VOL. XLVII. No. 1 JANUARY 1962

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1/3

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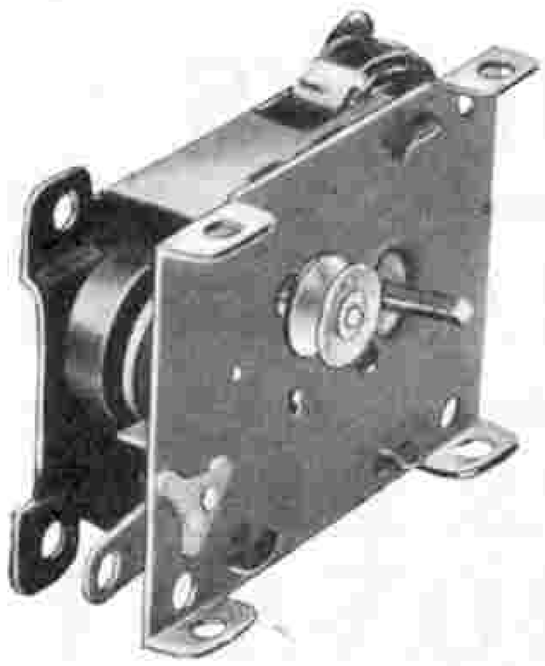

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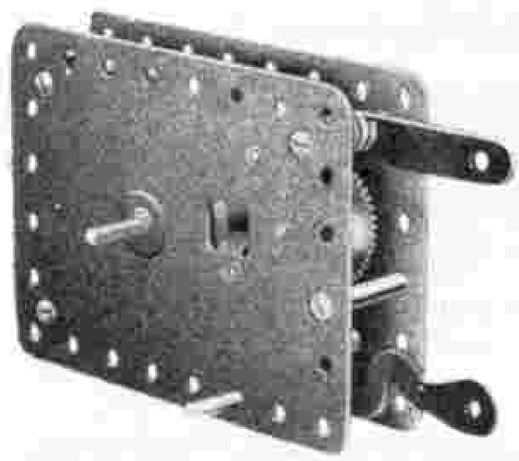

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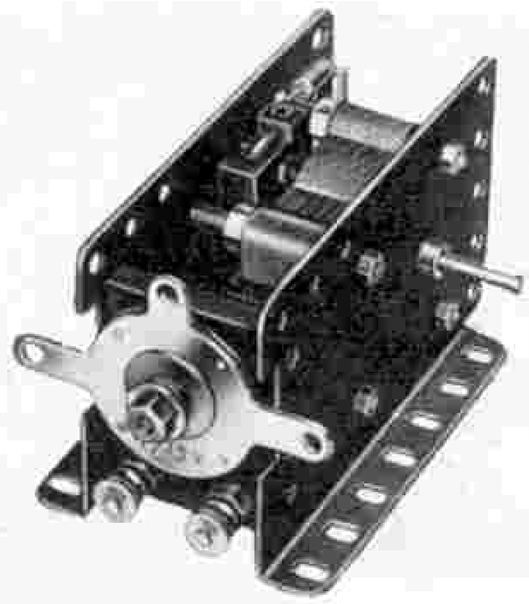

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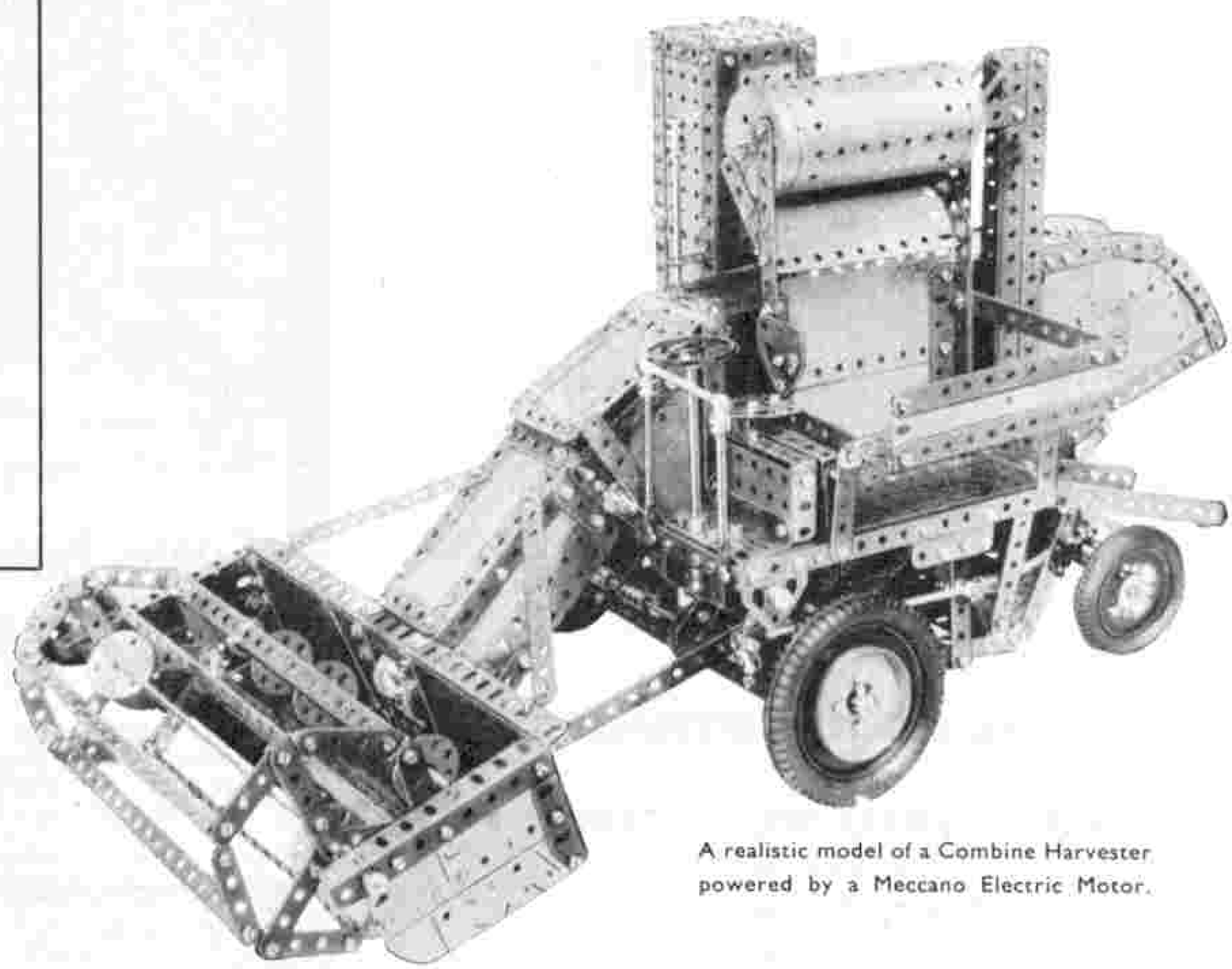

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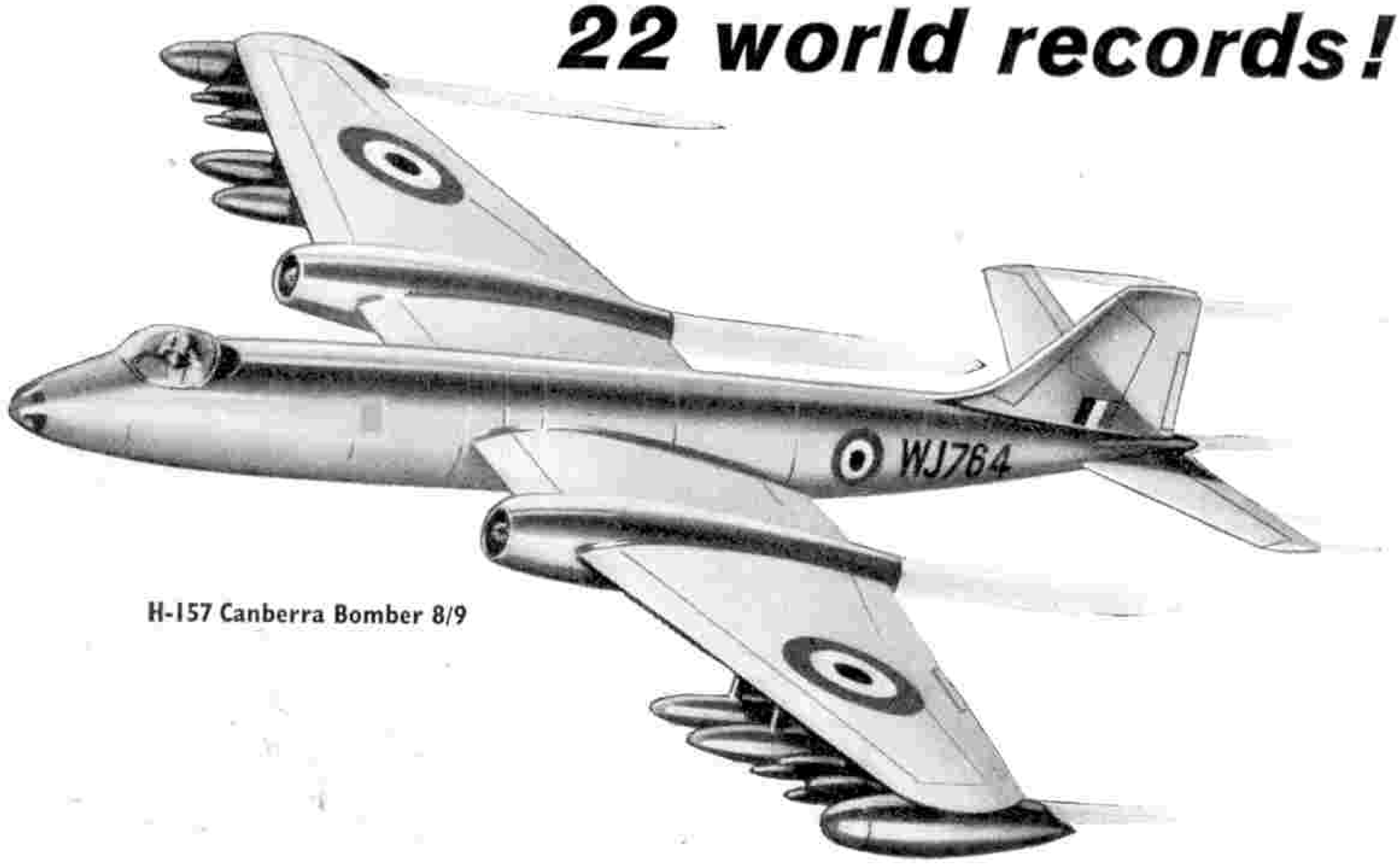

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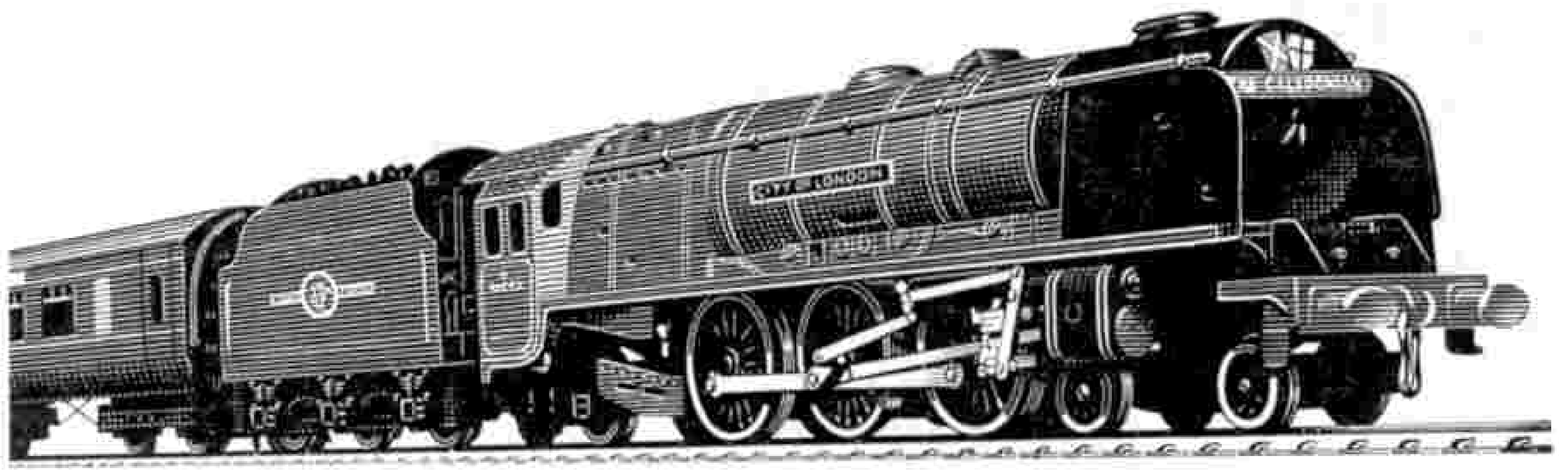

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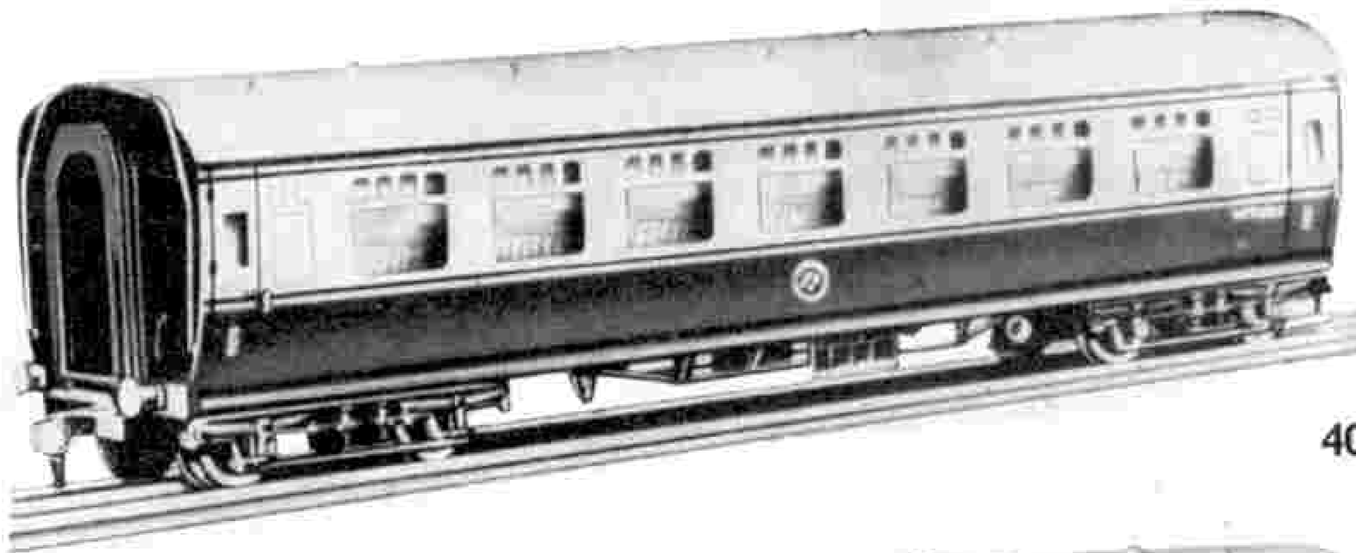

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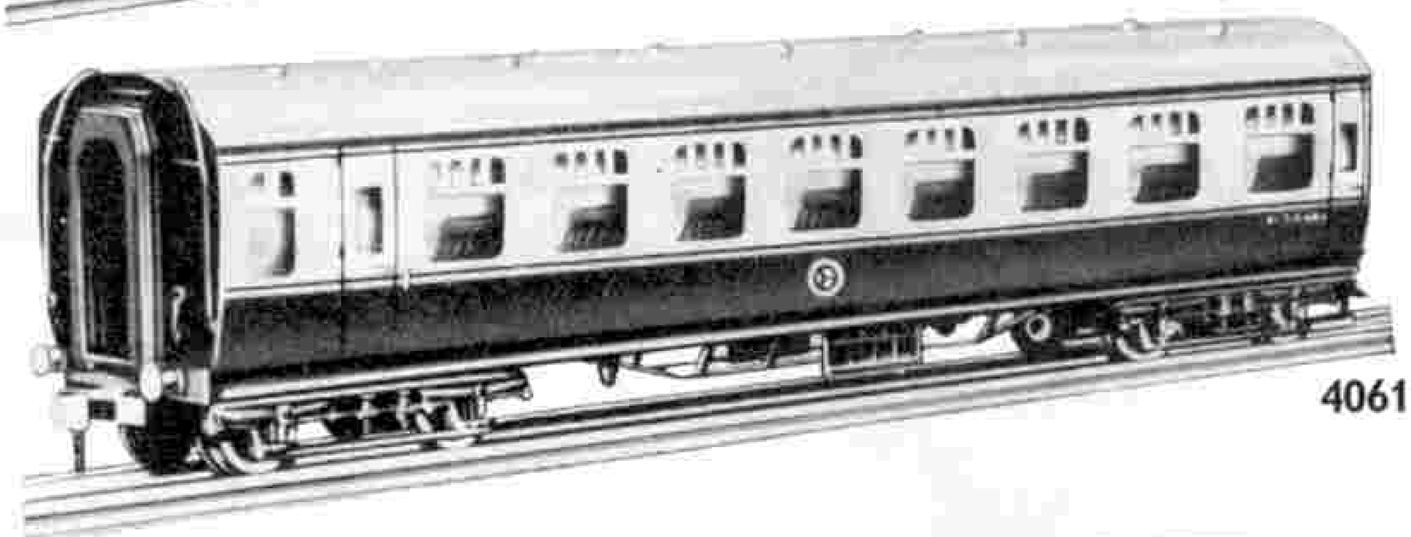

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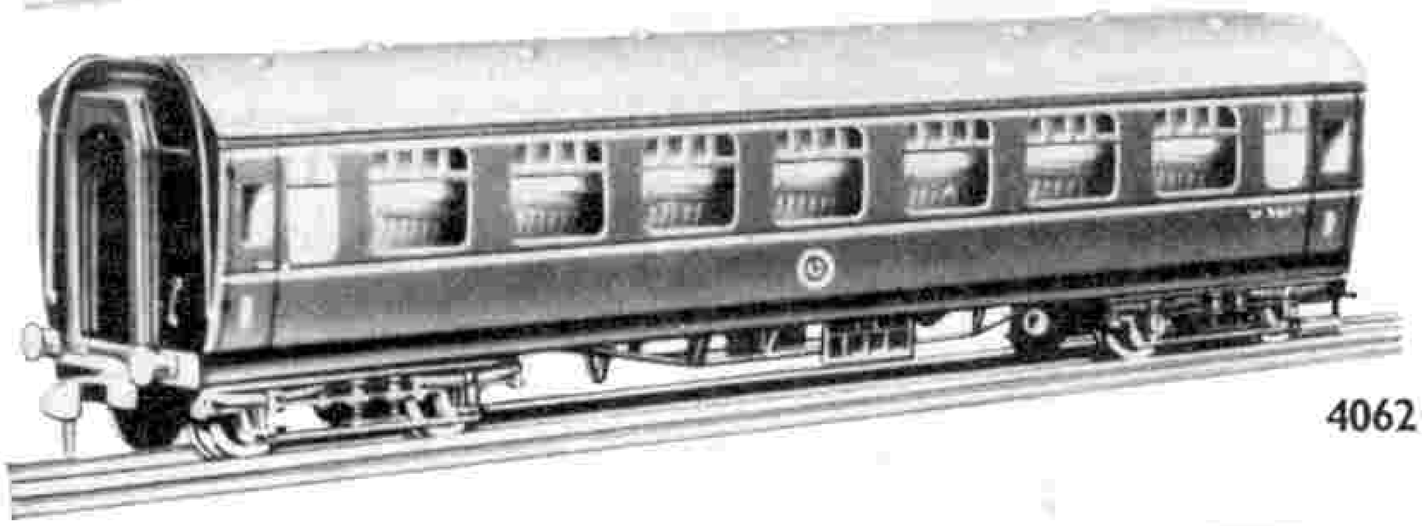

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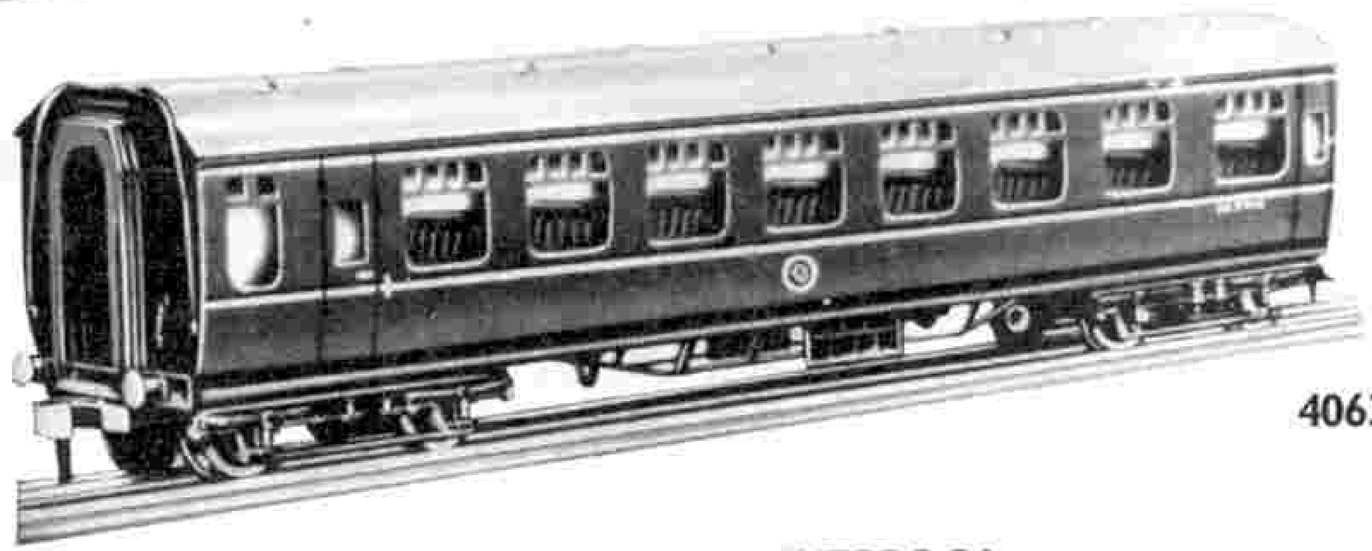

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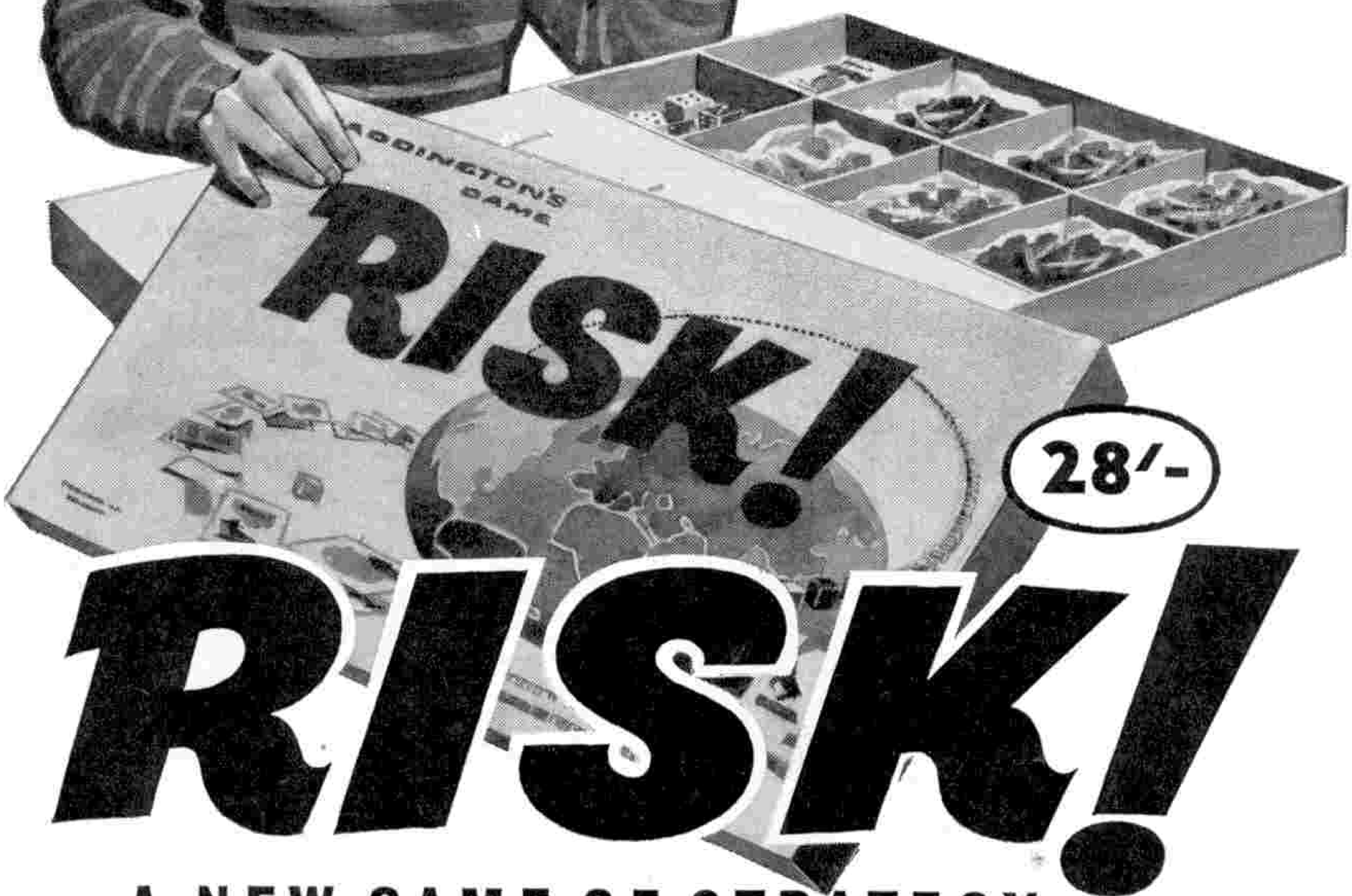

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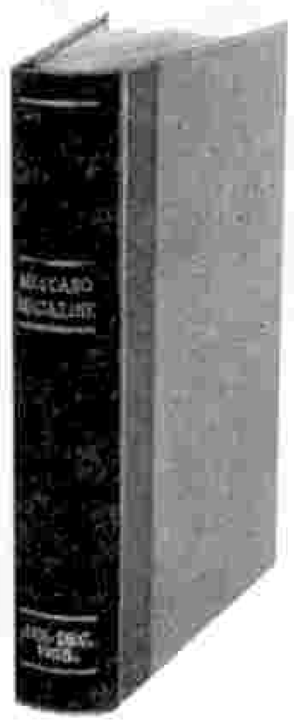

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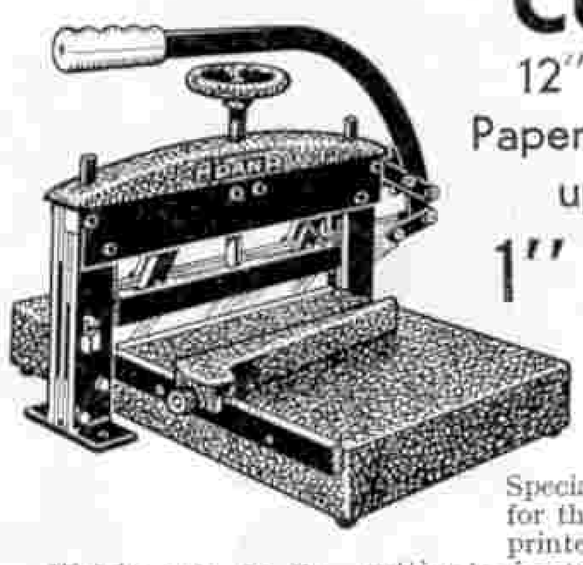

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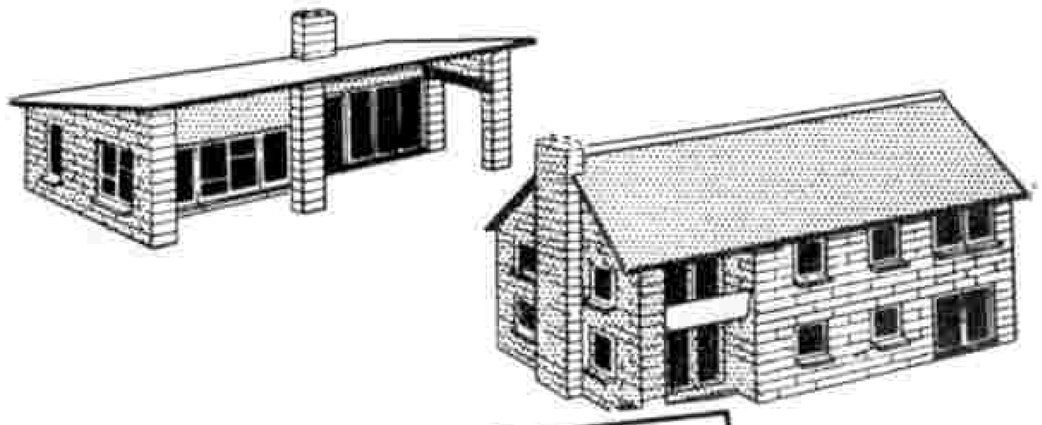

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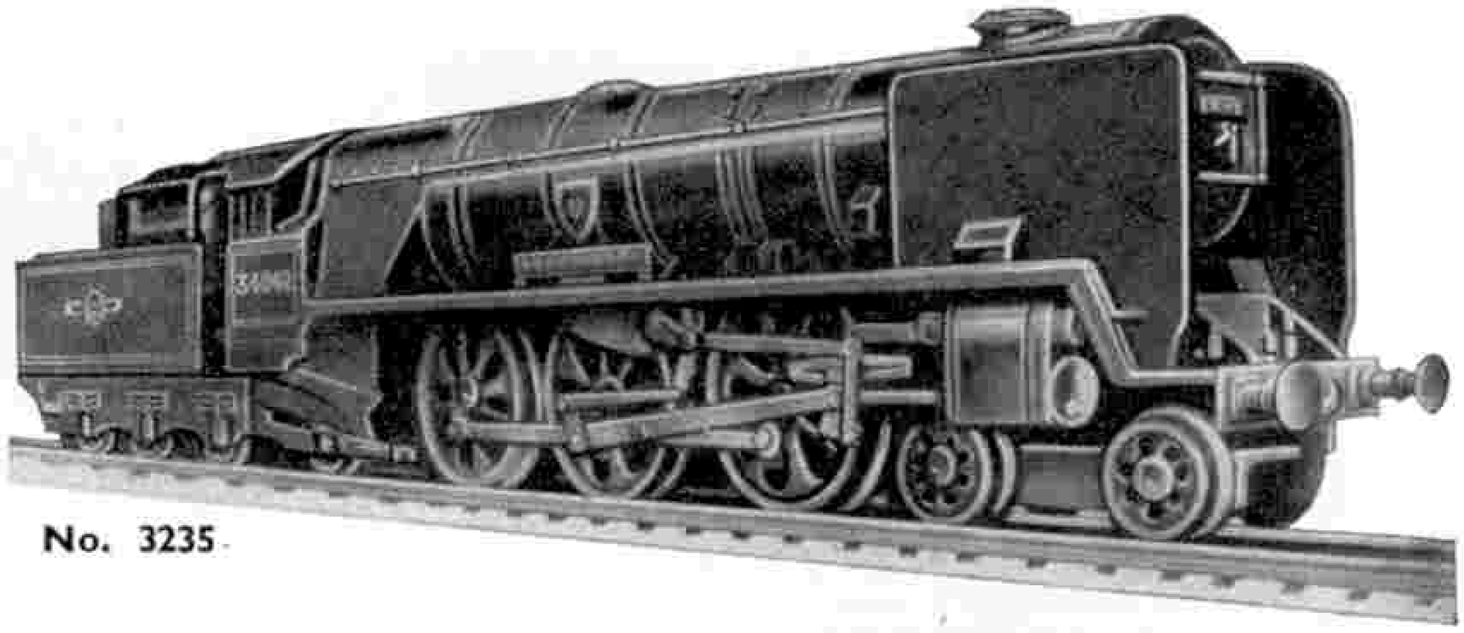

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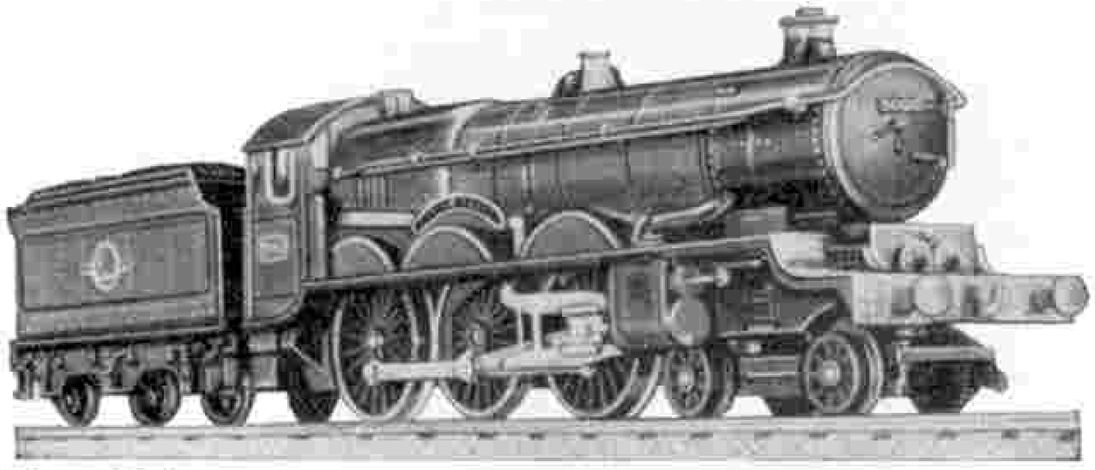

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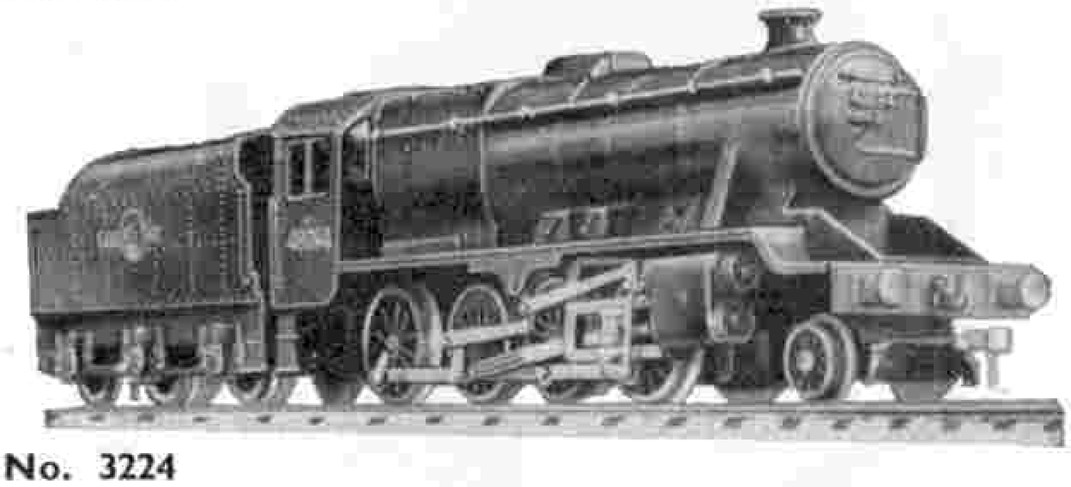

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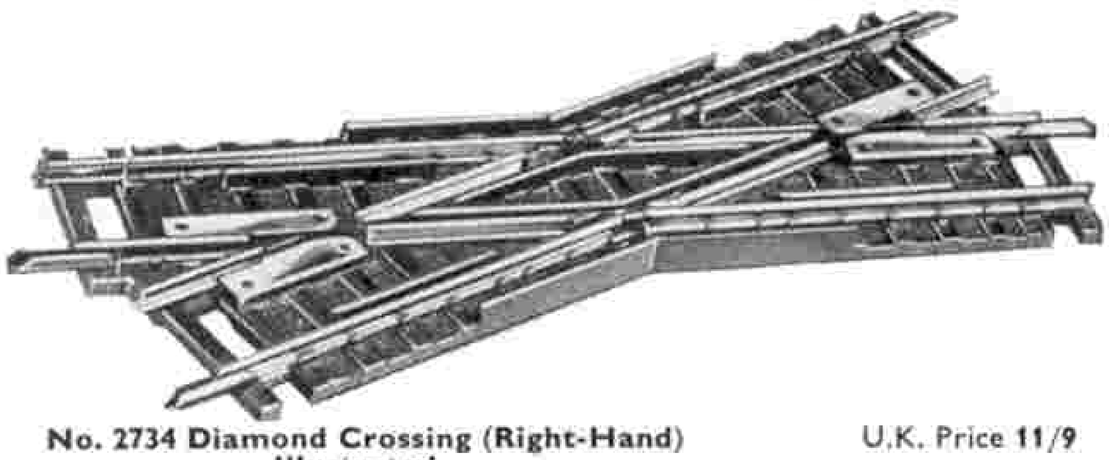

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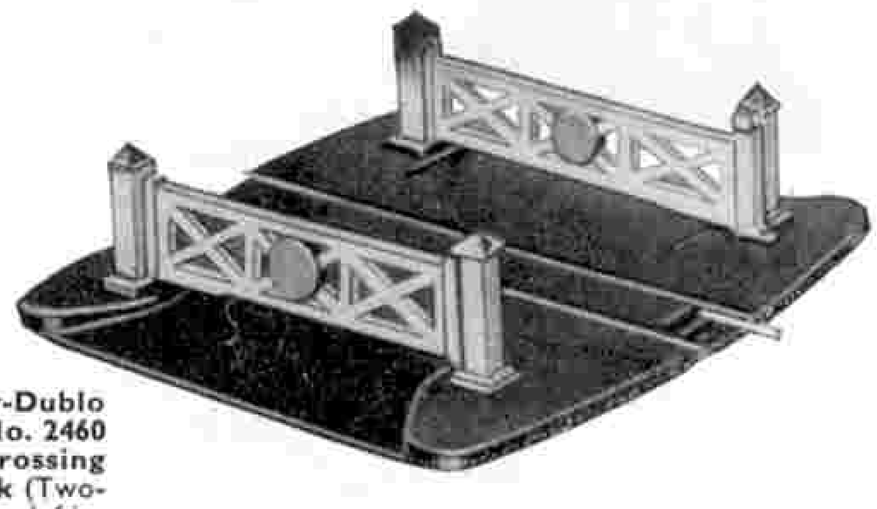

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MECCANO MAGAZINE

Volume XLVII No. 1 January 1962

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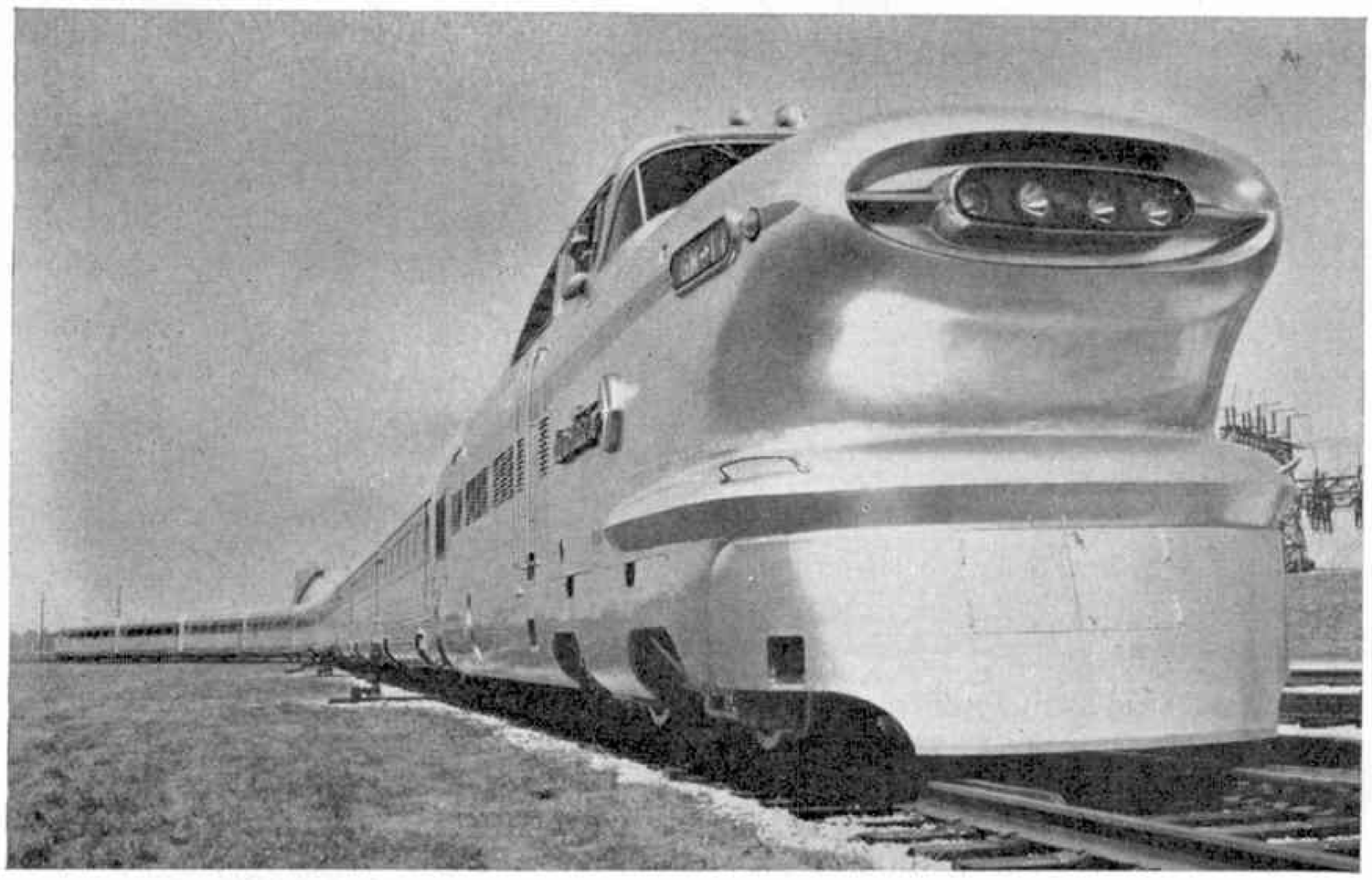

New Year Wishes

THE weeks and the months march by and here we are, once again, at the start of another year—one which we hope will be full of interest and challenge, since these are two of the qualities that make life worth while. It would indeed be a strange place for many of us if we were not able to see variety and change in the world around us. Although, as we get older, we have our dreams of yesterday and all its glories, we have always to accept that as time advances so do ideas and conceptions. In the words of Tennyson, we must be prepared to allow for the fact that "The old order changeth, yielding place to new".

The *Meccano Magazine* looks forward to the New Year in the hope that what it has to present to all its readers will hold their interest and help them, particularly the younger ones, to learn more about the huge and quite miraculous world in which we live. The front covers which have won so much approval will continue to provide variety and colour. Early on the list will be an illustration, referred to in my Editorial of last November, of a Foden Dump Truck at work at Hawarden Bridge Steelworks, Shotton, and an impressive illustration of the Wuppertal Overhead Railway, or the Schwebebahn, in Western Germany. Still another cover will show the wonders of Canada's famous Peterborough lift lock.

Many of your favourite *M.M.* authors will continue to be represented in the pages of the Magazine, and we shall try to present features not only of a scientific and engineering quality but also those which are of wide general appeal. Among the articles in early issues will be one dealing with the General Motors Aerotrain, illustrated in this month's picture. Sidney Allinson will tell the story of this gleaming, streamlined lightweight diesel-electric express which formed the basis of a modern experiment in transport.

In closing, I send to all readers of the *M.M.*, in whatever part of the world they may be, my sincere wishes that the New Year will prove a happy and prosperous one for them.

THE EDITOR.

Next Month: AN OIL "WELL"—IN TREES

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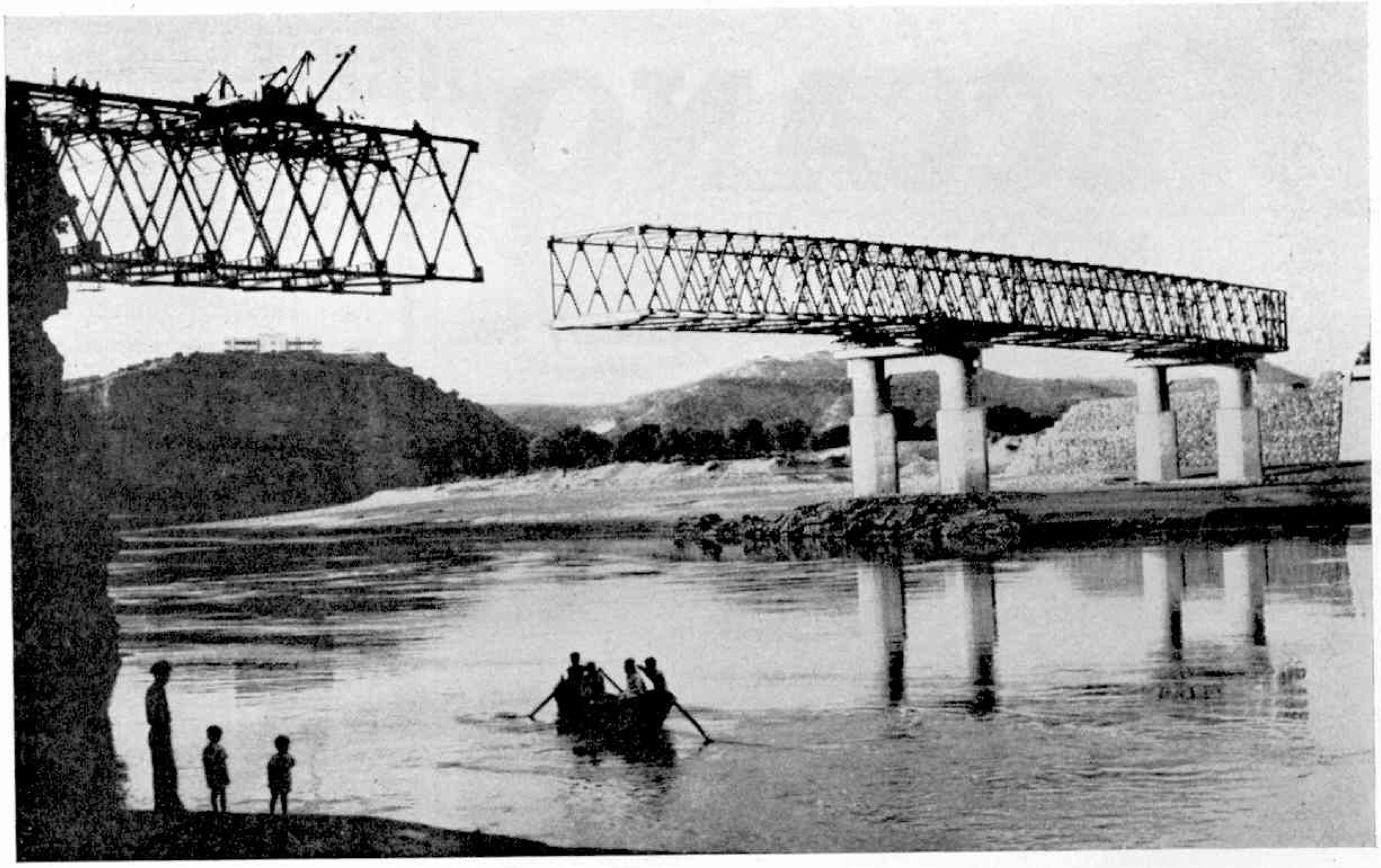
OUR FRONT COVER

Seen on our front cover this month is m.v. Freshwater, *one of three vessels which operate a dual-purpose (passenger and vehicle) service between Lymington and Yarmouth, Isle of Wight. There is a very frequent service in the summer time and, at the peak, some 12,000 passengers and 1,000 vehicles are transported daily. In winter there are eight sailings a day. These vessels, with hinged prows at both ends, are constructed specially to convey vehicles. Built at Troon, and launched in June, 1959, m.v.* Freshwater *is 164 feet overall, with a beam of 41 ft. 6 in. With capacity for 26 cars as well as passengers, she has a speed of 10½ knots.*



THE CALLENDER-HAMILTON BRIDGE

By EDWARD CROWLEY

"IT'S like a giant Meccano Set," said Mr. G. D. White-Parsons when describing the Callender-Hamilton Bridge which he developed before the war, for the Army, in conjunction with Mr. A. Hamilton.

During the 1939–1945 war, many thousands of tons of Callender-Hamilton bridge parts were used for military bridging purposes. At one particularly critical time in the Burma Campaign, three spans of the railway bridge over the Manas River were washed away by floods, cutting the only inland railway link with the front line through Assam. Within six weeks, drawing upon bridge parts being made in India, at the time, for the State Railways, a 284-ft. span was in position over the river, and communications were restored.

Many thousands of tons of bridge parts were also used for repairing bomb-damaged bridges and for replacing bridges to meet the needs of heavier traffic. After the war, this type of bridge proved invaluable in helping to restore the shattered highways and railways which were part of the price paid for victory in Europe and elsewhere.

Today, the Callender-Hamilton bridge is being used in many parts of the world to strengthen existing communications, for its versatility lends itself to a variety of bridging constructions including footway, carriageway, and long-span railway bridges.

The principles of this bridging system do have something in common with the Meccano system. There is a limited selection of accurately mass-produced standard steel parts, and similar parts are readily interchangeable. The parts are held together by bolts of large diameter which give rigid frictional holding as well as pin holding of all the joints.

The basic parts used for the construction of the truss members are 6 inch × 6 inch × $\frac{3}{8}$ inch angles. Using these, a truss can be designed for any gap and, by bolting together a suitable number of members, a bridge of any desired span and width can be assembled to carry any load.

In full-scale bridge engineering, many practical problems have to be solved. For instance, a bridge may be required in some remote and underdeveloped country where there is no highly skilled labour force or elaborate plant.

This is where the Callender-Hamilton system comes in. All the parts are light enough to permit easy handling and, under the supervision of a few trained engineers, local unskilled labour can be used during erection because there is no site welding or riveting to be done.

Details are Tabulated

Another advantage of the system is that the preliminary calculations for any erection process are greatly simplified by the fact that the strength values of all the parts are known and their weights are tabulated. Blank "assembly" forms can be supplied and the total weight of the structure is easily arrived at by filling in the numbers of the parts to be used. This relieves the erecting engineer of one of his headaches.

The various methods of bridge erection are in themselves of great interest. The simplest way is to build the bridge in its final position on temporary intermediate supports. The supports and any other

This fine view of the Mangla Dam, in West Pakistan, shows the two 150 ft. spans after launching 120 feet beyond the piers. The west bank main span is on the left.

similar site structures can be built from standard bridge parts which can be incorporated later into the bridge.

When bridges have to be erected across gaps where intermediate supports are impracticable, the skidding out method is used. The structure is assembled on well-graphited, heavy, flat-bottom railway lines on one side of the gap, wire ropes are attached and the whole assembly is pulled across. If there is not enough counter balance within the structure, the shore end is loaded with pig iron to act as a counter weight to the cantilever over the gap.

Where heavy lifting gear is available, it is sometimes possible to position a complete span by simply lifting it into place.

Yet another method is to build an aerial ropeway system where suitable sites exist at the ends of the bridge crossing. Standard bridge parts can be used effectively to construct the masts or towers for supporting the suspension cables. The system can then be used to place complete spans upon the far abutment or upon an intermediate pier.

River Crossings

If a river crossing is involved, it is sometimes possible to build the whole span on a line of anchored barges and lower it with the tide on to the abutments. This type of bridge can easily be dismantled if it is no longer required. In 1951—Festival of Britain Year—an 18 ft. carriageway Callender-Hamilton Bridge was used to provide access to the South Bank Exhibition from Waterloo Station across York Road.

The parts required for the job were drawn from Ministry of Transport stocks and returned at the conclusion of the Festival. As all the parts are hot-dip galvanised, they can be stored in the open for many years without deterioration.

One of the most recent and spectacular bridging operations was the erection of a Callender-Hamilton Bridge over the Jhelum River, in West Pakistan, to provide access to the Mangla Dam, the first major project in the vast Indus Waters Development Scheme.

The bridge crossing called for a 336 ft. main span from the west bank of the river to a first intermediate pier, a 150 ft. span from this pier to a second intermediate pier, and another 150 ft. span from this second pier to the east bank, a total length of 636 feet.

Because of the risk of monsoon floods during erection, the bridge was constructed without using any temporary supports between the east and west bank abutments and the piers.

First, the steelwork for the two 150 ft. spans was carried along existing tracks and by boat to the east bank, where it was assembled on rails as a continuous structure 300 ft. long and skidded over the east bank abutment on to the two intermediate piers. Part of the 336 ft. main span was assembled on rails on the west bank and skidded out until 130 feet of it projected over the river, balanced by 130 feet on the shore. The shore end of this span was then bolted into the rock.

Travelling Crane

The remaining 76 feet of the main span was constructed on the overhanging end by a crane which travelled along the top members of the bridge and which was mainly put together from bridge parts. Meanwhile, the two 150 ft. spans were moved further out over the two intermediate piers until 120 feet projected beyond the first pier. This left a gap of 10 feet between the ends of the two cantilevers and, after careful alignment, this gap was closed with special linking steelwork to make a continuous structure of 646 feet.

The end of the main span anchored to the west bank was then loaded with 150 tons of pig iron, the anchorage released, and the 646 ft. structure was skidded towards the east bank to its final position. The special linking steelwork was then removed and the three spans were separated. It only remained for the spans to be lowered and fixed on to their bearers at the abutments and piers and for the 26 ft. width bridge decking to be installed.

Nine hundred tons of steel parts and 52,000 assembly bolts were used in the construction of this bridge. Now it is in use it will be capable of carrying loads of machinery weighing up to 200 tons to the Mangla Dam site.

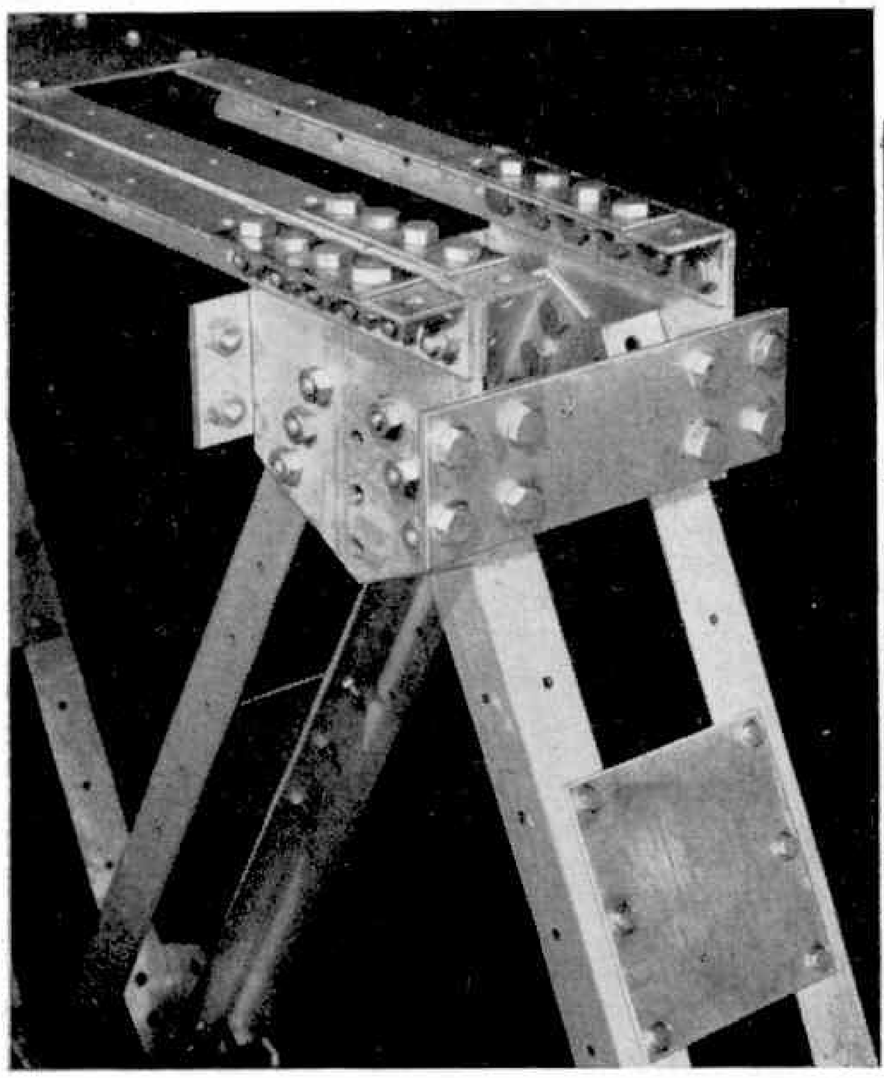
FOR STEEL X-RAYS

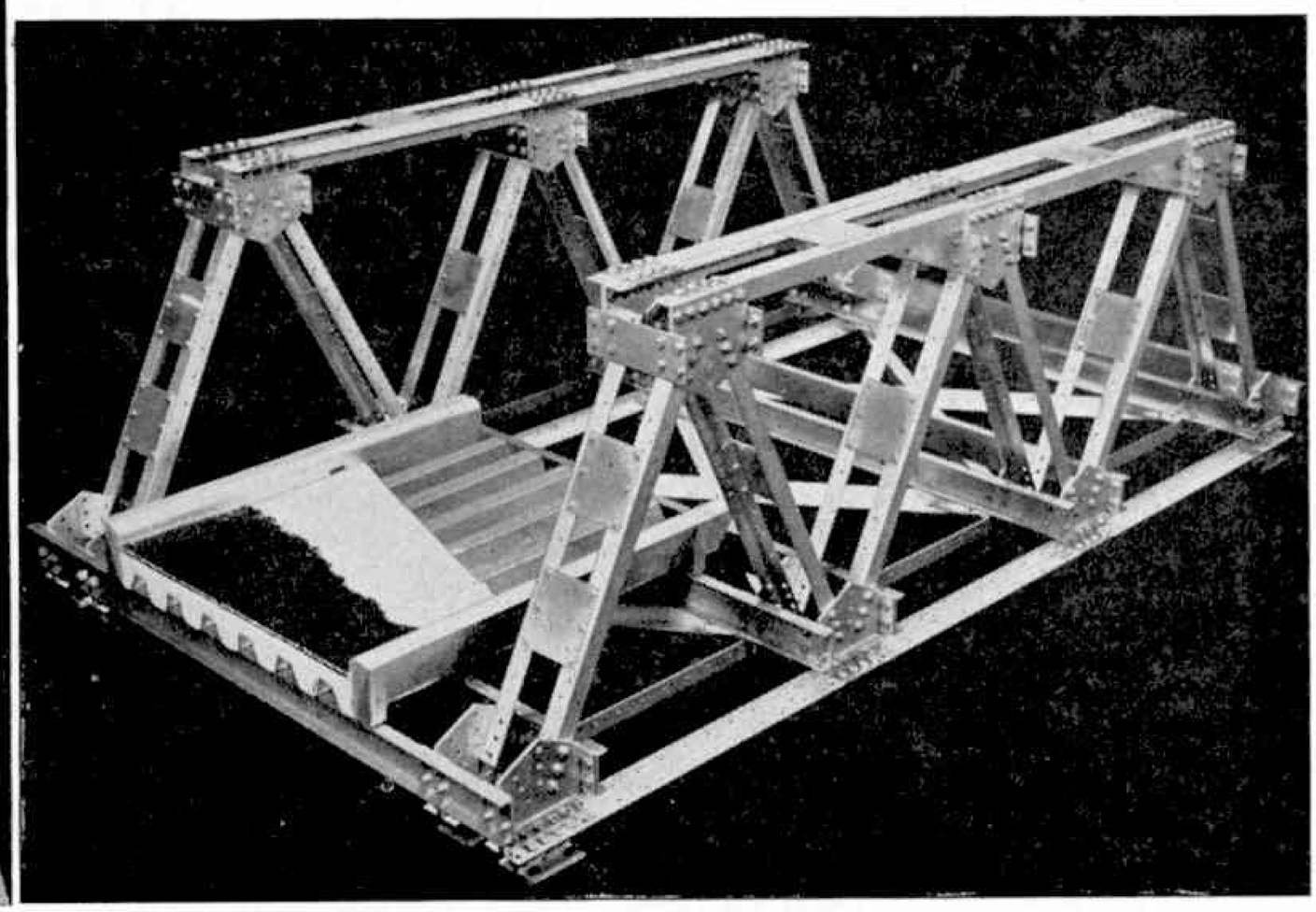
English Steel Corporation Ltd., Sheffield, has been supplied with a 6,000,000 volt X-radiographic unit by Vickers Research Ltd. The unit incorporates a 6 "MEV" sealed-off linear electron accelerator. This addition to the non-destructive testing equipment will be used by the Corporation and its subsidiaries for the examination of steel of thicknesses up to 12 inches. Because the unit is compact and easily manœuvrable, the range of products which can be inspected is very extensive.

* * * *

"Rolling Stock in TT-3" (Peco Publications and Publicity Ltd., 3/6d.) deals with the home construction of goods and passenger rolling stock for miniature railways of TT-3 gauge, in which the scale employed is 3 mm. to 1 ft. In it, Edward Beal, long recognised as an authority on the subject, deals with many aspects of rolling stock construction. Although written primarily for those who favour TT-3, much of the information is of use to workers in other small scales. There are numerous line sketches and also illustrations in half-tone.

The Callender-Hamilton Bridge system. (Left): Top chord end panel joint on double truss construction, (right): Single depth double truss construction, with trough deck.





DIESEL MAINTENANCE AT BRADFORD

By Leslie Norman

THE introduction of diesel motive power in various forms on British Railways has made it necessary to introduce new maintenance methods and techniques in order to keep the wheels rolling, and to train staff long used to steam locomotives to apply these fresh ideas to the servicing and maintenance of diesel locomotives and railcars. Some time ago, through the courtesy of the North Eastern Region of British Railways, I was able to visit the Diesel Maintenance Depot at Hammerton Street, Bradford, and see at first hand something of the equipment and routine in operation.

When the first services by multiple-unit diesel-powered railcars were introduced in the Bradford–Leeds–Harrogate district in 1954, this N.E.R. motive power depot at Bradford was the first to have diesel railcar trains quartered there. Since then, this one-time steam depot has been completely changed over to the maintenance and servicing of diesel railcar sets and diesel shunting locomotives.

In the process of fitting the depot to its new task a good deal of modernising has been carried out in stages, as further extensions of diesel railcar operation have been made. And the staff have developed a considerable degree of know-how in dealing with the rolling stock and equipment under their care.

As a result, the high degree of availability required by the intensive nature of the Bradford area diesel railcar duties is well maintained, and matters are so organised that no individual unit is out of service for attention for more than 24 hours, while it is possible for four railcar sets to be received, examined, and undergo minor adjustments if necessary, be refuelled, cleaned and turned out again for service in an hour. This is the routine of operations between running "diagrams", or spells of working, but would not include the special examinations due every 1,500 miles.

Suitability of Track

Hammerton Street Depot was selected for diesel maintenance because of the suitability of the track layout, without much modification, and because the special servicing and maintenance facilities required for diesels could be provided with little alteration or new construction. An additional point in its favour was its situation close to Bradford Exchange Station, entailing a minimum of light mileage between station and depot.

Heavy maintenance of locomotives and railcars and the interior cleaning of the cars themselves have been provided for within the main shed. A new servicing shed, the fuelling installation and siding, and the stabling sidings are the only external additions that have been necessary. Offices, stores and staff quarters have been extensively modernised.

On arrival at the depot a railcar unit enters the new servicing shed, which has been built over the site of an existing pit provided for steam locomotive work. Here routine details are checked and small adjustments made if found necessary. The building is open at both ends to enable diesel railcars to pass through it for regular routine inspections, minor adjustments and repairs. Fluorescent strip lighting, mounted on the walls, is directed from either side at the motors of the powered cars.

This stage completed, the unit passes down to the fuel oil installation where there are, protected by weather canopies, five fuel oil dispensing points each of 20 gallons-per-minute capacity. Six fuel oil tanks provide a total storage capacity of 38,000 gallons. There is road and rail access to the tanks, so that fuel deliveries can be made by either method of transport, which is most convenient. In addition, ten watering points for overhead tanks in the railcars, and for engine cooling systems, are situated there.

From this siding the train is run back towards the shed outlet, passing on its way through the washing plant, newly-

Refuelling a diesel railcar train at Hammerton Street Diesel Maintenance Depot, Bradford. This and the lower illustration on the opposite page are from B.R. North Eastern Region official photographs.

installed at the time of my visit. This is perhaps the most spectacular piece of equipment at the depot, and to be driven as I was, in a train which is being washed, through the mechanically-produced rainstorm that the plant provides, is quite an experience.

Battery of Revolving Brushes

Special care must be taken to see that all windows are closed before the train, travelling at walking pace, passes a spray pipe that gives it a preliminary wetting all over. The next stage takes it through the actual washing plant in which a battery of revolving nylon brushes, fed by sprays of water including a mild detergent, bear against the sides of the train as it passes through, to emerge after this treatment with all external dirt removed. A plain water rinsing treatment is the final stage of the operation.

Trains regularly cleaned in this manner have an extremely well-kept appearance, bright windows as well as shining bodywork showing the advantage of this method of cleaning. "*A good clean job*" is the verdict of the staff at Hammerton Street.

Within the main shed three of the eleven sidings have been partitioned off to to provide a repair shop for heavy maintenance. This is fully equipped to undertake all stages of engine overhaul as well as engine replacement. The sidings have illuminated centre pits and can accommodate twelve diesel cars. Injector-testing plant, lathes and drills have been installed, with compressed air lines and electric power for power-operated tools.

The remaining sidings within the shed have been equipped for cleaning the interiors of the coaches, a necessary and important part of the routine. There are hot water mains to provide water for cleaning purposes and power points for battery charging and vacuum cleaning. One siding has been converted to provide a suitable area for degreasing the transmission gears, the floor on each side of the track and the floor of the inspection pit having been re-surfaced with concrete.

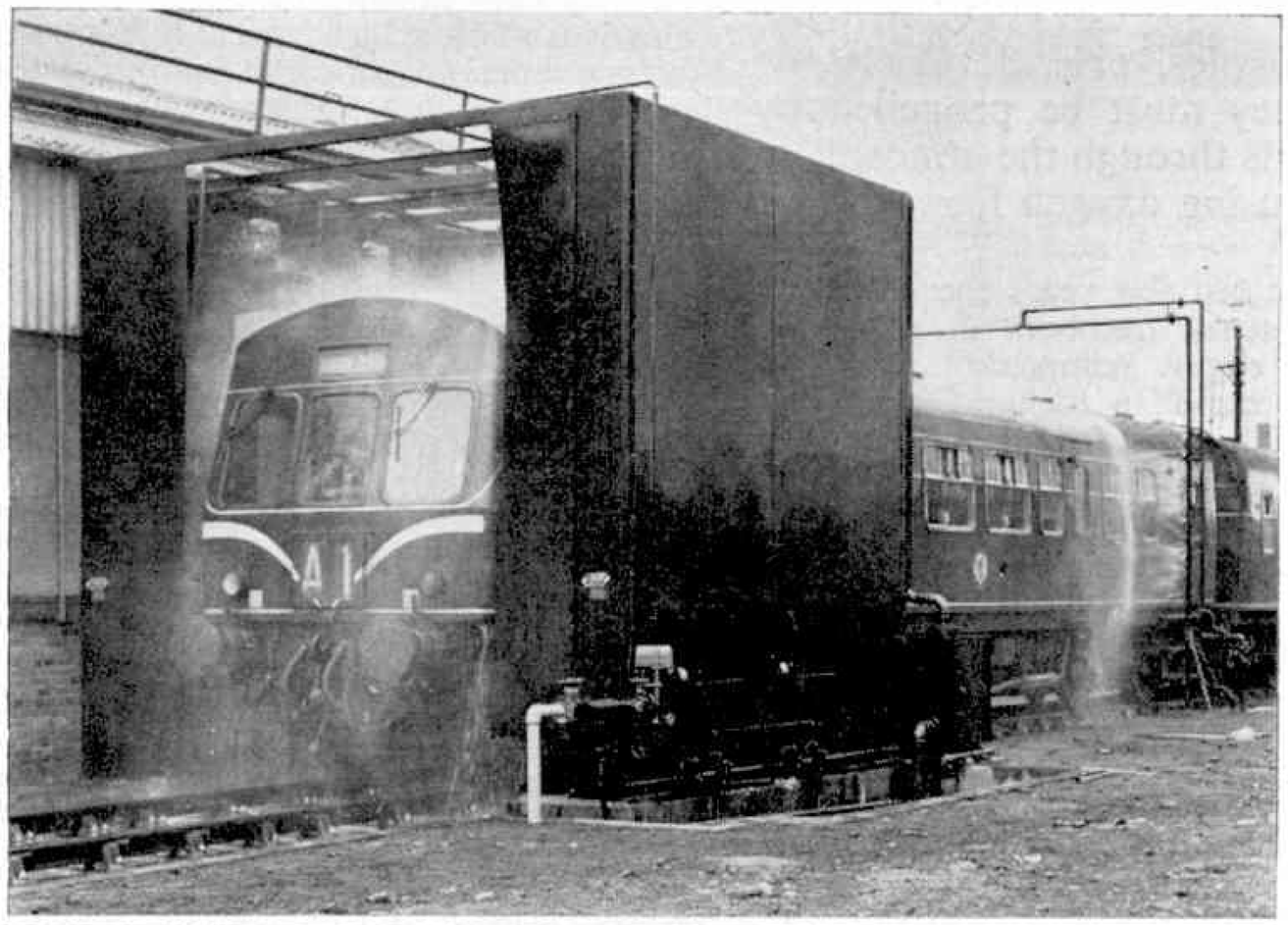
Railcar Repair Work

The former lifting shop with its overhead travelling crane and wheel drop, typical of heavy repair equipment for steam locomotives, has been converted for maintenance of diesel shunting locomotives. Diesel railcar repair work also can be handled when necessary.

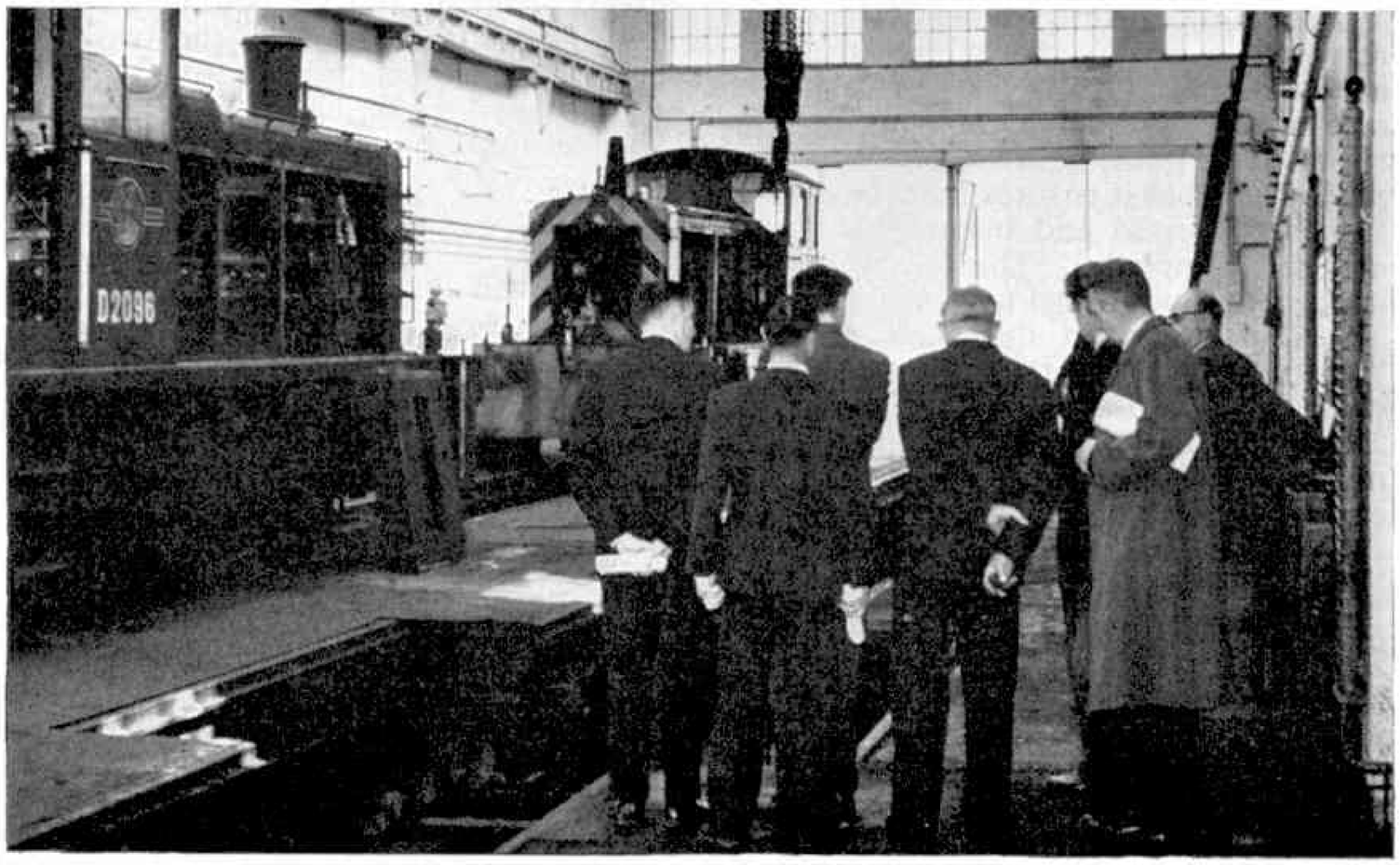
Office, stores and staff quarters form an annexe along one side of the main shed. New offices have been built for the Shed Master, Running Foreman and the clerical staff, and there is a modern, fully-equipped staff messroom. There is also a staff training classroom, equipped for showing demonstration films and slides.

All the rooms are heated by a central heating system which, on the principle of "Waste not, want not" burns oil which has been recovered from the diesel engine sumps during routine maintenance operations at the Depot.

The washing plant in action. The front of the first vehicle is about to emerge after washing, while the rear end receives a preliminary dowsing. Photograph by Dawson Bros. Ltd., Gomersal, the makers of the plant.



The picture below shows the interior of the former lifting shop, now adapted for diesel shunting locomotive maintenance. The wheel drop is being explained to a group of visitors.



UNITED STEEL COMPANIES SCHOLARSHIPS

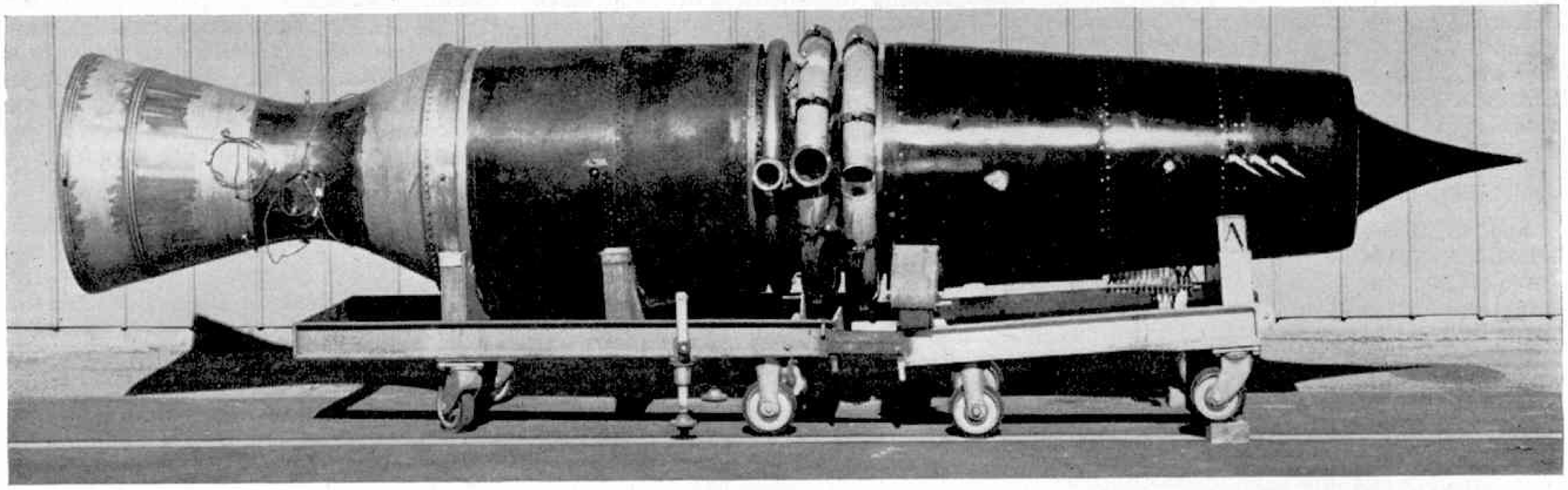
The United Steel Companies Limited have awarded five university scholarships, following a final selection board held in Sheffield at which a short list of 20 candidates was interviewed out of a total of 201 applicants.

The scholarships are tenable for three or four years and are to the value of £500 per annum, free of tax. It is intended that they should provide industrial as well as academic training, and arrangements will be made for the successful candidates—listed below—to receive industrial experience with the company. This is the second annual award of United Steel scholarships: five were awarded in 1960.

The successful candidates are: J. S. Briggs, Wakefield (Thornes House School, Wakefield), B. Cheetham, Sheffield 6 (King Edward VII School, Sheffield), R. A. Herbertson, Summertown, Oxford (Magdalen College School, Oxford), L. M. Jones, Oswestry (Oswestry High School for Boys), R. M. Sainsbury, Bickley, Kent (Sherborne School).

FOR STUDENTS OF SPANISH

Learn Spanish Quickly by James McConnell (MacGibbon and Kee, price 15/–). This book, by its concentration on the essentials of Spanish, will be extremely useful to the student desirous of making speedy progress. Clear and simple explanations and illustrations of the important points of grammar are combined with a very useful selection of "modern age" phrases and words, so often lacking in more stereotyped grammar books. The layout of the book makes a quick reference to a particular point of grammar or everyday topic the easiest of matters.



RAM-JETS

WHEN we think of long-range ballistic missiles, orbital vehicles or space vehicles we usually assume that they must be propelled by rockets. And yet, the first part of their journey is through the atmosphere and a considerable weight could be saved by using oxygen from the air instead of carrying it.

The only air-breathing engine light enough to be of practical use in this respect is the ram-jet. In its simplest form, air is taken in through an intake and is compressed solely by the forward motion of the vehicle. Fuel is injected and burnt and the resultant gases are expanded through an exhaust nozzle to produce thrust. A very simple device, as you can comprehend—the only moving part is the fuel pump—so why hasn't it been used? Well, one of its main drawbacks is that it will only work efficiently at very high speeds — preferably supersonic. Again, it is not very adaptable to a wide range of operating conditions. In other words, a ram-jet designed to work, say, at Mach 2, at an altitude of 30,000 feet, will not work happily, if at all, under conditions widely differing from these.

One of the major problems is that of maintaining combustion; if the air velocity is too high, the density too low or the fuel-air ratio not quite right, then the flame will go out. Many types of "flame-holder" have been tried, but none has so far been successful over the range of conditions that would be required for a first-stage booster.

A 36-in. diameter hyperjet engine capable of delivering 250,000 lb. thrust. Photograph by courtesy of Marquardt Corporation.

Over the last few years the American firm Marquardt has been developing a composite engine comprising a ram-jet "wrapped round" a rocket. The rocket provides high thrust for take-off and low-speed operation.

Space Notes

BY

J. HUMPHRIES, B.Sc.(Eng.), A.M.I.Mech.E., A.F.R.Ae.S.

This ram-jet is different in one important respect from a conventional one—the flame is stabilised not by a conventional mechanical flame-holder, but by the rocket flame itself. The rocket produces so much heat that it ensures that the ram-jet fuel is vaporised and burnt. The fuel is a boron compound. This is a very high energy fuel and is also used in the rocket. The illustration on this page shows a "hyperjet", as Marquardt calls these combined engines, capable of producing 250,000 lb. of thrust. This type of unit might well be used as the basic first stage engine for future space vehicles.

LOCKHEED SPACE STATION

The wheel-like satellite shown in the top illustration on page 7 has been designed by the Aerospace Division of Lockheed Missiles. It is intended to house a staff of ten in complete independence of the earth for six months. Laboratories would be housed in the hub; living and recreational quarters in the rim. Power would be supplied by a shielded nuclear source placed at the end of a boom.

The components would be fired as individual units into space, on pre-calculated orbits, and there assembled. For assembly an astrotug would be used. This is a small vehicle specially designed for construction work and manned by a crew of two or three. It would be capable of supporting its crew for several days.

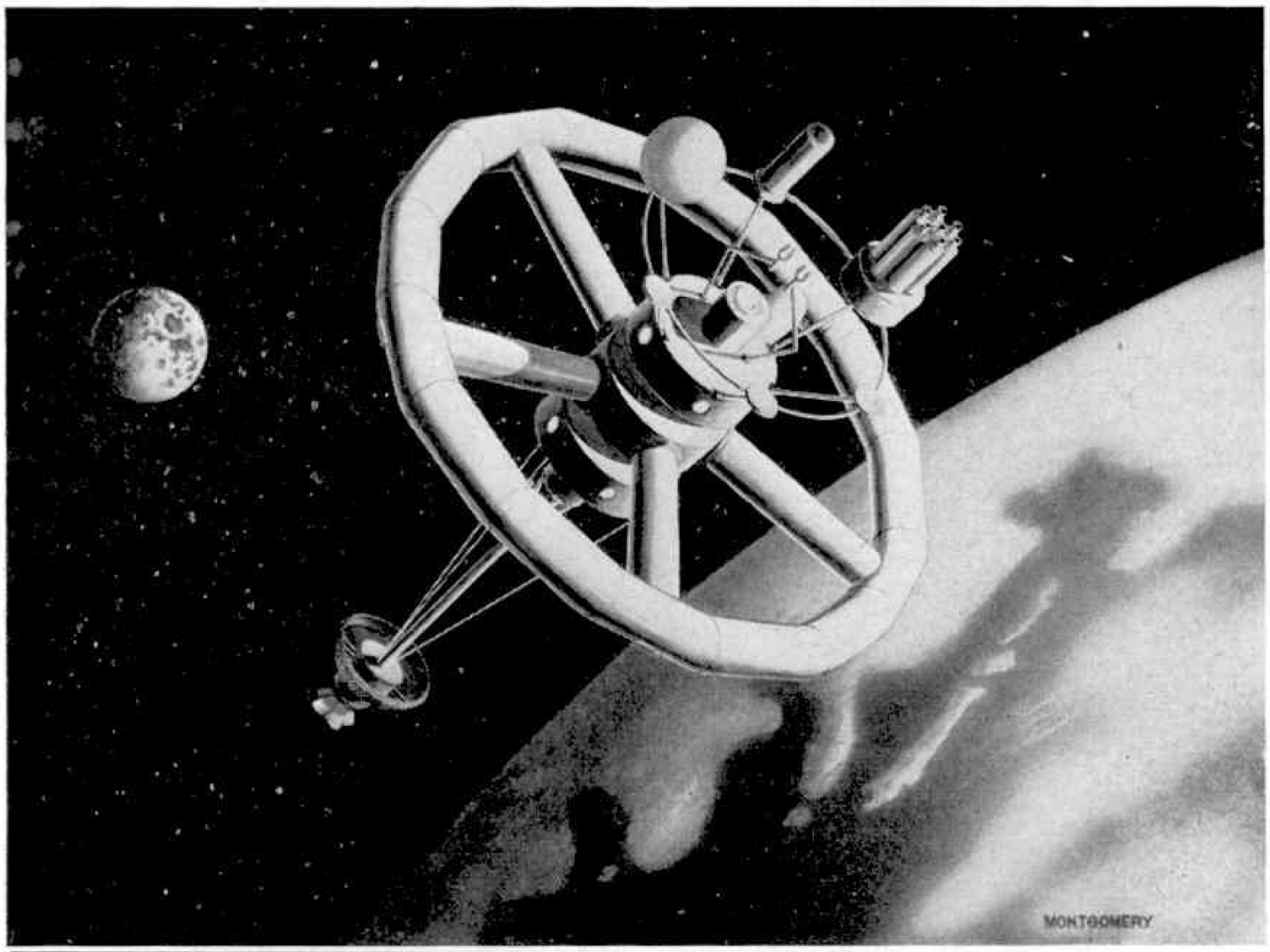
The astrotug is a completely independent working vehicle and personnel need not leave it in space-suits in order to work on the project of assembling the space station. The tug consists of two double-walled pressure vessels with an overall length of about 20 feet and an inside diameter of nine feet. Swivelling rocket nozzles are arranged for manoeuvring. On the forward end are four mechanical manipulator arms with interchangeable "hands" for such jobs as gripping, welding, hammering and cutting. Hands can be changed by remote control from inside, and viewing ports provide uninterrupted observation.

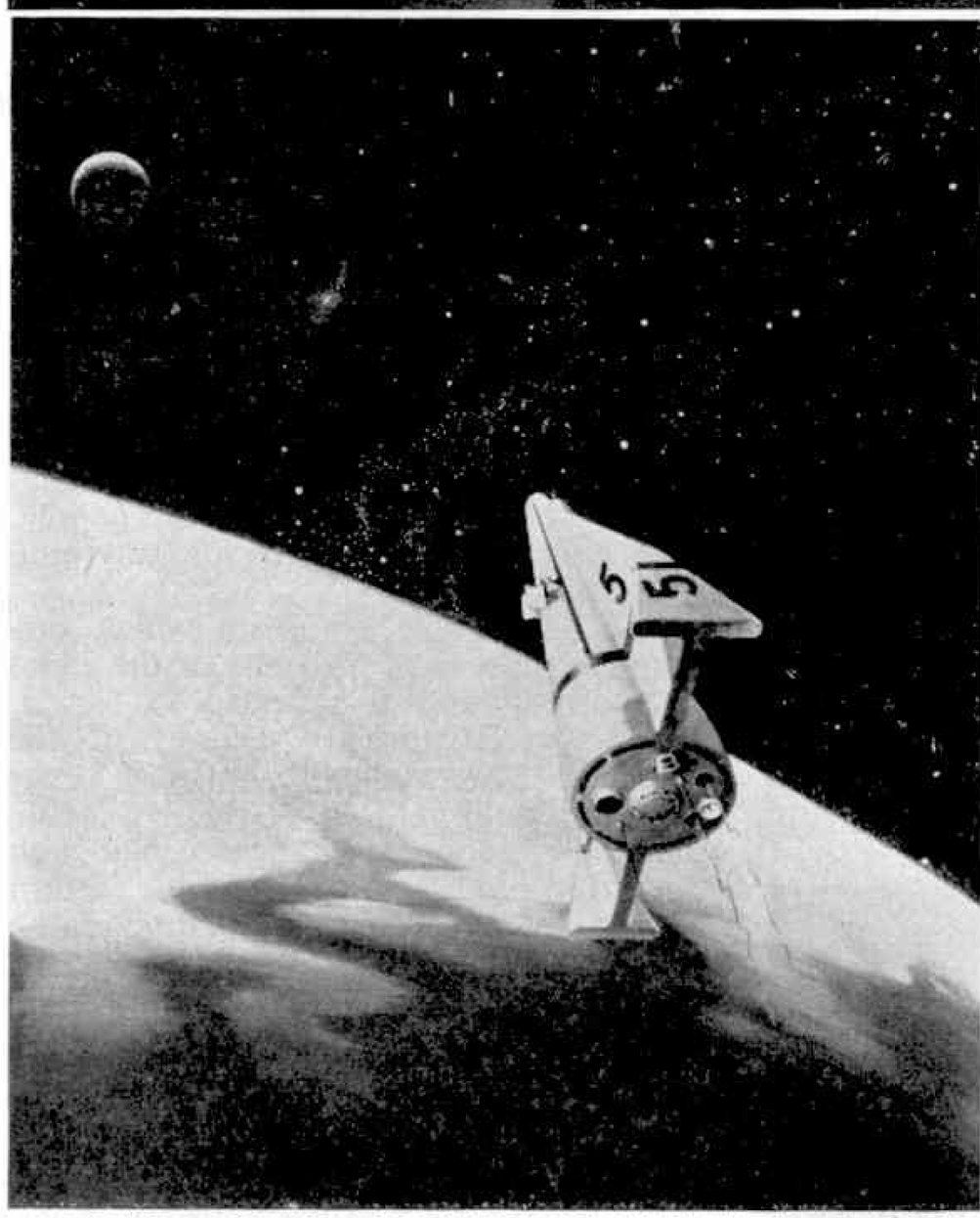
Radar aerials, searchlights, and other equipment necessary to the tug's work are mounted externally. Main controls and instruments, including radar, radio, computers, control and navigation consoles, are duplicated in each of the two compartments as a safety measure.

Men working in space-suits would be able to apply only very small forces and could work for limited periods of time. With the Lockheed astrotug, personnel could carry on the work in comparative safety and comfort with maximum efficiency. A special re-entry vehicle, shown in our third illustration, has been designed for ferrying to and from the earth. Tugs themselves would remain floating in orbit indefinitely, being re-provisioned as fresh relief crews arrive.

LIFE BEYOND THE EARTH

As soon as Man realised that the points of light in the sky were other worlds he wondered if there were life on them. For centuries philosophers—and more recently science-fiction writers—have discussed the problem, but until quite recently there has been no attempt to contact such life, if it exists. In looking for alien life it is natural





(Above): A 10-man permanent scientific space station. (Left): Two-man ferry vehicle for transporting personnel to space station. This illustration, and that at the top of page 6, are by courtesy of Lockheed Missiles.

to look close to home first, in our own solar system. The only planets on which intelligent life might conceivably exist are Venus and Mars.

Recently, the discovery of water vapour on Venus has made the possibility of life there rather more likely. However, oxygen has not been detected and radio studies indicate a surface temperature of over 600 degrees F. In addition, the surface is perpetually covered in cloud and nothing is known of its surface features.

On the other hand, the surface of Mars is well-known and the presence of markings which looked artificial and were known at one time as canals led certain astronomers to deduce that intelligent life had existed at some time on Mars. This theory is now discredited, but seasonal colour changes indicate that some form of vegetation may live on Mars. Again, there is no oxygen, and it is hard to believe that intelligent life could evolve without it.

When we leave the solar system we find we are unable to observe the planets of other suns. Present day earth-bound telescopes could not detect them. It is possible that a giant moon-based telescope (where there is no atmosphere to interfere with viewing) could detect giant planets, the size of Jupiter, around the nearer stars but would not enable us to see any detail nor even to detect smaller planets of a size more likely to support life.

The closest sun-like stars likely to have life-bearing planets are Epsilon Eridani, at a distance of 10.8 light-years and Tau Ceti at 11.8 light-years. If they have planets, and they support intelligent life, our only way of detecting the inhabitants is by radio.

Scientists at Cornell University have argued that any other beings in the universe who are as intelligent as ourselves will already have reached the same conclusions and may be sending out radio waves aimed at other intelligent life. The frequency used must be one that can penetrate atmospheres readily, say between one and 10,000 megacycles per second. It should also be a frequency that will be known to every scientific observer in the universe.

The most likely frequency, according to the scientists, is 1420 megacycles, which is one of the radio emission lines of neutral interstellar gas. It is reasonable to expect that sensitive receivers for this frequency would be developed early in any civilisation's investigation of radio astronomy.

At the National Radio Astronomy Observatory in West Virginia scientists have for some time been listening in to this frequency in the hope, so far unfulfilled, of detecting alien signals. This work may, one day, lead to our first contact with extra-terrestrial intelligences.

OLYMPIA EXHIBITION

The main theme of the British Transport exhibit at the National Schoolboy's Own Exhibition, at Olympia, from January 1 to 13 is "Careers on British Railways". There will be a special information counter with a display of photographic prints and colour transparencies illustrating various railway occupations. Push-button and static models of railway locomotives and rolling stock, and of British Road Services vehicles, will also be on view.

British Transport films will be screened in a cinema on the stand, and, at the end of each performance, the audience will be invited to take part in a prize quiz on the films they have seen. The winners will have the opportunity of participating in the final contest on the last day of the exhibition.

There will also be a British Railways and British Road Services information counter.

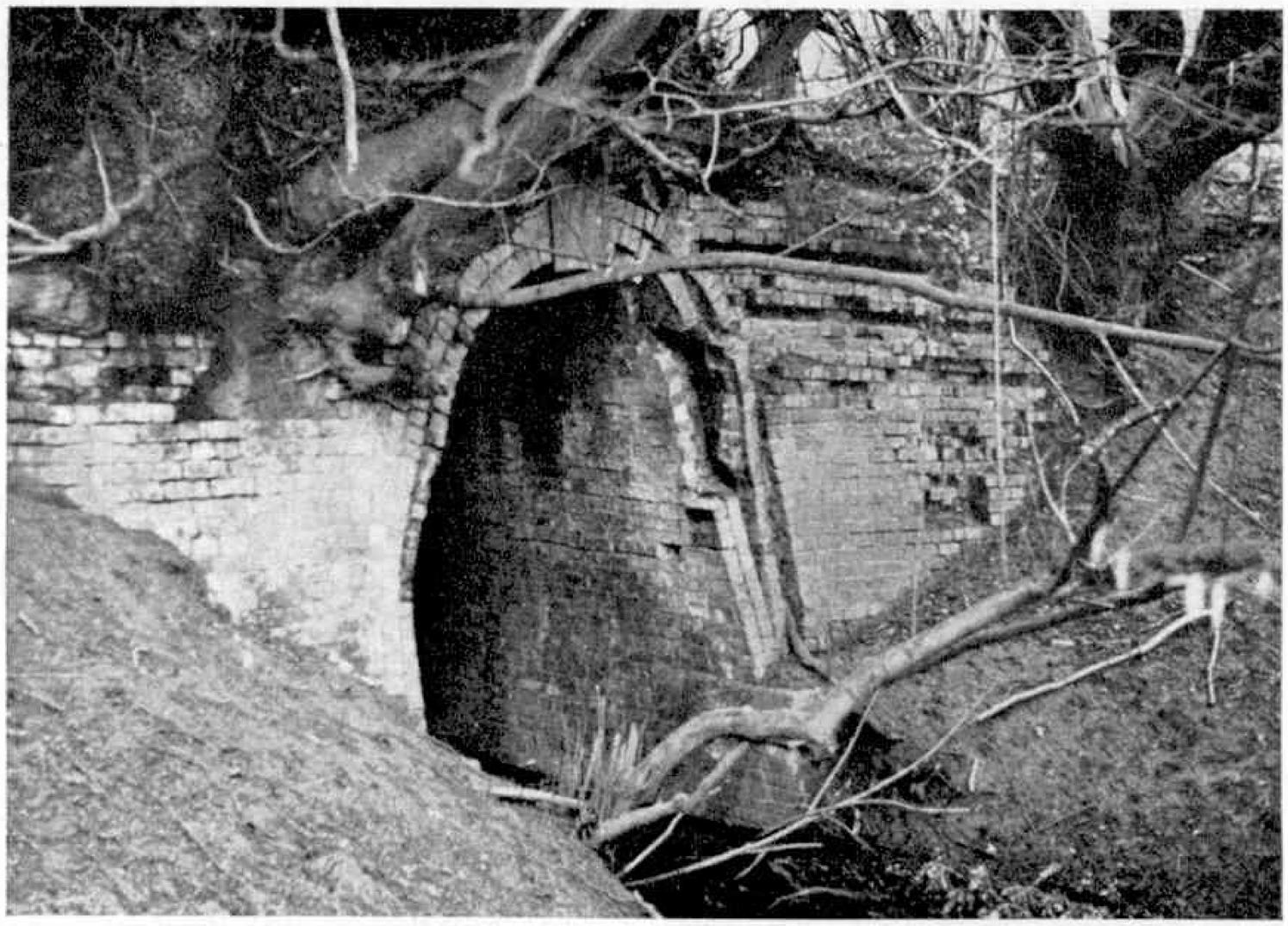
* * * *

The **"Ian Allan Book of Railways"** (6/6d.) is a re-issue of favourite stories selected from the *Locospotters' Annuals* Nos. 1–3 by the same publishers. The subjects have been well chosen and include a topical reference to the type 5 diesels recently introduced on the East Coast route. The Night Ferry, Royal travel and an account of the sharp competition between rival routes for the Plymouth traffic in the early days of this century provide pleasing variety. A ride with the guard of a goods train makes another story, while steam locomotive enthusiasts will welcome the account of the Stanier 4–6–2s of the West Coast route. There is, in addition, a particularly interesting section entitled "Night Mail", with a footplate adventure thrown in for good measure. There are plenty of pictures, several in colour.

Tracing A Lost Canal

By

ANTHONY A. VICKERS



The south-east portal of the old Sousnet Tunnel, near Mamble. The roof has fallen in not far inside, and it would be a dangerous venture to try to explore it. Photographs by the author.

THERE is much discussion these days about the future of our island railways, and their place in the transport system of coming generations. It is interesting, therefore, to reflect sometimes on past methods of providing transport. In days gone by, whenever a new method arose it was greeted with enthusiasm out of proportion to its real value; often wild schemes were put forward, and many of these were hastily abandoned before completion, or even before they were started.

One such proposal was the building of the Kington and Leominster Canal. Its interest lies in the ambitious engineering works which were envisaged, the fact that only the middle third of its length was completed, that it was the first of our canals to obtain legal powers of abandonment (in 1847), and that nearly all of the completed work can still be traced.

The canal was to start from Kington, in Herefordshire, where it was to have been connected by a tramway to Abergavenny, and thence, by canal, to Brecon. Eastwards it was to run to Leominster, and then along the Lugg Valley to Woofferton, down the Teme Valley to Newnham Bridge, and up the Rea Valley towards the Wyre Forest. It was then to travel through the hills back to the Teme Valley, under Pensax village, in a tunnel 3,856 yards long, and finally down a flight of 22 locks to descend the 207 feet to the Severn Valley at Stourport. Here it could connect, it was thought, with James Brindley's Staffordshire and Worcestershire Canal which had been completed in 1771.

For Carrying Coal

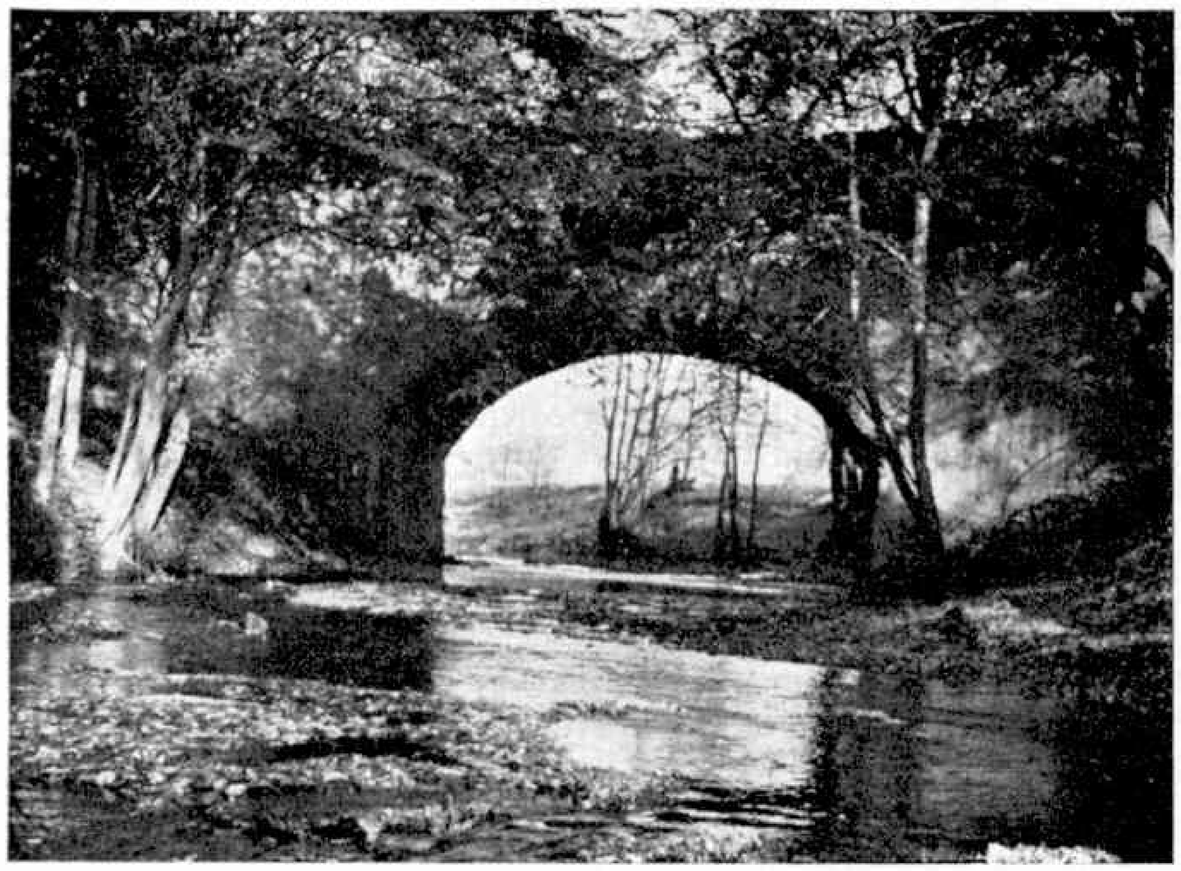
The Kington to Leominster section was never started, but work began between Leominster and Mamble soon after the canal was promoted in 1791. This section was opened in 1795, and was used principally for the carriage of coal from the pits at Mamble. The price of coal for the householder in Leominster was in this way very much reduced. The 1,250-yard tunnel at Sousnet, near Mamble, was begun and may, in fact, have been finished.

The site of the west end can be identified as a hollow in the hillside below the road at Broombank, and the eastern portal is still in good condition. The roof has fallen in a short distance inside, and there are local legends that many workmen were killed inside the tunnel. Along the projected route to Stourport, isolated remains of partly-completed portions of the canal bed have been described by various people, but I have not been able to find anything very convincing.

The remarkable optimism which surrounded these early projects of the canal and railway eras is reflected in Mr. J. Priestley's "Historical Account of the Navigable Rivers and Railways of Great Britain", published in 1831. He wrote that the entrance to the Severn had been opened in 1797, and described the eastern section of the canal as a functioning concern, including the great Pensax Tunnel, no trace of which has ever been found either by detailed exploration of the site or in local or other records.

As I have discovered that my interest in canals is sometimes regarded as an eccentricity, my proposal to meet a friend at 9 o'clock one Sunday morning, for a day of exploration, was something best not spread abroad. We duly arrived at Newnham Bridge and, leaving our lunch in the car, set off to trudge the old towpath into the fields. A short tunnel was found to have been filled in within the previous few years because of danger to cattle, after a considerable period of use as a cyder store.

Passing some old canal cottages, now isolated in the middle of a meadow, we soon crossed the railway line from Bewdley to Tenbury which had cut through



The bridge of a million bricks, the great aqueduct over the River Rea, as it still stands.

the canal in 1864, and immediately walked on to the vast pile of the Rea Aqueduct. Wide enough for the river below to be invisible from the tow-path, it was once known locally as the bridge of a million bricks. Unlike other, more slender, aqueducts, this was built to take the full width and content of the ordinary puddled clay bed of the canal. From below, the structure looks a little less sturdy, for there are some ominous cracks in the brickwork.

The Old Lock House

Above the aqueduct there is nothing of note as the canal winds past Marlbrook Farm, where two flights of locks have left little of the structure. Possibly they may have been earth-walled, like those on the Kennet and Avon Canal. The old Lock House lies by the top lock, and a little further along we saw Wharf House—with warehouse doorway on the ground floor—where coal was transhipped into the barges.

A few years ago, an aged man whom I met in the Old Colliery Garage at Mamble spoke of having heard his father tell of the donkeys which used to take the coal down from the pits to the canal. From his description, one would have thought the coal was carried in panniers, but 200 yards above Wharf House, where the canal bed turns into the site of Sousnet Tunnel, a clear track runs away slightly to the left. Unlike the dead level canal bed, this has a gradual rise and must have been a tramway.

After 200 yards the track divides, one limb continuing under the present roadway through a bridge, which has been partly bricked in, while the other limb rises steeply to the left up what must have been a rope-hauled incline. There are several such tracks in the vicinity, described to me as "rides" by one of the locals, who also pointed out the buildings where the wagons or tubs were formerly repaired.

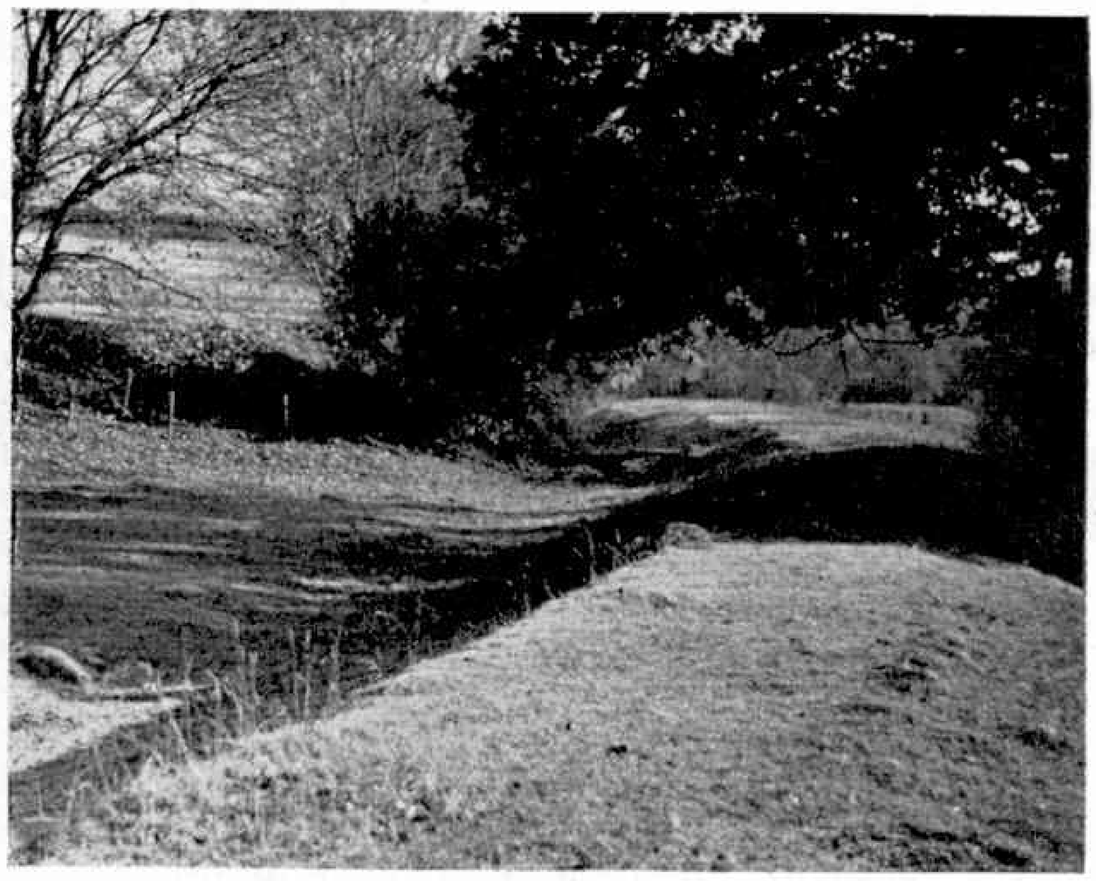
There is a certain amount of bridgework on these tracks where they cross small streams, and we were mystified to find an old railway sleeper of a rather unusual pattern. It was tempting, but hardly justifiable, to assume that it was a sole remnant of one of the old tramways.

We returned, by means of the roadway, to have our lunch and to make some inquiries at the Railway Tavern at Newnham Bridge. Here, no one was able to supplement our meagre information about the old canal, so long is it since it terminated its short active life.

Beneath Main Line

Down to Little Hereford the canal closely follows the side of the Teme Valley, running in and out of the hillside, gradually descending by a few locks, and still bridged at two points at least, by the original 160-year-old arches of overbridges. One of these still carries modern farm traffic.

Beyond Little Hereford the canal must have turned to cross the Teme by another aqueduct, but this was demolished during the last war. As we arrived at Woofferton, we could see the canal bed running straight across the fields, to pass beneath the main line from Hereford to Shrewsbury. After running alongside the railway for a short distance the canal reached the last of its engineering works, a tunnel under a hill at Putnam Field. We found that this tunnel also had fallen in, although both entrances were still sound, and at the far end the canal was holding water at its original depth.



A typical section of the dried-up canal bed. In the middle distance is a small brick dam, once used to keep water in the abandoned canal for use as a fishery.

After continuing in a cutting for a short way, the canal turns under the railway again, and is lost in the midst of cultivated fields into which it has, over the years, been ploughed. In one or two places it has been left to form a boundary ditch, but there is no trace of it at its southern extremity. This is marked, however, by Wharf House, lying alongside the main road from Ludlow to Leominster and formerly the dormitory for the canal barge workers. On the far—east—side of the road is Machinery House, where once the coal was weighed in the carts in which it travelled for the last mile of its journey to Leominster.

Sense of Achievement

Not everyone will appreciate how it was that we set off home again with a sense of achievement. The world around us is a place of noise, change, and destruction. New things arise, in place of the old, with scant regard for the past. There is refreshment in a quiet exploration through deserted fields, past typical old lockhouses, often now difficult of access for any vehicle other than a bicycle. The old coaching toll roads have gone, or have been changed beyond recognition; the narrow boat canals have been closed or are fast falling into decay, and roads are being superseded, in some cases, by motorways. Who knows when these last will be obsolete, and what will succeed them?

The Kington and Leominster Canal was a working proposition for barely 52 years, during which time it never made a profit. The same may be said of many of the railway schemes which followed the canal era. It is perhaps only the public ownership of our roads and motorways which will make it difficult for posterity to prove or disprove their economic value. Railways and roads may perish or be incorporated into adjacent agricultural or building projects; this has, indeed, already happened to some aerodromes. Canals, however, often owe their partial preservation to the irrigation and drainage rights acquired by adjacent villages and property. The anomalous situation has often arisen that it is cheaper for British Waterways to keep open, even if not navigable, a derelict watercourse than to close it legally and provide alternative water facilities for those now dependent on the canal.

Up and down the country we can find the desolate remnants of canals which for the first time enabled fuel and raw materials to be brought together in bulk, cheaply and reliably. Without them, the industrial revolution would certainly have been delayed.

ALBION TRUCK IN "OPERATION BUSHMEN"

A six-wheel truck made by Albion Motors Ltd. of Glasgow is helping an expedition which is undertaking a new study of a rare type of Bushman in South Africa. Fitted with a special narrow-track front axle, the 10-ton Albion Reiver will cover approximately 4,000 miles in mainly trackless country before returning to Johannesburg with its party of scientists. The same vehicle, which has a mileage of about 50,000 to its credit, was used for a similar expedition a few years ago. Portable X-ray equipment is to be taken to the area concerned for the first time to determine the ages of Hottentot and Bushmen from their bone structure.

Under the leadership of Professor J. S. Weiner of the Department of Physical Anthropology (Oxford) and Professor R. Singer of the Department of Anatomy (Cape Town), the expedition is a joint effort of Oxford and Cape Town Universities.

The Mile-A-Second Aeroplane

AIR NEWS

By John W. R. Taylor

MANY people scoffed when North American Aviation said they were designing an aeroplane to fly at 3,600 m.p.h., or a mile a second. The unofficial speed record then stood at 2,148 m.p.h., set up by Captain Milburn Apt a minute or two before he crashed and was killed in the rocket-powered Bell X–2 research aircraft, in 1956. To advance nearly 1,500 m.p.h. in a single jump seemed far too optimistic, and few pilots envied Scott Crossfield, who was chosen to make the first test flights in the new aeroplane, known as the X–15.

The main requirements were for an engine able to thrust the X–15 to more than five and a half times the speed of sound, and an airframe that would not melt or break up if the air flowing past it heated the skin to a temperature of 1,200 deg. F.

The Reaction Motors Division of Thiokol Chemical Corporation began work on a huge, single-chamber rocket engine that would develop a thrust of 57,000 lb., running on ammonia and liquid oxygen propellents. North American built the airframe mainly of titanium and stainless steel, with an "armour" skin of heat-resistant Inconel X nickel alloy steel.

When it was completed, the X–15 looked more missile than aeroplane, with a 50 ft. long bullet-shape fuselage, stubby wings spanning only 22 feet, and dart-like tail. As its engine was expected to consume the propellents at the rate of about five tons a minute at full power, North American decided to save fuel by launching the aircraft in mid-air, at a height of about 40,000 feet, from a Stratofortress bomber.

* * * *

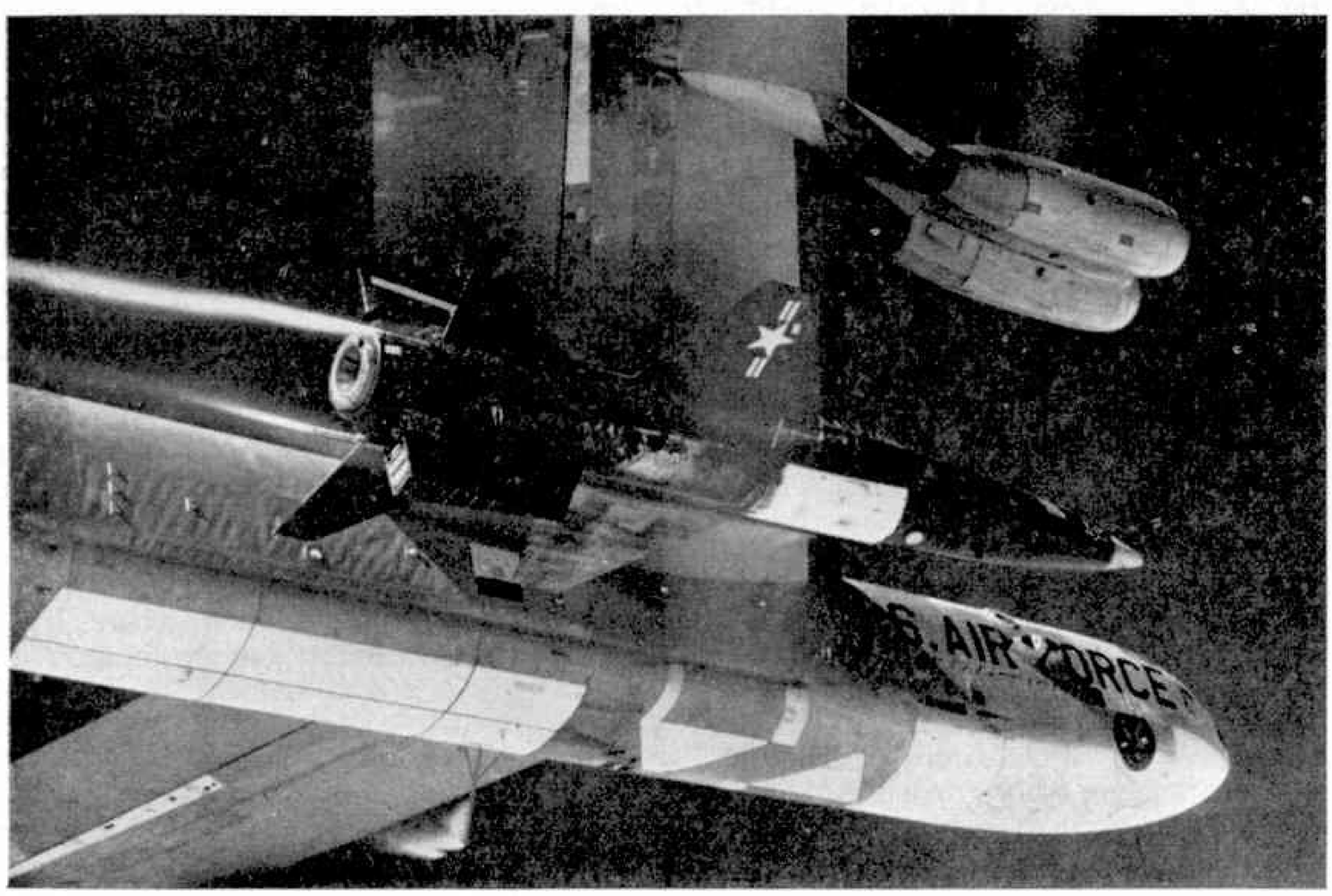
Three X–15s were built, and Scott Crossfield made the first powered flight in one of them on September 17, 1959. At that time, the aircraft was fitted with two smaller rocket-motors, as the 57,000 lb. thrust XLR99 engine was not ready. A speed of over 1,300 m.p.h. was reached in a shallow climb to 50,000 feet. Further flights followed, and on November 15, 1960, Crossfield made the first flight with the XLR99 installed, clocking nearly 2,000 m.p.h. even with the engine throttled back to its lowest power and with the air-brakes extended.

* * * *

Since then, almost every flight has raised either the unofficial speed or height record. The planned mile-a-second was first achieved by Major Robert White of the United States' Air Force, who recorded 3,603 m.p.h. on June 23, 1961. On November 9, he beat this with 4,093 m.p.h. Earlier, on October 11, Major White had climbed to a record height of 217,000 feet, or more than 41 miles.

These exploits of the X–15 have been overshadowed by Russian and American space-flights. This is a pity, because you and I are far more likely to travel in supersonic airliners, made safer by lessons learned with the X–15, than in Sputniks and space-ships.

The X–15 research aeroplane shown in captive flight with the B–52 carrier 'plane. Note the stubby wings of the X–15 which is capable of fantastic speeds. Picture by courtesy of National Aeronautics and Space Administration.



A STEP NEARER

The long-awaited B.E.A. helicopter service between London, Paris and Brussels, which might halve present journey times, has been brought a step nearer by the news that Westland Aircraft have obtained a licence to build the Boeing-Vertol 107 in England.

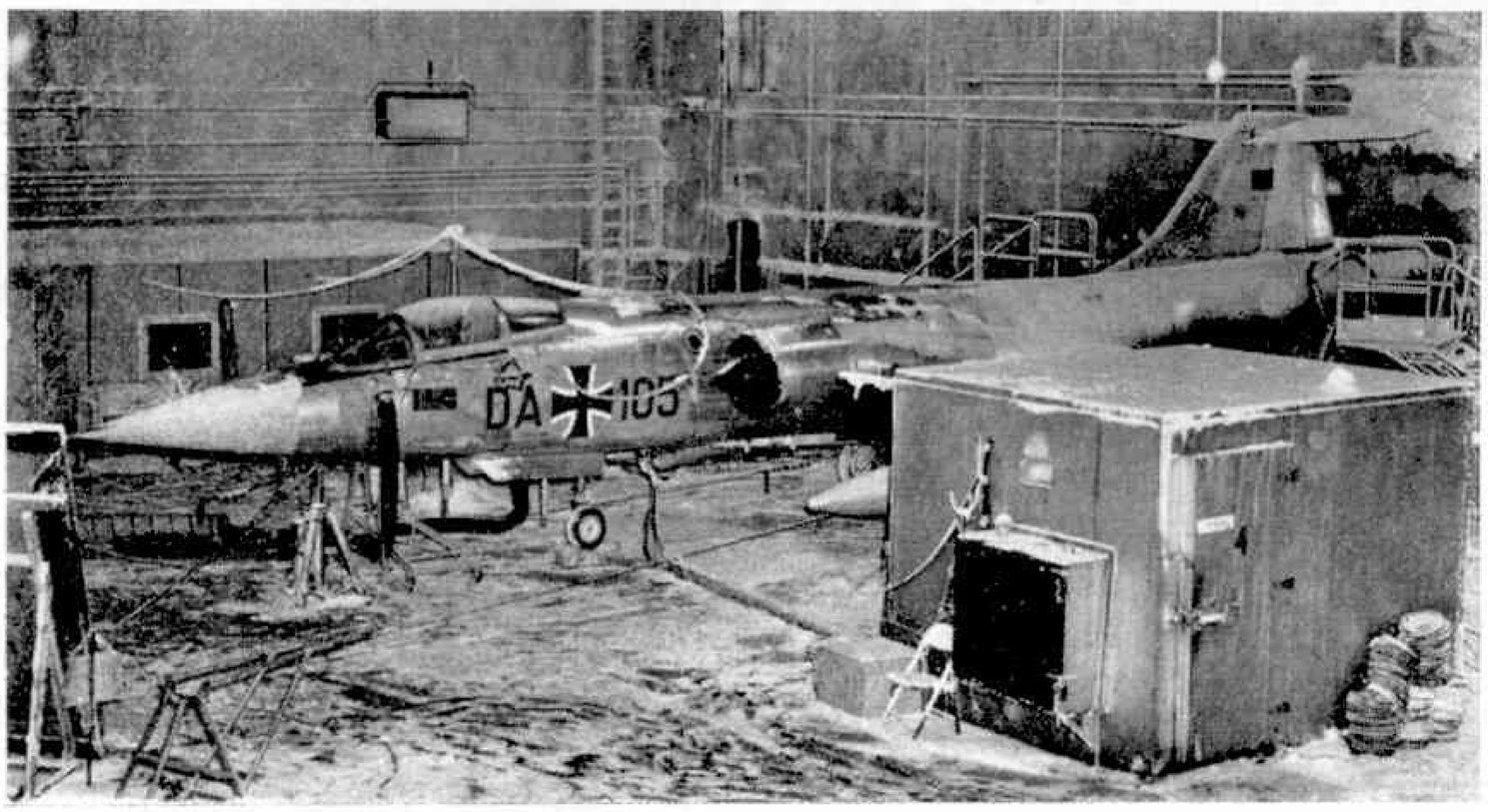
Able to carry 25 passengers at a speed of 155 m.p.h., the 107 is the best aircraft of its kind in the world and has already been delivered to New York Airways. The American version has two 1,250 h.p. General Electric CT58 shaft-turbine engines; the Westland-built 107s will almost certainly be powered by de Havilland Gnomes, which are British-built versions of the CT58.

The roomy cabin of the Boeing-Vertol 107 is similar to that of a fixed-wing airliner, with eight rows of seats which run in pairs on the port side and in single units on the starboard side of a central aisle. There are overhead luggage racks, and a roll-out baggage container in the underside of the rear fuselage.

PHOTOGENIC PODS

A favourite subject for the cameras of passengers travelling by Boeing 707 jetliner is the view of two of the engine pods suspended under the wing, as seen from windows at the front of the cabin.

To take full advantage of the free publicity offered by all this amateur photography, B.O.A.C. have now painted their name on each side of the support struts for the engine pods.



Left (top): This Lockheed Vega, built 32 years ago, is being used to test U.S. radar ground equipment. (Below): The Lockheed Starfighter for Germany which got cold treatment at a United States' Air Force base in Florida. The climatic hangar also duplicated rain and humidity conditions found virtually anywhere in the world. Both these illustrations appear by courtesy of Lockheed.

FLYING ON THE GROUND

A few years ago, I was invited by B.O.A.C. to sample the first American-built flight simulator brought to this country. I sat in a dummy cockpit, complete down to the last dial and lever, and had to "fly" it under radio instructions from somebody outside, relying on the instruments to tell me how fast and high I was flying, whether I was straight and level, and so on. The whole thing became so realistic after a time that I forgot I was on the ground and became quite worried when the instructor told me to come in to land—something I had never attempted in a real aeroplane on instruments.

Since then flight simulators have become normal training aids, used by almost all air forces and airlines. They enable aircrew to learn quite a lot about how to handle a new aeroplane without any danger, especially as the instructor can introduce faults such as an engine failure, brake failure, or radio interference just to make things more difficult for the men under training.

* * * *

The latest simulators are very elaborate, with tape-recorders to provide sound effects such as the squeal of brakes and the noise of a faltering engine. Every movement of the controls is reflected by the needles on several instruments, just as in a real aircraft.

Now, the realism is being carried a stage further by means of a development known as "Terravision", produced by General Precision Systems of Aylesbury, Bucks. This projects a closed-circuit TV picture of an airfield on to a screen which can be seen by the pilot during take-off and landing, so that he sees exactly the view that he would get from the flight deck of a real aeroplane. The result is so realistic that even experienced captains have been known to forget that they are in a simulator after half an hour's "flying".

The R.A.F. is to use "Terravision" attachments on its flight simulators, beginning with the simulator for the new Argosy transport.

"TENNIS NET" SAVES LIVES

When next you pass by an R.A.F. fighter station, you will probably notice something that looks like a giant tennis net slung across the end of the runway. Attached at each end by steel cables to brake drums, it is, in fact, a barrier to stop any jet aircraft that might get into trouble during take-off or landing. When an aircraft hits the barrier, the nylon net wraps round the wings, the cables and brake drums take the strain and the aircraft is brought to a halt with negligible damage and with no injury to the pilot or aircrew.

Built in Sweden, the barrier has been in service at R.A.F. stations in Germany since 1958 and has already been used there to stop ten Hunters, five Swifts, a Meteor, a Vampire and a Canberra. Another 30 aircraft have been stopped by the barrier at airfields in Britain, when they failed to take off properly, or "overshot" on landing due to a brake failure or for some other reason. The barrier normally lies flat on the ground, but can be raised in three seconds by an electric signal from the control tower in an emergency.

VETERAN VEGA

Radar was unknown when the Lockheed Vega monoplane illustrated at the top of this page made its first flight 32 years ago; yet it is in use today to test new U.S. radar ground equipment for the simple reason that it is the best aeroplane for the job.

The Vega is made almost entirely of wood, so that it forms a very difficult target for the radar to detect, and has a good performance, with a top speed of 180 m.p.h. and ceiling of 20,000 feet. To test the radar to the full, the few metal parts that were used originally have been replaced, where possible, by wood or fibreglass components, and the propeller now has blades of laminated wood instead of aluminium.

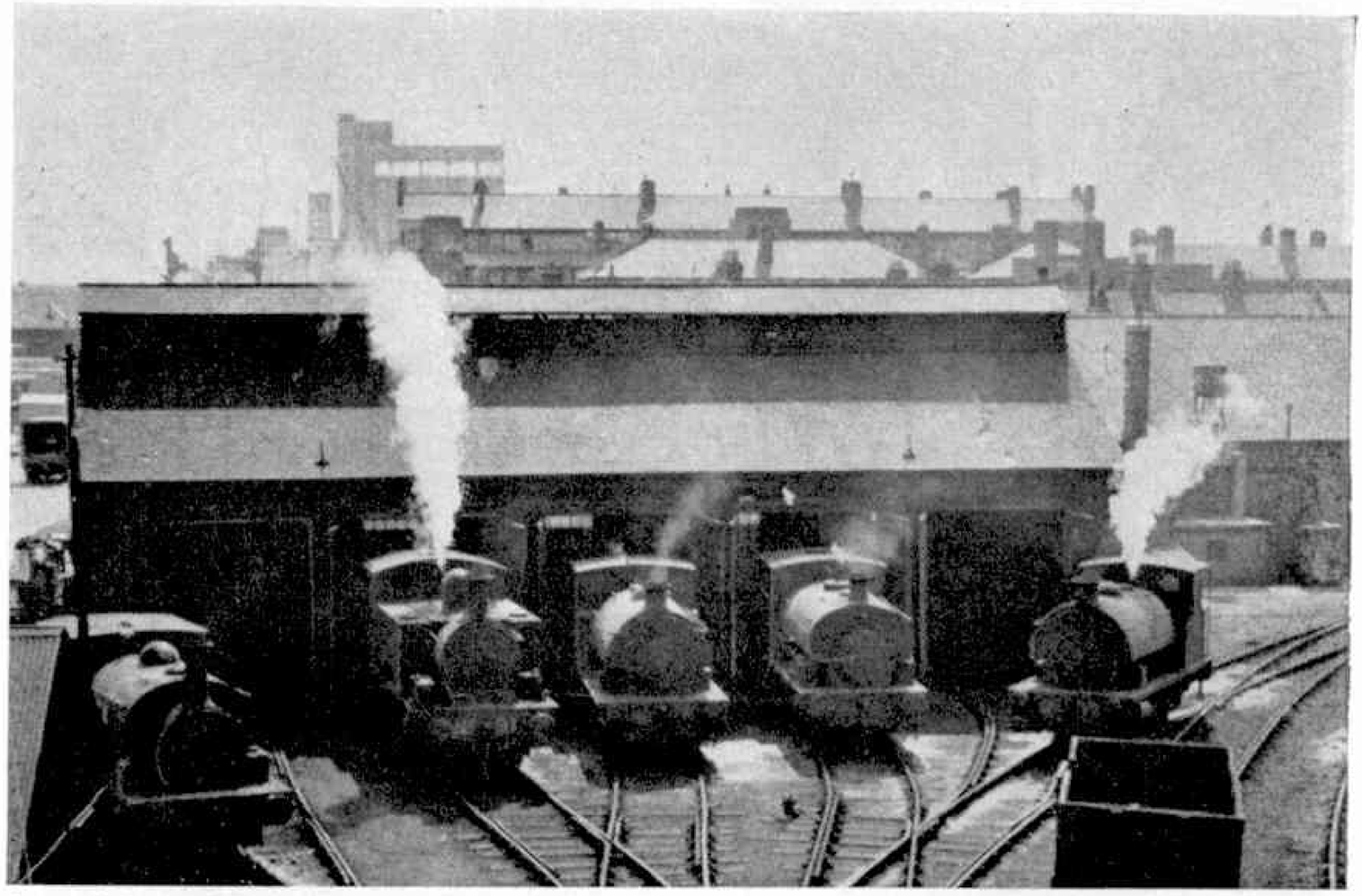
FLORIDA FREEZE

In spite of the snow and icicles, the photograph of a Lockheed Starfighter on this page was taken in Florida on a hot summer's day. The explanation is that the aircraft is inside the big climatic test hangar at Eglin Air Force Base, where all U.S. combat aircraft are taken to ensure that they will continue to work in whatever part of the world they have to fly.

The Starfighter, one of a number being built for the German Air Force, spent two months inside the hangar in temperatures ranging from plus 120 deg. to minus 65 deg. F. It was also deluged with rain and exposed to prolonged humidity. At regular intervals, engineers went inside to check that, in spite of everything, its engine would still start, its wheels retract, its hood open, its control surfaces work properly and all the other components do their job just as well as if the aircraft were newly off the assembly line.

Locomotives On The London Docks

FAITHFUL STEAMERS PASS FROM THE SCENE

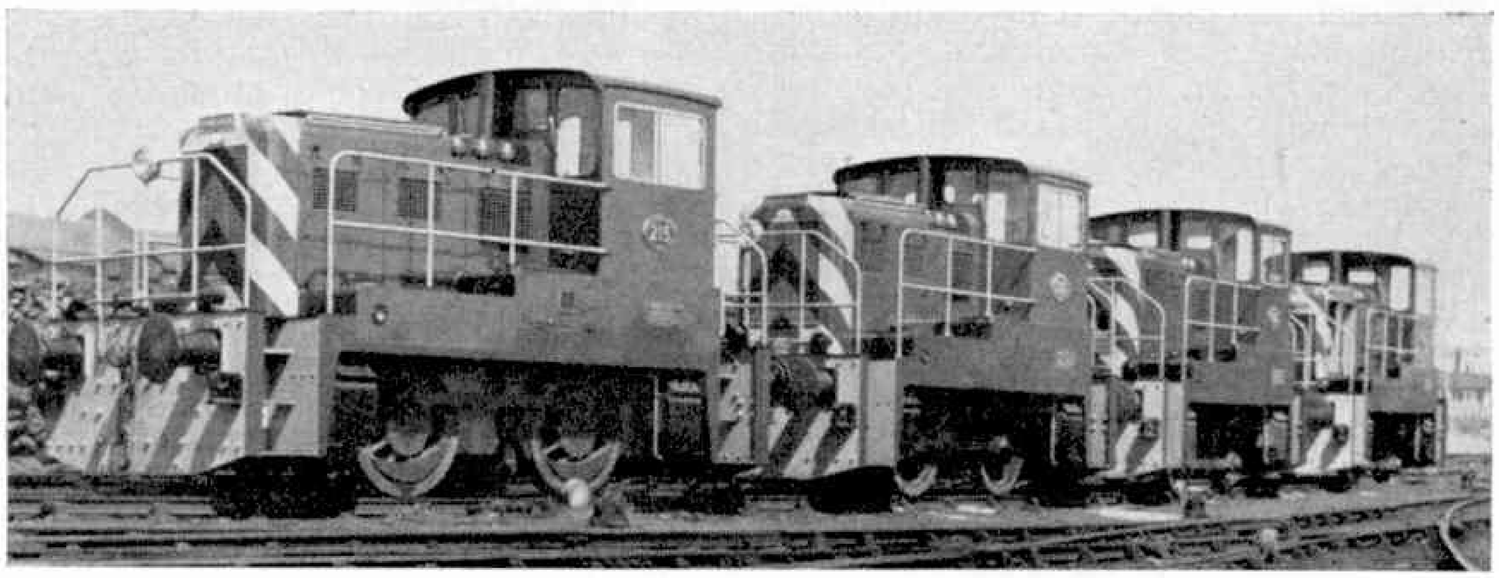


Some of the last P.L.A. steam locomotives raising steam at the running sheds, Millwall Docks. All the pictures illustrating this article are by the author.

AT the docks of the Port of London Authority the small steam shunting locomotive has given way to the diesel-electric shunter, for, with the arrival of six diesel-electric locomotives at India and Millwall Docks in July of last year, the modernisation of the P.L.A. Docks railway system was complete.

The steam locomotive made its appearance at this group of docks nearly 90 years ago, long before the Port of London Authority was formed, when a number of rival companies owned and operated enclosed docks along the River Thames. Competition between them was fierce, and it is not surprising that the owners of the new docks eagerly looked around for new methods and equipment with which to compete with their longer-established rivals.

Four of the diesel-electric shunters waiting to take over from the steam locomotives at India and Millwall Docks.



The oldest docks in the Port of London —the East and West India Docks—were built during the first quarter of last century. In those early days goods were moved by hand or on horse-drawn carts. When construction of the Millwall Dock started in 1865, however, the engineers decided that, in view of the rapid growth

By Maurice Rundle
B.Sc., A.M.I.E.E., A.M.I.Mech.E.

of railways during the previous 30 years, it was essential for a rail system to be laid down at the start for the movement of goods within the docks. This railway system was later extended over the India Docks Company's land to connect with the trunk railways then springing up all over the country.

About the same time, the Dock Companies joined with the Great Eastern Railway Company in building a short railway which ran through the dock for part of its length, while the remaining section was laid just outside the dock boundary. This railway carried passengers from the London–Blackwall Railway to the river ferry which crossed the River Thames at Greenwich.

For some years the passenger carriages were drawn through the docks by horses because of the risk of fire in the timber yards which lay along the route. The steam locomotive was coupled and uncoupled when the train reached the dock boundary.

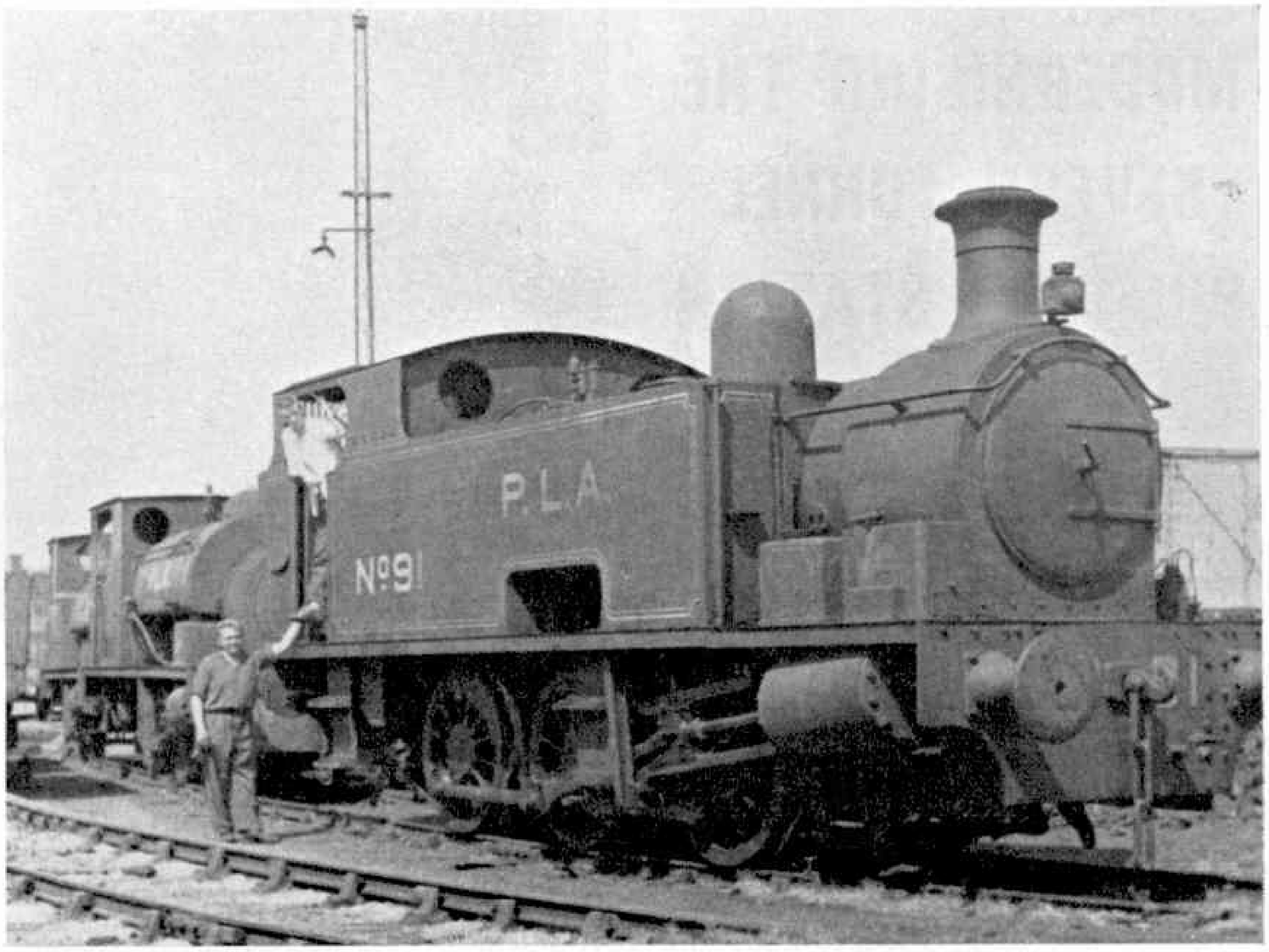
The earliest locomotive believed to have been used on this line was named "Ariel's Girdle" and it was owned by the Great Eastern Railway, who provided all the rolling stock on this line in its early days. This locomotive, built by Kitson, Thomson & Hewitson of Leeds, was shown at the Great Exhibition held at the Crystal Palace in 1851.

In about 1877 "Ariel's Girdle" was replaced by an engine named "Thames". When, shortly afterwards, it was decided to work steam locomotives over the entire line, the operating committee purchased three lightweight locomotives to their own design from Manning Wardle & Company of Leeds, who afterwards supplied many more locomotives to the Dock Companies.

Over the bridges

The three passenger locomotives were 2–4–0 type and their weight was restricted to 16½ tons because of the three light swing bridges they had to cross during

The date—July 8, 1961. The last P.L.A. steam locomotive (No. 91) joins its companions in retirement at the end of a job well done.



their journey through the docks. They were probably the smallest standard gauge engines in use at that time on a public railway in Great Britain.

The first two goods shunting engines appeared in 1873. One of them named "Primus", built by Manning Wardle & Co., weighed 12¼ tons; the other was bigger and heavier and was named "Cuxhaven". It was one of a batch of engines built by Shanks & Company for dock work in Europe, but when found to be surplus was bought by the Millwall Dock Company at a bargain price. These locomotives were 0–4–0 type and they worked in the docks for more than 40 years.

In 1880, three more shunting locomotives were purchased for use in the Millwall Docks, and in the same year the India Docks Company purchased its first locomotive. This was the "Swift", one of three built by John Fowler of Leeds for use in Egypt. But it was never sent there, as the ruler of Egypt went bankrupt in 1880 before the engine could be paid for. The locomotive weighed over 30 tons, and it was converted from metre gauge to standard gauge before being put into service in the docks where it worked until 1914.

The company's second locomotive also had an unusual history; it was named "Bee" and was built in 1880 by the Hunslet Engine Co., being one of a batch bearing the names of insects such as "Moth", "Fly", "Wasp", "Ant", etc., which were used by the contractor on the construction of Tilbury Docks. On completion of the dock, in 1886, they passed to the Dock Company, who transferred the "Bee" to its India Docks group.

Replacement scheme

When the Port of London Authority was set up in 1909 it found that most of the locomotives which had been taken over from the Dock Companies were almost worn out, and a replacement programme was put in hand.

During 1915 eleven new locomotives were delivered to the P.L.A. by Hudswell Clarke & Company and five of these, of the 0–4–0 type, went into service at the India and Millwall Docks. These were joined the following year by two more similar engines from Hawthorn Leslie & Company.

Six of these locomotives worked at this group of docks daily until replaced by diesel-electric machines in July of last year; the seventh had to be prematurely retired, because of the effects of old age, early in 1960, and its place was taken by one of the 0–6–0 engines which had been replaced by a diesel at another dock.

The three passenger locomotives which had been working the Millwall Extension Railway since 1880 were replaced in 1920 by articulated steam rail-cars. These had been used on the Great Western and Port Talbot Railways but were unsuitable for the Extension Railway and when this closed down, in 1926, they were scrapped.

The last of nearly 100 steam locomotives owned by the P.L.A. and the Dock Companies arrived at the docks in 1953, and two of them were still in service at India and Millwall Docks when diesel working was started last year.

Avoiding the long wait

The new diesels are the standard 0–4–0 with 3 ft. 6 in. driving wheels and are built by the Yorkshire Engine Company. The motive power is a 220 h.p. 6 cylinder Rolls-Royce diesel engine coupled to a generator which supplies power to the electric driving motors. These engines are more economical to run than steam locomotives, and have many advantages over them. Electric push-button starting avoids the long wait for steam pressure, and diesel fuel oil—enough for at least two weeks' working—is easily and quickly taken aboard.

Servicing is simpler than cleaning and maintaining a steam locomotive, and the absence of smoke makes for greater cleanliness all round—including the air we breathe. The footplate men also appreciate the comfort of their cabin which can be heated in winter and which does not get overheated in summer.

Some of the Authority's diesel locomotives are being fitted with radio telephones, so that, like taxis and police cars, their movements can be directed from a central control point.

These locomotives, the third generation to work in the London Docks, clearly differ greatly from those that have worked there over the last 90 years. Already they have shown their worth and they have been welcomed by all who have dealings with them.

But this welcome is tinged with regret at the passing from the dockside scene of the faithful steam locomotive. Change, however, is inevitable and as the steamers pass into retirement it is fitting to record their service as they go.

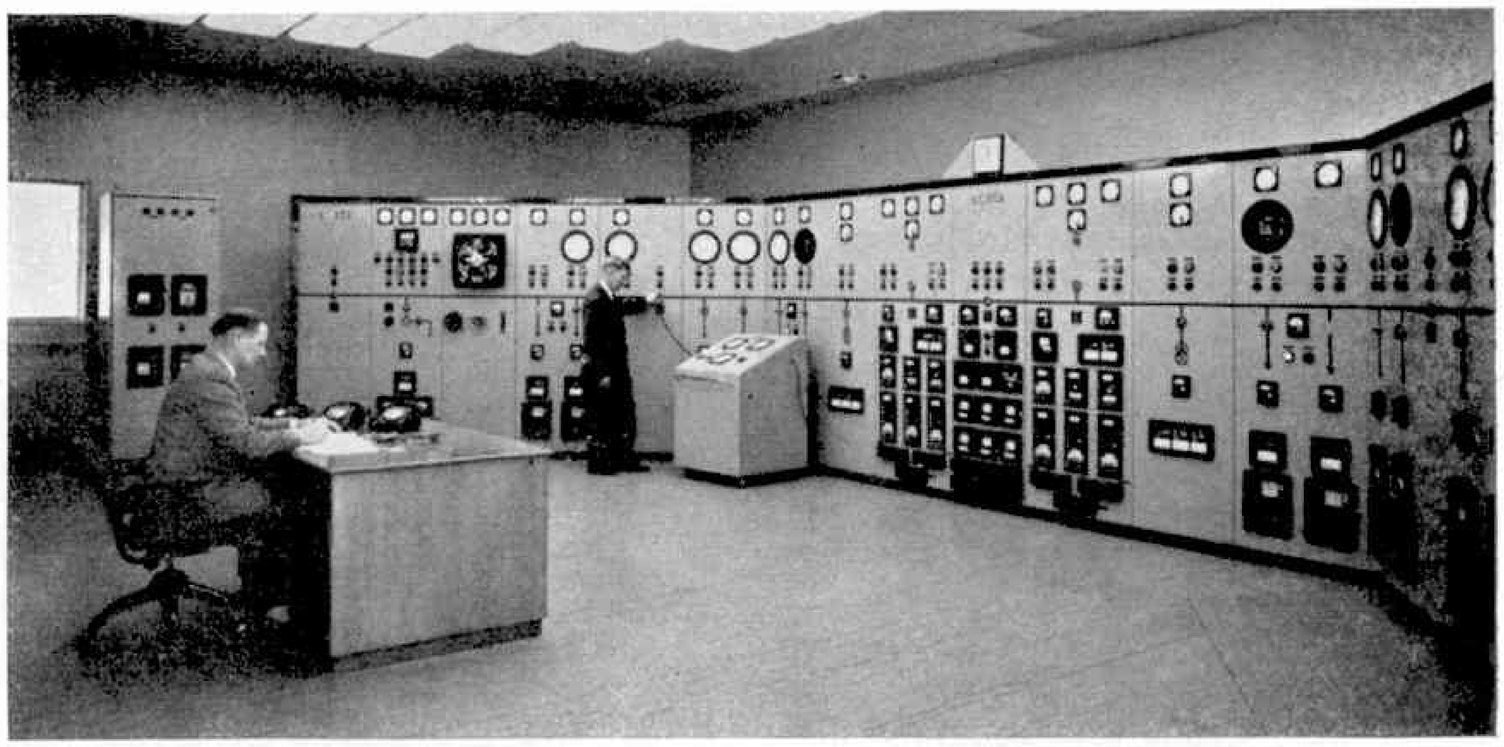
WORLD ENGINEERING EXHIBITION

The biggest international exhibition ever to be held in Britain will occupy both Olympia and Earls Court from April 23 to May 2, 1963. To meet changing European trading conditions the long-established Engineering, Marine, Welding and Nuclear Energy Exhibition is to be transformed into a huge international exhibition using the million square feet of the two exhibition buildings combined.

The exhibition, to be called the London International Engineering Exhibition, has been timed partly to overlap the Hanover Fair in West Germany, so that buyers from all over the world will be able to see both these great events in one visit to Europe. This will be the first occasion on which both Olympia and Earls Court have been used together for an international exhibition. About 1,200 exhibitors are expected to take part.

The exhibition will cater for every type of engineering product from the largest items of capital equipment to the smallest power tools and components. Olympia will, in general, take the heavier exhibits including a welding section—an exhibition in itself—while at Earls Court electrical engineering and a range of lighter products will be on display.

MODERNISING THE SEVERN TUNNEL PUMPING STATION



The main panel in the new control room.

IN early November of last year, the world-famous, steam-driven Cornish Beam Engines which have kept the Severn Tunnel clear of water since they were installed by the former Great Western Railway Company in 1886, were brought to a standstill. Their task was taken over by modern electrical pumping equipment.

To mark the occasion, a short ceremony was held at the Pumping Station at Sudbrook, on the Monmouthshire side of the tunnel. There, Mr. J. R. Hammond, General Manager of the Western Region of British Railways invited Mr. R. F. Hanks, Chairman, Western Area Board to perform the ceremony.

In doing so, Mr. Hanks asked Mr. T. C. Stephens, Manager of the Pumping Station, to stop the first of three beam engines, following which Mr. Hanks pressed a button and brought the first electric pump into action. Mr. Hanks then invited Mr. J. Carter, Senior Hydraulic Engineman at Sudbrook, who began his service in January 1915, to stop the second beam engine. Mr. Hanks then started the second electric pump, stopped the third beam engine and set the third, and final, electric pump in motion. So ended an era in which these beam pumps, fine examples of Cornish engineering, have given trustworthy and efficient service for 75 years.

Keeping the four-and-a-half mile long tunnel clear of water was one of the major problems which originally confronted the engineers engaged on its construction. This was finally overcome by the provision of the steam-driven pumps now displaced by more modern equipment. The steam pumping plant, which had been in continuous service since 1886, comprised seven plunger and five bucket type Cornish Beam Engines, supplied and erected by Messrs. Harvey & Co., of Hayle, Cornwall.

Variation Of Flow

The four pumping shafts at Sudbrook, on the Monmouthshire shore, handled an average of 20,000,000 gallons every 24 hours with a maximum of 34,000,000 gallons and a minimum of 14,000,000 gallons, the variation of flow being seasonal. An average of 12,000,000 gallons a day of water from the Great Spring was pumped from No. 1 shaft, in which were arranged three bucket and three plunger type pumps, each driven by a steam engine with a 70-inch diameter cylinder.

The remaining shafts dealt with seepage and surface water from the tunnel mouth at the Welsh end.

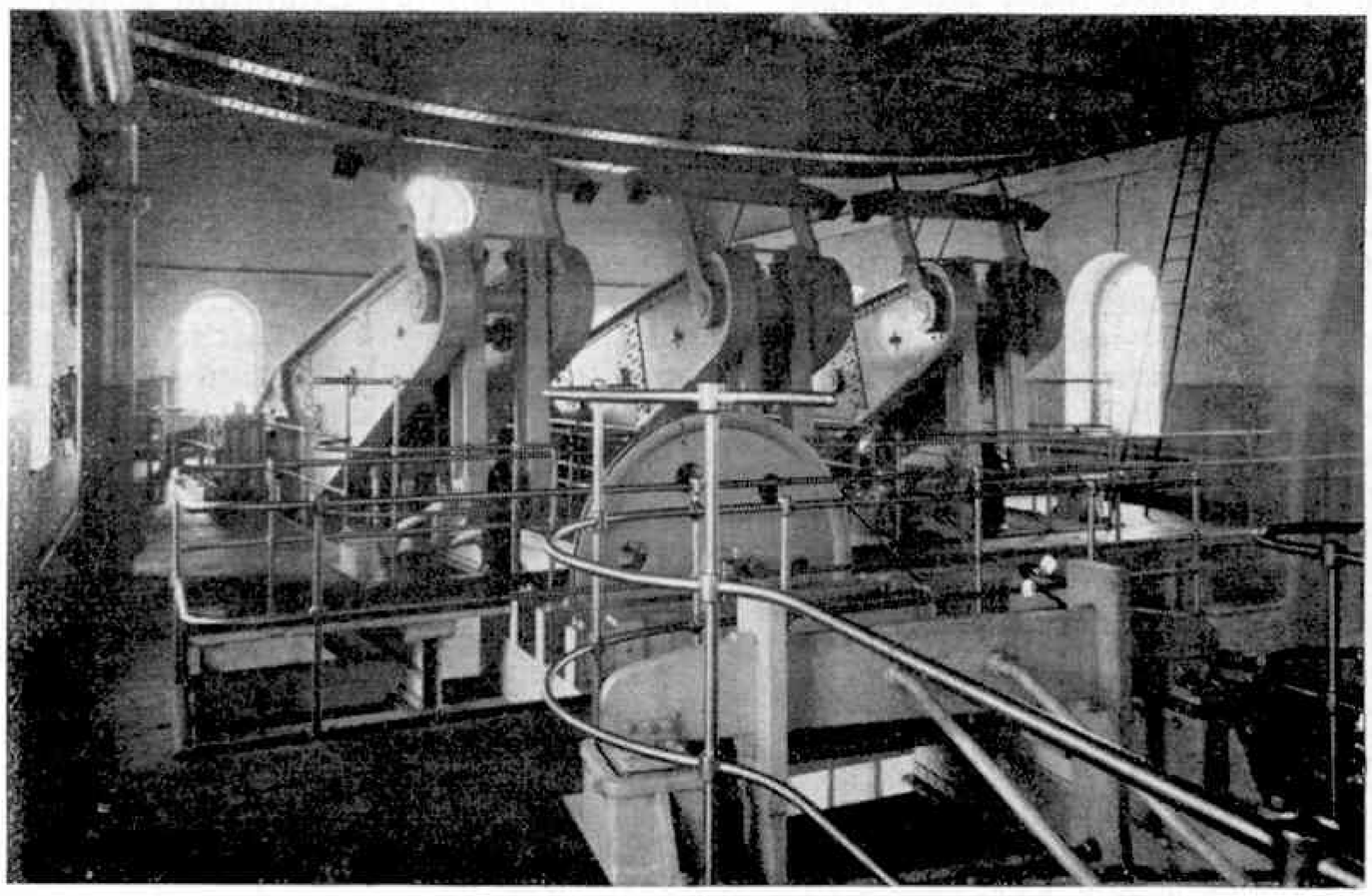
With the exception of No. 1 Engine House and its six steam engines, and the "Bull" engines of No. 2 Engine House, which are being preserved, *in situ*, by the Western Region, all existing steam pumping plant is being removed and engine houses are being demolished.

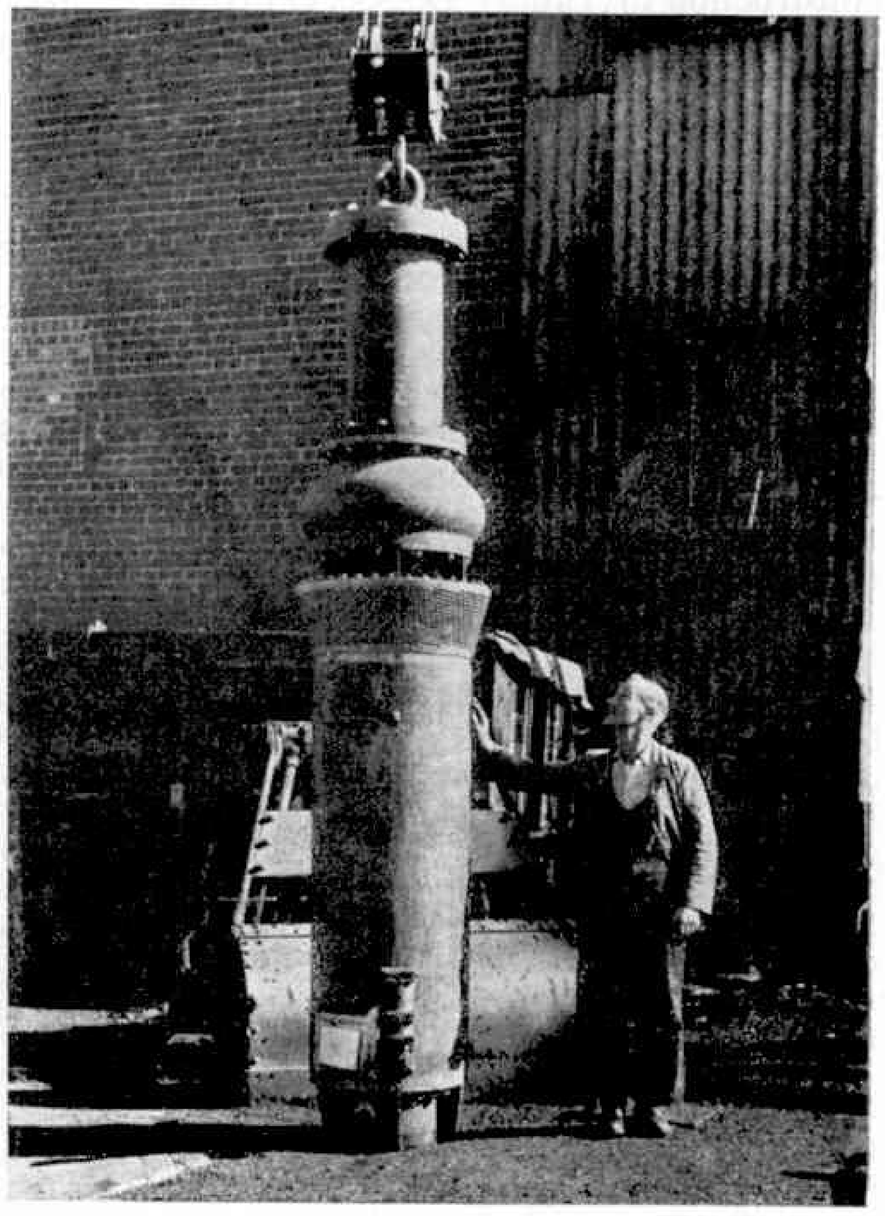
The Electric Pumps

The pumping engines have now been replaced by "Electromersible" pump units, supplied and installed by Messrs. Hayward Tyler, of Luton.

(*Continued on page 28*)

Below: No. 1 engine house. A view of the beam floor showing the old steam-driven bucket pumps. Right: An electrically-driven submersible pump being delivered prior to installation. All the photographs on this page appear by courtesy of British Railways.





Of General Interest

THE ESKIMO BUYS MECCANO

THERE is a saying in the Canadian Arctic that you can give an Eskimo a broken outboard motor and a few bits of baling wire, and he'll soon have it purring. There is a bit of exaggeration in this, but also an element of truth. One of the unexpected facets of the Eskimo character is a remarkable inborn mechanical aptitude.

This perhaps explains why Meccano is on the regular stock lists of the Northern Stores merchandise depots of the Hudson Bay Company, the oldest chartered trading company on earth. It can be found among the simple stock on the shelves of isolated trading posts just as readily as in the toy departments of the great urban department stores which are the mainstay of the Honourable Company today.

To reach the Eskimo customer, the Meccano Set has an adventurous journey.

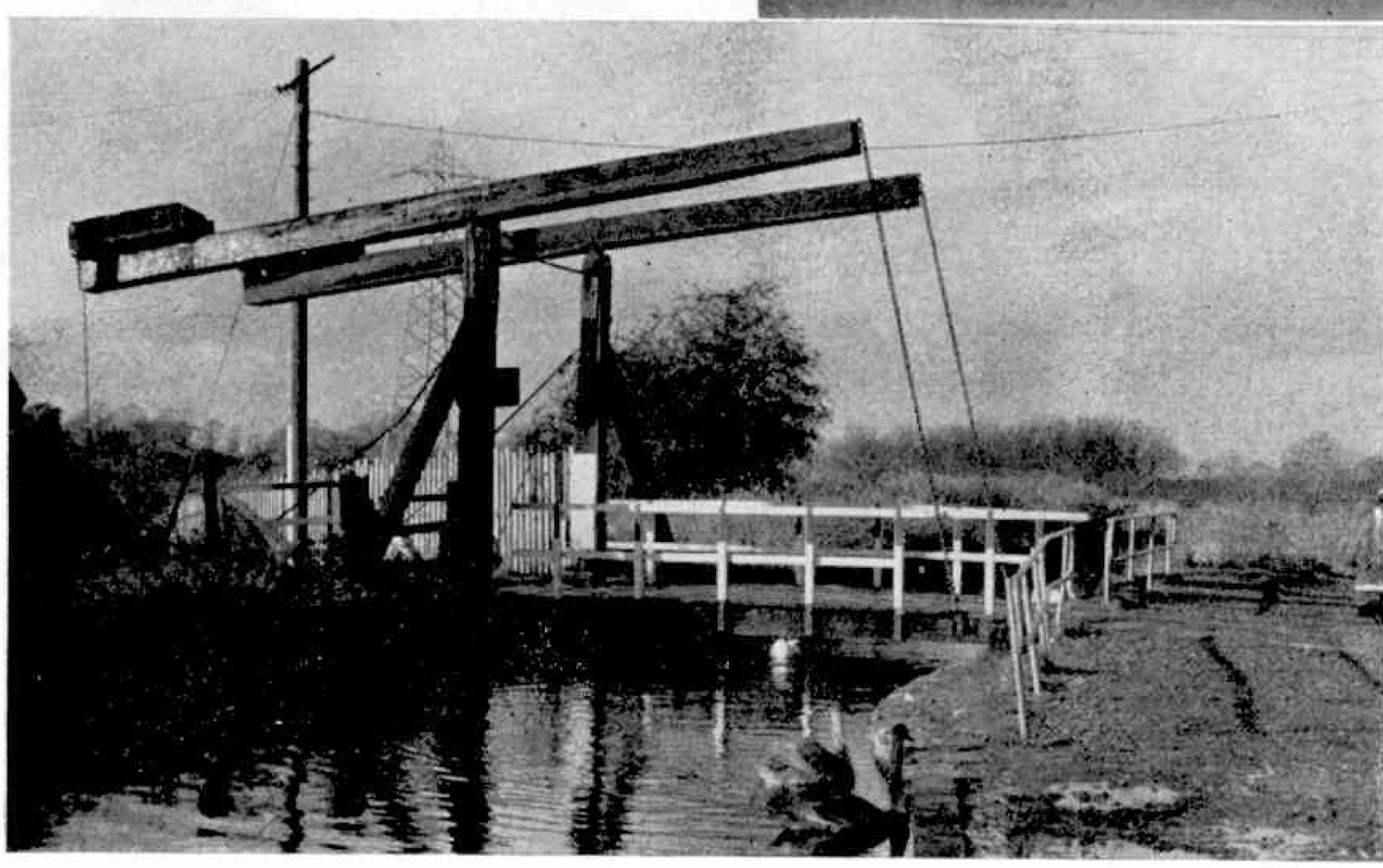
For Eastern and Central Arctic stores it is loaded, along with fuel drums, sacks of flour, bolts of cloth and other staples of the north, on one of the company's ships at Churchill, on Hudson Bay—and whether it reaches its destination at, say, Repulse Bay or Igloolik is at the whim of the ice. The season of open water lasts only six weeks, and even then there are summers in which the ice fails to leave some places at all.

For the Western Arctic, shipments travel overland to Waterways, then down the Mackenzie River to Tuktoyaktuk (usually known as Tuktuk) for trans-shipment to the company's vessels, and face the same risks.

Last summer the company lost one vessel, the Fort Hearne, *holed by ice in the Western Arctic, and has another, the* Fort Severn, *ice-bound at Eskimo Point in Hudson Bay, where she will remain until break-up time next summer.*

Finally, one day in August or early September, "ship day" comes to the Eskimo settlement, and everybody heads for the beach to help unload the barges which ferry the goods ashore—Meccano included.

Happy faces (top) as a Meccano Outfit is displayed in the Hudson Bay Company store at Gjoa Haven, in remote King William Land. The skins are white foxes and the sign on the central post, in Syllabics, says "No Smoking". Right: An aerial view of the bleak outpost of Gjoa Haven. Villy Svarre photographs, courtesy the Hudson Bay Company.



The unusual drawbridge shown on the left is to be found at Shirley, which is less than a mile from the boundary of Birmingham. It is situated on the Stratford-on-Avon Canal. Photograph by David Richmond of Solihull.

Fortress That Became A Sanctuary

Fort Jefferson—built 100 years ago to defend America's southern coasts.

MASSIVE CITADEL WHERE WILDLIFE NOW ABOUNDS

THE Dry Tortuga Keys sparkle in the amethyst waters of the Caribbean, tiny coral islets 60 miles from the mainland of Florida. Here, on one of these little-known, seldom-visited islands in the sun, is Fort Jefferson—a massive citadel built a century ago to defend the southern coasts of America.

In spite of the fantastic cost of its construction, Fort Jefferson was fated never to fire a shot in anger. Today, it remains a deserted monument to the past, maintained as part of a sanctuary for millions of migratory birds.

BY

SIDNEY ALLINSON

No words can convey the vibrant beauty of sea and sky that frames this massive, yet somehow graceful, fortress. It covers some ten acres of Garden Key, a vast, granite lozenge that claimed the lives of hundreds of nameless men who helped to build it. Its hexagonal walls are five feet thick, each section 450 feet long and sloping upwards to a height of 60 feet. Huge muzzle-loading cannon still bristle from its casemented, three-tiered walls—grim reminders of its early purpose.

Haunts of pirates

The Dry Tortugas were the haunts of pirates and smugglers for more than 300 years before the United States Government began to take an interest in the strategic importance of the area. Aware of the need for a bastion to defend the Gulf of Mexico, they chose Garden Key as the site of a military fort powerful enough to repel any aggressor. Plans were made on a massive scale to ensure that Fort Jefferson would outrival all others, and in 1846 construction began.

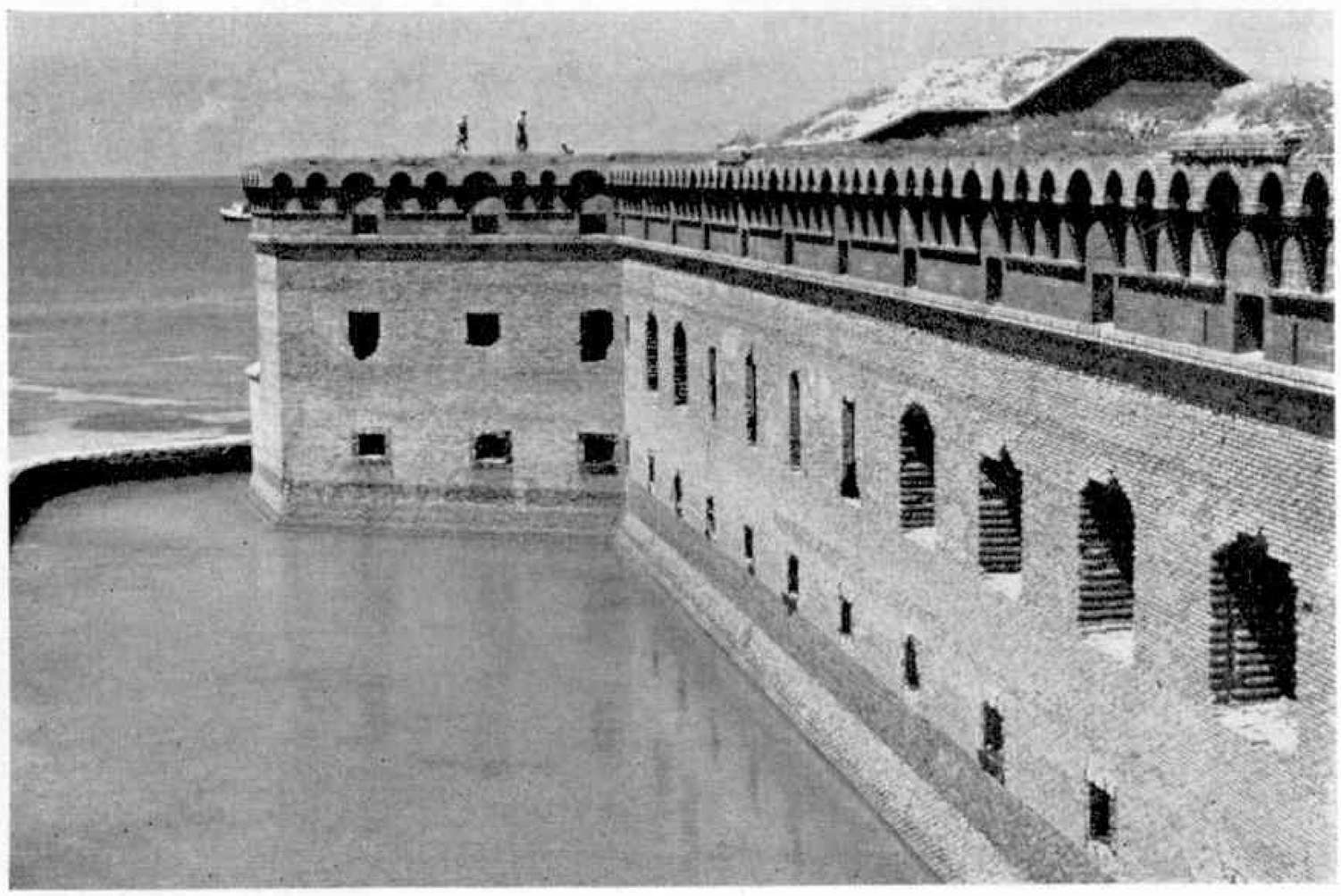
The cost of building this project in terms of money and human effort was staggering. The island's very isolation made added problems for the Army engineers and contractors who began work at Garden Key. All material needed for the buildings had to be brought by ship 1,500 miles from ports along the Eastern Seaboard. More than 4,000,000 bricks were used, at an estimated cost of one dollar each in transportation alone.

The low-lying islands were constantly swept by terrible hurricanes, awesome storms which often threatened to destroy the work before it had properly begun. Skilled workmen were difficult to find once the Dry Tortugas' evil reputation became known. Men died like flies in the rude labour-camps, struck down by extreme heat and tropical diseases. Soon, no more men could be found to face the deadly isolation of the Tortugas and Negro slaves were shipped south to continue the murderous task of building "Fort Jeff".

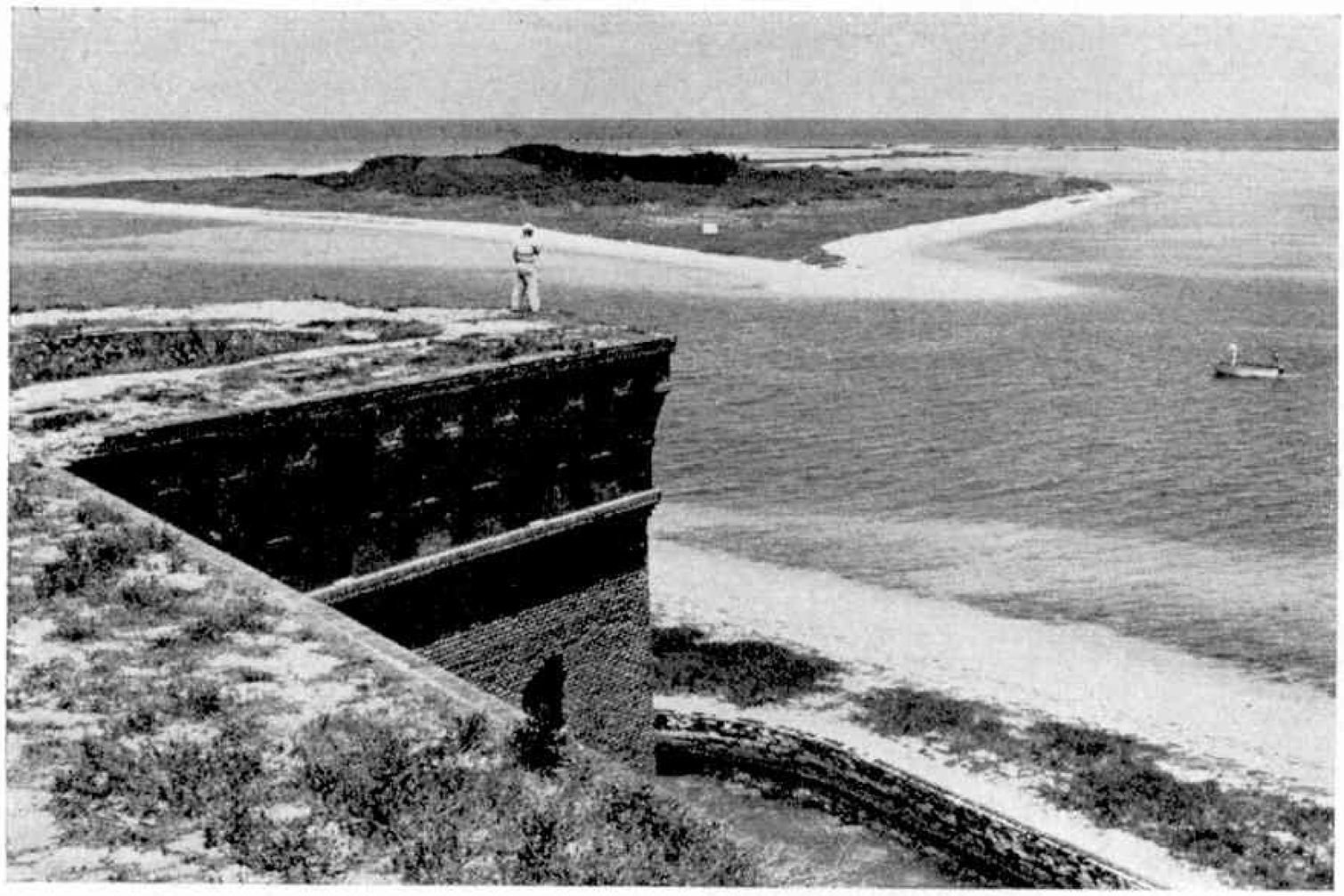
Twenty years' task

This work went on for over 20 years, until the gigantic structure was finally completed in 1869. During the four years of the American Civil War, a garrison of 600 Union soldiers held Fort Jefferson as a stronghold in the very centre of Confederate naval operations.

Soon after that conflict, the fort, built at such cost, was completely abandoned. The lessening threat of foreign interven-



The hexagonal walls of Fort Jefferson are 5 feet thick. Its moat is still patrolled by sharks and other carnivorous fish which once were effective guards against attack or escape.



The low-lying islet of Bush Key (above, centre background), guards the entrance to Fort Jefferson's anchorage.

The remote coasts of the Dry Tortugas (left) now form the perfect sanctuary for Terns and other sea birds. All the pictures illustrating this article appear by courtesy of the Florida State News Bureau.

tion in the Gulf of Mexico made the bastion virtually worthless. From then on, only a few naval storekeepers remained here to replenish vessels of the Caribbean patrol. There was a short flurry of activity when the fort was manned during the Spanish–American War of 1898, but the great walls were crumbling from neglect by the 1920's, when they housed the illegal cargoes of Florida rum-runners.

Many unique points

Shortly afterwards, however, official recognition was made of the remote area's many unique points of interest, both natural and man-made. In January 1936, the entire group of islands, which were set aside as a Federal Bird Reservation, and the fort itself, were given the status of Fort Jefferson National Monument.

Tropical life abounds among the reefs and waters of the Dry Tortugas. The very name "Tortugas" is from the Spanish word for "turtles". The huge reptiles can be seen today, sunning themselves on the surface of the water and diving with surprising speed at the slightest alarm. Commercial fishermen net the turtles which are in great demand for making into delicious green-turtle soup.

Huge red and black jelly-fish, named Portuguese-Men-O'War, float idly by in the semi-tropical waters. Fort Jefferson's wide moat is still patrolled by sharks and carnivorous barracuda, fish which once served as effective guards against either escape or attack.

From the battlements one can look down to see the cavorting of brilliant tropical fish. Their names indicate how their colours resemble the markings of other wildlife—tiger fish, parrot fish and zebra fish. The reefs are festooned with such beautiful coral growths as lavender sea-fans, grotesque sponges, brain coral and huge conch shells.

Guarding the entrance to Fort Jefferson's anchorage is the eroded, low-lying islet of Bush Key. James Audubon, the noted wildlife artist, voyaged to Bush Key in 1836 to study the habits of migrating Sooty Terns which flock to this island. Even today, naturalists are still puzzled over the enigma of where these birds come from every spring and where they go each autumn. They return to roost amongst Bush Key's coral rocks, congregating in raucous flocks estimated to number more than 100,000 birds.

Doughty doctor

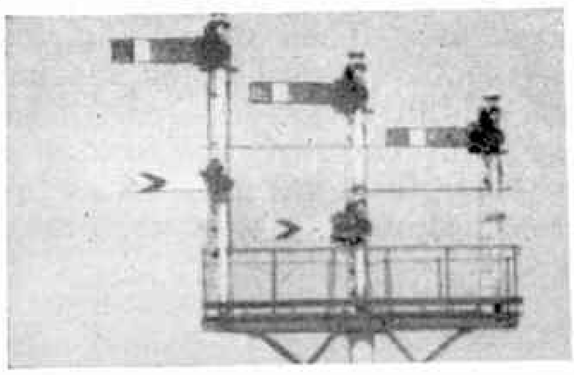
Although many legends have been born within the walls of "old Fort Jeff", none is more stirring than the saga of Dr. Samuel Mudd. This doctor unwittingly tended the wounds of John Wilkes Booth during the assassin's flight after murdering President Abraham Lincoln in 1865. Dr. Mudd was caught up in the wave of vengeful hysteria which followed the death of that popular American leader. He was sentenced to life imprisonment as an accomplice of Booth, and was sent in chains to Fort Jefferson without hope of ever again being free.

During the next two years, the doughty doctor made repeated, but vain, attempts to escape. Strangely, it was an epidemic of the dread Yellow Fever that led to his salvation. The disease rampaged through the fort, striking down soldiers and political prisoners alike. When the army surgeon was killed by the fever, Dr. Mudd was asked to take charge. He worked fearlessly to save all he could of the 200-man garrison and their prisoners. So effective were his methods that the Army men sent a signed petition to Washington, pleading for his release. This petition, together with the unceasing efforts of his wife, finally obtained Dr. Mudd's pardon, in 1869, and his exoneration from any part in the Lincoln assassination plot.

The Southern Cross

When your boat draws away from this island citadel at dusk, heading back to Key West, you are able to see yet another unique feature of a visit to the Dry Tortugas. It is a spectacle visible nowhere else in the United States—the Southern Cross. That brilliant constellation of stars is as familiar in tropic skies as is the Great Bear in Britain.

One's last memorable impression is of the Southern Cross as it glitters low in the velvet sky above old Fort Jefferson, seeming to comfort this lonely fortress in its strange role as a wildlife sanctuary.



RAILWAY NOTES

Contributed by R. A. H. Weight

WESTERN EXPRESS RUNNING CONTRASTS

THE eight-car diesel-electric *Bristol Pullman* propelled by self-contained 2,000 h.p. engines is one of the three blue and white de-luxe train sets providing rapid services each weekday, except Saturday, along three different routes to and from Paddington. On its first westbound journey at 12.45 p.m. it is booked to reach Chippenham, 94 miles, in 84 minutes from London, and Bristol, 118 miles, in two hours, including two stops. Both are the fastest-ever schedules of their kind.

On a trip in late September there happened to be various extra and exceptional delays, as was the case during several of my important 1961 express runs. School and Newbury race specials had to to be fitted in along the busy main line out to Reading or beyond, causing some cumulative delays that resulted in signal checks and one complete stop.

When there was a chance intermediately, up to 80 m.p.h. was reached; then, beyond Steventon—next station after Didcot—where full speed was attained, a tremendous effort ensued. Seven minutes were regained on a 70 m.p.h. (passing) timing, with 37½ miles to Chippenham stop, made quite gently, reeled off in 26½ minutes. Thirty of those miles past Swindon and Wootton Bassett were covered at an average of 88, at speeds between 84 and 94 m.p.h.! This was certainly another new record for me! I was travelling in the second car from rear, having lunch in the quiet comfort one associates with these luxurious trains, and for the most part running was extremely smooth.

The thirteen miles on to the next halt at Bath Spa took less than as many minutes, a little more time being won back, so that arrival in Bristol was very little late. Delays in all amounted to nearly fifteen minutes and there had been the customary rather more moderate speeds west of Chippenham. Allowing for stops and slowings, the 1¾-hr. non-stop *Bristolian* schedule operated until last September had been improved on by the Pullman "flyer" with a weight, in all, of about 375 tons.

On its evening run from Paddington this diesel express now provides the quickest service of the day to Bath, first stop, in 95 minutes; also to Bristol, in 1 hr. 55 minutes.

"WARSHIPS" GAIN TIME

A fine effort by No. D810, *Cockade*, one of the "Warship" B:B 2,200 h.p. diesel-hydraulic locomotives now operating in considerable numbers along the London–Bristol and West of England main line routes, was recorded a little while ago in the westbound *Bristolian* by Mr. D. S. M. Barrie, M.B.E.

There were two slowings for repair work, one very severe, before Slough. Very fast travel from that point onwards yielded an average of nearly 83 m.p.h. for 80 miles between Maidenhead and the outskirts of Bath, 90 or just over being attained three times along that splendid high-speed course. The Steventon–Chippenham time almost tied with my "record" previously mentioned, although in this case not to a stop, but passing the latter town at 70 m.p.h.

There was a momentary signal stop at Bath Spa, preceding a crawl over a viaduct under reconstruction, but even so, 107 miles from Paddington had been covered in 90 minutes. Bristol was reached with seconds to spare within the 1¾-hr. schedule then applicable, and with an extra coach on the train—the normal seven increased to eight on busy days—weighing in all about 295 tons full. Speeds by these locomotives are kept nearer to an 80 m.p.h. maximum at present. The current *Bristolian* time in each direction of almost two hours, including a Bath stop, allows for a 10-coach train, with a recovery margin.

As mentioned in these notes last September, revised W.R. timetables introduced during that month, featuring expresses running at more regular intervals, afford considerable improvement in service to and from principal intermediate points and involve faster start-to-stop running. For example, four Bristol–Paddington trains are allowed only 38 minutes for the 41¼ miles from Swindon to Reading. No. D807, *Caradoc*, improved upon this to the extent of 2¼ minutes, averaging over 69

The down "Pembroke Coast Express" passing the locomotive sheds at Canton, Cardiff, in charge of No. 5006 "Tregenna Castle", an engine well-known for its record-breaking exploits 30 years ago. Photograph by A. F. Smith.

Diesel-hydraulic locomotive No. D802 "Formidable" heads an up express through West Drayton. Photograph by C. R. L. Coles.

m.p.h. start-to-stop, with stretches at 80–84, after rapid acceleration. On towards Paddington running was similar, West Drayton, 22¾ miles, being passed in 19¾ minutes. After a slow approach we stopped in the London terminus in 34½ minutes for the 36 miles from Reading restart. We were before time, although Swindon had been left over five minutes late, and Bath eight minutes! There were "10-on", about 350 tons, plus the 78-ton "Warship".

STEAM ACTIVITY CONTINUES

At the time of writing, the 30 King class engines are divided between London (Old Oak Common), Wolverhampton (Stafford Road) and Cardiff (Canton) Depots. Introduced in 1927, they are the most powerful of the former Great Western Railway's comprehensive array of 4–6–0s. I saw four Kings recently at Paddington within half an hour, two heading South Wales expresses (on which Britannia Pacifics are no longer seen), and two on Birmingham-line trains, including the up *Cambrian Coast Express* which arrived four minutes early.

Pending further extension of diesel services those are now their two main routes, and they are supplemented by the smaller and much more numerous Castle four-cylinder type. Castles also are still used for principal Gloucester–Cheltenham, and Hereford–Worcester, services to and from Paddington, as well as express, cross-country and more local trains in many areas. County, and the more widely distributed Hall and Grange, two-cylinder 4–6–0s are seen to a considerable extent on more generally mixed traffic duties.

Consecutive express departures that I observed from Paddington were powered as follows: 4.30 p.m. *Mayflower* to Plymouth and Cornwall; 4.45 to Bristol and Taunton, Warship diesels; 4.50 *Birmingham Pullman*, 4.55 *South Wales Pullman*, diesel-electric multiple-unit sets; 5.0 *Cheltenham Spa Express*, 5.10 to Wolverhampton, 5.15 *Cathedrals Express* (Oxford–Worcester–Hereford) respectively Castle, King and Hall 4–6–0s.

No. 7015 "Carn Brea Castle" with double chimney, fresh from the shops at Swindon, posing for the camera of M. G. Martin.

A MILLION INQUIRIES!

It is estimated that one million personal train journey inquiries are dealt with each year at Paddington Station; together with the handling of more than 700,000 seat reservations, orders for 41,000 sleeping berths, some thousands of bookings for the thriving London–West of England car-tourist services in summer, and much other preliminary work in connection with passenger travel in England and to Southern Ireland. In 1961, camping coaches—with 60 coaches available at 43 sites—produced 3,400 inquiries. These led to 2,800 applications with 1,088 weeks booked.

To cater attractively for the stream of public callers and combine hitherto-scattered sections around the station, a palatial two-storey inquiry centre has been built and opened adjacent to No. 1 departure platform. The spacious first-floor hall displays some beautiful models of railway equipment—modern and historic—and provides small tables and comfortable seating. Counters, and an enclosed private inquiry office, cater for all types of reservations, including the issue of sailing tickets for passages from Fishguard Harbour to Eire during busy periods.

There is a large volume of postal business. Thirty-nine clerks are employed, as well as fourteen girls trained specially to read timetables and answer train inquiries by telephone. These may amount to 3,000 a day!

Installed behind the scenes in this centre is a closed-circuit television screen notifying the running times of all up trains on departing from, or when passing, Reading, Slough and Southall. Up-to-the-minute information can thus be given regarding expected arrival times of expresses. It is also simultaneously received at Paddington in the Arrival Signal Box, the Inspector's office at the adjacent shunting yard, and in the Running and Maintenance (Locomotive) Department, etc.

DINKY TOYS NEWS

BY THE TOYMAN

A Continental Airliner And New U.S. Sedan

AS this is January, and the start of another year, I will begin by wishing all my readers a Happy New Year. I hope you have all recovered from the mince pies and rich food of Christmas and have made your New Year resolutions.

Many enthusiasts have probably resolved to enlarge their collection as much as possible and are, even now, looking for new models to add to them. If this is so, I am sure they will not be disappointed with the two new Dinky Toys about which I am going to talk this month—the Caravelle SE 210 airliner and the Ford Fairlane.

The Caravelle, No. 997 in the Dinky Toys list, is a miniature of a famous airliner and lends itself to most effective use, as the picture above shows.

The actual aircraft is manufactured by Sud Aviation of France, who are also the designers, but power is supplied by twin Rolls-Royce Avon RA 29 engines situated on either side of the fuselage immediately in front of the tailplane.

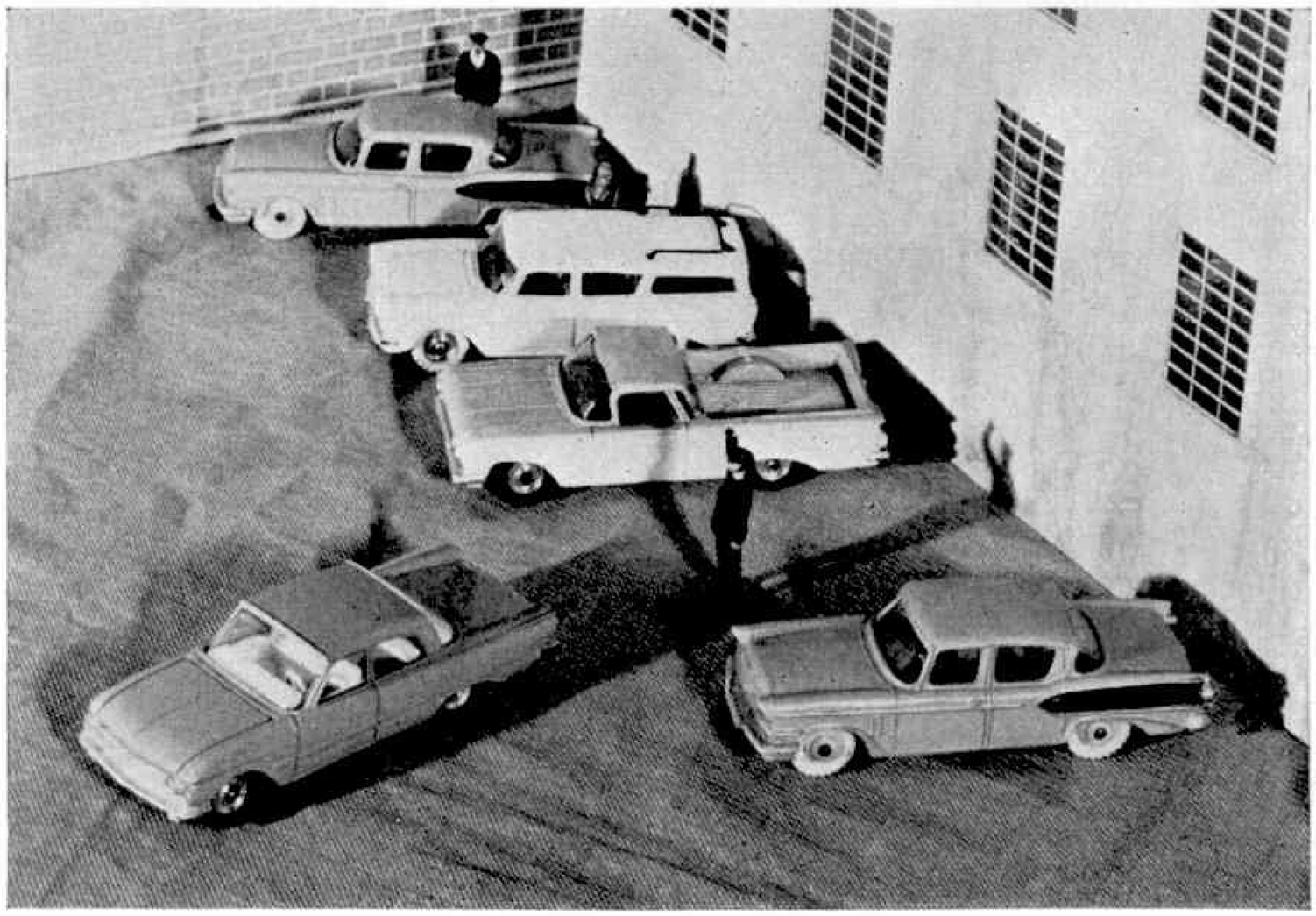
The Caravelle has a wing span of 112 feet 6 inches, is 105 feet long and has an overall height of 28 feet 6 inches. In spite of its relatively small size for a modern airliner, the 'plane will seat from 64 to 80 passengers and carries a maximum load of 92,600 lbs. It requires a normal take-off power of 2 × 10,500 lbs. static-thrust and a take-off run of 6,350 feet, but once in the air can cruise at 405 knots for a maximum range of 2,000 nautical miles. Taken by and large it is indeed a remarkable aircraft.

The Dinky Toys model, finished in the distinctive colours of Air France, and with that airline's insignia, has a wing span of $7\frac{1}{8}$ inches and a length of $6\frac{3}{4}$ inches. The undercarriage consists of two pairs of wheels on either side of the model, plus a double nose wheel—10 wheels in all. Perhaps the most novel aspect of this fine new model is the hinged staircase, towards the tail end of the fuselage, which can be raised and lowered—just like the real thing. On closing, the staircase clicks into position by means of a locking spring.

You will find this new aircraft model illustrated in colour on the rear cover of this month's *M.M.* An enlarged section gives prominence to the movable staircase.

The action shot of the Caravelle at the top of the page, to which I referred earlier, shows the 'plane turning into line above some trees, before landing. The slightly

Reversing into a parking place, with assistance from an attendant, is the new Dinky Toys Ford Fairlane.



Above: The Caravelle comes in to land—but the 'plane is, in fact, a Dinky Toys model.

A proof of the accuracy of detail in Dinky Toys models is the picture on the left. In it the Dinky Toys miniature of the Volvo 122S B18 saloon is photographed against the Albemarle Street, London, Showrooms of Volvo Concessionaires Ltd. Modelled on the 1·7 litre quality car from Sweden this miniature is finished in the authentic red colour of the actual vehicle, and is No. 184 in the Dinky Toys range.

overcast sky points to the fact that there is the possibility of a storm. I am sure that most readers, at first glance, thought —as indeed I did—that the photograph was that of a real aircraft making its landing approach. In fact it is a trick shot of the Dinky Toys model, taken by a staff photographer using the apparatus described in these pages last September, plus one or two extra items. These consist of a strip of wood placed above one edge of the detail paper, and raised above it, and some imitation trees placed across the strip of wood. If miniature trees are not available, small branches of firs will do.

The model to be photographed was placed on its tail with its nose pointing upwards towards the camera. The illustration proves what remarkable results can be achieved.

The Dinky Toys Caravelle will enhance any airport scheme. To give our readers some idea of the type of layout that can be achieved I have included, at the foot of this page, a picture of an airport scene in which good use has been made, in conjunction with Dinky Toys model aircraft, of the three Dinky Supertoys Nos. 967, 968 and 969 which form our popular "Television Trio".

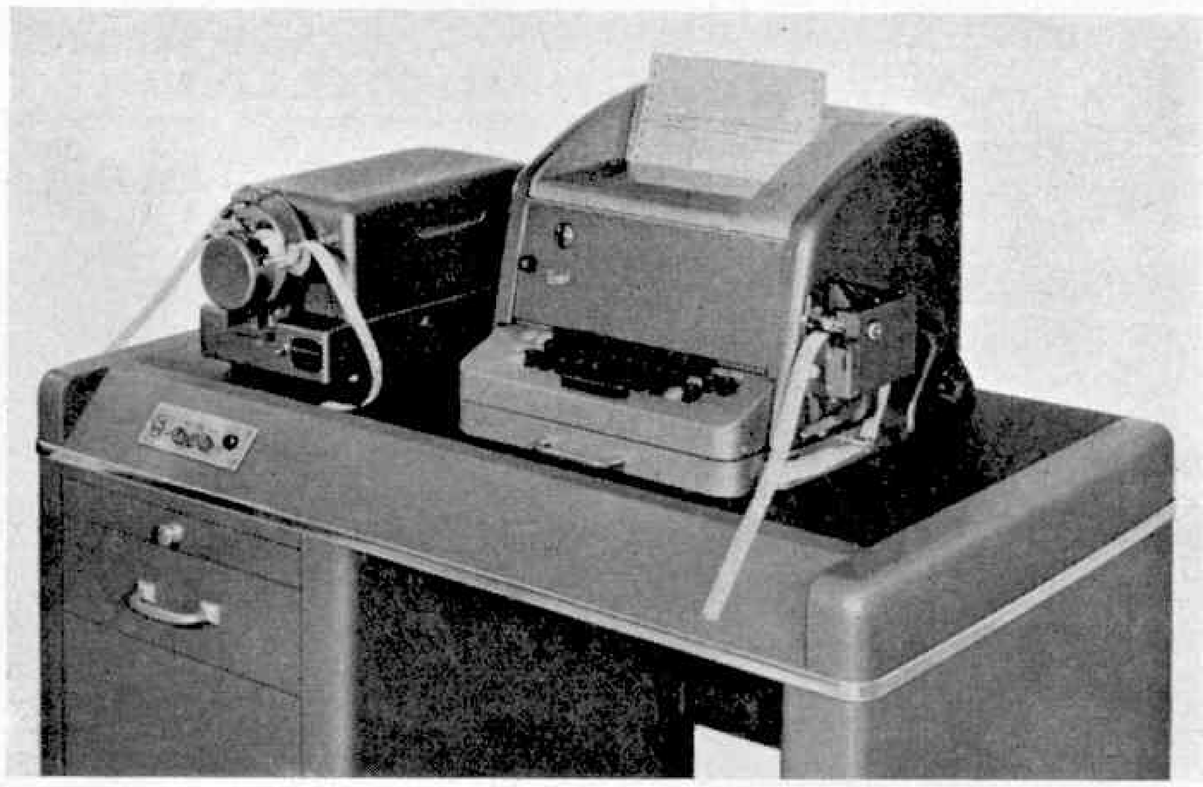
Now to the second model to be released this month—the miniature of that well-known American sedan, the Ford Fairlane. Fitted with fingertip steering, suspension, windows, seats and steering wheel, the model is $4\frac{3}{8}$ in. long by $1\frac{9}{16}$ in. wide. The bodywork is finished in a pleasing light green gloss, the interior is cream and the bumpers and radiator grilles are silver. I would say that this model, No. 148, is one that any collector would be proud to possess.

The actual vehicle is manufactured in Detroit, Michigan, U.S.A., but is also assembled in Canada for Commonwealth markets. The overall dimensions of this powerful sedan are: length 17 ft. $5\frac{9}{10}$ in., width 6 ft. $7\frac{7}{10}$ in., height 4 ft. 7 in. It has a wheelbase of 9 ft. 11 in., a front track of 5 ft. 1 in. and a rear track of 5 ft. A purchaser has the choice of either of two engines—a Thunderbird V–8 or a Mileage-maker Six. The former develops 205 horsepower, and has a capacity of 332 cubic inches with a compression ratio of 8·9 to 1, while the latter develops 135 h.p. and has a capacity of 223 cubic inches with a compression ratio of 8·4 to 1. Both are powerful, and they combine

(*Continued on page 43*)

Right: A close-up of the latest Dinky Toys car, the Ford Fairlane. Below: Television Vehicles and Aircraft from the Dinky Toys range make up this exciting airport picture.

British Teleprinter Triumphs



This "Model Seventy-Five" teleprinter is fitted with a tape punching device which provides a punched tape of the message typed or received on the machine. Alongside is an Automatic Transmitter which can transmit the message from the coded tape.

A NEW British teleprinter has, it is claimed, put this country ahead of the world in the design and manufacture of telegraph machinery. The "Creed Seventy-Five" is a triumph for Creed & Company Limited of Croydon, who have manufactured teleprinters and other telegraph machinery for more than 50 years. The word telegraphy means, literally, "writing at a distance". Imagine a typewriter connected to two wires at the other end of which is another typewriter. Whatever is typed on one machine is printed on both. That is the general idea of teleprinters. Therefore telegraphy is the science of transmitting written or printed messages by electrical means from one place to another.

Reuters, the world famous news agency, has teleprinter links with its offices all over the world. A message typed on a teleprinter in the Fleet Street office can be routed to New York, Hong Kong, Melbourne or practically any part of the world.

* * * *

Although "Creed" is now one of the world's leading manufacturers of telegraphic communication equipment, the company had a humble beginning.

Frederick Creed, a morse telegraph operator working for Western Union and the Central and South American Telegraphy Company, had a good idea. He wanted to build a machine on which the morse code could be punched on tape by typing out the message on a keyboard similar to that on a typewriter. He visualised feeding the tape into one machine which would transmit the code to a second, distant, machine which would punch the code on tape. The next stage would be to feed the tape into still another machine which would decode the morse and print the message in Roman capitals.

He gave up his job and set up his "factory" in a private house in Croydon. With the help of a few mechanics he set about developing his idea. From this beginning Creed and Company Limited was formed in 1909. The new company developed and produced the machines which were soon adopted by the British Post Office and many more telegraph (cable and telegram) companies. However, none of these early machines hit the jackpot. It was not until the late 1920's that Creed really got into the headlines with the Model 3 Teleprinter. This machine printed the message in Roman characters direct

By TERRY QUINN

on to a strip of tape without the intermediate use of punched paper. The message was printed straight on to gummed tape which was cut up into suitable lengths and stuck to sheets of paper. This system was adopted by the British Post Office in favour of the earlier machines and is, in fact, still in use today.

While this system of printing on a continuous roll of gummed paper was ideal for the Post Office Telegrams service, since all unwanted letters and words could be cut out of the tape before the message was passed on to the public, it proved a nuisance to business offices. It was because of this inconvenience that the Model 7 Teleprinter was developed and put into general production in 1931–32. The Model 7 was designed to print the message on a paper roll which moved in a carriage similar to that of a modern typewriter.

The "Creed 54"—the last model to be manufactured using the basic principles of the Model 7 Teleprinter. Photographs by courtesy of Creed & Company Limited, Croydon.

This new machine has undoubtedly become the most famous of all Creed products to date. So far more than 75,000 Model 7 machines have been manufactured and exported to all parts of the world.

The machine consists of two main parts —a keyboard transmitter and a receiver. The keyboard transmitter converts the operator's key depressions into suitably coded electrical signals. These coded signals, or electrical impulses, are then transmitted by land line or radio link to the receiver section of the teleprinter in the distant station. The "receive" mechanism decodes the signals and prints the message on a roll of paper. Briefly, this is done by passing the incoming electrical impulses through an electro-magnet which moves an armature back and forth. The movements of the armature are transferred mechanically into a "Combination Head"—the brain of the receiver. A revolving typehead containing the alphabet, numerals and punctuation marks is stopped at a position depending on the incoming signal. A hammer then strikes the type which has stopped opposite the printing point and the character is printed.

The Model 7 teleprinter has a maximum speed of 66.6 words per minute (considering a word as having an average of five letters and a space).

During the following years the Model 7 was improved and added to many times. New models, the "47" and "54" were produced in 1947 and 1954 respectively. With these models Creed's research technicians had reached the ultimate, using the basic principles of the Model 7, and so about this time work began on a basically new teleprinter of light weight and exceptionally small dimensions, using completely new principles.

(*Continued on page 43*)

Second Winter Model-Building Contest

Bigger Prizes For Winning Models

A fine model of a Canadian Caboose built by G. Gingras, M.D., of Montreal. It was awarded a prize in a recent Meccano competition.

THE Winter Model-Building Competition No. 1 closed for entries on December 31 last and within the next few weeks we shall be despatching letters to the prize-winners notifying them of their success.

Now we are announcing details of the second of our series of winter competitions and, as usual, this contest is open to every owner of a Meccano Outfit.

In these contests we are offering cash prizes—which are considerably bigger than those awarded in recent competitions—for the most original and best-built Meccano models of any kind. Models need not be confined to the parts actually contained in a given Outfit. Any quantity of extra parts may be used as required. You will find the prizes to be awarded in the panel at the top of column two.

HOW TO ENTER

If you wish to enter this competition all you have to do is to think of a new model and then to set to work to construct it, as neatly and realistically as possible, from standard Meccano parts. Models that are merely copies of models shown in Meccano Instructions Books or other Meccano publications will not, of course, be eligible.

When you have completed your model the next thing is to obtain either a good, clear photograph, or, if this is not possible, make a good sketch of it, and send this to us. **The actual model must not be sent in any circumstances.** However, if you cannot obtain a photograph and you are not much good at sketching, you can ask one of your pals to make the sketch for you. The model itself, however, must be your own unaided work.

It is also advisable to enclose with photographs or drawings a short description of the principal features of your model, mentioning any points of special interest you wish to bring to the attention of the judges.

EQUAL CHANCE FOR ALL

The competition is open to model-builders of all ages living in any part of the world, and in order to give everyone a fair chance entries will be divided into two separate Sections as follows: Section A, for competitors who will be under 14 years of age on March 31 next; Section B, for competitors aged 14 years or over on that date. In each of these Sections a separate set of prizes will be awarded, and full details of these are given in the panel above.

The judges will award the prizes for models that are most original in subject, and are well-proportioned and sturdily constructed. Competitors who possess only small Outfits need not feel they will not stand much chance against competitors with large Outfits at their disposal. Small, well-built, sturdy and original models will have a far better chance of success than a large and complicated structure that is rickety in construction and poor in design, and which does not show much originality in its subject.

The following notes may be helpful to competitors, especially those who have not entered a *Meccano Magazine* model-building competition before:

You may choose any subject you like for your model, but you should be careful to select one that you can reproduce realistically with the Outfit you possess. For instance, if you have only a small Outfit it would be difficult to make a really good model of a large type of crane. If, on the other hand, you choose a simple truck or windmill as your subject, the probability is that you will be able to make a really good job of it. It will also help you on the way to success if you choose a model that "works".

HOW TO POST YOUR ENTRY

Before posting your entry write your age, name and address, and the letter A or B, indicating the Section in which you are entering, in block letters, on the back of each photograph or drawing. You should address your envelope: "Winter Model-Building Competition No. 2, Meccano Limited, Binns Road, Liverpool 13".

CLOSING DATE

Intending competitors should note that this competition will remain open for entries until March 31 next. Entries may be sent in at any time between now and the closing date.

THE PRIZES

The following prizes will be awarded in each Section of the Competition:

SECTION A

(Competitors under 14 years of age on March 31 next)

First Prize	**Cheque for £5.5.0**
Second Prize	**Cheque for £3.3.0**
Third Prize	**Cheque for £2.2.0**
Ten Prizes each of 10/6	

Certificates of Merit also will be awarded in this Section to those competitors whose entries just fail to reach prize-winning standard.

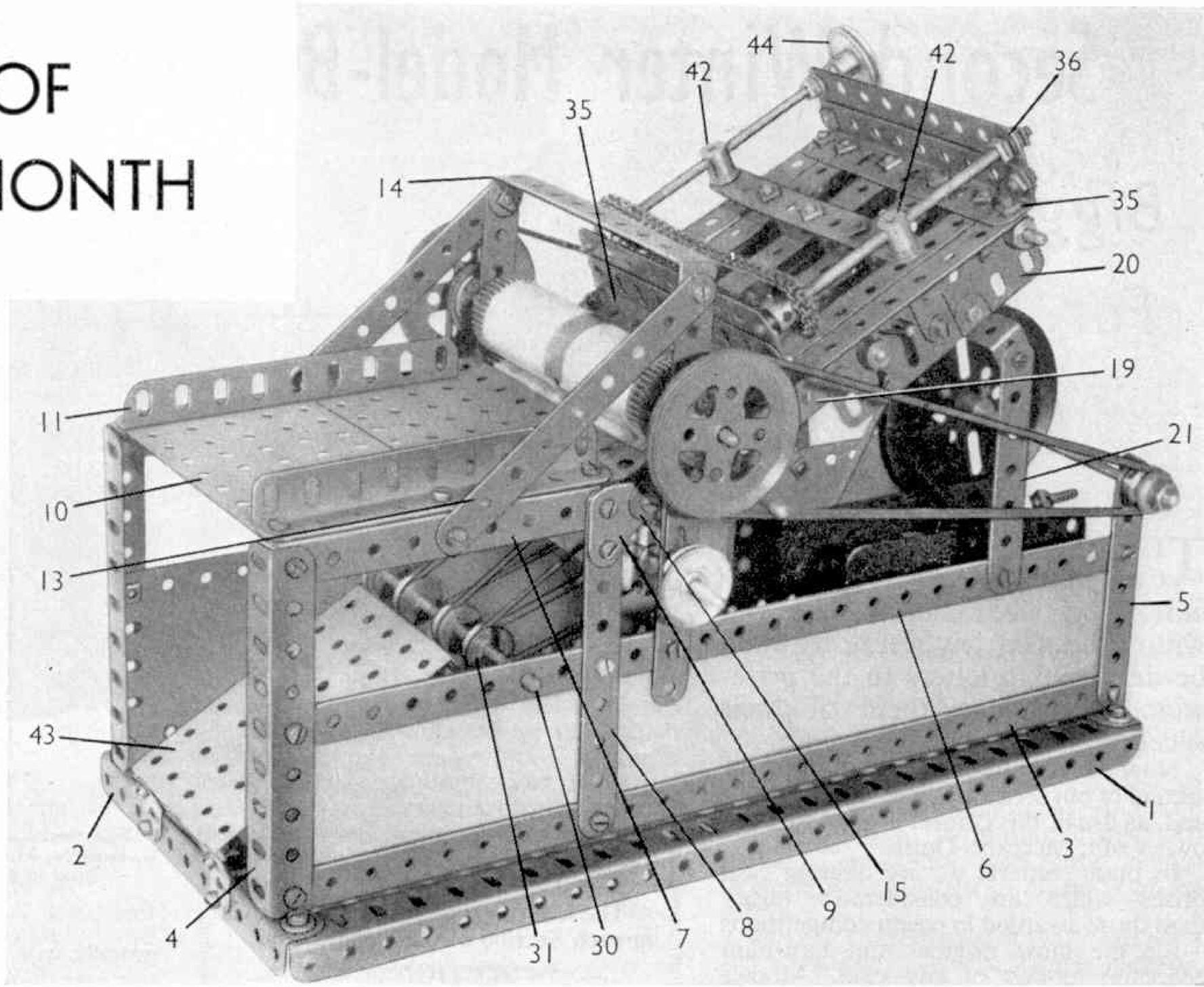
SECTION B

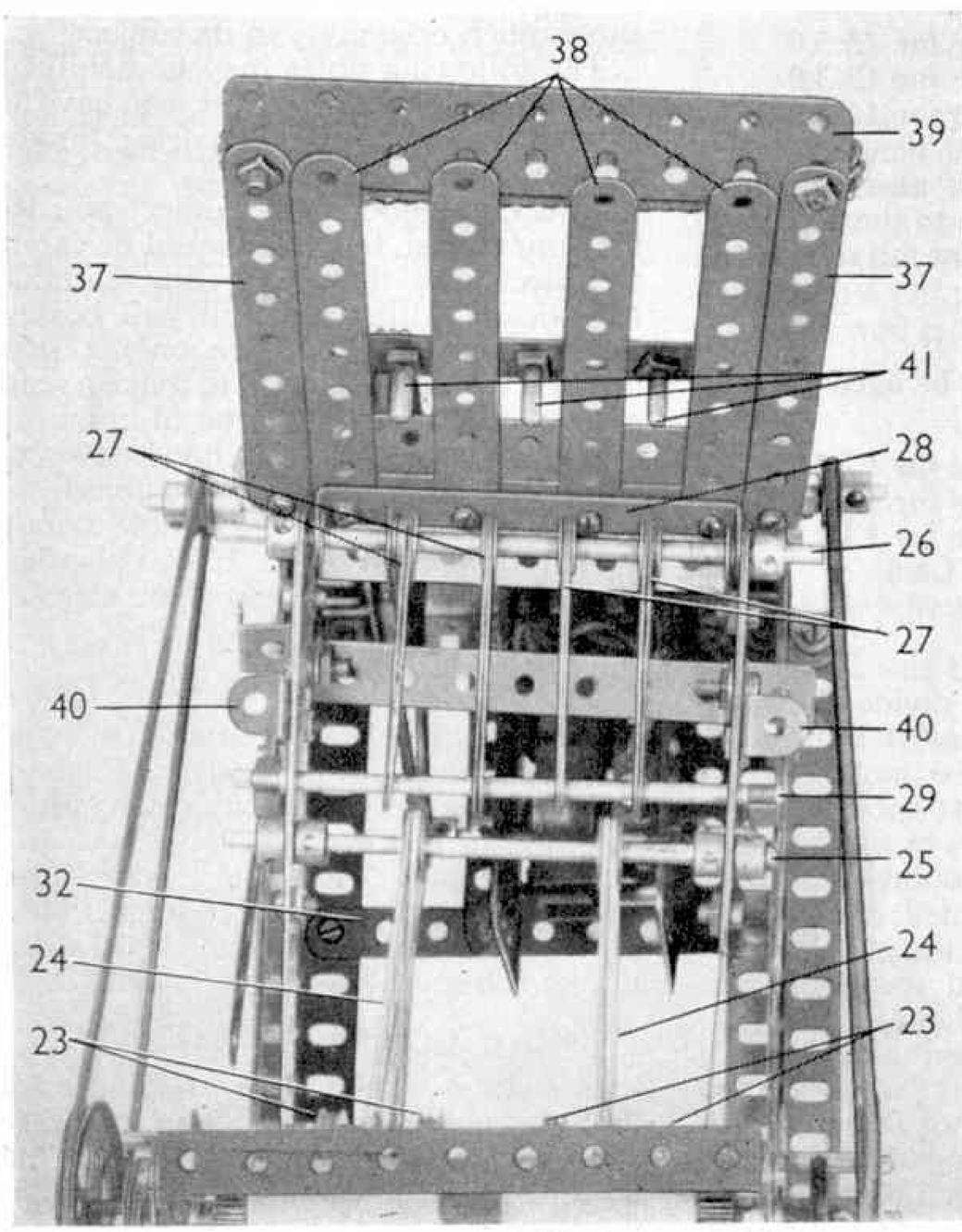
(Competitors who will be aged 14 or over on March 31 next)

First Prize	**Cheque for £7.7.0**
Second Prize	**Cheque for £5.5.0**
Third Prize	**Cheque for £3.3.0**
Ten Prizes each of £1.1.0	

MODEL OF THE MONTH

Meccano Paper-Folding Machine





IN the "Model of the Month" series I like to include, as often as possible, models of the more unusual types, and especially models that "do something".

Regular readers will no doubt remember the Automatic Box Filling Machine, the Wire Covering Machine, Adding Machine and Automatic Penny-in-the-slot Gift Machine models that have appeared in past issues. All of these proved most popular, and it seems that this kind of model-building makes a special appeal to those who have good stocks of parts available and desire a change from the ordinary run of models such as cranes and motor vehicles, attractive as they may be.

BY SPANNER

For January, therefore, I have chosen as the "Model of the Month" a neat model Paper-Folding Machine. This is shown complete in Fig. 1 and although externally it possesses no special appeal, it is really interesting to construct. You will find that its assembly and adjustment will provide a very pleasant leisure time occupation.

By studying the illustrations on this and the opposite page you will be able to obtain some idea of how the machine works.

Fig. 1 (Top). The completed model of the Paper Folding Machine. Fig. 2 (Left) Rear view of the Machine.

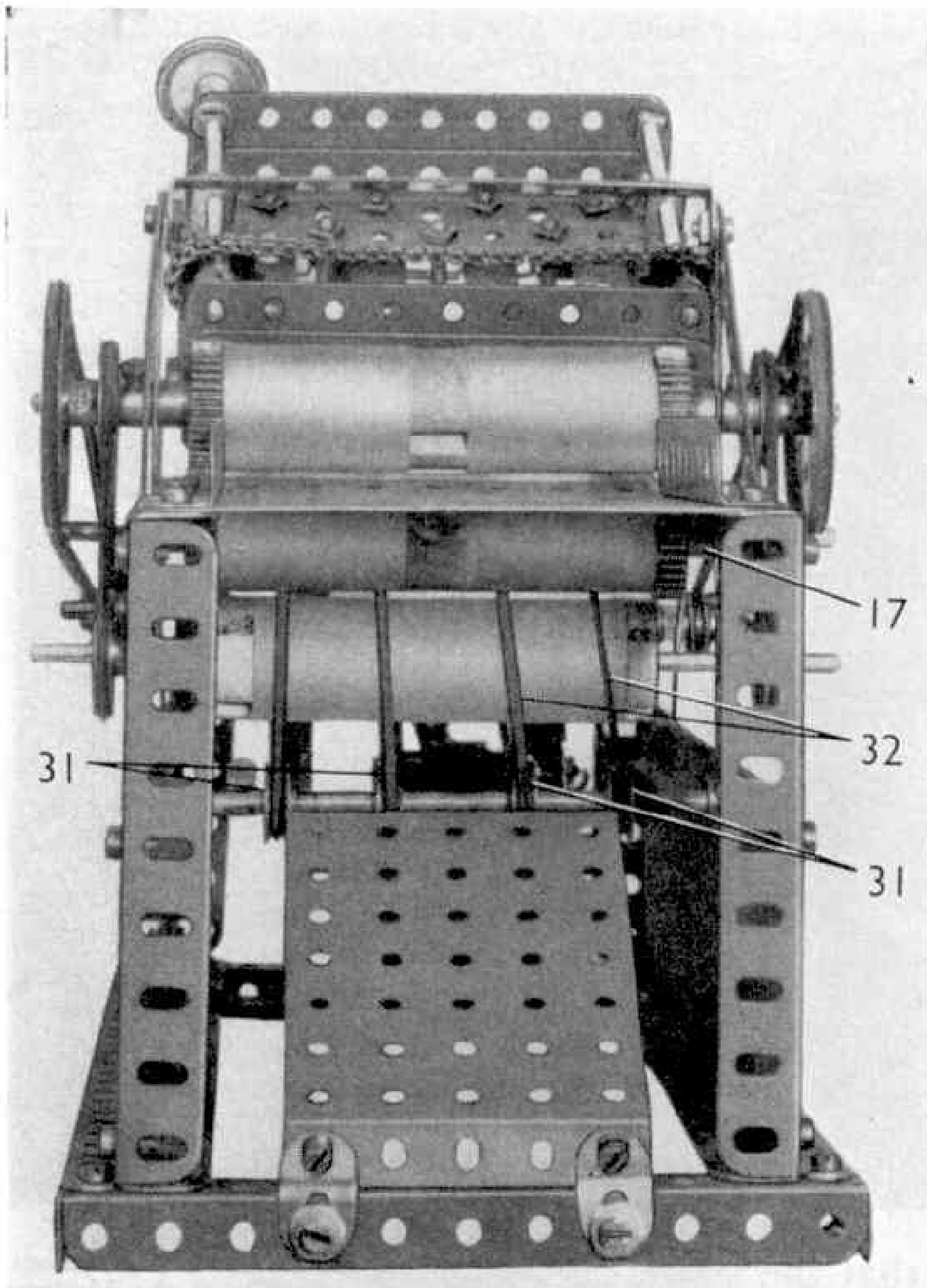


Fig. 3. The Paper Folding Machine seen from the front, or feed-in end.

It is designed to take a sheet of paper and fold it across the centre. The paper, which should measure about 3 in. × 7 in. is placed on the feed-in table 10 and pushed towards revolving rollers on the Rods 17 and 18. These carry the paper forward until it reaches the stop-pins numbered 41. The action of the rollers then causes the paper to bend slightly, and at this stage the Driving Bands numbered 32 feed it between a further pair of rollers, from which it emerges creased or folded.

Unusual Mechanical Action

This month's model is based on a machine which has quite a wide application in modern commercial life. The automatic paper folder is a necessary adjunct in many big offices. The model has the further advantage of demonstrating a somewhat unusual mechanical action, and Meccano builders should find nothing difficult in its construction.

I am quite sure that many readers will want to build this model and, as usual with these "Model of the Month" subjects, I have prepared full constructional details and any reader who would like to receive a copy free of charge has only to apply to the Editor, enclosing a 3d. stamp to cover return postage. Application should be made as soon as possible as, naturally, stocks of the instructions leaflets are not unlimited. Readers living in Canada, Australia, New Zealand, Republic of South Africa, Ceylon, Rhodesia, Italy, and United States of America, should not apply to the Editor but to our main Agents in those countries, enclosing of course suitable stamps.

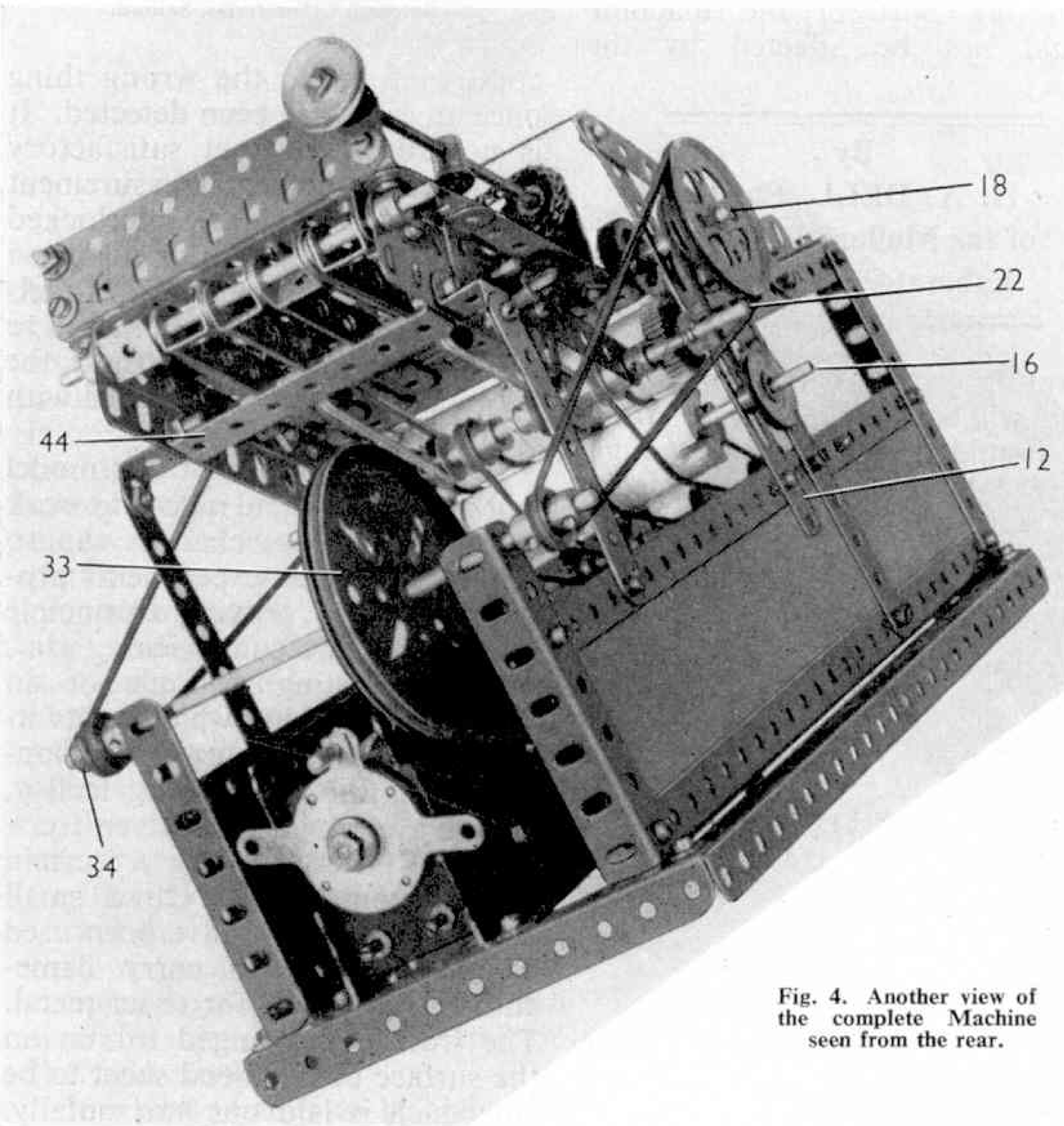


Fig. 4. Another view of the complete Machine seen from the rear.

NEW BOOK FOR PET LOVERS

Almost every youngster likes to keep a pet, whether it be a dog, cat, rabbit or small creatures such as white mice, and it is not surprising to learn that, apart from dogs and cats, there are more pet birds and other creatures in British homes than ever before. **Pet Lovers' Dictionary** by Jack Aistrop (Arco Publications, price 16/–) is a "must" for such enthusiasts. It offers advice on keeping, feeding and housing a wide variety of animals, birds, fish and reptiles, and includes useful information about societies connected with animals, legal matters, publications, and many other topics of interest to both new and experienced pet owners.

The book has the great merit of being written from personal experience, as the author, who has written many books on Nature, has kept, at one time or another, every creature mentioned in this book; and has had many successes in breeding unusual animals. Aistrop is married to Josephine Hunter, whose radio and TV programmes on animals are often based on creatures in their private collection. Now their small daughter is adding even more pet animals to the home.

Many charming line drawings by Roger Simons, and half-tone illustrations, add to the value and interest of the book.

Meccano's Uses In Industry

AN AUTOMATIC TROLLEY

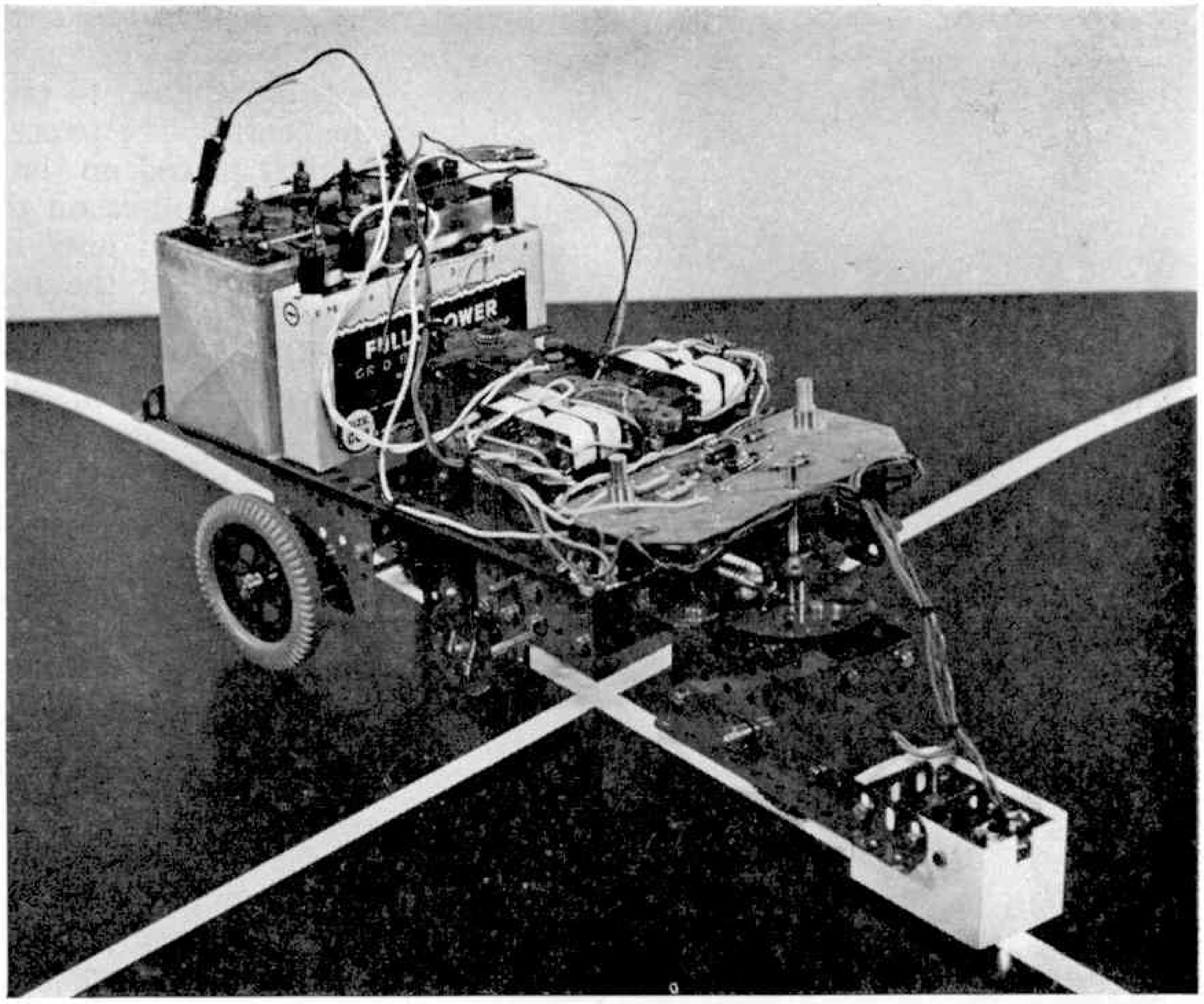


Fig. 1. This photograph and the other illustrations in this article appear by courtesy of the Mullard Research Laboratories, Salford.

TOWARDS the end of a working spell a human, from tiredness, will always work less well than when he was fresh at the beginning. He will work more slowly and less exactly, so that serious mistakes will occur more often. For this reason, in industry, more and more automatic machinery is being used. This is partly to make working easier, but it is also to prevent the tiredness of humans from affecting what is being done.

Automatic lathes, drills and other machine tools are all being used for the finest work. Automatic weighing and measuring apparatus checks their performance. Automatic handling machines move whatever is being made from place to place, from machine to machine.

There are always two quite distinct things which an automatic machine has to do: it must be able to measure what it is doing, and it must be able to act on what it finds out. It is most important that the measuring part of the machine should not be affected by the operating part, or false measurements will be made. The measuring part should also act quickly enough to prevent the operating part from continuing to do the wrong thing once an error has been detected. It is not surprising that satisfactory machines in which measurement and action are so closely interlocked can only be made after repeated tests of alternative methods. Models of important parts are often used to try out ideas, and based on these, the final machines can be designed with confidence.

By
H. A. DELL, Ph.D.,
of the Mullard Research Laboratories, Salford

In the early stages of this model work it is very useful indeed to work with Meccano, as changes can so easily be made as experiments proceed. Even for proving a principle such models are convenient.

An interesting example of an automatic machine which lends itself particularly to a model demonstration is the self-steering trolley. This is a mechanically-driven truck which is steered along a certain route automatically. On a small scale, such trolleys have been used for some years to carry flame-cutting equipment for sheet metal. The trolley is arranged to run on the surface of the metal sheet to be cut which is laid out horizontally.

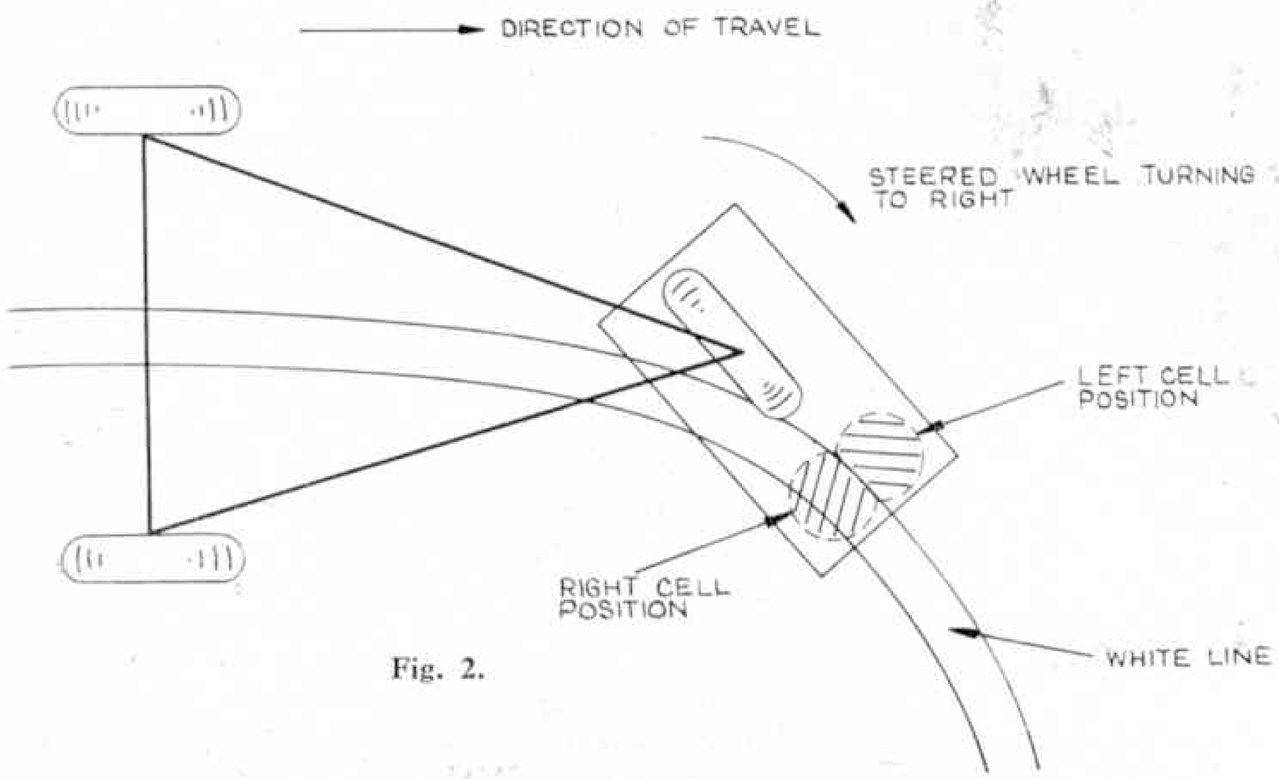


Fig. 2.

Diagram showing tricycle trolley negotiating a right-hand bend.

A white line is marked on the sheet showing the shape to be cut out and the trolley is made to follow this line, cutting as it goes. By this means intricate shapes can be cut out repeatedly and accurately.

More recently larger trolleys have been used which, unaided, convey goods about a factory. As small tractors, they run on the factory floor, following a route previously marked out in white paint. When a different route is needed it is only necessary to alter the markings on the floor. Of course, arrangements have to be made to start and stop the trolley at the ends of the route either by hand or automatically. Arrangements are usually included as well to stop it at once if it leaves the white line altogether because of some mishap. More complicated control facilities can be included.

To make a trolley self-steering it must have attached to it some sensing device which can tell it which way it has to steer. In addition to this, it must have some actuator coupled to the sensor which will turn the steering shaft to keep it on the right track.

If a white line is to be followed, the sensing device must be able to distinguish the white line from the dark floor. Some form of photo-electric cell which gives an electrical signal when it is illuminated is normally used for this and is arranged facing downwards. When it lies over the line, which is illuminated by a lamp, a signal is generated which does not exist when it is off the line on the dark surface. Like this, a single photo-cell cannot tell the trolley which way to steer but can only say if it is on the line or not. So two cells are used, placed a little distance apart, side by side. The left-hand cell is connected to the actuator in such a way that when light falls on it the trolley turns to the left. The right-hand cell is oppositely connected so that when light falls on it the trolley turns to the right.

In operation, when the trolley finds itself a little to the left of the line (Fig. 2) more light falls on the right cell, so it turns to the right. Likewise, if it is too far to the right, it steers left. Of course, the trolley is steadily moving forward all the time. If the line is straight it steers a straight course, but when the line curves away to right or left the correct steering motion is introduced to follow it.

The steering mechanism itself can take many forms. The direct pull from an electro-magnet, controlled by the photo-cells, can be used to work a tiller-like steering arm. Unfortunately only small turning angles can be produced this way. A better method is to use an auxiliary

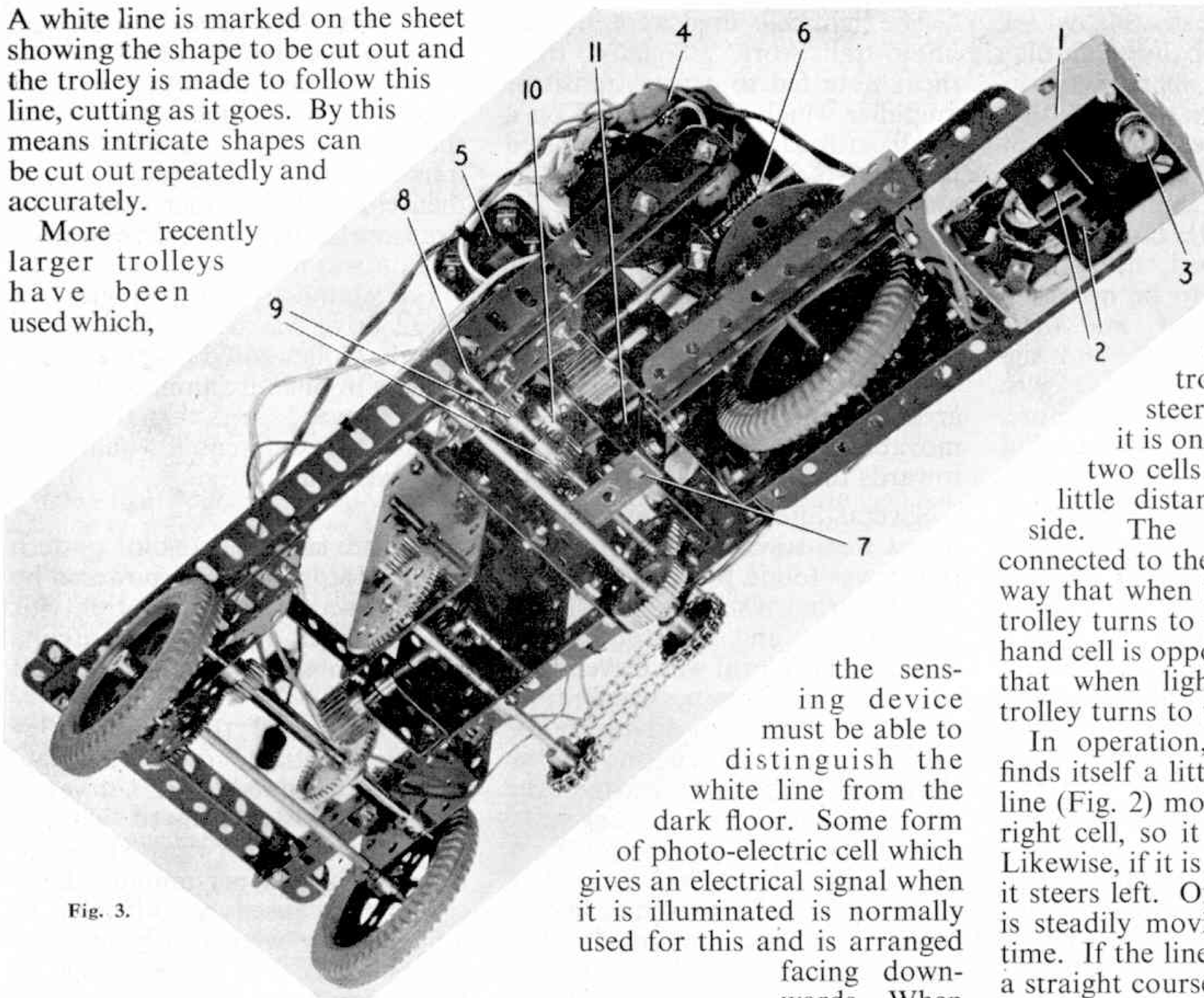


Fig. 3.

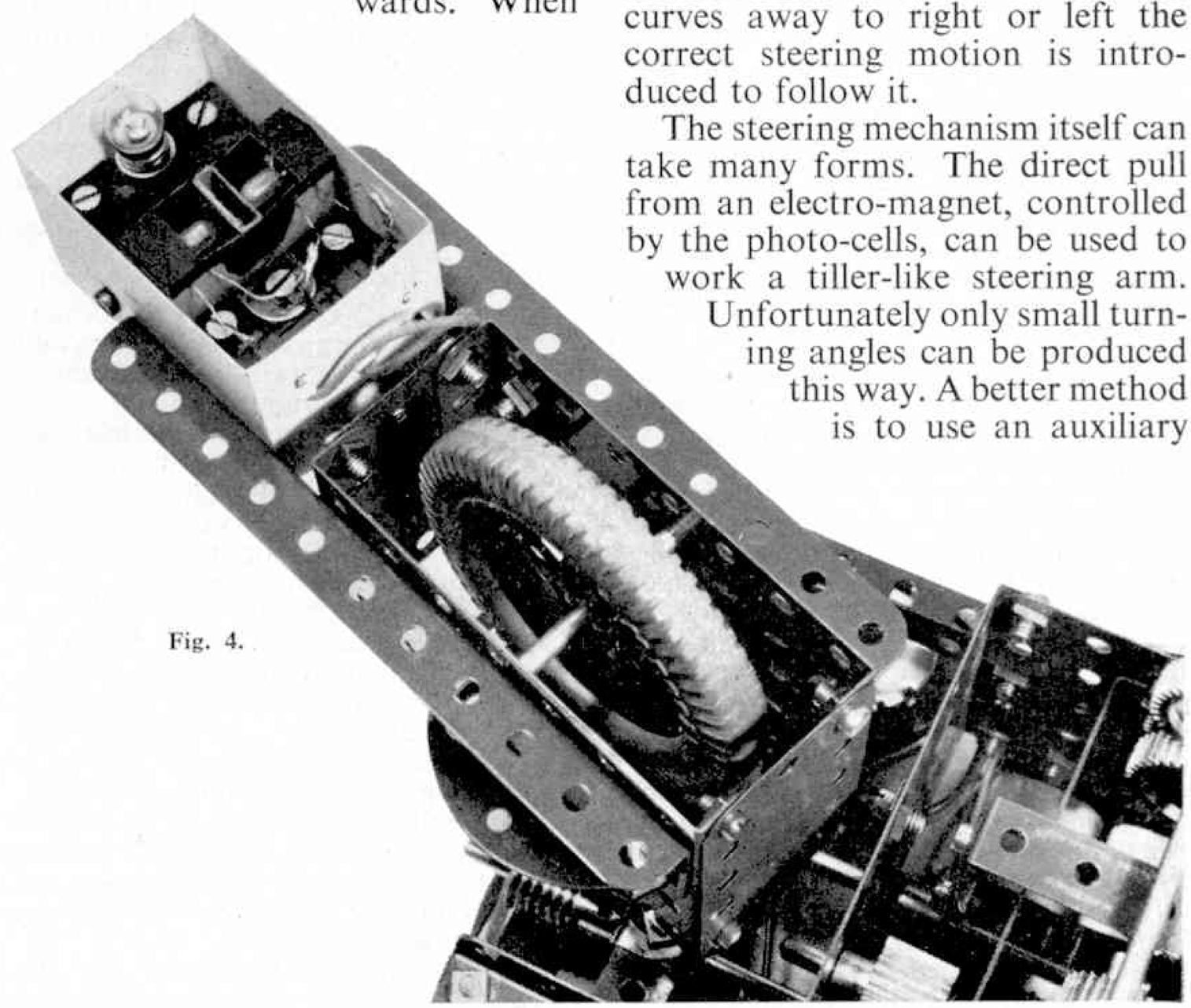


Fig. 4.

shaft drive, like a steering wheel, which can build up large turning angles if necessary. Sharper corners can then be negotiated, but they must be approached and left by gentle curves or the trolley may be unable to change course quickly enough to follow the line. Whichever method is used, quite large currents are likely to be necessary to work the actuator, and these must be controlled by the tiny signals from the photo-sensitive cells. Valve amplifiers have, therefore, often been necessary in the past, but transistors which are now available work from much lower voltages and need less power to do the same work. On models they are particularly useful as they are so small.

* * * *

The Meccano model on which a number of these different ideas were tried out is illustrated in Figs. 1, 3 and 4. It was a tricycle trolley steered by the front wheel. Attached to the front wheel housing and steered with it was a shaded light box (1), Fig. 3, in which the two photo-cells (2) were mounted. They were in separate compartments facing downwards to the left and right of the wheel track. A small lamp (3) also mounted in the box, was arranged to illuminate the line on the floor. The cells were shaded from direct light from the lamp but could pick up any light which was scattered from the floor.

The light cells used were, in fact, photo-transistors. Signals from them were fed to a four-transistor amplifier which was mounted on a small cardboard plate (4) supported just above the front wheel. This amplifier made the signals large enough to excite one or other of two electro-magnetic actuators (5). The electro-magnets were made up of small U-shaped stacks of Flat Strips over which bobbins wound with wire were slipped. They were arranged on opposite sides of a movable armature which was pulled towards the one which was excited.

Several different steering arrangements were tried, but the one illustrated was found to be the best. In this, the front wheel was steered by a Worm (6), and a 57-tooth Gear Wheel. The Worm was driven by a reversible gear train, which took power from the main driving motor of the trolley. When one of the electro-magnets was excited the armature swung over a cage (7), pivoted on a central shaft (11). A stud on the cage moved lengthwise along a shaft (8) on which two ½″ Pinions (9) were mounted. The shaft was continuously rotated by the drive motor via a chain and gear system. When the shaft was at one extreme of its travel one of the Pinions engaged a ½″ Contrate Wheel (10) which was coupled up to the steering Worm. As long as the Pinion was engaged, the steering shaft was thus turned more and more to one side as the trolley advanced. When the other electro-magnet was excited, the pinion shaft was driven to the other extreme position. The second Pinion then engaged the other side of the Contrate so that the reverse steering motion was introduced.

For simplicity, only single rear wheel drive was used. This meant that the trolley could follow sharper corners in one direction, due to the lower forward speed, than the other. A back axle differential would have improved this.

* * * *

In the model an old pattern 6-volt Motor was used, powered by a small accumulator. Current for the amplifier and control circuits came from this and a small 9-volt dry battery.

It was found that this trolley could negotiate quite intricate patterns of curved lines. Curves of 6″ radius were followed without failure with a forward speed of about eight feet per minute. Even crossovers caused no difficulty so long as they were nearly at right angles. This was probably due to the brevity of the disturbance which they caused.

It is by studying working models of this sort that the design of full-scale equipment can be undertaken with a clearer idea of its probable performance.

Modernising the Severn Tunnel Pumping System—(*Continued from page 14*)

Each unit consists of a single-stage, submersible, centrifugal pump, driven by a high tension, direct-on-line starting, submersible motor, running at 1,450 revs. per minute from a 3.3 KV, 3-phase, 50-cycles supply. The pumps deliver from 150,000 to 200,000 gallons of water per hour depending on the depth of the shafts, which vary from 140 feet to 200 feet.

The units are arranged in each shaft so that their 14-inch nominal bore rising mains discharge through a motorised sluice valve into the existing drain culverts. The sump water levels are maintained automatically at constant level by "throttling" the discharge of one pump per shaft, the valve control being actuated by a set of electrode probes in the sump.

The power supply is obtained from the South Wales Electricity Board through duplicate 11KV feeders and this is transformed, at site, to 3.3KV to feed the main H.V. switchboard for supplying the pumps. Two 3,300/415 volt transformers provide power for auxiliaries, lighting and heating. There are two 1,345 kW diesel alternator sets as a standby supply.

The pumping station has a central control room. The main switchboard provides switching for the pumps, standby sets, and pump discharge valves and gives indication of pump outputs, water levels in each shaft and all necessary data associated with the installation.

All the electrical equipment, which includes the switchgear control switchboard, standby sets, auxiliary transformers and cabling to each shaft, etc., was provided and installed by the Brush Electrical Engineering Co. Ltd., of Loughborough.

Work will start this year on the electrification of the tunnel ventilating system, which is also situated at Sudbrook, and this will complete the modernisation of the pumping station.

Near Pilning, at Sea Wall—on the English side of the river—duplicate, submersible, low tension units, each with a capacity of 80,000 gallons an hour, have been installed, replacing a further two Cornish Beam pumping engines.

This plant, which extracts surface water received from the English tunnel mouth, is automatically controlled and is connected by alarm relays to the control room at Sudbrook.

AER LINGUS APPRENTICESHIP SCHEME

An interesting career for a boy with an aptitude for mechanics is that of Aircraft Mechanic with an important airline. Aer Lingus–Irish International Airlines who employ some 500 skilled personnel on the servicing of their fleet, have introduced a 5-year apprenticeship scheme which is described in a special brochure just published. Readers who want further information should apply, by post card, to the Personnel Manager, Aer Lingus–Irish International Airlines, P.O. Box No. 180, Dublin, Eire.

WITH THE SECRETARY

Club and Branch News

An Enthusiastic New Club At St. Annes

SOME fourteen months after the formation of a Hornby Railway Company Branch at St. Annes Y.M.C.A., a very enthusiastic Meccano Club has sprung into being there. The Club has been started with a membership of 24, under the leadership of Meccano enthusiast Mr. G. Strangeway. There is, in fact, a waiting list for the Club already although it has been in existence only a matter of weeks.

St. Annes Y.M.C.A. is noted for its quite excellent work for young people, and in its sponsorship of the new Meccano Club—as in the case of other hobbies and recreations catered for there—it provides excellent accommodation, etc.

I had the great pleasure of visiting this Y.M.C.A. in late November to present the members of the Meccano Club with their Affiliation Certificate, and to hand the Leader's badge to Mr. Strangeway; and if the enthusiasm I met that night is any criterion the Club is in for a long and happy life. I was introduced to the members by Mr. Harry Richards, Secretary of the St. Annes Y.M.C.A., who in a very busy and active life finds time to encourage every aspect of recreational activity that is carried on in the splendid building in St. Alban's Road.

After the little ceremony I was invited by the members of the Y.M.C.A. H.R.C. to visit their section, and what a wonderful time I had. This comparatively new Branch now has a room 20 ft. × 16 ft., with a layout running round the entire perimeter and with a first-class lifting device by the doorway so that the entire track and baseboard can be raised to allow people to enter or leave the Club room.

The Branch layout has developed tremendously in twelve months, and the members now have 19 Locomotives and a large variety of Rolling Stock. The scenic effects are admirable, and the two-level layout, with a raised section which twists and turns quite cunningly, and with cuttings, sidings, sheds and everything to hand, is in every way a splendid achievement.

HORNBY RAILWAY BRANCH BEING FORMED

Hornby-Dublo enthusiasts in the Leeds area will be interested to hear that a Hornby Railway Company Branch is being formed by Mr. D. B. MacDougall, of 12 West Hill Avenue, Leeds 7. Readers who would like to join are invited to get in touch with him as soon as possible.

Ronald Timms, Secretary of the recently-formed Leconfield Close H.R.C. Branch No. 578, of Hull, Yorks., is evidently also a dog-lover. This picture was taken during a holiday in Scotland.

HORNBY RAILWAY BRANCH RECENTLY INCORPORATED

No. 579 ST. JOSEPH'S HOUSE FOR BOYS—*Chairman:* Mr. C. H. W. Champion, St. Joseph's House, P.O. Box 8059, Woodlands, Lusaka, Northern Rhodesia.

CLUB NOTES

CONSETT AND DISTRICT Y.M.C.A. M.C.—At present there are 18 members in the Meccano and Model Section, and model-building meetings are held on Monday and Wednesday evenings. A new venture is a car maintenance, general mechanics and lathework class, which meets on Tuesday evenings. Two motor car engines have been given, and with plenty of spares—gear boxes, etc.—the class has got off to a good start with six members. The sailing and canoe group—a division of the model group, meet on Thursday evenings, and during the winter are engaged in repairing and repainting their boats and canoes. Mr. Goodrum gives the Group lessons in rope splicing, knots, first aid, etc. On alternative Saturday afternoons these members visit the Durham Swimming Baths for swimming and life-saving practice, and once a month (on a Monday night) they visit the Baths in conjunction with the Durham Canoe Club for canoe and life-saving practice.

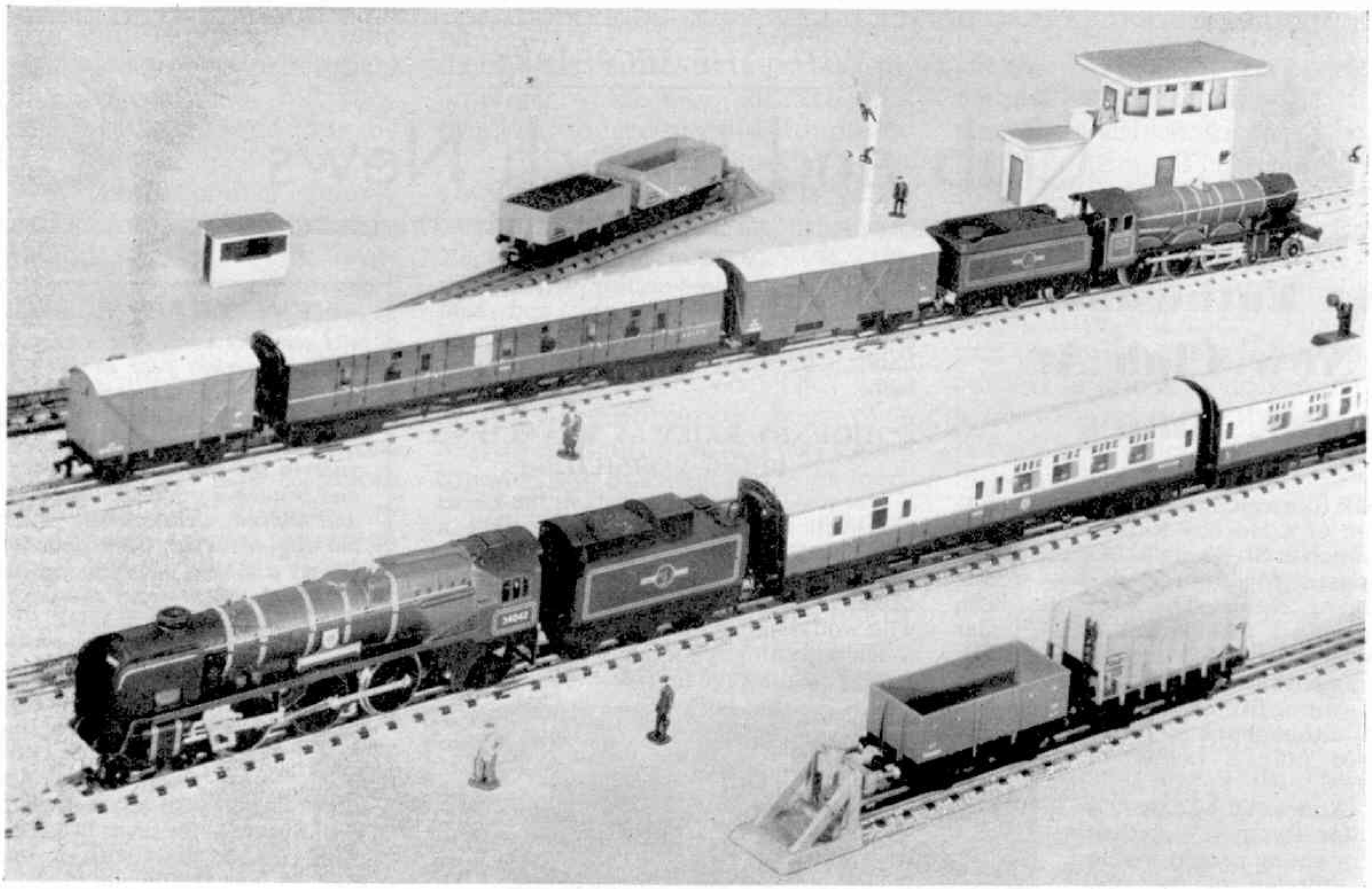
Occasional Open Nights are held—as on November 15 last—when parents and friends are able to visit the Y.M.C.A. and see the members at work and play. *Leader:* Mr. John R. Goodrum, Consett and District Y.M.C.A., Parliament Street, Consett, Co. Durham.

NEW YEAR WISHES

I send my wishes for a very happy and prosperous year in 1962 to all members of the Meccano Guild and the Hornby Railway Company. I hope that the progress made last year in the formation of new Clubs and Branches will be well maintained, and indeed, accelerated. There is nothing to equal Club and Branch life as a means of obtaining the utmost enjoyment from the Meccano and Hornby-Dublo hobbies.

AUSTRALIA

MAYLANDS M.C.—A photograph of Alan Vidler's fine power-operated Meccano Baltic tank locomotive, taken by a photographer of *The West Australian*, was reproduced in that newspaper. Voting for the new Club committee has been completed. Each of the three age groups—Senior, Intermediate and Junior—has elected its members, each group having two representatives. The unsuccessful candidates are then listed on the ballot paper for the election (*Cont. on page 43*)



New Hornby-Dublo Crossings

THE large number of items to be mentioned last month made me feel that our talk then was a rather breathless affair. Now, in connection with some of the recent additions to the Hornby-Dublo System I would like to make one or two points for which there was simply no space in the December issue, but before doing so I must pass on news that will be welcome to all Hornby-Dublo Two-Rail owners.

This concerns the Diamond Crossings which form an essential part of the Two-Rail track system. Production of these was being put in hand as I started to prepare these notes and you will be able to read about a typical layout which includes a Left-Hand Crossing, in the article by *Linesman* on page 33.

Crossing Gates

From this particular track product let us pass to another, actually one of the items briefly mentioned last month. This is the attractive Two-Rail Level Crossing which you see in one of our pictures. I am sure this has already found its way on to many Two-Rail layouts. Its inclusion in a given system is not difficult, as the built-in length of track incorporated in the Crossing is equal in length to a Straight Two-Thirds Rail. It is, therefore, easy to make allowance for the inclusion of the Crossing.

The road approaches represented on each side of the crossing gates have a gentle slope, and are not likely to cause difficulties to the drivers of Dublo Dinky Toys or other miniature motor vehicles making use of the Crossing. The usual built-up sleeper arrangement between the running rails is, of course, represented.

HORNBY RAILWAY COMPANY

By the Secretary

I assume that owners of the new Locomotives recently made available have already found plenty of work for them —heavy expresses for the 4–6–2 *Dorchester* and *City of Liverpool*, and the 4–6–0 *Ludlow Castle* and long freights for the Ring Field 2–8–0, on Three-Rail layouts, while no doubt the latest Hornby-Dublo Diesel, the Co–Bo, has proved its worth in passenger and express goods services on many miniature schemes. Real diesels of the Type 2 classification now seem to take a large share in working overnight and other long-distance freights.

Ideas with Open Coaches

So now to new rolling stock, beginning with the handsome Open Coaches, First-class and Second-class, available in W.R. brown and cream and in B.R. maroon. Each of these is illustrated in our advertising pages, so I need not describe their external features again, but I would like to emphasise that they include in their internal arrangements representations of the tables and seating found in real stock of this kind. Their special character provides plenty of possibilities from the operating point of view. In addition to use in ordinary express trains such vehicles are particulary popular for excursion work and similar duties, offering as they do a variation from the compartment style of vehicle favoured by many travellers.

Hornby-Dublo owners will, therefore,

Joint S.R.-W.R. working is portrayed in this Hornby-Dublo Three-Rail scene. "Dorchester", with W.R. Corridor Coaches is in the foreground, while a Castle 4–6–0 passes in the opposite direction with a short train of Vans.

be able to use their new "Opens" in quite a number of ways. Perhaps several Open Coaches can be coupled together with a Passenger Brake Van to form a holiday special, football excursion or other extra train. Or, for a change, you could include just one of them in a formation consisting otherwise of side-corridor stock. You would, in fact, be quite in order in assembling one of the new Open Coaches next to your Restaurant Car to supplement the accommodation provided by that vehicle. A First-class or a Second-class Open Coach might meet requirements, but if catering business is heavy on any of your services you might need a First-class and a Second-class Open Coach, one at each end of your Restaurant Car, for the benefit of your hungry passengers. This arrangement is often found in real practice, the tables provided between the facing pairs of seats in open stock making these vehicles suitable for such supplementary restaurant service.

S.R. Utility Van

Another coaching vehicle I could mention only briefly last month is the well-detailed Utility Van in its attractive Southern green livery. I use the term coaching vehicle because the real utility vans are suitable for running in passenger services as well as freight. Their long-wheelbase, four-wheeled design—which is followed exactly in the Hornby-Dublo model—provides a body of ample capacity, with two sets of double opening doors in each side. Parcels, mail, pigeon traffic and even boxed fish, as well as the host of other items, all come alike to the utility van. In addition, end doors are fitted to the real vans, with a bottom hinged loading flap so that cars or other wheeled vehicles, theatrical scenery and similar bulky items can be loaded or unloaded at a suitable end-loading platform.

The vans are ventilated, and have windows so that the staff working inside can see what they are doing, and altogether it would be difficult to find a more versatile type of vehicle.

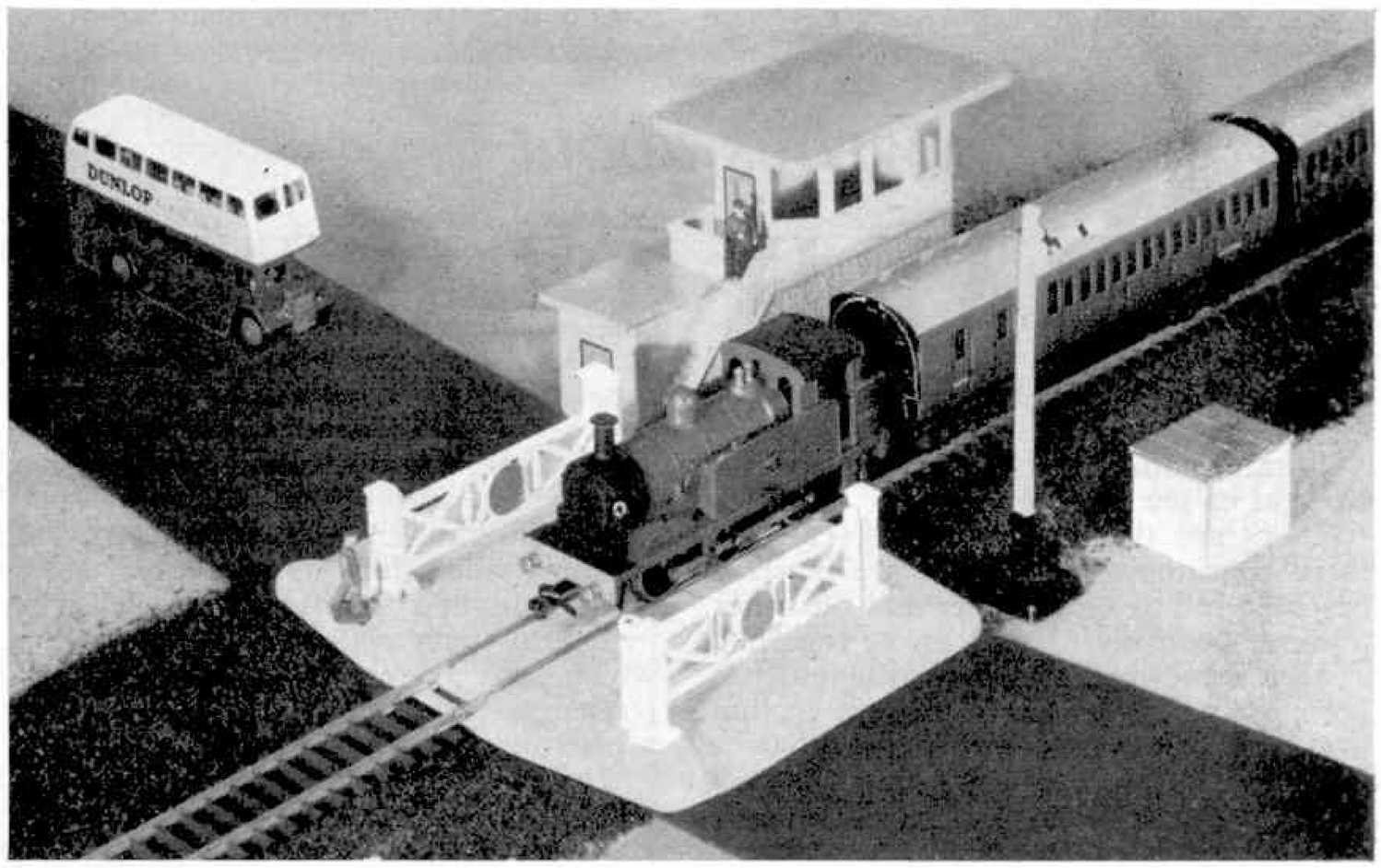
Clearly, the description utility van is a very appropriate title, although actually the Southern Railway code designation was *Covcar*. Nowadays the B.R. classification, which appears on the Hornby-Dublo vehicle, is *CCT*, signifying Covered Carriage Truck, and in this new guise the utility van continues to be as useful as ever. Hornby-Dublo traffic specialists will find plenty of use for this new Van in its miniature form, in passenger or in freight trains, or even in trains made up of several vehicles of similar kind for express parcels or mail service. Such trains are almost certain to include at least one Passenger Brake Van in their formation, and this arrangement is readily possible in Hornby-Dublo.

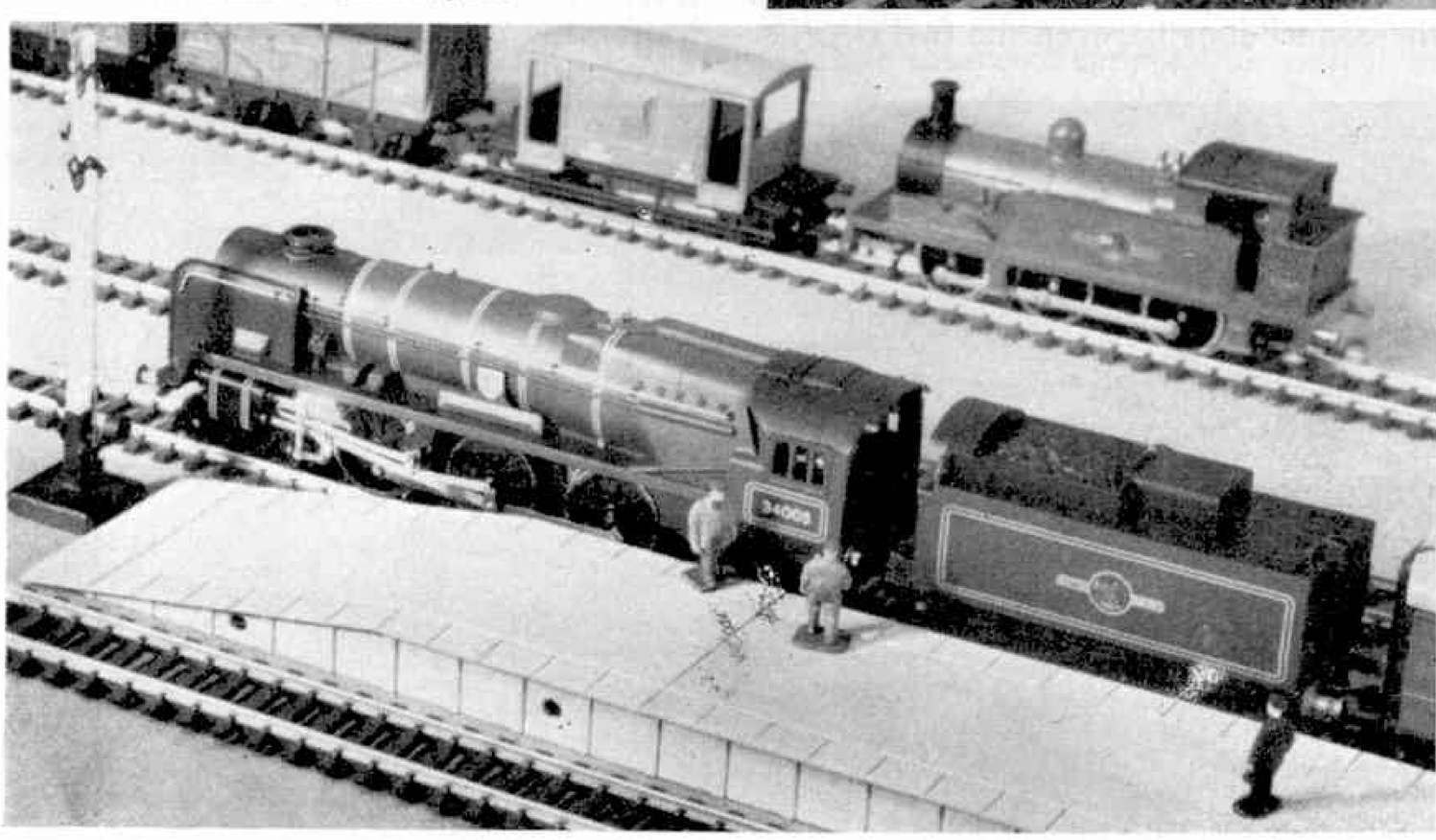
Running Fish Traffic

Fresh traffic possibilities in miniature are opened up by another recent introduction, the "Blue Spot" Fish Van that was described in November last. The name "Blue Spot" is explained by the fact that the real van has a distinctive blue circle, 15 inches in diameter, painted on a white ground on each side for easy recognition by railway staff, to ensure that all such vehicles are used only for the express service for fish between North East Scotland and London. It is some time since a Fish Van was included in the Hornby-Dublo system, so the new Van should be specially welcome.

Fish Vans can be attached to passenger trains at times, coupled in the rear, perhaps, and shunted on just before departure from a station representing an intermediate junction. This position in the train makes it easily possible to detach the Vans later, at another stop, and this may well be a convenient scheme in the general working arrangements on a continuous layout.

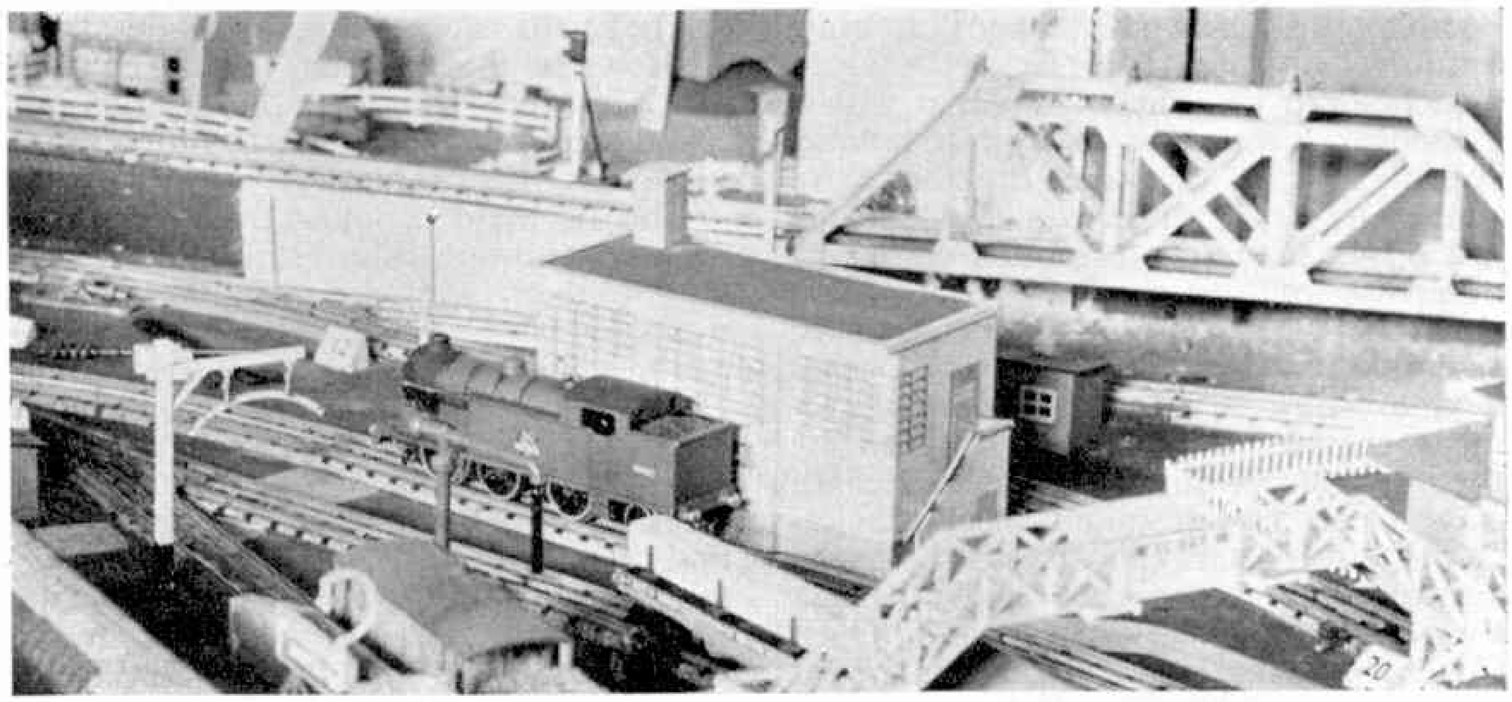
You can, of course, always build up your collection to include several of these new Fish Vans. Then you can run in miniature a *Blue Spot Fish Special* as operated between Aberdeen and London by the East Coast route. In the make-up of a train of this kind it is permissible to introduce a variation from the normal practice of having a brake van right at the rear of the train, because in the real *Blue Spot* service traffic for several different destinations is included and the train is marshalled accordingly. But there are two sections bound for Finsbury Park. One of these comes from Fraserburgh to Aberdeen, and is attached at the head of the train already standing at the loading dock; the other, conveying traffic from Aberdeen itself, is at the other end of the train, in rear of the brake van. In this position, the rear fish vans can readily be detached on reaching their destination. On the other hand if there is no traffic for these particular vans, it is a simple matter to uncouple them before the train leaves Aberdeen.





Right: A simple, yet effective, scene with the No. 2460 Level Crossing on a Two-Rail layout. A Dinky Toys Bus waits for the 0-6-0 Tank and its train to pass. (Below) All ready to go! "Barnstaple" makes an impressive sight at the platform end on a Hornby-Dublo Two-Rail layout.

More Hornby-Dublo Track Formations



The baseboard-level terminus yard, with an upper-level track beyond.

OUR Three-Rail pictures this month show parts of an attractive Hornby-Dublo layout permanently arranged in a basement room. This is operated by A. J. Fleming (H.R.C. No. 303892), of Bradford, with the able assistance and encouragement of his father, Mr. John M. Fleming, who started the railway off some ten years ago.

In the notes on the system that were submitted with the photographs the railway is said to be "almost a figure eight". Really, that is not at all a bad description, although the whole track is in fact more elaborate than a plain figure eight would be. Let us see how, and why.

Layout Man writes about . . .

RAILWAY IN A BASEMENT

There are two main circuits, each of them continuous, and these are perhaps best referred to as the inner and the outer track respectively. Each can be regarded as to a somewhat irregular oval that has been pinched in about the centre, so that the resultant "hour-glass" shape does somewhat resemble the well-known figure eight type of railway. This resemblance is carried a stage further when it is realised that, although different levels are involved, the inner and the outer circuits are connected together about the centre of the system and the running of trains from one circuit to the other is a regular part of the operations.

The inner circuit is at baseboard level throughout and is used for high-speed main line running and for most of the shunting operations. All stations are at present situated on this inner circuit. They include a fairly elaborate main terminal, which has three platform faces for passenger traffic and which also includes a platform for goods traffic alongside.

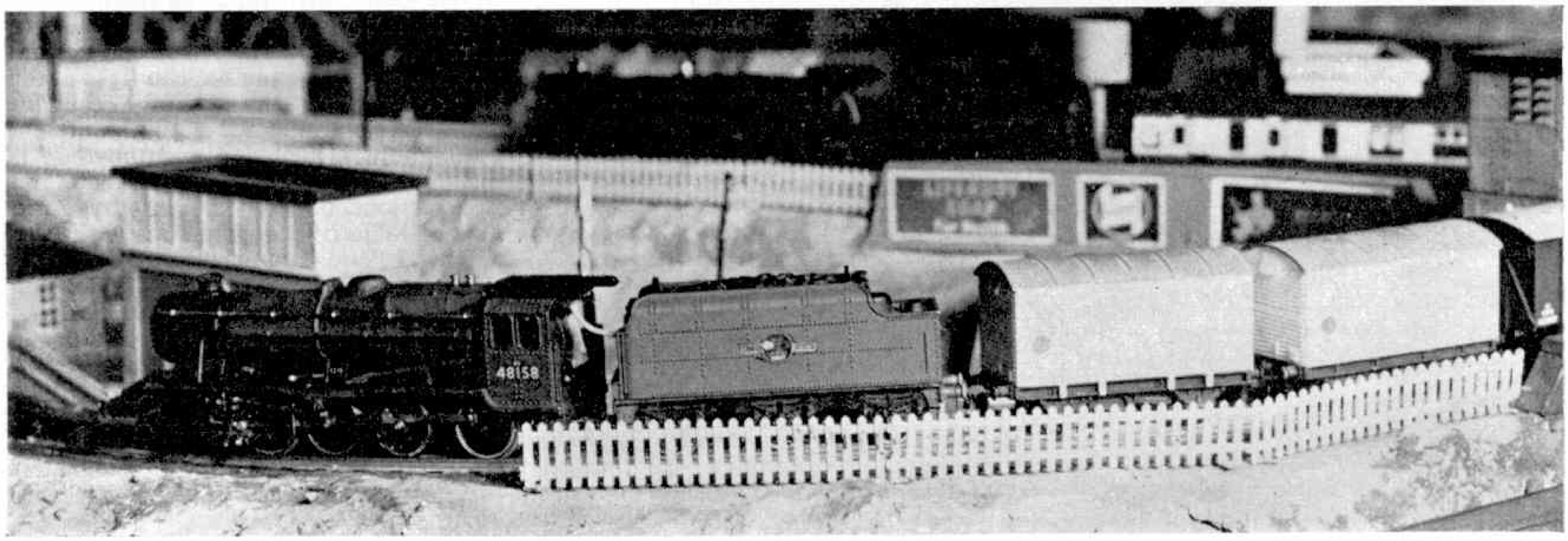
The outer circuit is partly at baseboard level, and outside the main terminus Electrically-Operated Points make one of the connections between the two circuits. From base level, and running roughly parallel to the inner circuit, the outer track climbs a gradual gradient to attain sufficient height to enable a diagonal track, which in effect forms a reverse loop, to pass over the main station and its approaches by means of a viaduct. From this high-level section trains passing over the viaduct and reverse loop can regain the baseboard-level tracks of the inner circuit by means of a steeply-graded connection.

An alternative route, avoiding the viaduct section, drops sharply to baseboard level, which is regained near by the crossover Points previously referred to that form the main connection between two circuits.

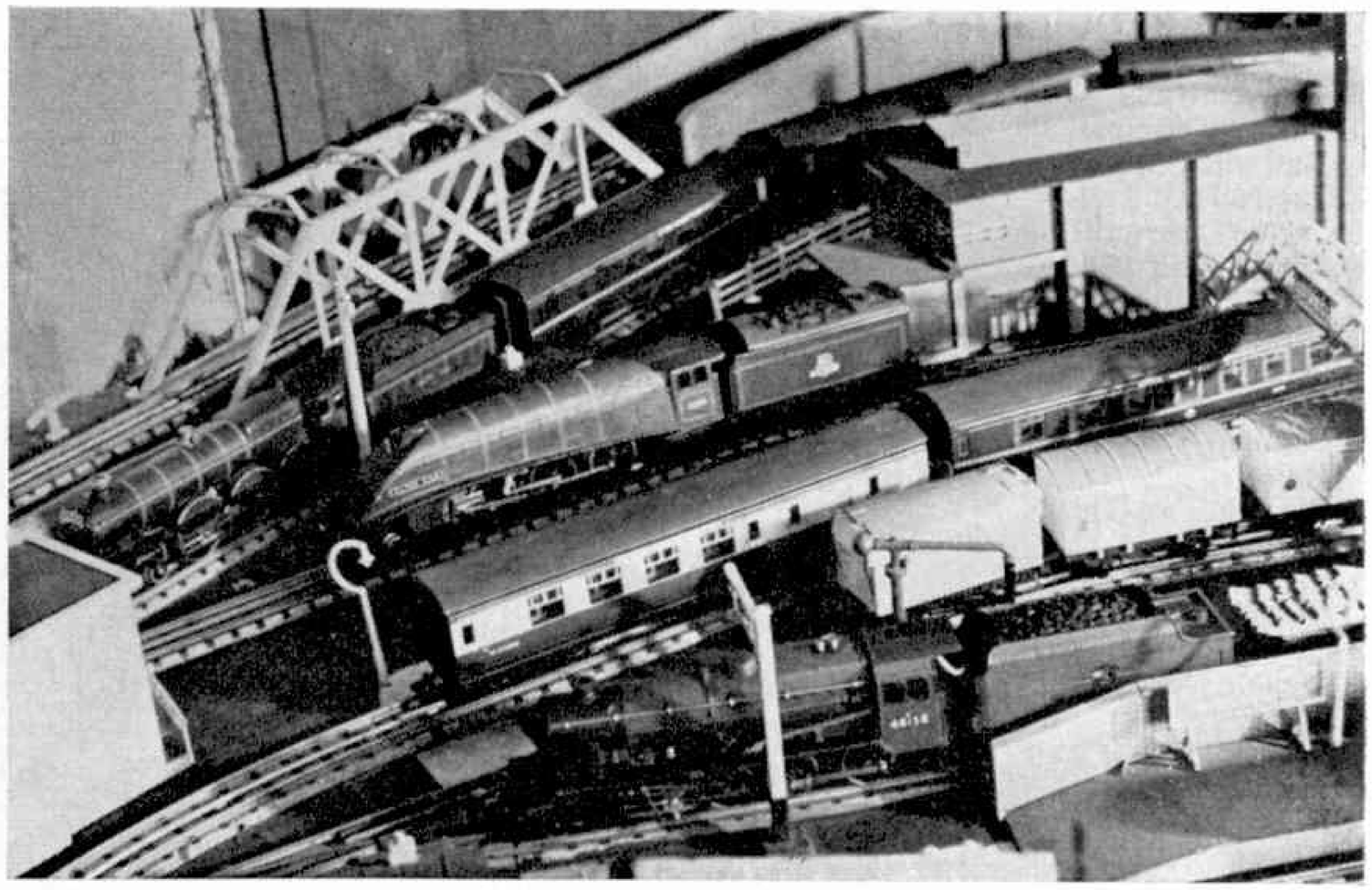
One branch line from the inner circuit runs to a village station at the opposite end of the layout from the main terminus. Several sidings lead off the high-level section and they are used for storage etc. purposes at present, but are likely to form a site for possible future developments.

As can well be imagined, train running on this layout can be quite an exciting business, especially in view of the alternative routes provided. A train can run from the terminus and make its way back there after negotiating the lower and the upper levels, if desired. Naturally the reverse loop adds considerably to the scope of

A 2-8-0 with a freight train makes its way down one of the inclines.



A general view across the outer end of the terminus, showing a variety of Hornby-Dublo Locomotives and Rolling Stock.



operations. In fact, train running is found so fascinating by the joint owners of this system that lineside development has been somewhat retarded, although the necessary station buildings and so on have been constructed at home to meet the rather special requirements of this railway.

Use has been made, too, of various building kits and further progress in actual scenic work is anticipated.

All rails and track components are the standard Hornby-Dublo Three-Rail products and the Locomotives and Rolling Stock are Hornby-Dublo throughout. The engines include two Duchess 4–6–2s, one of which is still a favourite performer in spite of its ten years' service. A recent addition has been one of the powerful Hornby-Dublo Co–Co Diesels, but otherwise the engines are all of the standard steam types. An interesting departure from standard practice has been the repainting, in B.R. green, by the owners, of the engines that are normally finished in black.

Rolling stock with tinplate and with moulded bodies is in use and to control the trains each circuit is divided into a number of isolating sections. For the time being, movements are authorised by a skeleton system of signals, including some Colour Lights. Further signalling developments are on the programme for the future.

Linesman this month discusses . . .

TRACK WITH CROSSING AND LOOP

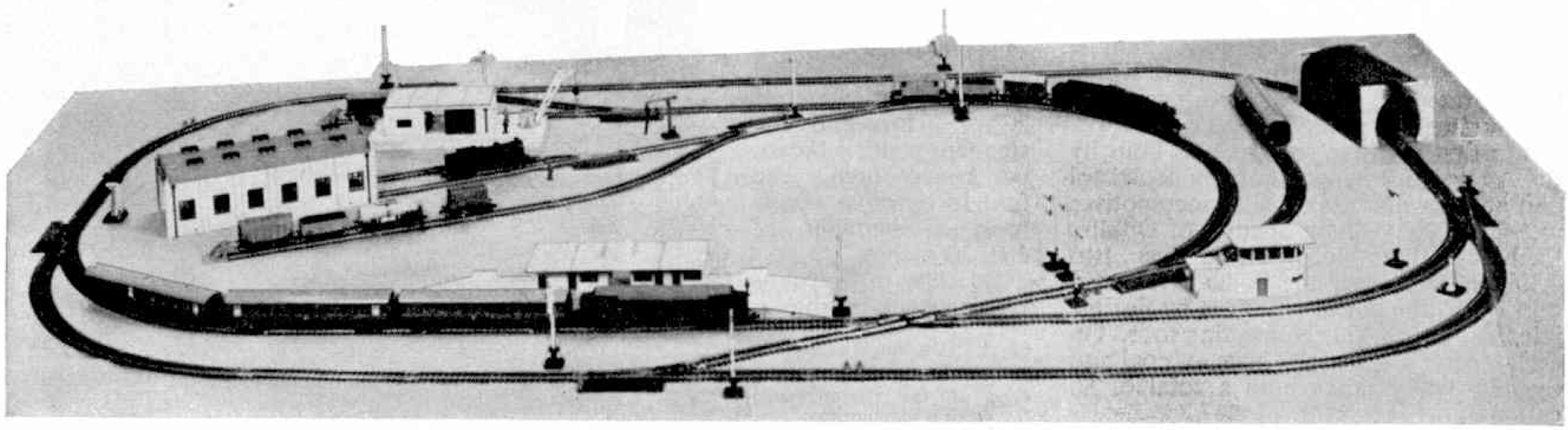
NOW that Diamond Crossings (left hand and right hand) have been introduced into the range of Hornby-Dublo Two-Rail track components, it is considered appropriate to feature this month a layout incorporating one of these valuable accessories.

The diagram overleaf shows a single track layout with an inner loop, which is passed over by a connection from the lower main track via a Left Hand Diamond Crossing and leading to several sidings. Two of the latter, as will be seen by reference to the illustration below —which shows in panoramic view the layout covered by the diagram—serve an engine shed. Another siding leads to a goods depot. The size of baseboard needed for the layout is 7 feet 6 inches by 4 feet 6 inches.

There is no electrical connection between the two tracks which form the Diamond Crossing, so that complete isolation is afforded. This means that the crossing can be used on tracks which have two sources of power supply and control —such as a double track—so that a train moving over the crossing on a track worked by one Power Control Unit will not interfere with a train on the other with its separate source of supply and control, as long as the two tracks are electrically isolated where points join them forming a crossover.

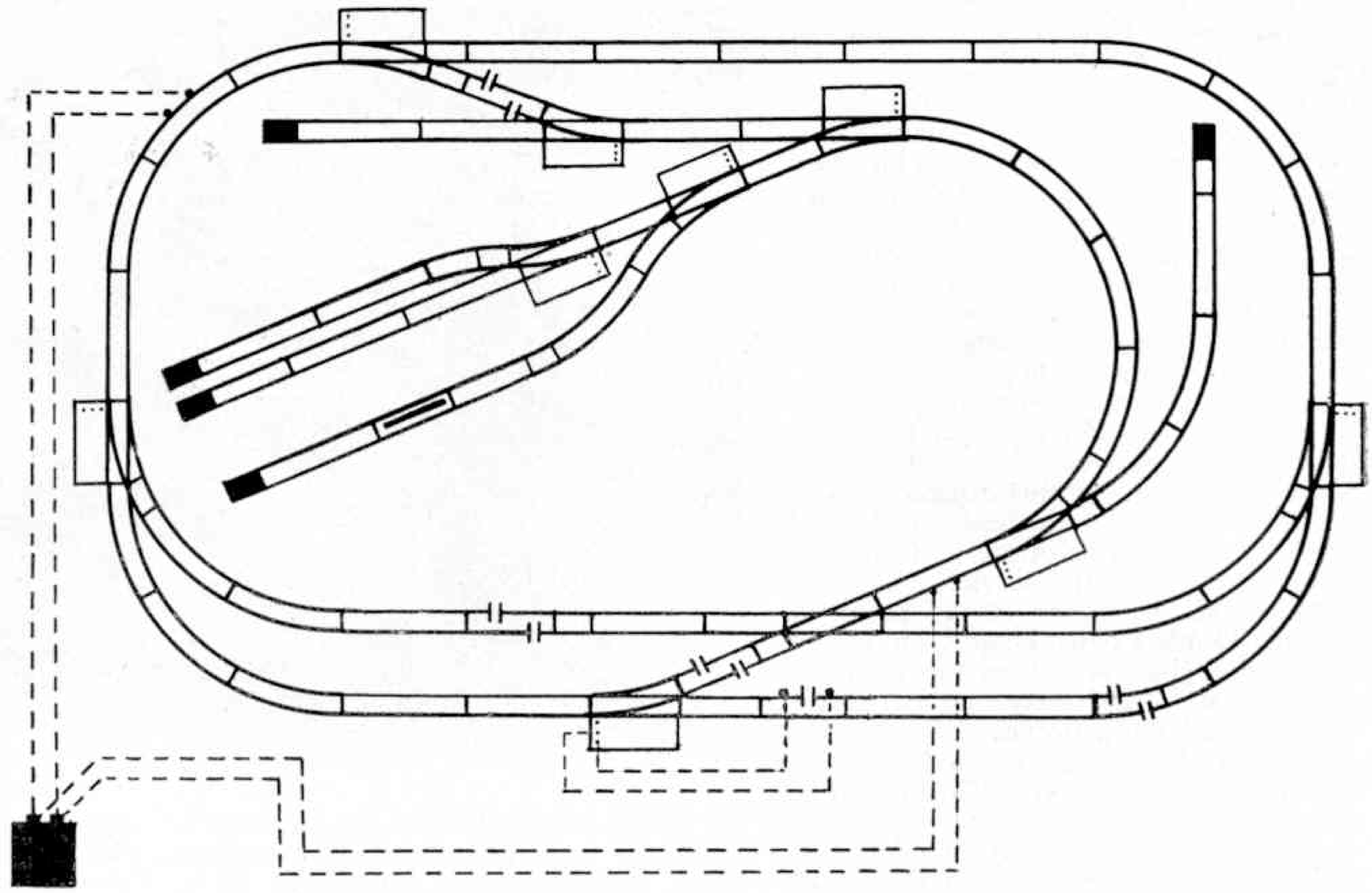
The layout gives possibilities for a considerable variety of train operations. There is no preferred direction of travel, but if the trains run in a clockwise direction the locomotive hauling them can perform shunting operations at the various sidings by backing the vehicles in. A complete train, with engine, can be left in a siding if required, and will be electrically isolated when the Points are set against it.

If it is desired to carry out a shunting movement while a train is left on the main line, it should be brought to a stand between the Single and Double Isolating Rails on the lower main track. This train also can then be isolated by setting the points against it. Another locomotive can then draw out of the sidings and traverse the main line via the inner loop and can



ITEMS REQUIRED

21 Curved Rails	2710
1 Curved Terminal Rail with Suppressor	2714
4 Curved Half Rails	2711
5 Curved Quarter Rails	2712
1 Curved Half Double Isolating Rail	2740
23 Straight Rails	2701
1 Straight Terminal Rail with Suppressor	2707
4 Straight One-Third Rails	2703
8 Straight Two-Thirds Rails	2702
1 Straight Two-Thirds Single Isolating Rail	2738
3 Straight Two-Thirds Double Isolating Rails	2739
1 Uncoupling Rail Hand Operated	2745
4 Right Hand Switch Points	2728
5 Left Hand Switch Points	2729
1 Left Hand Diamond Crossing	2735
5 Buffer Stops	2450



return to its original siding, or perhaps move into another one when it has finished its journey.

All the Points shown on the diagram are hand operated, but there is no reason why some should not be of the electrically operated kind. It must be noted, however, that the Points at either end of the inner loop must be hand operated for clearance purposes.

Each Electrically Operated Point will need a Hornby-Dublo 1614 Switch to operate it. Current for Points and other electrical accessories can be taken from the uncontrolled A.C. output of a suitable self-contained power control unit. It will be noted that only one power control unit is required for the layout.

A PIGGY-BACK RAILWAY

A MOST unusual railway is to be found in the Dublin Works of Arthur Guinness & Son. Two different rail gauges are used on this one railway—first, a narrow gauge of 22 inches and, secondly, the 63-inch standard gauge of the Irish Railway System. There are six miles of the narrow gauge track and nearly two miles of the wider gauge line.

By R. J. SALTER

After the railway was first built, during the years 1873 to 1877, several different locomotives were used on the system until, in 1882, the Chief Engineer, Samuel Geoghegan, designed a locomotive which incorporated all the good points of those they had used before.

The first of these engines was built by the Avonside Engine Company of Bristol and another eighteen similar locomotives were built by William Spence, of Dublin. Each of these locomotives has two cylinders fixed over the boiler and transmission to the wheel cranks is by flexible jointed, vertical, side connecting rods. On each engine is carried 3½ cwts. of coal and the two water tanks hold a total of 80 gallons.

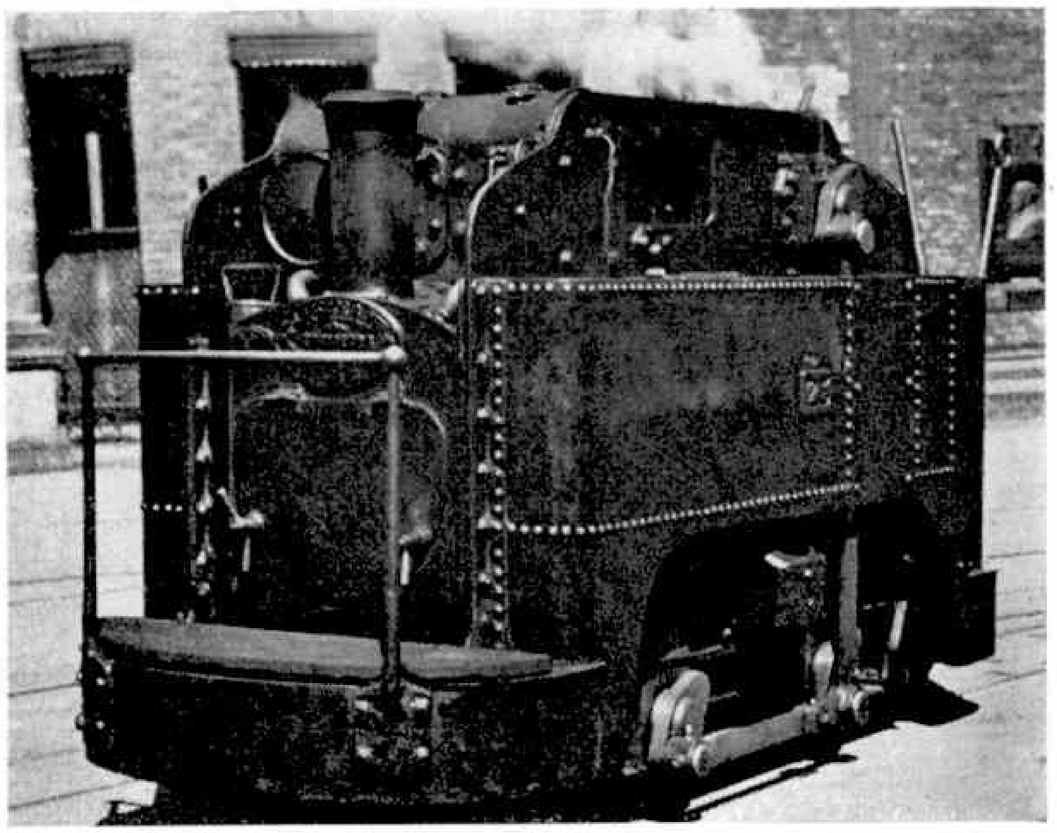
On the level, each engine will pull a 75 ton load and even on the system's steepest gradient 18 tons can easily be hauled along. The excellence of their design and construction is illustrated by the fact that only a few years ago, when there was a shortage of oil, four of these locomotives were put to work again for a few months as a replacement for the more modern diesel locomotives which were put into service after the last war.

Each of the twin cylinders of the locomotives has a diameter of seven inches and a stroke of 8½ inches. The boiler has a diameter of 2 ft. 5 in., and the steam pressure is 180 lb. per square inch. The four locomotive wheels have a diameter of 1 ft. 10 inches.

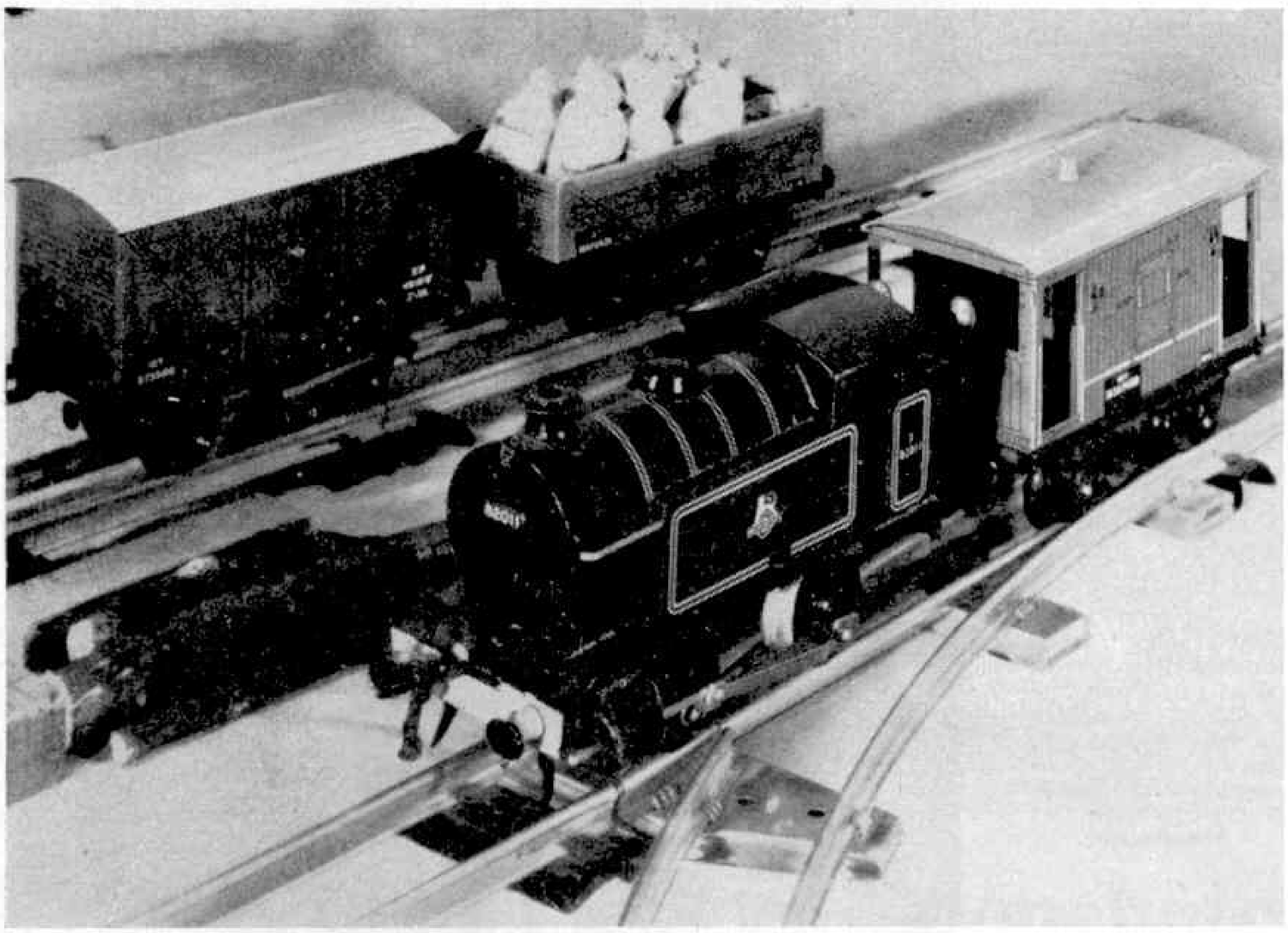
So that railway enthusiasts will be able to see these locomotives in the future one has been presented to the Belfast Transport Museum and another to the Talyllyn Railway Preservation Society, of Merionethshire.

At the present time motive power on the Dublin narrow gauge line is provided by twelve "Planet" type, 0–4–0 diesels built by Messrs. F. C. Hibberd & Company. Although not as romantic as the old Geoghegan steamers, the diesels are cleaner and quicker starting, and they

(*Continued on page 43*)



One of the narrow-gauge steam locomotives.



How To Build Up Your Train Set

NOW is the time when many Hornby layouts are begun and lots of youthful owners become familiar with the fun of laying down the track, assembling the train, winding up the engine and then watching it on its journey. Such things are simple enough, and so long as the instructions that are packed with every Hornby Locomotive or Train Set are carefully followed, no problems arise as a rule.

Lubrication of the working parts of an engine, and of the axle bearings of the Coaches or Wagons, is necessary from time to time, but there is no point in over-oiling. The oil simply finds its way into places where it is not wanted and its presence on the track, for instance, can affect engine performance. The driving wheels will slip on an oily track and the load that the engine can pull, or the distance it can run, will be reduced.

* * * *

Regarding loads, it is important to remember that when an engine is new it is inclined to be a little stiff, as all new machines are, and it requires what is known as "running in". By degrees, if you treat it properly, your engine will be able to take a longer train than it could originally, and it will be able to show its paces to advantage on the layout that you are sure to want to build up from the original Set, by the addition of various rails.

The choice of additions to your Train Set is governed by the type of equipment with which you begin, and by the amount of space that can be given to the railway. Not many clockwork railways nowadays are permanent affairs on a baseboard, but their owners have to engineer their way across the floor and avoid various obstacles such as furniture and so on.

Any of the standard Hornby Straight Rails can be used to extend a layout, but when it comes to Curved Rails, Points and Crossings, it is important to see that the additions made are of the correct type to suit the Curved Rails in your Set. The No. 20/21 and 30/31 Train Sets include

By "TOMMY DODD"

curves of what is known as 1 ft. radius and six of these form a circle. If your extended layout is to fit together properly you need Points with the curved section corresponding to your Curved Rails. Crossings too, either Acute-Angle or Right-Angle, must be of the correct type.

Similarly, additions to any of the larger Train Sets incorporating 2 ft. radius rails, twelve of which form a circle, must consist of 2 ft. radius Points or Crossings. It does not do to mix curves or other parts of different radii in the same system, as they may not fit together properly, and a distorted track, where the components have been forced together, means trouble.

So, the fit of the Rails is important, and once you have joined them together, be sure to use the Rail Connecting Plates designed to hold the end sleepers of adjacent Rails firmly together. They are not necessary on a layout which is screwed permanently on a baseboard, but should certainly be used on any temporary systems on floor or table, otherwise the movement of the trains might cause the rail joints to slacken, and the Rail Connecting Plates are provided to prevent just this.

The Locomotive Key is an important part of your equipment. Without it you cannot run your engine, so make sure that you do not lose it! You can get spare Keys, of course. For No. 20 Locomotives you want an "S" Key; for the others an "H" Key is necessary.

The Key should be used carefully and you should make certain that it is pushed on to the winding shaft as far as it will go before you start to wind up. Turn it steadily, and be sure not to overwind the mechanism as this will involve a repair job that can't be done at home. Wind up the engine full, just once, counting the number of half-turns of the Key as you do so. When winding the engine subsequently, give it a few half-turns fewer. Always let the clockwork run down when you have finished running.

The Key has another purpose too, the back of its handle being made to form a rail gauge, which can be slid along between the running rails in order to see that the track is not tight at any point. A little slackness is of no real consequence, but tight places, especially on curves, are to be avoided. Rails may become damaged in service, especially if the railway is on the floor, and the Key is handy if you wish to check your Rails.

I have said rather a lot about track, but don't forget that a railway is only as good as its track, and poor running will be experienced if the track itself is not properly laid on a nice level surface, and if the rails are fitted together in an irregular manner.

Distinctions between the different groups of rolling stock in the Hornby system are equally important. Additions in the way of rolling stock to a No. 20 or 21 Train Set should consist of Wagons or Coaches in the same series. The same thing applies to the Nos. 30/31 Train Sets, but it is possible to use the 20/21 and 30/31 engines and rolling stock together, although the coupling systems are different.

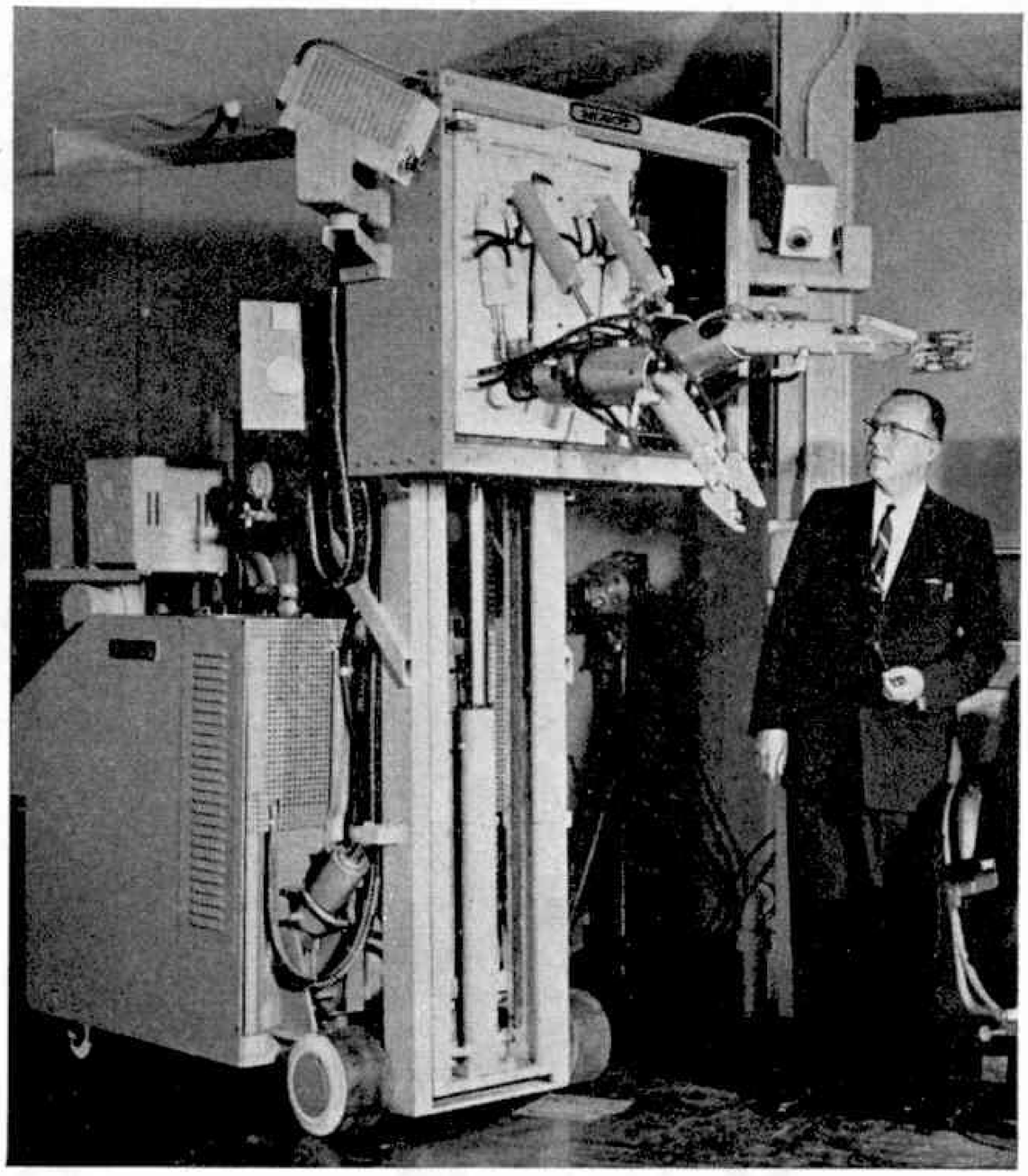
The Coaches and Wagons in the larger Train Sets have automatic couplings. These can be made to engage as the vehicles are pushed together and the same type of Coupling is fitted to the rear end of the No. 40 Tank. At the front end of this engine a plain single-line coupling is fitted, but there are no difficulties in using this in conjunction with the automatic type I have just mentioned. The scheme is to place the loop of the automatic coupling over the hook of the single-link coupling.

In the picture above the No. 40 Tank and No. 50 Goods Brake Van stand ready to head down the line and pick up wagons to form a train. A No. 50 Wagon and a No. 50 Goods Van are in the background.

NOW SCIENCE PRODUCES . . .

Mobile Robot For Nuclear Tests

"MOBOT" or, more fully, "Mobot Mark I", is the latest robot as well as the first operational, fully-mobile handling mechanism for the completely remote handling of dangerous materials in radioactive areas concerned with nuclear radiation environmental testing. It has been developed by scientists of the nuclear electronics laboratories of the Hughes Aircraft Company, in the United States, for the Sandia Corporation, direct contractors to the U.S. Atomic Energy Commission.



The robot goes through its paces to show its complete mobility. Watching is Mr. Robert W. Henderson, vice-president of Sandia Corporation of Albuquerque.

By Michael Lorant

The handling arm assembly of "Mobot" (with wheels and appropriate controls) is the only equipment which operates in the radioactive area. A cable extension on a reel connects the handling equipment to an operator's console located up to 200 feet from, and out of sight of, the radiation cell.

All controls, signals, and data transmission, as well as power, travel to and from the mobile equipment and the operator's position through a tri-axial cable 200 feet long. More than 100 commands may be sent to the "Mobot" handler through this cable. Power for the handling equipment is 7·5 Kva.

The vehicle has its own battery and D.C. motor, and provision is made for automatic trickle charging of the battery. Power is transformed to a higher voltage at the console before being sent through the cable. Transformers and rectifiers in the vehicle provide necessary operating voltages for the handling equipment.

Signal multiplexers are located in the vehicle and operator's console station. All "Mobot" commands go through these units and the cable.

* * * *

The equipment is designed to pick up mechanical components, electrical objects, soldering irons, voltmeters, etc., used in semi-hot radiation testing areas. Normally, equipment which has been irradiated is removed from the irradiation area and transferred by the "Mobot" to a hot laboratory. Extreme mobility, including the equipment's 3-foot horizontal and 10-foot vertical reach make it a versatile remote handler in most environments where man cannot, or does not, desire to work because of hazardous conditions.

Two remote-controlled TV "eyes" are provided to take the operator's eyes and mind into the hazardous area. Remote control pan (270 degrees), tilt and focus are provided separately and independently of the two handling arms. These last named are hydraulically operated and are capable of lifting 150 lb. A lifting hook is provided on the lift mechanism to handle weights up to 1,500 lb.

* * * *

Four-speed control with complete steering is provided in the vehicle power assembly and two separate hydraulic systems are used, one for the lift mechanism and the other for handling arm assemblies. Electro-hydraulic controls specially adapted for this purpose were developed by scientists of Hughes Aircraft Company.

The "Mobot Mark I" is 84 inches high, 36 inches wide, excluding the TV cameras, and 96 inches long with arms extended. The mobile assembly weighs approximately 4,500 lb.

The first model is the beginning of a family of similar type equipment with sizes ranging from several hundred pounds to 20 tons or more. Future models include applications requiring arm reaches of at least 50 feet.

While the "Mobot Mark I" is for indoor use, models to operate out of doors, and on rough terrain, may easily be developed.

"Mobot", termed "man's replacement for man in dangerous areas" will be used by Sandia to test effects of radiation on materials, but future versions may some day scoop up a bucketful of moondust for return to earth's laboratories, or take a sample from the floor of the ocean. They may fight fires, or rescue men from disaster areas such as those containing poisonous gases.

Sandia Corporation is now building a special nuclear reactor facility at Albuquerque, New Mexico, to subject materials and assemblies to man-made radiation and to move large, heavy objects about, performing certain tests in rooms where radiation would be too intense for man to enter.

"Mobot" will lead the way to new concepts in the field of remote handling of dangerous materials. There will be no individual "hot cells". A large "hot area" replaces them and, with the use of the "Mobot", engineers will be able to disassemble, test and store radioactive objects more efficiently, quickly and economically than before.

* * * *

The nuclear reactor at Sandia's will operate at 5,000,000 watts behind dense concrete walls and a door weighing a half-million pounds. There, "Mobot", with its TV-camera eyes, will find the item to be tested and carry it into a radiation lock adjacent to an irradiation cell, then "walk" back to its hot laboratory. The door (*Cont. on page 43*)

SPECIALLY FOR PHOTOGRAPHERS

Party Snapshots

THIS is party time, and flash is ideal for taking happy snaps and "family album" pictures during the festive season. Flashbulbs give a short, very intense burst of light and are ignited by a low voltage electric current. A synchronising switch in your camera shutter is arranged to close the flash gun electric circuit and fire the bulb when your shutter is opened.

By H. G. FORSYTHE

Exposure is calculated by the Guide Number System. The guide number of a flash bulb is simply the aperture of the camera lens multiplied by the distance in feet the bulb must be from the subject to give the right exposure. When using flash, just divide the guide number by the distance between the bulb and the subject to find the correct aperture to use. Similarly, if your aperture is fixed, divide it into the guide number to work out the correct distance. For instance, if the guide number is 110, this means that for correct exposure at *f* 11 the subject must be 10 feet away from the flash bulb (110/11=10).

Guide numbers, or flash factors as they are sometimes called, vary according to the kind of bulb and the speed of your film. Flash bulb packets usually contain full instructions and information about the appropriate guide number to use.

Flash light falls off very rapidly with distance. Double the distance between bulb and subject and the light intensity falls to *one quarter* of its previous value. Therefore, when using flash, it is important that all your subjects should be at about the same distance from the flash bulb, as illustrated above. Otherwise objects nearby will be grossly overexposed and those far off very underexposed.

The duration of a flash is very short. For most flash pictures, therefore, shutter speed, provided it is between 1/25 and 1/50 second, is not important in determining exposure.

Flash is very useful as an indirect source of light—that is, by bouncing it off a nearby wall or ceiling. Just aim your flash gun at a wall so that its light will be reflected off the wall on to the subject. Correct exposure must be found by trial and error, but, as a starting point, try dividing the direct flash guide number by three. Bounced flash is ideal for close-up photography of Meccano models because hardly any shadows are cast.

When using the flash gun off the camera, an extension lead is useful. These can be had from photographic dealers for a few shillings.

Next month: Night photography with fast films.

Taking a flash picture at a party (above). In this case the flash gun is attached to the camera.

(*Continued from last column*)

graph, I wondered why a post box should be mounted in such an elaborate sandstone housing. It is at Machrie Road End, Shiskine, Arran.

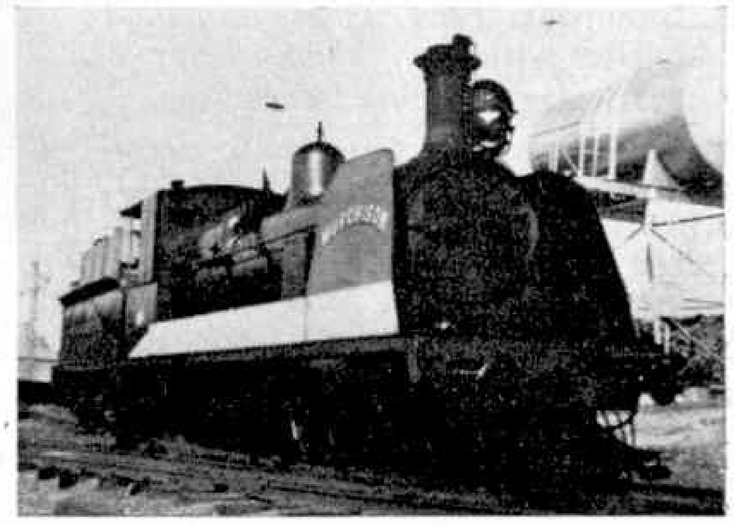
Can any of your readers answer my query? BILL REED (Pontefract)

FROM OUR READERS

● *I would like to take this opportunity of praising your magazine. I find it very interesting, and a very good 1s. 3d. worth. As I have several Meccano Outfits, many Dinky Toys and an ever-growing model railway, and a large foreign stamp catalogue and collection, plus an interest in science, railways and aircraft, your magazine has many added interests for me besides the happy hours of reading it contains. I have nothing but praise for the* M.M. *and I fully uphold all the changes made in this last year. I find the general interest articles very informative and very well illustrated.*

CHRISTOPHER HARDY
(Tollerton Hall)

* * * *



The Emu Bay Railway Company are undergoing a modernisation plan and have reconditioned with oil firing and a bright blue livery two of their old 4–8–2 freight locomotives built around the 1900s. Particulars are: Cylinder diameter 18 in.; Driving Wheel diameter, 3 ft. 6 in.; Grate area 11 sq. ft.; Tender: Oil 1,760 galls.; Water 2,500 galls.; Total weight, engine and tender, 103 tons; Total length, engine and tender, 50 ft. 1 in.

Besides these two passenger engines, named *Murchison* (pictured here) and *Heemskirk*, the company operate a number of diesel railmotors, six Beyer-Garratts and an 0–8–0 diesel-hydraulic for main line use. PHILIP G. GRAHAM
(Burnie, Tasmania)

* * * *

When on holiday in Arran we found that most of the post boxes there were sunk into walls. On discovering the one shown in my photo- (*Cont. in col. 2*)

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FOR OTHER STAMP ADVERTISEMENTS SEE ALSO PAGE 40

For Stamp Enthusiasts

"Charity" Stamps

By F. E. Metcalfe

I DON'T suppose collectors of modern stamps quite realise how much of the cash they spend in this way goes to charity, but it is a fact that by and large the total must be fairly substantial. Stamps issued for charitable purposes (not to mention the issuing post office's little "cut") are coming out all the time, and the number is growing, so it must be a paying proposition.

The objects to receive benefit are as diverse as the designs of the stamps themselves. Trust the foreign countries to see to it that these designs are particularly attractive, for that's the bait to charm the cash from our pockets. One collector with whom I discussed this question recently imagined that it was only those stamps which have a surcharge, like the "Health" issues of New Zealand, which are "Charity" issues. Of course, some of the stamps do have the surcharge—like those very popular issues of our sister country—showing just how much is to be allocated to some charitable object, but not all of

them by any means. Collectors will remember that last year several countries issued sets of stamps, ostensibly to help "Refugee" funds, which did not show a surcharge. But while the Vatican handed over a big sum—all that the stamps realised—some others saw to it that their own post offices did best out of the operation.

I have mentioned the "Child Welfare" issues of New Zealand. Another Commonwealth country which recently made a similar issue is Pakistan. Two triangular stamps were concerned; an attractive pair, with a quite interesting design. One of the stamps is illustrated on this page. The flower depicted in the centre of the stamp is a narcissus, and the eye is what the issuing post office describes as "a bonny healthy baby".

However, the "Child Welfare" stamps which have interested me most, so far as the designs are concerned, are those of Holland, and the issue for 1961 was really something exceptional. The set was released on November 13, and as they remain on sale until January 12 all who want a set will have time to buy one at current rates. (Don't forget to buy your New Zealand set as well, for not only are the stamps beautiful, but the cause behind their issue is most worthy.) There are four stamps in this Dutch set, and the motifs of the designs are 4c+4c, Saint Nicholas; 6c+4c, The Epiphany; 8c+4c, Palm Sunday; 12c+9c, Whitsuntide. So delightful are all of them that I really could not pick out the one I like best, but I am sure that the Feast of Saint Nicholas will be the one which appeals most to the young ones, in whose aid the stamps are issued.

The Dutch Post Office published some brochures about this set, and they give delightful details about the stamps and the subjects depicted on them. For instance, we are told that Saint Nicholas is the most popular feast in the Netherlands (as it is, incidentally, in many other countries. I well remember when I was in Hungary, what a great time it was for the youngsters). They explain that the name is that of a legendary Bishop of Myra (Asia Minor) who is the patron saint of children. December 5 is the actual day of commemoration, but weeks before this children—and grown-ups—are getting excited, and wonder what this other Santa Claus will have for them. The good children (which really means *all*) get presents and sweets brought from Spain in a big, big, sack by the saint's faithful servant Black Peter. But the naughty children (of course, there is none at such time) instead of seeing presents, see—dare I tell you—the rod, and at the very, very worst may even disappear into Black Peter's sack.

After his entry into the Netherlands, Saint Nicholas rides on his grev horse over the rooftops, and drops presents for the good children down the chimneys into their boots, which have been left near the fireplace. But the horse is not forgotten, and straw and carrots are put in the boots for it. Of course, by the time the children get up, the straw and carrots have gone (what a big appetite that horse must have!) and, instead, there are the presents.

There are more tales about the three other stamps which make up the set, and I so enjoyed reading them that I wish there was room for me to recount them here, in full. But the designs of the stamps themselves really tell most of the stories, and all in all this is a set of stamps which I could not resist buying if I wanted to.

To get back to "Charity" issues in general, it is the countries outside the British Commonwealth which have issued most of them, and I can hardly think of a charity which has not been helped by collectors' purchases. One collection I saw recently, which was made up exclusively of such issues, really surprised me. Fiji tried to follow the lead of New Zealand by issuing "Health" stamps, but unfortunately they did not sell very well. A great pity, as the profits were to have gone to assist Fijian soldiers who contracted T.B. when fighting in World War II. India also brings out modestly-priced "Children's Day" issues but, as already mentioned, it is mostly the foreigners who have taken toll of our pockets for their good causes.

I don't know whether there are any readers who would like to go in for a "Charity" collection, but they might do worse, for the stamps themselves are always very attractive.

Stamp Gossip

Maps

I MENTIONED some time ago that an *M.M.* reader wanted to go in for a thematic collection or two, and in reply I suggested that, contrary to what he thought, even current British Colonial stamps would provide quite a nice thematic range of stamps. I also said that the Crown Agents (Millbank, London S.W.1) were giving, in their Monthly Stamp Bulletin, lists of current stamps, covering various popular themes. Flowers, ships, machinery and maps have already been dealt with, and regarding the last-named, which are my favourite, I must say they really surprised me with the list provided. I never realised that the current issues of Aden, Ascension, Barbados, British Guiana, British Solomon Is., Cayman Is., Fiji, Gibraltar, Mauritius, Montserrat, Pitcairn Is., St. Helena, St. Christopher, Seychelles, Tonga, Trinidad and Tobago, Virgin Is. and Zanzibar all have map stamps actually current at the moment. Now what about asking your dealer if he can supply you with some of these? All would make a really fine show,

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(Dept. MM1), Eastrington, Goole, Yorks.
Please rush me the Free Stamp Collector's Outfit described above, and your Special Approvals for inspection. I enclose 9d. in stamps for postage.

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How about your friends? Owing to the value of this Offer, it is limited to one Outfit per applicant. But many of your friends will want to send for this Offer, so write their names and addresses on a piece of paper, enclose 9d. for each and we will gladly send the Outfit and Approvals to them. No need for them to use the Coupon.

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W. Granville Lucas (DS), Hinckley, Leicestershire.

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Plus Super Perforation Gauge to all applicants asking to see my famous ½d. upwards Approvals. British Colonial or Foreign. Don't delay, write today enclosing 4½d. in stamps for postage.

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TRIANGLE Show Jumping. SOUTH MOLUCCAS Set 2 multi-coloured butterflies, & 27 stamps free. Send 3d. post. & request appvls. **ROSEBERY STAMP SERVICE (Dept. A1), 37 Rosebery Rd., Epsom, Surrey**

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H. BANKS, 62 AVONLEA ROAD, SALE, CHESHIRE

50 STAMPS FREE—Ask to see my approvals. Mixtures at 20 for 1/–. Postage Please. (*Postal only*)
GBN(M), 41 Collins Road, WEDNESBURY, Staffs.

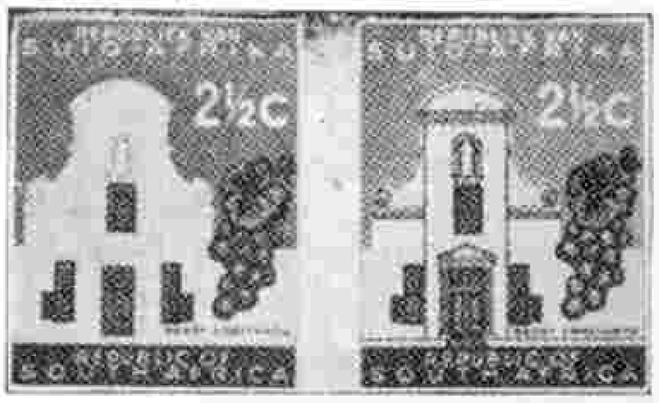
FREE! STAMPS CATALOGUED OVER 15/–
To all approval applicants. 3d. postage. **G. I. Pattle, "Pattlesden", Rattlesden, Bury St. Edmunds, Suffolk**

FOR OTHER STAMP ADVERTISEMENTS SEE ALSO PAGE 38

mounted. They would also help to make us see that the Commonwealth is not yet a dead duck.

REDRAWN DESIGNS

Some little time ago I got a letter from a young collector who apparently was all hot and bothered about two stamps she had received. Both were on one piece of envelope and, as was pointed out, although they were of the same face value and of roughly the same design, there was one



notable difference. One of the stamps had the outline of the building done in faint lines, but on the other these lines were much thicker, and the appearance of the doorway also strengthened. Had something happened to one of the stamps, she asked. Something *had* happened, but there was nothing to worry about, as it was just one of those cases where the design had been redrawn. There was another difference, however, which might have been noticed if the stamps had been washed off the paper—the one with the thin outlines would have been found to have a watermark, and the other, perhaps, would have been without one.

NEW DESIGNS

I am afraid that post offices in all countries get an awful wigging from time to time over the stamps they issue, for it is a fact that most of us, whether we collect stamps or not, are at least interested in the designs of the stamps released. One newspaper editor mentioned recently, when Great Britain brought out the three special issues, that for a week almost half the letters he received had to do with the stamps in question. Not all were favourable, however. I was discussing British stamp designs some time ago with a person who had actually designed some of them, and I thought of that conversation when I looked at a stamp which had come on a letter from Czechoslovakia. I could not help but wonder what we would say if our post office were to issue similar designs. Yet, I must admit that I found

this stamp delightful, as I did the whole set of five, which depicts Czech puppets. How would you like our St. Martin's le-Grand to issue a similar set?

CASTING SHADOWS BEFORE

Although Tristan da Cunha (see footnote) had only a few hundred inhabitants, it had plenty of postage stamps, and for various reasons they were very popular, not only in Britain and the rest of the Commonwealth but in the United States as well. The fishy designs helped that popularity. Consequently, when the stamps were withdrawn suddenly on October 12 (following the removal of the population owing to the volcanic eruption) there was a mighty scramble to obtain sets, and I am afraid that they cost a lot more than would have been the case had they been bought while still current.

There is one consolation for those who had to pay the increased price—the stamps only had a life of six months, and many dealers were also caught napping. Incidentally, a set of postage due stamps, in the decimal currency, were ready for release, but unless life is again resumed on the island they will never grace collectors' albums. A pity, will say the many Tristan collectors.

EUROPA ISSUES

Although these stamps have created, and still are creating, more commotion than perhaps any other stamps, and so much speculation has been attached to their sale, many *M.M.* readers who collect stamps will be interested in them, so a word or two may not be wasted. Many dealers had contracted to supply all but the Turkish set, and then that issued by Iceland did not come through, and those of Greece and Portugal were also in very short supply, in spite of hundreds of thousands of copies having been printed.

Are there so many genuine collectors of such items, or were some of the shortages brought about by speculation? Without a doubt there are many of the former, for I have heard it claimed that in West Germany alone there are 5,000,000 collectors. My advice, based on 60 years

(*Continued on page 43*)

Footnote—*The plight of those who lost their homes at Tristan da Cunha has evoked a response from many firms in Britain. Within a few days of the islanders' arrival in this country Meccano Limited provided a large Meccano Outfit and a number of Dinky Toys for the use of youngsters at the reception base.*

By E. W. Argyle

Locomotives On Stamps

THE Locomotive depicted hauling a sugar cane train on the Colonial Sugar Refining Company's lines in Fiji was built by Hudswell, Clarke and Co. Ltd., Leeds. It is one of 34 0–6–0 tender locomotives supplied through the years since 1912 to a basic standard design. The engines have 2 ft. 2 in. diameter wheels, with outside cylinders measuring 10×12 in., and weigh, in working order, 30 tons 4 cwt. The gauge is 2 feet. There are 300 miles of this line serving the plantations.

Shown on the stamp above is the "Golden Blowpipe" or, by its Malayan name, "Sumpitan Emas" of the Malayan East Coast Railway, an express running three times weekly from Gemas to Tumpat, 327 miles, mostly through primeval jungle. The express is being drawn by "0" class Pacifics 564.12 and 564.04. This east coast line was dismantled by the Japanese but has now been completely rebuilt for service.

CALLING ALL BUS SPOTTERS

Getting The Hamlet Habit—With Books

POLONIUS: "What do you read, my lord?"

HAMLET: "Words, words, words." (Hamlet Act. II Sc. II).

CHRISTMAS is over, but the long dark, cold evenings are still with us. This is the time of year to supplement your practical bus-spotting activities with some armchair studying of the many useful books that have appeared in the last twelve months. This month I want to draw your attention to a few of these. I can recommend them all.

Since we have recently dealt quite fully with the subject of trolleybuses, what about starting with "The London Trolleybus", published by Dryhurst Publications, 19 Winchester Road, London N.W.3, at 5/–? As you may know, on May 23 this year the last conversion to diesel operation will take place in the Metropolis, when the last depot (Fulwell) loses its trolley fleet. By the way, Fulwell was the first depot to have them, too! This book of 60 pages, with its 27 fine photographs, is an encyclopaedia of knowledge on these doomed vehicles. After a comprehensive history of their 30 years of service, each class, from A1 up to Q1, is handled from a technical angle. Appendices deal with such related topics as trolleybus depots and all the variations in the routes themselves.

* * * *

From the almost extinct to the very much alive; another volume well worth reading is Harold Brearley's "A History of Bradford Trolleybuses 1911–1960" (published by the Oakwood Press of Bucklands, Tandridge Lane, Lingfield, Surrey at 6/–). Bradford, along with its neighbour Leeds, pioneered trolleybus operation in June 1911 with crude looking single-deckers with solid tyres and a Siemens electric motor mounted on a Brown chassis.

The story of the momentous decision to try this form of transport, and its subsequent history, is well told by the author, who has worked in the city's transport department for 25 years, and obviously loves these vehicles. Fifteen excellent photographs give some idea of the advance in trolleybus design over the past half-century. Appendices provide a list of all rolling stock up to 1960 and some extremely technical notes on these follow, when such minutiae as the weight on front wheels, clear height of lower saloon and maximum speed on the level are quoted.

By

DAVID KAYE

For those who hanker after trams I can assure you of pleasant hours if you try "The Tramways of Northumberland" by George S. Hearse (published by the author at High Garden House, Blanchland, Consett, Co. Durham at 12/6, post free). The book's 104 pages, in stiff board cover, contain a wealth of detail about four systems—the Tynemouth and District Electric Traction Company, Newcastle-upon-Tyne Corporation Tramways, Tyneside Tramways and Tramroads Company and the North Sunderland Railway.

These are illustrated by no fewer than 65 prints, many of the vintage variety. One such shows Newcastle car 102 (now preserved), packed with more passengers than its 84 seats could hold, trundling along the famous Scotswood Road, not to the races, but to the factories. Even rosters, time clocks and tickets are dealt with in this amazing piece of private enterprise.

* * * *

My last pair of books deal mainly with motor buses. "The Birmingham and Midland Motor Omnibus Company" (published by the Omnibus Society and P.S.V. Circle as two parts—Part I (1904–33) price 6/6, and Part II (1934–59) price 4/6, both volumes at 10/–, from A. G. Johnson at 252 Albert Road, London N.22) is as full an account of the enormous Midland "Red" concern as has appeared to date. Each part starts with a detailed history of company development, followed by a full fleet rolling stock listed first by bonnet numbers and then by body numbers. Chapters at the end deal with the bigger firms acquired such as Kemp and Shaw and Startford Blue.

* * * *

Finally, if you live in London or its environs, don't forget the 19th edition of "ABC London Transport Buses and Coaches" (published by Ian Allan Ltd., at 2/6). This will be the last issue with trolleybuses in it, and therefore its pictorial section is particularly valuable. The new RM class is listed well past the 1000 mark to keep spotters up-to-date.

The tramcar is still a major form of transport abroad, but has almost vanished from Britain. In spite of this, interest in past tramway systems is spreading rapidly, and this is proved by the popularity of numerous tramway histories published over the last few years. There have, however, been very few books dealing with trams in a general way, so the appearance of *The British Tram* by Frank E. Wilson (Percival Marshall, 5/–) is particularly welcome.

There are six chapters, covering history and development, general features, cars and their electrical and other equipment, and finally their decline. A particularly interesting chapter deals with tramway track, a subject on which little has been written in the past. The numerous illustrations will give the younger readers an idea of what trams were like in their heyday, although only two show modern vehicles, these being at Blackpool. This town had Britain's first electric trams and will be the last to retain them.

The author is an authority on his subject, having studied tramways all his life.

Dinky Toys News—(*Cont. from page 21*)

with the rest of the vehicle to make a car which is well designed for use in the more difficult countryside areas of Canada and the United States.

The photograph at the bottom of page 20 shows the Dinky Toys model in a setting which can be seen today in almost any city or town throughout the world. An attendant is directing a Fairlane into a parking space behind a big office block. It is quite possible that the car-park is a private one for the people who work in the offices, because finding room in public "parking lots"—as they are called in America—is so difficult nowadays that the owners of many large buildings provide their own.

On page 21 you see a close-up of the new model which emphasizes its elegant, modern lines.

Before ending this month's notes I would like to say that I have received a number of letters asking about the possibility of further Dinky Toys competitions. I can assure readers I shall be including more of these in "Dinky Toys News" as the months go by.

British Teleprinter Triumphs—

(*Continued from page 22*)

A small, hand-picked team of top-flight engineers was assigned to the project and the tedious work of thinking out and testing new ideas began. As a result of their labours, Creed once again made news with the "Creed Seventy-Five" teleprinter—the fastest, lightest and smallest teleprinter in the world.

The new machine made its debut in March 1956 when it achieved the distinction of being the first teleprinter in the world to be used in a commercial airliner on a scheduled passenger flight. This was while installed in a B.O.A.C. Stratocruiser on a regular flight between London and New York, when it automatically printed weather data transmitted by radio from stations in Scotland and Nova Scotia.

The new "Seventy-Five" has been described as the world's most advanced teleprinter, and is capable of non-stop printing at the rate of 100 words a minute.

Among the many new features of the machine are the paper handling arrangements. The paper does not move back and forth in a carriage past the printing point, as in earlier models and typewriters. Instead, the typehead, which actually prints the message, moves in front of the stationary paper.

The first major installations of the "Creed Seventy-Five" after general production began was for Reuters. Two hundred machines were installed in London newspaper offices receiving the Reuter News Distribution Service which operates on a 24-hour, 100 words-a-minute basis.

Orders for the new printer flooded in and Creed's Croydon factory is now in full production turning out their new machine by the hundred.

This new British teleprinter is not only helping to speed up the communications of the world, but is also proving a valuable export item.

Mobile Robot for Nuclear Tests—

(*Continued from page 36*)

between the lock and the cell will then be lowered and the test items moved into position near the reactor by a track transport system.

The test items are removed by reversing this procedure. "Mobot" then disassembles the irradiated items for testing in the hot laboratory, with the assistance of more conventional manipulators and bridge cranes.

The device is, in fact, simple, rugged and inexpensive. Equipped with 200 feet of cable for wide-ranging manœuvrability it can pick up and use auxiliary tools such as wrenches, screwdrivers, hammers and shears for dismantling radioactive materials. By means of it, future generations will be able to service an aircraft that carries its own nuclear reactor aboard, or release a critical assembly of atomic energy too dangerous for man to approach.

The present "Mobot" somewhat resembles a small tractor. Its "pilot" does not ride aboard; he sits safely in another area behind thick concrete, where he has no direct view of his "slave", and directs the mobile robot's movements with pistol-like grip controls that form electronic "reins". The operator views the hot room through Mobot's closed-circuit television eyes, which are mounted on its shoulders and move with it. Other cameras on the walls of the room may afford overall vision. A microphone "ear" in Mobot permits the operator to hear its metal fingers grasp an object at the same time as he sees the hands clutch it on the close-up cameras.

Stamp Gossip—(*Continued from page 40*)

or more of collecting is that while it is all right to buy stamps if you can get them at a reasonable percentage over face value, leave the stamps severely alone when they have risen as have these "Europas". There is to be another lot out next year, and the same advice applies about these.

INDIA'S "SPECIALS"

I was talking to a Commonwealth collector the other day, and as he showed me one of India's latest special stamps he remarked, "India's still at it". Of course, what he meant was that this sister country is overdoing the issue of commemorative stamps. Now, to be quite candid, I do not think that she is. It only seems a lot because they are released in homeopathic doses, as it were. Why, one of Ghana's special issues has a face value as much as all India's stamps for 1961. I mention this because it is the stamps of countries such as India, with their low face value, which enable a young collector with limited pocket money to make a show within his means. Good for India.

THE TIP OF THE MONTH

Before the war, when Britain brought out a special issue (*when* she did!) the ordinary stamps of the same face value were withdrawn while the specials were on sale. This meant that with everybody using them there were plenty of used commemoratives about. It is not so now. Collect all the nicely-cancelled special stamps that come your way. At least they will make splendid swops.

Club and Branch News—

(*Continued from page 29*)

of the seventh and final member of the committee, and this member is elected by the whole Club. During the school holiday period a Club party went to see the Walt Disney film *Kidnapped*, and members also enjoyed a cycle run to the Club's old camping spot at Brumby Flats, where they supplemented the cut lunch they had brought from home with a meal of barbecued steak. *Secretary:* Trevor Criddle, 17 Kenilworth Street, Maylands, Western Australia.

BRANCH NEWS

NORTH END (PORTSMOUTH)—At the time of writing the Branch was busy preparing for the Christmas display and Bazaar. More Two-Rail track has been bought, and at present the layout resembles that illustrated on page 413 of the November 1961 *M.M.* but without the sidings and loop lines, which will be added when the above display is over. The track is at present on a temporary base, but will then be screwed down permanently. *Secretary:* Mr. A. J. Nicholson, 213 Sultan Road, Buckland, Portsmouth.

A Piggy-Back Railway—

(*Continued from page 34*)

offer the driver more protection from the weather.

In addition to the narrow gauge railway line there is also a length of broad gauge which connects through a siding with the Irish National Railway. So that the narrow gauge locomotives can be used on the broad gauge lines, an electric hoist is fixed at the junction between the broad and narrow gauges. The narrow gauge locomotives are then lifted on to a broad gauge wagon so that the locomotive wheels rest on friction wheels on the wagon top.

A system of gearing then connects the friction wheels driven by the locomotive with the wheels of the wagon. When the narrow gauge locomotive wheels turn, the broad gauge wagon is propelled along.

One section of the broad gauge line passes along a public street, and when locomotives run along that line, a man with a red flag must walk in front.

Yet another unusual feature of this interesting railway is the spiral tunnel which was built by Samuel Geoghegan. It rises 25 feet, carrying the railway from the middle to the upper level. Throughout its two and a half turns it rises at a gradient of 1 in 39. Built, as it was, so long ago it still is unequalled except in Switzerland.

A Competition For All Our Readers

WHICH COVER DO YOU LIKE BEST?

THE illustration below reproduces, on a small scale, the twelve covers of last year's issues of the *Meccano Magazine*. Being in black and white, it does not give any idea of the colour and brilliance of the originals, and is intended only as a reminder of what the subjects were. We invite readers to give us their opinion of these 1961 covers.

It is only necessary for each entrant to state on a postcard (a) which of the covers he likes best, and (b) in what order he thinks they will be placed by the combined votes of competitors.

In each list the covers must be referred to by the names of the months on which they appeared, and, of course, it is not necessary for a competitor to place his own favourite cover at the top of his list under the second heading.

The names, addresses and ages of entrants must be written on their postcards, which should be addressed to: 1961 Cover Voting Contest, *Meccano Magazine*, Binns Road, Liverpool 13.

There will be two sections in this competition, for Home and Overseas readers respectively, with prizes in each of 21/–, 15/– and 10/6 for the three entries which are judged the best, and consolation prizes for other good efforts.

Closing dates: Home Section, February 28; Overseas Section, May 31.

Hornby-Dublo On The Screen

THE film *Mining Review* (Issue No. 3, 15th Year), which contains scenes shot in the Meccano Factory at Binns Road, Liverpool, during production of the West Country Class Locomotive "Barnstaple", is due to be shown at cinemas in many parts of England, Scotland and Wales during January. *Mining Review* is a general film dealing with a number of topics. The production of Hornby-Dublo Locomotives is one of the subjects touched upon in the particular issue mentioned and the sequences run for about three minutes.

Anyone who is making a special journey to see the film should check with the theatre manager, in advance, that the picture is being shown on that particular day, since programmes are sometimes changed because of running times, etc. Here are details of the areas covered. The number of days on which the film is due to be screened is given in brackets after the name of the theatre.

LONDON AND HOME COUNTIES

January 1, Manhattan, Eastbourne (6); Essoldo, Poplar (6); Rex, Wood Green (6); Plaza, Thrapston (3). January 4, Crescent, Leatherhead (3). January 8, Rothbury, Portslade (6). January 11, Whitehall, Witham (3). January 14, Cinema, Saffron Walden (7); Essoldo, Bethnal Green (7). January 18, Priory, Royston (3); Regal, Biggleswade (3). January 22, Astoria, Ware (3); Empire, Wareham (3); Empire, Halstead, Essex (3). January 28, Empire, Great Yarmouth (7); Palace, Lowestoft (7.)

SOUTH WALES

January 1, Workmen's Hall, Rhymney (3); Cinema, Clydach Vale (6); Miners, Gwaun-Cae-Gurwen (6). January 4, Olympia, Cwmbran (3). January 8, Capitol, Ystalyfera (3); Lyric or Public Hall, Pontardawe (6). January 11, Workmen's Hall, Nantymoel (3). January 15, Workmen's Hall, Mardy (3); Workmen's Hall, Abercynon (3); Welfare Hall, Ammanford (3). January 22, Gaiety, Beddau (3); Miners' Hall, Seven Sisters (3); Coliseum, Blaenavon (3); Workmen's Hall, Ton Pentre (3); Workmen's Hall, Tylorstown (3).

WEST OF ENGLAND

January 15, Grand or Radway, Sidmouth (6); Cinema, Pembroke (3).

BIRMINGHAM AND MIDLANDS

January 1, Forum, Bradley (6); Kemble, Hereford (6). January 15, Broadway, Longton (6); Alhambra, Longton (6); Elite, Uttoxeter (3); Regal, Atherstone (3). January 22, Clifton, Lye, Worcester (6).

Fireside Fun

"So you're not on speaking terms with your neighbour?"

"No. He sent me a tin of oil to use on my lawnmower when I started to cut the grass at six in the morning. I sent it back and told him to use it on his wife when she started singing at eleven at night."

"Dad . . . I've just broken the Tube!"

"You've got to admire his pluck!"

Teacher (looking over Tommy's homework): I don't see how it's possible for a single person to make so many mistakes.

Tommy: It wasn't a single person, Miss. Father helped me.

* * * *

Politician: Did your paper say I was a liar and a scoundrel?

Editor: It did not.

Politician: Well, some paper in this town said so.

Editor: It may have been our contemporary down the street. We never print stale news.

* * * *

Austin: Which side of his face does the Meccano Guild Secretary shave first?

Fergus: The outside, of course!

NOTTINGHAM AND DERBY

January 1, Palace, Earl Shilton (3). January 8, Highbury, Nottingham (3). January 11, Lenos, Nottingham (3); Palace, Ibstock (3). January 15, Rex, Coalville (6).

LANCASHIRE

January 4, Ellesmere, Swinton (3). January 8, Magnet, Newton Heath, Manchester (3). January 14, Ritz, Preston (7). January 21, Palladium, Preston (7). January 22, Ambassadors, Pendleton, Manchester (3). January 25, Carlton, Clayton, Manchester (3).

YORKSHIRE AND LINCOLNSHIRE

January 1, Empire, Grimethorpe (3). January 4, Metro, Middlesbrough (3). January 5, Hippodrome, Rossington (2). January 8, Rex, Dewsbury (6); Coliseum, Bentley, Nr. Doncaster (3); Picture House, South Elmsall (3). January 15, Savoy, Lupset, Nr. Wakefield (3); Hippodrome, Hemsworth (3); Rock, Cudworth, Nr. Barnsley (3). January 22, Co-op, Horbury (3); Globe, Barnsley (6). January 25, Western, Armley, Leeds (3).

DURHAM

January 1, Majestic, Esh Winning (3). January 11, Regal, Whickham (3).

SCOTLAND

January 1, Capitol, Galashiels (3); Playhouse, Thornhill (3). January 5, Regal, Auchterarder (2); Playhouse, Stornoway (2). January 8, Cine de Luxe, Lochgelly (3); Curzon, Aberdeen (6); Broadway, Blantyre (3). January 11, Regal, Dalry (3); Birks, Aberfeldy (3). January 15, Picturedrome, Cardenden (3). January 19, North Star, Lerwick (2); Abbey, Mauchline (2). January 22, Regal, South Queensferry (6); Vogue, Cathcart, Glasgow (6); Vogue, Govan, Glasgow (6); Vogue, Possilpark, Glasgow (6). January 31, Rex, Wigtown (2).

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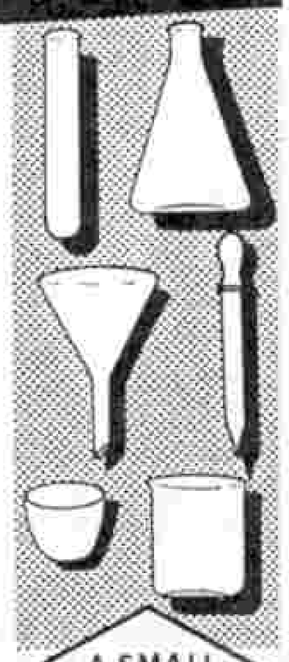

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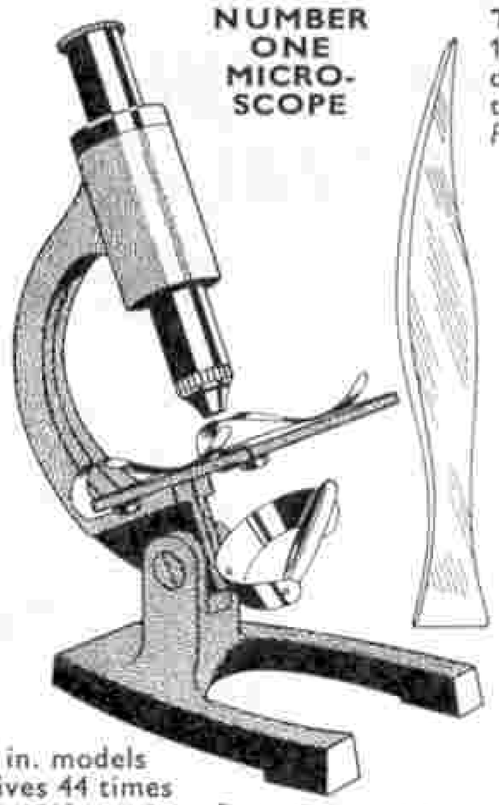

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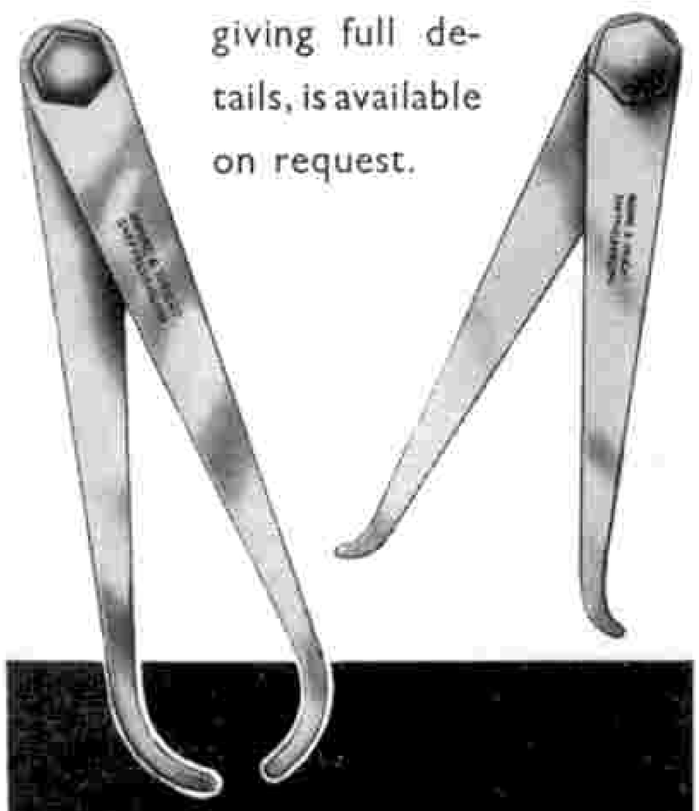

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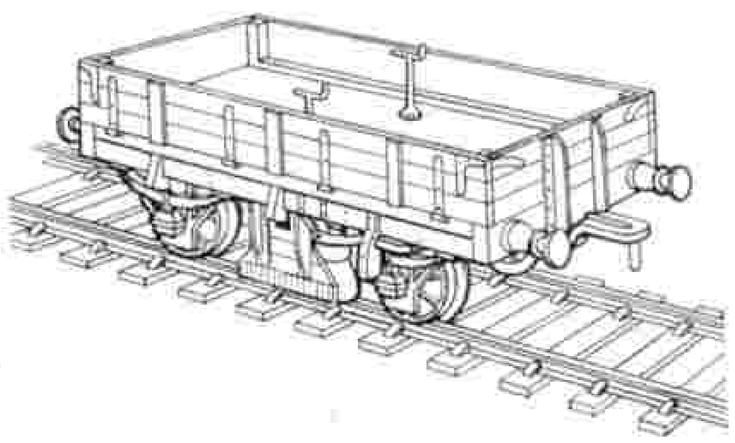

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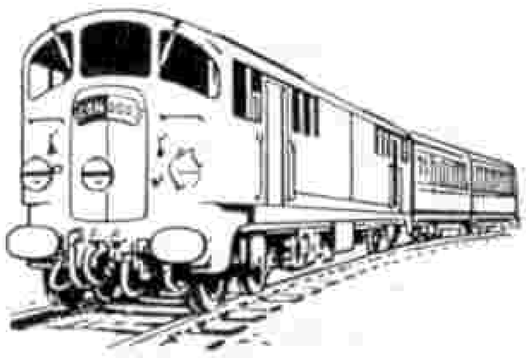

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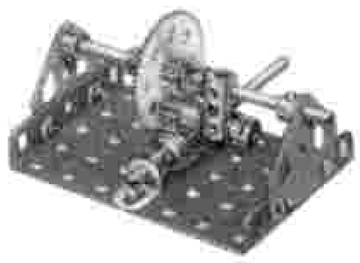

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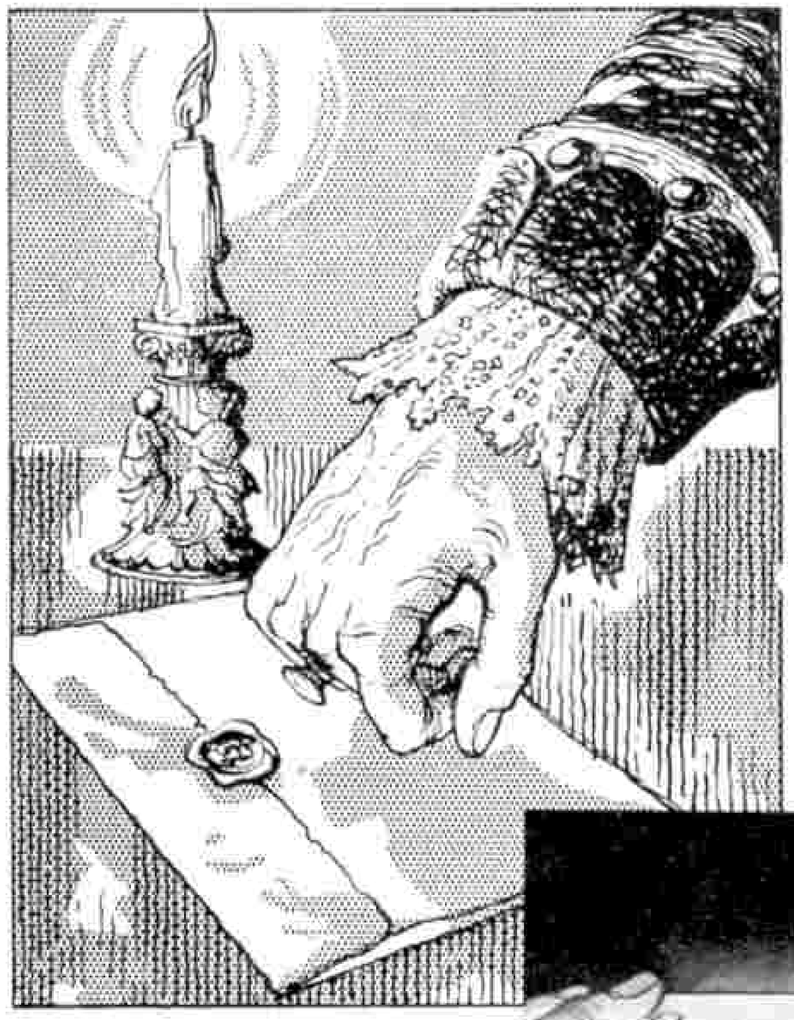

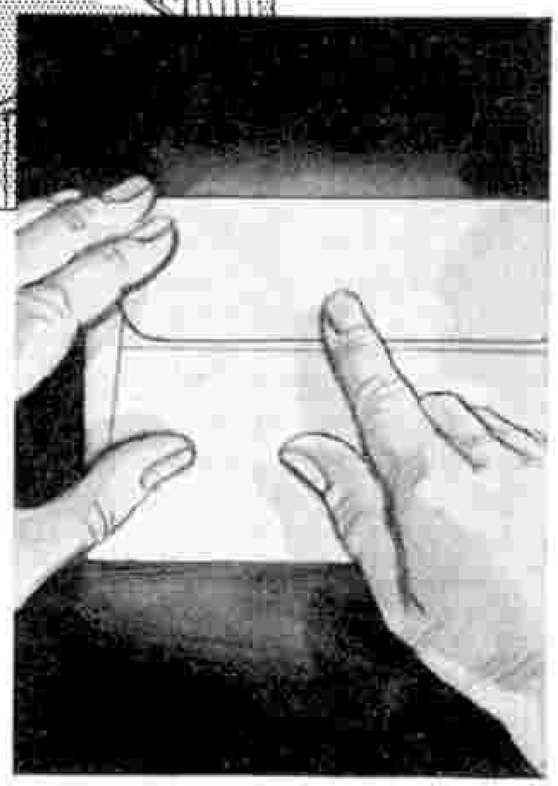

HOW TIMES HAVE CHANGED

When envelopes were invented early in the 18th century, they had to be sealed with wax. Sometimes a signet ring was used to press down the hot wax and mark it with the sender's initials. Not until 1840 were envelopes made with gummed flaps. Today there are *self-seal* envelopes which have, in place of the gum, a special latex adhesive supplied by Dunlop Chemical Products Division. They require no licking, and seal more securely; they cannot be opened without showing signs of interference. That is why they are widely used for pay-packets and for confidential correspondence.

DUNLOP

SYMBOL OF PROGRESS

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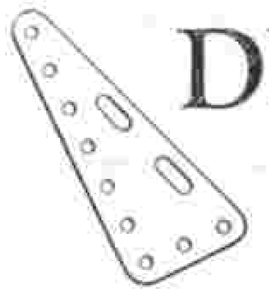

DEALERS WHO SPECIALISE IN MECCANO SPARE PARTS

Listed below are some of the dealers who sell Meccano accessories and spare parts. This is intended to aid enthusiasts—and there are many of them—who constantly require additional spare parts for their Sets. All dealers can of course order Meccano spare parts for their customers, but those listed below are among our spare part specialists.

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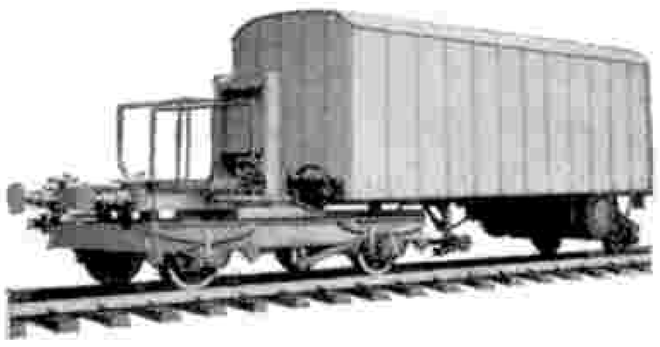

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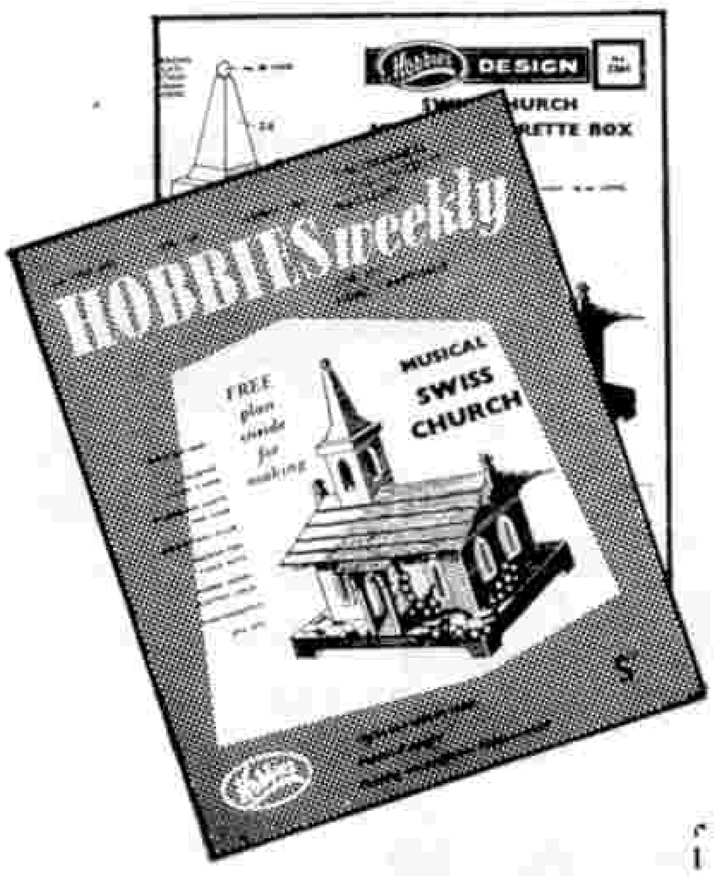

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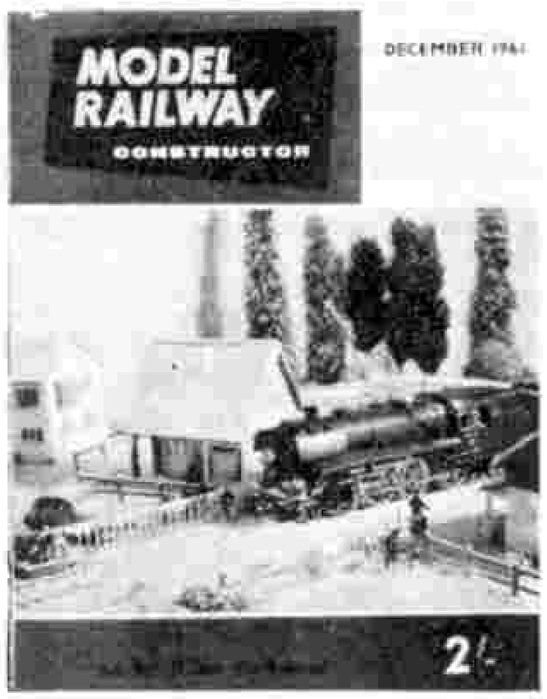

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Advertisements of goods recently and currently manufactured by Meccano Ltd. are not accepted.

SALES

Large general Stamp Collection being broken up. Selections willingly sent. S.A.E.—Mrs. M. Cummings, 71 Branksome Drive, Shipley, Yorks.

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Any pre-war Hornby items, Clockwork or Electric, good condition essential. Details to—Birchenough, Tarn Hows, Bosley, Nr. Macclesfield.

Books on Aerial Warfare, R.A.F., World's Airforces, Aviation, Zeppelins, Airships.—Letchford, 116 Bohemia Road, St. Leonards, Sussex.

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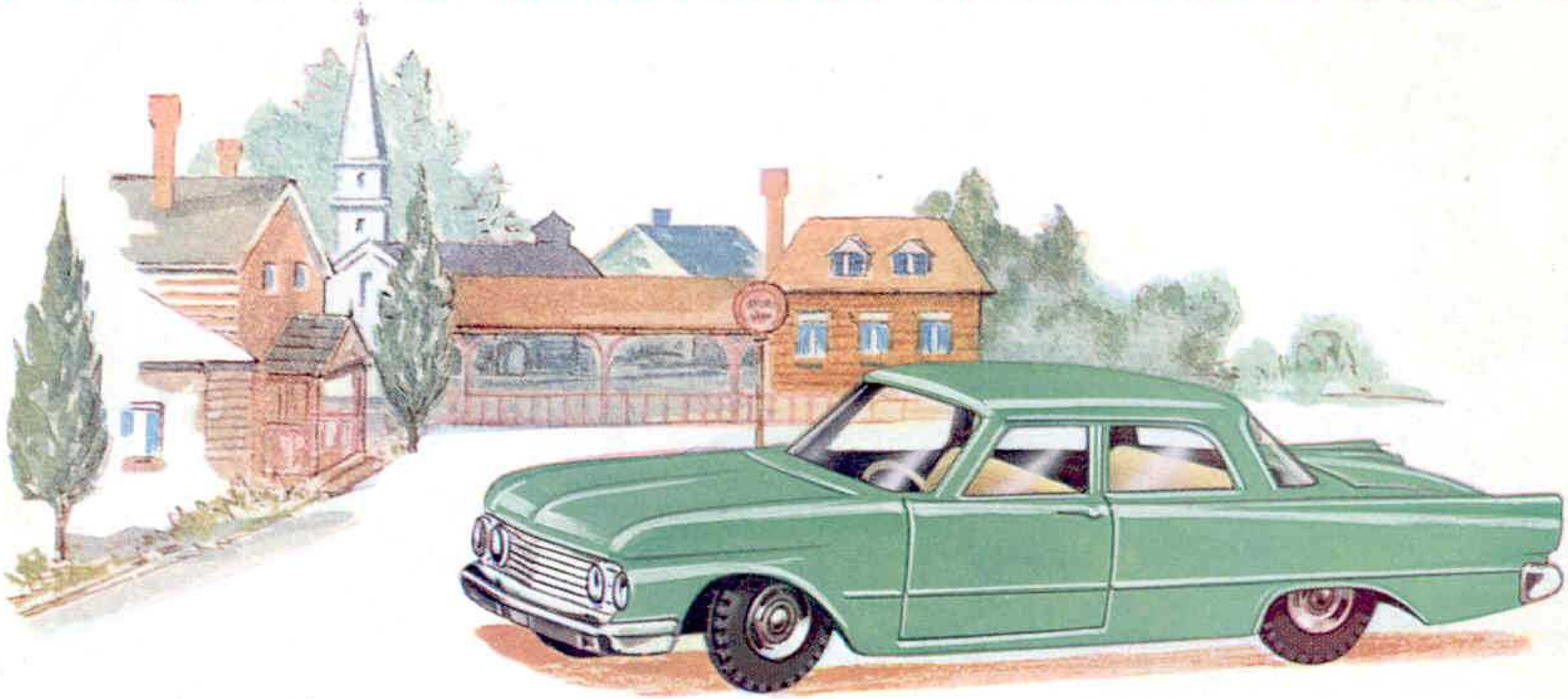

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MODEL OF THE MONTH.

PAPER FOLDING MACHINE.

Described in the January, 1962, issue of the Meccano Magazine.

Framework.

First assemble a rectangle from two 12½" and two 5½" Angle Girders 1 and 2 and then bolt two 12½" Angle Girders 3 to the 5½" Girders. To the ends of the Angle Girders 3, bolt a 4½" Angle Girder 4 and a 3½" Angle Girder 5. These are supported by a 12½" Strip Plate and a 12½" Strip 6. Now connect the 5½" Angle Girder 7 to the Angle Girder 4 and the 4½" Strip 8, placing a 1" Corner Bracket 9 at one end of the Angle Girder 7. Both sides of the machine are similar and they are joined together by two 4½" x 2½" Flat Plates 10, the front edge of the inner Plate being slightly upwards so as to clear the lower roller. Two 4½" Angle Girders 11 are bolted to the Plates as shown.

The Rollers.

On each side of the framework bolt a 5½" Formed Slotted Strip 12 and a 4½" Strip 13 to the 12½" Strip 6 joining them together at their upper ends by a 4½" x ½" Double Angle Strip 14. A 2" Formed Slotted Strip 15 is attached to the Corner Bracket 9. Now wind gummed brown paper around a Wood Roller so as to give it an even surface and cover the slots. Place the Roller on a 5" Rod 16 and secure it by Collars. Then place the Rod in the slots of the 5½" Formed Slotted Strips 12 with a 1" Pulley at each end. Two Rollers with 1" Gear Wheels at their ends, are placed on 5" Rods 17 and 18. Rod 17 is passed through the centre hole of the 5½" Formed Slotted Strip 12 and the slot of the 2" Formed Slotted Strip 15. A 1" and a 2" Pulley are fixed at each end of the Rod 18. A Driving Band is used to connect the 1" Pulley on Rod 18 to the 1" Pulley on Rod 16.

Rubber Band Paper Drive.

A 5½" Strip 19 on each side of the machine has a 3½" Flat Girder 20 bolted to it, and it is attached to the framework by a ½" x 1" Reversed Angle Bracket and a 3½" Strip 21. The Flat Girders are linked together

Contd./

by a $3\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip 44. The $5\frac{1}{2}$" Strips 19 are mounted on the 5" Rod 22 and journalled in the 2" Formed Slotted Strips 15. On this Rod are placed six $\frac{1}{2}$" Pulley Wheels 23 and 24. A $4\frac{1}{2}$" Rod 25 positioned by four Collars carries two loose $\frac{1}{2}$" Pulley Wheels, which are driven by elastic bands from the $\frac{1}{2}$" Pulley Wheels 24. The $4\frac{1}{2}$" Rod 26, placed in the end holes of the Strips 19, carries four pairs of $2\frac{1}{2}$" Strips 27 spaced apart by a Double Bracket and a Washer, and also carries the $3\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip 28. The $2\frac{1}{2}$" Strips 27 are now placed on another $4\frac{1}{2}$" Rod 29, held in place with Spring Clips. Four $\frac{1}{2}$" loose Pulley Wheels 31 are placed on a 5" Rod 30 and the four 10" Driving Bands 32, which pass above and below the bottom roller, and around the $\frac{1}{2}$" Pulley Wheels 23.

Drive.

An E15R or E20R Electric Motor is mounted on the $5\frac{1}{2}$" Angle Girder 2 and a $4\frac{1}{2}$" Strip 32. A $\frac{1}{2}$" Pulley on the armature shaft drives a 3" Pulley 33 on the 5" Rod 34 with a 10" Driving Band. At each end of the Rod 34 a $\frac{1}{2}$" Pulley is placed. Two 15" Driving Bands take the drive from the $\frac{1}{2}$" Pulleys to the 2" Pulleys on Rod 18.

Paper Fold Guide.

Two $4\frac{1}{2}$" Angle Girders 35 extended by a $4\frac{1}{2}$" Flat Girder 36 are bolted to two $4\frac{1}{2}$" Strips 37. A $3\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip 28 is attached to one of the Angle Girders 35. At the same time four $4\frac{1}{2}$" Strips 38 are placed in position. The other Angle Girder 35 is extended by a $4\frac{1}{2}$" Flat Girder 39. The Double Angle Strip 28 is now placed on the Rod 26. A 1" x $\frac{1}{2}$" Angle Bracket 40 is bolted to the Strip 19 to form an adjustment for the top. Three Threaded Pins 41 are attached to a $4\frac{1}{2}$" Strip that is secured to two Threaded Bosses 42 with two spacing Washers. Two Screwed Rods, one 5" and one $4\frac{1}{2}$", are screwed through the Threaded Bosses and held in position by a pair of lock-nuts on each side of the Flat Girder 36. A $\frac{3}{4}$" Sprocket Wheel is placed on each Screwed Rod and the two are connected by Chain. A 1" Pulley is attached to the 5" Screwed Rod to form a handwheel.

Contd./

A guide platform is made by securing a 3½" x 2½" Flanged Plate 43 to the Angle Girder 2 with Obtuse Angle Brackets.

Operation of Model.

The Motor is switched on and a piece of paper, size about 3" x 7" is placed on the platform 10 and pushed towards the revolving rollers on Rods 17 and 18. The paper then travels forward, until it reaches the stop pins 41. The rollers tending to carry the paper forward, cause the paper to bend slightly and the Driving Bands 32 take the paper between the bottom and middle rollers. As it passes through these rollers the paper is folded, the rollers putting in the crease.

If the fold is not in the centre of the paper, the stop pins 41 should be adjusted by means of the 1" Pulley 44, either nearer or farther away from the rollers as the case may be.

Parts required to build the Paper Folding Machine:- 2 of No. 1; 2 of No. 2; 12 of No. 2a; 2 of No. 3; 7 of No. 5; 4 of No. 8; 2 of No. 9; 8 of No. 9a; 2 of No. 9b; 2 of No. 10; 5 of No. 11; 2 of No. 12b; 4 of No. 14; 2 of No. 15a; 1 of No. 19b; 2 of No. 20a; 5 of No. 22; 6 of No. 23; 9 of No. 23a; 4 of No. 31; 4 of No. 35; 84 of No. 37a; 75 of No. 37b; 30 of No. 38; 1 of No. 48c; 2 of No. 48b; 1 of No. 53; 2 of No. 53a; 2 of No. 55; 2 of No. 55a; 12 of No. 59; 2 of No. 64; 1 of No. 80; 1 of No. 80b; 1 of No. 94; 2 of No. 96a; 3 of No. 103c; 2 of No. 103d; 3 of No. 106; 2 of No. 111c; 4 of No. 115; 2 of No. 125; 2 of No. 133a; 6 of No. 186a; 1 of No. 186b; 2 of No. 186d; 2 of No. 197; 1 E15R or E20R Electric Motor, 6 Elastic Bands (obtainable from Newsagents and Stationers).