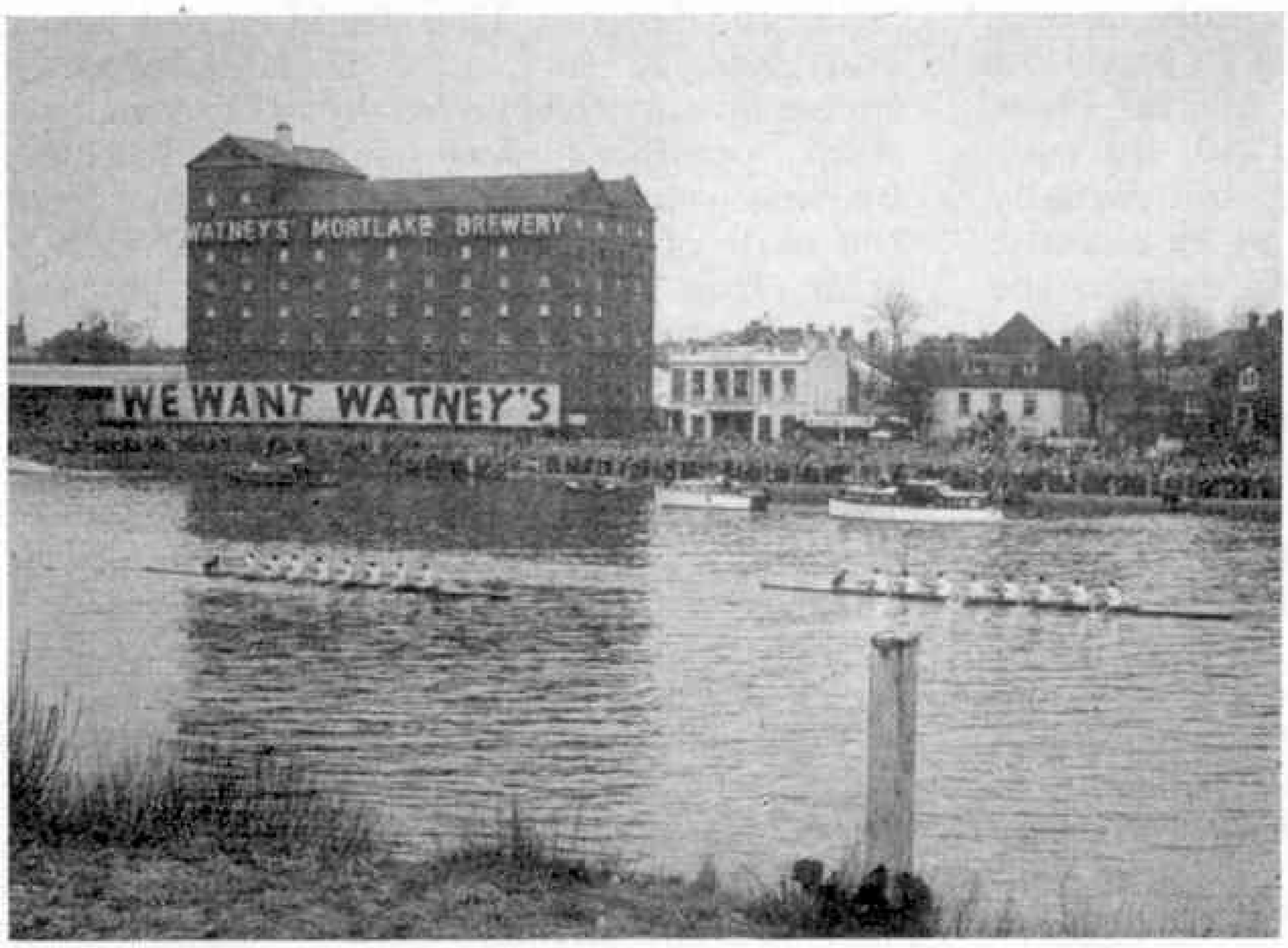
The bends in the river between Putney and Mortlake also influence the result of the race. Each crew strives to gain the inside station, for it is rarely worth while to fight for a lead on the outside of the bends. The aim is to gain enough lead sooner or later to cross over and take the opposing boat's water. Many seemingly easy finishes are actually the result of exciting hard-fought battles on the bends.

The Putney-Mortlake course has been used since 1845, but one of the most famous Boat Races was rowed at Henley in 1843, when Oxford won with only seven men. Another spectacular finish occurred in 1877, when the only dead heat in the long history of the event was recorded. In 1948 Cambridge became the first crew to finish in less than 18 minutes.

Last year the race was won by the second biggest margin ever achieved—sixteen lengths. The biggest of all was in 1900, when Cambridge passed the winning-post twenty lengths ahead of their rivals. The race has had to be repeated on several occasions, owing to one boat sinking. This happened in 1951. In 1912 both boats sank!

The most important member of the crew is the ninth man, the cox, for success or failure may depend upon his skill, judgment, and encouragement. He must have a detailed knowledge of the course, and must be able to decide the effects that the wind and tide will have on his crew. Above all he must be able to make vital decisions confidently and quickly.

Practising for the Boat Race usually starts early in January, when each of the two universities forms two fairly evenly matched



Cambridge passed the winning post at Mortlake 1¼ lengths ahead in 1956.

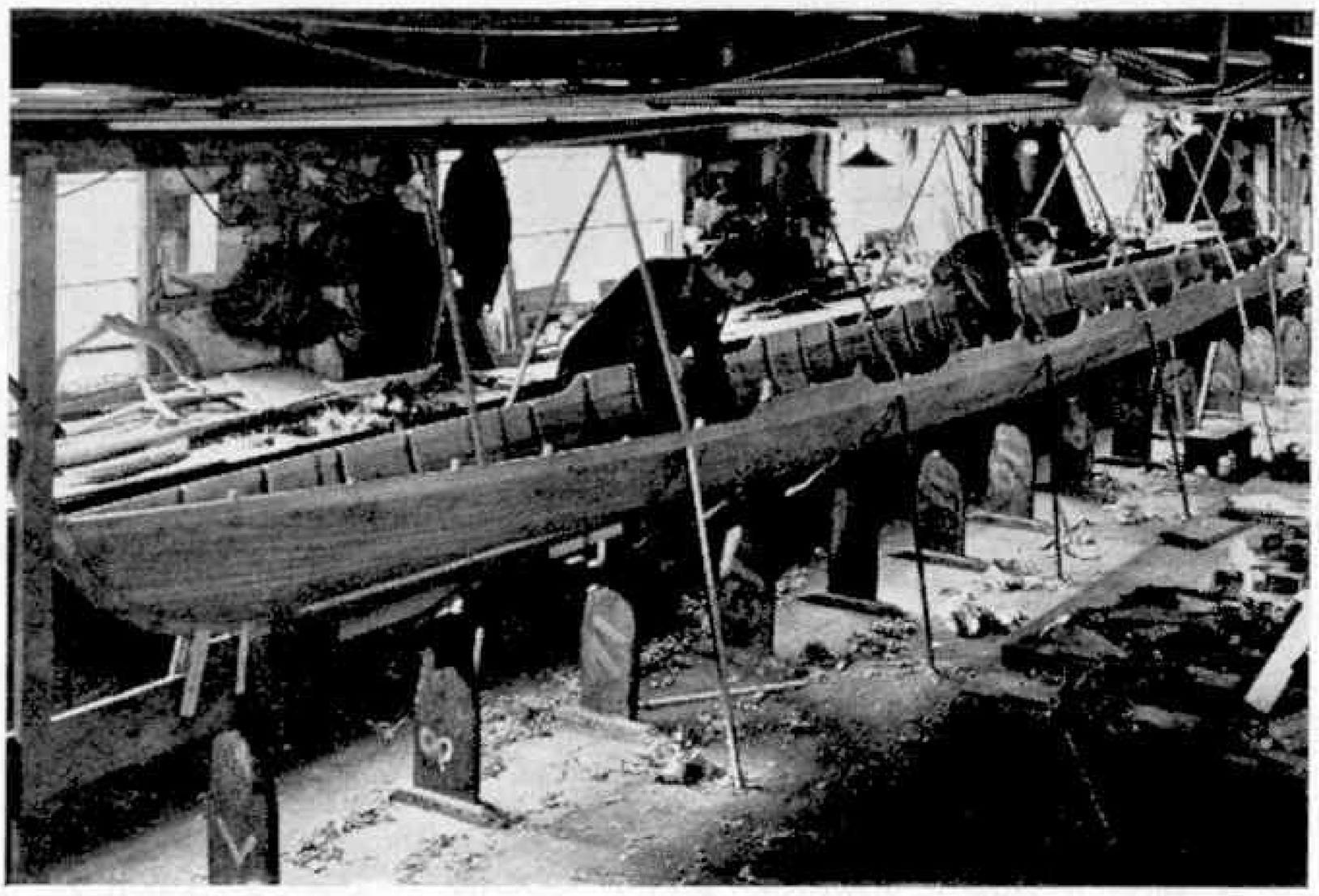
crews. The men are gradually sorted out, until one crew of eight is formed to be coached for the race. A fortnight or so before the day, the rival crews move to Putney, where individual coaching is replaced by training to "polish" the crew as a whole.

For much of the training they use craft that have served for earlier Boat Races, but meanwhile the boat for the forthcoming contest is being built. The racing eights used today are craftsman-built and bear comparatively little resemblance to those used in the earliest days of this famous rowing contest. Clumsy clinker-built boats were used until Sir William Christie, the Astronomer Royal, was called in to design the hull scientifically. But the first keel-less rowing boat for racing was the brain child of a ship's carpenter, Mat Taylor, who built one for use by the Royal Chester Rowing Club at Henley. It gave them such easy victories that other clubs adopted the same design. Both Oxford and Cambridge were early users of this style of eight-oar boat.

Oddly, no draughts or designs are used in building the racing eights for the Boat Race today. Experience is the only guide, though the builders do require to know the measurements and weights of the crew. Such a boat costs at least £250, for each piece of wood has to be individually selected, cut, and processed to fit exactly. A single badly made joint will destroy the whole balance of the craft and seriously reduce its tensile strength.

The first stages of construction are performed with the boat upside down, and several kinds of wood are used, though cedar-wood from the Honduras provides much of the material. Planed to a mere three-sixteenths of an inch, it is used for the hull and is made pliable by damping and artificial drying, so that the sheets can be shaped round the framework.

White oak, Hungarian ash or sycamore are used for the ribs, seat planking and struts. Strictly speaking, the craft are not keel-less, for there is a keel inside the skin, and this is usually made of silver spruce. More than 3,500 copper nails are needed to secure the hull to the framework. The sliding seats, stretchers, and steel outriggers are all made to fit the oarsmen who are to use them.



Building a racing eight in an Oxford builder's workshop. Photograph by courtesy of Salter Bros. Ltd.

When completed, such a boat, about 60 ft. long and with a 2 ft. beam amidships, weighs approximately 2½ cwt. With the crew aboard, the craft is less than four inches above water level at the gunwales.

There is no ceremonial launching or christening, the boat being put into service immediately by the crew, who are eager to carry out practice trips without delay. The building of such craft has, in fact, now been reduced to such a fine art that no further improvements seem possible. Any surprises brought by this year's Boat Race will arise from the skill of the oarsmen and cox, rather than from revolutionary ideas in the boats themselves.

The origin of this contest was not a great surge of rivalry between the Universities. In fact, the event owes its beginning to a challenge made more-or-less privately in 1829, when a Mr. Stanniforth, of Christ Church College, Oxford, championed Oxford rowers in the hearing of a student at St. John's College, Cambridge.

The ensuing argument culminated in the first Boat Race at Henley, but it is doubtful whether the instigators expected the affair to create the extrordinary enthusiasm it has aroused.

Robot Navigator

By John W. R. Taylor

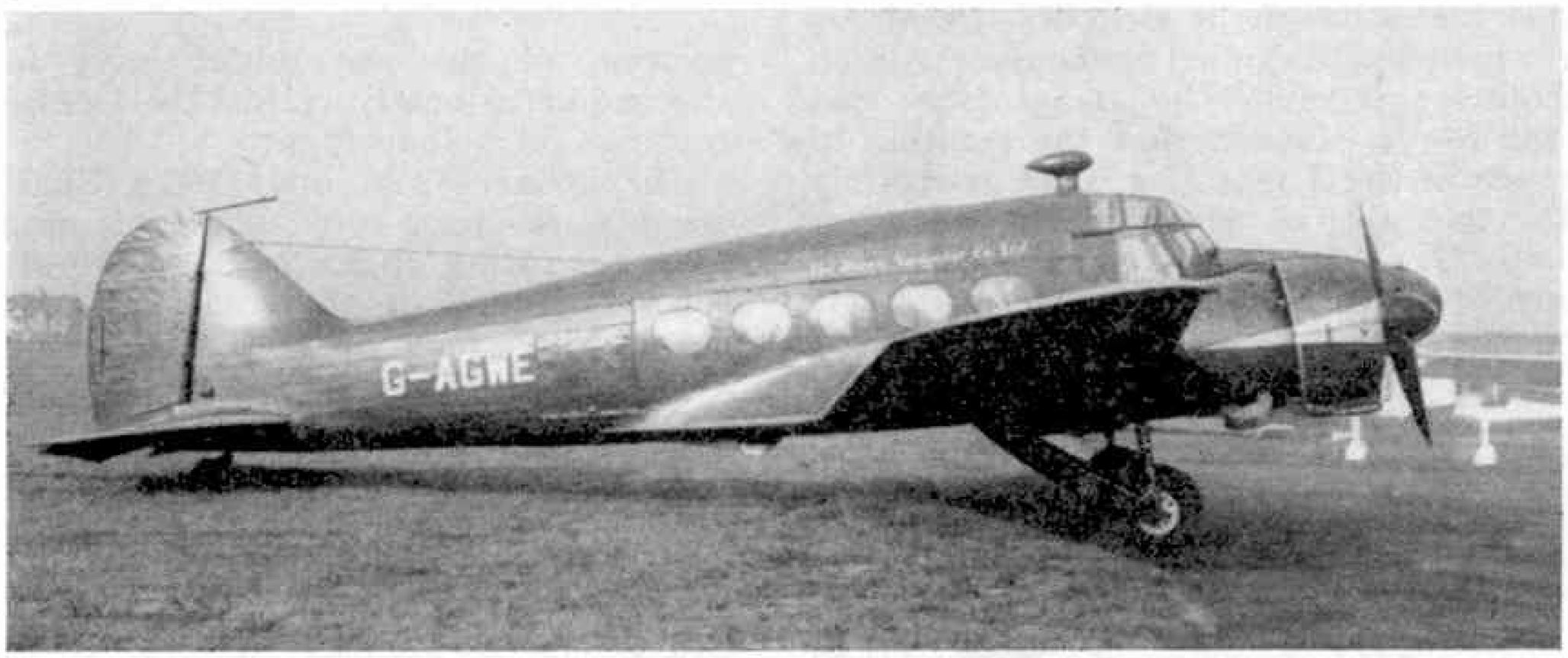
ON the desk in front of me as I write is a rather unusual map. At least, it is unusual so far as you and I are concerned, because it measures 11 in. wide and nearly 6 ft. long, so that it is about the same size as a roller towel. But for the pilots of many airlines it is the most familiar and welcome of all types of map, because it shows them exactly where they are at any moment while they are flying, quite automatically and even in the kind of weather that foxes the best human navigator.

Of course, there is more to it than just a map. The whole box of tricks is known as the Decca Navigator and, to start with, it can be used only in areas where the authorities are enlightened enough to have installed a Decca Chain.

Each of these Chains consists of a set of four radio beacons, with a Master Station in the middle and three Slave Stations arranged in star formation around it at distances of about 70 miles away. Without going into technicalities, these Stations send out signals at regular intervals in a precise sequence, and the signals from the two most suitable Slaves and the Master are picked up by a receiver mounted in the aircraft.

In some respects this is similar to the method by which air navigators have obtained position "fixes" from two widely-separated ground stations ever since aeroplanes began carrying radio. The main difference is that this time everything is done automatically and the "fix" is marked straight on to the map by a robot pen. Better than that, the pen traces the aircraft's track over the map continuously, which explains why the map on my desk is 6 ft. long, because it has to unwind gradually on rollers throughout the flight to cover all the ground between the airports at which the aircraft takes off and lands. It is, in fact, made up of a succession of small sheets pasted together.

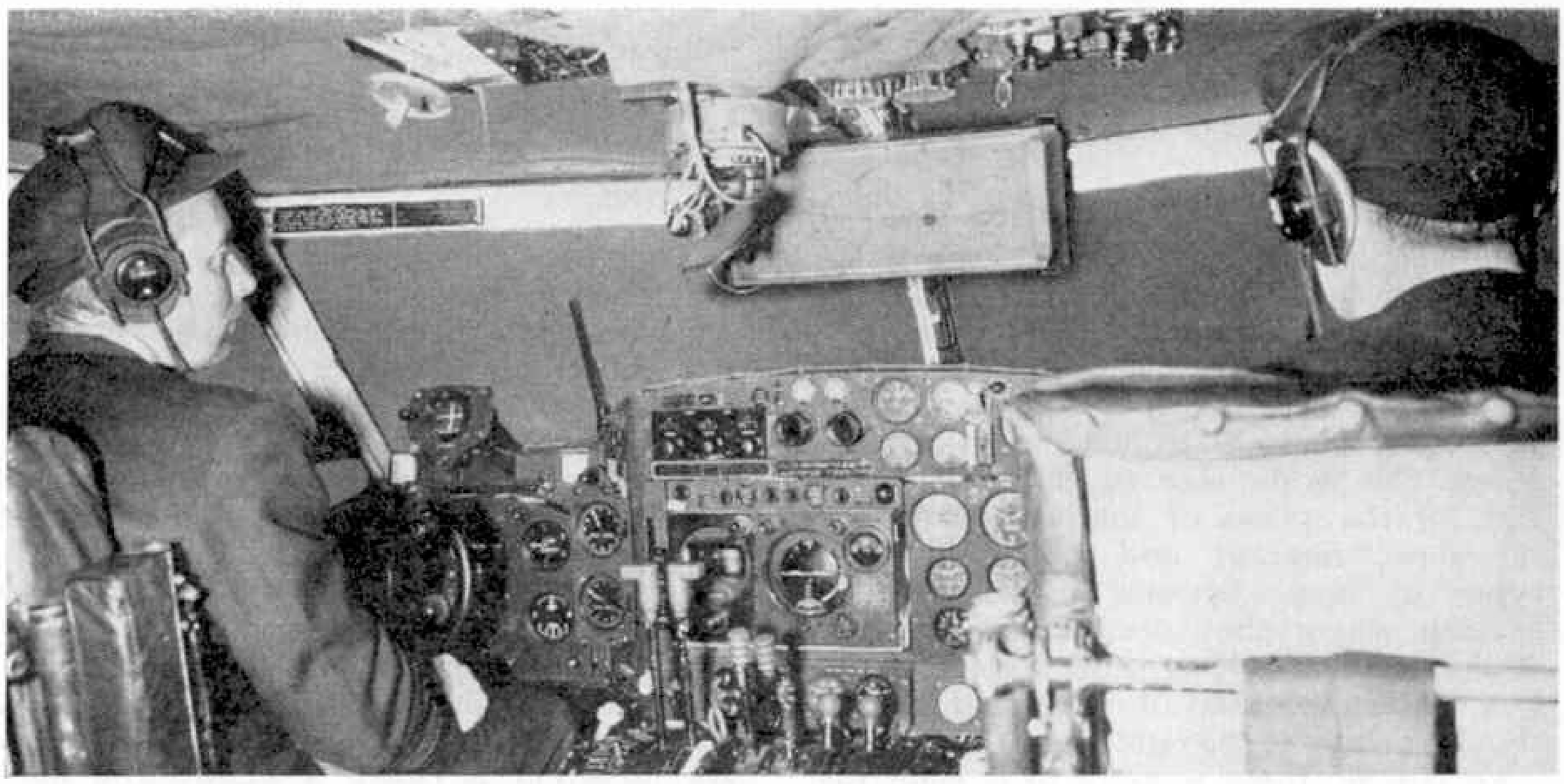
The box in which the map and rollers are mounted is called a Flight Log and, unlike most navigation equipment, is positioned where the pilot can see it, because it is essentially an aid for the pilot. This does not mean that it will take the place of a navigator in large air liners, because there are many important jobs that only a human navigator can do; but in smaller aeroplanes and helicopters it is perfectly safe and usual now to leave the navigation entirely to the Flight Log, and it is an enormous help in larger types.



The Decca Demonstration Anson XIX at Croydon. Photograph by John W. R. Taylor.

It is easy to be suspicious of "black boxes," especially when they have such an important job to do, and I must confess that I did not realise fully the tremendous accuracy and possibilities of the Decca Navigator until a few weeks ago when I motored over to Croydon Airport for a demonstration flight in the Company's "tame" Anson, G-AGWE.

Before take-off, I was shown over the



Installation of the special lightweight type of Flight Log, suitable for short flights or for use in helicopters, on flight deck of a Silver City Airways' Superfreighter.

"Annie," which has one Flight Log in the cockpit and another in the cabin where it can be watched closely by the passengers during flight. It is mounted in a console, rather like a telephone switchboard, above three instruments called Decometers. Each Decometer receives the signal from one of the Slave Stations and the position of the pen in the Flight Log is set accurately with the aid of their readings before take-off. After that everything is completely automatic, although the position of the pen might have to be checked occasionally against the Decometer readings on a long flight.

Changeover from one Decca Chain to another or from one scale of map to another during flight is done simply by turning a knob on the small control box, in which a series of appropriate "keys" are inserted before take-off to control the movement of the pen; and the airborne installation is completed by a mechanical computer and an electronic computer. The whole lot weighs only 58 lb., which can be reduced to under 20 lb. if the two computers are replaced by the latest lightweight combined electro-mechanical unit.

What does Decca offer for such a small cost in weight?

As we prepared to take off from Croydon, I noticed that the pen was poised exactly at the end of runway 120 on the map in the Flight Log. We began moving and so did the pen. It drew an elongated letter "S" on the map as we headed south on a course specified by Air Traffic Control to keep us clear of the Airways into London, and then we straightened out 1,500 ft. above the London to Brighton railway track, which runs straight as a ruler from Redhill to Gatwick Airport. The pen

drew a completely straight line on the map as we cruised above the rails.

We left Gatwick on our right, then did a very steep bank through 180 degrees and doubled back along the railway track. This was the first proof of the Navigator's accuracy, for the new ink-line fell exactly on top of the previous one. To show it was no trick, the pilot pulled steeply off course and did a vertical bank around Horley gasometer, which produced a bulge in the ink-line.

Looking now at the map, which I was allowed to keep after we landed, I can trace everything that happened in the next forty minutes as we flew over Dorking, around Box Hill and then on a new S.E. course. There is a very interesting squiggle soon after this. What happened was that I was asked to note that we flew exactly over a red and white tower on a small hill. The "Annie" was pulled around in yet another tight turn and we passed once more over the tower, on a course at 90 deg. to the first. A further turn and we were over the tower for the third time—and our three tracks printed on the map by the pen all intersected precisely at one point, where the tower stood.

Standard Flight Log, with three Decometers and control unit arranged as a test installation. Normally, they are in view of the pilot. Illustration by courtesy of British European Airways.

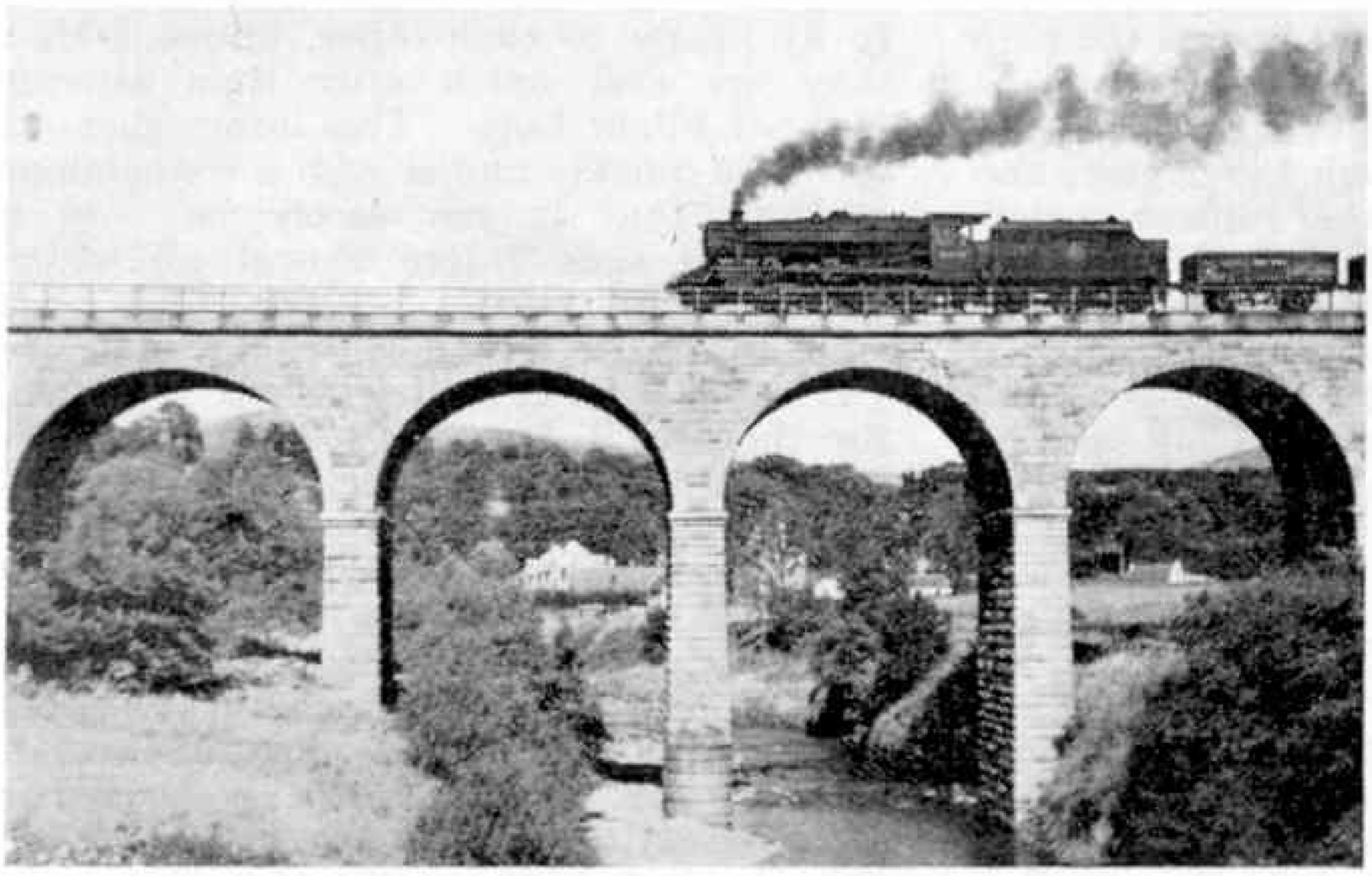
Such a standard of navigational accuracy was unknown until Decca was perfected, and it promises to solve one of the greatest problems confronting civil aviation today.

Major air terminals like London Airport are so busy that air liners have to be kept under strict control. Only one can be brought in at a time along the special Airway "sky tunnels" and the others have to be kept circling while it is landed. This wastes time and costs a lot of money in extra fuel; but it is essential if the risk of collision is to be kept to a minimum.

However, aircraft fitted with the Decca Navigator can fix their position with such great accuracy that the Ministry of Transport and Civil Aviation allows them to fly nearer to each other, knowing that they are still much safer than aircraft without Flight Logs. This brings them in far more quickly and is such a tremendous advance that it can surely be only a matter of time before almost all major airlines join B.E.A., Silver City, Air France and the other companies who use Decca. Nor is it restricted to civil use, for the Royal Air Force, Fleet Air Arm and the Air Forces of Denmark and Holland use it extensively.

At the moment, there are Decca Chains in the U.K., France, Germany, Denmark and Sweden, giving coverage of nearly all Western Europe. Further chains are being considered and, perhaps more important, a long-range system known as Dectra is to be tested over the North Atlantic route this year, where the traffic at peak periods is already heavy enough to cause a great deal of concern. Even that is not the end, for Decca are now working on a system that would provide unprecedented navigational accuracy over the entire globe by the use of only 21 Chains of ground stations.

We hear a great deal about the achievements of our aircraft and engine industry—and rightly so—but we should be equally proud of less-publicised developments like Decca and Dectra which are helping to keep the skyways safe in an age when there is an air liner taking off somewhere in the world every five seconds of the day and night. What is more, the same systems can be used with equal benefit at sea and over 3,000 ships are equipped with the Decca Navigator.



Against a sky background Stanier 2-8-0 No. 48472 crosses Crawick Viaduct, near Sanquhar, Scottish Region. Photograph by A. Macpherson.

Railway Notes

By R. A. H. Weight

The Post Office Tube in Action

In addition to the network of London Transport underground electric railways, carrying their millions of passengers every week, there is another busy line of the "tube" type that is little known, though of great importance. It has been in operation now for more than 25 years and is remarkable in that it carries no passengers, drivers or guards!

This is the Post Office's private railway, which extends for more than 6½ miles from east to west and serves by means of underground stations several of the most important sorting offices, including the vast central ones known as Mount Pleasant and King Edward Building, and the Liverpool Street and Paddington railway termini.

The tracks are laid to the rather narrow gauge of 2 ft. The trains consist of one, two or three low steel motored wagons fitted to carry containers of letters and parcels like strongly built large hampers. These can be lifted on and off at the station platforms. Lifts and moving belts or chutes allow quick transport of the hundreds of tons of postal matter handled daily to or from the offices or main line stations above.

There are two running tracks, with loops, sidings and an underground car depot, necessitating wide tunnels in places. The trains are operated from Control Cabins at the stations. Electric current is switched on and off as required, with automatic control. There is always a "dead" section behind each train for safety, and when a station is approached an arrangement of rising gradient helps to bring the little outfit to a stand at the right place. Correspondingly, a falling gradient and the application of electric power sets it going again. The average speed is about 20 m.p.h., and trains can be run at intervals of 2-3 minutes.

Western News and Running

Ticket halls and booking offices at Paddington station have now been modernised. With attractive lighting and decoration, they provide much improved facilities for passengers and staff.

At a number of principal stations camping coaches have been on view before location at country or seaside stations, where they can be rented for family or party holidays, being well furnished somewhat in the style of a large caravan.

Commendably enterprising was the decision to remove the famous old G.W.R. 4-4-0 locomotive *City of Truro* from York Railway Museum, after a sojourn there lasting 25 years, and to return it to Swindon Works for overhaul preparatory to being put in steam again from time to time for the haulage of Society or railway enthusiasts' specials in the Western Region. The City inside-cylinder, express class was introduced in 1903, and was of attractive appearance and very successful. In 1904, this particular engine while descending Wellington incline near Taunton with a light, special ocean mail train from Plymouth, was said to have attained a speed of just over 100 m.p.h., at the time the highest authentic figure recorded in a railway train, or any other form of travel. On that run the 127.8 miles from Plymouth, Millbay, to Pylle Hill, Bristol, were covered in 123 min. 9 sec. Another engine took the train on to Paddington.

Engine 3409, lately delivered by contractors, was the last of the exceptionally long line of 0-6-0 pannier tanks built to G.W.R. design, and was also probably the final locomotive turned out in Britain of pre-nationalisation type.

Two typically fine runs by the *Bristolian* were made behind Castle 4-6-0s No. 5055 *Earl of Eldon* westbound and No. 7018, *Dryslwyn Castle* from Bristol, with 7 coaches weighing about 265 tons full. The first named provided an exciting sprint after Swindon, covering 19 miles between Wootton Bassett and Box, including the descent of the only two grades of any note on the route, at an average of 84½ m.p.h. with a maximum of 94-95! After a signal check and the usual slowings around Bath, Bristol was reached slightly early in 104½ min. for the 118¼ miles. In the opposite direction, over the slightly shorter Badminton route with its considerable climbs in the first 17 miles, the very tight schedule was closely adhered to, 85 miles on almost level track being reeled off in 66 min. at an average of 77 m.p.h. Arrival in Paddington before 6.14 p.m. was over a minute early, with a clear road and easy finish.

Two lively runs towards London from Swindon starts had decidedly differing features. The 11-coach *Merchant Venturer* was for operating convenience enormously powered by 4-6-0s No. 1017 *County of Hereford*, of the Hawksworth post-war type, and No. 5027 *Farleigh Castle*. Didcot, 24 miles, was passed in 23 mins., Reading, 41¾ miles, in 38 min., with reduced speed through the platform line while a carriage was slipped. The train was now well ahead of time and suffered signal delays, as the day was a busy one. With a 10-coach Cheltenham-Gloucester-Paddington express calling at principal stations, Britannia 4-6-2 No. 70020 *Mercury* attained a considerably higher speed up to 84 m.p.h. in the first 20 miles, passing Didcot in 21¾ min. and Tilehurst, 38½ miles, in 34¾ min. amid heavy showers. So although almost stopped by signal outside the train was at Reading platform in 43 min., 3 min. early.

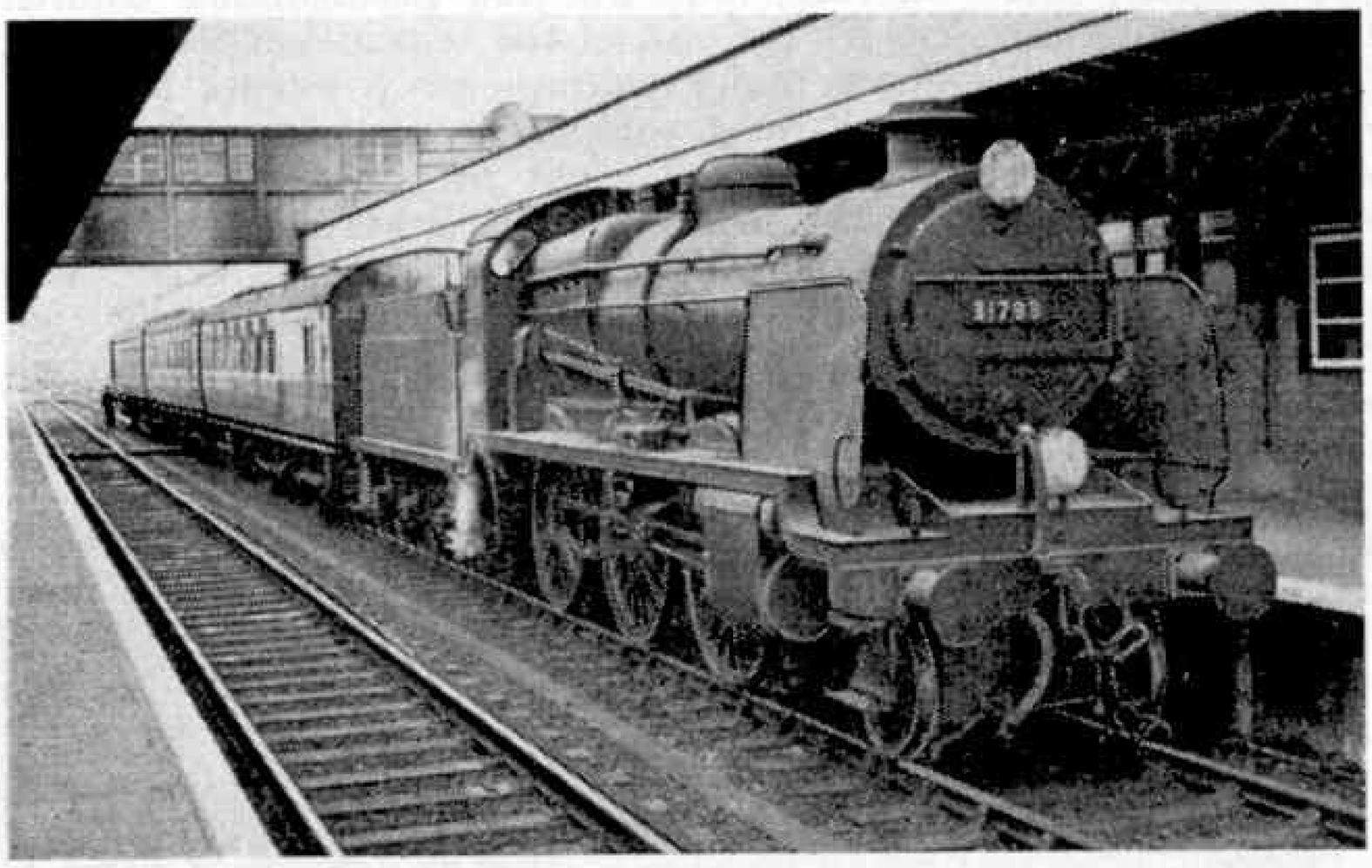
Messrs. D. S. M. Barrie, M.B.E., and G. Tibbett have kindly forwarded logs to me of runs reported this month.

Aboard the "Norfolkman"

This is one of the E.R. 2 hr. 10 min. restaurant car expresses over the 115 miles between Liverpool Street and Norwich, with a stop at Ipswich. The load was the usual 9 and the engine was No. 70038 *Robin Hood*, of the same type as *Mercury* mentioned previously.

Bright running over the fairly sharp ups-and-downs of the Great Eastern section main line, with a minimum of 43 m.p.h. at the top of Brentwood bank and subsequent speeds between 60 and 78, enabled Colchester to be passed with the usual caution with more than 3 min. in hand and 57 miles were covered in the first hour. A severe track repair slowing adversely affected the subsequent climb to Belstead, so that arrival at Ipswich was just behind time.

Again over undulating grades, the run on to Norwich bade fair to equal the "flying" 44-min. timing given to the afternoon *Broadsman* for 46¼ miles start to stop. At points where similar maxima or higher are often recorded, speeds of 84, 80 m.p.h., etc., occurred, providing impetus for the uphill stretches, and so the *Norfolkman* passed Swainsthorpe, 41 miles, in 38¼ min. and ran gently into Thorpe Terminus, Norwich, over 5 min. early, just after 11.35 a.m. having left London at 9.30. The journey was continued to Cromer and Sheringham with fresh engines.



S.R. No. 31793, a Maunsell 2-6-0, waits at Templecombe with a train for Salisbury. Photograph by M. Arnold.

Locomotive Stock Changes

All 10 class 4 2-6-4Ts in hand at Brighton Works, numbered 80145-54, are allocated to the Motive Power Depot there. New tender locomotives have been allocated as follows: Class 9 2-10-0, No. 92092, 36A, Doncaster, and Nos. 92115-8, 18B, Westhouses; Class 4 4-6-0 No. 75052, 1E, Bletchley; and Class 4 2-6-0 No. 76074, 65A, Eastfield, Glasgow, and Nos. 76075-8, 10D, Sutton Oak.

Additions to the diesel shunting engine stocks are again considerable. Of the larger 350 h.p. diesel-electric type the following have been gazetted to Scottish sheds: Nos. 13275-6, 65A, Eastfield; No. 13277, 65C, Parkhead; Nos. 13278-80, St. Rollox, 65B; No. 13281, 65F, Grangemouth; and Nos. 13282-7, 66B, Motherwell. To L.M.R.: Nos. 13288-9, 13291-3, 19A, Sheffield, No. 13290, 16A, Nottingham, and No. 13294, 20B, Stourton. For E. and N.E. Regions: No. 13327, 31B, March, Nos. 13328-13330, 36B, Mexborough, and No. 13331, 41A, Sheffield (Darnall), as well as diesel-mechanical locomotives No. 11183, 40A, Lincoln, No. 11216, 50B, Neville Hill, Leeds, and No. 11217, 52E, Percy Main, near Newcastle.

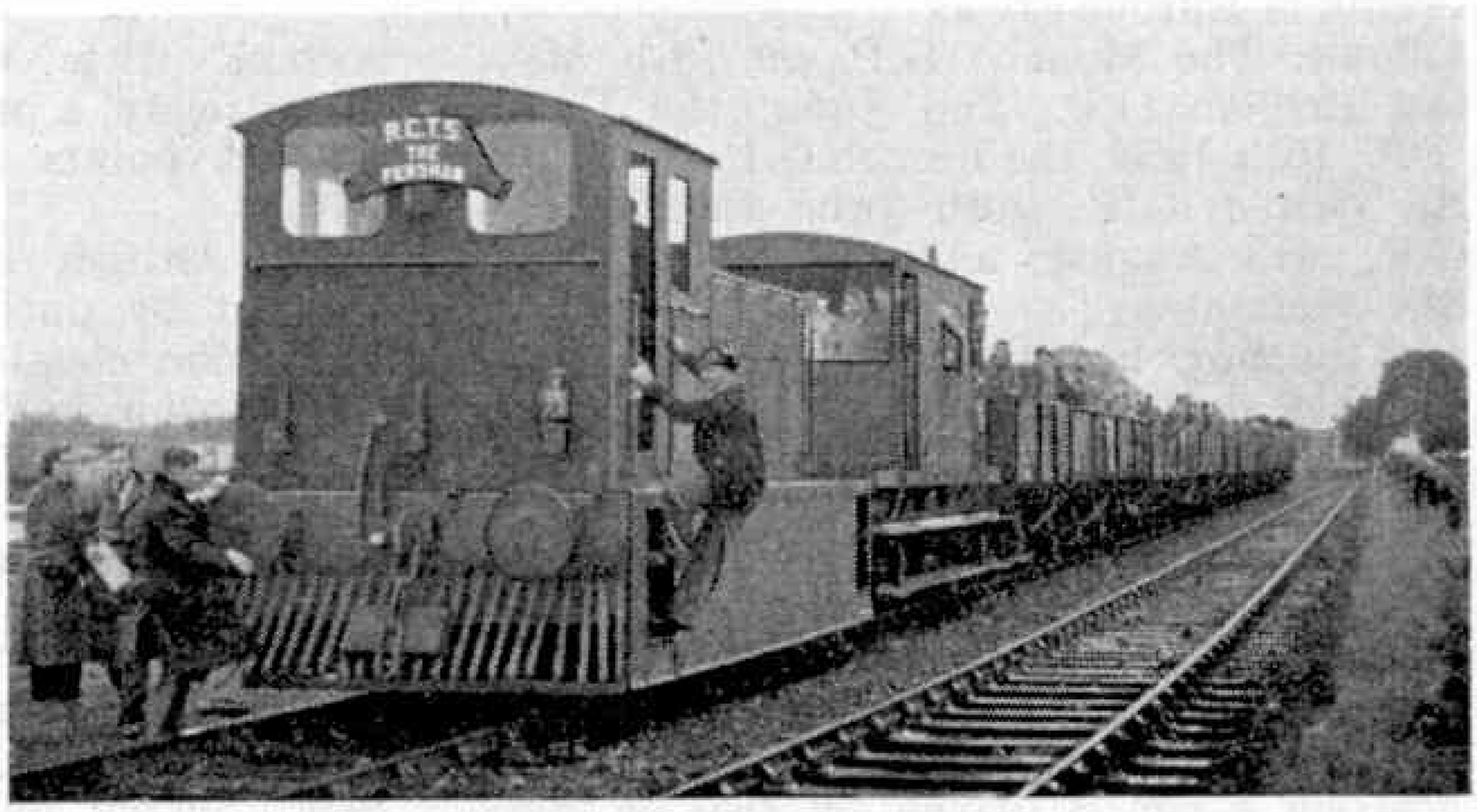
On the Southern, diesel-electric shunters numbered 13270-4 intended for 70C, Guildford shed, were temporarily at Hither Green. Some now work at Reading.

No little stir was caused at the New Year by the arrival in tow of withdrawn H2 ex-L.B.S.C.R. Atlantic No. 32425, *Trevose Head*, only slightly dismantled, at Slade Green carriage depot for electric trains near Dartford, Kent, for use there as a stationary boiler supplying heat and hot water. Old locomotives are employed for this purpose at various places, though frequently the boiler only is installed after removal of the wheels, frames, etc.

E. and N.E. locomotive classes rendered extinct by scrapping are J65, Great Eastern light 0-6-0T and N13, 0-6-2T. No. 69114, withdrawn, was the last of the former Hull and Barnsley Railway engines. Other classes now extinct are the S1 G.C.R. and L.N.E.R. 0-8-4 banking tanks and the N.E.R. Y8 small inside cylinder 0-4-0 tanks.

L.M.R. Running Sheds near Manchester, Trafford Park and Heaton Mersey have been renumbered respectively 17F and 17E. Their Yorkshire depots and locomotives at Wakefield, Goole, Mirfield, Sowerby Bridge, Low Moor and Farnley Junction, are transferred to the N.E. Region. The Sheds concerned will be recoded in the 53-, 55-, 56- numeration.

Former L.M.S. Standard Compounds Nos. 40917 and 41088 have been withdrawn.



The wagon passengers on this train are R.C.T.S. members on a tour last Autumn of branches closed to passenger traffic. Motive power is provided by a tramway type diesel locomotive built for service on docks, quays and lightly laid branches. Photograph by H. N. James.

Road and Track

By Peter Lewis

MANY times during recent weeks I have been asked whether I consider the British Grand Prix will take place at Aintree in July if petrol rationing is still in force. Well, that remains to be seen. World Championship events, in which points are awarded to the drivers and not to the makes of car, carry tremendous prestige value in the highly competitive world automobile markets. If, as may well happen this season in one or other of the seven European championship races, a British car is victorious, our motor industry therefore would reap world-wide benefit.

The importance of championship events in fact is that they are the very essence of motor racing. They not only endorse the skill, courage and sportsmanship of the men who drive the potent Grand Prix machinery, but turn the world spotlight on the automotive genius of the country that produces the most successful racing cars.

The Championship events in Europe are as follows: The Monaco G.P. on 19th May; the Belgian G.P., 2nd June; the Dutch G.P., 16th June; the French G.P., 7th July; the British G.P., 20th July; the German G.P., 4th August; and the Italian G.P., 8th September.

Why not keep a chart showing the placings during the season? Make it up yourself on the Friday after each event, allotting points in each race as follows: First, 8; Second, 6; Third, 4; Fourth, 3; Fifth, 2; and Sixth, 1. There is also 1 point for the fastest lap; if several drivers tie for this then the point is divided into halves or thirds if necessary.

When a car is driven by two or more drivers, points gained are equally divided, but a driver is only eligible if he has completed a distance of a third of the race; and if a driver handles several cars during a race, only his best performance counts.

At the end of the season—depending on how many championship events actually take place—markings are assessed on the best five of eight or nine performances, or the best four of six or seven.

Following the Argentine G.P. last January, World Champion Fangio led with 8 points, Jean Behra, the French champion and a clever, forceful driver, was second with 6 points, while Carlos Menditeguy, a protégé of Fangio, was third with 4 points and Harry Schell fourth with 3.

This large modern building houses the cars of all visitors to Venice. Photograph by courtesy of Autorimessa Agip.

Top British driver is Moss, who gained 1 point by putting up fastest lap in the Argentine classic, while F. Gonzalez and the Marquis de Portago each have one point for sharing the fifth car home; C. Perdisa and P. Collins have half a point each for sharing sixth place.

Connaught and Vanwall

I have often written about the courageous way in which Connaught Engineering of Send, Surrey, have carried on in spite of dwindling financial resources. Now, the Connaught Grand Prix Car Club has been formed with the object of subsidising

starting money at continental events from club funds to the extent of £250 per car. This is bound to result in more green cars than ever before on the continental starting "grids," but it may also mean that

Mr. Rodney Clarke, organising genius of Connaught Engineering. Photograph by courtesy of Auto Course.

we see less of Connaught in this country. Mr. Rodney Clarke will not jeopardise the participation of his cars in "prestige" European events by entering for minor British ones.

Connaught have big plans for this season, and do not overlook the fact that on two occasions last year—in the World Championship Grand Prix of Britain and Italy—Connaughts finished well up.

Now that Moss is leading Vanwall—and with the possibility that either next year or the year after Mercedes-Benz might enter gas turbine cars in Formula 1 races—I expect a maximum effort from Mr. A. Vandervell's *equipe*. Moss has taken a bold step at a time when he is at the peak of his driving form, and it is obvious to people who know him well, as I do, that his decision was made because of a sincere wish to put a British car on top.

Frankly, I cannot see either Vanwall, Connaught or B.R.M. providing the 1957 World Champion's car, for a full season of reliability on tough, exacting circuits is required of the car. But I shall be very surprised if Moss does not win one of the vitally important events that make up the Championship.

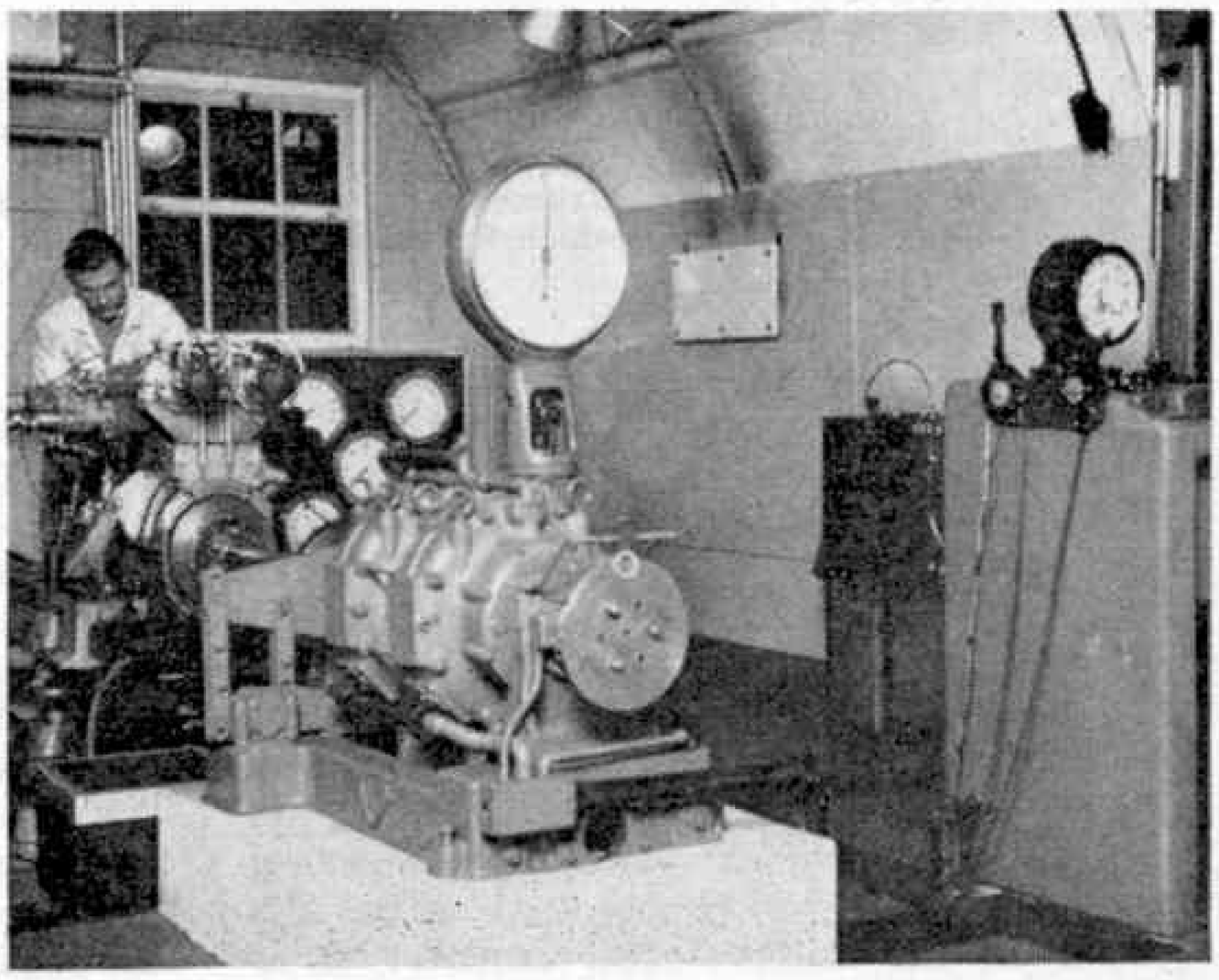
Europe's Wonder Garage

We are planning and building some wonderful garages in this country, but none of them will have the unique appeal of the Autorimessa Agip in Venice. Twice I have visited this fascinating city in recent years and on each occasion I have been amazed by the highly efficient organisation of this super garage.

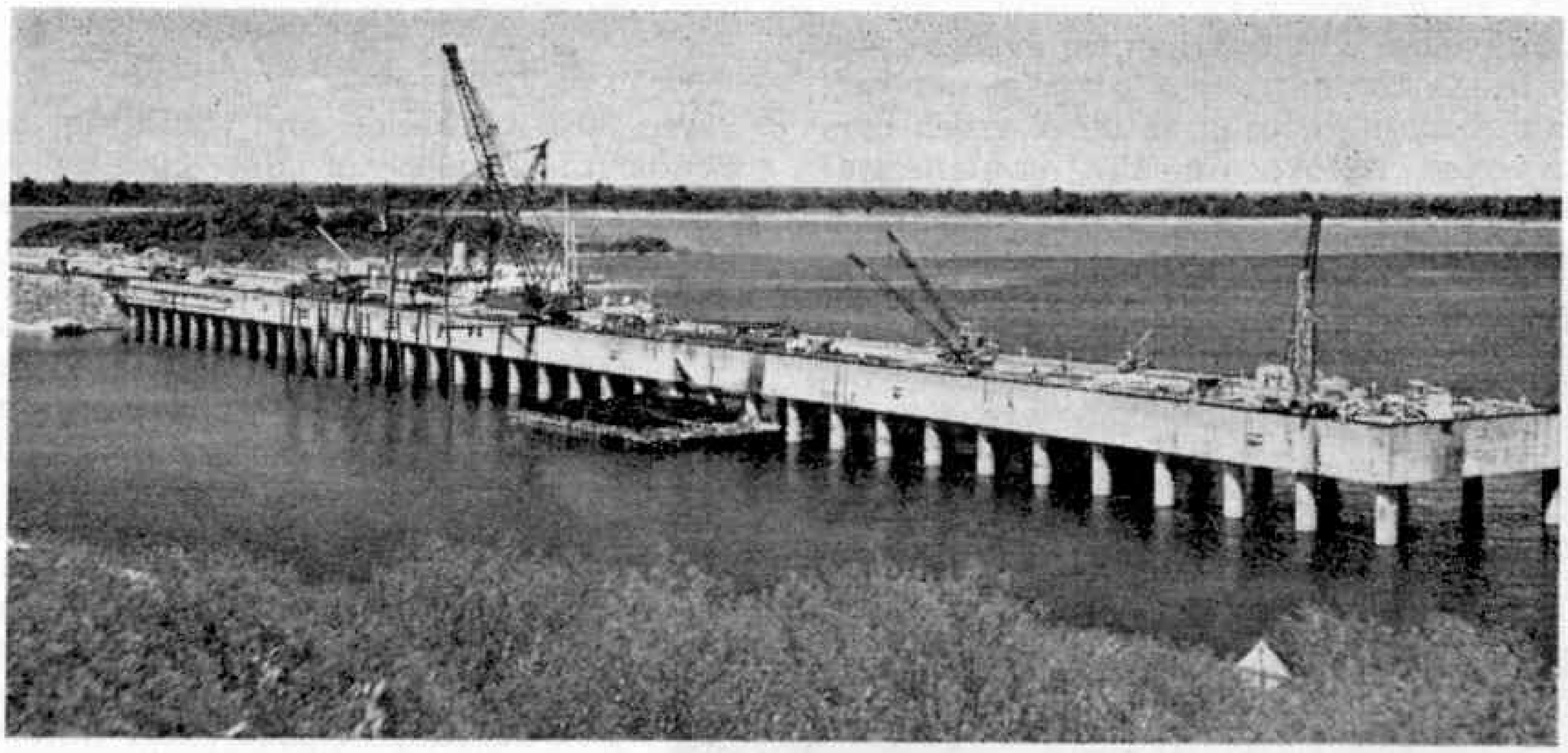
Last year, we crossed the two and a half mile causeway from the mainland in close company with a German Mercedes, a French Simca and a Ford Prefect from Holland. We all drove into the vast reception hall of the Autorimessa within a few seconds of each other and were immediately directed along a one-way channel, halted, and had our luggage unloaded by a porter.

I was then taken a few yards to the Hotel Bureau where two clerks, both of them linguists, were able to establish telephonic communication with any of the Venice hotels. While one dealt with the driver of the Mercedes, the other dealt with the Frenchman. When my turn came, the clerk's English was faultless. "What sort of hotel? How much do you want to pay?"

Within minutes it was settled, and while I drove my Fiat 1100 up and up, round and round the ramps, to the roof car park the family accompanied a porter with our luggage to the Boat Landing Stage, a few yards away, to board a water bus. I believe the garage is still the largest in Europe, servicing no less than 600 a cars a day.



The engine test house at the Send, Surrey, works of Connaught. Photograph by courtesy of Auto Course.



Docks That Can Be Transported

By R. J. Salter

IF you have ever been to one of the large seaports you will have seen the docks and wharfs where the largest liners and cargo steamers unload their cargo. Usually the dock is built of stone, concrete or steel, and the depth of water is maintained if necessary by dredging in the dock itself or in the approaches, so that large liners are not caught in the mud and sand.

Where the depth of water is not very great, as is the case where the port is along the edge of a river, the dock may run out into the deeper water. A dock built in this way is similar to a pier at the seaside that starts on the sands and runs out into the deep water. Such a pier generally is made of steel columns with a grating over the top to walk on, and the sea can be seen lapping around the supports. Others, such as the old fashioned fishing jetty, are built of stone walls with the space between filled in solid with rocks and other hard material.

In this country, wherever a cargo has to be delivered, there is almost always a convenient port where the merchandise may be unloaded and then carried to its destination on lorries. When engineering equipment has to be moved into the interior of an undeveloped country it is rather more difficult. The only ports are usually native fishing villages, where canoes may tie up, and in any case roads do not exist.

To bring bulldozers into the country the ships sail as far up a river as possible and then unload the equipment on to a dock or jetty built out into the river. A pier such as this takes a good deal of time and money before it can be completed. The United States Steel Company had this problem to solve when they wished to build a port in the Venezuelan jungle on the Orinoco River.

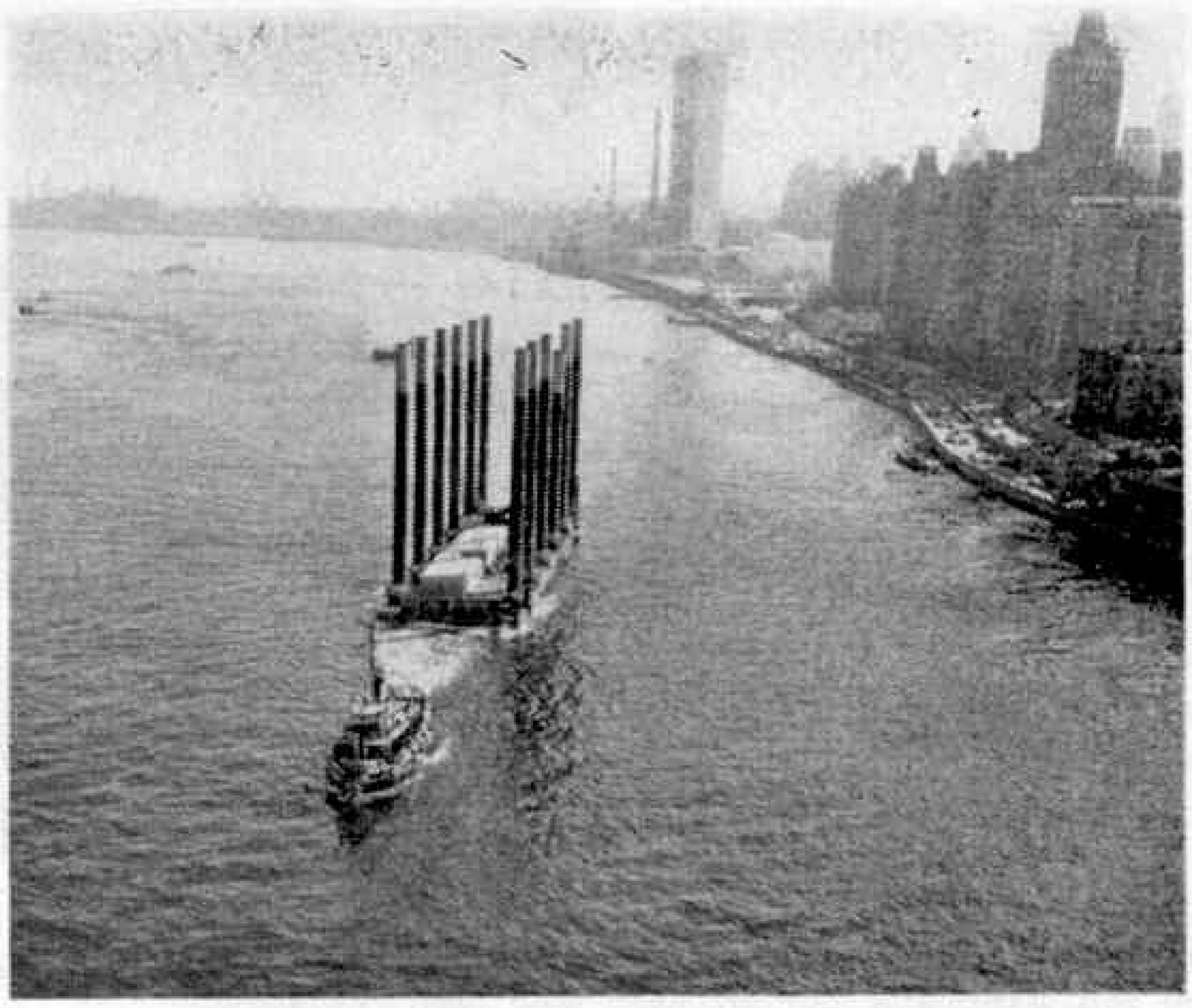
Engineers working in the United States for the Delong Corporation solved the problem when they designed a new type of floating platform, which could be towed across the sea by a tug to wherever it was needed. These platforms are built of concrete and steel, and are often sixty feet wide and a hundred feet long. Down each of the longer sides circular steel tubes, six feet in diameter, fit through holes in the deck.

A floating platform being used as a jetty at Puerto Ordaz, on the Orinoco River, in Venezuela. On the site steel tubes fitted to the platform were driven into the river bed, after which the platform was raised to the required height.

An ocean going tug often tows the platform many thousands of miles to the place where the dock is required. It then moves it into position before it is secured by steel ropes. Once firmly anchored the steel tubes are allowed to slide downwards through the deck until they reach the river or sea bed. All this time the platform has been floating on the sea, and it must be

lifted up if it is to be any use for unloading cargo. Powerful air jacks are fastened to each tube and to the deck, so that when air under high pressure is fed to them the platform is lifted clear of the water.

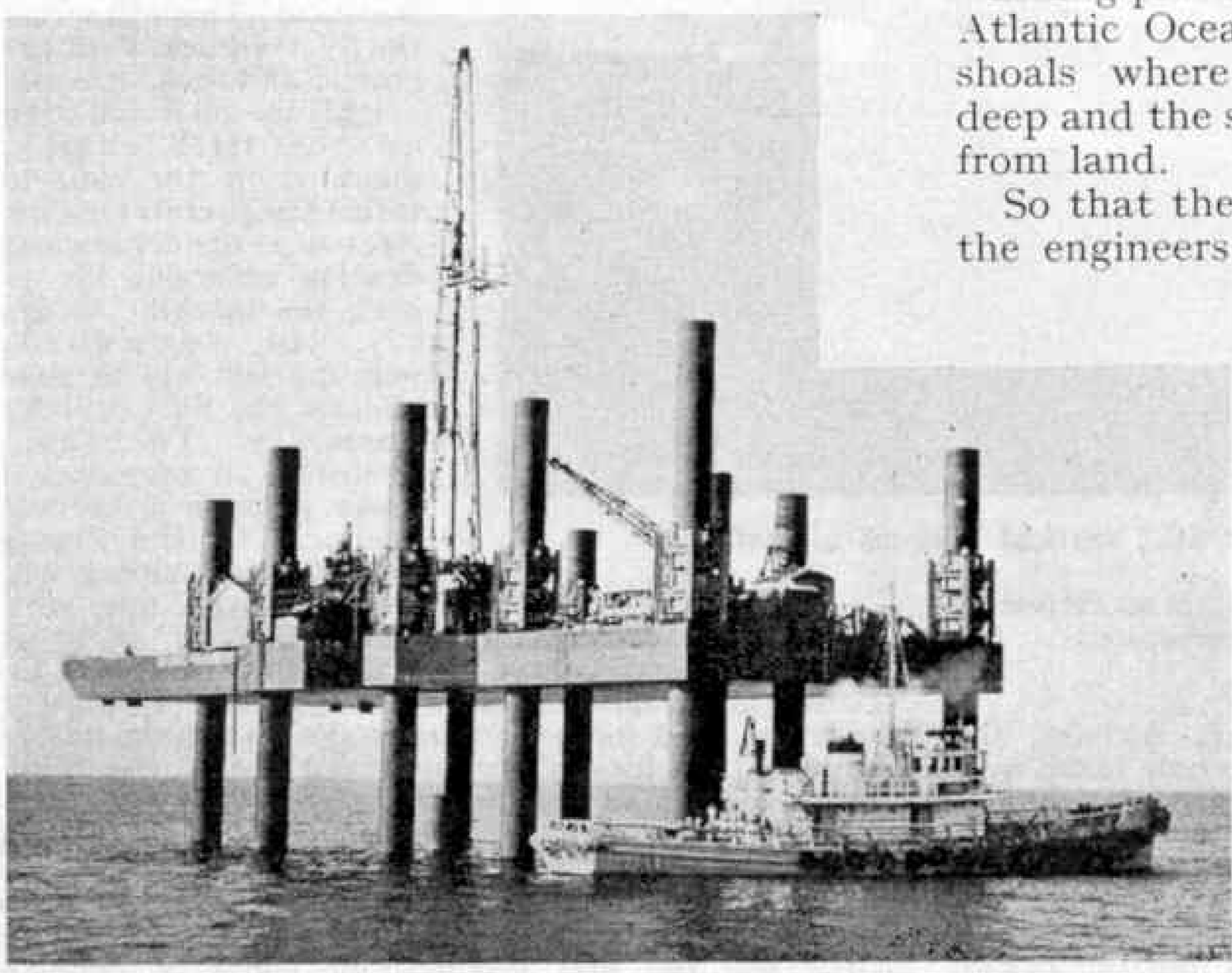
With only the weight of the platform pressing the tubes down on to the sand the first storm would soon move the dock out of position. To prevent this happening the steel legs are driven, one at a time, into the sand with powerful steam hammers, which hit the top of the tube with a heavy weight.



A floating platform used for drilling in the Atlantic being towed up the East River, New York. This picture shows very plainly the steel tubes that were driven into the sea bed.

In a very different climate the Engineers of the United States Army needed a port to construct a new air base at Thule, in Greenland. Four of these dock platforms were built at Houston in Texas and towed to Thule, six hundred miles inside the Arctic Circle. Within two weeks of arriving in Greenland a dock 50 ft. wide and 1,000 ft. long had been built, and valuable equipment had been moved on to the shore before winter pack ice stopped shipping.

These floating platforms have also been used for obtaining oil from beneath the sea. Not every well drilled hits the oil stored deep down in the earth. So that exploration can safely be carried out, the drilling machinery has been fitted on one of these platforms, which is towed to one of the coastal oil fields. If oil is found the dock may be used as a permanent platform on which to place the apparatus for extracting the oil from the ground. As often happens, oil may not be found and the steel tubes are then drawn up out of the sand and the platform floated to another spot.



This movable platform was used in drilling for oil in the Gulf of Mexico.

Some time ago details were released of secret work carried out by the United States Government, using one of these floating platforms. To guard the country against a surprise air attack radar stations have been built on the mainland. To give earlier warning platforms are to be built out in the Atlantic Ocean. They are to be sited on shoals where the water is about 60 ft. deep and the stations are as far as 100 miles from land.

So that these stations could be designed the engineers wanted to know exactly of what material the bottom of the sea was made. There was only one way to find this out and that was to drill into the bed of the sea. One of the platforms was fitted with large huts for the 50 men who were needed to operate the drills, and to inspect the samples of sand brought to the surface. The platform was then taken to the Brooklyn Naval Yard and the usual 100 ft. long legs were replaced with

[Continued on page 158]

Air News

By

John W. R. Taylor

Convair B-58 Hustler supersonic bomber coming in to land at conclusion of a test flight.

First Supersonic Bomber

Towards the end of my article *America's Big Stick*, in last month's *M.M.*, I referred briefly to the new Convair B-58 Hustler supersonic bomber. Photographs of this formidable aircraft have now been released, and one is reproduced above.

With a span of only 55 ft., which is less than half that of a Valiant, the B-58 has four General Electric J79 turbojets, with afterburners, in pods under its razor-thin wings. Each gives a thrust of over 16,000 lb., and together they are as powerful as the engines of a large naval cruiser.

As can be seen, the delta wing has a sharply-cambered leading edge. The crew of three are seated one behind the other on ejection seats, and the slim fuselage is "wasp-waisted" to keep the airflow smooth and so ensure an easier passage through the "sound barrier".

The warload is carried in interchangeable packs slung under the fuselage and can include nuclear or H.E. bombs, reconnaissance cameras, flight refuelling equipment or even air-to-air rocket missiles, because the performance of the B-58 would make it an extremely effective, if costly, high-altitude interceptor.

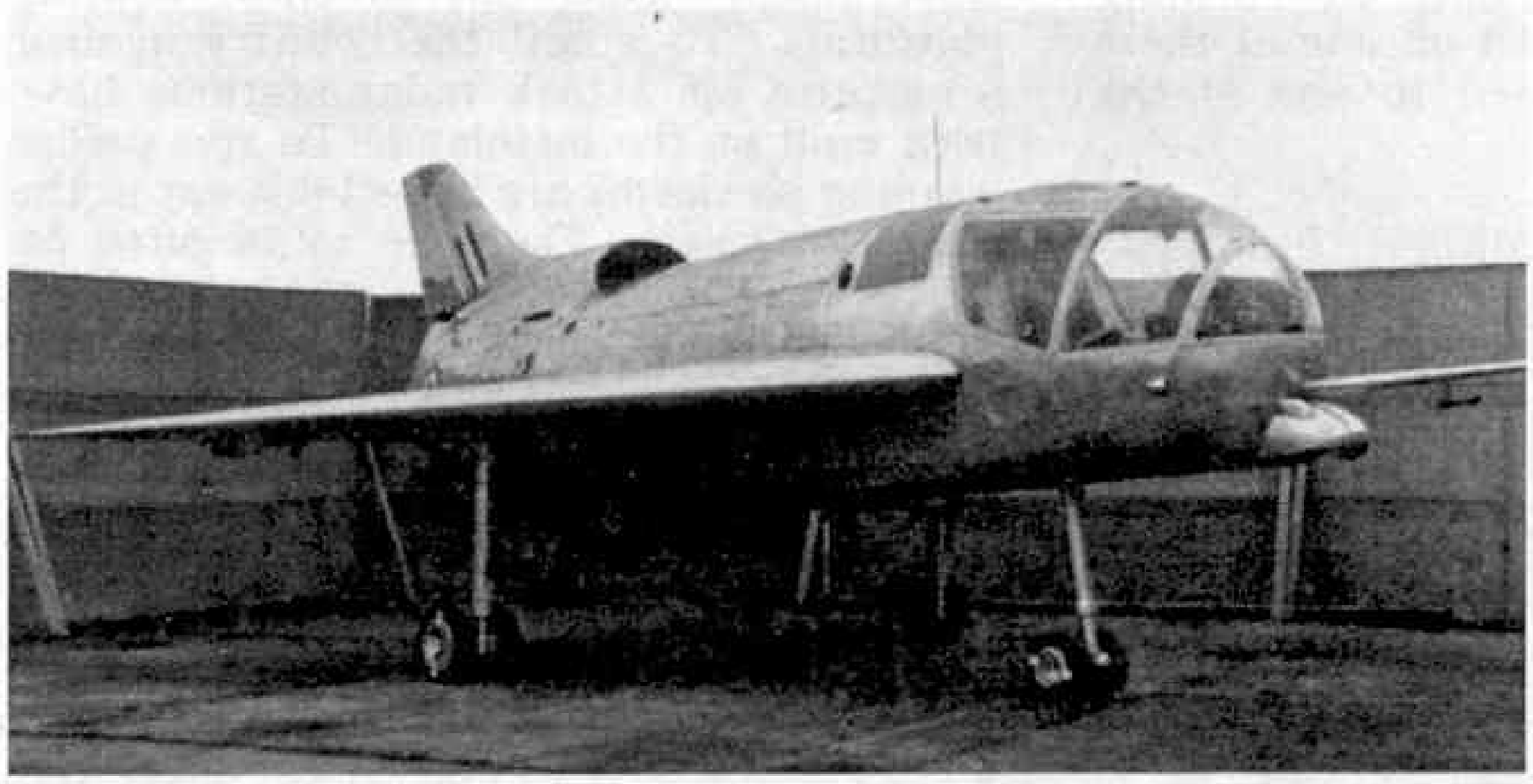
More Airline Mergers

Following their purchase of Manx Airlines, the British Aviation Services Group have now taken over the Lancashire Aircraft Corporation, whose network of routes links the north of England and the Midlands with the Isle of Man and Jersey.

As the Group already included Air Kruise, Aquila Airways, Britavia and Silver City Airways, it now has a total fleet of 42 aircraft, made up of fourteen Bristol Superfreighters, eight Bristol Freighters, seven Douglas DC-3's, five Handley Page Hermes 4's, three Short Solent flying boats, two D.H. Rapides, one D.H.86B and other small twin-engined aircraft. Excluding Lancashire Aircraft Corporation, the Group carried more than 300,000 passengers and 70,000 tons of freight during 1956.

Short's Super-Bedstead

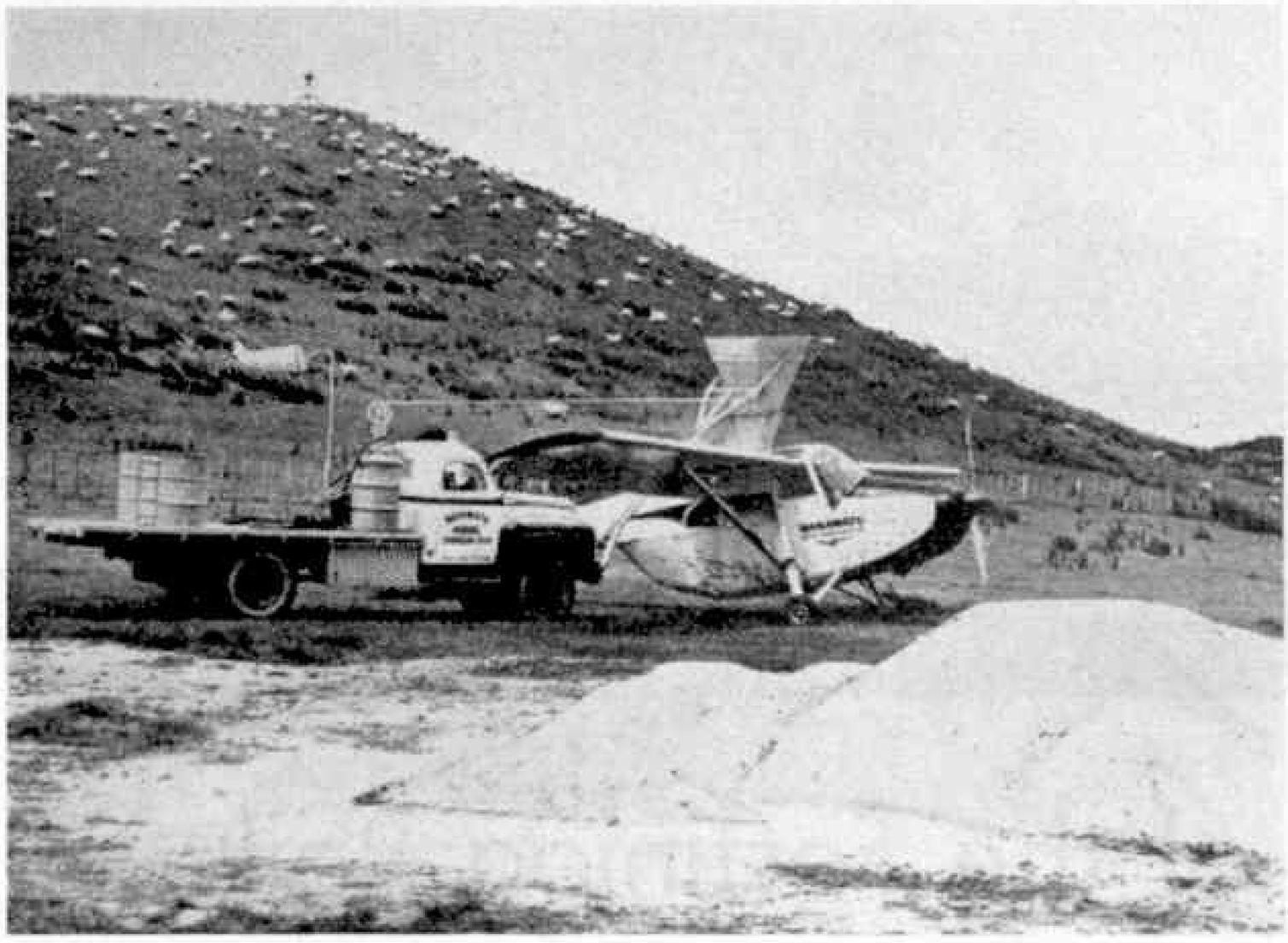
First British aeroplane to make use of the direct jet-lift principle pioneered by the Rolls-Royce "Flying Bedstead" is the Short SC.1, shown in the lower illustration on this page. Details are lacking, but it is known that the SC.1 is powered by five Rolls-Royce R.B.108 turbojets. Although the photograph is not a good one, it is possible to work out with reasonable accuracy how the aircraft works.



First picture of the Short SC.1 vertical take-off aircraft.

Four of the engines are almost certainly arranged so that their exhaust is directed downwards, like the engines on the "Flying Bedstead". This will thrust the SC.1 vertically off the ground and then, at a safe height, the pilot will open up the fifth engine, mounted in the tail, to thrust the aircraft forward. As soon as the delta wings develop sufficient lift to keep the machine in the air, the downward-pointing jets will be shut off and the SC.1 will fly normally. The same procedure in reverse will make possible a vertical landing. Control during take-off and landing will be by air jets at the nose, tail and wing-tips, with normal flying controls for cruising flight.

Many experts believe that jet-lift will be used by giant transatlantic air liners of the future to do away with the need for lengthy runways. At the moment, however, the idea is very new and the SC.1 is being tested first as an ordinary aeroplane, with horizontal take-offs and landings, followed by straightforward vertical lifting and descending tests with the aircraft tethered in a special test structure that has been erected on the company's airfield at Belfast. Only then will the first attempt be made to convert from vertical to forward flight.



The Edgar Percival E.P.9 agricultural aircraft was designed primarily for farm work in New Zealand. Here one of these machines, bought by the Manawatu Aerial Topdressing Co. Ltd., is being loaded with superphosphate during a demonstration at Christchurch, N.Z.

E.P.9 Proves Itself

Since I described the new Edgar Percival E.P.9 agricultural aircraft in the November 1956 *M.M.*, the first two E.P.9's have been making some very convincing demonstration flights. One of them, bought by the Manawatu Aerial Topdressing Company, was seen at work in a 30 m.p.h. wind with rain squalls by H.R.H. The Duke of Edinburgh during his visit to New Zealand.

The type of country in which it operates is shown well in the photograph reproduced above, which emphasises why aircraft designed for farm work must be sturdy, manœuvrable and able to operate from short fields.

Floating Weather Buoys

To supplement the work of the flying weathermen who locate and track hurricanes from the air, the U.S. Navy has put down a number of radio-equipped weather buoys in the tropical Atlantic Ocean, the Caribbean and the Gulf of Mexico.

Each weighs slightly over 300 lb. and is 25 ft. long, of which 14 ft. is below the surface of the water. Above the water is a superstructure containing instruments and a 7 ft. whip aerial, from which each of these automatic weather stations transmits a report on wind direction and speed, and air and sea water temperature every six hours over a range of at least 1,000 miles.

The positions of the buoys are checked daily by radio direction finders, and the U.S. Navy hope that their reports may make it possible to detect and locate hurricanes that would otherwise strike America's S.E. coast without warning.

Flying Boat to Switzerland

The first regular flying boat service between Britain and Switzerland is due to begin this summer, when Aquila Airways will open a new route between Southampton and Montreux. Their 58-seat Solents will alight on Lake Geneva.

Temporary Undercarriage

A story to rival the exploits of the old-time Hollywood stuntmen has come from Norfolk, Virginia, U.S.A., where one of the main undercarriage wheels dropped off a lightplane as it took off on 10th December last. After talking to the pilot by radio another airman drove his car over the airfield as fast as possible, and the man in the crippled aircraft dropped until one wing rested on the car, with the remaining wheel on the ground. After which they braked together, quite safely.

Missiles from Under the Sea

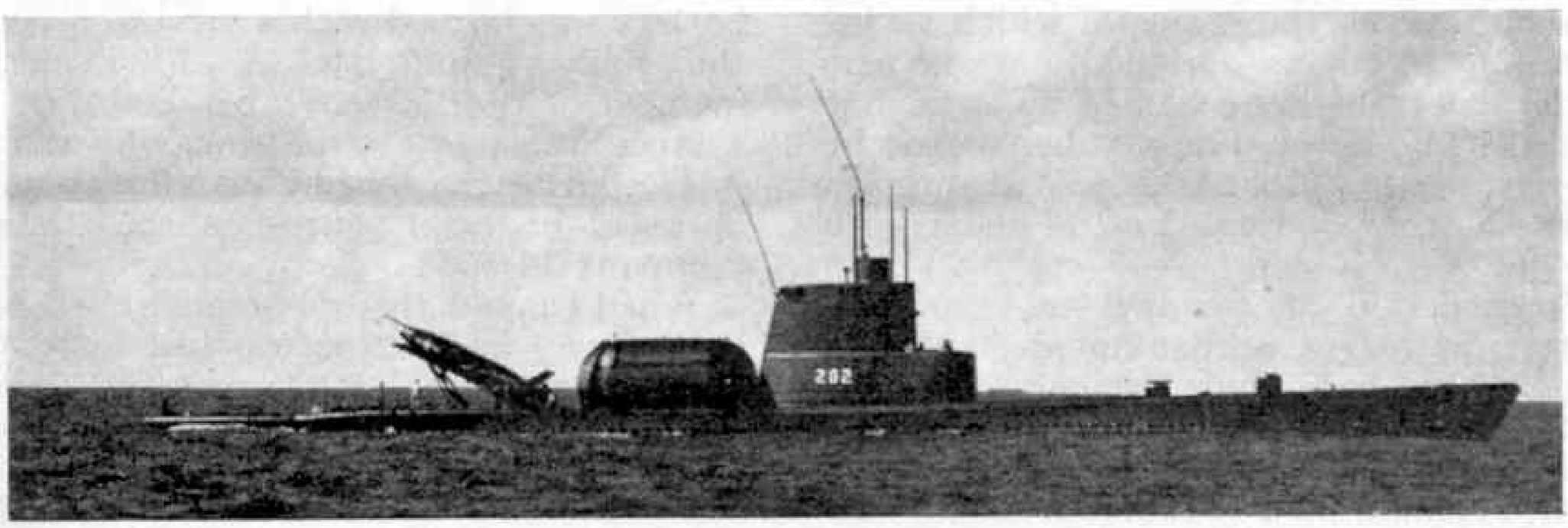
The development of guided missiles has made the long-range submarine into an offensive weapon to rival bomber aircraft, because it can approach an enemy coast unseen, surface for a few minutes under cover of darkness, launch its missile against a shore target and then submerge out of sight again.

One of the first submarines equipped with this new type of armament is the U.S.S. *Tunny*, shown in the illustration below. When submerged, it carries two Chance Vought Regulus "flying bombs" in a cylindrical hangar on its after-deck. Mounting a missile on its launching ramp and firing takes only a few minutes.

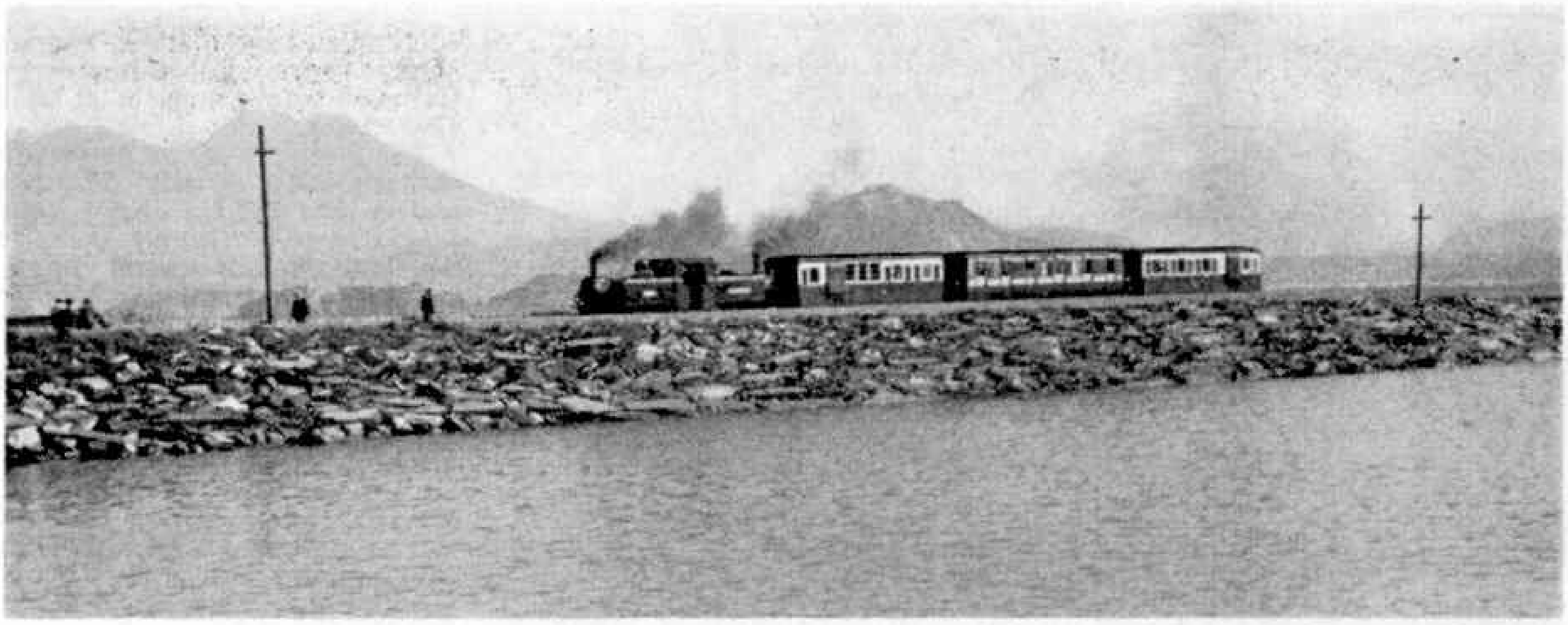
The Regulus I carried at present by the *Tunny* is powered by an Allison J33 turbojet, and has a range of 500 miles at just below the speed of sound. It will be replaced in due course by the newly-announced Regulus II, a tail-first supersonic missile.

* * * *

Most airminded city in the world is probably Anchorage, Alaska, with 2,000 private pilots among its population of 60,000, owning 500 aircraft.



U.S.S. "Tunny," the U.S. Navy's guided missile submarine, with Regulus 1 "flying bomb" on launching platform being prepared for firing during operations in the Central Pacific. Official U.S. Navy photograph.



The Revival of the Festiniog Railway

By G. Oates

THE history of the recently revived Festiniog Railway, which has been described as the most wonderful railway in the Kingdom, is a long one. The line was very closely linked with the North Wales slate industry established at Blaenau Ffestiniog in the middle of the eighteenth century. In those far off days slate was brought down by horse and cart to Portmadoc for shipment by sea.

The Festiniog Railway, now the oldest surviving passenger carrying narrow gauge railway in the world, was constituted by an Act of Parliament in 1832, and the line was opened four years later for goods traffic. It was built to a gauge of 1 ft. 11½ in. and it climbed 700 feet from Portmadoc to Blaenau Ffestiniog, a distance of nearly 14 miles, through a series of curves, the radius of which varied from 8 to 1¾ chains. Originally at one part of the line trains were hauled up an incline by ropes and lowered on another incline by gravity, working that later was abandoned when a tunnel was driven underneath the hill.

Construction of the line was no easy matter, as ledges, embankments, and two tunnels have been made through solid rock, and ravines bridged by narrow stone embankments. The Festiniog Railway will always remain as a monument of the fine engineering qualities of its builder, James Spooner.

For nearly thirty years loaded slate wagons came down from Blaenau Ffestiniog by gravity controlled by brakesmen, and were hauled back empty from Portmadoc by horses, which came down in a special wagon at the rear of the train. In 1863 steam locomotives were introduced and by 1865 passenger traffic was officially sanctioned. As the years went by the Railway prospered as both passenger and freight traffic increased, slate being shipped by sea to all parts of the world from Portmadoc. The tide of prosperity ebbed in the years between the Great Wars. The outbreak of hostilities in 1939 brought an end to passenger traffic, and the dwindling slate trade compelled the Railway to close down completely in 1946.

The picture at the head of the page shows the Festiniog Railway 0-4-4-0 Fairlie locomotive "Taliesin" at the head of a train crossing the Traeth Embankment, usually known as the Cob, on the way to Portmadoc. This railway was closed, but has been revived by the Festiniog Railway Society.

Five years later the Festiniog Railway Society was formed with a view to reviving the Railway and Mr. A. F. Pegler, a member of the Eastern Area Board of the British Transport Commission, who was also interested in the scheme of reinstatement, obtained financial control of the Railway Company in 1954.

When I made my first acquaintance with the railway in 1952, it was sad to see the track overgrown with vegetation, while wagons lying derelict were not only exposed to the ravages of the weather, but also to vandalism. Deserted stations with helpless signals were but a very pale shadow of former days. But one has been spared the

awful thought that the interesting selection of locomotives rusting in Boston Lodge shed might go to the scrapyard. Since 1954 Boston Lodge Works, which at one time employed over 50 men, has again hummed with activity as the work of reinstating locomotives and rolling stock took place, while track clearing operations were also being carried on.

So on 23rd July, 1955, the mile stretch from Portmadoc to Boston Lodge was opened for passenger traffic. I made my first trip on the line in September of that year. The engine *Prince* was painted green and certainly looked very smart, and so did the solitary coach in the new livery of green and ivory sides with dark red ends.

The booking clerk did some brisk business, after which he became the guard, but before the train left for the one mile journey he clipped the tickets and locked the carriage doors. In our compartment there was an elderly gentleman and an old Welsh lady with her shopping basket, who said she was delighted that the railway was running again. The train set off and proceeded along the Traeth Mawr embankment, which is often referred to as the Cob. The elderly gentleman in the corner suddenly came to life and with rapture began to name the various peaks of Snowdonia that came into view as we travelled towards Boston Lodge, where we arrived all too soon, for I had enjoyed this run.

"Taliesin" at Portmadoc, waiting to leave for Minffordd.

Another coach was added for the reverse journey, but before returning a tour was made of the locomotive sheds, where we saw some of the engines that had formerly worked on the line and were now awaiting overhaul or rebuilding.

Inspection of the locomotives was a reminder that the motive power employed on the Railway also has a long and interesting history. For the introduction of steam haulage in 1863, two 0–4–0 tank engines each weighing 7½ tons with outside cylinders were used. They were named *Princess* and *Prince*, and the latter has been the mainstay of the passenger services since August Bank Holiday 1955. Rebuilt as a saddle tank and provided with a four wheel tender, it is still going strong after 93 years. These two locomotives were followed in 1864 by two more similar engines called *Mountaineer* and *Palmerston*. With increasing freight traffic and the

A scene at Minffordd station.

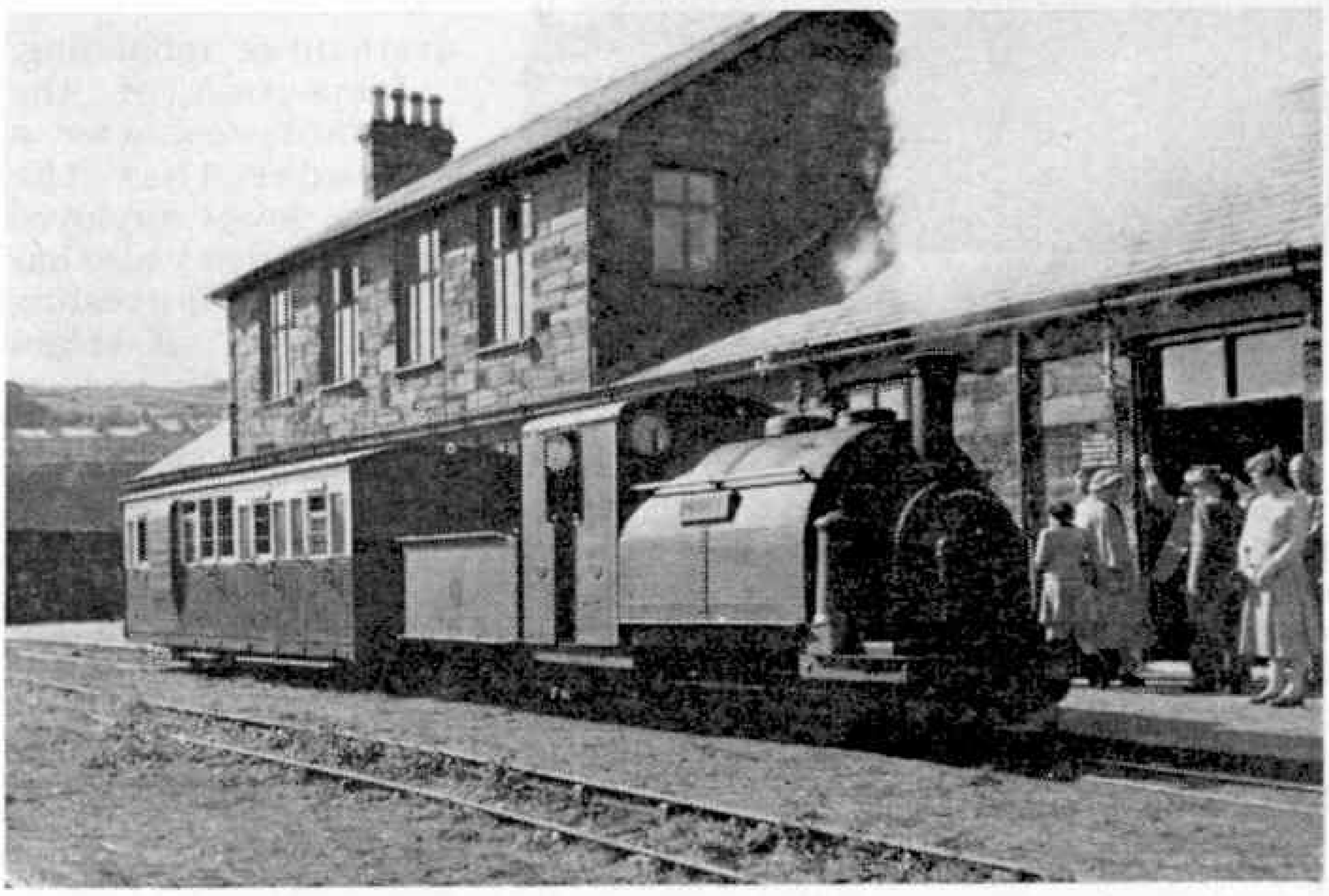
introduction of passenger services, two more four-coupled tank engines went into service in 1867, named *Welsh Pony* and *Little Giant*.

Although these capable little locomotives were able to haul 50 ton trains up to Blaenau Ffestiniog, the traffic was steadily growing heavier. It was thought that Robert Fairlie's patent would answer the railway's need for more power. In 1869 a Fairlie "double-ended" locomotive was purchased and named *Little Wonder*, being an 0–4–4–0 engine. This had a boiler at each end, with two chimneys but only a single fire-box. The driver worked on one side of the fire-box while the fireman was on the other side, the coal being fed from bunkers carried alongside the boilers. The Fairlie had two engine units, with their cylinders and motion actually mounted on bogies, each being free to move on its own axis, with flexible steam and exhaust pipes. The obvious advantage of this was that they were not only capable of hauling heavier loads, but also very adaptable to the sharply curved route of the railway.

Little Wonder apparently lived up to its name because three years later a second Fairlie, given the name *James Spooner*, was purchased, followed in 1876 by yet another called *Taliesin*, which was a single-boilered locomotive. Finally, two double-boilered Fairlie engines were built at the Festiniog Railway's own Locomotive Works, *Merddin Emrys* in 1879, and *Livingstone Thompson* in 1885. The latter engine was renamed *Taliesin* when the original locomotive was scrapped.

The present stock of steam locomotives in Boston Lodge Works are the 0–4–0 saddle-tanks with four-wheel tenders, named *Princess*, *Prince*, *Palmerston* and *Welsh Pony* and the Fairlie locomotives *Taliesin* and *Merddin Emrys*, the latter two being the only surviving engines of that type in Europe. A Simplex petrol tractor and a Baldwin 0–4–0 petrol locomotive, now fitted with a Gardner diesel engine, complete the motive power of the railway. This last engine is not only a standby for passenger services, but is also used for works trains and has made trips recently to Blaenau Ffestiniog to collect telegraph poles for re-use on the Cob. It is proposed to name this locomotive *Moelwyn*.

At Whitsuntide last year a further mile of line was opened from Boston Lodge to Minffordd. In addition, a new halt known as Pen Cob Halt (for the Beach), was provided at the Boston Lodge end of the Traeth Mawr Embankment. Passengers wishing to alight at the Halt have to advise the guard at Minffordd or Portmadoc, and those desirous of joining the train must signal the driver to stop.



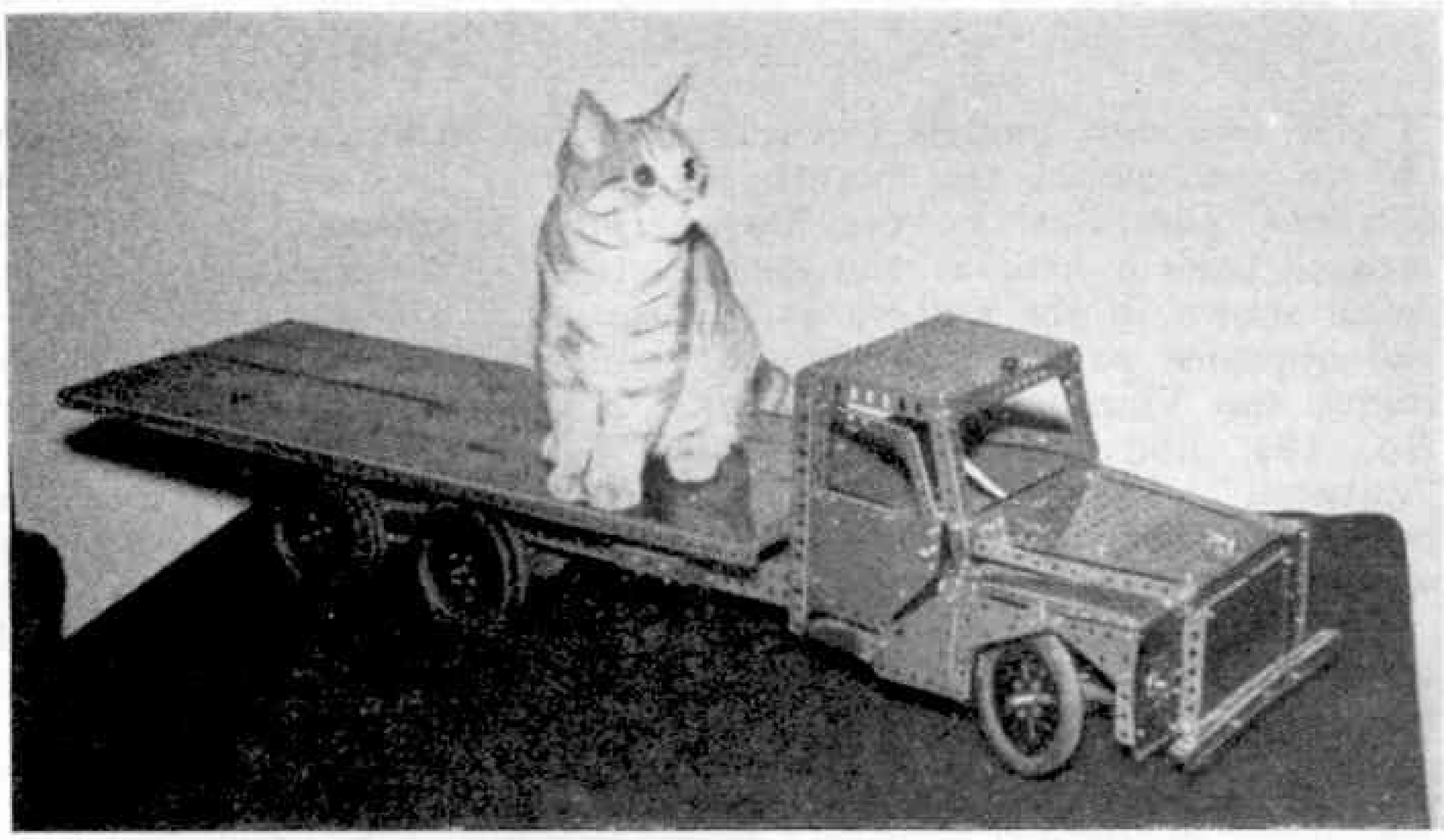
"Prince" at Portmadoc, photographed in the early days of the revival of the Festiniog Railway, when it was customary to run only one coach.

The progress of work at Boston Lodge was such that by early September 1956 it was possible to have a Fairlie in steam. *Taliesin*, the chosen locomotive, will only appear on rare occasions, such as holidays, owing to extra labour and fuel costs. I was fortunate to see and ride behind this engine and was greatly impressed by its smart and clean appearance in the green livery of the Company. I also heard the peculiar double blast of the exhaust as I travelled in the three coach train, and *Taliesin* could certainly make more smoke than *Prince*, for she darkened the sky while running between Portmadoc and Minffordd! The Fairlies will be more useful when passenger

(Continued on page 158)

MECCANO MAGAZINE

Junior Section



Sandy takes a rest after superintending the building of Peter Saunders' lorry.

PORTLEY, who watches Peter Webb, of Warlingham, Surrey, when he is building Meccano models, as described in the July 1956 *M.M.*, is not the only cat who loves Meccano. On this page is a picture of another, this time from New Zealand. He is Sandy, and the Meccano lorry on which he is sitting was built by Peter Saunders, a member of the Christchurch M.C., of which his father, C. E. Saunders, is Leader. Whenever Peter is working on a model, along comes Sandy to keep an eye on everything he does. Occasionally he feels like taking a hand himself, but as this usually consists in having a game with some of the smaller parts, he isn't very helpful. But he does enjoy the fun.

The picture at the foot of the page is another example of Meccano fun, but of a different type. Every year, just before Christmas, a gigantic children's party is organised by the members of the Meccano Recreation Club, who are employees of Meccano Limited, and this photograph was taken at the Christmas party of December last. Even the entertainers, in whose activities the children in the photograph are so absorbed, come from the ranks of those who are engaged during the working week in the production of Meccano Outfits, Hornby Trains or Dinky Toys.

DINKY NEWS

A New Van and a Vauxhall Cresta

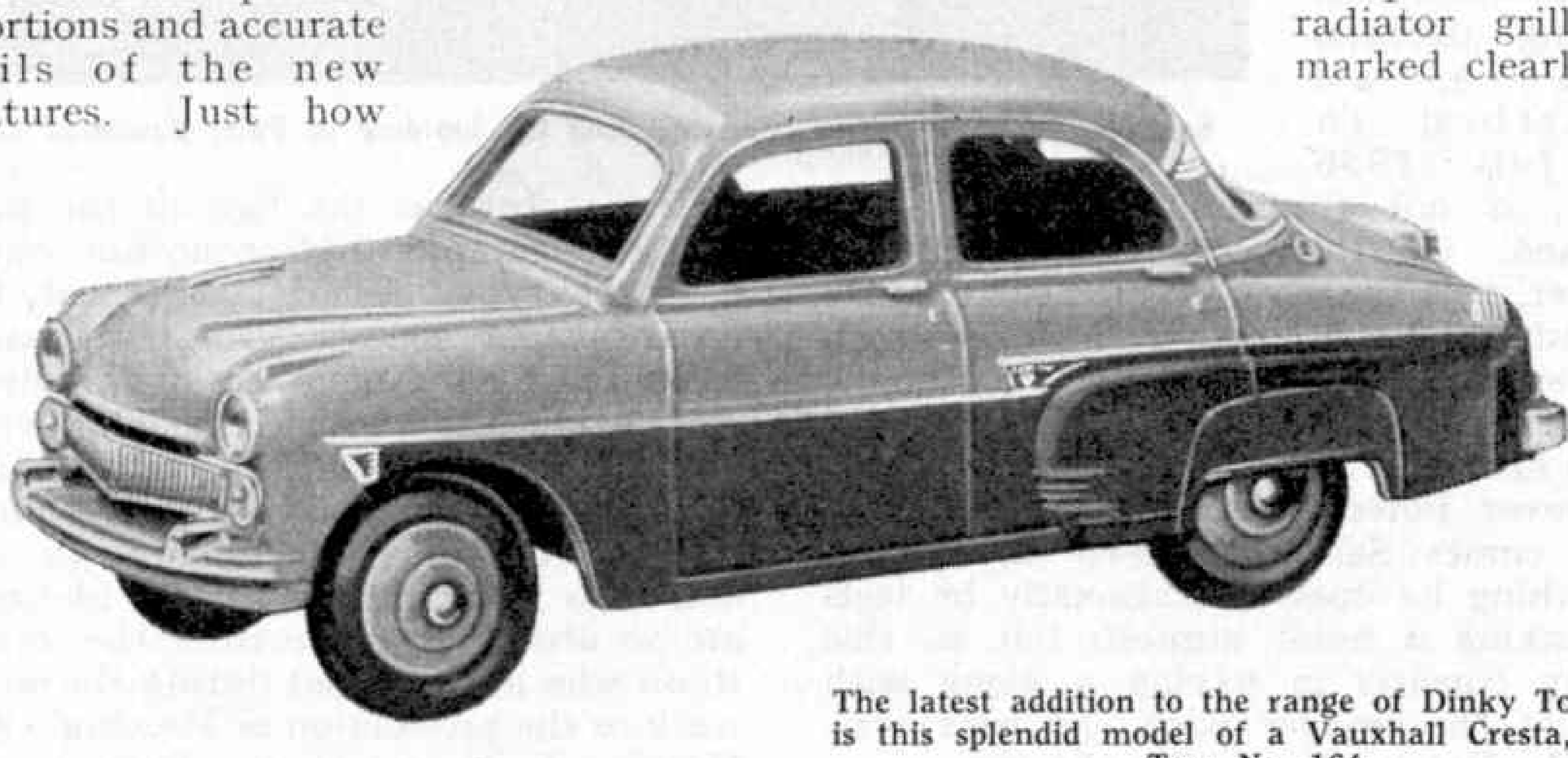
By **THE TOYMAN**

THE two new models I want to bring to your notice this month are really splendid additions to the Dinky Toys range. Take a look at the simple street scene shown in the picture at the top of the opposite page. This shows the new items, the Vauxhall Cresta, Dinky Toys No. 164, and the Morris 10-cwt. Van "Capstan," Dinky Toys No. 465, in a realistic setting, and you will notice how well the models fit in with the scene.

The true to life appearance of the picture will also give you a good idea of the splendid proportions and accurate details of the new miniatures. Just how much detail is included, and how well the models capture the lines of the real vehicles, you can judge for yourselves from the large pictures of them on this and the opposite page. Add to the wonderful lines and accurate details the usual high standard of finish and attractive colour schemes associated with all Dinky Toys, and you will realise that in the new models this month, you have two really outstanding additions to the range.

Dealing with the Vauxhall Cresta first, I think every collector will welcome the addition of this miniature. Indeed on occasions I have been overwhelmed with letters from enthusiasts pointing out the omission from the Dinky Toys range of one of the cars made by Vauxhall Motors Ltd. The reason for the apparent oversight is quite simple. Although we introduce as many new models as possible, nowadays there are so many attractive and popular cars available that it is impossible for us to make models of all of them! As far as Vauxhall cars are concerned we have been able to remedy the position by the addition of the stylish Cresta.

You will notice in the main picture of the Cresta that all the chief features of the real car have been reproduced faithfully in the model. The fluting along the bonnet is typical of Vauxhall practice, and in addition the moulding along the side panels, the massive bumpers and the radiator grille are marked clearly and accurately. The model is available in two distinctive two-tone colour schemes, green with grey top and wheels and red with stone coloured top and wheels. As usual, the front lamps, radiator grille, bumpers and, in the case of the Vauxhall, the bonnet flutes, are finished in aluminium.



The latest addition to the range of Dinky Toys cars is this splendid model of a Vauxhall Cresta, Dinky Toys No. 164.

Turning now to the "Capstan" Van, this is a reproduction in miniature of the Morris 10-cwt. Van, which has proved its value for light delivery work of many kinds. The Morris Van is a familiar sight in practically every community, and the Dinky Toys version carrying the well known Capstan advertisement will make a colourful and popular addition to every Dinky Toys collection. The model is attractively finished in two shades of blue and of course the detailed casting

The striking realism of this month's two new Dinky Toys is well shown in this effective street scene.

has all the usual features clearly and accurately indicated.

Now a special word for members of the Dinky Toys Club. The applications for membership have been overwhelming, and I am sure that already many friendships have been established among members who have been able to recognise each other through wearing their badges. These friendships are doubly important. Firstly, they provide opportunities to meet and discuss your hobbies, and secondly they open up the possibilities of making really large and attractive layouts through the pooling of the resources of a group of enthusiasts. Already I have received letters giving details of some of the schemes that have been devised by groups of Club members, and I hope many more enthusiasts will be able to arrange similar combined layouts.

Whatever kind of layout you have, write and let me have details of it. Some of your ideas may be helpful to other Club members and I shall be glad to pass them on. If you can let me have pictures of your schemes, so much the better, but in any case don't hesitate to write and let me know about your ideas for making the best use of your Dinky Toys.

Most Dinky Toys collectors are frequent visitors to their local Dealers, and I expect many of you already know of the introduction last month of miniature soldiers for use with the Dinky Toys Army vehicles. I have received many requests for the introduction of these figures, which represent seated soldiers and fit neatly into holes provided in the seats of some of the vehicles in the range. The new figures are listed as Dinky Toys No. 603.

This view of the Morris 10-cwt. Van "Capstan," Dinky Toys No. 465, shows the accurate moulding and details of the model.

Easy Model-Building

Spanner's Special Section for Juniors

Electric Locomotive—Industrial Tractor

A SIMPLE Electric Locomotive that can be built from parts in Outfit No. 2, and an Industrial Tractor for Outfit No. 4, form the subjects of the two attractive models I am describing this month.

The Electric Locomotive is seen in Fig. 1. To make each side of this model you require a $5\frac{1}{2}'' \times 1\frac{1}{2}''$, a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. First arrange these Plates as shown and then bolt them to the side of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The Flanged Plate is arranged level with the upper edges of the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, and these Plates overhang the Flanged Plate by one clear hole at each end. The $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate projects three clear holes above the Flanged Plate. The lower edge of each side should be strengthened by two $5\frac{1}{2}''$ Strips overlapped nine holes.

To make each end of the Locomotive you should bolt three $2\frac{1}{2}''$ Strips to a Flat Trunnion. Then attach the assembly to Angle Brackets fixed to the sides. To one end you can attach a $\frac{1}{2}''$ Reversed Angle Bracket to support a Small Loaded Hook.

Fix two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 1 between the upper corners of the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, and attach a straightened $1\frac{11}{16}''$ radius Curved Plate 2 to Angle Brackets bolted to the Flexible Plates. Use the same bolts to secure two Trunnions 3. Now loop a short piece of wire through these Trunnions as shown to represent the current collector of a real electric locomotive.

The next step is to add the wheels of the model. These are 1" Pulleys and they should be fixed in pairs on $3\frac{1}{2}''$ Rods supported in $2\frac{1}{2}''$ Stepped Curved Strips 4. To complete the model bolt together a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 5 and a straightened $1\frac{11}{16}''$ radius Curved Plate 6. Fix a Bush Wheel to the centre of the Flanged Plate, and place the Plates 5 and 6 over the boss of the Bush Wheel so that at the centre the Flexible Plates are raised above the level of the Flanged Plate. Now bolt the Plates 5 and 6 to Angle Brackets fixed to the ends of the model.

Parts required to build the Electric Locomotive: 4 of No. 2; 6 of No. 5; 8 of No. 12; 2 of No. 16; 4 of No. 22; 1 of No. 24; 37 of No. 37a; 37 of No. 37b; 6 of No. 38; 2 of No. 48a; 1 of No. 52; 1 of No. 57c; 2 of No. 90a; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 188; 2 of No. 189; 2 of No. 190; 1 of No. 191; 2 of No. 200.

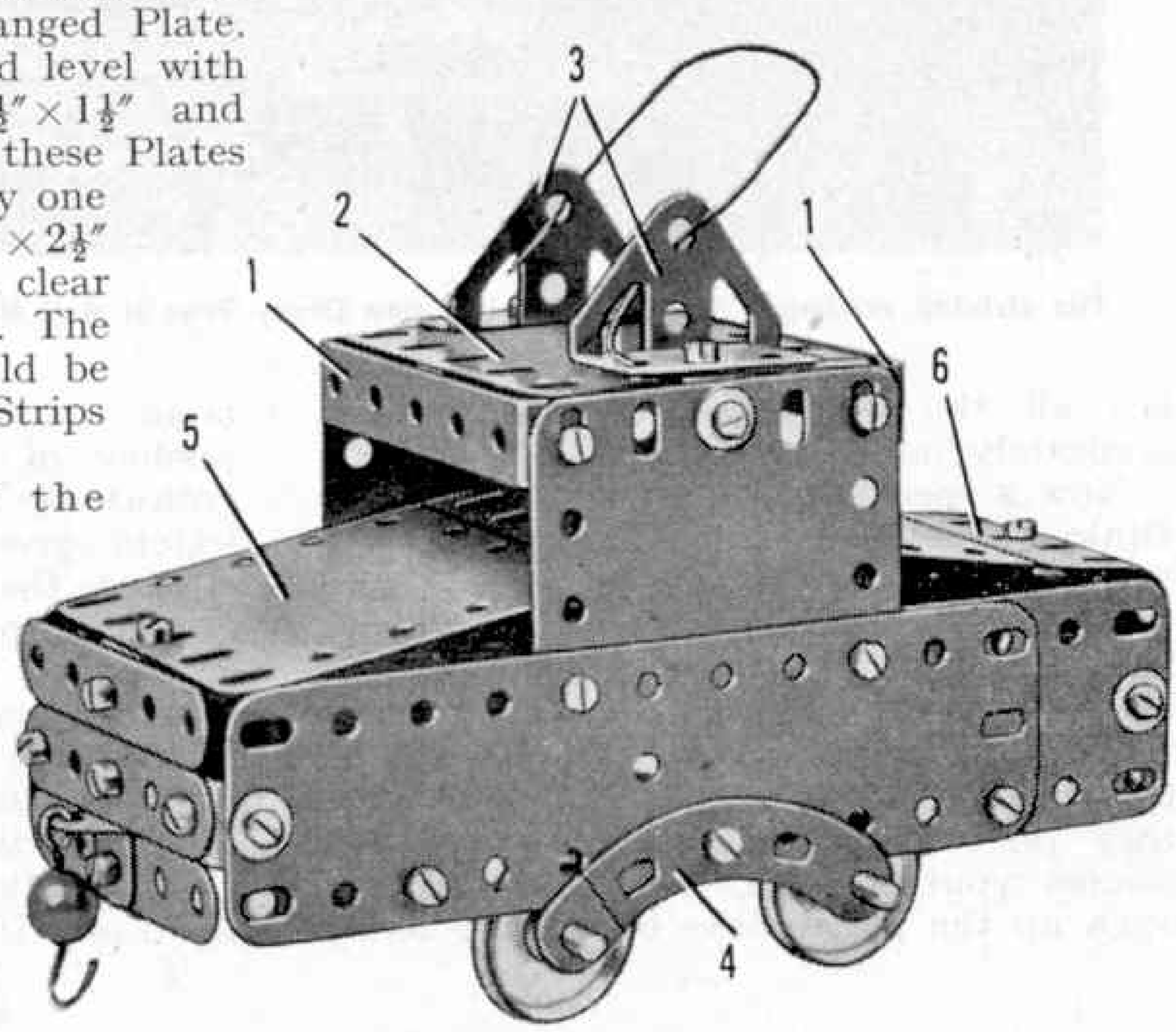


Fig. 1. This Electric Locomotive can be built from parts in Outfit No. 2.

Construction of the Industrial Tractor, which is shown in Figs. 2 and 3, should be commenced with the chassis. Each side of this consists of two $12\frac{1}{2}''$ Strips. These are connected at the rear by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 1, and at the front the upper Strip on each side is bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 2. The two Strips on each side are connected by a Fishplate, and the bolt used to fix the upper Strip supports also a Trunnion 3, arranged with its pointed end projecting outside the chassis. The bumper at the front of the chassis is formed by two $2\frac{1}{2}''$ Strips and four Formed Slotted Strips. These are connected together as shown by Fishplates, and the

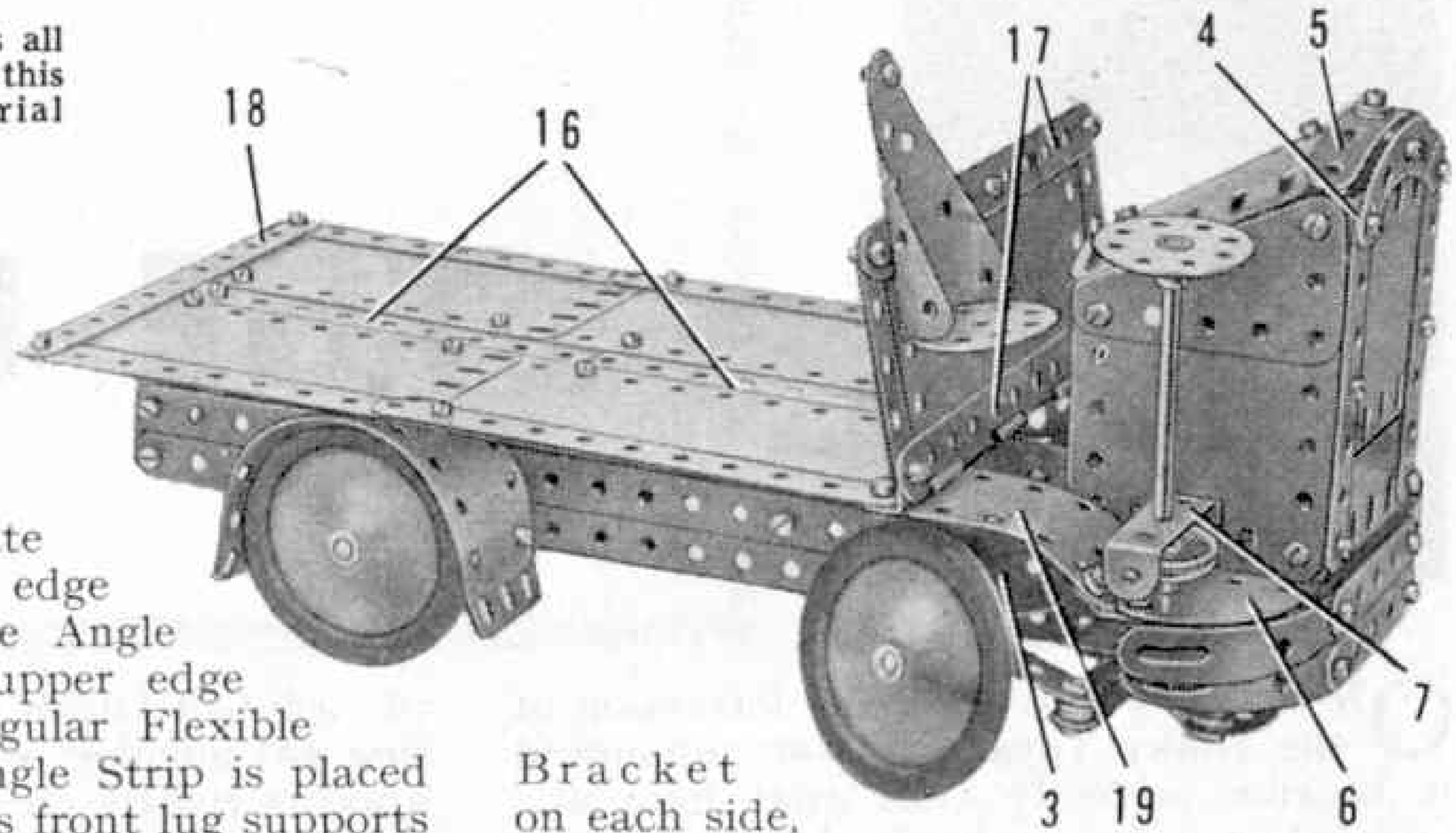


Fig. 2. Outfit No. 4 contains all the parts required to build this attractive model Industrial Tractor.

assembly is bolted to the front flange of the Flanged Plate 2.

Each side of the engine cover is a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate fitted along its lower edge with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, and along its upper edge with a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plate. The Double Angle Strip is placed inside the Plate, and its front lug supports the lower end of the radiator. The radiator consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates edged at the sides by two $3\frac{1}{2}''$ Strips and at the top by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 4 and a $2\frac{1}{2}''$ Stepped Curved Strip. The Double Angle Strip 4 is bolted between the front corners of the Triangular Flexible Plates, and to the centre of the Stepped Curved Strip is fixed an Angle Bracket. This Angle Bracket supports a slightly curved $2\frac{1}{2}''$ Strip 5 and an Obtuse Angle Bracket, and to the other lug of the Obtuse Angle Bracket is bolted one end of a $1\frac{11}{16}''$ radius Curved Plate that forms the top of the engine cover. The other end of this Curved Plate is attached to, but is separated from, a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip by a Spring Clip on a $\frac{3}{8}''$ Bolt.

The Double Angle Strip is fixed between the rear corners of the engine cover.

The complete engine cover is attached to the Flanged Plate 2 by an Angle Bracket on each side, the bolts being used also to fix in place Semi-Circular Plates 6. At one side a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 7 is bolted to the engine cover. The steering column, a 4″ Rod, is mounted in Double Angle Strip 7 and the Semi-Circular Plate, and is held in place by a 1″ Pulley above the Semi-Circular Plate and a Cord Anchoring Spring below it. A 1″ Pulley 8 is fixed on the lower end of the steering column.

The rear axle consists of a $3\frac{1}{2}''$ and a 2″ Rod joined by a Rod Connector. It is mounted in the lower $12\frac{1}{2}''$ Strips of the chassis and in Flat Trunnions 9 and $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 10 bolted to the chassis. The Rod is held in place by 1″ Pulleys. Each rear mudguard is a curved $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate bolted to the lugs of one of the Double Angle Strips 10.

Each front wheel is fixed on a $1\frac{1}{2}''$ Rod held in a Double Bracket 11 by a Spring Clip. A $2\frac{1}{2}''$ Strip 12 is placed between the lugs of each Double Bracket, and a $\frac{3}{8}''$ Bolt is passed through the two parts. This Bolt is then fixed by two nuts in one of the Trunnions 3, leaving the Double Bracket and the Strip free to pivot on the Bolt as a unit. The ends of the Strips 12 are pivotally connected by a strip 13, which is attached by lock-nutted $\frac{3}{8}''$ Bolts with

(*Continued on page 158*)

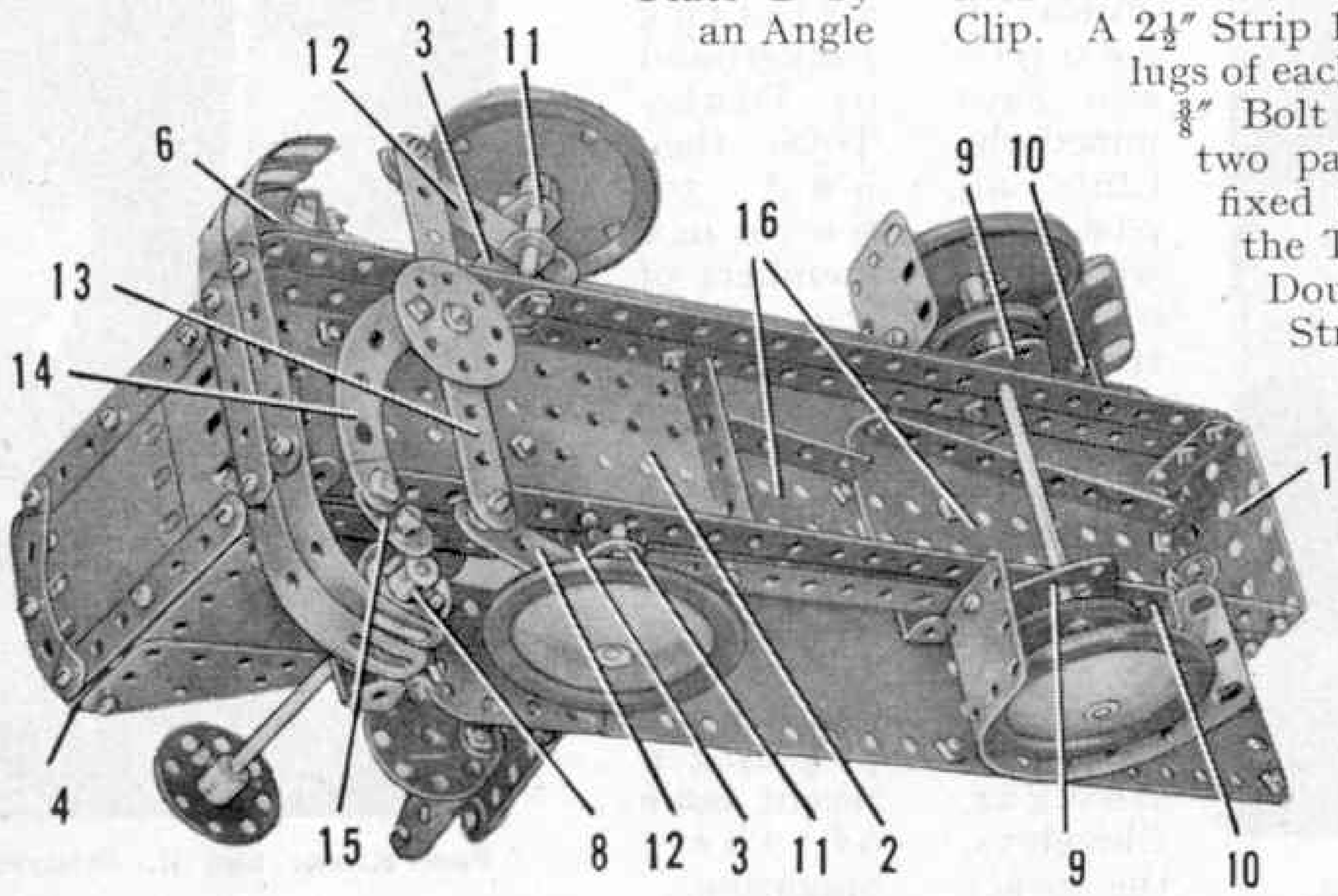


Fig. 3. An underneath view of the Industrial Tractor.

Stephen Foster, Rodley.

HAVE YOU JO

THE DINKY

Founder and President

ON the very day when the formation of the Dinky Toys Club was announced it became perfectly clear that here was something for which Dinky Toys enthusiasts had been waiting. Applications for membership began to roll in immediately, and in their letters enthusiasts gave the idea of the Club a delighted welcome.

The smiles on this page help to show how much pleasure the news gave. These smiles are on the faces of some of the many who joined in the first day or so. One of the very earliest was Stephen Foster, of Rodley, nr. Leeds, whose portrait appears above. He is 11 years of age and describes himself as an enthusiast for Dinky Toys, and the owner of many sets of these. No wonder he was in a hurry to become a member.

Philippa Bowker, Cleveleys.

Girls and even grown up people also have joined the Club, all pleased with the opportunity of doing something in support of their favourite hobby. Here above is Philippa Bowker, Cleveleys, the owner of "a lot of DINKY TOYS" and the very first girl member of the Club. Her portrait appears rightly on this page as one of the pioneers of the Dinky Toys Club.

At the foot of the page is a portrait of David Jaynes, Brockley, with a friend. I do not know whether the friend is a Dinky Toys enthusiast, but David has 32 reasons for joining, and these impelled him to make application as soon as ever he heard of the existence of the Club.

While the Dinky Toys Club was being planned I got a great surprise from Holland. There two Dinky Toys enthusiasts have actually started a Dinky Toys magazine of their own. They are Paul Kleene and R. Driessen, who live in Amsterdam. With their existing background of Dinky Toys, they had to become members of the newly-formed Dinky Toys Club as soon as ever it came into existence, and here is a picture of them preparing a recent issue of their magazine.

David Jaynes, London S.E.4.

Paul Kleene and R. Driessen, of Am
magaz

JOINED YET?

TOYS CLUB

ROLAND G. HORNBY

Anthony Everall, Walsall.

Anthony Everall, Walsall, whose portrait is seen in the top right hand corner of these pages, is particularly interested in the use of Dinky Toys in his Hornby-Dublo train layout. He is already a member of the Hornby Railway Company and when writing to me he told me of the realistic look that Dinky Toys give his railway, not only on the roads of his very comprehensive layout, but also in the goods yards of his railway.

Michael Sandford, Stow on the Wold, whose picture appears in the middle of the page, is interested in Dinky Toys for their value in road games that he plays. Entry into the Club will stimulate Michael to greater efforts in this direction, with results that I hope some day to be able to illustrate in the Magazine. Ian Gault, Grappenhall, portrayed in the bottom right hand corner of the page, is interested very definitely in just Dinky Toys. He has already built up a collection of nearly 150 Dinky Toys and Supertoys, and in time this looks like becoming a historic collection.

Michael Sandford, Stow on the Wold.

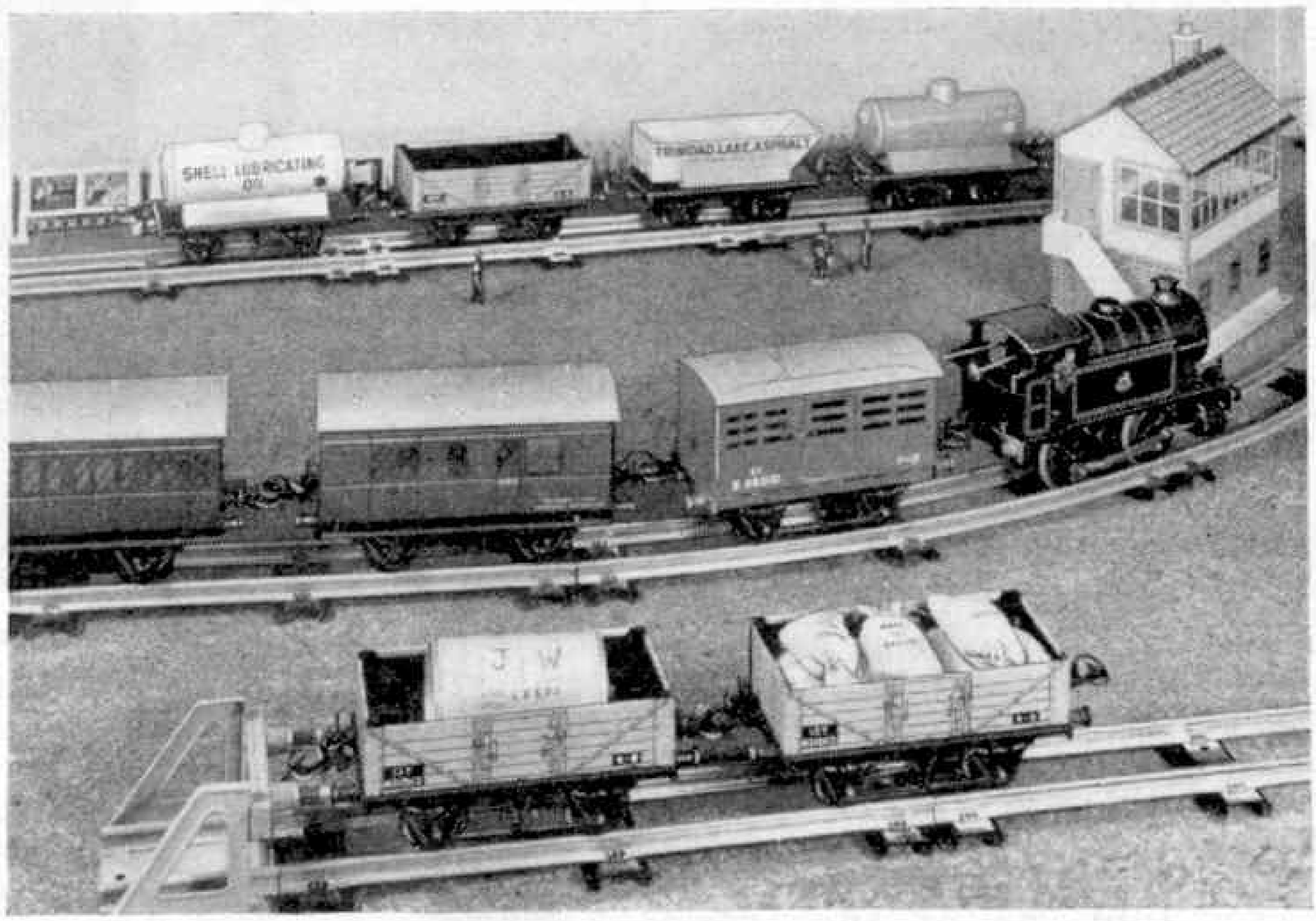
Whether you just collect Dinky Toys, as Ian Gault does, or whether you use them on a road or railway layout, as Michael Sandford and Anthony Everall do, let me know, and if possible send me a drawing or a good photograph. There is often something in a layout that may be just what some other member of the Club is looking for to complete schemes he already has in his mind, and one of the purposes of the Dinky Toys Club is to make this exchange of ideas easier. Including in The Dinky Toys section of the *Meccano Magazine* pictures and descriptions of your layouts, and accounts of novel ways of making use of Dinky Toys for serious purposes, such as promoting road safety, as well as in play, is one of the best ways of effecting this exchange.

If you have not already joined, just write to the Secretary, Dinky Toys Club, Binns Road, Liverpool 13, enclosing a postal order for 1/- for the badge of membership.

Amsterdam, preparing their Dinky Toys
agazine.

Ian Gault, Grappenhall.

"Tommy Dodd" writes about



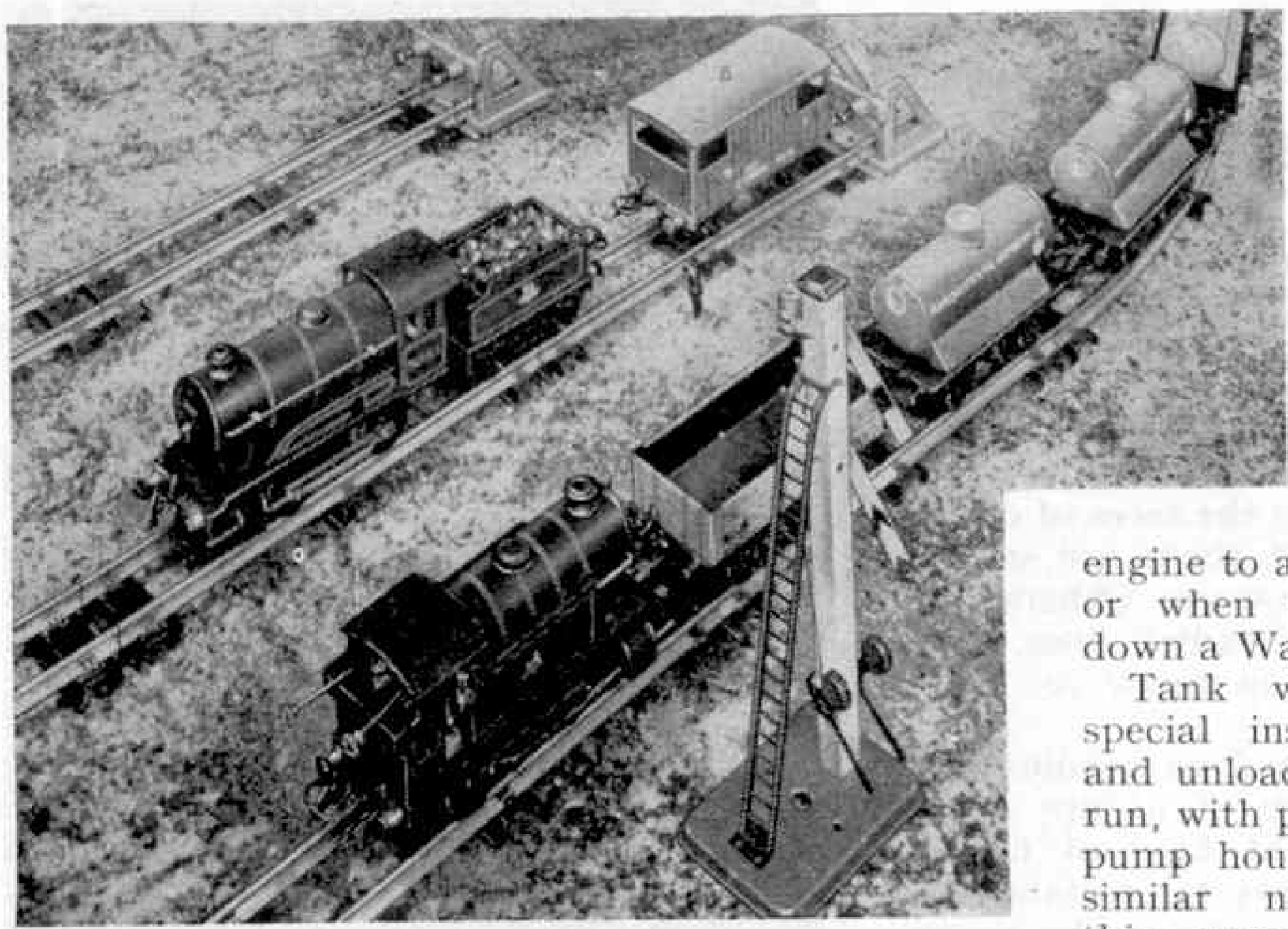
Tanks—and Tanks!

PERHAPS some of you will think that the above is a peculiar title for the subject of our talk. But there are various kinds of tanks so let us talk about some of them. Probably the most usual meaning of the word "tank" for Hornby Railwaymen is a tank locomotive. So let us begin by saying something about the Hornby No. 40 Tank. This is the only tank engine in the Hornby System now, although older readers will recall and possibly some may still have in service one or other of the more varied Hornby Tank engines of earlier times. The present No. 40 Tank is a good representative of its type for miniature railway work, not too big, yet capable of taking good trains and handy enough for use even on fairly restricted layouts. It requires 2 ft. radius curves.

The handy nature of a tank locomotive is one of its chief advantages. It has no separate tender for coal and water, but it carries its own supplies in its bunker and tanks, hence the name tank engine. It does not have to be turned at the end of each trip, although some are, so that the Hornby No. 40 Tank necessarily has a reversing mechanism. This is worked by hand by means of the operating rod on the right hand side of the cab. The left hand rod works the brake, and the brake mechanism can be applied by hand as well as by means of the track trip of the BBR Rail. When this trip is in the central position between the rails it is set for working the brake of the No. 40 engine. I need not remind you Hornby engine drivers that it is best not to make use of the BBR Rail trip when the engine is moving really fast. Of course the gear operates when the engine is travelling in either direction.

In the picture above the Hornby No. 40 Tank is rounding the curve with a passenger train. The Wagons in the foreground carry neat and effective loads.

Varied jobs are readily undertaken by the No. 40 Tank as the accompanying pictures show. In the one above a No. 40 Tank is in charge of a stopping passenger train of No. 41 stock. Between the engine and the leading Brake Van there is a Hornby Cattle Truck that is being worked in this way down the line. Perhaps it is urgently required for important traffic and therefore is being conveyed by passenger train. The working of empties and the usual shunting duties both passenger and freight can be carried out very well by a No. 40 Tank. Local freights of all kinds can be handled by it and the two illustrations on the next page show it on this kind of work.



A Tank Wagon train has a clear road past the Double Arm Signal.

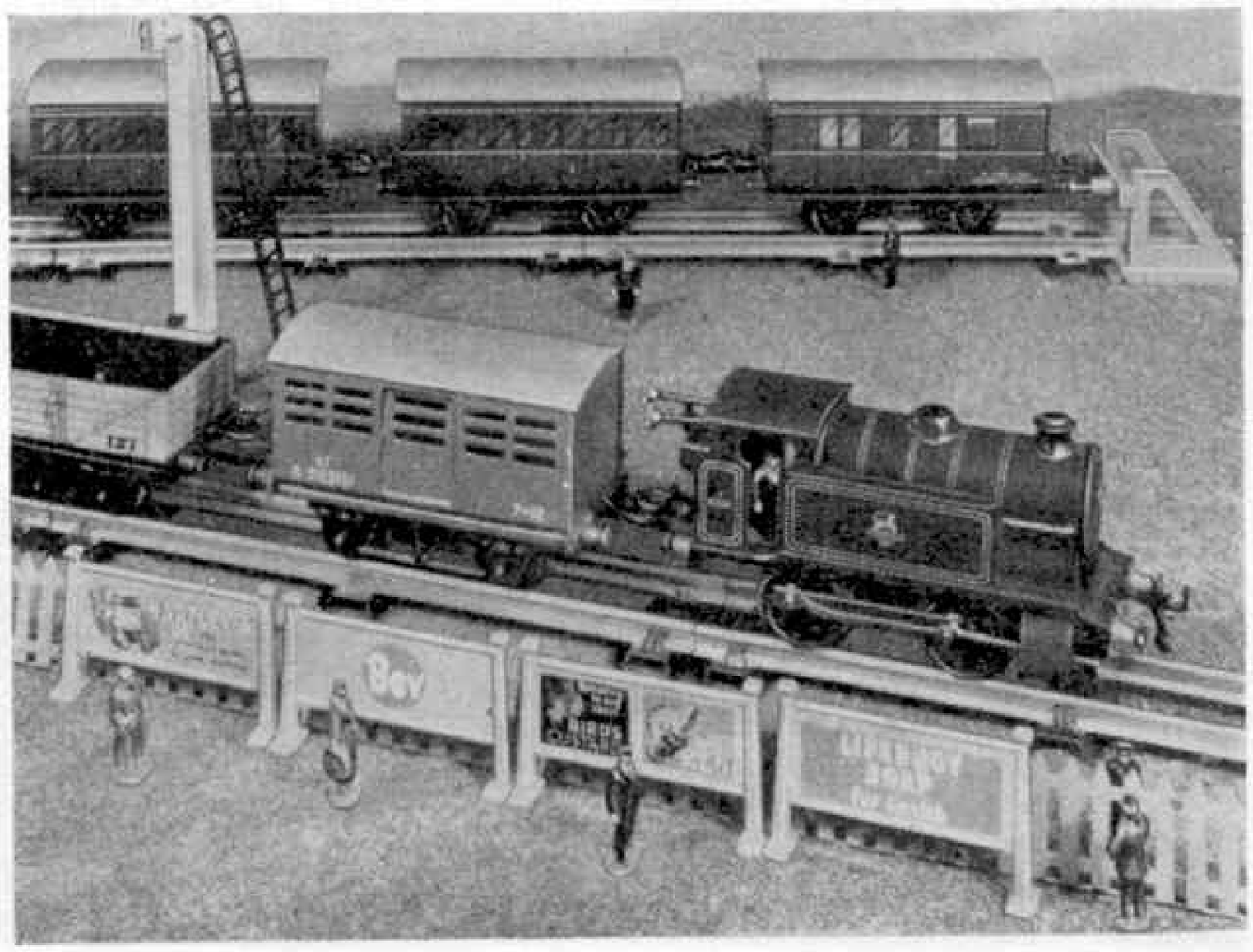
The upper picture introduces us to another kind of tank that is well known in the Hornby System. This is the Tank Wagon, a popular type of vehicle that is available in several different types of finish. The Tank Wagons in the picture bear the wording *Manchester Oil Refinery* and examples of them and of others in the range can probably be found on most Hornby layouts nowadays.

Tank wagons are common enough on the real railways nowadays, for many liquids that were formerly carried in separate drums, barrels or other containers are now handled in bulk. So there is plenty of excuse for the Hornby Railway owner to have quite a collection of Tank Wagons in service and I know that a lot of you do make a special feature of Tank Wagon traffic.

Special care is the rule in actual practice in handling tank wagon traffic and we can pay equally careful attention in miniature. In a mixed train our Tank Wagons, if "loaded," especially with petrol, should as far as possible, be about the centre of the formation. No rough shunting should be permitted, so here is a chance for you to see how deft you can be when hooking up your engine to a train of Tank Wagons, or when picking up or setting down a Wagon or two of this kind.

Tank wagon traffic involves special installations for loading and unloading at the ends of the run, with pipe lines, storage tanks, pump houses and other plant of similar nature. In miniature this presents some interesting opportunities in the matter of lineside features and some good results can usually be obtained in a fairly simple manner. Where space difficulties arise, some of your industrial effects can perhaps be represented on a scenic background. Look out for pictures of this sort of thing in papers and magazines for you to copy. Perhaps some, or sections of them, can be cut out and used in your background.

Another type of tank is shown in our first picture. This represents a plain storage tank loaded in one of the open Wagons, on its way from the makers. A short length of cardboard tube can be painted and marked to represent a tank.



A No. 40 Tank in charge of a local goods train makes its way along the line, with the roadway running parallel to it at this point.

Of General Interest

The face of the church clock at Buckland-in-the-Moor, Devon.

IT is astonishing how varied are the figures that appear on the faces of clocks and watches. Some of them are of the familiar type, some Roman. Others just mark the hours with radial lines, and these we can "read" as easily as those carrying figures.

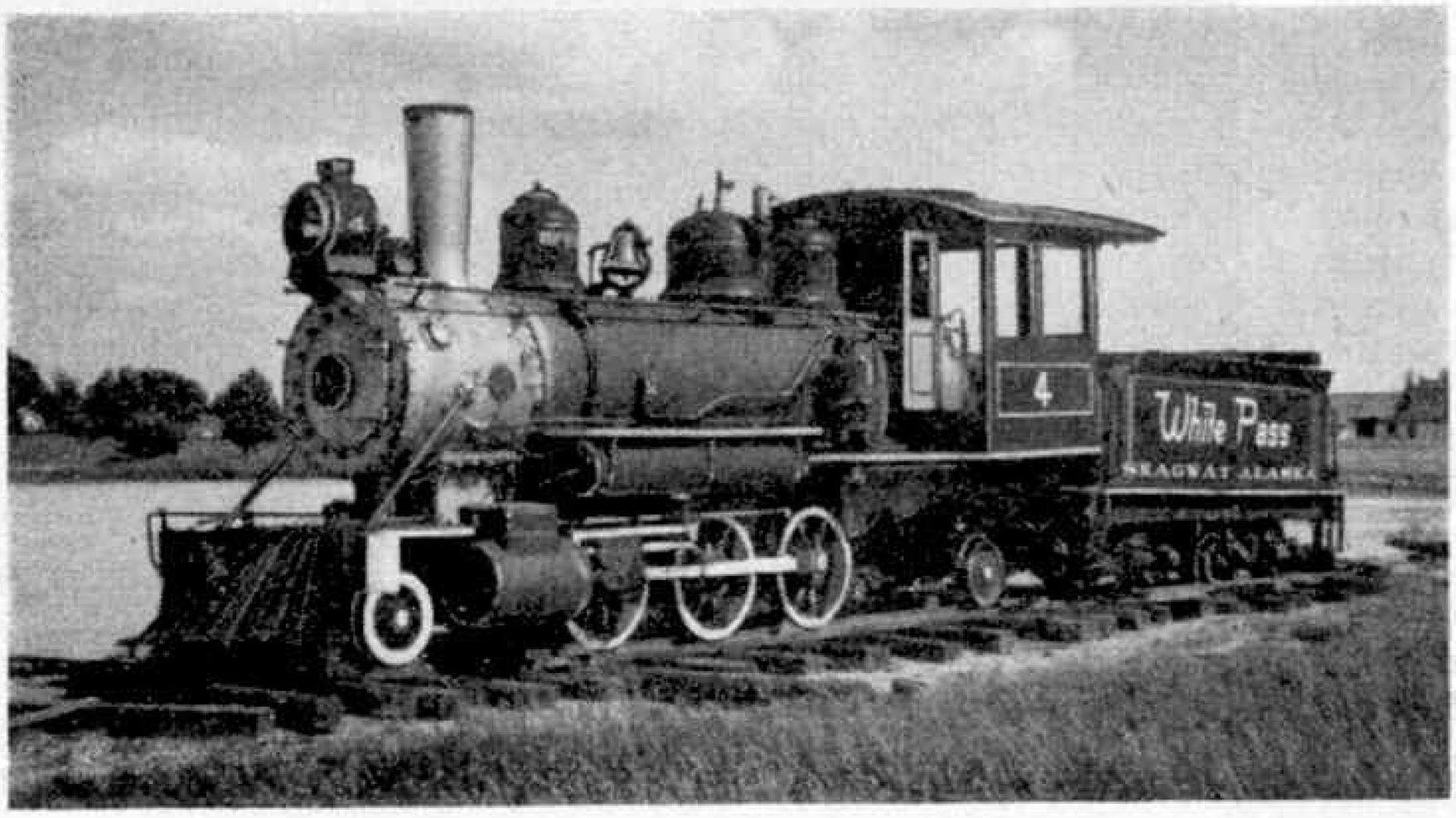
We are so accustomed to reading the time indeed that many of us are never quite sure exactly what kind of figures clocks have. Can you say for certain how the hours are marked on the public clocks you see regularly? Write down what you think they are, and then go out and look at them. You may be surprised at the result.

However the clocks you use daily are marked, few of you see regularly a clock with the hours marked as they are in the one in the picture of the church clock on the right. This was sent to me by H. B. Gillett, a keen Magazine reader who spent his holidays last year in Devon, where he visited Buckland-in-the-Moor. He was astonished when he found that round the clock he could read the words *MY DEAR MOTHER*.

Soon the holiday season will be here again. Keep an eye open for curiosities of this kind.

A glance reveals the fact that the locomotive seen at the foot of the page is not British. It is a veteran from a railway in the far north of Canada that roughly followed the route of the gold seekers who penetrated to the Klondike goldfields about 60 years ago.

The locomotive was destined for the scrap heap. From this it was saved by enthusiasts and now it runs on the Black Hills Central Railway in South Dakota, in the United States, which is run by amateurs. This line is five miles long and its gauge is only 3 ft.



A veteran of the 3 ft. gauge White Pass and Yukon Railway that has been renovated and now runs on a private railway in South Dakota. Photograph by C. E. Keevil, Chicago, U.S.A.

Pillar Box on a Mountain

Posting Letters at a Height of 7,308 ft.

By Geraldine Mellor

AUSTRALIA'S 7,328-ft. high Mount Kosciusko can claim to have the loftiest letter box in the Commonwealth of Australia, if not in the world. This was placed in position near the summit of the mountain in 1955, and mail was taken from it for the first time on Christmas Day of that year.

Charlotte Pass, Mt. Kosciusko, and the chalet, seen from Mt. Stilwell. Photograph by courtesy of Australian News Information Bureau.

Mount Kosciusko, Australia's highest mountain, was discovered by Count Strezlecki, a Polish explorer, in the year 1840, when he was undertaking the first geological survey map of New South Wales. He called the peak after the Polish patriot, General Tadeus Kosciusko, who took part in the American War of Independence, and later led an unsuccessful rising against the Russians occupying his country in 1794. A memorial plaque on the mountain marks the very spot where he made his first ascent.

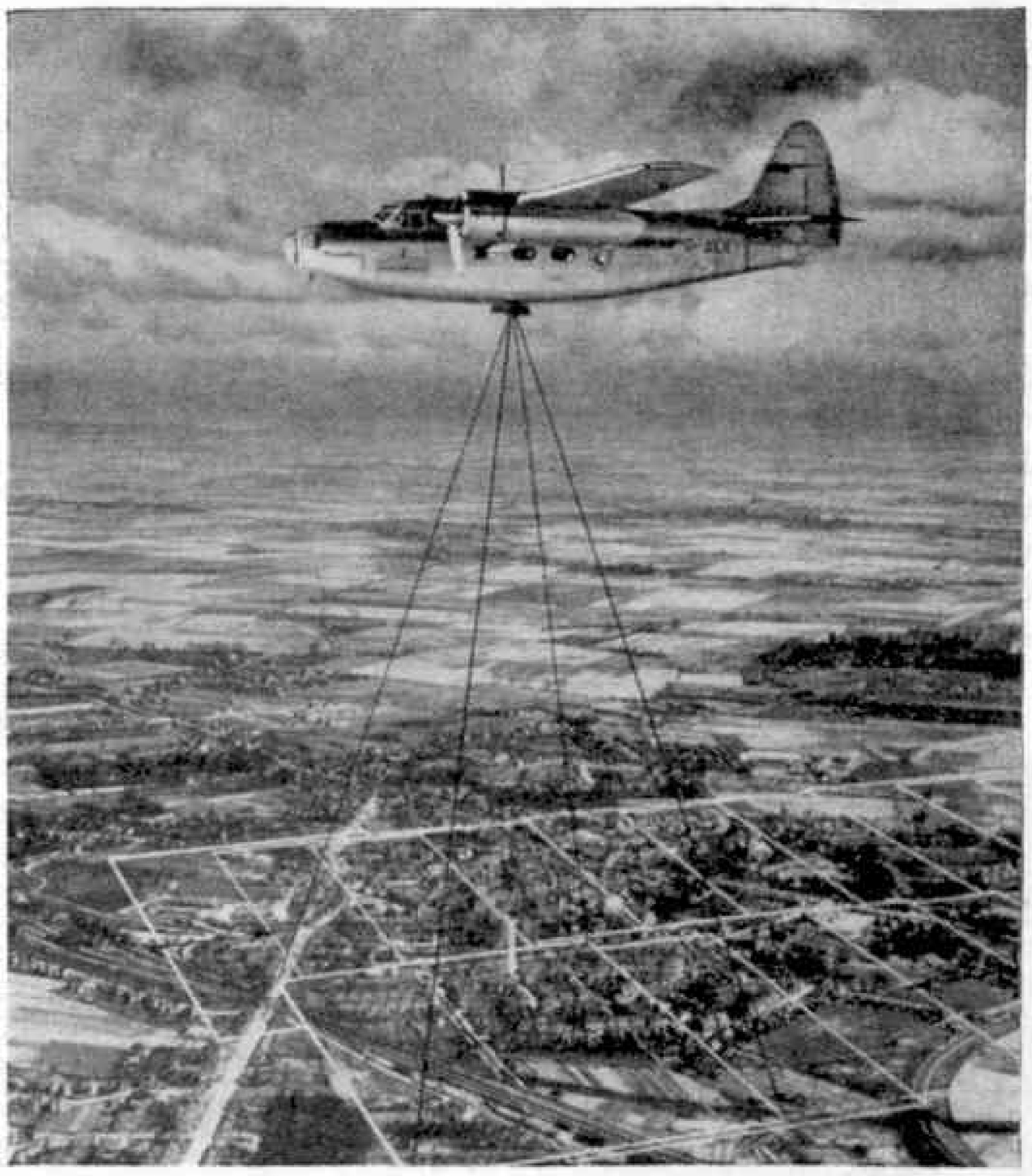
When the Mount Kosciusko letter box was first emptied, it was discovered that in it there were 2,500 letters and cards, directed to people not only in Australia, but also in Great Britain, New Zealand, South Africa, Germany and the United States of America. A clearance was made weekly until February 1956. The mail was taken 17 miles to the post office at Mount Kosciusko, and there a special pictorial postmark was applied.

The postmark, which is reproduced at the head of the page, is a circular cancellation, an inch and a half in diameter. It publicises this great scenic, tourist and winter snow district of New South Wales, for the inscription reads: "THE SUMMIT, MT. KOSCIUSKO, N.S.W., AUST." It bears also a representation of a skier making a downhill glide, and mountain peaks are to be seen at the top, with the words "7,308 ROOF OF AUSTRALIA" immediately underneath.

It is a great thrill for visitors, tourists and stamp collectors, among whom there are many young people, to be able to let their relations and friends know that they have climbed, walked or ridden to the summit of the highest mountain in the Commonwealth! Moreover, in the immediate vicinity ice skating, ski-jumping and running, ski lessons, carnivals, and exhibitions make a visit an exciting, exhilarating and fascinating experience.

The man who was responsible for the erection of this stone letter box on a mountain was the then Member of Parliament for Monaro, whose electorate includes the Kosciusko area. He made representations to the postal authorities regarding a mail box on the mountain peak, and suggested that one should be built corresponding to "the special box at Land's End, in Cornwall, from where souvenir mail is posted to all parts of the world."

The Member also remarked that tourists visiting the area and climbing the peak could claim the distinction of having posted a letter from the roof of Australia.



Hunting for Minerals

By the Editor

YES, the picture at the head of this page is quite right. The aeroplane shown in it is taking part in a hunt for minerals. It seems queer that to find what is underground we fly through the air, but there is reason behind this method, which saves an enormous amount of time and trouble, and is extremely effective.

We usually think of the mineral hunter as a lone surveyor, trekking through the wildest regions and living rough as he surveys the rock formations and makes crude tests to determine whether they contain valuable minerals. The gold prospector, in fact, that romantic figure of the gold rush days of last century in California, Australia, the Klondike and many other remote and difficult regions, is the idea of the mineral hunter that many of us carry in our minds. There are prospectors of this kind at work today, but in general the picture is a false one, and more and more scientific methods are brought into play in the ceaseless search for valuable metals. The uranium hunter, indeed, the successor of the gold prospector, himself makes use of a scientific instrument familiar to all of us by name at least. This is the Geiger Counter, which reveals the presence of uranium and other radioactive minerals to him as he makes his way across country in which he hopes to find a fortune.

Before a geophysical survey is carried out from the air, the first step is to obtain vertical photographs of the area, and this is achieved by the method shown in the picture at the head of the page. Photographic coverage is used also for geological interpretation. Experts can distinguish rock and soil types by their colour and appearance. The illustrations to this article are reproduced by courtesy of Hunting Geophysics Limited.

Now let us come back to the modern way pictured here and in the other illustrations to this article. We all know how the ground can be mapped from the air. In brief, what is done is to take a series of photographs by means of a special automatic camera as the aircraft flies over the territory to be mapped, and the successive photographs obtained in this way are then built up into a mosaic that reveals the geographical character of the ground beneath. For this, very exact flying at a standard height and at a constant speed is necessary, for every small area of the ground must be recorded by the camera, and the many photographs taken must be on precisely the same scale so that they will fit together into a picture of the whole of the area covered.

Searching for minerals follows the same plan, but with this end in mind a very sensitive instrument called a magnetometer is required as well as a camera. The purpose of the magnetometer is to detect variations in the strength of the Earth's magnetic field. This is something about which every schoolboy knows a little today. The Earth is itself a gigantic magnet, with one pole in the north of Canada and the other on the Antarctic continent. The lines of magnetic force between the two poles run almost north and south over the greater part of the Earth's surface. That they do not run exactly north and south is due to the simple fact that the magnetic poles are not at the geographical poles.

We can find the exact direction of the lines of magnetic force at any one place by using a compass. This of course has been

At the controls of the console of a magnetometer in the cabin of the Percival Survey Prince. The console interprets the impulses transmitted from the head to a large graph recorder. The smaller graph recorder on the right shows the variation in height above the ground of the aircraft.

known for ages, and the compass has been used by sailors and travellers on land to give them their directions. The magnetometer is an instrument for measuring the *intensity* of the Earth's magnetic field. This increases as the lines of force are concentrated, which happens in the neighbourhood of bodies of iron ore and certain other mineral deposits. The instrument is so sensitive that it can detect very small changes that an ordinary compass would not reveal. Every little variation in intensity helps to indicate that there are mineral deposits in the area.

A magnetometer can be used in surface surveys of the Earth, but clearly it is much quicker to mount the magnetometer in an aeroplane, and to fly this at a convenient height over the ground. When a survey of this kind is being made the magnetometer is mounted in the tail of the aircraft, where disturbance by the steel parts of the engine and propellor is least. The aircraft is then flown in straight lines up and down the strip of country over which the search is being made.

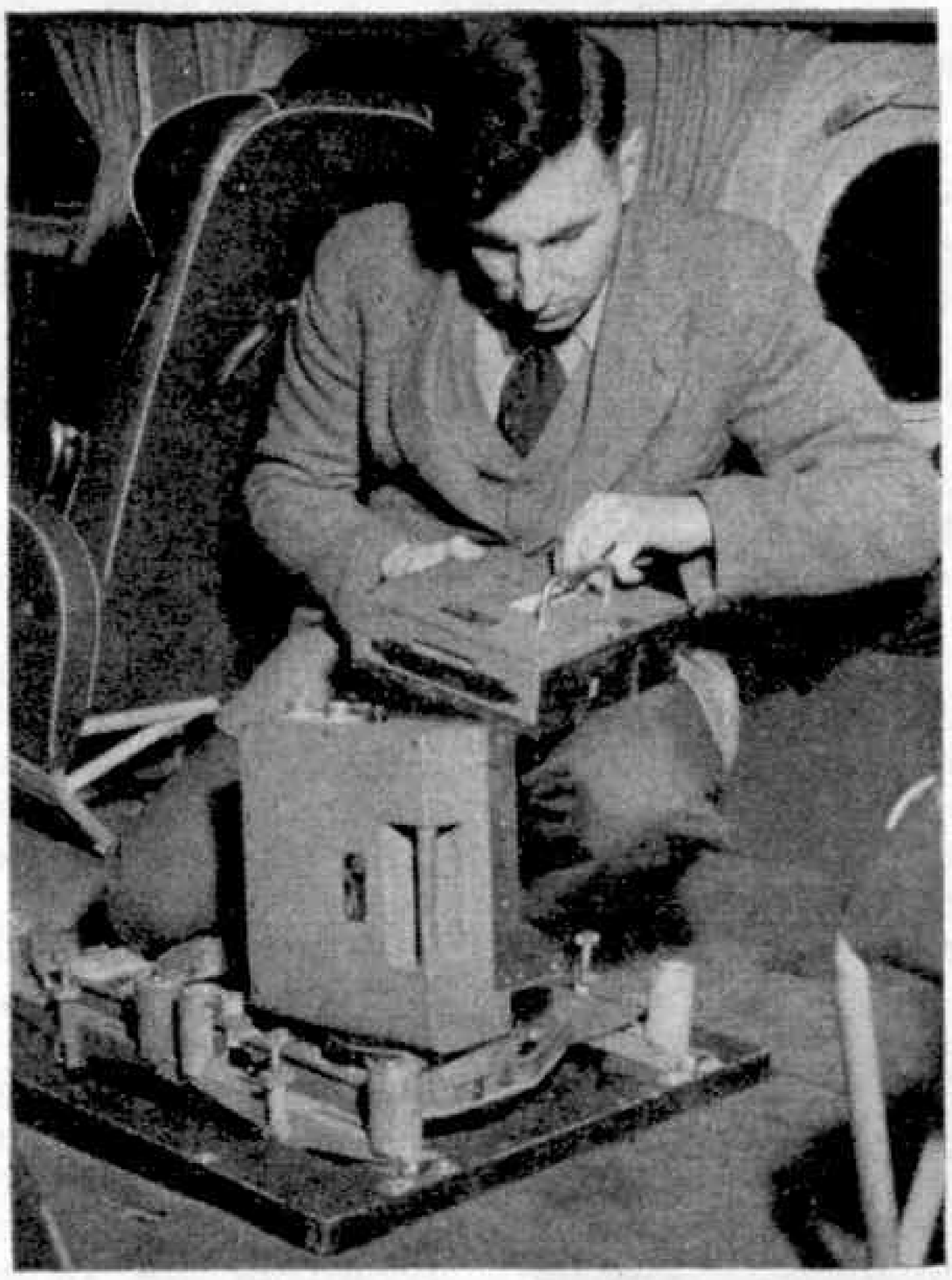
A record is essential, of course, and this is taken by means of an instrument in the cabin of the aircraft that draws a line on a moving strip of paper to represent the intensity of the magnetic field. This instrument is connected to the magnetometer and so provides a complete record of the detective work that this instrument is doing.

What this recording instrument is like can be seen from the illustration at the head of this page, where a surveyor is seen at the controls of the installation. The moving strip of paper is mounted directly in front of him, and when the aircraft is moving over a long strip of country where there are no mineral deposits worth mining, a pen under which the paper runs draws a fairly straight line. But suppose that the aircraft flies over a hill containing a vein of iron ore. There the magnetic field is of greater intensity, and the pen, responding to the increase, moves sharply sideways to record this.

The detector head of the magnetometer is mounted in the tail of the Survey Prince. It is usual to mount it as far as possible from interference caused by the steel parts of the engine and propellers.

This happens whenever the aircraft flies over an area in which there is a metallic deposit of the kind that affects the magnetometer. So at the end of the flight there is a record of all the places over which it has flown where there is an increase in the intensity of the magnetic field, and consequently a possibility of the presence of minerals.

You will notice that in the last sentence it is pointed out that the record suggests the possibility of the presence of minerals, and this has to be borne in mind. The movement of the pen does not say definitely "There is a deposit down there;" all that it says is that there may be one. So when the chart has been removed from the instrument it is sent to experts, who examine it and draw a map showing what the outlook is. Then further tests are made on the ground. If these confirm the flight tests, drillings are made and mining is begun at the points where the aerial survey experts have indicated that there may probably be something. If a "strike" is made, then all points on the map that have shown a similar change in magnetic intensity will contain similar deposits.



The specially designed 35 mm. camera. The photographs taken by this allow the track of an aircraft to be quoted on the map or mosaic used.

Different ores have different twisting effects on the Earth's magnetic fields, and a high degree of skill and experience is necessary to extract the greatest possible amount of information from a plot of this kind. A complete survey too makes use of other instruments in addition to the magnetometer. There are also the electromagnetic detector and the scintillation counters, of which the Geiger Counter is an example. In general it may be said that the magnetometer is used for detecting iron, oil, asbestos, titanium and nickel, the electromagnetic detector is for sulphide bodies containing copper or lead, and the scintillation counter for uranium.

A very interesting example of the use of this method is provided by the discovery in Norway of enormous deposits of ilmenite, an ore of the valuable metal titanium. This followed a survey carried out in 1955 by Hunting Geophysics Ltd., one of the nineteen companies in the Hunting Aerial Survey Group, on behalf of Titania A/s, a well-known Norwegian mining company. The area examined was some 300 square miles in extent and was in south west Norway. It provided a very difficult field for the work required, because it is intersected by fiords and gulleys. The aim in a magnetometer survey is to maintain a constant height above the ground, but as near to it as possible, for magnetic intensity falls away as height is increased. In this survey the sharp changes in land heights, and the low clouds often met with, made it exceedingly tricky to keep to the desired height throughout the flights.

To begin with, a photographic survey was made in order to provide a guide for the magnetometer work that followed. This was carried out in a Hunting Percival Survey Prince, with a magnetometer mounted in its tail, which flew up and down at a height of 500 ft. on parallel lines about 1,650 ft. apart, covering certain areas with a line spacing of half that distance at a height of 300 ft.

The actual flying took about three weeks, after which the records were examined by experts. From their conclusions a programme was drawn up for making a ground survey by magnetometer over promising areas. Finally, at sites selected on the basis of the measurements of magnetic intensity carried out in this way, drilling was commenced. This resulted in the discovery of what is now known as the Tillnes deposit, a vast quantity of good quality ilmenite.

Meccano Competition

Start Preparing Your Entry Now!

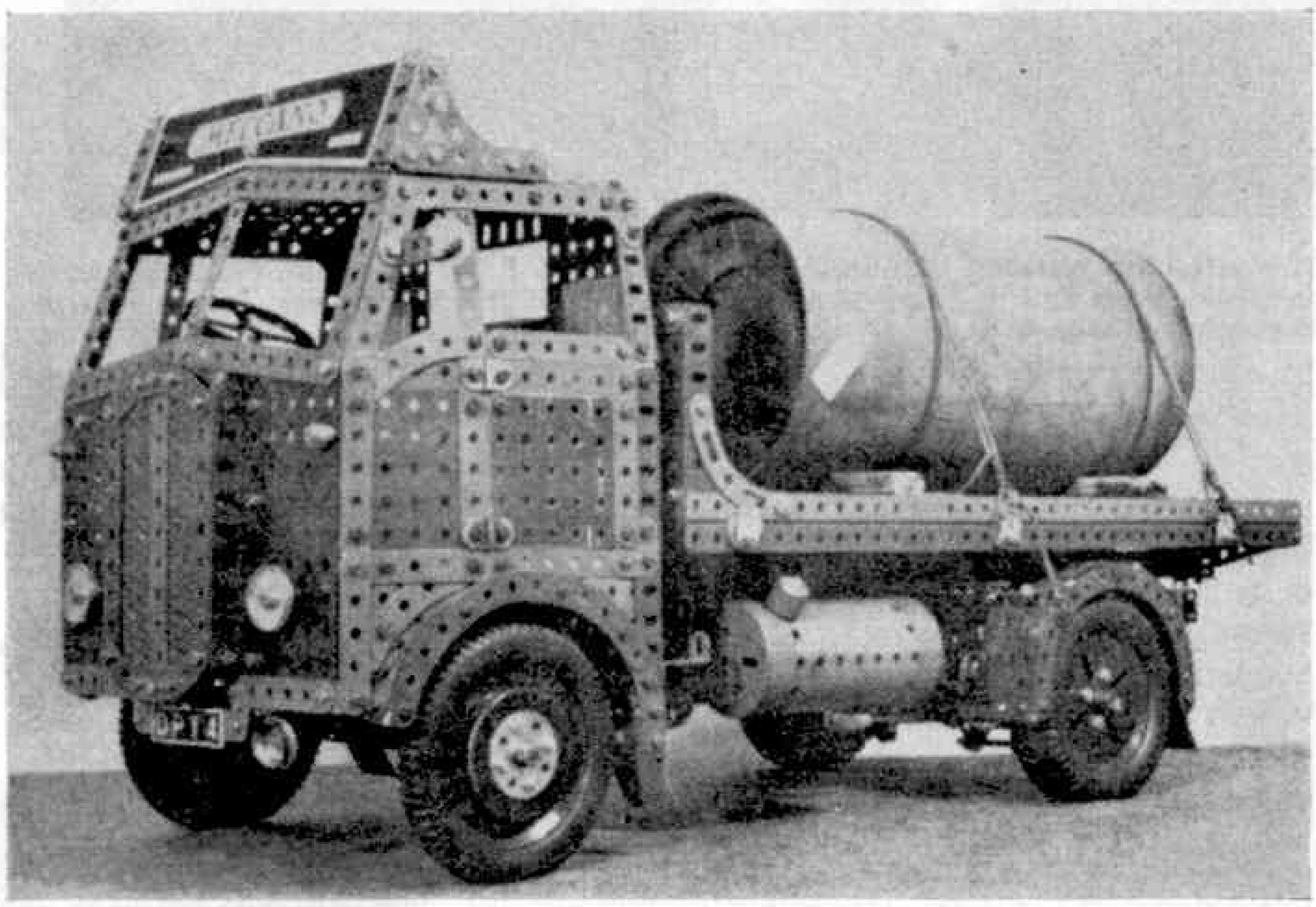
ALTHOUGH March sees the approach of spring in this country, with the prospect of better weather in store, winter is still here and most of us are glad to spend a few quiet evenings at home during spells of bad weather. Meccano enthusiasts can turn these periods to good account, for there is no better way of spending them than by building a model for entry in our February General Model-Building Competition. The Contest is open for entries until the 31st May next, so there is plenty of time for you to design and build a model, obtain photographs or prepare sketches of it, and send them in as your entry.

In a general model-building competition of the kind now open, there are no restrictions on the subjects of the models or on the number of parts used in them. Every model-builder can enter, no matter what the size of his Outfit, and indeed the parts used need not be confined to those included in any particular Outfit.

Once you have built your model all you have to do is to send details of it to *February General Model-Building Competition, Meccano Limited, Binns Road, Liverpool 13,* so that your entry reaches us on or before 31st May next. Photographs of the models are preferable, but if they cannot be obtained readily then clear sketches will do quite well. *The actual models must not be sent.* Each competitor must write his age, name and address clearly on the back of each print or piece of paper submitted.

There are two Sections of the contest. Section A is for readers under 12 years of age on 31st May next, while entries from readers aged 12 or over on that date will be placed in Section B. Cash prizes will be awarded to the senders of the best models in each of the Sections A and B, and these prizes are listed in the panel at the foot of this page.

As mentioned, you can base your model on any subject you like, but to make sure that the model is the best you can build you should take particular care when you select its subject. Choose something that you can reproduce really well with the parts you have available, and remember the judges will look for neat and sturdy design and originality when they examine the entries. Size alone is not important, and providing he chooses a suitable subject and make a good model of it, the owner of a small Outfit has every chance of success.

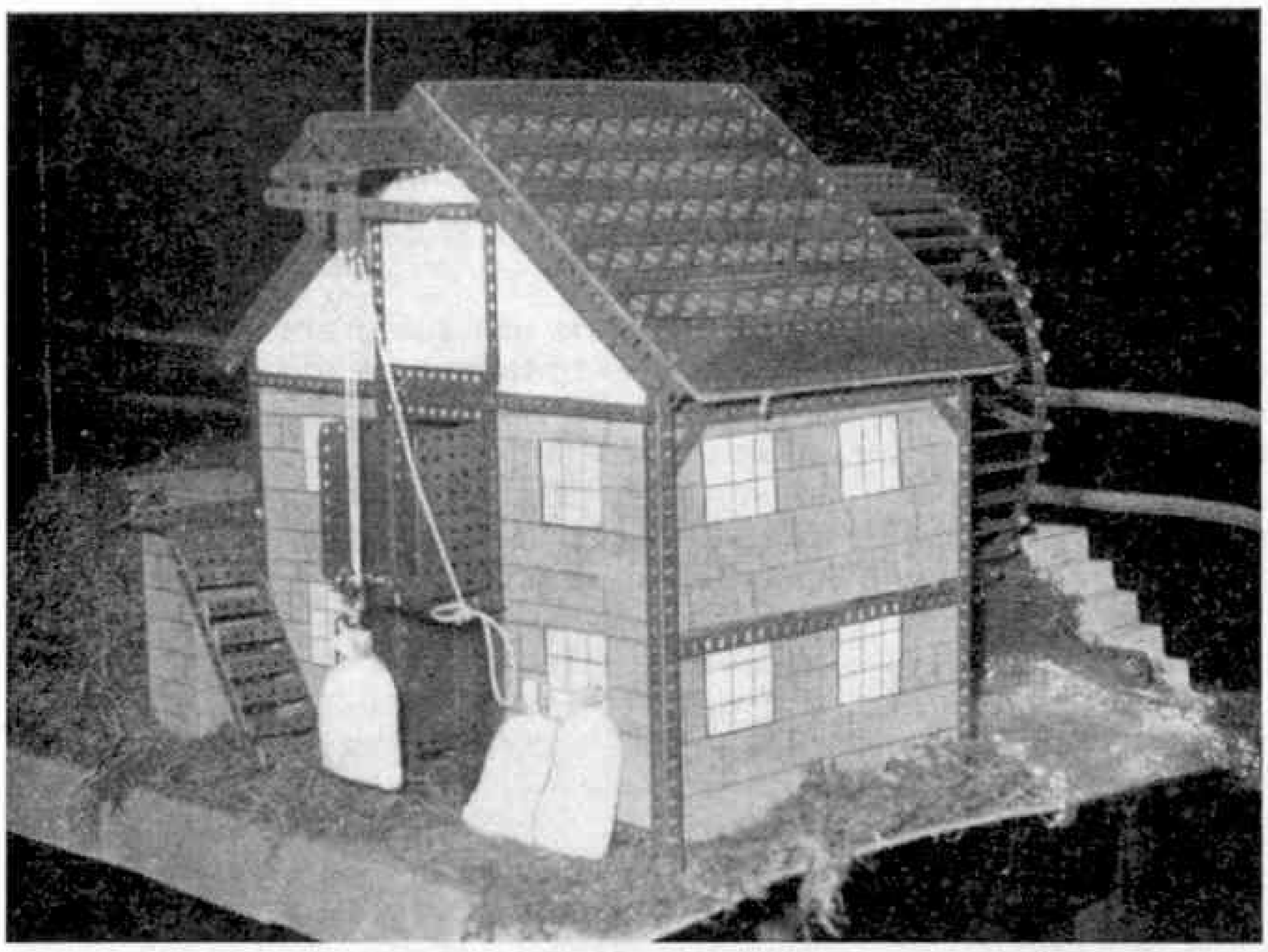


This model lorry won a prize for J. Thorpe, Sidcup, in a previous general model-building competition.

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



This attractive working Watermill was built by Mr. F. C. Nicholson, Mablethorpe, and was shown on the Stand of a Meccano dealer at the Mablethorpe Trades Fair. It covers an area 4 ft. × 3 ft., and is activated by an E20R(S) Electric Motor.

Among the Model-Builders

By "Spanner"

Jib Radius Indicator

A useful accessory for model cranes is illustrated in Fig. 1. Just as in a real crane, the safe lifting capacity of a model varies according to the radius at which the load hook is working, so in a crane fitted with a jib that can be raised or lowered, the operator must know exactly the radius at which the crane is working to make sure it is operating within its permitted range. A simple indicator that will give this information automatically can be made quite easily from a few Meccano parts, and from it the jib radius can be read at a glance.

The pointer of the indicator shown in Fig. 1 is a Centre Fork 1 held in a Coupling. The Coupling pivots freely on a Rod 2 and is held in place by a Collar. Rod 2 is fixed in a Double Arm Crank bolted to the jib. A balance weight is provided by a Worm, which is fixed on a 1″ Rod held in the Coupling. A suitable dial cut from cardboard is bolted to the jib behind the pointer.

To calibrate the indicator, the jib should be set at its greatest radius and the position of the pointer marked on the scale. The jib should then be raised slightly, and the new position of the pointer noted. The radius is determined by measuring the distance at ground level between the load hook and the foot of the jib.

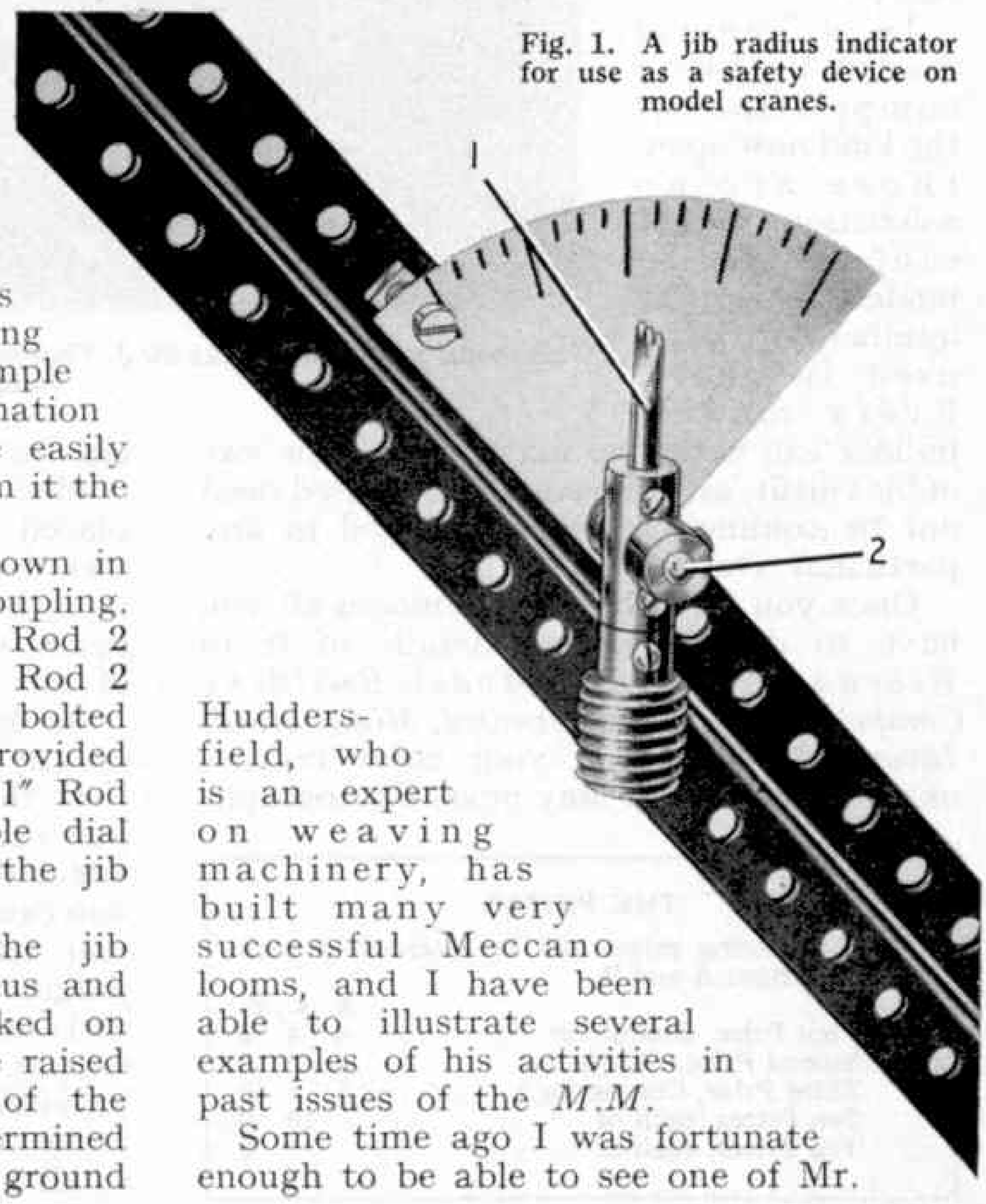


Fig. 1. A jib radius indicator for use as a safety device on model cranes.

A Gear-Operated Shuttle Mechanism

One of the most popular subjects for advanced model-builders is a weaving loom, and many fine models of this kind have been built by Meccano enthusiasts. Mr. H. H. Taylor, Huddersfield, who is an expert on weaving machinery, has built many very successful Meccano looms, and I have been able to illustrate several examples of his activities in past issues of the *M.M.*

Some time ago I was fortunate enough to be able to see one of Mr.

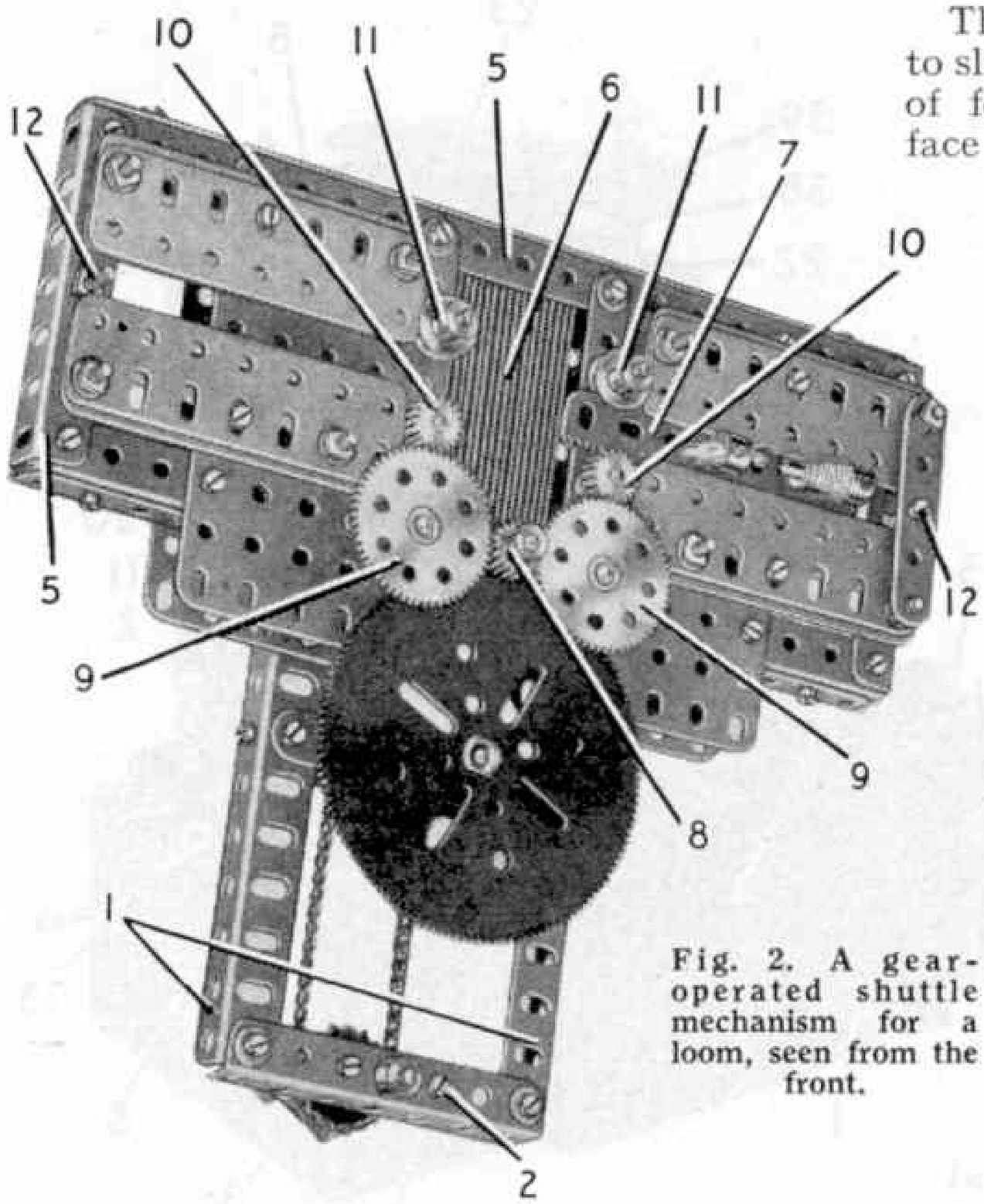


Fig. 2. A gear-operated shuttle mechanism for a loom, seen from the front.

Taylor's models in operation, and I was greatly impressed by the ingenious mechanism designed to carry the weft thread to and fro across the loom. The usual type of loom makes use of a flying shuttle, which is "thrown" from one side to the other by the action of picking sticks. These sticks strike the end of the shuttle with great force, and fling it quickly along a special slide. In Mr. Taylor's model the usual form of shuttle was not required. Instead a gear drive drove the thread carrier positively across the model. The arrangement is not suitable for making wide material, but it is ideal for looms designed to produce narrow ribbons. The mechanism is illustrated in Figs. 2 and 3.

The framework consists of two 9½″ Angle Girders 1 connected by a 3½″ Angle Girder 2, a 3½″ × ½″ Double Angle Strip 3 and a 3½″ Strip 4. Two channel girders 5, each of which is made from two 9½″ Angle Girders, are connected as shown by four 4½″ × 2½″ Flat Plates and two 3½″ Angle Girders, and the assembly is bolted across the Girders 1. The reed frame 6 for the warp threads consists of 3″ Strips spaced by Washers on 3″ Screwed Rods.

The "shuttle" is a 3½″ Rack Strip 7 free to slide along special guides, each consisting of four 3½″ Flat Girders placed face to face and connected by long Bolts fixed by nuts in the main framework. The two inner Flat Girders are placed slightly lower than the outer ones, so that a channel is formed along one edge of the assembly. The Rack Strip slides in this channel.

The driving gear is a 3½″ Gear that engages a ½″ Pinion 8. The Pinion in turn drives two 57-tooth Gears 9, which engage ½″ Pinions 10, and two ½″ fixed Pulleys 11 serve to guide the Rack Strip.

The Rod carrying the 3½″ Gear is driven through an automatic reversing mechanism, which is adjusted so that the Rack Strip 7 is given sufficient movement to carry it across the frame. On reversing the 3½″ Gear drives the Rack Strip back again, until it reaches stops formed by Bolts 12. The weft thread is wound on a 1″ Rod held in a Collar, fixed on a bolt in the Rack Strip. The thread is passed through a second Collar in which a piece of cotton wool is placed to prevent the thread from unwinding too freely.

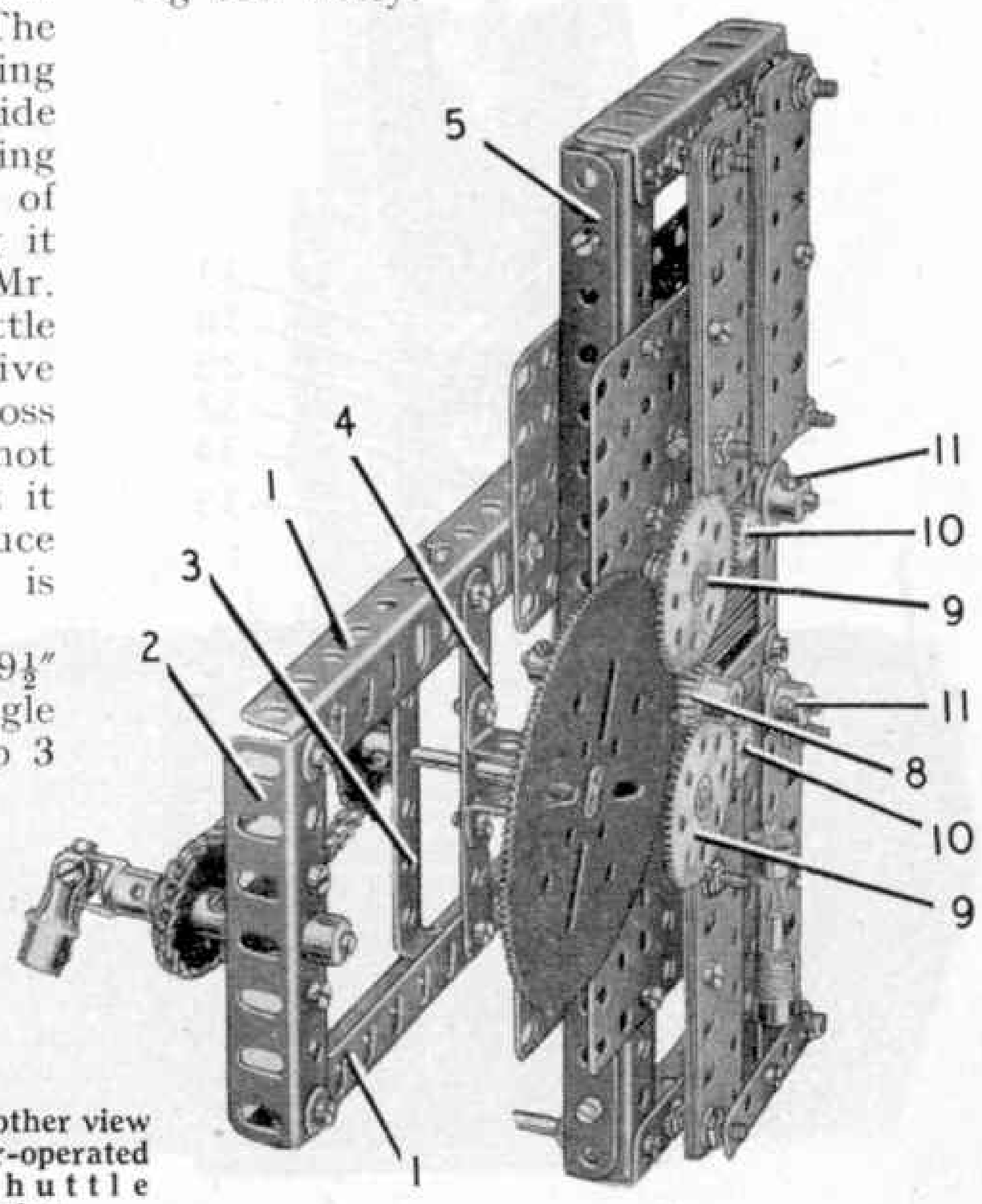


Fig. 3. Another view of the gear-operated loom shuttle mechanism.

MODEL OF THE MONTH

Vertical Milling Machine

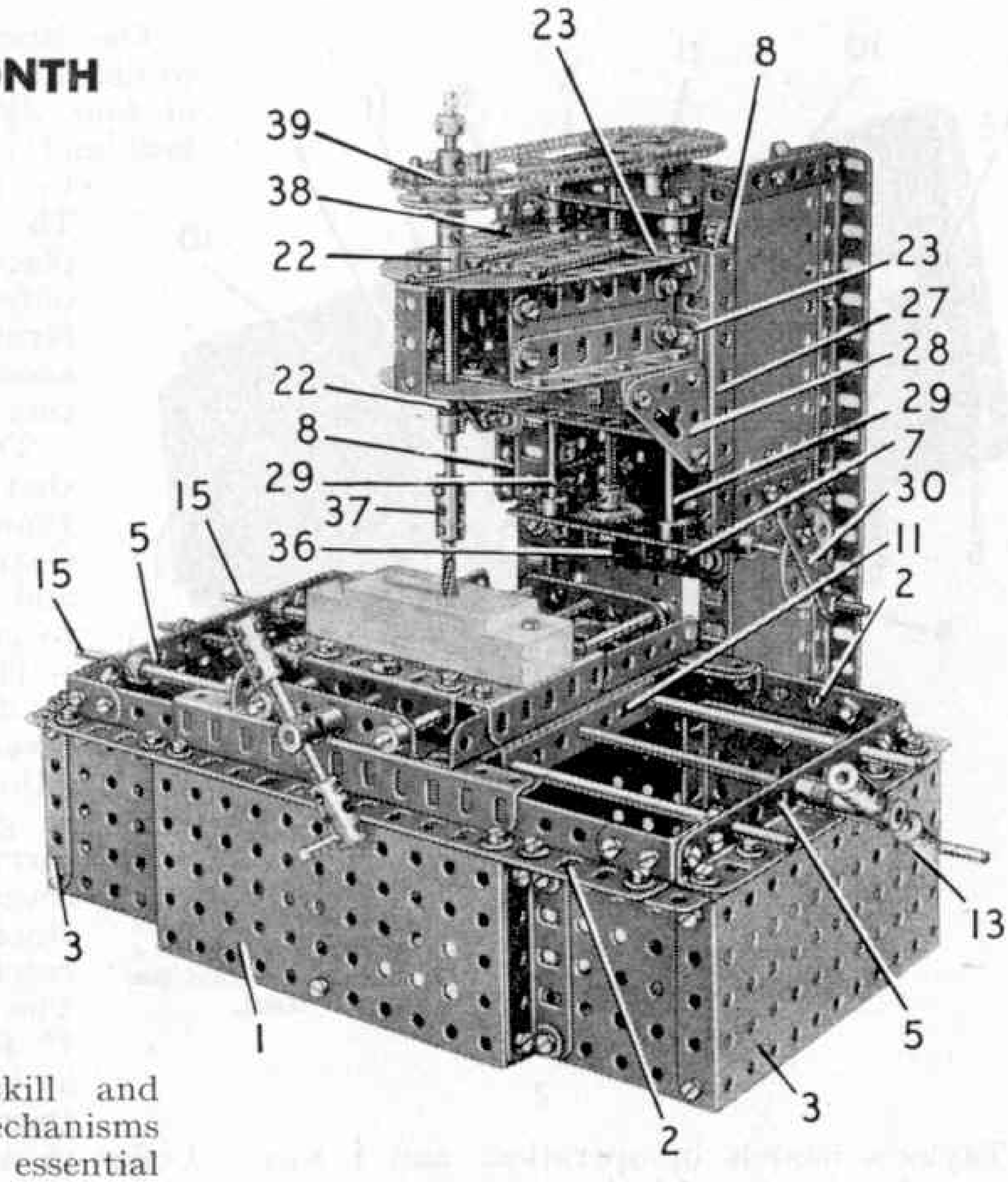


Fig. 1. The Meccano Milling Machine in its completed state.

THERE are few more attractive and interesting subjects for keen Meccano model-builders than the many different kinds of machine tools used in modern workshops. Drilling machines, lathes, milling machines and many others provide splendid scope for Meccano model-builders to display their skill and ingenuity in reproducing the mechanisms required to carry out the essential movements, and for our latest "Model of the Month" subject we have chosen one of the most fascinating of these machine tools, a vertical milling machine. The model is based on a large type of vertical miller used for general machining operations of many kinds in engineering workshops.

The actual machining operation is carried out by a special milling tool driven at high speed by an electric motor. The head carrying the tool can be raised and lowered to vary the depth of cut in the metal to be machined. The metal is clamped to an adjustable work table that can be moved as required to bring it underneath the tool.

Our model is operated by an E20R(S) Electric Motor that drives the milling tool through Chain and Sprockets arranged to provide a step up ratio. A special slide arrangement

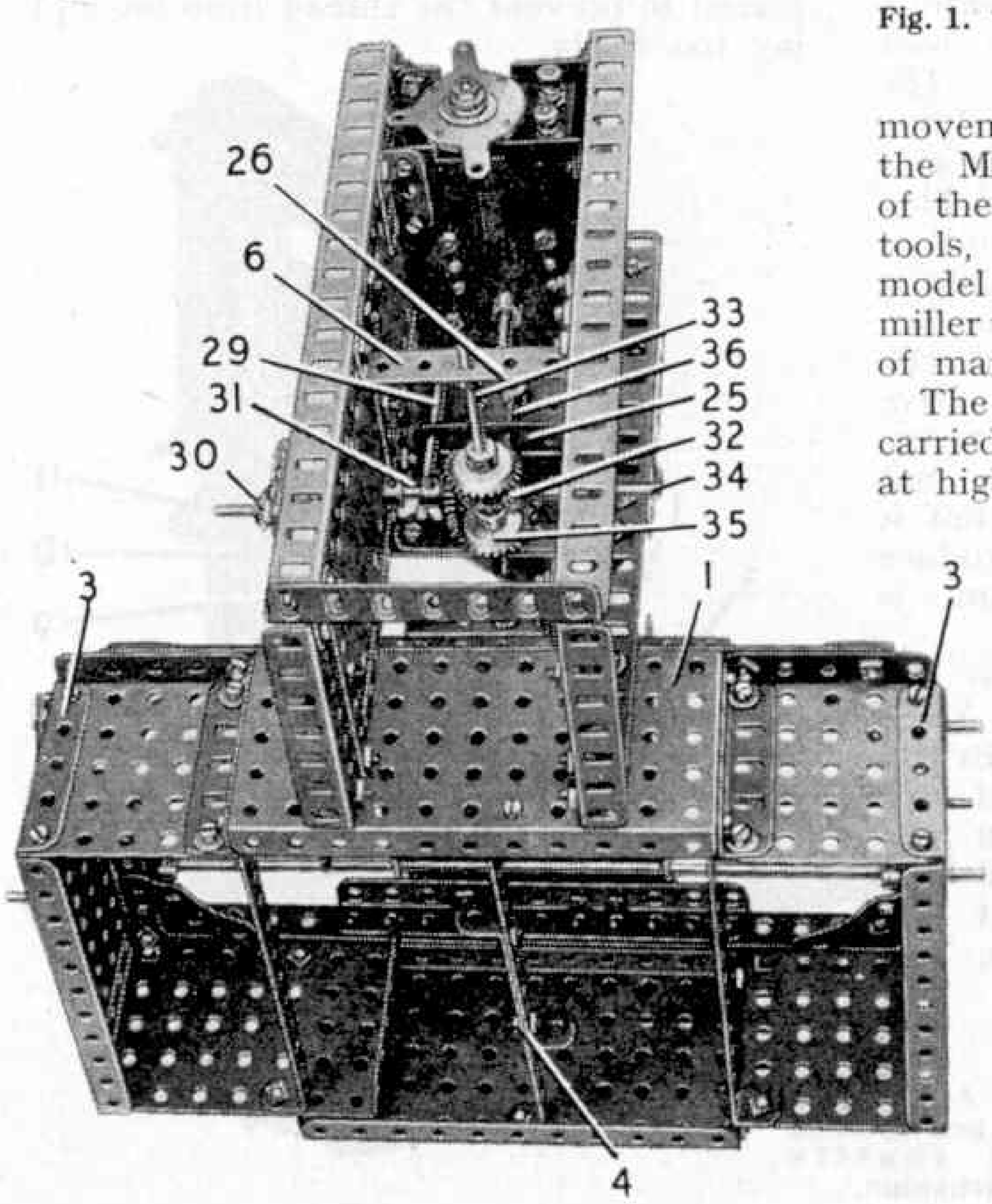


Fig. 2. A rear view of the Milling Machine.

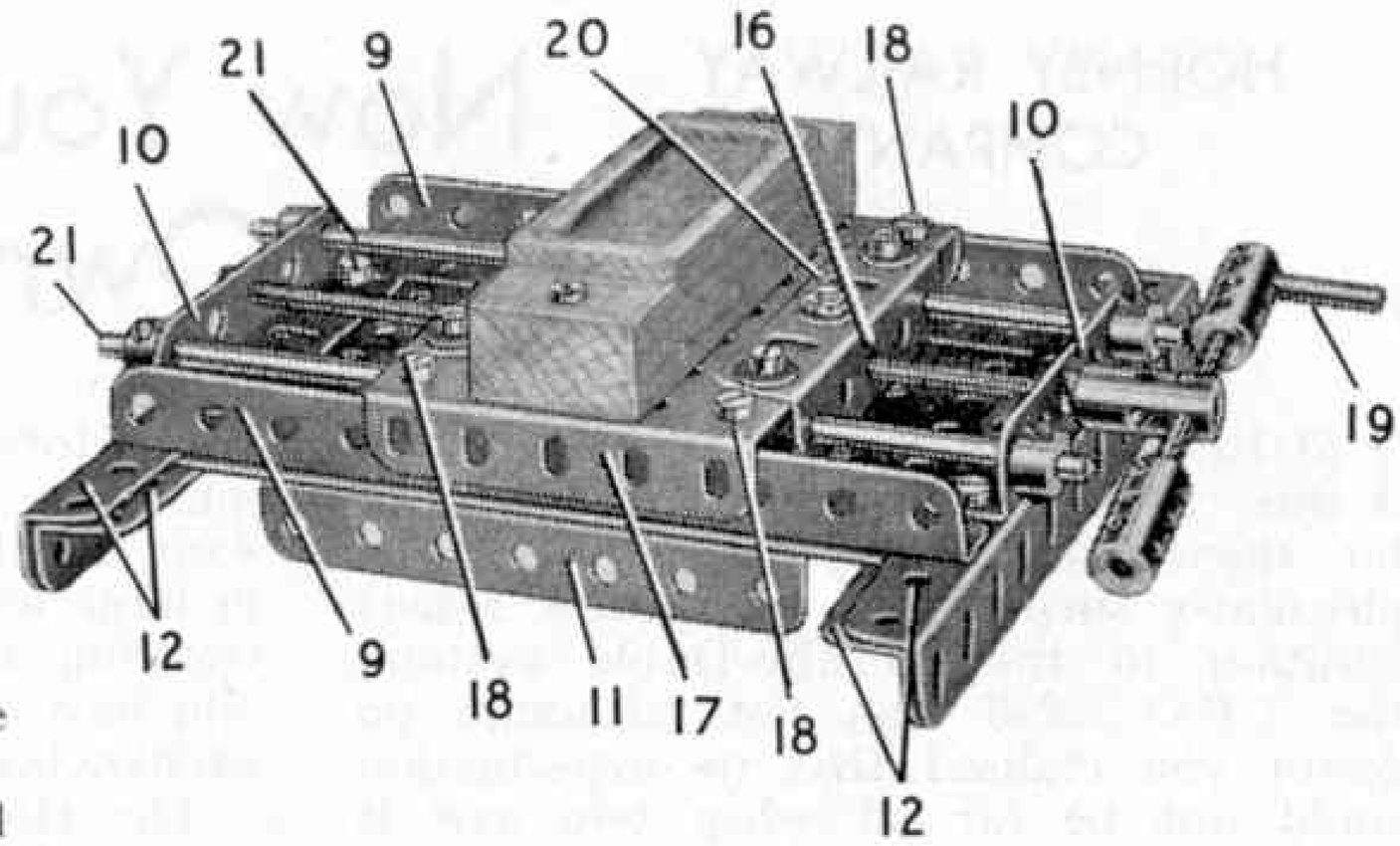


Fig. 3. The work table, showing the construction of the slides.

incorporated in the drive permits the tool head to be raised or lowered without interfering with the drive. The work table is provided with longitudinal and transverse adjustments. These movements and the milling head adjustments are screw operated and give very fine control over the machining operation.

In the model the milling tool can be represented by a short $\frac{5}{32}''$ high speed twist drill. The model is capable of operating with a block of wood as the work to be machined, and the block should be bolted securely to the work table as shown in the picture.

Full instructions and a list of the parts required to build the Milling Machine can be obtained by writing to the Editor, enclosing a 2d. stamp for postage. Readers in Canada, Australia, New Zealand, South Africa 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.

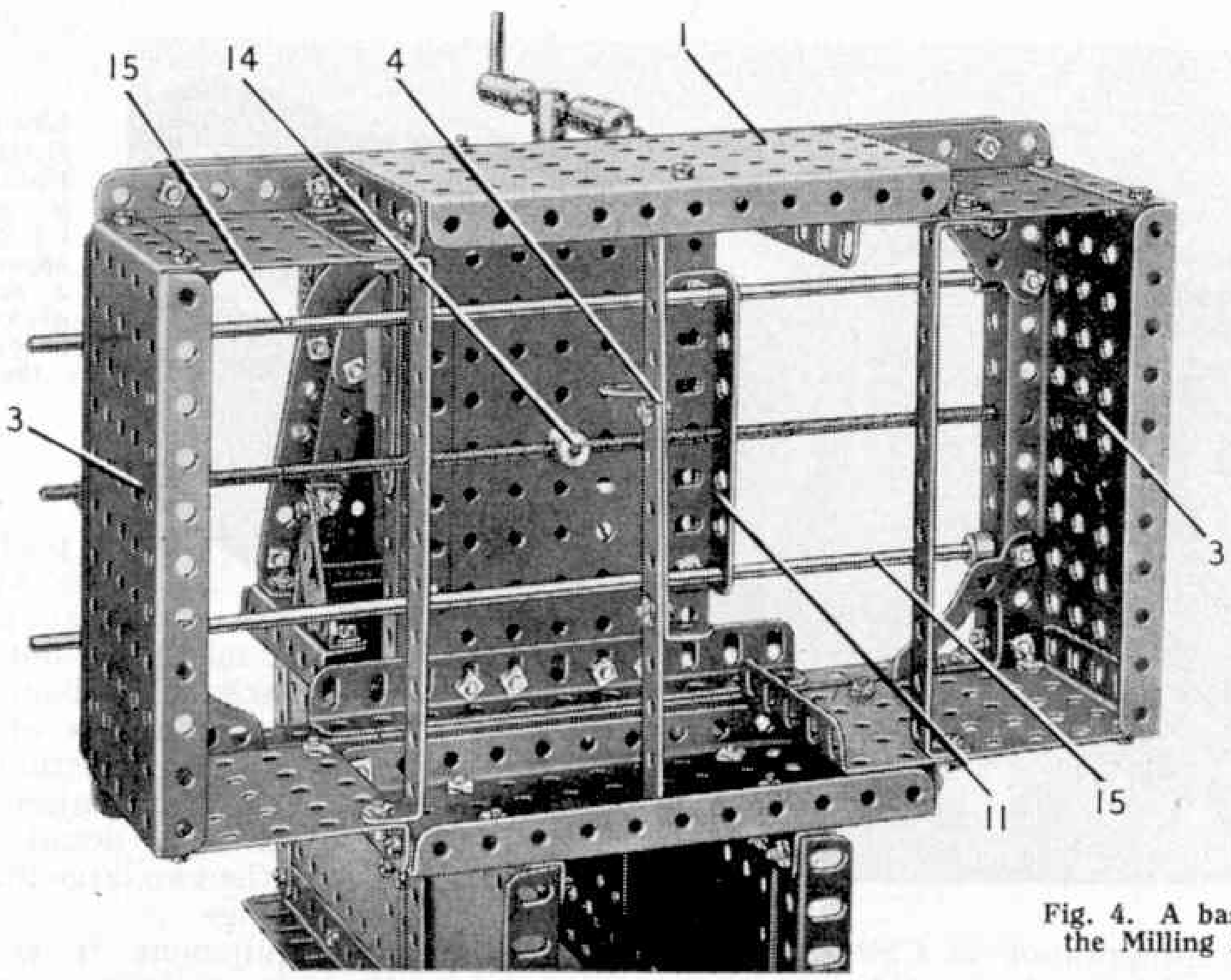


Fig. 4. A base view of the Milling Machine.

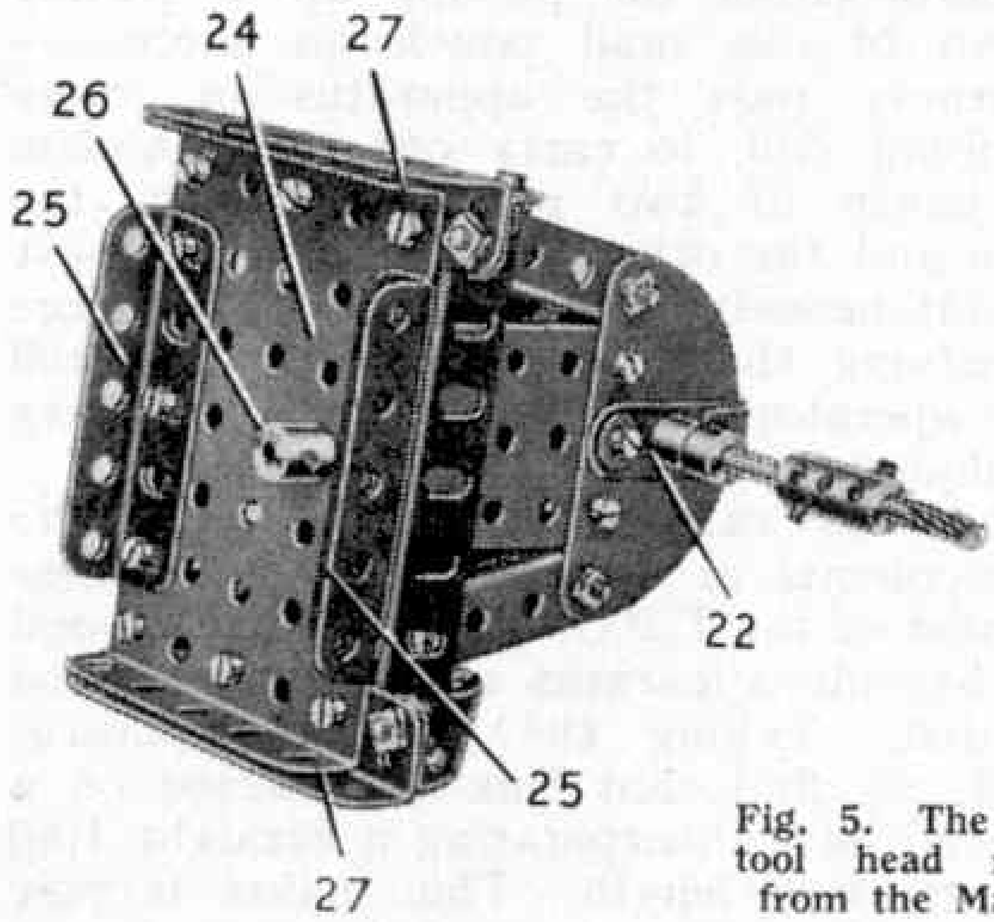


Fig. 5. The milling tool head removed from the Machine.

HORNBY RAILWAY COMPANY

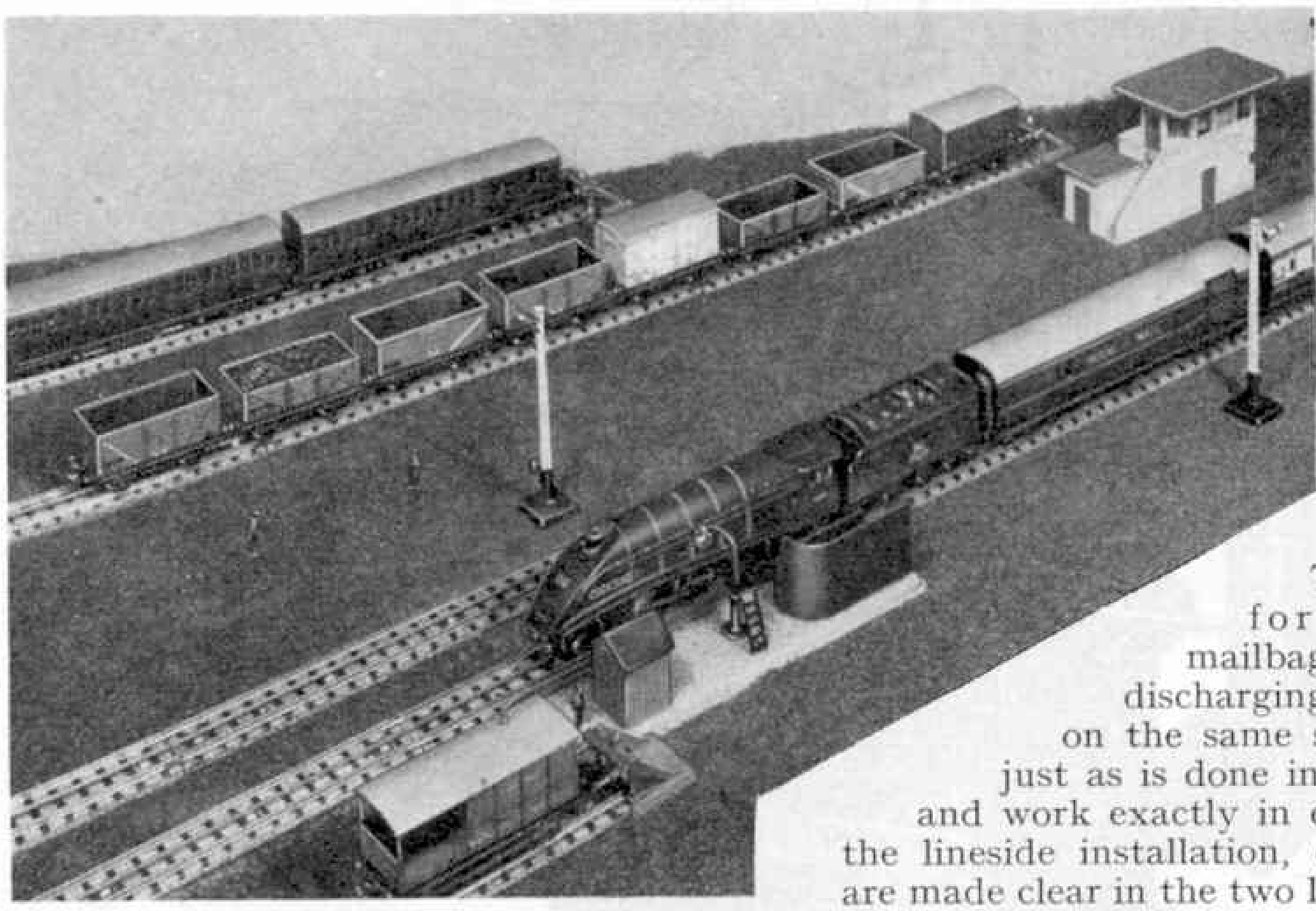
Now You Can Run Your Own Mail Train

By the Secretary

I SUPPOSE that really the pictures on this and the opposite page speak for themselves. Many of you will be pleasantly surprised by that most recent addition to the Hornby-Dublo system, the T.P.O. Mail Van Set, although no doubt you realised that its introduction could not be far off when you saw it actually operated a few weeks ago in a television programme in Children's Hour that showed something of how toys are made. I am sure all of you who saw this realised at once that you were seeing the making of toys in the works of Meccano Ltd.

The T.P.O. Mail Van Set, the components of which appear in our pictures, brings in miniature to the Hornby-Dublo Railway all the thrill of the exchange of mail bags at speed that is carried out almost every day and every night on real railways. I need not tell you that the initials T.P.O. mean Travelling Post Office. There is a network of T.P.O. services on British Railways main trunk routes as well as cross-country runs, whereby the carriage, sorting and exchange of mails on the run are carried out. Now you can have on your Hornby-Dublo Railways a splendid miniature reproduction of those long red vans, bearing the magic words *Royal Mail* in large letters on their sides and proudly carrying the Royal insignia *E. II. R.*, and also of the lineside arrangements for exchanging mail without stopping.

The Hornby-Dublo T.P.O. is not only good to look at; in addition it works perfectly. The apparatus for picking up mailbags and that for discharging them are fitted on the same side of the Van, just as is done in actual practice, and work exactly in conjunction with the lineside installation, details of which are made clear in the two large illustrations on the opposite page.

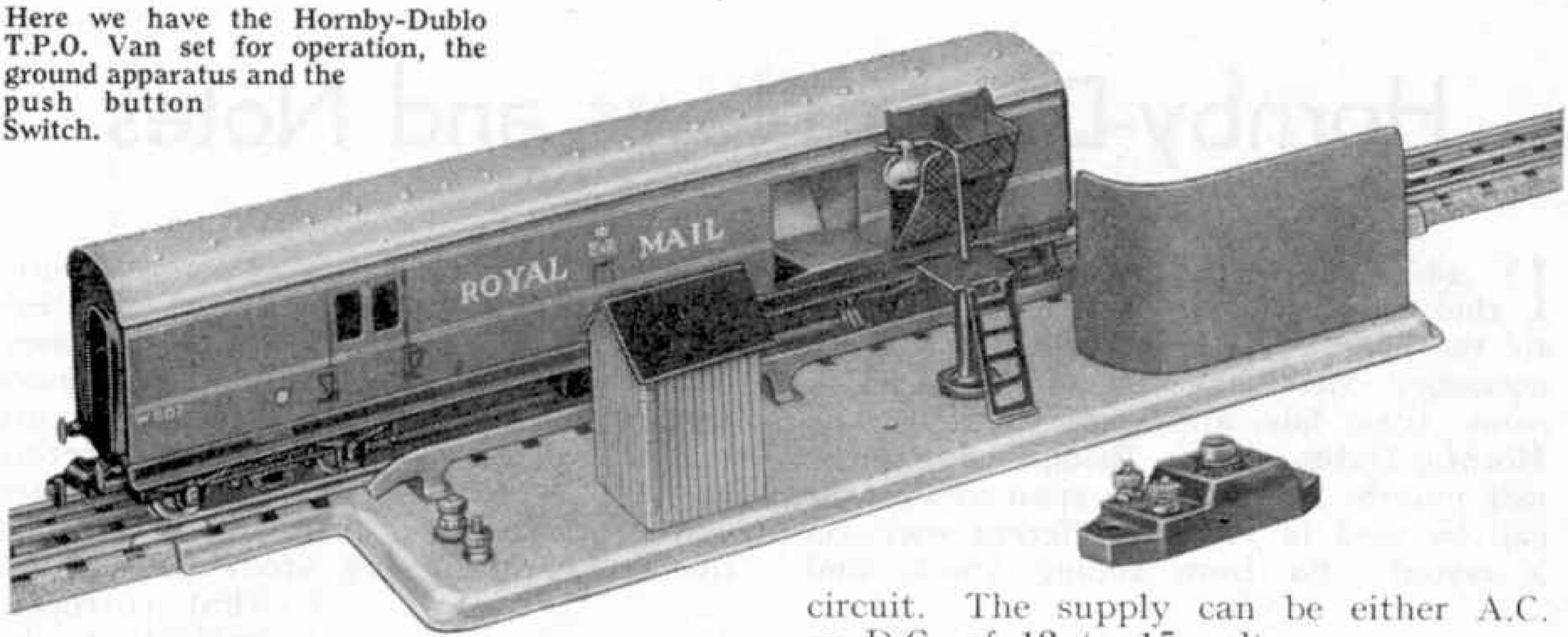


Line clear for the Hornby-Dublo Mail! The train is passing the lineside apparatus where a pouch to be picked up is suspended from the standard.

With this equipment it is easy to operate either the picking up or setting down of one mail pouch on successive journeys past the apparatus or, more thrilling still, to carry out the complete exchange of two pouches, one in the Van and the other at the lineside, almost simultaneously; and nothing can be more satisfying than the sharp raps that tell the operator that the two mailbags have exchanged places.

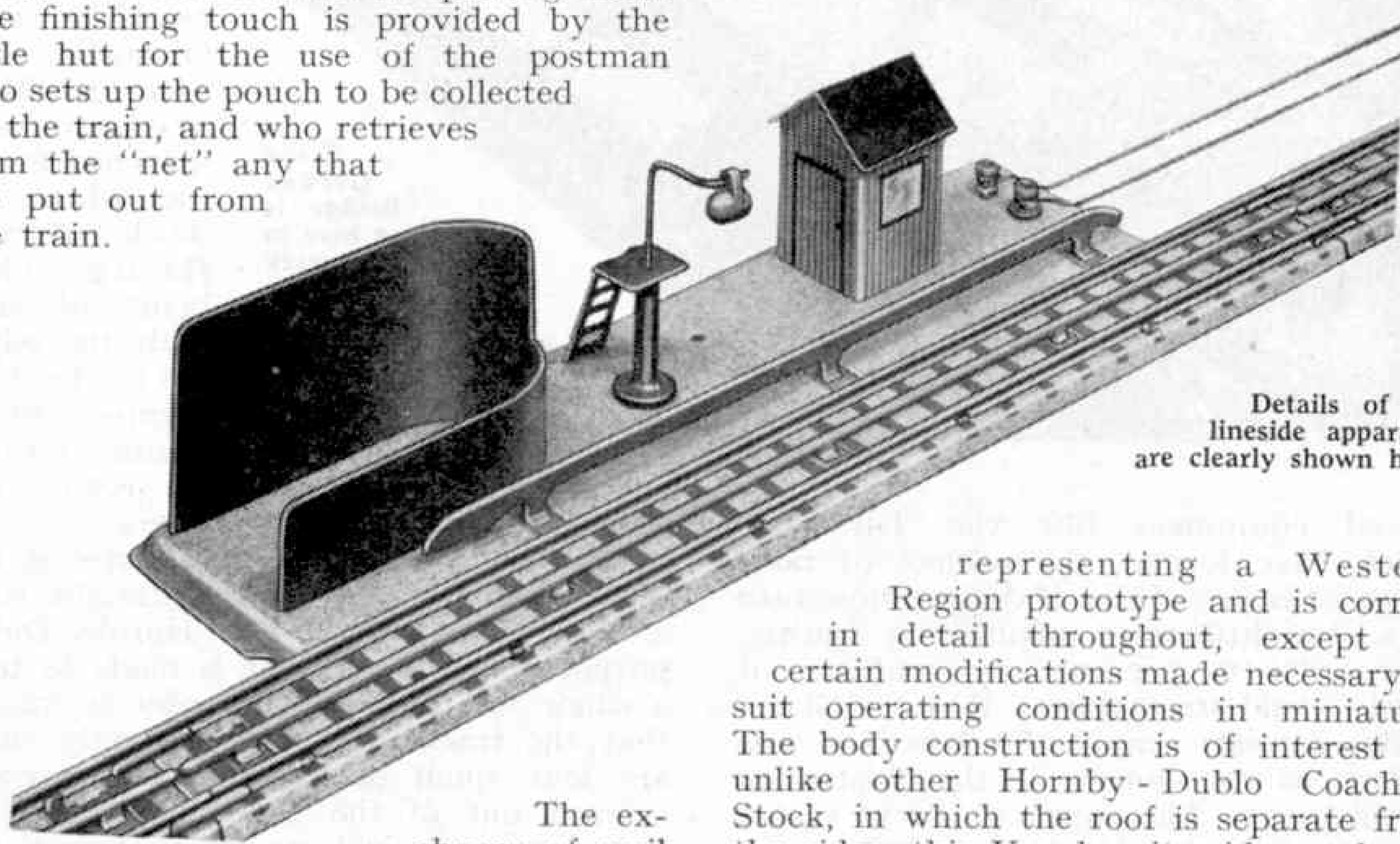
Let us take a closer look at the components of our Mail Van Set. These consist of the T.P.O. Mail Van, the ground or lineside apparatus and a push button Switch. Taking the ground apparatus first, we find that this is mounted on a special base incorporating a Straight Rail of standard length. This makes it easy

Here we have the Hornby-Dublo T.P.O. Van set for operation, the ground apparatus and the push button Switch.



to include in a Hornby-Dublo Railway, for all that is necessary is to substitute it for a Straight Rail already there.

Alongside the track is a special raised contact rail and the wayside standard, from a hook on which mail pouches are picked up by the T.P.O. For practical reasons in miniature, the "ground net" of real practice, in which the outcoming pouch is delivered, has the form of a metal "box," open at the approach end and at the side nearest the passing train. The finishing touch is provided by the little hut for the use of the postman who sets up the pouch to be collected by the train, and who retrieves from the "net" any that are put out from the train.



Details of the lineside apparatus are clearly shown here.

The exchange of mail pouches in Hornby-Dublo is effected electrically, the necessary current being fed in by the contact rail I have already mentioned. There are two terminals at one end of the special base, to allow for wiring to a suitable current supply, with the push button Switch that controls the operation in the circuit. The supply can be either A.C. or D.C. of 12 to 15 volts.

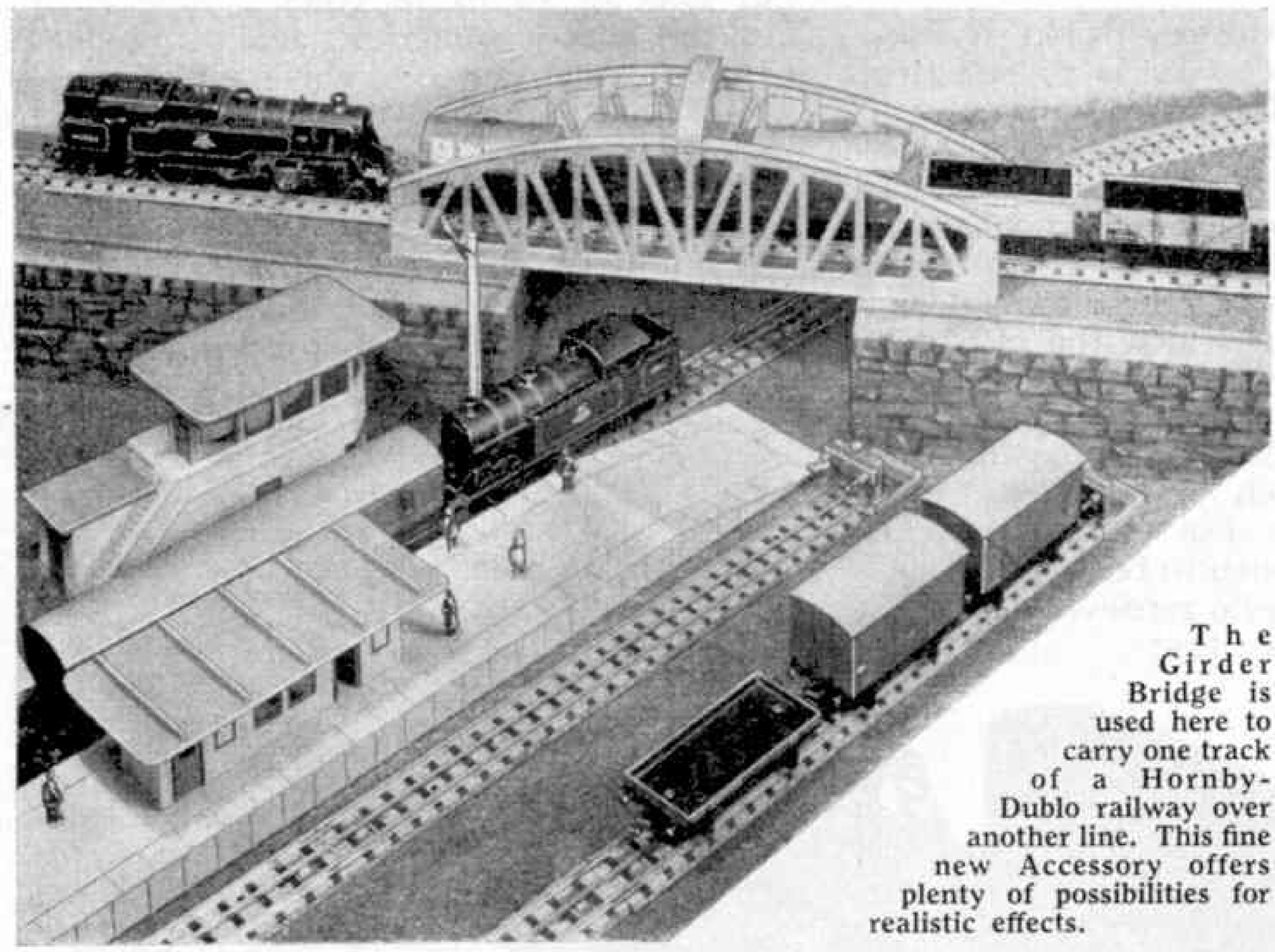
And here is something really important to note: The source of this current supply **MUST** be separate from that used to provide current for train driving. A separate 15 volt A.C. output of a power unit can be used, or a separate transformer if you have one. Alternatively, 12 volts D.C. from an accumulator, or even dry batteries, can be employed.

Now for the T.P.O. itself. This is an attractive vehicle representing a Western Region prototype and is correct in detail throughout, except for certain modifications made necessary to suit operating conditions in miniature. The body construction is of interest as, unlike other Hornby-Dublo Coaching Stock, in which the roof is separate from the sides, this Van has its sides and roof formed all in one piece, the division between the roof and sides being marked by embossed ridges that represent the gutters. The tinprinted finish of the body work is very well carried out, the wide doors on both sides and, on the "near" or operating side, the special sidelights and

(*Continued on page 158*)

Hornby-Dublo News and Notes

IN addition to the splendid Turntable that is a welcome recent introduction to the Hornby-Dublo system, a further accessory that has been promised for some time has appeared. This is the Hornby-Dublo Girder Bridge, announced last month, a fine single span affair that can be used in various different ways on a layout. So from rolling stock, and special equipment like the Turntable, which have formed the subject of talks in recent issues of the *M.M.*, we now turn to a straightforward engineering feature.



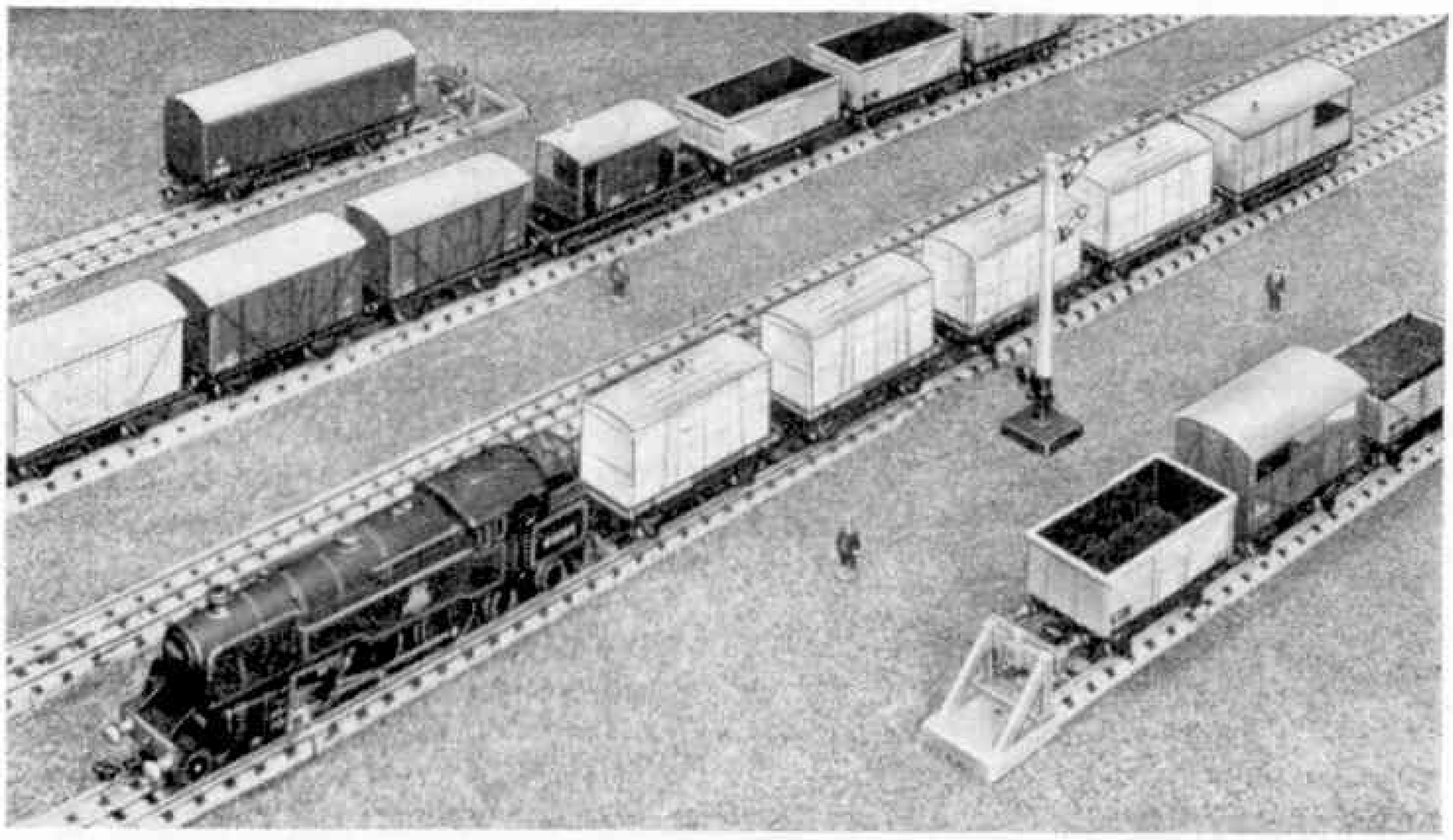
The Girder Bridge is used here to carry one track of a Hornby-Dublo railway over another line. This fine new Accessory offers plenty of possibilities for realistic effects.

In order to prevent any confusion it must be said straightaway that the Girder Bridge consists simply of a base and side girders, as you can see in the illustration on this page. The approach works shown are not provided, just the Bridge. Of course keen Hornby-Dublo owners will not have much difficulty in arranging suitable settings for the Bridge, or even for several of them, and in fixing up the required approaches or supporting arrangements.

Let us have a word about the Bridge itself first. The two main side girders are of the type built up with upper and lower booms connected by a series of members forming what are known as N-trusses. As the upper boom is curved, these trusses are of varying heights. The girders are braced by means of a cross-connecting member, or bridge-piece, at the centre of the span. The girders themselves and the bridge piece are stout die-castings that correctly reproduce the sections and flanges, and show a great deal of fascinating detail in the way of gusset plates and rivet heads, which give a remarkable impression of realism and strength. The two girders are securely attached to the baseplate or deck of the Bridge, this being of steel with the edges specially formed to a channel section to receive the lower booms of the side girders.

The length of the Girder Bridge is the same as that of a standard Straight Rail, a convenient unit for Hornby-Dublo purposes, and the Bridge is made to take a single line of rails. In order to ensure that the track is centred correctly there are four small projecting pieces pressed upward out of the base of the Bridge, two near each end, to bear against the edge of the base of a standard Hornby-Dublo Rail. This ensures that on temporary layouts no troubles will be experienced through disturbance of the track or of the Bridge itself.

The Bridge should be firmly supported at each end of the span, and two holes are provided so that it can be firmly



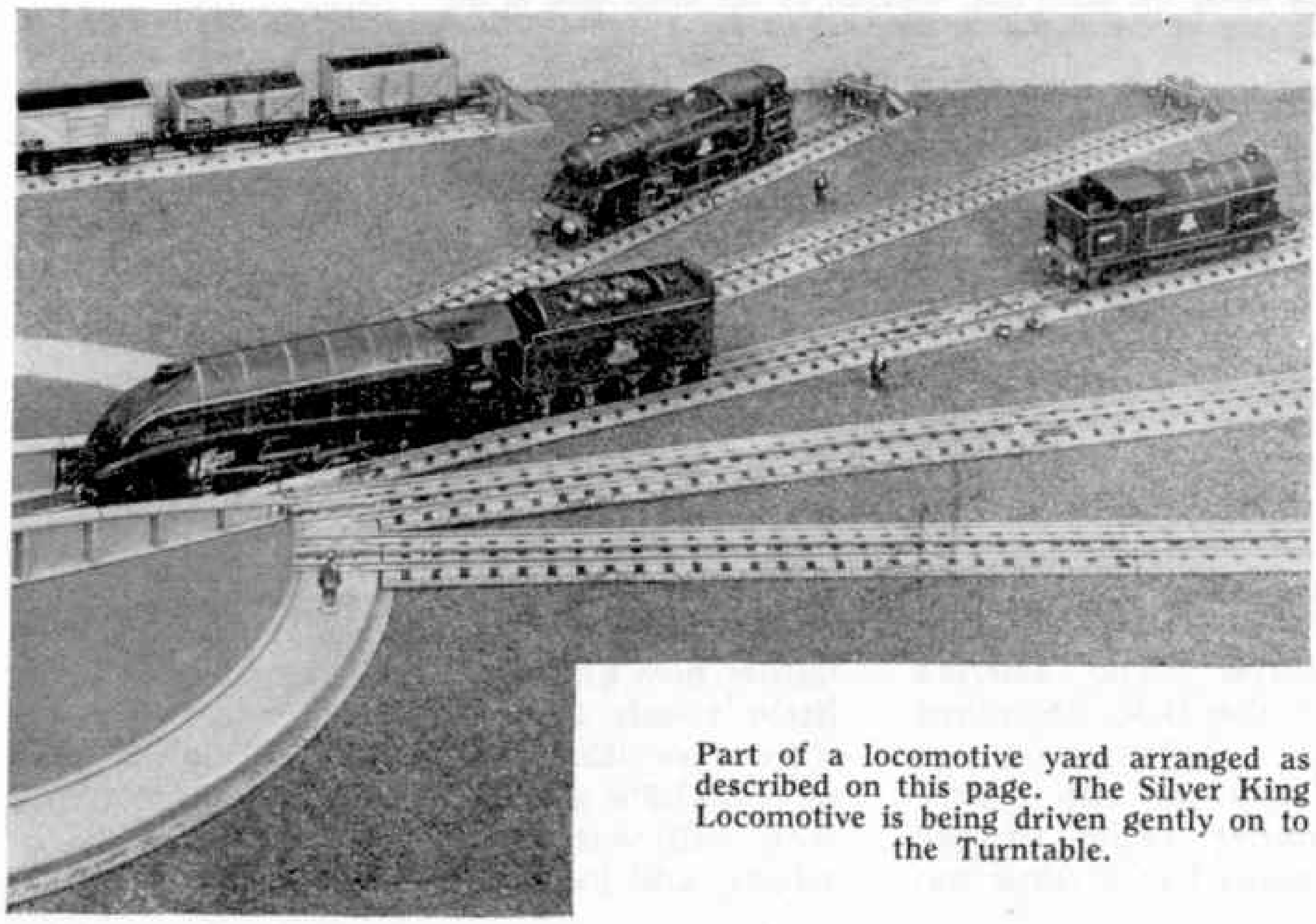
A load of perishable traffic is here being handled by the Hornby-Dublo 2-6-4 Tank. The standard Insulated Containers are carried on Low-Sided Wagons.

screwed down to its abutments. The arrangement of the approach tracks also should be carried out with care. Where approach gradients are not possible owing to baseboard conditions, Hornby-Dublo owners who want to use the Girder Bridge to good effect could arrange a single track that runs throughout at a higher level than the rest of the railway.

It is not necessary to make the raised section, or any approaches where these are in use, of solid pieces of timber. A built-up structure will be lighter and on the whole easier to arrange. It is important that the foundation or base for the track and the supporting blocks should be accurately made, so that when the rails are laid along the upper surface a good smooth course will be assured. How to fill in the part between this raised level and the normal baseboard will depend on the material available to the owner, and of course the conditions on the site. Shortage of space may make it necessary to have more or less vertical walls between the two levels.

Where there is no room for the Girder Bridge actually to span a gap at higher level than the normal, many readers no doubt will simply include the Bridge as it is at baseboard level. They will at least have the pleasure of seeing the train pass through the girders, which in itself is a wonderfully satisfying experience!

In his talk last month, the Secretary of the H.R.C. wrote about a useful Turntable scheme involving the use of an Isolating Rail and D2 Switch. A variation of this arrangement appears in the lower photograph on this page, where the centre track is divided into two sections. You can see the terminals of an Isolating Rail, just to the rear of the 0-6-2 Tank Locomotive. The section beyond this rail can be cut out by a D2 Switch, so the 0-6-2 Tank can stand there while the *Silver King* moves on to the Turntable.

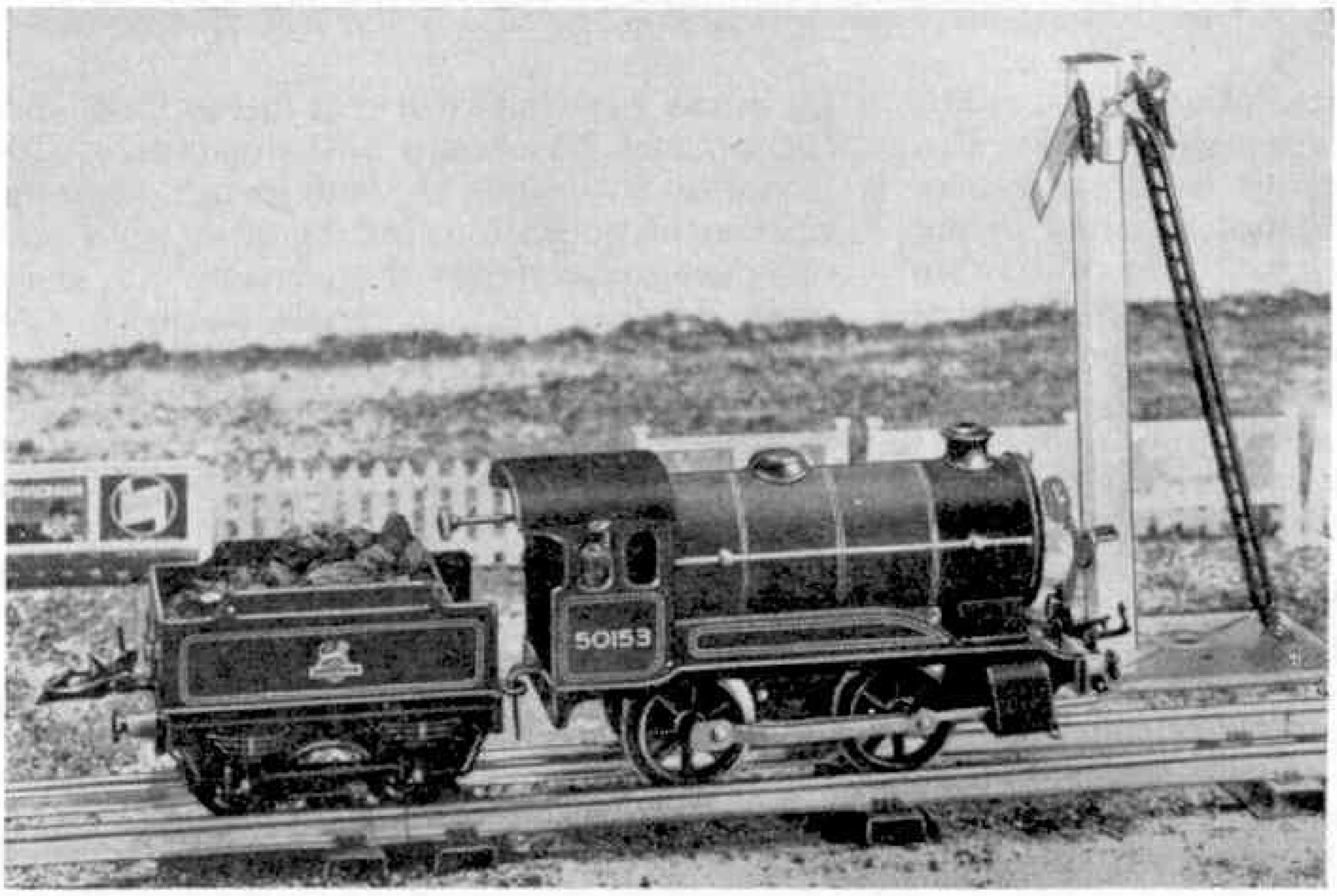


Part of a locomotive yard arranged as described on this page. The Silver King Locomotive is being driven gently on to the Turntable.

More About Lamps

ALTHOUGH the scene in our picture is a simple one, it will suggest many interesting and useful ideas to all Hornby Gauge 0 railwaymen.

To begin with, look at its central figure, as it were—the No. 51 Locomotive making its lonely way down the line! Engines do run alone at times, for instance when they are making their way to and from the Depot to which they belong. Sometimes there may be a regular run of some length to work an engine to a point where a particular train has to be picked up, or perhaps some other working begun.



A light engine makes its way along the main line, watched by the lamp man at the top of the signal ladder.

As this is a real working, the same sort of thing can well be done in miniature. But when it is, don't wind the engine to the same extent as you would if it had to pull a load. A few tests or practice runs will show you just how far to wind it, and you will soon become expert in judging distances.

Next, the running of an engine on its own, or light engine running as it is known, provides an interesting note on headlamp code displays. The correct indication according to the B.R. Standard headlamp code is for a light engine to carry a single headlamp on the centre bracket above the buffer beam of the engine, or tender, according to the direction in which the engine is moving. A corresponding tail lamp will of course be displayed at the opposite end, to show that the "train" is complete.

Where there are several engines in use on a layout, each with its own complement of lamps, it is not a bad idea to have a sort of lamp "pool," or common stock from which the head or tail lamps required for particular duties are withdrawn when necessary, and—to which they are returned when the duty is finished, which is even more important. This will help to keep them all in one place, such as a small box, which is not a bad thing, as sometimes Hornby engine drivers have been known to report the loss of headlamps that somehow or other never turn up again!

Fortunately it is not difficult to make good such losses, as the lamps themselves are readily available separately. But why lose them at all? That is not good railway working.

From movable lamps we can turn our attention to the fixed ones on the Signals of Hornby railways. In actual practice the lamp cases are always in position, like the Hornby ones. The inner part of the real oil burning lamp has to be withdrawn regularly for cleaning and filling, etc. Evidently it is "lamp day" in the picture on this page, the miniature figure at the top of the ladder representing the lamp man about his business. The placing of this little man on the Signal ladder now and again will impart a realistic little touch to operations generally, and if he does stop to look at a passing engine or train he is acting like a good railwayman, who will watch for anything unusual or wrong, and look specially for the tail lamp.

Club and Branch News

WITH THE SECRETARY

EXHIBITIONS ARE POPULAR

The interesting reports summarised here this month show that the value of Exhibitions as a regular feature of Club and Branch life is generally recognised, as almost every report mentions such an occasion. Preparation for an Exhibition is a wonderful stimulus, unifying the members in a common effort to put on a really first-rate display that, when this takes place, delights and surprises the visitors, and gives all who strove to make it a success that grand feeling of a job well done. The Club or Branch concerned benefits too by becoming better known and achieving public appreciation of its constructive activities.

In fact, there is no better way in which a Club or Branch can bring its winter activities to a close than by staging a good Exhibition.

CLUB NOTES

NEWTOWN SCHOOL (WATERFORD) M.C.—Some interesting models have been built. It has been decided that members shall be given a free choice of subject in constructing models for a forthcoming Exhibition. Club roll: 12. *Secretary:* R. B. Wardell, Newtown School, Waterford, Eire.

NEW ZEALAND

CHRISTCHURCH M.C.—The final meeting for 1956, at which 18 members were present, included competitions and a film show. A supper of tinned peaches, ice cream and cordial was immensely enjoyed! Club roll: 21. *Secretary:* R. Boundy, 49 Evesham Crescent, Spreydon, Christchurch, New Zealand.

BRANCH NEWS

DROYLSDEN LITTLEMOSS BOYS' COUNTY SECONDARY SCHOOL—The Branch has settled down nicely in its new quarters, and is enjoying the improved facilities. The Branch Hornby-Dublo layout has been displayed and operated at three Church Bazaars, and on each occasion was a great attraction. Good progress is being made in constructing an extensive Exhibition layout, and at the time of writing one section, covering 16 ft. of baseboard, has been completed. Some 24 yds. of track have been laid, and another 50 yds. are to be put down. The construction of scenic effects also is in hand. The Branch sent a Hornby-Dublo layout to the Manchester Model Railway Society's Exhibition, where it was much praised by model railway enthusiasts and other visitors; and it was commented upon favourably in the local press. *Secretary:* J. Lawton, Droylsden Littlemoss Boys' County Secondary School, Cryer Street, Droylsden.

HALE END (LONDON)—Model railway activity has continued. There is increased interest in the running of model cars, and the construction of model boats. It is hoped to hold an Exhibition this year. *Secretary:* A. Coe, 463 Hale End Road, Highams Park, London E.4.

EDLINGTON COUNTY SECONDARY SCHOOL (DONCASTER)—Branch meetings are held from 4 p.m. to 6.30 p.m. on Wednesdays and Thursdays, one night being reserved for older members and the other mainly for new members with a few of the seniors present to organise activities. A new and much larger control panel, with all controls ready to hand, has been installed in the Branch layout, which is to be extended as soon as a suitable opportunity occurs. An entirely new running programme has been drawn up, and a series of operation cards prepared to give continuous operation of the layout for a fairly long period. During this period all members take a turn at the controls. An end-of-term display of the Branch layout resulted in several applications for membership. *Secretary:* P. Nichols, 21 Mallin Drive, Edlington, Doncaster, Yorks.

MILE END (PORTSMOUTH)—Layout nights maintain their popularity, and the extensive layout working, both clockwork and electric, has reached a high standard of efficiency. A novel feature to be introduced at the next Branch Exhibition will be a record of train noises that will be played on a gramophone. One member has painted some additional scenery for the layout. *Chairman:* Mr. A. J. Nicholson, 213 Sultan Road, Buckland, Portsmouth.

NEWPORT (I. O. W.) C. OF E. JUNIOR BOYS' SCHOOL—While some members have been engaged in train running, others have been busy with the construction of new scenic effects, including model houses. An interesting addition is a model sawmill, where freight trains are loaded with timber for transport to the model port, for shipment. *Secretary:* A. P. Keeley, Newport C. of E. Junior Boys' School, West Street, Newport, Isle of Wight.

They are a jolly crowd at Exeter M.C., as you will gather from this excellent picture taken by one of their members last summer. Standing in the centre background is Mr. J. Turner, the Club's President and Headmaster of Ladysmith Boys' School. Immediately in front of him is the stalwart Leader, Mr. M. C. Hodder.

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For other Stamp Advertisements see also pages 156 and xviii

Stamp Collectors' Corner

By F. E. Metcalfe

MAKING STAMPS

I HAVE written a lot about collecting stamps recently, so now I had better say something about the making of them. I will try to do so without being too technical, for after all it is a hobby we are dealing with. Yet, to know something about the why and wherefore of what we are collecting does add to one's interest. Moreover, as a collector progresses he is bound to encounter snags, and a knowledge of stamps themselves will help to overcome these difficulties.

In the first place there is the paper from which stamps are made. The process of making paper is simple enough, and to explain the manufacture without going into a lot of details, substances such as linen and cotton rags, wood fibre, esparto grass, etc., are reduced to a pulp. This is carried in film form through the rollers of a machine that gradually expel the moisture, until the reel is quite dry. It is then ironed, or calendered, to use the trade term.

If the paper is to bear a watermark, in the process of moving along the machine the film of pulp passes under what is known as a dandy roll. This latter is a roller composed of wire of a fine mesh, which has fastened on it pieces, or *bits*, to use again the trade name. These are of metal and it is they that make the impression that we know as the watermark.

And here I can refer to the watermark errors that so stirred collectors of K.G. VI colonial stamps when they were discovered in 1954. The paper used for most current British Colonial stamps has the watermark impression of a crown—called Tudor—and the letters C.A., meaning Crown Agents, which is the body concerned with the ordering of our Colonial stamps. These little crowns, or bits, become detached from time to time, and in this instance two were replaced by bits with a crown of a different shape, which we would now call St. Edward's Crown. When these were discovered collectors got quite excited, stirred up too by a good deal of publicity, and stamps showing the watermark errors are worth several pounds.

So far I have been referring only to machine-made paper, which is what is used mostly nowadays for postage stamps. There is also hand-made paper, where a film of pulp is put into a frame and rocked by hand. This sounds as though it will be a quite simple operation, but as a matter of fact, it is one that calls for considerable practice and skill if one is to get sheets of paper all of the same thickness. If the hand-made paper is to be watermarked, then the bed of the frame on which the film of paper lies has the necessary bits attached. It is here that we get the deckle (rough) edges of the sheets, which can often be seen on high class writing paper. Some of the older stamps were made with hand-made paper.

There are many kinds of paper, but we need not go into much detail, though collectors of our Colonial stamps must certainly look a little further into the matter, particularly if they collect K.G. VI issues, for important changes were made in the paper used during the reign of the late sovereign.

We have the ordinary plain paper with the C.A. Crown watermark, or what collectors call C.A. Script, to distinguish it from paper where the letters of the watermark were of the Roman type. Then there is the "chalky" or coated type of paper. This has a film of chalk, etc., that is supposed to act as security against the washing off of postmarks, for then the design goes as well. This paper also allows for a clearer and better impression. Many Colonial stamps have been printed on this "chalky" paper, such as the higher values of Bahamas, Bermudas, Hong Kong, Leeward Is., Nyasaland, etc.

During World War II another kind of paper was used instead, known to collectors as substitute or sub paper for short. This was paper that was heavily calendered, but had no chalky film.

It is rather important to know how to tell one paper from the other. If one gets a piece of silver—an *old* silver coin will do, but not one of modern mintage—and rubs it lightly on the surface of the stamp, a mark will be left that resembles that made by a lead pencil.

At this point I had better issue a word of warning. Make only the lightest and shortest of lines, and then with the help of a piece of good clean rubber, the mark can be erased. If the stamp is on sub paper, that is paper without the chalky coating, the silver will make no mark at all, unless it happens to be a bit dirty.

There is perhaps one other paper to which I should refer, for it is being used for some of the current stamps of Ceylon. It is known as granite paper, and the Swiss firm of Courvoisier generally use it for their stamps. In the pulp of this paper fine coloured silk hair-like threads are incorporated, and can be seen more easily on looking at the back of the stamp.

It has its advantages as a security agent, and also the surface of the paper can be kept perfectly smooth, allowing a good impression that is much easier to obtain than with watermarked paper. This is one of the disadvantages under which our printers work when using photogravure. For Australian stamps they are discontinuing the use of watermarked paper up to the 2/6 value, and so will get better impression.

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Stamp Gossip

CROWN AGENTS

I KNOW from letters I receive how many Meccano readers are interested in our own Commonwealth stamps, and as they frequently see the name of the Crown Agents mentioned in connection with these stamps, I am often asked what part they play in it all. Well, theirs is the job to get the stamps printed.

As far as the Colonies are concerned, after agreement is reached with the Colonial Office, who all too often play anything but a helpful part if a new issue is projected, it is left to the Crown Agents to make all arrangements. When the stamps are printed, as many as they think they can sell to dealers on their approved list are retained in London, and the rest are released in the Colony concerned. Supplies are sent out from Millbank, where the C.A. have their headquarters, and it is the latter stamps that most dealers distribute to their new issue customers.

The Crown Agents sell several hundreds of thousands of pounds worth of stamps in a year. I should mention here that they have an agency in Washington, which also gathers in a lot of dollars for us by the sale of Colonial stamps. In view of all this it is only natural that the Crown Agents are keen to sell all the stamps they can, not only to help their customers, the Colonies, but to gather the commissions that dealers, strangely enough, have to pay when they place an order.

And now I come to the point that should interest my readers. A book was published some time ago that gives details of all these C.A. handled issues. The first edition had a number of errors regarding dates of issue, etc. But now the Crown Agents have taken over publication, and a second edition is on sale at 5/–. This any stamp dealer will be only too pleased to supply. It is a very fine work full of illustrations, and contains all you need to know about these stamps. A thematic collector will find it a real treasure, and if all collectors of Q.E. II stamps will take my tip, they will buy a copy at once.

CANADIAN PROGRAMME

While it is not possible to say with certainty which is the most popular country in the Commonwealth with British collectors, one can be sure that Canada is not very far from the top. So a few details of Canada's programme for 1957 will be of interest.

I have been officially informed that at least 10 new stamps will be released. Four of these will come out in March, and they will be in quite novel form, for while all will be 5c. in value and they will represent different sports—fishing, swimming, skiing and hunting—and all four will appear on one sheet. Thus collectors will be able to get blocks of four, with each stamp of a different design.

These will be followed in April with another 5c. stamp, to support National Wildlife conservation, on which the Canadian bird the Common Loon will be depicted. June will see the release of yet another 5c. stamp, this one in honour of the explorer David Thompson, and in August a 5c. and a 15c. stamp will be emitted to mark the 14th Congress of the Universal Postal Union, which is being held in Canada for the first time. Two stamps to follow, also 5c., will commemorate the 6th Mining and Metallurgical Congress and the United Nations' Childrens Fund respectively.

These stamps are the certainties. Perhaps there may be one or two more, but even if no more come along collections of Canada are going to look a lot brighter at the end of this year than they did at the beginning. Wouldn't it be nice if our own country would follow Canada and the rest of the world with a few nice commemoratives?

YUGOSLAVIA

I recently received one or two brochures from the Yugoslav Post Office, giving details of some of the sets of stamps it has issued recently. Actually I had seen some of the stamps, and some time ago I referred to them.

Yugoslavia is producing some real gems for thematic collectors these days. One set issued in 1956 has to do with Yugoslav art through the centuries. One of the stamps of this set is illustrated. Then there have been sets on sea animals, etc., all very beautiful. But I do wish every reader interested in stamps could get a copy of this "Art" brochure, for not only is each stamp in the set of 12 illustrated, but full details also are given of what is depicted. I think a copy would probably be sent if one wrote to the Jugofilatelija, 2 Palmoticeva Beograd P.O.B. 757, Yugoslavia.

FLYING SWANS

Some collectors are surprised to note that more than one country recently issued two stamps depicting five swans in flight. Why the same design? The reason is that it is desired to emphasise the affinity between the five northern countries, Denmark, Iceland, Norway, Sweden and Finland.

The five swans are connected with H. S. Pedersen's poem *The Swans from the North.* None of the ten stamps will cost more than a copper or two each.

FORMOSA

It is not often that Taiwan stamps are referred to, but I feel sure that the one illustrated will catch the fancy of many readers, in view of the motif of the design. The stamp is one of a set of three issued last June to commemorate the 75th Anniversary of Chinese railways.

Docks that can be Transported—

(*Continued from page 123*)

some 20 ft. longer. After a special drill had been fitted at each corner the dock was towed from the naval base out into the Atlantic Ocean.

On 16th July the first shoal was reached and the taking of samples commenced. Drilling took three days at each radar station site, with a day taken up in moving on to the next station. In these regions hurricanes cause tremendous damage to anything in their path and so it was decided that drilling must be finished by 10th August, the date of the earliest known hurricane. In spite of bad weather and fog, drilling was completed before the time limit, and the dock was towed back into port with valuable information on the seabed of the Atlantic Ocean.

The Revival of the Festiniog Railway—

(*Continued from page 128*)

services are eventually extended to where the route has more curvature and the grades stiffen, for on the last 12 miles to Blaenau Ffestiniog the average gradient is 1 in 92.

The Railway was single track with passing loops at stations. Trains are now run on the one engine in steam principle, but in former days electric staff and token was employed. At one time the railway set a model example for all narrow lines with its signalling arrangements, by properly protecting all junctions and crossings by signal and catch points, together with a complete telegraph system. Telephonic communications have been restored between Portmadoc and Minffordd, together with Boston Lodge works and a level crossing keeper's house near Minffordd.

Bogie type passenger coaches were introduced about 1872 and were believed to be the first of their kind in Great Britain. Two coaches were reinstated in 1955 and a further two were ready for 1956, the latter both having a first class compartment that appears to have been very much appreciated.

It has always been the practice of the Railway that while trains were in motion all carriage doors were locked, a necessary precaution on account of the fact that the clearance between the side of the train and the rock along the line is less than the width of a carriage door. In addition iron bars are fitted across compartment windows that open as another preventive measure against accidents.

In the two months following the opening of the railway on 23rd July, 1955, 11,371 passengers travelled over the mile stretch from Portmadoc to Boston Lodge. During 1956, with the service extended to Minffordd, there were occasions when all four coaches had to be employed, and 38,689 passengers were carried on the Railway in that year.

Unfortunately it will not be possible to reach Blaenau Ffestiniog by the original route, as a proposed hydro-electric scheme will flood part of the line at the northern end. But it is anticipated that at least eight miles of the line will eventually be opened for traffic, and there is little doubt that the route will not lose much of its scenic value.

Easy Model-Building—(*Continued from page 133*)

three spacing Washers on each Bolt. Strip 13 is formed by two 2½" Strips and a Wheel Disc bolted together, and to the Wheel Disc is lock-nutted a 2½" Stepped Curved Strip 14.

The Curved Strip is lock-nutted also to a Fishplate 15, and the latter is bolted tightly to an Angle Bracket. A bolt fitted with a nut is passed through the Angle Bracket and is screwed into a threaded hole in the boss of Pulley 8. The nut is then tightened to fix the Angle Bracket firmly to the boss of the Pulley.

Each side of the load carrying platform consists of a 5½"×2½" and a 4½"×2½" Flexible Plate edged by two 5½" Strips, while the centre of the platform is made with two Flanged Sector Plates 16. The centre pin is withdrawn from a Hinged Flat Plate and to one half of this Plate are attached two 5½" Strips 17 and two 2½" Strips. This assembly is then connected to the front of the platform by two Angle Brackets, while at the rear a 5½" Strip 18 is bolted across the end. The complete platform is supported by a ½" Reversed Angle Bracket bolted to the Flanged Plate 2 and by an Angle Bracket fixed to the Flanged Plate 1.

The driver's seat is made from two curved 2½"×1½" Triangular Flexible Plates bolted to the other half of the Hinged Flat Plate, and a Wheel Disc supported by an Angle Bracket. A 2½"×1½" Flexible Plate 19 on each side is bolted to the platform and to an Obtuse Angle Bracket fixed to the Semi-Circular Plate 6.

Parts required to build the Industrial Tractor: 4 of No. 1; 7 of No. 2; 2 of No. 3; 9 of No. 5; 5 of No. 10; 2 of No. 11; 8 of No. 12; 3 of No. 12c; 1 of No. 15b; 1 of No. 16; 1 of No. 17; 2 of No. 18a; 4 of No. 22; 1 of No. 24; 2 of No. 24a; 3 of No. 35; 87 of No. 37a; 75 of No. 37b; 10 of No. 38; 1 of No. 48; 6 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54; 2 of No. 90a; 6 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 155; 1 of No. 176; 4 of No. 187; 2 of No. 188; 2 of No. 189; 4 of No. 190; 2 of No. 191; 2 of No. 192; 1 of No. 198; 1 of No. 200; 1 of No. 213; 2 of No. 214; 4 of No. 215; 4 of No. 221.

Now You Can Run Your Own Mail Train—

(*Continued from page 149*)

the traductors alongside the leading doors being well represented.

Toward the rear end of the Van is the hinged flap arrangement for ejecting the mail pouch and working with it is the representation of the folding net of actual practice that picks up the incoming pouch. On the miniature vehicle this is of metal, fitting snugly up to the body of the Van when closed. When the Switch is operated it opens at the right moment, as you see it in the upper picture on page 149, to receive the pouch waiting on the lineside standard.

The contact rail is live *only* as long as the button of the Switch is pressed down. Thus the apparatus is worked only when required by the operator, and not every time a train passes the lineside apparatus, a point of some importance. Incidentally, the button of this T.P.O. Switch is coloured green, so that it will not be confused with the red coloured button of the similar Switch for the EUBR Uncoupling Rail.

Finally, what about the pouches? These are die-cast in order to stand the knocking about to which they are subject. It is important that they should be kept well polished, and another good tip is to have at least a straight half rail at each end of the lineside apparatus, which ensures good operation.

H.R.C. BRANCH EXHIBITION

The Droylsden Littlemoss Boys' County Secondary School Model Railway Club (H.R.C. Branch No. 555) is holding an Exhibition at the school, Cryer Street, Droylsden, on the 15th and 16th March. The many fine exhibits will include both static and working models, and there will be Hornby-Dublo and other model railway layouts in operation.

THIS MONTH'S SPECIAL ARTICLES

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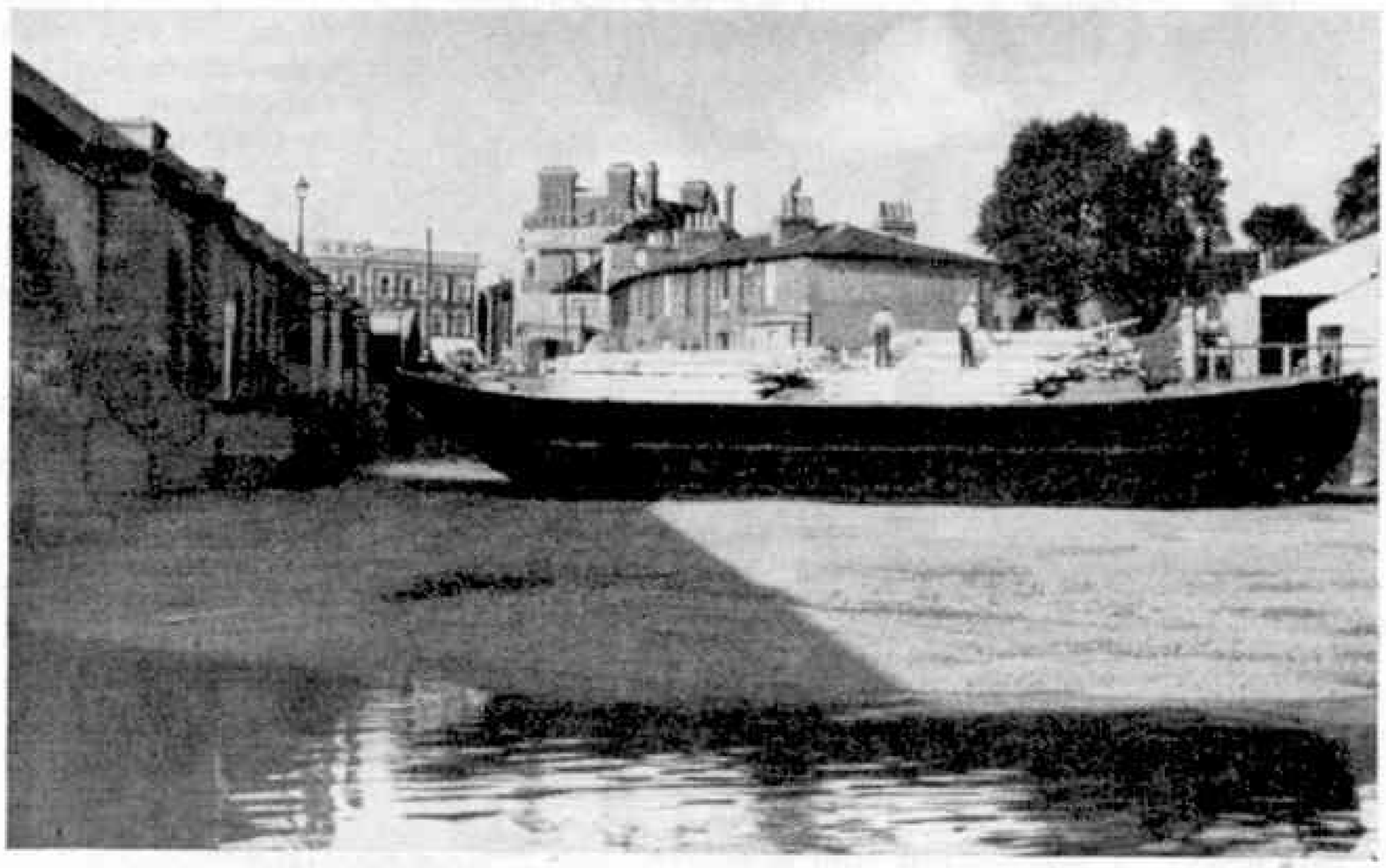
From Our Readers

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.

Thameside "Milestones"

At Strand-on-the-Green, Kew, a spot immortalised by artists of succeeding generations, barges unload timber under the shadow of Kew Bridge, cheek by jowl with houseboats and pleasure dinghies; while on the other bank, the P.L.A. jetty is busy with the comings and goings of steamers bringing visitors to Kew Gardens, the world's most famous botanical gardens.



Unloading timber from flat-bottomed Thames barges at Strand-on-the-Green, within the shadow of Kew Bridge. Photographs by T. B. Shilvock, Kidderminster.

A few miles farther up river Richmond town comes into view, with its riverside gardens, filled in fine weather by a crowd in deckchairs, more reminiscent of Brighton than the river. And then comes a fine, gracefully arched eighteenth century bridge, at one end of which is an obelisk, which not only records details of the building of the bridge, but serves as one of the most comprehensive milestones I have ever seen.

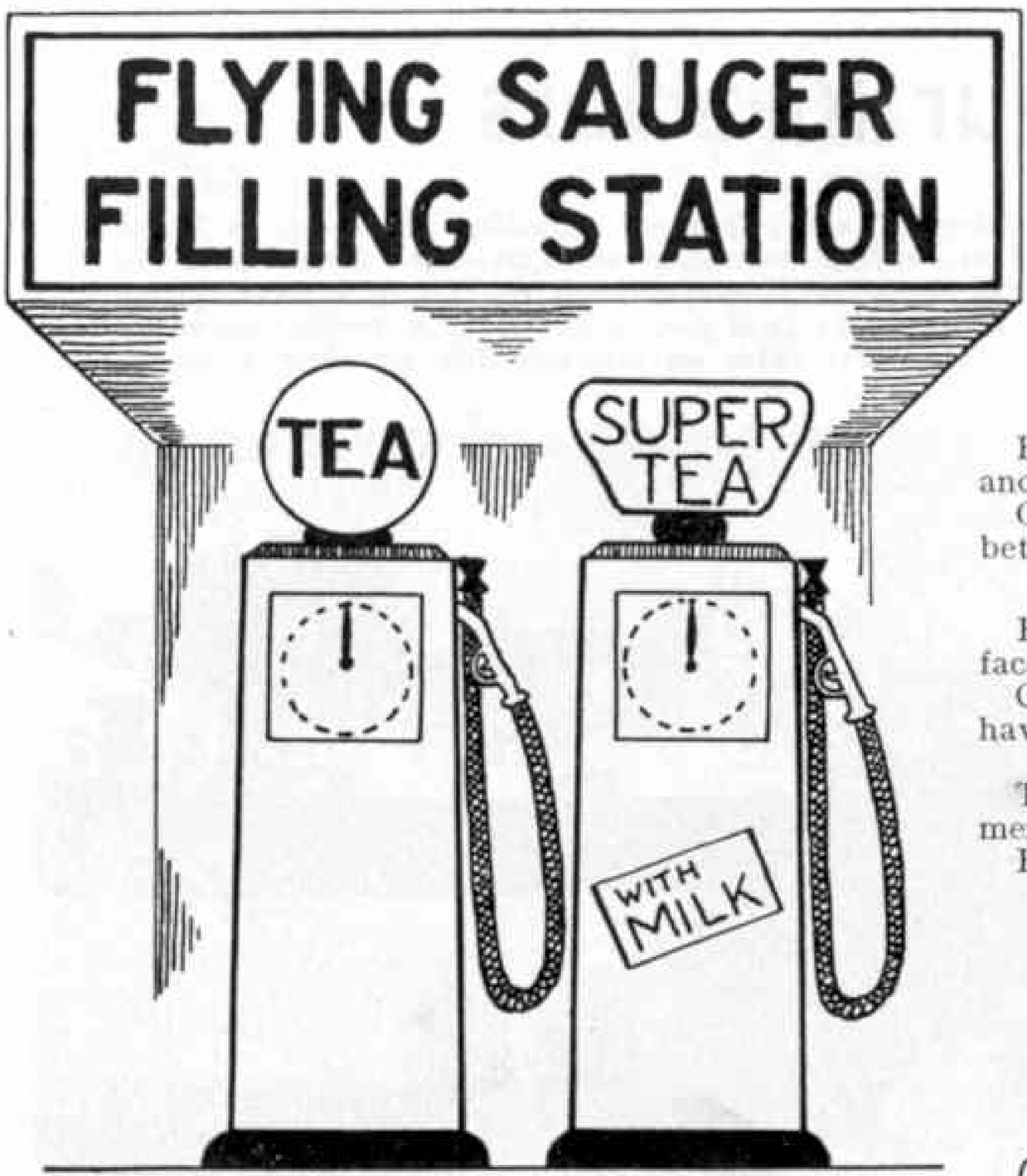
The bridge was started in August, 1774, and completed in December, 1777, no mean feat, when one considers the building methods then in use and the width of the river at this point, and one can scarcely blame its builders for leaving details of their achievement for posterity.

A comprehensive milestone on a pylon bearing details of the building of Richmond Bridge.

They did far more service to the travelling public, for the two sides of the obelisk that face the road show no less than twelve names and distances, and these are set down with great detail, to the nearest quarter mile. It is interesting to see from it that from Westminster Bridge, ten miles and three quarters away, to Blackfriars Bridge, and from the latter to London Bridge, the distance in each case is a quarter of a mile.

Finally there is a stern warning, which reads: *Any person who shall wilfully deface or damage this obelisk will be prosecuted by order of the Commissioners.* One wonders who has taken the place of the Commissioners today. Perhaps it is the "Man in Blue," but strangely enough the stone is remarkably free from initial carvings.

T. B. SHILVOCK
(Kidderminster).



Fireside Fun

Boss: "If you can't do better work I'll have to hire another office boy."
Office Boy: "Thank you sir. I could get along much better with some help."

* * * *

Barber: "Now sir, will you have anything on your face when I've finished?"
Customer: "I don't know, but I hope I'll at least have a nose!"

* * * *

Teacher: "Brian, can you give me a definition of mercury?"
Brian: "Yes miss. Mercury is a solid liquid."

* * * *

BRAIN TEASERS

SIMPLE CROSSWORD

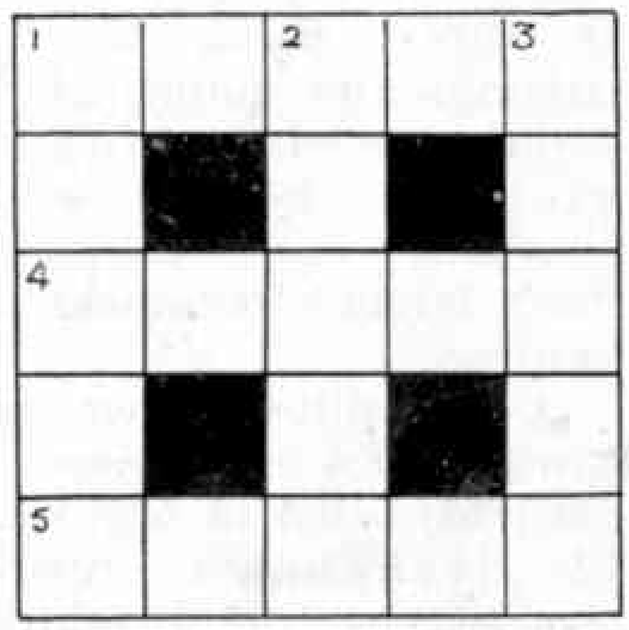
Clues

Across:

1. A rousing instrument
4. Best given a miss
5. A hostile person

Down:

1. A world "best seller"
2. Feel blindly
3. Make an attempt



Summerfield

* * * *

CAN YOU NAME THEM?

What Meccano parts are indicated by the following clues?

1. A domestic quadruped—and to seize.
2. The front—and wrought gold or silver.
3. A source—to cut off.
4. Thin or broken clouds—and to expose.
5. To twist and one who drives.
6. A slant and tackle.

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

A Curious Sum

The solution to the addition sum is as follows:

	£	s.	d.	
Stone	14	0	0	—(14 lb.)
King	1	0	0	—(Sovereign)
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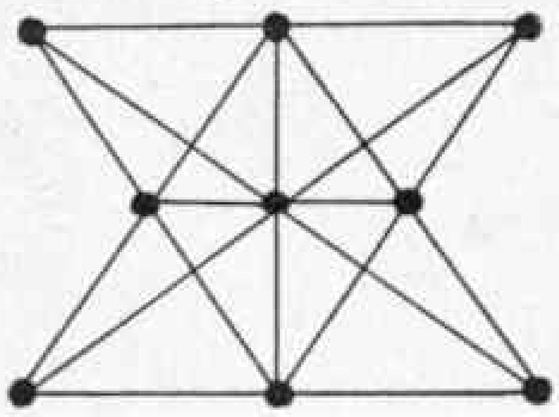
Singer	10	0	0	—(Tenor)
Head Wear		5	0	—(Crown)
Bicycle			1¼	—(Penny Farthing)
North and South Poles			½	—(Two far things)
A Trade			6	—(Tanner)
Total ..	£26	6	7¾	

* * * *

Three in a Row

The manner in which the nine apple trees were planted is shown in the sketch alongside.



Employer: "I want a lad who is active. One who isn't afraid to move about."
Applicant for job: "I think I'll do sir, I've had nine jobs in two months."

* * * *

Inspector: "Got away, has he? Did you guard all the entrances?"
Country Constable: "Yes, sir. But we think he must have left by one of the exits."

* * * *

Pete: "What time is the next train to Crewe?"
Booking Clerk: "You'll have to wait until 4.30, sir."
Pete: "Will you be able to tell then?"

* * * *

Poet: "Have you sold much this month?"
Artist: "Yes, two suits and my best armchair."

* * * *

Customer: "Why do you have such mis-spelled and ungrammatical signs in your window?"
Merchant: "People think I'm dumb and come in to cheat me. My business is booming."

* * * *

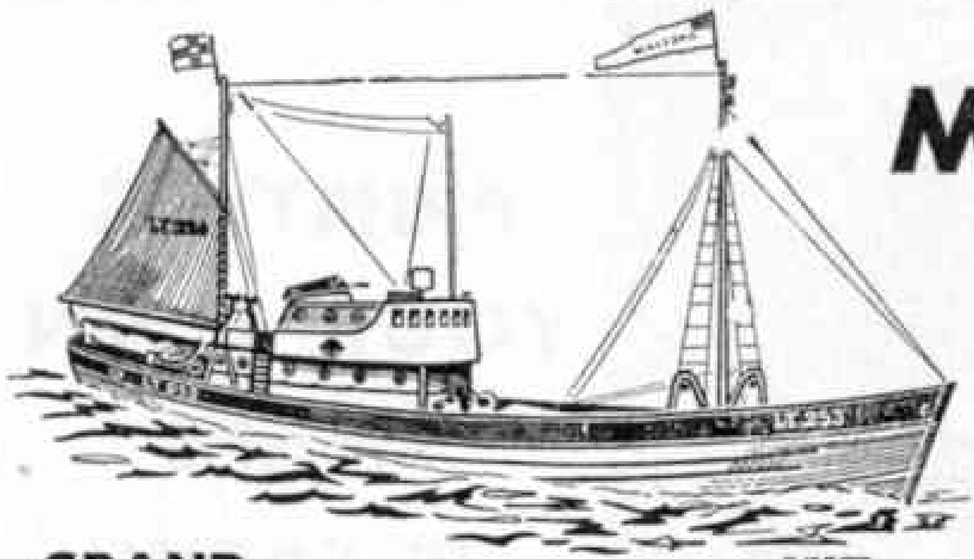
"More cyclists before the Bench," muttered the magistrate crossly. "They ought to be kept off the road. What's the first case?"
"Riding a bicycle on the footpath, your worship," replied the clerk.

* * * *

Medicine salesman: "Ladies and gentlemen, I have sold over a million bottles of this wonder remedy and never had a complaint. I ask you what does that prove?"
Voice from the crowd: "Dead men tell no tales."

* * * *

Lady (engaging cook): "I hope you wake easily in the morning?"
Prospective Cook: "Lor, yes Mum. All you have to do is to give me a couple of shakes."



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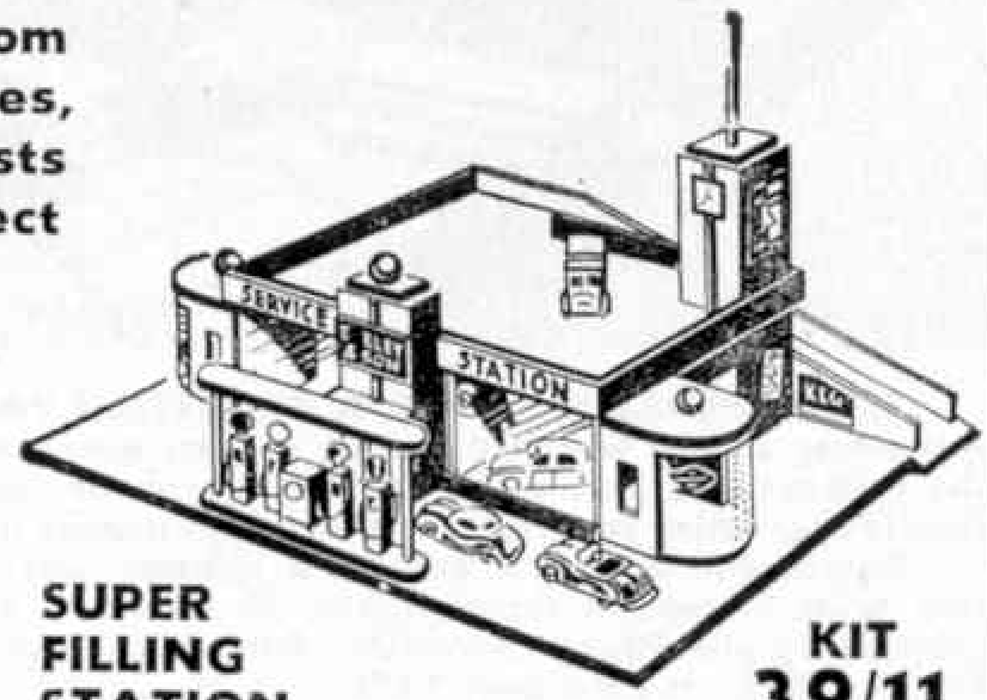

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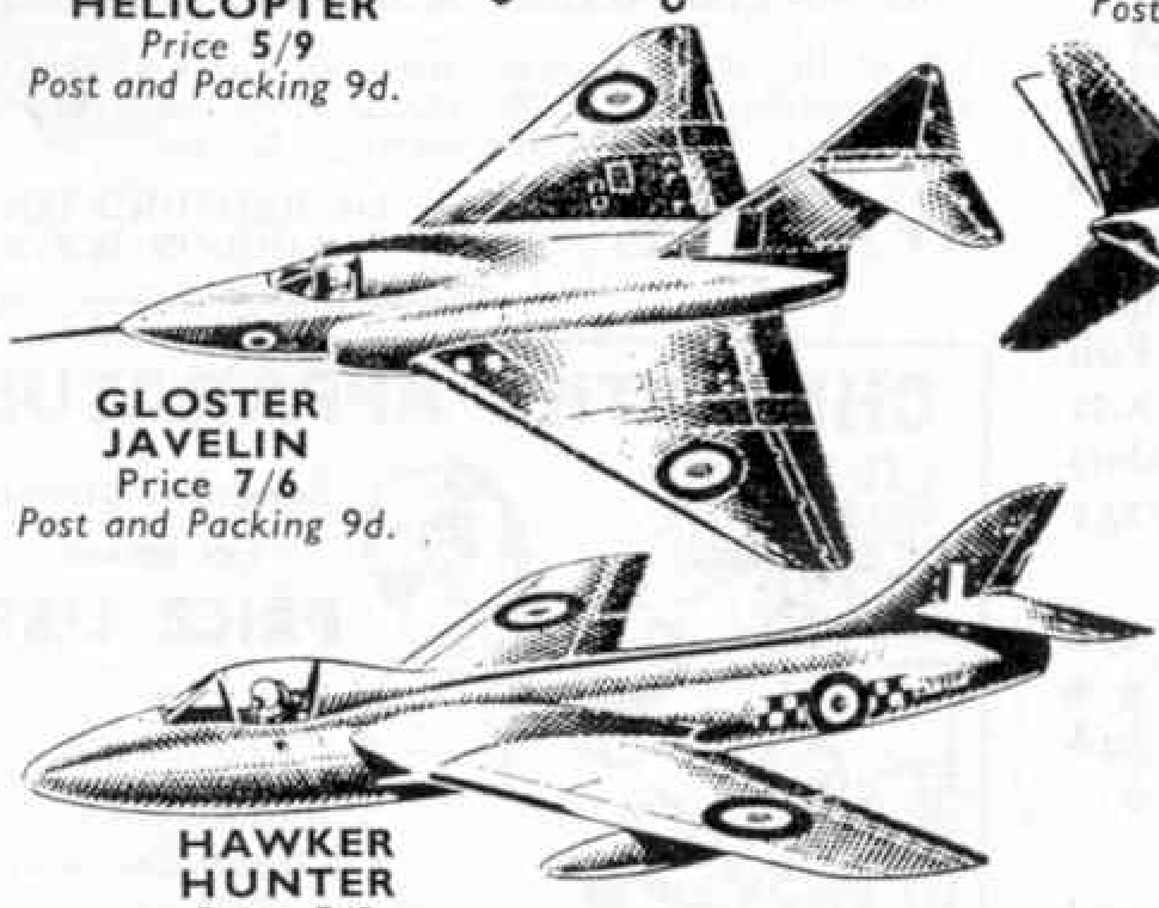

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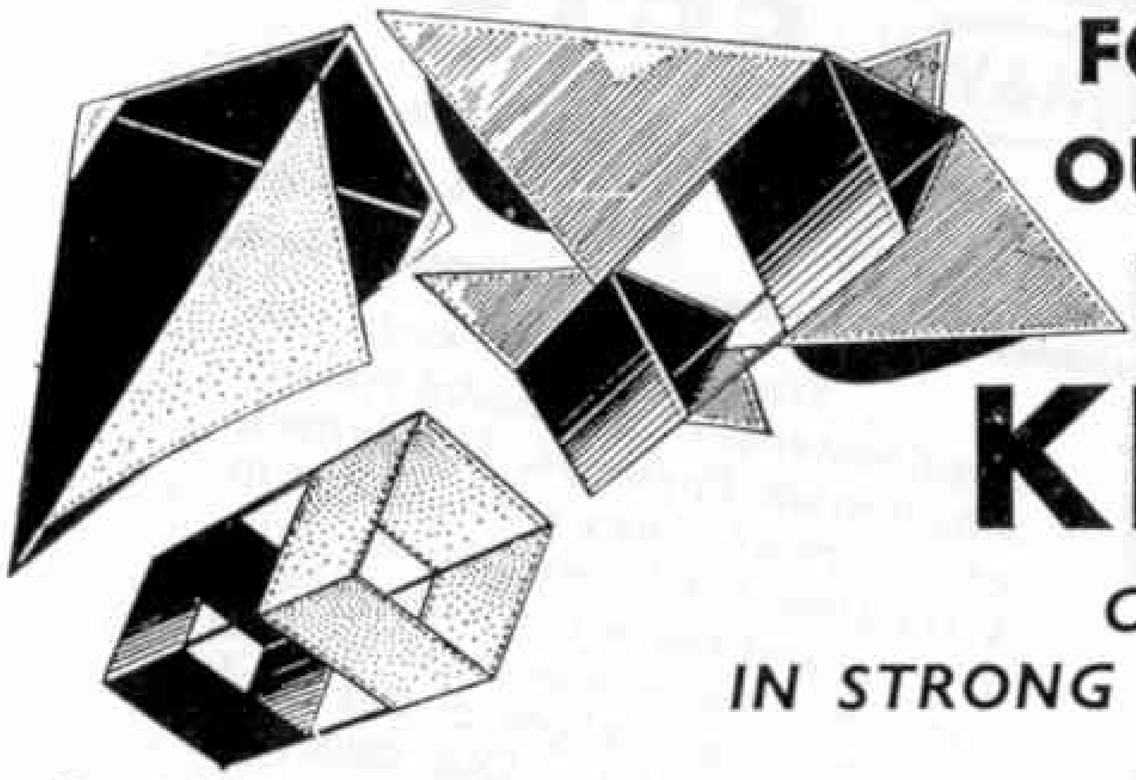

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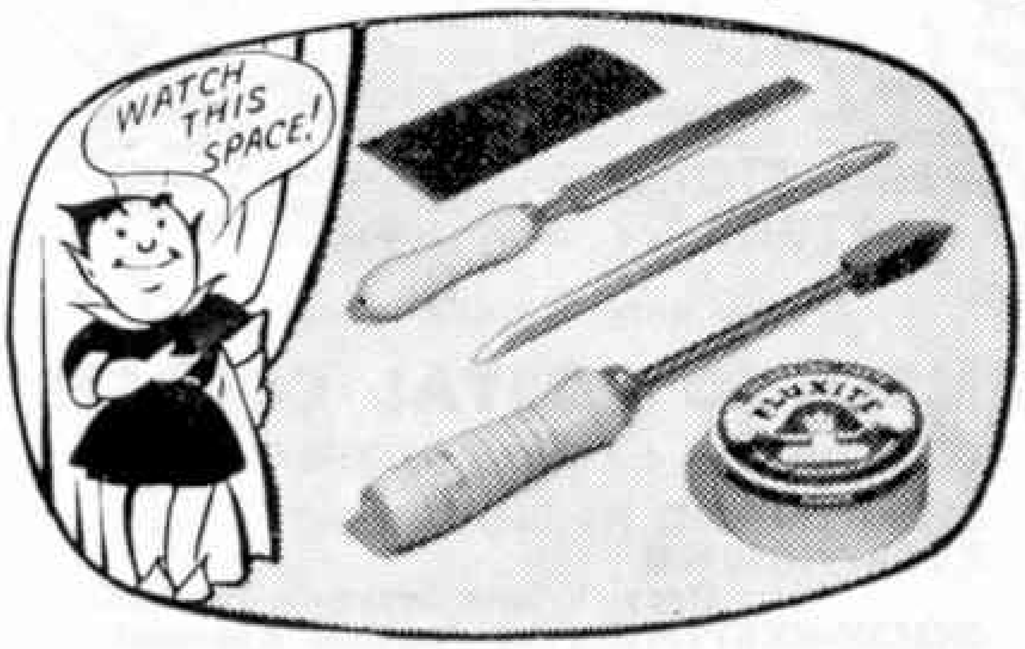

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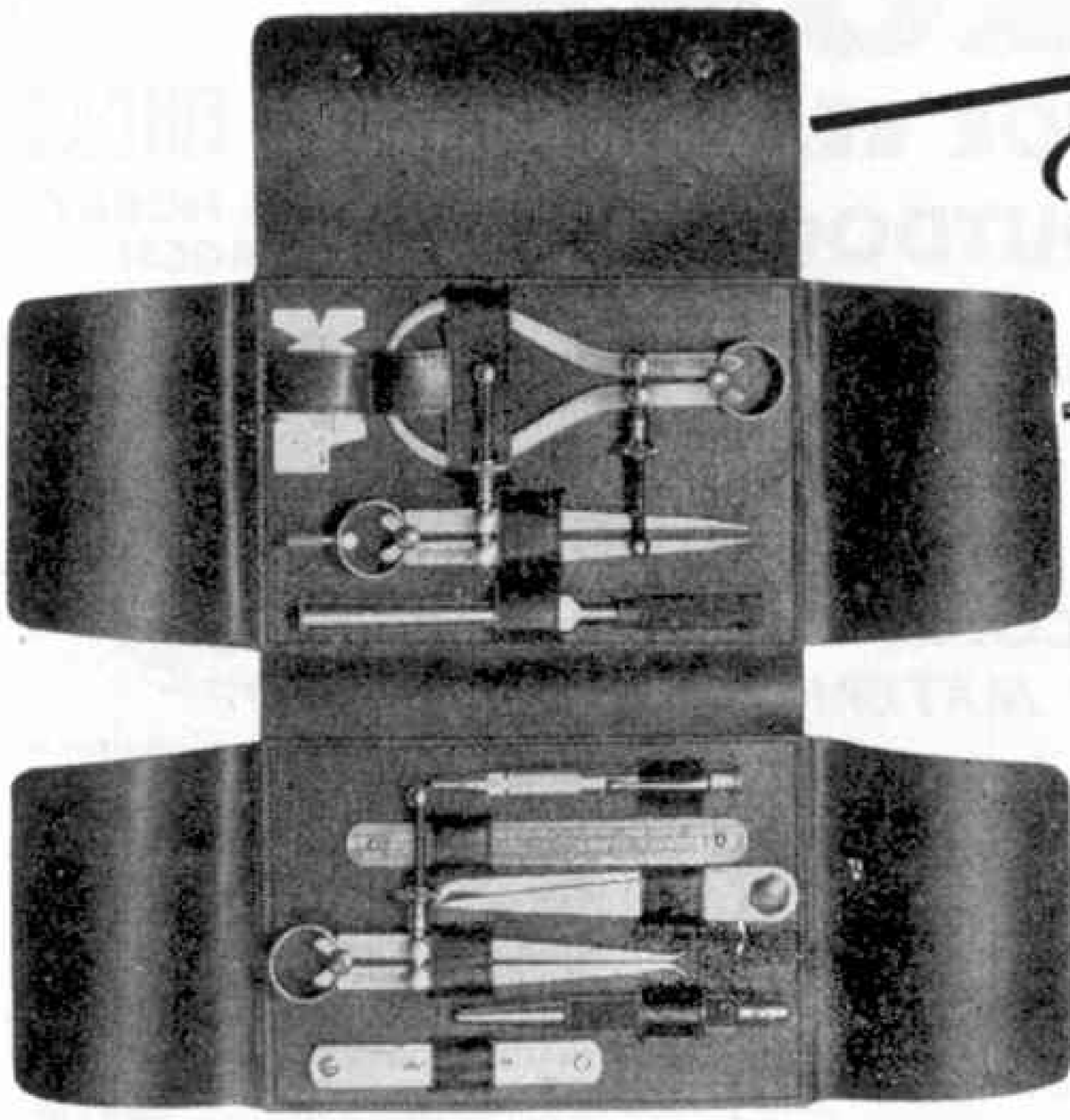

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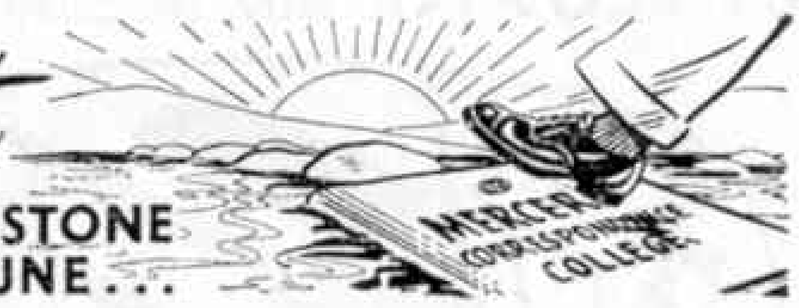

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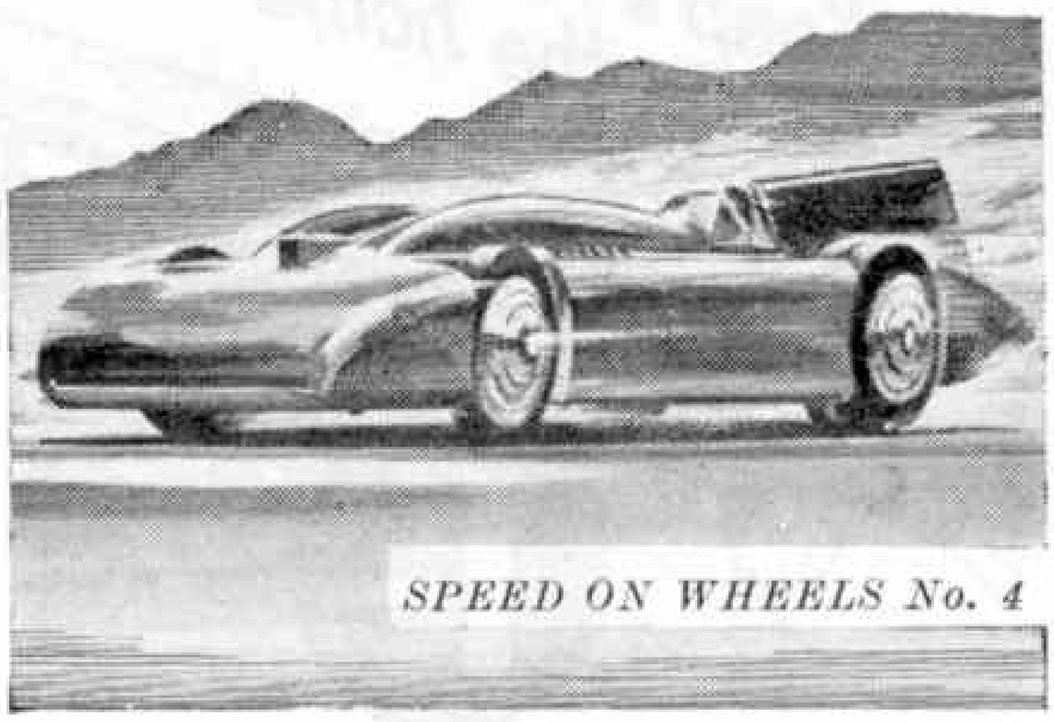

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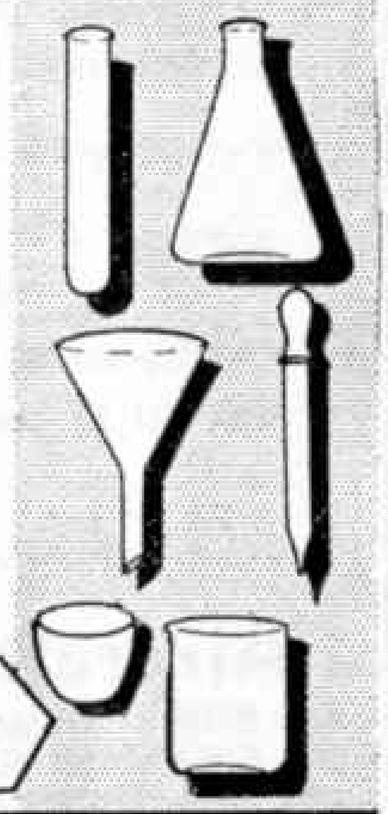

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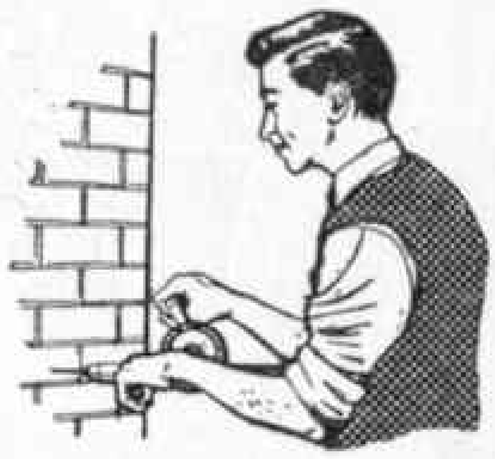

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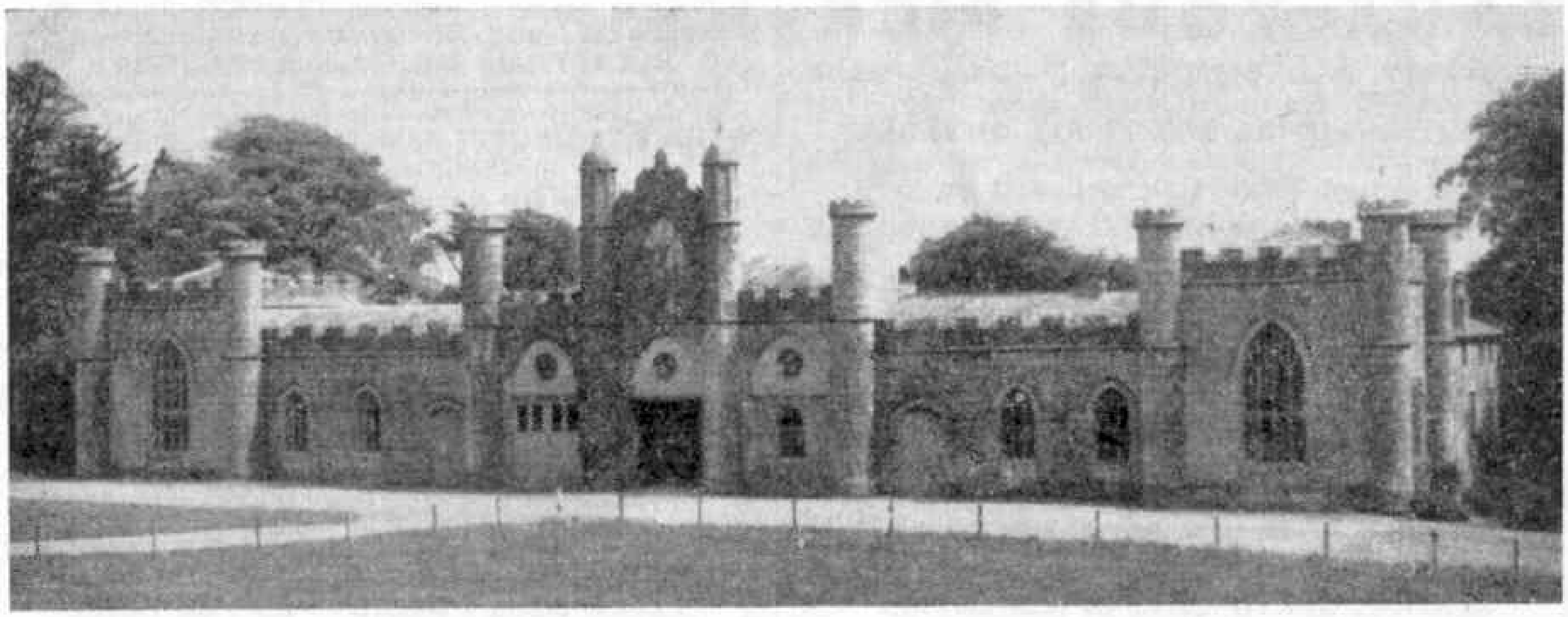

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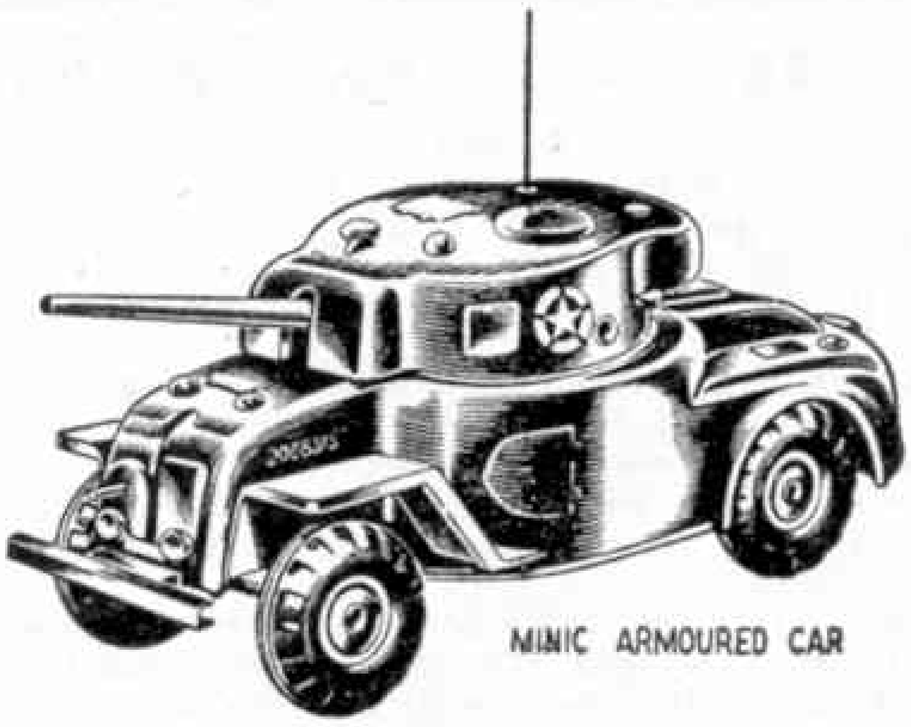

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"M.M.s" January 1950–December 1954 inclusive. Some covers damaged but mostly good condition. What offers? Also large Box Kite, with Cable, almost unused—offers?—Roberts, "Dorsets Cottage," Long Crendon, Bucks.

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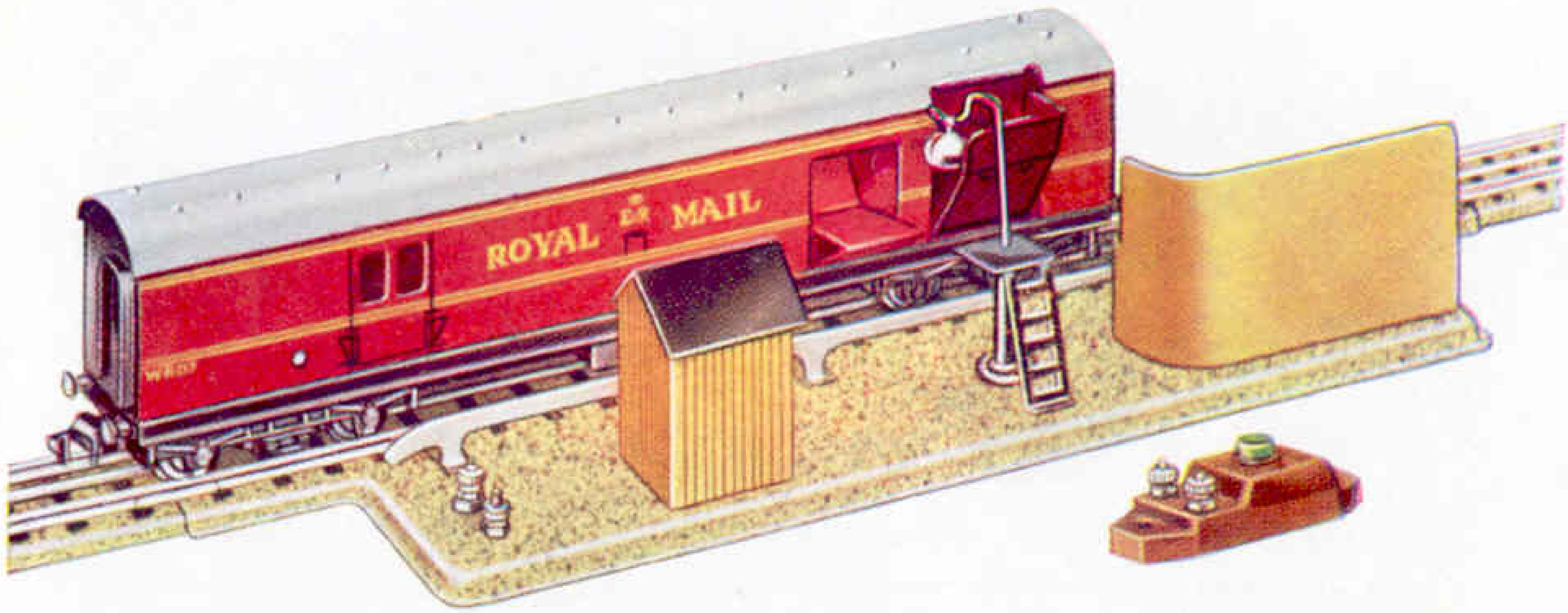

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MODEL OF THE MONTH

VERTICAL MILLING MACHINE

Illustrated in the March 1957 issue of the "Meccano Magazine"

Construction of the Machine Frame

Each side of the base consists of a $5\frac{1}{2}$" x $2\frac{1}{2}$" Flanged Plate 1, a $3\frac{1}{2}$" x $2\frac{1}{2}$" Flanged Plate and a $2\frac{1}{2}$" x $2\frac{1}{2}$" Flat Plate joined together as shown by means of two $2\frac{1}{2}$" Angle Girders. A $9\frac{1}{2}$" Angle Girder 2 is attached to the upper edge of each side by two $2\frac{1}{2}$" Angle Girders. The sides are connected by two $5\frac{1}{2}$" x $2\frac{1}{2}$" Flanged Plates 3, two $5\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips, and a made-up double angle strip 4 consisting of two $4\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips overlapped. A $5\frac{1}{2}$" Angle Girder 5 is fixed to the upper flange of each of the Plates 3 and is connected to the Girders 2 by 1" x 1" Angle Brackets. The upper corners of the base are strengthened by Corner Gussets.

Each side of the vertical column is formed by two $9\frac{1}{2}$" Angle Girders joined together by $3\frac{1}{2}$" Strips and a $3\frac{1}{2}$" Angle Girder, with two $4\frac{1}{2}$" x $2\frac{1}{2}$" Flexible Plates bolted to the Strips between the vertical Girders. A $2\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip 6 and a $3\frac{1}{2}$" Angle Girder 7 are bolted to the column as shown, and an E20R(S) Electric Motor is fixed by its flanges to one side and is connected to the other side by two $1\frac{1}{2}$" Angle Girders. The column is bolted to one of the Flanged Plates 1, and a $4\frac{1}{2}$" Angle Girder 8 is attached to the front $9\frac{1}{2}$" Angle Girder of each side.

Assembly of the Work Table

The work table is provided with longitudinal and transverse travel movements controlled by screw operated mechanisms. The table consists of a $5\frac{1}{2}$" x $3\frac{1}{2}$" Flat Plate to which are bolted two $5\frac{1}{2}$" Angle Girders 9, two $2\frac{1}{2}$" Angle Girders 10 and two $3\frac{1}{2}$" Angle Girders 11. At each end of the table two $5\frac{1}{2}$" Angle Girders 12 are arranged as shown, with a slight gap between their vertical flanges. The gaps should be sufficient to accommodate the vertical flanges of the Girders 2 and allow the table to slide freely along these Girders. The sliding movement is controlled by a handle 13 formed by Couplings on a Rod held in a Threaded Coupling, which is fixed by a nut at one end of an $11\frac{1}{2}$" Screwed Rod. The Screwed Rod is supported in the Girders 5 and is screwed into a Rod Socket 14 fixed centrally to the $5\frac{1}{2}$" x $3\frac{1}{2}$" Flat Plate. The Threaded Coupling is spaced from one of the Girders 5 by Washers and a Collar, and the Screwed Rod is held in position by lock-nuts arranged at the end opposite to the handle. Two $11\frac{1}{2}$" Rods 15 form guides and they are held in the Girders 5 by Collars.

Two $2\frac{1}{2}$" Angle Girders 16 are fixed to a $3\frac{1}{2}$" x $2\frac{1}{2}$" Flanged Plate 17, which slides freely on the Girders 9. A $2\frac{1}{2}$" Angle Girder is bolted by its slotted holes to each end of the Flanged Plate, the bolts used for this purpose being indicated at 18. The sliding movement of the Plate 17 is controlled by a handle 19 made from Couplings on a Rod held in a Threaded Coupling. The Threaded Coupling is fixed by a nut on a 6" Screwed Rod, which is supported in the Girders 10 and is screwed into a Rod Socket placed underneath the Flanged Plate 17. The guide rods 21 are held in place by Collars, and the Screwed Rod is retained in position by lock-nuts at one end. The material to be machined should be bolted firmly to the Flanged Plate 17.

Arrangement of the Milling Head and Drive

Each side of the milling head is made by bolting two 3" Angle Girders to a 3" Flat Girder. The sides are connected at the front

by two Semi-Circular Plates, to which Double Arm Cranks 22 are bolted, and at the rear by two 3½" Angle Girders 23. The Girders 23 are attached to a 3½" x 2½" Flanged Plate 24, which carries also two 2½" Angle Girders 25. A Threaded Boss 26 is fixed to the centre of the Flanged Plate, and two 3" Angle Girders 27 are bolted in position as shown, leaving a slight gap between them and the flanges of the Plate. A 3½" Angle Girder is bolted to the lower edge of the Flanged Plate, and a 1½" Corner Bracket 28 on each side is attached to Angle Brackets bolted to the 3" Girders. Two 3" x 1½" Flat Plates are fixed between the Girders 23 and the Semi-Circular Plates, the upper Flat Plate being strengthened by 3" Strips as shown in Fig. 1. A 1½" x ½" Double Angle Strip is bolted between the Semi-Circular Plates.

The flanges of Plate 24 and the Girders 27 form guides that slide freely over the Girders 8. Two 5" Rods 29 are passed through the side-plates of the Electric Motor, the 2½" Angle Girders 25 and the 3½" Angle Girder 7, and these Rods are held in place by Collars.

The milling head can be raised or lowered by turning a handle 30, formed by a Threaded Pin in a 2½" Strip bolted to a Bush Wheel. The Bush Wheel is fixed on a Rod 31 passed through one side of the vertical column into a Coupling 32 that is mounted freely on a Rod 33. A ⅞" Bevel Gear on Rod 31 drives a similar Gear on Rod 33, which is supported in Double Angle Strip 6 and in a 2½" Strip bolted to the Girder 7. Collars are used to hold the Rods in place, and a Rod 34 is fixed in Coupling 32 and projects through the side of the column. A ⅞" Bevel Gear 35 fixed on Rod 33 drives a similar Gear fixed between two nuts on a 6" Screwed Rod 36, which is screwed into the Threaded Boss 26 and is supported in the Motor side-plates and Girders 25 and 7. Lock-nuts are used to prevent the Screwed Rod from sliding in its bearings.

The milling spindle is a 5" Rod, which must be able to turn freely in the bosses of the Double Arm Cranks 22. The Rod is held in place by Collars and it carries a Coupling 37, a Bush Wheel 38 and a 1½" Sprocket 39. The Sprocket is loose on the Rod, but it is connected to the Bush Wheel by two Threaded Pins. The Bush Wheel is fixed on the Rod and Sprocket 39 is connected by Chain to a 2" Sprocket on the Motor shaft. The Coupling 37 is used to support the milling tool.

Parts Required

10	of	No.	3	1	of	No.	16a	6	of	No.	63
4	"	"	4	3	"	"	17	2	"	"	63c
3	"	"	5	2	"	"	18b	2	"	"	72
2	"	"	6a	2	"	"	24	2	"	"	73
6	"	"	8a	4	"	"	30	1	"	"	78
8	"	"	9	175	"	"	37	2	"	"	79a
2	"	"	9a	12	"	"	37a	1	"	"	94
11	"	"	9b	66	"	"	38	1	"	"	95
4	"	"	9c	1	"	"	48	1	"	"	95a
15	"	"	9d	1	"	"	48a	2	"	"	103c
2	"	"	9f	2	"	"	48c	4	"	"	108
4	"	"	12	2	"	"	48d	2	"	"	111
4	"	"	12a	4	"	"	52	3	"	"	115
2	"	"	13	1	"	"	52a	2	"	"	133
2	"	"	14	3	"	"	53	2	"	"	179
3	"	"	15	20	"	"	59	4	"	"	191
1	"	"	16	3	"	"	62b	2	"	"	214

1 E20R(S) Electric Motor.