VOL. XLIII No. 4 APRIL 1958

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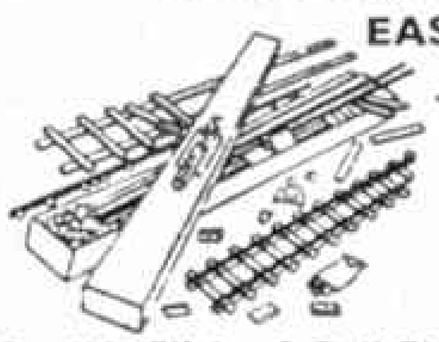

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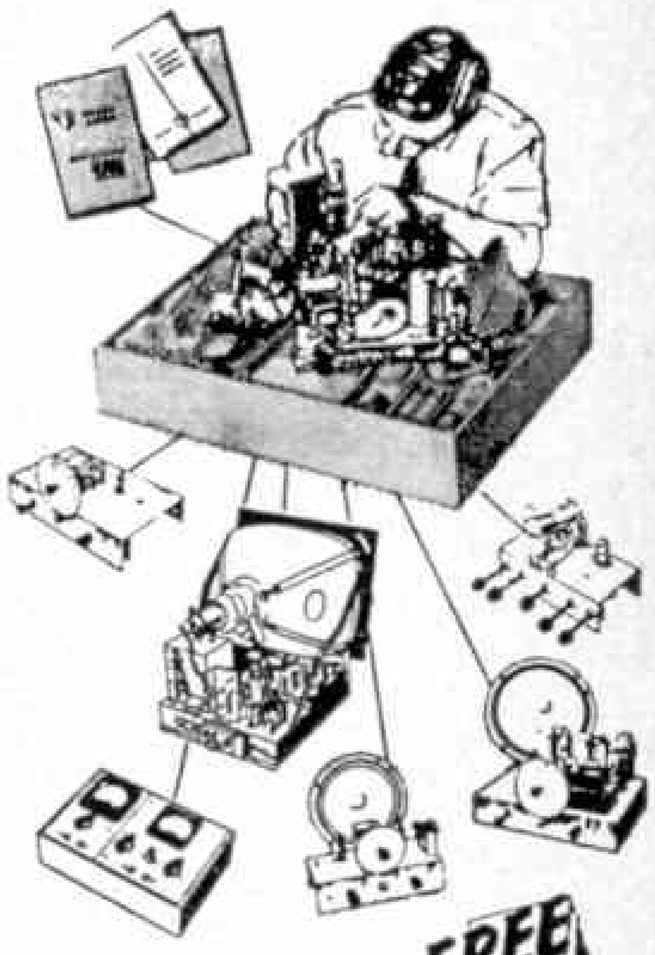

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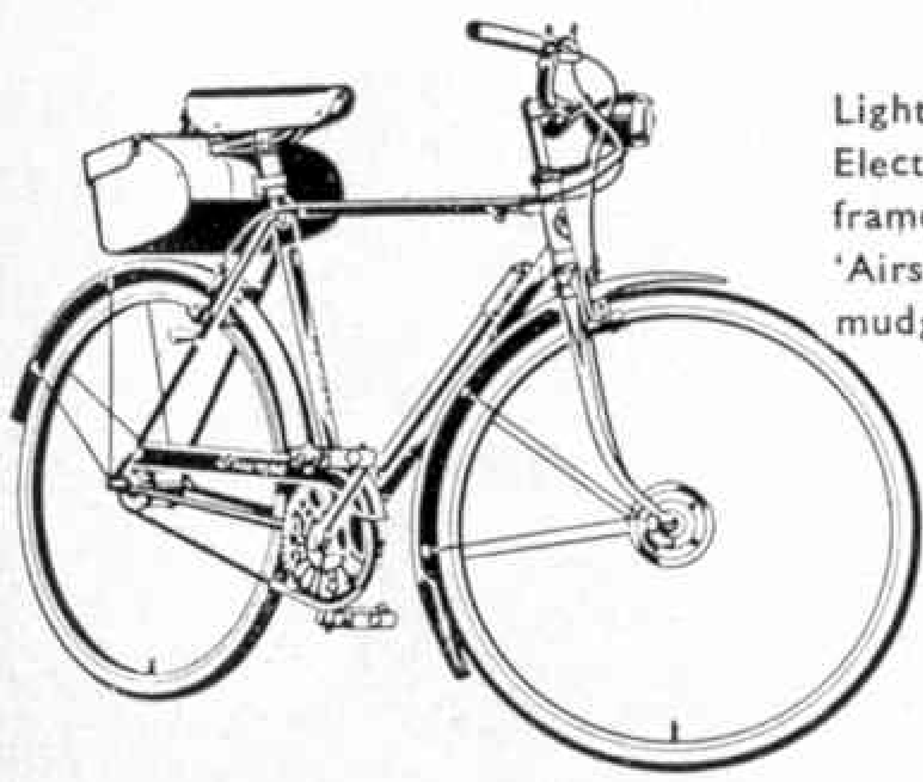

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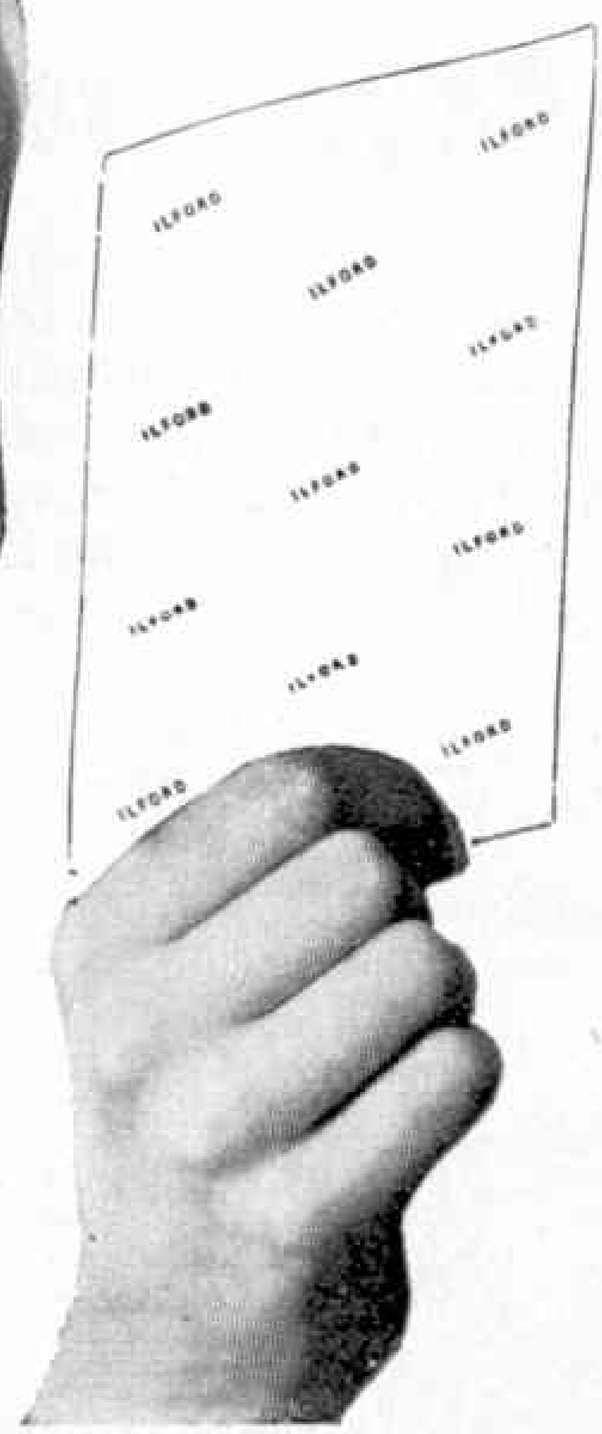

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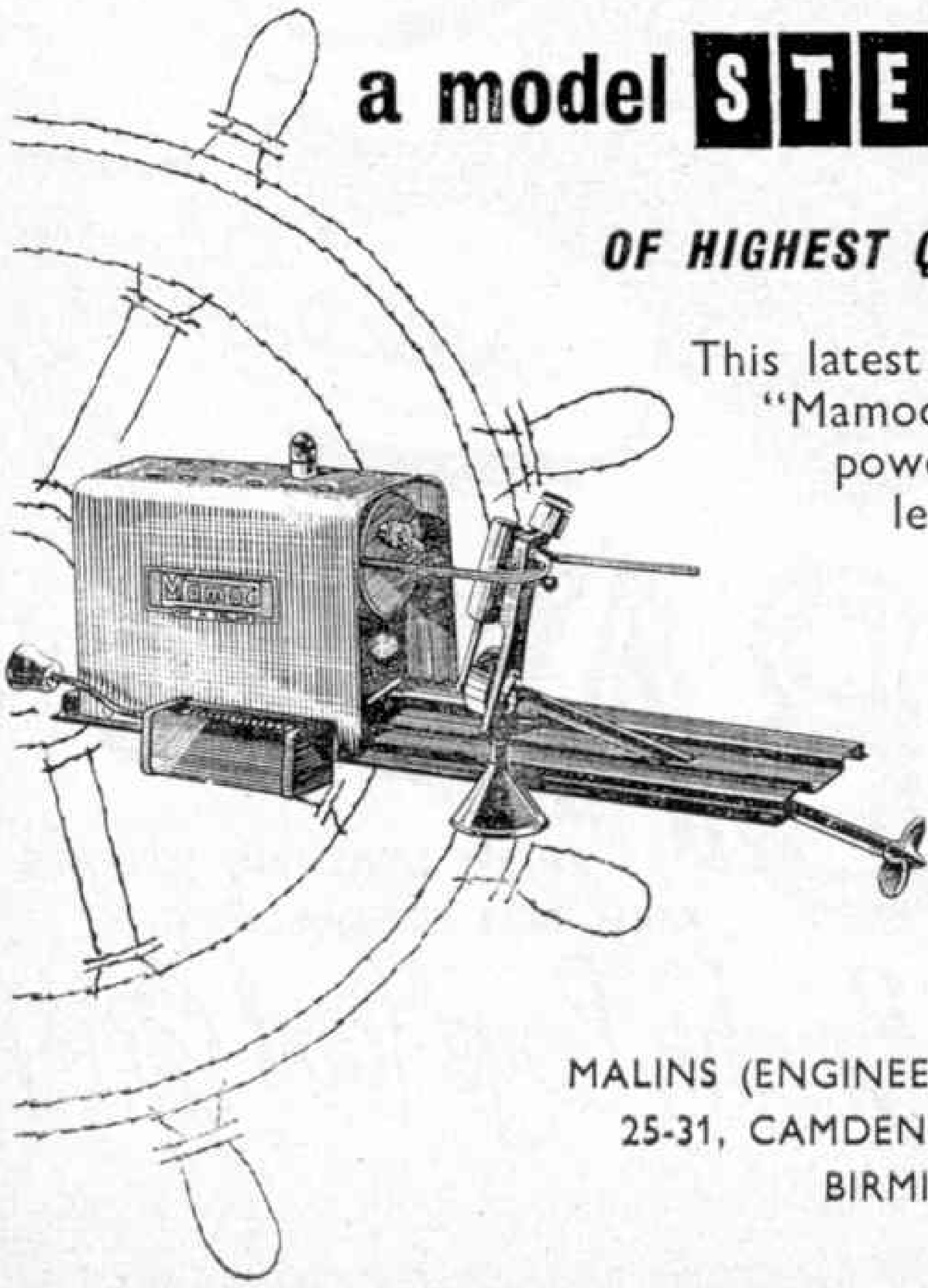

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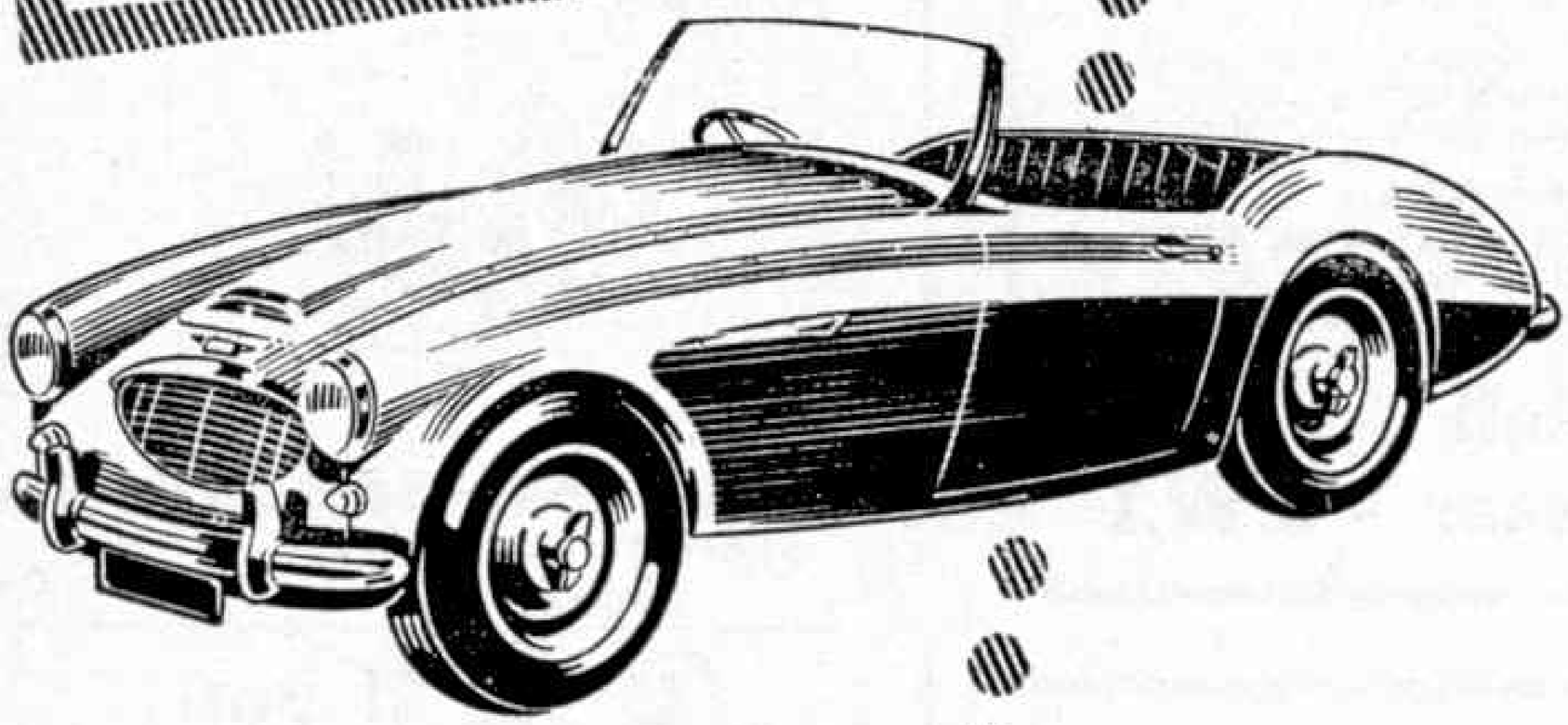

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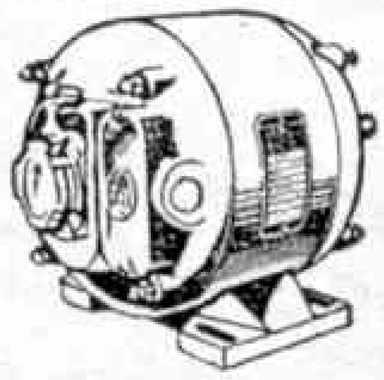

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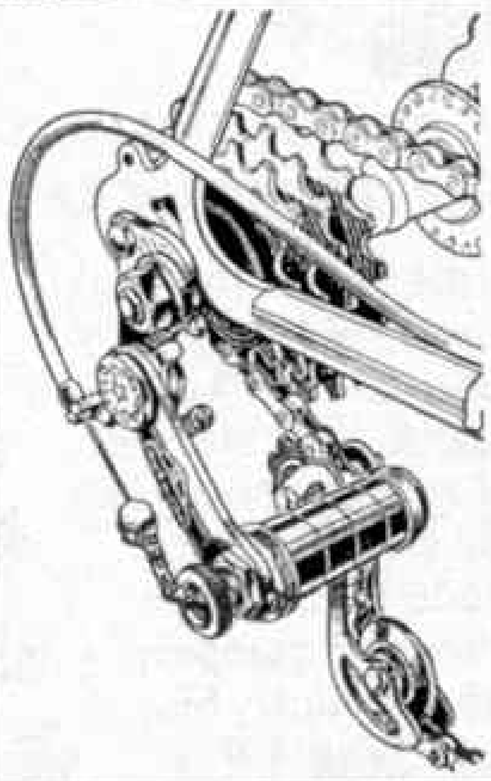

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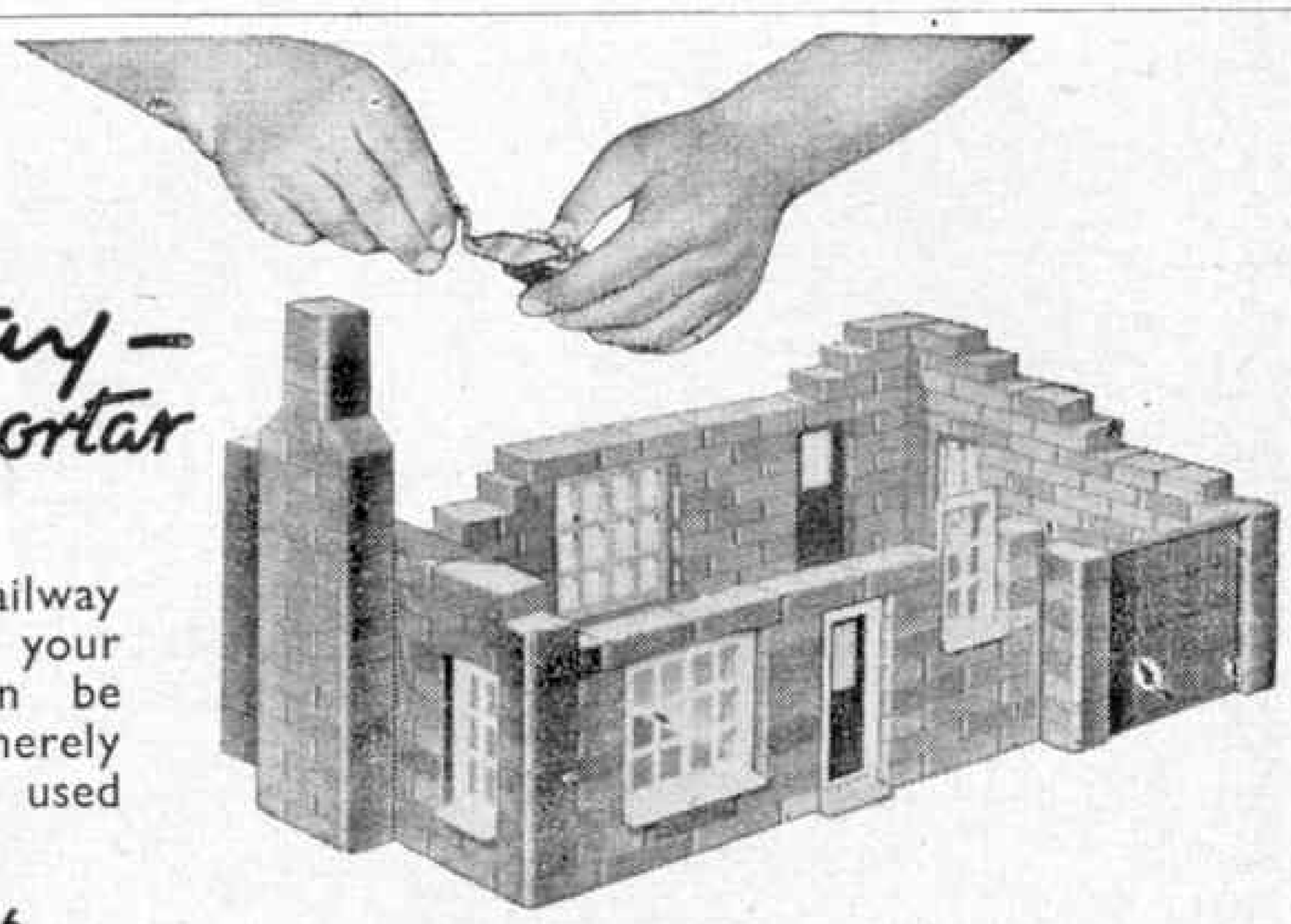

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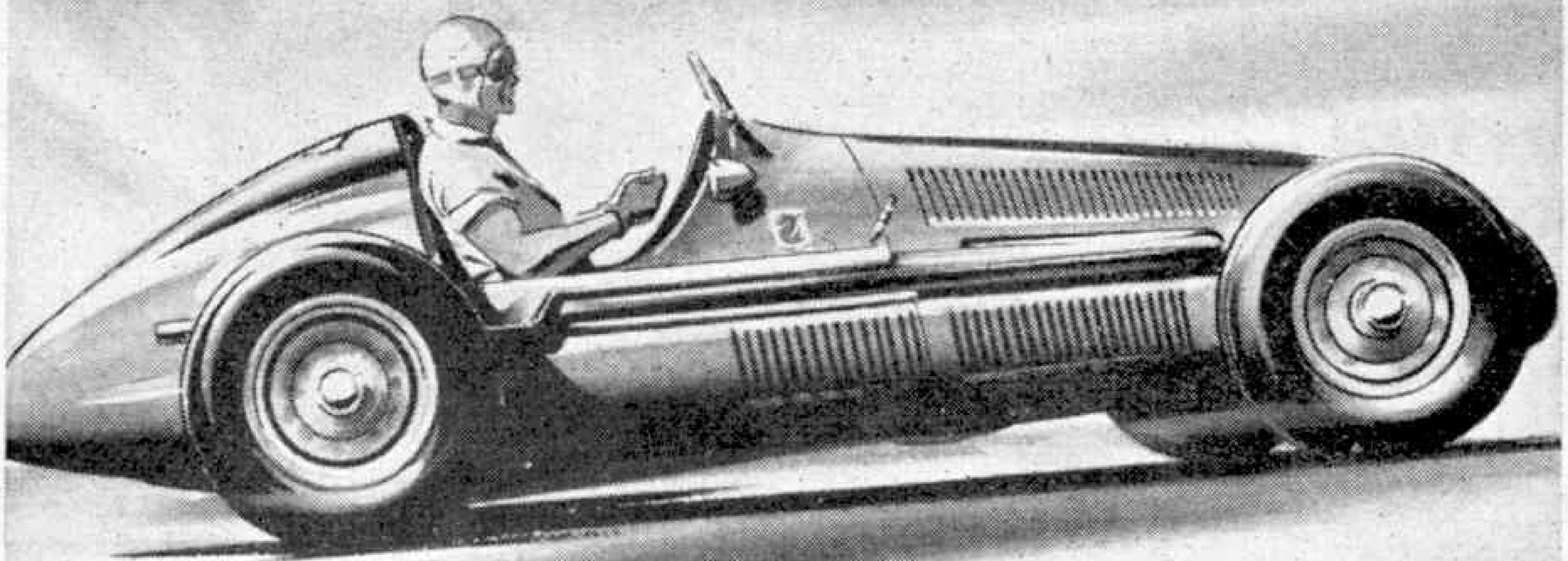

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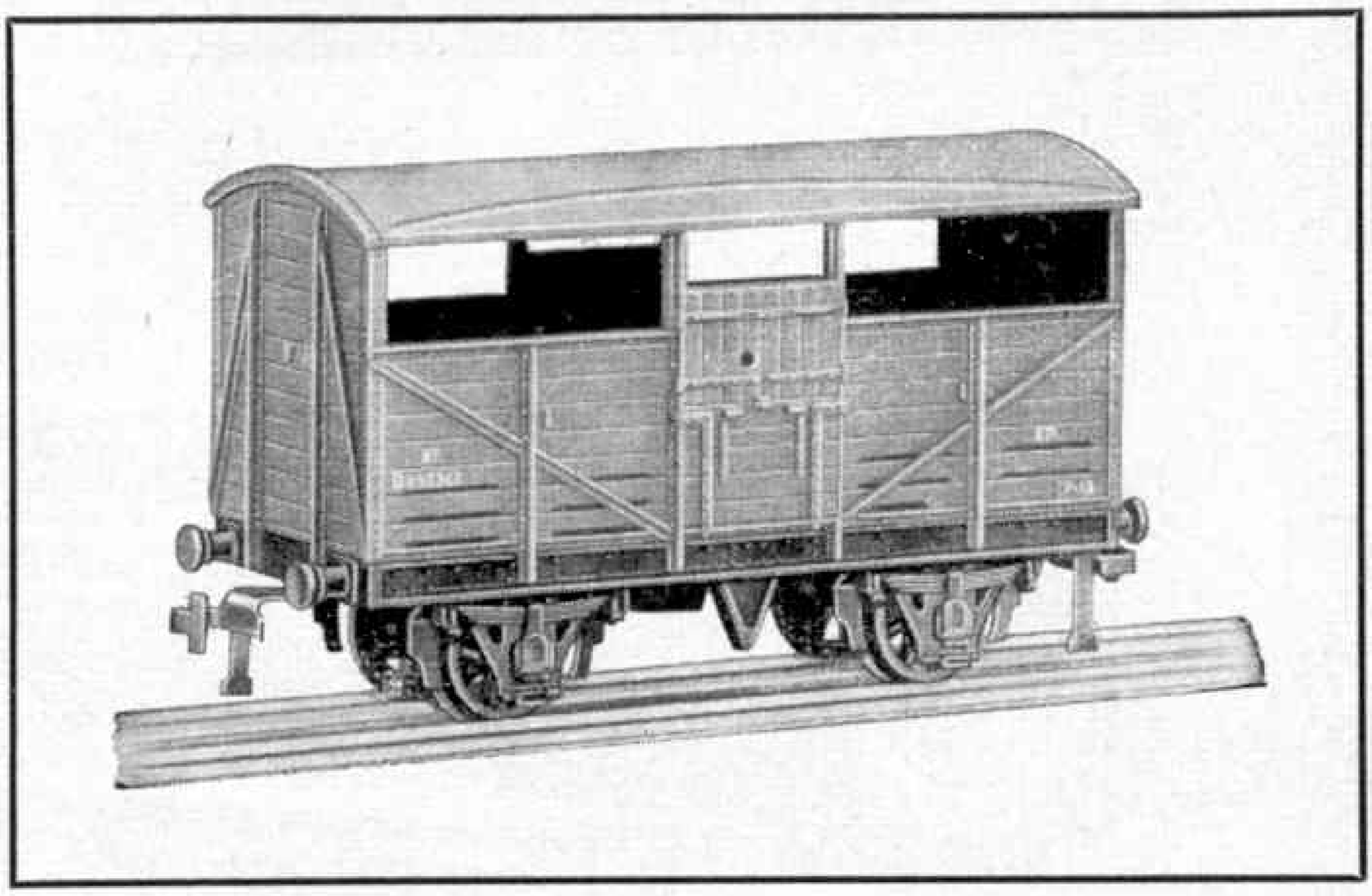

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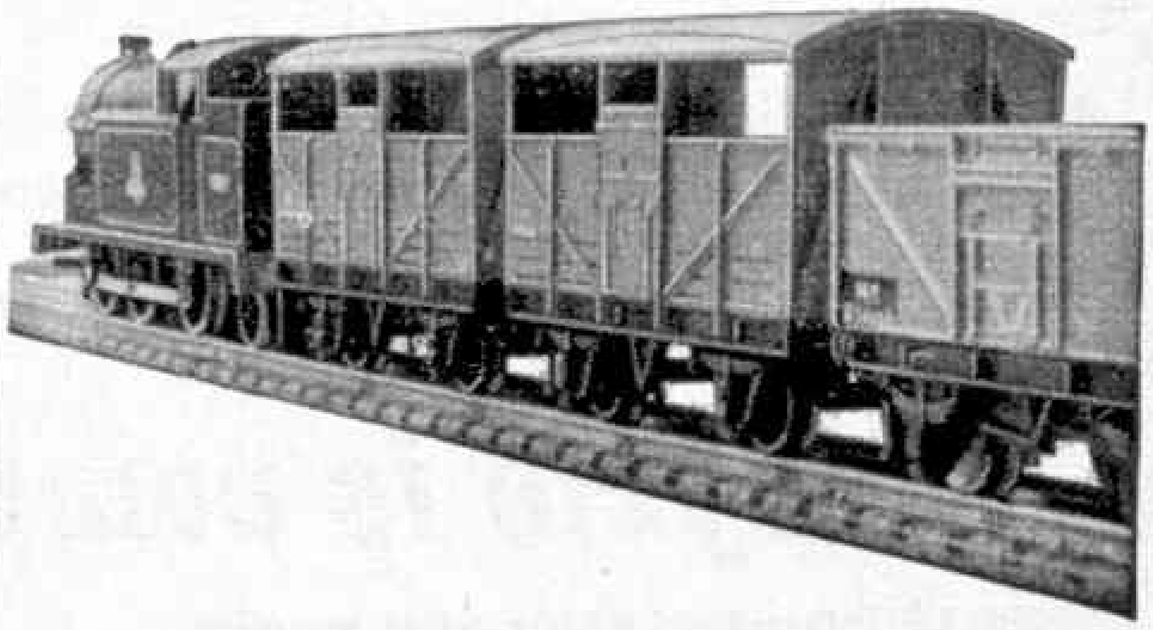


Made in England by Meccano Ltd., Binns Road, Liverpool 13

Next Month: "COCKNEY BUTTERFLY." By L. Hugh Newman

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool 13
England

EDITOR : FRANK RILEY, B.Sc.

Vol. XLIII
No. 4
April 1958

Astronomy from an Armchair

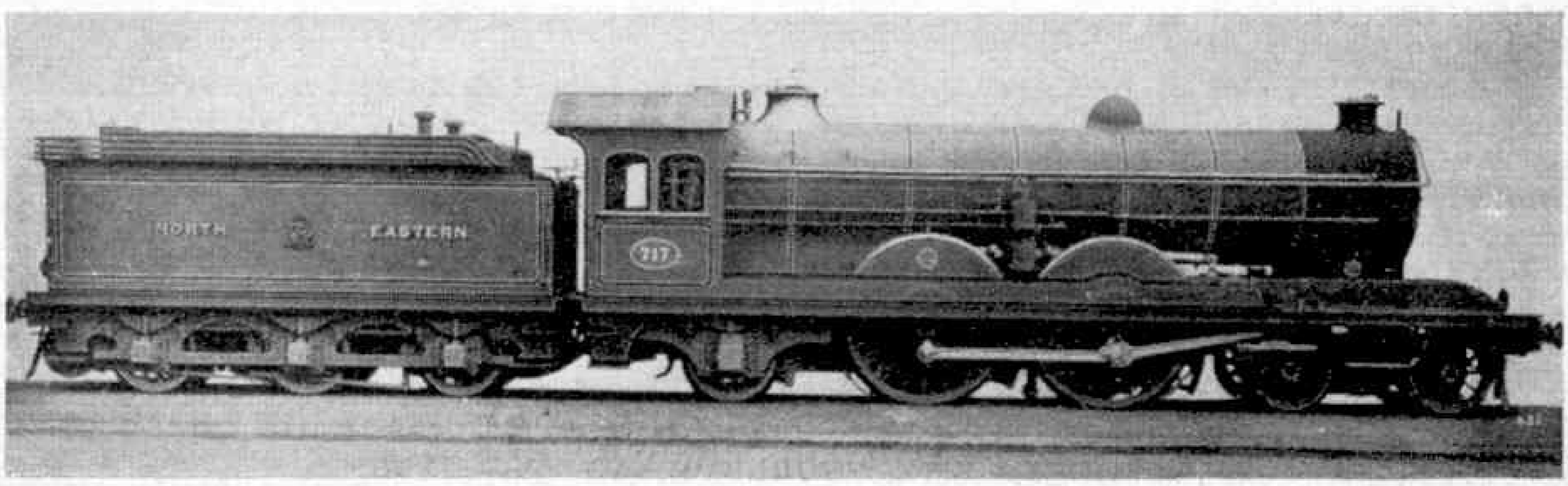
Astronomers have often been pictured as leading hard lives, staring skyward through crude telescopes in the cold hours of the night. This picture is rather misleading. The telescopes of today *are* used at night, but their chief work appears to be concerned with the photography of planets, stars and nebulæ, and with such things as the recording on photographic plates of the spectra that tell us so much about the heavenly bodies. At one time others interested in the night sky, those for instance who built for themselves small reflecting telescopes, did have to work the hard way, as the old astronomers must have done, and no doubt many enthusiasts still do. But now it is possible for thousands who do not have any instruments at all to study the stars and to do this easily and comfortably from armchair seats.

For this purpose they can visit a planetarium, a kind of theatre in which the ceiling takes the form of a dome on to which points of light representing heavenly bodies are projected. And they can see on the dome the skies of regions distant from their own, those of the past and even those of the future. Now a planetarium that in all respects is the finest of all has been established in London, and you can read about this on page 178 of the present issue.

Next look at the picture at the foot of the page. Most of you have never seen the locomotive it shows, but it is one that in its day was second to none for speed, and for smooth and easy running. An article in next month's *M.M.* by a former L.N.E.R. engine driver who had considerable experience with locomotives of its class, the Z Atlantics of the old North Eastern Railway, relates some of his experiences with these magnificent engines.

Is there any chance of the construction of a tunnel under the English Channel? Well, you can perhaps answer this question as well as I can, but see what the author of an article on this topic in next month's issue has to say. That issue will also include a contribution on spotting at London Airport, and on the many changes that the next year or two will bring there.

The Editor



A locomotive of a class that in its day earned a great name for speed and easy riding. It is No. 717 of the Z Atlantic class of the former North Eastern Railway, on which it hauled famous East Coast Route expresses between York, Newcastle and Edinburgh. B.R. (N.E. Region) photograph.

Exploring the Great Orme

By E. Emrys Jones

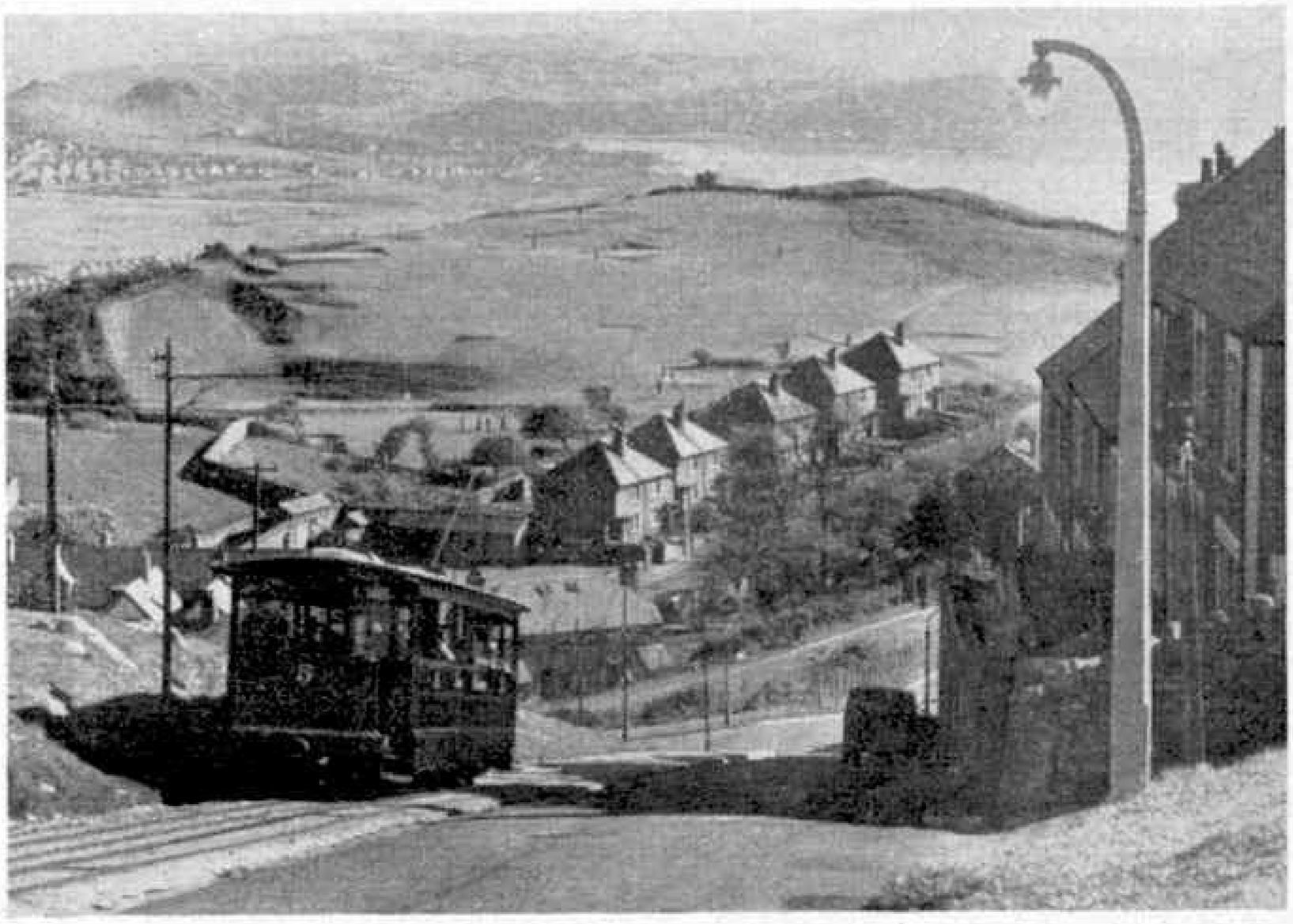
DIVIDING Conway Bay from Llandudno is a huge but fascinating lump of carboniferous limestone—the Great Orme. It is 2½ miles long and ½ mile wide, and rises to a height of 697 feet above sea level. A more picturesque description is that from Conway Mountain it looks like a huge whale floating on the placid water. There is indeed nothing quite like it in the whole of Britain. It is the highest mass jutting out to sea that can be found round Britain's coasts.

Stone Age man lived on the Orme, and the Romans mined copper there. Today you will find farms on the summit and sheep roaming about the crags. Also, of course, thousands of visitors, because the Orme provides health and relaxation to the many who come from industrial centres to enjoy the healthy sea breezes and the gardens that abound there.

You can easily walk to the top—there are many roads and footpaths within easy reach of Llandudno itself, because the Orme comes down steeply to Llandudno's promenade and shopping centre. You can also go up by means of a special bus, but the most popular way by far is to climb it by means of the Great Orme Railway. This is a cable railway in two sections, one opened in 1902 and the other a year later. Half way up is the power house containing the engines that provide power for the drums round which the cables that operate the cars wind and unwind. There you change cars, for the summit is reached in a second vehicle. The height of the terminus is 650 feet, so from there you have not far to climb to reach the summit of the Orme.

The total length of the railway line is a little over a mile. The gradients of the lower section are much stiffer than those of the upper one. The *average* gradient of the lower part indeed is 1 in 6, with a steepest section of 1 in 4.7. The upper section is comparatively easy, the worst part being at only 1 in 8.

The track of the lower section, which is of 3 ft. 6 in. gauge, consists of heavy steel rails laid on longitudinal sleepers. These are well bolted and fastened down with tie rods to the special rails that form the lips of the conduit inside which the cable runs along suitable rollers and pulleys. Both the line and the conduit rails are embedded in concrete. The upper section rails are laid in the same way, but in this case no conduit is needed because the track is on private land.



Climbing the steepest gradient on the lower section of the Great Orme Railway. Our cover this month, based on a photograph by the author of this article, shows a similar scene in colour.

At the engine house there have been since the opening two colliery-type steam winding engines, one of 120 h.p., for the lower section, and the other of 60 h.p. for the upper section. So the winding engine for the upper section is at its lower end, the upper section cable being endless. The line is single except for the passing places midway, and certain other sections.

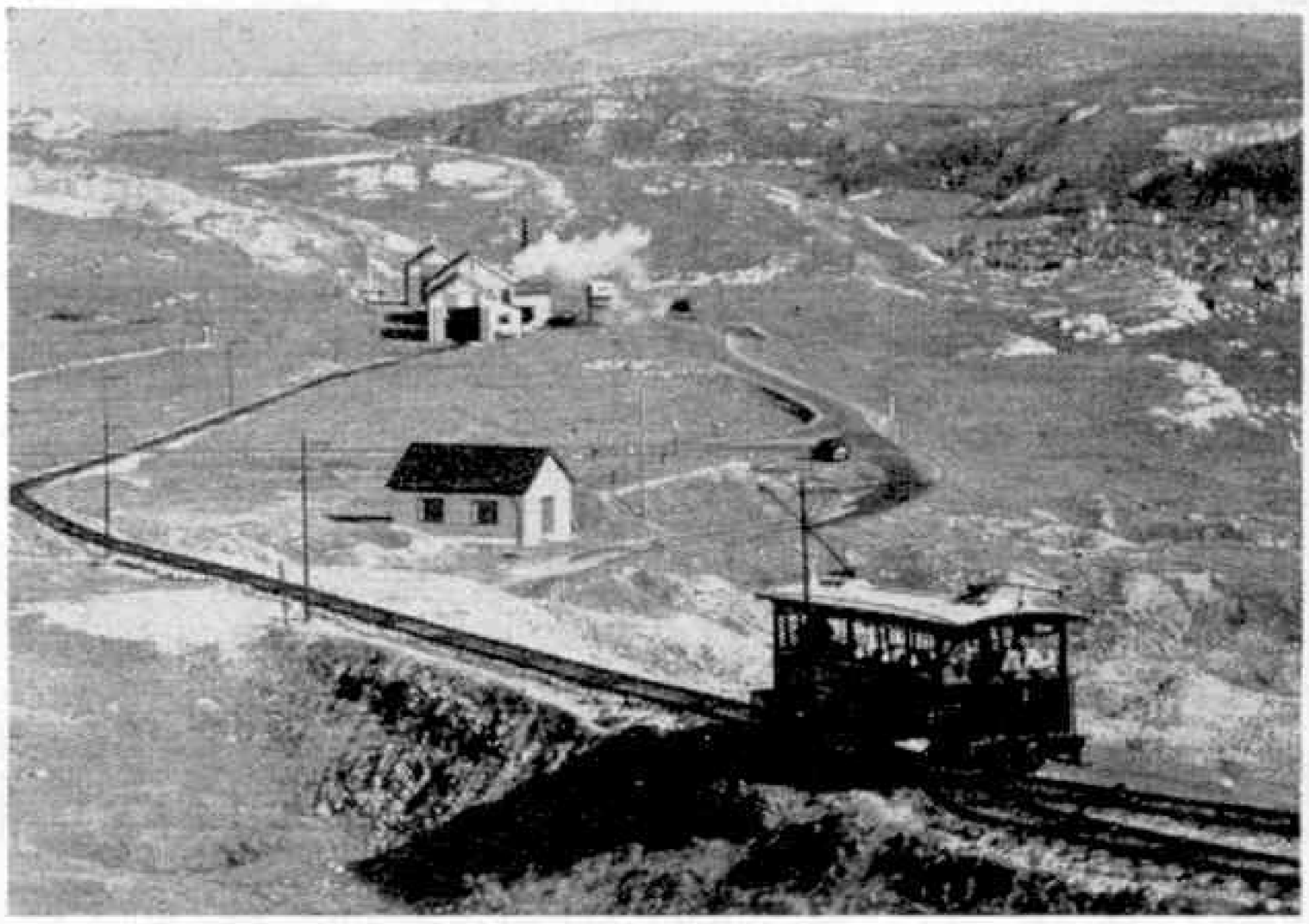
The railway is now to be electrified and it is hoped to complete the change in motive power by Whitsuntide, after which the holiday season gets into full swing.

The cables are of plough steel, with hemp cores, and are tested to a point much in excess of the normal working strain of such cables. Together with an extremely powerful braking system, they make the railway a very safe one. The cables used on the lower section are $1\frac{1}{4}$ in. in diameter, while on the upper section the diameter is only $\frac{7}{8}$ of an inch.

There are four cars, painted dark blue with white roofs and lettering, and fitted with wooden seats with reversible backs. At each end of the car is a platform. A communication system is in use, consisting of an overhead trolley—often mistaken by locals and visitors alike for the current pick-up which we see on electric railways—with its light section wire, a bell and telephone system.

During the summer season over 100,000 passengers are carried by this unique railway, and at its height there is a service every ten minutes or so. Along the route there are many houses built on really steep hills. The locals who live in this part of Llandudno find the railway a boon and a blessing, as indeed do the visitors.

There is also a bus service going as far as St. Tudno's Church, which is not near the actual summit, although within easy walking distance of it. There are two large buses and two small ones. The former cost some £3,000 each and have a Foden chassis, the body-builders being Messrs. Metalcrest, Stoke-on-Trent. The engines are 102 b.h.p. Gardiner diesels. There is a safety device in the form of an extra brake, that is, a ratchet brake is fitted to the rear wheels. This is engaged when the bus is ascending the steep hills, and would prevent the bus from running backward if the ordinary brake failed.



The upper portion of the Great Orme Railway, and the road to the summit.

The two large buses have five forward and two reverse gears, an extra low gear being fitted. This extra low is often referred to as a "super low." The two original buses commenced this service in May 1951, and in 1954 they were joined by two smaller vehicles. These carry 25 passengers each, and are fitted with 57 h.p. Gardiner 4 cylinder diesel engines. They have the orthodox gear box of 4 forward and 1 reverse gears, and also have a special ratchet rear wheel brake fitted to the back wheels in addition to the standard brakes.

Now, what would we see if we went up the Mountain, as

The Orme dominates the Llandudno scene.

Llandudno folk say? The answer is the glorious panorama of the mountains of Snowdonia. Snowdon cannot be seen, but one can see Carnedd Llewelyn, the next largest mountain, which is only a few feet lower than Snowdon itself, together with dozens of the other peaks that make up Snowdonia. Below us is Conway Bay, Puffin Island and Anglesey, and on clear days, one can see the Isle of Man, the Lake District mountains and even the Wicklow Hills of Ireland. This wonderful view alone is well worth the trouble of climbing the Orme, with the interest of the bus or railcar journey thrown in.

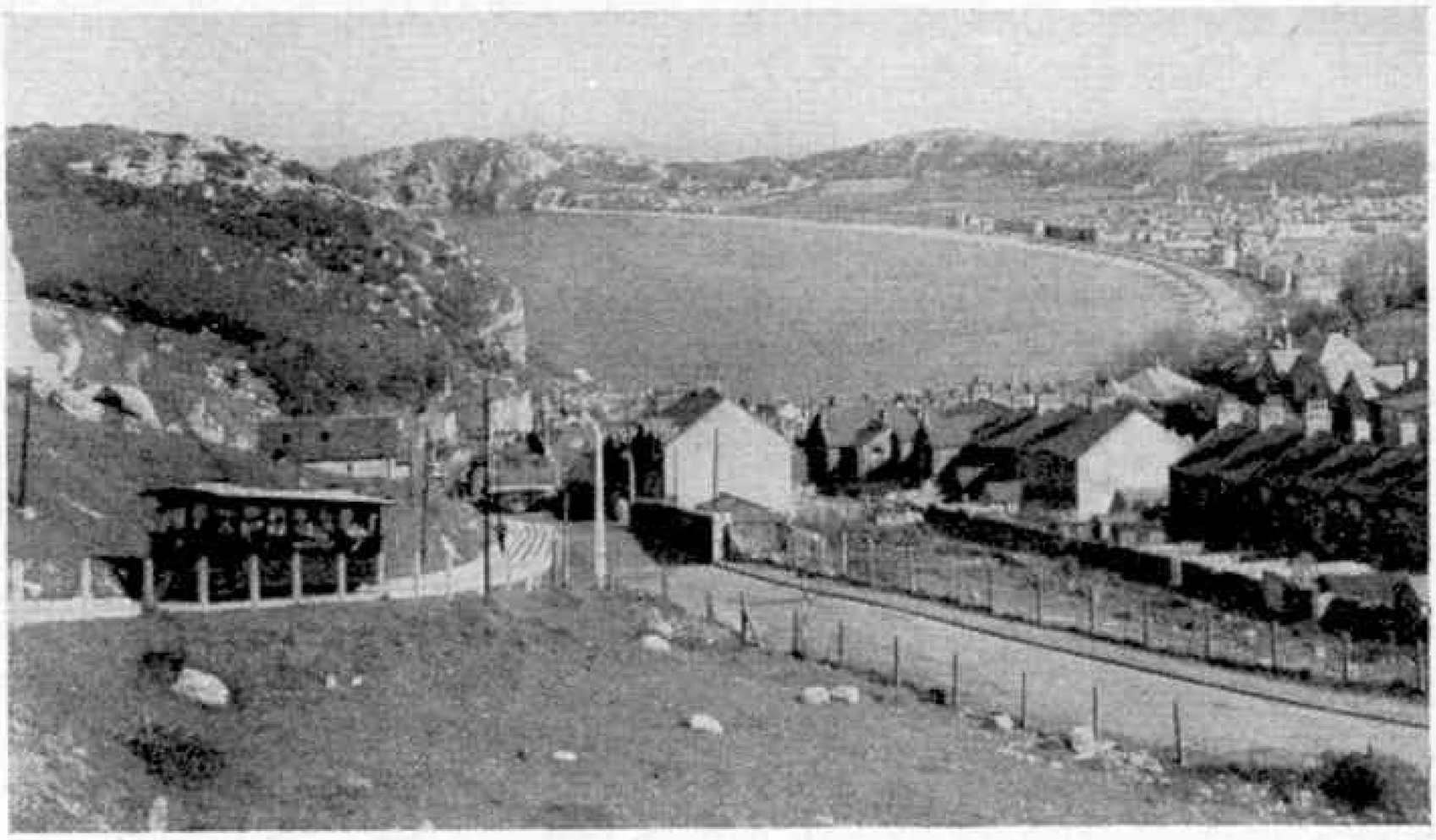
There is an hotel on the Orme. Many years ago it was a telegraph station maintained by the Trustees of the Liverpool Docks. Signals passed on from Puffin Island to the Orme, on to another station above Colwyn Bay and so on, allowed track to be kept of shipping between Holyhead and Liverpool.

Among other interesting things to be seen there as one roams over the Orme is St. Tudno's Church by the bus terminus, and only a short walk from the summit. This dates from the 12th Century, and is dedicated to the patron saint of Llandudno. St. Tudno was an early Christian missionary who was said to possess a whetstone that would readily sharpen the sword of a hero, but would destroy the weapon of a coward.

In the years between 1835 and 1848, three mines on the Orme provided between them £240,000 worth of copper, but today only their ruins are to be seen. The Romans also worked the mines, and the fact that pre-historic man lived on the Orme is proved by the many bones and teeth of neolithic men and animals that have been discovered there.

The Rocking Stone is said to be of Stone Age origin, but historians say that the Druids used it. When these powerful Druids held a trial (in pre-Roman days) it was staged by the Rocking Stone, in the Llandudno district. If perchance the jury could not arrive at a decision, then the prisoner would be blindfolded and led to the stone. If he could rock the stone with one touch of his hand, then, according to legend, he would be freed, if he failed to do this, then he would be thrown down the steep cliff nearby.

The Marine Drive, which goes right round the Orme, is well known to all who have visited Llandudno. It was built in 1875 at a cost of about £12,000 to replace a narrow path. It is five miles long. Halfway round is the castellated lighthouse, and below the drive are many caves, to explore which a boat would have to be hired from near the pier. One of the best known of these is the Hornby Cave, so named after a brig from Liverpool had been wrecked close to it.



Looking down on Llandudno Bay, which stretches in a wide sweep from the Great Orme to the Little Orme, seen here in the distance.

I hold the view that a visitor to Llandudno should go at least twice up the Orme, once by bus and once by rail, because each one in its own way is quite an experience. Although you can also go up in your own car, there is nothing quite like the thrill of these two excellently run public transports. Take my tip and try them both!

Incidentally, there has been a real need for buses to supplement the Orme Railway service. The housing estate on the Orme is a very large one, and added to that is the fact that the tourist trade is increasing annually in this very popular resort. In other words more and more people are going up the Orme.

As soon as the railway starts running I shall be first to be on it. Then I will linger until the very last Great Orme bus leaves—as usual I shall make a mad dash for it—because I enjoy every minute of my stay on Llandudno's wonderful Orme.

Keeping An Eye On London Buses

By

the Editor

A driver points to the reflector on the side of his bus that will tell the control centre where it is when in service. Photograph by courtesy of London Transport.

THE eye is an electronic one. It is obviously a very good thing indeed if the operating department of the London bus services can get a complete picture of the running of the 7,000 buses that are in service on its 500 routes. The problem was to find some way of tracing the buses so that it could be known at any instant just whereabouts each was. Many different schemes were considered, and in the end a comparatively simple electronic way was designed.

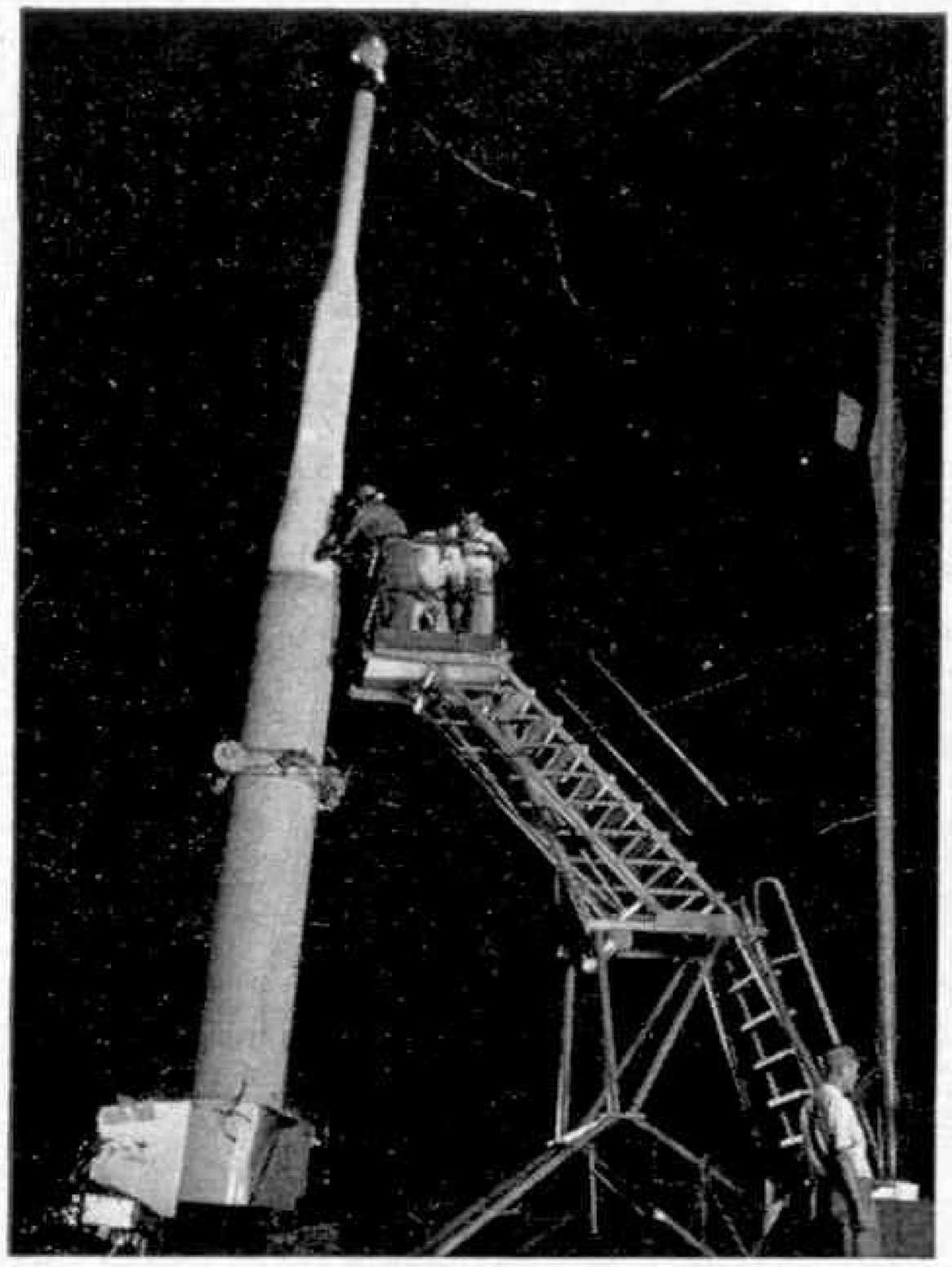
To see how the scheme works suppose we start from a bus. To enable it to give the control centre an indication of its whereabouts a plate fitted with reflectors of the cat's-eye type is fixed on the side of the bus, as shown in the picture on this page. The reflectors on the plate are in a kind of code that gives the actual number of the bus. Check points are established along each route, and these light beams can read the number of the bus and transmit this to the control centre, where it is shown on a panel and is also recorded on a chart.

When the bus passes on to the next check point, its number is transmitted again to the control centre, and appears on another panel, the record on the previous panel being automatically cancelled. With all the buses along the various routes doing this, there is a picture on the panel at the control centre that gives approximately the position of each bus.

Now let us see how the indications of the bus numbers are transmitted to the control centre. At each check point the equipment for this is mounted at the same height as the bus plate, and as near as possible to the roadway. In it is a source of light that is focused on to the plates of the buses as they pass. The beam reflected from the plate is then made to fall on a photo-electric cell. This of course generates a current, and it is this signal that is passed back to the control point through the wires of the private telephone system of London Transport. There the incoming pulses of current operate relays that build up the number of the bus and cause the actual running number to be illuminated on the check point display panel.

The plates and scanners are placed high up to avoid interruption to the beam of light that starts the sending of the signal, say by people passing to and fro. The scanner also is designed to reject all signals other than those passed back to it by the reflectors, so that it is not affected by the gold lettering and other reflecting vertical lines often seen on vans and other trade vehicles.

At the time of writing the Bus Electronic Scanning Indicator, or B.E.S.I., as it is known, is in its early development stage, and no doubt many improvements will be made as experience is gained. The end to be achieved by its use is an improvement in service regularity.



Making final preparations for firing the Lockheed X-17 at Patrick Air Force Base, Florida. This rocket has been specially designed for trying out nose cones in efforts to develop war heads and satellites that will return intact to earth. Lockheed photograph.

Space Notes

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

Explorer, the First American Satellite

THE collective sigh of relief that went up from the citizens of the United States when the first Explorer was successfully launched must have been almost audible on this side of the Atlantic! Explorer is not a separate satellite, as is Vanguard, but is the final stage of the launching vehicle. It carries a payload of about 18 lb., and is therefore considerably larger than the tennis-ball size satellite that the first two Vanguard vehicles were carrying. Its orbit is very much higher than either of the Sputniks—about 1,800 miles maximum and 230 miles minimum.

Information on air density obtained from Sputnik I relates only to lower altitudes and so it is impossible to calculate the lifetime of Explorer with any accuracy, but it is safe to say that it will stay up for several years. It carries two radio transmitters, which are sending back information on cosmic rays and the minute meteors that are hitting the satellite. One of these transmitters is expected to work for 2–3 weeks and the other, at a much lower power, for several months.

Perhaps the most amazing thing about Explorer is that only four months were needed to produce it after the go-ahead signal was given. This is because, as far as possible, standard rockets and equipment were used in its construction, and extensive testing and development were not needed.

The first stage is a Redstone ballistic rocket using liquid propellants, and the remaining three stages are made up from solid propellant Recruit rockets. Fifteen Recruits are used altogether, the final stage consisting of a single rocket.

More Explorers are to follow and, although the two attempts to date have ended in failure, further efforts to launch Vanguard satellites are also to be made.

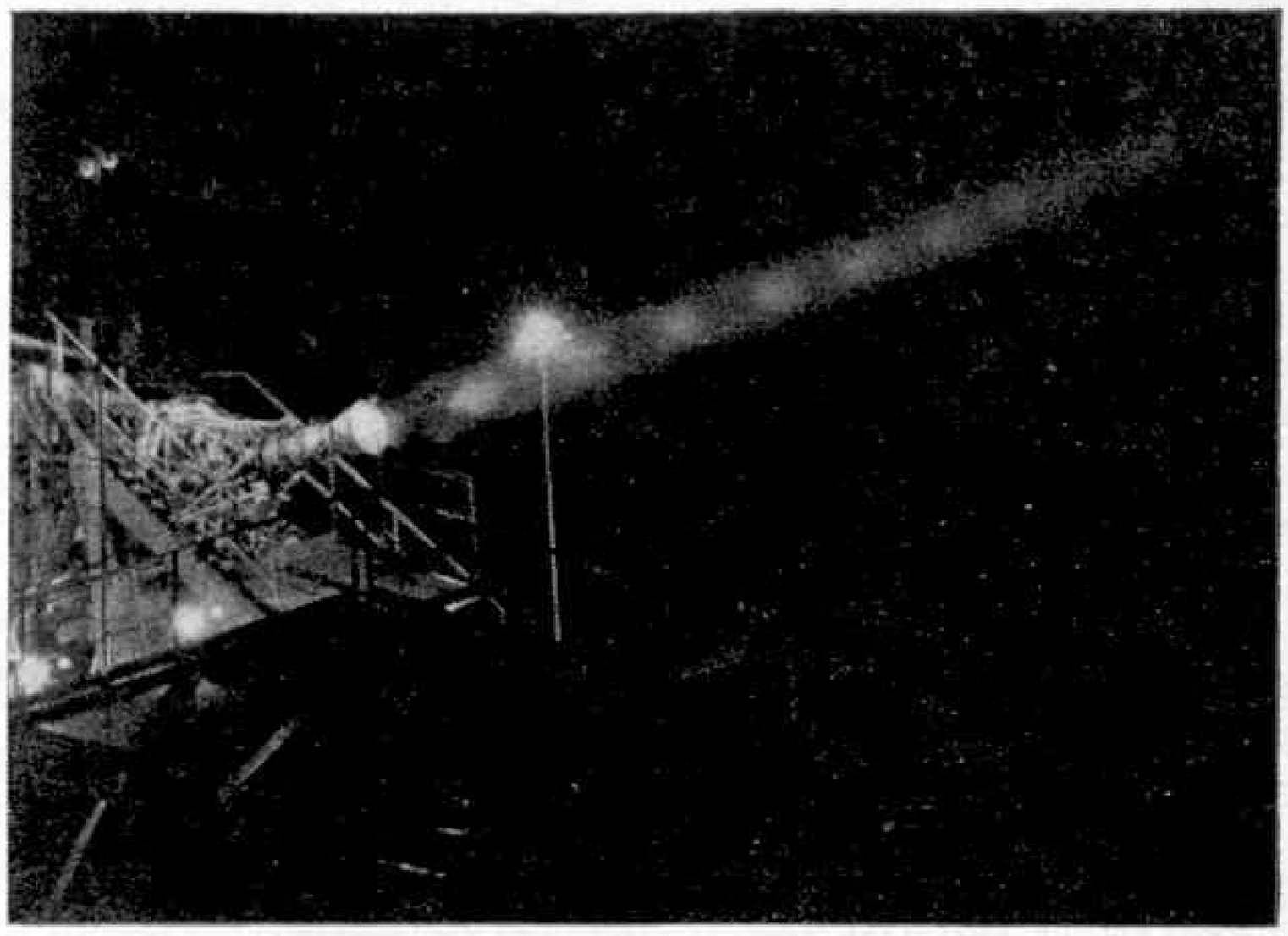
Testing Large Rocket Motors

One thing common to all satellite launching vehicles is a large first stage with a really powerful liquid-propellant rocket motor. Developing and testing such motors is very much a specialised business. Rocket propellants are potentially high explosives, and in the early phases at least of testing a new design special testing emplacements must be used and rigid safety regulations observed.

Some figures for the Redstone may give some idea of the scale of these motors. Redstone develops about 85,000 lb. thrust at sea-level, which is over four times as much as that of the largest aircraft jet engine. To produce this it consumes 40 gallons of propellants per *second;* the cost of these propellants is about £5 per second. In flight the horse power developed by the jet reaches over one million! If a large missile fails in flight it means a complete loss of perhaps hundreds of thousands of pounds.

The large test stands required for these motors are erected far out in the country—most of those in the United States are in deserts and mountainous country—and a very considerable area all around them is fenced off. The motors are often fired in a

vertical direction to simulate true flight conditions, but this requires a very tall test stand, to ensure that the exhaust jet does not reach the ground and cause damage by blowing rocks and debris about, or a complicated and expensive water-cooled duct to turn the gases before they reach the ground. Much testing is therefore carried out in the horizontal type of test-stand shown on this page.



A rocket motor that yields about 75,000 lb. thrust. The characteristic diamond pattern of the shock waves in the jet can be seen. Rocketdyne photograph.

The Lockheed X-17

The biggest problem in long-range ballistic missiles or satellites is the provision of a vehicle with a high enough performance to carry out the required mission. The development of high performance rocket motors and of light weight structures has made the present large missiles and satellite carriers possible.

Second in importance is the problem of returning to earth intact the warhead of a missile or, in the case of the satellite, its instruments or even animals or, sometime in the future, its pilot. The great difficulty is that at the extremely high flight speeds involved the temperature of the vehicle is very much raised as it returns to earth, sometimes even to the melting point of the metals of construction.

A blunt nose cone for use at speeds up to 10 times that of sound in the rarified upper atmosphere. Lockheed photograph.

Fortunately, much can be done by correct shaping of the nose of the vehicle. Wind tunnel tests have helped a great deal in choosing the correct nose shape, but final testing must be by rocket in free flight. The Lockheed X-17 has been specially designed for trying out such nose cones. It is a three-stage vehicle using all solid-propellant motors. The first stage is used to climb up through the atmosphere, after which the X-17 is allowed to fall until the air is sufficiently dense to make it fall nose-first. The last two stages are then fired to bring its speed up to a figure sufficient for nose-cone tests.

Several nose-cones have survived. One of the secrets of success, as can be seen from the lower illustration on this page, is a very high polish.

New Method of Rocket Recovery

Finding small rockets after test-firing has always been a problem. Radio equipment is hardly likely to be in working order and reliance has been placed on looking for them from the air.

Recently the Aerophysics Development Corporation in America have been fitting some of their small test rockets with radio-active sources. These can be located easily and accurately by instruments in aircraft,

(*Continued on page 208*)

Forty Fighting Years

By John W. R. Taylor

SINCE the Royal Air Force was born, just forty years ago on 1st April, 1918, it has been at war almost continuously. This may surprise most readers, because we tend to forget all the little wars and local campaigns; but they were real enough to the men who took part in them, and the fact that they stayed little and local is due mainly to the efficiency and courage with which they were tackled.

Even in the last ten years, units of the R.A.F. have been in action almost every day against bandits in Malaya, the Mau Mau in Kenya, EOKA forces in Cyprus, the Communists in Korea, rebel bands in Aden and the Egyptians at Suez. In addition, they played a great part in the Berlin Air Lift of 1948-49, which may have prevented a major war; and there have been several "peacetime" incidents, such as the shooting down of an R.A.F. Lincoln bomber by Russian fighters over Germany in March 1953 and the mercy flight of a Sunderland flying boat to aid the gunboat *Amethyst* after it had been shelled by Chinese shore batteries in the Yangtse river in April 1949.

The late Marshal of the Royal Air Force, the Right Hon. the Viscount Trenchard, G.C.B., O.M., G.C.V.O., D.S.O., hon. D.C.L., LL.D. Air Ministry photograph.

A remarkable thing about some of the campaigns fought by the R.A.F., mainly before World War II, is that it did the entire job by itself. This brings us to the most important fact of all—that throughout its 40 years it has been a completely independent Service, and not a mere branch of the Army or Navy as were most foreign air forces until comparatively recently.

In a nutshell, its two guiding principles have always been independence and a belief that attack is the best means of defence. These formed the gospel of the man who created and led the R.A.F. through its early difficult years, Lord Trenchard, first Marshal of the Royal Air Force and the greatest officer in the whole history of military aviation.

That he should have become so great is rather wonderful, because he was more or less sent home to die after being severely wounded in the South African War in 1900, and then weakened by a deadly bout of fever in Nigeria some years later. He was not one to give in so easily; and in July 1912 he took flying lessons at the Sopwith School at Brooklands, after which he was sent to the Central Flying School of the newly-formed Royal Flying Corps as its Chief Staff Officer. He was never a good pilot; but he proved such a fine leader that when almost every aeroplane and every man who could fly were whisked over to France at the start of the 1914-18 War, he was given the job of creating a new air force out of what was left in England, and of ensuring a steady flow of replacements for the fighting squadrons.

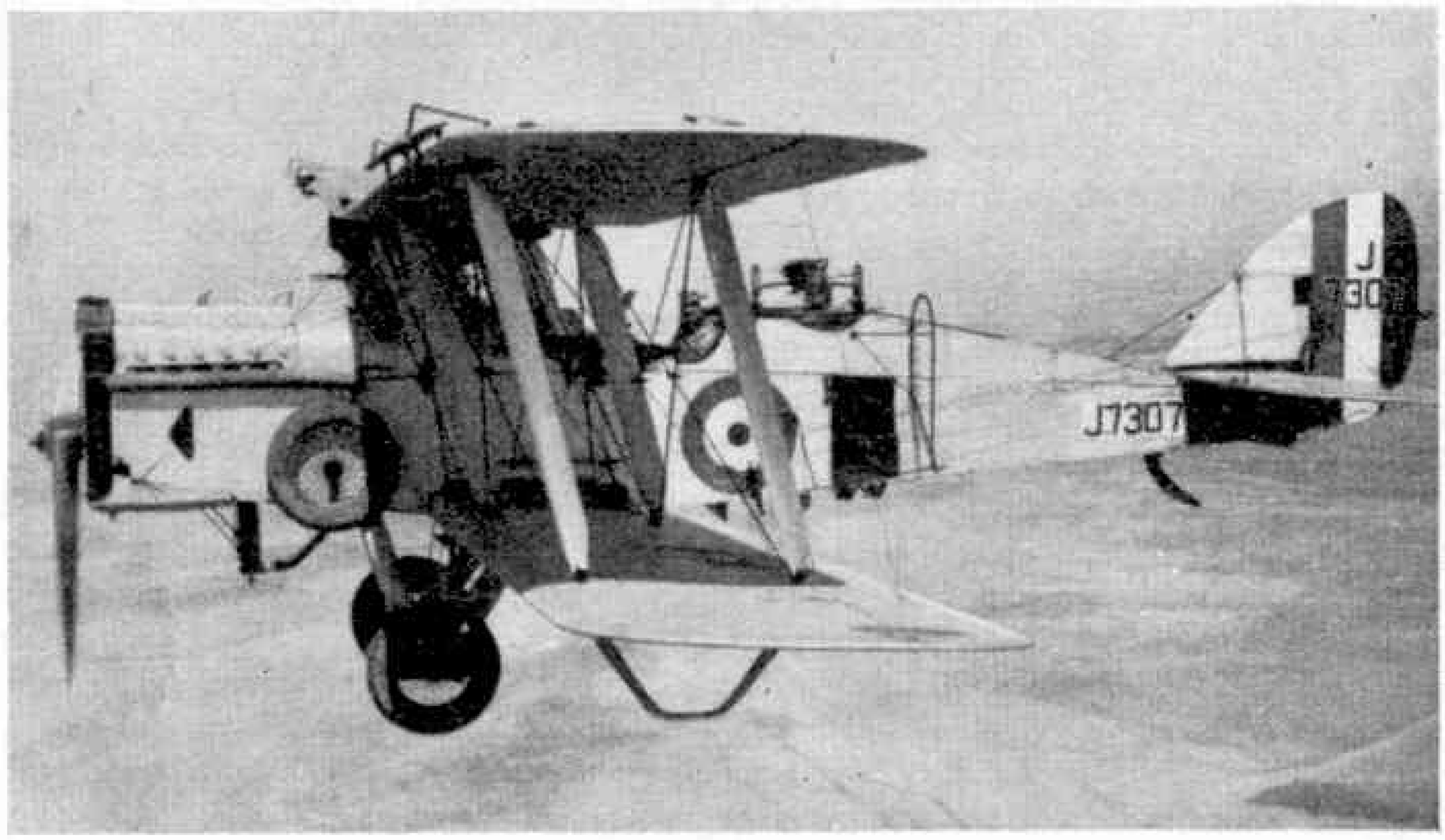
Before the end of 1914 he was in France himself, commanding No. 1 Wing of the Royal Flying Corps. A few months later, in August 1915, he was promoted to command the entire R.F.C. on active service. And when the R.F.C. and the Royal Naval Air Service were combined to form the Royal Air Force on 1st April 1918, he was the obvious choice as the

Chief of the Air Staff.

Unfortunately, Trenchard could not see eye-to-eye with the Secretary of State for Air, Lord Rothermere, and resigned. This was a momentous decision, because he went back to France and led the Independent Force of the R.A.F., which was something entirely new in military flying. Up to that time, aircraft had been used mainly for reconnaissance and to attack enemy troops on the ground, or to protect their own armies from similar reconnaissance and attack by hostile aircraft. Independent Force, on the other hand, was not tied to the Army in any way, but was stationed as close as possible to Germany with the object of bombing targets in the enemy homeland. It achieved so much in the few remaining months of the war that the R.A.F. has built its strength around a nucleus of powerful strategic bombers ever since.

By 1919 Trenchard had such experience of creating air forces out of nothing that he was once more made Chief of the Air Staff and asked to draw up plans for the peacetime R.A.F. It was not even certain then that there would be any R.A.F. to plan, because the Army and Navy could see no point in retaining a separate air force in peacetime and began compaigning to have its units put under their control. This Trenchard resisted fiercely, and he won, because the R.A.F. was firmly established by the time the Fleet Air Arm was put back under Admiralty control in 1937.

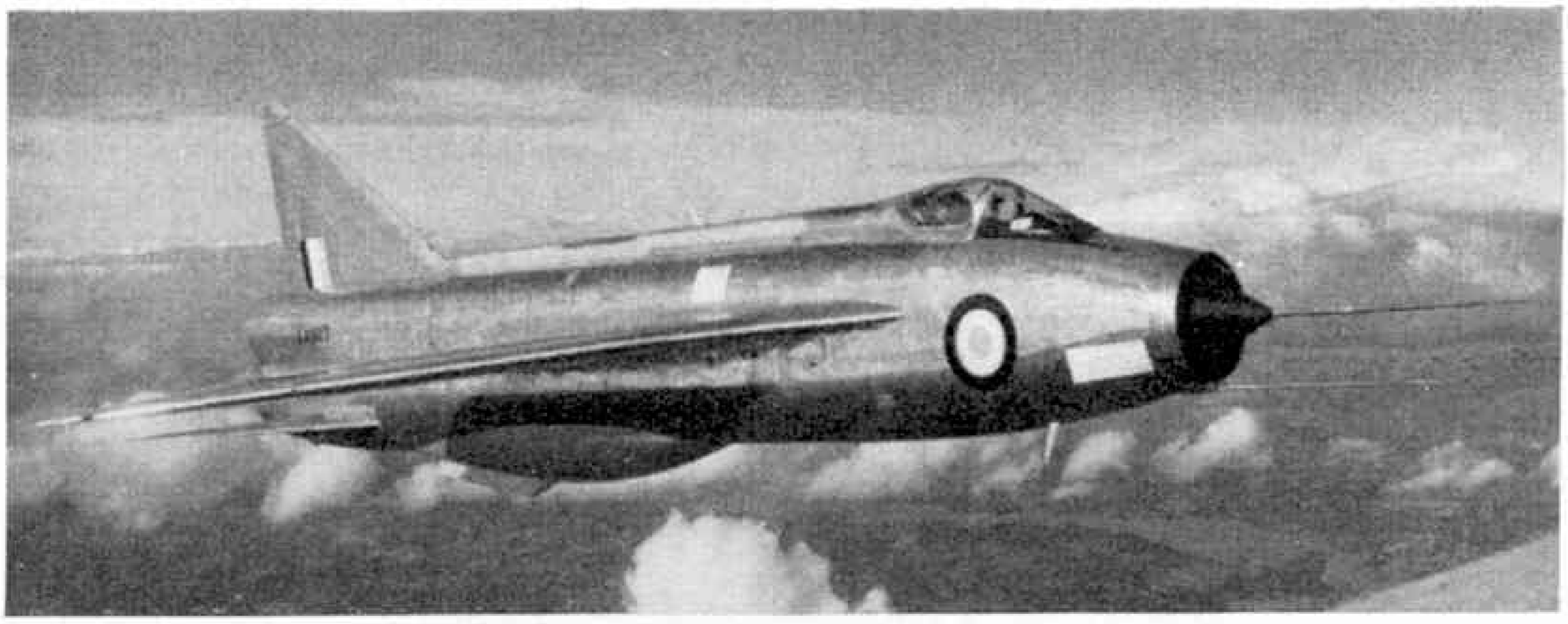
Trenchard had to start from scratch because, following the Armistice in November 1918, the R.A.F. had been reduced from a tremendous fighting force of 263 squadrons and 15 flights, made up of 291,710 officers and men and 22,647 aircraft, to a mere 33 squadrons. With thousands of almost-new warplanes in store, it was clear that the Government would spend little money on aircraft for years; so he produced a plan for the R.A.F. that aimed at building up a comparatively small, highly-trained nucleus of fighting squadrons and spending the rest of whatever money was available on training schools and research. He realised more than anyone that the future of the R.A.F. depended on the quality and morale of its men, and his ideas bore fruit when the Service eventually got its own Cadet College at Cranwell, Apprentices' School at Halton and Staff College at Andover. In his own words, he had laid the foundations for a castle, and if nothing better than a cottage were built on them, it would at least be a very fine cottage!



The D.H.9A, a typical "Colonial" aircraft of the 1920's—everything but the kitchen sink! Air Ministry photograph.

An opportunity to prove the value of a peacetime air force came sooner than expected, because Britain became involved in so many small-scale wars all over the world in the early 'twenties that it was decided to let the R.A.F. see what it could do to sort out some of the problems. As a start "Z" Expedition, consisting of 36 officers and 183 airmen, with 12 veteran D.H.9 bombers, some trucks and 800 tons of stores and supplies, were sent out in 1920 to Somaliland, where the notorious "Mad Mullah" had been defying the British administration for about 25 years. Within three weeks this tiny force, in co-operation with a few members of the Camel Corps, restored peace and quiet to the territory.

Impressed, the Government agreed to let the R.A.F. have a shot at keeping an entire area under control almost by itself. The place chosen was the old trouble-spot of Iraq, or Mesopotamia as it was then called, and soon a few old Sopwith Snipes and Bristol Fighters, D.H.9A bombers and



English Electric P.1B, the fastest British fighter. It is in production for the R.A.F. Illustration by courtesy of The English Electric Co. Ltd.

troop-carrying Vernons had taken the place of the thousands of troops formerly stationed there.

The local tribes, especially those led by Sheikh Mahmud, thought this a fine idea, and began causing trouble in one district after another. With the prestige of the R.A.F. at stake, the pilots made splendid use of the speed and mobility of air power, by attacking bands of lawless tribesmen, and by supply dropping, troop carrying and casualty evacuation duties. Some of the operations were on quite a large scale, such as when the Turks tried to seize Mosul in 1922, but a few well-placed bombs and propaganda leaflets normally restored the situation without much loss of life on either side.

Similar operations were carried out in many other places, including the North-West Frontier area of India and Afghanistan, where the R.A.F. performed the first-ever large-scale air evacuation in the winter of 1928-29. A rebel leader named Kabibullah Khan had occupied heights overlooking the British Legation at Kabul and began shelling it. In two months, R.A.F. transport aircraft carried to safety 586 passengers, mostly women and children, flying 28,160 miles in the process over mountains 10,000 ft. high, during one of the most severe winters on record and in an area where forced landings were impossible.

The stories of these local campaigns make exciting reading and it is a pity that everyone seems to have forgotten them nowadays. However, they achieved one important result, in that they convinced the Government of the importance of air power, so that from the mid-twenties the R.A.F. was able to order new and improved aeroplanes.

It was still a comparatively small force, because Britain had great hopes that the Disarmament Conference at Geneva would succeed in banishing major war for ever. In fact, in 1934 it was still seven squadrons short of the total of 81 squadrons that had been planned ten years earlier. But when Hitler finally revealed the existence of the formidable new German Air Force, there could no longer be any hope of disarmament.

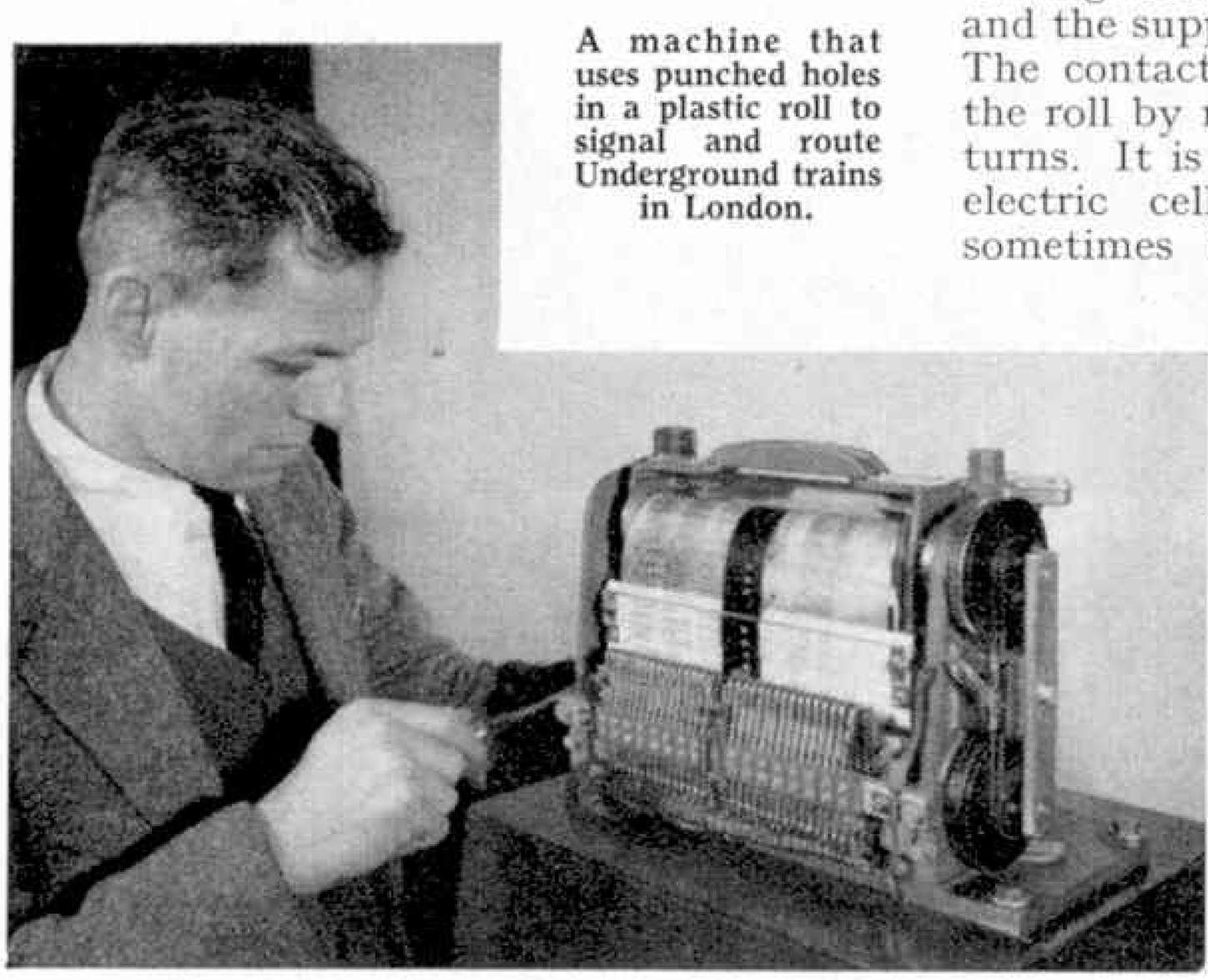
British designers produced a series of wonderful new fighters and bombers—the Hurricane, Spitfire, Wellington, Battle, the Sunderland flying boat and others—and put them into mass production. Dozens of new training stations were opened. Lord Trenchard, now retired, saw that his cottage was becoming a castle, and a finer one than even he could have dreamed.

If war had started at the time of the Munich crisis of 1938, or even if there had not been six months of "phoney" war in 1939-40, the R.A.F. would not have had sufficient fully-equipped squadrons of the new aircraft to withstand an all-out attack by the *Luftwaffe's* 1,800 modern bombers. But it was given the extra time and the rest of the story is history.

Today, the R.A.F. is once again comparatively small, because its job is to fight small wars and prevent big ones. It is highly-trained and superbly-equipped for both tasks, as all *M.M.* readers know. Soon it will be even better-equipped, for the P.1B fighter, Victor and Vulcan bombers and other types now in production have no equals anywhere in the world. They have an important role to play, because it will be many years yet before guided weapons can supersede piloted aircraft as weapons of total warfare. Even more important is that missiles may never replace the man in the cockpit in the kind of local wars which have kept the R.A.F. busy for most of its 40 years.

Signalling by "Pianola" Roll

THE machines that automatically signal and route a complete day's programme of trains are now remarkable features of the working of certain in-town sections of the Northern Line of London Transport.



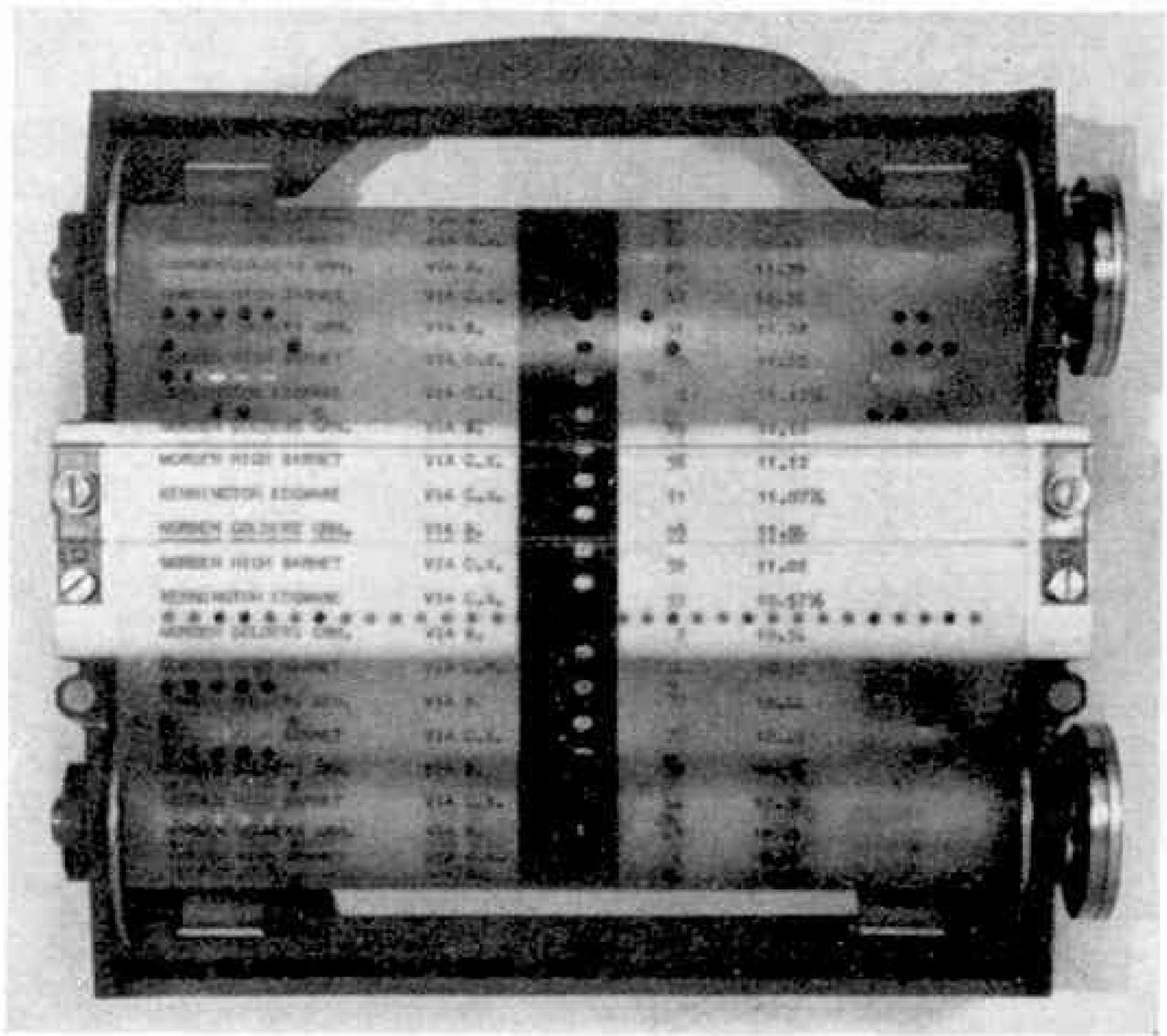
A machine that uses punched holes in a plastic roll to signal and route Underground trains in London.

The operation of each of these machines is controlled by means of a roll of plastic material called Melinex. This is about 8 ft. long and 8 in. wide, and is wound on rollers mounted in a frame that can easily be slipped into the machine or removed from it. One of these rolls is shown in the lower picture. Three rolls are used, one controlling the programme of trains during an ordinary week-day, others serving the same purpose for Saturdays and Sundays respectively.

Details of the destinations and routes of the entire series of trains for a working day are typed on the roll, as the lower picture shows. These particulars are coded by the holes punched between the lines of type, each row referring to a particular train. The signals and points are controlled by means of electrical contacts made through the holes by means of probes, of which there are 30 in a contact assembly in the lower part of the machine. This assembly is pressed against the programme roll by compressed air.

The Melinex roll does not move continuously. When a train passes, the driving motor operating relay is energised and the supply of compressed air is cut off. The contact assembly is then lifted from the roll by means of a spring, and the roll turns. It is stopped by means of a photo-electric cell, or electric eye, as it is sometimes called, which acts when it detects a hole immediately beneath it, and the contact assembly is then once more pressed against it. So it moves in steps, from a row of holes referring to one train to those for the next.

This remarkable machine sounds a warning if trains are more than two minutes late. At the touch of a push button it can send one train at certain converging junctions forward if the first is late—and it remembers to signal the laggard when it arrives—and it can be switched out altogether if necessary, when routes will be operated by hand from the central supervision room.



One of the plastic rolls that fit into London Transport's signalling programme machines. The punched holes are between the lines of type describing the trains.

A favourite Pacific, No. 60103 "Flying Scotsman", makes a brave sight at the head of "The Talisman" passing Oakleigh Park. Photograph by M. W. Earley.

Railway Notes

By R. A. H. Weight

New "Warship" Class Locomotives

It is a happy thought by the Western Region to allocate British past or present warship names to the impressive type 4, A1A-A1A, pioneer diesel-hydraulic main line locomotives now coming into service. Those so far chosen for the five being completed by the North British Locomotive Co., Glasgow, are as follows: Nos. D600–4, respectively *Active*, *Ark Royal*, *Bulldog*, *Conquest* and *Cossack*. The names are prominently displayed on a red background centrally on each side of the casing below the British Railways totem. The external finish is bright green with broad lining.

The first one, stationed at Swindon, was undergoing trials in February and next month I hope to report a most interesting and at times exciting journey behind *Active* on the occasion of the inaugural special express passenger circular runs from London to Bristol and back.

East Coast Express Running

The Talisman, seen in this month's first illustration, is at present the quickest express on the London (King's Cross)–Edinburgh (Waverley) service, covering the 393 miles in about 6 hrs. 40 min. with a stop at Newcastle, where engines are changed. Still sharing important long-distance and other principal train haulage with success are the Great Northern-type A3 Pacifics, many of which are more than 30 years old and little altered in appearance, though benefitting by the intermediate provision of higher boiler pressure, larger superheaters and modified cylinders. *Flying Scotsman* was the first 4–6–2 to enter service after formation of the L.N.E.R. group in 1923, and was shown at the British Empire Exhibition, Wembley, in 1924-5. It took a prominent share in the working of the London–Edinburgh summer non-stop *Flying Scotsman*, begun in 1928 and continued in subsequent seasons, though on a much slower schedule than the *Elizabethan* nowadays.

With streamlined A4 No. 60013 *Dominion of New Zealand* at the head of the northbound *Talisman*, in the expert hands of Driver Hoole, the smart 8-coach set weighing nearly 300 tons full, much very fast travel was recorded. Some slower trains ahead, running a little out of course perhaps, caused a number of signal delays while there were three track repair slowings. High speed stretches when there was opportunity included 14½ miles between Grantham and Newark in 10 min. and 30¼ miles in nearly level open country between York and Darlington in 21½ min., these representing averages respectively of 87 and 83½ m.p.h. Though Newcastle was not quite reached to time owing to a signal stop and other slacks due to a special train in front, the overall time from King's Cross had been not much more than 4½ hr., equivalent to a mean speed of 63 m.p.h. for 268 miles, allowing for the extra delays.

No. 60024 *Kingfisher* of the same class, with Driver Nairn from Haymarket depot in Edinburgh, now took over from the King's Cross engine and crew and soon set out to make up time. It was another splendid performance, faster on balance than my *Fair Maid* run reported in February, which had one coach more. Edinburgh was reached in only a few seconds more than 2 hrs. for 124½ miles, including a slowed approach from Inveresk, and with a number of maxima in the 80-85 m.p.h. range.

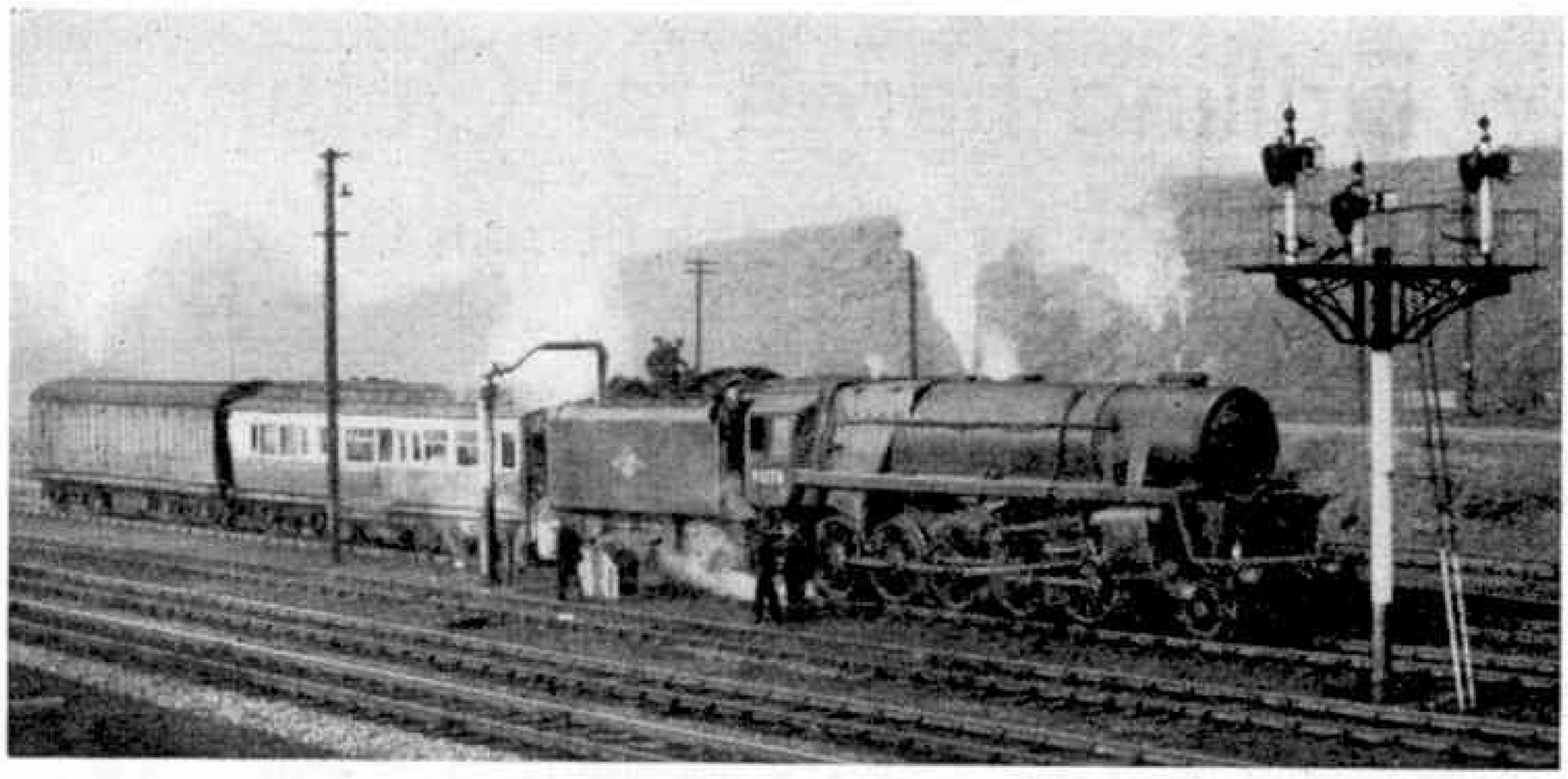
Southbound, A4 No. 60003 *Andrew K. McCosh*, with double chimney, driven by Driver Clowes, King's Cross, gained 9½ min. on a brisk timing from Durham to York start to stop, arriving well ahead of schedule with a Sunday morning 11-coach express. An A8 4–6–2T banked in rear for a short distance to aid the start on the curved rise out of Durham. Darlington, 22 miles, was passed on the through line at 74 m.p.h. in weekday *Elizabethan* or *Talisman* style, in no more than 21¾ min. Then along the regularly very fast stretch to the outskirts of York 77 m.p.h. was averaged, with a maximum of 87, in spite of a signal check at Thirsk.

Newer A1 Pacific No. 60157 *Great Eastern* ran the 44 miles Darlington–York stop with a heavy, 13-coach 460-ton load in 42 min. the allowed time being 44, and the maximum speeds were 82-84; No. 60156 *Great Central* completed the distance in only 38¼ min. (schedule 43) with 11 on, 385 tons, averaging 69 m.p.h. and a top rate of 92 on level!

Driver Hoole was in charge on each occasion of the first morning Newcastle–King's Cross express. The latter sprint beat my own quickest so far when *Dominion of Canada* passed slowly through York in 37 min. from Darlington start on the 330-ton *Tees–Tyne Pullman*. The quickest start to stop timing has been reduced to 40 min., one of the fastest bookings of its kind in Britain. Mr. Norman Harvey has kindly supplied details of the fine runs just mentioned.

Locomotives in the News

New class 9 2–10–0s lately completed and allocated to the Eastern Region are Nos. 92168–72, at 36A, Doncaster depot, and Nos. 92182–6, 35A, Peterborough. These powerful and versatile engines include express, braked freight workings in their more regular routine now.



B.R. Standard 2-10-0 No. 92178 takes water at Stoke Gifford yard prior to a test run to Reading, hence the W.R. dynamometer car behind the tender. Photograph by Ivo Peters.

Turning to diesels, additions to stock for announcement are as follows. With electric transmission: A1A–A1A Nos. D5502–3, 30A, Stratford; Bo–Bo 1,000 h.p. mixed traffic, Nos. D8016–7, 1D, Devons Road, London; 6-wheeled shunting classes, Nos. D3404–9 to Cardiff Yards, sheds 88A or B; Nos. D3473–8, to the King's Cross district, 34A–C; D3479–80, 36A, Doncaster; and D3497–3502, 30A, Stratford.

Diesel-mechanical shunting type Nos 11175–6 (old numbering, probably to be D2572–3), 32A, Norwich, D2000–3, 34C–D, Hatfield or Hitchin; D2004–8, 31A, Cambridge; D2260–1, 2264–5, 56G, Bradford; and D2266–7, 55D, Royston, Yorks.

The last ex-L.N.W.R. 0–6–2 coal tank and sole active survivor of the Webb 19th century Crewe mixed traffic designs, No 58926, coupled to "super-D" 0–8–0 No. 49121, from the same company's stock, with whistles blowing and with thousands of sightseers among the scenic steep hills between Abergavenny and Merthyr, were at the head of a special train organised by the Stephenson Locomotive Society prior to the closure of a spectacular line through a mountainous region of Monmouthshire and S. Wales. Another enthusiasts' special of equal success and unusual interest, which I accompanied, traversed the London Inner Circle and other Metropolitan tracks electrified for many years, hauled by 61-year old L.T.E. (former Met. Rly.) 0–4–4T, L46.

The second of the two V4 ex-L.N.E.R. light 2–6–2s, No. 61701, has been withdrawn for scrapping in Scotland, where Caledonian type 0–6–0s are usefully employed on suitable mixed traffic duties, as a photograph on this page shows; a few of their 3P 4–4–0s still appear on passenger trains in Glasgow, Central.

Changed Locomotive Shed Codes

Consequent upon altered Regional boundaries or areas, a good many Motive Power Depots are having their descriptive codes changed. Among fresh ones now in use are the following: In Carlisle, Kingmoor, 12A; Upperby, 12B and Canal, 12D. Chester, W.R. 6E; G.C. Section, hitherto E.R. sheds, moved into the Midland Division, L.M.R. and renumbered; Neasden, 14D; Woodford Halse, 2G; Leicester, 15E, Annesley, 16D; Gorton, 9H.

Some Motive Power Districts will cease to operate independently, the depots being merged into adjacent groups. Further announcement will be made giving details.

Diesel Car Numbers and Extensions

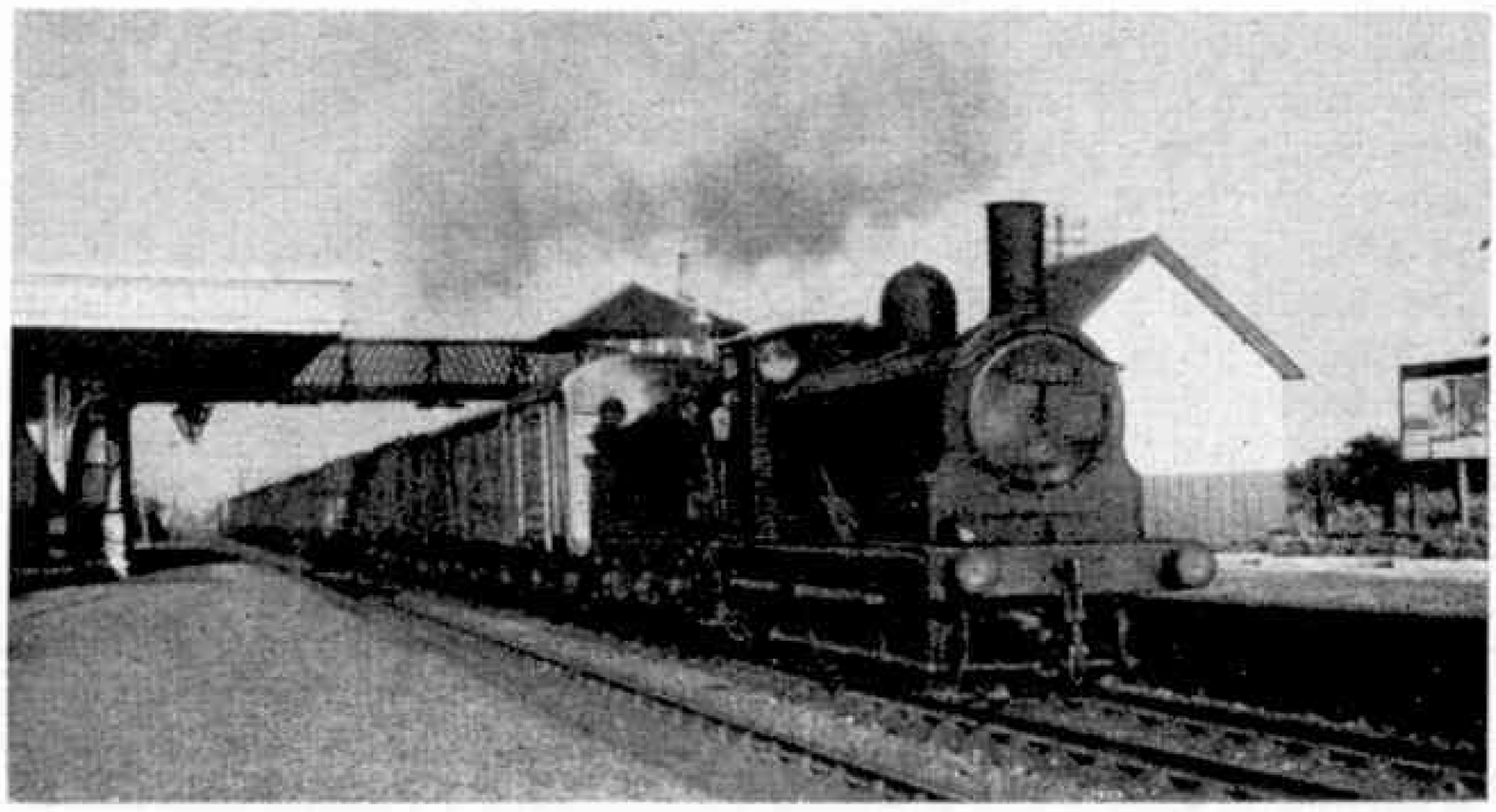
Diesel-mechanical railcars and multiple unit sets continue to enter service and to prove popular. Services lately introduced include Darlington–Penrith over the Northern Pennines; around Edinburgh and thence to North Berwick; Liverpool (Central) to Warrington and Gateacre; Manchester–Stoke.

Power cars containing underfloor engines are numbered in the 50000–55999 series, trailers with driving compartment 56000–58999 and intermediate hauled cars from 59000 upwards. A number of the earlier ones carry numbers in the 79000 range, which were allocated before the above scheme was decided.

Several Regions are receiving 4-wheeled lightweight diesel railbuses for selected rural areas. Each weighs 11 tons and seats 46 passengers.

Mechanical Wonders in Thornton Yard

Remarkable novelties at the new freight marshalling yard near Thornton Junction, Fifeshire, Sc. R., include two sets of electrically-operated retarders to check the speed of wagons as they descend from the hump into the required siding, controlled automatically by weight detectors and v.h.f. radio signals measuring their speed. Points are changed and re-set in quick succession without further attention by the Control Tower operator who presses buttons setting up the required sequence of routes after receiving by pneumatic tube a list of the "cuts" to be effected. Closed-circuit television enables the Yardmaster to view activities outside; there are complete electric signalling, loudspeaker and telephone installations.



Caledonian Drummond "Jumbo" No. 57327 comes cheerfully through Garnkirk with a long freight train. Photograph by G. H. Robin.

New Drilling Barge for Qatar

Underwater Search for Oil in the Persian Gulf

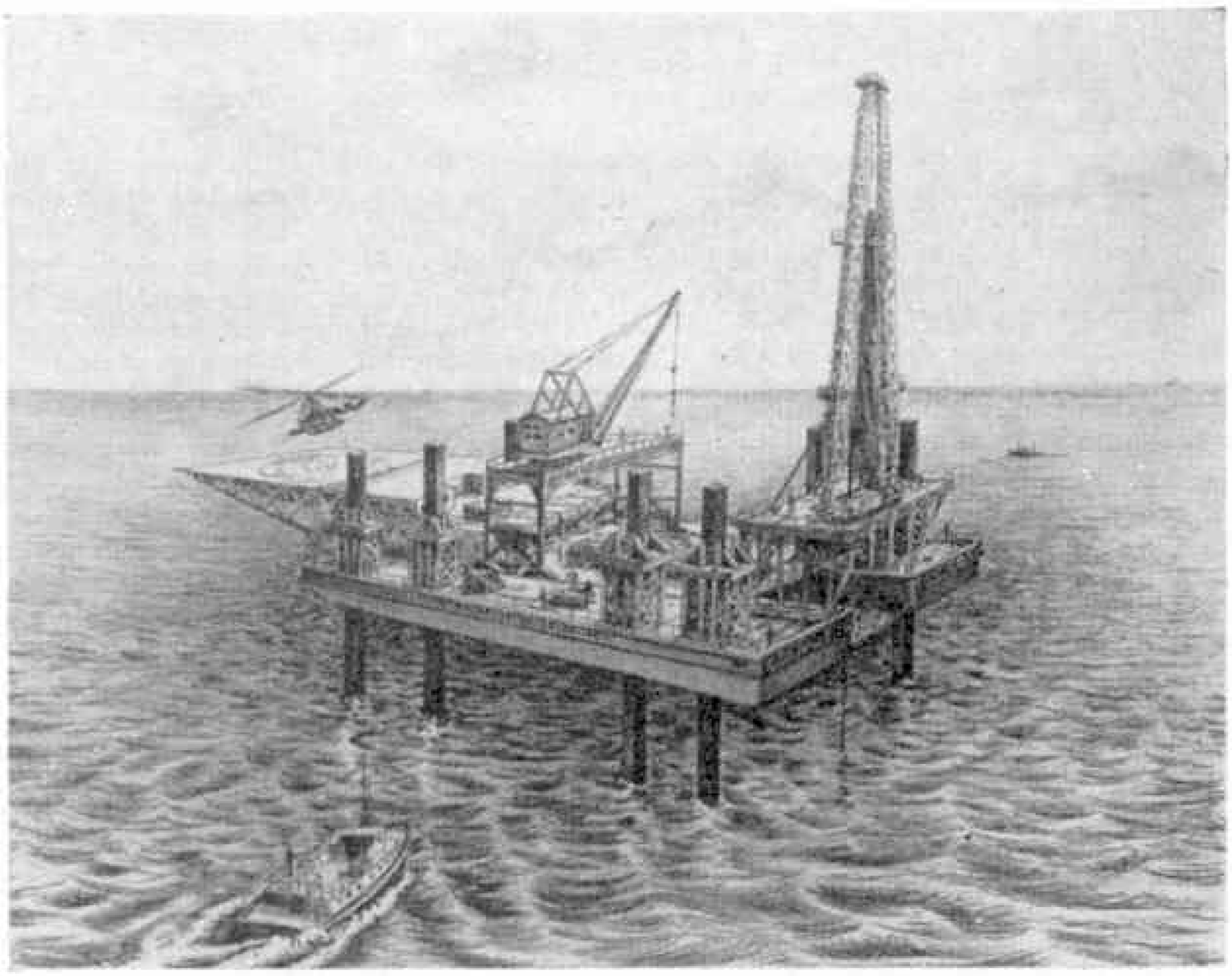
By the Editor

ONE of the most remarkable features of the intensive world-wide search for oil is the fact that in many areas drilling is carried out under water. For instance, there are wells off the coast of California, in the Gulf of Mexico and in Lake Maracaibo, in Venezuela. Another oil region where wells are drilled at sea is that in the Persian Gulf area, and special attention was drawn to this last December by the destruction of a drilling platform owned by the Royal Dutch/Shell combine that had been at work off the coast of Qatar. This had cost very nearly £1,000,000.

The drilling platform was wrecked 50 miles off the coast. It was being towed to Doha for modification on 27th December last year when the wind changed direction and a heavy sea developed. When it was being towed the platform was supported by two 2,000-ton pontoons, and in the stormy night these broke loose and caused damage to the electricity generating machinery on the structure, with the result that all the lights were extinguished. This was not all. The legs carrying the platform when at work too were damaged, and eventually it became necessary to withdraw the staff and crew. Later one of the pontoons capsized and then sank, and eventually the platform sustained so much damage that it appeared impossible to repair it.

Two wells had been sunk from the platform without finding oil, although drilling had been continued to depths of 6,700 ft. and 12,000 ft. respectively. On its destruction it became necessary to consider whether any further efforts should be made or not. Eventually it was decided to try again, but at a place to the north of those where drilling had been carried out. For this it was necessary to build a new platform, the approximate cost of which will be about £1,000,000.

Work was begun on this new platform as soon as possible, and the illustration on this page, which is reproduced from an artist's impression of it when it will go into service, shows what it will look like. In addition to the equipment for drilling, and a 75-ton gantry crane for handling heavy equipment, it has a special helicopter deck, on which a helicopter can be seen landing in the picture.

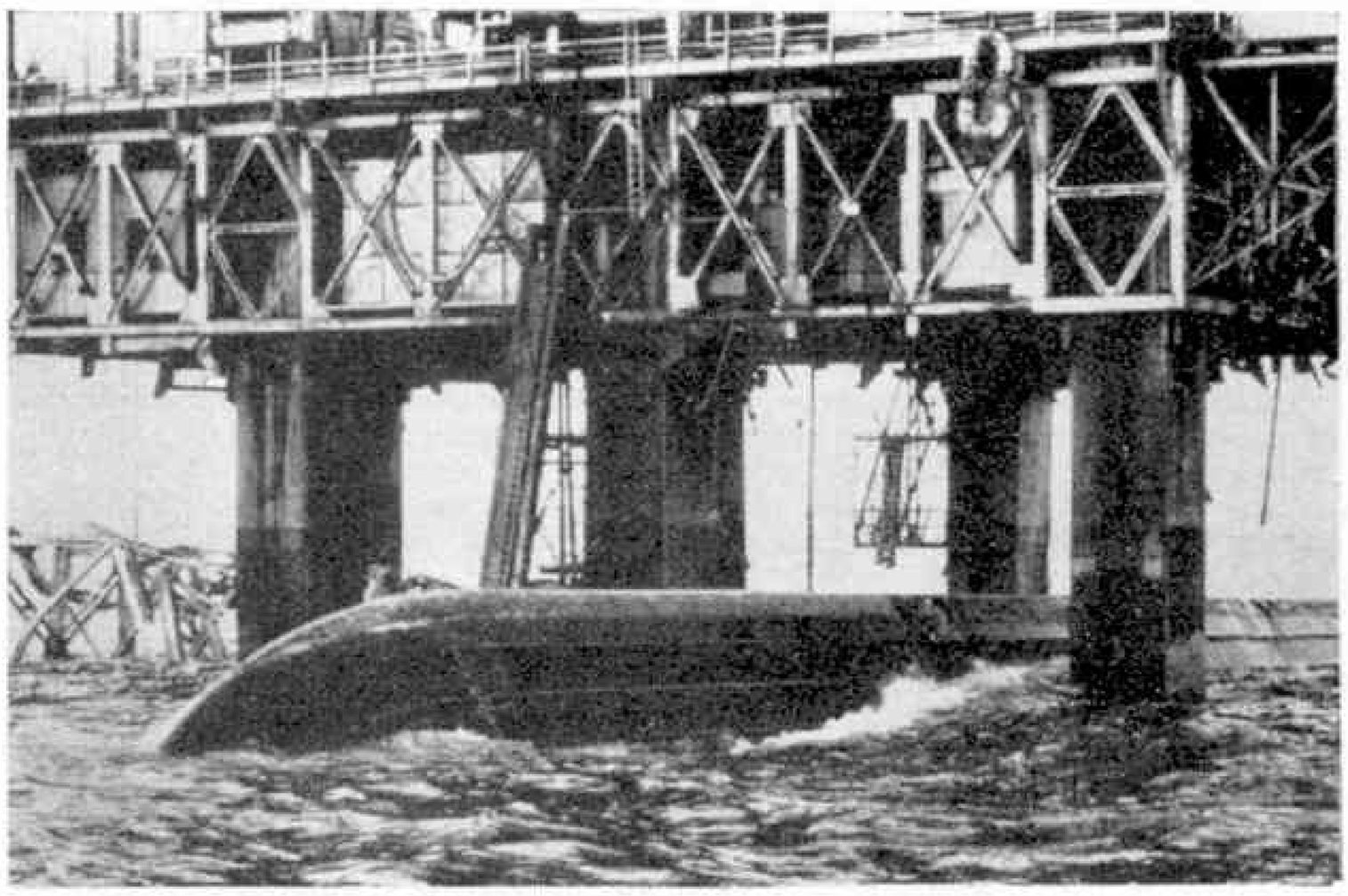


An artist's impression of a new Dutch/Shell mobile drilling platform for use in the Persian Gulf, in place of one damaged beyond repair in a violent storm on 27th December last.

The new platform is extremely strong. Remembering the fate of the first platform, it has been so designed that it is resistant to the attack of a wind of 100 m.p.h., acting on the superstructure simultaneously with waves measuring 30 ft. from crest to trough, in water 100 ft. deep. It is of a different type from the drilling platform that was destroyed. Both rested on legs that went down to the bed of the sea, as can be seen in two of our pictures, when drilling was in progress. The first platform

was floated on two pontoons run under the superstructure when a change of position was to be made, as was being done when the platform was destroyed, while the new platform has a floating hull. On reaching the space where drilling is to be carried out the hull will be lifted 30 ft. above water level by means of a hydraulic jacking mechanism. Then the weight of the barge will be carried by the legs, the lower ends of which will rest on the sea bed.

Each leg will be 22 ft. long and capable of being loaded to 1,400 tons. The total weight that will be carried will be about 7,000 tons, of which 3,500 tons will be the weight of the hull with its drilling and other equipment, 1,900 tons will be the weight of storage and 1,600 tons will be the weight of the legs themselves. The latter are to be constructed in sections, so that they can be broken down for ocean transport and re-assembled by bolting together. The storage, that is material carried for use in operations, will include 2,800 barrels of mud for circulating round the drill, 11,000 sacks of dry mud material or cement, and fuel and lubricating oil.



This picture shows part of the damaged drilling platform, and one of the two 1,800 ton pontoons that was capsized.

The platform will be capable of carrying out work in depths of water ranging from 20 ft. to 100 ft., and it is equipped to drill down to depths ranging to 15,000 ft. The 140 ft. drilling mast is mounted on sliding equipment on the main deck, the purpose of this being to allow a cluster of wells to be drilled without moving the platform hull, the length and breadth of which are 210 ft. and 105 ft. respectively. The drilling slot at one end of the hull will be 40 ft. by 30 ft.

A unique feature of the barge will be the 75 ton gantry crane. This will be capable of reaching any point on the deck when the mast is laid down, so that the barge will be self-contained and there will be no need for outside heavy lifting equipment. It will be used for assembling the legs, handling supplies and, if necessary, installing a protective structure around a complete producing well. The main power plant will consist of four English Electric 795 h.p. diesel engines, and auxiliary power will be provided by two further 470 h.p. diesels driving two 326 kw. A.C. generators. Living quarters for 50 will be placed under the helicopter deck.

Local Arab trainees making the first joint on the drill collar during operations with the first drilling platform. The drill collar is the heavy alloy steel pipe that gives the weight needed at the bottom of the drilling string.

Air News

By John W. R. Taylor

A Tail of Four Jets

News that B.O.A.C. have awarded Vickers the biggest order for commercial aircraft ever received by a British manufacturer is further proof that we can still build in this country the finest air liners in the world. The order is for 35 VC.10's, each powered by four Rolls-Royce Conway turbojets, mounted in pairs on each side of the rear fuselage—an arrangement that offers so many advantages, such as reduced noise, easier servicing and a "cleaner" wing, that it may soon replace completely the older practices of burying engines in the wings or hanging them underneath in pods.

The general lines of the handsome VC.10 can be seen in the illustration on this page. Its "double-bubble" fuselage will accommodate 108 first class or up to 152 tourist passengers on the upper deck, with very large freight and baggage holds on the lower deck. Delivery of the B.O.A.C. fleet, which will cost about £60 million, will begin in 1963.

A model of the Vickers VC.10, Britain's new jet air liner. B.O.A.C. have ordered a fleet of 35 of these great aircraft.

B.E.A. News

This month will see the beginning of an important new B.E.A. service linking London twice-weekly with Warsaw. It will be operated with Viscount 701 air liners, and may be followed soon by an even more interesting service to the other side of the iron curtain, because Britain and Russia signed an agreement last December under which B.E.A. and the Soviet airline Aeroflot will begin operating between Moscow and London as soon as details have been agreed. One of the snags is that the Russian Tu-104A jet-liner is said to be too noisy for regular flights into London Airport; but we must hope all difficulties will soon be solved.

The date set for B.E.A. to begin flying most of their Channel Islands services from the new "No. 2 London Airport" at Gatwick in Surrey is 9th June, and H.M. the Queen will open the Airport officially on that day.

Building his own Plane

Many of us must have dreamed of making our own aeroplane and flying in it; but 16-year old Edgar Taylor of Spalding is going one better by doing it. Like many other young people in Britain, he has bought plans of the French single-seat Druine Turbulent lightplane and is building it at home under the supervision of the Popular Flying Association.

By the beginning of this year, the fuselage and wings were almost complete, and he hopes to have the little aircraft ready for flight when he is 17 years old, the minimum age at which anyone is allowed to fly solo. The total cost will probably be around £400, plus a lot of hard work—and it will be well worth it! Cruising at 80 m.p.h., the Turbulent does 40-50 miles on a gallon of petrol, which is better than most cars.

Helicopters Lays Eggs—and Fries Them!

To demonstrate the precision with which it can be flown, a Djinn jet-powered helicopter belonging to the Australian Ansett-ANA company flew over Essendon Airport, Melbourne, carrying half-a-dozen eggs in a linen bag under its fuselage, and laid them gently, without a crack, on the tarmac, in spite of gusty winds and rain. As a stunt, one of the company's air hostesses then broke the eggs into a frying pan and cooked them on the still-hot tailpipe of the Djinn's Palouste engine.

Flying Boat News

Although we in Britain seem to have lost all interest in flying boats, this is certainly not true of the rest of the world, and particularly America. The U.S. Navy has recently awarded contracts worth over £1 million to the Convair and Martin companies to finance design studies for an atomic-powered flying boat. A condition of the contract is that they should investigate whether the British Saunders-Roe Princess 'boats, now "in mothballs", could be fitted with atomic engines, to avoid having to build an entirely new aircraft.

Martin have also resumed flight tests of their 600 m.p.h. SeaMaster flying boat, which were interrupted by the loss of the first two prototypes. The new machine is the first of six "evaluation" YP6M-1 SeaMasters, powered by four Allison J71 turbojets with reheat. Compared with the prototypes, it has a new hydraulic control system, redesigned engine air intakes, outwardly-inclined exhausts to carry the hot gases away from the rear fuselage, and a modified tail fin fairing.

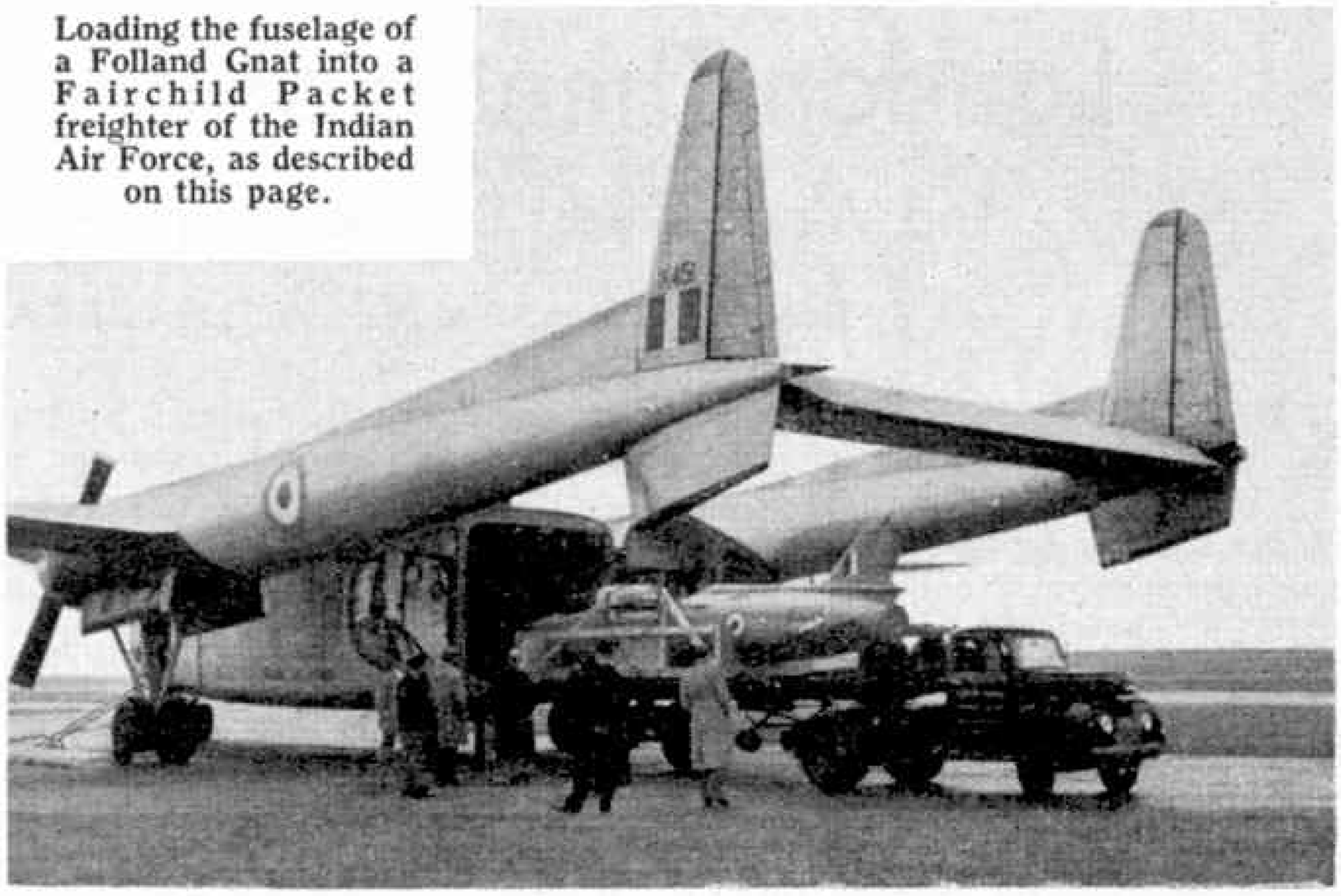
The YP6M-1's will be followed by a production series of 18 P6M-2 SeaMasters, each powered by four Pratt & Whitney J75 turbojets. These flying boats will be suitable for minelaying, bombing or reconnaissance duties and should be able to fly almost at the speed of sound.

Fighter Delivered in Packets

Remarkable proof of the mobility of the Folland Gnat was given recently when one of these little fighters was test flown, dismantled, carried a quarter of the way around the world in transport aircraft,

re-assembled and flown again in the space of a week.

The story began when the Indian Government decided they would like a Gnat to take part in a fly-past over Delhi to celebrate the country's Independence Day on 26th January. There was no chance of having a locally-produced model because, although the Gnat is being built by Hindustan Aircraft at Bangalore, the first one will not be completed for quite a time. So the Indians asked the help of Folland, who have a contract to supply 25 complete Gnats and components for 15 more to get the re-equipment of Indian Air Force squadrons under way as quickly as possible.



Loading the fuselage of a Folland Gnat into a Fairchild Packet freighter of the Indian Air Force, as described on this page.

Folland had already flown one of these aircraft, but it was being used for important development testing. Another was ready to come off the assembly line and it was decided to send this to India. A few hours after it had completed its acceptance tests at the company's aerodrome at Chilbolton in Hampshire, the wing was removed and the complete fuselage was loaded into a Fairchild Packet of the I.A.F., which took off next day. A second Packet, carrying the Gnat's wing and a load of spares, left England on 20th January and arrived at Kanpur on the 23rd. The fighter was assembled and test flown on the following day, in plenty of time to take its place in the fly-past.

Fastest Fighter

The 30-ton Avro CF-105 Arrow, built by Avro Aircraft of Malton, Ontario, is almost certainly the fastest and heaviest fighter in the world. The picture below was taken during the Arrow's first public appearance on 4th October last, and the aircraft will probably have made its maiden flight by the time this issue of the *M.M.* appears.

Intended eventually to supersede the CF-100 in service with the Royal Canadian Air Force, the Arrow is a two-seat delta-wing aircraft with a "saw-tooth" wing leading-edge to ensure good control at both high and low speeds. The Mk.1 version has two Pratt & Whitney J75 turbojets, each giving about 24,000 lb. of thrust with reheat, and is expected to have a maximum speed of over 1,500 m.p.h., with the ability to climb to 70,000 ft. in four minutes. The Mk.2 production version will have two Canadian-built Orenda Iroquois turbojets, which are even more powerful, and will be armed with Sparrow missiles carried in a retractable fuselage pack. The Arrow spans 50 ft. and is 77 ft. 9½ in. long without its nose probe.

Chemical-Fuel Bomber

After winning a hard-fought two-year design competition against Boeing, North American Aviation have received a U.S.A.F. contract to build a new bomber known as the WS-110A (Weapons System 110A). No details are available officially, except that it will be an intercontinental aircraft with a speed of 2,000 m.p.h. at heights above 70,000 ft.; but it is expected to be powered by turbojets able to run on new chemical fuels like pentaborane, which offer tremendously increased power. Unofficial drawings have depicted it as a tail-first aircraft, with four engines mounted on its straight wings and two in the rear fuselage.

Irish Airlines Enter Atlantic Trade

Irish Airlines are opening their first transatlantic service this spring, using three L-1049H Super Constellations leased from Seaboard & Western Airlines. Each will carry 95 "economy" class passengers on the Dublin-Shannon-New York route, and will fly in the insignia of Aerlinte Eireann, a sister-company of Aer Lingus.

Avro Arrow 1, Canada's first level-flight supersonic aircraft, leaving the flight test hangar to begin engine test runs. Illustration by courtesy of Avro Aircraft Ltd.

London Theatre of the Skies

The World's Best Equipped Planetarium

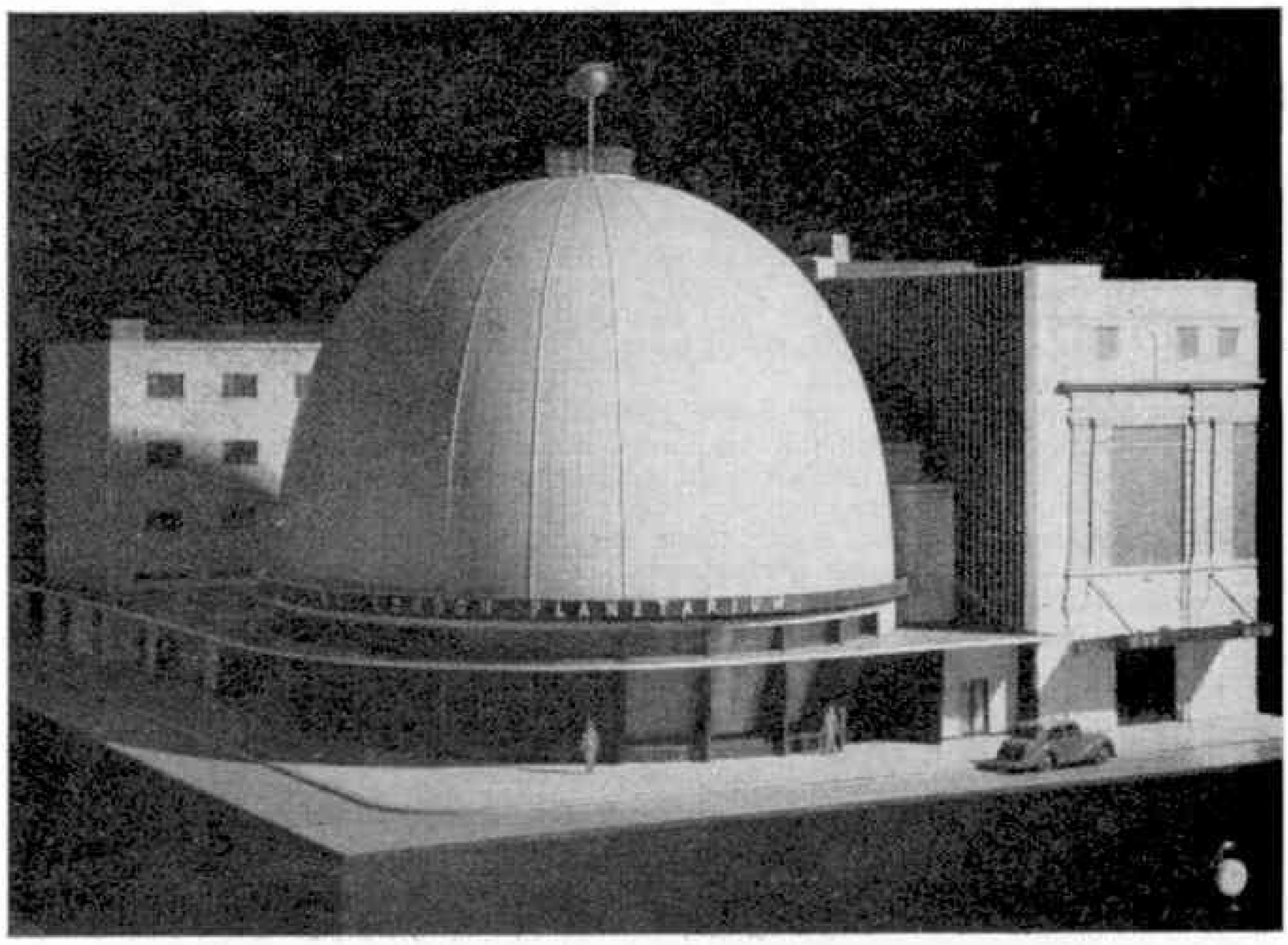
By Frank W. Cousins, A.M.I.E.E., A.C.I.P.A., F.R.A.S.

READERS of this Magazine, with their innate love of engineering wonders, will be thrilled to learn that the London Planetarium opened its doors to the public last month. It is the only building of its kind in the British Commonwealth and although most other civilised countries have had similar theatres of the stars for many years, we in Britain have been denied these advantages until now.

At the outset I should explain that a planetarium in its modern form is the idea of Dr. Bauersfeld, of the famous Zeiss optical works in Western Germany. It comprises a building containing two essential main components. One of these is an auditorium having a hemispherical roof. The other is a complex optical projector at the centre of the auditorium that is capable of projecting the Sun, Moon, planets and stars on to the inner surface of the hemispherical roof. With the aid of the projector an artificial night sky is produced having all the authenticity of the night sky of nature, as it would be seen on a cloudless night from a point of vantage far from city lights and obscuring haze. What the interior of the London Planetarium is like can be gathered from the upper picture on page 180.

The London Planetarium, which is the 33rd of its kind to be built, is the most lavishly equipped of any in the world. Its general appearance from the outside is clearly seen in the picture of the architect's model on this page. The building proper is situated in Marylebone Road, near to Baker Street Station and adjoining Madame Tussaud's Waxworks. It can readily be distinguished by its handsome copper clad dome, topped by a model of the planet Saturn. The copper clad concrete dome covers an inner perfect hemispherical dome 67 feet in diameter that has been made from aluminium sheeting. This inner hemisphere is perforated with millions of fine holes to obviate undesirable acoustic effects. It forms the roof of the 1st floor auditorium, which provides accommodation for 547 persons.

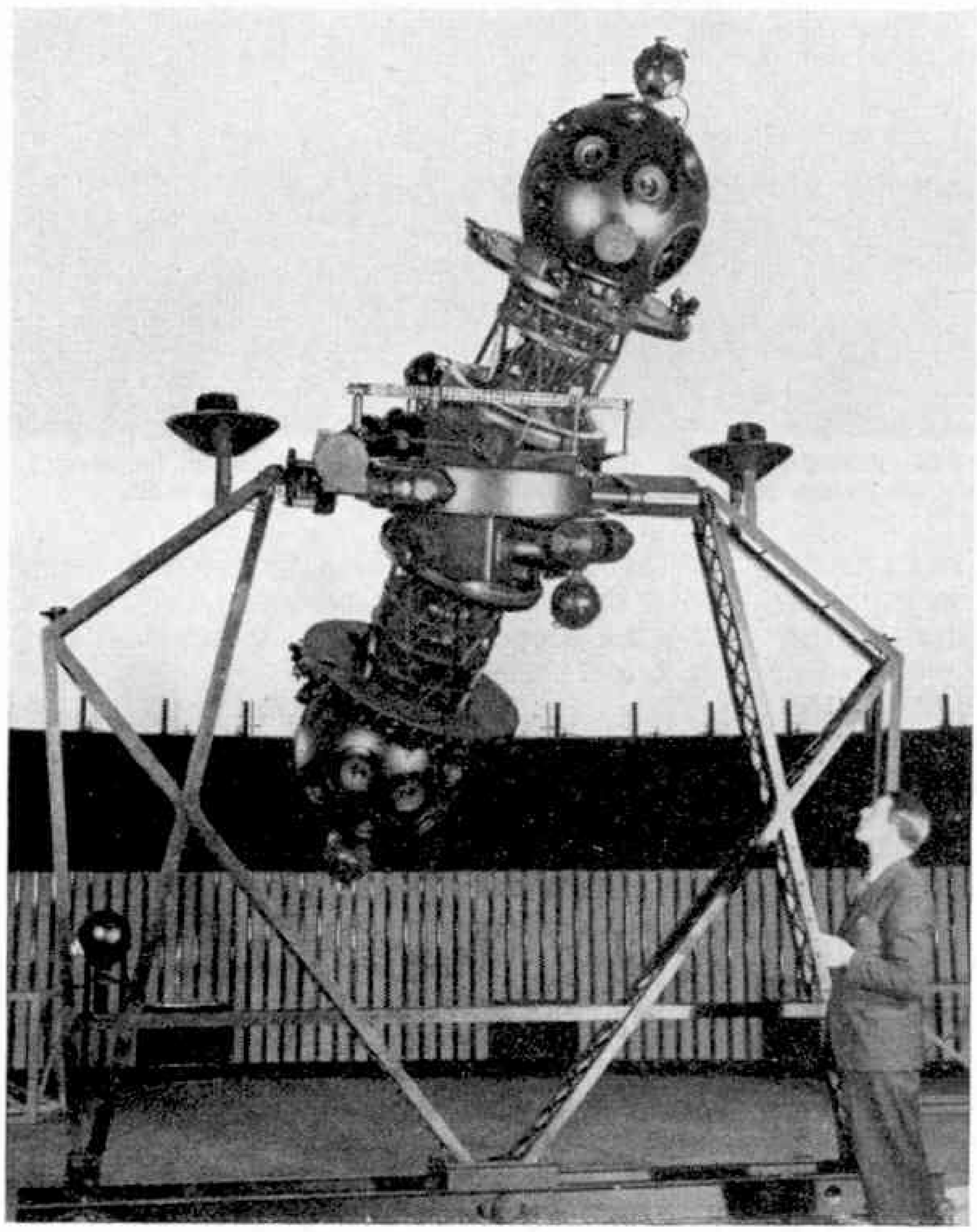
At the centre of the auditorium is a platform supporting the £70,000 Zeiss universal optical projector, which is illustrated on the opposite page. When in operation it is this that projects the hosts of heaven on to the hemispherical roof. The horizon of the artificial night sky—that is to say the periphery of the hemisphere at auditorium level, is provided with cut outs of steel to represent the sky line of the metropolis in silhouette. The audience will be able to discern clearly the dome of St. Paul's, the Tower of London, Westminster, Greenwich observatory and the cranes of dockland to mention the more prominent. The purpose of this is to help



Artist's drawing of the London Planetarium, Marylebone Road, opened last month.

to give the effect of being in the open, the natural place in which to study the stars, but visitors to the planetarium are warm and comfortably seated.

When the Zeiss projector is not in use the platform can be lowered and the projector then passes into a glass case in the foyer of the building, where it can be admired at close quarters. In appearance it looks like a dumb-bell of gigantic size—its length is 13½ feet—mounted on a steel lattice-work carriage. In the picture on this page the London projector is shown with Dr. H. C. King, the lecturer in charge of the London Planetarium, standing beside it.



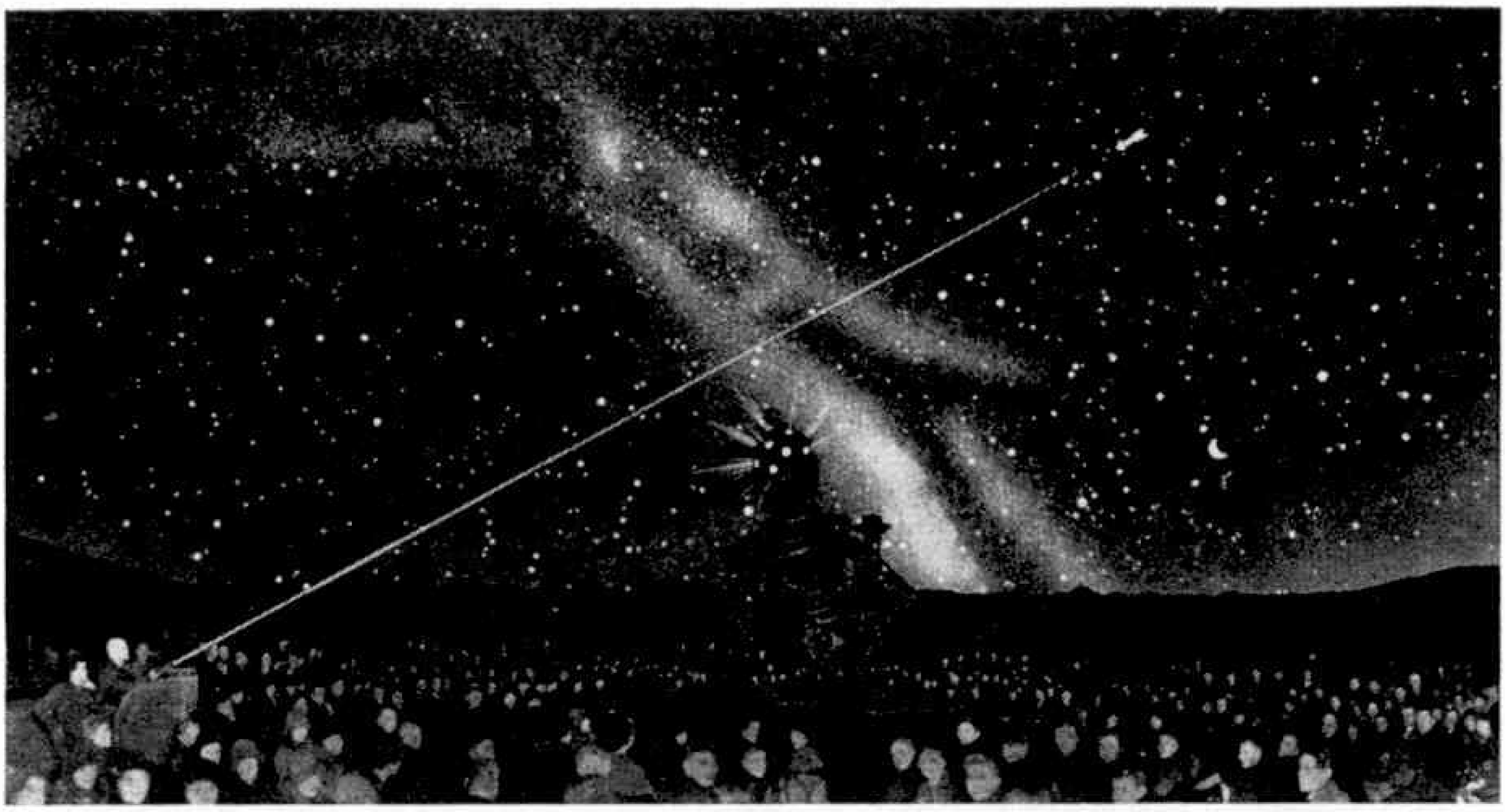
The intricate projector of the London Planetarium.

This complex instrument provides the reproduction of the movements of the heavenly bodies that it presents on the dome. It is capable of movement in three ways. These are rotation about the Polar Axis, which reproduces the daily rise and set of the heavens; rotation about a horizontal East to West axis to reproduce the appearance of the night sky as seen from any latitude; and rotation about the line normal, that is at right angles, to the plane of the Earth's orbit about the Sun, to show annual motions and the precession of the equinoxes. All these motions are uniform and they are electrically controlled from the lecturer's desk.

The two star globes, one for the Northern Hemisphere and one for the Southern, provide 8,900 stars of the 3rd to the 6th magnitudes of brightness. Brighter stars of the 1st and 2nd magnitude are produced by 42 special projectors fitted below the star globes. Stars of the 1st magnitude are 100 times brighter than stars of the 6th magnitude which are only just visible to the naked eye.

The star globes carry projectors for special objects such as the Clouds of Magellan, nebulæ, globular clusters, the Milky Way, and variable stars such as the well known stars Algol, Mira Ceti, and Delta Cephei. Further sets of projectors give the main parts of the grid systems of reference for the celestial equator (declination and right ascension and the ecliptic (celestial latitude and longitude). One projector on the main frame throws the meridian on the artificial sky. The cylindrical central cage of the dumb-bell between the star-globes houses the intricate moveable projectors for Sun, Moon and naked eye planets Mercury, Venus, Mars, Jupiter and Saturn. Some idea of the design of these mechanisms can be gained from the lower picture on the next page, which shows the beautiful gear train of the linkage mechanism for the Moon projector's motion — a delight to any Meccano enthusiast.

The Zeiss universal projector is able to show the night sky as you would see it if you were privileged to journey over the Earth's surface. While you are sitting in a comfortable seat the projector will, in a few minutes, show you the night sky as seen from the North Pole, from the South Pole or from a point at any intermediate



What the interior of a planetarium looks like during projection, with an arrow of light projected on the dome to point out the heavenly bodies. This picture shows the sky theatre at Jena, the first ever built.

latitude. Boys and girls who live in England can be shown the skies of far away places as seen by their brothers and sisters at the antipodes.

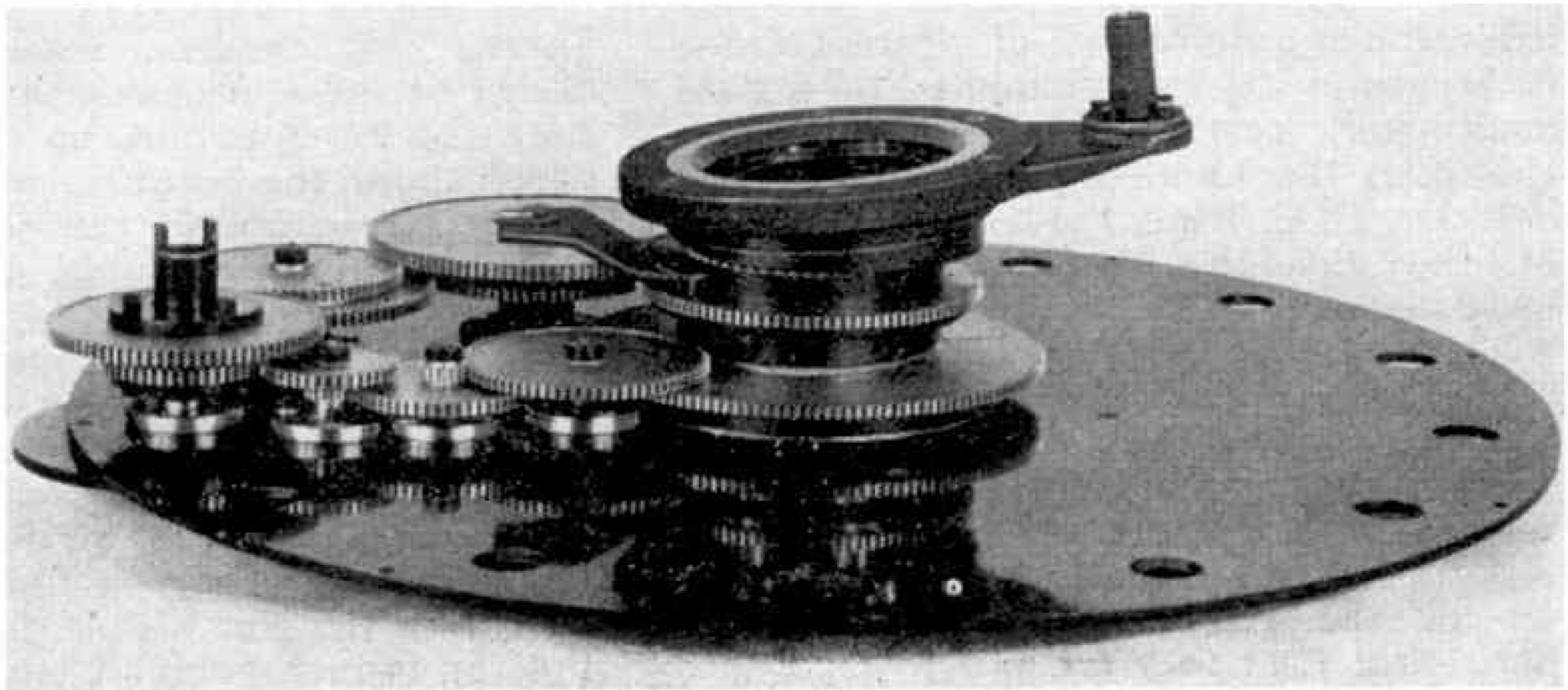
Even more wonderful is the ability of the projector to show the skies of yesterday and tomorrow as well as those of today. The night sky seen by Captain Cook as he discovered Australia, or by Columbus as he neared the New World, the sky from London in the year 2000 A.D.—all these and other skies of the past and the future can readily be demonstrated.

You will appreciate that this is only possible by the quick action of the electrically driven projector. In fact, the slow moving events in the natural heavens, such as the wandering of the celestial pole among the stars, which makes one cycle every 25,800 years, can be demonstrated in the planetarium in a few minutes, and with the London Planetarium the passage of a thousand years can be demonstrated in one short lecture.

The London Planetarium gives demonstrations morning, afternoon and evening on each weekday, and on Sunday the demonstrations are in the afternoon and evenings only.

Literature on astronomy and postcards of the great sights of the heavens taken by the world's finest telescopes will be on sale. It is hoped to make the planetarium a centre for presenting accurate astronomical information to children and layman alike, without appeal to the worst facets of science fiction and space travel.

The author wishes to thank A. H. Degenhardt, Esq., and Dr. H. C. King for the loan of photographs.



Intricate gearing of the greatest accuracy is needed for planetarium projector mechanisms, such as that for showing the movements of the Moon.

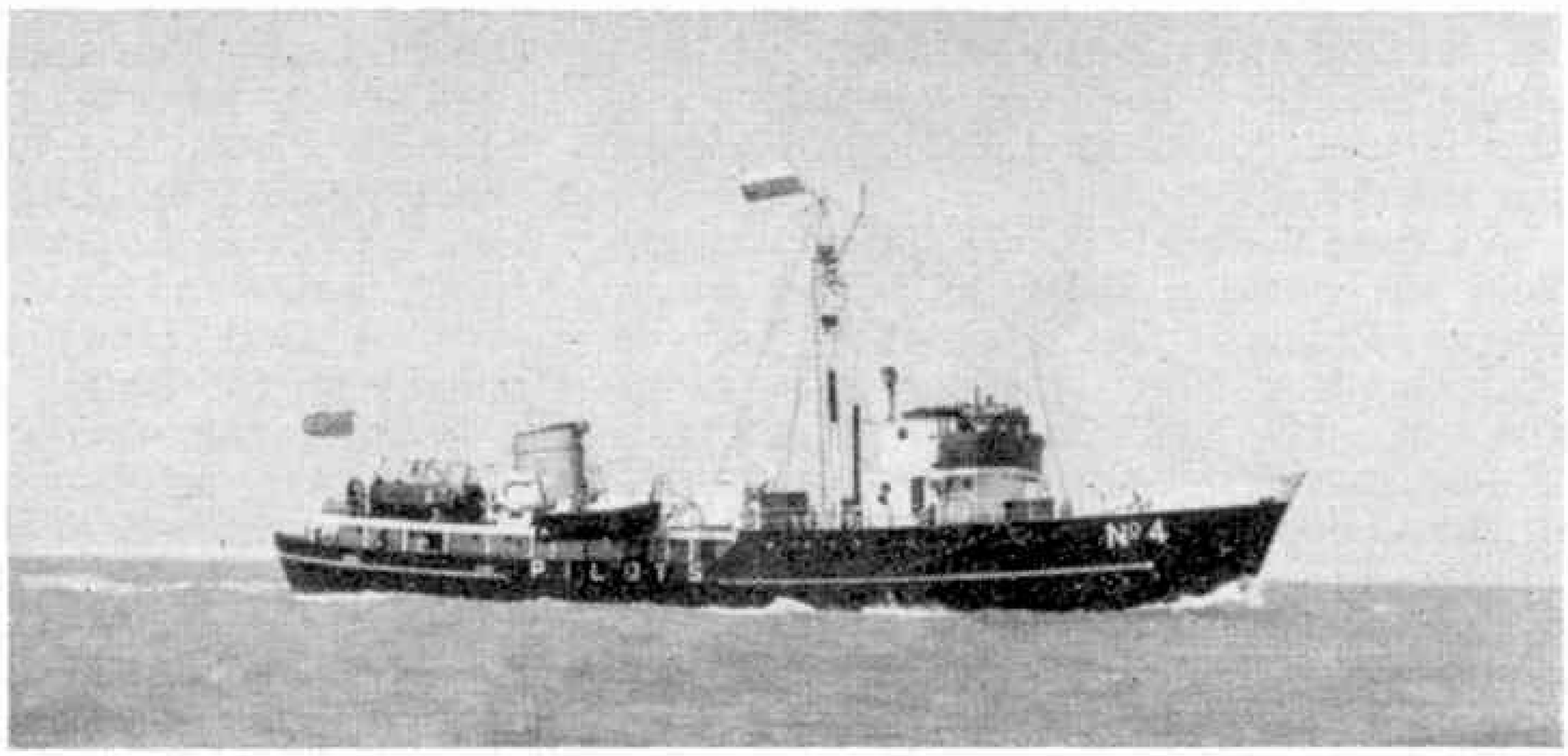
MECCANO MAGAZINE

This signpost is on top of one of the pylons of Sydney Harbour Bridge. Photograph by Jon Ketelhohn, Murrumbeena, Victoria, Australia.

Junior Section

HERE is a signpost that is decidedly varied in its directions. It shows quite plainly that to get to London from the top of one of the pylons of Sydney Harbour Bridge you will have to travel 11,708 miles, although the two places are only 7,926 miles apart — through the Earth! The directions take the visitor in imagination on journeys round the world, and also guide him to the position of the pylon cafe—71 steps down. I wonder if any other signpost in the world makes use of a step as a unit of distance.

In the February *M.M.* I included an article on shipping in the Strait of Dover. From its author, Mr. J. Mannering, I have received the photograph reproduced below, with the remark that any description of shipping in the Strait would be incomplete without a reference to such a vessel as this, one of the pilot cutters of the Corporation of Trinity House. They are based at Dover or Harwich, and serve traffic bound to and from the Thames Estuary or the great continental ports. The vessel shown is *Pelorus*, a modern diesel-driven craft of 443 tons photographed returning to Dungeness, her usual station. Mr. Mannering was sailing from Dover to Rye before a brisk north easterly wind when he met the *Pelorus* as she was making full speed over a brilliant summer sea.



"Pelorus", a diesel pilot cutter, photographed off Dungeness by J. Mannering, Dover.

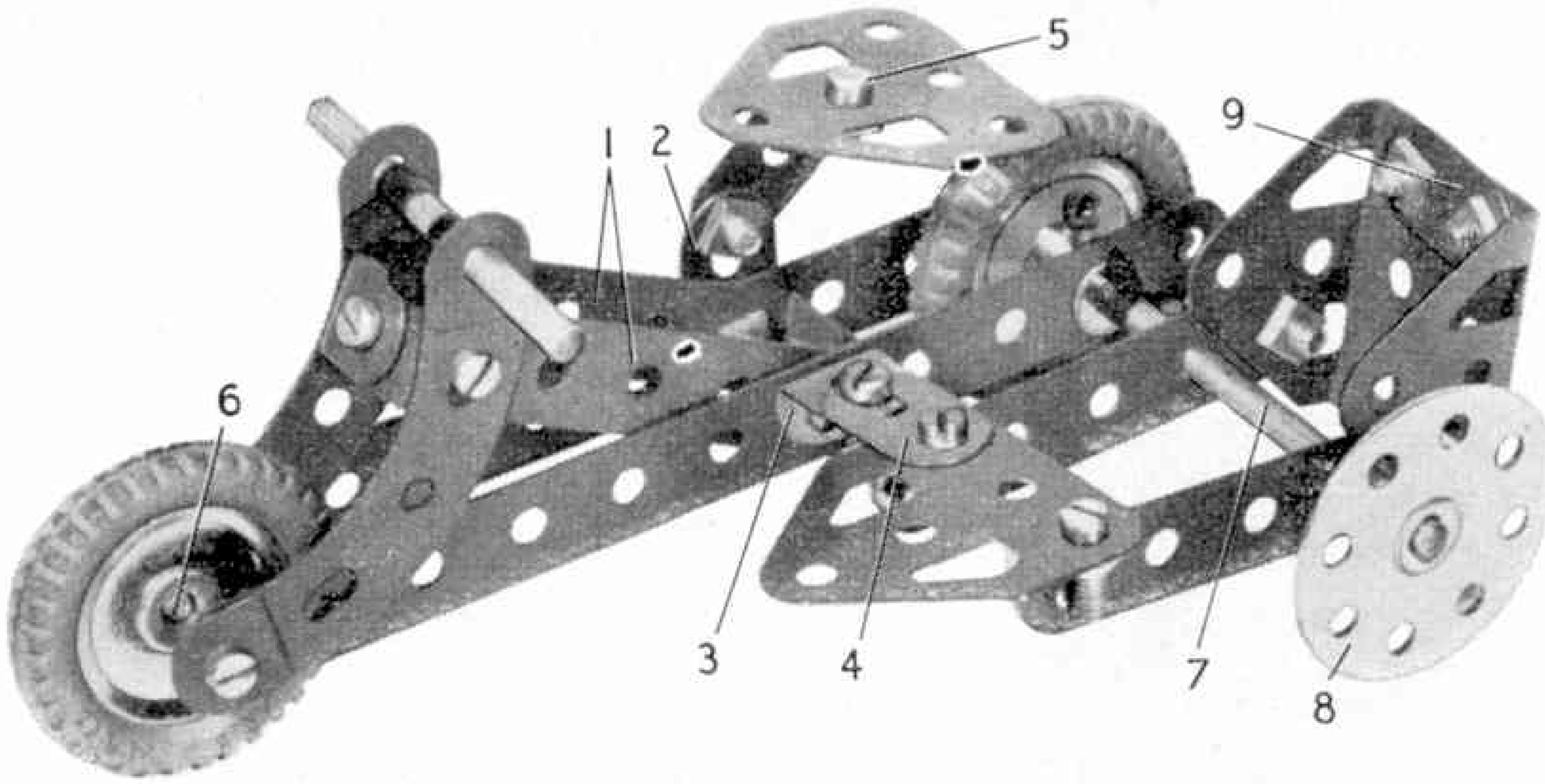


Fig. 1. An easy-to-build Motorcycle and Sidecar that is designed for construction from Outfit No. 0.

Easy Model-Building

Spanner's Special Section for Juniors

Models for Outfits Nos. 0 and 2

AN easy to build Motor-cycle and Sidecar is shown in Fig. 1. and it makes an excellent subject for owners of Outfit No. 0.

Build the Motor-cycle first. For this you will need two 5½″ Strips. At one end of each of these bolt a 2½″ Curved Strip as shown. Now bolt together two 2½″ × ½″ Double Angle Strips 1 by means of bolts through their lugs. Having done this attach the 5½″ Strips to each side of the Double Angle Strips as indicated. One of the bolts fixing a 5½″ Strip to the Double Angle Strips secures in place a Fishplate 2, and the other bolt is used to fix a 1″ × ½″ Angle Bracket 3 in place on the inside 5½″ Strip. To this Angle Bracket a Fishplate 4 is bolted and this is used to attach the Motor-cycle to the sidecar.

A second Fishplate bolted to the Fishplate 2 in the position shown is bolted to an Angle Bracket fixed by the bolt 5 underneath a Flat Trunnion that forms the seat. The handlebars are formed by a 2″ Rod passed through the upper end holes of the Curved Strips and held in place by Spring Clips. The front wheel of the Motor-cycle is fixed by its set-screw on the shank of a ⅜″ Bolt 6 passed through the front end hole in one of the 5½″ Strips. The rear wheel is fixed on a 3½″ Rod 7, which carries also a Bush Wheel 8 that forms the wheel of the sidecar.

The sides of the sidecar are 2½″ Strips, and the pointed front is a Flat Trunnion fixed to Angle Brackets bolted to the front ends of the 2½″ Strips.

The back of the sidecar consists of two Trunnions joined together by a Fishplate 9 and fixed to the rear ends of the 2½″ Strips.

A list of the parts required to built the Motor-cycle and Sidecar is given at the end of this article.

For owners of Outfit No. 2 we have the attractive Garage Crane and Trolley that is shown complete in Fig. 2. You should begin construction by assembling the base of the crane. Place two 2½″ × 2½″ Flexible Plates face to face, and connect them together by bolts used to attach also two 2½″ Strips 1. Bolt an Angle Bracket to the outer end of each of the Strips 1, pass a ⅜″ Bolt through each Angle Bracket and fix on the Bolt a 1″ Pulley.

Bolt together two Trunnions, using the bolts to support also an Angle Bracket 2 and a ½″ Reversed Angle Bracket 3. Fit a 3½″ Rod in a Rod and Strip Connector, and lock-nut the last-mentioned part to the Angle Bracket 2. Fix a Bush Wheel on a 2″ Rod supported in the Trunnions, and pivot the Reversed Angle Bracket 3 on a bolt lock-nutted in the Flexible Plates.

Now bolt two Angle Brackets to the base of the crane to form a U-shaped piece, and use each Angle Bracket to support a 5½″ Strip 4. Each of the Strips 4 is braced by a 3½″ Strip 5 that also is connected to the base by an Angle Bracket, and the Strips 5 support a Crank Handle held in place by Spring Clips. The Strips 4 are lengthened by 2½″ Stepped Curved Strips, which are connected at their upper ends by a ⅜″ Bolt. Cord fastened to the Crank Handle is passed over this Bolt, round Washers on a ⅜″ Bolt 6, and is tied to one of the Curved Strips. The Bolt 6 connects together two Flat Trunnions, and another bolt passed through them supports a small Loaded Hook.

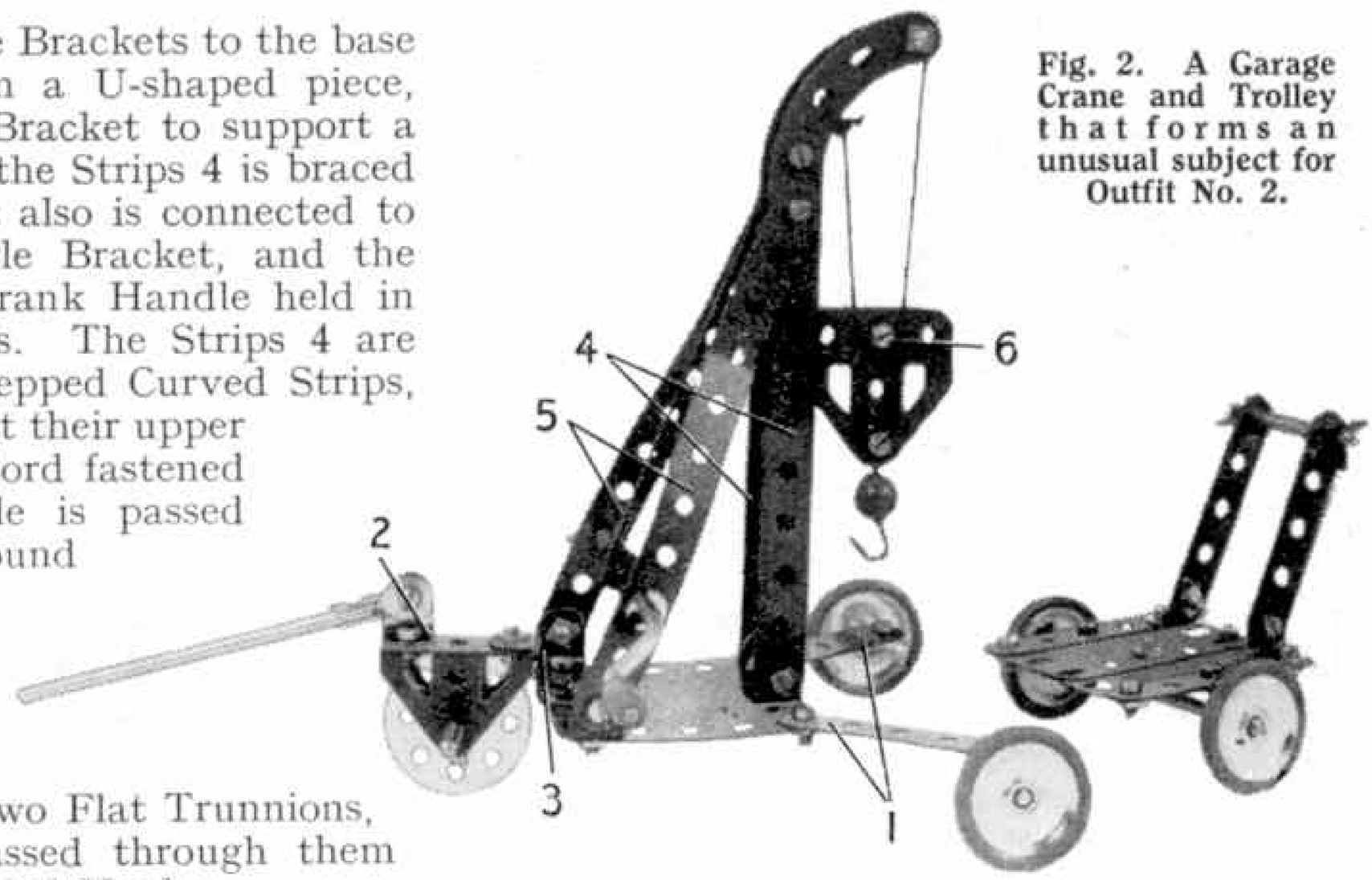


Fig. 2. A Garage Crane and Trolley that forms an unusual subject for Outfit No. 2.

The trolley is made from two 2½″×1½″ Flexible Plates bolted together and strengthened by two 2½″ Strips. Fix a 2½″×½″ Double Angle Strip underneath the Flexible Plate, pass a 3½″ Rod through the Double Angle Strip and fix on it two 1″ Pulleys. For the trolley handle use a 2″ Rod held by Spring Clips in 2½″ Strips, which you must bolt to Angle Brackets fastened to the Flexible Plates. To make a supporting leg for the trolley fix a Fishplate to an Angle Bracket, and bolt the last-mentioned part underneath the Flexible Plates, below the handle.

Parts required to build the Garage Crane and Trolley: 4 of No. 2; 6 of No. 5; 1 of No. 10; 8 of No. 12; 2 of No. 16; 2 of No. 17; 1 of No. 19g; 4 of No. 22; 1 of No. 24; 4 of No. 35; 36 of No. 37a; 34 of No. 37b; 5 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 57c; 2 of No. 90a; 4 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 4 of No. 155; 2 of No. 188; 2 of No. 190; 1 of No. 212.

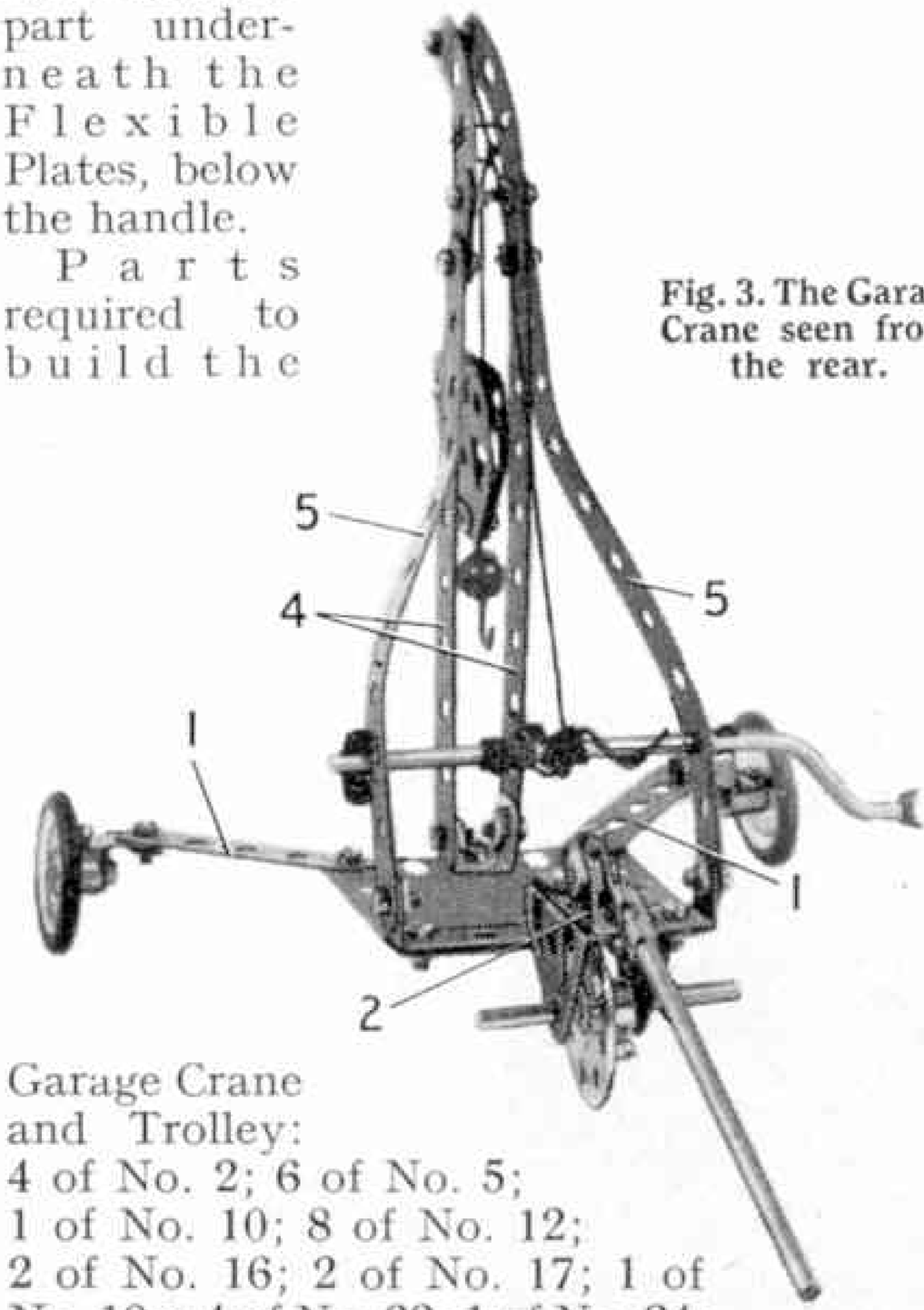


Fig. 3. The Garage Crane seen from the rear.

Parts required to build the Motor-cycle and Sidecar: 2 of No. 2; 2 of No. 5; 4 of No. 10; 4 of No. 12; 1 of No. 16; 1 of No. 17; 2 of No. 22; 1 of No. 24; 4 of No. 35; 19 of No. 37a; 18 of No. 37b; 1 of No. 38; 2 of No. 48a; 2 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 142c.

Some Notes on Gearing

These notes on the use of gearing may be helpful to young model-builders. For the model-builder, gearing is simply a mechanical arrangement for transmitting power from a Clockwork or Electric Motor to a model in such a way as to drive the moving parts of the model at a suitable speed.

If we wish to transmit a drive from one shaft to another parallel to it we use "Spur" gears. Parts Nos. 25, 26, 26c, 27, 27a and several others are spur gears. If the shafts are not parallel, but at right angles to each other, we can use either "Bevels" or "Contrate" gears, such as Parts Nos. 28 and 29. The latter are generally used with Pinions. Another form of gear, used to connect shafts at an angle to each other, is the Worm, Part No. 32.

Another and very important function of gearing is to drive a shaft at a different rate of speed from that of the driving shaft, and I shall have more to say on this subject later on.

DINKY TOYS NEWS

By **THE TOYMAN**

EVERY day brings me news of Dinky Toys Club Members and their activities, and I always look forward with keen anticipation to opening their letters and examining the photographs that are enclosed in most of them. One of the letters I received recently was from D. Poulten, Anerley, London, who wrote to tell me that he had been busy with his young brother-in-law, David, making a garage and fire station layout for use with David's Dinky Toys. I gather from what he told me that they have obtained a lot of fun and pleasure.

David is seen with the layout in the picture below. It will be noticed that the layout consists of a very simple road plan that is nevertheless carefully planned so as to provide plenty of scope for the movement of vehicles and for carrying out interesting traffic operations. Every Dinky Toys owner should try to make up simple play schemes of this type as they add very greatly to the fun and pleasure of Dinky Toys collecting.

An attractive fire station and garage layout with its young owner David Poulten, Anerley, London S.E.20.

Club Members will be interested to know that applications from youngsters eager to join continue to pour in from all parts of the world, and there are now many thousands of happy members in many widely scattered countries. It is quite a big job dealing with the volume of letters they send me, for many Dinky Toys collectors are so enthusiastic that they write to me almost every other day! Sometimes they write to tell me of a new model they have bought, or to put forward lists of suggestions for new Dinky Toys that they would like to see added to the range.

Keith Johnson, Chilwell, Notts, one of the thousands of Dinky Toys Club members.

Occasionally I get a few grumbles! These come mainly from very keen collectors who are interested only in certain types of Dinky Toys such as aircraft or military vehicles. These would like all the new models to be either aircraft or some form of military equipment! Others are interested only in private cars and lorries—and *they* let off steam whenever a new aircraft model appears! I always point out to these

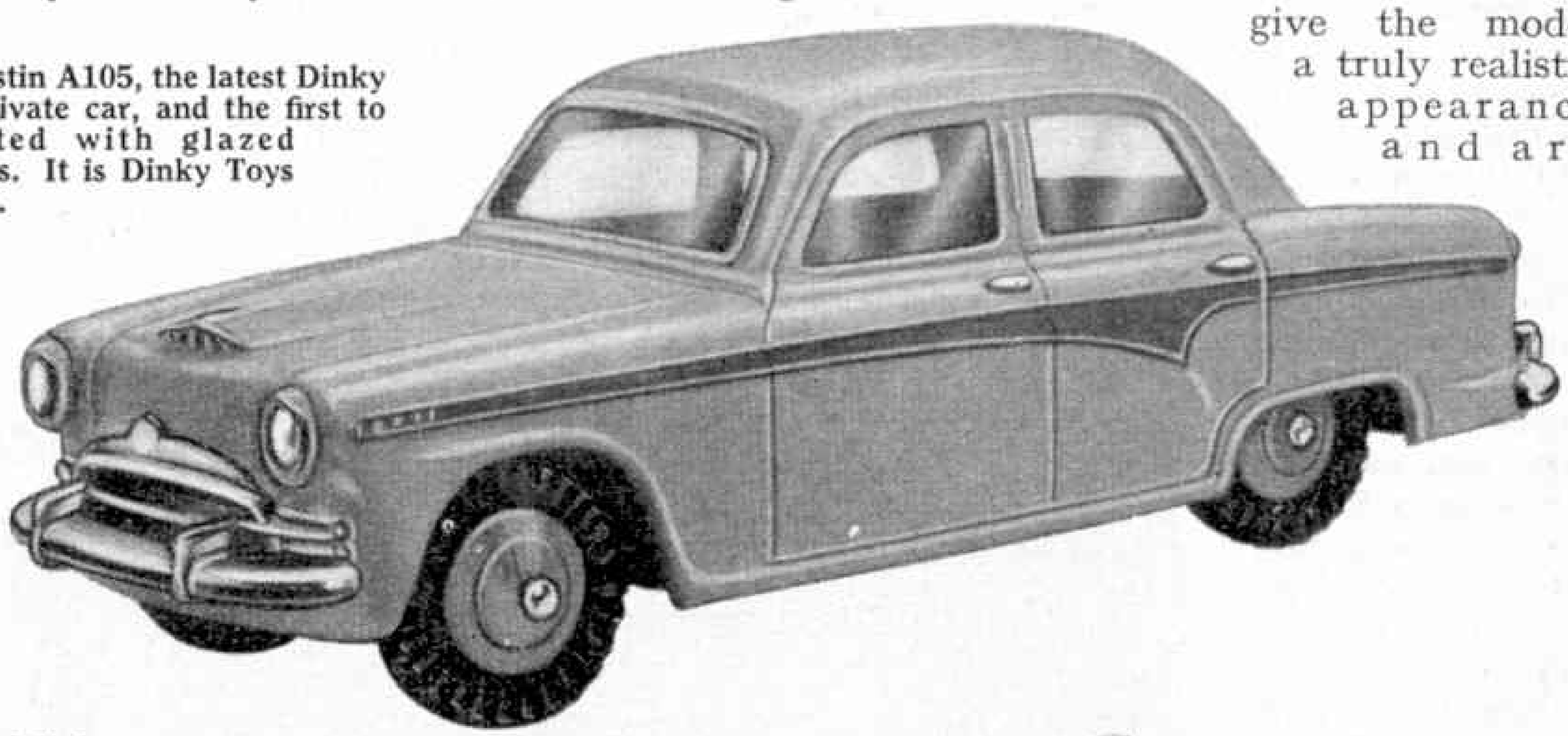
"In the lead!" The new Dinky Toys Vanwall Racing Car (Dinky Toys No. 239) heading the field in a miniature road race layout.

correspondents that while they may be interested only in certain kinds of models, the vast majority of collectors have much wider interests, and anyway we have to do our best to please everyone.

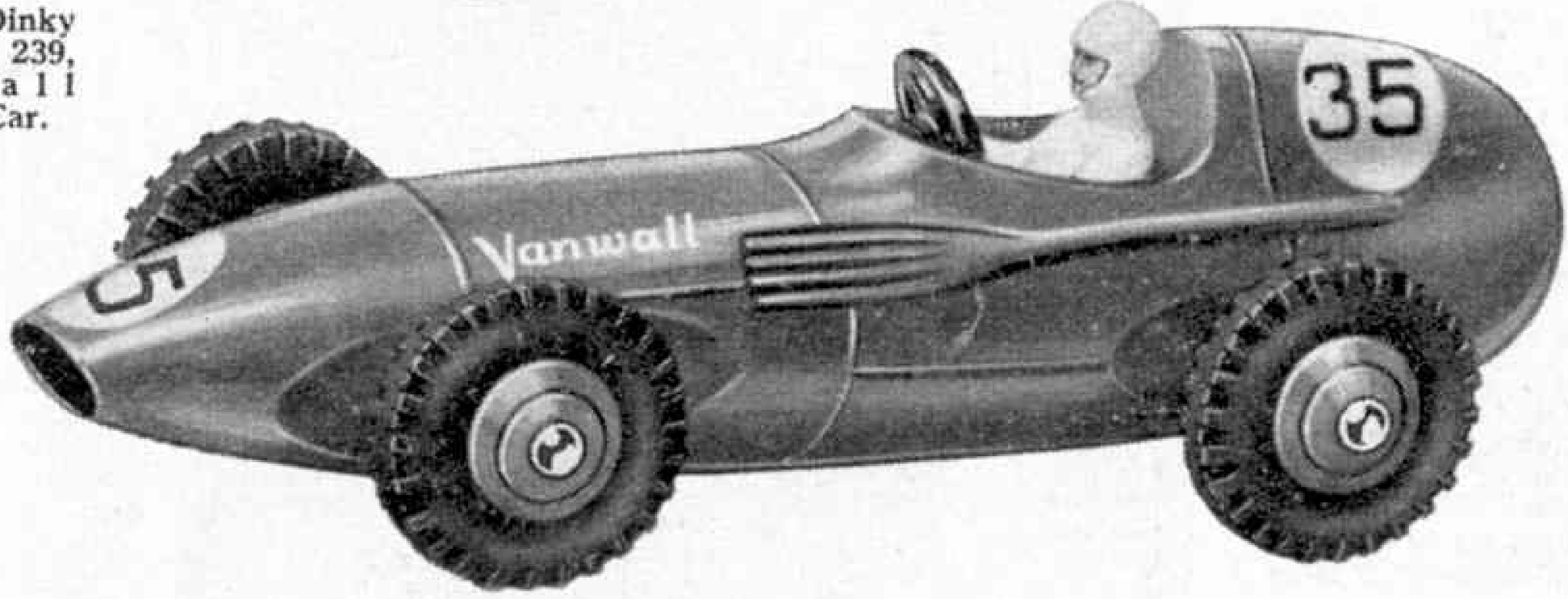
One of the privileges of Club Membership is that Members can write to me and put forward their views and suggestions, which are always carefully considered, and I am very pleased indeed that so many take the opportunity to write as often as they can.

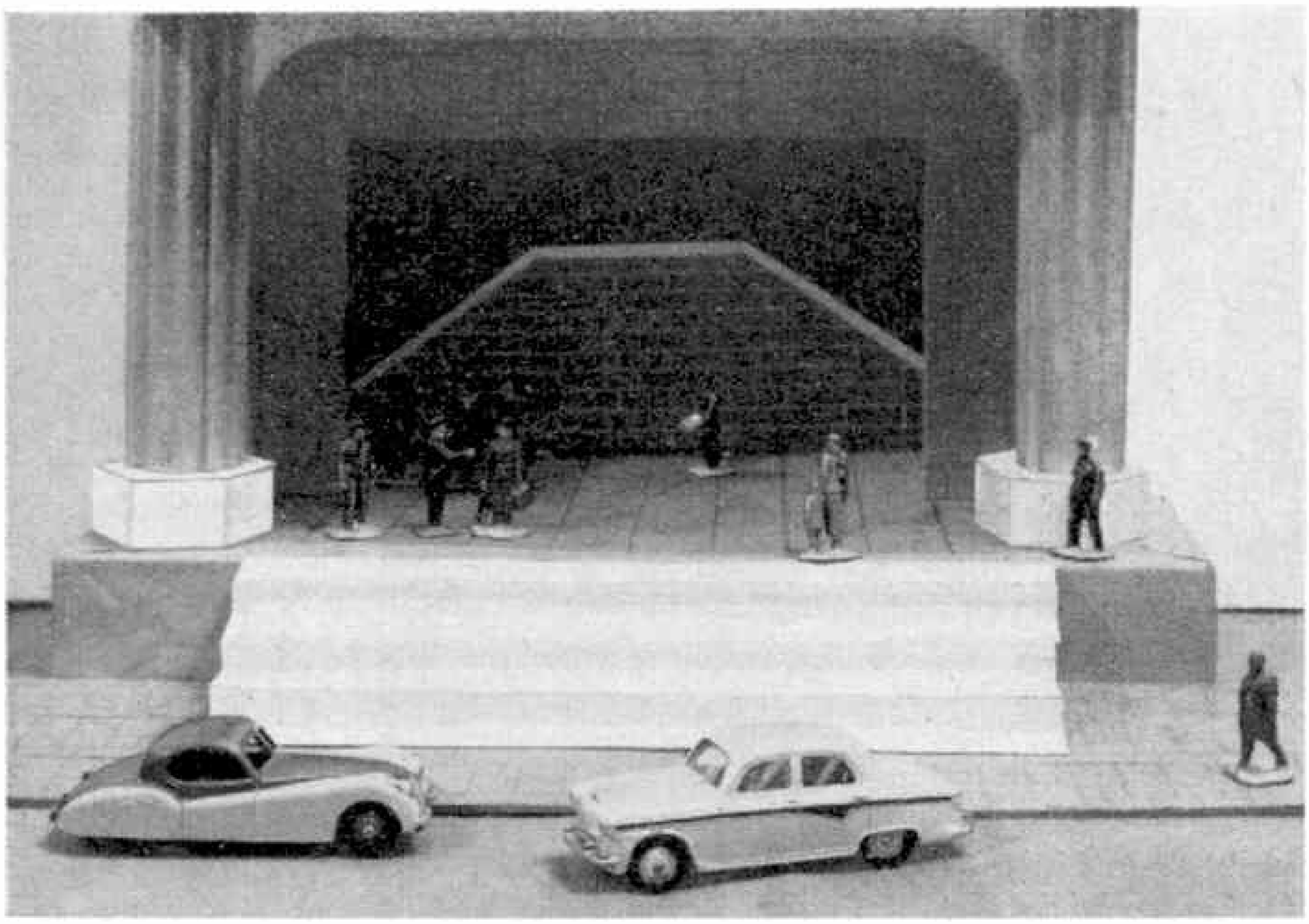
Well, so much for the Club. Now for some really exciting news about one of the two fine new Dinky Toys that have made their appearances this month. The first of these I want to mention is the Austin A105, Dinky Toys No. 176, and you will find a picture of it on this page. It represents the very latest development in Dinky Toys, for in addition to all its other fine features it is equipped with glazed windows and windscreen. These give the model a truly realistic appearance and are

The Austin A105, the latest Dinky Toys private car, and the first to be fitted with glazed windows. It is Dinky Toys No. 176.



(Below) Dinky Toys No. 239, Vanwall Racing Car.





The new Dinky Toys Austin A105 leaving the main entrance to a railway station.

bound to make it one of the most popular in the series.

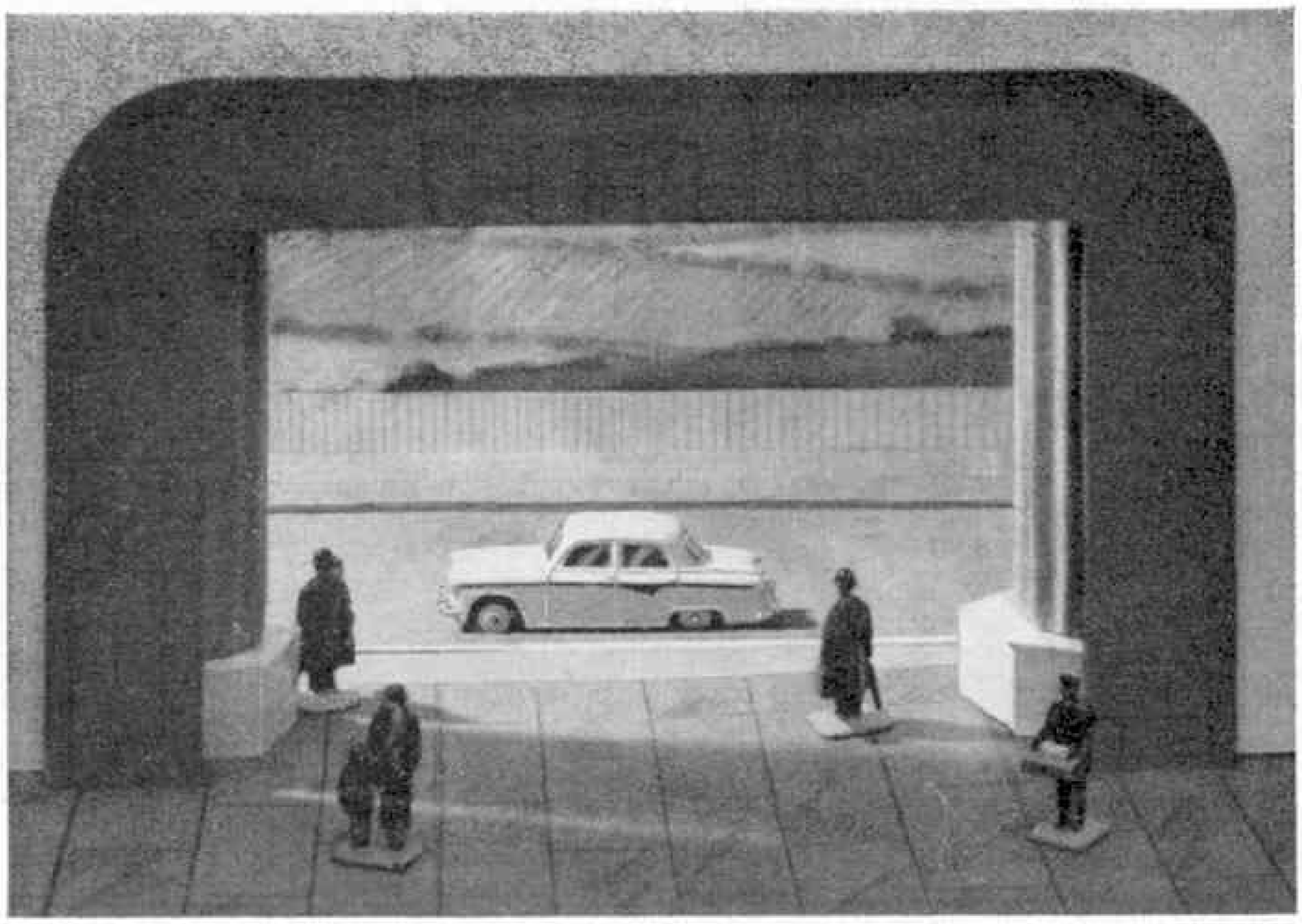
The windows are made from a plastic material, and the rear one and the windscreen are correctly bowed.

The main body features of the A105 are accurately reproduced and the car is available in two colour finishes. In one the body is stone coloured, with light blue flashes along the sides, aluminium grille and bumpers, stone coloured wheel hubs, black tyres and red rearlights. The other colour scheme has the bodywork grey with bright red flashes, wheels and rearlights.

In the lower picture on this page you can see this splendid new car standing outside a large hotel entrance and you will notice how distinguished and life-like it looks. Another view of the car is shown in the upper picture on this page. I can foresee a very big demand for this fine Dinky Toy, in which a new level of realism and finish is achieved, and I am sure that every Dinky Toys enthusiast will want to add at least one A105 to his collection.

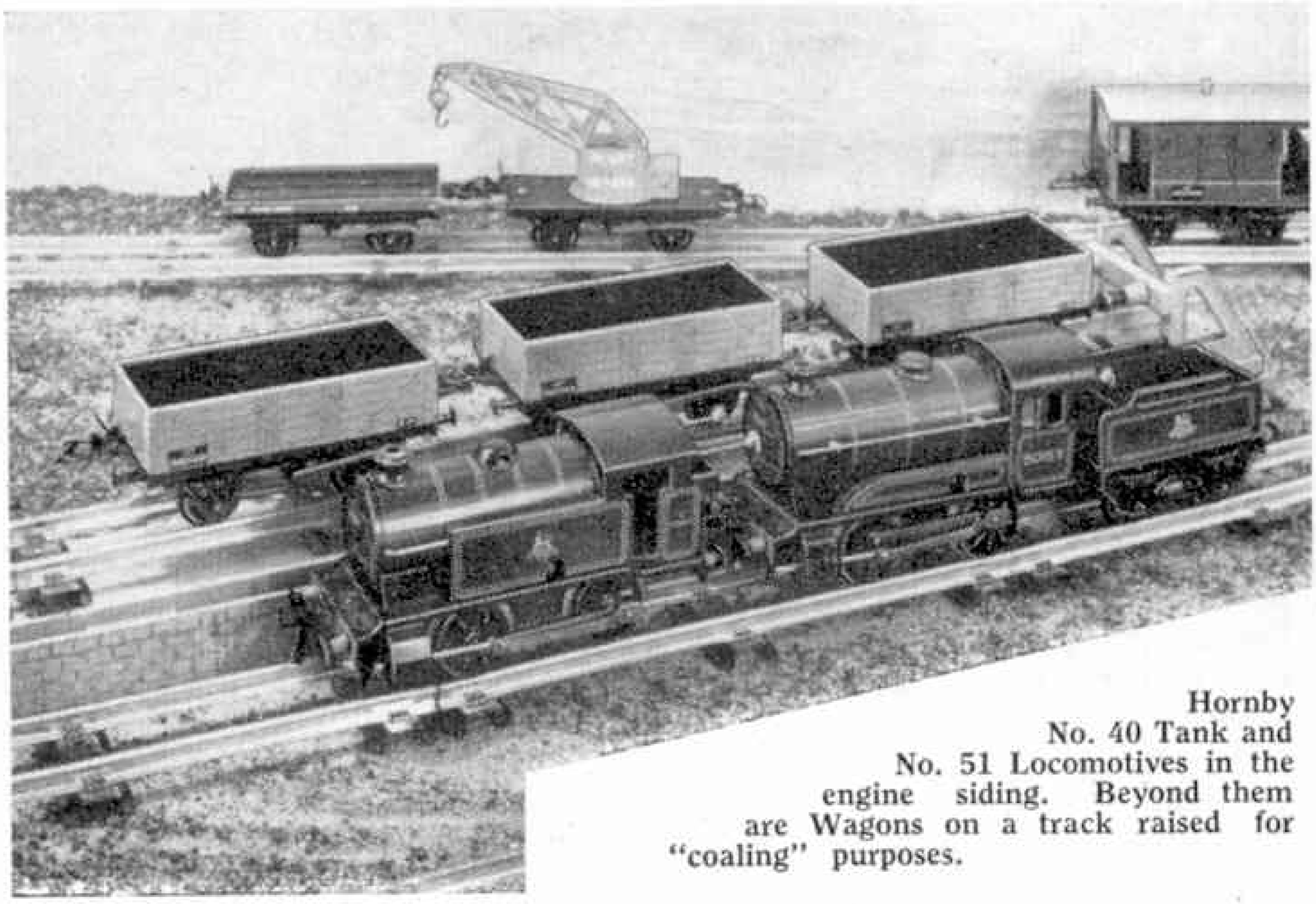
For the motor racing enthusiast we have introduced this month a striking model of the famous British Vanwall Racing Car, Dinky Toys No. 239. Vanwalls driven by Stirling Moss won three Grand Prix last year, and proved to the world that Britain now has a very formidable racing car. The car originated as a 4 cyl. 2 litre "special" with Cooper chassis and surface radiator, and has been gradually developed over the past few years. At the end of 1954 the engine capacity was increased to 2.3 litres. Then in 1955 came a general smartening up in appearance, which brought us to the triumphant cars of 1956/7. The Vanwall has fuel injection and produces about 280 b.h.p.

(*Continued on page 197*)



With the sunlight gleaming on its brilliant enamelled body, the Austin A105 looks very realistic as seen from the doorway of a large hotel.

"Tommy Dodd" writes about:



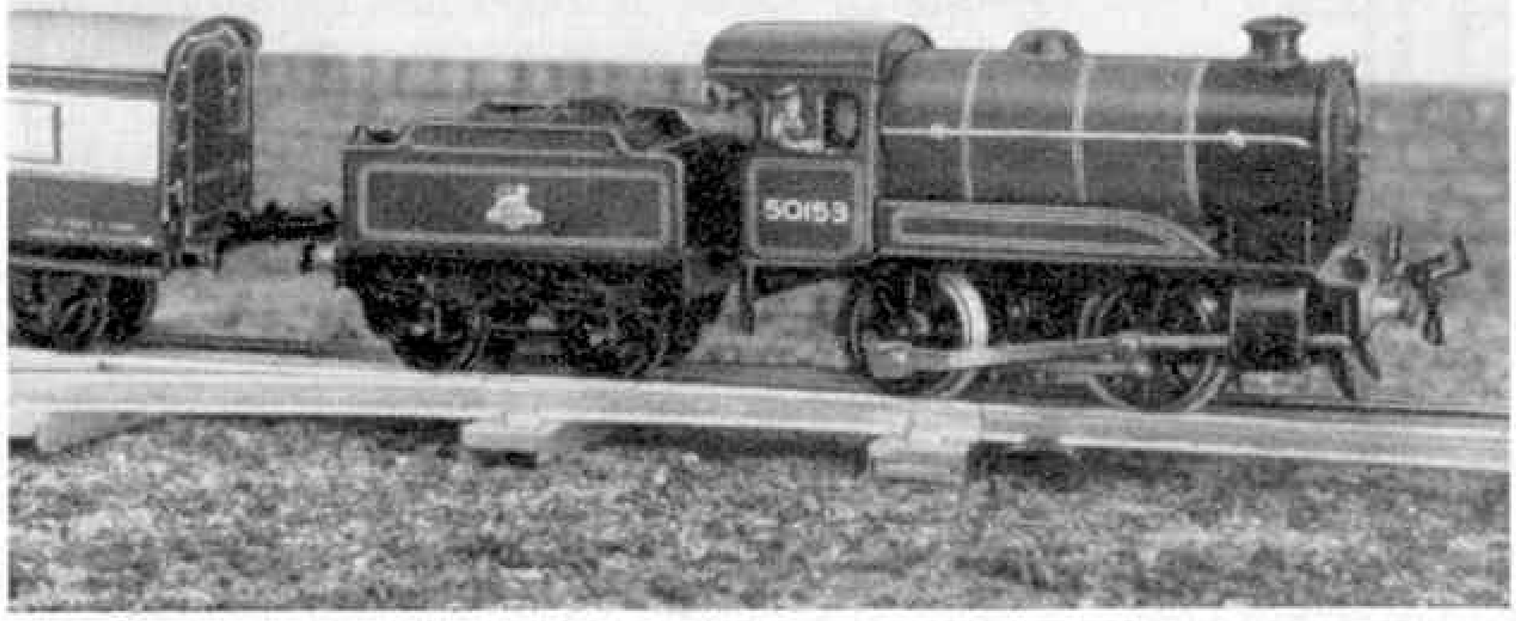
Hornby No. 40 Tank and No. 51 Locomotives in the engine siding. Beyond them are Wagons on a track raised for "coaling" purposes.

Engine Sidings and the Turntable

MOST Hornby Locomotives have a busy time running trains, shunting and generally taking part in the working of the layout, but they are not as a rule running all the while that the railway is in use. There are bound to be waiting periods between their different jobs, so many Hornby railway owners rightly try to provide sidings in which to put their engines when they are not wanted for train working.

While engines are standing by, as it were, they can quite conveniently be supposed to be refuelling and watering. Real engines always need water, lots of it indeed, so in miniature a Hornby Water Tank is sure to find its way into a convenient spot on practically any layout. Now we have to pretend that our Hornby engines take water, just as we may have to imagine that their tenders get loaded with coal. It is possible to provide dummy loads for Tenders and for the Wagons that bring supplies, but "dummy water" does not exist, so we just have to imagine that we are filling up the tanks. But even this pretence can be made quite realistic.

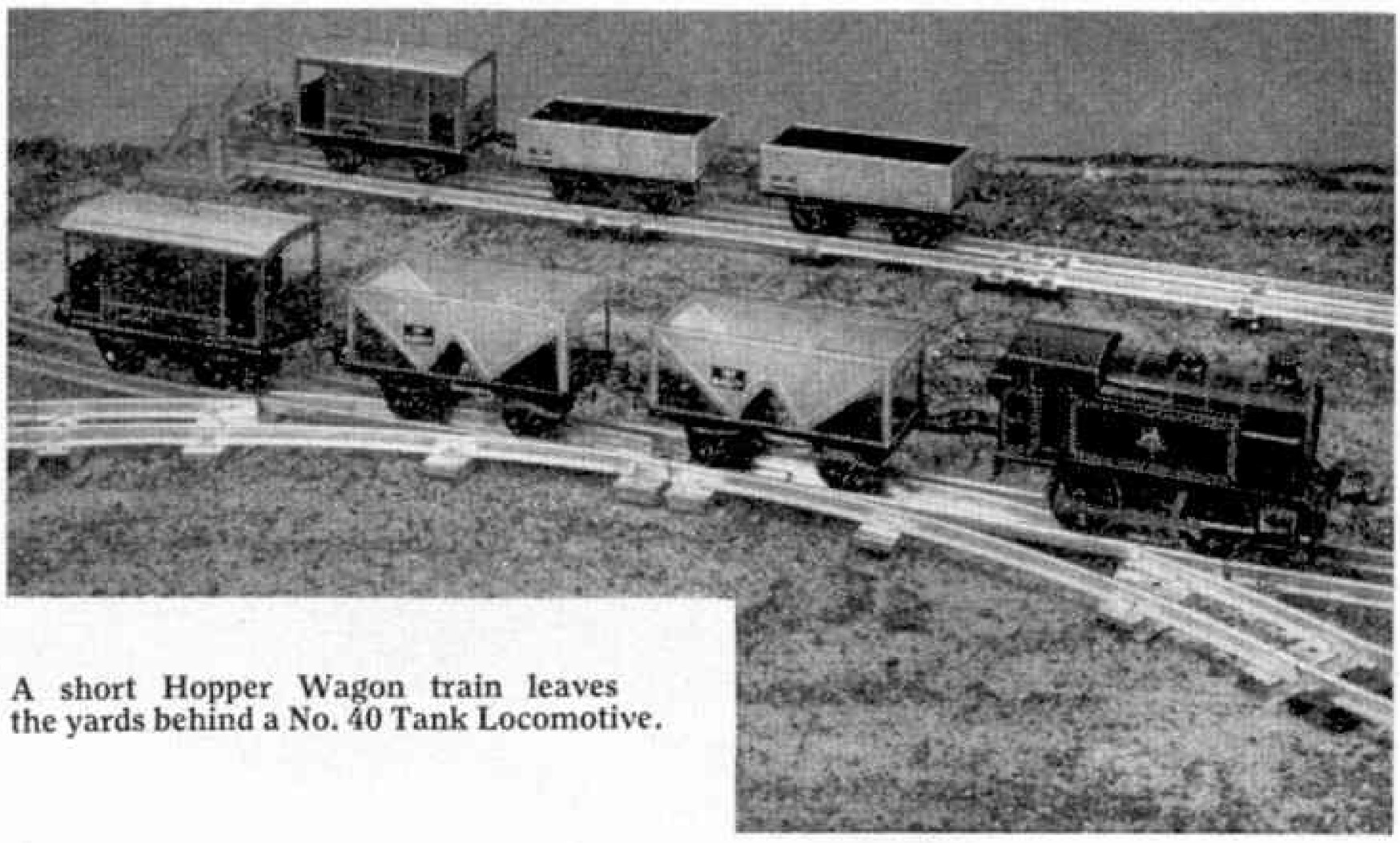
Perhaps the Wagons that bring the coal—or are supposed to if dummy coal is not used—stand on another track next to the engine siding. Better still, they may stand on a road that is slightly raised above the level of the engine track. This makes the job of taking coal easier, although nowadays most real engines receive their rations from some form of mechanical coaling plant. Ordinary Wagons can be used for "Loco Coal" purposes, but perhaps you may prefer to use some of the Hornby Hopper Wagons and to keep them



A Hornby No. 51 Locomotive at work on the main line with a train of No. 51 Coaches.

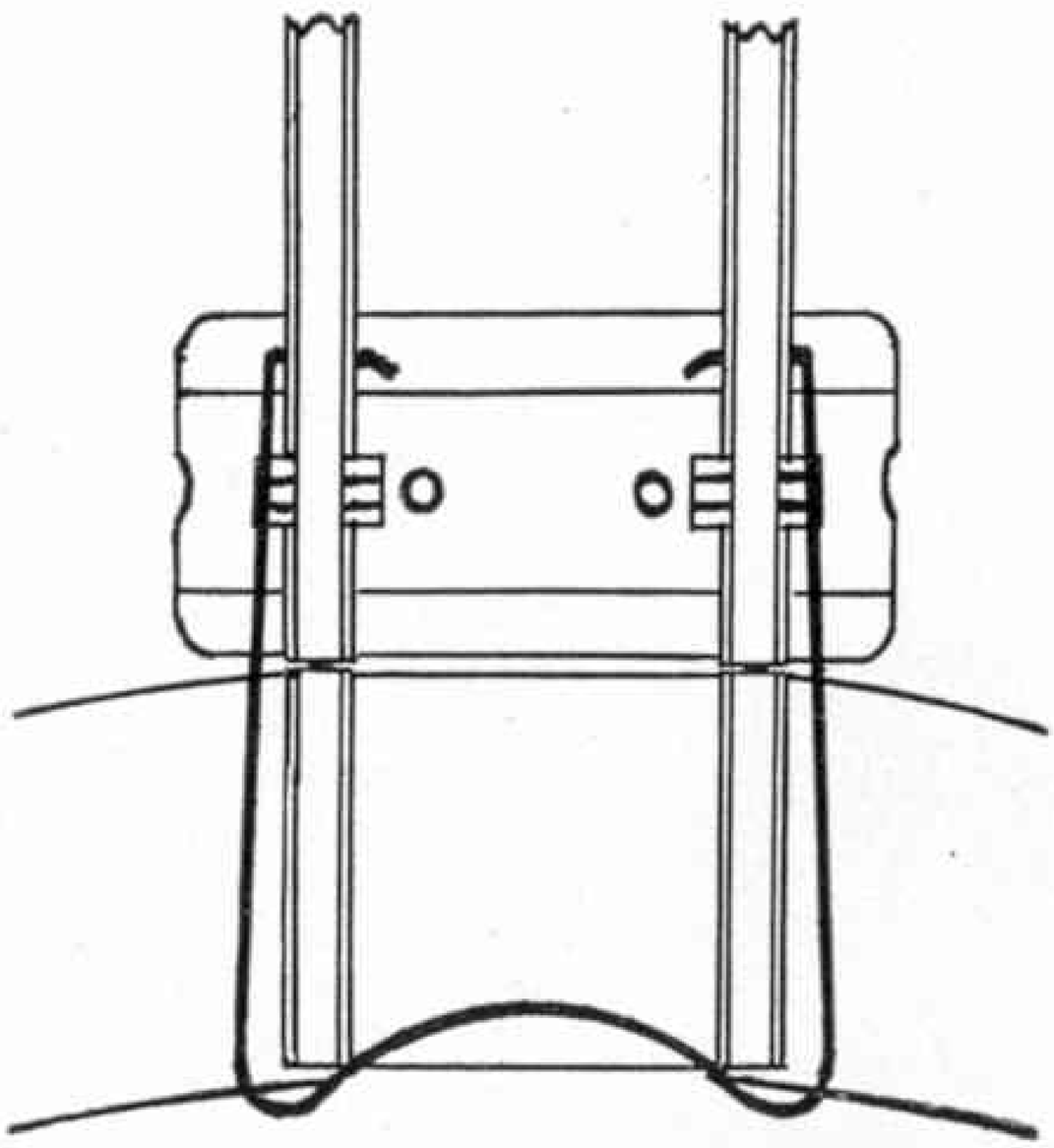
specially for this purpose.

Engines have to be turned from time to time, so a Turntable is found near to the engine siding in many a Hornby layout. Where the Turntable is joined up to several different parts of the layout it usually retains its position quite well. There is of course no difficulty in this direction on a permanent layout, where the rails are attached to a baseboard. But a system that is in use only temporarily may perhaps include a Turntable at or near the end of one of the tracks, simply for turning purposes. In that case the anchoring of the Turntable to the adjacent lengths of rail becomes important.



A short Hopper Wagon train leaves the yards behind a No. 40 Tank Locomotive.

As the Turntable is not adapted to the use of the standard Rail Connecting Plate, some Hornby owners that I know have devised their own form of fixings. Actually it is scarcely necessary to do this, for there is a very simple way in which the PCC Point Connecting Clip is used for the purpose.



This shows how to use the PCC Point Connecting Clip in an unusual manner, to secure the Turntable firmly to the adjacent Rail.

This bright idea has reached me from *M.M.* reader G. T. Endacott, of Plymouth, who describes his scheme as follows: "I first placed the open ends of the PCC securely under the two running rails, but over the turned-up portion of the first sleeper. Then with a little manœuvring, the curved end of the PCC was fitted over the inner ends of the rail of one of the Turntable outlet tracks. In other words, this Rail-Turntable link-up was done the opposite way round to that used in the Points-Rail link-up, for which the PCC is designed. The movable portion of the Turntable rail can now be revolved without any obstruction."

I tried the scheme out myself, and found it to work very well. Probably some of you will make one or two experiments with it and you might care to follow up the suggestion, from the same enthusiast, that the PCC Point Connecting Clip can be used to anchor the Level Crossing to adjacent Rails.

To effect this place the closed end of the Clip against the inner side of the first sleeper of one of these Rails, then allow the free ends of the Clip to pass through the slots in the ends of the base of the Level Crossing. The ends of the Clip require bending for this particular purpose, but the scheme may be worth trying if you find that the rail joints at either end of your Level Crossing tend to open out gradually as the result of intensive rail traffic. Here again the scheme is only necessary on railways that have to be put down and taken up each time they are used. Where the rails are screwed down on a baseboard, the Crossing will be firmly held.

Of General Interest

The unusual wooden pier that was formerly to be seen at Seaview, Isle of Wight. This photograph and the accompanying notes are by P. Norris, Ryde.

THE unusual piece of engineering here illustrated is a pier that until recently graced the sea front of Seaview, Isle of Wight. It was built to cater for seasonal pleasure steamers, but was little used except by anglers.

The pier was 1,000 ft. long and built on the suspension principle. The piles, decking, and lattice towers were of timber, with wire ropes supporting the decking. This was slightly arched, which gave it a certain fairy-like appearance. In high winds the oscillation was very noticeable and to walk along the pier with a gale whistling through the wires and a turbulent sea surging beneath was a frightening experience.

During the last war the pier fell into disrepair, and in a night gale a few years back it was blown to pieces. Thus was lost an attractive and unique wooden structure.

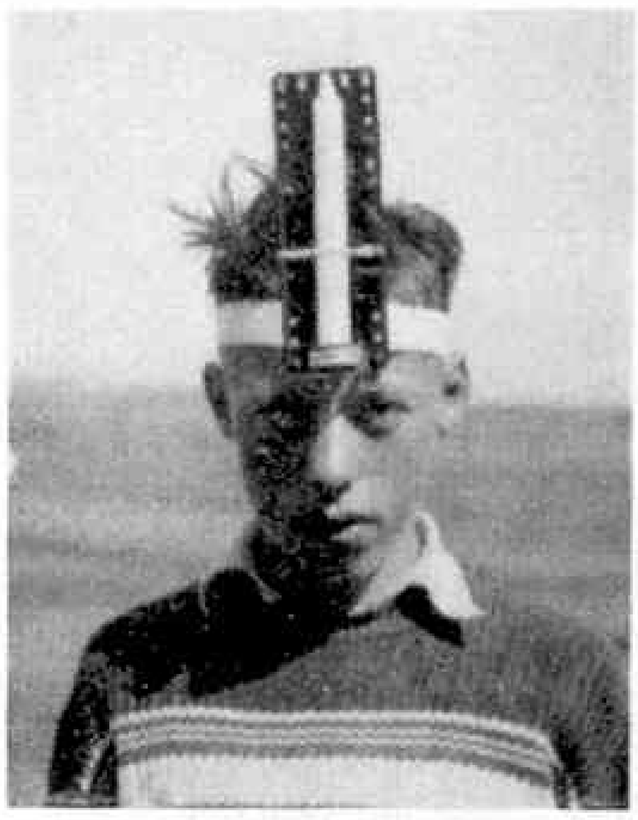
What time is it? For the answer see the account of the clock on this page by H. N. Saunders, Lydiate.

One of the most interesting features of the delightful village of Burton in Wirral, Cheshire, is the single-fingered clock that ticks majestically in the stately tower of the Parish church. For more than 200 years it has steadily counted the hours, and seems good enough for many more years to come.

Study the photograph carefully, and try to guess at what time the picture was taken. Most people imagine this to be ten minutes to four. Actually the photograph was taken at 3.30 p.m.

Single-fingered clocks are rare. The largest in Britain, 16½ feet in diameter, still lingers in the tower of the Church of St. Michael at Coningsby, Lincolnshire. Another one-handed veteran on the walls of Castletown Castle, Isle of Man, bears the monogram of Queen Elizabeth I.

With the introduction of the minute hand on clocks the single-fingered timepieces became known as "crippled clocks." Be that as it may, the surviving timekeepers of yesterday are still ticking as strongly as ever, although one handed!



A Cave—and Meccano

By Hugh Proctor

DO you want to go where no one has ever been before? I have not, for sure, been the first human in any place, but I have been the third in one. And that place was within a mile of my house, which is not in the Antarctic or on the Moon, but in England. True, it is in a sparsely populated district, high in the Pennines, but tradesmen's vans come to the door, and one would not expect anywhere near at hand to be still unexplored.

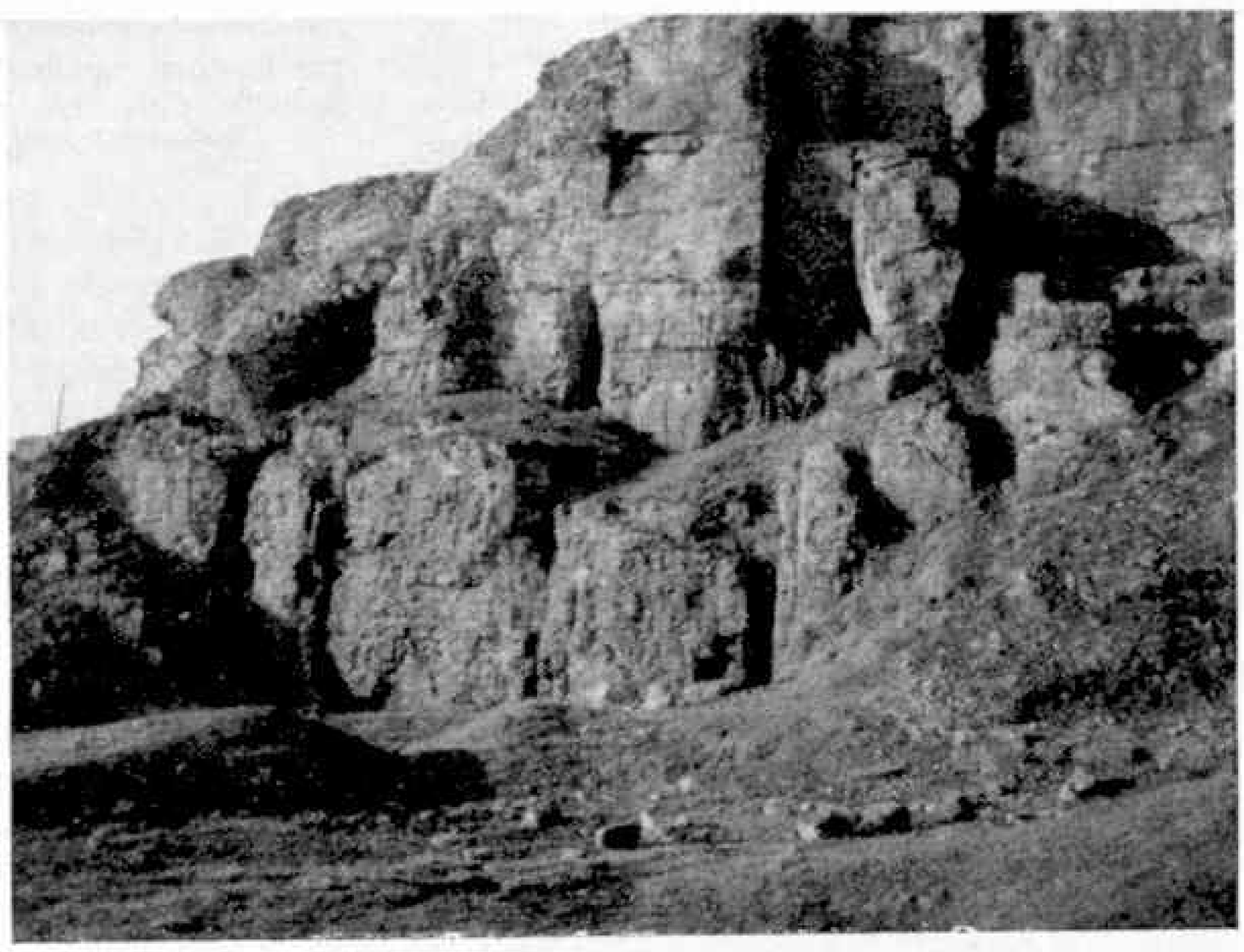
If you want to find an untrodden place without going far, look underground. You do not know what you may find. Already nearly 700 caves are known in Great Britain. There are almost certainly many more. Three or four years ago a friend of mine investigated a little hole in a hillside. No one supposed it went in very far. But it turned out to be the entrance to a cave 2½ miles long.

The cave I want to write about is not as long as that. But being near to my home it is the one I know best. I was first taken into it twenty years ago, and reckoned its length to be over 200 feet. A list of British caves, made since, says 255 feet. For twelve years I did not go into it again. Then, having come to live near it, I did. But after only 80 feet there seemed to be no way on. The other 175 feet of it had disappeared. It was not for another few days that I found out what I had forgotten. A crack that looked to be full of stones had a hole above them. That was the road.

Three more years passed until, in 1952, I went in again; with an agile party, including a boy of ten, that left me far behind. At last I got to 255 feet, the end of the cave. No one there. O well! If three people wanted to walk into solid rock and vanish, that was their affair.

An eerie silence was broken when the missing three could be heard talking, inside the rock. There was some slippery calcite leading up to an avens, or chimney, on the right. But it led nowhere. Or did it? The boy came slithering down it.

In the side of the avens he had found a very narrow crack indeed. But once it was shown to be worth trying, even adults found they could get through. The returning party described how the cave went on beyond it, to a low place where there was a lot of water. In a few days one of the older members of the party went back, and found he could get through the water and under the low place.



Brian Staley and David Hodgson outside the cave explored by the author and his friends. The main entrance is immediately behind the former.

He soon went again, taking me. Beyond what we had thought was the end, and beyond the water, is the best part of the cave. There is a passage wide enough for easy walking and fifteen feet high. On some parts of the walls is a band of dark objects that stick out of the rock. That is the "cockle-shell limestone". But the

"cockles" are really corals, fossilised South Sea island stuff. In an alcove a mass of calcite is like a walrus with several tusks, each a short thick stalactite. Near it is a curtain, twelve feet high, draped in most natural folds and so thin that a light held behind it shines through. But it is stone.

The new "end" of the cave was 200 feet beyond the old one. But it was a question whether this new "end" was really as far as we could get. There was a high fissure in which a man could squirm along as far as some calcite, which made it impossibly narrow. But a torch beam showed the fissure still going on, farther still.

In one way, our exploration was a disappointment. There was a penny at the fissure's beginning. Someone else had found the way up the avens and through the water.

Above the cave is a plateau in which is a small pothole, dropping away into darkness. It looked too narrow for anyone to get down, but two sixth-formers from a Grammar School now determined to try. I went with them. They spun for the honour of first descent. John won. Neville held a rope. Somehow John got down, and sank out of sight.

The next few minutes were like the scene in *Hamlet* where a ghost moves about underground but can be heard above. John had unsnapped the karabiner on the rope and was exploring down there. I moved about on the top, following the voice underfoot.

Not much was found that day. There seemed to be only some short passages down the pothole. One was blocked with mud. But on the next descent a small hole in that mud was found to have grown slightly larger. It preyed on John's mind. Two months later, he climbed down alone. Behind the mud was a long crack, so small that he had to lie on his hip to go through. It ended at a ten-foot drop, making the total depth of the pothole about forty feet. Down there was the end of the calcite-blocked fissure, the one with a penny at its other end.

John turned the other way. There were no pennies in this part of the cave. Stalactites as thin as straws, but up to ten feet long, hung from the roof. It was impossible to get along without breaking some. There was no sign of any having been broken there before. John knew that his foot was the first ever to tread in that spot. He went on for a distance that has not yet been accurately measured, but is between 100 and 200 feet. A fallen block of stone stopped him at last. He could not quite squeeze by it.

At Easter 1953, John, Neville, I and a thin boy called Walter went down the pothole in that order. That is how I came to be only the third person ever in a place within a mile of home. At the fallen block of stone the scene became—not *Hamlet*, but like putting the dormouse into the teapot at the Mad Hatter's party. Walter was not keen

A point 90 ft. within the cave.

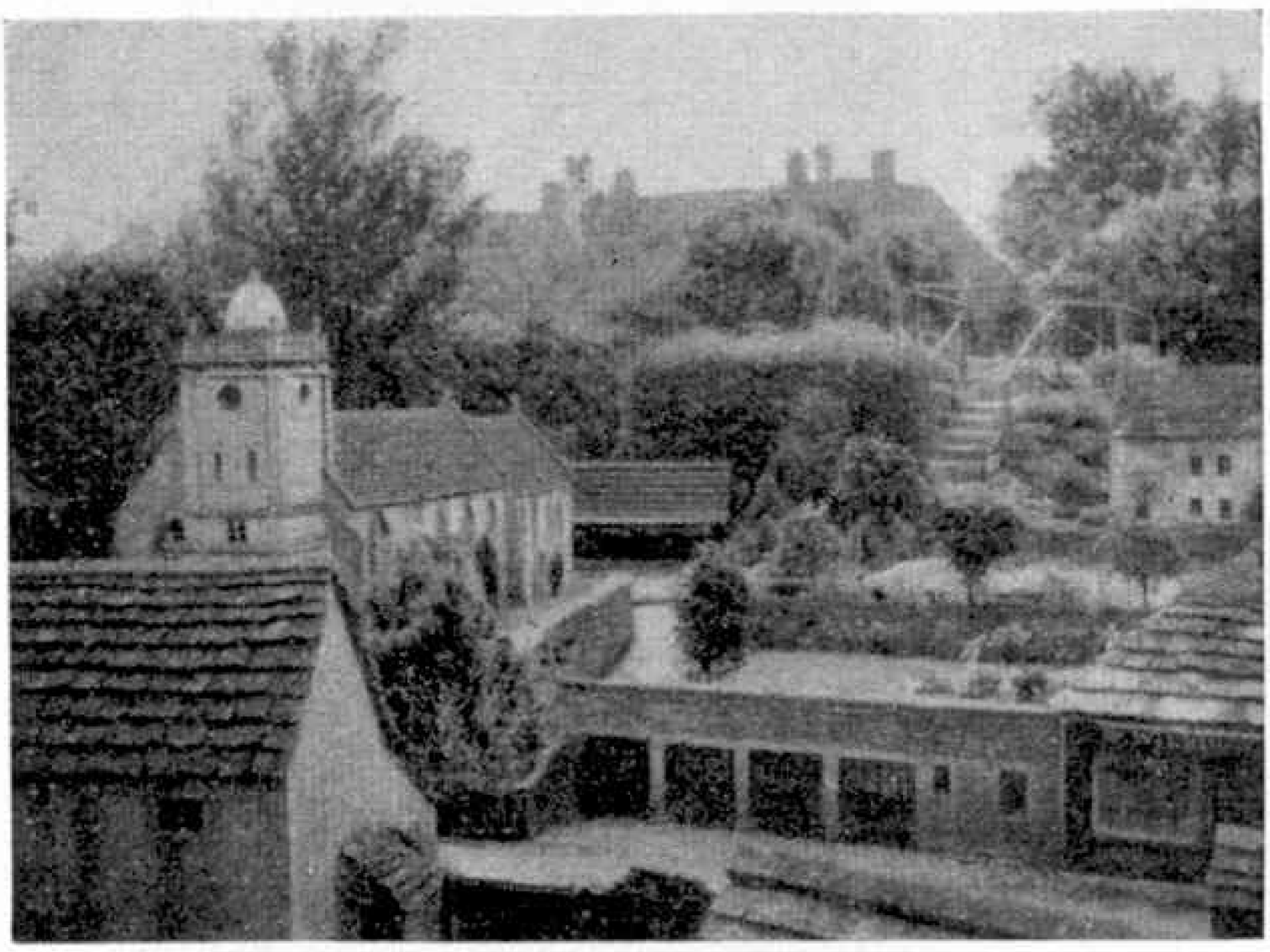
when he saw where he was expected to go. The first time he stuck, and was unwilling to try again. But his jacket and pullover were taken off, to make him even thinner, and then he went through. He was pleased at once at the thought that no one had ever been beyond that fallen block of stone but he. Treading unknown ground he disappeared round a corner, and came back to tell us that the cave went on a little farther, but there was there some very low roof.

Four years later, in 1957, we were still not satisfied that we knew everything there is to know about this one cave. The fallen block of stone has been moved. People have crawled under the low roof, hoping it will get high again, and no one is sure they have crawled as far as possible. There are plans for removing the calcite in the fissure between the two parts of the cave. If that is done, it will be possible to

(*Continued on page 208*)

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.



The model of a village within a village, Bourton-on-the-Water. Photograph by B. B. Ardron, Churchdown.

MODEL VILLAGE

Set in the heart of the Cotswolds is a model village that is a perfect replica of the village in which it stands. It is in Bourton-on-the-Water, a typical Cotswold village, the buildings of which are of Cotswold stone. A crystal stream flows quietly through the main street and is laced with small footbridges.

The model village is beautifully reproduced to a scale of one tenth. The church is worth noting. The interior is faithfully copied from its original, even down to the pews and altar. The tower clock of the church strikes on the hour and even choir boys can be heard singing, but their voices are on records.

Perhaps the most remarkable thing about the model village is that in one corner there is a "model" of the model village set. This is a remarkable piece of craftsmanship, showing even the trees and hedges, which are really grown and not reproduced artificially.

B. B. Ardron
(Churchdown)

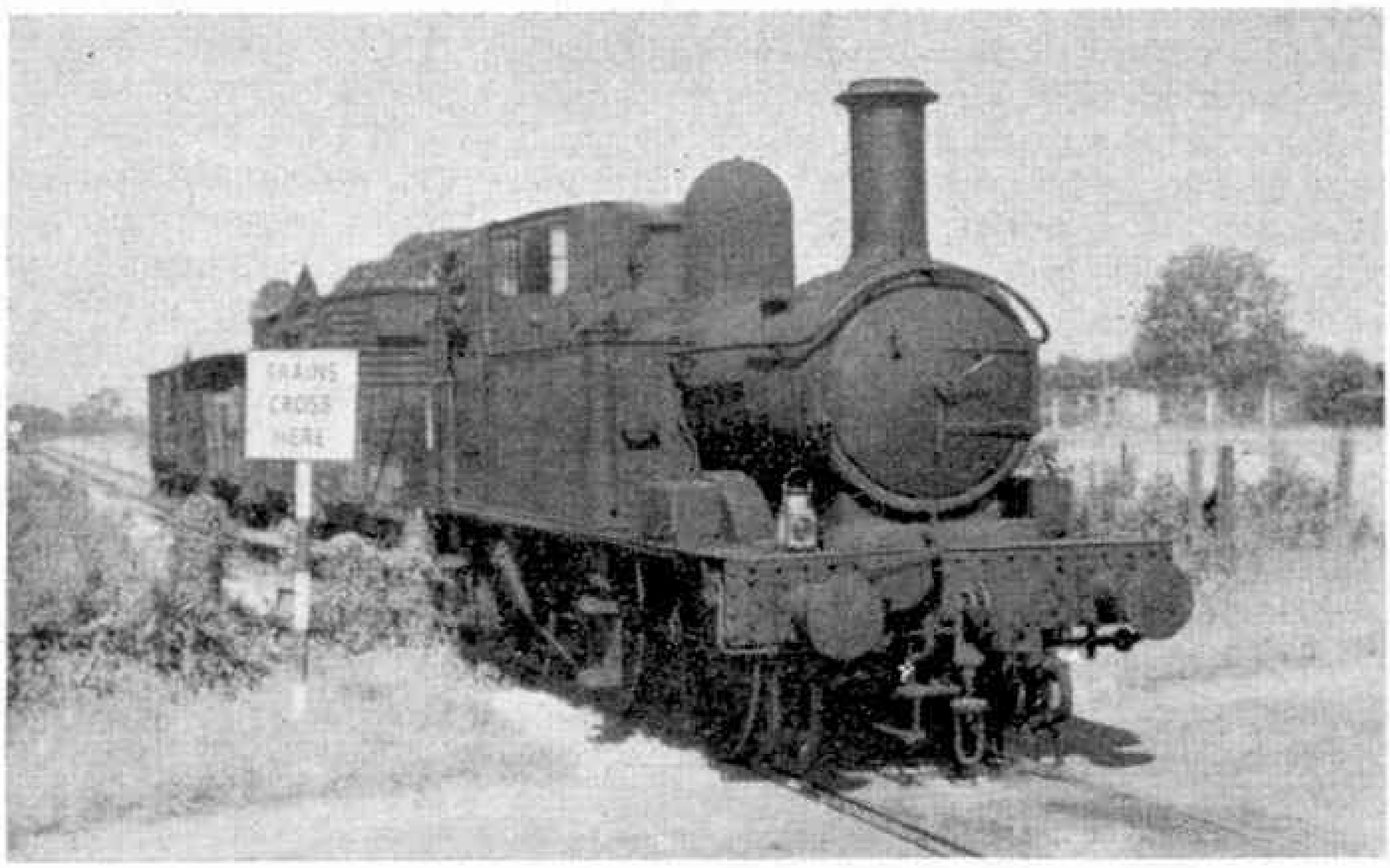
WRINGTON VALE LIGHT RAILWAY

Between Bristol and Weston-super-Mare is the Wrington Vale Light Railway. It leaves the Yatton-Witham branch at Congresbury and was built by the G.W.R. under a Light Railway Order and opened on 4th December, 1901, carrying 1,500 passengers on that day. With competition from buses, passenger traffic was withdrawn in 1931 and in 1950 the branch was shortened to end at Wrington instead of Blaydon. It now only has one train a day.

The original rails were flat bottomed and spiked directly to the sleepers. There is one spike each side holding the rails to the sleepers, but on alternate sleepers one spike on the outside only. Some of this track still exists.

The two level crossings are ungated and animals are prevented from straying on the railway by cattle grids. To ensure that there are no collisions with road vehicles trains are restricted to 10 m.p.h. and have to sound their whistles. Vehicle drivers are further warned by three notices reading *Beware of Trains*; *Crossing, No Gates*; or finally *Trains Cross Here*, as seen in the accompanying picture. In spite of these precautions a lorry was hit and overturned by a train some years ago.

C. J. Maggs (Bath).

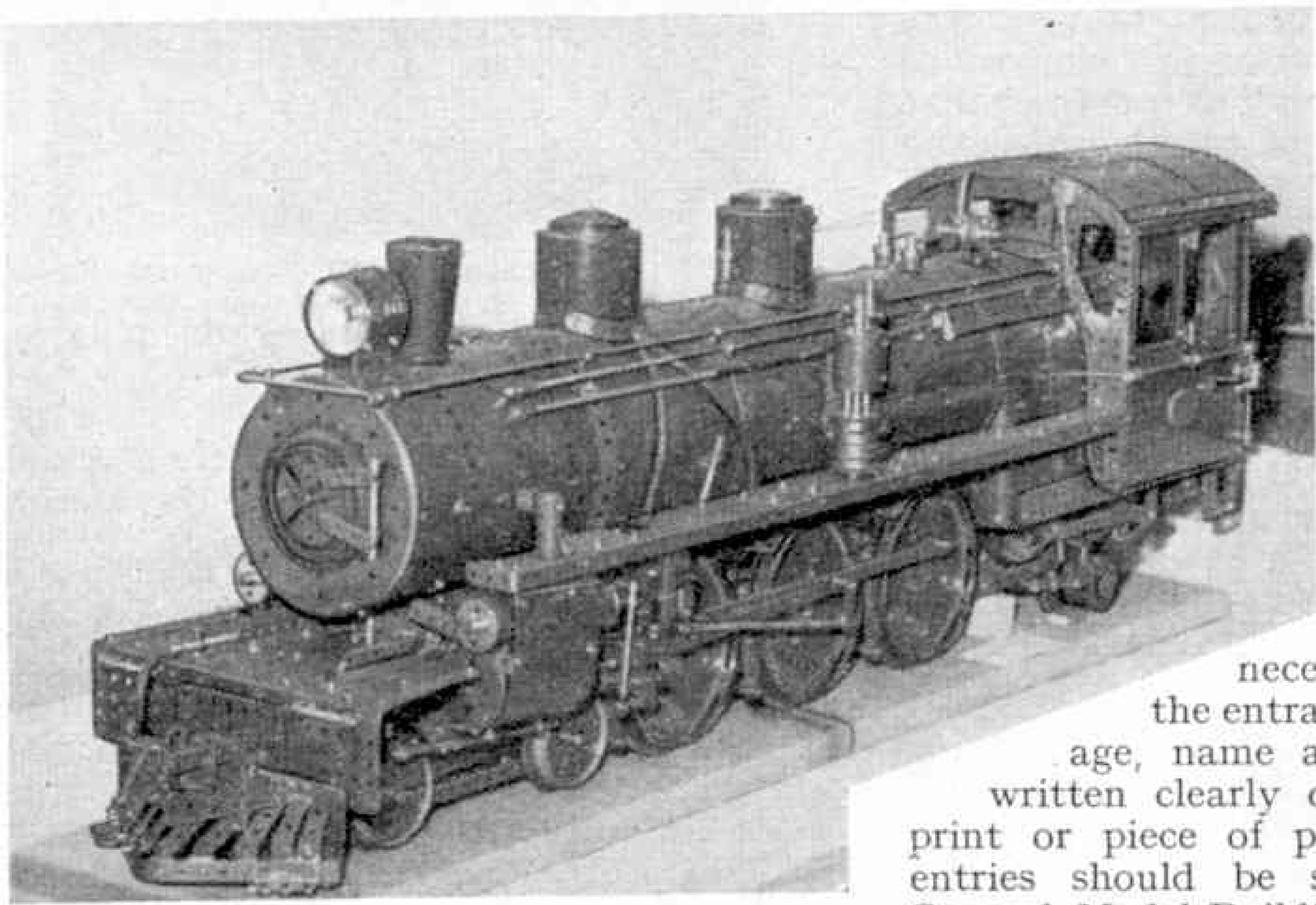


Train on the Wrington Vale Light Railway passing over an ungated level crossing. Photograph by Colin J. Maggs, Bath.

Meccano Competition

A Final Reminder to Model-Builders—Still Time to Win a Prize

THIS is the last opportunity we shall have of reminding intending competitors in the "New Year" Model-Building Competition that this Contest closes for entries on 30th April. If you have not already sent in your entry therefore you must hurry now, otherwise you may miss this fine chance to win a cash prize for your efforts.



This finely detailed model represents a mixed traffic Pacific type locomotive in service on railways in New Zealand. It was one of the prizewinning entries in a recent competition and was built by Mr. B. D. Baxter, Whangarie, New Zealand.

Don't forget that the competition is for models of any kind or size and there are no restrictions as to age. The rules are that models must be the unaided work of competitors themselves and that entries must be posted in time to reach us not later than the end of this month.

In order to give young competitors a fair chance the entries will be divided into two Sections: A, is for competitors who will be under 12 years of age on 30th April next, and B is for those who will be aged 12 or over on that date. A separate set of prizes as detailed in the panel at the foot of this page will be awarded in each Section.

In judging the entries and awarding the prizes the judges will look out for such points as neat design and sturdy construction and mere size of a model alone will not impress them. Full allowance will be made for the age of a competitor so that each entrant will have an equal opportunity to win one of the splendid prizes, irrespective of his age or the size of his Outfit.

Entries should consist preferably of good, sharp photographs of the models, but if these are not readily obtainable, sketches will do quite well, providing they show the main features clearly. Notes covering points of special interest can be added if desired. It should be noted that the photographs or the sketches need not necessarily be prepared by the entrant. Each competitor's age, name and address must be written clearly on the back of each print or piece of paper submitted, and entries should be sent to "New Year General Model-Building Contest, Meccano Limited, Binns Road, Liverpool 13."

Photographs and sketches of prizewinning models become the property of Meccano Limited, and will not be returned. An unsuccessful entry will be returned to the sender provided that a suitable stamped addressed envelope is sent with the entry for that purpose.

All prizewinners will be notified by letter as soon as possible after the closing date of the Competition, and we may be able to illustrate some of the prizewinning models in the *M.M.* later on.

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: 30th April, 1958.

Among the Model-Builders

By "Spanner"

An Aid for Photographers

Mr. D. A. Pickford, Hadleigh, Suffolk, who is a keen photographer has in use in his dark room a dish rocker operated by a simple Meccano mechanism that he has designed. I am illustrating this mechanism here, because it is so easy to construct that I am sure it will appeal to other Meccano users who also include photography among their hobbies. There are of course other uses to which it could be put.

Mr. Pickford's device, shown in Fig. 1, consists of a long pivoted pendulum at the top end of which is a tray that carries the developing dish. A simple crank and connecting rod joins the pendulum to a No. 1 Clockwork Motor mounted as shown. The connecting rod is a 5½″ Strip and the crank is a bolt in a Bush Wheel mounted on a driven shaft journalled in the Motor side-plates. The device operates for about 12 minutes on one winding of the Motor.

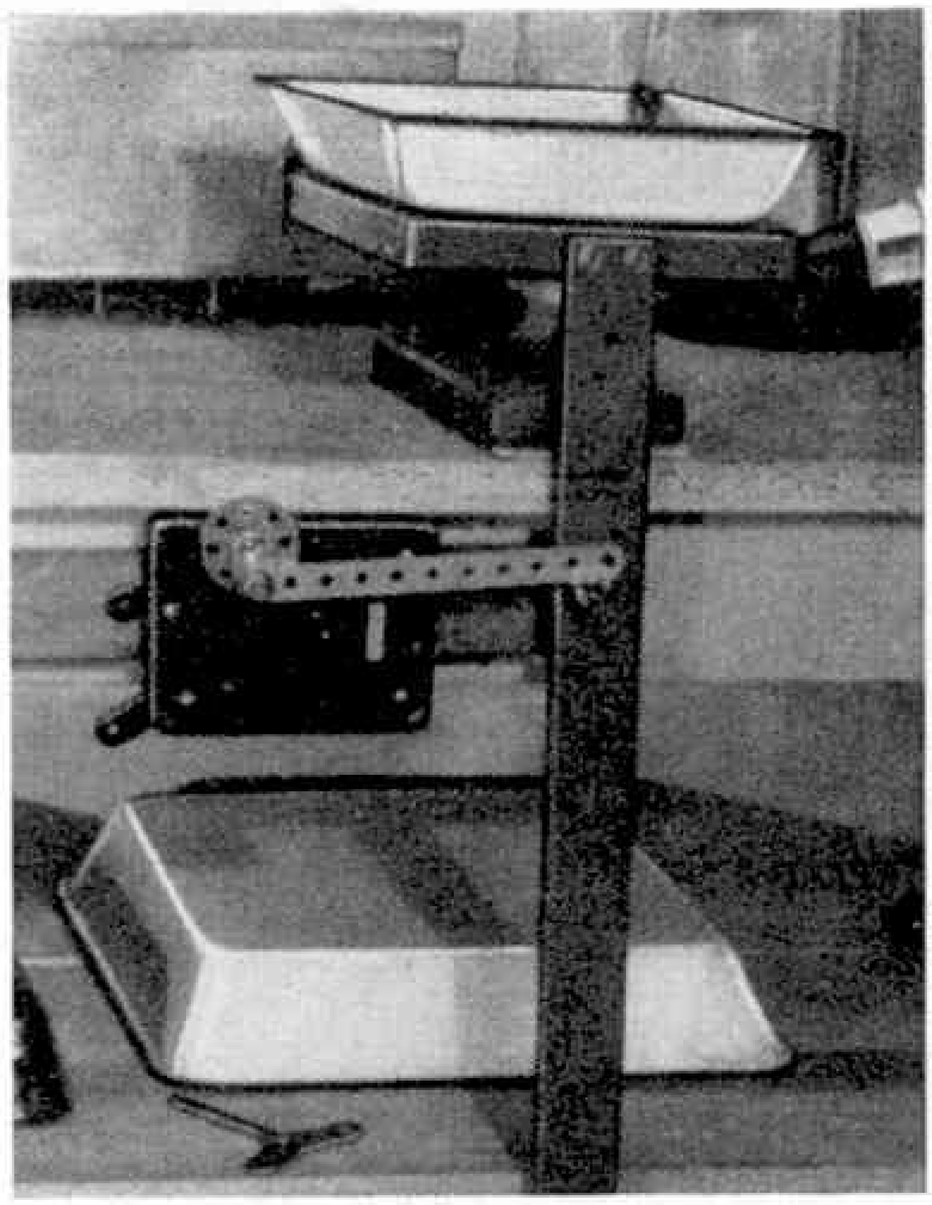
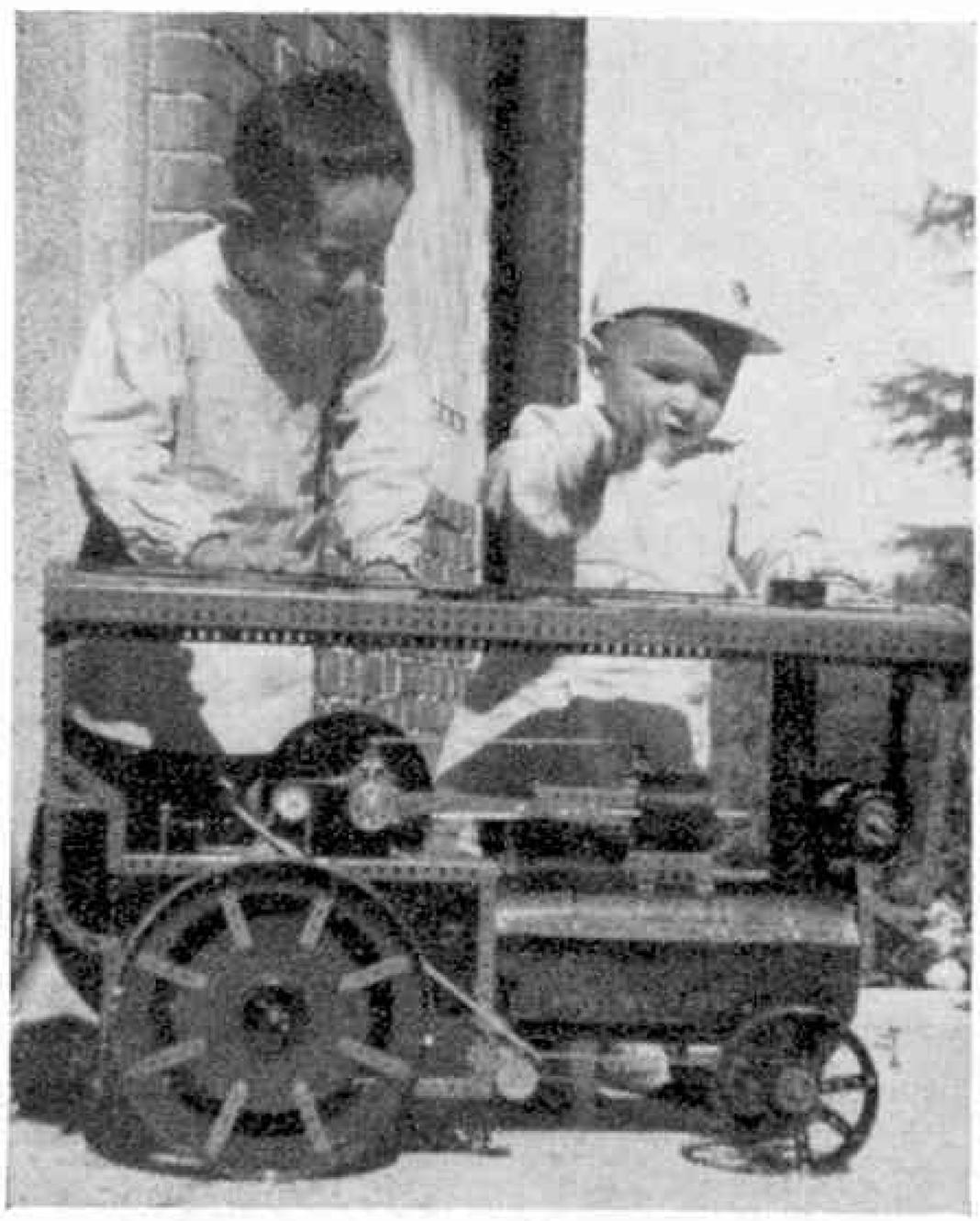


Fig. 1. A Mechanical Dish Rocker for the darkroom that is worked by a Meccano mechanism. It was devised by Mr. D. A. Pickford, Hadleigh, Suffolk.



Roger and Alexander Castiglioni, Milan, Italy, take great interest in the models built by their father. Here they are admiring a fine Showman's Traction Engine that Mr. F. Castiglioni constructed recently.

Lever Lock for Clutches and Gear-Boxes

The device shown in Figs. 2 and 3 will prove very useful in many mechanisms requiring a lever that can be locked in two positions, for example, to provide on and off positions for clutches, brakes, etc. It is made by bolting two Flat Plates 1 and 2 to a 5½″ × 2½″ Flanged Plate 3. To a 3″ Rod 4 Double Arm Cranks 5 and 6 are fixed at each end. A 2½″ Strip 7 is bolted to the Crank 5, which also has a Threaded Pin 8 secured in its elongated hole. A 1½″ Corner Bracket 9 is held by a Collar on an Adaptor for Screwed Rod and spaced with two Washers.

A length of Spring Cord is connected between the Corner Bracket and an Angle Bracket 10. The Threaded Pin 8 must be adjusted so as to lock in the slotted hole of the Corner Bracket. If the Threaded Pin binds in the Corner Bracket it should be eased slightly with a smooth file, near the sharp corners.

A 4½″ Rod 12 is mounted in two Trunnions 11 bolted to the Flat Plate 1. A 1″ Pulley Wheel with Rubber Ring is fixed to the Rod 12, a Collar holding it in position. In a Socket Coupling 13 a 1½″ Pulley Wheel is secured. This unit is held against the 1″ Pulley by a Compression Spring 15 held in place by a Collar 16. A Coupling fitted with two 1″ Rods is fixed

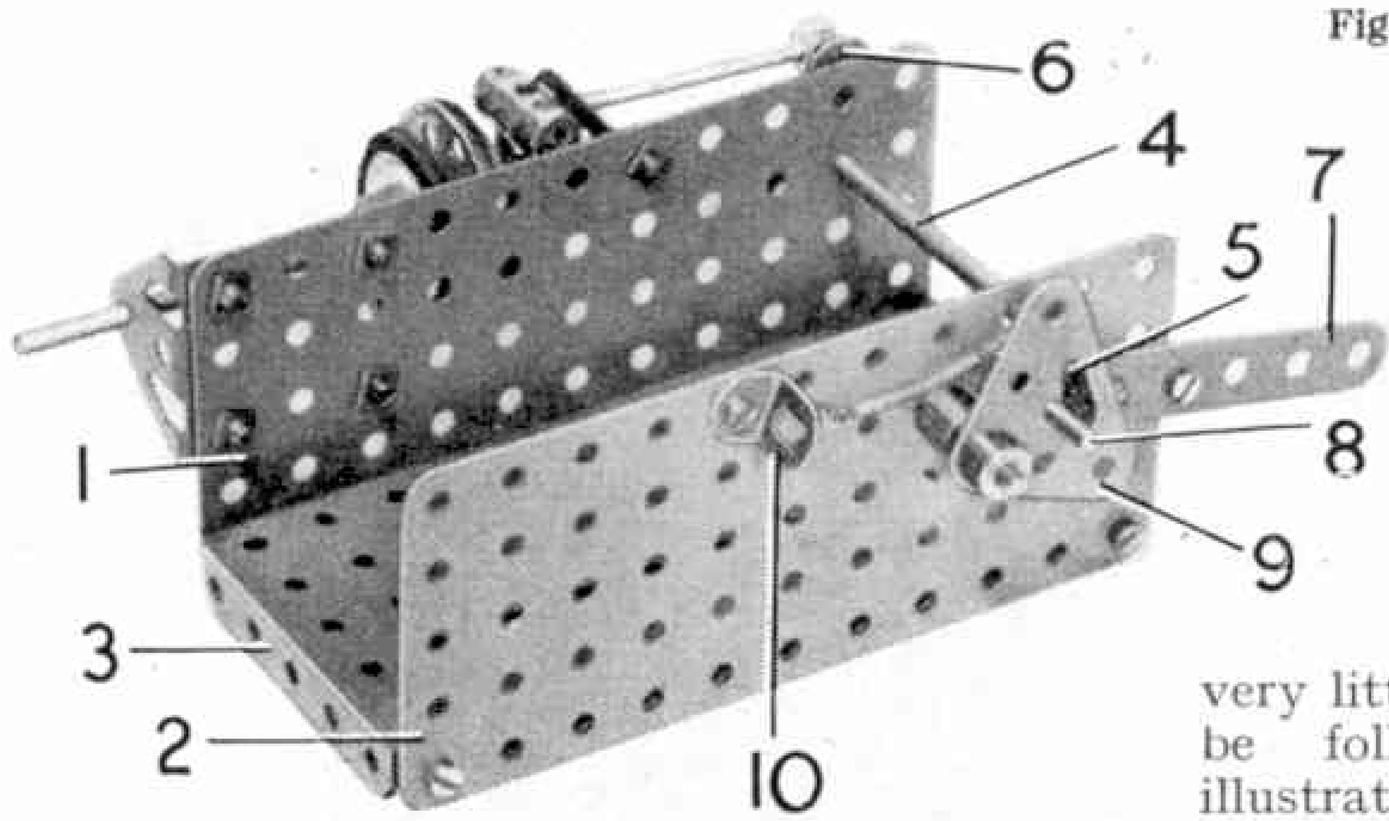


Fig. 2. A lever locking device suitable for locking gear and clutch operating levers.

on a Rod 17, which is attached to the Double Arm Crank 6 with a nut and bolt, the nut locking against a Collar on the Rod. A $\frac{1}{2}'' \times 1''$ Angle Bracket supports the Rod.

When the Strip 7 is depressed, the Double Arm Crank 6 should be adjusted to disengage the $1\frac{1}{2}''$ Pulley Wheel from the 1″ Pulley with Rubber Ring. The Strip 7 is raised to its upper position to put the clutch in gear.

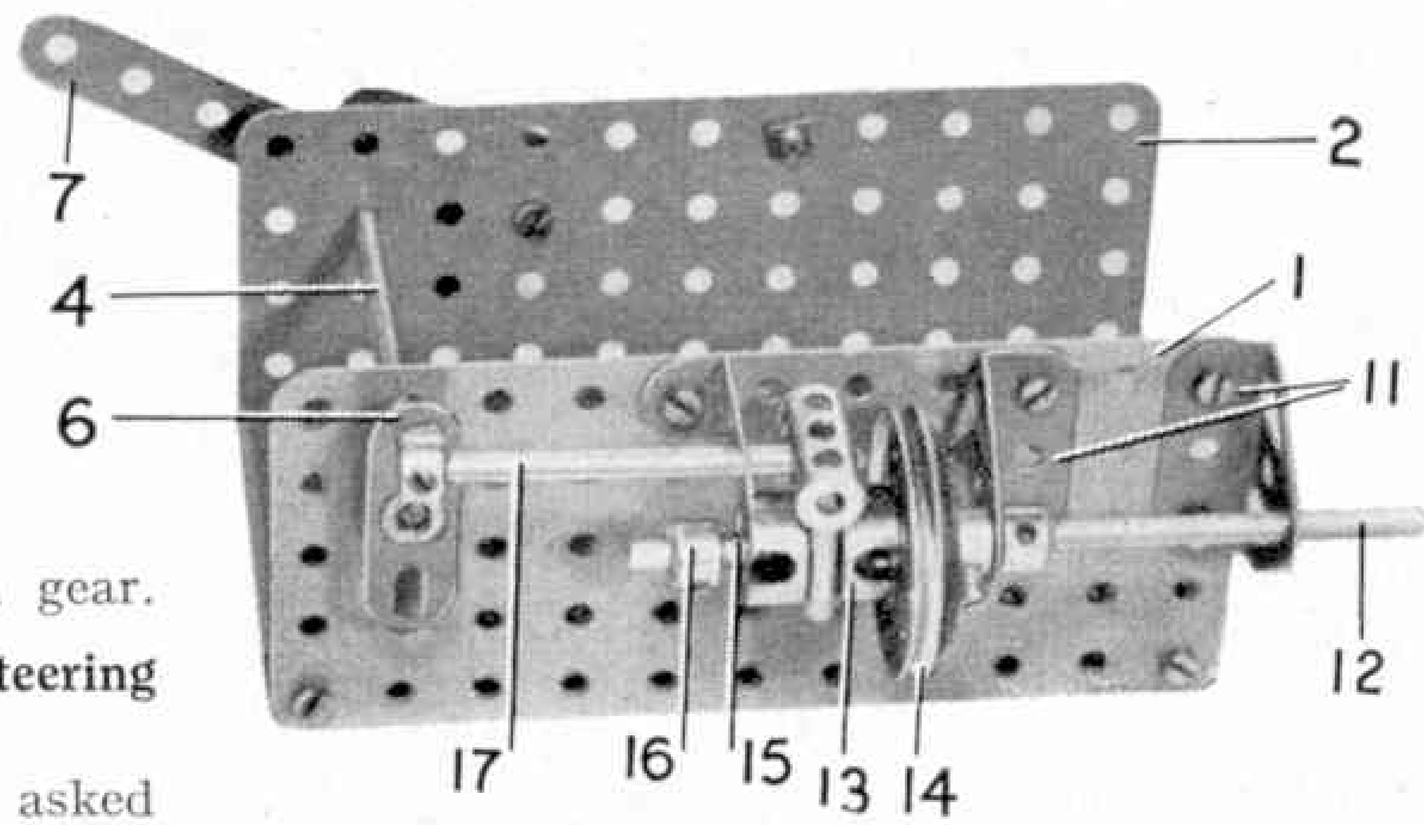


Fig. 3. Another view of the lever locking device.

included several examples of such mechanisms in these pages from time to time and a further example is shown in Fig. 4 on this page.

This one is suggested by Mr. W. Johnstone, Liverpool, who used it in a little car that he built for his young son. It requires very little explanation and the details can be followed quite easily from the illustration, but I think one or two points are worthy of mention.

Each Road Wheel is fixed on a $\frac{3}{8}''$ Bolt mounted in an Angle Bracket that is fixed to a second Angle Bracket bolted to the chassis of the car, which in my example is represented by the framework 2. The two Angle Brackets are joined together by a $\frac{3}{8}''$ Bolt 3. The Bolt is passed through the first Angle Bracket, fitted with a nut, and then passed through the second Angle Bracket. A second nut is then placed on the Bolt and the two nuts are tightened up. Then the Bolt is passed through the end hole of the $1\frac{1}{2}''$ Strip 4. This construction is the same for each wheel.

The two $1\frac{1}{2}''$ Strips are connected by lock-nutted bolts 5 and 6 to a $2\frac{1}{2}''$ Strip 7 that forms the tie bar. The steering column, represented by a Crank Handle, is mounted as shown and the cranked end engages between two $\frac{3}{4}''$ Bolts fixed as shown in the $2\frac{1}{2}''$ Strip.

A simple steering arrangement of the kind shown here can be built into the majority of vehicles constructed from the smaller Outfits and will be found to function satisfactorily.

A Simple Steering Gear

I am often asked by young model-builders for suggestions for making up very simple steering arrangements that they can use in small model cars. I have

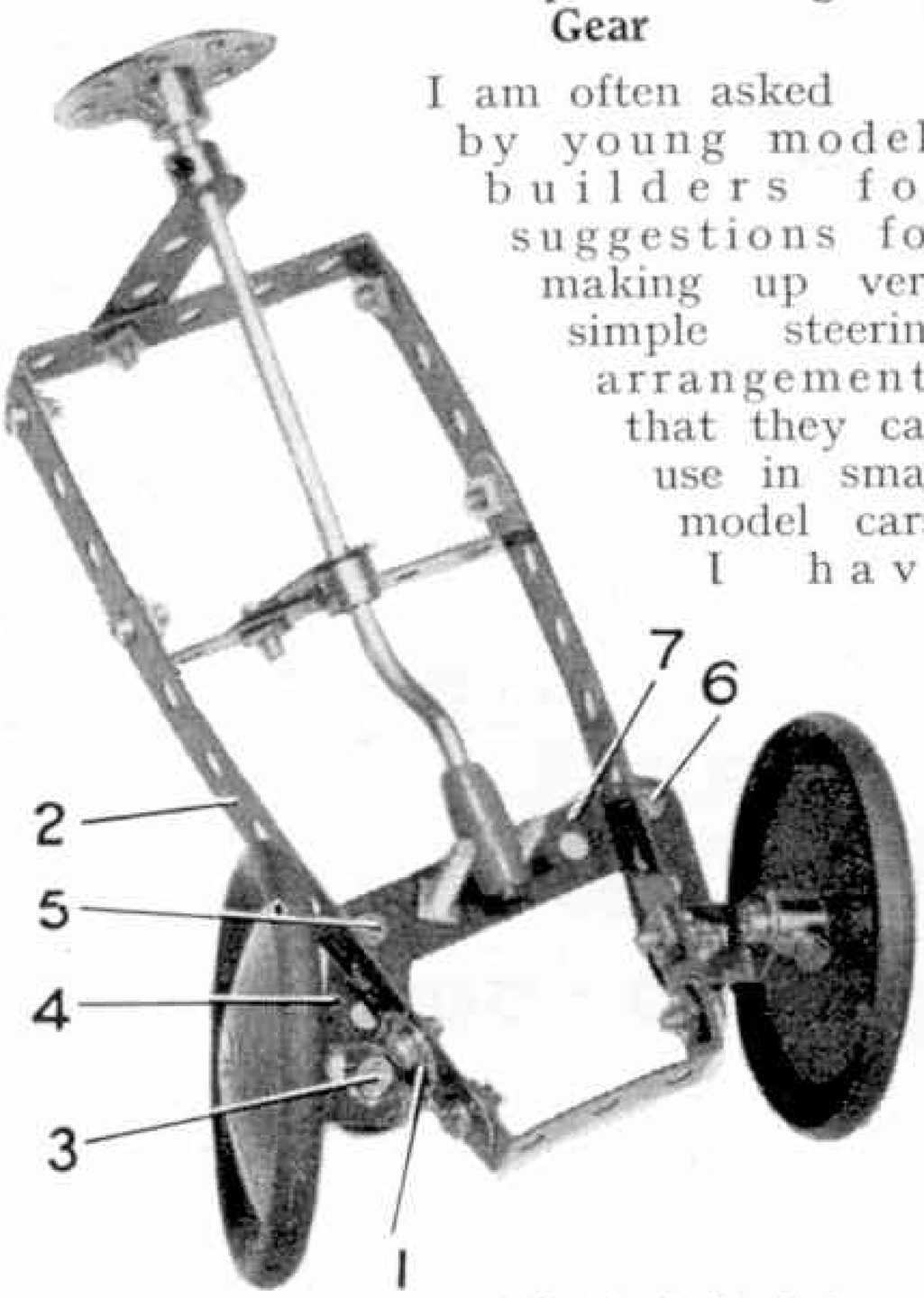


Fig. 4. A simple form of steering gear for a small model car.

MODEL OF THE MONTH

Engineers' Shaping Machine

SHAPING machines, of one type or another, form part of the equipment of almost all general engineering workshops, and it is one of these very useful machine tools that we have chosen as the subject for this month's "Model of the Month." It is shown in Fig. 1 and embodies most of the features of its prototype.

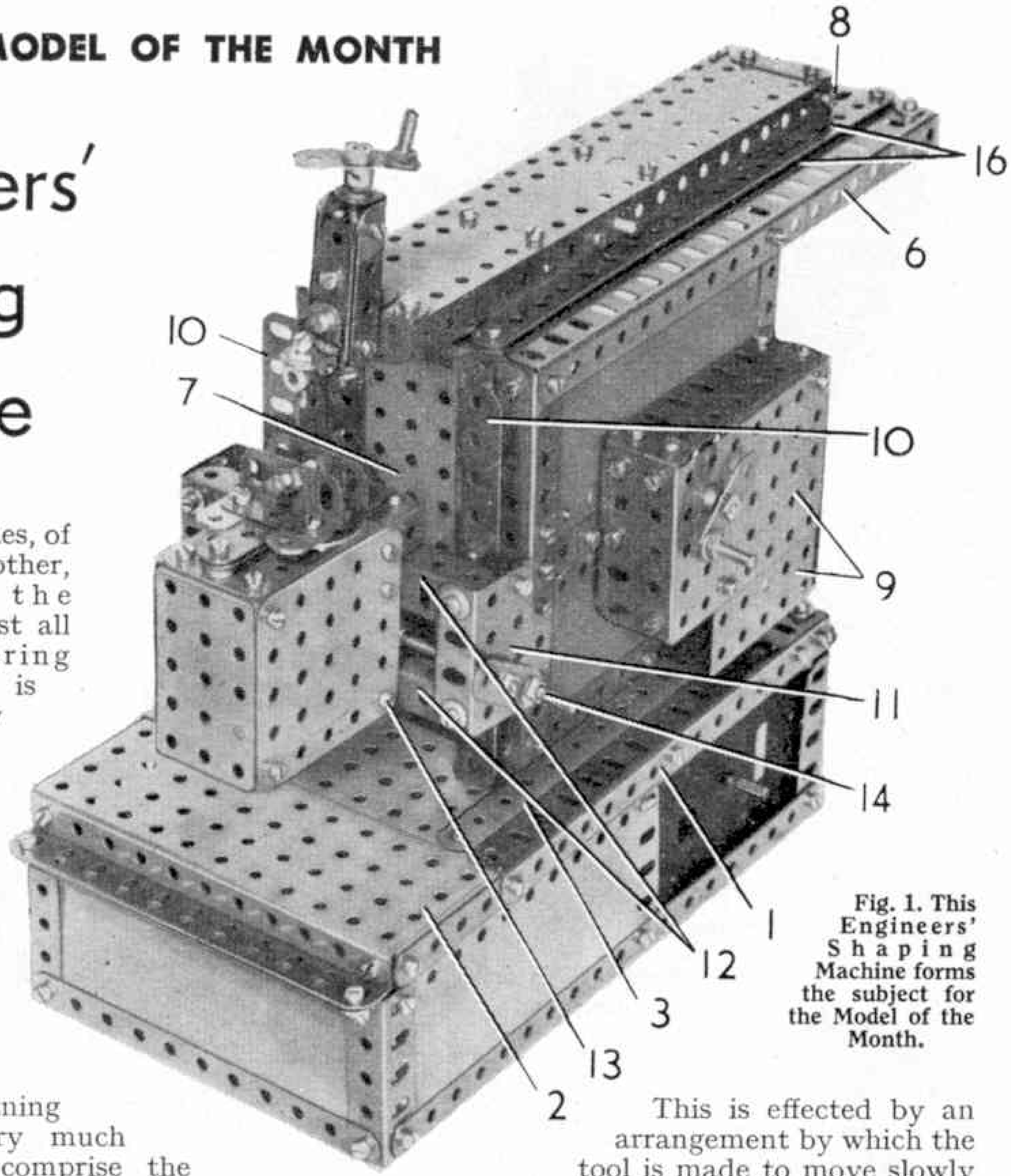


Fig. 1. This Engineers' Shaping Machine forms the subject for the Model of the Month.

Shaping and planing operations are very much alike, since both comprise the machining of flat metallic surfaces by means of tools having only one cutting edge.

Shaping is usually carried out on small areas of metal and small pieces of work that are not bulky enough for the big planing machines. In addition most shaping machines can be adapted to the cutting of convex or concave surfaces as readily as plane surfaces.

This is effected by an arrangement by which the tool is made to move slowly through the arc of a circle.

The cutting tool is carried in a special "tool box" fixed to a stout arm or ram that in some machines moves in a horizontal direction. In others the ram moves vertically.

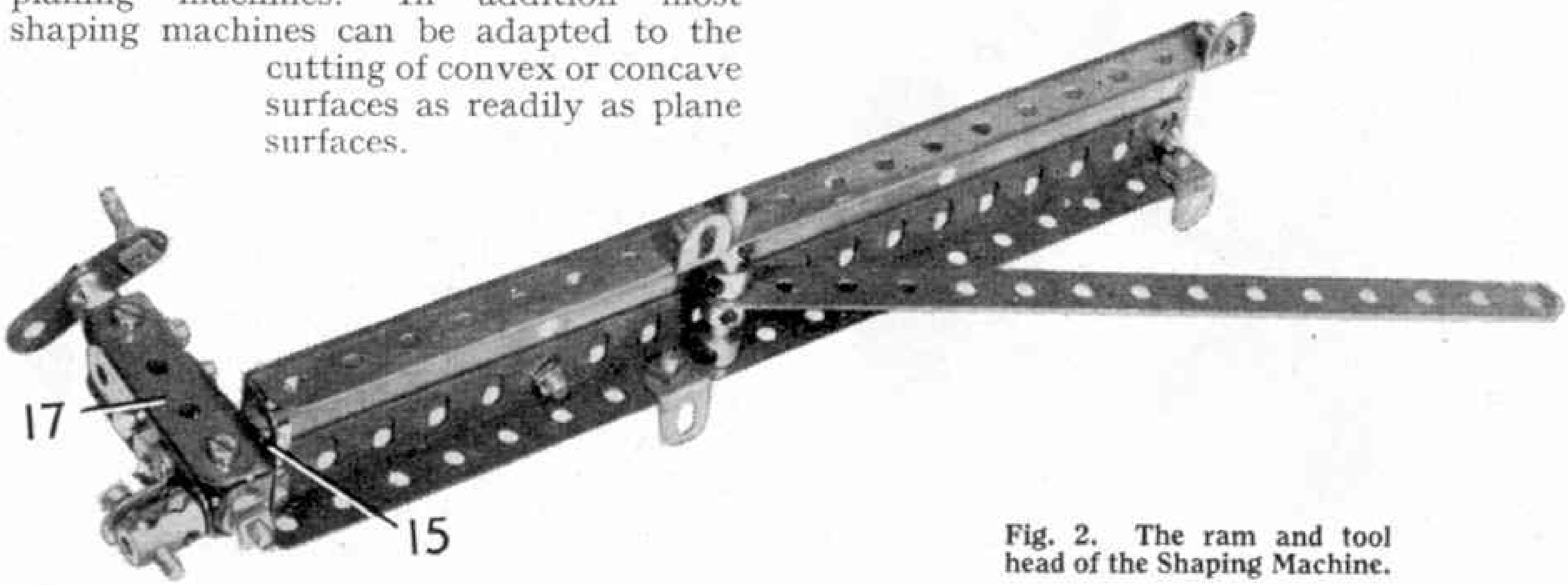


Fig. 2. The ram and tool head of the Shaping Machine.

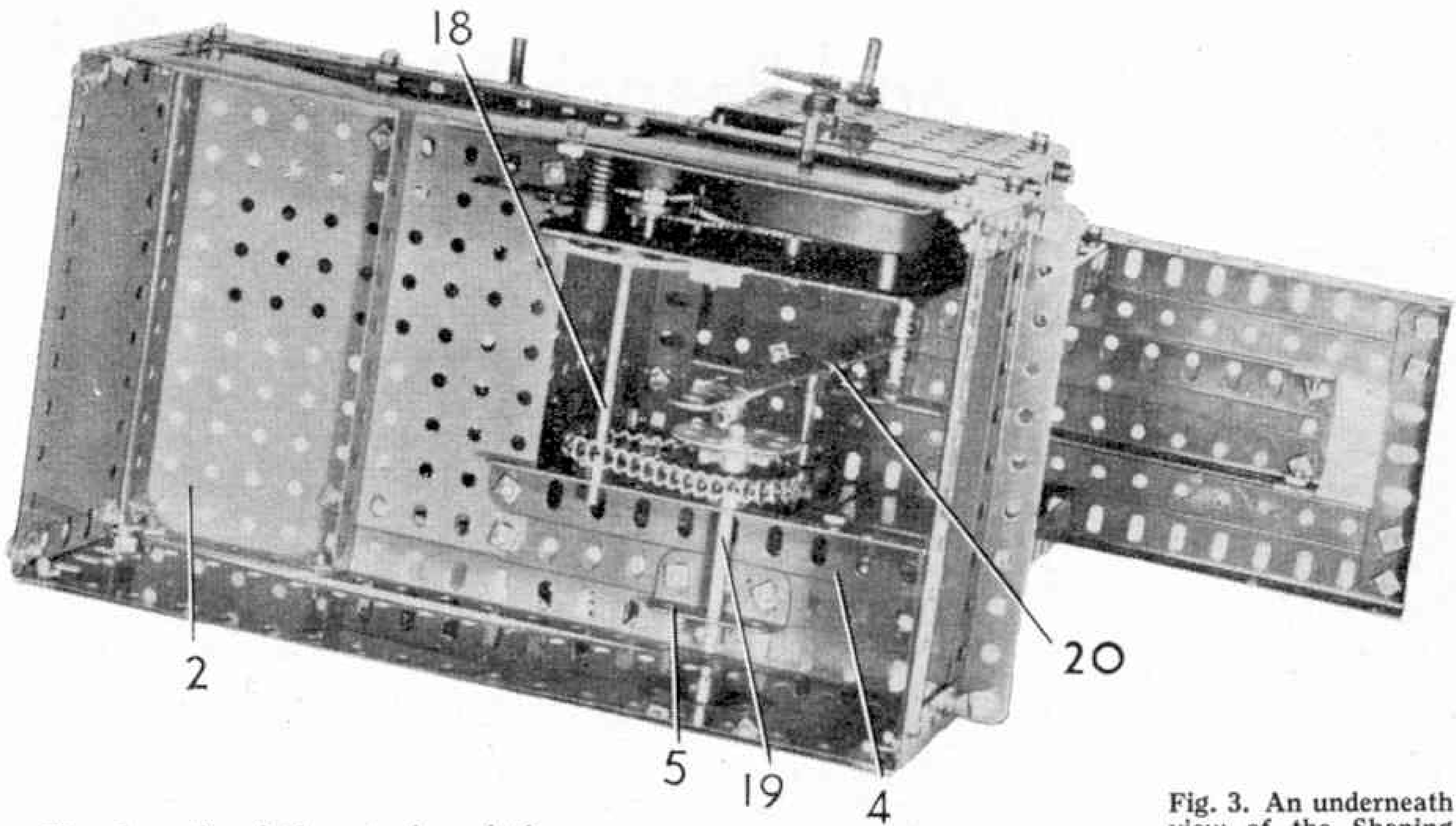


Fig. 3. An underneath view of the Shaping Machine, showing how the Clockwork Motor is fitted.

The length of the stroke of the ram can be adjusted, and in the larger machines a "quick return" motion is provided, the tool being run back to the starting point of its travel, ready for a new cut, at a higher speed than when cutting. This saves much valuable time.

Our model is based on a horizontal type of machine and it will be found an interesting structure to build. It is not designed for any particular Outfit, but makes an attractive subject for those having a good general collection of parts.

Full constructional details of the Shaping Machine and a list of the parts required to build it, can be obtained by Home readers by writing to the Editor, enclosing a 2d. stamp for postage. Overseas readers in Canada, Australia, New Zealand, South Africa, Ceylon, Rhodesia, United States of America and Italy should apply for the instructions to the main agents for those countries, enclosing suitable stamps for postage.

If you wish to avoid disappointment write for your copy as soon as you receive this issue. Supplies are of course limited, and we cannot guarantee to supply copies of the instructions once the original stock has been distributed.

A NOVEL MECCANOGRAPH

Most model-builders are familiar with the Meccanograph designing machine, which has for many years been one of the most popular Meccano models. It is possible to introduce a lot of variety into the design of these machines and one of the most novel that has come to my notice is one built by Mr. E. H. L. Roden, Truro, Cornwall. In Mr. Roden's model the designs are drawn continuously on a travelling band of paper instead of on a square of paper pinned to a rotating table as in the ordinary style Meccanographs. There are two pen arms spaced 2½" apart on the sliding carriage, and although they have a common forward movement each of them is controlled independently by a separate crown head.

Dinky Toys News—(*Continued from page 186*)

The picture of the Dinky Toys model appears on page 185 and readers who are familiar with the actual car will readily realise how accurately the shape of the real car has been reproduced in it. The Vanwall is finished in British racing green and the driver has white overalls and helmet.

The upper illustration on page 185 shows the Vanwall leading the field on a miniature racing layout. Scenes of this kind can be arranged quite easily and there are so many different ways in which they can be put together. My scene is perhaps rather more elaborate than some of the younger Dinky Toys enthusiasts could manage to make up on their own, but quite a lot of fun can be obtained from a much more simple affair.

Club and Branch News

WITH THE SECRETARY

An Annual Review

In his excellent Report on Club activities last December, the Secretary of the Cape Peninsula M.C. —in sunny South Africa—mentioned that a few days after what was officially the final meeting of the year "a special Committee Meeting was held to discuss the minutes of the previous meetings and outings"; in other words, to review the year's activities and note, for future guidance, what had proved most successful and what had failed to come up to expectations. This is very sound policy, and with the second of the 1957-58 Winter Sessions just completed, this is a suitable time for Clubs in the Home country to similarly take stock.

Portsmouth M.C. Open Day

The Mile End (Portsmouth) Meccano Club will hold an Open Day on 9th April next—the Wednesday in Easter Week—in their Club Room in the Buckland Congregational Church Hall, Kingston Road (corner of Queens Road), Buckland, Portsmouth. It will be open from 2.30 p.m. until 9.30 p.m. Admission: Adults, 6d.; Children, 3d. There will be working electric and clockwork railway layouts, and fine displays of Meccano models and Dinky Toys. Refreshments will be available, and there will be music.

H.R.C. BRANCHES RECENTLY INCORPORATED

No. 564. Weston Boys' Grammar School—*Chairman:* Mr. D. W. Flower, 122 Quantock Road, Weston-super-Mare.

No. 565. Featherstone Castle—*Chairman:* Mr. D. N. Clark-Lowes, Hillbrow School, Featherstone Castle, Haltwhistle, Northumberland.

No. 566. Potters Bar—*Chairman:* Mr. F. Millam, 72 Moffats Lane, Brookmans Park, Herts.

CLUB NOTES

Launceston M.C.—Model-building has continued as the main activity, and at the time of writing some fine new models are being built for the Club's Annual Exhibition. Another Film Show is being arranged. *Secretary:* R. Thorne, Hill Barn, St. Stephens, Launceston, Cornwall.

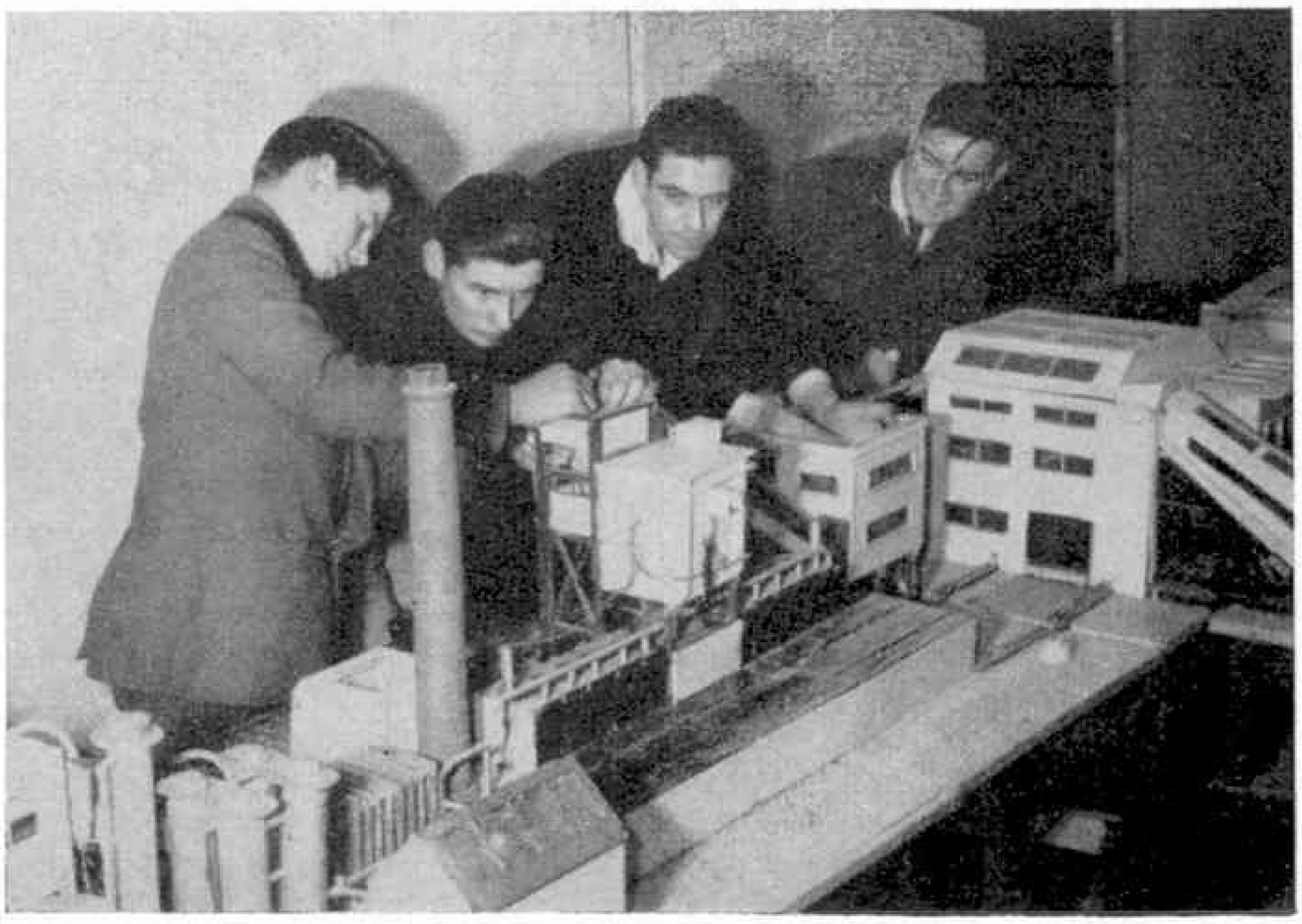
SOUTH AFRICA

Cape Peninsula M.C.—Each of the six Groups into which the Club membership is divided now has its own cabinet in which to store its allocation of Meccano parts. The cabinets have been made by Mr. Z. A. de Beer, the Leader, and the sixth was recently installed by him. (One of these cabinets was illustrated on page 569 of the November 1956 *M.M.*) The prize-winning models in the annual Group Competition were dive bombers, built respectively by C. Cohen, B. Milner, and J. Rawlings. A party of members recently visited the Electricity Supply Commission's power station, and greatly enjoyed seeing "behind the scenes". On another occasion an excellent day was spent on Robben Island. *Secretary:* C. Cohen, 23 Upper Rhine Road, Sea Point, Cape Town, South Africa.

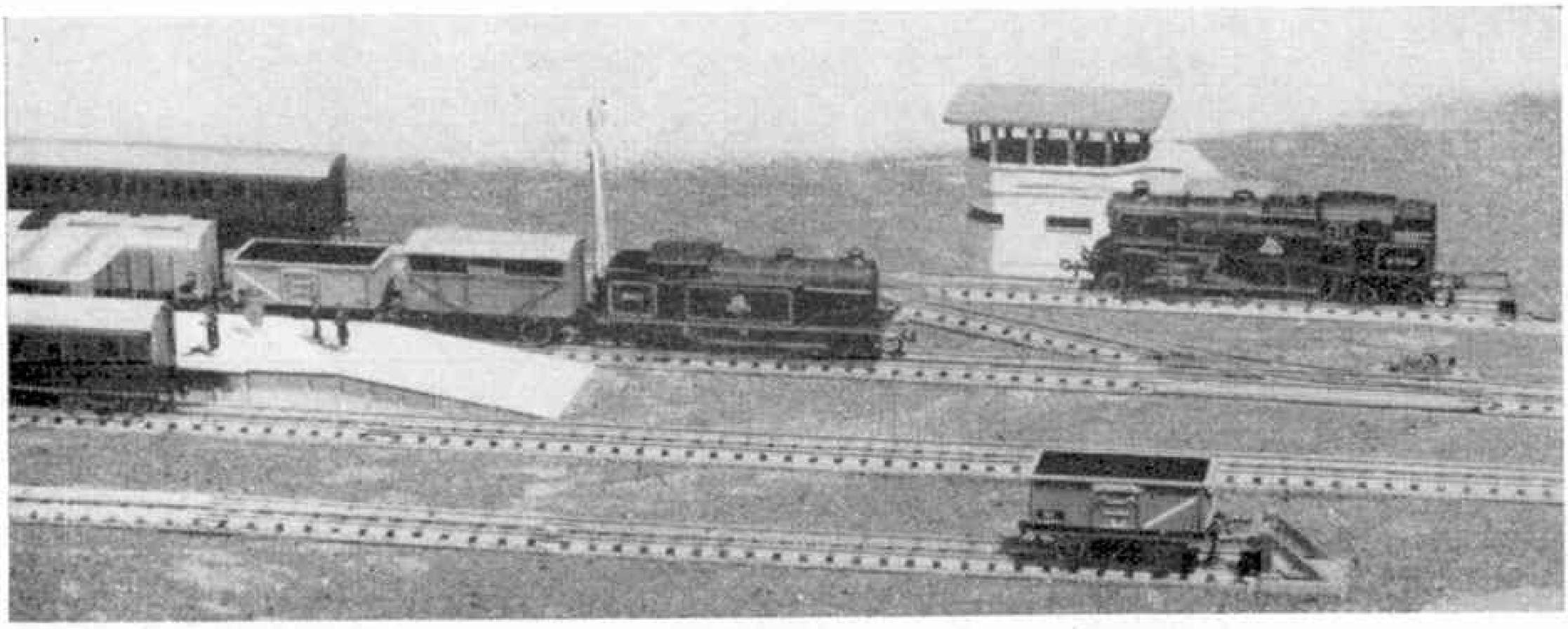
BRANCH NEWS

Edlington County Secondary School (Doncaster).—The Branch is recovering by degrees from the serious loss of equipment resulting from a school burglary a year ago. Track operations on a reduced scale have been carried out, in which the loan of a separate power supply from the school Science Department has been of great help. *Chairman:* Mr. K. J. Templeman, 41 Warmsworth Road, Doncaster.

Mile End (Portsmouth).—A grand time was had by all who attended the 8th Birthday party of this Branch and its associated Meccano Club. The Chairman Mr. A. J. Nicholson, made an interesting speech in which he reviewed the history of the Branch and Club to date, and a recording of his speech was made by one of the founder members who turned up unexpectedly. R. Dart built an interesting Meccano diesel locomotive, powered by an electric motor, and suitable for gauge 0 track. The Secretary gave an excellent Talk on "Gears and their Uses", and a shortened version of it may be printed in an early issue of the Branch Magazine. *Secretary:* A. Firman, 171 Fratton Road, Portsmouth.



Part of a fine model industrial plant built by the Meccano Club associated with the Consett and District Y.M.C.A. The picture shows the "coke ovens" mine screening plant, chimney, and part of the power station on the extreme right. The four senior members are (left to right): D. Whitfield, Secretary; A. James; K. Oram; and B. Ward, Deputy Leader. Illustration by courtesy of the "Newcastle Chronicle and Journal Limited".



Cattle Wagons Magnificent!

IN last month's *M.M.* you were able to read about the Hornby-Dublo SD6 Bulk Grain Wagon, the first of an entirely new series of Hornby-Dublo rolling stock of accurately detailed character of a standard that is higher than has ever previously been seen.

Now you can see in the illustration above the second of these magnificent vehicles, the SD6 8-ton Cattle Wagon. Like the Bulk Grain Wagon, it has a moulded body of the very finest character, as a mere glance reveals. Apart from the special "open side" construction that is a feature of cattle wagons, in the original there is an angle iron framework of various sections that presents in modelling some splendid opportunities for finely detailed relief work. These opportunities have been seized, and in this new Hornby-Dublo vehicle the raised corner pillars, the door stanchions and the vertical and diagonal members on the sides and ends are reproduced in complete detail and absolutely to scale, with minute bolt heads in all the right places. Just look at them through a magnifying glass, and you will be astounded to see how completely right every little detail is.

In the local goods train shown above there is one of the new Hornby-Dublo SD6 8-ton Cattle Wagons next to the engine. In the background a 2-6-4 Tank waits in the engine siding until required for its next turn of duty.

The body sides themselves are worth the closest examination. Not only do they show the planking joints, but they also have precise representations of the slotted openings that are provided in the three lower planks in the real body sides for ventilation purposes. Then again, every detail of the dummy doors is reproduced in a remarkably realistic manner.

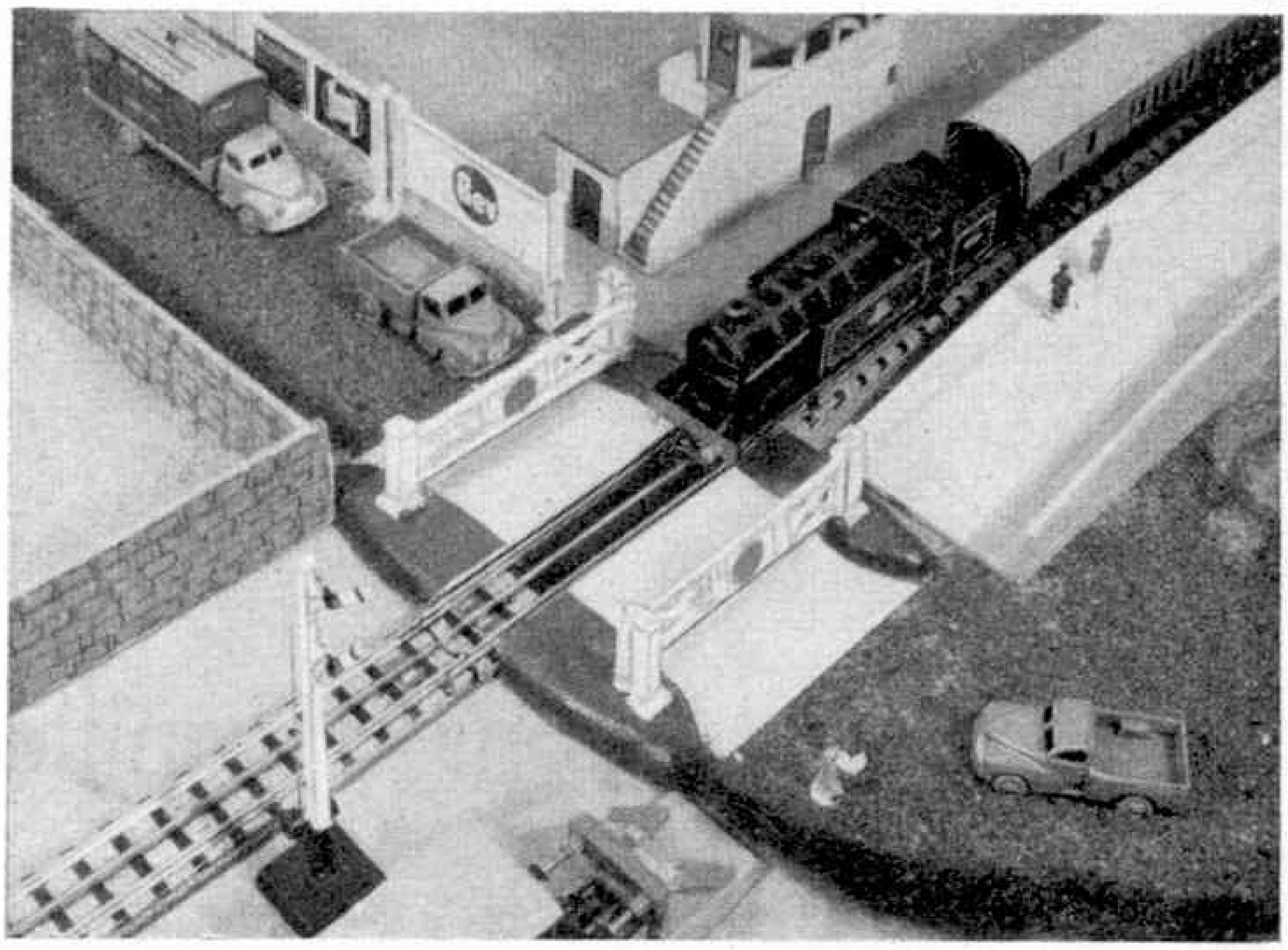
As you probably know, cattle wagon doors are rather special. They are arranged so that the lower door on each side opens downward to form a loading flap, by means of which the animals can be driven on board or detrained on to the cattle loading platform. There are two upper doors as a rule, hinged vertically like the doors of a cupboard, and the whole arrangement involves a fine collection of hinges, strapping, handles and locking arrangements. Needless to say, the door details in the new Hornby-Dublo Wagon follow precisely those of the real vehicle, which is the B.R. Standard 8-ton Cattle Wagon.

The moulded body and roof are in one piece, and this upper part of the vehicle is securely fastened to the die-cast base. The base is remarkably well detailed, with a dummy brake cylinder represented underneath, as well as the usual V-hangers for the brake gear. The Wagon runs on the same type of moulded spoked wheels as are fitted to the Bulk Grain Wagon. Dummy clasp type brake blocks are fitted on either side of each wheel, these details being quite strong because they are formed in one piece with the brackets in which the axle journals actually run.

As the vehicle represents a vacuum brake fitted prototype the colouring is in bauxite brown, the base being black, and the roof the standard B.R. shade of roof grey.

HORNBY RAILWAY COMPANY

By the Secretary



In the illustration above a Hornby-Dublo 0-6-2 Tank is about to pass the Level Crossing arranged near the end of a Station platform. See how neatly and correctly Dublo Dinky Toys on the roadway fit into the picture.

Useful Tips for Good Running

YOU will remember that we finished up our talk last month with some notes on the marshalling of fitted vehicles in passenger trains. Now, the upper photograph on the next page reminds me that there is an additional point that could be mentioned with advantage. Our correspondent Mr. R. P. Walford, who contributed the details given in our last talk, mentioned that on the Western Region brake fitted or *XP* Wagons of the kind represented by the Hornby-Dublo Low Sided Wagon may only be run in passenger trains if they are loaded with a container. Apparently the Western considers these vehicles a little light for the risk of derailments at express train speeds, if run without their normal load.

This seems to me an excellent rule that could very profitably be adopted by all Hornby-Dublo owners, whether they are Western Region enthusiasts or not. It need not apply when the Low Sided Wagons form part of a goods train, like that in the picture mentioned, which is a local one at that, for then there is no need to anticipate any particularly high speeds.

Speaking of miniature train speeds, another reader and enthusiast, Mr. P. R. Frances, of Wealdstone, remarks very truly that there is a great deal of satisfaction to be gained in working trains at something more resembling the correct speed to scale than that often observed when youthful operators are in control. As you know, I have emphasized this point to some extent in recent talks. After all, as a rough guide, a speed of 60 m.p.h. in Hornby-Dublo is represented by your train covering approximately 14 inches in one second.

Some of you may take me to task for including in our third picture a standard 12-ton Goods Van coupled between the engine and some passenger stock. This is not permissible during the steam heating season, from October to April, but in this particular instance the train is supposed to be an empty one being worked by the 2–6–4 from the carriage sidings up to the terminus ready to form an outgoing express. Thus the part of the train that you see in the illustration will actually be the rear end when the passengers come aboard.

The train of Low Sided Wagons mentioned previously is making its way down the yard and happens to be passing

An open crossing in a freight yard of the kind referred to in this article. Hornby Poster Boards have been used to provide a distinctive background.

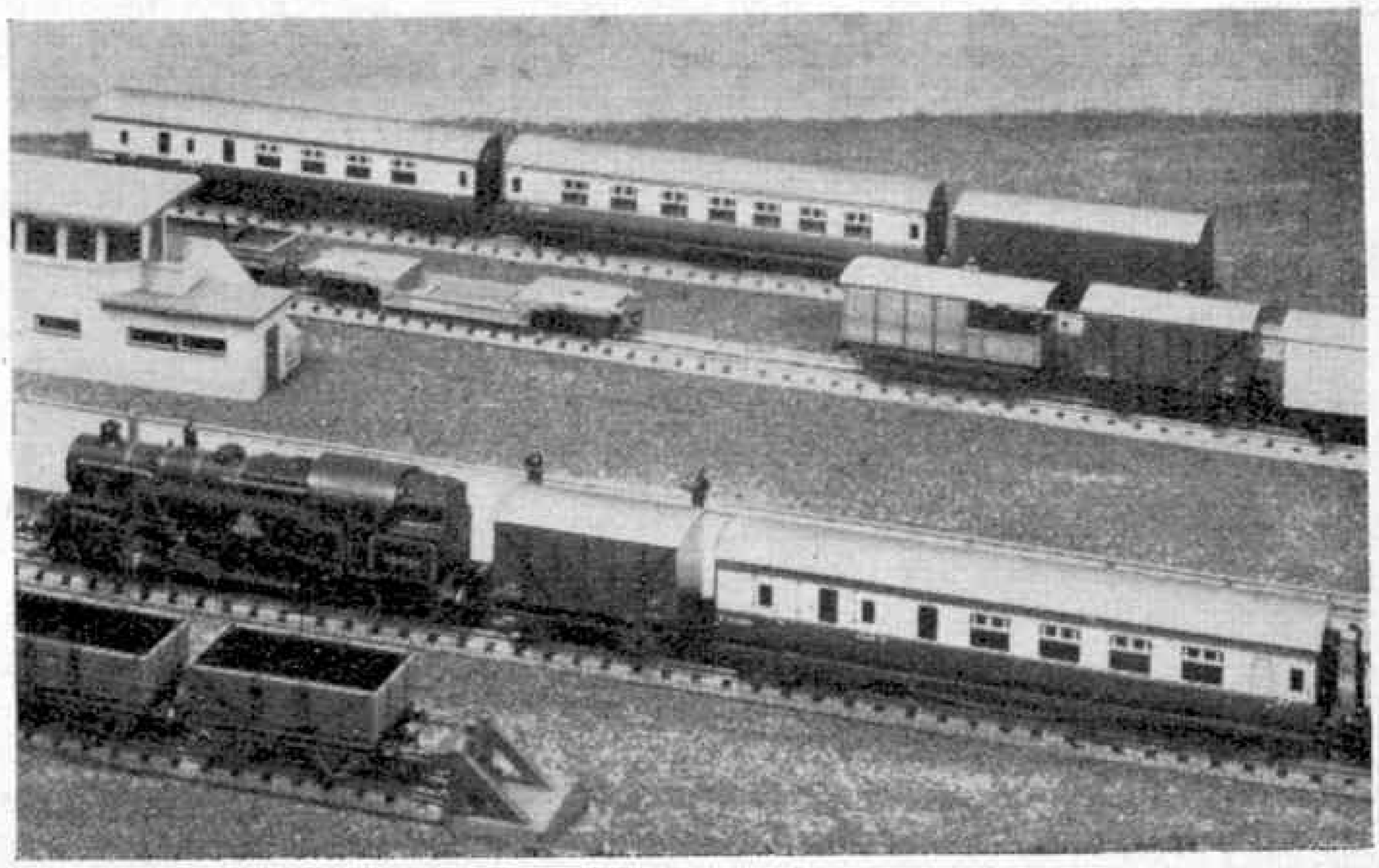
a place where it is possible for road goods vehicles to cross the tracks. This sort of situation is frequently seen in and around large goods depots and on dock estates and so on.

You can build up this sort of paved way for your road motors in similar situations in Hornby-Dublo. This has been done in the layout shown and the surface of the built up "roadway" is covered with imitation ballast. You can get this sort of material at a hobby shop. Usually there are no gates at a crossing of this kind, because strictly speaking there is no real road, at least in the sense of being a public highway. So there is plenty of scope for a certain amount of latitude when you are representing a situation of this kind in miniature.

The appearance of the Dublo Dinky Toys has given a new interest to road systems and traffic in connection with 00 Gauge layouts generally. The Level Crossing scene at the head of the opposite page is given special interest by the inclusion of the first three vehicles of this series. Now others have been added to the range, and these were dealt with specially by our friend *The Toyman* in his contribution last month. I must say that the addition of two passenger cars, one of them a saloon vehicle, is a move that I am sure will be welcomed by all keen Gauge 00 railway owners.

Note, by the way, that the level crossing in this picture is quite a different affair from that over the goods lines. The popular Hornby-Dublo Level Crossing is used effectively to allow both rail and road to intersect, and this with its distinctive white-painted gates, gives exactly the right appearance. The Level Crossing looks particularly well when used in conjunction with the Station, which is the sort of thing that one frequently finds in real life, so there are many possibilities in arranging situations of this kind.

By some level crossings in real practice there is a footbridge as well, so that pedestrians can pass over the railway whether the crossing gates are open or not. This is an arrangement that could very well be reproduced in Hornby-Dublo, using the well known D.1 Footbridge.



The Hornby-Dublo 2-6-4T runs through a Station with some "empty stock" that is intended to form an outgoing express from the terminus further along the line.

Railway that is a Door

One Way of Solving the Storage Problem

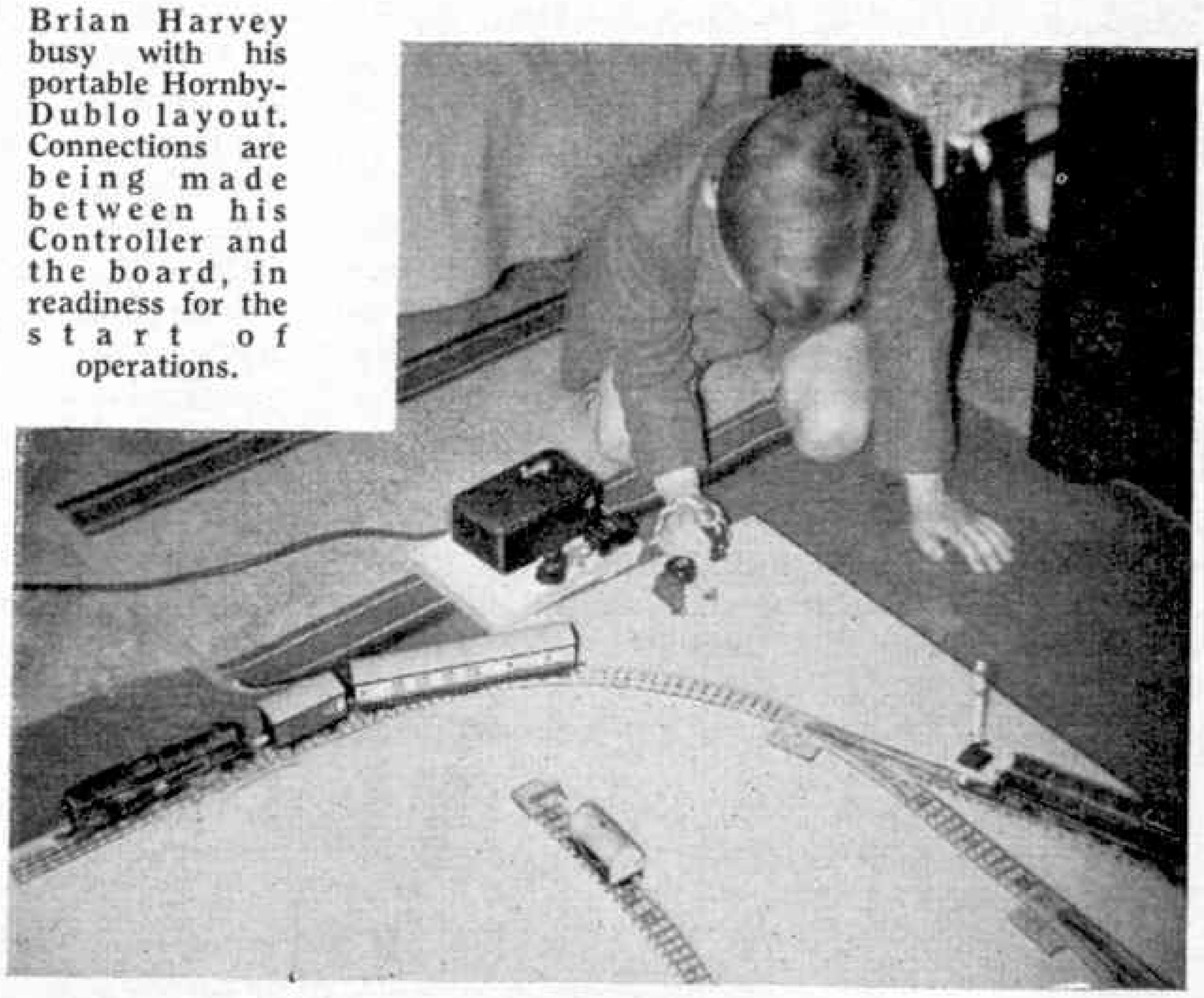
THE Hanging Gardens of Babylon were one of the wonders of the ancient world. The hanging railway of Basingstoke must surely be one of those of the Hornby-Dublo world. This latter marvel belongs to *M.M.* reader Brian Harvey, of Basingstoke, who shares his railway with his father; and how, when and why it hangs we can learn from his own story.

"There comes a time when all young Hornby train operators have to 'close for the night.' This usually means putting the railway away. What to do with even a compact Hornby-Dublo layout when it is not in use is a problem that confronts many owners, especially in these days of rather small modern houses. To take the whole system to pieces takes time, and even if the track is screwed down to a board, it can be difficult to find a home for the board itself. One way to overcome this problem, which may be of interest and value to other Hornby Dublo owners, will be clear from the details that follow.

"The railway itself is mounted on a plywood baseboard, 6 ft. by 4 ft. 6 in., which is suitably braced underneath to prevent warping or twisting. A double track serves an island station known as *Pegastoke*, and opposite this is a goods platform. A goods yard line leaves the inner track and there is a locomotive shed for a *Duchess of Montrose* and a 2-6-4 Tank, on a convenient spur. The oval is completed by a single main line track, from which a carriage siding branches off at a point handy to the station. Various items of scenery are about to be added.

"The rails themselves are screwed permanently to the baseboard, but all other stationary components such as signals, the buildings and even the station are easily removable, being firmly and accurately located by pegs which fit exactly into small holes in the board. The station has electric lighting and several of the Signals are Electrically Operated. Wiring to these items is laid permanently beneath the board and connects to multi-pin sockets. Plugs are attached to the electrically operated items and these are simply inserted in the sockets when the railway is in use.

"The Transformer and Controller are mounted on a small separate baseboard from which runs a short flexible lead terminating in a plug. This is connected to a main socket, mounted on the baseboard near the control switches, for running purposes. One of the illustrations shows the plug-in operation in progress ready to begin train running.

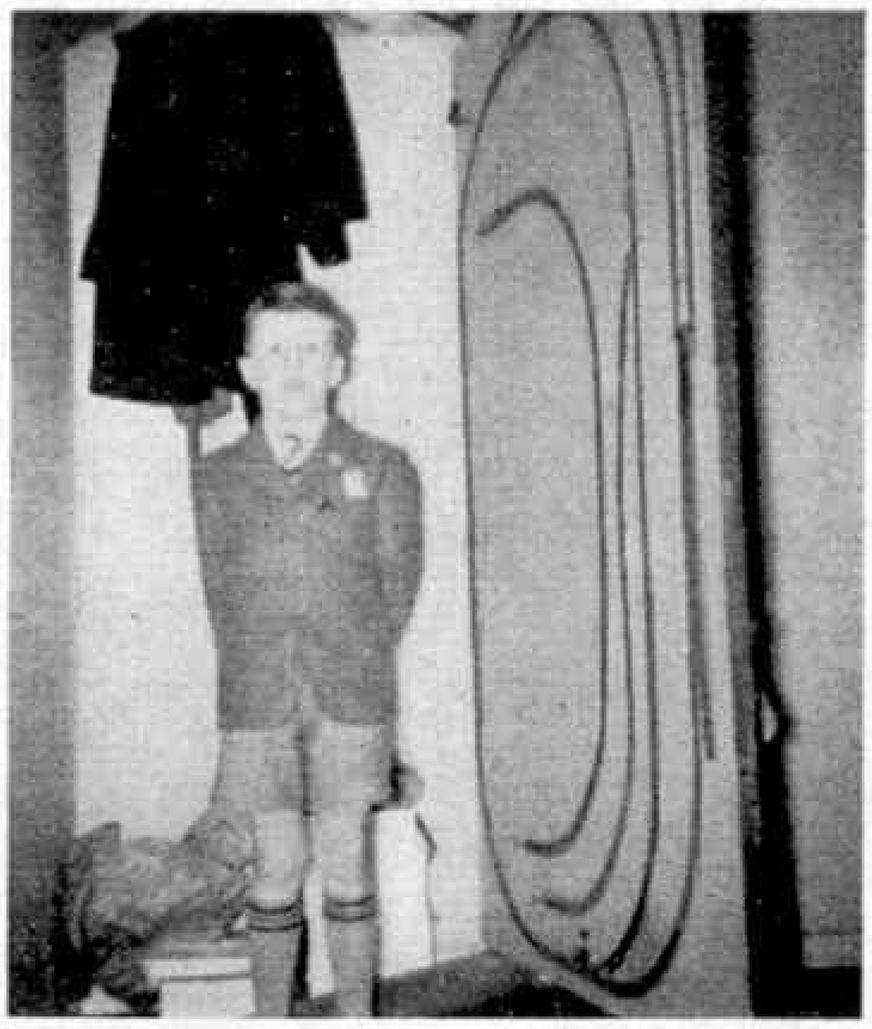


Brian Harvey busy with his portable Hornby-Dublo layout. Connections are being made between his Controller and the board, in readiness for the start of operations.

"The whole railway can be 'stripped' and stored in a matter of a few minutes only, leaving the board quite flat except for the track, the control Switches and the goods platform. The latter is less than an inch high. Now comes the secret of the storage problem. On one side of the board are two hinge pins. When turned to the upright position, with the board on end, these locate into two hinge sockets on the wall of a bedroom, where the railway then

becomes the door of a home-made corner cupboard used for clothes and shoes. The second illustration shows this 'railway door' clearly open on its hinges.

"Another advantage of this system is that the railway is readily transportable as a unit with no tall items standing up and liable to be damaged. In summer months it can be taken out on the lawn, and quickly dismantled if a sudden shower develops! It has also been taken, complete and without damage, to the homes of friends, and to a local hospital to entertain young patients. Such movement would be much more awkward if components were built permanently on the board—and the railway could not then be a cupboard door!"



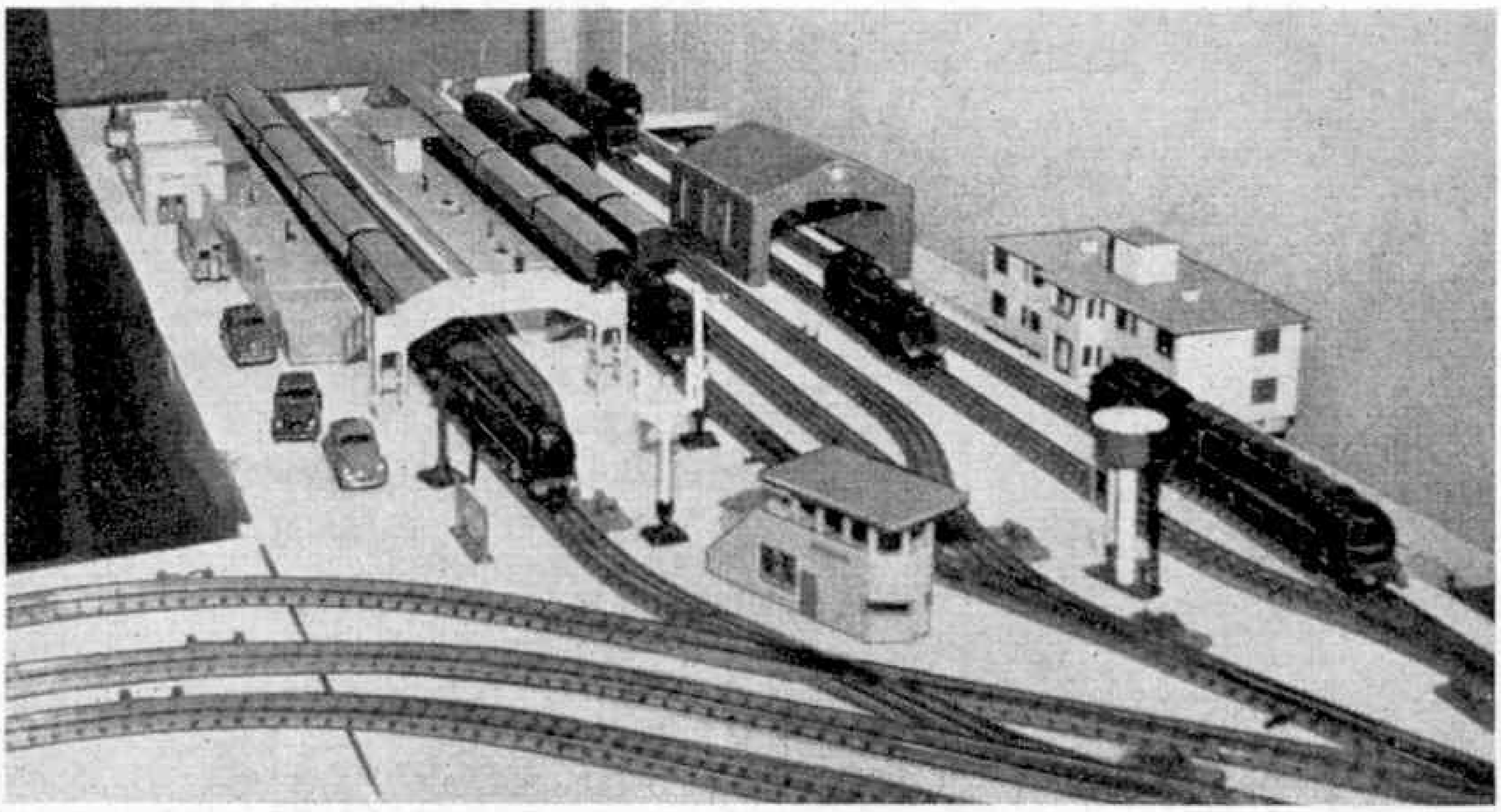
Brian in the bedroom cupboard, the door of which forms his railway baseboard!

A base of quite another type appears in our other illustration. This is arranged to meet the requirements of a particular layout and obviously consists of a number of various sections. You can see the join between two sections quite clearly underneath the tracks in the left hand corner of the picture.

This layout formed part of a Speech Day Exhibition and was arranged by the Miniature Railway Club at Highgate School. The equipment was contributed by the various members and the Engineers concerned are to be congratulated on the neat and effective terminal station layout shown in the picture. This branches off from the main continuous track, involving the use of the standard Points and Diamond Crossings in order to complete the various junctions.

Plenty of space has been allowed for this terminus, so that four coach trains are readily accommodated alongside the platform and the realistic effect of the whole arrangement will be noted in the picture. There is plenty of accommodation for engines and there are sidings for rolling stock as well, all conveniently situated so that movements between them and the platform tracks or the main line are readily carried out.

This ease of movement was specially useful on the occasion of the Speech Day demonstration. There were nine engines in use, including three Hornby-Dublo "Duchesses" and one A4 Pacific. The trains were made up from a selection of 15 Coaches and about 60 Wagons.



A neat terminal station layout forming part of a Hornby-Dublo system arranged by members of the Miniature Railway Club at Highgate School. Photograph by N. Douglas Mackay.

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For other Stamp Advertisements see also pages 206 and xxi

Stamp Collectors' Corner

By F. E. Metcalfe

MEDITERRANEAN BLUE

Monaco stamps have always enjoyed a fair amount of popularity, and the many fantastic issues its post office has released during the past few years show that it has been out to make that institution more than pay its way. Recently I have seen several collections of these colourful emissions. I found them quite attractive, and I think that we can with profit just run through Monaco's postal releases.

Latterly this principality has indulged in every possible shape and size in stamps, with designs and colours as bright as its own Mediterranean. All this is in great contrast with its first issue. I am not going to bore you with a long geographic exposition. All must know just where Monaco is, and that it is a little corner of France that is allowed autonomy so long as there is a direct heir to the throne. Also that the present ruler, Prince Rainier went to the U.S.A. for a bride, and apparently the pair will live happily ever after. They should do, living in such a delectable spot. Anyhow, one of the latest philatelic sets to be released, to commemorate the birth of a daughter, shows a portrait of the now Princess Grace.

Incidentally, stamp dealers are not very happy about this set of stamps, for they were told that in addition to the postage stamps a 100f postage due stamp would be issued at the same time. Those who bought the latter found it had no connection at all with the happy event, and they are now wondering how they can sell them, for postage dues are really popular only with a few specialists, apart from those of our Colonial issues, though there was a time, very recently in fact, when they were not liked. But latterly collectors of KGVI and QEII stamps have taken all into their nets, and now dues are almost as popular as postage stamps. There is no logical reason why they should not be—not that logic ever worries stamp collectors unduly.

To get back to Monaco stamps, the first issue was made in 1885, and it would be hard to find duller designs than those of either the first or the next set anywhere. But dull as the early issues were, they are in great demand on the continent, particularly in France. Some of them are scarce and costly. For instance, copies of the first 1fr. and 5fr. stamps would cost getting on for fifty pounds. Alas, I once owned a pair of perfect mint, but they sold for a lot less than they would bring today.

I suppose young collectors looking at the catalogue, and seeing the prices quoted for these very ordinary looking stamps, will wonder why they are getting more costly every day, and why people buy them, when for coppers as against pounds, they can obtain the really beautifully designed modern issues. They will also have heard where over £700,000 have been realized on a collection of various early stamps which has not all been sold yet! These were not all Monaco stamps of course.

It is of course true that collectors do in the main buy these old stamps, but there is more to it than just filling up spaces in albums. It is the same with pictures. Recently one quite small picture by Gaugin brought over £100,000. And this applies to other art objects. People who are afraid of inflation would rather have their money in stamps than in currency as they feel these will not be affected by the continual fall in money values. Let us hope their fears are groundless.

Monaco went on issuing one dull set after another until well into the present century. In 1933 there was a change for the better, however, and I remember that when I saw that set my first thought was how bright it looked. But compared with Monaco's later efforts it looks almost dull.

Air stamps and charity stamps followed, and by the beginning of World War II Monaco had got well into its stride. Printed by one of the finest stamp producing firms in the world, the French Government Printing Works in Paris, the issues show clear evidence of the designing merit that makes modern French stamps so outstanding. One hears a lot of praise of the gaudy photogravure stamps turned out by some continental firms, but they look little better than cheese labels compared with the stamps that France is producing for herself and Monaco. Incidentally, most British Commonwealth recess stamps are printed when the sheets of paper are damp. But France has perfected a system in which the paper is dry, and they are supreme masters at this class of work.

Just look at the catalogue from say 1938 onwards. There are too many sets for one to have room to detail them, but one issue after another simply poured off the French presses, each more fantastic than the last. But well mounted and written up they made a wonderful show. I know that most of my readers prefer our own colonial stamps, and from an investment point of view they could not do better, so long as they take care to buy stamps in good condition and house them well. But any who want a change could do far worse than collect Monaco. Most dealers stock short sets which cost very little. Start at about 1942, collect mint, and give plenty of space to each stamp purchased.

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For other Stamp Advertisements see also pages 204 and xxi

Stamp Gossip

FLOWERS ALL THE TIME

The news that Australia was to issue stamps with floral designs this year pleased many people, for among the multitude of thematic collectors stamps depicting flowers are almost at the top in the popularity race. I don't say that Australia is going to show some of her own special flowers to spur collectors on to buy her stamps. But there is no doubt that many other countries have done just that. There is no compulsion about buying such beautiful stamps, but who can resist such choice efforts as say the one illustrated from Belgian Congo.

GRAPHITE LINES ON STAMPS

By now most collectors who go in for modern British stamps will have obtained copies of our Q.E.II stamps up to 3d. face value with black lines running down the backs. There are two lines on all values except the 2d., which has only one. I occasionally get letters about these stamps, so I suppose I had better write a few words for the benefit of those who are not quite up to date in the matter.

I do not think there is a Postal Administration in the world to beat our own. It never rests on its laurels either, always trying out one idea after another in efforts to be more efficient still. Now those black lines on the back of some of our stamps are all part of that quest for improvement. The facing up of letters so that the stamps can be cancelled is quite an operation in itself, and if this could be done automatically the saving of time and labour would be considerable. This is where the graphite lines come in. There is no room here to go into full details. Suffice it to say that an electronic facing machine can now do this work, and it sorts out letters bearing a 2d. stamp from others as well.

These lined stamps will be put in the *Commonwealth* and *Two Reigns* catalogues.

BLACK STAR

Collectors of modern British Commonwealth stamps got rather a surprise when they heard that Ghana had ceased to use the services of our Crown Agents for the distribution of their postage stamps, and instead had appointed a New York firm to do the handling, with a British firm to serve other dealers in the British Commonwealth. The first set under the new arrangement commemorates the founding of the Black Star shipping line, which will belong to the Ghana Government. I have said "will", because it is hardly a line at the time of writing, for there is only one ship, and that is certainly not the one depicted on the top value of the set. Actually the boat, a tramp steamer, sailed from Liverpool for Accra last December.

I am sure we all wish the venture well. What is worrying everybody who has anything to do with stamps is whether a lot of sets are to be issued, and later withdrawn, after which the balance will be cancelled and sold at under face value. It must be remembered that Ghana sells a lot of stamps, and used will be sold well under face, even if they have been genuinely used. So perhaps the danger is not very great. Anyhow, what can be said is that the Black Star set is a good start as far as attractive designs are concerned.

EAST OF SUEZ

The stamps of Egypt were very popular when they were listed in the British Empire section of Gibbons' catalogue. Later they were removed to another section, but that made little or no difference. What did make a change, however, was the Suez trouble, when the stamps of the Land of the Pharaohs slumped. Now they are back again in favour, which shows either that collectors' resentment is short lived, or that they cannot resist attractive designs, for there is no doubt about it that Egypt does produce some beauties.

Since the trouble some rather comic stamps also have appeared in Egypt, for some of the designs suggest that the Egyptians wiped the earth with both France and ourselves. Anyhow, Egyptian stamps are once more popular, and as there are a lot of used about, at quite low prices, they are within the reach of most of us. Just notice the little stamp which is being illustrated. It is fairly new and depicts Rameses II. Who could resist buying one for a mere copper?

THE TIP OF THE MONTH

The popularity of Pakistan stamps is growing, so now is the time to look around for stamps that could be bought with advantage. There are a number that look to be undervalued. For instance, in 1952 two stamps were issued to commemorate the centenary of India's first postage stamps, the Scinde Dawk issue. At the present time a set costs about 5s, but I feel sure that it will bring quite a bit more as time goes on.

That issue comes in the "Q.E.II" period. A stamp of the "KGVI" era that is costly to buy—about 60s. mint—but which should be looked out for, as it is a perforation variety and might turn up as the ordinary stamp, is the 1 rup. value of the 1948 Independence set perforated 14. When the set first appeared, the 1 rup. stamp was perforated 12, and it was a long time afterwards that stamps in the finer perforation appeared. So there you have a cheap set to buy, and a scarce stamp to look for among your duplicates, and as there are plenty of the latter about, no doubt some readers will have a bit of luck. The scarce perforation is easy to spot, for the teeth are so much finer than those of the more common one that they will be quite obvious to anyone.

Space Notes—(*Continued from page 167*)

and the area is then marked with flares so that a ground crew can pick up the rocket. Recovery time has been reduced from three hours to half an hour.

Life on Mars

Some quite fanciful statements about life on Mars have been made during the past hundred years, in fact since Schiaparelli discovered the "canals". In practice there is no scientific evidence of animal life or of the higher forms of plant life, and only recently has fairly firm evidence for lower plant life been discovered.

The axis of Mars wobbles on its journey round the Sun and this produces seasons in the same manner as on Earth. It has long been known that the appearance of the poles changes with the season. In winter each pole is covered with a highly reflecting substance. In spring this cap melts and the appearance of the area surrounding the pole alters—as though vegetation were springing up.

The light reflected by these areas has been examined by means of spectroscopes on a number of occasions over the past 30 years to try to discover if vegetation really exists, but without success. Recently experiments with specially designed equipment have shown that in fact infra-red radiation is absorbed by these areas in exactly the same way as it is by plants. It is deduced that plant-life, probably lichens, almost definitely exists on Mars.

A Cave—and Meccano—(*Continued from page 191*)

go into the cave by the old entrance and come out by the pothole 500 feet inside. Ours is not a big cave. But its whole length is about four times what we used to think, and a 200-foot side passage has been found in the old part.

Most cavers wear acetylene or electric head-lamps. I do not go underground often enough to bother with them, and candles serve. But as both hands are sometimes wanted for getting along, a gadget was needed to carry a candle on my head. Meccano provided most of one that has worked well—and become so black and greasy with use that a new one had to be made for the photograph. Peter Riley is seen wearing it in the upper illustration on page 190.

A headband of 1" wide elastic is held between two 5½" Perforated Strips and a 4½"×2½" Flat Plate, with bolts at bottom, half-way up and top of the Plate. To the projecting ends of the Strips a 2½"×2½" Plate is added, making a shield 7"×2½" in all. The candle rests in a squash bottle's metal top niched in four places; so that the rim can be bent inward to grip the candle better. By a hole punched in it, the bottle-top is bolted to a Trunnion, which is bolted to the bottom of the shield. Through the sixth holes up the shield's sides are twisted the ends of a pipe cleaner, the middle of which curves round the front of the candle to make sure it stays upright. Surgical lint is stuck on the back of the shield, but may not be necessary; especially if a woollen hat is worn.

My Meccano head-candlestick was recently borrowed by a mason with work to do in a dark loft. He said it was very useful.

Do not go caving without leaving word where you are going. If you find a cave that is awkward or deep, get adult help.

"ABC BRITISH TRAWLERS"

By H. M. Le Fleming

(Ian Allan, 2/6d.)

With great ocean liners and coastal cargo and passenger ships already catered for in this excellent series of shipping pocket books, Mr. Le Fleming here turns attention to the hundreds of sea-going fishing vessels which operate from our shores.

In a useful introduction he explains the different classes of trawlers and the areas in which they operate, and describes the principal methods used in catching fish at sea. Propelling machinery in British trawlers ranges from steam reciprocating engines to diesels, and the abbreviations used in this booklet to identify the different types are explained. All fishing vessels bear port and registry letters and numbers on their bows, and often elsewhere, and an alphabetical list of these identification letters is given.

Nearly 700 British trawlers are listed in the booklet, grouped under the names of their owners and with the vessels of each fleet given in alphabetical order of name. Port of registry, date of building, gross tonnage and type of propelling machinery used are given for each vessel, and each fleet list is headed by details of colour scheme and funnel markings. There are over 50 excellent half-tone illustrations of typical trawlers listed in the booklet.

"ABC BRITISH RAILWAYS DIESELS"

(Ian Allan, 2/6d.)

With the spread of diesel motive power on British Railways, the appearance of this first edition *ABC* meets the real need for a handbook giving classified lists of numbers of diesel locomotives and of diesel car units and trains. In this it follows the same general scheme as in the well known *ABC* steam locomotive booklets. Illustrations are plentiful, and of course desirable, for there is an unexpected amount of variety in diesels, and in addition there are several sections explaining the whys and wherefores of diesel power on our railways.

Special attention that the train spotter will appreciate is given to wheel arrangements and numbering schemes.

"ABC RUSSIAN AIRCRAFT"

By John W. R. Taylor

(Ian Allan, 2/6d.)

Interest in Russian aircraft has increased considerably in recent years, and was further stimulated in March 1956, when the first Soviet Tu-104 jet air liner to be seen in this country arrived at London Airport. Strict Soviet security still hides from the Western world much detail of the achievements of the Russian aircraft industry, but a good deal has become known, and this available information is summarised in this booklet.

Here the aircraft are dealt with in alphabetical order, and in the case of each main type there is a short history of the aircraft and, where possible, dimensions and performance data. The descriptive notes are supplemented in each case by a half-tone illustration of the aircraft dealt with and neat 3-view silhouettes, a combination that gives the reader an excellent idea of the proportions and appearance of the aircraft concerned.

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Fireside Fun

A city girl holidaying on a farm was determined not to show her ignorance of farm life and manners, so when the farmer's wife put a dish of honey before her at the breakfast table, she smiled and observed carelessly, "Oh, I see you keep a bee."

* * * *

"Could you just water my window-box while you're up here?"

Father: "Is there a half fare for children?"
Booking Clerk: "Yes, under twelve."
Father: "Oh, that's all right. I've only got five."

* * * *

Chief Screeching Train Whistle asked for the Court's permission to change his name.
"What name do you wish to use?" the judge asked.
"Toots," said the Chief.

* * * *

A Magician was being interviewed for a booking in a pantomime.
"I've got a wonderful new trick that will shake everyone," he said. "I can saw a woman in half."
"That's not a new trick," scoffed the manager. "That's as old as the hills."
"No," retorted the magician. "I do it lengthwise!"

* * * *

"I saw your advertisement to the effect that you re-cover umbrellas. I'd like mine recovered."
"Yes sir, where is it?"
"If I knew that I'd recover it myself."

"Waiter!"
"Yes, sir."
"What's this?"
"It's bean soup, sir."
"No matter what it's been. What is it now?"

* * * *

"You told me these were fast colours. Yet in one washing the shirt has become faded."
"Well, you couldn't ask for anything faster than that, could you?"

* * * *

"Have I told you about my grand-children?"
"No, and I appreciate it."

* * * *

The following reply was made by a football team coach when asked about the size of the opposing team.
"Big?" he growled. "Why, that team is so big that when their boys run on to the field, they tip it up on one side."

* * * *

Angry Passenger (tired of waiting for train): "What use are the figures in your time tables?"
Station Master: "Well, sir, if it were not for those figures, we should never know how much late the trains were."

* * * *

BRAIN TEASERS

BIRDS AND BEASTS

The keeper of a menagerie was asked by a boy how many birds and beasts he had altogether. "I do not remember, exactly" was the reply, "but I do know that there are 36 heads and 100 feet."
How many creatures of each kind were there?

* * * *

A CASE OF ORANGES!

An orange grower sent away two loads of oranges on the same day. One load consisted of 9,044 oranges and the other load 6,916. If all the packing cases held the same number, what would be the smallest number of cases he required and how many oranges were in each case?

* * * *

ANSWERS TO LAST MONTH'S PUZZLES

NAME THE PARTS

1. Sleeve Piece. 2. Slide Piece. 3. Fishplate. 4. Fan. 5. Dog Clutch. 6. Boiler. 7. Pawl. 8. Crank. 9. Ball. 10. Boiler End.

* * * *

FIVE MINUTE CROSSWORD

The solution of last month's Five Minute Crossword is shown here.

A	P	P	L	E
N		O		A
G	O	I	N	G
E		N		E
R	O	T	O	R

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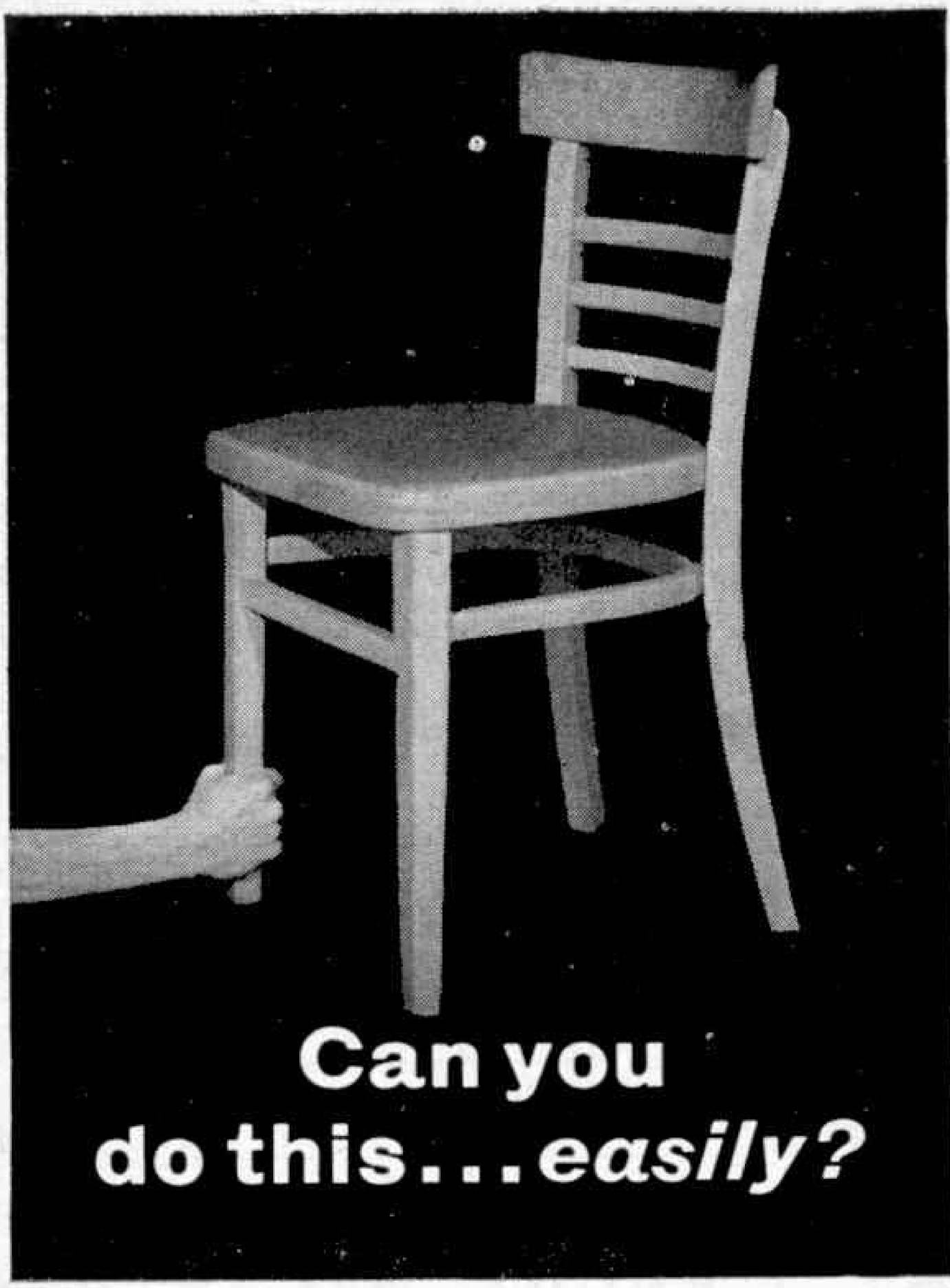
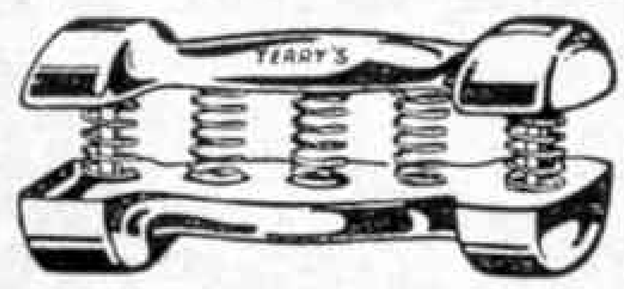


Can you do this...*easily?*



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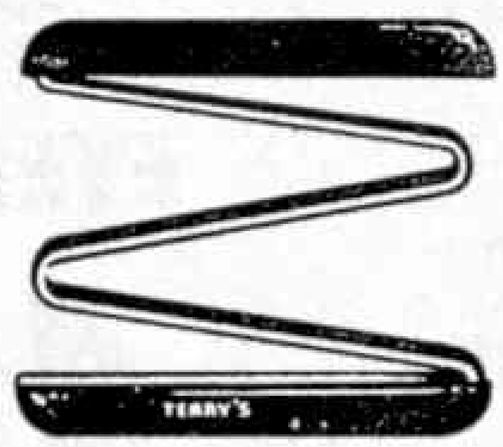

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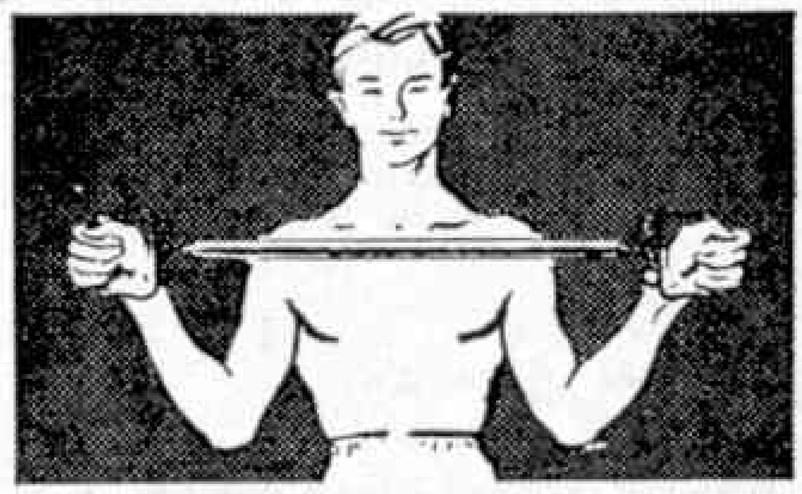

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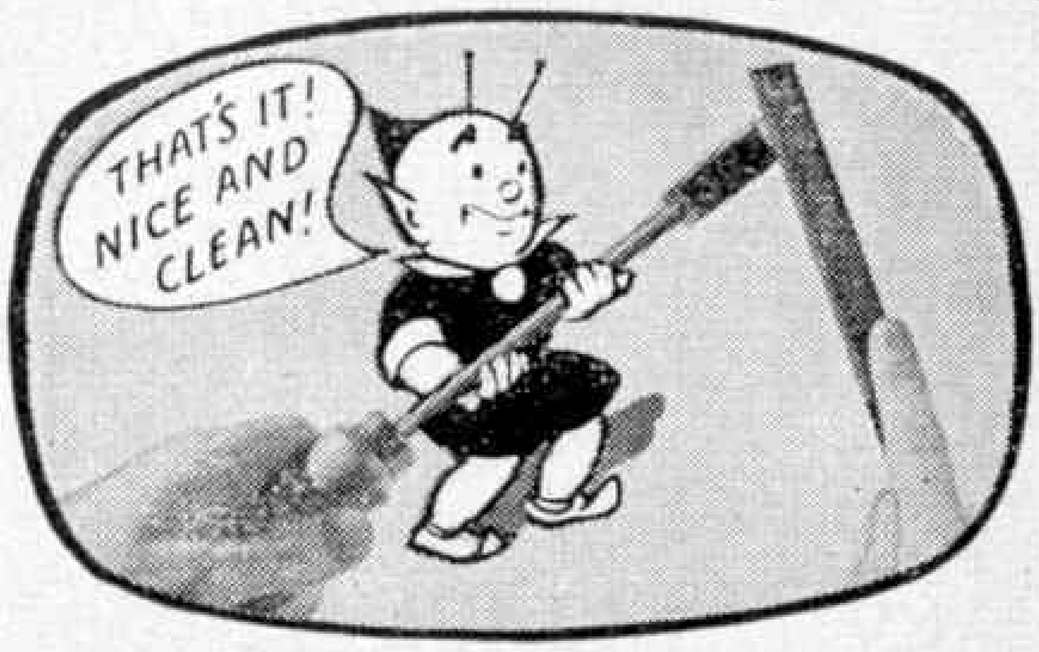

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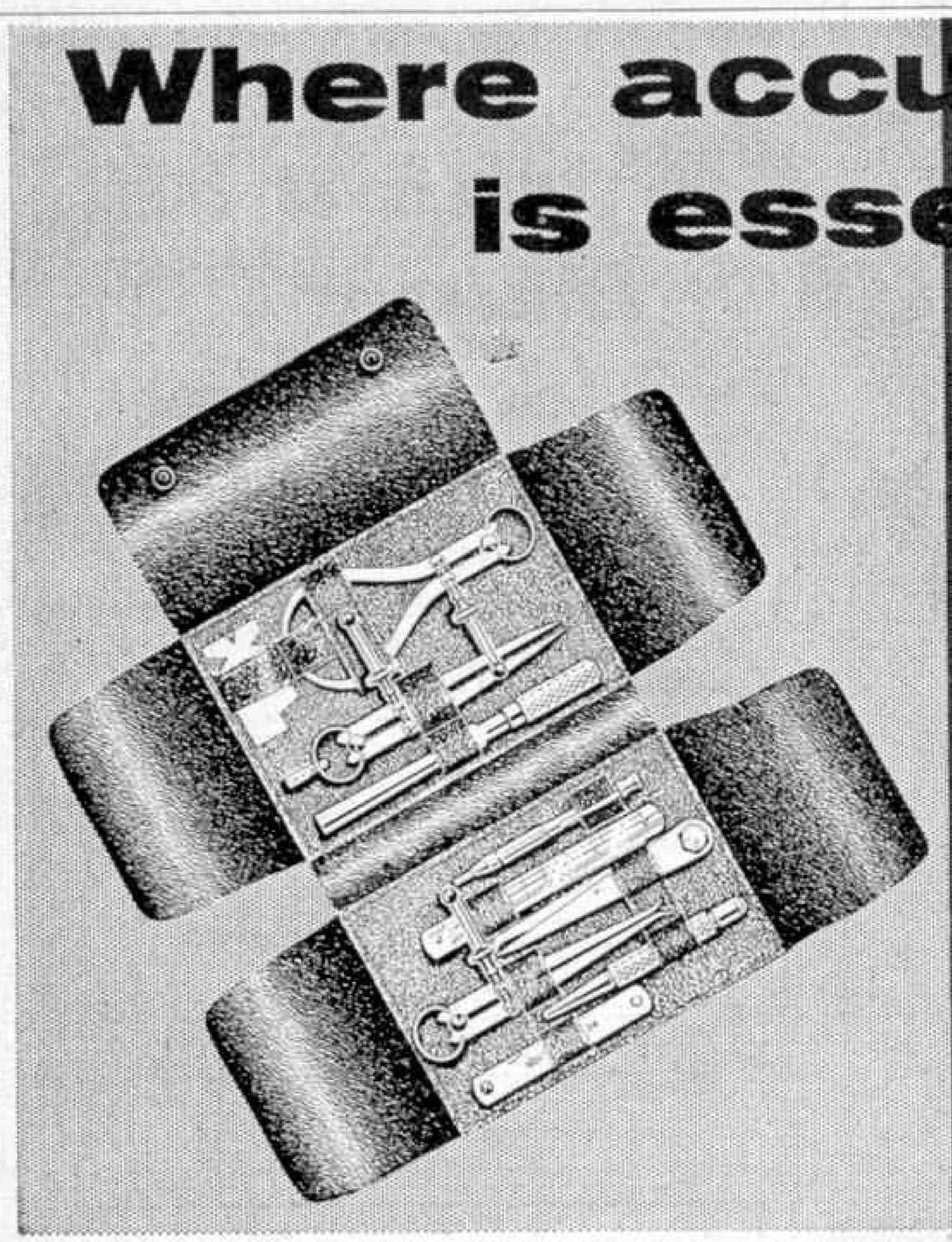

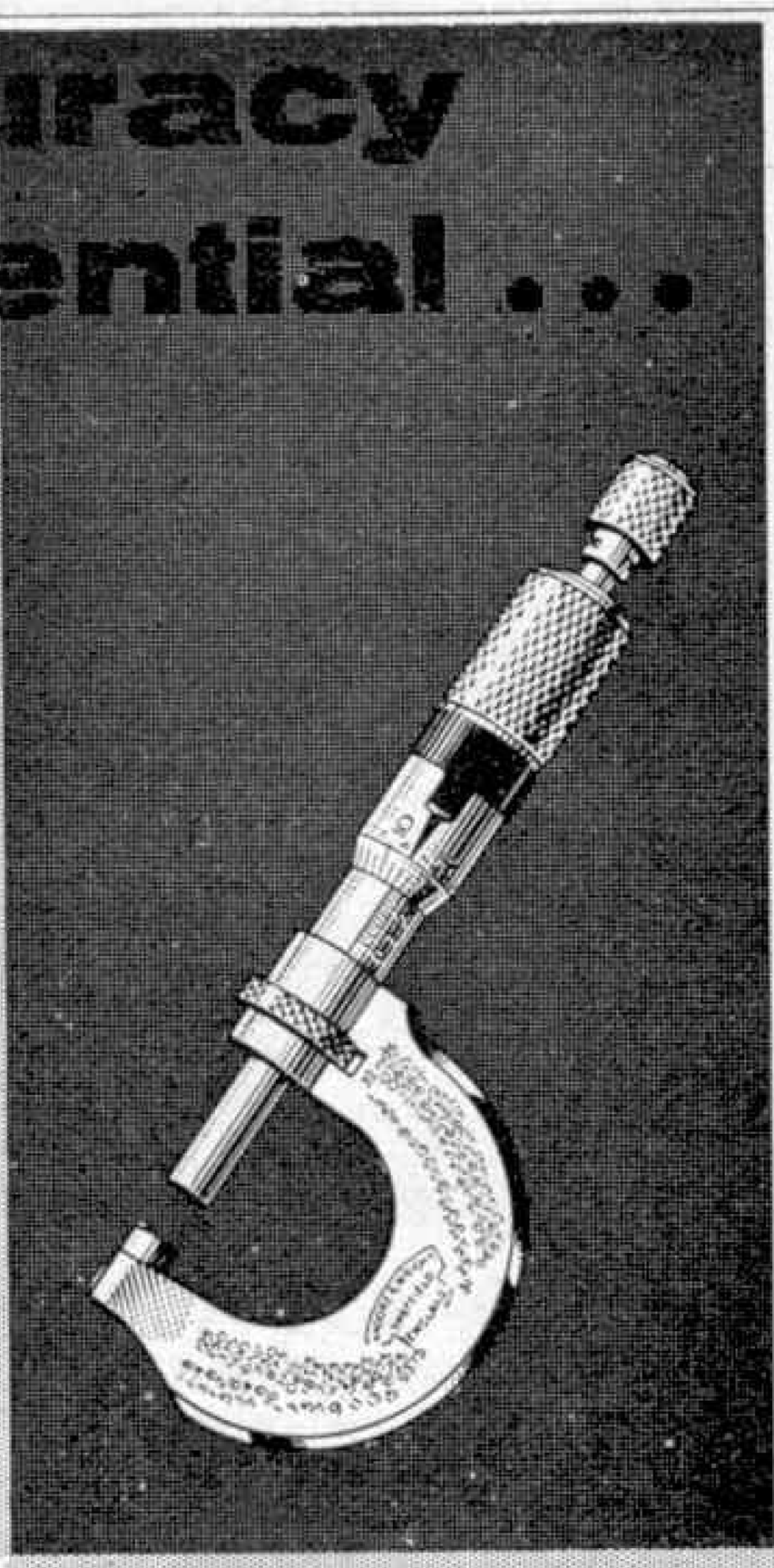

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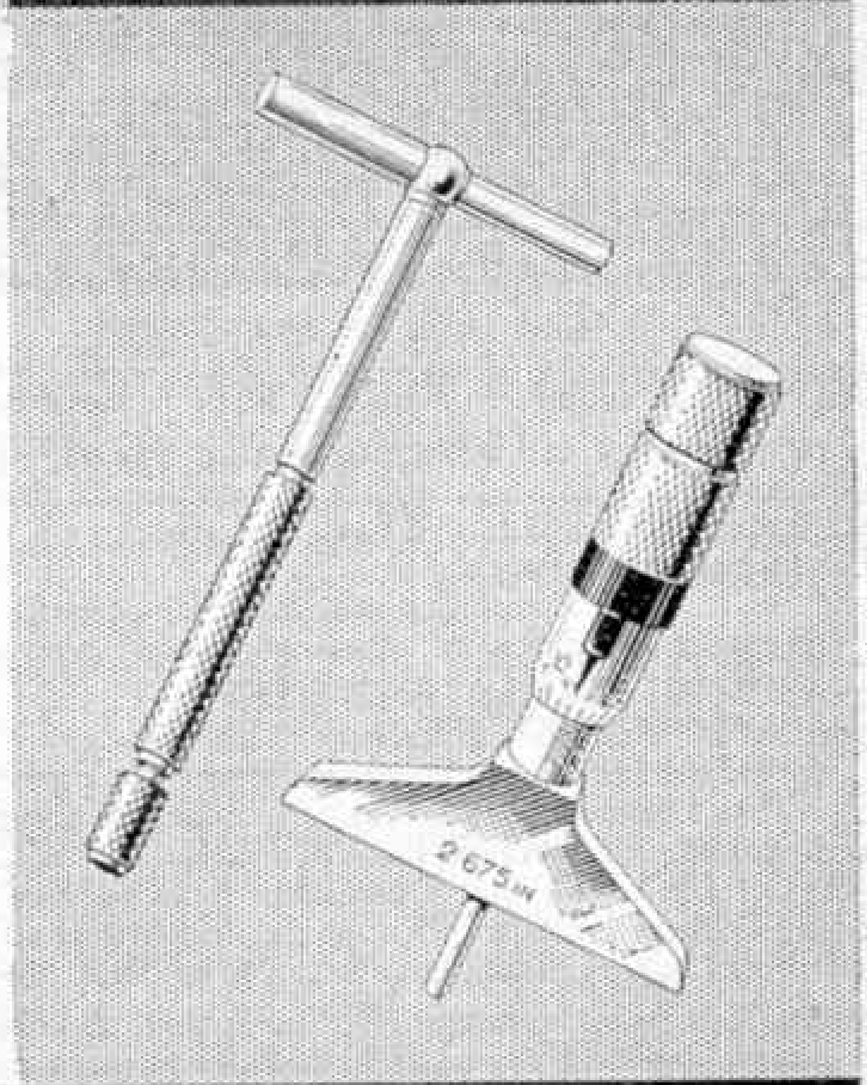

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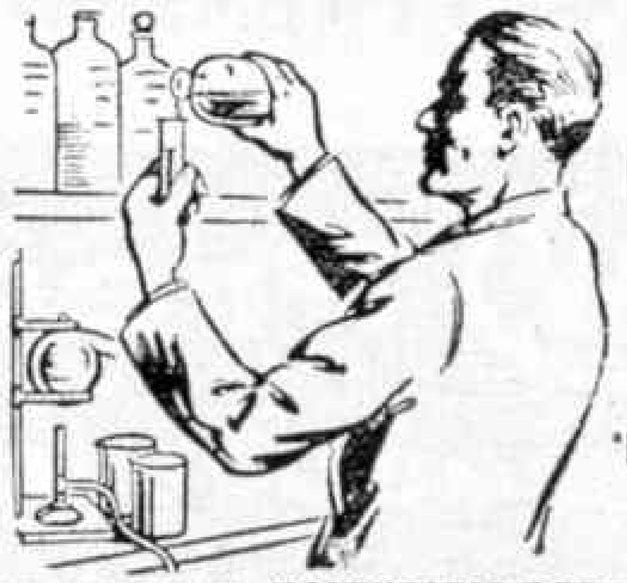

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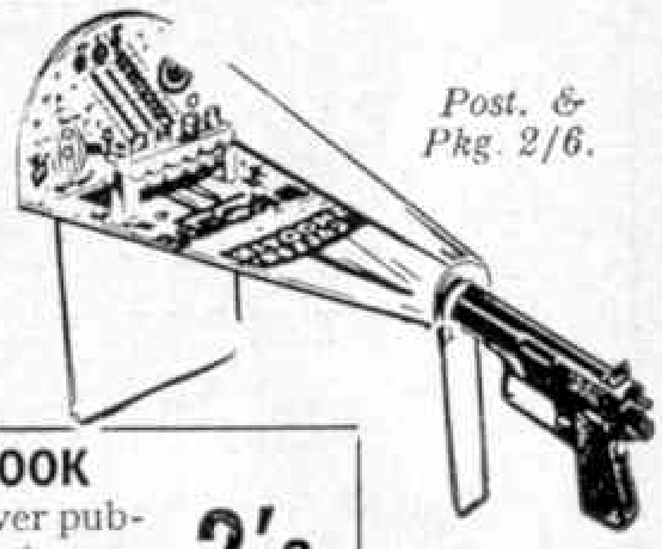

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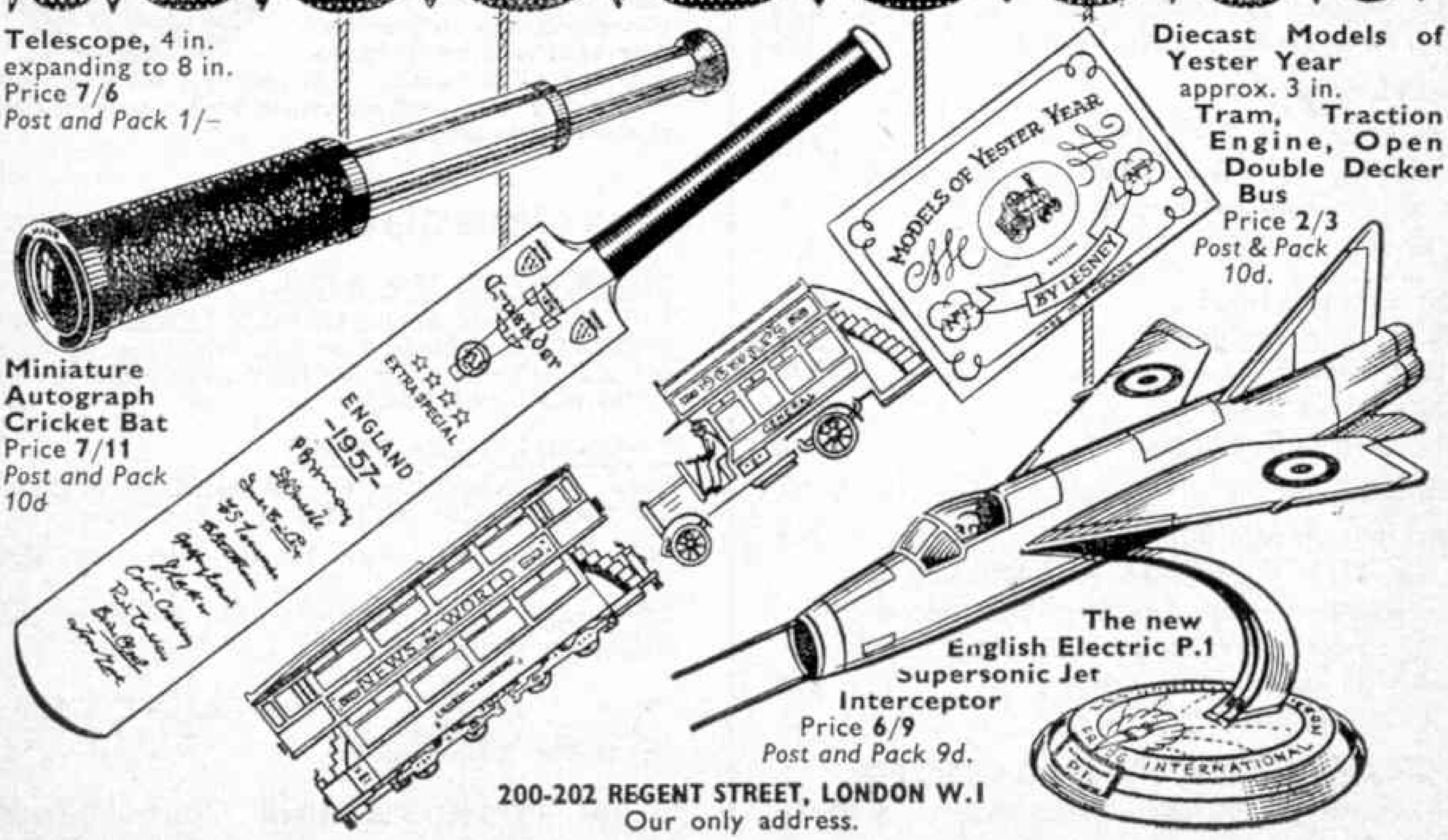

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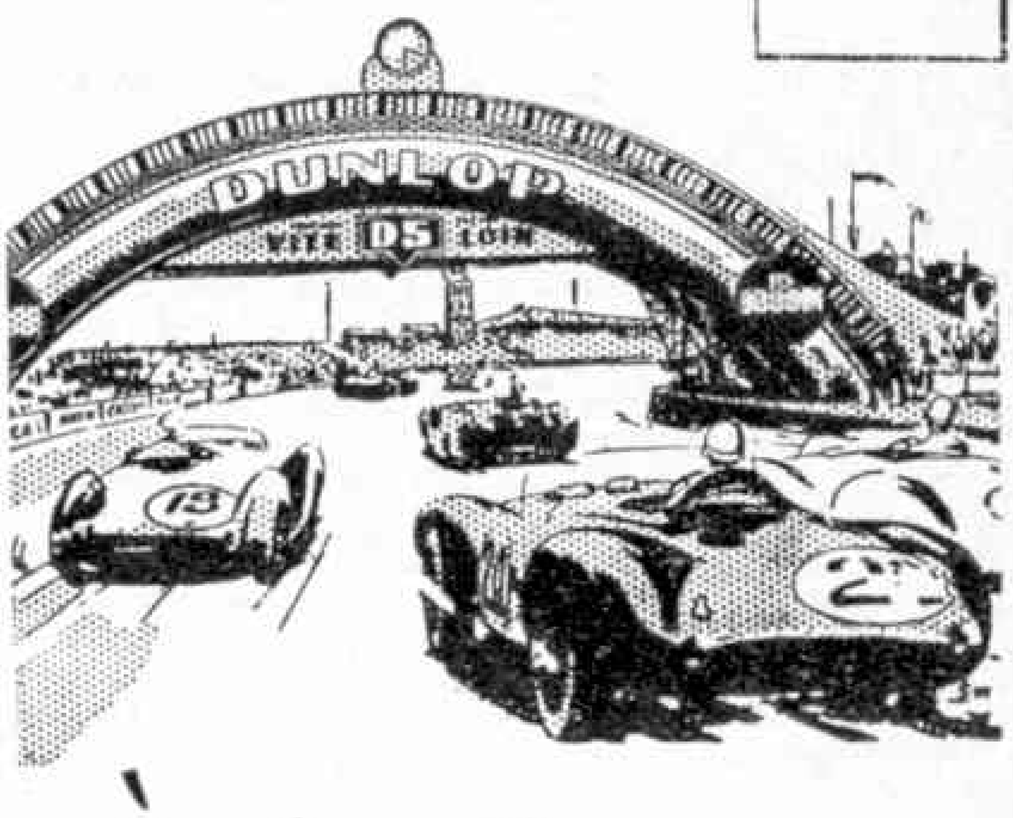

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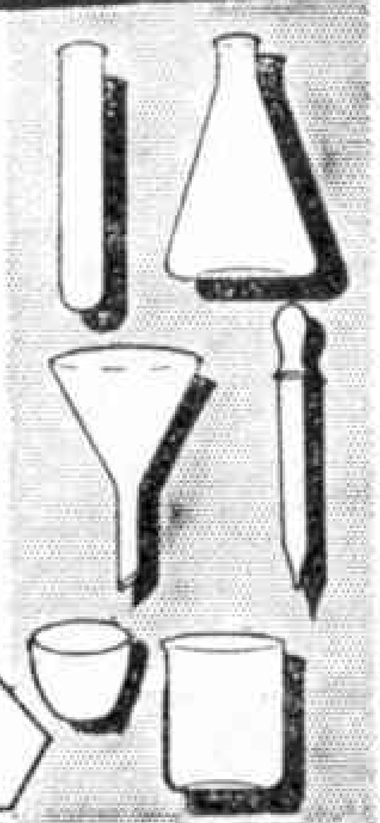

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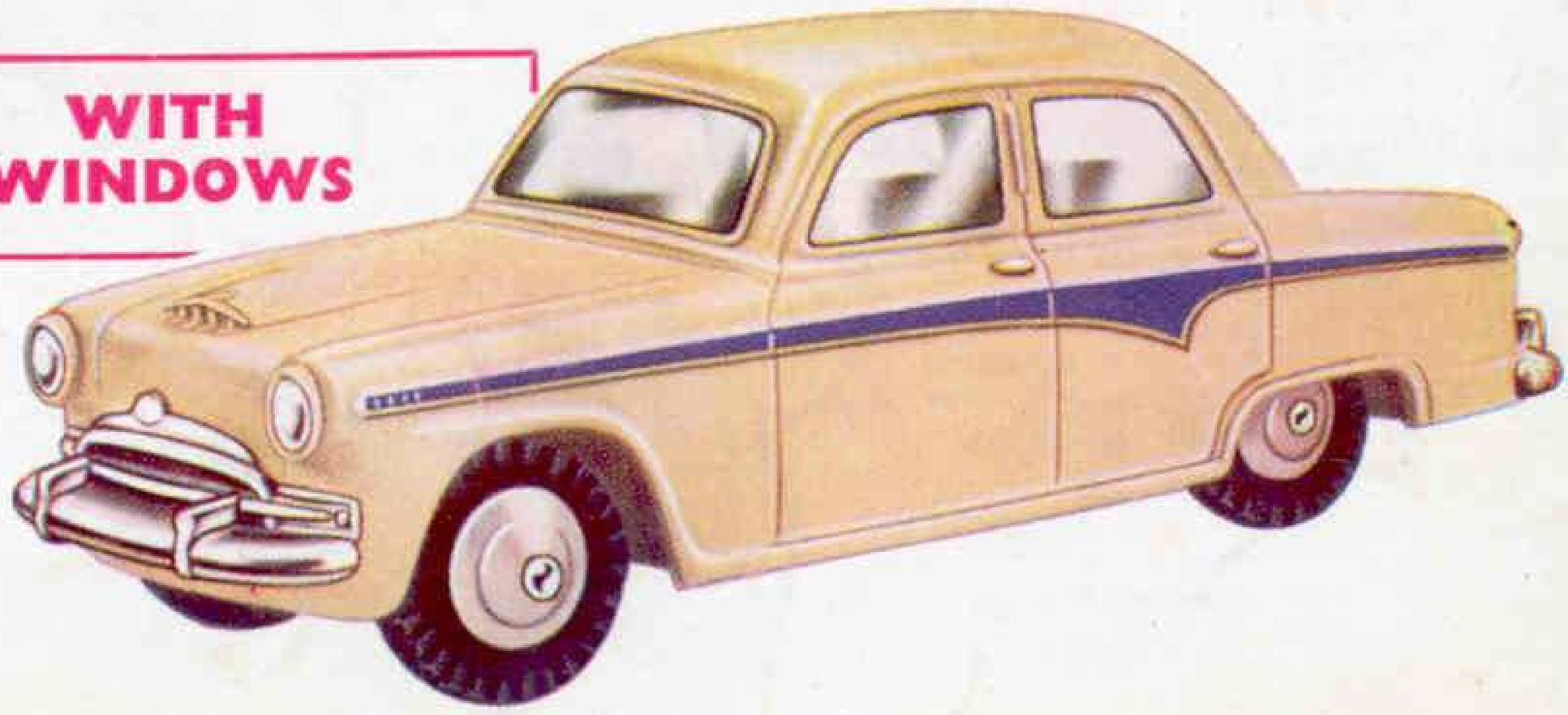

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MODEL OF THE MONTH

ENGINEERS' SHAPING MACHINE

(Illustrated in the April 1958 issue of the Meccano Magazine)

The machine bed consists of a $7\frac{1}{2}$" Angle Girder 1 on each side extended by a $9\frac{1}{2}$" Strip that supports a $5\frac{1}{2}$" x $2\frac{1}{2}$" Flanged Plate 2. The rear ends of the Girders 1 are connected by a $5\frac{1}{2}$" Angle Girder, and a $7\frac{1}{2}$" Strip 3 on each side is bolted between this and a $4\frac{1}{2}$" x $2\frac{1}{2}$" Flat Plate attached to the Plate 2. A $5\frac{1}{2}$" Angle Girder 4 is arranged next to one of the Strips 3, and a $1\frac{1}{2}$" Angle Girder 5 is bolted in place.

One side of the base is a $9\frac{1}{2}$" x $2\frac{1}{2}$" Strip Plate and the other is formed by a No. 1 Clockwork Motor and a $5\frac{1}{2}$" x $2\frac{1}{2}$" Flexible Plate. The lower edges of the sides are strengthened by $9\frac{1}{2}$" Strips. Each end of the base is a $5\frac{1}{2}$" x $2\frac{1}{2}$" Flexible Plate edged by a $5\frac{1}{2}$" Strip, and these are connected to the sides by $2\frac{1}{2}$" Angle Girders. The base is attached to the machine bed by $5\frac{1}{2}$" Angle Girders, which are bolted to similar Girders secured to the ends of the bed.

Each of the Strips 3 supports a $5\frac{1}{2}$" Angle Girder, which is fitted at each end with a vertical $5\frac{1}{2}$" Angle Girder. The two vertical Girders are connected by two $5\frac{1}{2}$" x $2\frac{1}{2}$" Flexible Plates, a $5\frac{1}{2}$" Strip, and a $9\frac{1}{2}$" Angle Girder 6. A $5\frac{1}{2}$" x $3\frac{1}{2}$" Flat Plate 7 is bolted between the front pair of vertical $5\frac{1}{2}$" Angle Girders, and a $3\frac{1}{2}$" Angle Girder 8 is arranged between the ends of the Girders 6.

At one side of the machine a dummy gear-box housing is fitted. This consists of two $3\frac{1}{2}$" x $2\frac{1}{2}$" Flanged Plates 9 bolted together as shown and edged by two $3\frac{1}{2}$" Flat Girders attached to 1" x $\frac{1}{2}$" Angle Brackets. The control handle is a Threaded Pin in a $1\frac{1}{2}$" Strip mounted on a lock-nutted Bolt. The unit is attached to the side of the machine by 1" x $\frac{1}{2}$" Angle Brackets.

Two $5\frac{1}{2}$" Angle Girders are fixed vertically to the Flat Plate 7 and to them are attached further $5\frac{1}{2}$" Angle Girders 10. A Girder Bracket 11 on each side is attached to two 1" x $\frac{1}{2}$" Angle Brackets bolted to each of the Girders 10, and the Girder Brackets are connected by two $4\frac{1}{2}$" Angle Girders 12.

Each side of the work table is a $2\frac{1}{2}$" x $2\frac{1}{2}$" Flat Plate fitted at the top with a 3" Angle Girder. A 3" x $1\frac{1}{2}$" Flat Plate is bolted to the Girders, and a $2\frac{1}{2}$" x $1\frac{1}{2}$" Flanged Plate is arranged between this and a $1\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip that connects the lower corners of the sides. A $1\frac{1}{2}$" Angle Girder is bolted to the inner ends of the 3" Girders, with another $1\frac{1}{2}$" Angle Girder attached to it so that the flange of the last-mentioned Girder engages underneath the flange of the upper one of the Girders 12. A $1\frac{1}{2}$" x $\frac{1}{2}$" Double Angle Strip is fixed in place by a bolt 13 on each side, and a $1\frac{1}{2}$" Angle Girder is bolted to the Double Angle Strip. The flange of the $1\frac{1}{2}$" Girder engages behind the vertical flange of the lower one of the Girders 12. This construction allows the work table to be slid along the Girders 12, and its movement is controlled by a handle 14. This is a Threaded Pin in a $1\frac{1}{2}$" Strip fixed by nuts on a 3" Screwed Rod, which is passed through one of the Girder Brackets 11 and is screwed into a Threaded Boss. The Threaded Boss is fixed by a bolt to one of two $2\frac{1}{2}$" Angle Girders bolted to the inner edges of the $2\frac{1}{2}$" x $2\frac{1}{2}$" Flat Plates.

The clamp for the work to be machined consists of two $1\frac{1}{2}$" Angle Girders connected by nuts on a $\frac{3}{4}$" Bolt, with Fishplates bolted to one of the Girders. The Girders are attached to two face to face $2\frac{1}{2}$" Strips spaced from the top of the work table by Washers on the securing bolts.

The sliding ram that carries the cutting tool is formed by two $9\frac{1}{2}$" Angle Girders connected by two $5\frac{1}{2}$" x $1\frac{1}{2}$" Flexible Plates, a $1\frac{1}{2}$" Strip and a $1\frac{1}{2}$" Angle Girder 15. Two Angle Brackets bolted to each of the $9\frac{1}{2}$" Girders are free to slide between two $9\frac{1}{2}$" Strips 16. These are spaced apart by a Washer on each of the Bolts that fixes them in place.

The cutting tool is represented by a $\frac{3}{4}$" Bolt fixed by a nut and a Short Coupling in one lug of a Hinge. The Hinge is bolted to a 2" Strip to which a Threaded Boss is fixed by a bolt. The Threaded Boss is screwed on to a Screwed Rod mounted in an Angle Bracket bolted to the Girder 15, and in two 1" x $\frac{1}{2}$" Angle Brackets fixed together to make a $1\frac{1}{2}$" x $\frac{1}{2}$" reversed angle bracket, which also is fixed to the Girder 15. Two Double Brackets bolted in place support a 2" Strip 17 on each side. The Screwed Rod carries a handle formed by a Threaded Pin in a $1\frac{1}{2}$" Strip, which is clamped tightly between nuts with a Collar serving as a spacing piece.

A $\frac{1}{2}$" Pinion on the No. 1 Motor shaft drives a 57-tooth Gear on a $3\frac{1}{2}$" Rod 18. A $\frac{3}{4}$" Sprocket on this Rod is connected by Chain to a $1\frac{1}{2}$" Sprocket on a $2\frac{1}{2}$" Rod 19. Rod 19 carries a Bush Wheel to which a Slide Piece is pivotally attached by a $\frac{3}{8}$" Bolt. A $7\frac{1}{2}$" Strip is passed through the Slide Piece and through a similar part 20 fixed on a $2\frac{1}{2}$" Rod. The Rod is free to turn in a Bush Wheel and a Double Bent Strip bolted to one side of the machine. The upper end of the $7\frac{1}{2}$" Strip pivots on a 2" Rod held by Collars in the sides of the sliding ram.

Parts required to build the Shaping Machine:-

8 of No. 1a; 3 of No. 1b; 4 of No. 2; 2 of No.5; 3 of No.6; 4 of No.6a;
4 of No.8a; 2 of No.8b; 15 of No.9; 2 of No.9a; 1 of No.9b; 2 of No.9c;
6 of No.9d; 6 of No.9f; 4 of No.10; 2 of No.11; 5 of No.12; 10 of No.12b;
1 of No.16; 2 of No.16a; 1 of No.17; 1 of No.24; 1 of No.24a; 1 of No.26;
1 of No.27a; 164 of No.37a; 158 of No.37b; 22 of No.38; 1 of No.45; 2 of No.48;
2 of No.50; 1 of No.51; 1 of No.52; 1 of No.52a; 2 of No.53; 1 of No.53a;
9 of No.59; 1 of No.63d; 2 of No.64; 2 of No.72; 1 of No.73; 2 of No.80c;
1 of No.94; 1 of No.95a; 1 of No.96a; 2 of No.103d; 1 of No.111; 4 of No.111c;
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