VOL. XLII No.11 NOVEMBER 1957

MECCANO MAGAZINE

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1/3

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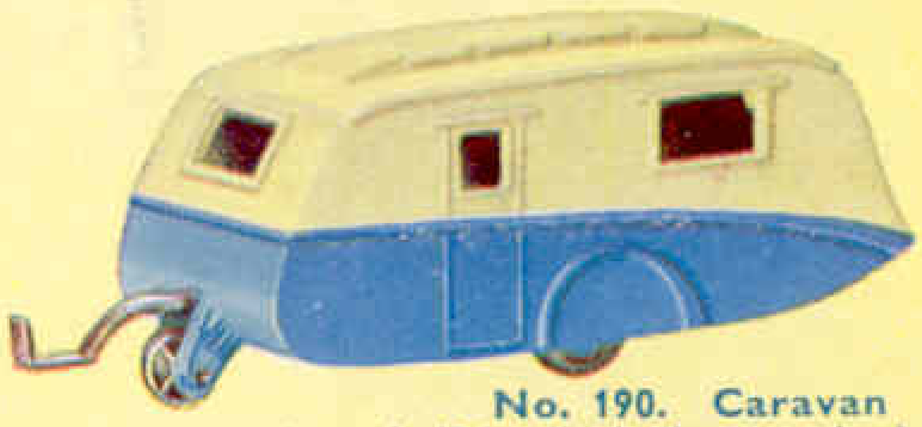

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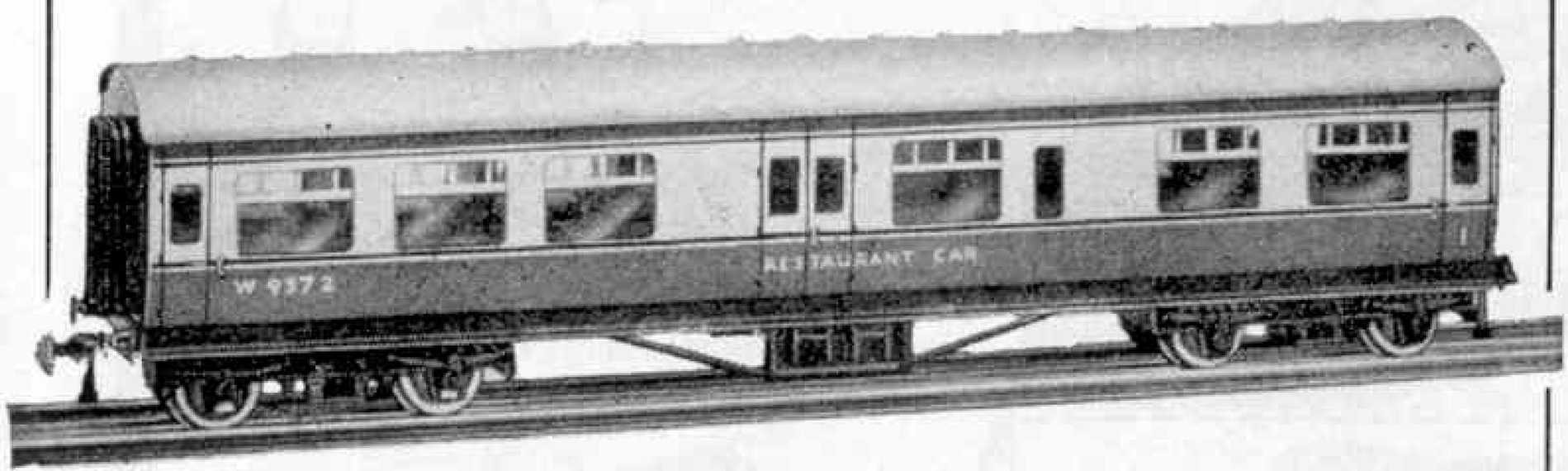
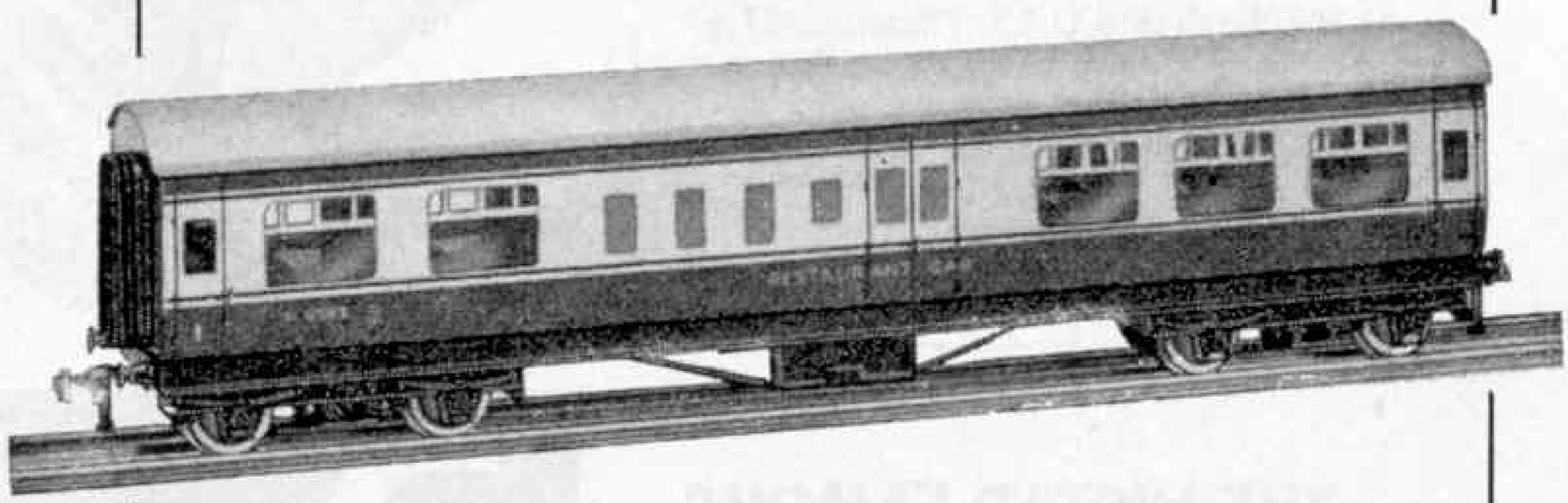
D20 COMPOSITE RESTAURANT CAR B.R. (W.R.)



This is the D20 Composite Restaurant Car in W.R. brown and cream livery. The interior of the Car is fitted up to represent the two saloons, for first class and second class passengers respectively, with a central kitchen and the side corridor connecting the various sections.

U.K. PRICE 15/11 *(inc. Tax)*

D20 COMPOSITE RESTAURANT CAR B.R.



The Restaurant Car is available also in B.R. red and cream finish, for those who already have Hornby-Dublo D12 Corridor Coaches in this livery. This illustration shows the opposite side of the Car from that of the W.R. brown and cream vehicle shown above.

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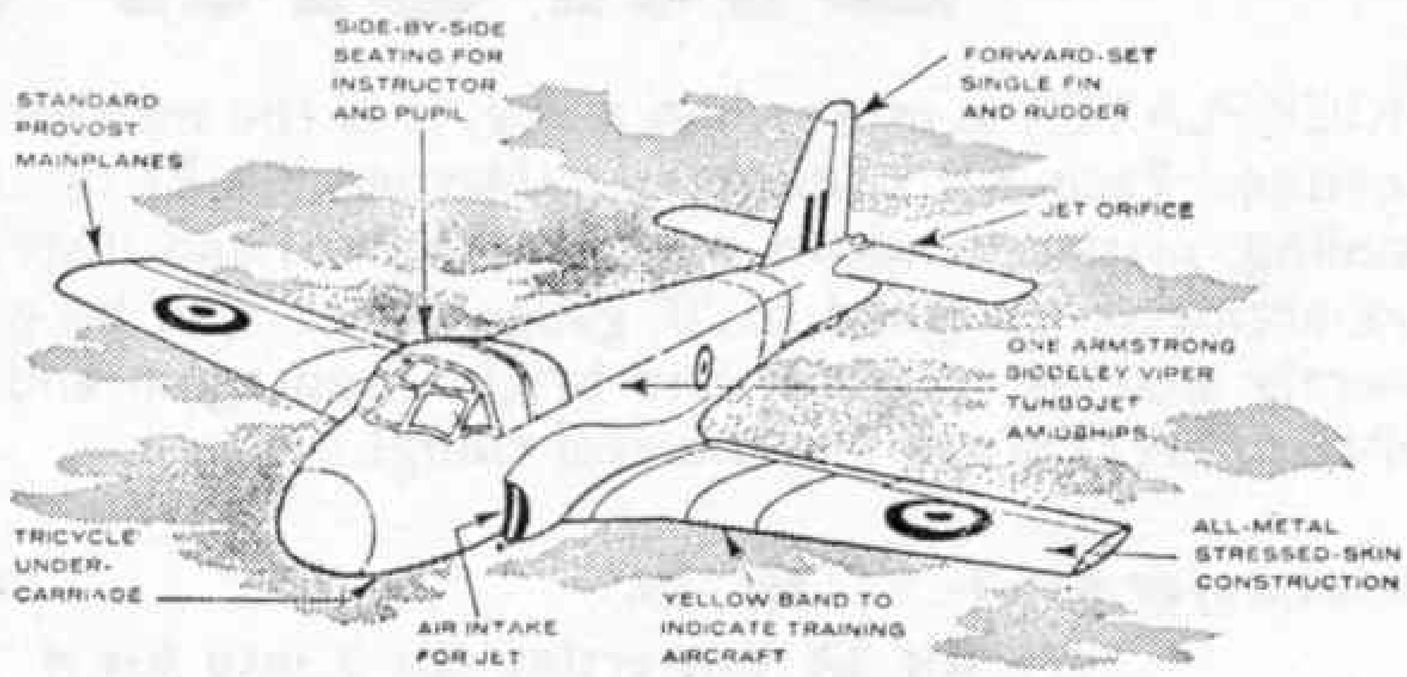

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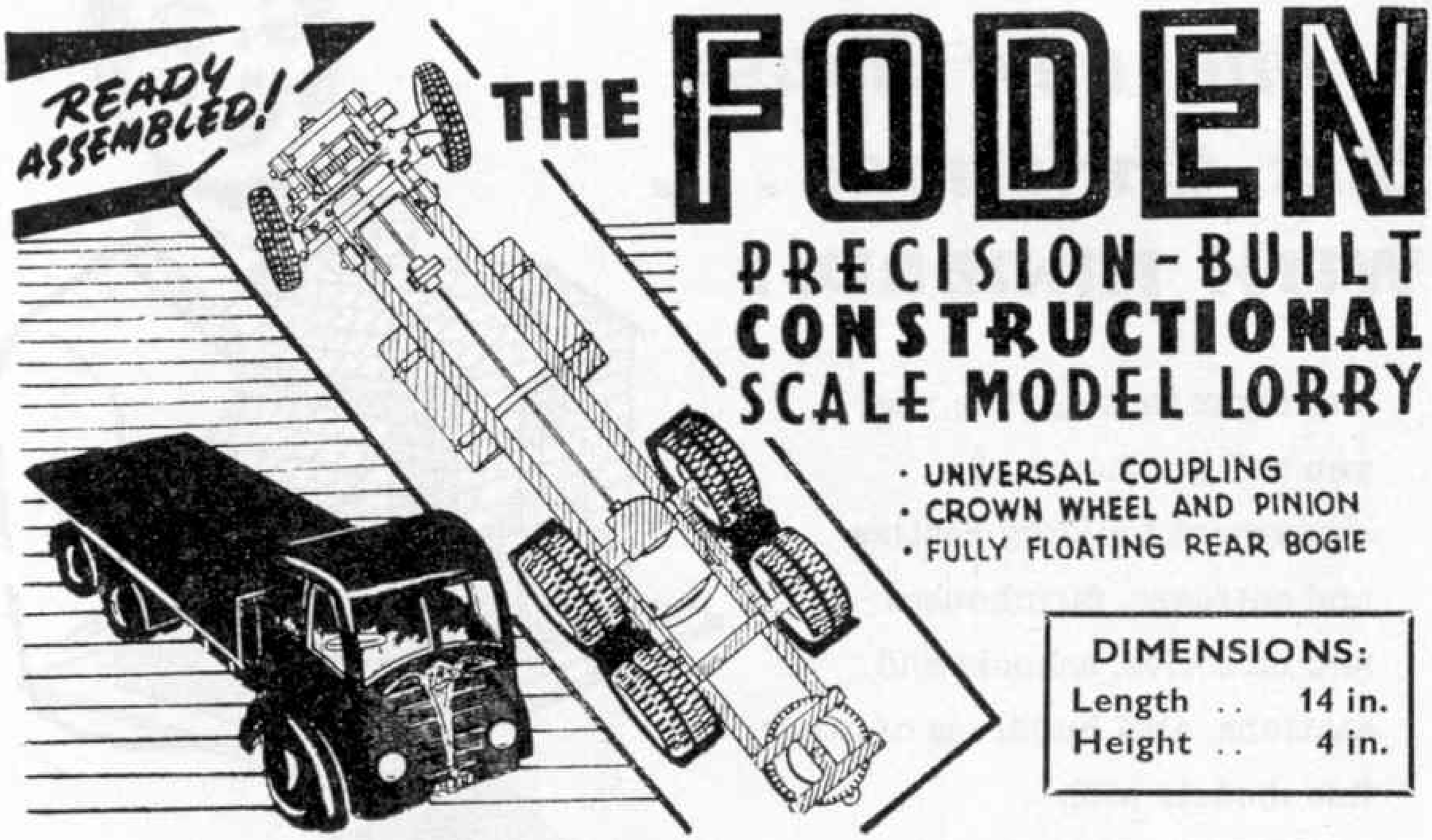

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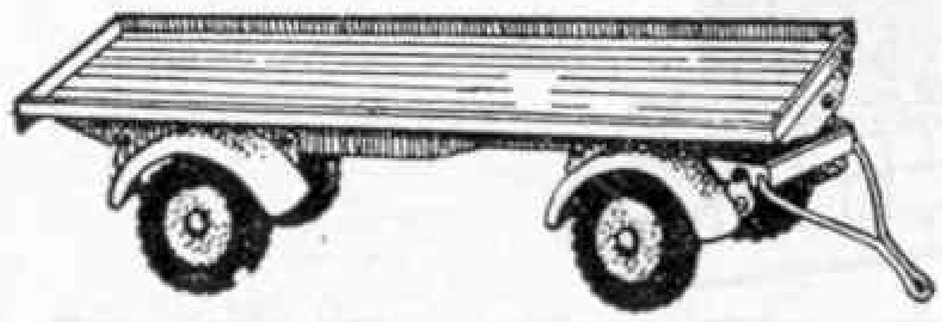

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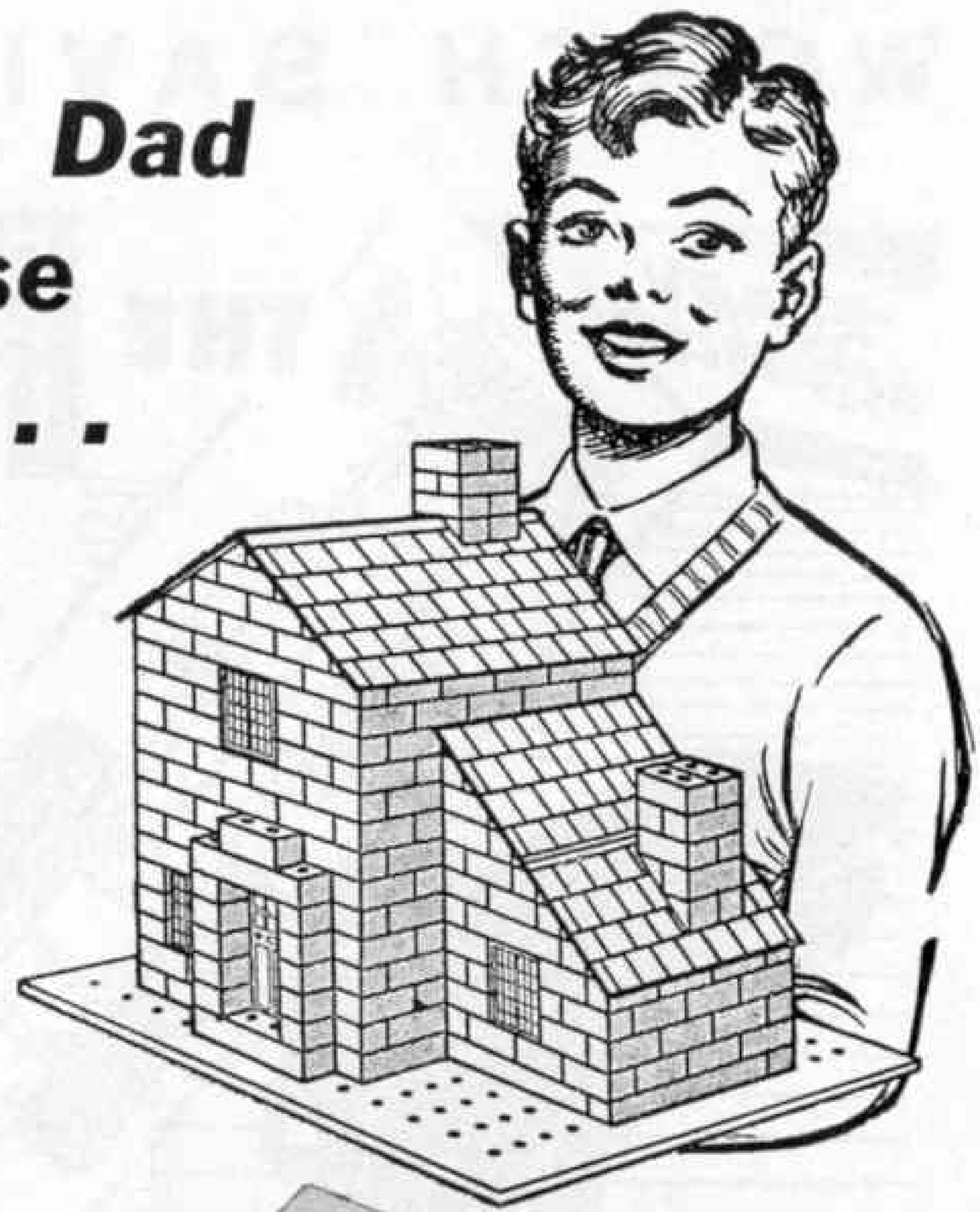

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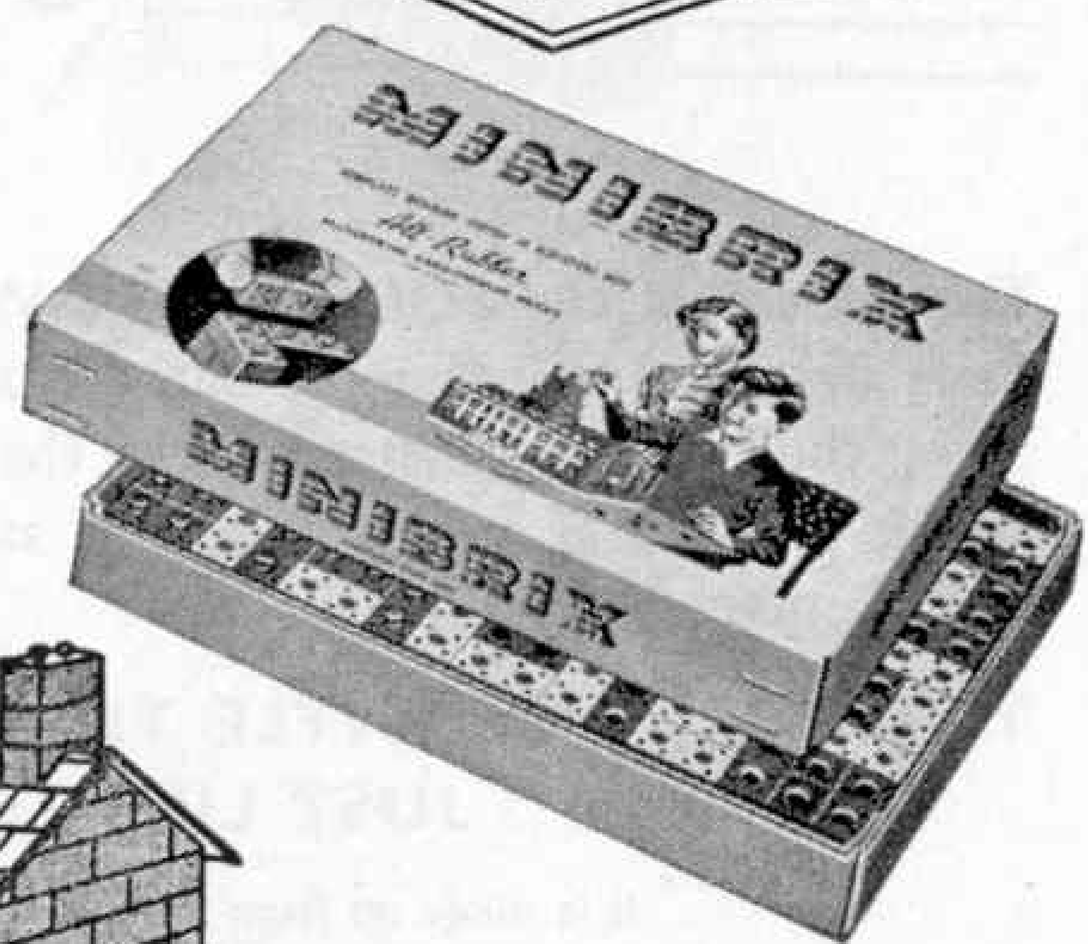

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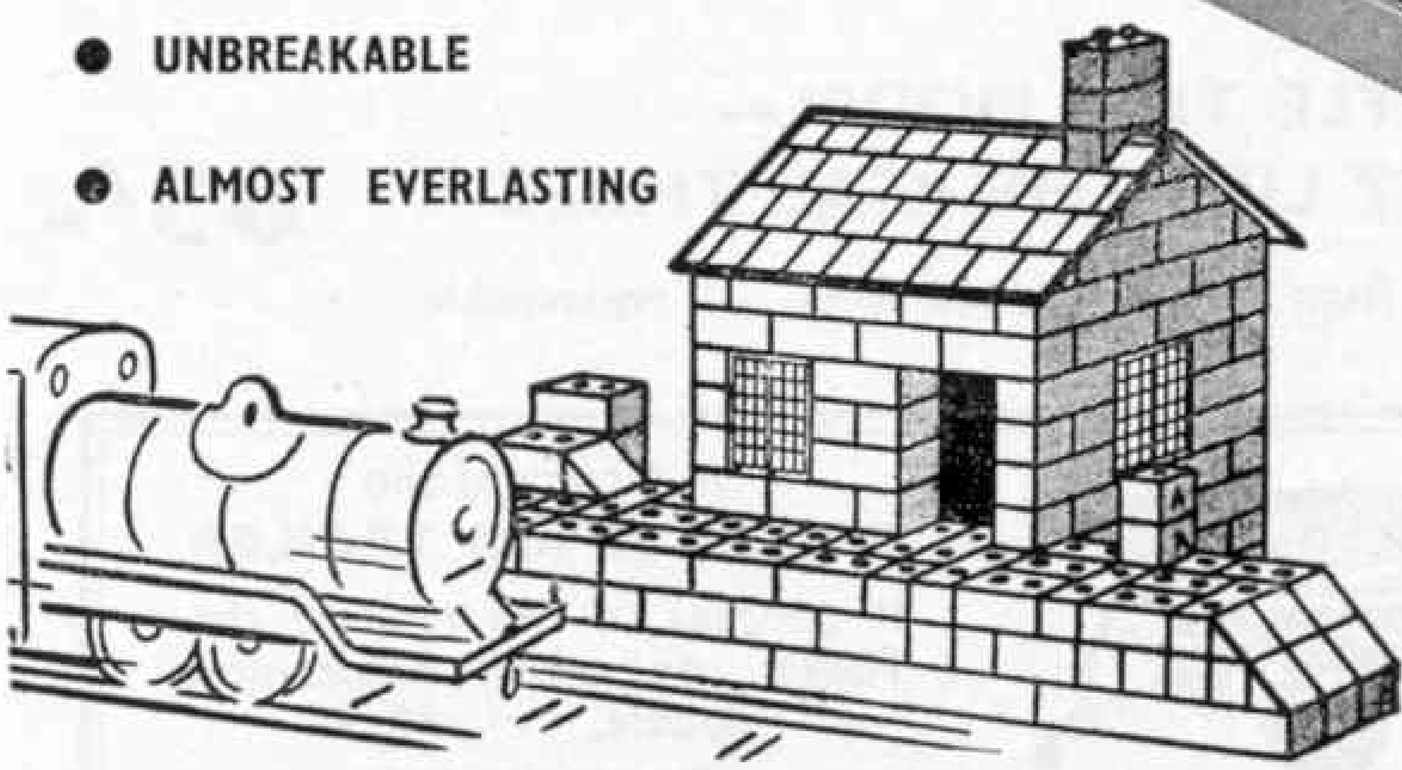

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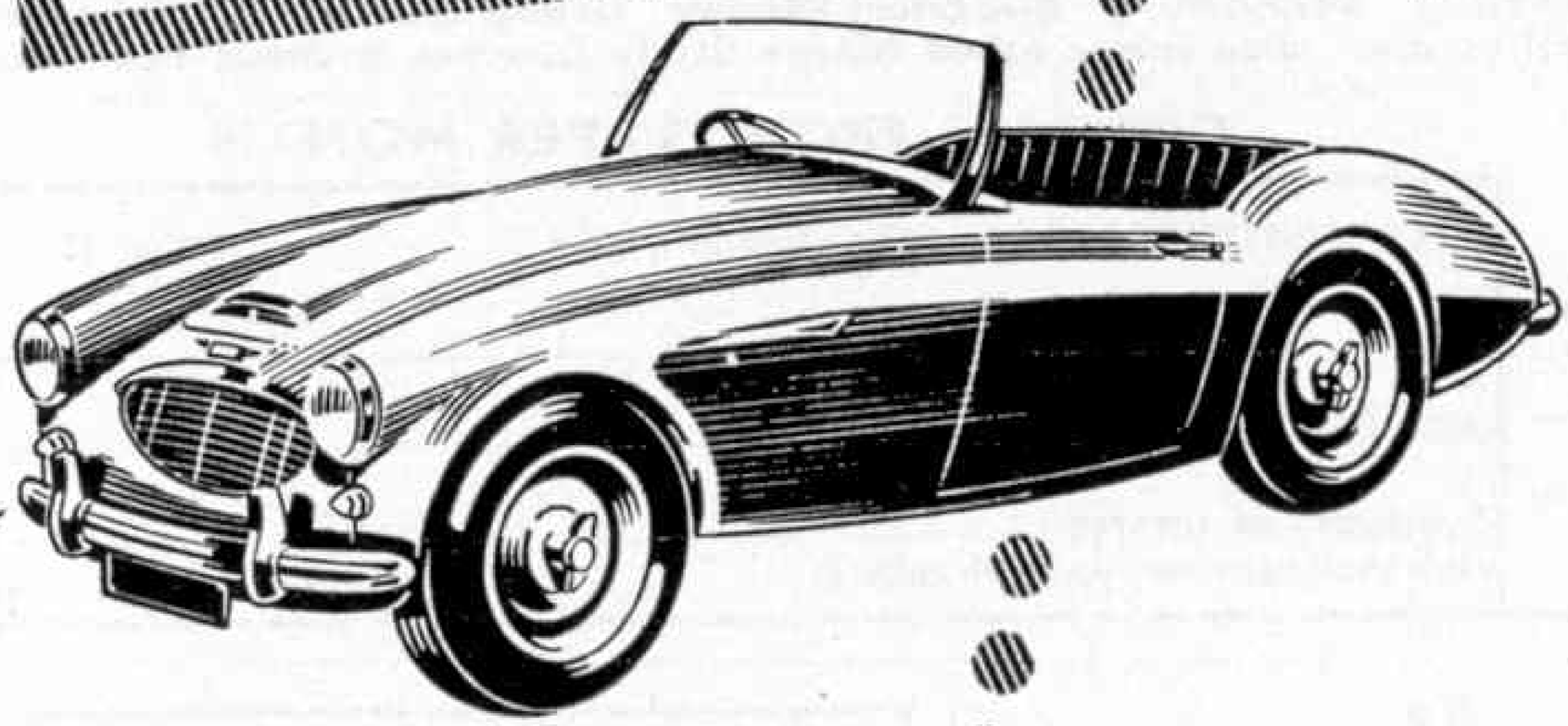

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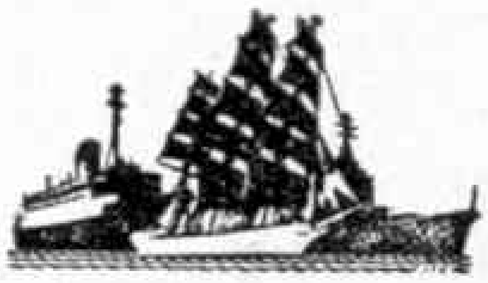

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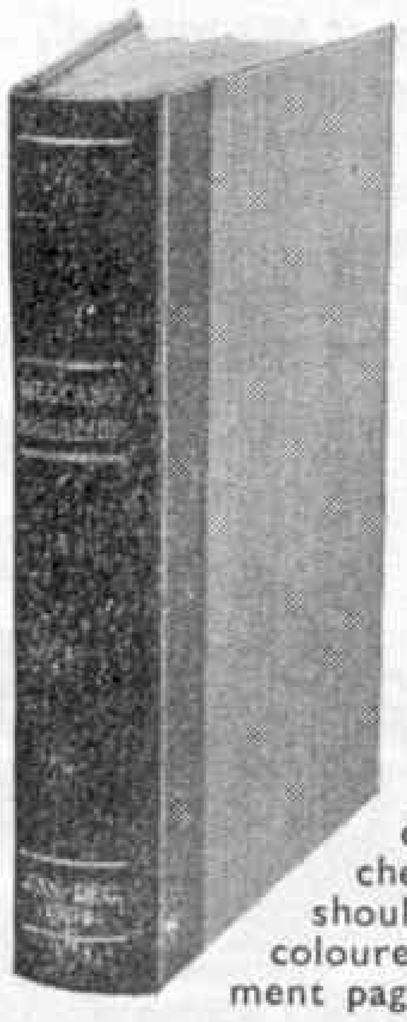

Readers of the *M.M.* can have their copies of the 1957 issues bound in the official cover by T. L. Duncan Ltd., 20 Cumberland Street, Liverpool 1. This cover is in cloth and morocco, and the words "MECCANO MAGAZINE" are embossed in gold on the back, with the year. The cost is 13/-, including return carriage.

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Volumes of the *M.M.* from 1942 to 1956 also can be bound in the official cover at the same rate. The charge for those prior to 1942 is 18/6.

BASSETT-LOWKE announce

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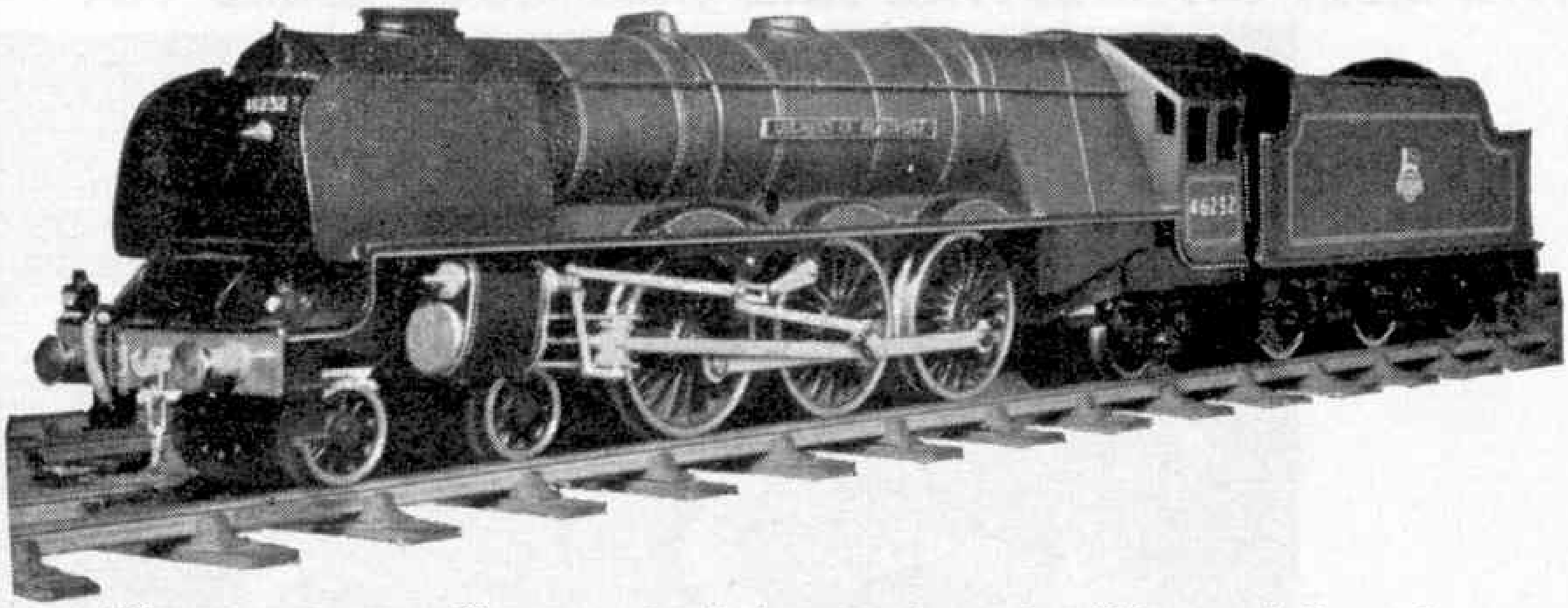

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17/11

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12/11

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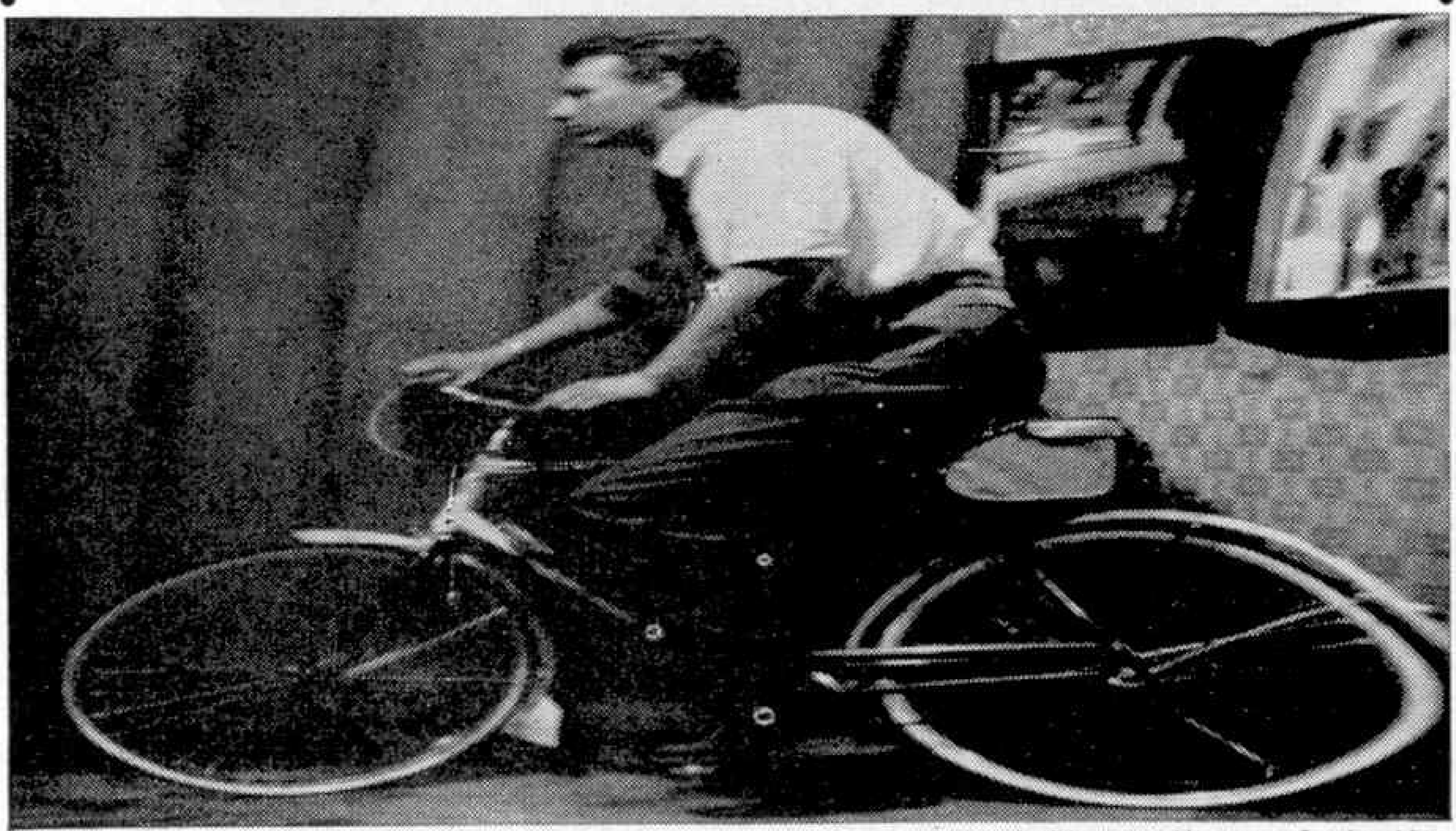
Squashing and Stretching



Photographed in the Distorting Mirrors on Southend Pier

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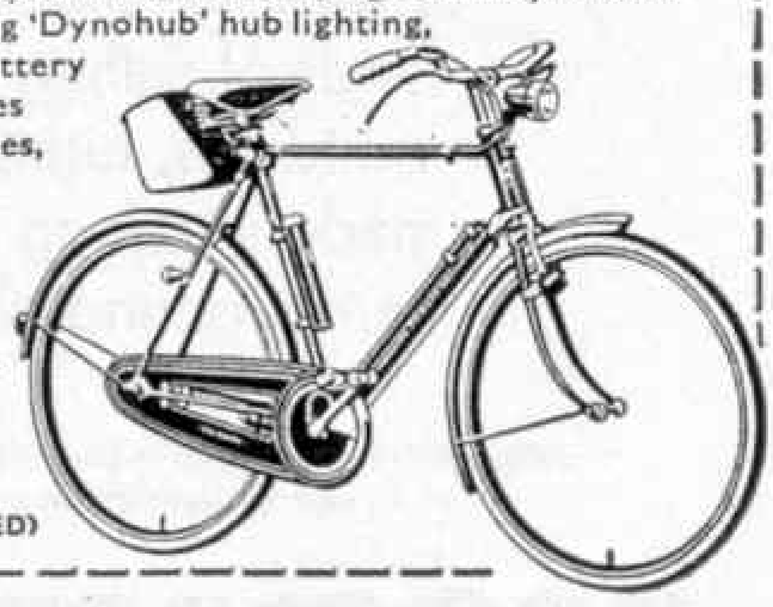

The New TRIUMPH has science behind it

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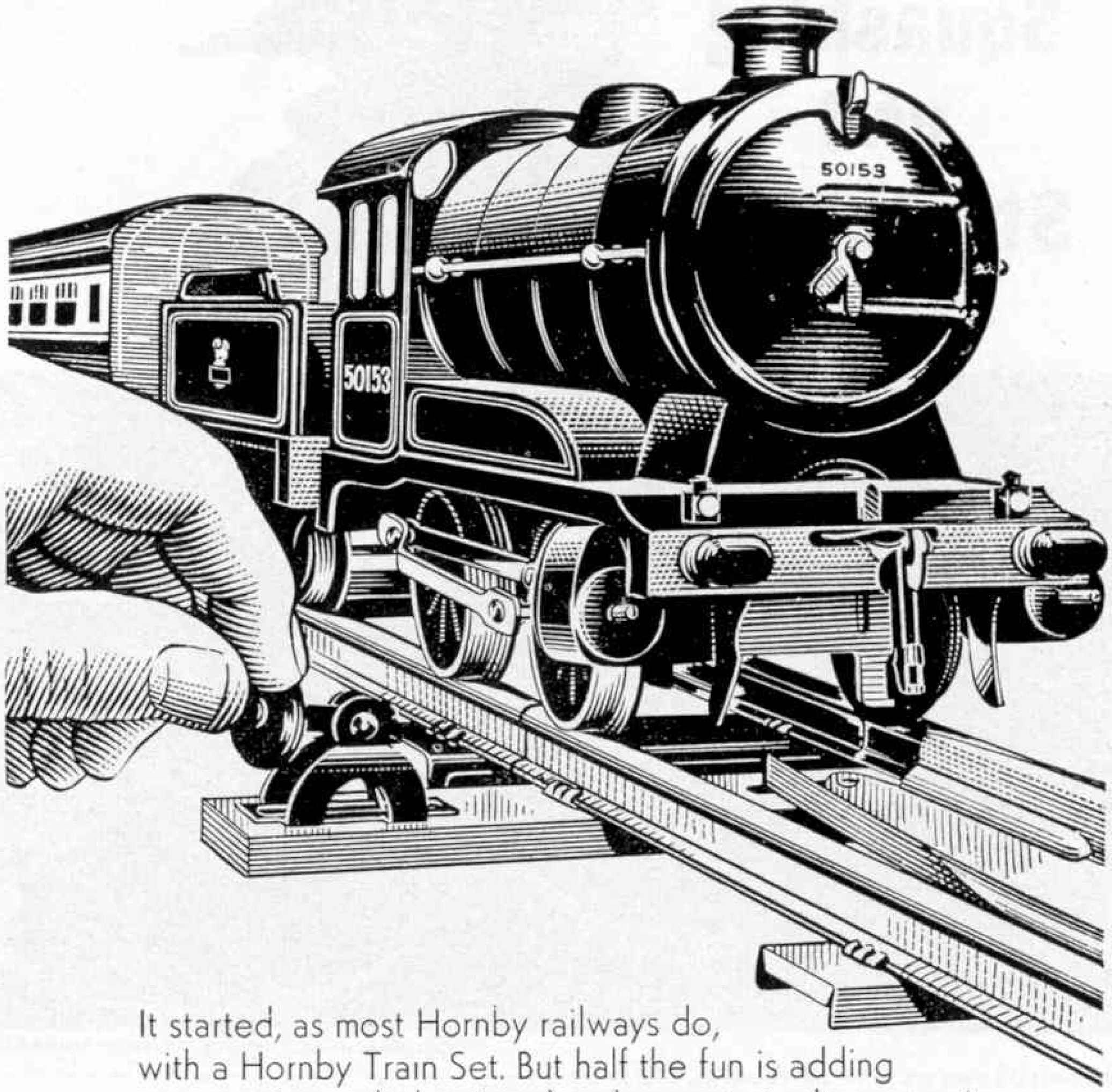
Main line clear



It started, as most Hornby railways do, with a Hornby Train Set. But half the fun is adding accessories and planning developments to the system! There are plenty of accessories to choose from — many kinds of rolling stock, different track parts, buildings, turntable, level-crossing, etc. — all made in strong metal to withstand the rigours of a hard-working play room railway.

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HORNBY *Clockwork* **TRAINS**

MADE IN ENGLAND BY MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

Next Month: "ROCKETS ARE NOT NEW!"

MECCANO MAGAZINE

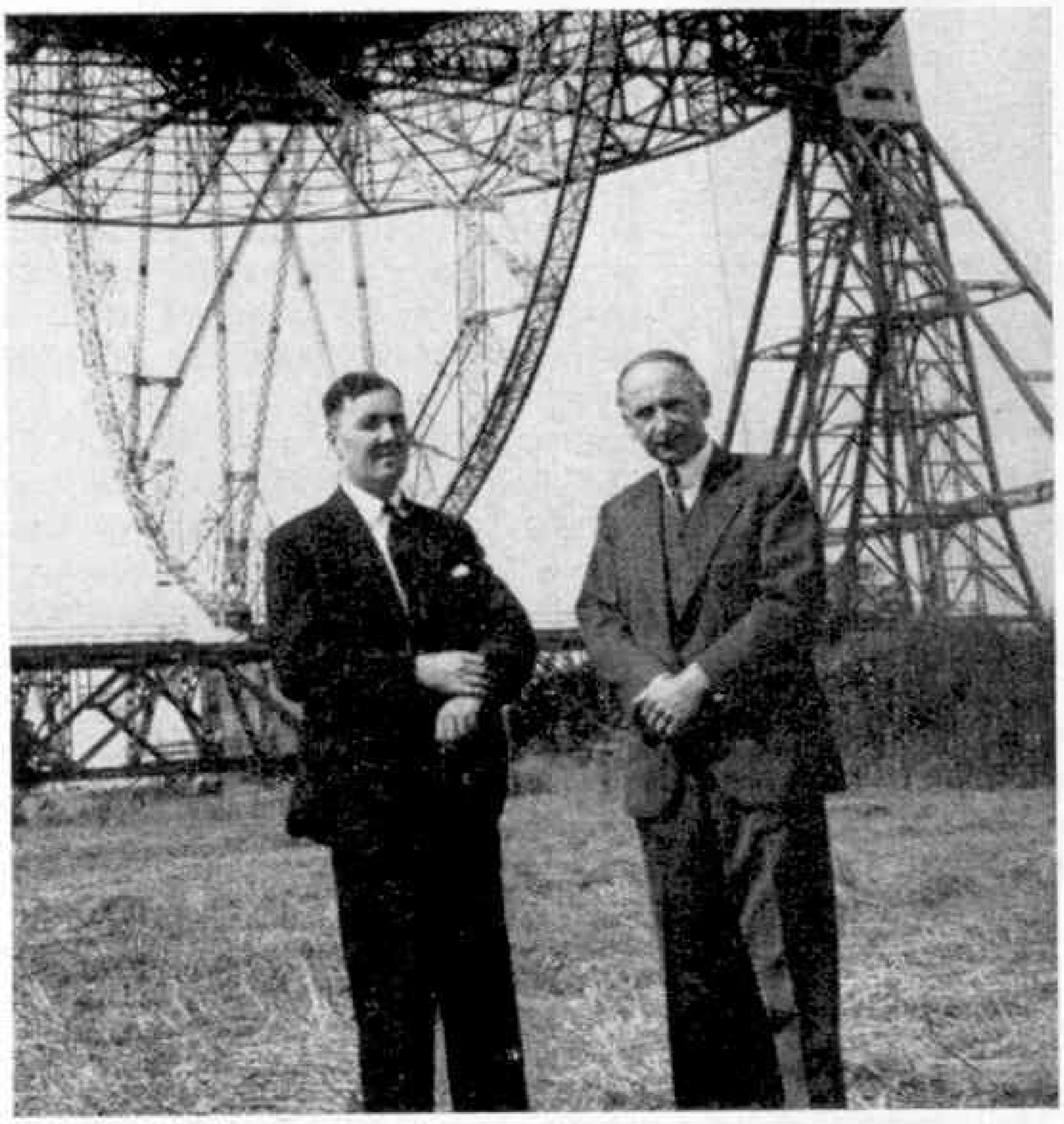
Editorial Office:
Binns Road
Liverpool 13
England

EDITOR : FRANK RILEY, B.Sc.

Vol. XLII
No. 11
November 1957

An Astronomical Marvel

In this issue there is the story, with pictures, of the giant radio telescope at Jodrell Bank, in East Cheshire. Nearly 2,000 sources of radio waves in the heavens have been discovered, but as yet we know very little about them, and there are plenty of mysteries that the Jodrell Bank radio telescope will help to solve. We already know that one source, the strongest of all, appears to be a mass of gas in violent motion, and that a second is the explosion of a star resembling on an immense scale that of a man-made atomic bomb. It also seems possible that giant systems of stars in collision can produce radio waves, and in its searches for sources of this kind the new telescope can reach farther out into space than light telescopes.



In the shadow of the great Jodrell Bank radio telescope are Mr. H. C. Husband, B.Eng., M.I.C.E., M.I.Mech.E., its designer and builder, and Professor A. C. B. Lovell, F.R.S., Professor of Radio Astronomy at Manchester University. Central Office of Information photograph.

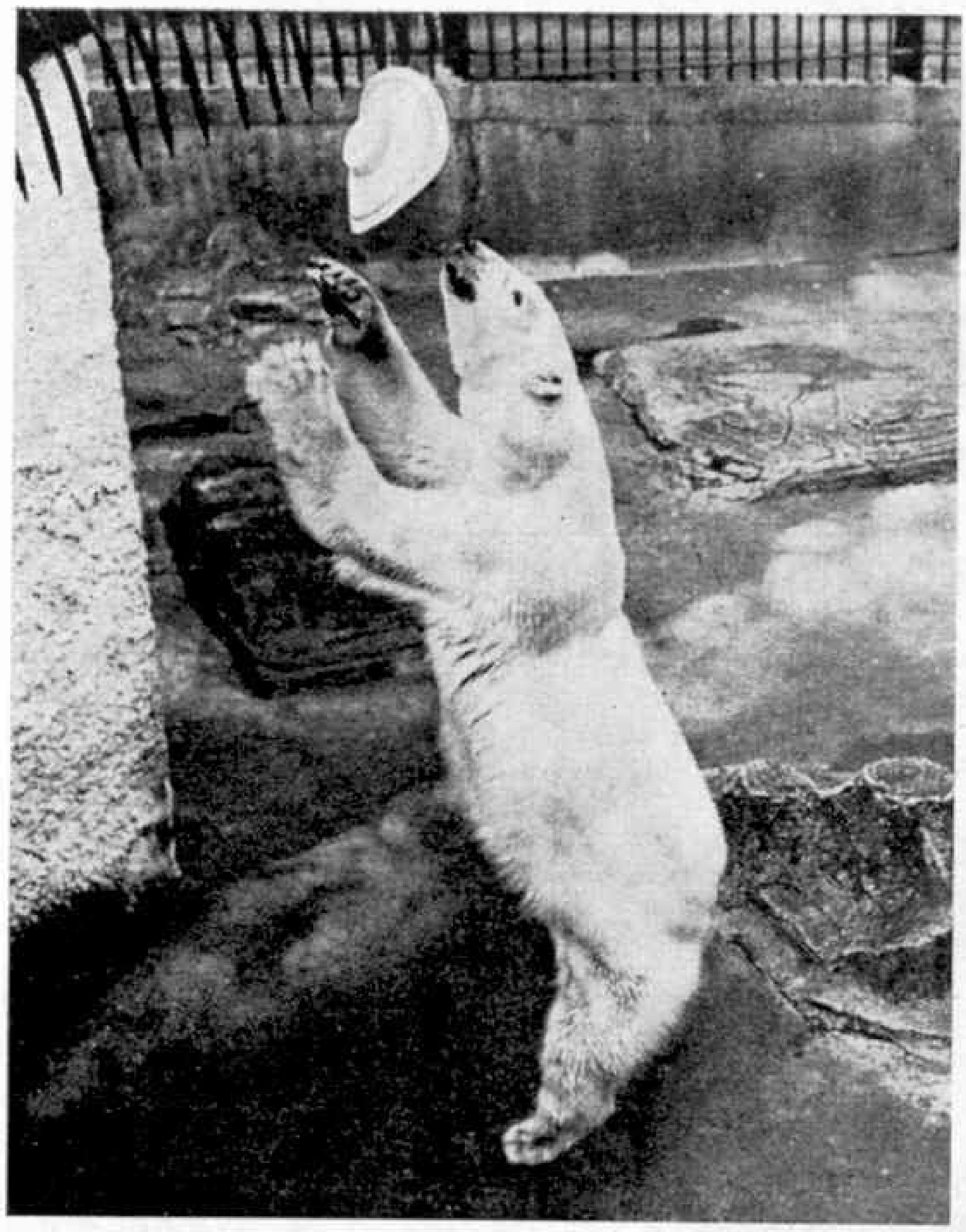
The giant radio telescope can be used as a transmitter as well as a collector of radio waves, sending these out to the Moon or the planets and receiving their echoes, for detecting the flight of meteors through the upper atmosphere by recording the radio messages that these send out automatically, and for studying the tremendous magnetic storms on the Sun that at times interfere so greatly with radio communications on Earth.

We are indeed only at the beginning of what seems to be a new era in astronomy, and it is good to know that this giant British instrument will play a prominent part in extending our knowledge of the skies.

Our Christmas Number

Just a word about the next issue of the *M.M.* This will be an enlarged Christmas number, but the price will remain the usual 1/3. There is sure to be a huge demand, so make sure of getting your copy by placing an order with your dealer or newsagent, if you have not already done this.

The Editor



The London Zoo

by

The Editor

WHAT more delightful spot is there than a zoo, particularly if it is one so well planned and so full of interesting creatures, all in perfectly good spirits, as is what is known to many of us as THE Zoo, the Gardens of the Zoological Society in Regents Park. There visitors can admire the stately elephant, the lions, tigers and other large cats, gaze with wonder into the gigantic open mouth of the hippopotamus, quite a humorous and kindly creature when seen in these surroundings, laugh at the solemn penguins, revel in the agility in the water of the sea lions, and their dexterity in catching fish, and be driven almost into hysterics by the amusing antics of the chimpanzees—all this with wonder at such delightful creatures as graceful deer, many beautiful birds and hosts of other wild creatures of all kinds.

The picture at the head of the page shows Brumas, the famous polar bear born and reared in the Zoo. She is delighted with a new bonnet, but after playing with it she chewed it into pulp and finally remodelled it.

The old small cages of the original zoos have almost disappeared, and as far as possible all creatures in a zoo nowadays are in surroundings that are as natural to them as possible, and are very carefully looked after.

A further development has been the introduction of new panoramic methods of exhibiting them. These were developed by Carl Hagenbeck, at Stellingen, near Hamburg in Germany. He had plenty of space in his zoo to build natural and theatrical panoramic views, with "rocks" made of wood covered with a thin shell of concrete shaped over metal, and the caves for his animals led into dens. At the Antwerp Zoo space was too limited to allow for developments of this kind, so to put this new and attractive scheme into operation a panorama was actually raised on substantial pillars over a building that was used for service purposes.

Sir Peter Chalmers Mitchell was secretary of the Zoological Society of London when this change in the ways of allowing animals to display themselves was begun, and he was greatly interested in the new ideas. The London Zoo was not so spacious as that of Carl Hagenbeck, and if the new scheme were to be introduced it would obviously have to be planned on similar lines to those adopted at Antwerp. Such a scheme was eventually effected, giving us the now famous Mappin Terraces, which rise tier upon tier over the Aquarium building in which the wonderful exhibits of freshwater and sea fish are housed today.

Our cover this month, based on a photograph taken by Miss V. C. White, Stoke-on-Trent, a reader of the *M.M.*,

gives a view of one of the terraces of this well-known structure, which was opened early in 1913. It was designed by Sir Peter Chalmers Mitchell, and the cost of construction was met by Mr. J. Newton Mappin, then head of the firm of Mappin and Webb Ltd., who presented it as a gift to the Zoological Society.

The terraces are constructed in the form of a quadrant. The highest tier is a crescent of rock work rising to four peaks, which are high enough to be seen from the Outer Circle of Regent's Park. These peaks are the home of goats, mountain sheep and mouflon.

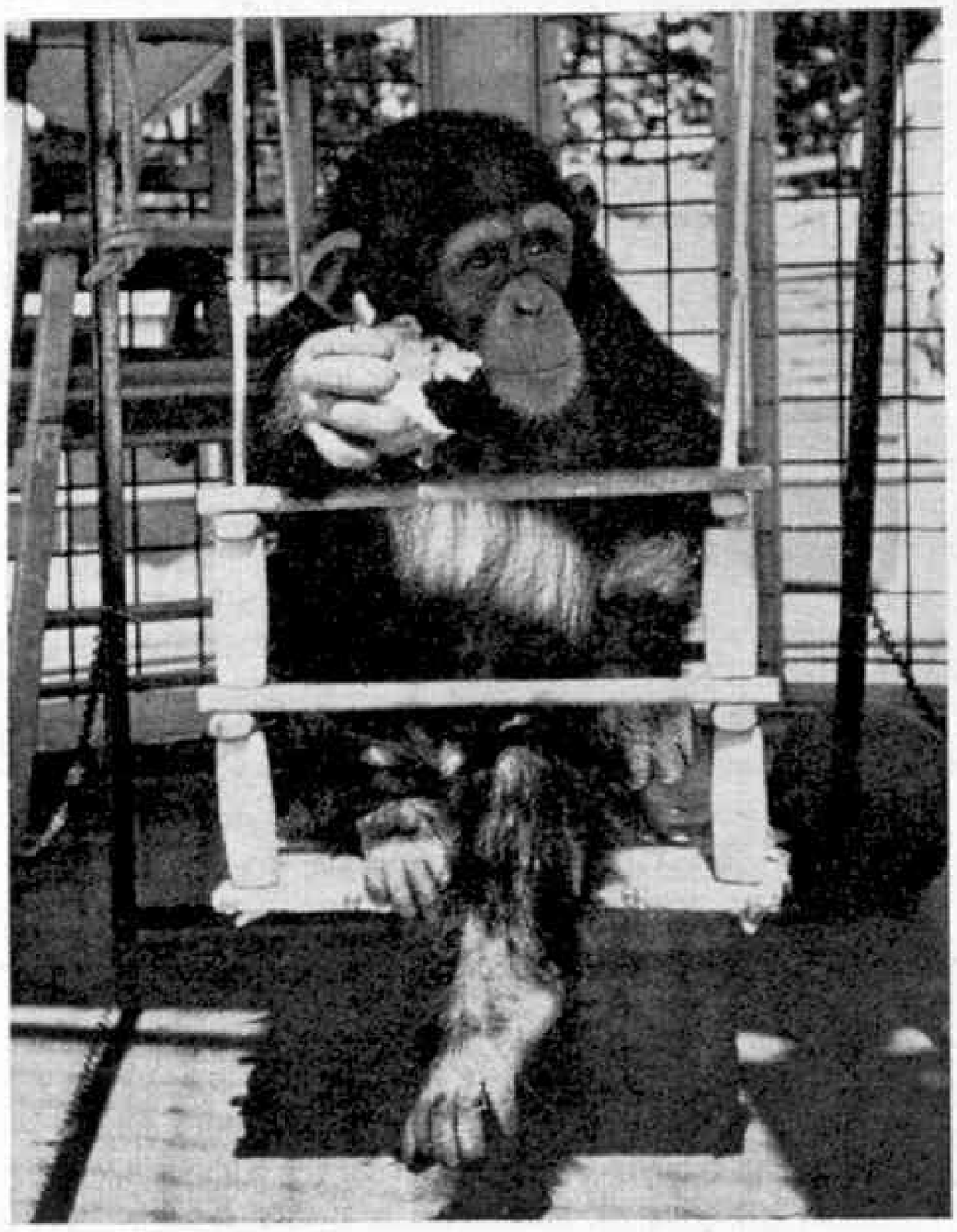
Susan was three months old when this photograph was taken just over a year ago. Even then she was ready to tackle a real tiger size meal.

Running along under this rock work is a terrace for visitors. The second tier is divided into spacious enclosures in which are the bears. Each of these enclosures has ponds and also caves into which the animals can retire for rest, or perhaps when they are tired of the human beings parading for their benefit! Lower down still is another terrace separated from the rock work by a deep ditch, and below the second terrace are paddocks for wild goats and sheep and beyond them a large pool in which are the King penguins.

The terrace shown on our cover is the one where the bears can be seen. Among these are the Syrian Bear and the Brown Bear of Europe, but undoubtedly the greatest favourites are the polar bears, the largest of their kind. Some of them grow to a weight of more than three quarters of a ton. It is astonishing that such huge creatures can be so agile in the water, in which they thoroughly enjoy playing with old motor tyres and other objects, and arouse untold amusement and admiration for their skill among onlookers.

Seven years ago interest in the polar bears rose an extraordinary height, following the arrival of what could probably be described as the most famous polar bear ever seen in the Gardens. This was Brumas, the first polar bear reared in the Gardens, who attracted an extra half million visitors to the London Zoo when she was born. Last winter she occupied the "old bear's" den, but this was wanted for three elephant seals then on their way to the Zoo, and now has been returned to the Mappin Terraces where she was born, in an enclosure next to that in which is her mother Ivy.

(*Continued on page 578*)



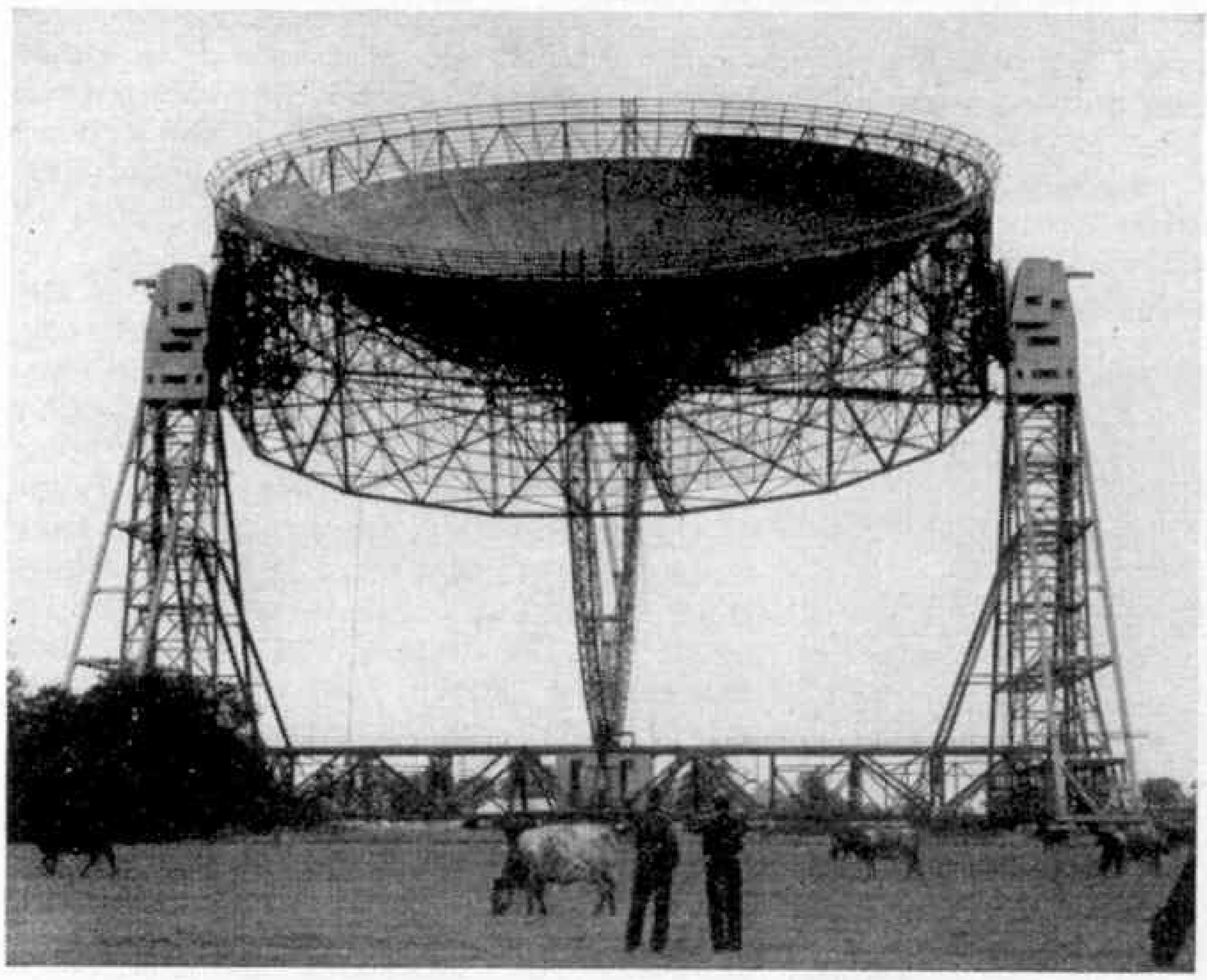
The benevolent interest of a wise old chimp.

A Giant Radio Telescope

To be Used to Track Invisible Stars

By the Editor

THOSE who travel anywhere near Jodrell Bank, in the pleasant parklands of East Cheshire, cannot help seeing an enormous metal structure, the chief feature of which is a huge bowl that now towers over the tree tops. Many of those who stop to look at it are rather startled to learn that it is a telescope, and this is not surprising, for it does not look at all like the telescopes that we see in pictures of astronomical observatories. The reason is that instead of having lenses or a concave mirror to bring *light* waves to a focus, it has a concave reflector to focus *radio* waves from space on to a receiving aerial. As radio waves are longer than light waves, this reflector has to be much larger than that of a light telescope, and this accounts for the great bowl, which is the reflector in this radio wave telescope, and is 250 ft. across.



The radio telescope, near completion, is tilted during a test. It stands in the lovely Cheshire plain amidst farms. Photograph Central Office of Information.

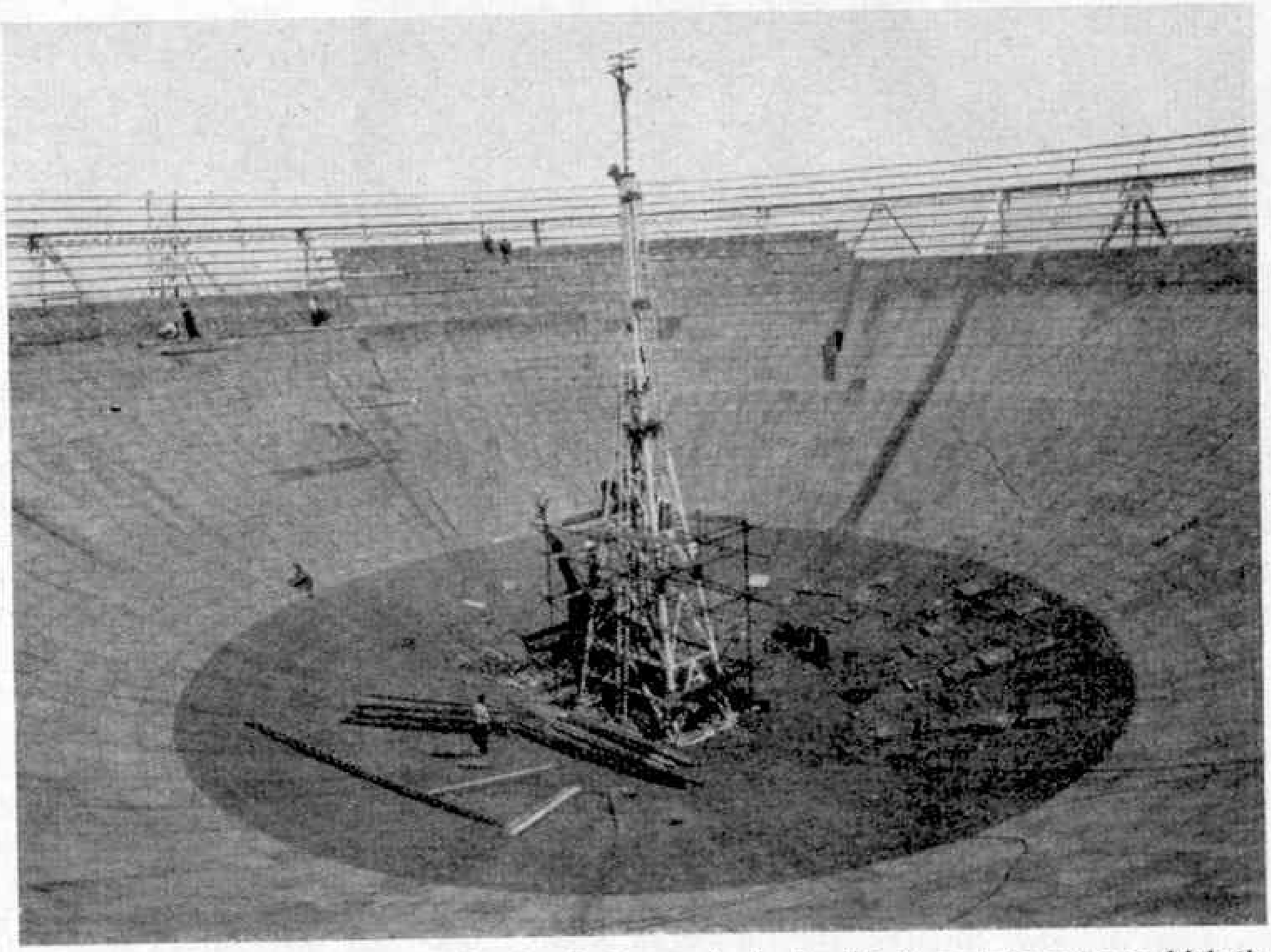
It is now more than 30 years since an American scientist named Jansky discovered some mysterious radio waves that appeared to come from outside the Earth. For a long time after that very little was done to follow up his discovery. In fact, it is only since the end of the Second World War that larger radio telescopes have been built, and observations made with them in the hope of finding where the radio waves from space originate and what they indicate.

None of these instruments could be compared with the one recently completed at Jodrell Bank. Most of them consisted of receiving aerials spaced out horizontally, and of course these could not cover the whole of the sky, all that they were able to do being to detect waves from a band in the sky as the Earth turned round. The Jodrell Bank radio telescope is what is known as steerable, which means that it is so mounted that its reflector can be pointed to any place in the sky. It is larger than previous telescopes of this kind already built, and is very sensitive. The radio waves beating down upon it are concentrated by means of the great reflector, which focuses them on to an aerial so that their length and intensity can be measured.

A general view of this amazing structure is to be seen in the illustration on this page. In this it is possible to look down into the reflecting bowl to a certain extent, as well as to distinguish the enormous steelwork cradle that carries its reflecting surface. The bowl is of steelwork and is suspended from the tops of two steel lattice towers 180 ft. high, which rise from a system of girders. The bowl alone weighs 800 tons, and the whole mass has a total weight of 1,800 tons. This is carried on

wheeled bogies, supporting the towers, that run on a circle of railway track that measures 352 ft. across.

This construction allows a double movement. The whole telescope can be rotated slowly on the circular track, and the bowl can be rocked between the towers, so that the reflector can be trained on any point in the sky. The general effect has been compared to having the inner part of Trafalgar Square swinging between the tops of two Nelson's Columns, and turning round slowly at the same time, a nightmare suggestion, but one that gives an excellent idea of the scale on which this gigantic radio telescope is built and the manner in which it can be moved.



Inside the great 250 ft. diameter bowl. In the centre is the 62½ ft. aerial mast on which the aerial will be mounted. The reflecting surface consists of more than 7,000 steel plates, each specially shaped and curved for its particular place.

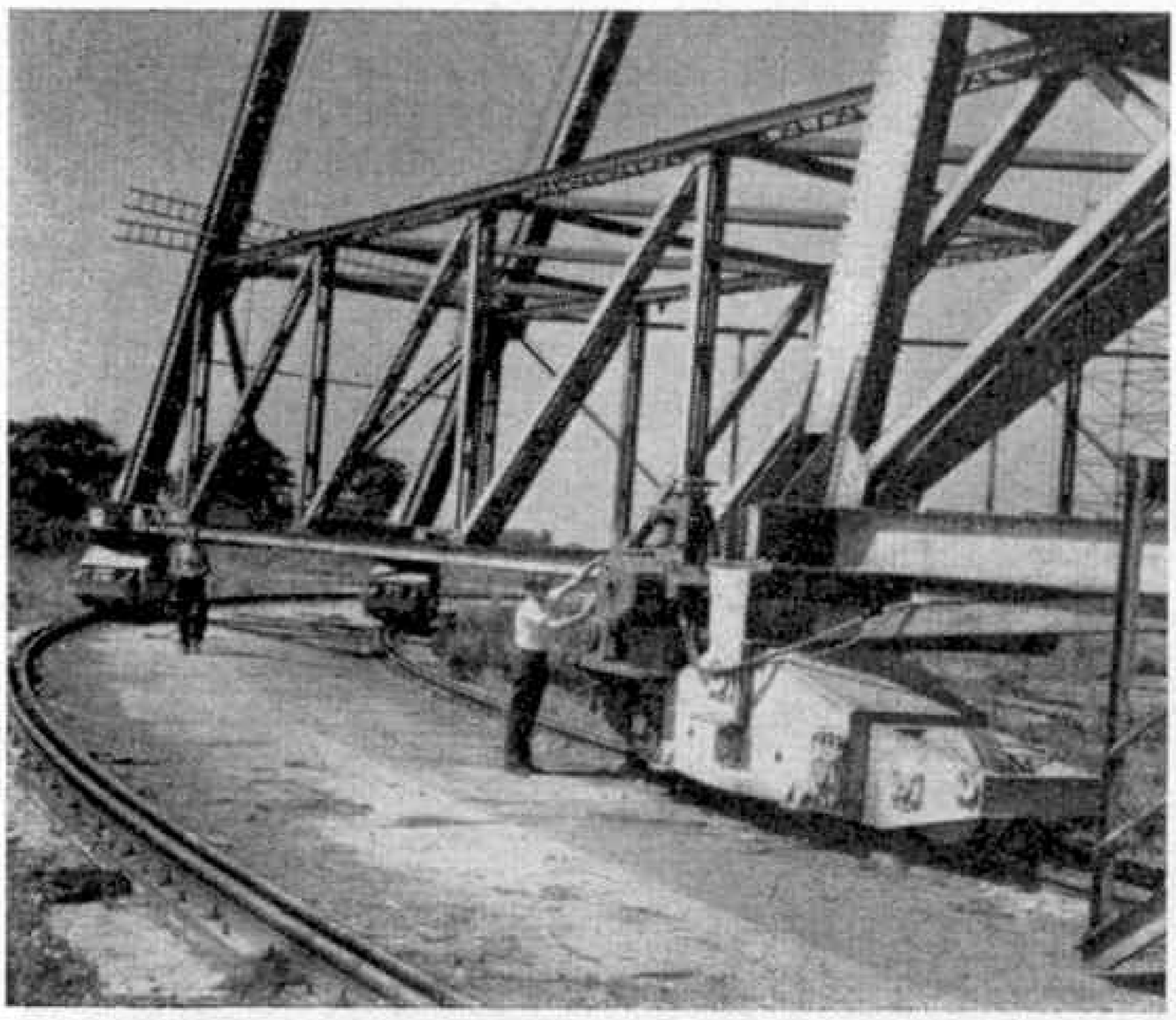
The reflector is made of steel sheet, and it was given its accurate curved shape by bending the steel plates used. There are more than 7,000 of these, each 3 ft. square. The illustration on this page shows the bowl being completed by welding the steel plates together after placing them in position on the steel framework supporting them.

This illustration also shows the mast, 62½ ft. high, rising upward from the centre of the reflector, at the top of which the aerial is fixed. A tower of this height is required to bring the aerial to the point at which the radio waves collected by the bowl are concentrated after reflection from its surface. Signals received there are carried to a laboratory hanging below the bowl. This is always on an even keel, even when the bowl itself is completely inverted, as it has to be when the aerial has to be changed.

The structure had to be constructed painstakingly with the greatest accuracy, after very careful planning. Some of the demands made can be illustrated by the design of the bogies on which the structure is carried. The circular movement of the telescope has to be very slow as it follows the passage of a point in space over the Earth as the latter turns, the movement required indeed being slower than that of the hour hand of a watch. To ensure steady movement at this low speed, friction has been reduced to a minimum by various means. For instance, the axles of the bogies are not strictly parallel to each other; instead they are slightly nearer together on the inner sides of the bogies and if lines were drawn along their length they would meet at the very centre of rotation. The rollers on which they run on their rails are in the shape of cones that if extended would reach their apex at the centre pivot.

When moving at its greatest speed the telescope can make a complete rotation on its axis in 18 minutes, and the bowl can make a complete rotation in 15 minutes. The telescope is just fast enough to follow the course of the Earth satellite that is to be projected shortly by the Americans, but its normal speed is only a fraction of this.

The steel plate reflector is very heavy, and the cradle supporting it had to be of



A view of some of the bogies on which the huge structure revolves. In the foreground is one of the driving bogies, with two of the wind carriages in the background.

sufficient strength and rigidity to carry it safely. One of the steps taken to ensure this was to fit a stabilizing girder on the axis, at right angles to the line adjoining the trunnions at the heads of the towers around which the reflector pivots. This can be seen in the illustration on page 529. It looks something like part of a giant bicycle wheel, with spokes radiating from the centre of the cavity of the underside of the bowl. It is 280 ft. in diameter.

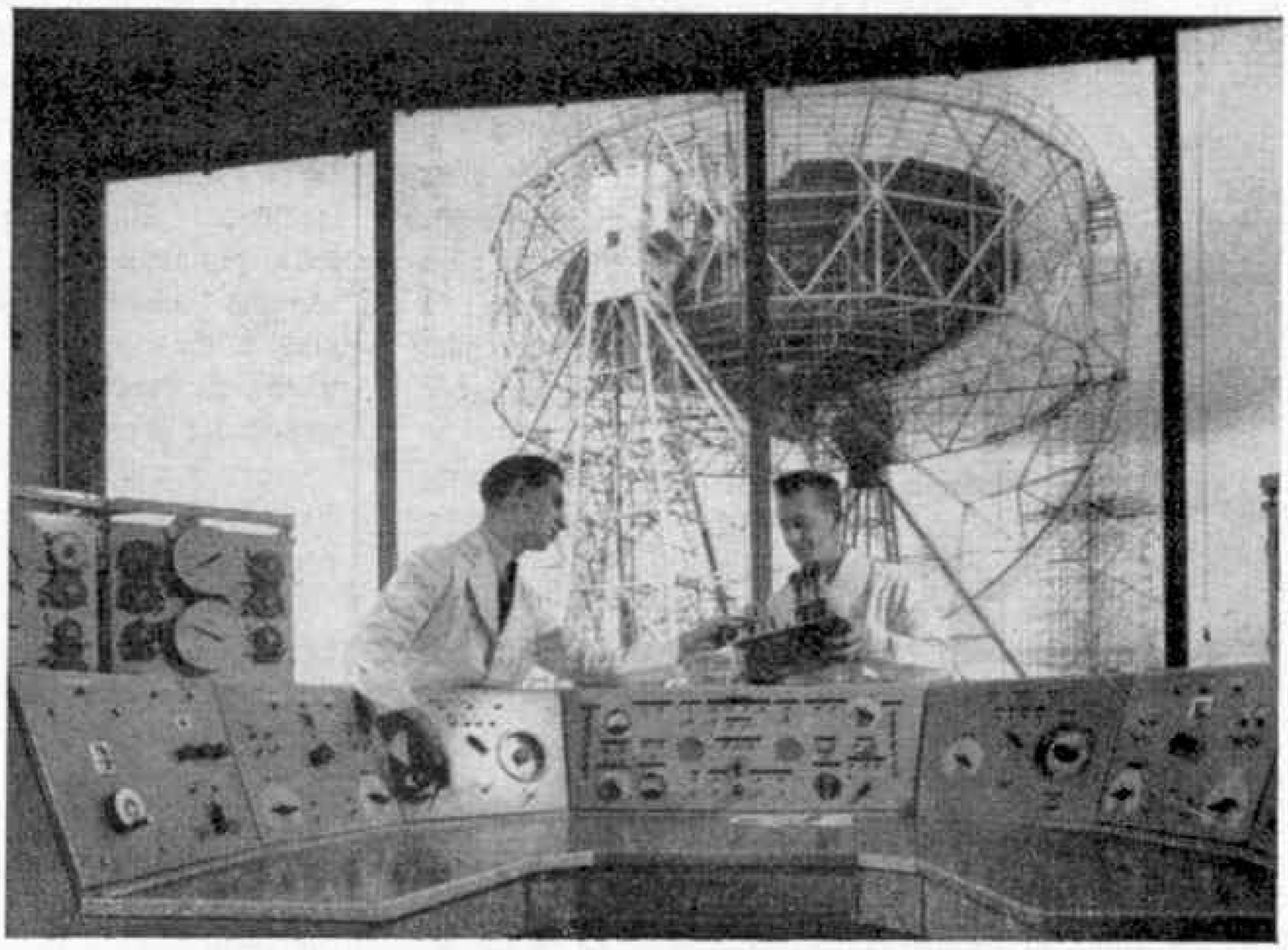
Another interesting point is that great care had to be taken to provide a substantial foundation for the mass of nearly 2,000 tons that was to be placed on it, especially as any movement of the structure would defeat the purpose behind the construction of the telescope, which is to provide very accurate measurements. So 152 bored concrete piles were driven into the ground, each 19 in. in diameter and designed to take a load of up to 76 tons.

Some of the piles go down 90 ft. below ground level, but others reach firm ground at less depth than this. Six of them support the central thrust block, on which is the central pivot of the supporting framework. The rest carry rings of reinforced concrete on which are two circles of twin rails, with diameters of 352 ft. 9⅛ in. and 319 ft. ¾ in. respectively. On these tracks the supporting bogies run, the driving bogies on the inner track. The outer track is used for wind carriages that keep the entire structure level, taking the thrust imposed on it by the wind.

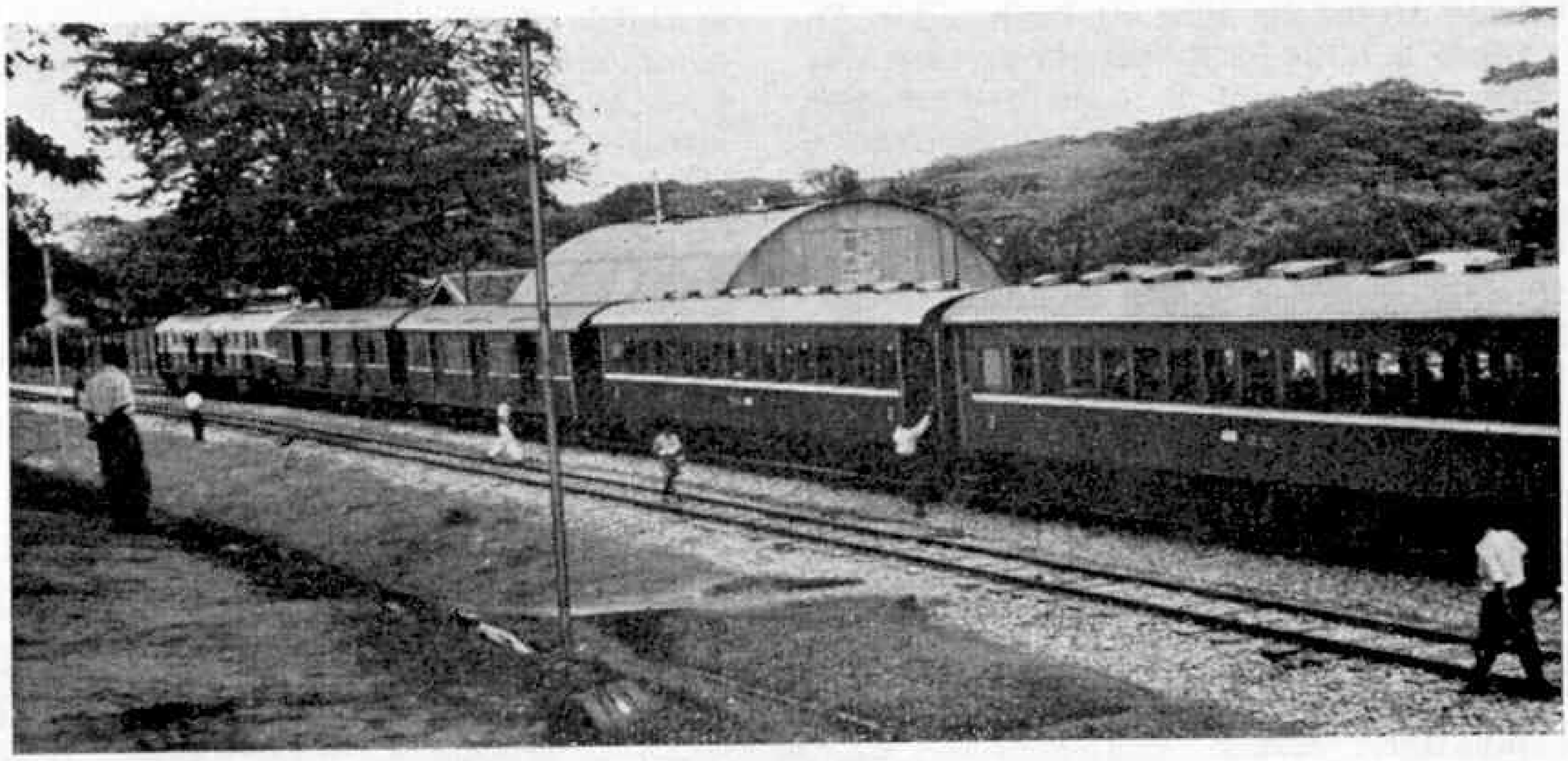
There are four driving bogies and eight wind carriages. All four of the former and four of the latter travel on the inner track, with the remaining wind carriages on the outer track. Each driving bogie weighs 16 tons, and has its own motor unit that drives four monorail track wheels. The wind carriages weigh 13½ tons each. Each bogie runs on four steel rollers.

There are many ingenious engineering devices and refinements in this amazing radio telescope, all necessary in order to make it the precision instrument of scientific research that it was designed to be. An interesting example is the way in which any tendency of the stabilizing girder, already referred to as resembling a bicycle wheel, to flutter in the wind, is

(Continued on page 578)



A view of the radio telescope taken from the desk at which the controller will sit. At night the telescope will be floodlit so that the controller can still keep everything in view.



Tropical Train Journey

From Singapore to Bangkok

By Bernard Llewellyn

IT is over 1,100 hot tropical miles by rail from Singapore to Bangkok; and it is not surprising that most people who want to go from the tip of the Malay peninsula to the capital city of Thailand either fly or travel by boat. I admit there were times on the journey when I wished I had done the same.

I made the journey in three stages. The first was from Singapore, the city that has long been the great trading port of South East Asia, to the Federation capital of Kuala Lumpur; the second took me from there to Penang; and on the third I crossed the frontier to Bangkok.

The picture at the head of the page shows the train in which the author of this article left Singapore on his journey of over 1,000 miles to Bangkok, the capital of Thailand. The journey was made in three stages, with a trip by water to the island of Penang. The illustrations are from photographs by the author.

I left Singapore one morning in a comfortable second-class coach, and I had hardly settled in my seat before a ticket collector gave me a leaflet welcoming me as a passenger on Malayan Railways. It was entitled *Safety on Rails* and contained a long explanation of the signal techniques used. The whole line was apparently divided into "block sections" about five miles long, and only one train was allowed on to a section at once.

There was also a paragraph to delight railway enthusiasts and dispel any dull interludes during the journey. "If your watch has a second hand," I read, "count the number of rail joints in 20 seconds for rails of 30 ft. lengths, or the number of rail joints in 27 seconds for rails of 40 ft. lengths. Da-da da-da (one) da-da da-da (two) etc. . . . and the answer will give you the speed of the train in m.p.h." We were advised to consult the guard to find out the lengths of the rails on different sections of the line.

A causeway links the island of Singapore with the Federation of Malaya, and the train rattled over the narrow strait, with the towering palace of the Sultan of Johore making a splendid picture on the skyline. Soon we were in the jungle, and when you have seen a little jungle you have seen it all.

It is easy to forget just how much jungle there is in Malaya. Seen from the air, almost the whole country is a green wilderness and the problems facing the security forces in trying to keep the jungle free of terrorists are seen for what they are. The presence of troops on the train reminded me that not so long ago trains were attacked.

The ever-encroaching jungle has been

cut back from the line on both sides. In one place a large strip had been torn out of the greenery; on it a helicopter was parked and nearby were three lorries loaded with troops in jungle green. A monotonous, dangerous and sweaty job is this wardenship of the Malayan jungle!

I soon managed to distinguish the rubber estates. There were mile upon mile of them, their tall trees with V-shaped slashes on their trunks along which the white latex drained into the cups. Sometimes I glimpsed one of the isolated foreign-style homes of the planters. Malay houses huddled together in clearings in the jungle, raised on poles above the ground. They were built of wood and had roofs thatched with palm leaves. From Malaya into Thailand there is an essential similarity between the homes of the people.

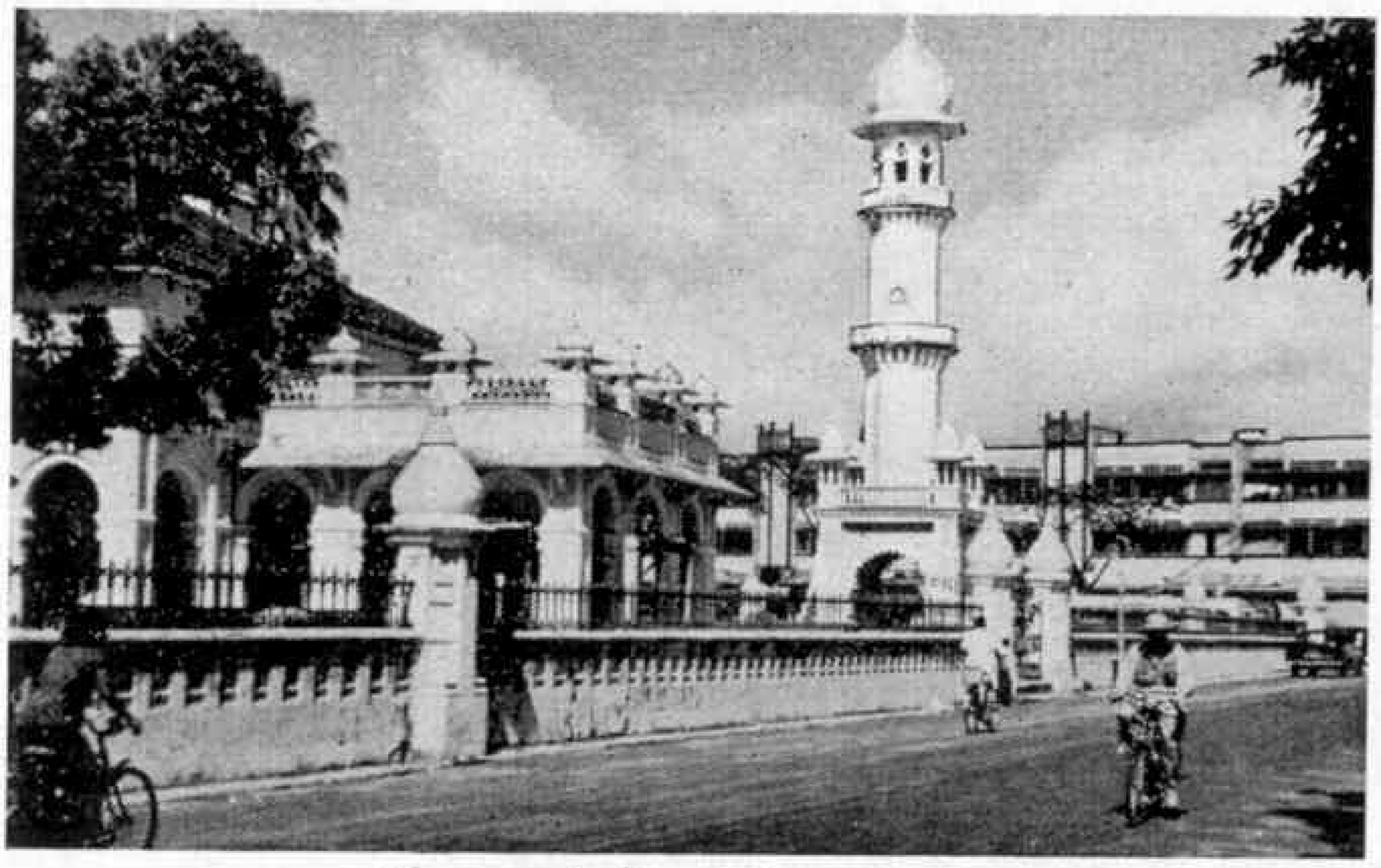
The jungle was full of tattered palms, but when these gave way to squat, fan-shaped trees planted in rows I knew I was looking at a palm oil estate. When processed in the small factories, the green nuts of these trees provide a thick nutritious oil that is another of Malaya's exports to the markets of the world.

It is primarily rubber and tin that have brought prosperity to Malaya. Roughly a third of the world's supply of these commodities comes from Malaya, and when I stopped for a few days in Kuala Lumpur I was lucky enough to visit both a rubber estate and a tin mine. Open-cast mines are familiar sights to train passengers, while occasionally, in the midst of a huge lake of muddy water you will see one of the great bucket dredges at work—some weigh as much as 3,000 tons—sucking the powdery ore out of the dirty, yellowish sludge.

At Prai trains are met by the river steamer seen above, which carries passengers to George Town, chief town of Penang.

So I came to Kuala Lumpur. Like much of this city, the station with its decorative minarets reveals the influence of Moslem architecture. Inside it is clean, and it will doubtless be even cleaner when the new diesel-electric locomotives entirely replace the steam engine. I took a second-class berth on the night train to Prai, which is the station for Penang. It was not an air-conditioned coach but the fans were adequate and I spent a comfortable night, alighting on Prai platform at 7 o'clock the following morning.

Penang is an island, and the crossing to the old settlement of George Town takes about an hour on the railway steamer, the mainland berth of which adjoins the platform. At George Town the railway station lies across the road from the landing stage. There is a



A mosque in George Town, Penang.

booking office where one can buy tickets, but the station is one of the oddest in the world, for it has no trains and no permanent way. To see a train you must return to Prai.

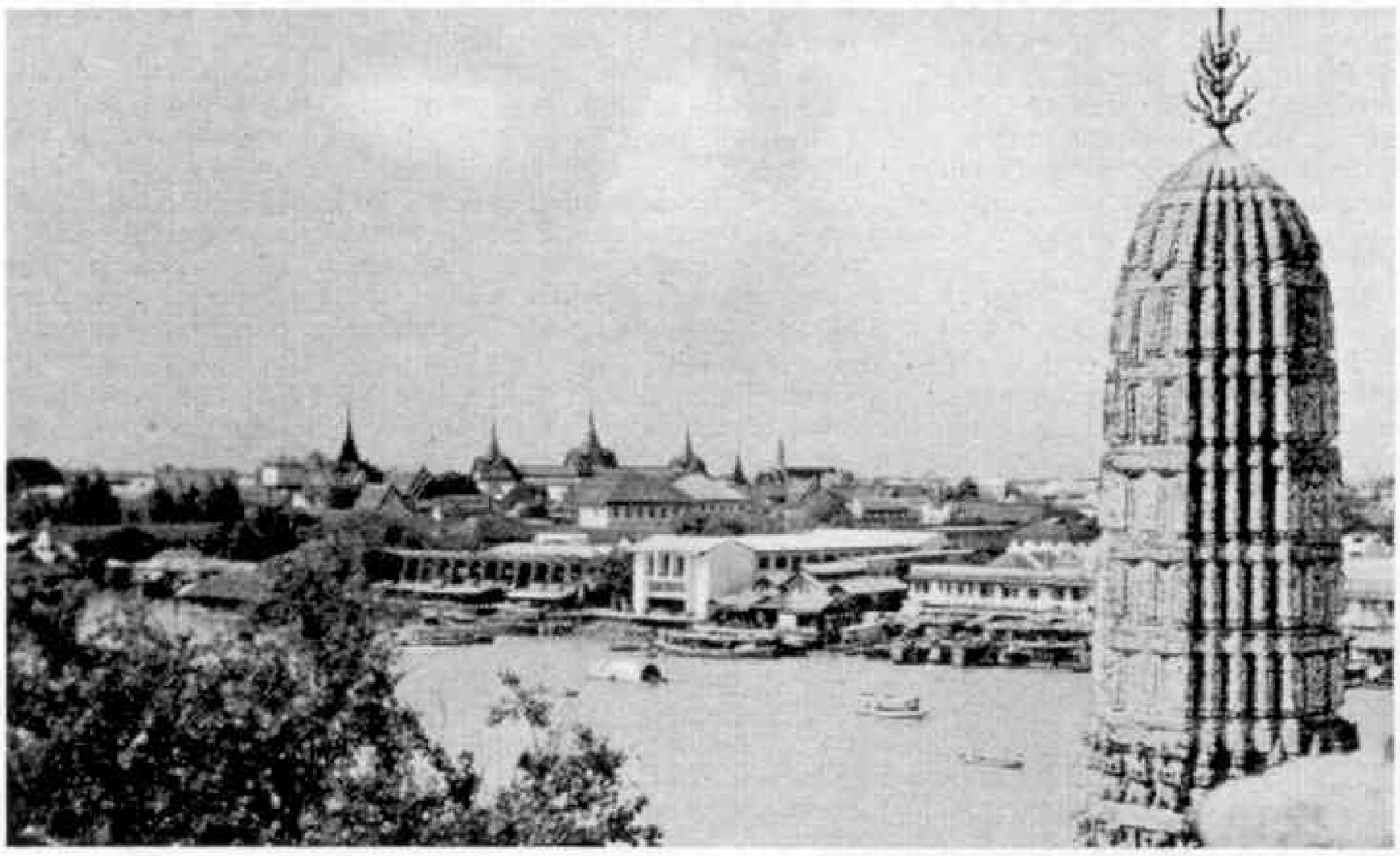
The Malaya-Thailand border town of Padang Besar is 112 miles north of Prai and 600 from Singapore. I reached it in the early afternoon, and we stopped there for a couple of hours while the Customs officials came through the train to examine the baggage. Now that we were motionless the heat grew more oppressive. Sellers of cold drinks did a brisk trade; the cheapest and most popular of these—if you could bear the thought of perhaps catching typhoid—was iced water and syrup served in scrapped tins.

We were supposed to have our passports checked at the frontier post. Here there was great confusion. The tables were piled with passports, which were being pawed over by an excited crowd of passengers. I never expected to see mine again, but luckily I got it back on the train when we were properly over the Thailand border.

At the first station in Thailand my comfortable journey abruptly ended. Hitherto the coach had been a second-class on the Malayan Railways. Now in a twinkling it was transformed into a Siamese third. Through the windows were hoisted baskets and cases, tin trunks and parcels, and through the doors swarmed the passengers, to stow their possessions on the racks or under the seats. There weren't enough seats to go round and I found myself sharing a double seat with two young men. The aisle down the centre of the coach was soon impassable, and any small empty space was jammed solid. It was to stay like that for twenty hours.

Already the countryside was opening out. Jungle had given way to farming land, and men and water-buffaloes were busy in the rice fields. On a distant hilltop I spied a Buddhist pagoda, looking like an enormous white bell with a long pointed handle. We stopped at most stations now, and since it was well nigh impossible to move along the train to the buffet car, most people in the coach bought food from the vendors who passed up and down the train at every station selling pieces of pineapple, bunches of bananas, portions of cooked rice and various other country delicacies.

When night came, I wished more than ever that I had travelled by air-conditioned sleeper. I slept on and off, wakened now by the glare of station arc-lamps on my eyeballs, then by the elbows of the youth sitting next to me or the thump of his head sagging on my shoulder or by cramping pains in my back or neck or arm. In the light of dawn everyone in the coach looked the worse for wear.



Looking towards temple spires over the river at Bangkok, the capital of Thailand.

At our first halt that morning, women and children staggered along the train with buckets of water. They were soon filling up tin bowls and passing them through the windows for passengers to drink or wash their faces in.

Around noon that day the train steamed into Bangkok. An enormous crowd thronged the platform, for it is the done thing in Bangkok to celebrate arrivals and departures, and the Siamese crowds were having a wonderful time.

Nowadays few westerners ever travel from Singapore the way I had done; it is so much simpler to fly. But I did not regret my overland journey up the long peninsula to the land of *The King and I*.

Air News

by

John W. R. Taylor

The ambulance version of the Saunders-Roe Skeeter helicopter.

Skeeter Payload Doubled

One of the surprises at this year's S.B.A.C. Display at Farnborough was an ambulance version of the Saunders-Roe Skeeter helicopter which flew with two "casualties" on stretchers mounted externally on each side of its cabin, in addition to the pilot and a nurse.

Previously, the little Skeeter has been seen only as a two-seater; but the 215 h.p. Gipsy Major engine fitted in the latest Mk.12 version gives it sufficient power to take off with almost double its original load. In addition, it can have Napier rocket-engines, weighing only 1 lb. each, built into the tips of its rotor blades, to improve its performance still further.

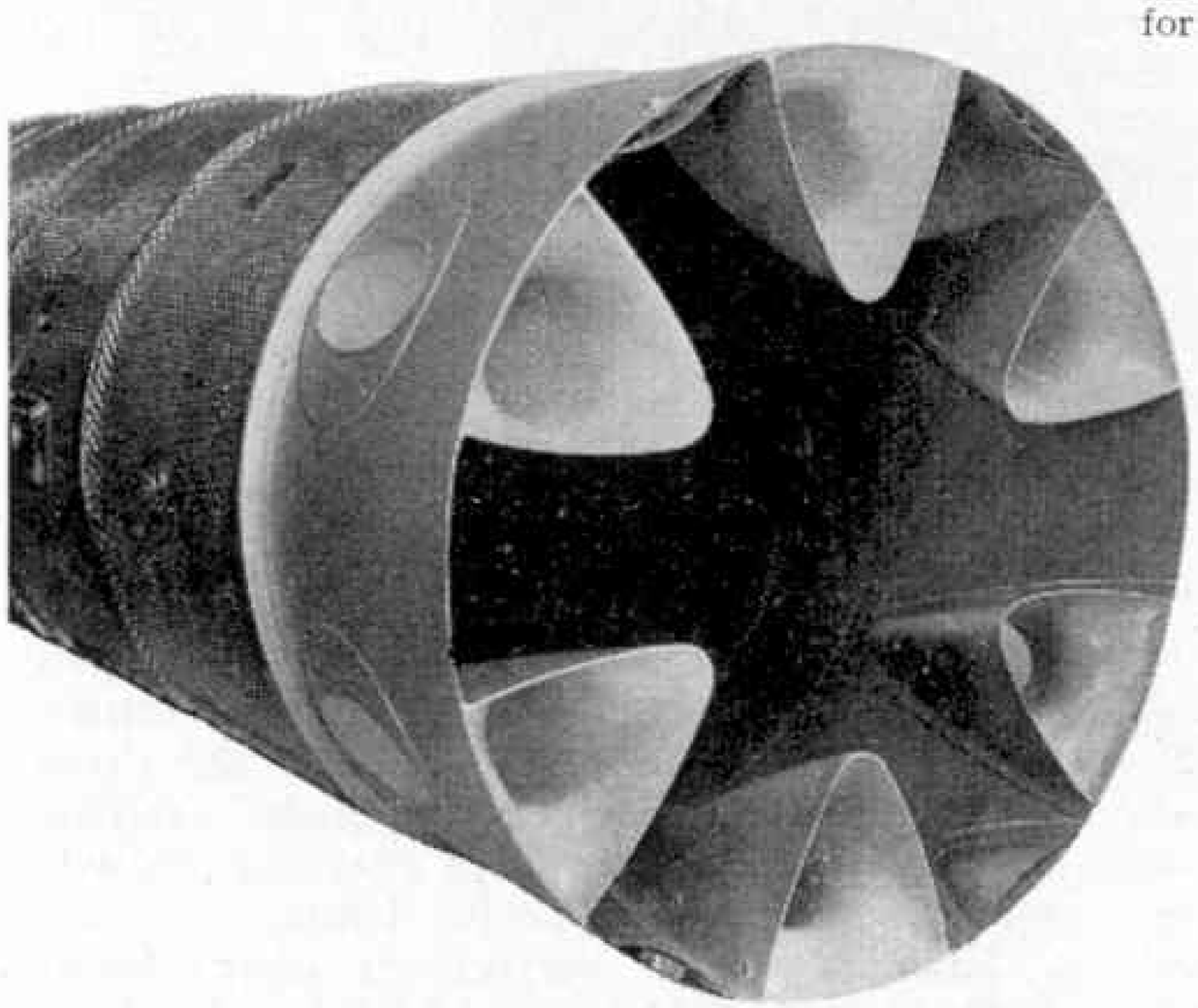
The Mk.12 is in production for the British Army, the Royal Air Force, and the West German Army and Navy, for observation, training and liaison duties.

New Navigator

Fresh off the secret list, the Marconi Doppler Navigator is the most incredible navigation aid ever developed for aircraft, because it is completely self-contained and independent of ground stations, and can be used anywhere in the world, in all weathers.

Without going into technical details, it makes use of the well-known "Doppler effect", by transmitting two continuous radar beams towards the ground, one forward and the other rearward, and measuring the difference in frequency of the waves when they "bounce" back from the ground to receivers in the aircraft.

The difference in frequency between the transmitted and received waves is in direct relationship to the speed of the aircraft, and the equipment also measures the aircraft's drift in a cross-wind. By feeding the data into a computer, the Navigator will give automatic, instantaneous and continuous information on the aircraft's position in latitude and longitude, distance from destination, wind direction and speed, ground speed and drift angle. It has been fitted to R.A.F. aircraft for the past three years and is now available for use on civil airliners.



The Rolls-Royce noise suppression unit which will be fitted to the Avon engines in the de Havilland Comet air liners ordered by B.O.A.C. Similar units are under development for the Rolls-Royce Conway by-pass engines.

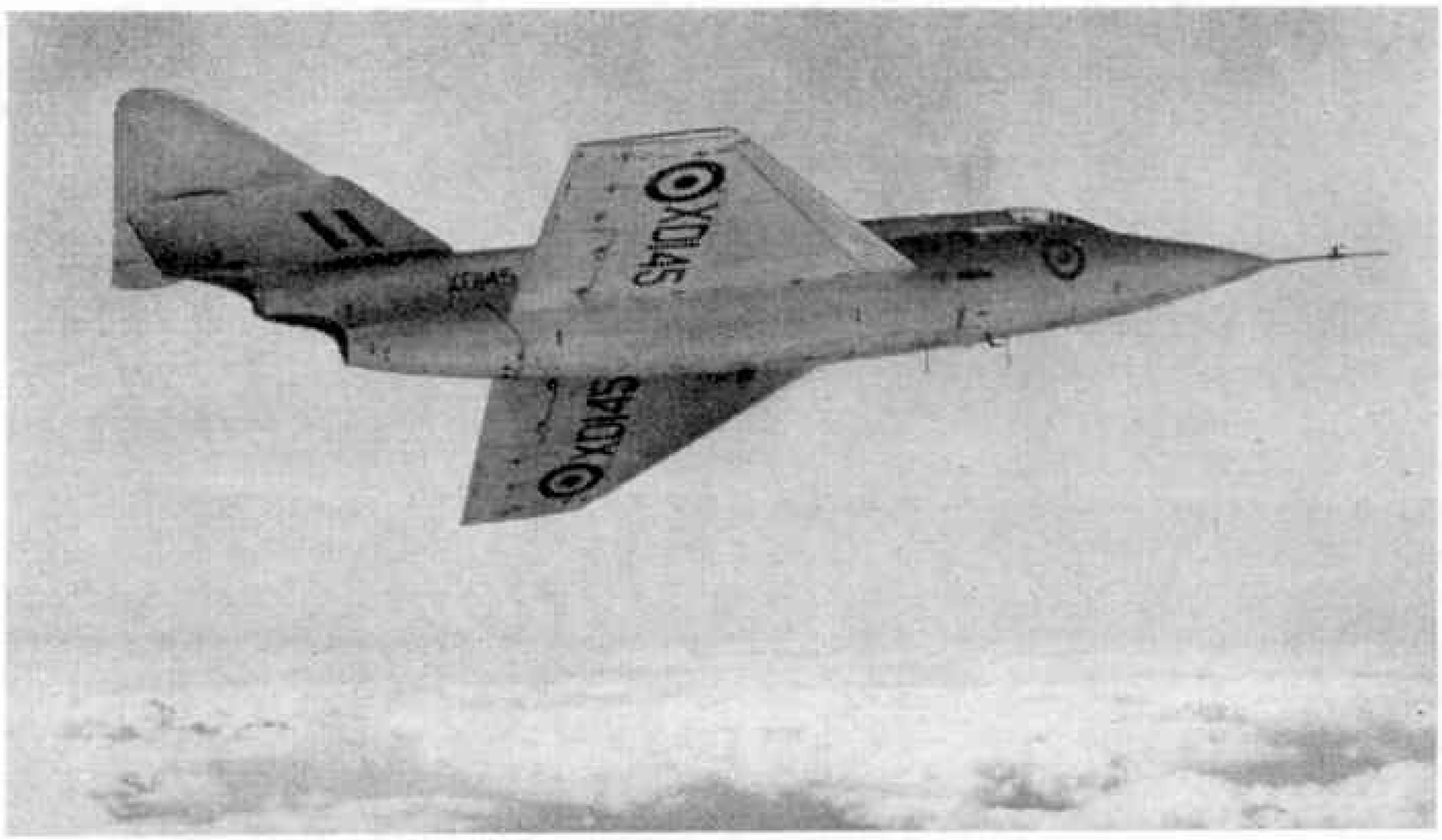
Jet Silencers

Proof of the considerable progress that Rolls-Royce have made with silencers for jet engines was given at Farnborough by the Comet 3 prototype, the Avon engines of which are fitted with the type of silencers that will be used on B.O.A.C.'s Comets.

As can be seen in the bottom picture on this page, these units consist of a simple "corrugated" nozzle with six corrugations, which is attached to the end of the engine tail-pipe. Fitted with silencers of this kind, the Comet 4 will have a noise level of 105 decibels when passing overhead at a height of 500 ft. in a climb, which is quieter than most of the large piston-engined airliners of today. The increase of weight is only 35 lb. per engine and the loss of thrust less than 20 lb. in 10,000 lb.

New Altitude Records

A few days before the S.B.A.C. Display opened, on 28th August, Mike Randrup, chief test pilot of the Napier company, set up a fine new world aeroplane height record of 70,000 ft. in a Canberra bomber with a Napier Double Scorpion rocket-engine mounted in the bottom of its fuselage. He climbed to 44,000 ft. on the Canberra's two Avon turbojets, then switched on the rocket and



Saunders-Roe S-R.53 mixed power-unit interceptor, designed for high altitude interception. It carries air-to-air guided weapons.

zoomed up to 70,000 ft., with the Avons doing little more than to provide power for the electric and hydraulic systems in the "thin" air.

Napier's comment that the Scorpion will shortly be in quantity production as a high altitude power unit for jet fighters leaves little doubt that this engine will be fitted in the form of an under-fuselage rocket-pack on the English Electric P.1B interceptor, giving it a top speed of 1,500 m.p.h.

The world's absolute height record was also raised to over 100,000 ft. on 19th-20th August last by a U.S.A.F. doctor, Major David Simons, who sat in a small aluminium gondola under a 202 ft. diameter plastic research balloon.

Star of the Show

The star of this year's S.B.A.C. Display was the Saunders-Roe S-R.53 mixed power-unit interceptor. Powered by a de Havilland Spectre rocket motor and an Armstrong Siddeley Viper turbojet, it streaked up almost vertically after take-off, trailing a long spear of flame from its rocket, and with a de Havilland Firestreak air-to-air guided missile mounted on each wing-tip.

In its developed form, with a powerful de Havilland Gyron Junior turbojet replacing the Viper, this small interceptor will have a top speed of at least 1,500 m.p.h. It is one of the types under consideration as the standard defence fighter of the new German *Luftwaffe*.

Comets for B.E.A.

To meet the competition of other European airlines that will be equipped with jet-liners in a few years' time, B.E.A. have decided to add a small fleet of jet transports to the turboprop Viscounts and Vanguards with which they had planned originally to operate all their services from 1959 onwards.

As a start, they will have six de Havilland Comet 4B's, which are 78 in. longer than the 19 Comet 4's ordered by B.O.A.C. and will carry up to 99 passengers at 520-545 m.p.h. when powered by four 10,500 lb. thrust Avon R.A.29 turbojets.

To follow the Comets, B.E.A. are expected to order the more advanced Bristol 200 powered by three Bristol Zephyr or four Rolls-Royce RB.140 turbojets, or a new de Havilland design with three de-rated Rolls-Royce Conways. In each case, the engines are mounted on the rear fuselage, like those of the French Caravelle.

Missiles at Farnborough

A special guided weapons enclosure at the 1957 S.B.A.C. Display contained nine types of missiles, of which the smallest was the Vickers Type 891 anti-tank rocket. Intended for use by infantry, it can be carried around by one man in a combined canister-launching ramp and is guided to its target visually by radio. Shown with it was the Vickers Type 888 "Red Dean", a very large air-to-air missile that was designed to arm the now-abandoned "thin-wing" Javelin. Fairey Fireflash and de Havilland Firestreak missiles completed the air-to-air exhibits.

Perhaps even more interesting were the ground-to-air anti-aircraft missiles. Shorts showed a small rocket, labelled as a test vehicle, but with obvious possibilities for anti-aircraft defence against low-flying raiders. Bristol displayed for the first time their Bloodhound missile, powered by two Thor ramjet engines, which will enter service with the R.A.F. next year. It can fly at three times the speed of sound and has a semi-active guidance system. This means that a radar beam is directed at the target from the ground, "bounces" off the target and is picked up by a scanner in the nose of the Bloodhound, to guide it towards its quarry.

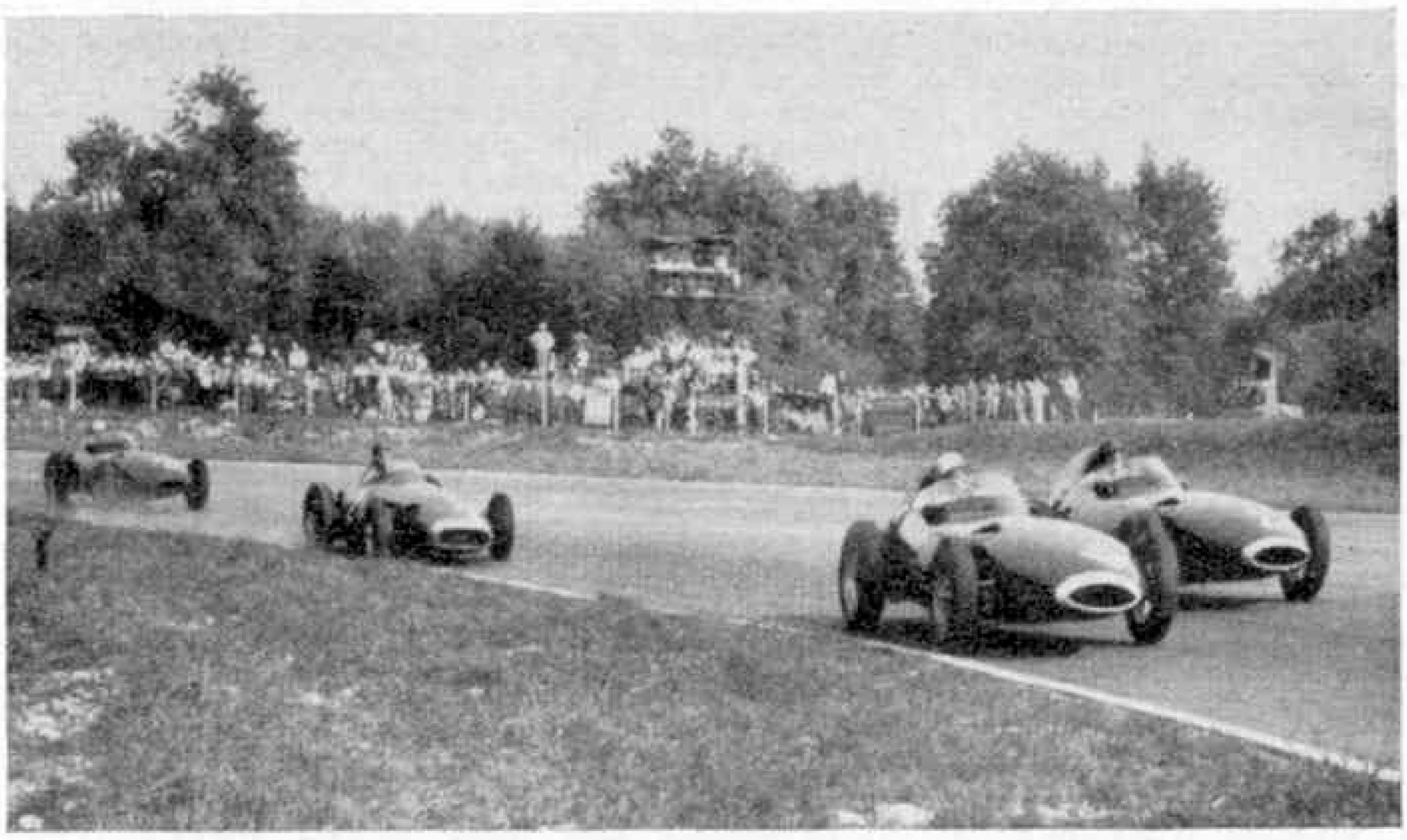
Second R.A.F. ground-to-air rocket will be the solid-propellant English Electric Thunderbird, which will also be used by the Army. It was displayed on its launching ramp, which is turned and elevated automatically by a radar installation that locks on to the target and follows its every movement. Like the Navy's Armstrong Whitworth Seaslug, its performance is as good as that of "second generation" U.S. missiles such as the Nike-Hercules, and may be even better. In fact, those people who have implied that Britain's missile-makers are behind the times received a shock, because as in every other branch of aviation except possibly the development of long-range airliners, Britain is clearly second to none.

The Bloodhound ground-to-air guided missile on its launcher.

Road and Track

By Peter Lewis

THIS has been the greatest season ever for British racing cars in the all important World Championship events, the only races that really matter so far as prestige is concerned, with the British Vanwall, which appeared for the first time in 2-litre form at Silverstone in May 1954, winning three of the 1957 series. The remaining four went to Fangio's Maserati. Prior to the 1957 season no combination of a British car and driver had won a major Grand Prix since 1923, when Sir Henry Segrave in a Sunbeam won the French G.P. at Tours.



Vanwalls in the lead in the Italian Grand Prix at Monza. The two leading cars are those of Stirling Moss, No. 18, and Tony Brooks, No. 22. They are followed by Juan Fangio in a Maserati, No. 2, and Stuart Lewis-Evans in the third Vanwall, No. 20

The third in this series of Vanwall triumphs—the Italian G.P. at Monza—was a stunning blow to the Italian factory teams from Modena, and a triumphant British finale to the season. The meteoric record lap by Lewis-Evans of 125.62 m.p.h. in the final practice session shattered the Italians, and the appearance of the entire British team on the front row of the grid with Fangio was unparalleled.

By the 11th lap of this memorable race, with the Vanwalls forcing the pace and leading 1–2–3, the massed Italian spectators could scarcely believe their eyes. There was more to come. Stirling started to pull away from Fangio until just before half distance (40 laps) he led the Argentine ace by 17 seconds and a little later, to the consternation of the crowd, the British driver *lapped the World Champion.*

The excitement was intense when—with ten laps to go—Stirling made a rapid pit stop and Fangio came on to the same lap, but even so the World Champion was still beaten by 41 seconds. This was not all, for Tony Brooks, making up for lost time after a pit stop, recorded the fastest lap at 1 minute 42.7 seconds, equal to 124.04 m.p.h. What a great day for Great Britain. Now for 1958!

Utah—and the B.M.C. Engine

When Stirling Moss returned to London after his five record breaking runs at speeds approaching 250 m.p.h. on the Salt Lake Flats at Bonneville, Utah, he told me something of his experiences with the beautifully streamlined 1½-litre M.G.

The actual record is taken over a stretch of only a mile, but there is an approach run of five miles and another five miles is needed in which to stop the car. The M.G. has only one nine-inch disc brake, mounted inboard on the back axle, as opposed to the normal four wheel brake system on most racing, sports and family cars. Front brakes are omitted to save weight, but in any case one does not brake hard when the tyre treads are only one millimetre thick!

Stirling found the salt surface very slippery indeed and wheel spin was considerable, which meant of course that he could not accelerate rapidly. Incidentally, he did one trial run at over 100 m.p.h. just to warm up the back axle and gear-box.

Most people are aware that the engine used in the M.G. record-breaker is basically the 4-cylinder 1½-litre unit, supercharged

but with many standard components, as used in the M.G.A. sports car. The power developed by the engine is 290 b.h.p. at 7,300 r.p.m., with petrol consumption at maximum output in the region of four miles per gallon.

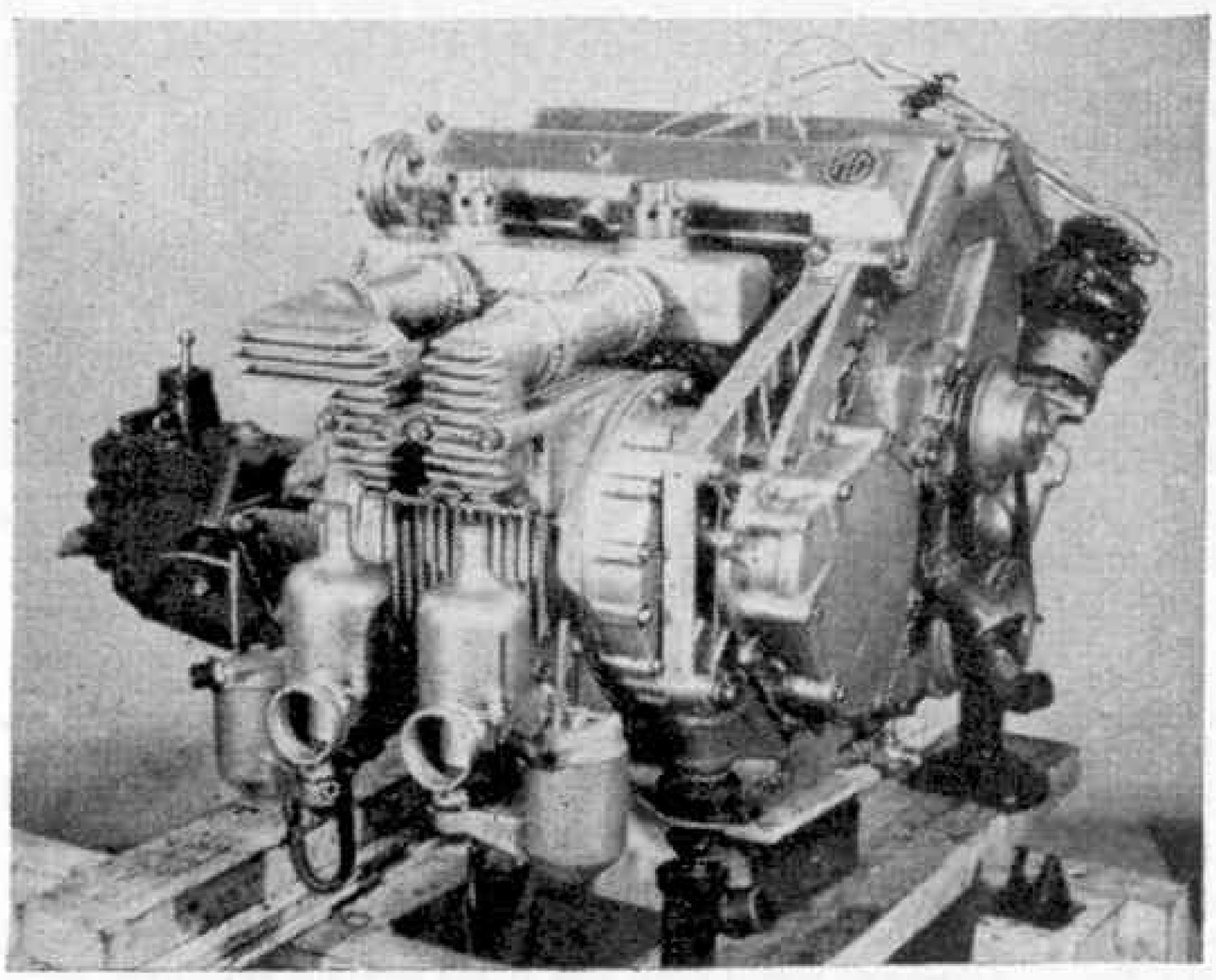
It is not so widely known that the M.G.A. engine, which appeared for the first time in public at Le Mans in 1955, is the most fully developed version of the British Motor Corporation 1½-litre overhead valve engine, generally known as the B. series engine.

In the Austin A.55 Cambridge this engine is used in single carburettor form with a compression ratio of 8.3 to 1, and develops 51 b.h.p. at 4,250 engine revolutions per minute. In the Morris range, again with one carburettor, it powers the Cowley 1,500 and the Series 3 Oxford, developing 52 b.h.p. at 4,400 r.p.m.

The luxurious 15/50 Wolseley has it, developing 50 b.h.p. at 4,200 r.p.m., and it is used yet again in the lively new Wolseley 1,500, with a compression ratio of 7.2 to 1 and 43 b.h.p.

It is in the M.G. range that the B.M.C. engine with twin S.U. carburettors and a compression ratio of 8.3 to 1 develops its maximum power. In the Magnette, a 90 m.p.h. saloon with handling, brakes and roadholding to match, it develops 68 b.h.p. at 5,400 r.p.m. while the 100 mile an hour M.G.A. sports car develops 72 b.h.p. at 5,500 r.p.m.

The Lister-Jaguar, fitted with a 3.8-litre "works" engine, and almost entirely constructed in the small Cambridge workshop of Brian Lister. Eventually it will sell, without tax, for £2,750.



The twin O.H.C., twin carburettor, supercharged version of the B.M.C. 1½-litre power unit as used in the Utah M.G. The Brake Horse Power developed (290 at 7,300) is astounding for such a small power unit. On the extreme left is the selector for the remote control gear change.

Brian Lister

Brian Lister is the 31-year old Cambridge designer of the Lister-Jaguar that carries the green and yellow colours of Brian and Archie Scott-Brown. He gave himself the only technical education he has ever had by studying engineering books. Following three seasons of club racing with a Cooper-M.G., followed by a J.A.P. engined Tojeiro, he persuaded his father to advance £1,500 and 18 months of the firm's time so that he could build his first Lister-Bristol.

This was really the start of the success story that is still unfolding, a story that is now mainly concerned with the remarkable Lister-Jaguar, powered by a 3.8-litre "works" engine, and which will undoubtedly embrace the Formula 2 Lister racing car as well in the 1958 season.

The sports car is based on the chassis of that first Lister-Bristol which Archie Scott-Brown raced in 1954/5, and the engine is tuned by Brian's resident wizard, quietly spoken Don Moore, who has

(Continued on page 578)

Railway Notes

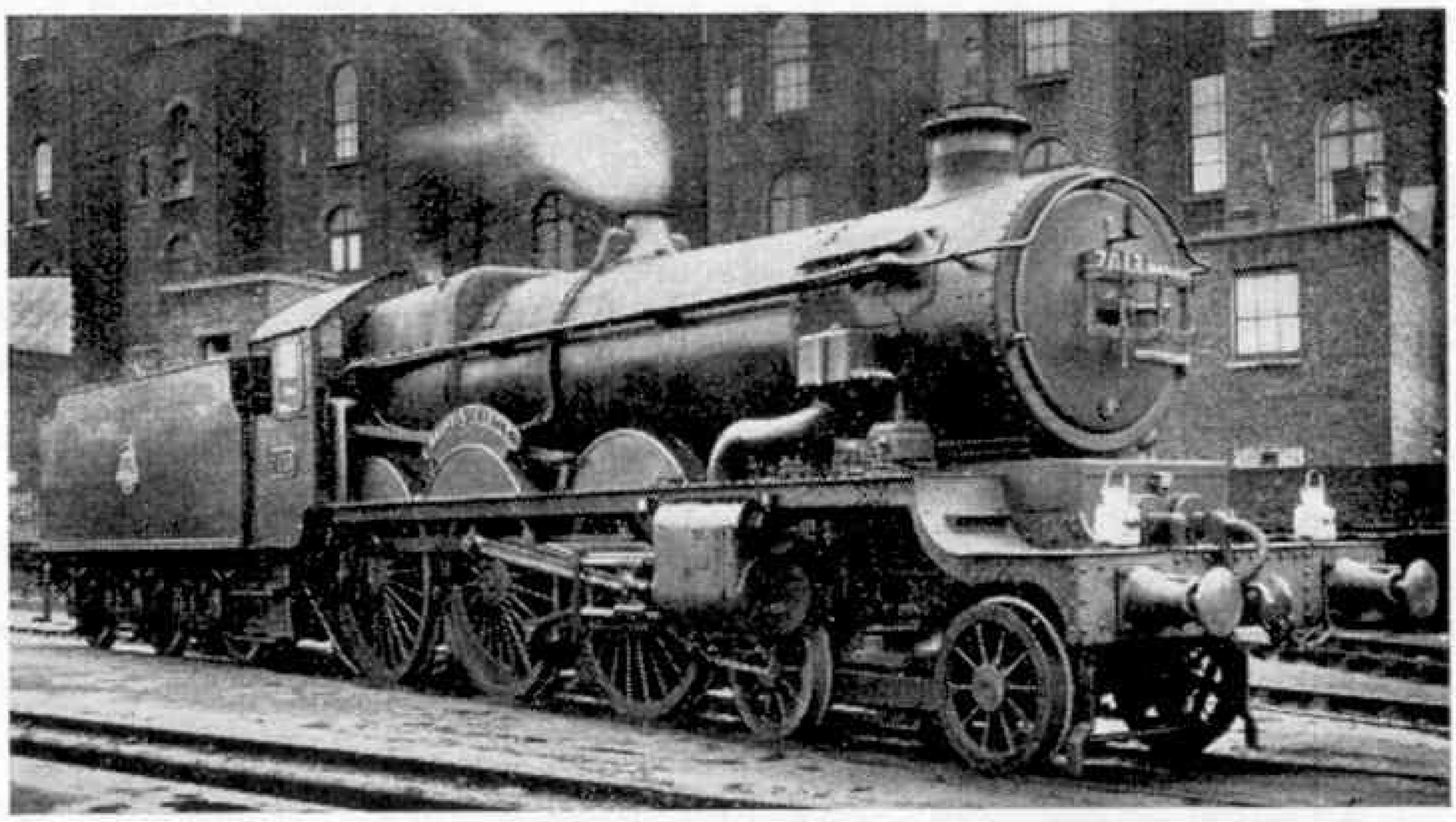
By R. A. H. Weight

Aboard the "Atlantic Coast Express"

This notable S.R. express has several claims to distinction. It provides decidedly the quickest service between London (Waterloo) and Salisbury, Exeter and beyond. Its comprehensive formation is unique in Britain, since it conveys no fewer than eight different portions or through carriages. This is most interesting from the operating point of view.

I was privileged last summer to make a return trip in the *ACE*, as it is familiarly known, from London to the Cornish border and back. It was an extremely comfortable and enjoyable experience with lots of thrilling running and delightful scenery.

Westbound at 11 a.m. from Waterloo the formation from the engine on an ordinary weekday was as follows: two coaches for Padstow (Cornwall), making the longest run and forming the main stem of the train; one for Bude (Cornwall), detached at Halwill, Devon; and two for Plymouth, detached at Okehampton, these forming the first section of the train. Then came two for Ilfracombe and one for Torrington (N. Devon), detached at Exeter, Central, as were the two restaurant and buffet cars, which work no farther; two composite coaches for Sidmouth and Exmouth, taken off at Sidmouth Junction; and one for Seaton (Devon) and intermediate stations, left behind at Salisbury to follow as part of a slow train. Nearly all these vehicles of modern type were painted green, and reach their destinations or commence their journeys attached to branch or connecting trains.



A splendid study of W.R. No. 7013 "Bristol Castle" standing outside Paddington. This Castle locomotive is the one on which the new Hornby-Dublo locomotive was based. B.R. (Western Region) Official Photograph.

In the opposite direction to Waterloo, we had through carriages from Padstow, Bude, Plymouth, Torrington, Ilfracombe, skilfully merged together with two restaurant cars at Exeter, Central, to form the 12.30 p.m. express with 11 coaches to Salisbury. As along that stage on the outward journey, we had 13-on, over 450 tons gross, from Salisbury to London, having added on in rear carriages from Lyme Regis and Yeovil transferred from the preceding slower up train.

Rebuilt Merchant Navy locomotive No. 35018 *British India Line* suffered a long track-repair slowing near Walton-on-Thames, and then attained speeds up to 88/86 m.p.h. downhill beyond Basingstoke, reaching Salisbury only 1 min. late on the fastest S.R. timing from Waterloo. After taking water and restarting 2½ min. late, a brilliant run was made over the steeply graded 76 miles on to Sidmouth Junction in 75½ min., more than recovering the deficit. We were also slightly early into Exeter, Central, on a very tight timing, reaching there just after 2.4 p.m. There had been six sprints at 80 m.p.h.—or more!

As on the time-gaining return journey in charge of the similar Pacific, No. 35023 *Holland Afrika Line*, there was some splendid hill climbing. Highest speeds eastbound were 82 m.p.h. before Salisbury and 77 after, between Woking and Weybridge, when 63 miles had been covered from Salisbury start in 59 min. and the engine was eased. Nearly all signals were clear throughout each way. Waterloo arrival was 1 min. before time, at 3.39. From Exeter to Okehampton, which is high on the northern slopes of Dartmoor, amid grand scenery close to the S.R. Meldon Granite Quarries, 1,000 ft. above sea level, we had West Countries *Exeter* and *Honiton* on five coaches, the first through to Padstow, the second to work to Plymouth from Okehampton. B.R. class 3 2-6-2Ts, N 2-6-0s and light Pacifics were noted as the engines on various portions and branches.

Winter Timetable Features

The British Railways winter schedules now in force until after Whitsuntide, subject to modification or additions at busy periods, present a number of welcome innovations and improvements in addition to the new and faster E. R. and Anglo-Scottish express services reported last month.

The 44-mile stretch of the East Coast main line 'twixt York and Darlington, fairly level and straight with modern colour-light signalling, has become to an even greater extent "the fastest railway in Britain" as regards start to stop timings of long distance and other trains. Many of these exceed 60 m.p.h. average, while the quickest, allowed only 40–41 min., have to sustain a mean speed of 64–66 m.p.h.!

Additional fast trains to and from Aberdeen, Glasgow, Edinburgh and Perth provide improved local services and English connections. The *Caledonian* Glasgow-Euston high speed express runs as last summer.

The L.M.R. accelerated and much improved Midland Division express service begun last June continues, with other developments, including the naming of the 7.55 a.m. fast trains from Euston and St. Pancras to Manchester, respectively the *Lancastrian* and the *Palatine*, each returning in the afternoon. Additionally named W.R. expresses with coaches in chocolate and cream livery are the *Mayflower*, leaving Plymouth for Paddington at 8.30 a.m. and Paddington westbound at 5.30 p.m., and *The Cathedrals Express*, departing from Hereford at 7.45 a.m. via the Worcester-Oxford route to Paddington, whence the return journey begins at 4.45 p.m. There are some quicker Paddington-Birmingham times.

The down "Atlantic Coast Express" passing Surbiton. The engine is rebuilt Merchant Navy 4-6-2 No. 35014 "Nederland Line." Photograph by R. F. Roberts.

Notably improved winter timetables are in force on the Waterloo-Southampton-Bournemouth S.R. route, as the summer's new 2-hr. London-Bournemouth timings still operate, with an additional express each way. There is also an extra up and down fast Waterloo-Salisbury-Exeter train, as well as additional London-Sussex coast electric ones. Faster and more frequent diesel-electric services are being introduced in the Portsmouth-Southampton-Winchester-Salisbury area. In general, with more fast timings and long non-stop runs on various routes, the picture is a gratifying one.

Locomotive News

New locomotives have been placed in service and allocated as follows: class 4 2-6-0s Nos. 76093–5, 67A, Corkerhill, Glasgow; 76105–8, 61A, Kittybrewster; and 76109–11, 62A, Thornton, Fife. With diesel-electric propulsion, Bo : Bo freight Nos. D8002–4, 1D, Devons Road (Bow, London); six-wheeled shunting, D3372–4, 26A, Newton Heath; D3375–8, 55D, Royston, Yorks.; diesel-mechanical, Nos. 11169–70, 32A, Norwich; and Nos. 11708–12, 62B, Dundee, Tay Bridge.

Several large engines have been loaned or transferred to British Railways from the W.D. Longmoor or other Military Lines. Among them are 2–10–0 No. 601, lately at work in Scotland; ex-W.D. 2–8–0s Nos. 500–1 and 512, renumbered 48773–5 in the L.M.R. 8F series.

No. 52510 3F L.M.R. 0–6–0, now being scrapped, was the last representative of the former Furness Railway's locomotive stock, having been rebuilt with a Lancashire and Yorkshire Railway type boiler of which there are still a number in use. Another last survivor withdrawn was No. 32331 *Beattie*, of the S.R. N15x 4–6–0 class (rebuilt from ex-L.B.S.C.R. 4–6–4T). H2 No. 32424, *Beachy Head*, remains as the sole active 4–4–2 or Atlantic engine in standard gauge.

Since last month's notes were written, it has been reported that the latest modifications to W.R. No. 4074, *Caldicott Castle* are concerned with the inside cylinders and enlarged superheater, but when last seen this engine did not carry a double chimney. In honour of the centenary of the famous Composer's birth near Worcester, No. 7005, previously *Lamphey Castle*, has been renamed *Sir Edward Elgar*.

A Miscellany of Enterprises

Considerable track and signalling improvements have been brought into use at Dumfries, situated on the main Carlisle-Gretna-Glasgow (St. Enoch), line, with junctions for Stranraer and Lockerbie. Latest type colour light signalling has been installed with electric control of points.

In an entirely different field, the Scottish Region has distributed an attractive series of booklets outlining fast freight train facilities to and from its five main industrial areas around Glasgow, Edinburgh, Kilmarnock, Dundee, Aberdeen. These give next day delivery in many cases and indicate, as elsewhere, the increasing number of fast goods services operated to a timetable comparable in reliability with passenger train working.

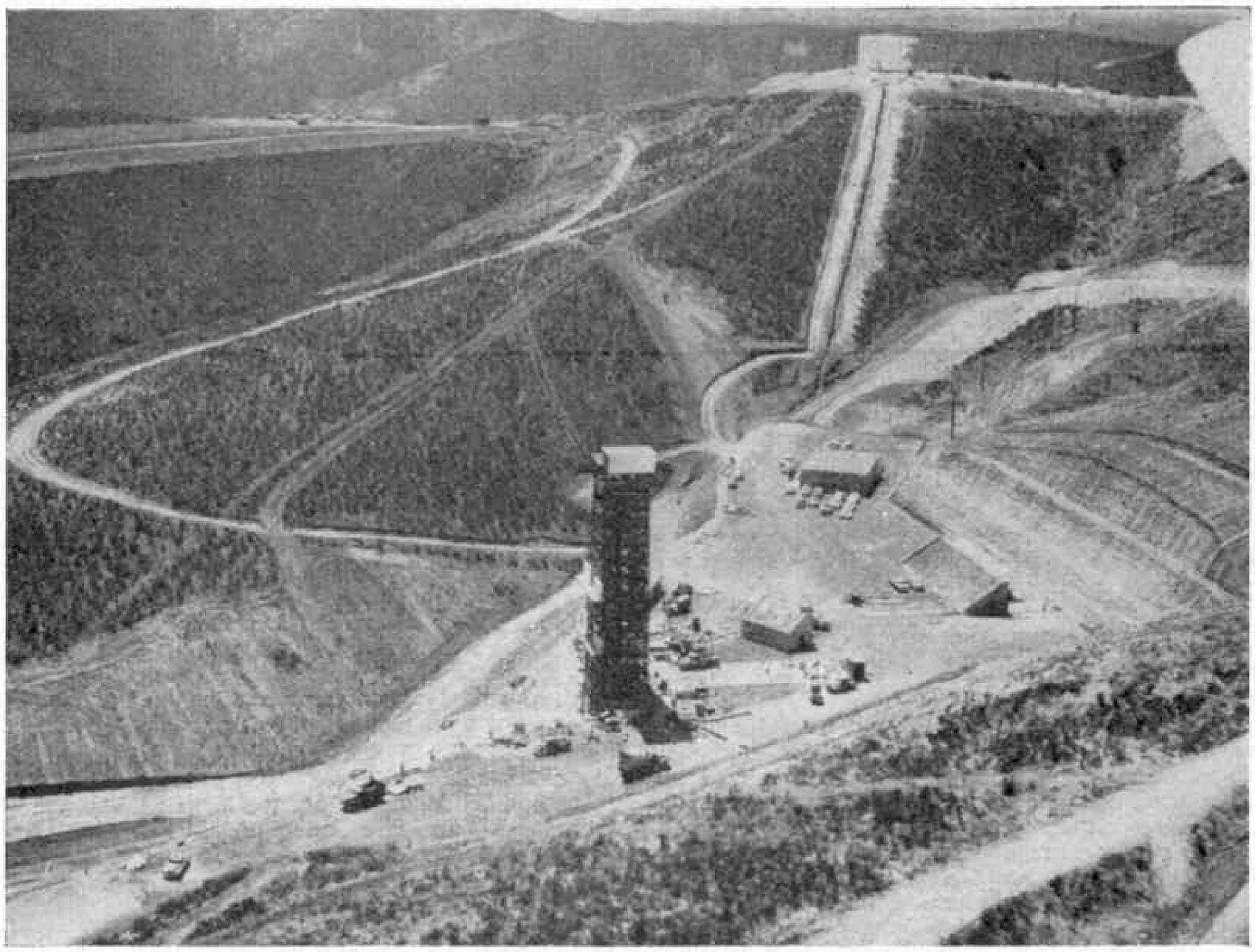
Modernised and much improved passenger and staff accommodation is being installed at Leighton Buzzard station, on the borders of Bedfordshire and Buckinghamshire, which sees frequent expresses to and from Euston pass at high speed, although there is considerable local business as well.

The first travelling diesel instruction train of its kind is making a tour of E.R. Motive Power depots. It is formed of two coaches fitted with lecture room, projectors, living quarters for the Instructor, diesel generator set and a wide variety of models, diagrams, replica controls and so on, for the training of drivers. A well-equipped diesel and electric training centre for the same purpose has been built as Ashford, Kent, by the Southern Region, which has also established a training centre at Eastleigh.

Heavy holiday traffic demands on locomotive power last summer no doubt accounted for the appearance of 2-10-0 No. 92051 on an express passenger train, which is seen here leaving Derby for Bristol. Photograph by P. J. Lynch.

The Western Region estimates that it will save £10,000 a year by using an electronic computer, the first of its kind, installed in the Accountant's Office at Swindon. It calculates the pay, taking account of all sorts of additions and deductions, for 10,000 employees in the locomotive, carriage and wagon works there, and is capable of much other rapid accounting work.

A Wellington, N.Z., firm has produced two fine sets of colour slides depicting New Zealand locomotives, rolling stock, and train running through grand scenery.



Testing Giant Rockets

By John W. R. Taylor

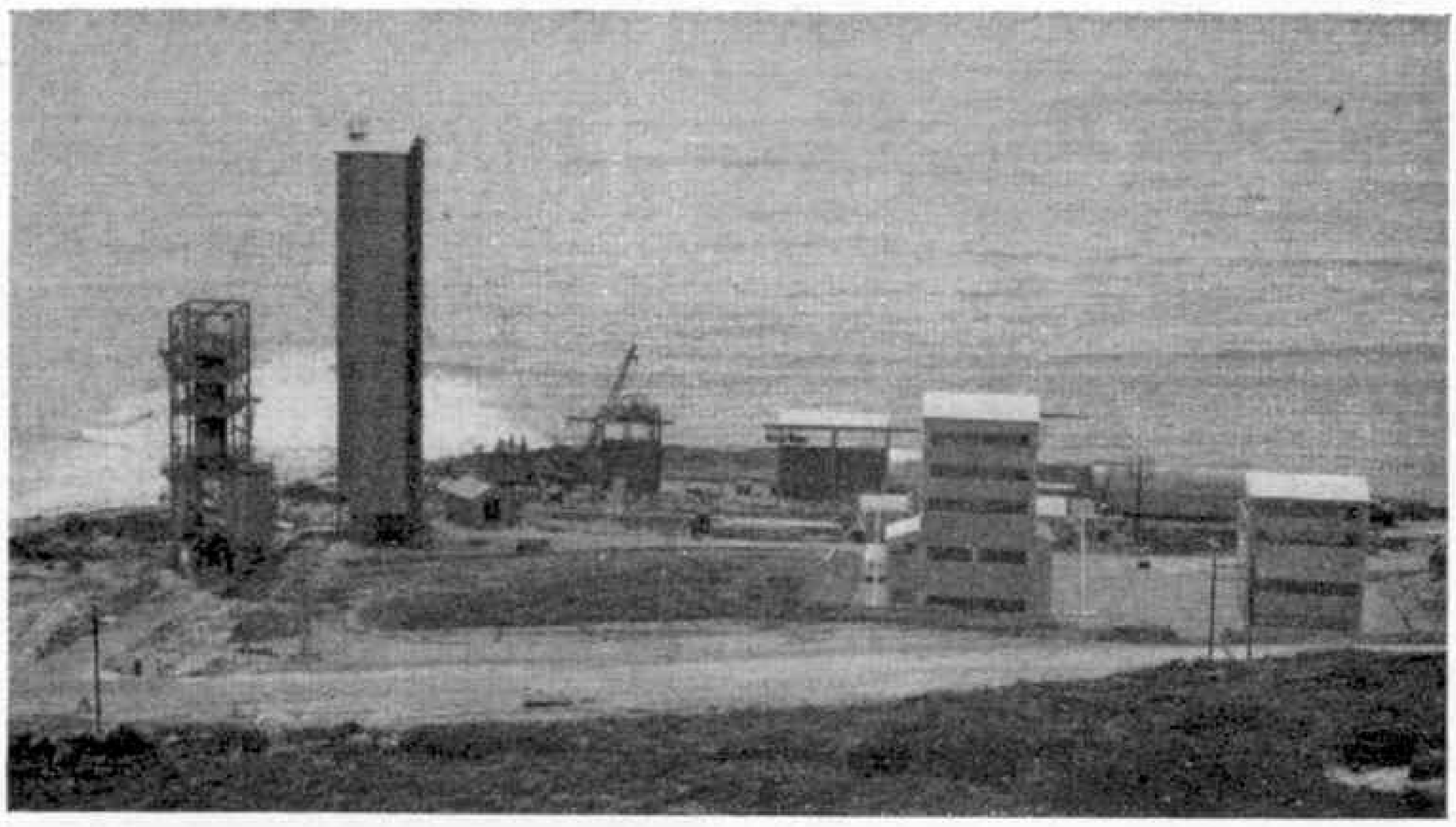
DURING the coming year we shall hear a great deal about the three-stage Vanguard rockets with which the Americans hope to put instrument-carrying satellites or "baby moons" into orbit around the Earth, as part of their contribution to International Geophysical Year research.

We shall read less about some of the other giant U.S. rockets, because they are highly-secret military weapons. Yet the great Intercontinental Ballistic Missiles (I.C.B.M.'s) now being built on the other side of the Atlantic are among the most interesting projects ever tackled by the aircraft industry, and the most costly. Their purpose is to prevent war, by threatening any would-be trouble-makers with a terrifying counter-attack. But of far greater interest to many people is that their test firings may include an attempt to land a rocket on the Moon within the next few years.

Two types of I.C.B.M. are under construction, both designed to carry a hydrogen-bomb warhead at least 5,000 miles. To do this, they must reach a speed of over 10,000 m.p.h., and they will be so big that even the 72 ft. long, 11-ton Vanguard rocket will look small by comparison.

The picture above shows the Atlas test base in Sycamore Canyon, a secluded site on a military reservation north east of San Diego, California, U.S.A. Illustrations by courtesy of Convair.

One, the two-stage Martin Titan, will have the same kind of conventional design as Vanguard, in which the main motor will not ignite until the first-stage booster rocket has burned out and fallen away. But the Convair Atlas will present a truly fearsome sight at take-off, because the booster motors are mounted on each side of its tail end, so that its main rocket motor also will be able to operate from the start. Produced by the North American Rocketdyne Division, the boosters and main engine will have a combined thrust of 335,000 lb.—about 150 tons. This is more than four times the power of a B-52 Stratofortress bomber, the engines of which make as much noise as if all the people in the world talked at once.



Components of the U.S. Air Force's Atlas Intercontinental Ballistic Missile are tested at this isolated plant, situated on the ocean side of Point Loma, which lies between the Pacific and San Diego Bay.

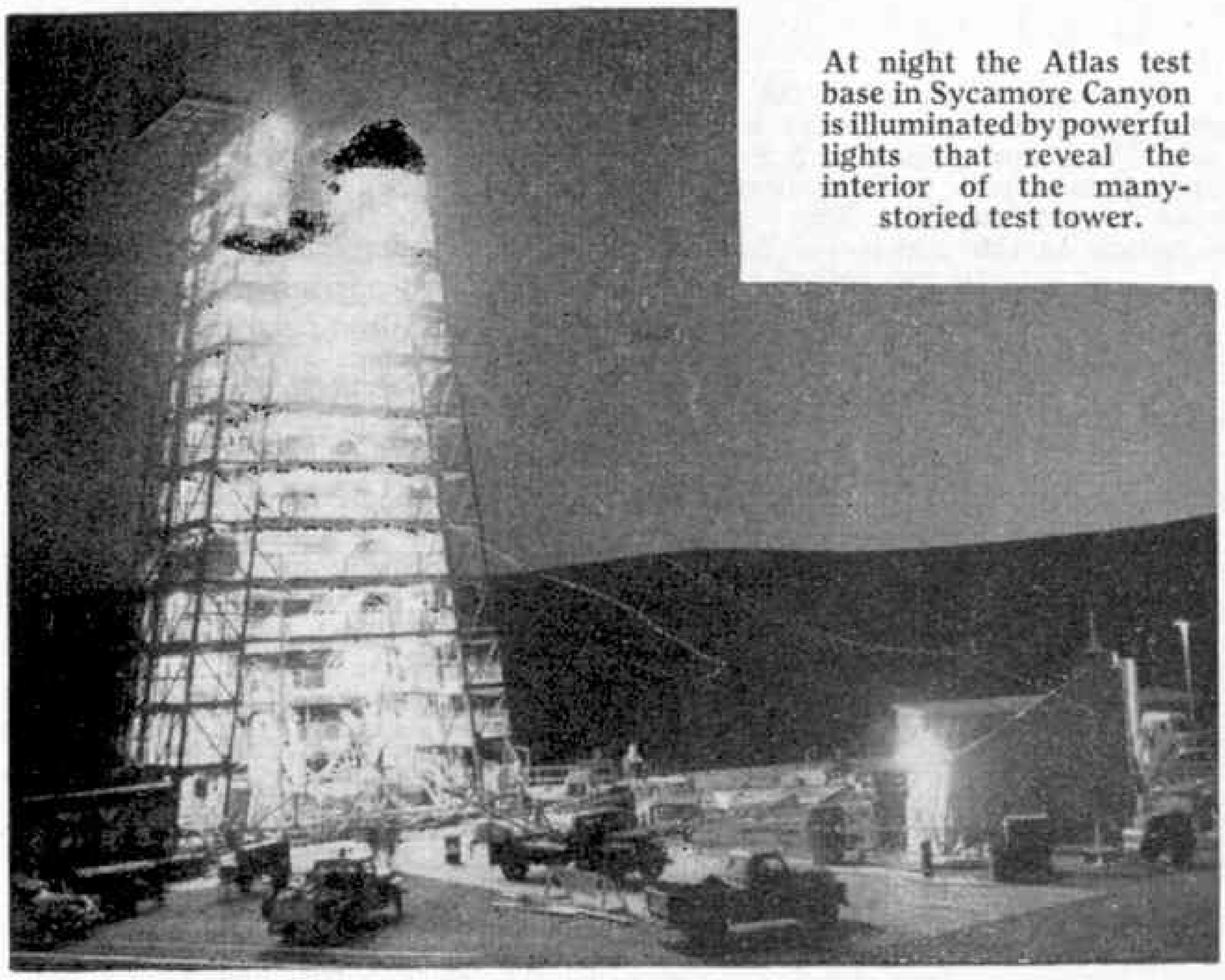
Obviously, the testing of such rocket motors and of the Atlas airframe, which stands 100 ft. high and weighs 40 tons at take-off, requires a great deal of equipment. And it must be done in out-of-the-way places where the noise will not be a nuisance to people in their homes or offices.

The illustrations on these two pages show some of the bases which Convair have built for the Atlas test programme, and which will house more than 1,000 engineers, technicians and workmen when tests reach their peak. Smallest is the cluster of buildings on the beach at Point Loma, which lies between the Pacific and San Diego Bay, California. Only components are tested there, because the site is too near populated areas for engine run-ups.

Short engine runs are possible at the second base, which stands in a hollow at Sycamore Canyon, a secluded corner of a military reservation north-east of San Diego. But the main purpose of this base is to check the fuel, guidance, control and other systems of the I.C.B.M. in a huge steel test tower.

Similar work is done at Edwards Air Force Base—America's "Farnborough"—while actual launchings of the complete missile are made from the Air Force Missile Test Center at Patrick Air Force Base, Florida. From there, the great rockets can be sent out under radio control across a stretch of the Atlantic dotted with islands, from which scientists and engineers can observe every stage of their flight.

They had little opportunity to do so at the first test launching of a complete Atlas missile earlier this year, because the rocket blew up soon after firing. But much is learned even from a failure, and the Americans will redouble their efforts now the Russians claim to have an I.C.B.M. ready for service. In any case, the very name of the company's rocket division—Convair Astronautics—promises plenty of excitement in the future

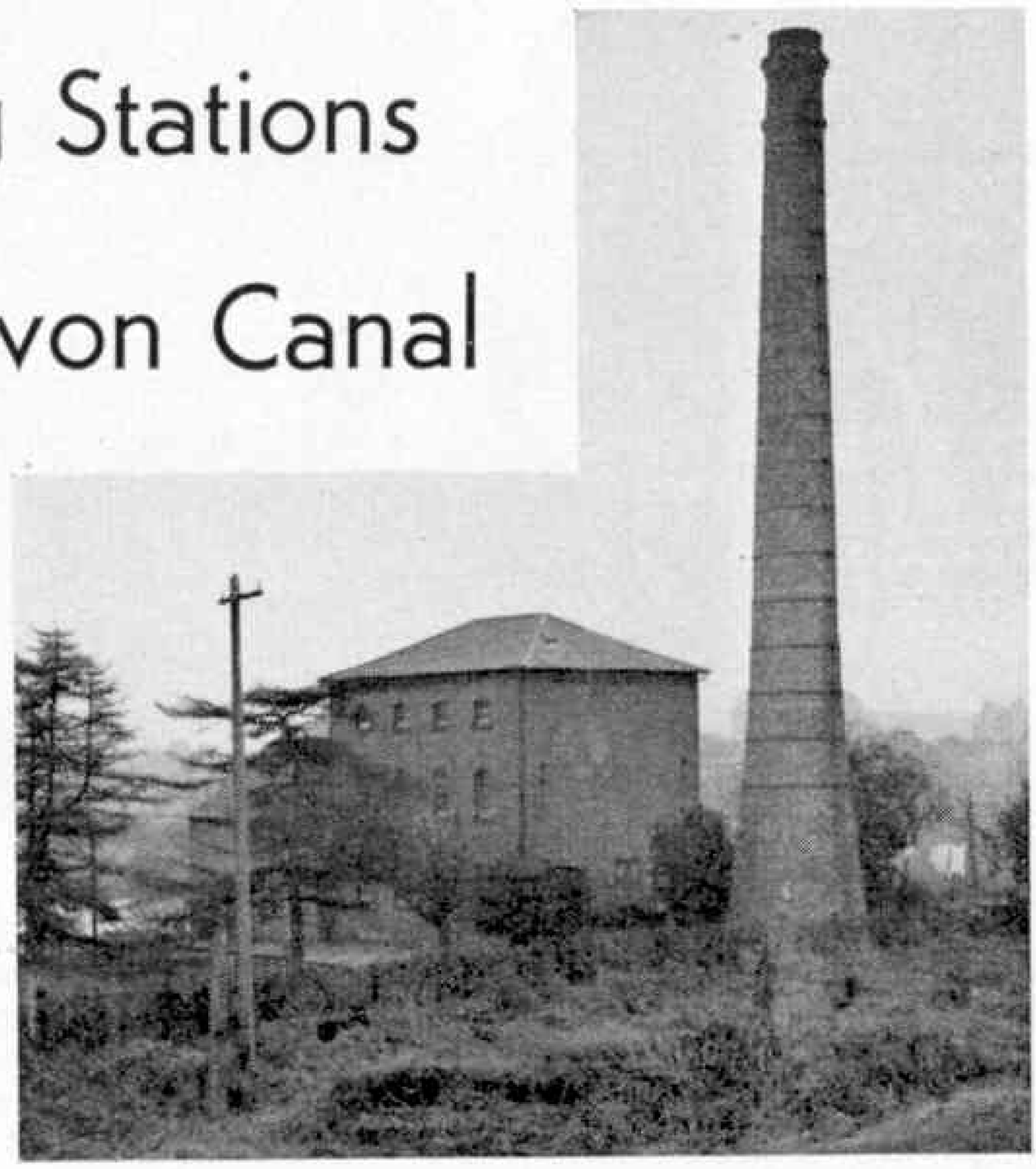


At night the Atlas test base in Sycamore Canyon is illuminated by powerful lights that reveal the interior of the many-storied test tower.

Old Pumping Stations on the Kennet and Avon Canal

by

C. P. and C. R. Weaver



READERS of the *Meccano Magazine* no doubt have been aware of the controversy about proposals to abandon certain of our inland waterways. Our canals were among the earliest of the famous engineering works of pioneer days, and of the many engineers who planned and built them the most famous was James Brindley, who constructed the Bridgewater and Grand Trunk Canals. Many fine engineering features distinguished these works, among them Barton Aqueduct, which carried the first-named canal across the Irwell, and a tunnel at Harecastle on the Grand Trunk waterway.

Other canals of those pioneer days were notable for engineering features, and one of these was the Kennet and Avon Canal, which was planned and built by John Rennie. It is now unused, but not yet abandoned, and on its banks are to be seen two old and interesting pumping plants.

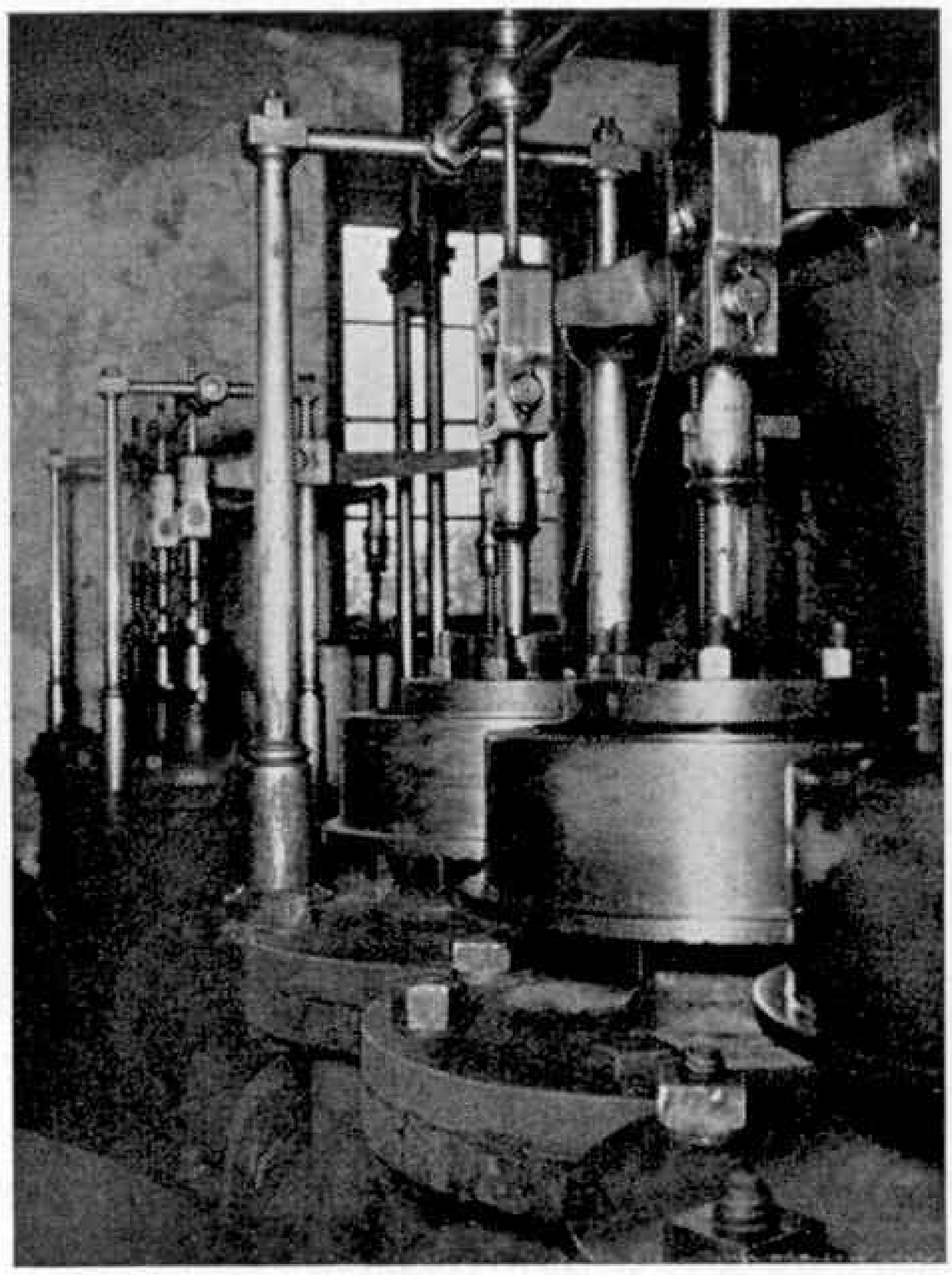
A plentiful supply of water is essential for the efficient operation of an artificial cut, and in general the summit levels have to make good all requirements for lockage, seepage, evaporation, etc. This problem was always serious on the Kennet and Avon Canal, for owing to the nature of the country surrounding its short summit level, reservoirs for water to make good these losses could not be made, and the land on its western side from Bath to Devizes was so porous that it proved a heavy drain on the meagre water resources.

Because of this more or less continuous pumping of water was necessary from the only natural reservoir of Wilton Water, at Crofton, and from the River Avon at Claverton, near Bath. The pumping station at Crofton discharges its water direct into a specially deepened summit level, whilst that at Claverton makes good wastage on the Bradford to Bath "Nine Mile" pound.

The picture at the head of the page shows the Crofton pumping station on the Kennet and Avon Canal. The beam engines in it may be the oldest steam engines still in operation, although now worked intermittently. This and the other illustrations to this article are from photographs by the author.

How many of you, travelling westward along the Western Region main line, have noticed the tall chimney and engine house, so reminiscent of Cornish tin mines, at the end of the climb out of the Kennet Valley, between Great Bedwyn and Savernake? In this old building are two beam pumping engines worthy of closer examination, because they may well be *the oldest steam engines still in regular operation.* The Canal is in a semi-derelict condition, and has not carried traffic for years, but water has to be maintained at a certain level to fulfil obligatory requirements, and so the engines are still at work.

The older and smaller engine, known as "The small engine" or No. 1, was originally built for the West India Dock Co. by Messrs. Boulton, Watt and Co. in 1801. It was, however, diverted to the Kennet and Avon Canal Co. in 1802 and commenced regular pumping on 5th November, 1809.



General view of the valve chests of the two beam engines at Crofton pumping station.

Following a recommendation by John Rennie, who foresaw trouble if a breakdown occurred, an order was placed in 1810 with the same manufacturers for a second and more powerful engine. This was duly installed and commenced duty early in 1813. It became known as "The large engine" or No. 2.

Both engines as supplied by Boulton and Watt were single acting and employed Watt's famous condensing cycle. Steam was supplied at a pressure of 4½ lb. per sq. in. from three "Wagon-top" boilers housed in an adjoining boiler house. Two boilers were always in steam the third being a stand by.

No. 1 engine has a bore and stroke of 36 in. and 8 ft. respectively, and is connected by an equally divided beam to a 26¼ in. bore bucket pump at the bottom of a well, which is connected to Wilton Water by a tunnel driven horizontally into the hillside. The water is lifted 40 ft. and discharged into a leat, along which it flows into the summit pound, the store of water from which the canal is replenished.

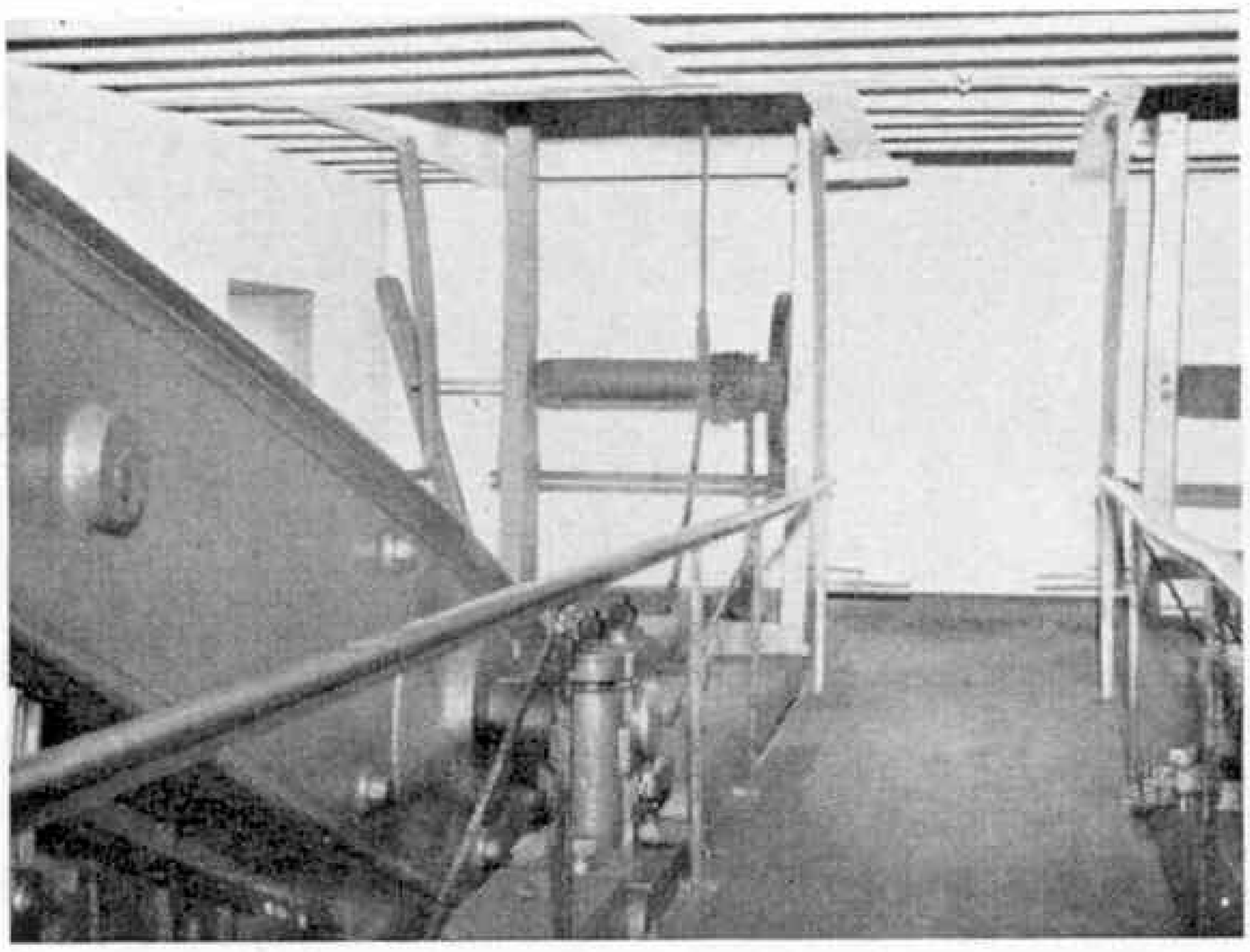
The larger engine has a bore of 42 in. and a stroke of 8 ft. It operates a 30 in. diameter pump in the same well.

In 1843, a decision was made to increase the efficiency of the plant and output of water, by converting both engines to work on the Cornish cycle and by modifying the pumps. This work was undertaken by Messrs. Harvey and Sons of Hayle, Cornwall, in 1844, and took about a year to complete, as only one engine could be taken out of service at a time. The original "Wagon-top" boilers were also removed and replaced by three single flue Cornish type 26 ft. long and 5 ft. 9 in. diameter.

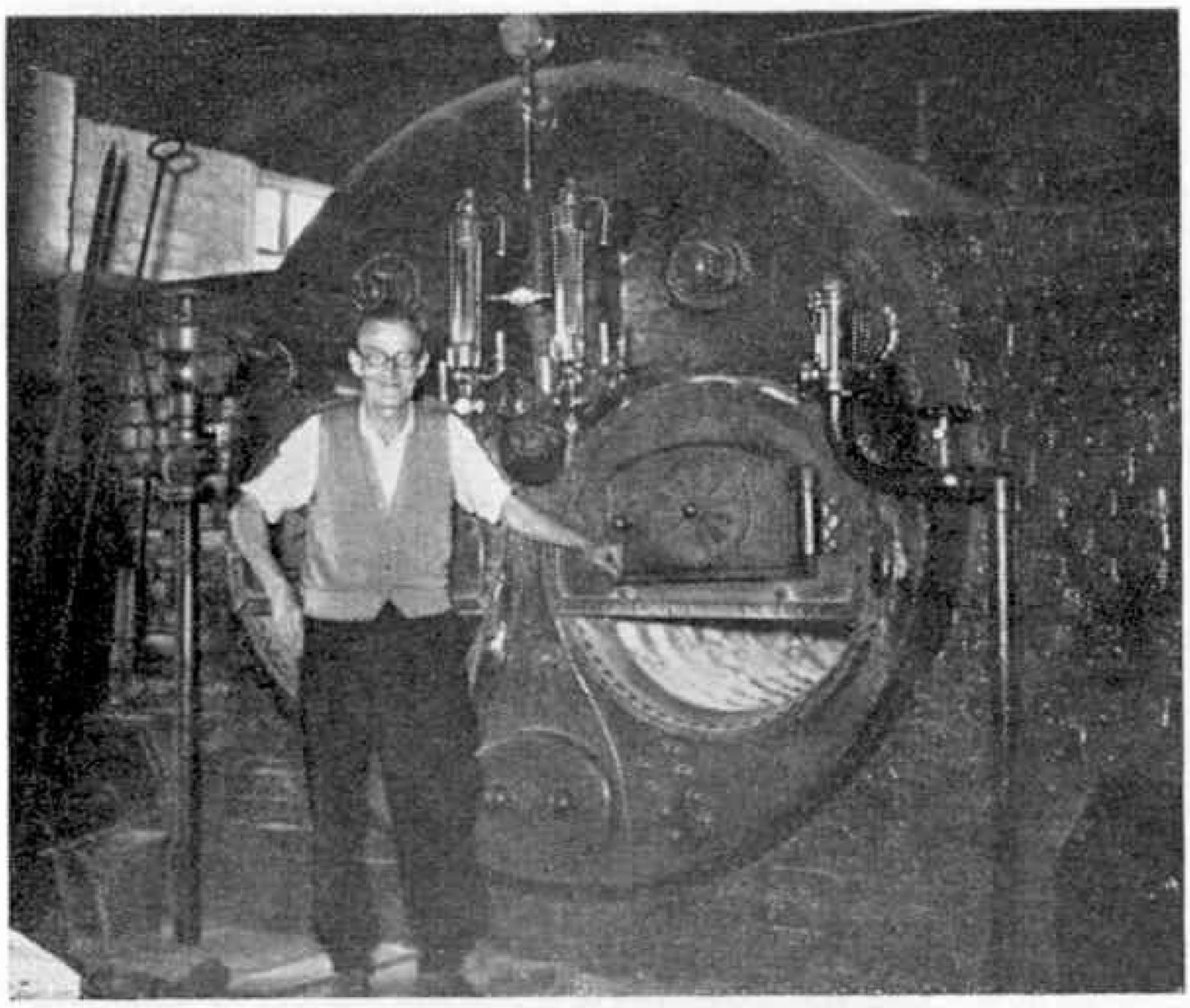
The boilers and all other material for this work were despatched by sea from Hayle to Bristol, and thence along the Kennet and Avon Navigation to Crofton.

In 1852 the canal was acquired by its greatest rival, the Great Western Railway, which continued to operate the plant, although traffic was not encouraged. At the turn of the century the Cornish boilers were removed and replaced by the present Lancashire type, 27 ft. long and working at a pressure of 20 lb. per sq. in.

Although present water requirements do not make regular pumping necessary, the older engine was seen in steam as recently as September of last year, and it was working



This view shows part of the beam of one of the two Crofton engines.



One of the Lancashire boilers providing steam for the two engines. This photograph was taken in September, 1956.

perfectly despite its 147 years of service.

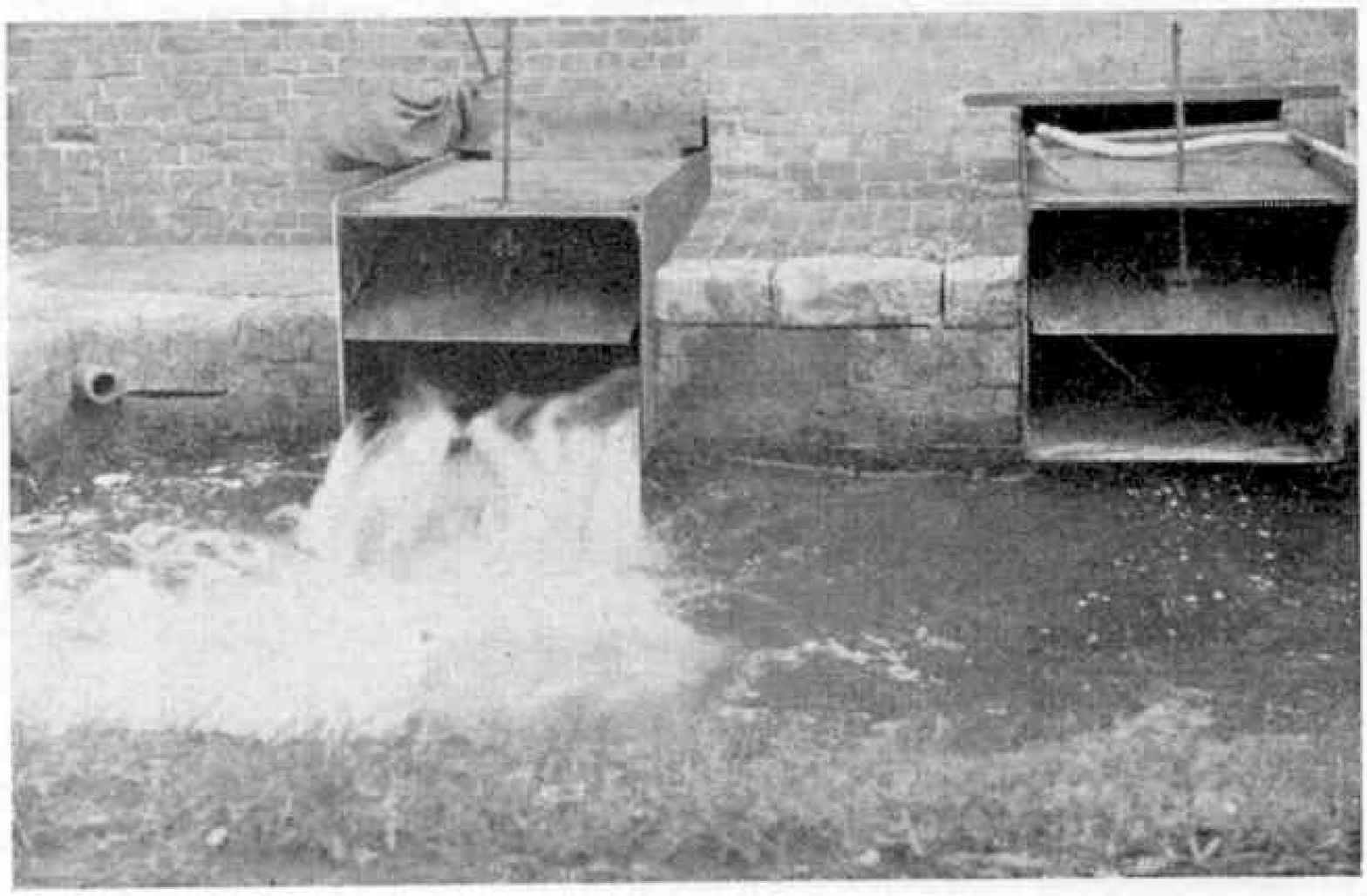
Earlier in this article mention was made of the pumping plant at Claverton near Bath. Raising water from the River Avon into the Canal is accomplished by a unique twin pumping set, made by converting one of the many water mills placed along this stretch of river.

The design is attributed to John Rennie, and the millwrights credited with its erection were a London firm whose name is not now known and Messrs. Fox of Bristol. The plant commenced work early in 1813, after delays occasioned by difficulties in purchasing the old mill and various water rights from the then Duke of Somerset.

The original breast-shot water wheel was 25 ft. wide, 19 ft. 4 in. in diameter and carried on two bearings. Continual trouble was experienced owing to its great width and massive construction. In 1844 Messrs. Harvey lightened the wheel considerably and replaced the stay bolts with tension rods, thereby stiffening the structure and reducing any tendency to sag.

These modifications proved fairly successful, for little else was done until the early years of the present century, when a central pedestal bearing was added. The installation as seen today gives the appearance of two wheels placed side by side on a common shaft. The overall dimensions remain unaltered. Water is led to the wheel along a leat from the River Avon, and control is by means of two separate sets of sluice and paddle gear. The main axle is connected by an ingenious coupling to a pit wheel 13 ft. in diameter. This wheel is cast in eight sections and bolted together. No automatic governing is provided, but the coupling could quickly be disconnected if necessary.

Hanging on a wall in the wheel house are some original wooden patterns used when casting the gear wheel segments and pedestal bearings. It is interesting to note that despite their age and seeming lack of preservative, they are in excellent condition. In November, 1953, some of the 204 inserted teeth on the pit wheel failed and the plant ceased to function. A small diesel-driven pump was then installed.



Evidence of the working of the pumps. Water pumped by one of the engines from Wilton Water entering the leat at the summit level of the canal.

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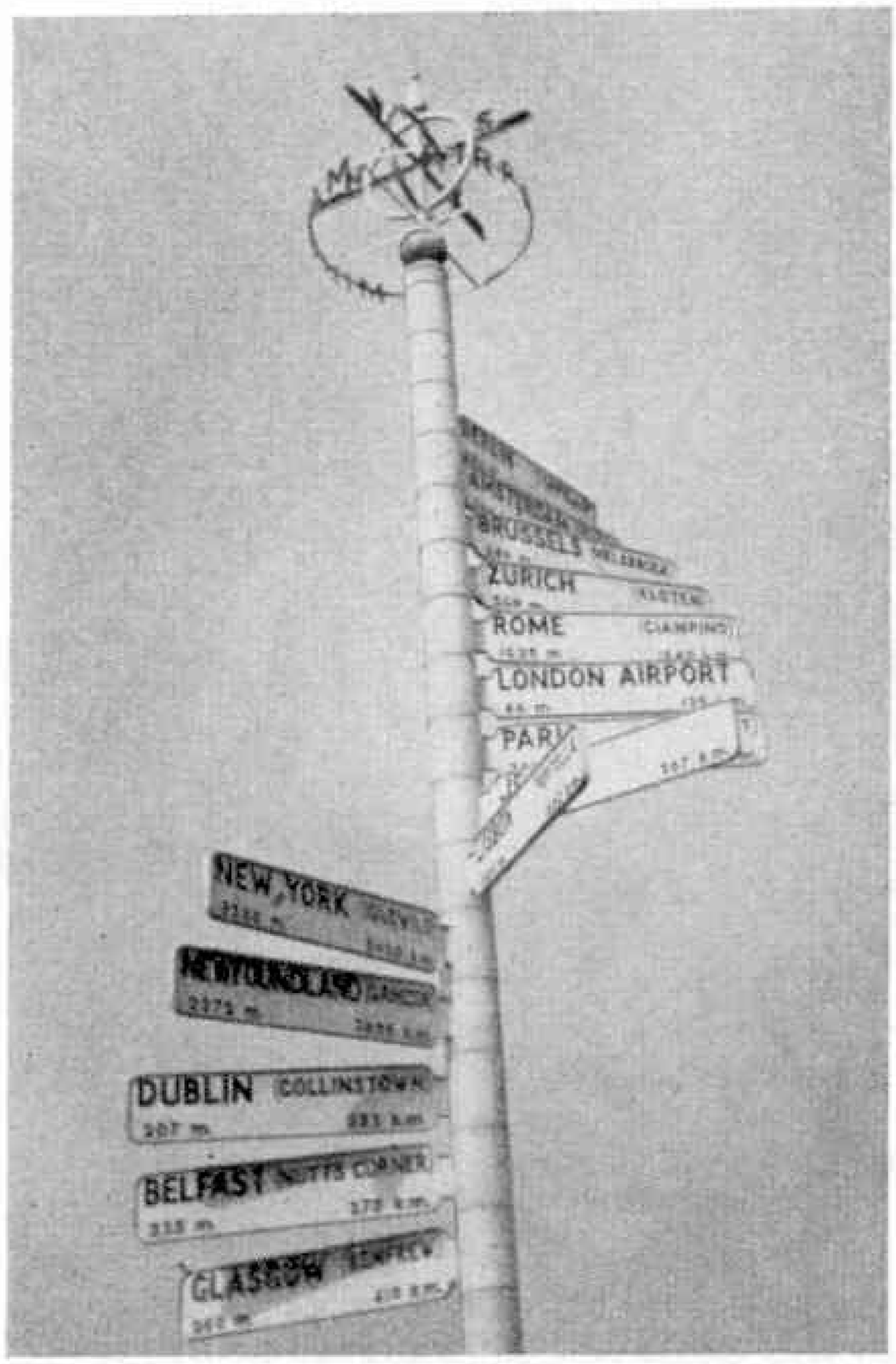


Many destinations are shown on the directions sign at Birmingham Airport. Photograph by S. A. Bennett, Solihull.

THE remarkable signpost seen on this page is at the Birmingham Airport, and its many arms show the directions of airports that are served from Birmingham. The nearest of these is London Airport, at a distance of 86 miles, and the most distant is Idlewild, New York, which is 3,368 miles away. Most of the destinations can be read in the photograph. The one on the arm pointing outward from the picture is Portella, Lisbon, and the name partly covered by it is Jersey.

It must be interesting to stand by the signpost and to look successively in the directions of the great cities of the world indicated by the arms. The distances are given in both miles and kilometres.

The lower picture on this page shows a scene at the Pier Head, Liverpool, with the Royal Liver Building and part of the Cunard Building on the right. In the foreground is Francis Mahnen, a Meccano enthusiast from Luxembourg who came to Liverpool to see how not only Meccano but Hornby and Hornby-Dublo Trains and Dinky Toys also are made. This photograph was taken during his visit.

Junior Section

Francis Mahnen, a visitor from Luxembourg, at the Pier Head, Liverpool.

Easy Model-Building

Spanner's Special Section for Juniors

Models for Outfits Nos. 1 and 3

THE wheeled base of the simple model Excavator shown in Figs. 1 and 2 is a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and the wheels are 1″ Pulleys with Motor Tyres fixed on $3\frac{1}{2}''$ Rods as shown. To make the cab you will need two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bent to U-shape and bolted together. Now fix a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip along the lower edges of these Plates at each side, so that the Double Angle Strips are in line with the edges of the plates. The Double Angle Strips should now be connected at the front by a Trunnion 1 and at the back by two Fishplates bolted together.

The cab is pivotally attached to the base, so that it can be turned from side to side. The bearing for the cab is made by bolting a $\frac{1}{2}''$ Reversed Angle Bracket 2 to the base so that the hole in the upper lug of the Reversed Angle Bracket is in line with the centre hole of the Flanged Plate. A $\frac{3}{8}''$ Bolt should be passed through the hole in the upper lug of the Reversed Angle Bracket and through the hole at the pointed end of the Trunnion 1. The Bolt is then fitted with lock-nuts so that the cab can be turned on the bearing.

To make the jib you should assemble two made-up strips 3. Each of these consists of a $5\frac{1}{2}''$ Strip and a $2\frac{1}{2}''$ Strip overlapped two holes,

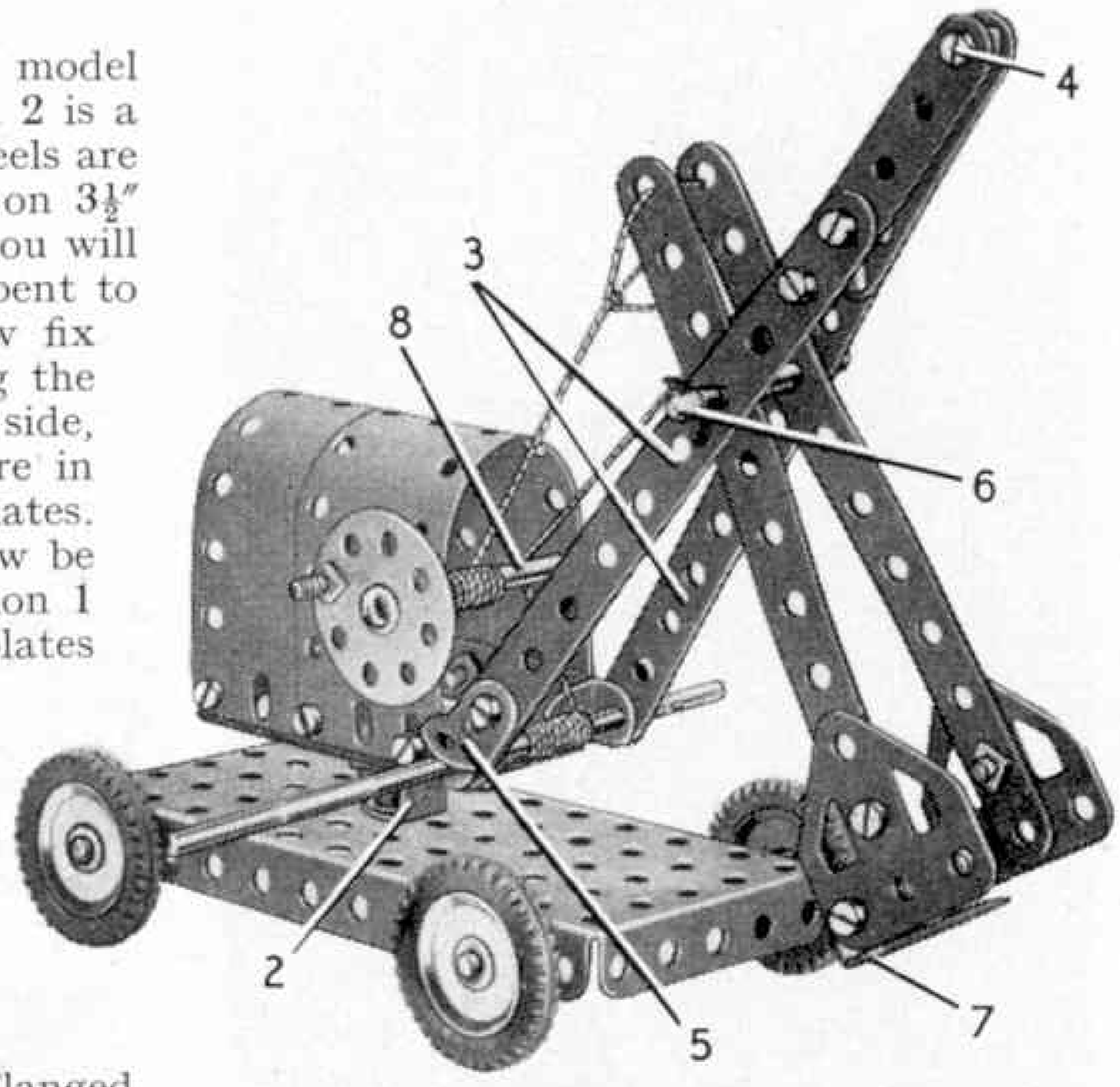


Fig. 1. A neat and effective model of an Excavator. It can be built with parts in a No. 1 Outfit.

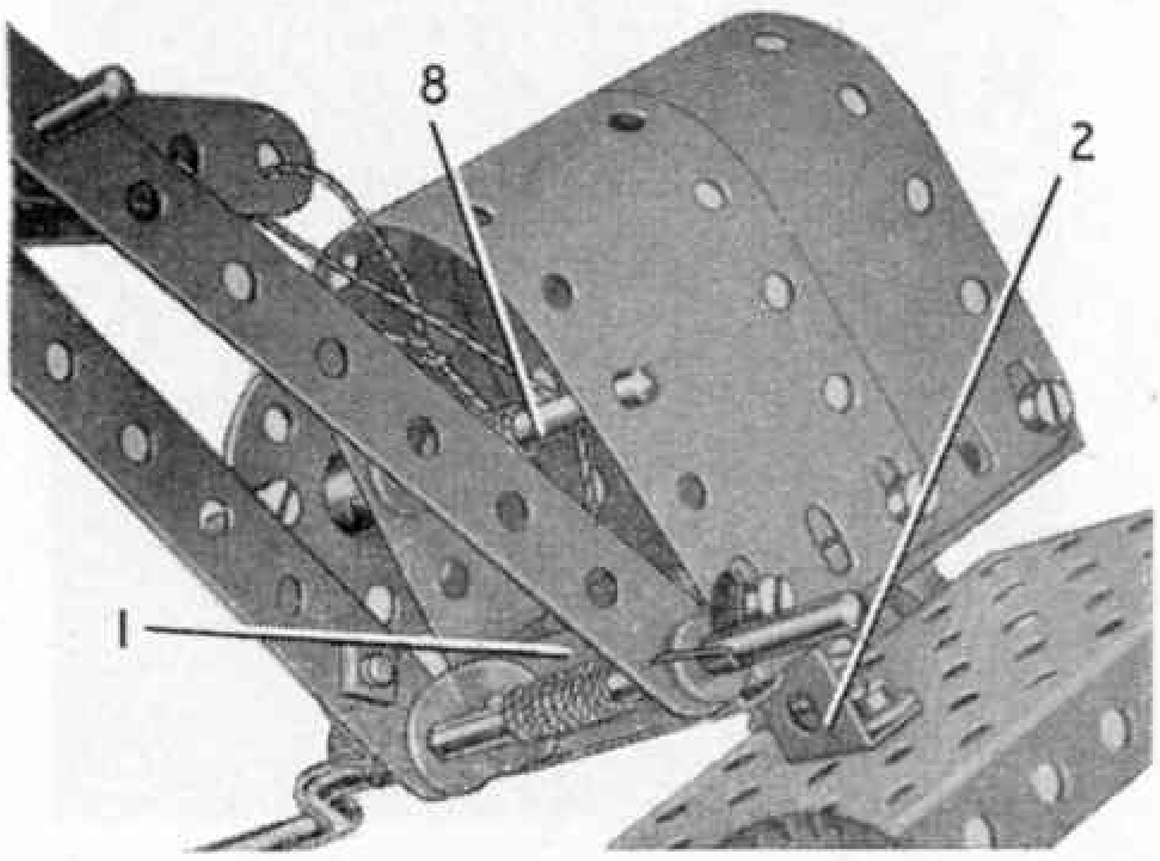


Fig. 2. A close-up view of the Excavator cab, showing the method of mounting it on the base.

and they are connected at their upper ends by a $\frac{3}{8}''$ Bolt 4. This Bolt is fixed in one of the strips 3 by a nut, and is attached to the second strip 3 by two nuts. The jib pivots on a Crank Handle that is mounted in two Angle Brackets bolted to the front of the cab. An Angle Bracket 5 is arranged so that it presses against the lugs of a Spring Clip on the Crank Handle.

The bucket arm can be made from two $5\frac{1}{2}''$ Strips mounted on a 2″ Rod 6, which is held in the jib by Spring Clips. A Flat Trunnion is bolted to the lower end of each $5\frac{1}{2}''$ Strip, and a Trunnion 7 is connected to the Flat Trunnions by Angle Brackets.

A piece of Cord tied to the Crank Handle is taken over a 2″ Rod 8 and is tied to the top of the jib. Another length of Cord fastened to Rod 8 is attached to the upper end of the bucket arm. A handle on Rod 8 can be made by fixing a $\frac{3}{8}''$ Bolt by a nut in a Bush Wheel fastened on the Rod.

Construction of the simple but realistic Cabin Cruiser shown in

Figs. 3 and 4 should be begun by assembling the sides of the hull. For each side you must bolt together a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plate 1, a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 2, a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 3, a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate 4 and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Triangular Flexible Plate 5. Strengthen the lower edges of these Plates with a $12\frac{1}{2}''$ and a $2\frac{1}{2}''$ Strip, and bolt two $5\frac{1}{2}''$ Strips overlapped five holes along the upper edges of the Plates 1, 2 and 3.

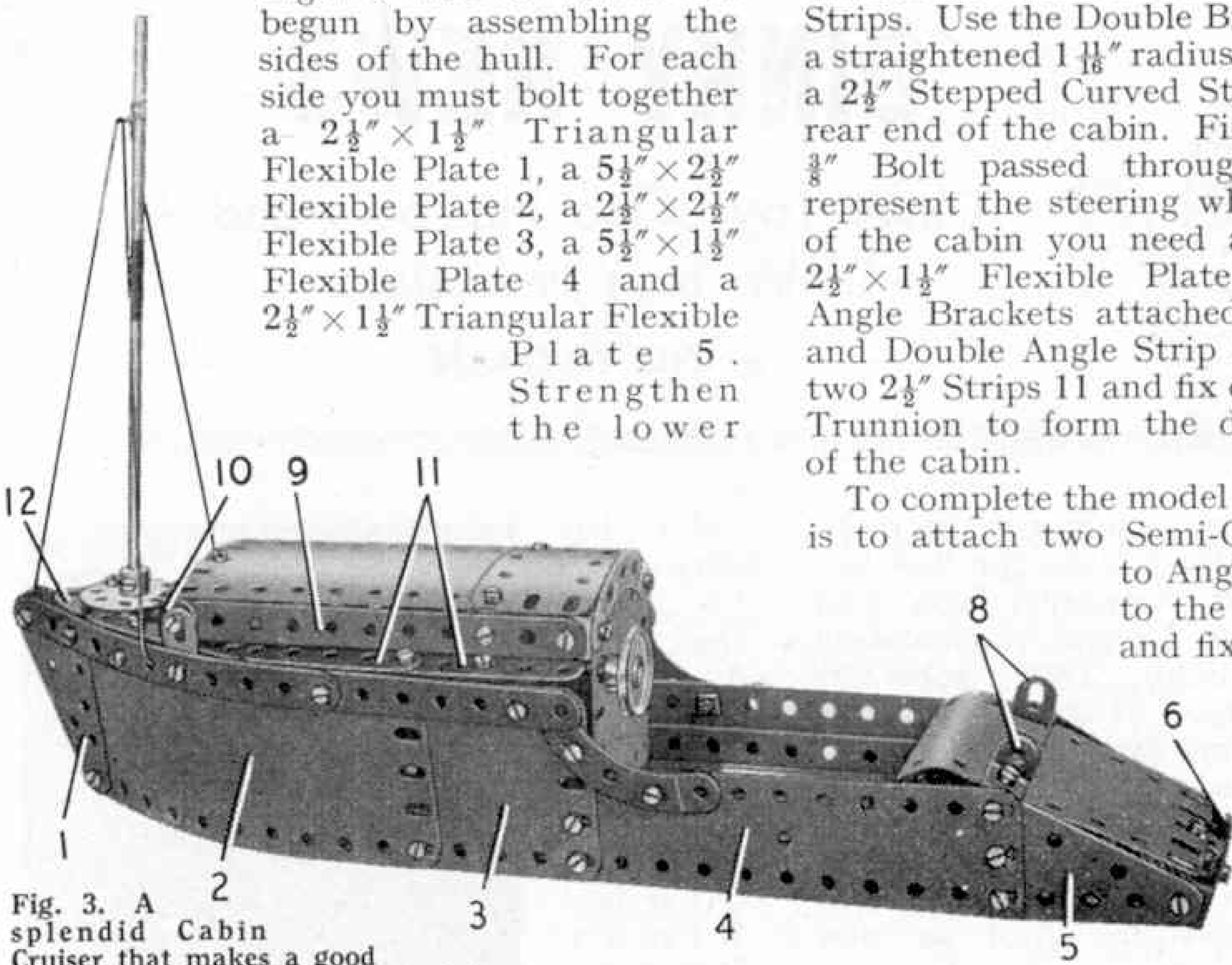


Fig. 3. A splendid Cabin Cruiser that makes a good subject for a No. 3 Outfit model.

To join the sides together you must bolt in position a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 6 and a $2\frac{1}{2}''$ Strip 7 attached to Trunnions. Connect the Plates 1 by passing $\frac{3}{8}''$ Bolts through them to form the prow of the model. Straighten a $1\frac{11}{16}''$ radius Curved Plate and open out a U-section Curved Plate slightly, then fix these parts to $\frac{1}{2}''$ Reversed Angle Brackets 8. Bolt the rear end of the $1\frac{11}{16}''$ Curved Plate to an Angle Bracket attached to the Double Angle Strip 6. Now place a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate between the Plates 4 and bolt it in position, then fix $2\frac{1}{2}''$ Stepped Curved Strips between the Plates 3 and 4 on each side.

To make each side of the cabin fix a $5\frac{1}{2}''$ Strip 9 to an Angle Bracket attached to the Trunnion and to a Fishplate bolted to the Plate 2. You should arrange a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 10 between the forward ends of the Strips 9, and bolt a Double Bracket to the rear end of each of these Strips. Use the Double Brackets to support a straightened $1\frac{11}{16}''$ radius Curved Plate and a $2\frac{1}{2}''$ Stepped Curved Strip that form the rear end of the cabin. Fix a 1" Pulley on a $\frac{3}{8}''$ Bolt passed through the Plate to represent the steering wheel. For the top of the cabin you need a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. Bolt these to Angle Brackets attached to the Strips 9 and Double Angle Strip 10. Bolt together two $2\frac{1}{2}''$ Strips 11 and fix one of them to the Trunnion to form the deck at each side of the cabin.

To complete the model all you have to do is to attach two Semi-Circular Plates 12 to Angle Brackets bolted to the sides of the hull, and fix a Bush Wheel to one of the Plates, using a $\frac{3}{8}''$ Bolt. The mast is made by joining together a 4" and a $3\frac{1}{2}''$ Rod with a Rod Connector. Mount the mast in the Bush Wheel and pass the rigging Cords through a Cord Anchoring Spring on the upper Rod.

If desired the Cabin Cruiser can be mounted on wheels formed by three 1" Pulleys, arranged one at the bow and two at the stern.

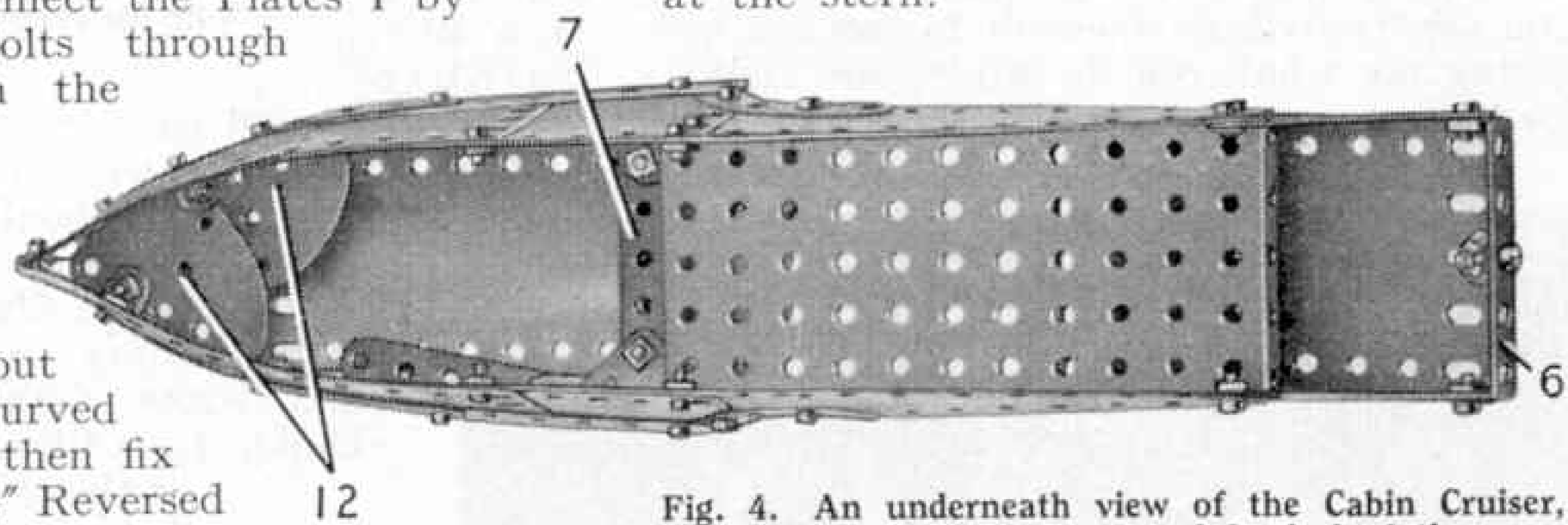


Fig. 4. An underneath view of the Cabin Cruiser, showing the arrangement of the deck plating.

Parts required to build the Cabin Cruiser: 2 of No. 1; 6 of No. 2; 7 of No. 5; 2 of No. 10; 2 of No. 11; 8 of No. 12; 1 of No. 15b; 1 of No. 16; 1 of No. 22; 1 of No. 24; 54 of No. 37a; 50 of No. 37b; 2 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 3 of No. 90a; 4 of No. 111c; 2 of No. 125; 2 of No. 126; 1 of No. 176; 1 of No. 188; 2 of No. 189; 2 of No. 190; 1 of No. 191; 2 of No. 192; 1 of No. 199; 2 of No. 200; 1 of No. 213; 2 of No. 214; 4 of No. 221.

Parts required to build the Excavator: 4 of No. 2; 2 of No. 5; 2 of No. 10; 5 of No. 12; 2 of No. 16; 2 of No. 17; 1 of No. 19s; 4 of No. 22; 1 of No. 24; 4 of No. 35; 29 of No. 37a; 23 of No. 37b; 6 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 3 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 4 of No. 142c; 2 of No. 189.

DINKY NEWS

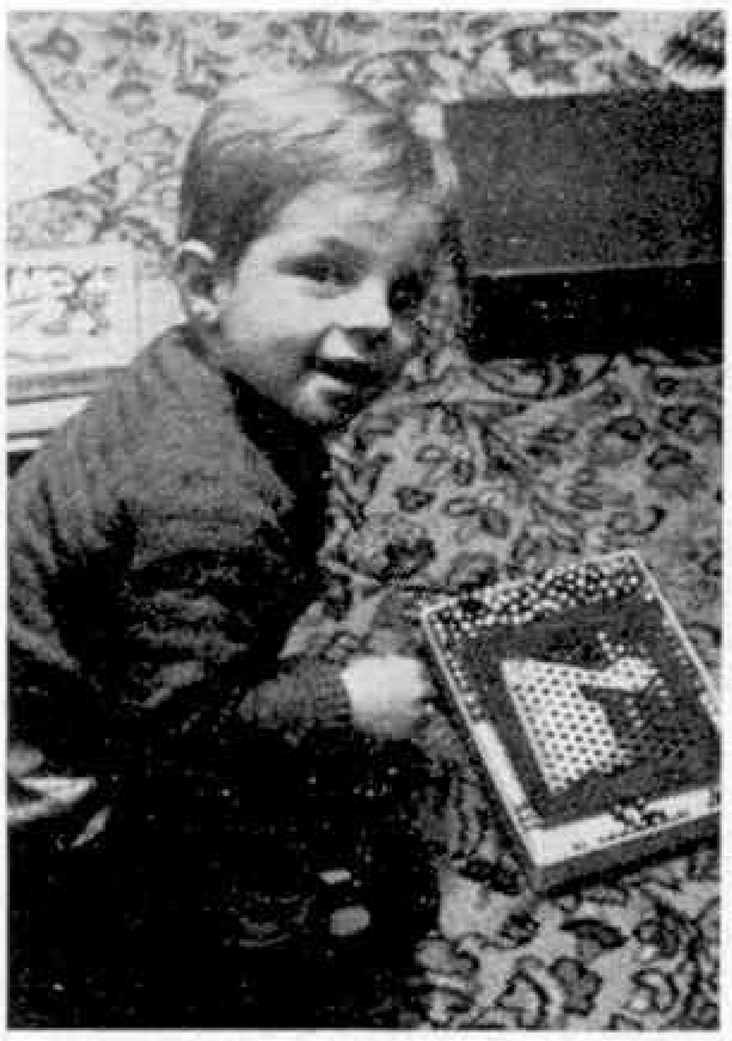
For Dinky Toys Club Members and All Dinky Toys Enthusiasts

By **THE TOYMAN**

THE Dinky Toys Club will soon be one year old. Ever since the day last January when its formation was first announced, it has become increasingly popular with Dinky Toys collectors everywhere and most of those who were collectors at the time the Club was formed have already joined up. More and more boys and girls are taking up the Dinky Toys collecting hobby each day, however, and it is these boys and girls that I am now particularly anxious to enrol as new members.

If you have not already joined the Club I hope you will do something about it today, because as long as you are outside the ranks of its enthusiastic members you are missing a lot of the fun and pleasure you can obtain from your hobby. In correspondence with me and the Dinky Toys experts at headquarters you can learn so much about the hobby that you will find helpful, and you can contribute yourself to the fun by telling me what you do with your Dinky Toys.

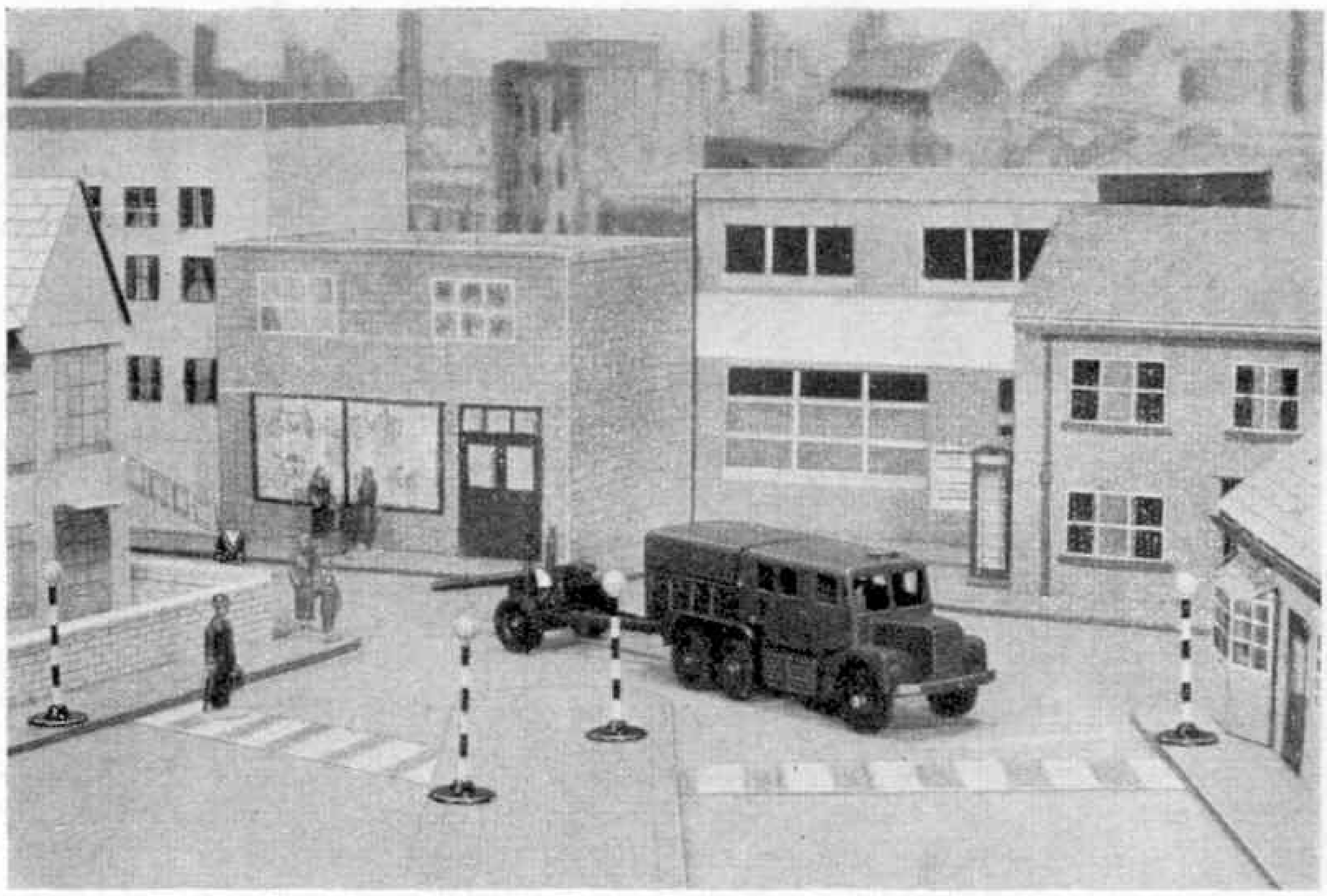
It is very easy to join the Club. Just write to the Secretary, Dinky Toys Club, Binns Road, Liverpool 13, enclosing a postal order for 1/- to cover the cost of the Membership Badge. You will then be enrolled and an attractive Certificate of Membership, bearing your name, will be sent to you, together with the handsome Club Badge. This is beautifully enamelled in red and white with the lettering Dinky Toys Club in gilt around the circumference. In its centre is a fine representation of the steering wheel of a car, also in gilt.



Dinky Toys Club member R. A. Soper, Wallington, takes a spell from playing with his beloved Dinky Toys.

Before I come to the news of this month's addition to the Dinky Toys range

Officials of the Balby Secondary School Dinky Toys Club with the attractive and well-equipped Club layout.



I want to draw your attention to the fine road layout shown in the lower illustration on page **552**. It is one that has been built up by the members of a Dinky Toys Club formed by boys at Balby Secondary School. They built it during the hobbies period in their school work, and in addition to the usual streets and buildings it includes a dock area and an airport. The Club has its own boy officials, with Christopher Rowland as Leader, and each undertakes responsibility for a particular job. I understand that next year they hope to build another and completely different layout. I congratulate the members on their enterprise and workmanship and wish the Club every success.

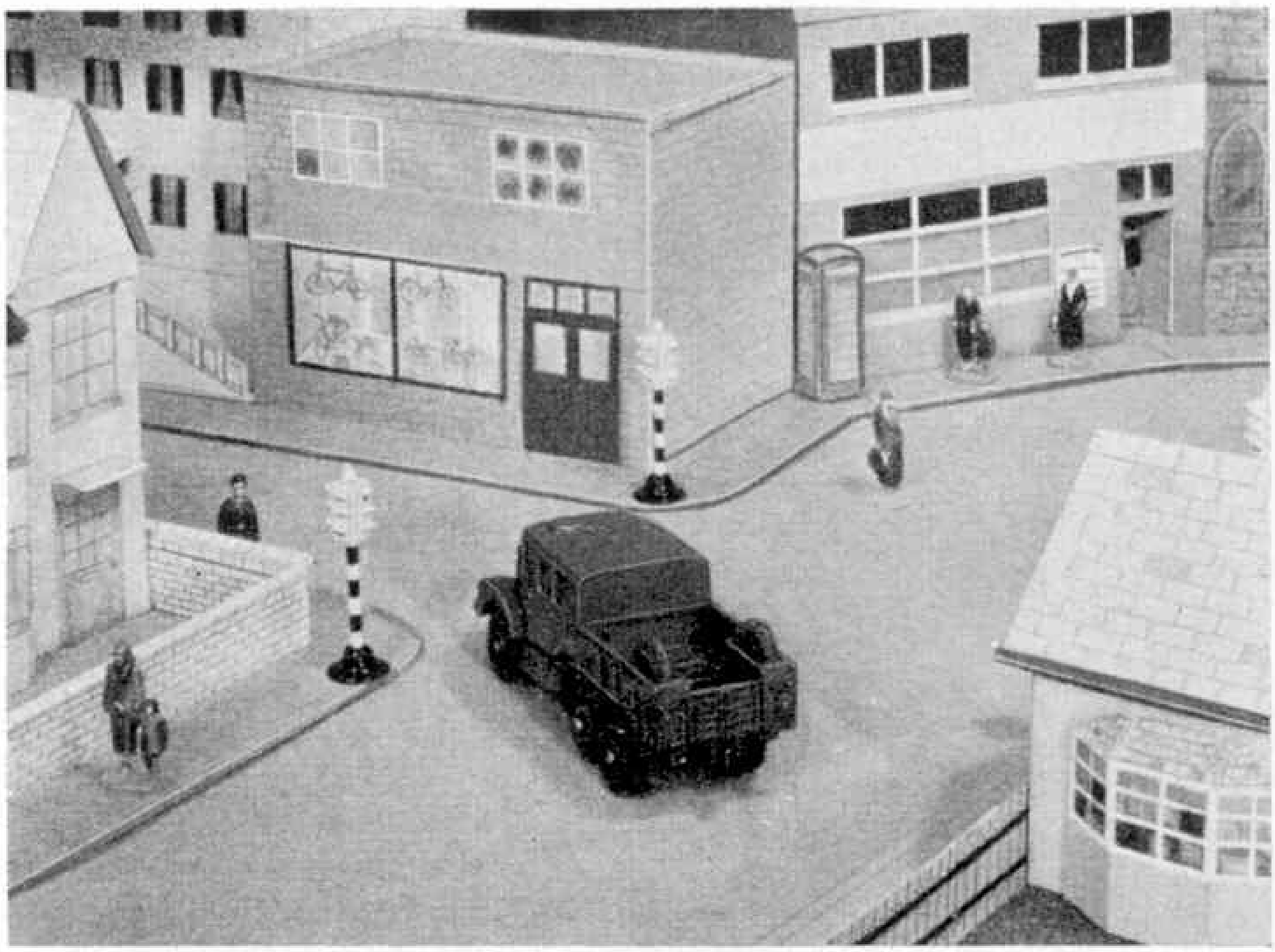
In this general view of a town layout is seen the new Dinky Supertoys No. 689, Medium Artillery Tractor, hauling a 5.5 Medium Gun (Dinky Toys No. 692).

I know well how eagerly enthusiasts look forward to additions to the Army series, for since the announcement of the 25-pounder Field Gun Set in July I have been almost overwhelmed by suggestions for more new Army vehicles. Many of the letters I have received have put forward ideas for a vehicle suitable for towing the 5.5 Medium Gun, and the readers who have asked for a model of this kind will be particularly pleased to see my pictures of the new model this month. These pictures show Dinky Supertoys No. 689, Medium Artillery Tractor, the latest addition to the Army series, and in one of them it is seen towing the gun.

The original of the Dinky Supertoys model is a powerful Leyland vehicle, with a 10-ton power-operated winch fitted into the chassis. The tractor is intended for towing medium artillery equipment, and as it is designed to travel into forward battle areas it is provided with six-wheel drive, so that it is capable of operating in difficult conditions. A striking feature of the real vehicle, and one that is apparent in the model, is its exceptionally large cab. This has seating accommodation for twelve and room for their personal arms and equipment. Thus the tractor can accommodate the crews of both the vehicle and the gun.

Behind the cab is a load body with a canvas cover. This body will carry 4½ tons of ammunition, gun stores and equipment, so that the loaded vehicle and gun form a self-contained unit ready to go into action at a moment's notice. An interesting feature of the tractor is that the body has special compartments for the carriage of two spare wheels. One of these wheels is for the vehicle and the other is for the gun. The spare wheel compartments are reproduced in the model, and as you can see in my picture showing the model with its cover removed, each compartment is provided with a tyre.

The striking appearance and accuracy of detail of the models in the Army series is an acknowledged feature of these miniatures,



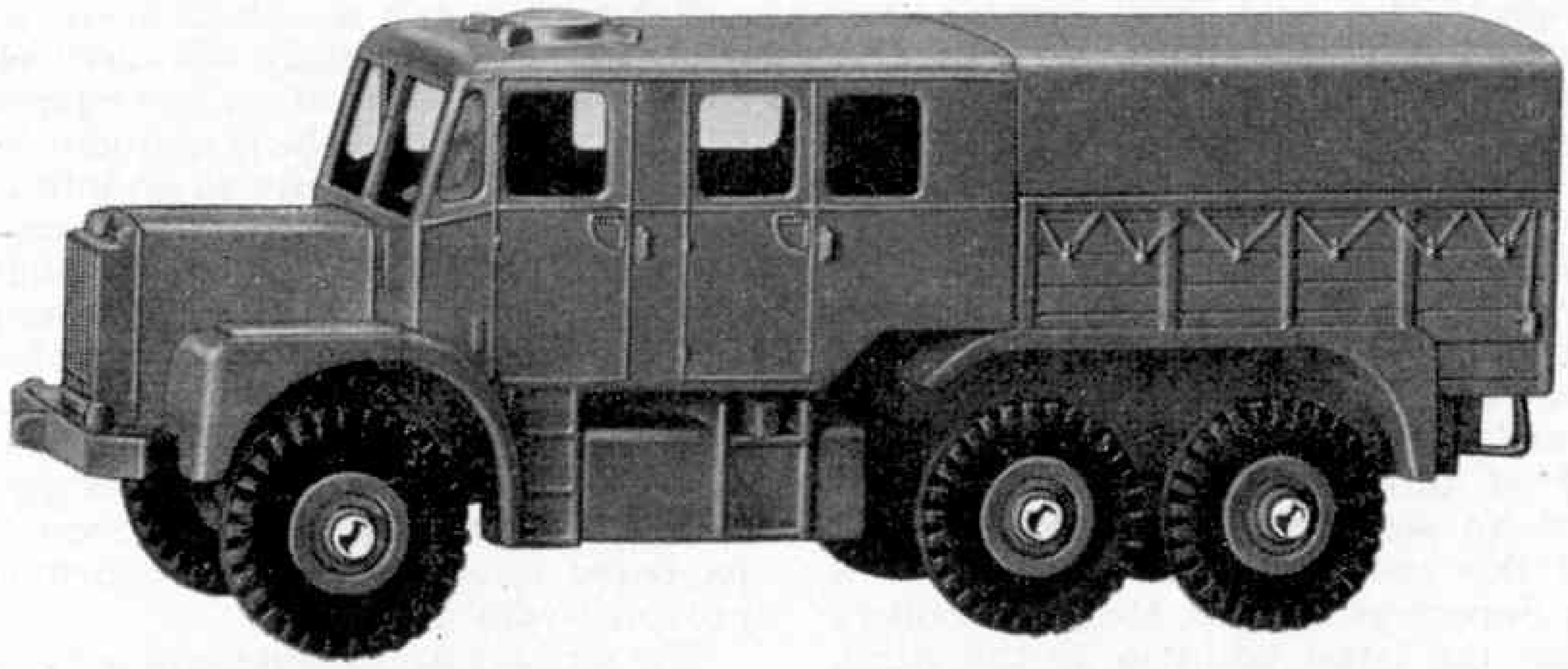
A view of the Medium Artillery Tractor with the cover removed to show the inner details, and spare tyres carried in the rear of the body.

and the Dinky Supertoys Medium Artillery Tractor is no exception. The model is superbly detailed, and a particularly attractive feature is a representation of the ammunition load inside the body. Other details include the familiar red and blue Royal Artillery markings and a miniature driver seated inside the cab. The wheel arrangement follows the now standard practice for models with more than two axles, as the leading axle at the rear is mounted in elongated bearings. This ensures that all the wheels remain in contact with the ground even if the surface is not level.

Two of my pictures show the Medium Artillery Tractor passing through a Dinky Toys town. This is rather unusual for a new Army model, as normally additions to the Army series are shown in open country or in a typical military scene, but I chose the town layouts for a special purpose. If you look at the pictures of them closely you will see that they show two more recent additions to the Dinky Toys range. They are No. 773, Traffic Signal, 4-face, and No. 777, Beacon.

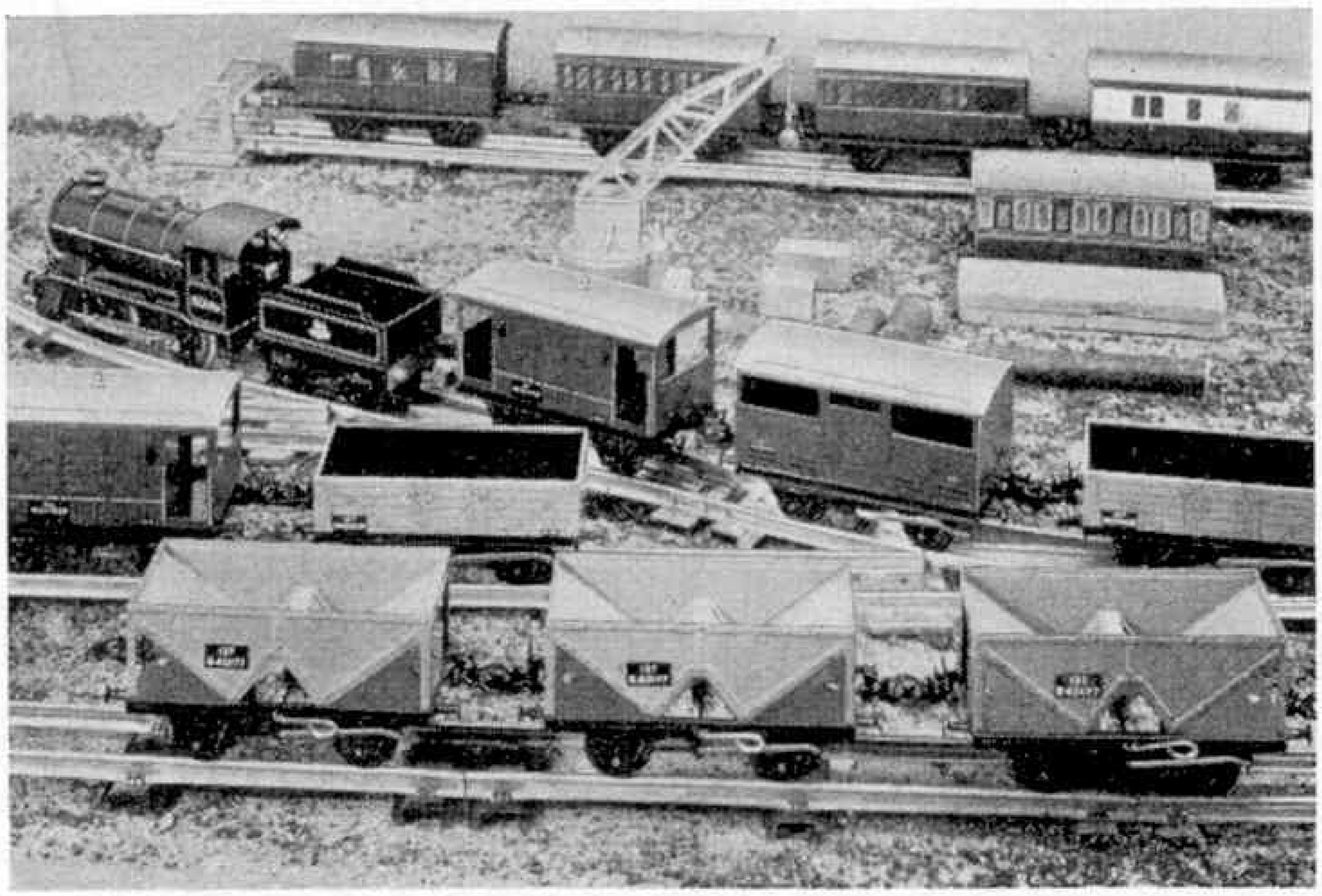
These attractive road accessories are just the thing to add life and interest to town layouts. The Traffic Signal is particularly useful at a cross roads, and the Beacon can be put to good use marking a Zebra crossing in a busy street. The black and white stripes of the crossing can be painted on the road of a permanent layout, but in a temporary scene it is just as effective to mark the stripes on a strip of paper laid across the road.

The two town layouts illustrated this month show how easily different scenes can be made, using the same buildings.



The Medium Artillery Tractor (Dinky Supertoys No. 689). This illustration shows the wealth of detail that is sure to make this fine new item one of the most popular in the range.

"Tommy Dodd" writes about



Gauge 0 Couplings

IN recent months we have had a few talks about the recently introduced No. 50 series of Hornby Goods Rolling Stock, with notes on their uses. The appearance of these new vehicles does not mean that the older No. 1 Goods Stock is no longer of any use. The idea has been that the new No. 50 introductions should replace the older No. 1 types in the Hornby range, but the older items will naturally continue to run on very many layouts. They and the newer No. 50 types can be used together quite correctly and successfully, although they do vary in constructional detail.

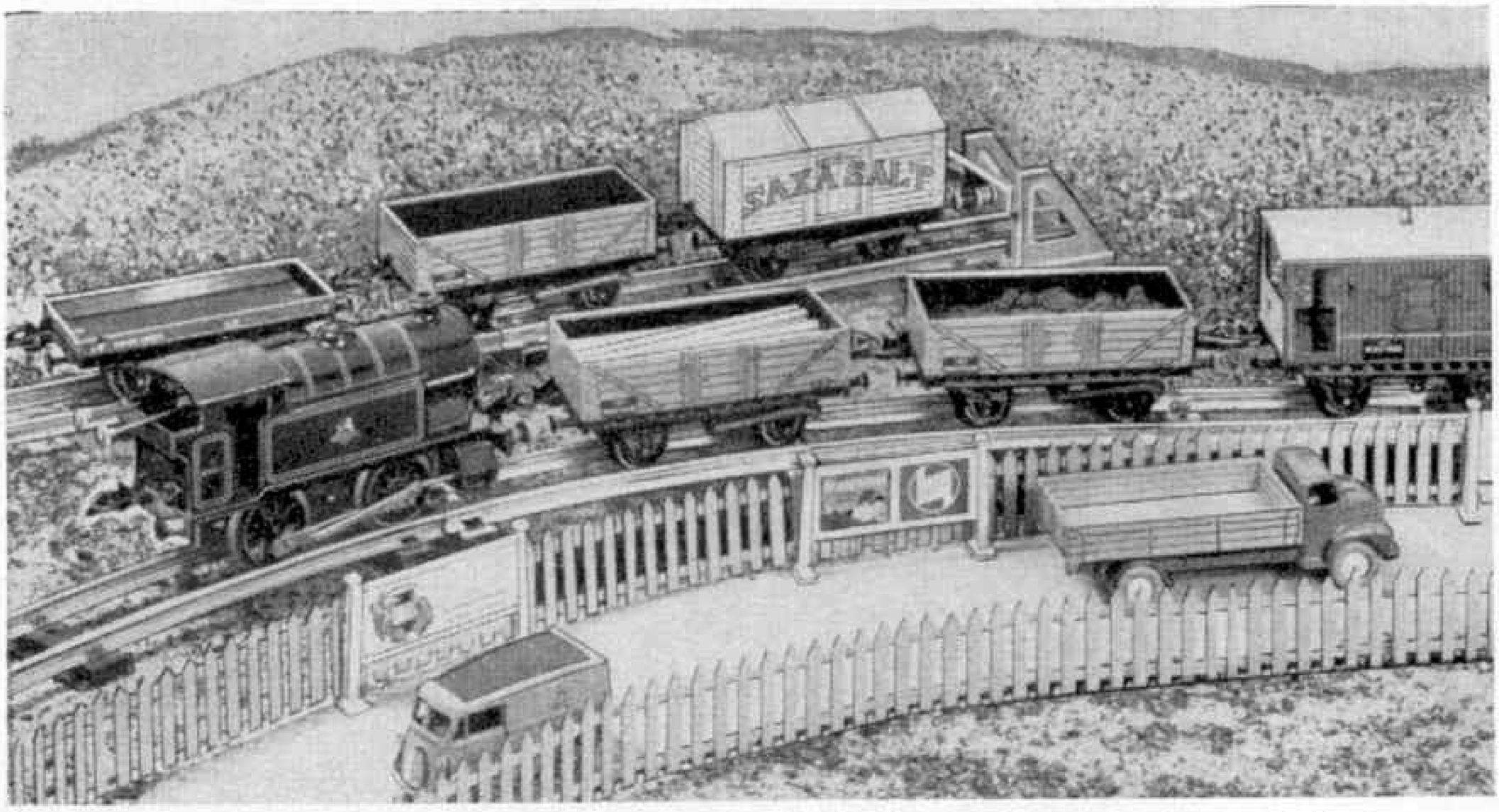
Above a Hornby No. 50 Locomotive threads its way past the sidings with a freight train. A Platform Crane serves the small yard beyond the running track.

The use of different kinds of stock together depends a great deal on the couplings provided on individual types. In the Hornby System, so far as the No. 1 and the new No. 50 Vehicles are concerned, there are no difficulties at all, for precisely the same type of automatic coupling is fitted to both kinds. So the Yardmaster in miniature has no difficulty in marshalling a selection of mixed stock to form a train. Then he just has to push the vehicles together with an engine and the couplings do the rest.

The same type of coupling, which has been familiar in the Hornby System for many years now, is provided on the Nos. 41 and 51 Passenger Coaches so that stock can be mixed quite successfully if operations require it. Goods Vans, or possibly such items as the Gas Cylinder Wagon dealt with last month, may require to be conveyed by passenger train, and the fact that a standard coupling is in use makes this quite easy.

What we may, for the "Forties" and "Fifties," regard as the new Standard Rolling Stock is intended for use with the Train Sets that include 2 ft. Radius Rails, that is the No. 40 Train Set and upward. It is important to remember this because the smaller Train Sets, such as those of the Nos. 20/21 and Nos. 30/31 types, are in a different category. These Sets incorporate 1 ft. radius Rails, and on such tracks the larger engines and stock of the Hornby System cannot be used with success. The smaller Locomotives and vehicles of the Nos. 20/30 systems have been designed with the Curved Rails of this radius in mind, and as a result quite satisfactory running can be enjoyed with them.

The coupling equipment of the Nos. 20/21 Trains is of the simplest possible kind, and its use presents no difficulty to the



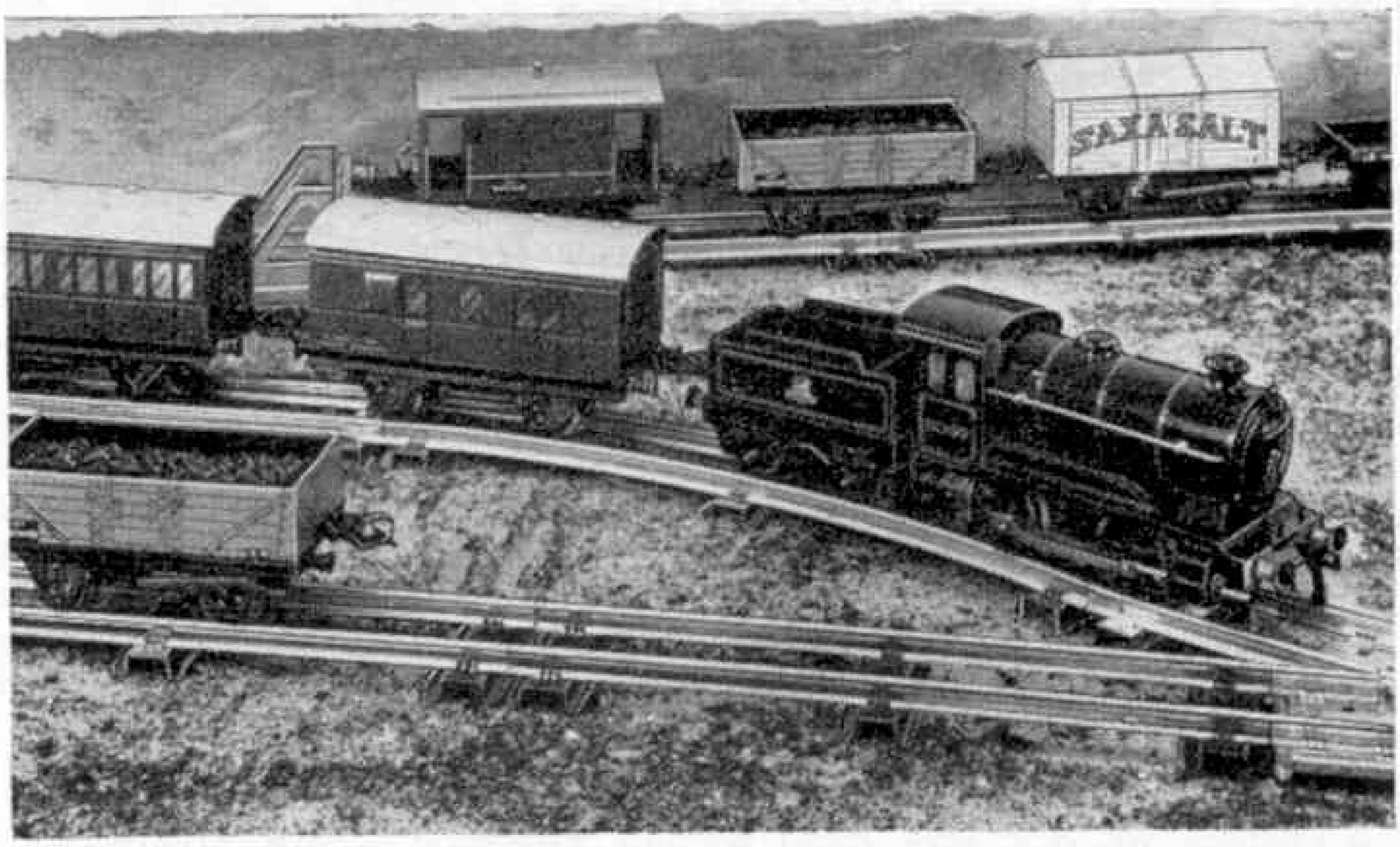
Road and rail curve together at this corner of a Hornby layout. The engine is a No. 40 Tank.

youngest Hornby Railway member. The fixed hook and loop type of coupling is used, the hook or the loop in each case being formed in one piece as an extension of the base of the items of Rolling Stock concerned. The train owner simply puts the vehicles in the order required and places the hook of one into the loop of the next and so on.

With the introduction into the Hornby System of the Nos. 30/31 Train Sets, some time ago, a new type of coupling made its appearance. It is peculiar to the Nos. 30/31 Trains and consists of a one-piece combined hook and loop. These are separate fittings attached to the vehicles, and are arranged in such a manner that a train of them can be pulled or pushed without difficulty. The Nos. 30/31 stock cannot be coupled to that of the No. 1 or No. 50 series, but it can be used in conjunction with the Nos. 20/21 vehicles. The small range of the latter that is available for separate sale will be familiar to most Hornby Gauge 0 enthusiasts.

It is useful to the Hornby Rolling Stock Superintendent to know that the various types of rolling stock now in the Hornby System are all fitted with the same type of wheels. Most of you will know these wheels quite well by now. They are smooth black mouldings, which spin freely on their axles and run easily and, moreover, quietly, so long as the track that supports them is properly arranged on a level base.

I mention these wheels specially because sometimes the odd wheel or axle can get lost, so that it will perhaps be useful to know that the Rolling Stock wheels on axles listed in our literature, and obtainable from your dealer, will suit any of the current types of Coach or Wagon. They are right for any of the present-day engine Tenders as well.



A train of No. 41 rolling stock leaves the siding, to begin a passenger service down the line.

Of General Interest

THE *From Our Readers* Section of the *M.M.* for April of this year included a short article describing how sledges are used for carrying pikes of hay down steep hillsides in the Lake District. The article was accompanied by an illustration showing a load of hay being moved in this way.

The appearance of this picture has brought a further photograph from another reader, I. Harvey, Llandaff, Cardiff, of a similar way of carrying hay, but with an interesting addition. This is shown in the upper picture on this page, a reproduction of a photograph taken almost below Cheviot itself, some 60 miles or so to the north east of Loweswater. At the front of the flat cart on which the hay is to be carried there is a windlass, and when the pikes of hay are ready for carting a rope from this is passed round each in turn so that it can be wound on to the cart. This very neat method saves much labour and avoids breaking up the pike.

Winding a pike of hay on to a flat cart by windlass in the Cheviot region. Photograph by I. Harvey, Cardiff.

What would you do if you wished to make sure that traffic passing over a weak bridge should slow down considerably, in order to avoid shocks that might eventually lead to its collapse? A large warning notice of course could be placed at each end of the bridge, but it is by no means certain that this would be sufficient, and even placing guards at each end to enforce the warning probably would not be fully effective.

Obstacles placed on a weak bridge at Youghal, Co. Cork, to enforce a low speed limit. Photograph by G. B. E. Stone, Shirley, Croydon.

This was the problem with the bridge shown in the lower picture, which is at Youghal, in County Cork, and it was solved very neatly indeed. Each of the sets of posts and rails that can be seen in the picture covers half the roadway, but they are placed on opposite sides alternately, so that any vehicle passing along the bridge must pursue a series of curves that simply cannot be taken at high speeds.

There are 29 of these "obstacles" on the bridge, and drivers must find it rather tedious to negotiate them over its full length at 5 m.p.h., the speed specified on the notice. But they will have the satisfaction of knowing that they are not contributing to its fall!

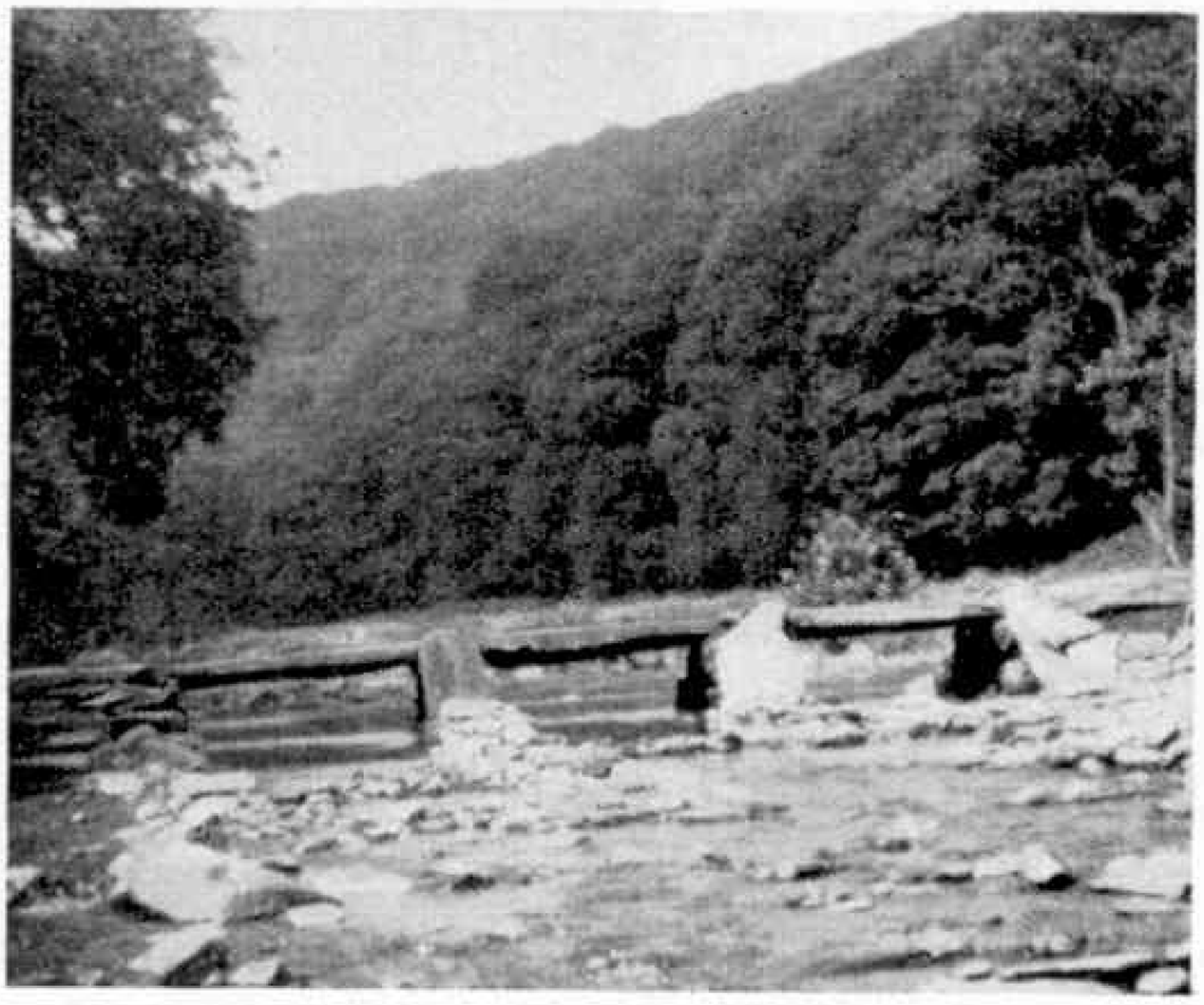
From Our Readers

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

Tarr Steps

Tarr Steps, considered to be the finest ancient relic on Exmoor, span the River Barle a few miles west of Dulverton, Somerset. This "Clapper" bridge is 150 ft. long, its 17 spans formed by flat slabs weighing over a ton each, supported on piers on the river bed. There is no doubt that it dates from a very early period, and legend has it that it was built by the Devil.

The bridge has not always remained intact. In the winter of 1941–42 the river froze. Ice piled up behind the bridge when the thaw set in, destroying the middle, but it was later restored by the Somerset Archæological Society. In 1952 an immense tree trunk was carried down at high speed by the Exmoor flood, which did such heavy destruction at Lynmouth, destroying it again. The breach was repaired, with the help of a Territorial Royal Engineers Unit, and no trace of any injury is now visible.



Tarr Steps, on Exmoor. Photograph by I. M. Gedling, Taunton.

Now a network of steel ropes crosses the river 250 yards upstream to prevent boulders being washed down in flood times.

I. M. Gedling (Taunton).

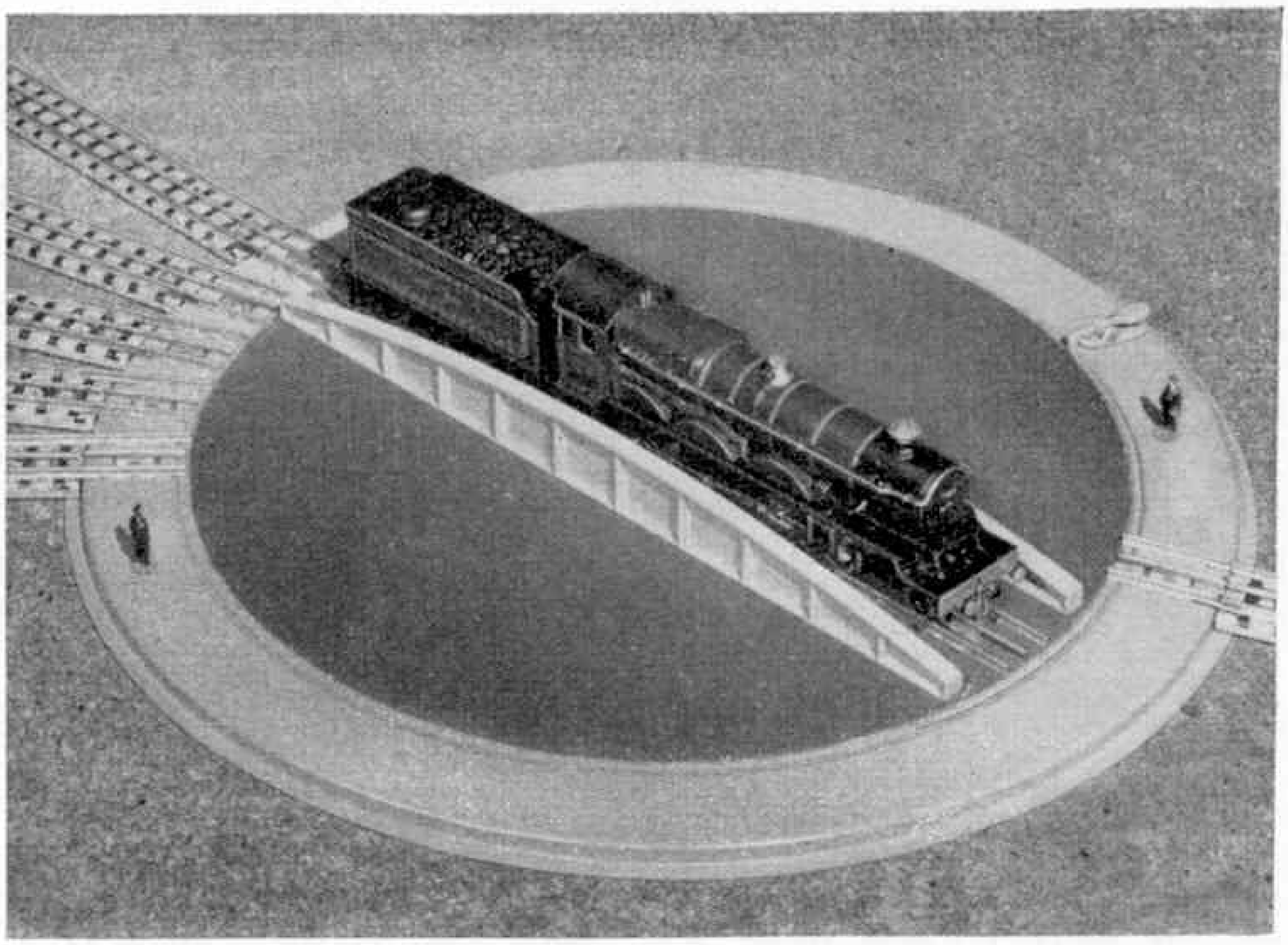
Loading lighters with salt at Ibiza. Photograph by J. H. Kennedy, Coventry.

Ancient Salt Workings

At Las Salinas at the southern tip of Ibiza, one of the Balearic Islands, in the Mediterranean, are salt pans that are thought to have been founded by the Carthaginians and which have been in continuous use since Roman times. Altogether there are some forty salt-ponds, rectangular in shape. Sea water flows into them and is allowed to evaporate. The salt left behind is collected in shallow baskets and then stacked in large mounds shaped like pyramids.

From the ponds the salt is transported by narrow-gauge railway to the nearby loading jetty at La Canal, where it is tipped into chutes and thence into lighters that take it out to ocean-going ships.

J. H. Kennedy (Coventry).



"Bristol Castle" poses on the Turntable, to the admiration of the miniature figures standing near the edge of the Turntable base.

HORNBY RAILWAY COMPANY

"Bristol Castle" in Hornby-Dublo

By the Secretary

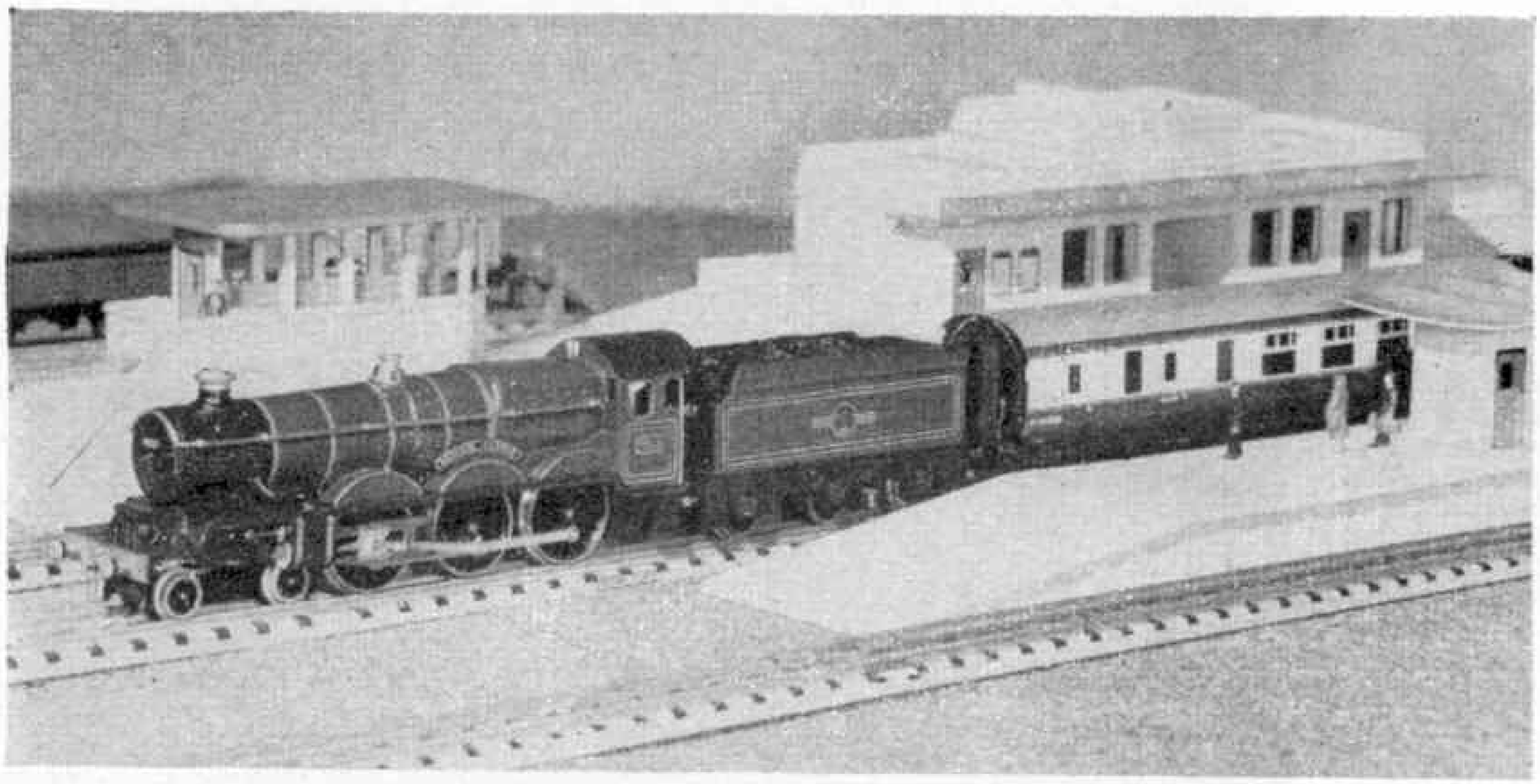
LAST month the Editor foretold the appearance of a new Hornby-Dublo Train Set representing the W.R. *Bristolian*, which is the fastest train on British Railways. From the picture reproduced then you will have gained an impression of the splendid appearance of the locomotive included in this Set, the Hornby-Dublo *Bristol Castle*, and here are more fine pictures that show also the handsome coaches that with it make up the train itself. Every Hornby-Dublo enthusiast will welcome the new Set, and those who live in the Western Region of British Railways and the many others who admire its productions will be delighted with it.

The Set, known as EDP20 *The Bristolian*, consists of the *Bristol Castle* engine and tender and two D21 Corridor Coaches, one a 1st/2nd and the other a Brake 2nd, in the well-known brown and cream livery, with the usual formation of rails to make an oval track requiring a space of 4 ft. by 3 ft.

For the engine, the Castle class was selected as being Swindon's classic design, noted for economy, reliability, smooth running and high speed. It is one of the later Castles of the 70XX group that is represented in Hornby-Dublo, the actual engine being No. 7013 *Bristol Castle*.

The new engine follows accepted Hornby-Dublo practice in having die-cast bodywork, and there are many new features to which I must draw your attention. In the first place, the wheel arrangement of the engine and its narrow fire-box called for a new design of Hornby-Dublo motor. This is extremely powerful. There is plenty of adhesion weight, and with a gear ratio of 36 to 1 we get an extremely powerful engine for its size.

The movement at low speeds is particularly impressive and is one of the most attractive characteristics of the engine. *Bristol Castle* will back gently on to the train, and then simply start away with a heavy load in the traditional Paddington manner, the engine pulling evenly and smoothly. This indeed is so at any speed from a crawl to its maximum. The speeds are characteristic of those of the Castle class and of the real *Bristolian*, the haulage of which is a regular Castle duty. The train covers the greater part of its journey, up and down, at a sustained speed of 80 m.p.h.



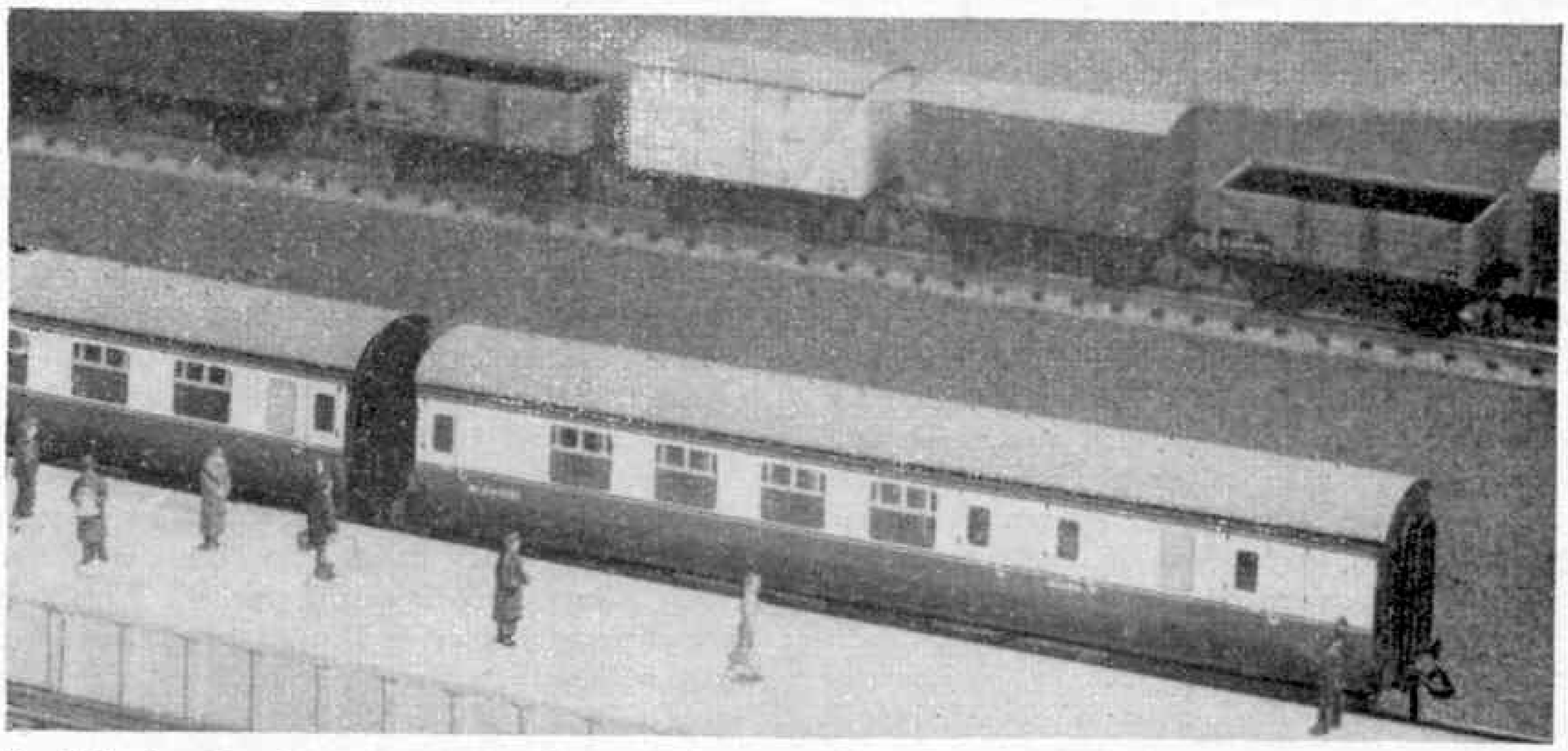
A W.R. Passenger Train in Hornby-Dublo is something new, and this picture gives a splendid impression of the "Bristol Castle" Locomotive and Tender in action.

or so, rising to the 90s and even higher. So the Hornby-Dublo Castle has been designed for a scale speed of well over 90 m.p.h., at which it runs safely and perfectly. The new locomotive indeed both looks like a Castle and runs like one!

Now let us look at other details of the engine. The driving wheels are of the correct type for this class of engine, with the characteristic square ended balance weights, those on the centre driving wheels, which are flangeless, being larger than those on the leading or trailing coupled pairs. The driving wheels are coupled by plain side rods, which is correct, and the connecting rods also are of true Swindon pattern, with a fluted profile and solid-eye big ends and oil reservoirs.

Crossheads and slide bars too are shaped to represent those typical of Swindon 4-cylinder engines, the slide bars having the correct tapered ends. The cylinders themselves are attractively detailed and a special feature, typical of the care given to represent every characteristic of the locomotive, is the representation at their front ends of the piston valve spindles and rocker arm connections of the real engines.

Now look at the front end of the real Castle—there is a picture of one on page 542—with its inside cylinder block extending beyond the lower edge of the smoke-box door and the swept back S-shaped steam pipes. The effect of these has been captured exactly in the model. Furthermore, the chimney really *is* copper capped.



The tail of a Hornby-Dublo W.R. express alongside the Island Platform. The principal features of the W.R. coach style and livery are well reproduced.

The boiler barrel with its tapering sides and the Belpaire fire-box with its own special profiles also have been reproduced precisely. The boiler barrel is surmounted by a brass-finished safety valve casing just like that of the real Swindon "bonnet." Top-feed pipes and clacks, the humped-shaped casings on each side of the safety valve, the two whistles peculiar to Western locomotives—these and other characteristic details are all reproduced, including the rivets, round-headed as are those of all Western Region products!

The fine sweep of the name plates, set well above the centre splashers, which are correctly off-set, will please all W.R. enthusiasts, as will the fact that the reversing rod is a separate fitting finished to represent polished steel. The cab, with its high arched roof and rear pillars, includes side windows and the brass beadings found on the edges of the real cab sides and round the window opening are represented as well. The splasher edges are beaded too, of course, and the brass figures of Swindon name and number plates and the beadings round them are well brought out in the transfers used to produce these features on the Hornby-Dublo Castle.

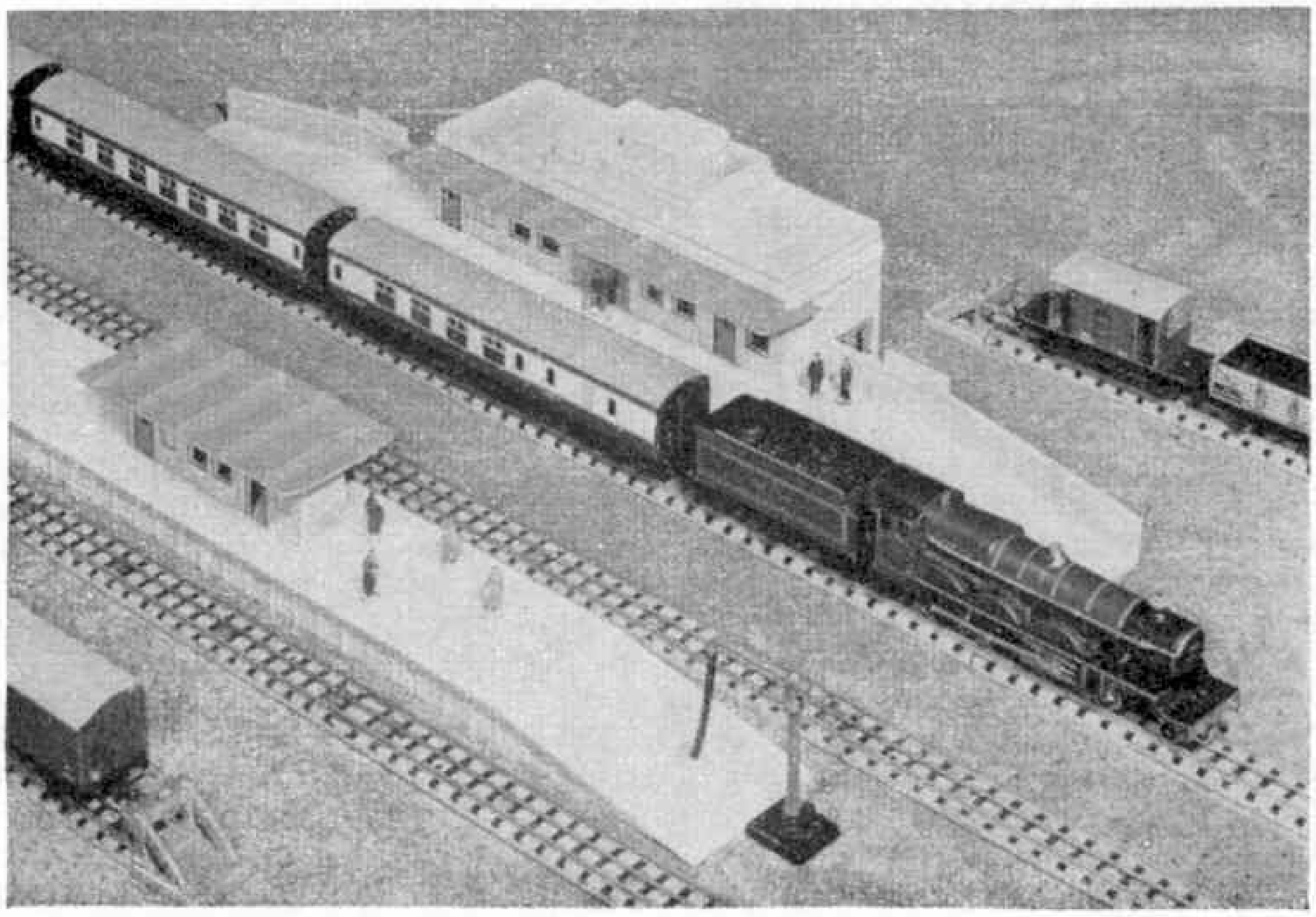
The Tender represents the large 4,000 gallon type that is familiar behind Castles, Kings and the other bigger engines. It has a die-cast body and is finished to represent the tank top with water fillers and the pick-up dome, separated from the coal space by a division plate. The coal, too, is well represented!

A departure from previous Hornby-Dublo practice is the inclusion of the centre rail pick-ups beneath the tender, not the engine. The necessary electrical connection between Tender and Locomotive is provided by a lead that has a spring push fitting to allow it to be plugged into the socket on the tender front.

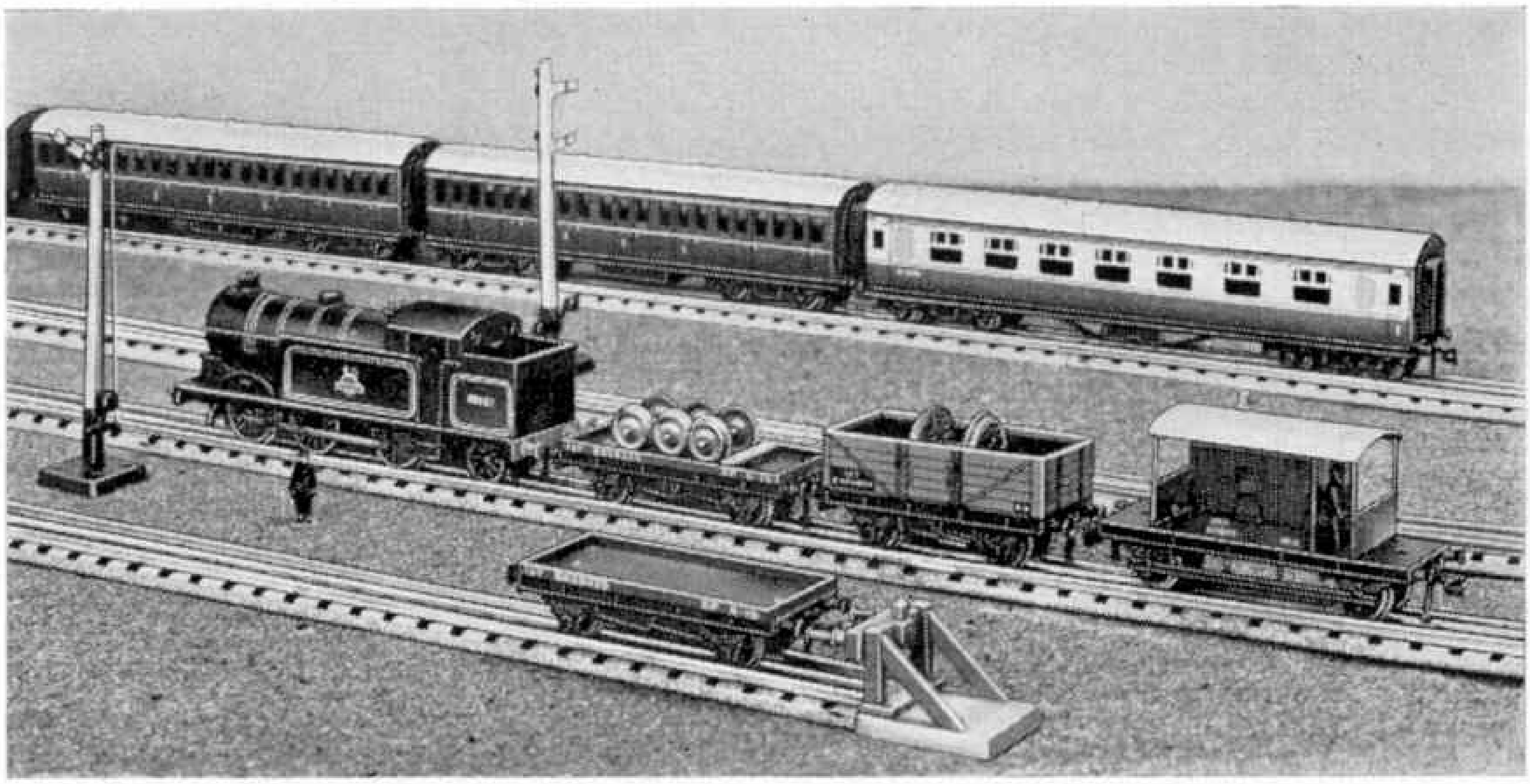
With this arrangement the engine and tender have to be securely coupled, and this is looked after by a stout drawbar linking the two. A suppressor device fitted in the tender surpasses the requirements of British Standards.

The fine colour scheme of "Western" brown and cream on real rolling stock is captured correctly by the tinprinted finish of the Hornby-Dublo D21 Corridor Coaches in the Set. The types represented, 1st/2nd and Brake/2nd, provide the means of assembling a realistic "Western" express that can represent not only the *Bristolian*, but practically any of the more important long-distance trains on the Paddington line. They have transparent windows and internal partitions.

Associated with these vehicles is another newcomer, the Hornby-Dublo D20 Composite Restaurant Car. There are fine pictures of this on page i of this issue. It is available in W.R. livery, to match exactly the D21 Corridor stock just referred to, and also in red and cream, so that it can be used by those who already have Hornby-Dublo D12 B.R. red and cream Coaches. The interior is fitted up to represent the tables and seating accommodation.



A W.R. express speeds past the Hornby-Dublo Through Station. The Coaches are D21 W.R. Corridor Stock.



Loads for Hornby-Dublo Wagons

THERE is little doubt that loading wagons helps to make a Hornby-Dublo railway look better. The practice indeed brightens the miniature railway scene considerably. You cannot load Vans, of course, because they are closed up, and anyway the loads of real vans are not visible. But there is no lack of opportunity for ingenuity in providing loads for other Hornby-Dublo vehicles, and for having these about platforms of goods stations, and indeed of wayside and other stations as well. Their very presence too will suggest the actual loading of the closed vans. Similarly the inclusion of a cattle pen or a loading dock for Horse-Box traffic will help to suggest a lively scene, even though miniature animals themselves may not be present.

A short train carrying rolling stock and locomotive wheels supposedly for repair. Such loads can be seen fairly often in real practice.

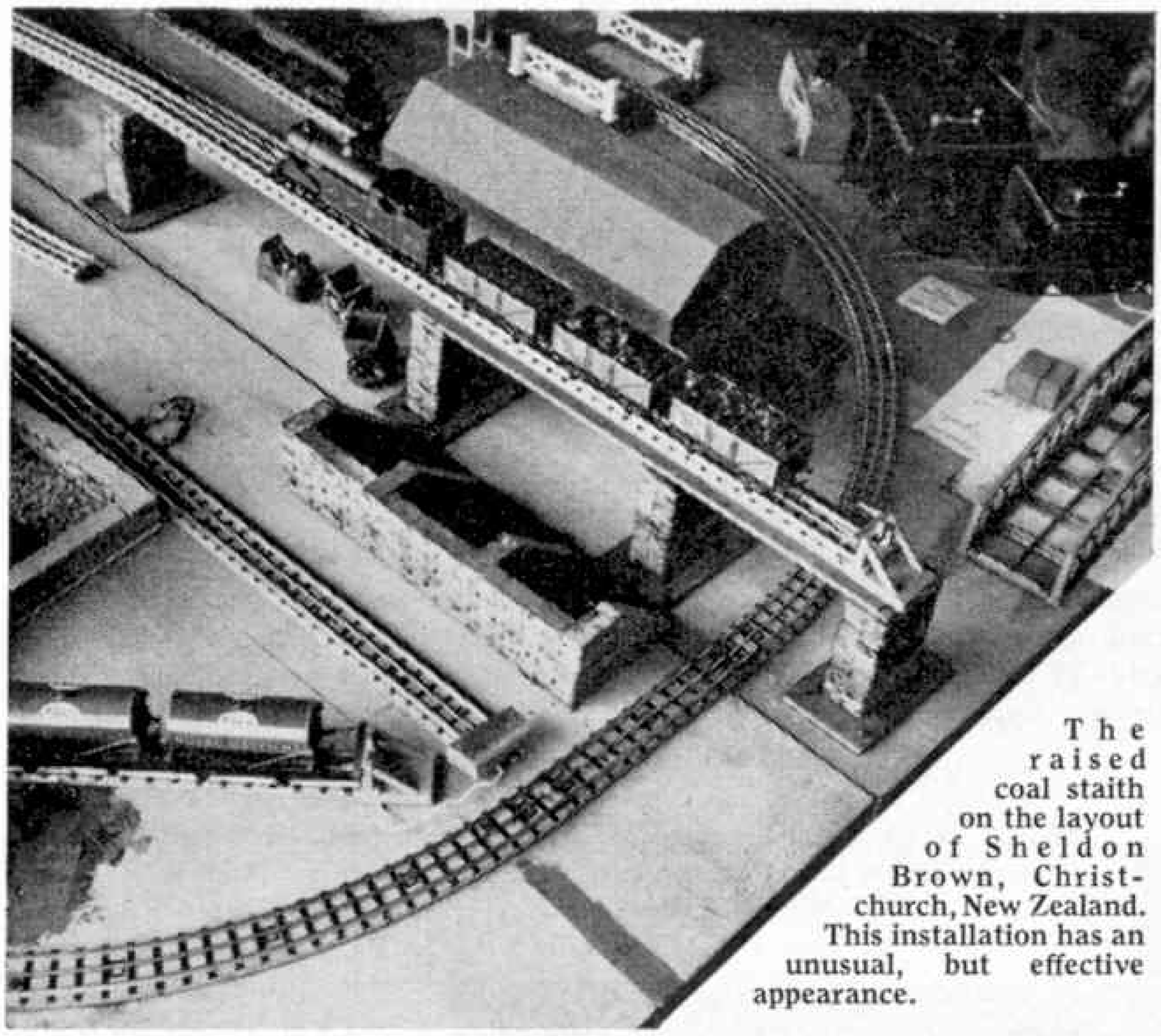
The Tank Wagons of the Hornby-Dublo system also cannot carry real loads, but here again you can have lineside installations that suggest the purposes for which tank wagons are operated.

This leaves us with the various Open, Low Sided and Mineral Wagons, the Well Wagon and the Bolster types. All these can be used for the handling of actual freight and all sorts of ideas can be developed in this direction.

For certain types of traffic the lineside installation idea can be made use of as well, and a very good example of this sort of thing is shown in the upper illustration on the next page. This shows part of the layout of Sheldon Brown, Christchurch, New Zealand, whose activities have been referred to before in the *M.M.* He had the bright thought to add to his Hornby-Dublo system a raised gantry or staith for coal traffic. This is a simple built-up structure carrying ordinary Hornby-Dublo track and approached by means of a rising gradient. In order to obtain sufficient height, and to make the installation more interesting, the overhead track has been extended to span the main line. This extension could be of use in the event of further developments of the system that might involve a high level track.

Below the staithes there are "pockets" or bunkers for actual storage purposes, the idea being that the railway wagons discharge their load direct from the elevated track. This kind of thing is frequently seen in industrial plants.

From special handling of this kind, we may as well pass to special loads. Hornby-Dublo enthusiast G. Malcolm Kennedy, of Toronto, Canada, whose cattle pen you will remember in the *M.M.* of September last, has since sent us the photograph from



The raised coal staith on the layout of Sheldon Brown, Christchurch, New Zealand. This installation has an unusual, but effective appearance.

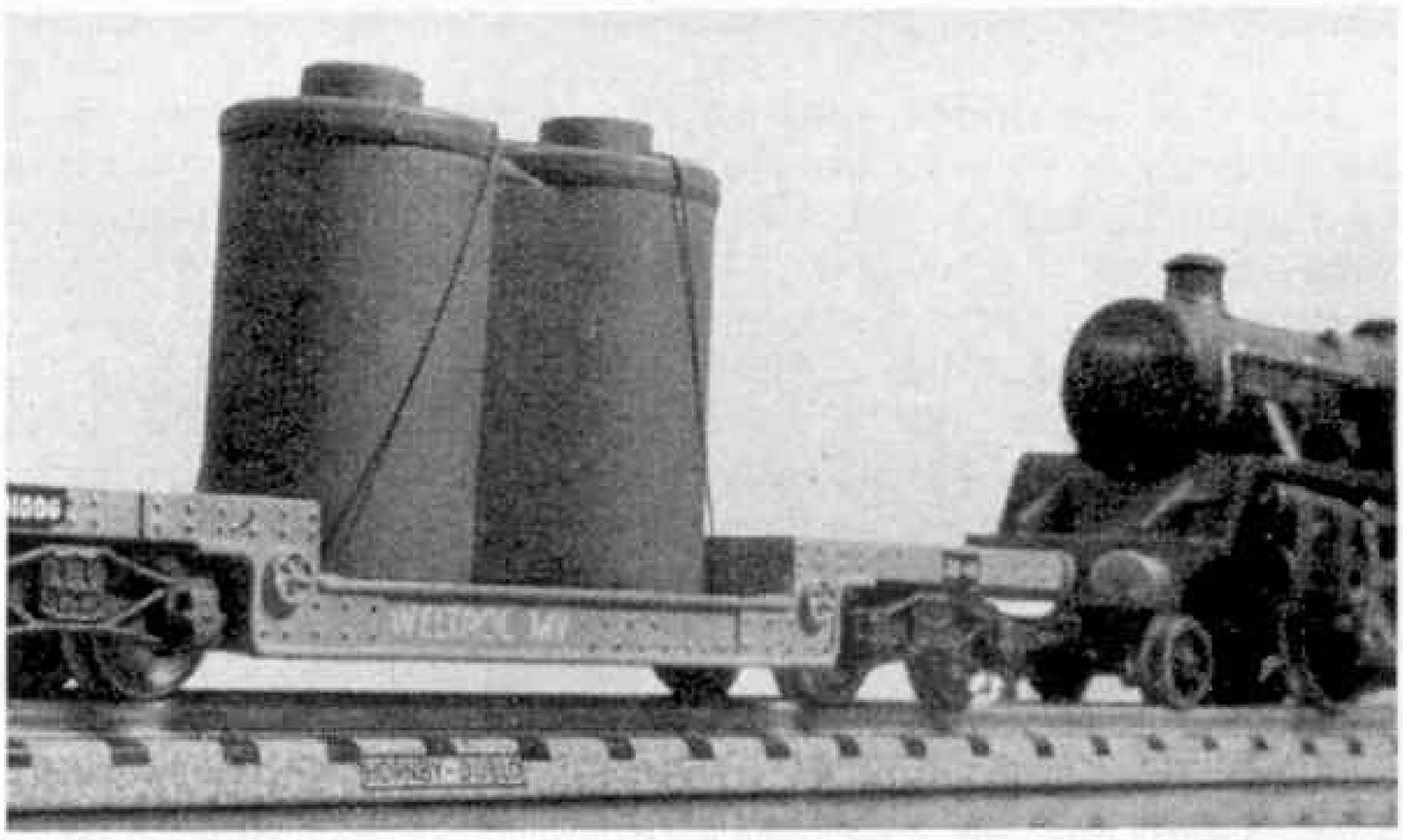
in ordinary open Wagons, but you can see them better if you have them on one of the Low Sided Wagons, with a miniature "timber" at each end of the group of wheels to prevent them moving about when the Wagon in on the run.

Speaking of Low Sided Wagons reminds us of the miniature Containers and Cable Drums, which are loaded on this type of Wagon. The Containers are readily handled on and off their vehicles, but the Cable Drums are supplied roped on their Wagons with Meccano Cord. These Wagons have special seatings cast on their floors to receive the Cable Drums, but ordinary Low Sided Wagons have no such provision. So R. Saunders, of Rochester, has devised a handy gadget that permits the Cable Drums to be loaded securely on the ordinary Low Sided Wagon.

The gadget referred to is a piece of hardboard or thick card about $\frac{1}{8}$ in. deep measuring $2\frac{7}{8}$ in. by $1\frac{3}{16}$ in., and slightly chamfered round the edges so that it fits snugly within the Low Sided Wagon. This piece of material has a central slot $\frac{11}{16}$ in. wide and 2 in. long on the bottom surface, increasing to $2\frac{1}{8}$ in. long on the upper surface to carry two Drums on this Wagon.

which the lower picture on this page has been prepared. This shows a Hornby-Dublo Bogie Well Wagon carrying a type of out-of-gauge load that is suggestive of the generous loading limits that apply on the railways of the North American continent. The items used are empty daylight loading cassettes, or film magazines, as they are known in Canada, and they look quite reasonably like big drums or cylindrical sections required for an industrial plant. You will notice that the load is roped to the Wagon, the four holes in the well making this possible. The cassettes certainly form a spectacular load!

Coming to more ordinary freights, no doubt many Hornby-Dublo enthusiasts keep handy one or two pairs of rolling stock wheels that are available separately. Apart from their practical value, they are useful for "scenic" purposes and a pair or two standing on the ground by the rolling stock depot or in any other likely spot will add a realistic touch. They make good loads too, either supposedly on their way to the works for attention or perhaps representing a load of wheels for shipment overseas. They could travel



An out-of-gauge load on the Hornby-Dublo Bogie Bolster Wagon on the layout of G. Malcolm Kennedy. Readers will notice that the camera film cassettes are "roped" to the Wagon, a point that is sometimes neglected even by keen operators.

Two Layouts for Good Running

LAST month the Editor remarked on the importance to *M.M.* readers of the layouts described in its pages from time to time. In view of this, the pictures on this and the following page will be found to be of special interest.

In the first illustration, on this page, the proud owner Brian Hutchinson is shown having a happy time controlling his train, in which he has developed considerable skill. Brian belongs to the H.R.C., and indeed has been a member for some time although he is not yet 6.

Brian Hutchinson, of Bolton, is a keen Hornby-Dublo owner and here he is having fun with his trains.

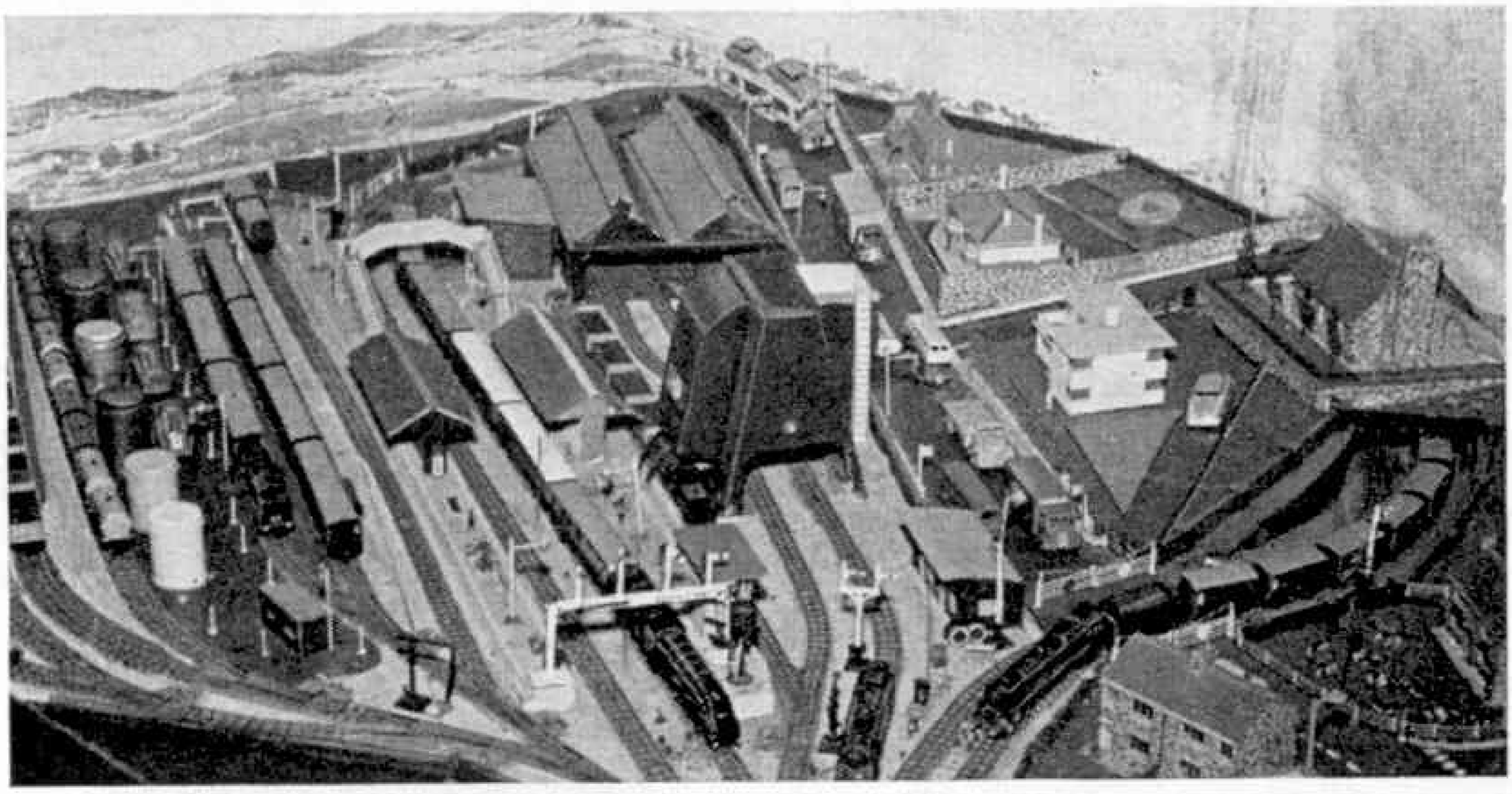
For this, no doubt, and for the fact that his railway is so well developed, Brian has to thank his father, for after all a boy of 6 cannot be expected to do much constructional work, although he can be a skilled operator. But he helped in building up the layout on a stout baseboard measuring 8 ft. × 4 ft. The system includes double track throughout, with an inner loop and the favourite internal "S"-shaped reversing loop. Sidings and station platform roads diverge at convenient points, and it can be truly said that the fullest advantage has been taken of the area available for the railway.

Apart from its sound construction, which is always good policy in connection with a baseboard, as with anything else, the board has one interesting feature that will commend itself to many Hornby-Dublo owners. It is built with a shallow protective "wall" round the edge. This is not high enough to spoil the view of the trains, but it is an advantage in case of any derailments. Derailments are not to be regarded as regular occurrences, of course, but it is wise to take precautions.

The layout of the system provides for continuous main line running, while trains can start or finish their journeys at the station that can be seen within the main oval. This is a terminal made up with the standard Hornby-Dublo Through Station and the Island Platform, with Platform Extensions to help in giving a fine look to the terminus as a whole. The Footbridge is actually mounted on the extension part of the platforms, and thus provides ready access for "passengers" from one side of the station to the other.

As might be expected of a member of the Dinky Toys Club, for Brian belongs to that too, there is a road layout, arranged in conjunction with the railway. A Level Crossing over an inner running loop provides road access to a goods siding, which you can pick out from the position of the Loading Gauge on the right.

The Level Crossing gates appear in the illustration at each side of the approaching four-coach train hauled by the 2-6-4T. The road serves the houses in the foreground. It turns to run behind the station buildings and then carries on by means of an overbridge crossing the "S"-shaped reverse loop. There is plenty of Dinky Toys traffic, and apart from the various buildings associated with the road there are several areas that are fenced in to represent fields.



An aerial view of one end of the extensive layout built up by Mr. J. Winfield, Pinxton, for his sons. The photographs on this page are by Colin Godfrey.

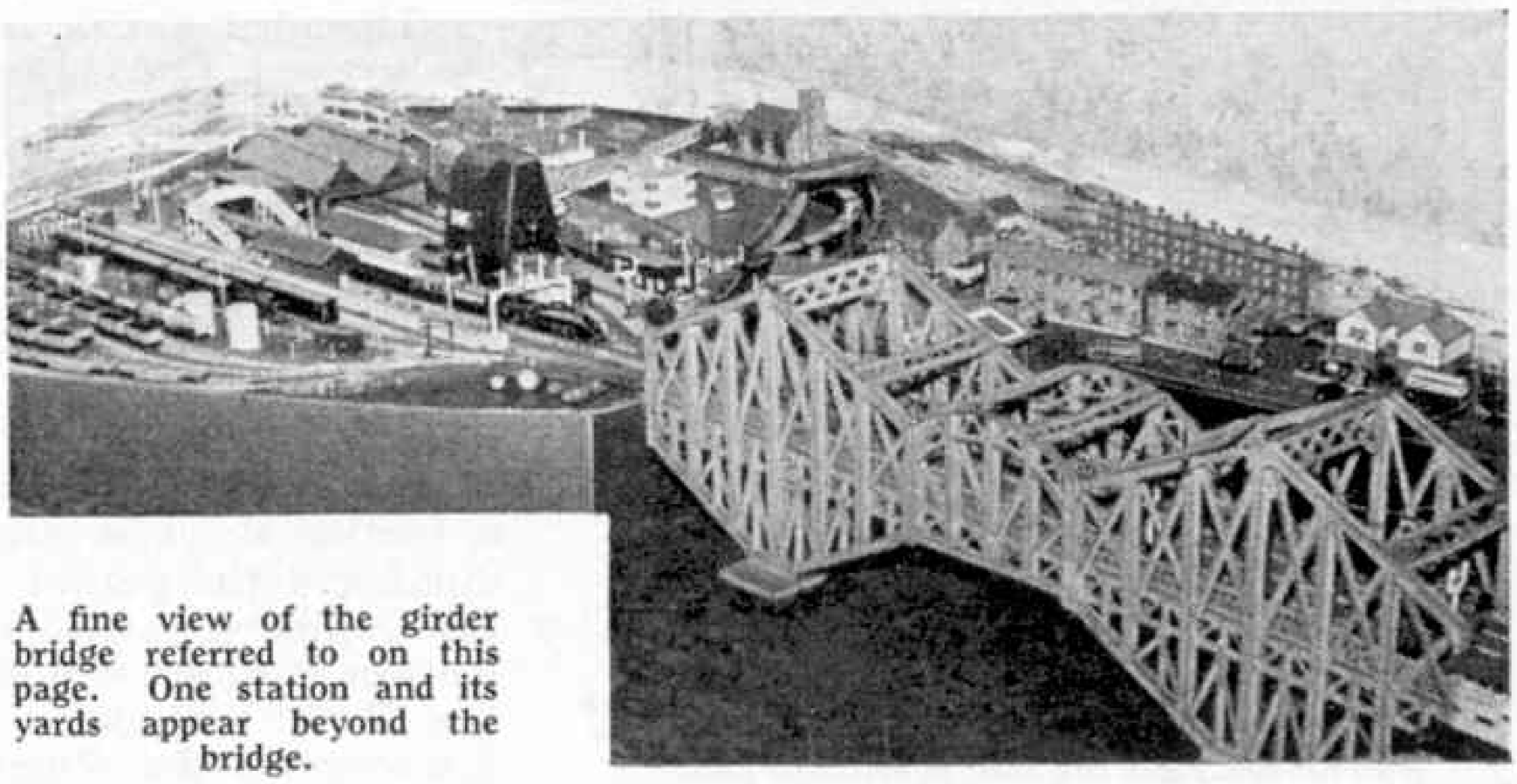
Now for the second layout, shown in the two pictures on this page. In this more space has been available and full advantage has been taken of it. This system has been developed by Mr. J. Winfield, of Pinxton, for his boys John and Maurice.

The complete railway is 17 ft. long and actually involves three baseboards. It provides a continuous run on both up and down main lines, but instead of following the familiar so-called oval shape, reverse curves at each end bring the up and down tracks together in pairs to form a four-track section for some distance between the roughly circular ends of the system.

Thus the general shape is that of an "hour-glass" with one side made flat. The ends of the layout are considerably wider than the centre section. As far as the track is concerned the centre section consists of the fine cantilever bridge, shown in the lower picture, that connects the two end baseboard sections. The centre section of the baseboard as yet does not actually carry any railway at all, but it is fully developed to accommodate the lineside effects and to provide a continuation of those that are found on the end baseboards as well.

There are two stations on the layout, both of them being of the combined terminal and through type. Point to point working is therefore possible, while of course there are splendid opportunities for good long continuous runs. Sidings and accommodation for rolling stock and for locomotives are included, and the engine shed premises have a realistic water tower and a coaling plant.

Good use is made of isolating sections, which allow of the presence on the layout of six Hornby-Dublo Locomotives at the same time. Points, some of which are of the Isolating Switch type, are arranged in such a manner that any engine can readily be moved from one track to another. There is a complete lighting installation for buildings and roads, and some 60 Dinky Toys are in use on the road system.



A fine view of the girder bridge referred to on this page. One station and its yards appear beyond the bridge.

Among the Model-Builders

By "Spanner"

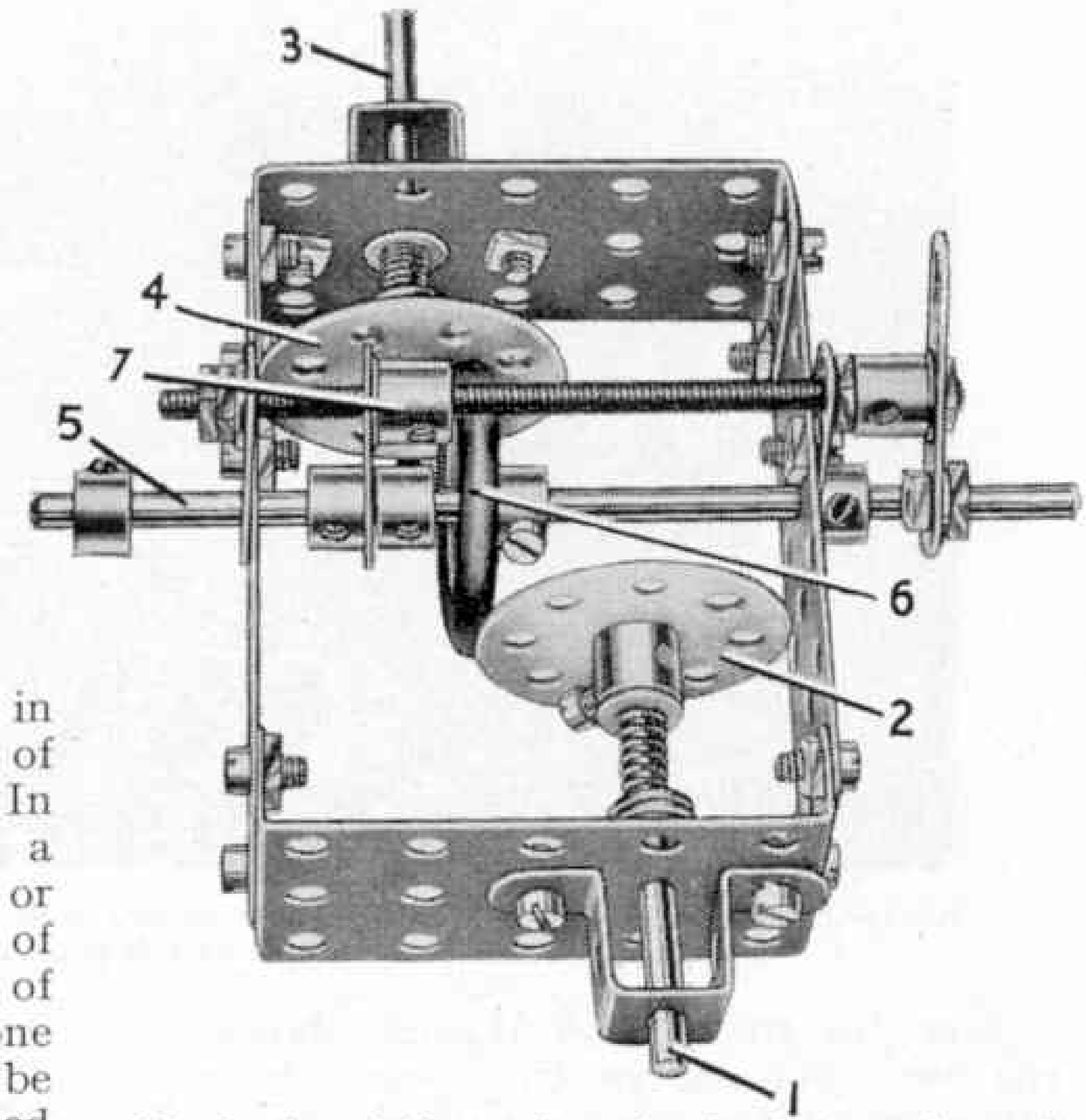


Fig. 1. A variable speed mechanism that can be used to control the running speed of a model and allow it to be varied as desired within limits.

Variable Speed Mechanism

Mechanism that allows for variation in the speed of a machine is familiar to most of us from our knowledge of motor cars. In these, and in countless other instances, a gear-box is used to provide two, three or possibly four fixed ratios. A mechanism of this kind is not suitable for every type of Meccano model, however. Frequently one is required with which a model can be started slowly, increasing the speed gradually up to a maximum and then decreasing it until motion ceases. This cannot be done with a gear-box, which increases or decreases speed in steps and some form of control is needed that allows the driving speed to be varied continuously between set limits.

Mr. H. Lindsay, Barnet, has devised an exceptionally neat mechanism that fulfils these requirements, and details of the device are shown in Fig. 1.

The framework for the mechanism consists of two 3″ × 1½″ Flat Plates connected at their ends by 2½″ × 1½″ Flanged Plates. The input shaft 1 is mounted in one of the Flanged Plates and in a Double Bent Strip, and it carries a Bush Wheel 2. A Compression Spring is placed on the shaft between the Bush Wheel and the Flanged Plate, with Washers for spacing purposes. The output shaft 3 is arranged in the same way as the input shaft and it carries a Bush Wheel 4.

A Rod 5 is mounted across the mechanism and is free to slide in its bearings within limits set by Collars fixed on the Rod. The Rod carries a 1″ Pulley with Rubber Ring 6, and a Threaded Crank 7 located between Collars. The Threaded Crank is screwed on to a Screwed Rod, which is supported in 1½″ Strips bolted to the Flat Plates.

A Double Arm Crank, fitted with a Threaded Pin as a handle, is clamped between nuts at one end of the Screwed Rod, and lock-nuts at the other end prevent the Screwed Rod from sliding in its bearings.

The Compression Springs press the Bush Wheels against the Rubber Ring 6, so that a friction drive is provided between the input and the output shafts. By turning the Double Arm Crank the Pulley and its Rubber Ring are carried across the faces of the Bush Wheels, so that the effective diameters of the Wheels vary. This gives

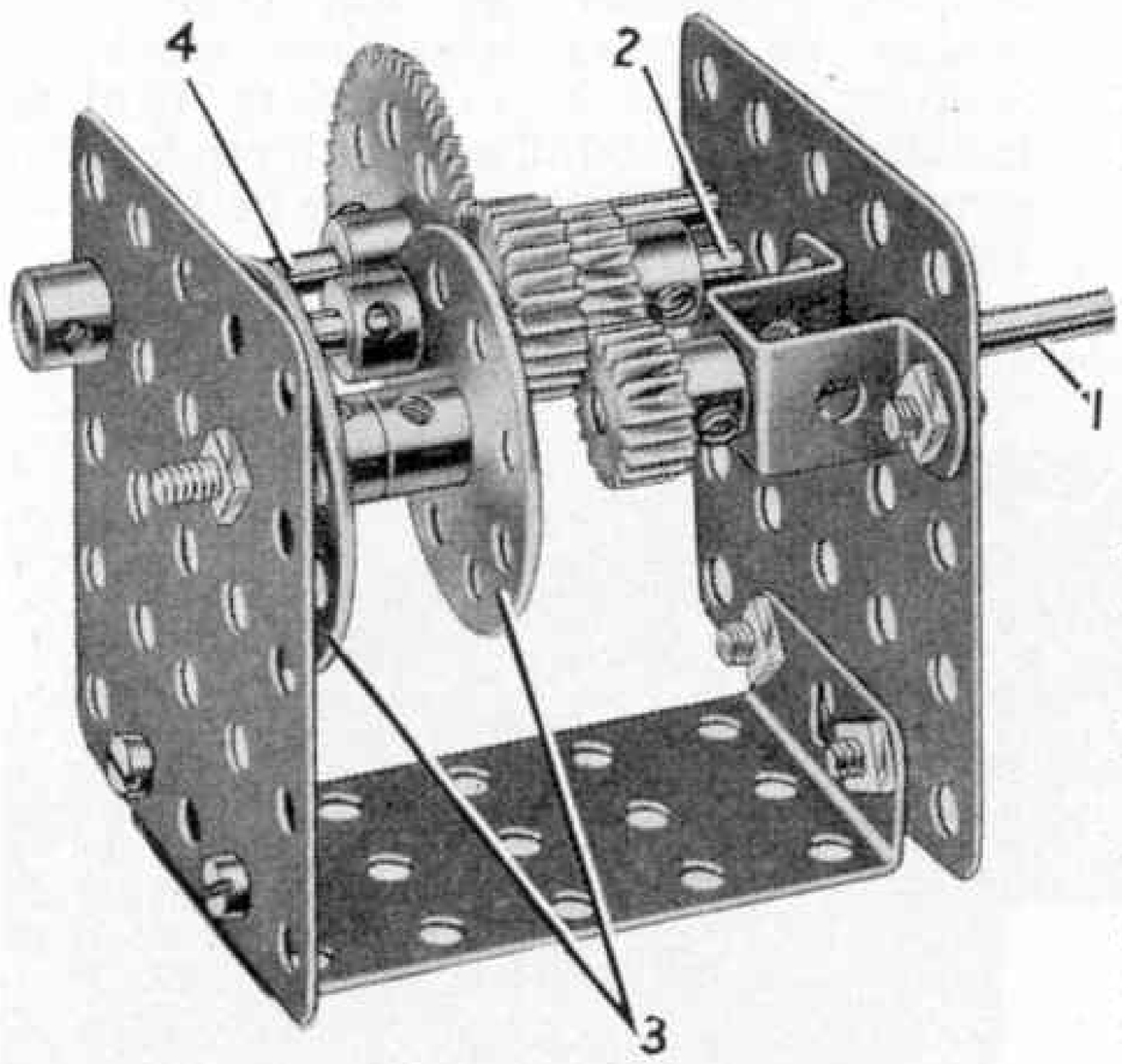


Fig. 2. An adjustable bearing that allows the meshing of Gears and Pinions whose centres do not coincide with the spacing of the holes in Meccano parts.

David Walters, Buckfastleigh, photographed with a model traction engine that won him two First Prizes in Carnivals at Buckfastleigh and Ashburton this year.

rise to a corresponding variation in the gear ratio.

Adjustable Bearing

Meccano Gears and Pinions are so designed that their teeth mesh accurately, irrespective of the sizes of the parts, but if it is necessary to use together a Gear and a Pinion whose centres do not coincide with the spacing of the holes in Meccano parts, special bearings must be arranged. Fig. 2 shows an adjustable bearing for this purpose, and the arrangement is based on a suggestion put forward by Mr. F. Richardson, Surbiton.

The driving shaft 1 carries a ½″ Pinion that engages another ½″ Pinion on a Rod 2. Rod 2 carries also a ¾″ Pinion, and the Rod is mounted in holes in two Bush Wheels 3. The Bush Wheels are locked together by a nut on a 1⅛″ Bolt which is fixed by a second nut in a hole in the side-plate of the mechanism. By rotating the Bush Wheels on the 1⅛″ Bolt the ¾″ Pinion can be set to mesh with a Gear on the output shaft 4.

Power-Operated Door Mechanism

Model vehicles are firm favourites with Meccano enthusiasts of all ages, and those model-builders who are specially interested in them are always on the lookout for novel mechanisms to add interest to their constructions. Often in actual practice these vehicles are fitted with power-operated folding or sliding doors, remotely controlled by the driver or conductor. A simple way of carrying out a similar scheme in Meccano was sent to me by M. Lovatt, Epsom, and it is one that will appeal to enthusiasts who wish to build really up-to-date models.

In Fig. 3 the mechanism is shown housed in a simple framework, but in a complete model this frame can be made to form part of the chassis or body assembly. An 8″ Rod 1 is mounted in the frame and is held in place by Collars. Two 1½″ Strips 2 are free to slide on Rod 1, and they are connected by Angle Brackets to a 3½″ Rack Strip. The Strips are free to slide also on an 11½″ Rod 3, which carries a Worm Gear that engages the teeth of the Rack Strip. Rod 3 is driven

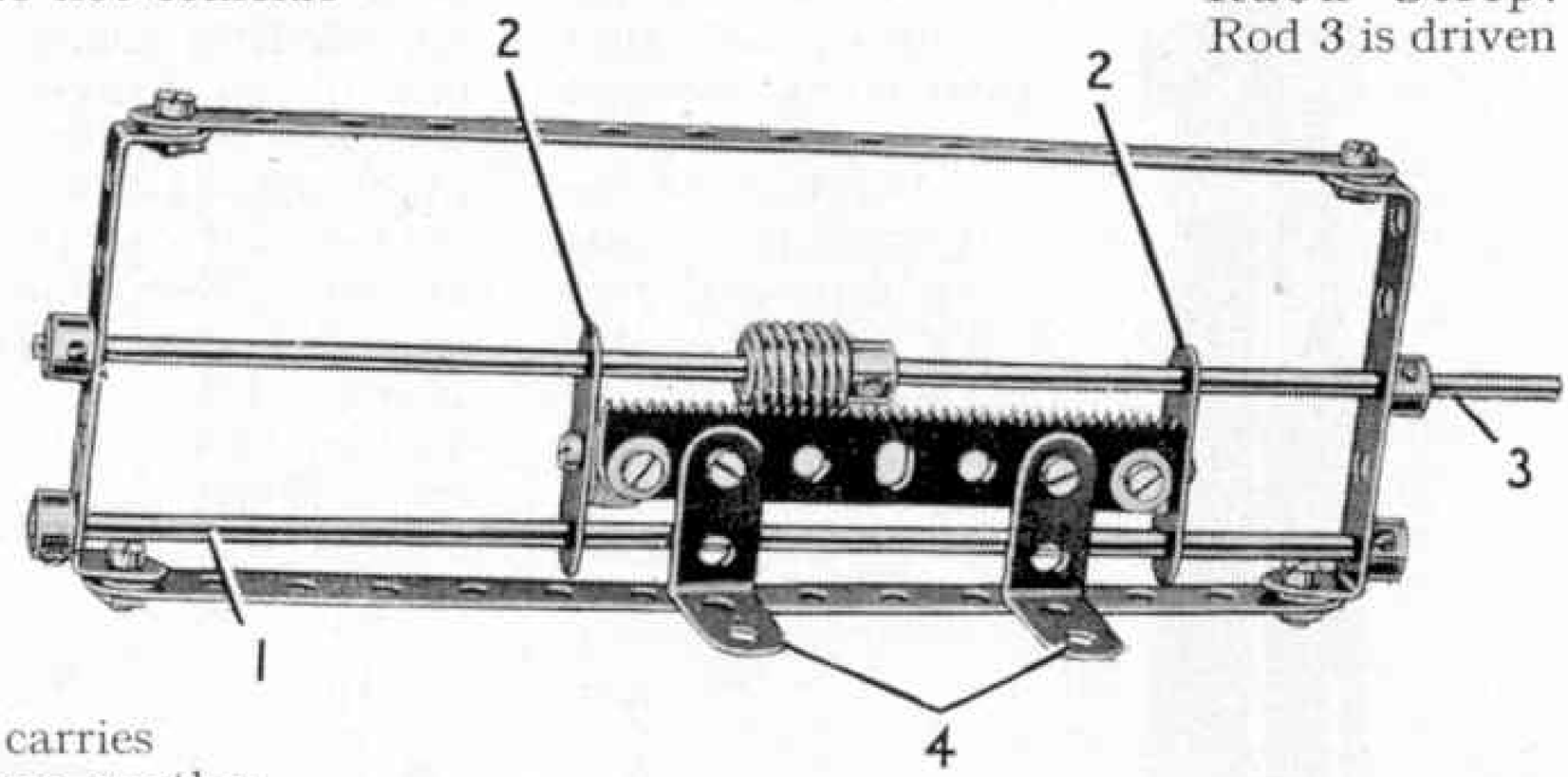


Fig. 3. A mechanism for operating folding or sliding doors on model coaches and buses.

through a suitable clutch or gear mechanism that provides means for reversing the drive, and as the Rod rotates the Worm causes the Rack Strip to move parallel to the two Rods, forward or backward as desired. Sliding or folding doors attached to the 1″ × 1″ Angle Brackets 4 bolted to the Rack Strip would move in a similar manner.

An Attractive Novelty Model

Lighthouse with Automatic Supply Ship

THIS attractive working model represents a supply boat sailing between a boathouse and a lighthouse. The boat moves steadily along its course, and at each end it turns round and makes the return journey. The operating mechanism is concealed in the base, and the action of the model is rather puzzling to onlookers as there is no visible means of driving and turning the boat.

The base of the model should be assembled first. Each side consists of two 24½″ Angle Girders 1 and 2, a 12½″ × 2½″ Strip Plate and a 9½″ × 2½″ Strip Plate overlapped, and a 5½″ × 2½″ Flat Plate 3. The sides are connected at each end by a 3½″ × 2½″ Flanged Plate, and two 3½″ Angle Girders 4 and 5 and a 3½″ Strip 6 are bolted between the Girders 2. Two 12½″ Flat Girders are attached to the Girders 1, and support two further Flat Girders 7, which are raised slightly by placing Collars on the ½″ Bolts that fix them in place. The Flat Girders 7 are arranged so that there is a narrow slot between them.

The base of the lighthouse is made by curving two 5½″ × 1½″ Flexible Plates and bolting them together to form a circle. The Flexible Plates are attached to a 5½″ × 3½″ Flat Plate 8 by Angle Brackets, and a ring of four 2½″ Stepped Curved Strips is bolted to Angle Brackets fixed to the upper edges of the Flexible Plates. The Curved Strips support further Angle Brackets, to which eight 7½″ Strips are bolted. The upper ends of these Strips are connected together by Obtuse Angle Brackets, and a 1½″ × ½″ Double Angle Strip is bolted across the top of the tower formed by the Strips. A 3″ Screwed Rod is passed through the centre hole of the Double Angle Strip, two Wheel Flanges, two Chimney Adaptors in a Sleeve Piece, and through 1⅛″ and ¾″ Flanged Wheels. The parts are held tightly together by nuts on the Screwed Rod. The Flat Plate 8 is spaced from the Girders 1 by Collars on ½″ Bolts.

The floor of the boat-house is a 5½″ × 3½″ Flat Plate 9 and this also is spaced from the Girders 1 by Collars on ½″ Bolts. Each side consists of three vertical 3″ Strips, two 4½″ Strips, a 4½″ Angle Girder and two 2½″ × 1½″ Flexible Plates. The 4½″ Angle Girders are bolted to the Flat Plate 9. An E20R(S) Electric Motor is attached by one of its flanges to two 1″ × ½″ Angle Brackets bolted to the Flat Plate 9, and the upper side-plate of the Motor is supported by two 2½″ × ½″ Double Angle Strips seen at 10. The Motor armature shaft is extended by a 2½″ Rod 11 connected by a Short Coupling.

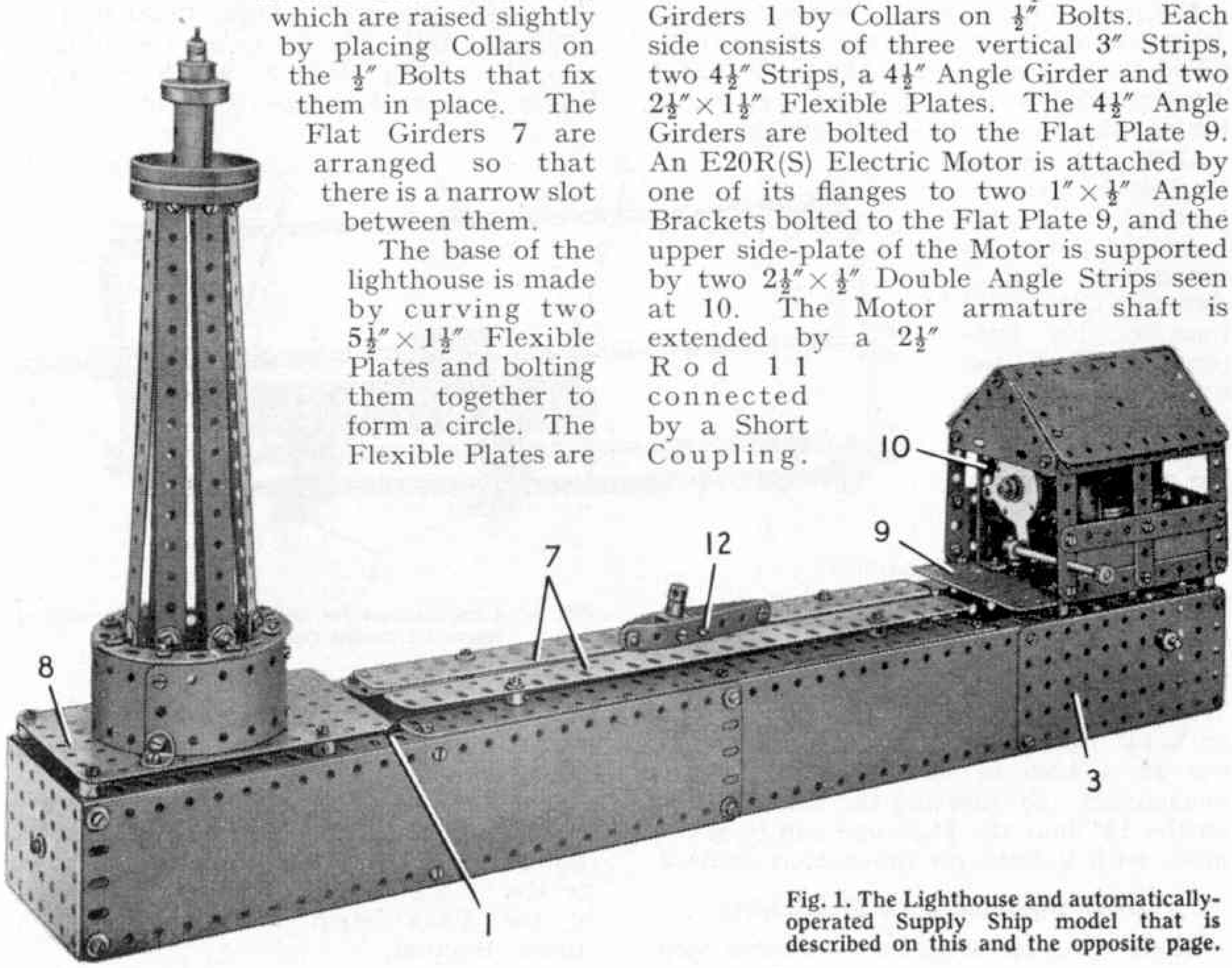


Fig. 1. The Lighthouse and automatically-operated Supply Ship model that is described on this and the opposite page.

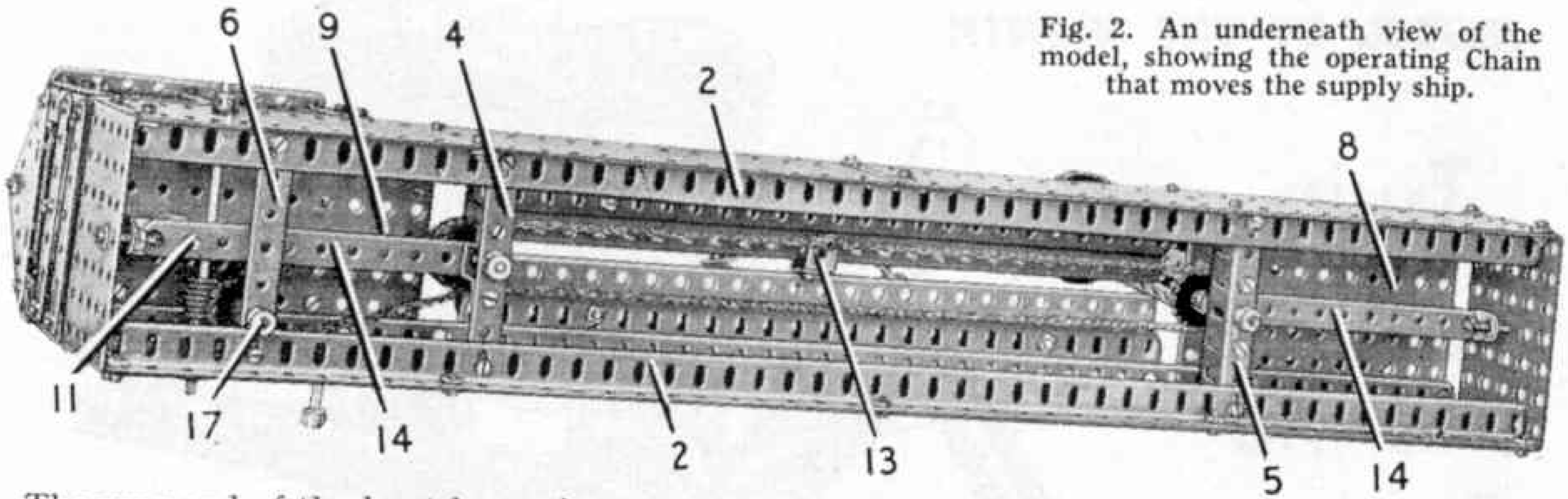


Fig. 2. An underneath view of the model, showing the operating Chain that moves the supply ship.

The rear end of the boat-house is filled in by two 3″ and two 3½″ Strips, two 2½″ × 1½″ Flexible Plates and a 2½″ × 2½″ Triangular Flexible Plate. These are bolted together and attached to Angle Brackets fixed to the sides. The boat-house roof is a Hinged Flat Plate supported by Obtuse Angle Brackets. At the front a second 2½″ × 2½″ Triangular Flexible Plate is attached to Angle Brackets.

The boat is made by bending two 3½″ Strips slightly and bolting them together with a Double Bracket between them. Two Collars fixed on a ½″ Bolt passed through the Double Bracket represent the funnel. A Fishplate is located centrally between the Strips by Washers on a ¾″ Bolt 12, and the Fishplate is bolted tightly to a ½″ Reversed Angle Bracket 13. The prongs of a bifurcated paper clip are passed through the Reversed Angle Bracket and through a link in a length of Sprocket Chain. The prongs are then opened out so that the link will pass over the teeth of Sprocket Wheels. The Chain forms an endless length round 1″ Sprockets on 2″ Rods, which are mounted in the Girders 4 and 5 and in Double Bent Strips bolted to the Girders. The 2″ Rods are held in place by Collars, and at each end a 5½″ Strip 14 is passed over the Rod and is connected to the end of the base by an Angle Bracket and a ¾″ Bolt. One of the 2″ Rods carries a 1″ Sprocket 15.

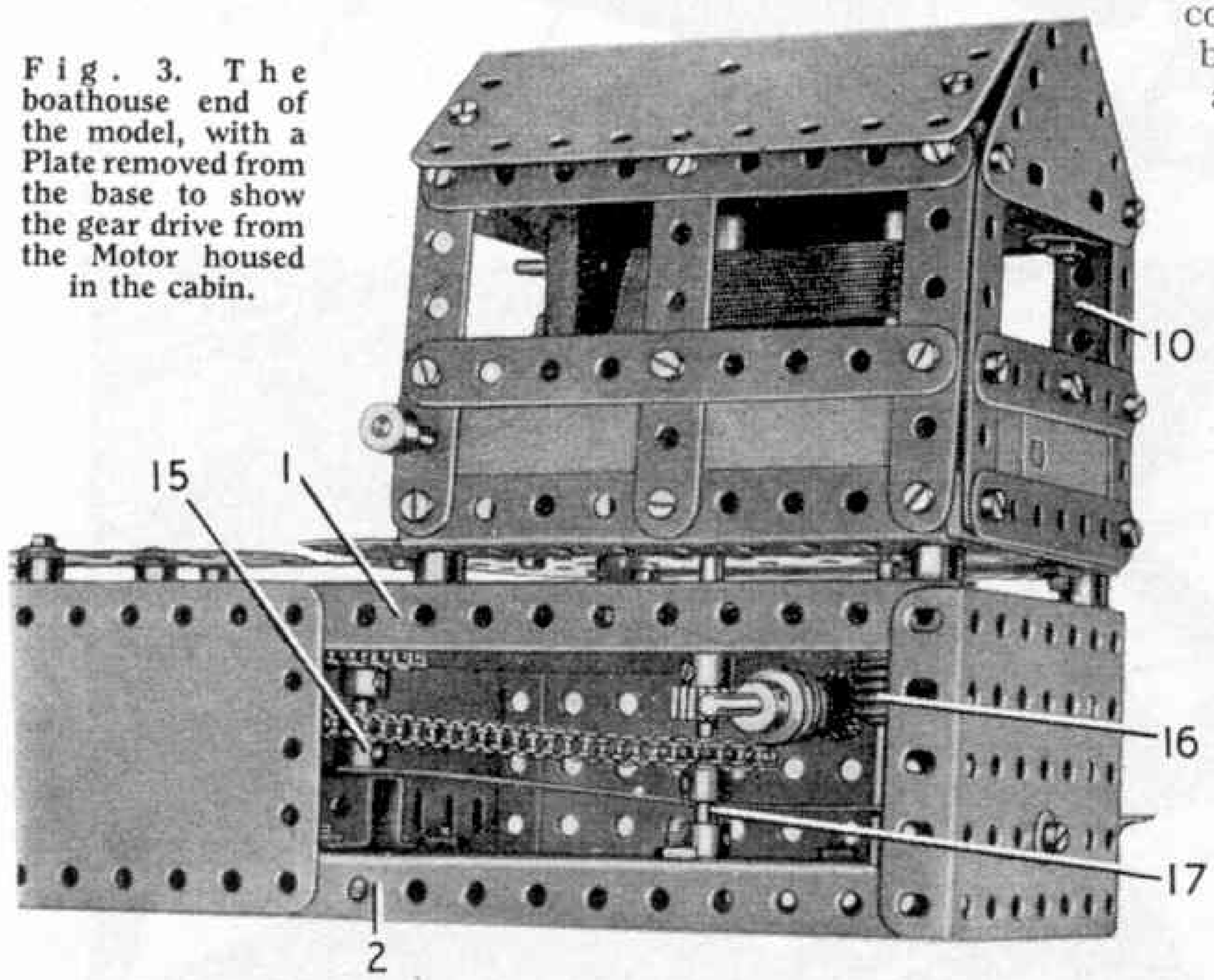


Fig. 3. The boathouse end of the model, with a Plate removed from the base to show the gear drive from the Motor housed in the cabin.

The Rod 11 carries a Worm Gear 16, and the lower end of the Rod is supported in one of the Strips 14. The Worm drives a ½″ Pinion on a 4½″ Rod held in the Plates 3 by Collars. A Worm Gear on the 4½″ Rod engages a ½″ Pinion on a vertical 3½″ Rod 17 mounted in Plate 9 and the Strip 6. A 1″ Sprocket on Rod 17 is connected by Chain to the Sprocket 15.

Parts required to build this model Lighthouse and Automatic Supply Ship: 8 of No. 1b; 2 of No. 2; 4 of No. 2a; 4 of No. 3; 8 of No. 4; 4 of No. 7; 2 of No. 9a; 2 of No. 9b; 1 of No. 10; 1 of No. 11; 24 of No. 12; 2 of No. 12b; 12 of No. 12c; 1 of No. 15a; 1 of No. 16; 1 of No. 16a; 1 of No. 16b; 2 of No. 17; 1 of No. 20; 1 of No. 20b; 2 of No. 26; 2 of No. 32; 138 of No. 37a; 114 of No. 37b; 32 of No. 38; 2 of No. 45; 1 of No. 48; 2 of No. 48a; 2 of No. 52a; 2 of No. 53; 23 of No. 59; 1 of No. 63d; 2 of No. 70; 1 of No. 80c; 4 of No. 90a; 1 of No. 94; 4 of No. 96; 4 of No. 103b; 3 of No. 111; 12 of No. 111a; 1 of No. 111c; 1 of No. 125; 2 of No. 137; 1 of No. 163; 2 of No. 164; 6 of No. 188; 2 of No. 189; 2 of No. 196; 2 of No. 197; 1 of No. 198; 2 of No. 223; 1 E20R(S) Electric Motor.

MODEL OF THE MONTH

Twin Cylinder Marine Engine

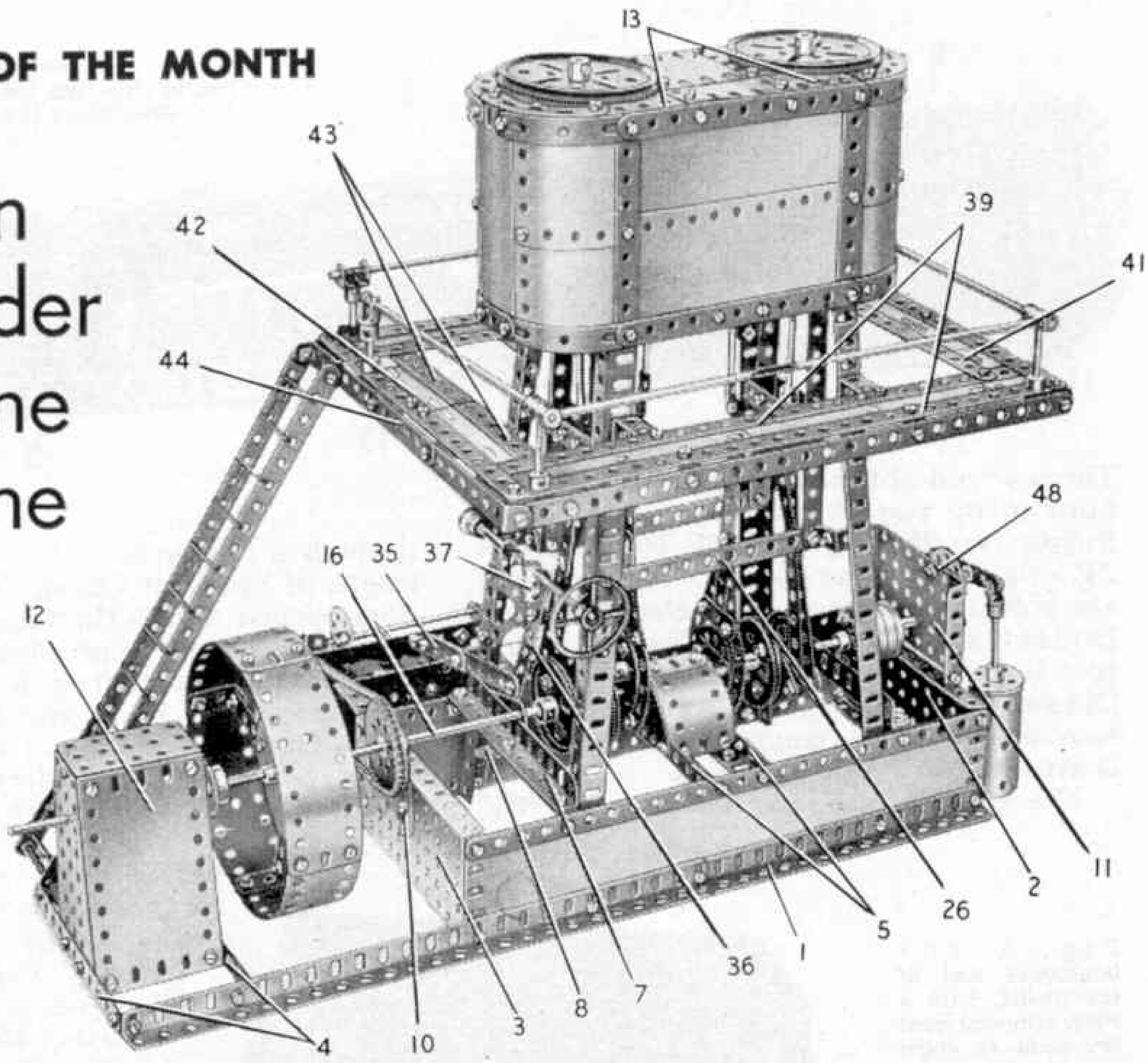


Fig. 1. This splendid model can be built with parts in a No. 8 Outfit.

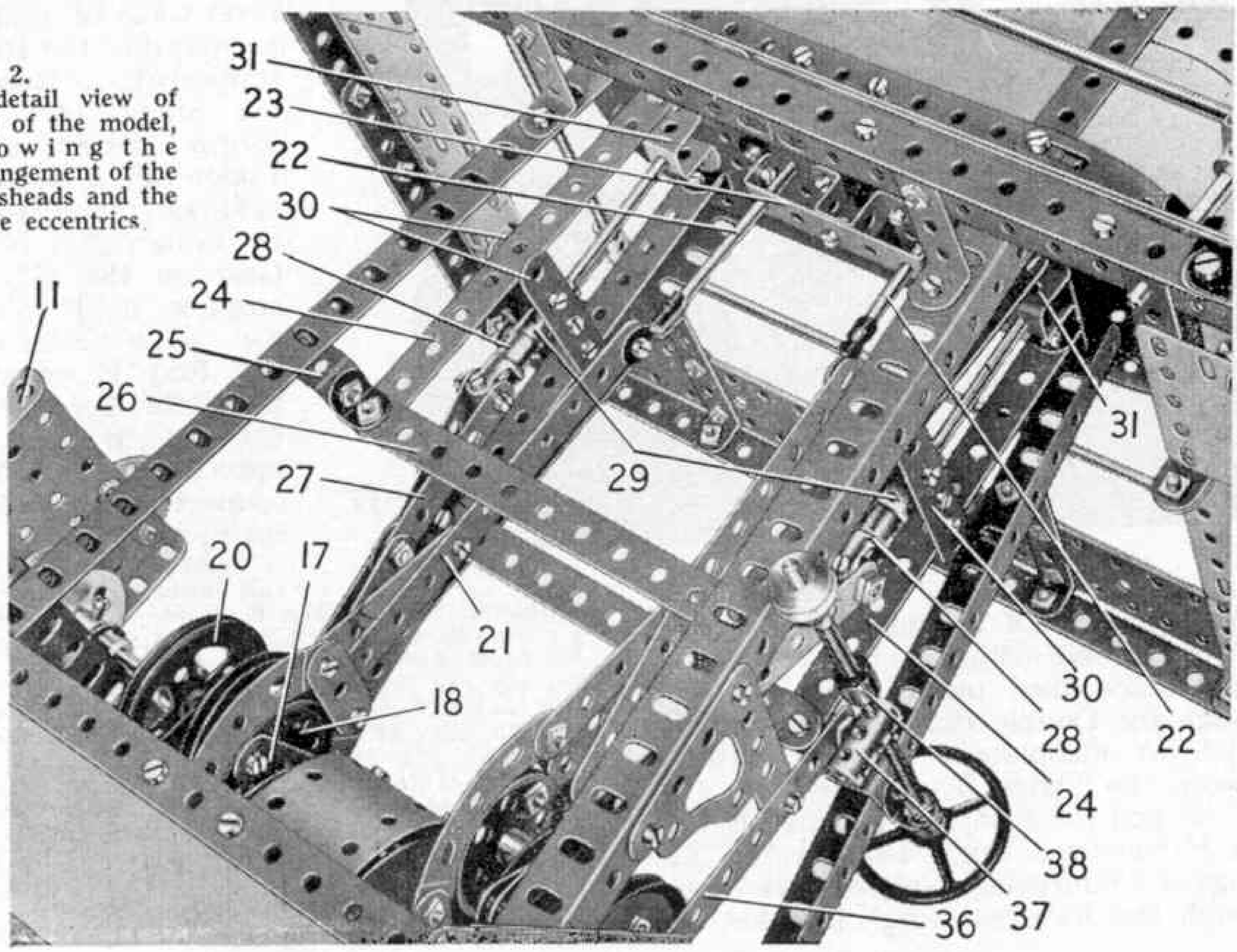


Fig. 2. A detail view of part of the model, showing the arrangement of the crossheads and the valve eccentrics.

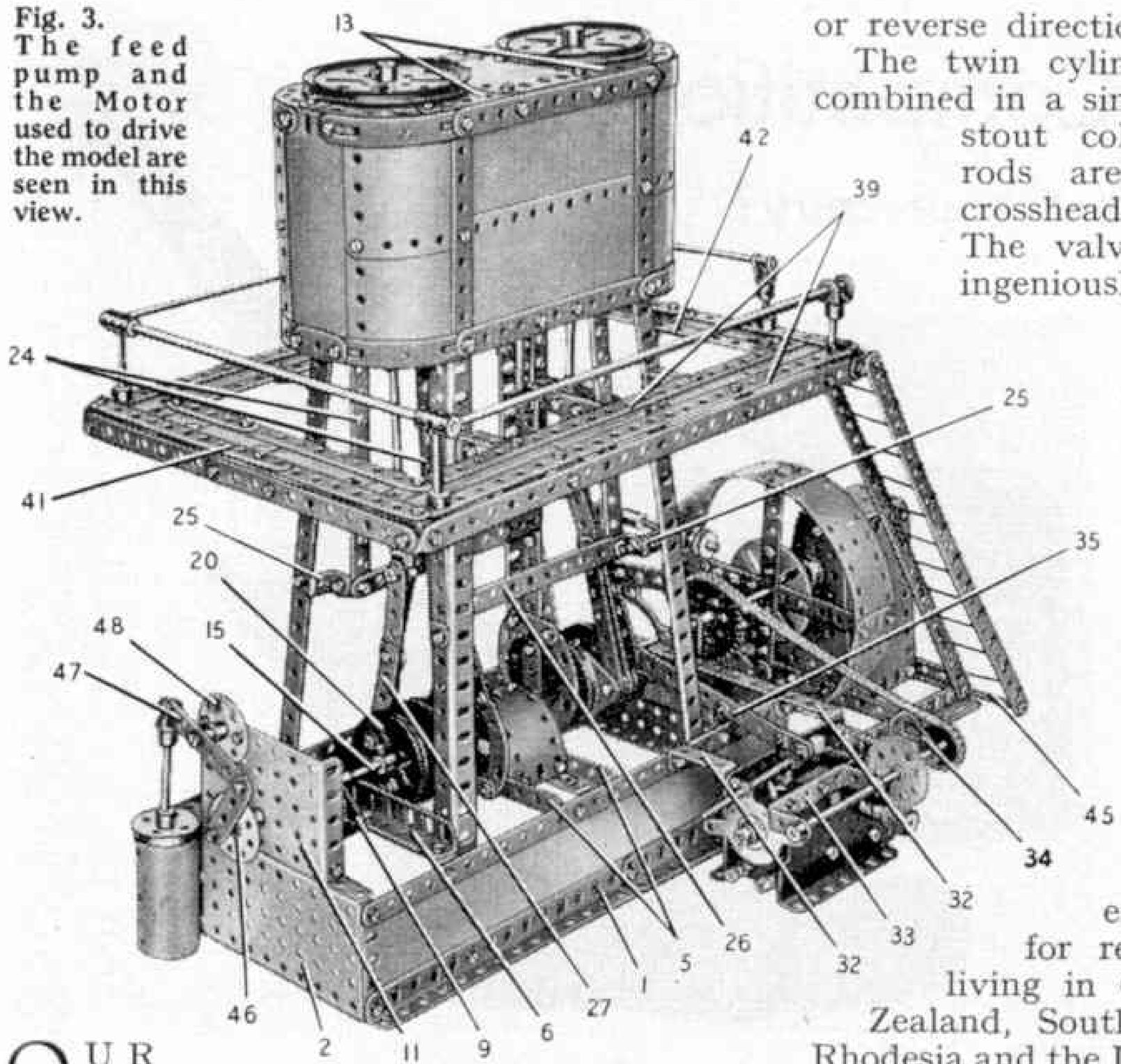


Fig. 3. The feed pump and the Motor used to drive the model are seen in this view.

OUR model this month is one that will appeal to the many model-builders who delight in the construction of model steam engines and other forms of power units. The Twin Cylinder Marine Engine illustrated in these pages is designed for construction with parts in a No. 8 Outfit, and it is shown fitted with an E20R(S) Electric Motor that drives the crankshaft realistically. An attractive feature is that the reversing switch of the Motor is connected to a screw-operated mechanism controlled by a hand wheel. Turning this wheel enables the model to be set working in either forward or reverse directions.

The twin cylinders of the model are combined in a single casing supported by stout columns, and the piston rods are correctly fitted with crossheads guided by slide bars. The valve rods are worked by ingeniously built-up eccentrics, and at one end of the crankshaft a crank-operated feed pump is fitted. An inspection platform surrounds the cylinder block.

Meccano enthusiasts in this country who wish to build the Twin Cylinder Marine Engine can obtain full constructional details and a list of the parts required by writing to the Editor, enclosing a 2d. stamp for return postage. Readers living in Canada, Australia, New Zealand, South Africa, Ceylon, Italy, Rhodesia and the United States of America, can obtain their copies of the *current* Model of the Month Instructions by writing to the main Meccano agents in those countries, enclosing suitable stamps to cover return postage.

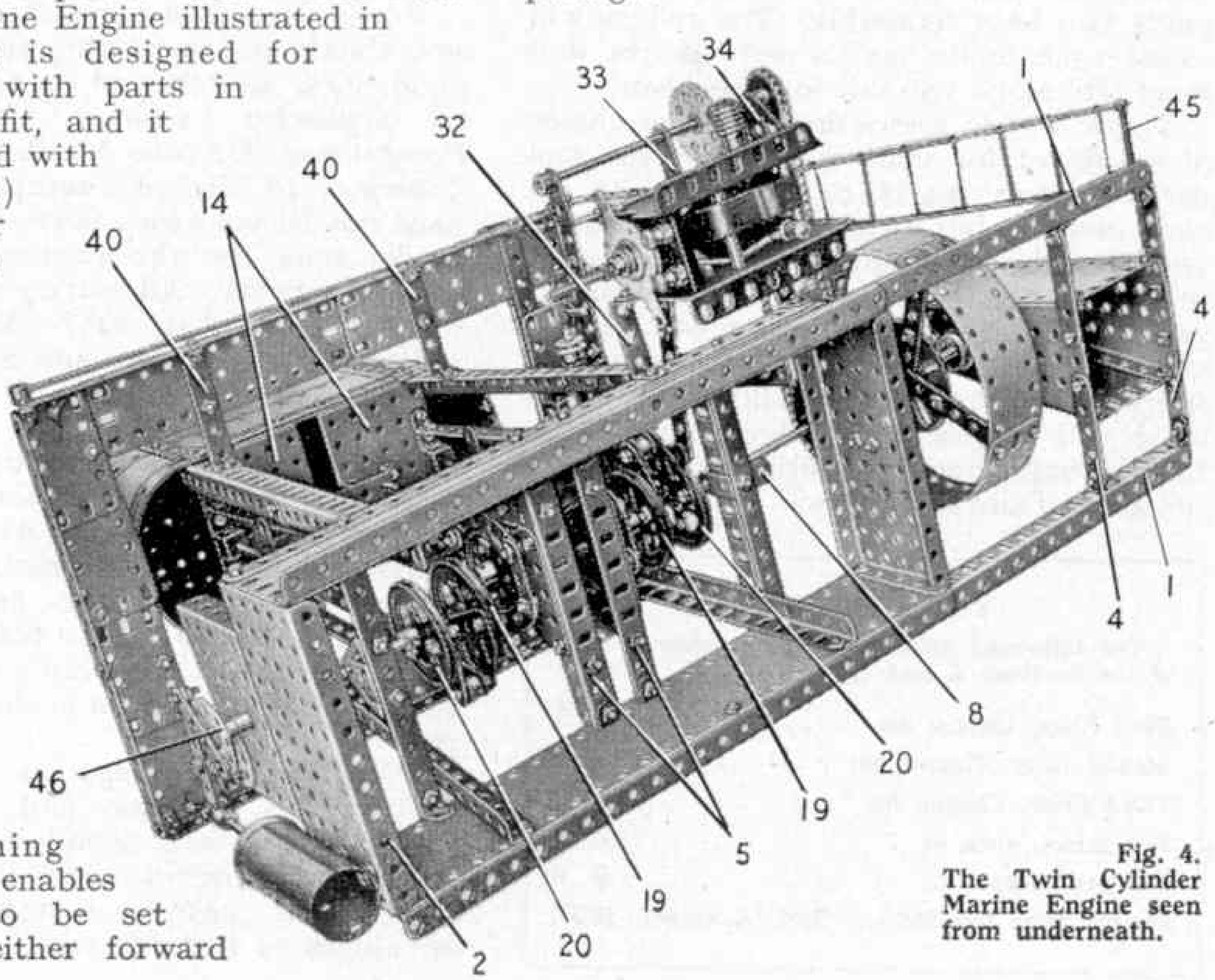


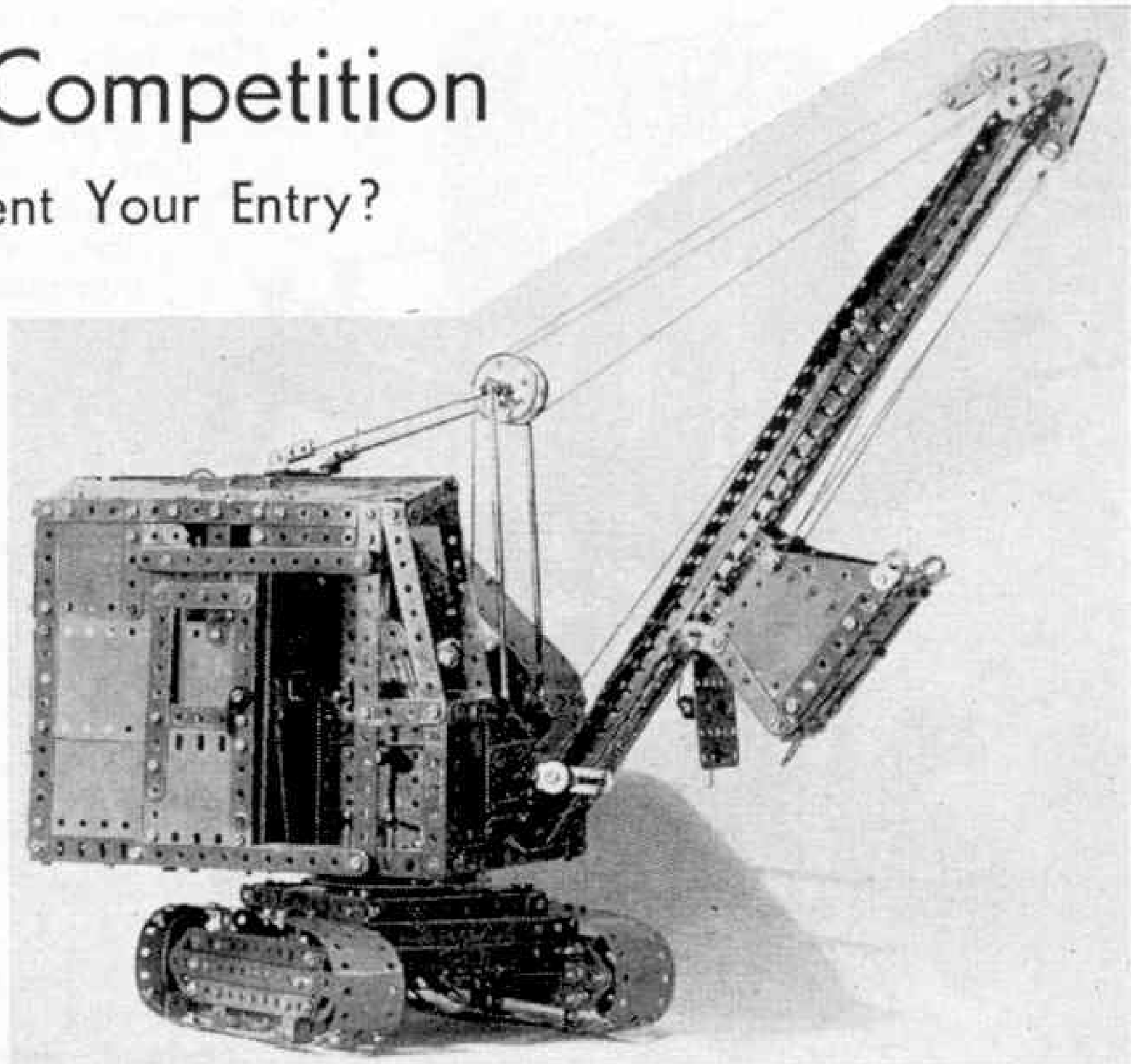
Fig. 4. The Twin Cylinder Marine Engine seen from underneath.

Meccano Competition

Have You Sent Your Entry?

CAN you build a Meccano model as neat and as realistic in appearance as the skimmer scoop shown in the picture on this page? If you can, and you send photographs or sketches of it to us, you have every chance of winning one of the splendid prizes offered for the best models submitted in the September General Model-Building Contest. Your model can be of any kind, and it need not be as large or as detailed as the one illustrated. Indeed, small but well-designed models have just as much chance of winning prizes as larger and more complicated structures. The main thing is to build a neat, sturdy model, as realistic as possible, with the parts you have available. The judges will assess each model on its own merits, and mere size alone will not impress them.

There are no restrictions on the choice of a subject for your model and you can use as many parts as you like in its construction, but before starting to build your model you should give careful thought to the choice of a suitable subject, particularly if your selection of parts is rather limited. It is far better to choose a simple model you can build really well, as it will impress the judges much more than a large model flimsily built owing to the lack of suitable parts.



This model skimmer scoop is fully workable and has many attractive details. It won Third Prize, for G. B. Lewis, Swansea, in one of last winter's model-building competitions.

When you have completed your model you should obtain photographs or prepare good, clear sketches of it, and send them to *September General Model-Building Competition, Meccano Limited, Binns Road, Liverpool 13.* The photographs or sketches need not be your own work, but the actual model must be the result of your own unaided efforts. All entries must reach us by 31st December, 1957. Make sure you write your age, name and address clearly on the back of each print or piece of paper you send.

Entries will be divided into two Sections, according to the ages of the competitors. Section A is for competitors up to twelve years of age on 31st December next, while entries from competitors aged twelve or over on that date will be placed in Section B. A full list of the prizes to be awarded in each Section is given in the panel on this page.

Prize-winning entries become the property of Meccano Ltd. and are not returnable. Unsuccessful entries will be returned to their senders if they include with their entries stamped addressed envelopes of suitable size.

THE PRIZES

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

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

Closing Date for Entries: 31st December, 1957.

Club and Branch News

WITH THE SECRETARY

CATERING FOR THE JUNIOR MEMBERS

It has been interesting to note from Club reports during the year the increasing use of Dinky Toys at Club meetings, not merely as accessories to large Meccano models or as lineside features on Hornby-Dublo layouts, but in their own right so to speak. They do indeed provide an ideal play medium for very junior members, to whom an entire evening helping others in building Meccano models or assisting in a small way in the operation of a Branch layout can be rather too much of a good thing at first.

Some Clubs have always had a few Dinky Toys on hand for the benefit of their young members. The range of these delightful miniatures is now so wide, however, that many Clubs are building up their stocks of Dinky Toys Army vehicles and racing cars on a scale that makes it possible to carry out realistic military manœuvres and motor races in which many members can take part at the same time. The senior members, turning aside for a while from their main activities, are giving a helping hand by designing appropriate scenic backgrounds for these exciting events. In this connection several Club leaders have expressed their appreciation of the practical advice given by "The Toyman" in his "Dinky News" articles.

A NORBURY EXHIBITION

A Road and Rail Transport Exhibition will be held on Saturday, 23rd November next, from 2.30 p.m. until 7.00 p.m. at St. Stephen's Church Hall, Winterbourne Road, Thornton Heath, Surrey. On show there will be Model Railways and Tramways, Railway Oddities and Relics, Tickets and Labels, "Electrification on the Railways", and Transport Serendipity. A Film Show concerned mainly with transport can also be seen.

The Exhibition has been organised by The Norbury Transport and Model Railway Club, which includes the Norbury Meccano Club. Tickets are obtainable in advance from the Exhibition Manager, D. Bradley, 19 Stuart Road, Thornton Heath, Surrey, price 9d.

CLUB NOTES

St. Thomas District (Exeter) M.C.—Club activities continued without a break during the summer holiday season, the girl members in particular maintaining good attendance. One of the girls made an excellent model of a garden seat, and one of the boys a nice model of a banjo. A football team to be known as the Meccano Rangers is being formed and will play in the League, in the "under 14" age group. Club roll: 20. *Secretary:* E. Milton, 17 Beaufort Road, St. Thomas, Exeter.

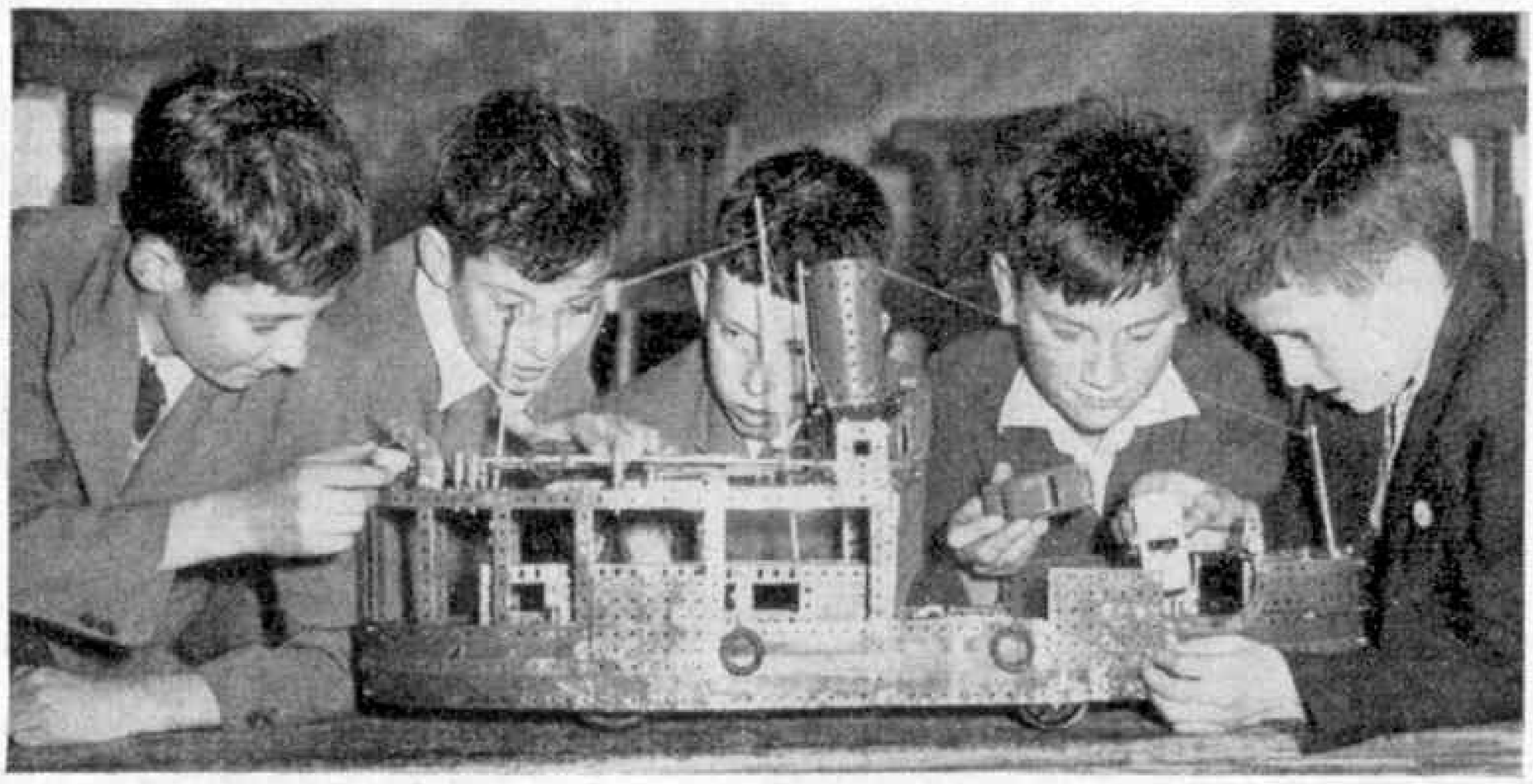
Mile End (Portsmouth) M.C.—An Open Day in which the associated Mile End H.R.C. Branch took part was held on 28th August last and was very successful, over 100 visitors attending. In addition to an attractive working Hornby-Dublo layout, there were good displays of Meccano models and Dinky Toys. A scrap book entitled *History of the Club and Branch in Pictures*, in which the Secretary had mounted photographs of Club displays, Branch layouts, etc., since early days, greatly interested the visitors. *Secretary:* Mr. A. J. Nicholson, 213 Sultan Road, Buckland, Portsmouth.

SOUTH AFRICA

Cape Peninsula M.C.—The nicely varied programme drawn up for the new Club year includes a trip to Robben Island—a Naval post just out of Table Bay—a visit to a local power station, and film shows, lectures, and a Group Competition. The subject of the Annual Winter Competition will be *In the Dockyard.* The Committee have decided to raise funds for the Club by collecting and selling used newspapers, the members working in groups. Each group will be awarded one point per 5 lbs. of newspapers that it collects, and any group obtaining 100 points by the end of six months will receive a prize of 10/-. Club roll: 25. *Secretary:* C. Cohen, 23 Upper Rhine Road, Sea Point, Cape Town, South Africa.

BRANCH NEWS

Kidderminster—Attendance at meetings has been good. At the time of writing Club activity is centred round preparations for the Third Annual Display. An important feature will be a working "End-to-End" Hornby-Dublo layout with block signalling by bell code. There will also be a clockwork layout, a models and steam engine stand and, of course, a Dinky Toys stand. *Secretary:* A. J. Potter, 35 Woodfield Crescent, Kidderminster.



This attractive Meccano model, built by David Hueston, was one of the exhibits at Our Lady's Horticultural and Parish Development Society's Annual Show at Drimnagh, Eire. It is here seen being critically examined by a group of model-building enthusiasts. Illustration by courtesy of "Sunday Independent" Dublin, Eire.

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PTS

Stamp Collectors' Corner

By F. E. Metcalfe

MALAYA

Changes there are everywhere, and nowhere more than in the British Commonwealth. One of the greatest of these was the one that took place in Malaya at the end of August last, when eleven separate states merged to form a new state, and before very long we may see a twelfth making up the new Federation of Malaya. The stamps of this part of the globe have always been fairly popular, and for reasons that I will give later, their popularity has increased tremendously during the past few years. So it is worth our while at this stage to run over the philatelic history of Malaya.

If we want to look for the first Malayan stamps in Gibbons Catalogue, we must turn to the title Straits Settlements, which covered Singapore, Penang, Malacca, etc., to start with. Then we come to the Straits Native States, such as Johore, Kedah, etc., to be followed by the Federated State of Negri Sembilan, etc., and lastly the Unfederated State of Trengganu.

Now all that looks very complicated, and I think was made needlessly so, when these various split-ups were made in the catalogue. This was the reason why when I compiled the Commonwealth Catalogue I placed all the states together in alphabetical order under the heading Malaya, ignoring any political differences.

There are far too many criss-cross issues in this story to give them in detail here, and in any event I do not think that the average collector will want to concern himself with more than the later stamps. It is my suggestion that a really worth-while collection could be started from the Straits Settlements KGVI Coronation issue of 1937, following on with the definitive KGVI set and the corresponding issues for the various states that are now merged.

So let us start off by tackling the Straits 1937 set. This is a most interesting issue. A large percentage of the stamps are quite cheap, particularly the used, and apart from some very fine shade varieties, there are two dies and the illustrations in the Commonwealth Catalogue make their identity quite simple. One stamp that you are not likely to find in a hurry, but which is well worth looking for, and does turn up occasionally, is the 50c. with the brownish-grey centre.

I once had a bit of luck with this variety. Its existence was not known by many until the Commonwealth Catalogue was published. One day I received half a sheet from a dealer, who explained that the centre of each stamp was of a different shade compared with the normal, and asked if I would give him 1/6d. a stamp. I would! Mint copies are catalogued now at 40/- and used at 10/-, but it was only the other day that I came across several used, quite cheap.

This 1937-41 issue was on sale when the Japanese moved in on Singapore and Malaya, and they promptly took over what stocks of stamps they found and overprinted them to suit their own purposes.

There are a multitude of these Japanese overprints, and none can deny their interest. But most are expensive and there are forgeries about that could easily deceive. I do not recommend them, for I do not think they will hold their present prices, in spite of the fact that they are now much cheaper than they were a few years ago. They are not listed in the Commonwealth Catalogue, because it is not considered that they are British Commonwealth stamps at all, in view of the occupation by a foreign power of Malaya at the time of issue. Lists of them are to be found in Gibbons Catalogue, if any are interested.

The time came when the Japanese were pushed out. Now a lot of stamps had been taken away and stored in Great Britain and Australia, while some had been kept in Kuala Lumpur. These, with new printings were overprinted B.M.A. Malaya, the initials meaning British Military Administration. These gave collectors a right royal time for there were many new printings on both chalk coated and uncoated paper, which produced some very fine shades, and I do not think that there is a more interesting issue of stamps in the whole of the catalogue.

The stamps are mostly cheap, in spite of the huge quantities of stamps overprinted, and I know of no single case where the overprint was wrongly applied, surely a wonderful piece of work by those responsible. The increased interest in Malayan stamps is to some extent due to the fun this issue provided, for one does not need to be an expert philatelist to enjoy it. One just needs to be able to use one's eyes and exercise common sense.

As far as Singapore itself is concerned, that territory now uses the "ship" issue. I don't need to say much about that, for most young collectors have gathered a few of those beauties already. A full used set, including the handsome top values to $5, only costs about ten shillings, whilst a short set can be picked up for as many coppers.

Interesting as the Singapore set may be, it is the sets for the various states that appeared from 1948 onward that have been most in demand. Two of the states, Penang and Malacca, now have stamps with the portrait of Queen Elizabeth, but these two countries as well as Singapore brought out sets in 1948-49 with a portrait of King George VI. The other states feature native rulers, with the exception

(*Continued on page 578*)

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For other stamp Advertisements see also pages 574 and xxii

Stamp Gossip

A CHANGING WORLD

Just look at the stamp from French Equatorial Africa illustrated here. I wonder what the grandfather of the native on the tractor would say if he could see his grandson now. And just look at the ploughed acres and factories depicted on the stamp.

French Colonial stamps are without exception by far the finest that are being printed today, taking them all round, and I am surprised that they are not more popular here in Britain than they actually are. Recently I saw a collection of these fascinating stamps, and so interesting were they that I am sure anyone would have been charmed to see the wonderful scenes so well brought out in their designs. Don't forget that if you want to get together a little collection of these French stamps—and those of France are just as handsome—the cost need not be large if you only take lower values. They will perhaps not be as good an investment as our own Commonwealth stamps, but that is not so important as the sum involved will be small.

CHRISTMAS STAMPS

Most of the Christmas stamps that have appeared specially on letters round Christmas time have been mere stickers, with no postal status at all. But round about November look out for a pair of the real thing from Australia, which this year is to have 3½d. and 4d. Christmas postage stamps. The idea has been considered for a long time, but the prospect of getting them seemed remote when a new Postmaster General was appointed who was apparently against the issue of all kinds of special stamps.

The present Postmaster General has swept away all those old-fashioned ideas against special stamps, and the result is that once more Australia is producing stamps that will be of interest to collectors, and indeed others. An instance was that 7d. stamp issued in August to carry out not only a postal duty—there was need for a 7d. value—but also to do homage to the wonderful flying doctor service. I recently had an opportunity of talking to one of those flying doctors, who attend to patients almost all over the continent. With the service a wonderful system of almost self-help has developed.

The new "flying doctors" stamps have been very popular, and so will be the Christmas stamps.

THE NEW CATALOGUES

Gibbons Simplified catalogue enjoys great popularity with the large band of thematic collectors, and in its field is about the finest catalogue produced. Other simplified catalogues have been published, but none is quite as good.

In case there are any collectors who wonder how a catalogue can be simplified, it can be mentioned that the operation consists in only listing stamps that are face different, no notice being taken of shade or perforation varieties.

The Commonwealth Catalogues deal with Queen Elizabeth and King George VI stamps and are the only catalogues devoted entirely to the stamps of these reigns. A new edition of the former appeared at the beginning of September, and a new edition of the King George VI catalogue will be published shortly.

POINTS OF VIEW

Our very faithful Indian correspondent, Mr. E. R. Kooka, has kindly sent samples and first day covers of the two stamps issued by India on 15th August to commemorate the centenary of what is called out there India's First Struggle for Freedom, described in our history books as the Indian Mutiny.

Call the event what you like, there can be no two opinions about the stamps, which are quite attractive, as all will agree. One depicts the Rani of Jhansi on horseback, brandishing a sword. The stamp is brown in colour, and the face value of 15 naya paise, which is about 3d., means that a copy can be picked up for very little. The other value, of claret colour, has a symbolic design, showing a sapling enshrined as it were. A copy will cost a bit more than the other, and I would say both together, while they are current, will be bought for 2/– mint, and used about half that price a little later on, when more are about.

TIP FOR THE MONTH

In the new edition of the Commonwealth Catalogue, figures are given of some of the British stamps that were overprinted for Tangier, etc., which are now obsolete. All eyes have been fixed on the commemorative set, which was only on sale for the last month of the period of a century during which the British Post Office in Tangier was in existence.

Good as this centenary set is, as the figures referred to show, there is another little set, a sort of a shrinking violet, that may well be overlooked, and this is the one that I suggest collectors should go after. It is the one that runs from ½d. to 1/3, Nos. 50 to 59, issued in 1956. The overprint TANGIER is on British stamps with the St. Edward's Crown watermark. There were only 42,240 copies of the 1/3 value, and not many more of some of the other denominations.

If you can find a set, as you may be able to at double face, say around 6/–, take my tip and buy it, even if that leaves you a bit short for a week or so.

The London Zoo—(*Continued from page 531*)

Brumas did not like the idea of changing her home. A cage with a trap door was put into her den with the idea of trapping her in it so that she could be taken away to the Mappin Terraces. The cage was baited with all the foods she liked, particularly new carrots, cake and ice cream. She went in and took the food, but stood so that the drop door could not close. So the box was lengthened, and then she stayed out, although her food was reduced to quarter rations!

Head-keeper Bruce Smith described the affair as a real siege, for he knew that a polar bear is capable of living more than two months without food. In the end she entered the box, more out of curiosity than because of hunger, and so she came back to the Mappin Terraces. Brumas is no longer a baby, but she still gets fan mail, which includes chocolate for her birthday, which occurs this month.

Now the Zoo has been extended by the creation of the Zoological Park at Whipsnade, in Bedfordshire, 500 acres in extent, with spacious enclosures in which the animals live in surroundings as near as possible to their natural haunts. Those that require heated houses remain at Regent's Park, where they can be displayed better, but many tropical animals, including lions, tigers, zebras and tapirs, flourish there, while the belts of trees that have been planted have attracted what is probably the largest concentration of birds in Great Britain. The Park is a sanctuary for British birds, and in the scrub and brushwood many exotic mammals and birds roam freely in the wide spaces open to them.

A Giant Radio Telescope—(*Continued from page 534*)

prevented. For this purpose two axles of the type used in heavy motor lorries are fitted, each with four wheels on which giant tyres are mounted. Any tendency to quiver in a severe gust of wind causes the tyres to rotate slightly, which itself has a cushioning effect, and by means of hydraulically operated brakes on the wheels carrying the tyres the resistance to wind shock can be finely adjusted.

The signals focused on the aerial at the top of the tower within the giant reflecting bowl are amplified, and finally are carried by cables passing through an underground duct from the centre of the instrument to a control house, which is seen in the lower illustration on page 534. From the control desk the entire telescope is visible to those in charge, even at night, for then it is floodlit. It is intended that the telescope shall work 24 hours a day, observations being continuous.

Stamp Collectors' Corner—(*Continued from page 575*)

of Negri Sembilan, which is Moslem and does not allow the illustration of human beings.

All the sets that appeared from 1948 onward have been chock full of interest. One new printing after another has appeared, and they have been wonderfully fruitful in good shades.

The 1948 set of Singapore was perforated $13\frac{3}{4} \times 14$. To everybody's astonishment, a year later this perforation was changed so drastically that there were no gauges to measure it. They did not go as high as 18 gauge, and the new measurement was $17\frac{1}{2} \times 18$. All the states sets that appeared afterwards were of this range. This is the only perforation variety we have had, and it is the shades I have already referred to that have provided the real excitement. Most are still to be obtained quite cheaply. As they are rapidly going obsolete, there is no time to be lost by anyone interested.

And now the new Malayan Federation is giving us new sets all round. The states are sharing stamps of a common design, but with portraits of their own rulers. One exception to this is Johore. The ruler there did not agree with one of the designs, which figured a tiger breaking cover, which according to his complaint gave a false picture of the country. A second is Negri Sembilan, the stamps of which will show the State Arms instead of a portrait for the reason already given.

Four stamps, 6c., 12c., 25c. and 30c., are being used by all the eleven states—I should make it clear that Singapore for the time is out of all this. Not only are the stamps quite attractive, but quite a nice little postmark collection could be formed by getting all four stamps cancelled in the eleven states.

With the range to be covered so large, it has only been possible to refer very sketchily to Malayan stamps in general, but for those looking for a group worth collecting, I can recommend above all others the Federation of Malaya.

Road and Track—(*Continued from page 541*)

tuned all the Lister cars in the Abbey Street, Cambridge, works since 1948. The gear-box is a standard D. type Jaguar box, the brakes are Girling single pad with discs of 11 inches diameter at the front and 10 inches at the rear, and the steering is much modified Morris Minor rack and pinion.

The performance of the car has already spoken for itself, at Snetterton, Oulton Park, Aintree, Crystal Palace, Brands Hatch, Goodwood and Silverstone. With over 250 b.h.p. under the bonnet, a car that weighs only $14\frac{1}{2}$ cwt. and a driver of the calibre of Archie Scott-Brown, it is not surprising that to date this season the Lister-Jaguar has started in 14 races and has taken the chequered flag on no less than 10 occasions. I hope that Brian Lister will decide to race the car abroad in 1958 and give the continentals yet another problem on their home ground.

"CAVALCADE OF NEW ZEALAND LOCOMOTIVES"

By A. N. Palmer and W. W. Stewart

(Reed 25/-)

This historical survey of the locomotives of New Zealand Railways from 1863 up to date is a splendid joint effort on the part of the two authors, and is the result of researches and study extending over a period of many years.

One is struck by the variety of motive power that has served the New Zealand Railways over the years. British, American and locally built engines of many wheel arrangements have worked side by side on the 3 ft. 6 in. gauge metals, and there have been compounds on the de Glehn system and examples of articulated locomotives, including Fairlies and Garratts, with battery electrics, main line electrics with overhead transmission and, in more recent times, diesels.

The book is well printed on art paper with plentiful illustrations, well reproduced, mostly from photographs not only from official sources, but also from the collections of individual enthusiasts, including of course that of W. W. Stewart, whose name has long been familiar as a photographer and recorder of the New Zealand locomotive scene.

The book is completed by an index of all classes and there are maps of the railway system in the North and South Islands respectively. The book is published in Wellington by A. H. and A. W. Reed, for whom the agents are Bailey Bros. and Swinfen Ltd., 46 St. Giles High Street, London W.C.2.

THIS MONTH'S SPECIAL ARTICLES

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by C. P. and C. R. Weaver

Fireside Fun

Enquirer: "Six pounds a month for this miserable room! Why, it's so damp that I could grow mushrooms in it."

Landlady: "In that case it will be seven pounds a month."

* * * *

A commercial traveller, having missed the train, found himself with two hours to spend in a very remote village.

He approached an ancient porter.

"Got a cinema here?"

"No."

"A billiard table, or library?"

"No."

"Well, how on earth do you amuse yourselves?"

"We go down to Jones' the butcher in the evenings. He has a new sausage machine."

* * * *

"I once took a trip to see my uncle in London," Tom told a friend, "and all during the train trip I kept feeling like I had forgotten something."

"Did you finally remember what it was?" his companion asked.

"Yes," replied Tom, "just as the train was pulling into Euston, I remembered that my uncle had moved to Bristol."

* * * *

Globe Trotter: "And there I stood, drinking in the sight, with the giant abyss yawning before me."

Bored listener: "Was the abyss yawning before you got there?"

* * * *

Visitor: "How many work in your office Mr. Ham?"

Ham: "About 1 in 10."

* * * *

Customer: "This writing paper hasn't the usual watermark."

Stationer: "Quite so, sir. That is on account of the recent drought."

* * * *

Irate passenger on train: "Guard, why are we stopping now? We're not in the station yet, are we?"

Guard: "No, we've caught up with yesterday's train."

* * * *

One little boy to another: "I'm so tough I wear out a pair of shoes in a week."

Second boy: "I wear out a pair of jeans in a day."

Third boy: "I wear out my grand-parents in an hour."

"What's the time, Guy-nor?"

Johnny had asked so many questions that his father had run out of patience. "Look here," he said, "didn't you ever hear of the little boy who asked so many questions that he turned into a question mark?"

Johnny thought for a minute. "Daddy," he asked, "how did he keep the dot under himself?"

* * * *

Employer: "We need a responsible man."

Job Applicant: "That's me. Wherever I've worked, if anything went wrong, they told me I was responsible."

* * * *

Policeman: "Don't you know your way round this town?"

Motorist: "Certainly not. If I did, do you think I'd waste time driving through it?"

* * * *

Employer: "Call yourself a typist, and can't fix a ribbon on the machine?"

Typist: "Well, does Myra Hess tune her own piano?"

* * * *

Insurance Agent: "It's high time you were insured against accident, sir!"

Hotel Visitor: "Why?"

Insurance Agent: "You are sitting on the local boxing champion's hat."

* * * *

BRAIN TEASERS

A store contained a certain number of eggs. If the eggs were counted in two's, three's, four's, fives or sixes, there was always one egg left over, but if they were counted in sevens they worked out exactly. How many eggs were there?

* * *

THE MAGIC WINDOW

A man had a square window in his house 3 ft. high and 3 ft. wide. It let in too much light, so he blocked off half of it, and he still had left a square window 3 ft. high and 3 ft. wide. How was this possible?

* * *

ANSWERS TO LAST MONTH'S PUZZLES

A Beastly Problem

The beast is a Fox. Behead it and it becomes an ox. Behead it again and the result is X, the Roman symbol for 10.

* * * *

A Walk Around the Town

Starting at the point lettered A on the plan of the town in last month's *M.M.* every street can be covered without traversing any street more than once by following the route indicated by the following sequence of letters:

A B C D H K M L K A D B M C L N E A G E F G H F J K

There may be other solutions to this problem and possibly some readers may have discovered them.

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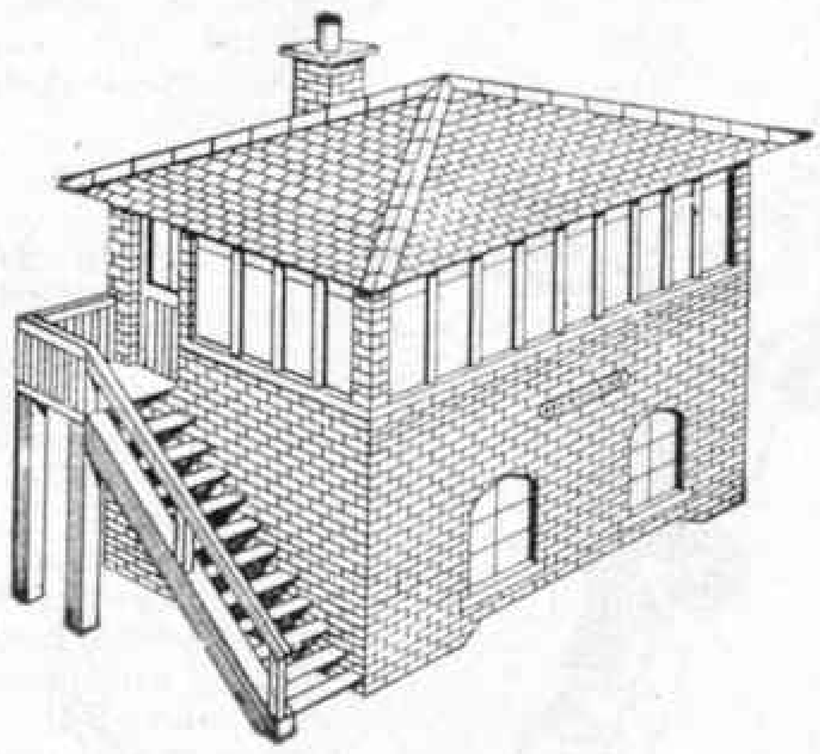

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But wrap up warm
or you'll catch cold

It's fun to have
a snowball fight
But don't use stones—
it isn't right!

E141/7

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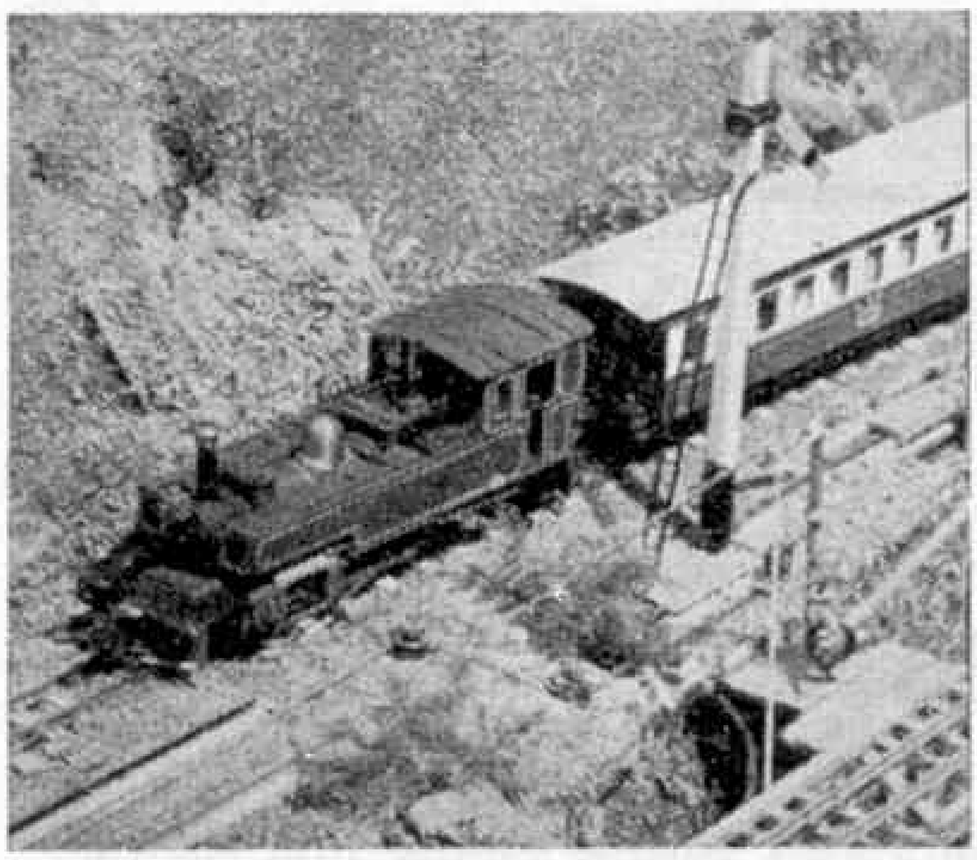

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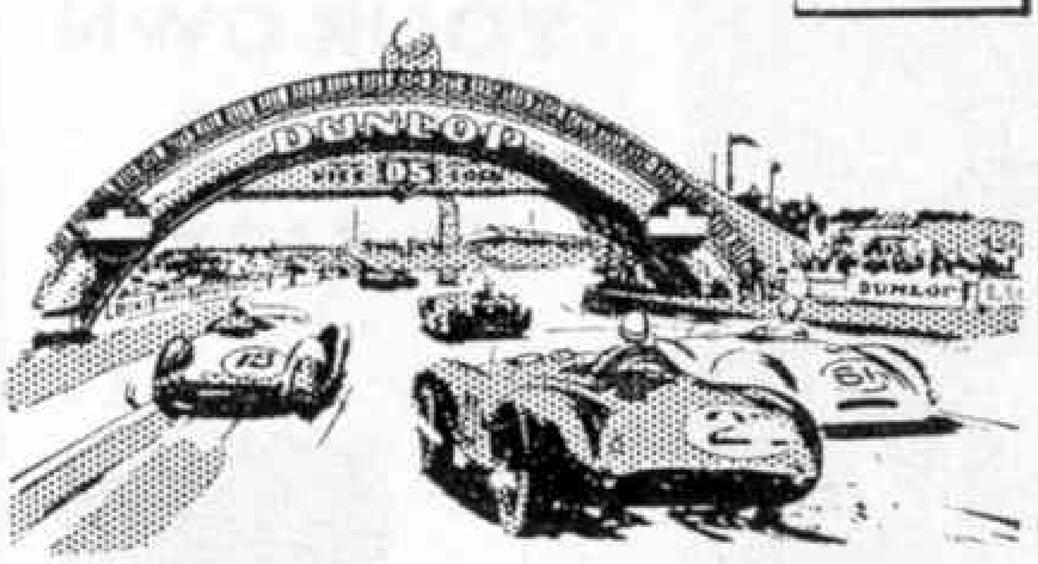

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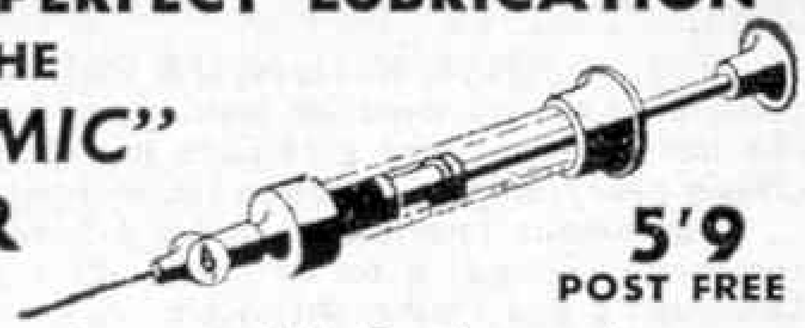

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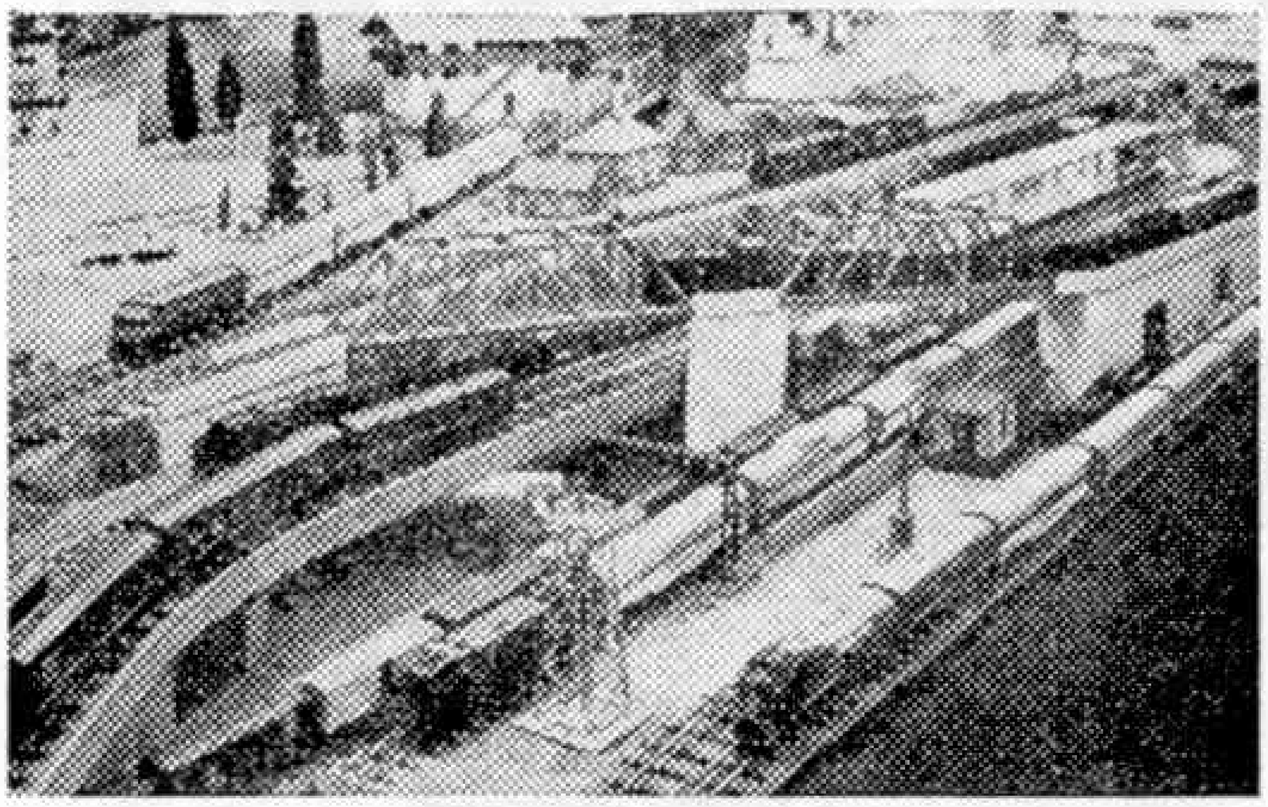

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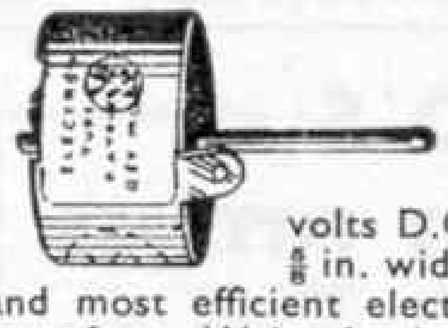

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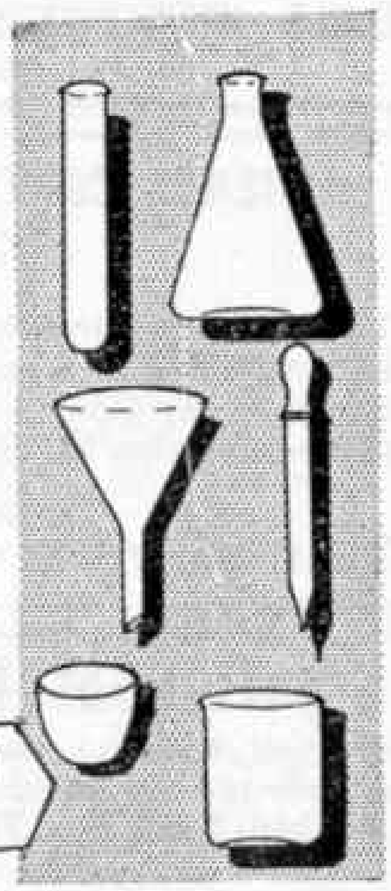

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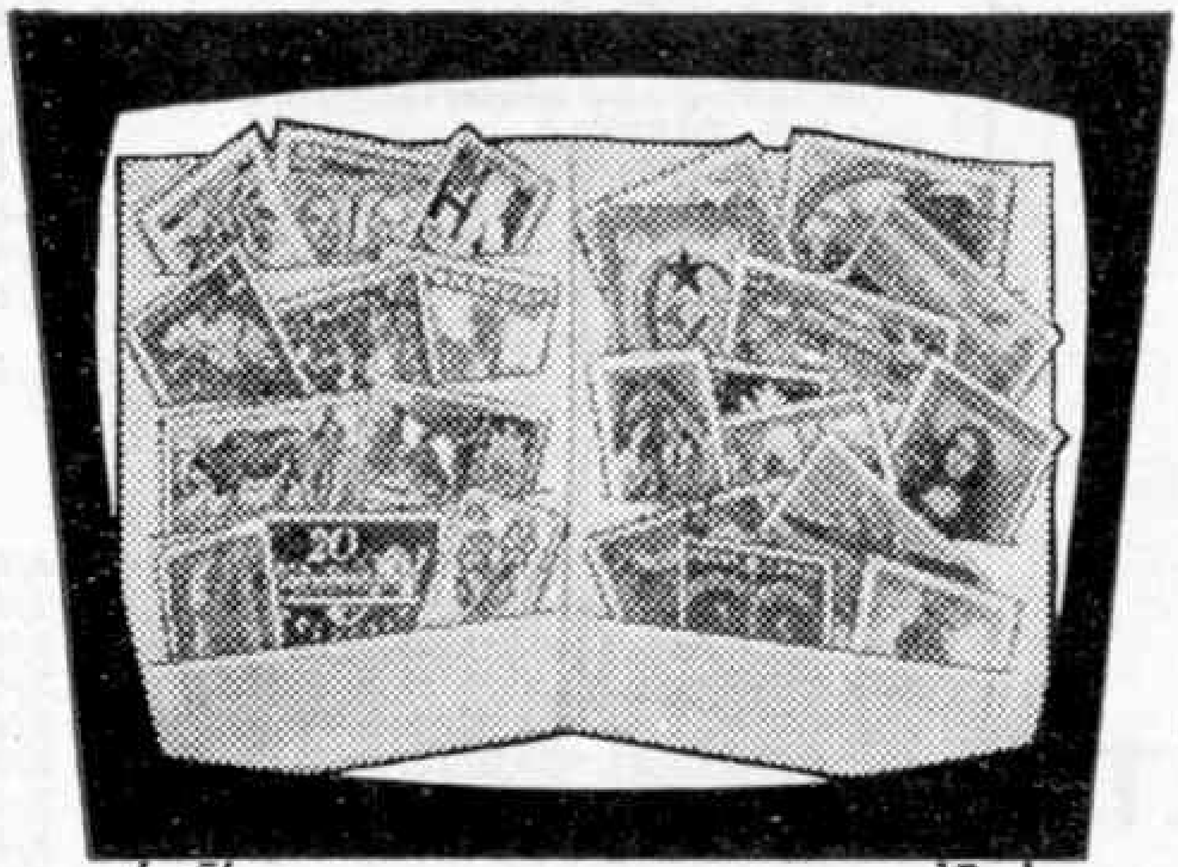

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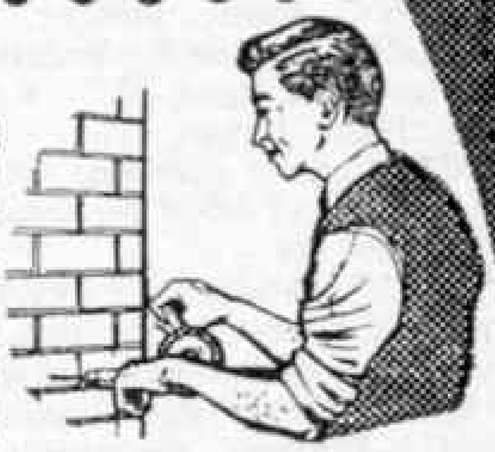

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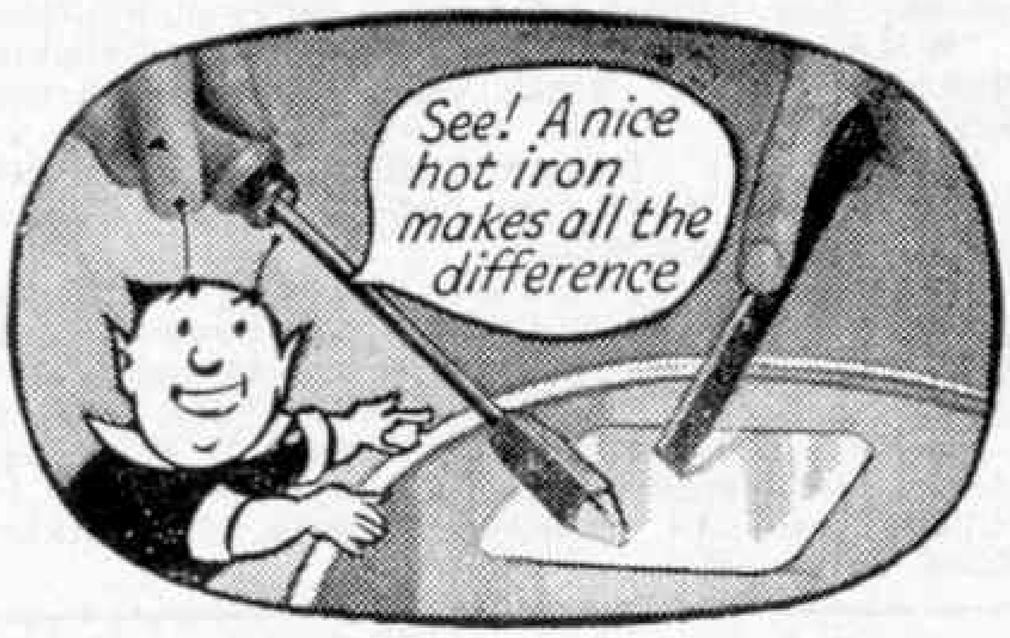

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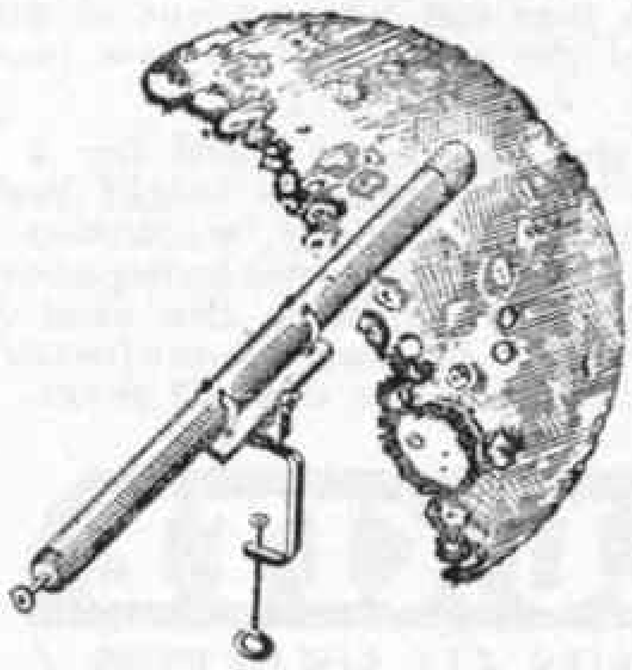

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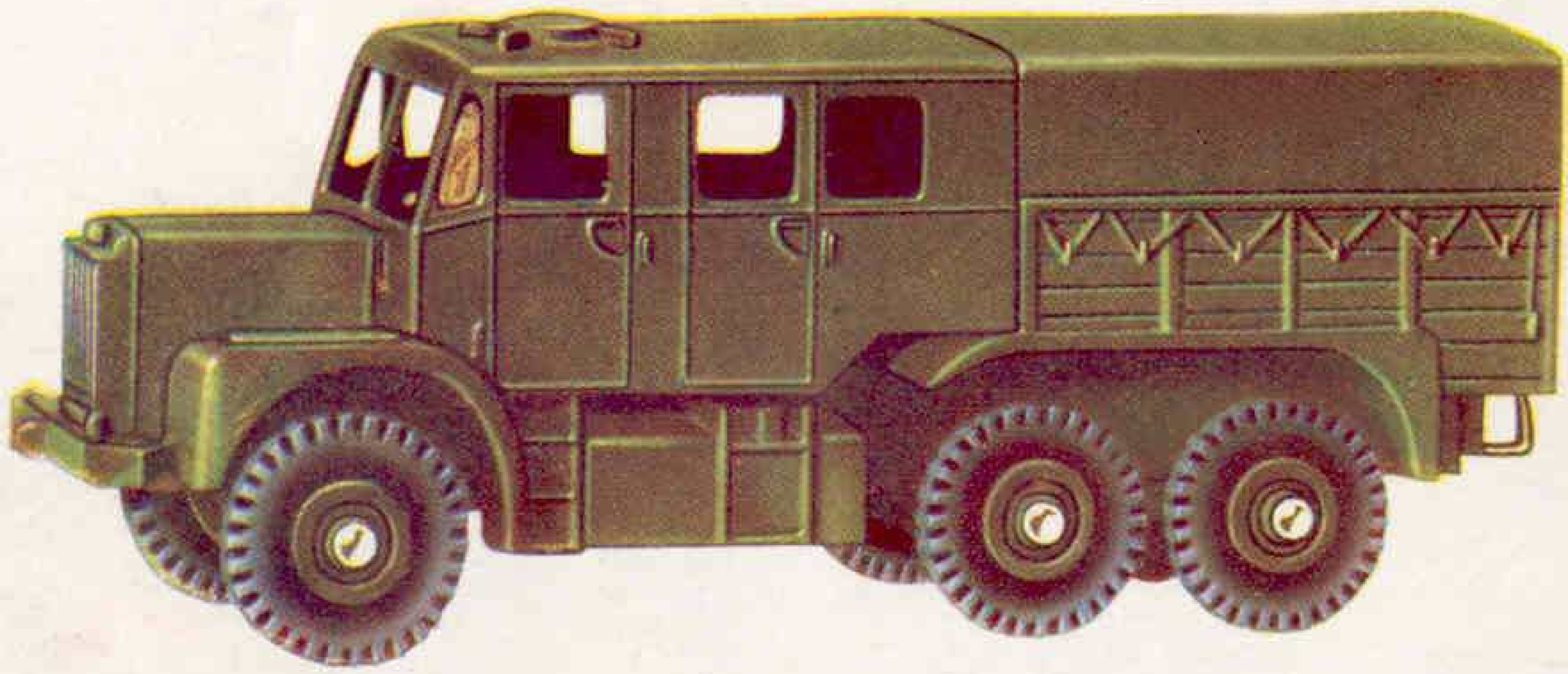

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MODEL OF THE MONTH

TWIN CYLINDER MARINE ENGINE

Illustrated in the November 1957 issue of the Meccano Magazine

Construction of the Engine Bed

Each side of the engine bed consists of a 12½" x 2½" Strip Plate, edged along the top by a 12½" Strip and at the bottom by a built-up girder 1 made from two 12½" Angle Girders overlapped 11 holes. The sides are connected by 5½" x 2½" Flanged Plates 2 and 3 and by a 5½" and two 2½" Strips 4 attached to Angle Brackets.

Two 5½" Angle Girders 5 are fixed to Angle Brackets bolted to the sides, and to each Angle Girder is bolted a Semi-Circular Plate. Two 2½" x 1½" Flexible Plates are curved and are attached to the Girders 5 by Angle Brackets, between the Semi-Circular Plates.

Two 5½" Angle Girders 6 and 7 are bolted to 5½" x ½" Double Angle Strips fixed between the sides of the engine bed. A 1" x 1" Angle Bracket 8 is attached to the Girders 7, and a Trunnion 9 is fixed to the Girder 6. A 2½" Strip 10 is bolted to the Flanged Plate 3 and a 3½" x 2½" Flanged Plate 11 is attached to the Plate 2 by Angle Brackets.

The thrust block 12 consists of two Flanged Sector Plates joined by 4½" x 2½" Flexible Plates and capped by a 2½" x 1½" Flanged Plate.

The Supporting Columns and the Cylinder Block

Each column is a 12½" Angle Girder fixed to one of the girders 1 and bolted to the cylinder block. The sides of the block are each made from two 5½" x 2½" Flexible Plates edged by 5½" and 4½" Strips. Each rounded end consists of four 1 11/16" radius Curved Plates and a curved 4½" x 2½" Flexible Plate, edged as shown in Fig. 3 by four Formed Slotted Strips and a 1½" Strip.

Two 3½" x 2½" Flanged Plates 13 are bolted between the sides at the top, and to them are fixed two 2½" x 2½" Flexible Plates, four 2½" Stepped Curved Strips, and two 3" Pulleys mounted on ½" Bolts. Two further 3½" x 2½" Flanged Plates 14 (Fig. 4) are bolted between the lower edges of the sides.

The Crankshaft, Piston and Valve Assemblies

The crankshaft is in three sections, a 4" Rod 15 mounted in the Flanged Plate 11 and the Trunnion 9, a second 4" Rod mounted in the Semi-Circular Plates bolted to the Girders 5, and an 11½" Rod 16 supported in the thrust block 12, the Strip 10 and the Angle Bracket 8.

A Crank 17 is bolted across the face of a 1½" Pulley 18, and is fixed to one end of the centre 4" Rod. A similar assembly is fixed at the other end of the Rod, and two 2" Pulleys 19 are also fixed to the Rod. A 2" Pulley 20 is fastened to the inner end of each of the Rods 15 and 16, and a Flat Trunnion is bolted to the face of each of the Pulleys 19 and 20 so that the hole in the pointed end of the Flat Trunnion projects outside the rim of the Pulley.

The strap of each valve eccentric consists of two 2½" Stepped Curved Strips connected by two 1½" Strips, and arranged so that the assembly rotates freely in the groove of one of the Pulleys 18. A 5½" Strip 21 is bolted to the ends of two 2½" Strips fixed to the Stepped Curved Strips as shown in Fig. 2. The upper end of Strip 21 is lock-nutted to a Rod and Strip Connector on a Rod 22. The Rod is free to slide in one of the Flanged

Plates 14 and in a $2\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip 23, (Fig. 2), which is attached to the Flanged Plates 14 by Angle Brackets and a Double Bent Strip.

The piston rod slide bars are $5\frac{1}{2}$" Strips 24 attached to the Flanged Plates 14 by Angle Brackets and connected by Angle Brackets at their lower ends to $\frac{1}{2}$" Reversed Angle Brackets 25. The lower ends of the Strips 24 on each side are connected by a $5\frac{1}{2}$" Strip 26.

The piston connecting rods 27 are each made from two $2\frac{1}{2}$" and two $3\frac{1}{2}$" Strips spaced apart at their lower ends by a Collar and connected at the centre by a bolt. A $\frac{3}{4}$" Bolt is passed through one of the Flat Trunnions bolted to the 2" Pulleys and is fitted with two Washers and passed through the lower end of the connecting rod. A Washer is placed on the Bolt, which is then fixed by two nuts in the second Flat Trunnion of each pair.

The upper end of each connecting rod pivots on a $\frac{1}{2}$" Bolt lock-nutted in a Swivel Bearing 28. This is fixed on a Rod passed through a Coupling 29, to which two $2\frac{1}{2}$" Strips 30 are fixed by bolts. A bolt is passed through each Strip, is fitted with a nut and is screwed tightly into the Coupling 29. The nut is then tightened against the Strip to fix it at right angles to the Coupling. Each pair of Strips 30 is fitted with two Double Brackets and these slide freely between the Strips 24 forming the slide bars.

The piston rods are supported inthe Flanged Plates 14 and in Double Bent Strips 31 bolted to the Flanged Plates.

The Driving Mechanism

An E20R Electric Motor is attached to one side of the engine bed by two $1\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips 32. A Worm on the Motor shaft drives a 57-tooth Gear on a 5" Rod supported in a $2\frac{1}{2}$" x 1" Double Angle Strip 33 and in a Trunnion 34. A 1" Sprocket on the 5" Rod is connected by Chain to a 2" Sprocket on Rod 16.

A Screwed Rod is fixed to the Motor switch lever by two nuts, and is similarly attached to a 1" Triangular Plate bolted to a built-up strip 35. This strip consists of a $4\frac{1}{2}$" Strip extended one hole by a $2\frac{1}{2}$" Strip, and it is lock-nutted to a $3\frac{1}{2}$" Strip 36. Strip 36 pivots on a bolt lock-nutted to a Corner Gusset (Fig. 2), and is connected to a Coupling 37 by a bolt locked in the Coupling by a nut. The Coupling is threaded on a Screwed Rod joined to a $1\frac{1}{2}$" Rod by a Rod Connector and a Screwed Rod Adaptor 38. The Screwed Rod and the $1\frac{1}{2}$" Rod are mounted in Angle Brackets bolted to the supporting columns, and are held in position by lock-nuts on the Screwed Rod and a $\frac{1}{2}$" fixed Pulley on the $1\frac{1}{2}$" Rod. By turning a Steering Wheel on the Screwed Rod the Motor switch is operated through the connecting links.

The Flywheel

The flywheel rim consists of four $5\frac{1}{2}$" x $1\frac{1}{2}$" Flexible Plates bolted together so that they overlap by two holes at each of their ends. The rim is attached by 1" x 1" Angle Brackets to $5\frac{1}{2}$" Strips bolted across a Face Plate.

The Inspection Platform

Each side of the platform consists of two $5\frac{1}{2}$" x $1\frac{1}{2}$" Flexible Plates bolted to the $12\frac{1}{2}$" Strips 39 and edged by a $12\frac{1}{2}$" Strip bolted to the lugs of $2\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips 40 and to Angle Brackets. The platform end 41 is made from four $2\frac{1}{2}$" x $1\frac{1}{2}$" Flexible Plates bolted on the outside to two $5\frac{1}{2}$" Strips overlapped four holes, and on the inside to a $5\frac{1}{2}$" and a $2\frac{1}{2}$" Strip overlapped two holes. This end is edged by two $5\frac{1}{2}$" Strips attached to Angle Brackets.

The platform end 42 is made from two $2\frac{1}{2}$" x $1\frac{1}{2}$" Flexible Plates

bolted on the outside to a $5\frac{1}{2}$" and a $4\frac{1}{2}$" Strip overlapped two holes, and edged on the inside by two $4\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips 43. The edge of this end is completed by two $3\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strips joined at the centre by a 3" Strip 44.

The handrail supports are 2" Rods held in the platform by Collars and Spring Clips. The handrails are Rods supported in Couplings and Fork Pieces as shown. One of the side handrails consists of a $6\frac{1}{2}$" and a $4\frac{1}{2}$" Rod joined by a Rod Connector.

The completed platform is attached to the cylinder supporting columns by means of the Double Angle Strips 40.

The ladder is made from two $12\frac{1}{2}$" Strips attached to the platform by an Angle Bracket and a Fishplate, and to one of the girders 1 by means of nuts on a Screwed Rod 45. The rungs are represented by Cord.

The Feed Pump

A Bush Wheel 46 is fixed next to a Collar on Rod 15, and a 2" Strip is lock-nutted to the Bush Wheel and to a 3" Strip 47, Strip 47 is pivoted on a Pivot Bolt and is spaced from a Bush Wheel 48 by a Collar. The Pivot Bolt is held in the boss of the Bush Wheel 48. The Strip 47 is lock-nutted to an End Bearing on a $3\frac{1}{2}$" Rod, which slides freely in a $1\frac{1}{8}$" Flanged Wheel pressed into one end of a Cylinder. The Cylinder is attached to the Flanged Plate 2 by $\frac{3}{8}$" Bolts, but is spaced from the Flanged Plate by two Washers on each Bolt.

PARTS REQUIRED

10	of	No.	1	1	of	No.	18a	2	of	No.	48d
21	"	"	2	2	"	"	19b	1	"	"	51
6	"	"	2a	3	"	"	20	2	"	"	52
5	"	"	3	4	"	"	20a	5	"	"	53
2	"	"	4	1	"	"	20b	2	"	"	54
17	"	"	5	2	"	"	21	10	"	"	59
1	"	"	6	1	"	"	23a	2	"	"	62
6	"	"	6a	2	"	"	24	6	"	"	63
8	"	"	8	1	"	"	27a	1	"	"	77
4	"	"	9	1	"	"	32	1	"	"	80a
1	"	"	10	5	"	"	35	2	"	"	80c
4	"	"	11	289	"	"	37a	8	"	"	90a
33	"	"	12	257	"	"	37b	1	"	"	94
5	"	"	12a	23	"	"	38	1	"	"	95
2	"	"	13	2	"	"	38d	1	"	"	96a
1	"	"	13a	1	"	"	40	1	"	"	108
3	"	"	14	3	"	"	45	1	"	"	109
4	"	"	15	1	"	"	46	2	"	"	111
1	"	"	15a	2	"	"	48	5	"	"	111a
2	"	"	15b	5	"	"	48a	7	"	"	111c
1	"	"	16	2	"	"	48b	1	"	"	116
5	"	"	17	2	"	"	48c	1	"	"	116a

4	of	No.	125			
2	"	"	126			
4	"	"	126a			
1	"	"	147b			
2	"	"	165			
1	"	"	166			
1	"	"	173a			
1	"	"	185			
8	"	"	188			
8	"	"	189			
2	"	"	190			
4	"	"	191			
4	"	"	192			
2	"	"	197			
8	"	"	200			
2	"	"	212			
2	"	"	213			
2	"	"	214			
8	"	"	215			
1	"	"	216			
1	E20R(S)	Electric	Motor.			