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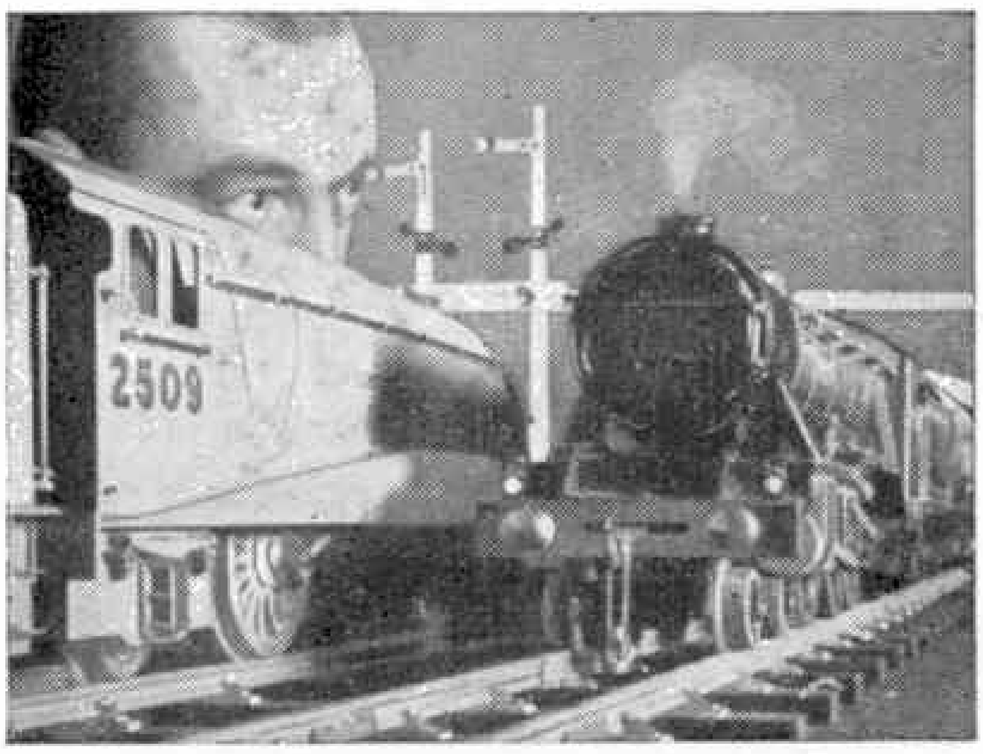

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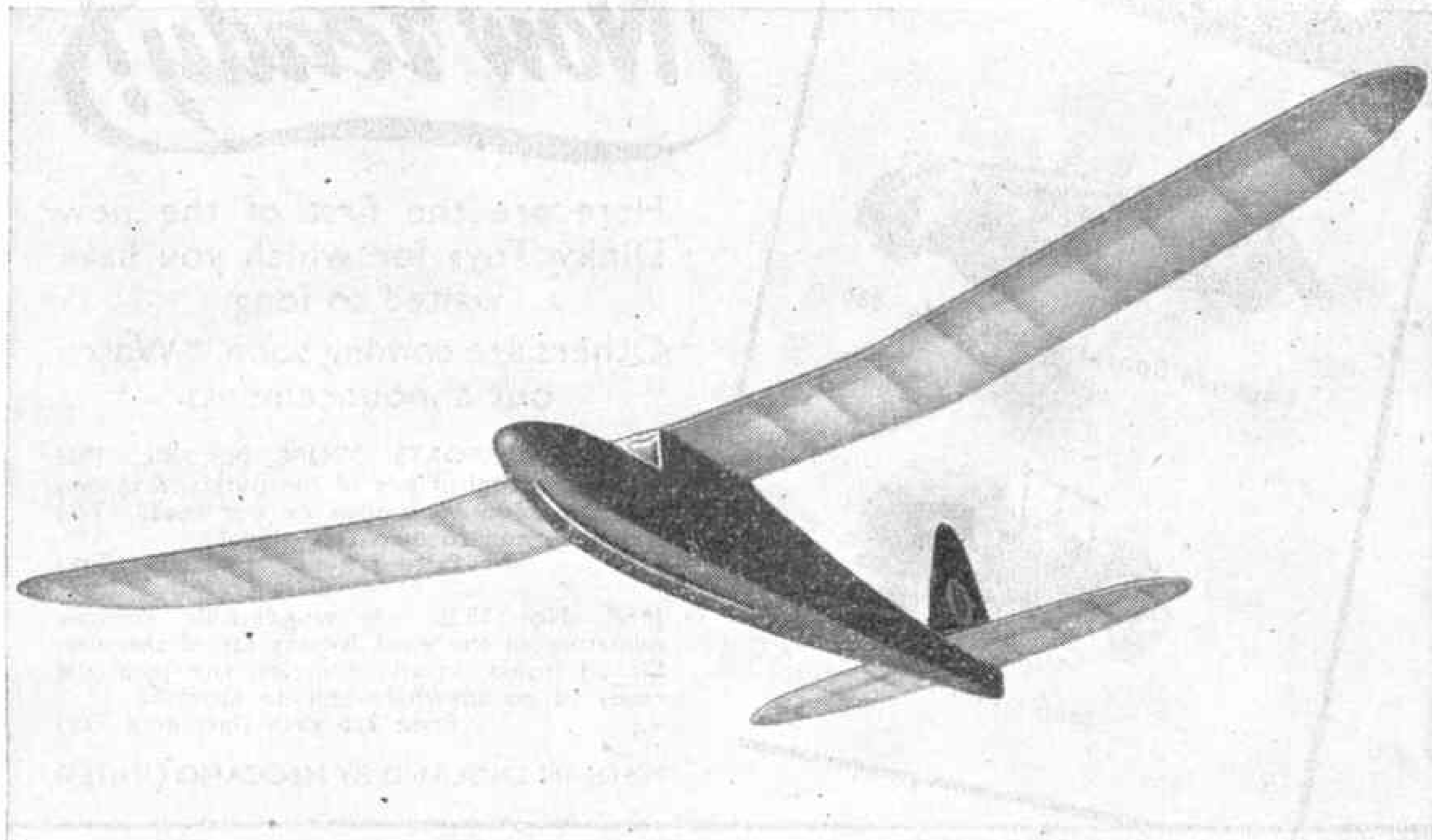

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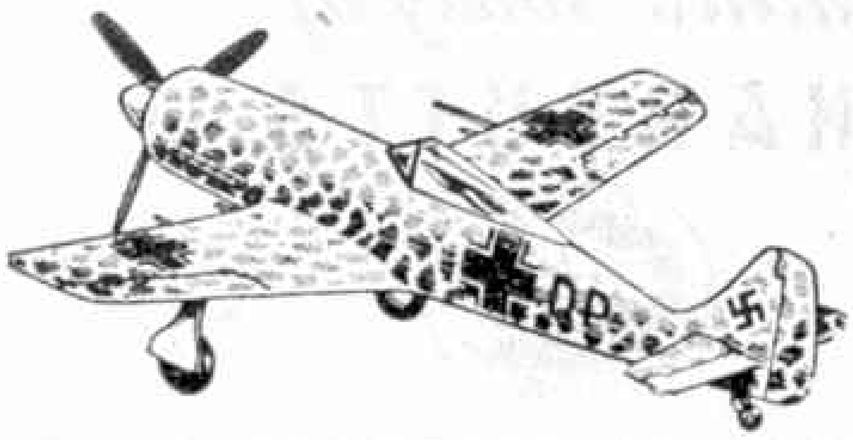

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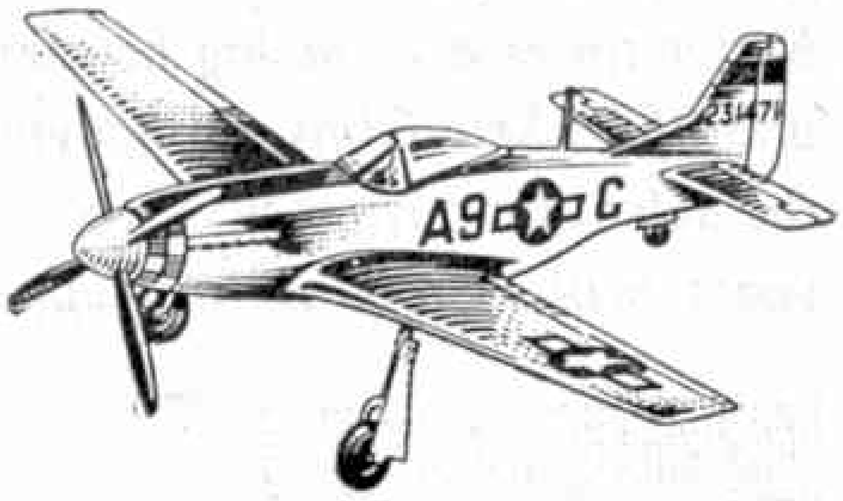

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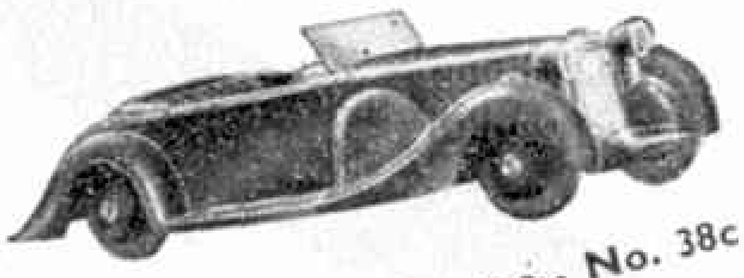

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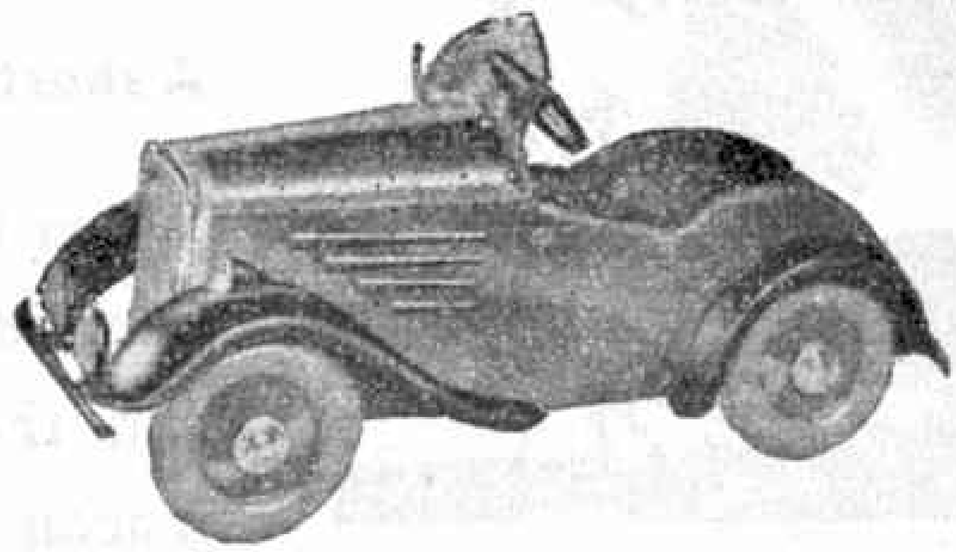

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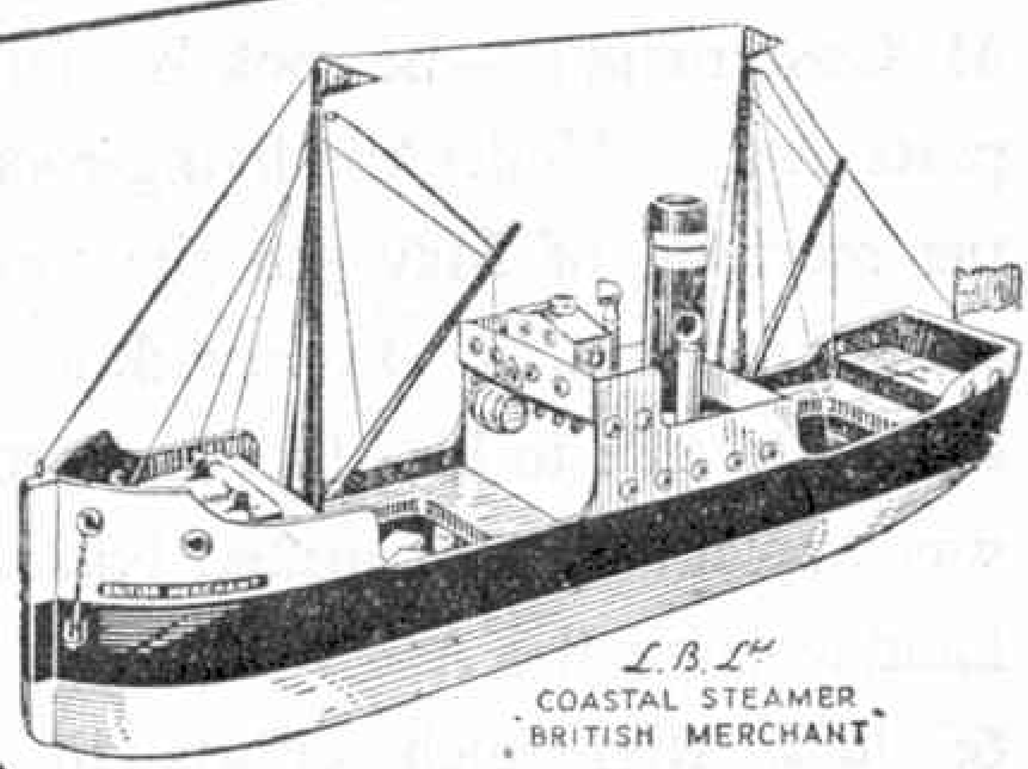

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THE CASE OF THE SECRET BICYCLE

A short story about Nazi-occupied Holland

When the Nazis occupied Holland, things became very difficult for Dutch cyclists, and they had a hard job keeping their machines on the road. For one thing, there were no rubber tyres — M. Oosterwijk, an enthusiastic cyclist who told us this story recently, had eventually to fit *wooden* tyres to his B.S.A.— and he had to obtain a permit even for those. But it still kept going. (B.S.A.s are tough!) Then, as the war went on, the Huns started a cycle-grabbing campaign. But they didn't grab M. Oosterwijk's — he took his faithful B.S.A. to pieces and hid the parts away. Under the living-room floor was one hiding-place! On the morning of May 5th the news of the German surrender was announced and M. Oosterwijk joyously re-assembled his B.S.A. and started to ride to his office in Rotterdam. Then came tragedy! He was waylaid by four armed Nazis and forced at the pistol point to hand over his B.S.A. What a terrible piece of luck after such efforts to save his cherished cycle! No wonder that M. Oosterwijk, like so many cyclists throughout the world, is anxious to get hold of another B.S.A! But soon there will be one for everyone everywhere. So keep in touch with your B.S.A. dealer — he can help you.

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Next Month: "THE HELICOPTER TO-DAY." By J. W. R. Taylor

MECCANO MAGAZINE

Editorial Office:
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April 1946

With the Editor

Famous Light Railway Reopened

One of the most interesting home railway events since the end of the war was the re-opening last month of the Romney, Hythe and Dymchurch line. Any miniature railway, whatever its size, has a great attraction for nearly everybody; but there is a special fascination about one that is capable of carrying passengers. This fascination was proved beyond doubt in pre-war days by the success of the miniature railways at Blackpool, Southport, Scarborough and other pleasure resorts. But these railways cannot compare in interest with the Romney, Hythe and Dymchurch line, for this is a real public railway, whose timetables have achieved the honour of being included in "Bradshaw." The line was requisitioned by the War Department during the war years and was used for conveying stores, and later for carrying "Pluto" pipeline equipment to Dungeness. The line was patrolled by an armoured train mounting a small anti-aircraft gun.

The Romney, Hythe and Dymchurch railway was built under a Light Railway Order obtained in 1926 by Captain J. E. P. Howey, and was inaugurated by the present King, then Duke of York. The main line, Dungeness to Hythe, is just over 13 miles long. The gauge is 15 in., equivalent to the width across eight columns of a daily newspaper. The coaches seat two each side in ample comfort; and the saloons, which have large windows, electric light and soft cushions, ride easily on roller bearings. In hot weather passengers can ride if they wish in open carriages.

The company operates nine steam locomotives, one petrol locomotive evolved from a Rolls-Royce engine and reserved for winter traffic, and one petrol runabout for inspection of the track and works. The steam locomotives weigh, with tender, about 8 tons each, and they haul trains of 100 passengers and freight trains of up to 100 tons. They include five "Pacifics" and two Canadian Pacific type 4–6–2s. Of the latter, "*Doctor Syn*" leads in popular estimation because Russell Thorndyke's thriller of Romney's smuggling days was written hereabouts, at Dymchurch.

The oldest employee on the railway is not yet a grandfather; and the youngest, aged 14, is generally envied in the Romney school world as the luckiest lad in the kingdom!

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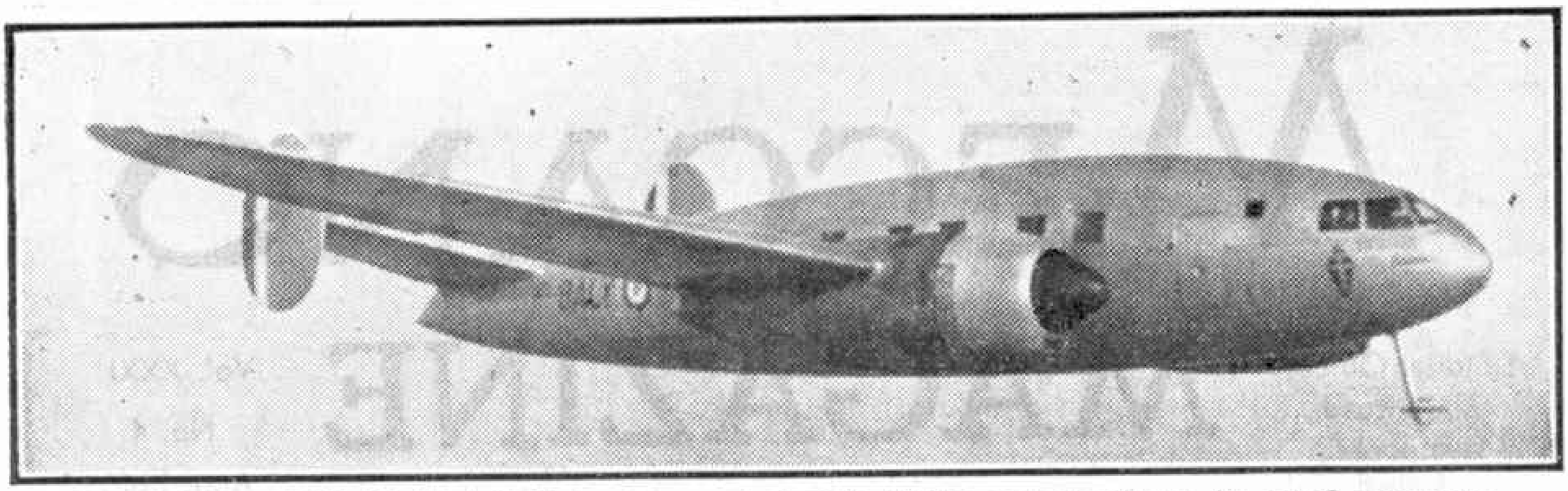


The Sud-Ouest 30N "Bellatrix" 15-ton transport aircraft. It has accommodation for 22-23 passengers.

The French Aircraft Industry

By J. W. R. Taylor

IN these days when nationalisation is in fashion a study of the French aircraft industry is particularly interesting, for almost all of it is under the direct control of the French Government. Remembering the tragic days of June 1940, the opponents of nationalisation will probably feel like saying "I told you so . . . .," but examination of the available facts shows that state-control has had no adverse effect on French production. In fact the Government-run companies were proving much more efficient in 1939 than many of the "free" companies, and the best warplanes—Bloch, Potez and Dewoitine designs—came from their factories.

The eclipse of the French Air Force was not due to inferior equipment, or lack of courage and skill on the part of its pilots, so much as lack of initiative and imagination by those who planned its strategy, and failure by the Government to appreciate the importance of aircraft in present-day warfare. In 1939, for instance, the aircraft industry was building about 120 aeroplanes a month, which seemed quite a reasonable number. Unfortunately German production over the five years up to 1939 was about seven times as great as French production. As a result the French pilots, always outnumbered and badly directed, lost faith in their leaders, and so shared in the moral collapse that really sealed the fate of their country.

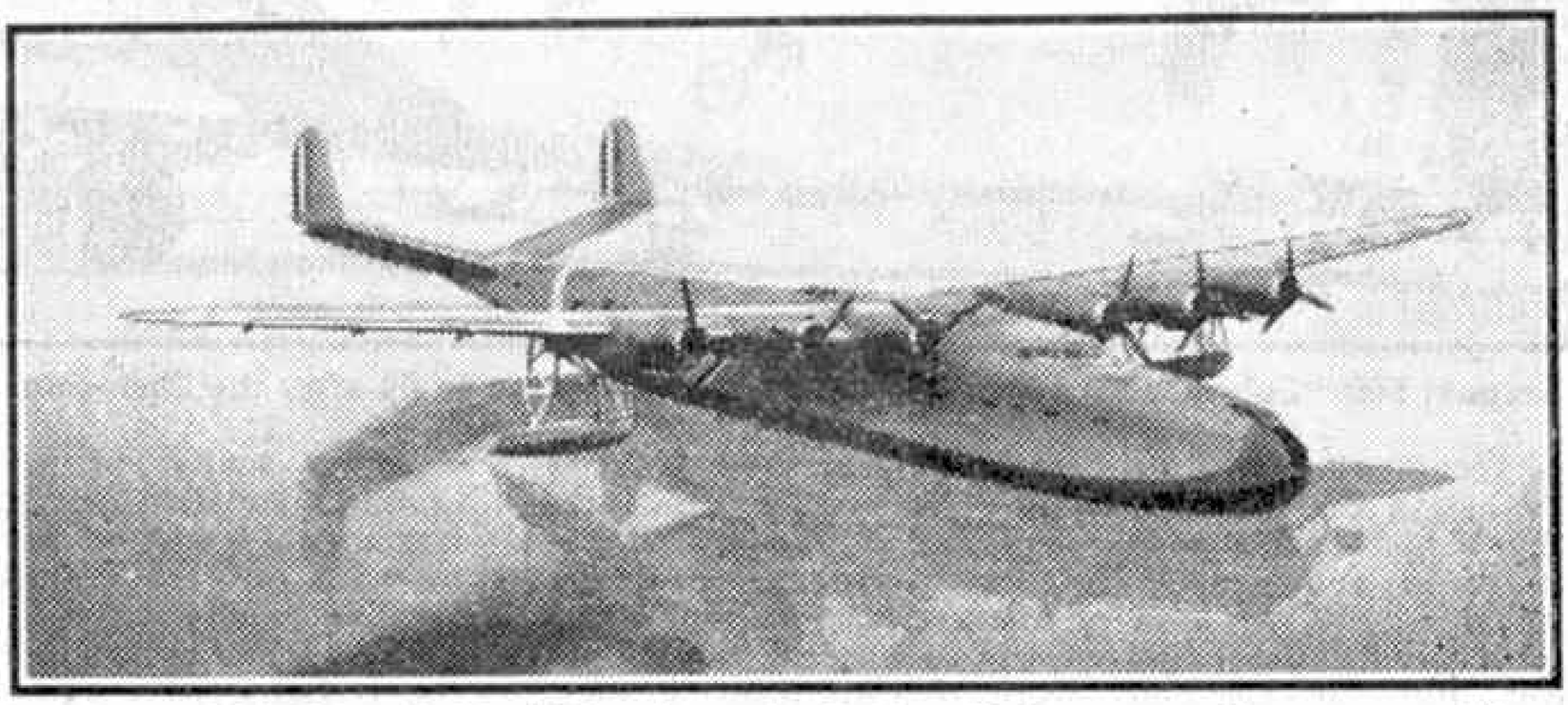
The Germans were quick to make use of French industry and many companies were compelled to produce equipment for the Luftwaffe during the years of occupation. In some cases the companies continued to build aircraft and engines of their own design, others had to re-tool to produce aircraft designed in Germany. A few lucky ones, chiefly those in what was originally the unoccupied zone of France, were able to continue with the development of civil designs started before the war. No doubt, in these cases, the enemy considered that he had enough factories producing military aircraft to win the war, and could visualise the eventual use of these transport aeroplanes by a National-Socialist World Air Line.

The Germans did not find many of the French people willing workers. In fact, apart from a great deal of repair work, it is doubtful if the Luftwaffe received much real help from the aircraft industry during those four years. Added to which there was also the very real danger of sabotage, the extent of which is well shown by the advice given to Allied airmen after the liberation that it was dangerous to fly any aeroplanes found on factory airfields.

By persuading the French to build some of their transport aircraft, and by using French engines in others, the Germans hoped to leave the bulk of their home industry free to produce warplanes. This scheme met with some success. The Siebel 204D communications aircraft was put into production by the state-owned S.N.C.A. (Societe Nationale de Construction Aeronautique) du Centre, and Junkers 52 three-motor transports were built by Ateliers Aeronautiques de Colombes. French firms were also entrusted with the development of one or two German warplanes, but this work did not come to much. For example, Farman were working on the Heinkel 274 four-engined high-altitude bomber—the enemy's last attempt

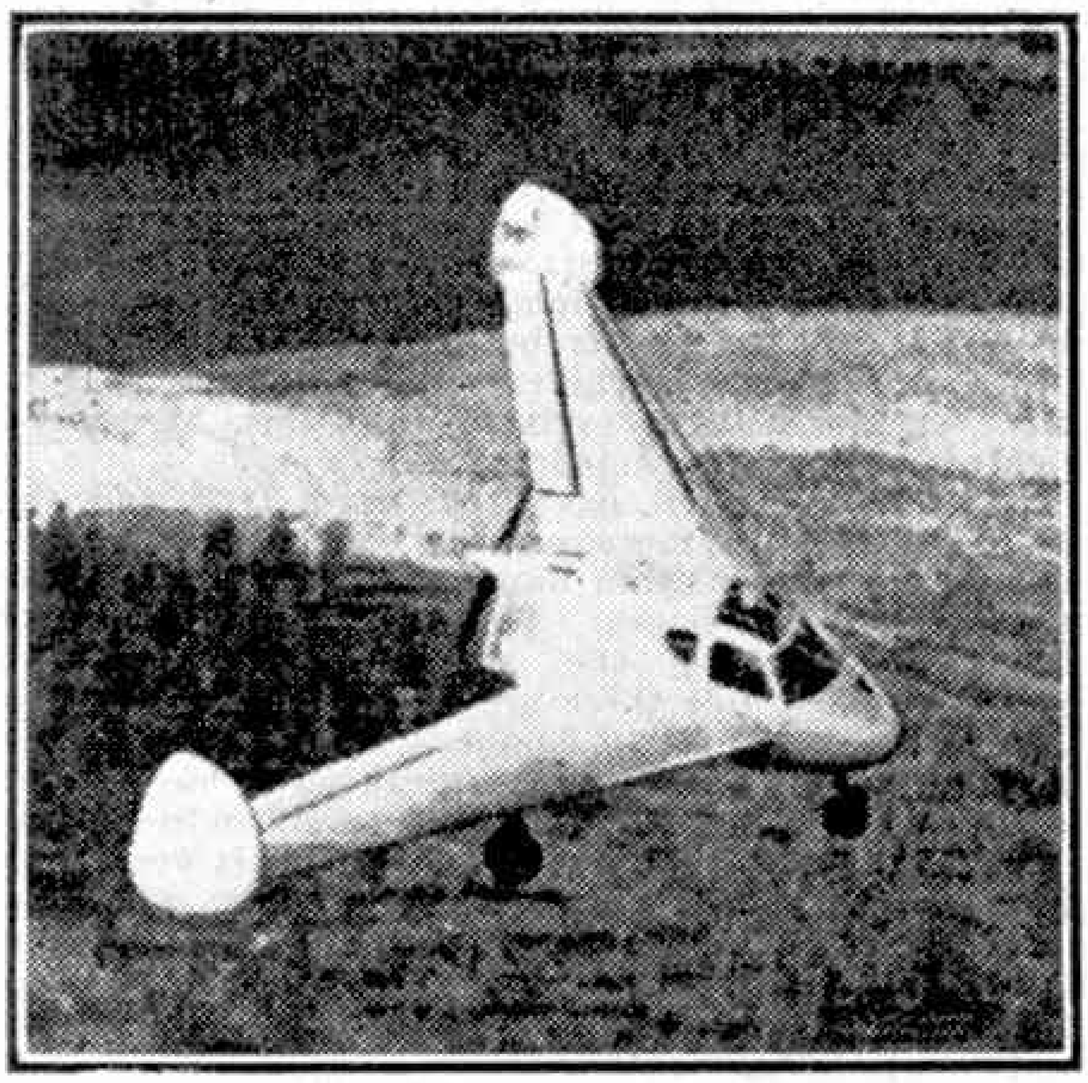
to produce a pressurised high-flying bomber capable of eluding British defences But this machine never flew.

Large numbers of 800 h.p. Ghome-Rhone radial engines were built in an underground factory near Tours and these proved ideal for the Messerschmitt 323 powered-gliders, which provided the "Warhawks" and "Kittyhawks" with such good sport off Tunisia. Cleanliness of design was not a feature of the Me.323, and so the fact that it needed six engines to pull it along at anything like a reasonable speed did not bother its designers. These engines were also fitted to some of the twin-engined Henschel 129 attack-fighters, which put in a brief appearance in North Africa.



Latecoere 631 flying boat. This six-engined aircraft has normally a crew of ten and can be equipped to carry up to 50 "sleeper" passengers.

One of the few French military aircraft that remained in production after the collapse in 1940 was the Dewoitine D.520 fighter, which was built by S.N.C.A. du Sud-Est at Toulouse. The D.520 is a pretty little single-seater, very similar in general appearance to the early "Spitfires," and was the best French operational fighter in 1940. It is quite obvious that the Royal Air Force too realised that this factory, like so many others, might be of use to the enemy, for it was well and truly "dealt with" by Bomber Command. But the job of reconstruction has been tackled in a business-like manner, and already new aircraft are beginning to leave this Toulouse factory. The industry in general has profited somewhat from German experience in the design and use of machine-tools, but any advantages such as this were more than outweighed by the effects of R.A.F. experience in bombing.

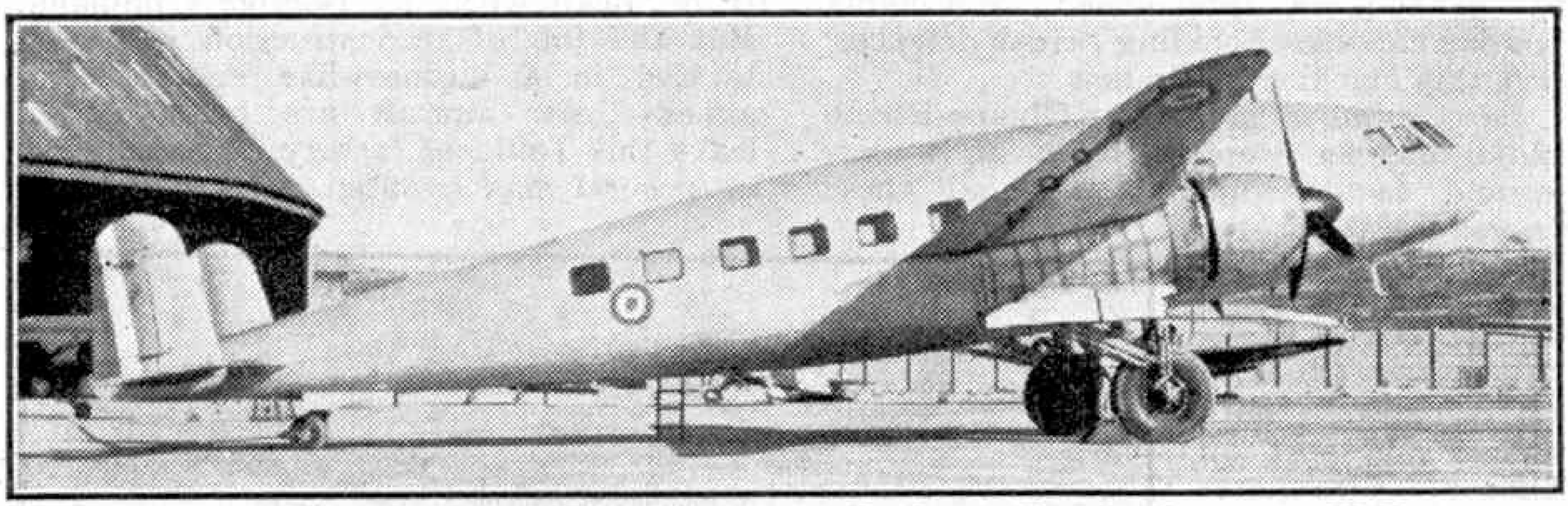


The Sud-Est 2100 "flying wing" two-seater aircraft.

Far more interesting than the French-produced German types and the early French designs are the numerous aircraft developed during the years of occupation. In many cases only the prototypes are flying, as, except in a few collaborationist companies, design and construction work was deliberately slow to avoid giving more than a bare minimum of assistance to the enemy's war effort.

Two of the most progressive designs are the S.N.C.A. du Sud-Est 200 and Latecoere 631, both of which are neat 70-ton flying boats, powered by six Wright "Cyclone" engines. The S.E.200, which has a wing span of 170 ft., has an interesting history. Four of them were being built in the factory at Marignanne, near Marseilles, in 1939. Two were subsequently completed and seized by the Germans. This did the enemy little good, however, as both were destroyed by Allied action. The third S.E.200 did not even get as far as that, but was bombed in the factory before completion. It is now being re-built, and together with the fourth aircraft will go into service with Air France this year, probably on the North and South Atlantic runs.

The prototype of the graceful Latecoere 631 was also nearing completion at Arcachon in June 1940. But by the time the Germans reached the factory it had vanished into thin air. Showing more confidence in the future than their



Breguet 500 "Colmar" air liner, the first French prototype to fly after the liberation. It can carry 22-23 passengers.

Government the Latecoere engineers had worked 24 hrs. a day at full pressure dismantling the huge flying boat, after which they hid all the component parts in the nearby Landes Forest. There they remained, all 70 tons of them, for over four years until finally the hopes of the engineers were borne out and the Germans were driven from France. Then came the job of collecting all the carefully hidden bits and pieces and re-assembling the La 631. On its subsequent proving flights it met with a series of unfortunate accidents, but, nevertheless, promises to be a very useful aeroplane.

The interior of this flying boat is extremely luxurious and it provides a higher standard of passenger comfort than any other aircraft in the world. Only 20 passengers are carried, and they have almost all the amenities found in a modern steamship. In the nose there is a spacious and comfortable lounge bar aft and slightly below which is the writing room. Then come the main day and night cabins, which are centrally placed in the fuselage. They are separated by a wide corridor, and each has its own toilet room. Next are the two dining rooms, one a beautifully appointed room seating 16 passengers that would do justice to any hotel and the other a small, cosy room with a single table for four. Finally there is the galley, a douche bathroom and toilet room and the baggage compartment.

For those who like figures, the La 631 has a wing span of 189 ft., a length of 143 ft. and a loaded weight of 154,500 lbs. If desired, the accommodation can be varied to carry up to 50 "sleeper" passengers as well as the normal crew of 10, three tons of freight and 2½ tons of baggage.

S.N.C.A. du Sud-Est have also built the prototype S.E.1000 transport at Marignanne. It is a very promising four-motor sub-stratosphere aircraft intended for the transatlantic mail run. A feature of the new aircraft designed by this company is the neat cockpit layout. The pilot has only a bare minimum of controls and instruments to look after, all the other instruments being mounted on the flight engineer's panel, aft of the main cockpit. This feature will considerably ease the strain on the pilot during a long transocean flight. One of the devices developed by S.N.C.A. du Sud-Est is a fuel content gauge indicator rather like the electric train position indicators found in modern railway signal boxes. It shows the flight engineer just how much fuel he has left in each tank and which tanks are in use at any moment of the flight.

To fill a gap until the S.E.1000 is ready for service, S.N.C.A. du Sud-Est are turning out at Toulouse numbers of 33-seater S.O.161 transports, powered by four Gnome et Rhone 14 N engines. These machines are really only improved versions of the old Bloch 161 transports that were regular visitors to Croydon before the war, but will certainly tide French airlines over a difficult time until the newer types are ready.

Another of the new French aircraft that had an exciting wartime history is the S.O.90, which was designed by S.N.C.A. du Sud-Ouest in 1941. By the Spring of 1943 it had been completed at Cannes and was ready or its first test flights. Its pilot, Commander Hurel, decided, however, that the S.O.90 was much too good for the Luftwaffe and so began to work out the details of a scheme to deliver the machine where it would do most good.

On 14th August Hurel obtained permission from the Italians, who were then in charge of Cannes, to carry out taxying trials of the S.O.90. Afterwards he said that it was all right apart from a spot of trouble with the brakes. Then, while the Italians believed that the brakes were being adjusted for a re-test, extra fuel tanks were fitted and seven passengers hidden under sacks as "ballast." On the 16th permission was once more obtained for brake tests. But instead of short taxying runs up the runway the S.O.90 took off and raced out to sea towards French North Africa. It made the 400 mile flight quite safely, although the two 350 h.p. Bearn engines were also prototypes and had never been flown before. The French aircraft industry had achieved one more victory against the enemy.

The S.O.30N "Bellatrix" was also completed in the Spring of 1943, but the Germans refused permission for test-flying it. So it remained in the S.N.C.A. du Sud-Ouest factory near Marseilles until November 1943, when the enemy occupied the whole of France. Then like the Latecoere 631 it disappeared!! The component parts were hidden in barns and farm buildings at Draguignan, 20 miles from the Riviera. They were never discovered and, as soon as the South of France was liberated, the parts were collected and the "Bellatrix" re-assembled. It was, in fact, the first French prototype to fly after the liberation.

Both the "Bellatrix" and the new Breguet 500 "Colmar" are useful medium-range transports. They are approximately the same size with wing spans of 83 ft. 3 in. and 73 ft. 4 in. respectively. Both weigh 15 tons and have accommodation for 22-23 passengers.

Although the emphasis at the moment is very much on large civil transports, other types of aircraft have not by any means been forgotten, and many other interesting machines are now flying, from three or four-seat air taxis to autogyros, high-speed fighters and flying-wing designs.

S.N.C.A. du Nord have the Nord 1101 and the Nord 1201, both more or less conventional single-engined low wing cabin monoplanes with retractable tricycle undercarriages. The first prototype Nord 1101, built during the occupation, had German Arado engines, but these are now being replaced by 220 h.p. Renault 6Q10 engines. As a private-owner machine or air taxi it seems ideal, as it has a range of 745 miles at 140 m.p.h. and is economical to operate. The cabin, which seats four passengers, is very comfortable and is fitted with dual controls, while the whole top is jettisonable in an emergency. The Nord 1201 is more or less a "scaled-down" 1101, with accommodation for three persons and powered by a 140 h.p. in-line engine.

The little S.N.C.A. du Sud-Est 2100 flying-wing is the French counterpart of the Handley Page "Manx," described in the (*Continued on page 172*)

Whistle Language

By "Shed Superintendent"

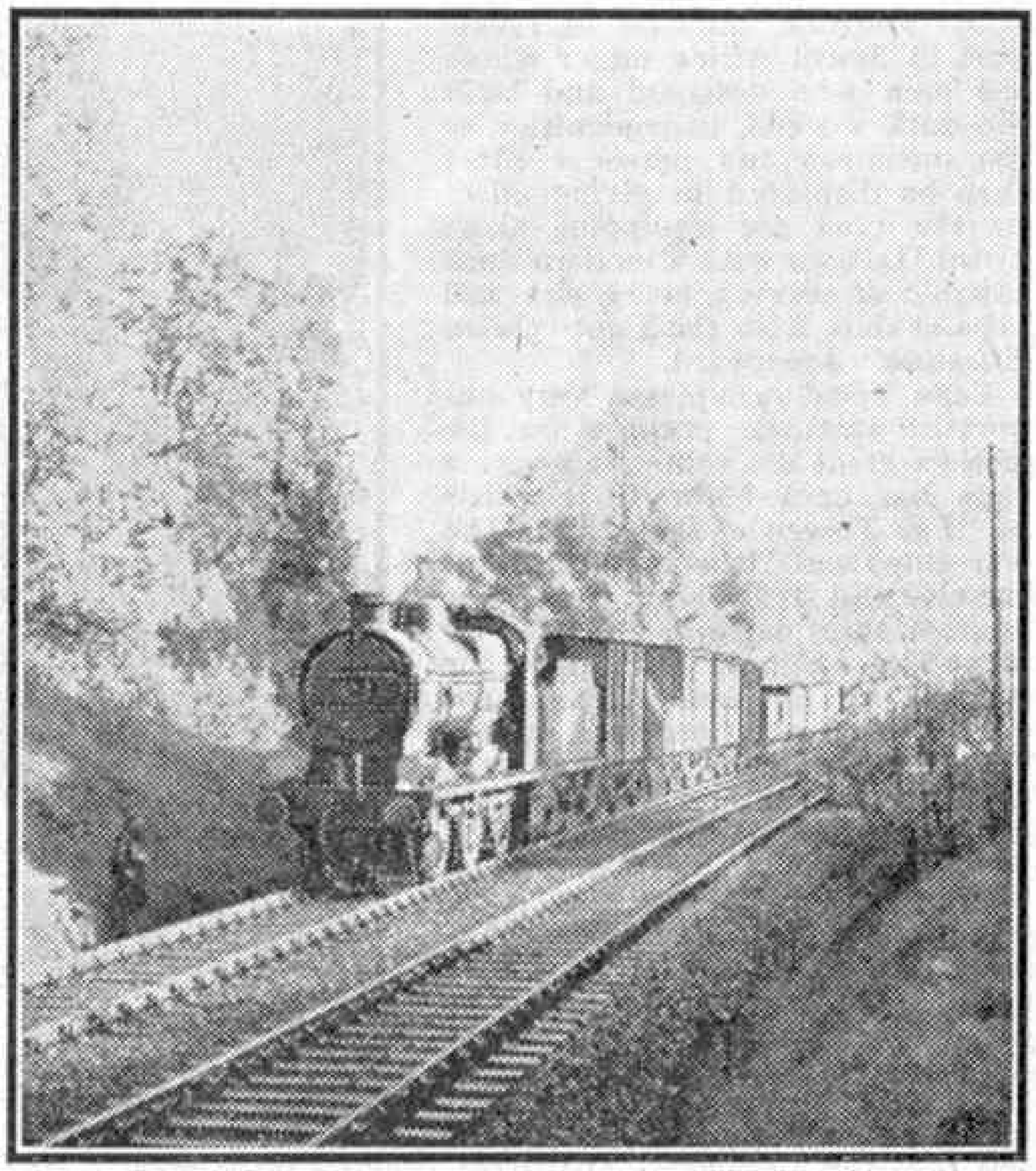
TO the enthusiast the delights of railway observation are not limited to the sights he sees. The hiss of a brake valve, the "chink" of buffers or the call of a whistle—all these sounds convey information to him, even during darkness or in the compartment of a train.

The whistle language is an interesting study. The use of the whistle in certain circumstances is, of course, laid down strictly in the Rulebook in force on all the main line companies. To take examples, there is the long full note used when a train is approaching an adverse signal, to remind the signalman of the presence of the train, usually followed up by "pop" whistle when the signal is cleared. Drivers of freight trains must give three or more short, sharp whistles if the assistance of the guard's hand brake is required and if a banking engine is in rear, crow or "cock-a-doodle-oo" whistles are exchanged between the drivers before starting the train, whether freight or passenger.

A series of pop whistles is required by the Rules to be sounded frequently when a train is travelling on the wrong line in an emergency or in special circumstances making this working necessary. It is interesting to note that the use of a succession of pop whistles has become the accepted warning of sudden danger, by reason of the agitated sound of this call. If, for example, six or more hurried pop whistles are heard in a shunting yard it may mean that a driver has spotted a wagon running away or observed a shunter walking into danger. This has saved many lives, and on hearing it you will notice that railwaymen at once look round, to see what is wrong.

Local whistle codes may be listed in the Appendix to the Rules issued by each company, or in Divisional instructions, which require certain whistle calls to be used at various junctions to denote to the signalman the correct route of the train or the destination of a light engine. The understanding of these codes requires some local knowledge. There are nearly always descriptive code whistles in force at the exit from a locomotive depot, especially at a big depot whence light engines travel to a number of different places to take up their duties.

Then there are variants in whistle calls used by individual drivers. For instance the Rules stipulate whistling during the passage of long tunnels but the type of whistle call is not defined in words, and I could always tell when a certain driver was in charge of the train by hearing his peculiar and effective tunnel whistle, which was a long-drawn-out wail ending in an expressive "pip."



An S.R. freight train travelling on the wrong line, owing to track repairs.

Other whistle calls established by custom, which certainly do not appear in the Rulebook, include the "Cooee" whistle used in greeting one's colleagues on the line, the V-sign whistle accorded to Mr. Churchill, and the jubilant whistling that occurs to celebrate the return home of a football team that has won the Cup Final. Last there is the short, low whistle, known to schoolboys as the *"Cave"* warning, which on the railway means simply *"Look out, here comes the Superintendent."*

South Africa's Giant Graving Dock

ONE of the greatest of wartime achievements was the construction at Cape Town of a gigantic graving dock, which in spite of its immense size was completed in less than three years and opened on 18th September last. No dock in the world exceeds it in all its dimensions. Its length is 1,212 ft. 5 in., and its width 148 ft. The great dock at Toulon in France is about 150 ft. longer, but has a width of only 131 ft., while the St. Nazaire Dock, which exceeds the Cape Town dock in width by 16 ft. 1 in., has a length of only 1,115 ft. To give comparisons nearer home, the King George V Dock at Southampton has a length of 1,200 ft. and a breadth of 135 ft., while the Gladstone Dock at Liverpool is 1,050 ft. 4 in. long and 120 ft. wide, so that they too are surpassed.

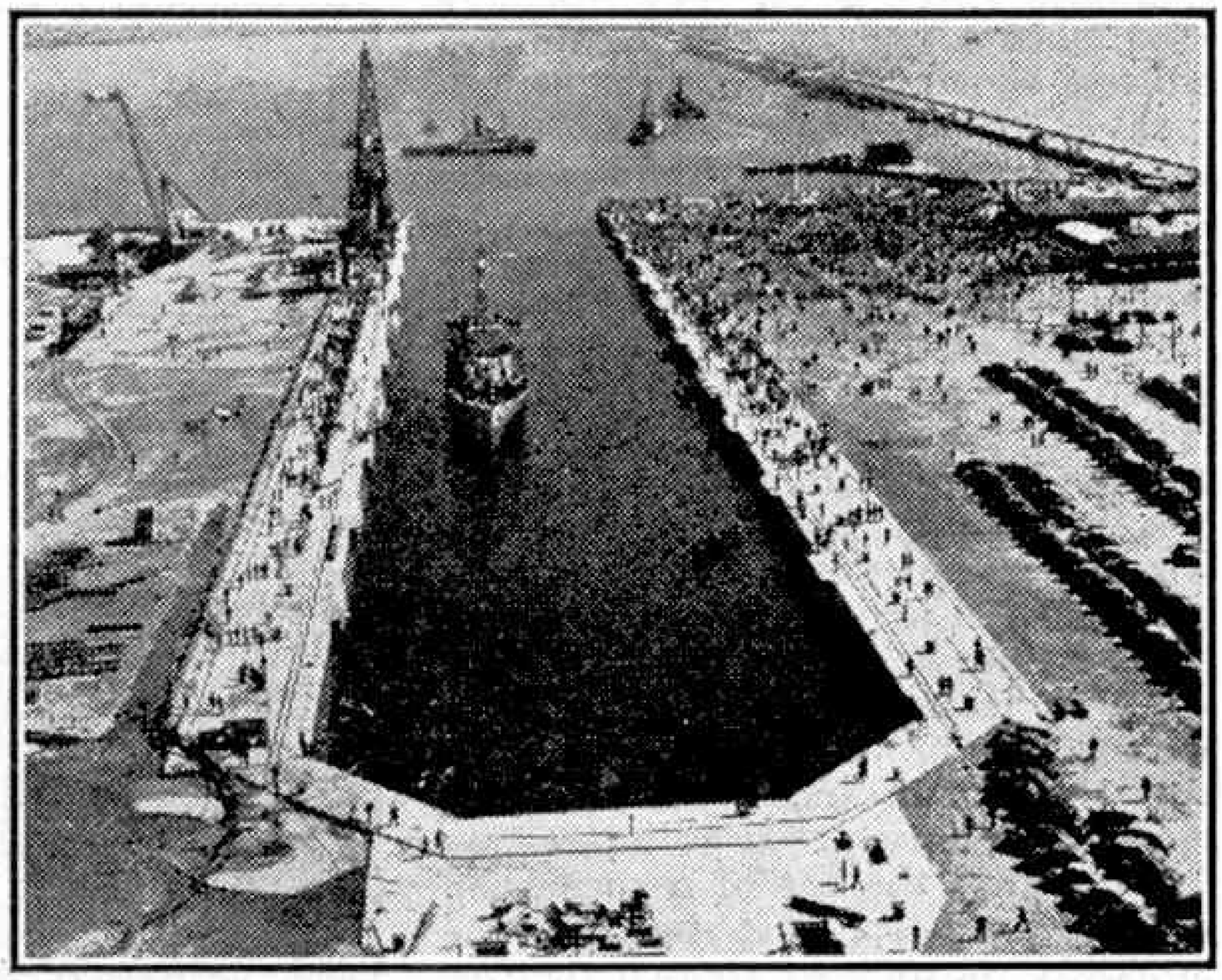
The total cost of the Cape Town dock was approximately £3,510,000, and the actual construction period of the dock itself was only 16 months. It was named after Mr. F. C. Sturrock, Minister of Transport in South Africa under whom the men who designed and built the dock worked, in recognition of the initiative and personal effort that he displayed in giving effect to the plan for equipping Cape Town Harbour with a modern dock capable of serving every size and type of ship, from the giant "*Queen Elizabeth*" downward.

Cape Town occupies a very important strategic position on the world's great sea routes, a position that has earned for it the title of "*The Tavern of the Seas.*" The war emphasised the importance of the city and its harbour. One after another ships came in damaged by torpedoes, mines, stranding or collision, or by gunfire, as in the case of the armed merchant cruiser "*Carnarvon Castle.*" Another large ship brought in damaged, this time after collision with another vessel, was the 18,000 ton "*Ceramic,*" which had a hole in her side, extending nearly 30 ft. below the water line, large enough to hold a small house. Few of these ships could be accommodated in the only dry dock then available, and they had to be patched up and sent off in a crippled state to be docked and repaired elsewhere. The great graving dock now makes it possible to carry out repairs and examinations there, even with the largest vessels of the Royal Navy, or the Merchant Navy.

Cape Town Harbour has undergone steady development and has been largely extended in recent years by the construction of the Duncan Dock from reclaimed ground. This dock presents an unbroken water surface of 290 acres, with a ruling depth of 40 ft. at low water. It is the largest dock seen in the view from the air of Cape Town Harbour reproduced on the opposite page, and the Sturrock Graving Dock has been constructed in the north east corner, in the position marked on our illustration by a white circle.

Before work on the dock commenced it was necessary to know something about the underlying rock, and a careful survey was made with a drill. Rock breakers and a dredger were employed to excavate the site and to deepen the approach channel, while a further section of the Duncan Dock also had to be dredged and excavated. Reclamation dykes were constructed by dumping dredged material up to 5 ft. below low water level, and rubble retaining dykes were built up above this level on either side of the position of the cofferdam of steel sheet piling that was then constructed to enclose the site for the dock. The space between the dykes was filled with sand, and the piles were driven down through this core and the underlying soft rock deposited by the dredgers. An opening was left in the cofferdam for the passage of the rock breakers and dredgers, and this was closed when the vessels had completed their task and had been taken out. An interesting light on the size of the dock is given by the fact that a total length of 4,791 ft. of piling was required.

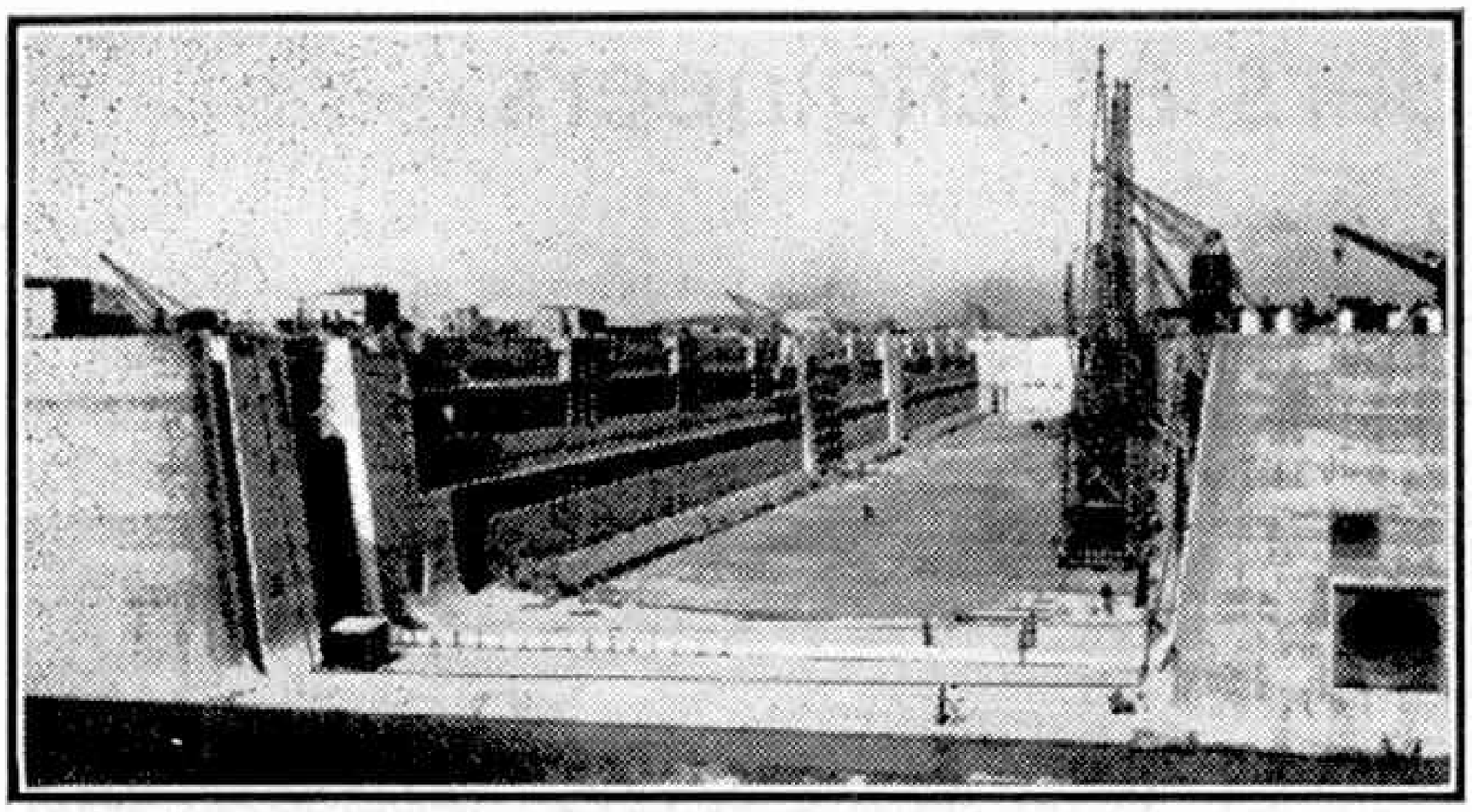
Pumps were then set to work to remove the water from the site. These were mounted on a pontoon inside the cofferdam, and from this a single pipe line 60 ft. long and 2 ft. in diameter led to another pipe through which the water was discharged. At each end of the 60 ft. pipe line there was a flexible rubber joint, so that the pontoon could sink as the water level fell without causing any disturbance or making any re-arrangement necessary. The site was found to be remarkably dry, and the sheet steel piling had been so efficiently erected that two small electrically driven pumps working intermittently were sufficient to deal with water seeping through or coming from subterranean springs.



The Sturrock Graving Dock, Cape Town, immediately after the opening ceremony on 18th September 1945. Photograph by courtesy of the South African Railways and Harbours Administration.

Preparations for the actual constructional work began even before the cofferdam was closed and dewatering began, for four dockside cranes of 4 tons capacity were removed from the Duncan Dock and placed in position at the head of the graving dock site through 50 ft. of water. These cranes were placed in position by means of a 60 ton floating crane.

Where the foundation of the dock proved unsatisfactory owing to softness of the rock and joints, the excavation was taken down to a depth of 80 ft. below low water of spring tides, and there the concrete floor of the dock was given a thickness of 35 ft. 6 in. In other places, where the underlying rock was stronger, the excavation was only carried down to a depth of 51 ft., leaving a floor thickness of 6 ft. This thickness



The construction of the Sturrock Dock is well shown in this illustration. Photograph by courtesy of the South African Railways and Harbours Administration.

s not sufficient to withstand upward water pressure, so a system of vent pipes has been installed to relieve this.

There were several interesting features of the concreting operations that followed the preparation of the site. Most of the cement was handled in bulk instead of in bags in order to speed up constructional work. Compressed air cement pumps were used to transfer the cement from the trucks in which it was brought into hoppers erected over the mixing plant. The hoppers were 100 yds. away from the cement unloading shed, and it proved a simple matter to shoot the cement the whole distance by compressed air at 30 lb. per sq. in. pressure. Altogether 1,333,305 cu. ft. of cement were handled in this way, and a further 536,505 cu. ft. of concrete in bags was used.

Two concrete mixing stations were erected. The larger of these had four mixers, electrically driven, with four 100-ton cement hoppers above them. The necessary stone and sand were brought by means of trains of one cu. yd. trucks hauled by petrol-driven locomotives over a narrow gauge railway system. The smaller mixing station, handling about a tenth of the total concrete required, was used for the mixture required for the special facings to all exposed surfaces of the dock walls and culverts.

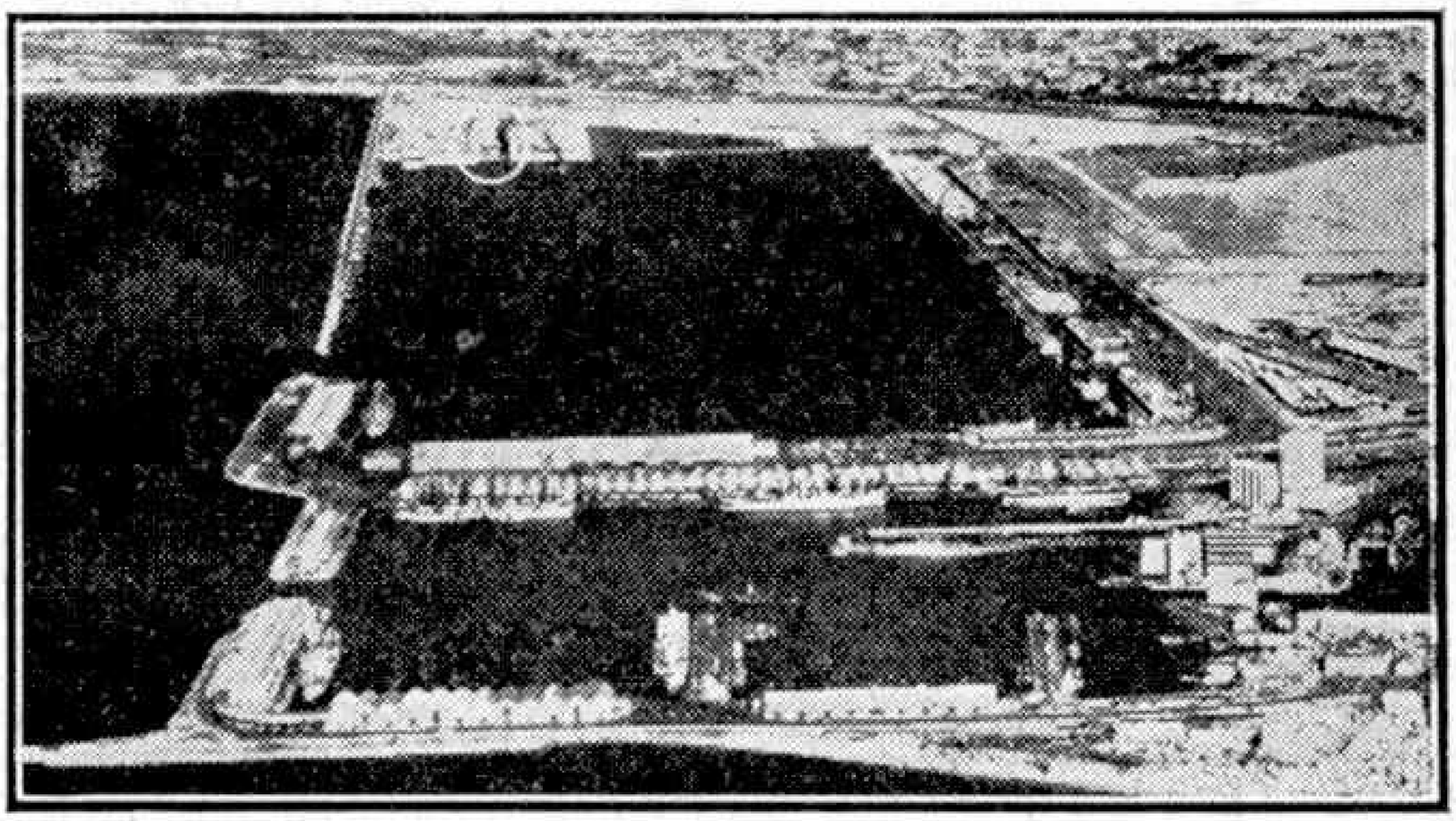
There was a shortage of timber for shuttering, that is for constructing the forms into which the concrete was poured, and in their place travelling steel shutters were used. The concrete was brought along from the mixers in skips with collapsible bases, carried on 5-ton lorries, and the skips were then picked up by one or other of the 4-ton cranes already referred to and their contents poured into position. The concrete was thoroughly vibrated, in order to ensure that it set as densely as possible. At one time as much as 1,600—1,800 cu. yds. of concrete were being laid a day; the highest amount poured was 2,132 cu. yds. in 9½ hours.

The entrance of the dock is closed by means of a sliding caisson, the steelwork for which was fabricated in Scotland. Altogether about 1,200 tons of steel went into its construction, and it was built on its side on the west side of the graving dock. The site eventually was flooded, and the caisson then floated off, so that it could be towed to the dock entrance. In its normal position it gives the dock an effective length of 1,181 ft., so that the largest ship now afloat can be accommodated with 120 ft. to spare. This length can be increased to 1,212 ft. 5 in., the figure already given as the length of the Sturrock Dock, by placing the caisson in an emergency stop position.

When the floating caisson was placed in position the concrete work had practically been completed and the dock was then flooded. Tests showed the caisson to be completely in order, and it was then sunk into its runway, after which the dock was emptied. The dock walls were backfilled with sand obtained from Table Bay, and the cofferdam at the entrance to the dock was then removed. This was done by partially dredging away the earth mounds supporting the row of steel sheet piling, and extracting the piles themselves. A floating rock breaker then deepened the site, the broken rock being removed by a bucket dredger.

The giant dock will not always be in use for dealing with giant liners and battleships requiring its full length, and to adapt it for work on smaller vessels two inner caisson grooves and a floating caisson are provided, so that various docking lengths can be made available. With the floating caisson in one set of grooves a ship of 469 ft. or under can be docked at the head and a larger vessel not exceeding 674 ft. in length can be accommodated in the remaining outer portion of the dock. Alternatively, docking lengths of 709 ft. and 434 ft. can be provided.

An interesting feature of the dock is that its centre line coincides as nearly as possible with the direction of the prevailing winds. The pump house is at the entrance to the dock, and a substation containing the electric equipment is placed at the head. When the dock is full of water and there is no shipping within it, it contains almost 55,000,000 gallons of water. This can be pumped out in 4¼ hours, but filling requires only 1¼ hours, water entering through two large culverts 9 ft. diameter.



Cape Town Harbour, now one of the best equipped in the world. The new graving dock is marked by a circle. Photograph by courtesy of Cape Times Ltd.

Spiders as Engineers

By R. H. Ferry

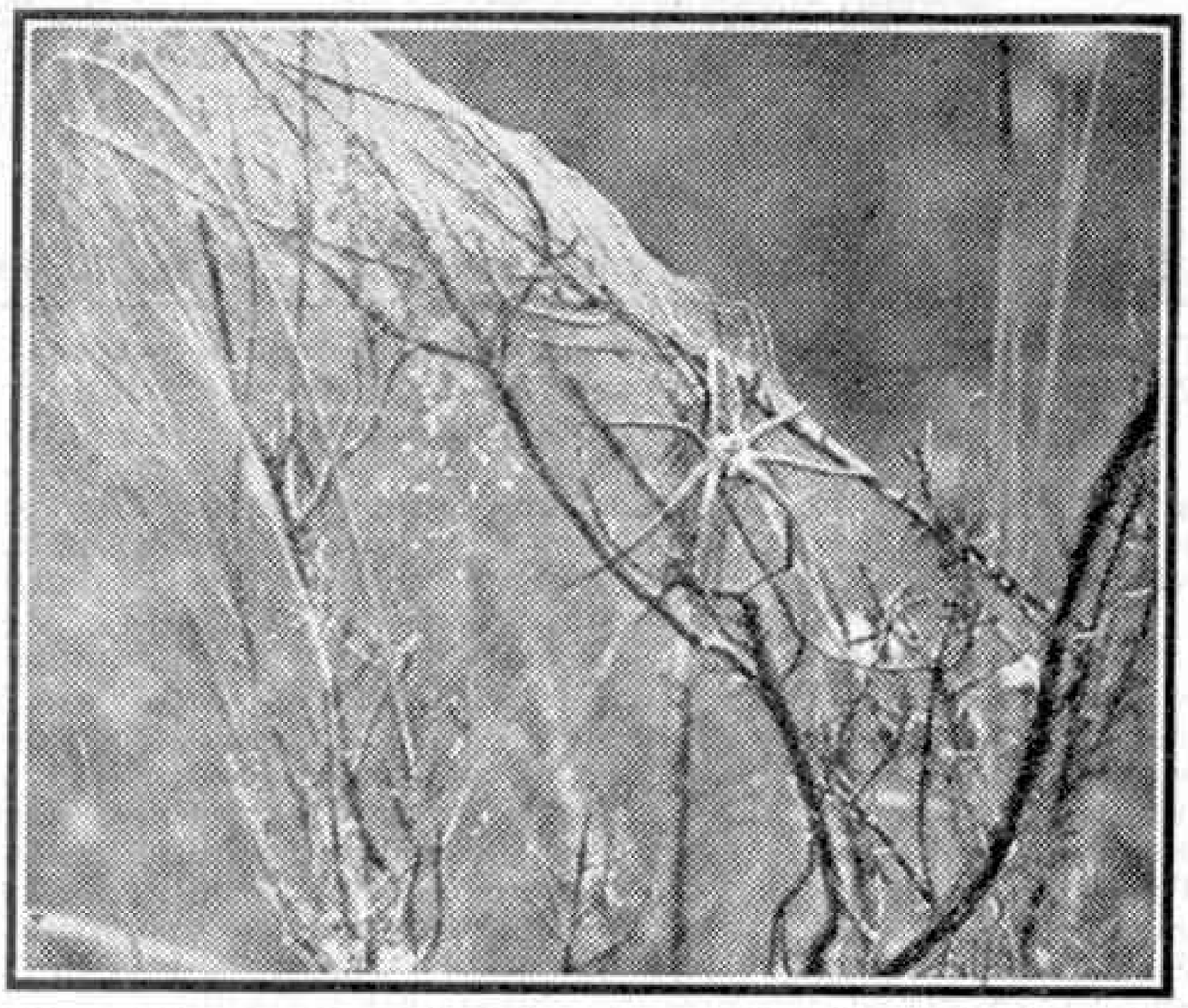
SPIDER silk is the lightest solid in the world, yet were a piece of steel spun out to the same thickness it would not compare with it in strength. A spider uses its silk for constructional engineering in much the same way as engineers use steel, or boys use Meccano parts. It has the natural advantage of being able to produce all its building material on the site chosen. "Bottle necks" or "short supplies" are not known in the spider world; in fact, the silk-making glands inside the spider can turn out cables to order and ad. lib. Half a pound of spider's silk, if laid out, would stretch right round the world.

Most spiders produce three to four different gauges to meet various requirements, and they can switch over from the production of one to another as they walk, without halting. There is a strong silk used for guys to hold the web in position, and a sticky resilient silk that takes the shock of the fly flying into the web, and prevents it from escaping. This silk makes up the circular lines of the web. The spokes in the web are dry or non-adhesive. On this "scaffolding" the engineer runs up and down, seeing that all is well. Spiders too pluck at their lines to attract the attention of other spiders, just as I have sometimes seen men high up on constructional jobs tap the steel girders with their hammers to attract the notice of their mates below.

When not building webs, some spiders turn their attention to making soft baby-blanket silk in which to carry their eggs. From our own point of view spider silk is used for the "fine line" in precision instruments, and in some countries for dress fabrics and silk stockings.

Silk is not the only spider output. When constructing a web, there is a great deal of "soldering" of joints to be done, so that the spider has to produce a quick drying cement for this purpose.

Wonderful as a spider is as a manufacturer, it is still cleverer as a constructional engineer, and this in spite of the fact that it works blind. As its eyes are right in front of its head, it cannot see the cable laying operations going on with such precision behind. Everything is done by touch, and a web made in a night shift is just as perfect as one made in bright sunlight. These creatures are able to measure angles and divide them equally, to estimate the strain on a rope, and to allow sufficient sag to prevent it from snapping.



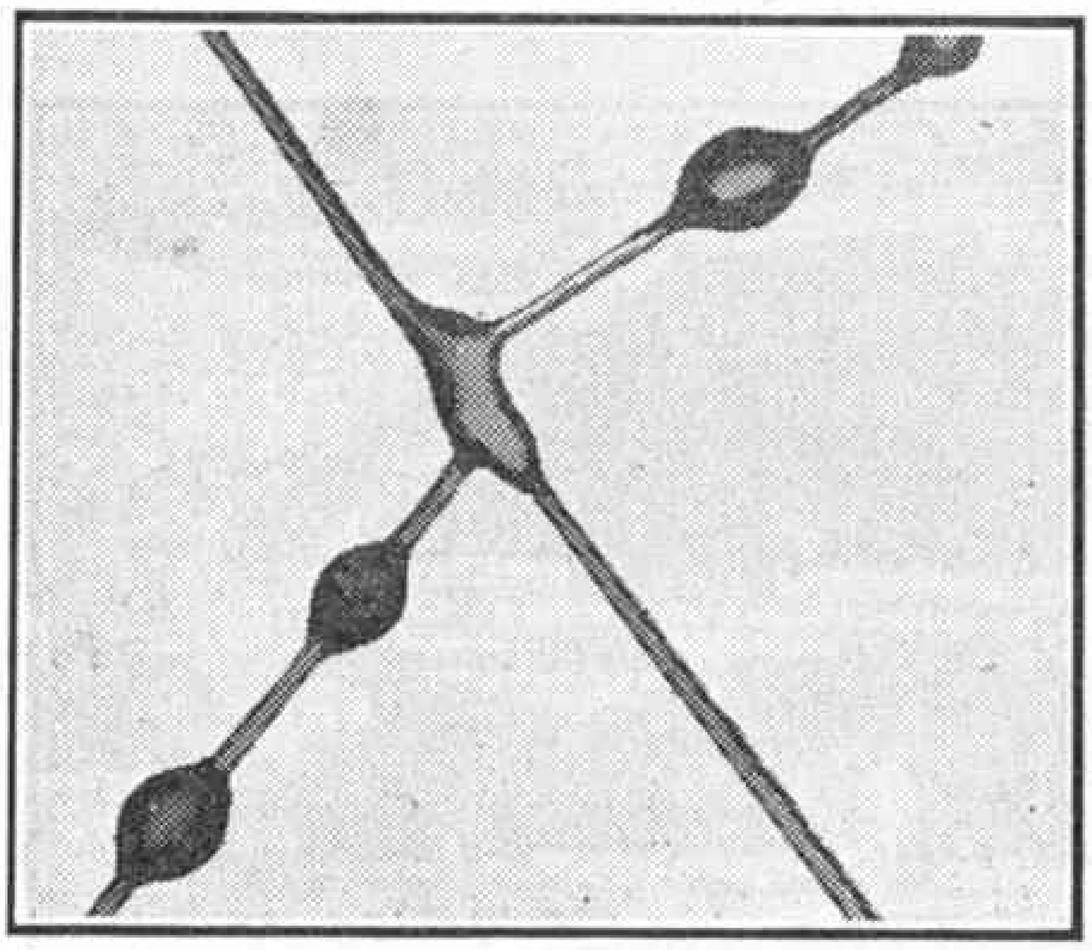
The spider engineer in his own construction. Photograph by courtesy of L. H. Newman.

An ordinary garden spider's web takes about 40 min. to make. After attaching a rough outline to projections and guy ropes, the spider divides this structure up into 20 sections by radial lines. On these it starts its circular walk, laying on the sticky cable. The stretches between each pair of spokes are tested for correct tension and faults before being soldered at the joints. There are approximately 70,000 of these joints to be fixed. If the spider finds its web becomes top heavy or lop-sided, it stops its spiral walk and lays on extra strands to counterbalance and correct the weight. At the start the spider stops to rest or to think, but as the work proceeds the pace speeds up. In the web's centre the spider nips off the spokes, joining each one carefully to a circular ring. In the gap thus formed it lies, making this the control point, foreman and boss of all it surveys.

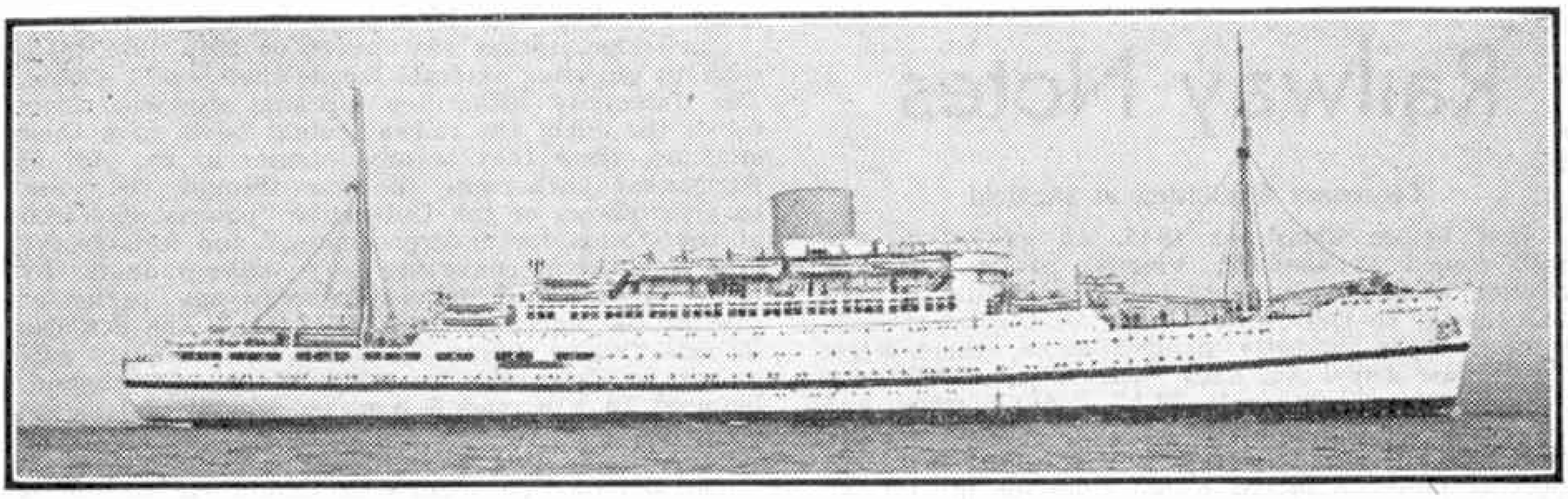
If you shut your eyes and try to draw a circle the size of a saucer on a piece of paper, and to divide this into 20 equal parts with the lines meeting at a central point, you will have some idea of the difficulty of planning and design that the spider encounters and surmounts with apparent ease.

A naturalist reports seeing the guys of a web carried away in a gale, allowing the web to flap like a sheet drying on a line. The spider hastened down to fasten a new guy to a broken twig on the ground. This twig had enough weight to stay the flapping, but sufficient drag to avoid another break. As a hasty emergency job, this would appear hard to improve.

These eight-legged creatures work night and day, without a thought of striking, for our benefit. They catch all the fly pests in our garden. Without them we should be unable to grow any crops or vegetables. Dr. Bristowe, who has made a careful study of these creatures, estimated that there were 2,000,000 spiders to the acre in one Sussex field, where a pretty big contract must have been under survey!



A cemented joint in a spider's web, with sticky blobs that catch flies. There are 130,000 of these blobs to each web.



The Largest Diesel-Electric Ship

By Denis Rebbeck, M.A. (Cantab. & Dublin), M.Inst.N.A.

A SHORT time before the war started in 1939 the Germans built a passenger liner which they named the *"Patria,"* and which was proudly referred to as "the largest diesel electric ship in the world." The *"Patria"* was built for the Hamburg American Line's service to the west coast of South America via Southampton, the Panama Canal and Valparaiso; and with a gross tonnage of 16,595 and twin screw machinery of 15,000 brake horse power, was by far the largest ship to be propelled on the diesel-electric system.

The *"Patria"* was built at the Hamburg yard of the Deutsche Werft to the highest classification and in accordance with the regulations of the Germanischer Lloyd. Her overall length was 584 ft., her maximum beam almost 73 ft., and her depth to the shelter deck 31.5 ft. Her displacement was 20,076 tons, and her service speed of 17 knots placed her among the express class of passenger and cargo liners.

The passengers totalled 185 first class and 164 second or tourist class, while the crew amounted to 241. Good cargo handling gear was provided, the equipment consisting of 14 five-ton winches and four three-ton Demag electric cranes.

The accommodation was arranged in a rather unorthodox manner with the main first-class dining saloon on the promenade deck. This dining saloon had a gallery on the boat deck above, and the seating arrangement gave 120 seats in the saloon and 48 in the gallery. At the after end of the dining saloon the cinema equipment was provided and at the forward end was a large lounge; this arrangement allowed the two rooms to be thrown together for use on festive occasions. On the boat deck, leading aft from the gallery section of the dining saloon, a large grillroom was laid out, and this opened out into a veranda café overlooking the boat deck.

The propelling machinery consisted of six three-phase alternators each driven by a diesel engine running at 250 r.p.m. and supplying current to two 7,500 brake horse power electric motors. These two huge motors were placed well aft in the ship and quite separate from the main engine room, and were coupled to propellers which turned at about 110 r.p.m. for the maximum speed of the ship. The diesel engines consisted of five eight-cylinder two stroke single acting M.A.N. trunk piston engines and one six-cylinder engine, all of 520 mm. bore and 700 mm. stroke.

It was on this ship that Grand Admiral Karl Doenitz, as Fuehrer of the Reich, after the death of Hitler, signed the preliminary surrender of the German forces in the North-West.

In due course the ship was handed over by her German crew at Methil, in the Firth of Forth, and was brought to Belfast for reconditioning by Harland and Wolff Ltd. She arrived at Belfast on 18th July last year and after being overhauled and refitted as a troopship she left for her trials on the Clyde on 15th November. The dirty-looking camouflage paint has been replaced by a clean white coat with a pleasant blue "waistline" and a yellow funnel, which make the ship, now renamed the *"Empire Welland,"* look very smart. Under international agreement the final owners of this vessel will be the U.S.S.R. and arrangements are being made whereby the *"Empire Welland,"* together with other ex-German ships, will be turned over to the Soviet Government.

Railway Notes

Centenary Exhibition at Sheffield

Just before Christmas 1945, an exhibition was well staged at Sheffield, Victoria Station, in connection with the centenary of the first railway from Manchester to the Cutlery City. Of the latest locomotive types, brightly painted green, there were: "B1" class 4-6-0 No. 8304 "*Gazelle*"; No. 9000, the first of Mr. Thompson's "L1" 2-6-4T type; and No. 6701, the experimental main line electric locomotive, which is probably to be the prototype of a large fleet of powerful mixed traffic units for use on the Manchester line when the overhead electric traction installation is completed. A diesel-electric shunting engine was also shewn, together with two corridor coaches of the newest design. In addition there was an interesting indoor display of early documents, maps and pictures.

The line was originally the Sheffield, Ashton-under-Lyne and Manchester Railway, a bold venture that involved the passage of the Pennine Range and much rugged country. It was commenced in 1838 and completed in 1845. Driving the Woodhead Tunnel beneath wild mountain and moorland was an exceptional engineering feat for those days. This tunnel has a length of 3 miles 13 yards, and is still the longest on the L.N.E.R. and the fourth longest in Britain. It took six years to construct as a single line bore; the second separate tunnel for up trains was completed in 1852. A long climb of some 20 miles at an average gradient of about 1 in 120 faces trains approaching it in each direction. The summit at the eastern portal of the great tunnel is 943 ft. above sea level, but the grade eases to 1 in 201 through the tunnel.

The line developed into the important trunk route through to Retford, Lincoln, Grimsby and other places on the Manchester, Sheffield and Lincolnshire Railway, which became the Great Central in 1897 and was merged into the L.N.E.R. in 1923. In the neighbourhood of Stockport and Manchester it links with the Cheshire Lines as well as various sections of the L.M.S., and it carries a heavy freight and passenger traffic to and from all parts of the Midlands, East Anglia and London (Marylebone). At present, "Green Arrow" 2-6-2s, with 4-6-0 and 2-8-0 locomotive types largely of former Great Central origin, operate this difficult road to a considerable extent.

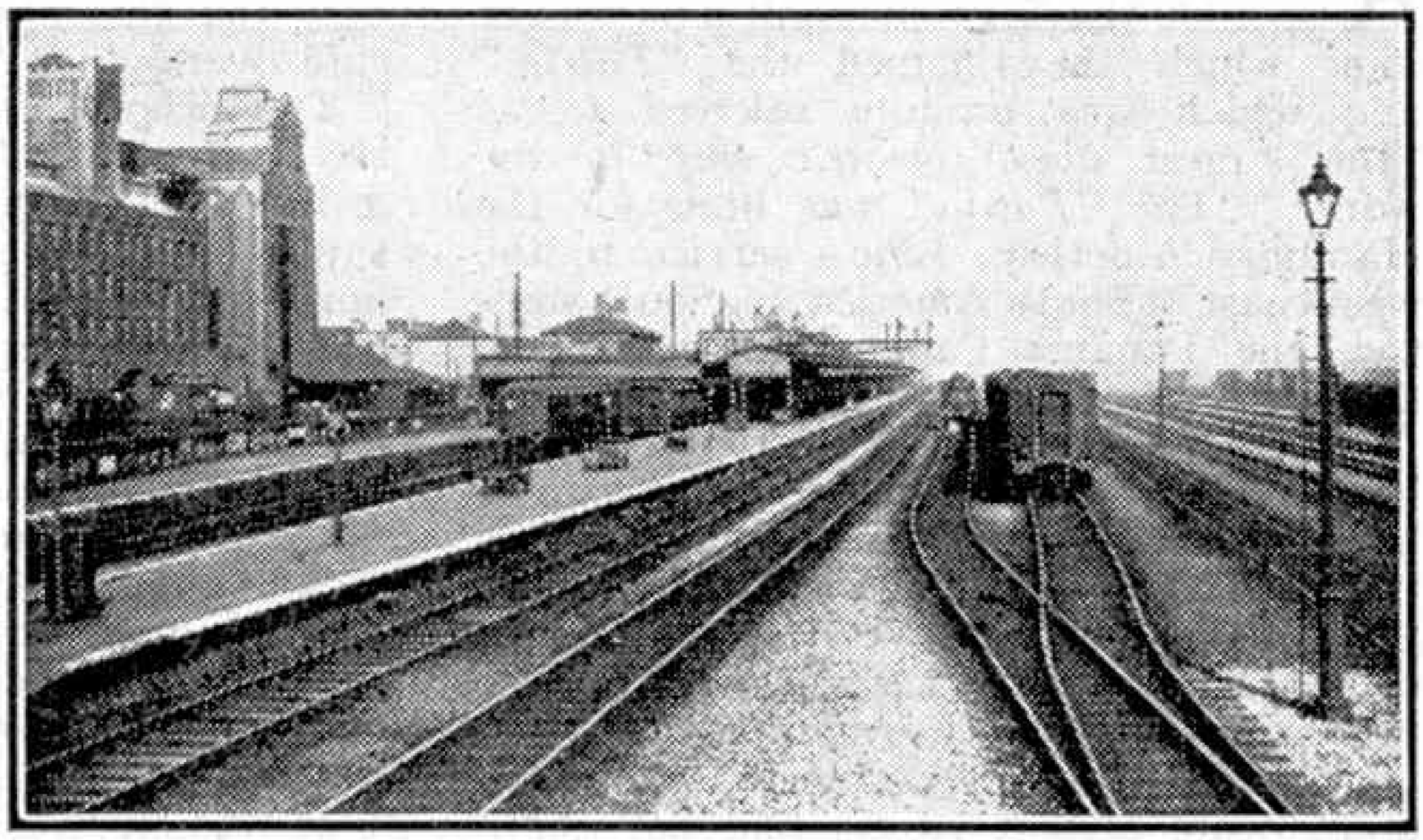
A Hundred Years of East Anglian Railways

Round about 100 years ago, several of the principal railways in the Eastern Counties had commenced through running, while others were in course of development under the auspices of various small undertakings, which were often in financial difficulty. Some of them employed the unusual rail gauge of 5 ft. at first, though from 1844 the standard 4 ft. 8½ in. was substituted. With an amalgamated title of Eastern Counties Railway, which was changed to Great Eastern in 1862, through trains were running from Shoreditch, London, by way of Stratford and Broxbourne to Cambridge and Norwich, with through connection to Yarmouth. Liverpool Street terminus was opened in 1874, when the Colchester-Ipswich main line had also been in operation some time.

Cambridge station was opened on 29th July 1845, with an imposing external facade that is still visible. The University authorities appeared somewhat fearful of the effect the railway might have upon their students, since they secured clauses in the Act of Parliament authorising the line through the town to give officers of the University "powers of search at the station for undergraduates," and forbade the Company from conveying any undergraduate by train "if requested not to do so in any particular case by an officer of the University." The act also forbade "trains taking up or setting down any passengers at Cambridge, or within three miles thereof, between 10 a.m. and 5 p.m. on Sunday unless the train had been delayed by accident." In course of time this restriction became void.

The outstanding feature of Cambridge station is its tremendously long single platform, now 1,650 ft. in length. Down trains are dealt with at the northern end, up ones at the Southern, and there are fully signalled scissors crossings protected by interlocking and track circuits approximately half way along. There are important bay lines with inset short terminal platforms at the south end, used by trains of the L.M.S. and the G.N. section of the L.N.E.R.

The locomotive depot is adjacent to the north end, while through goods and siding lines are placed to the east. Cambridge is now one of the principal main-line and cross-country centres on the Great Eastern section of the L.N.E.R., where many different classes of ancient or modern locomotives and rolling stock may be seen.



Cambridge station from South Signal Box, showing bay platforms and signals halfway along main platform. Photograph by courtesy of the L.N.E.R.

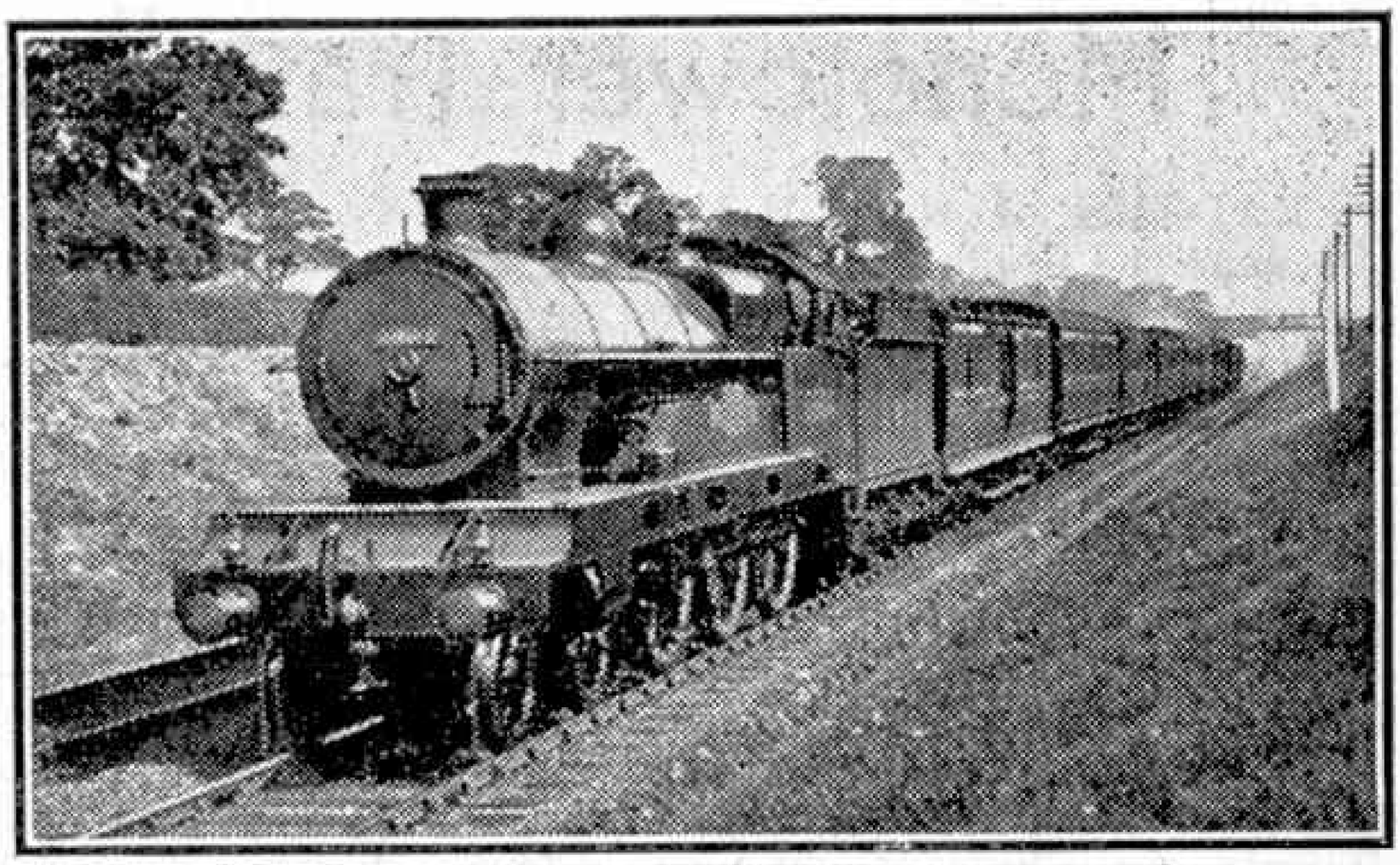
L.N.E.R. Locomotive News

Those "B12/3" 4-6-0 rebuilt Great Eastern express engines which we reported some time ago as being allocated to hospital trains have now returned to their home sheds after overhaul, and it is now permissible to state that each locomotive was attached in 1944-5 to an American Ambulance Train Unit. This was formed of British rolling stock, with two drivers, two firemen and a fitter, who were all volunteers from the Running Dept. They slept and fed on the train while off duty, and were well cared for. They made long runs along various lines as required from bases in the south or west of England, accompanied by pilot drivers provided on occasion by all four groups. At times they were assisted over steeply graded routes by L.M.S., S.R. or G.W.R. locomotives, as their trains were heavy.

Another "B17" 4-6-0 rebuilt to "B2" with two cylinders and 225 lb. per sq. in. boiler pressure is No. 2839 "*Norwich City*." Further conversions from "A10" to "A3" 4-6-2 are No. 2557 "*Blair Athol*,"

No. 2550 "*Blink Bonny*" No. 2572, "*St. Gatien*" and No. 2548 "*Galtee More.*" The last two have boilers off the withdrawn "P1" 2-8-2 mineral engines Nos. 2393/4; the one now on No. 2572 has a steam collector "banjo" dome. Nos. 921 and 924 are now "B16/3" mixed traffic 4-6-0s, with three sets of Walschaerts gear.

"Atlantics" withdrawn include "C1" Nos. 3276, 3289, 3290, 3296, 4413 and 4435. When two expresses were being run as one train during the miners' strike of 1921 No. 3290, then provided with piston valves, 20 in. cylinders as modernised, but with a smaller superheater than now, ran from Peterborough to King's Cross in half a minute under the 93 min. then allowed for the 76½ miles with a 600-ton train. At that time this was a remarkable performance over that road.



Former L.N.W.R. 1914-18 War Memorial locomotive No. 5964 "Patriot," of the 4-6-0 "Claughton" class, on a Birmingham express. Photograph by W. Leslie Good.

"C7" N.E.R. 4-4-2s scrapped were Nos. 728-9 and 737; 4-6-0s withdrawn are No. 5424 "*City of Lincoln,*" of the G.C. inside cylinder "Sir Sam Fay" class, lately "B19," and ex-N.E.R. "B15s" numbered 795-6.

Readers will find plenty of interest, and perhaps some bewilderment, in watching for the new numbers now appearing gradually on L.N.E.R. locomotives. We hope shortly to publish more details of the scheme, but briefly the plan is to concentrate all engines of one wheel arrangement and class together. All tender engines, beginning with the largest and most modern types, will be numbered below 6,000; tank engines from 7,000 to 9,999; and electric locomotives 6xxx. Plenty of room will be left for new and rebuilt engines in the various groups. "Pacifics" and "Green Arrows" come mostly between 500 and 999; 4-6-0s and 2-6-0s from 1,000 upwards; 4-4-2s, 4-4-0s and 2-4-0s will have 2xxx numbers; 2-8-0 and 0-8-0 engines follow on in the 3,000s; and the numerous 0-6-0 types come between 4,000 and 5,999.

Southern Tidings

When the Kent lines became the Eastern section of the S.R. in 1923 as regards regular main line passenger traffic, they were operated entirely by 4-4-0 engines, of which only the "L" class of the former South Eastern and Chatham had any pretensions to large size. Owing to weak underbridges, even their use was then considerably restricted. By 1927 the faster and more modern "L1" 4-4-0s were at work, and 4-6-0s were making their appearance on Continental expresses in the shape of "King Arthurs." These were soon followed by the bigger 4-cylindered "Lord Nelsons" and there was also a return to the 4-4-0 wheel arrangement, in the very powerful form of the 3-cylinder "Schools." By the early 1930s all these classes were in general main line use, apart from certain restrictions on the Hastings direct line. "River" 2-6-4 tank locomotives were also used for a time, before their conversion to 2-6-0 tender engines.

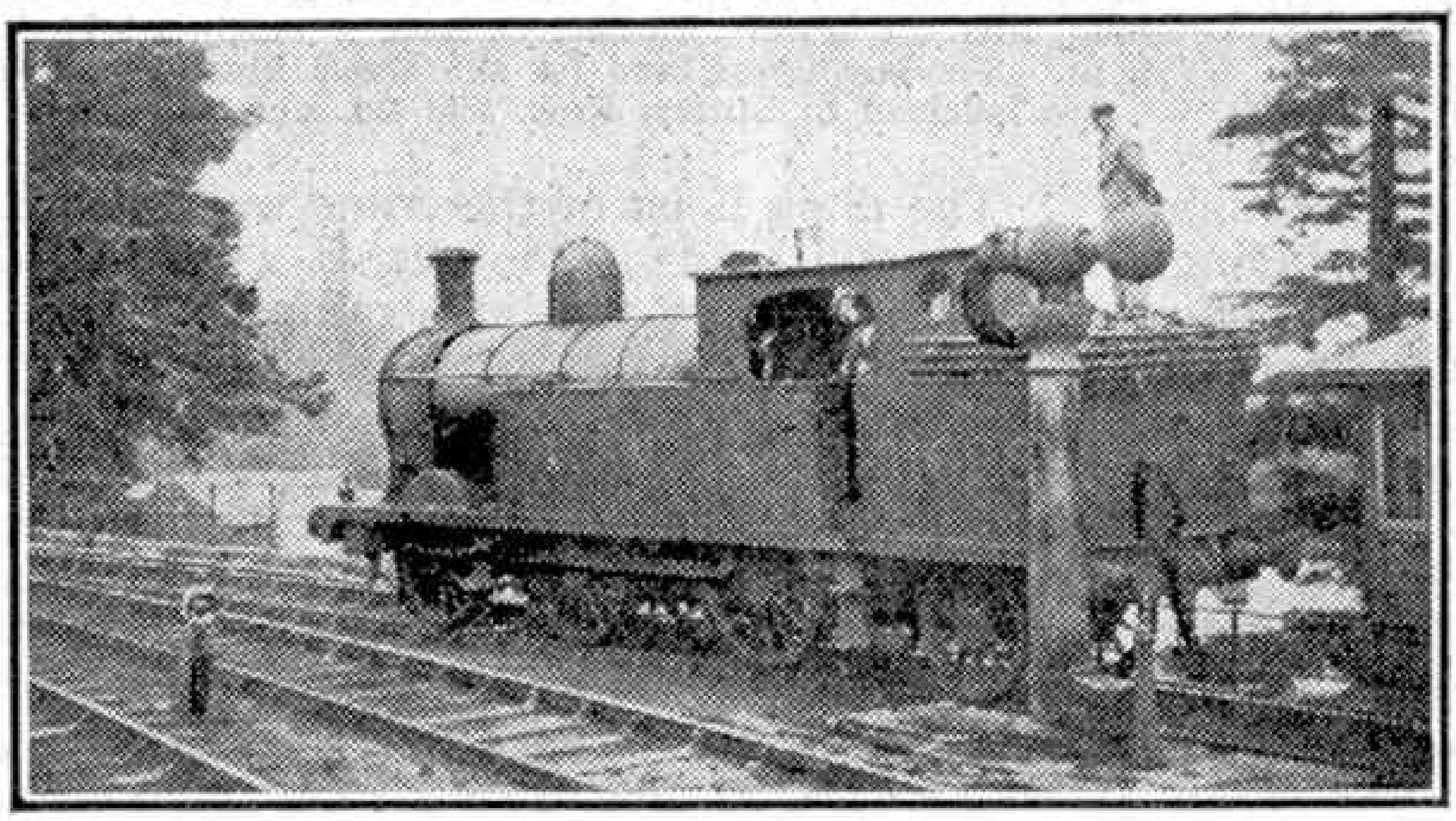
It is evident that with a return to more normal, faster services in the coming summer, really big engines will be much more in evidence on the Kent coast routes, as a batch of 12 "West Country" 4-6-2s is destined for Ramsgate shed, whence trial runs with light "Pacifics" began in February. British W.D. type 2-8-0s are also taking over a number of the principal Kent freight workings, and more "N" class 2-6-0s are allocated to the Central Section.

L.M.S. Stock Alterations

During the eight weeks from 2nd December to 26th January last, new engines were turned into traffic and these were allocated to the sheds shewn as follows: Class "5" 4-6-0 Nos. 4915-6, Northampton; Nos. 4917-8, Leicester; Nos. 4919-20, Saltley; No. 4921, Sheffield; No. 4922, Low Moor; No. 4941, Crewe; Nos. 4942-3, Leeds; No. 4944, Sheffield; No. 4945, Bath; and No. 4946 Bank Hall.

New 2-cyl. 2-6-4T No. 2218 has gone to Plaistow, so joining the three-cyl. similar engines on the Southend line. Other class "4P" 2-cyl. 2-6-4Ts are Nos. 2209-12, Farnley; Nos. 2213-7, Polmadie. It will be noted that the Midland, Central and Scottish Divisions all receive a share of new power.

Among scrappings, which largely follow current practice, are "Prince" 4-6-0s Nos. 25725, 25749 and 25683 "*Falaba*"; and No. 11628, class "3F" 0-6-2T, the last of that class originating on the former Furness Railway, whose engines have almost disappeared. There are few left, too, from the Glasgow and South Western Company's stock, as three more of their 0-6-2Ts, Nos. 16921-2 and 16926, have now been withdrawn.



Furness Railway 0-6-2T No. 101 at Coniston. This was the last of its class to remain in service on the L.M.S. after grouping. Photograph by W. Hardin, Osborne.

Monotower Travelling Cranes

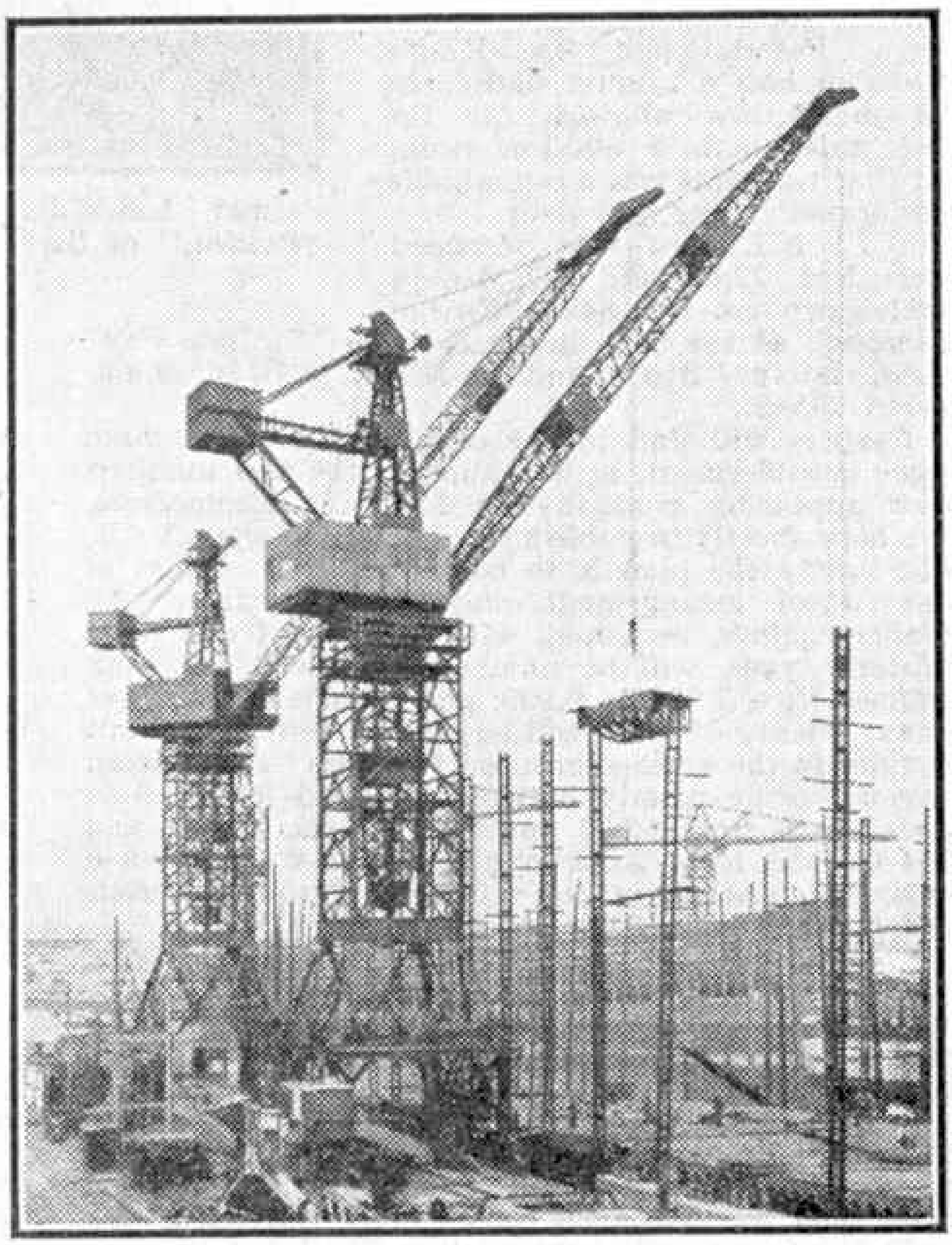
READERS of the *"M.M."* who live near the Clyde, the Mersey, the Tyne, or in any other district where shipyards abound, will be familiar with scenes such as that shown on our cover this month. This shows a vessel in dry dock, undergoing repair or re-fitting. Giant cranes play an important part in such operations, and their jibs tapering upward are familiar features of the skyline in shipbuilding centres.

Our cover picture and the illustration on this page show typical 15-ton electric travelling Monotower cranes built by Butters Bros. and Co. Ltd., Glasgow, installed in a shipbuilding yard, alongside one of the berths in which ships are built. They are specially suitable for this work, as their great height enables them to lift plates, girders and other necessary parts, and to deliver these where they are required at all stages. They can readily move alongside the berth on rails laid for the purpose, and their jibs are capable of swivelling and luffing, that is swinging round and lifting, so that they can reach any desired point within their range with their loads.

It should be noted that not all of the tower cranes installed in a shipyard are of the travelling kind; in many cases fixed cranes on concrete foundations are sufficient. Monotower travelling cranes such as those illustrated are now largely used throughout Great Britain, however, with lifting capacities from 5 to 20 tons, and of these the most popular are the 15-ton and 10-ton cranes.

The 15-ton crane is electrically driven and is equipped with five motors providing the necessary power for the main hoist and the auxiliary lift, also luffing, slewing and travelling motions. These motors are all controlled by the operator from a cabin placed in a forward position on the revolving superstructure mounted on the steelwork tower. The jib is 127 ft. 6 in. in length, and the tower on which it is carried itself has a height of 76 ft. 6 in. The tower is mounted on 16 cast steel wheels fitted in eight compensating bogies. The rails on which these run are 25 ft. apart, and the tower is so constructed that it provides clearance for two wagons loaded up to the British railway gauge.

The revolving superstructure on top of the tower is supported by a set of anti-friction rollers. Its lattice work extends 40 ft. down inside the tower, where it revolves on a ball-bearing footstep. A ballast tank of sufficient size to hold 30 tons of scrap metal is provided; the purpose of this is to balance the revolving portion of the crane.



Fifteen-ton travelling Monotower cranes alongside a shipbuilding berth. The jibs of these cranes are 127 ft. 6 in. long, and the towers themselves have a height of 76 ft. 6 in. For our cover, and for the above illustration, we are indebted to Butters Bros. and Co. Ltd., Glasgow.

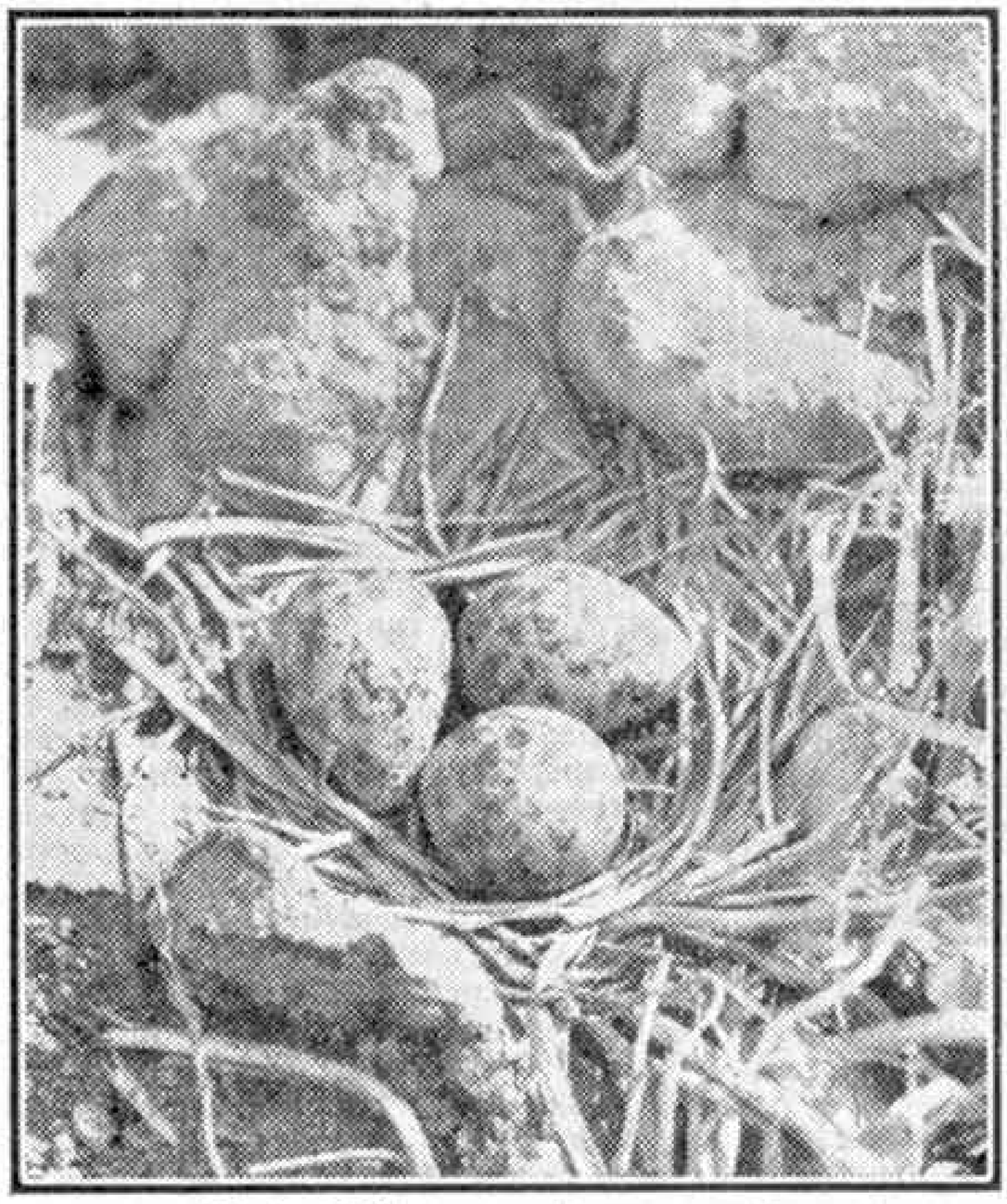
The main hoist of the crane works to its maximum load of 15 tons at a radius of 90 ft., or with 6 tons at a radius of 125 ft. In addition to this there is an auxiliary hoist of 1½ tons. The speed of hoisting varies with the load. Thus a 15-ton load can be swung upward at the rate of 30 ft. a minute, and a 6-ton load at 100 ft. a minute, while with the 1½-ton auxiliary lift the speed is 150 ft. a minute. The crane moves along on its rails, with a load of 15 tons, at the rate of 75 ft. a minute.

Electro-magnetic brakes are fitted on all motors except the slewing, with a powerful mechanical brake on the hoist gear.

Making Pictures of Birds' Nests

By E. E. Steele

APRIL brings, among many other delights, the season of bird-nesting. In hedgerow, field and wood, pond or stream, and in the trees, are to be found all kinds of nests, some showing elaborate construction, while others are little better than a hollow scraped in the ground. Many nests are robbed every year by egg-collectors; this is wrong because birds are a tremendous help in keeping down the myriads of grubs and insects which do so



Nest of Plover on bare ground.

much harm to our precious crops. None of the delights of bird-nesting is lost when the camera is used, and the eggs are left to hatch.

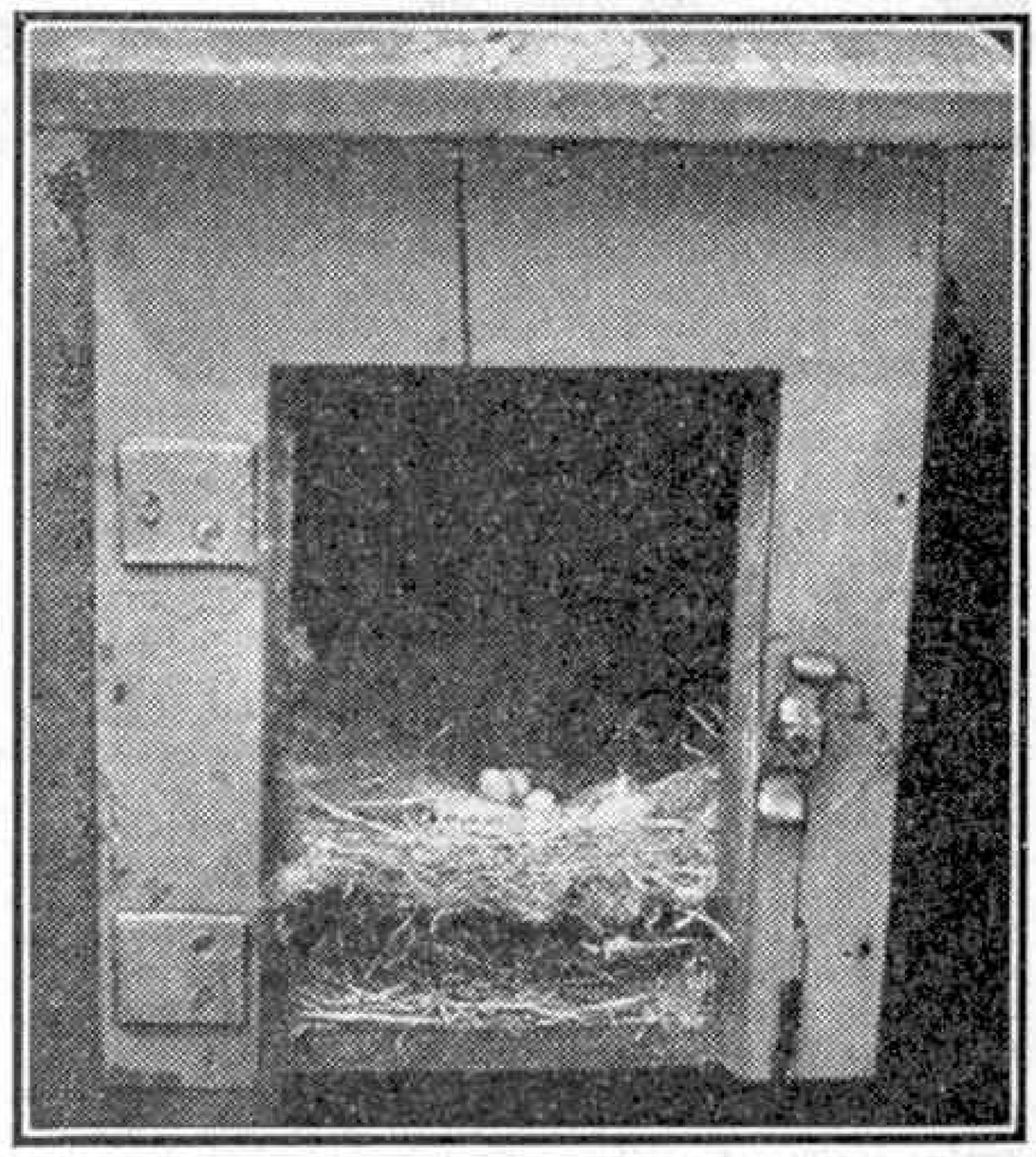
The easiest nests to photograph are those built on the ground, such as those of partridge, plover, lark, etc. To make a good job of it, set the camera on a firm support and focus on the front edge of the nest. This will ensure that the straws or twigs in the foreground are not out of focus, a defect which spoils many otherwise good pictures. Where possible the lens should be stopped down, and the necessary longer exposure given. By stopping down, the depth of focus is

Nest of Water-Hen.

increased, which helps to produce sharper pictures.

Nests in the open need a normal exposure, but those in hedgerows and woods may require from four to eight times normal.

Making photographs of nests is great fun, and can be carried on from year to year until an extensive collection is made.



Nest of Blue Tit in rural postbox.

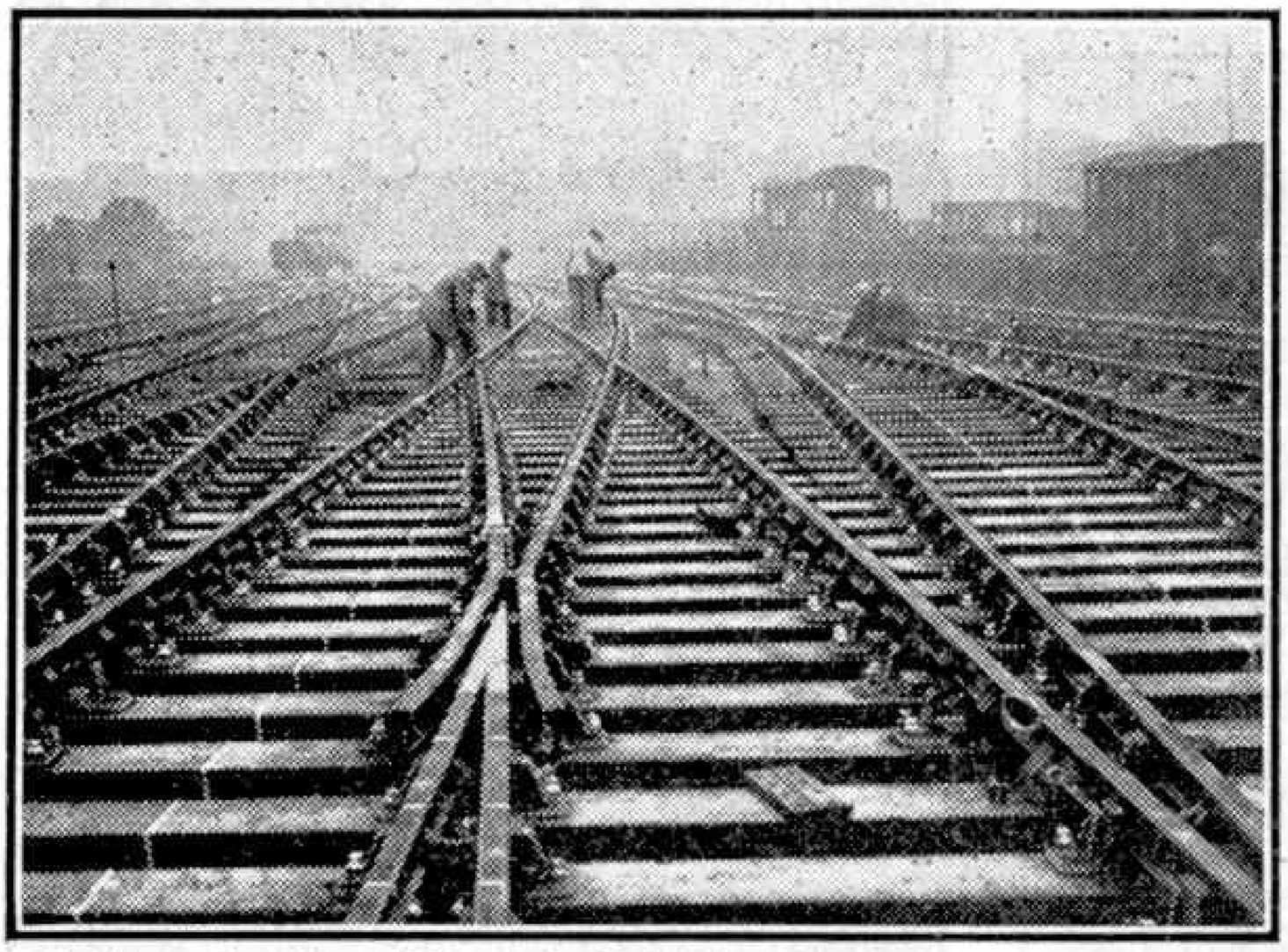
HOW THINGS ARE MADE:

The Railway Rail

By Eric N. Simons

GREAT BRITAIN, the original home of the railway, is now largely covered with an amazing network of track. We are so used to this that we just take it for granted and probably few of us have ever tried to realise the enormous number of rails that have been laid down and are in daily use. These rails vary in length, but normally measure 60 ft. and weigh 95 lb. per yard run. Their manufacture represents the use of a vast amount of steel and machines, together with skill of the highest degree. The object of this article is to describe briefly the processes involved in the making of a railway rail.

First, the steel maker must produce by means of the acid open hearth furnace process, which I have described in earlier articles in the "*M.M.*", a batch or "melt" of "acid" carbon steel. When hot enough, the steel is cast into ingot moulds of suitable size, provided with fireclay heads. The fireclay is a material designed to resist heat, and the head serves to keep the metal in the tops of the ingots hot, while also holding a reserve of liquid steel from which the ingot is "fed." Without this "feeding" of the ingots, cavities taking the form of long pipes down the centre of the ingot would form as the steel in the moulds contracted on cooling. The fireclay head prevents the formation of these pipes, and so serves an extremely useful purpose.



Relaying a junction; "V-crossing" in foreground. This photograph and the lower one on the opposite page are reproduced by courtesy of the Southern Railway.

Samples of the steel are taken at the time of casting the ingot, and a careful analysis of these specimens is made to ensure that the composition is correct. These analyses have to be made very quickly, or otherwise it would be too late to modify the steel's composition; and a special laboratory is kept close to the furnace for this purpose, while specially quick methods of analysis have been developed by chemists to enable the required details to be obtained in a surprisingly short time.

If the composition of the steel is found to be correct, the ingots are then transferred to large pits known as soaking pits. A soaking pit is a gas-heated furnace in which steel ingots are heated up very gradually in order that the heat may thoroughly penetrate or "soak" into the steel. If the ingots were not thus heated, they would probably break when subjected to rolling in a rolling mill. Complete soaking of the heat is necessary to ensure that the ingot is of the same or nearly the same structure throughout. Even Mother, when she bakes a cake, has to "soak" it with the heat to ensure that both the middle and the outside of the cake are cooked through.

In the soaking pits the ingots are heated up to the correct temperature for rolling, enough time being allowed to ensure that soaking at this temperature is complete. Each ingot is then taken to the rolling mill, where by the use of rolls having the correct form of grooves corresponding to the shape of the finished rail, it is gradually rolled direct into the completed rail shape. The next stage is transferring it to a circular rail saw running at a high speed. This saw cuts the rail to the desired length.

Thus far we have dealt with the straight rail, but quite a large number of rails are not straight, but curved, and such rails must be bent to the required form. Other rails or sections of rails are built up into complicated switches and crossings, enabling a train to transfer from one set of rails to another. Because of the heavy wear on these switch rails, they are usually made from a different kind of steel, the manganese steel containing 12 to 14 per cent. of manganese, which has the curious property of work-hardening. In other words, while this steel is relatively soft in itself, as soon as you start to cut or abrade it the surface *structure* changes, and the steel becomes extremely hard on the surface. This is just what the railway engineer requires—a steel soft enough in itself to be capable of being bent in the cold state without breaking, yet taking on extraordinary surface hardness as soon as it is subjected to wear.

Rails designed for points, switches and crossings are treated rather differently from ordinary steel rails. After having been sawn, they are quenched or hardened in water. This quenching is a process of great importance, and the rail is at a temperature of from 900 to 950 deg. C. when it is plunged into the tank of water. It is this drastic cooling that makes the steel ductile or capable of being bent when cold, and it is a remarkable thing that this effect is the direct opposite of what would happen if an ordinary steel rail were treated in the same way. The ordinary acid steel rail would become hard and brittle.

It must be remembered that although manganese steel is ductile after it has been quenched, it cannot be turned in a lathe or otherwise machined without extraordinary difficulty, for precisely the same reason, that its work-hardening property comes into action the moment a tool starts to bite into it.

From the quenching tank, these rails are taken to straightening machines. Rapid quenching is always liable to throw a long piece of steel slightly out of the straight, owing to the sudden contraction of the material, which is not uniform all over the entire

Curves, points and crossings at the approach to a large station. Photograph by courtesy of the L.M.S.R.

length. The straightening machines take out any twist or warping that may have occurred. From these machines the rails then pass to inspection racks, where they are scrupulously examined by trained engineers to make sure that they are free from defects. They are also subjected to severe tests known as drop tests.

In these tests, the rail is hoisted by a crane or other lifting appliance to a pre-established height, and allowed to fall, after which it is examined all over to see what harm, if any, has been done. Successive drops at increasing heights follow, and the rail has to be able to show little or no injury up to a certain height before it is passed as satisfactory. Usually a sample rail from a batch is taken at random for this test, and the quality of the remainder assumed to correspond to it; so that if the chosen rail fails the entire batch may be scrapped, or at least will be further tested.

When the rail inspector has passed them as satisfactory, the rails are then ready to be made into switches, crossings, junctions, etc., or to be curved ready to be laid straight into the track, as the case may be.

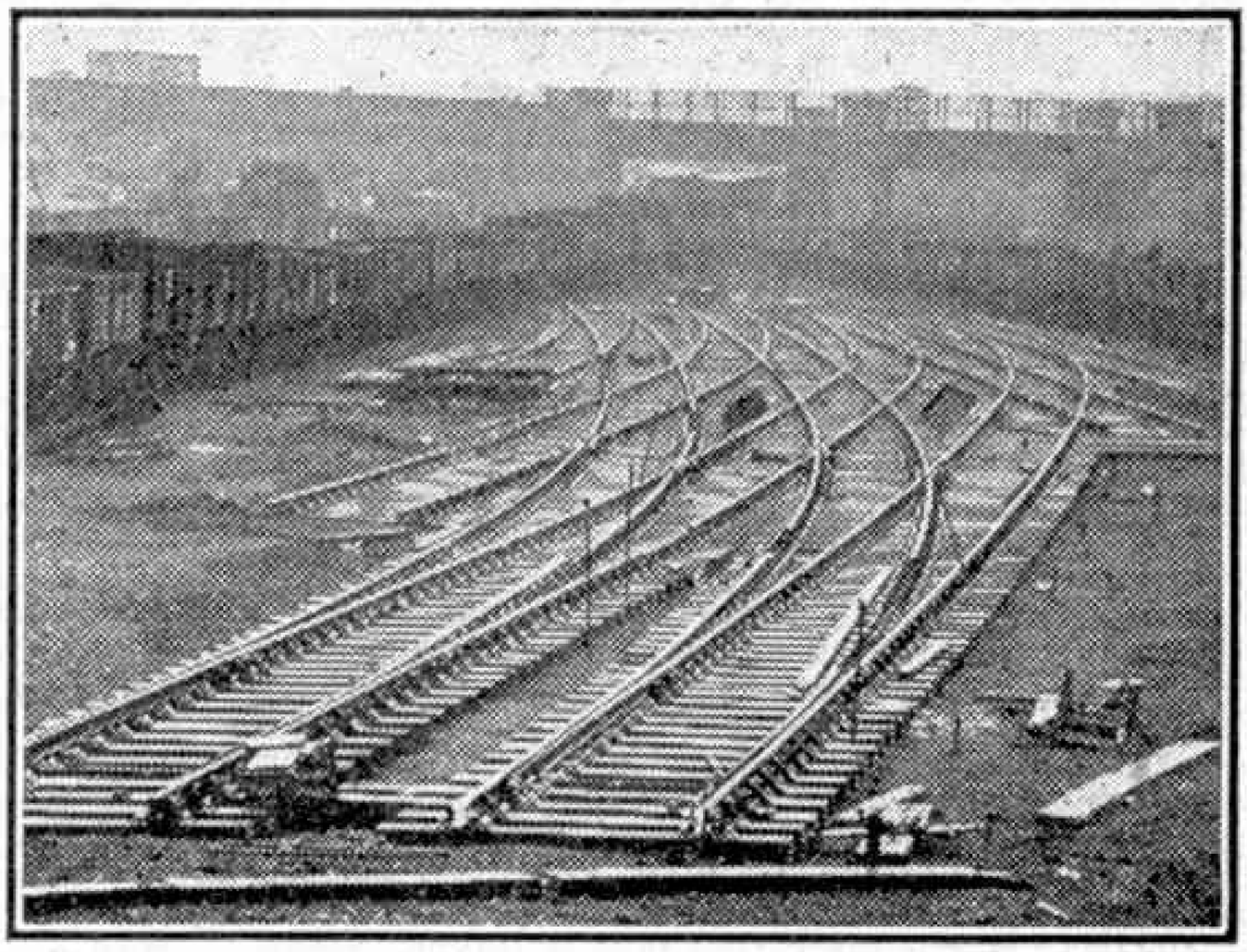
After the rails have been cut again to the lengths required for switches and crossings, they are taken to marking-out tables, and the marker-out, a skilled man, who has a fully detailed drawing of the switch or crossing required, proceeds by marking lines on the rails with a suitable tool, or in other ways, to indicate what surplus metal may, in the first place, be removed by the oxy-acetylene burning process. In this process cylinders filled with compressed oxygen and acetylene deliver the gases mixed under pressure to a burner; the gas is ignited, and the intense heat generated by the flame enables the operator to cut the steel virtually by melting it. The marker-out also shows the position of holes for bolts, etc. Holes are then punched in the rails, which are heated for the purpose, or, in the most modern shops, drilled by twist drills of special design and composition developed specially for the drilling of manganese steel. The oxy-acetylene burning or cutting is also carried out, and the rails are then taken to hydraulic straightening machines, where they are carefully straightened, and any required setting is put in.

This done, they return to the marking-out tables, and now the marker-out indicates by lines the finished shape and dimensions of the rails, in readiness for the grinding machines. As these manganese steel rails are too hard to be machined in the normal way, all the finishing to shape must be done by grinding, an expensive process that calls for grinding by machine to exact dimensions. Trained and highly-skilled men are needed for this work, and the grinding wheels they use have to be of a special composition. In the old days, these grinding wheels used to be made of the same material as ordinary grindstones; but when it was found that a terrible lung disease known as silicosis arose from the inhaling of the dust created, laws were passed making the use of these stones illegal, and now they are no longer employed in this type of grinding.

The grinding machines are of special design, the wheels being capable of swinging about, so that they can readily be transferred from one point to another of the rail, with little physical effort. After they have been ground, the rails pass to a second set of grinding machines, and are carefully fitted together. In this way the complete switch or crossing is put together, or assembled, as it is termed, and all the component parts such as bolts, etc., are fitted. The entire job is then checked over with the drawing to ensure that it is exactly of the right dimensions in every respect. The finished work is then transferred to the inspection racks and is checked over by a shop inspector before being put forward for inspection of a more formal kind by the railway company's inspector.

When complete lay-outs are being manufactured, that is when a whole complicated system of rails, points, crossings, etc., is made for a particular traffic site, the survey particulars of the site where the work is to be laid down in the track are reproduced in a setting-out yard, and the job is laid out in relation to these. This ensures accuracy, and as a result it is possible for the complete layout to be placed in the track with the minimum of trouble and delay to the traffic. In these days this is a matter of the greatest possible importance.

On a busy railway it is far (*Continued on page 172*)

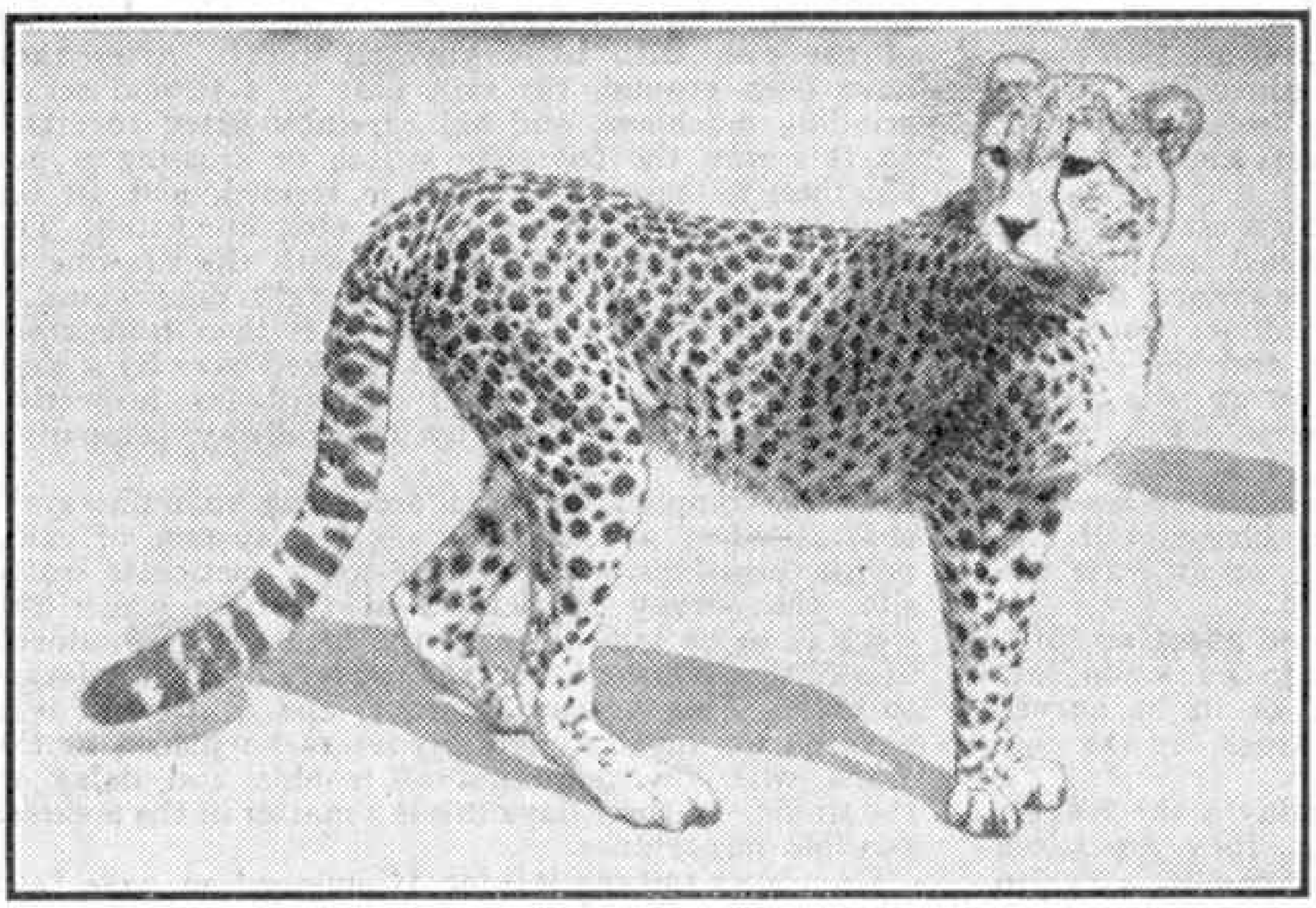


Junction track assembled for inspection in the layout-out yard.

Fifteen Thousand Miles a Second

By James E. Carver

WHEN the Nazis first sent rockets over this country, they claimed that V2 could not be heard before it exploded because it travelled at a speed faster than sound. The speed of sound varies according to the temperature of the atmosphere, but it may be put at 750 m.p.h. It would be very surprising if a rocket, thrown into the stratosphere to a height of 60 to 70 miles, did not travel at terrific velocity. As a matter of fact the Air Ministry gave the V2 rocket a topmost speed of 3,000 m.p.h., but this was reduced greatly when the fuel was cut off and the resistance of the atmosphere came into play as it descended, and V2 probably hit the ground at 900 m.p.h. After all, the Germans did not make a lot of progress after the war of 1914–18. Then Big Bertha, the giant gun that shelled Paris at a range of 76 miles, achieved the highest muzzle velocity so far attained by a man-propelled object. The speed attained was 5,000 ft. a second, or 3,400 m.p.h.



The cheetah, or hunting leopard, the fastest animal in the world over a short distance.

Yet after all there was not a lot for the enemy to shout about, since an aeroplane under human control has pretty well achieved the same speed as that at which V2 landed. Lt.-Col. Hough, the U.S. ace pilot, has power-dived a Thunderbolt at 780 m.p.h., winning the American D.F.C. for his exploit.

Jets may blaze the path to fantastic speeds that may make it possible to travel from London to New York in three hours, or from New York to Shanghai in six; and in a vision of the future we can see transport aeroplanes flying faster than the speed of sound, rocket propulsion harnessed to commercial communication, and huge passenger-carrying rockets hurtling from one end of the Earth to the other.

Speed, speed and yet more speed is the cry of the present age. Leaving rockets and jet propulsion on one side, the internal-combustion engine is enabling aeroplanes to work wonders in the never-ending race against time. Australia will soon be within two days' flying time, and aeroplanes already can land in India with London and other British newspapers of the day before on board.

Do these speeds mean that man is leaving Nature behind? Not yet. Unaided he makes a pretty poor showing, for the fastest that an Olympic Games 100 metres speed champion can manage is only a little over 21 m.p.h.; but what is believed to be the fastest living creature can leave any aeroplane standing in level flight. This is the deer botfly, which streaks along at over 800 m.p.h., or 400 yards a second, so that it could travel round the globe, on the course usually followed by pre-war round-the-world aircraft, in 17 hours.

This insect is a native of South America, and on the wing the human eye cannot make it out, nothing more than a blurred streak being visible. Its speed was calculated by Dr. Charles Townsend, of the American Museum of Natural History, with the aid of a split-second camera.

The speed of birds is sometimes grossly overestimated, and none can compare with the deer botfly. Indeed, it is fairly certain that even the 200 m.p.h. mark sometimes quoted is never reached, but it is possible that the golden eagle may attain 150 m.p.h. on occasion.

Dr. Fraser Darling, the biologist, watched an astonishing flight by an eagle in the Scottish Highlands. The bird was being pursued by two peregrine falcons, themselves wonderful fliers. The eagle rose from the height of 1,000 ft. to 4,000 ft., and then made another sweep to land on a buttress cliff at an altitude of 2,000 ft. The time taken was 1¾ min. and the distance as measured on the Ordnance Survey map was 3½ miles. The eagle therefore flew at 120 m.p.h. and at the same time gained 1,000 ft. in height. On the level the flight would have been much swifter.

Racing pigeons, with weather conditions in their favour, have been known to attain 90 m.p.h., while driven game birds average 40 to 50 m.p.h. Swallows can certainly travel at almost two miles a minute. Experimenters took a mother swallow from the nest and put an identification tab on her foot. The bird was taken by car for a distance reckoned to be 79 miles in a straight line. She was then released, and observers at the nest timed her home in 43½ min. Her speed worked out at approximately 108 m.p.h.

Animals cannot compare with birds and insects, but there are some very capable performers among them. Just before the war some racing cheetahs were showing off their paces here, and their performance was impressive. These hunting leopards have been employed for centuries in Persia and India for chasing game, and their acceleration exceeds that of a racing car. It is believed that over a distance of 100 yds. they are the fastest four-footed creatures alive, with speeds up to 70 m.p.h. They can give the best racing greyhounds 40 yards start and a beating over a quarter of a mile. But both the cheetah and the greyhound are left behind over a long distance by the Indian black buck when this gets into its stride, which varies from 19 to 22 ft.

The speed for the Derby course works out at approximately 35 m.p.h., and to compare a racehorse with a hound, the interested may like to recall the historic match between foxhounds and horses over the Beacon Course at Newmarket, the distance being

A Royal Canadian Navy pigeon, with its wing outstretched to show its beauty and power.

4 miles 352 yards. It took the winning hound a few seconds over eight minutes, but of the 60 horses started at the same time only a dozen were in at the finish.

Even fish can get up respectable speed at times, and one must remember that this has to be achieved against the resistance of the water. The salmon swims at 7 m.p.h. and the pike at 10, although greater speeds are attained at times. The flying fish is perhaps the fastest of all, for it reaches a speed of some 35 m.p.h. before it leaps from the water. The mackerel is one of the speediest of fish; it can travel at 30 m.p.h.

It is not until we leave the Earth and get into space that the realm of real speed is entered. Terrestrial speed is almost entirely the product of a single century, and when we compare the 12 miles a minute of the fastest controlled dive, the six miles a minute of John Cobb's car, and the two miles a minute of the steam train, with the staggering velocities which have been observed by astronomers, man's efforts fade into puny insignificance.

All celestial bodies are rushing through space at speeds that make those of man and other living creatures negligible. Take the Earth, one of the least of these bodies. As it rotates, a point on the Equator is whirled round at a speed of about 500 yds. a second, and anyone sitting quietly in a chair in London is being whizzed through space at about 650 m.p.h., although he is not conscious of it. Besides this movement, the Earth is journeying round the Sun on a circular path of 580,000,000 miles a year, which works out at a forward speed approaching 19 miles a second.

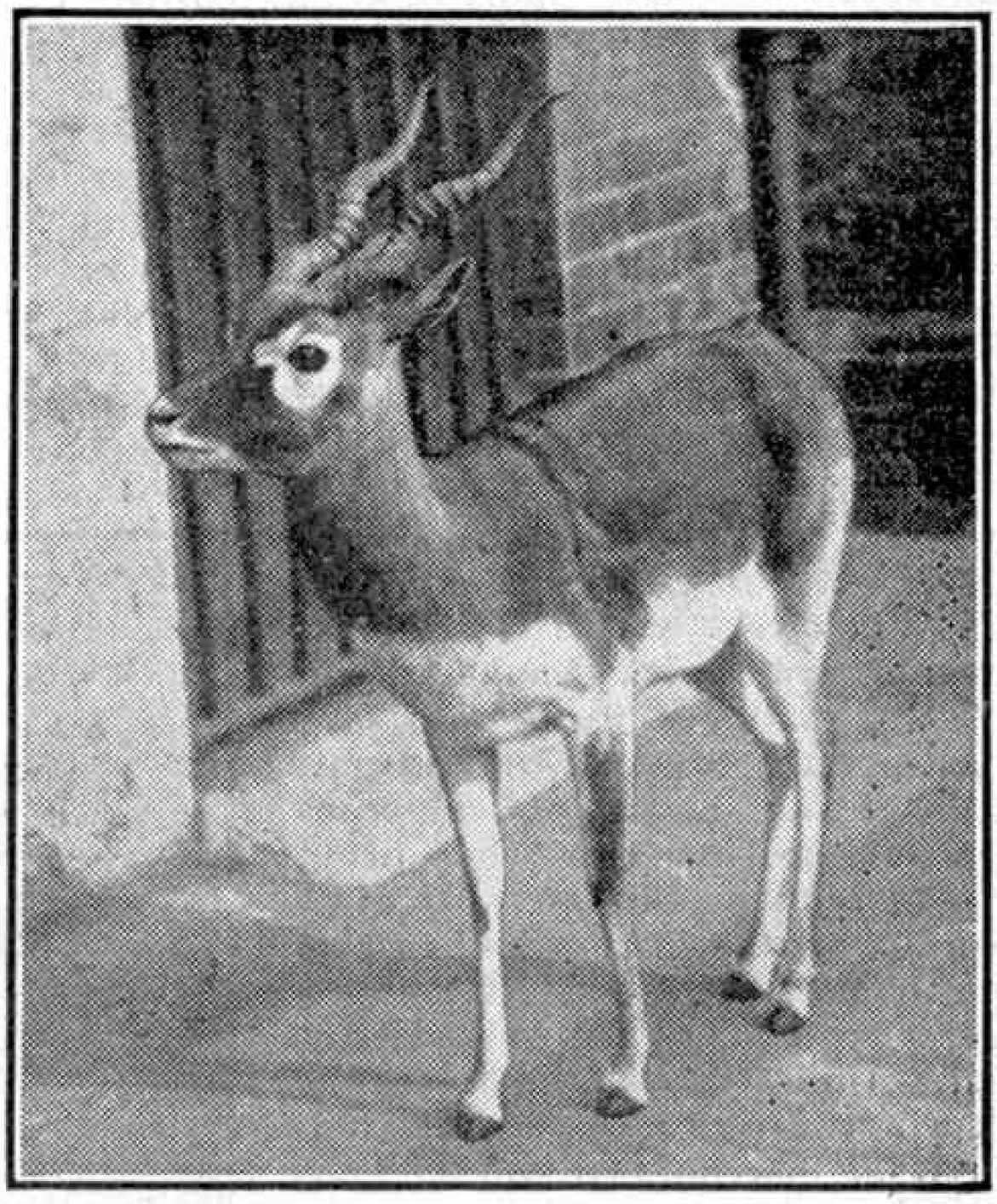
The so-called "shooting stars" that enter the Earth's atmosphere are volatilised and rendered luminescent for a few brief but glorious instants by the frictional resistance of the air as they rush through it. They travel at anything from 10 to 45 miles per second, although occasionally those limits are passed.

It is when outer space is reached that astronomers begin to report speeds that are almost frightening. The star Spica is a double one, consisting of two stars revolving around each other, the larger nearly twice as massive as the smaller. The former has been estimated to have a diameter approaching six million miles, or nearly seven times that of our own Sun, and the smaller revolves round it at an average rate of 130 miles a second.

Even this is slow compared with other celestial speeds. The constellation Coma Berenices contains a nebula that is receding at a rate of 5,000 miles a second; while the farthest observed nebula is retreating from us at a rate of 15,000 miles a second, a speed that is inconceivable to the finite human mind.

In the present state of human knowledge it is impossible to say whether man will ever be able to achieve speeds comparable with those of the outside universe. The swiftest thing under human control that he has yet invented is the aeroplane. Some declare it was an evil day for mankind when the Wrights first took to the air, and suggestions have been made that aircraft should be abolished. This will never come to pass. Man's restless spirit is ceaselessly urging him forward to fresh achievements. Only a year or two back it was declared that no machine would ever be flown by man at the speed of sound. Now that speed is within measurable distance of attainment.

Just over 100 years ago Greville, the famous diarist, wrote: "Scientists go so far as to say that there would be no danger in going 25 m.p.h. when such speed becomes practicable. Human beings, they think, would still hold together in such velocities." Since then speed has advanced almost meteorically. The question arises: what is the use of it all? A significant story is told by an explorer in the Amazon valley. He urged his native bearers to attempt a forced march. All went well for two days, and they covered much ground, but on the third morning there were no signs of activity. The natives sat solemnly around with a quiet, waiting look on their faces, and the headman explained that "they could go no further until their souls caught up with their bodies."

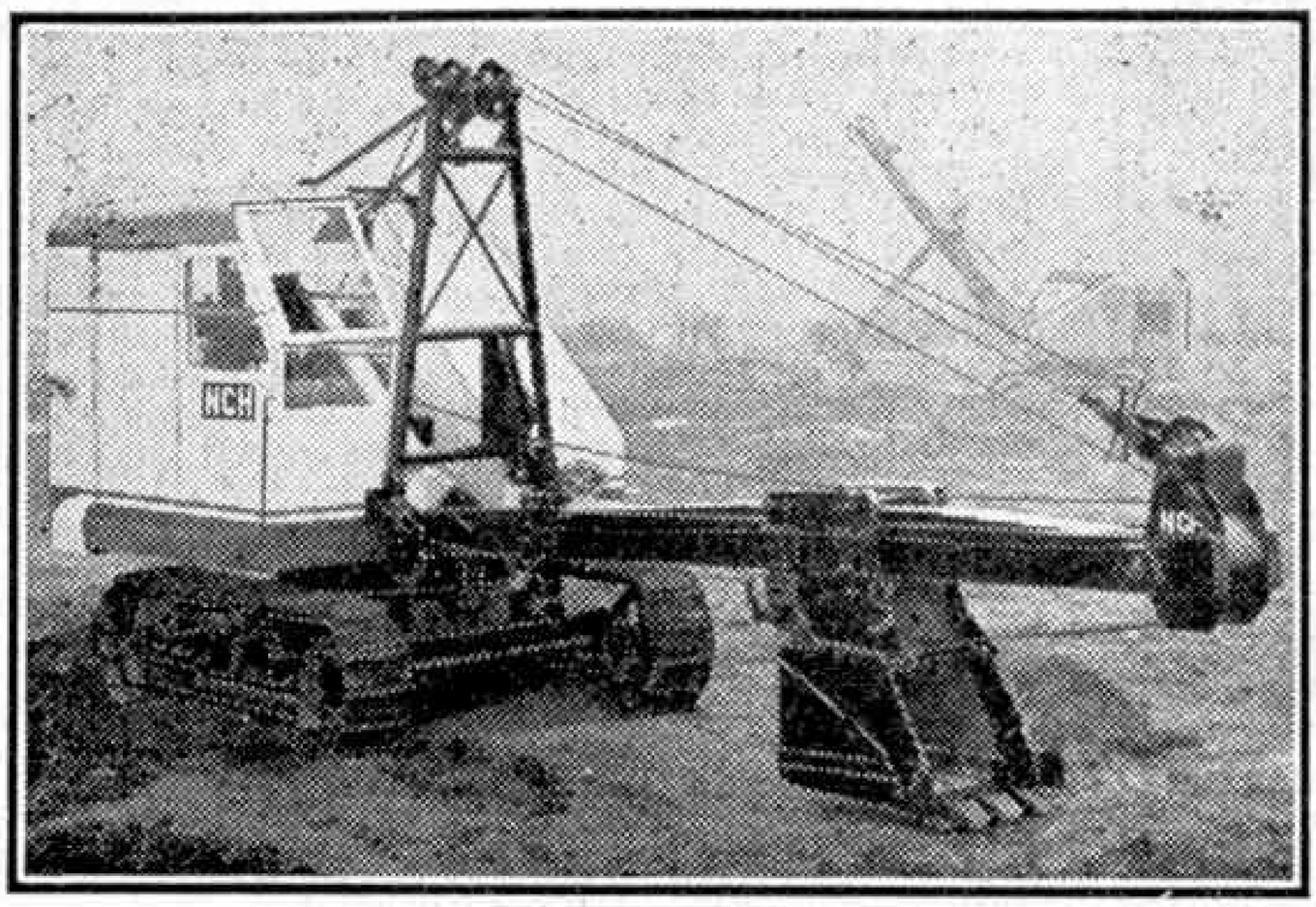


The Indian black buck, which over a long distance can outpace the cheetah.

Engineering Notes

A Quick-Changing Mobile Excavator

The upper illustration on this page shows a versatile mobile excavator manufactured by Messrs. Newton Chambers and Co. Ltd., Thorncliffe. This machine



The N.C.H. Excavator described on this page. It is a product of Newton Chambers & Co. Ltd., Thorncliffe, to whom we are indebted for our illustrations.

is known as the N.C.H. Model 150 Excavator and has many special features, including an all-welded car body and quick-change attachments that enable it to be used as a crane, shovel, trencher, dragline or grabcrane, and a piledriver. It is built largely of high tensile and alloy steels, which make it light, but yet strong. The reduction of excess weight has many advantages, including a low centre of gravity and low ground pressure on the tracks, which gives the machine greater mobility.

The machine illustrated has a bucket of ½ cu. yd. capacity, and is a very versatile machine, as its seven quick-change attachments enable it to lift four tons as a crane, trench 17 ft. deep as a trencher, handle 400-500 tons of material per day when fitted as a shovel, skimmer, dragline or grabcrane, and also to drive in piles when converted to a piledriver. The all-welded construction of the car body can be seen from the lower illustration. Larger machines of similar type but having capacities up to 5 cu. yd. have been developed.

Britain Produces World's Tiniest Tube

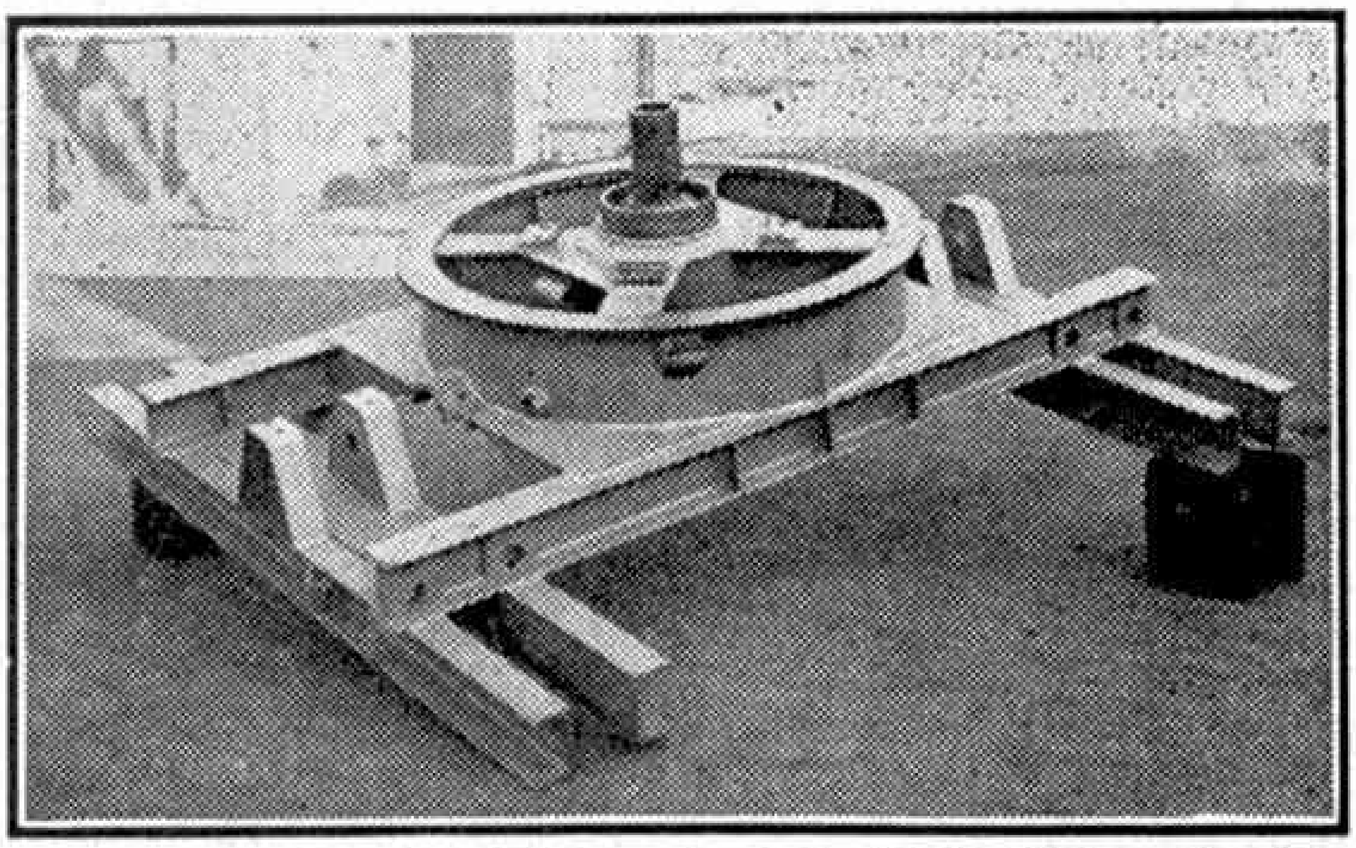
A tiny metal tube almost like a fine silver thread in appearance, and having an outside diameter of only .006 in., has been produced by Tube Investments, a group of engineering industries, at Oldbury, Birmingham. The inside diameter of the tube is .0035 in., but perhaps a better idea of its extreme fineness is given by the fact that one pound of the tubing would measure nearly 8¾ miles. The new tube has been developed in connection with hypodermic needles and is claimed to be the smallest and lightest metal tubing in the world.

Sunk Train Ferry Salved

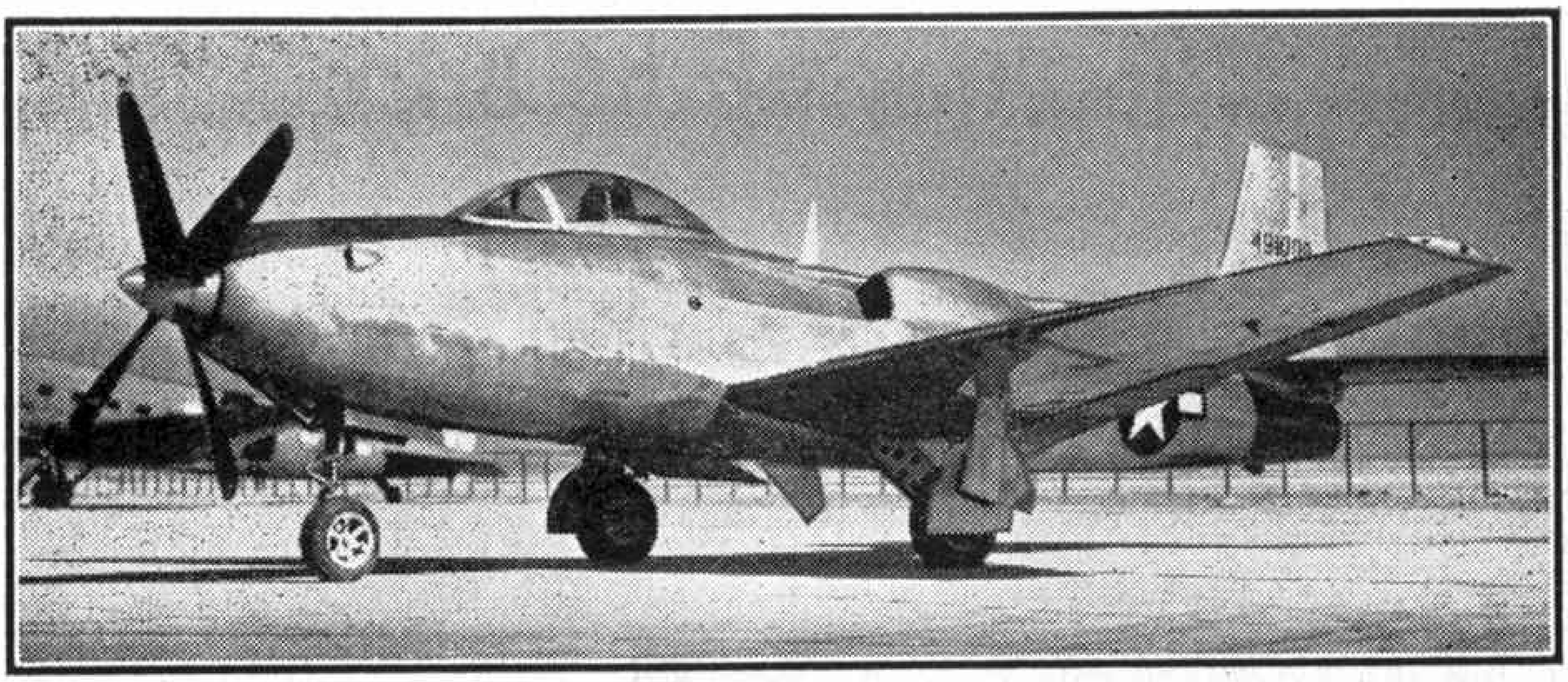
An ice-breaking train ferry, which struck a mine and sank off the island of Rügen, has been salvaged and rebuilt after nine months at the bottom of the sea. She is the Swedish vessel *"Starke"* and the reconstruction work has been carried out at the Kockum shipyard. Her length has been increased to 367 ft., and the ship's profile has been altered considerably as she now carries two funnels instead of one previously.

The Severn Bridge

Work is already in hand on the necessary plans and drawings for the construction of a road bridge across the Severn, and it may be possible to start the actual constructional work on the foundations this year, after the Trunk Roads Bill has received Royal assent.



The car body of the N.C.H. Excavator. It is of all-welded construction.



The Vultee XP-81 Twin-Jet Fighter

By John W. R. Taylor

AT first glance the Consolidated-Vultee XP-81 seems a fairly orthodox—though rather large—single-engined, single-seat fighter. A closer inspection shows two large air intakes above the fuselage and jet-type exhaust outlets in the tail and under the cockpit, proving that the XP-81 is neither orthodox nor single-engined. Actually it is a twin-jet fighter of advanced design, with its engines mounted in tandem in the fuselage. It is equipped with a pressure cabin for operation at high altitudes and has a tricycle undercarriage.

The reason for its comparatively orthodox appearance is that the forward engine, which is mounted in the nose, is what is known as a gas turbine, that is a jet-unit which drives a propeller. It is built by the American General Electric Company and is designated TG-100 "Propjet." The other engine, which is mounted well behind the cockpit, is also of General Electric design, being a standard I-40 unit as used in the Lockheed "Shooting Star."

Although gas turbines do not usually give quite such good speed characteristics as true jet-engines, because of their propellers, they are much more economical on fuel, as tests in Britain with the Bristol "Theseus" and Rolls-Royce "Trent" units have proved. Consequently, they are particularly suited for long-range aircraft, and it is possible that production Bristol 167 air liners will be fitted with gas-turbines. Up to the present most jet-propelled aircraft have had a very short endurance, only a few minutes in the case of some German fighters, and the XP-81 is an attempt at producing at the same time a fighter with a high speed and a satisfactory range. No performance figures have yet been released although a cruising speed of over 500 m.p.h. has been hinted at, and Vultee have added "The high efficiency of the engines, which usually burn kerosene, enables the XP-81 to cruise over long ranges."

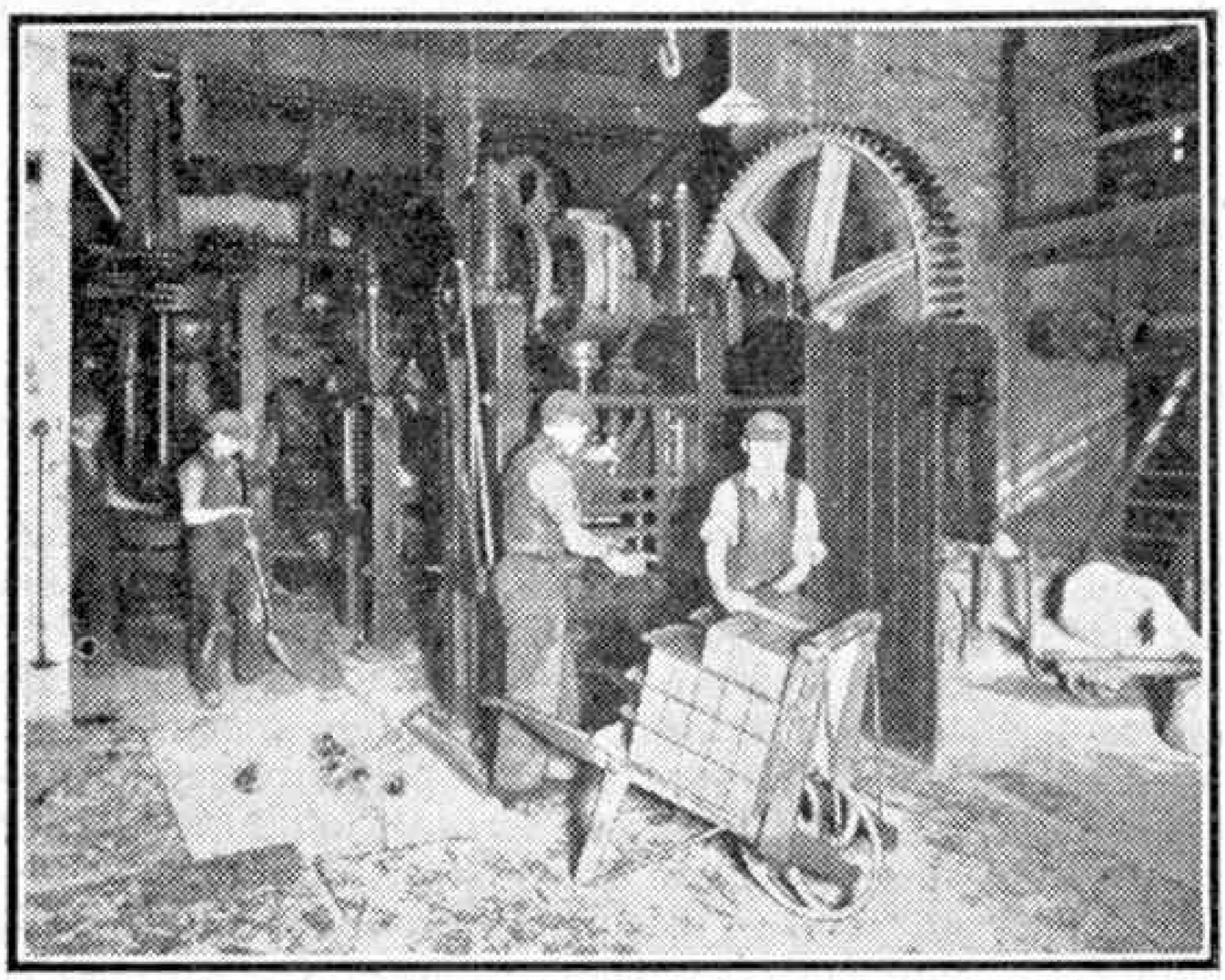
The two engines operate independently, air for the TG-100 being taken in through the nose and that for the I-40 through the large intakes above the fuselage. The two engines, whose combined power is virtually the same as that produced by all four engines of a "Superfortress" bomber, exhaust under the cockpit and out of the tail respectively. An interesting point is that the XP-81 can fly on both engines or either one, although the effect on handling qualities and manœuvrability with the different engines in use has not been described.

As already stated the XP-81 is large, with a wing span of 50 ft. 6 in., length of 44 ft. 8 in. and loaded weight of 19,500 lb. But for a twin-engined fighter that is not excessive, and it seems to be a most promising design. At any rate it will provide a great deal of flight research data that will be invaluable in the development of future designs.

The Story of the Brick

MOST of us are surrounded in our daily lives by millions of bricks, and we have vague ideas of the existence of clay pits from which the raw material is dug out and of great kilns in which bricks made from it are burned; but we give very little thought to these matters. Yet in reality nothing is of greater importance to us than bricks, which for ages have provided us with homes. How important they are was revealed when German bombs scattered the bricks of many of our houses, and still more when we began to realise the need for new houses that confronts us to-day.

Bricks indeed have almost become a part of human life. Anyone who is solid and reliable, or who has given some good service, is usually described as a "brick," and this expresses vividly the high opinion of the brick that mankind has gained since it was first invented. When that happened we cannot say, for it was before history began. The Tower of Babel was built of bricks, and stories of bricks and brick-making come from ancient Assyria as well as Egypt. The earliest bricks were not the kind that we have to-day, for instead of being fired in kilns they were simply dried in the sun. Such bricks indeed are in use in many parts of the world to-day. For instance, in many parts of South and Central America such bricks dried in the sun are used in the erection of adobe buildings, as they are called.



Bricks being taken off a stiff-plastic facing brick machine. The illustrations to this article are reproduced by courtesy of the Brick Marketing Co. Ltd., Doncaster.

Most of the bricks of the ancient Assyrians and Egyptians were of this kind, for they were made by mixing the clay with finely chopped straw. The straw added to the mixture some chemical that had the effect of making the clay plastic. It will be recalled that the children of Israel complained bitterly during their bondage in Egypt that they were not given straw with which to make their daily toll of bricks, so that they could not satisfy their taskmasters. This was a well justified complaint, for without straw they were simply wasting their time. The bricks they made must have cracked and fallen to pieces while drying.

The brick earth that the Israelites used was taken from the banks of the Nile, and bricks are said to be made there still by exactly the same process. The mud is thrown into a pit, along with the chopped straw, and the mixture is then trampled by foot until it is a uniform plastic mass, from which the shapes required can be cut and set out to dry in the sun.

In some parts of England there are old farm buildings that have been built of bricks made in very much the same way. One interesting characteristic of buildings of this kind is that the roofs usually project well beyond the walls. The purpose of this is to keep the rain off the bricks as far as possible, and so to avoid their breaking up.

It was a great step forward when the discovery was made that fired bricks were stronger and much more durable than those dried in the sun. Here again we do not know when or where the discovery was made, but it seems certain that firing was used 3,000 or more years ago by the Babylonians and Assyrians. Baked tablets of clay were used for writing and for inscriptions in those days, and many of these tablets have been discovered. Apparantly the Tower of Babel too was built of burned bricks, and in the Bible, in the second Book of Samuel, King David is described as making the children of Ammon pass through the brick kiln.

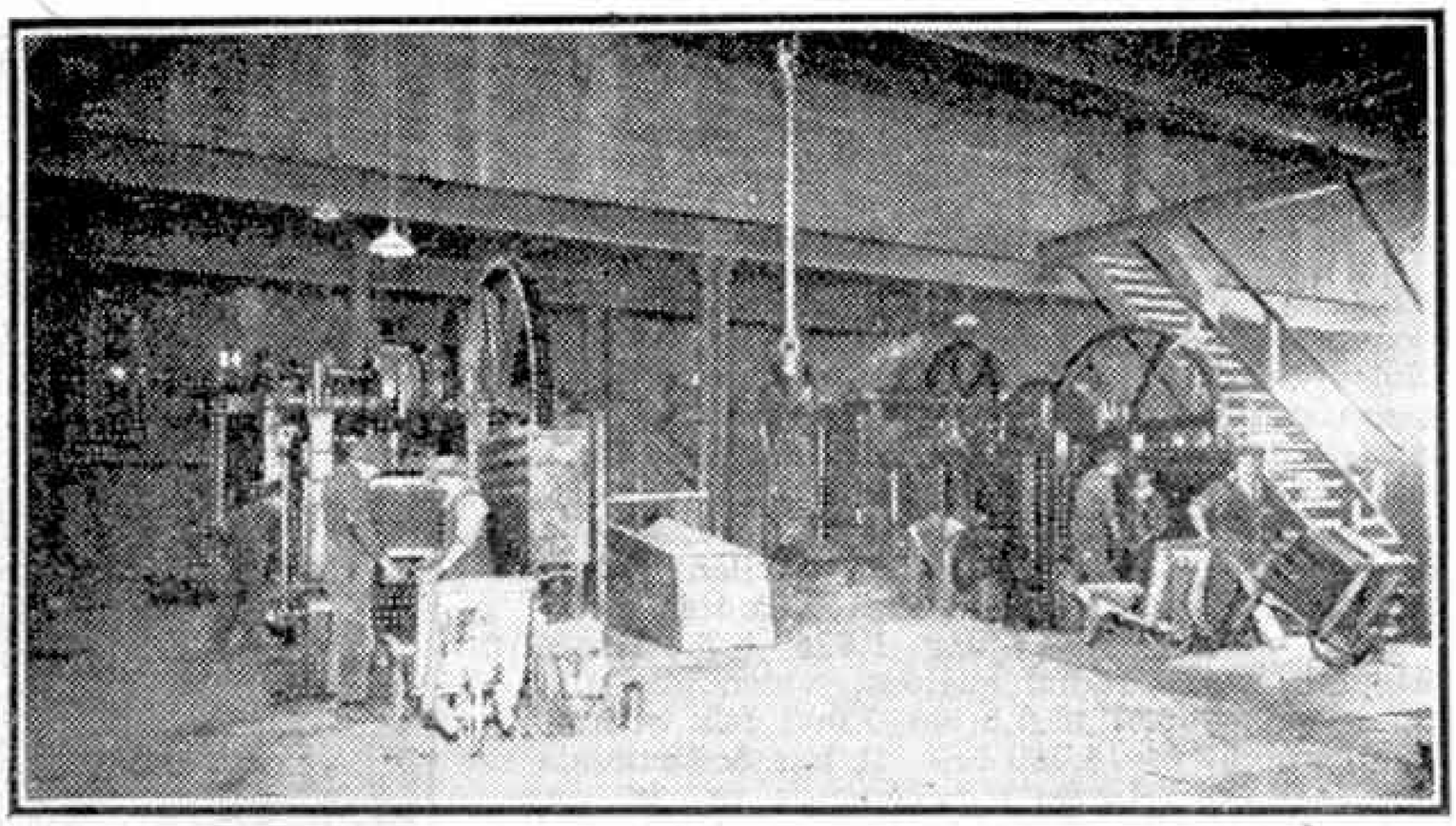
The making of bricks seems to have come to Great Britain with the Romans, who were great builders, and understood well the making and firing of good bricks. The excellence of the Roman brick is shown by the examples that are to be seen in many Roman ruins. Many of their bricks were used again for building by the Saxons, who found Roman ruins valuable quarries for their own building operations. For a long time, however, bricks were little used in this country. Many of the houses that were burned in the Great Fire of London in 1666 were built of beams with the spaces between filled with lath and plaster, but when the new London arose bricks were used instead.

The revival of brick making in this country was largely due to the coming of refugees from Holland. There are ample supplies of building stone in this country, but Holland is lacking in this material, and there the art of making bricks and tiles had to be acquired in order to supply all needs. When the revival did come in Great Britain the result was magnificent, as many great buildings of Tudor times show. Among these the old part of Hampton Court Palace calls for special mention. The bricks were often carved and the ornamental effects generally were very carefully looked into by architects and builders.

The normal capacity of the brick industry of this country is 8,000 million bricks a year. This seems an enormous number, but it takes many bricks to build a house and still more to erect a large building or a giant chimney. More than a million bricks may go to the building of the chimney of a large power station, and one towering chimney at Thorncliffe, in South Yorkshire, is 250 ft. high and weighs 1,400 tons. Fortunately there are ample supplies of brick earth in this country, varying from plain clay to shale, in which the clay has been subjected to pressure, and marl, in which it is mixed with lime.

These materials require different treatment and so there is a variety of brickmaking processes in use. In the Peterborough and Bedford districts shales are turned into bricks by what is called the semi-dry process. In this the material is ground in dry pans by means of heavy rollers rotating in a saucer on a solid plate, and the product is conveyed by scrapers over grids through which it passes on its way to

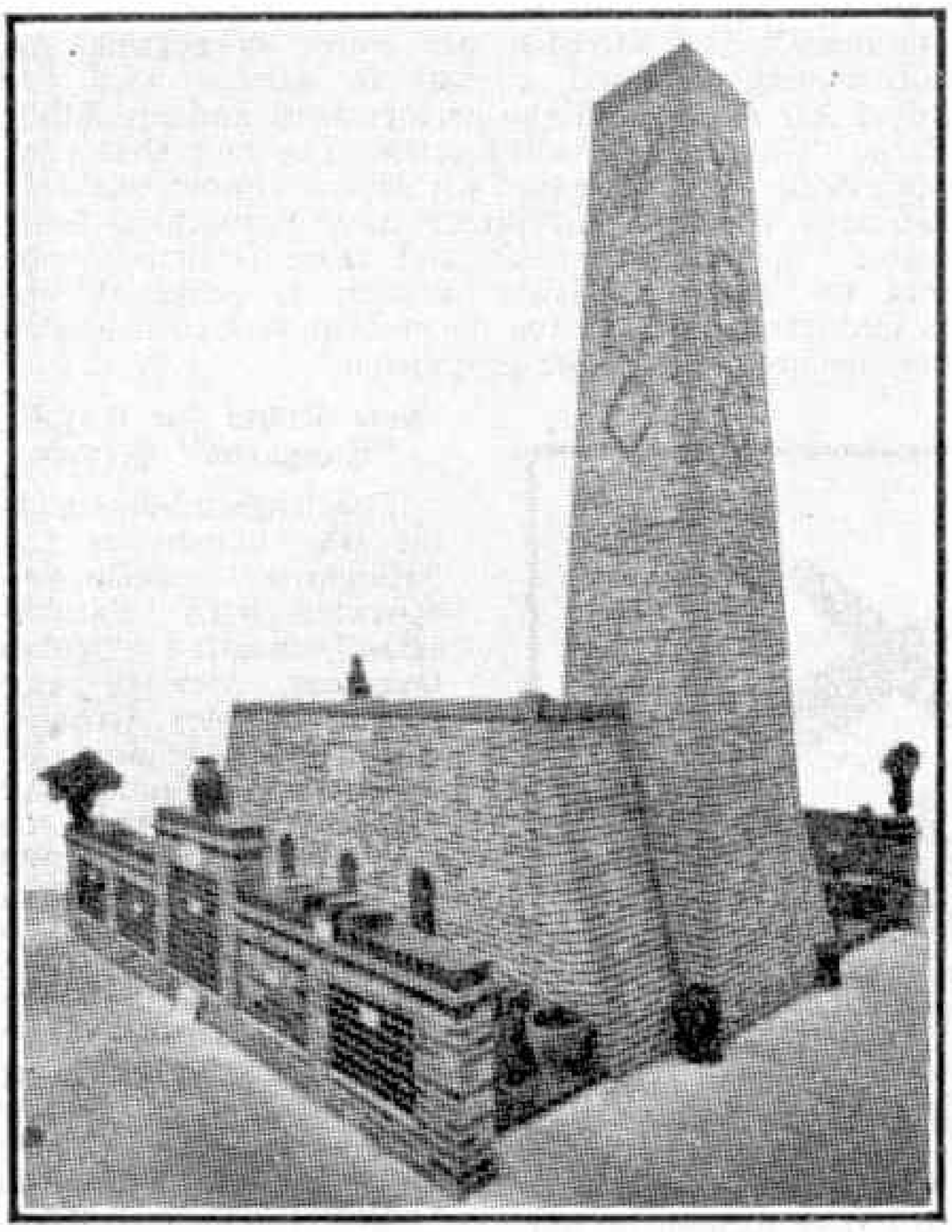
machines in which enormous pressure is applied. In the North of England the stiff-plastic method is the most largely used. The clays employed are ground and mixed with water, and then forced into moulds on a rotary table. This forms rough clots, which are pressed. In another process, employed in most parts of the country, the raw material is ground over grids through which it is forced into a series of rollers. The crushed material is then compressed and forced through a die to form a column that is cut to suitable lengths and forced through a series of wires spaced at regular intervals to form the bricks.



A general view of a brickworks machine house.

Some bricks are still made by hand. The material is ground and treated as in the wirecut process, and is then allowed to mature in dark chambers for two or three weeks. It is then made up in moulds and the resulting bricks are dried, ready for firing. In yet another process, the stock-making one, the clay with a proportion of chalk is put through a washing mill, in which arms rotate to stir it up. The product eventually flows through screens into a series of settling tanks, where ashes are added. When the resulting material is stiff enough it is forced out and conveyed to tables, where it is moulded by hand.

In all cases the bricks are first dried and then set in the kiln to be fired. Here again there are many types of process in operation. To most of us the most familiar kiln is a huge brick building in which the bricks are stacked. The kiln is then sealed and fires are lit so that the temperature inside rises to the point required to transform the "green" brick into the familiar object that the builders require. In the latest type of kiln the unburned bricks are set on cars that pass through long tunnels. The temperature of the bricks rises as they move along, and when they reach the end of the tunnel they are completely burned and ready for use. The introduction of this type of kiln has speeded up the burning of bricks, for an average of three to four days only is required for the process.



A model brick kiln exhibited at Olympia in 1932.

The standard brick has a length of about 9 in., a width of 4½ in. and a depth of 2½ in. Bricks are made in all shapes and sizes to suit varying requirements, however, and there are many different textures, varying from a smooth faced one to a rough rustic surface. The colour of brick too varies, chiefly in accordance with the proportion of iron in the material. The higher the percentage of iron the darker the brick. The blue brick is made up of a material containing a fairly large proportion of iron, while light coloured bricks are manufactured from brick earths with a very low iron content and a fair proportion of lime. Chemicals are often added to control colours.

Nowadays there is considerable artistry in brickwork, especially in the production of high grade facing bricks, which can be made in an extensive range to give pleasing effects both in regard to colour and texture. Colour schemes in fact can be made up to suit any environment, and the splendid results of careful selection and treatment have been shown in many exhibitions.

The resistance to crushing of a well-made brick of good quality is truly remarkable. The bricks at the base of the chimney at Thorncliffe, already mentioned, have to support the enormous weight of 1,400 tons, yet this is easily within their capacity. The stack was built of bricks manufactured of shale from a bed that outcrops at Stairfoot, in South Yorkshire, a material that produces bricks of good colour, uniform texture and great strength. In crushing tests six such bricks withstood a gradually increasing thrust of 259,900 lb. before cracking and 399,000 lb. before being crushed. This crushing strength works out at 10,360 lb. per sq. in., or 666 tons per sq. ft. Bricks possess durability as well as ability to withstand crushing stresses. One possessing a dense and uniform body, that has been well burned, will resist the disintegration effects of wind, rain and frost for thousands of years.

There is much more in using bricks than merely piling them up with layers of mortar between them. Bricklaying indeed is an art, for a definite arrangement must be followed if the proper results are to be achieved. The arrangement is known as the "bond," Every course must be laid perfectly level, the wall itself must be kept plumb, and the "perpends" or vertical joints must be vertically over each other. In English bond, the courses are alternatively of "stretchers" and "headers," that is bricks laid with their length along and across the wall respectively. In Flemish bond there are alternate headers and stretchers in the same course.

Air News

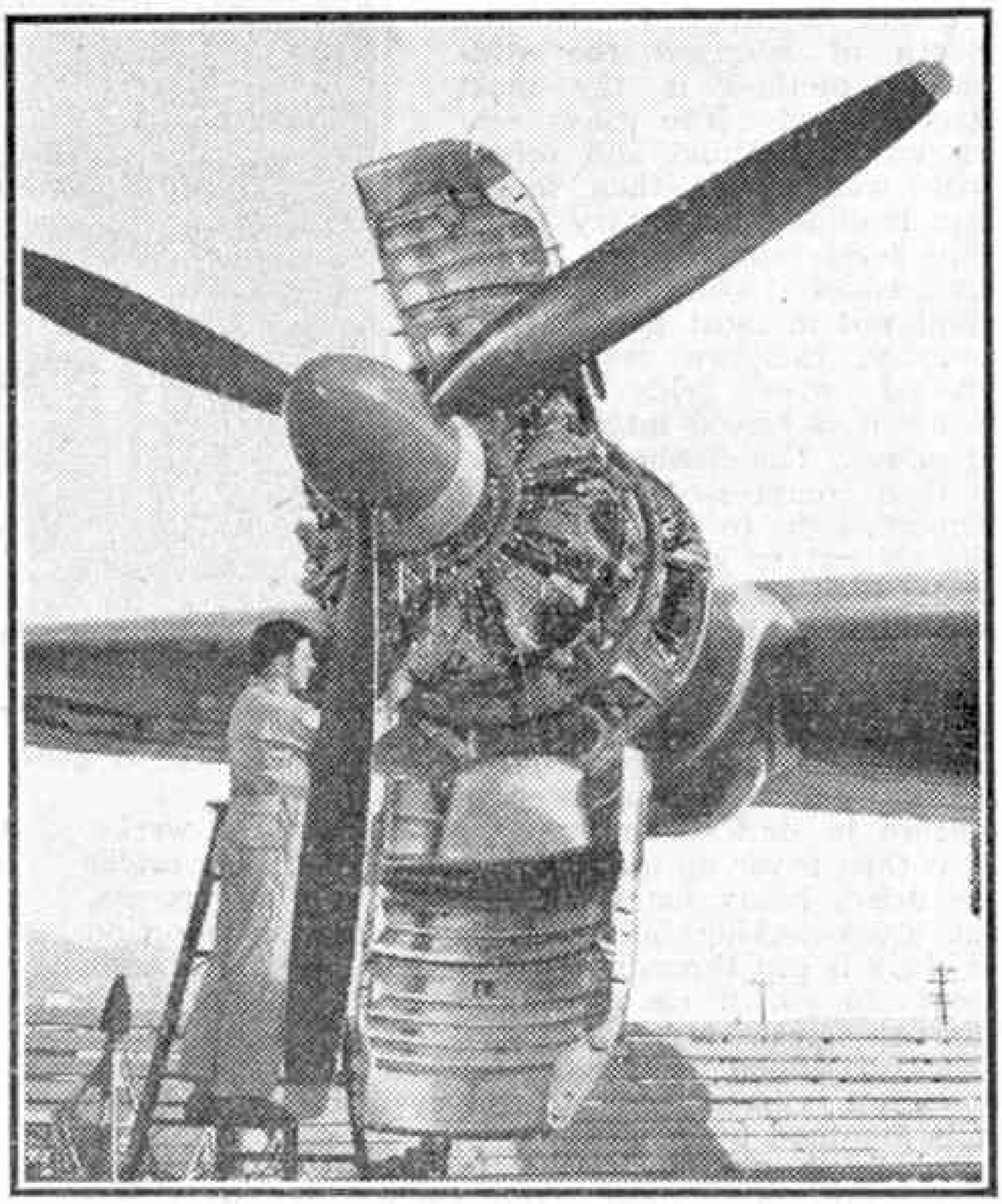
The Short "Solent" Flying Boat

British Overseas Airways Corporation will soon be receiving the first of a fleet of 12 Short "Solent" flying boats, capable of operation on transatlantic air routes. The "Solent" has been developed from the "Seaford" military flying boat, and should prove a worthy successor to the "Empire" and "Sunderland" aircraft that have put in so many years of excellent service on Imperial Airways and B.O.A.C. routes.

The "Solent" has four 1,675 h.p. Bristol "Hercules" 130 radial engines, which give it a top speed of 236 m.p.h. at 7,000 ft., with an all-up weight of 75,000 lbs. It has accommodation for 24 "sleeper" passengers or 36 day passengers in six cabins, four on the lower deck and two on the upper one. When 24 passengers are carried the upper-deck cabins are used as a lounge and dining room. Normally a crew of five is employed—two pilots, a navigator, radio officer and flight engineer—but two stewards also can be carried. This new flying boat has a wing span of 112 ft. 9½ in., length of 89 ft. 6½ in., and is 37 ft. high. J.W.R.T.

New Type Engine Cowling for "Constellation"

The upper photograph on this page shows one of the engines of a Lockheed "Constellation" aircraft fitted with the new type of engine cowling that has been adopted for these aircraft. The new cowling gives airline mechanics full access to the engine in 2 min., and consists of four main panels. The two side panels, hinged to the upper section, can be removed without unfastening hinge-bolts or pins, and the upper and lower panels are hinged to the main structure of the engine nacelle. The upper panel houses the carburetter air intake system and the lower one includes a duct for the oil-cooling air.

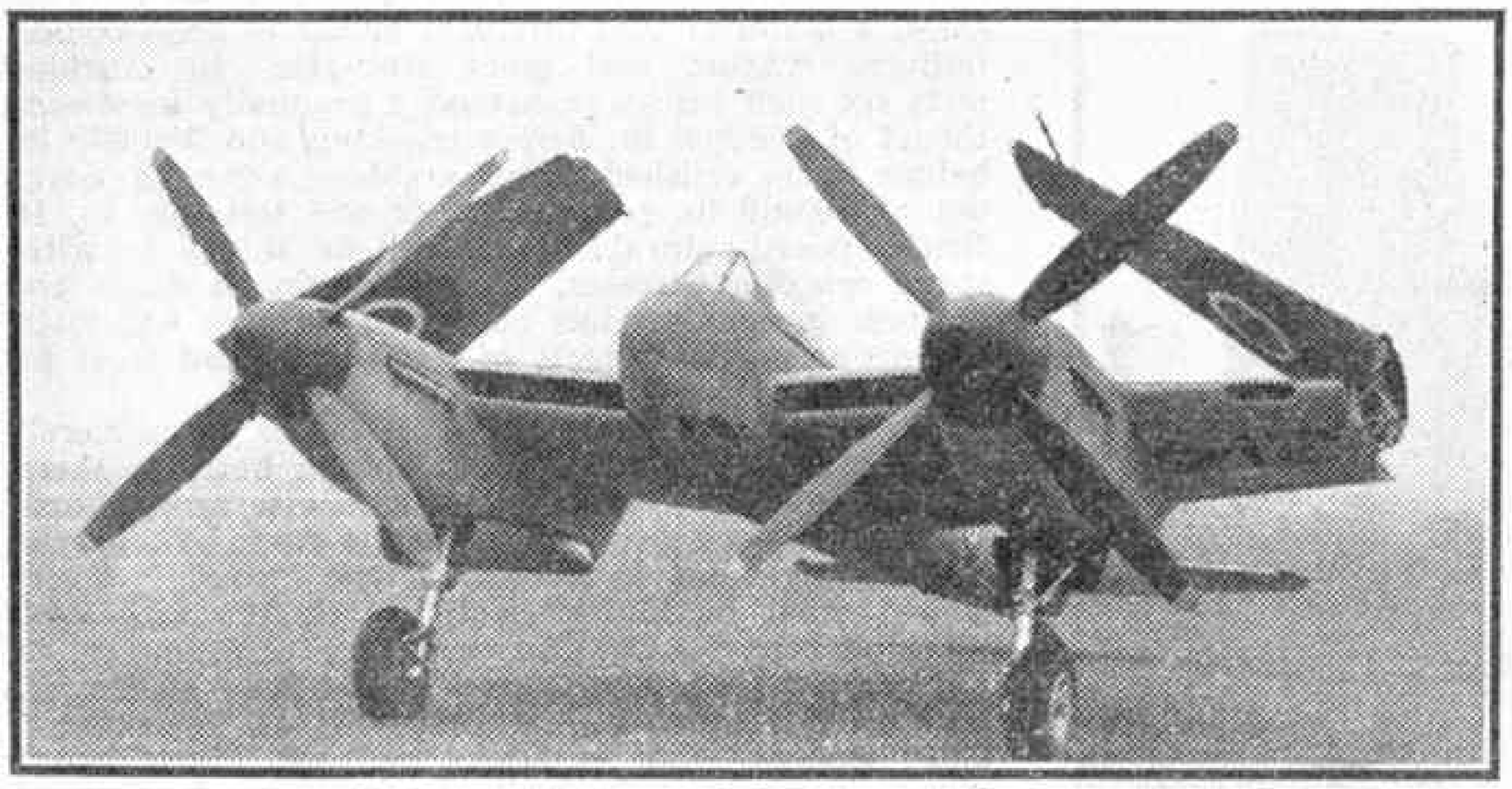


New type engine cowling for the "Constellation." The side panels of the cowling have been detached and the upper and lower panels, looking like giant jaws, have been swung out of the way while the mechanic works on the engine. Photograph by courtesy of Lockheed Aircraft Corporation, U.S.A.

"Vampires" for Sweden

The de Havilland Enterprise, which includes all the companies in the de Havilland group, recently signed three very important contracts with the Swedish Government. The first contract covers the supply of a large number of "Vampire" jet-propelled fighters, the second is a separate order for "Goblin" jet-engines, and the third grants a license to build the "Goblin" in Sweden.

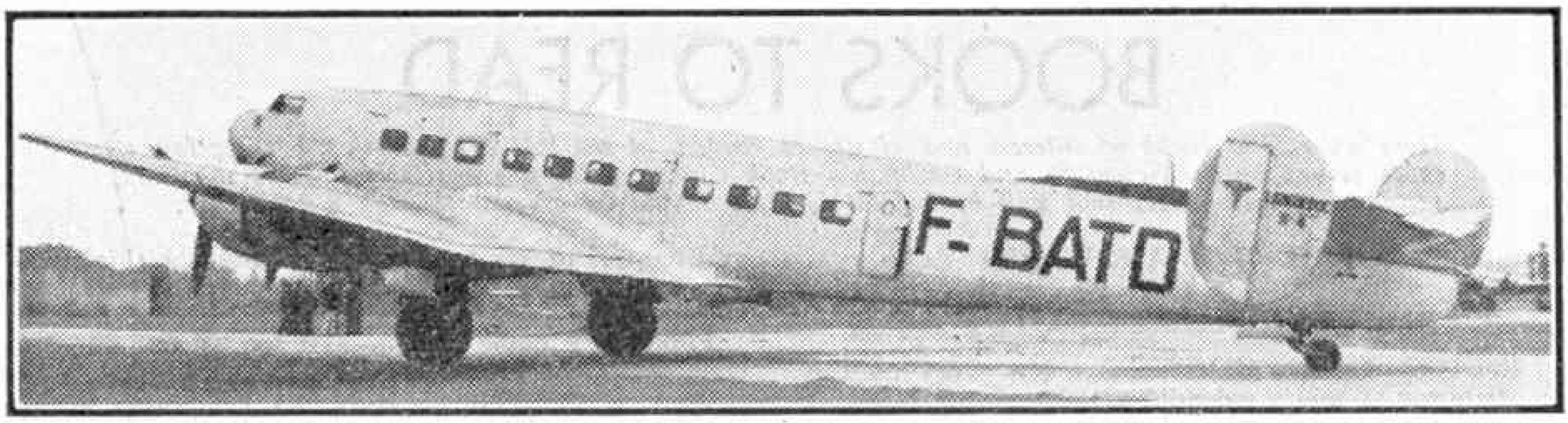
Together these contracts constitute one of the biggest overseas orders ever secured by a British aircraft company, and they are a practical recognition of the high prestige of British aircraft abroad. In the "Vampire" the Swedish Air Force is getting the fastest single-engined aircraft in service with the Royal Air Force, and the performance and reliability of the "Goblin" are well known. The fact that such equipment is now released for export almost certainly indicates that de Havilland have something even better "up their sleeves," and there is little doubt that the British aircraft industry is going all out to maintain and improve its present technical lead in the development of jet-propulsion. J.W.R.T.



The de Havilland "Sea Hornet," the fastest propeller-driven fleet fighter in the world. Photograph by courtesy of de Havilland Aircraft Co. Ltd.

New Route for B.O.A. "Kangaroo" Service

The England-Australia air line known as the "Kangaroo" service and operated with "Lancastrian" aircraft by British Overseas Airways and Qantas Empire Airways, will in future be flown by way of Singapore and Darwin, eliminating the long flight of over 3,500 miles across the Indian Ocean from Ceylon to Western Australia. On the outward flight the B.O.A. crew "hand over" to a Qantas crew at Karachi, and a similar transfer in the reverse order is made when the "Lancastrians" arrive there on their way to England.



French S.N.C.A. du Sud-Ouest 161 "Languedoc" air liner. (See special article on page 134.)

New U.S. Navy Patrol Bomber

The U.S. Navy's new patrol bomber, the Lockheed P2V, is illustrated on this page. This machine has been developed from specifications set before the end of the recent World War, and is the first land-based aircraft ever designed for the U.S. Navy for the specific job of patrol. The makers claim that it has a greater range, speed and armament than any other patrol bomber yet developed. Over 100 P2Vs are in production for the Navy.

The new bomber has a range of 3,500 miles with full load, and of more than 5,000 miles when provided with bomb bay tanks. The longer range is sufficient to enable the machine to fly non-stop from Pearl Harbour to New York, or from Washington to Moscow. It performs equally well at high and low altitudes, and can skim the ocean on search or rescue missions, or fly more than four miles high for accurate photographic and radar mapping. It carries more than 2,000 lb. of the latest radar equipment.

The P2V is armed with six 20 mm. cannons in the nose and twin-mount .50 calibre machine-guns in top and tail turrets. It can carry sixteen 500 lb. bombs, or eight 1,000 lb. or four 2,000 lb. bombs. Alternatively it can carry twelve 325 lb. depth charges, two 2,165 lb. aerial torpedoes or four 11.5 in. "Tiny Tim" aerial rockets. Various combinations of these deadly weapons can be carried, of course, and in addition it can fire sixteen 5 in. high-velocity rockets from underwing launchers—twice as many as carried by previous U.S. Navy patrol bombers.

British Jet Engines

The quality of British jet-propulsion units was proved to the world when two Rolls-Royce "Derwent" V engines, operating with throttles only two-thirds open, powered the Gloster "Meteor" in the successful attempt on the absolute speed record. Already more powerful engines are being developed by British companies. One of them is the Rolls-Royce "Nene," which develops 4,500 lb. thrust at 12,300 r.p.m. In technical terms this engine has a double-entry centrifugal compressor, single-stage turbine and nine straight flow combustion chambers. It is 49.5 in. in dia., 97 in. long and weighs 1,550 lbs., compared with the "Derwent's" 42.5 in. dia., 84 in. length and 1,000 lb. weight. It was designed, made and assembled in 5½ months and was first run in October 1944. Since then it has been flight-tested in a Lockheed P-80 "Shooting Star," giving the machine a considerably better performance than with its usual American General Electric turbo-jet engine.

Metropolitan-Vickers also have been busy with jet-engines during the war, but these Metrovick units have axial flow type compressors, with the compressor, combustion chamber and turbine arranged in line. This contrasts with the more usual centrifugal-type compressors of the Rolls-Royce and de Havilland engines which were developed from the basic Whittle design, and is more like German jet-engines. The first Metrovick gas turbines were cleared for flight in December 1942 and had a thrust of 1,800 lb. They were flown in a Gloster "Meteor." Engines of the latest series, the F2/4, have a thrust of 3,500 lb.

Although most of these engines were developed for warplanes, post-war civil machines were not entirely forgotten, and the Bristol Aircraft Company have designed an engine, the "Theseus" I, which combines jet-propulsion with a propeller. This arrangement is considered most suitable for civil types as it has a high power output and low fuel consumption, with consequent improvement in range, which has been the worst drawback encountered with jet-propulsion.

The "Theseus" I weighs 2,310 lbs., develops 2,000 h.p., and has a substantial "jet"-thrust in addition.

J.W.R.T.

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Several Avro "York" transports are to be added to the fleet of Avro "Lancasters" and "Lancastrians" used by British South American Airways.

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Aer Lingus Teoranta, the Irish air line company, have bought nine Douglas "Dakota" aircraft from the U.S. Foreign Liquidation Commission.

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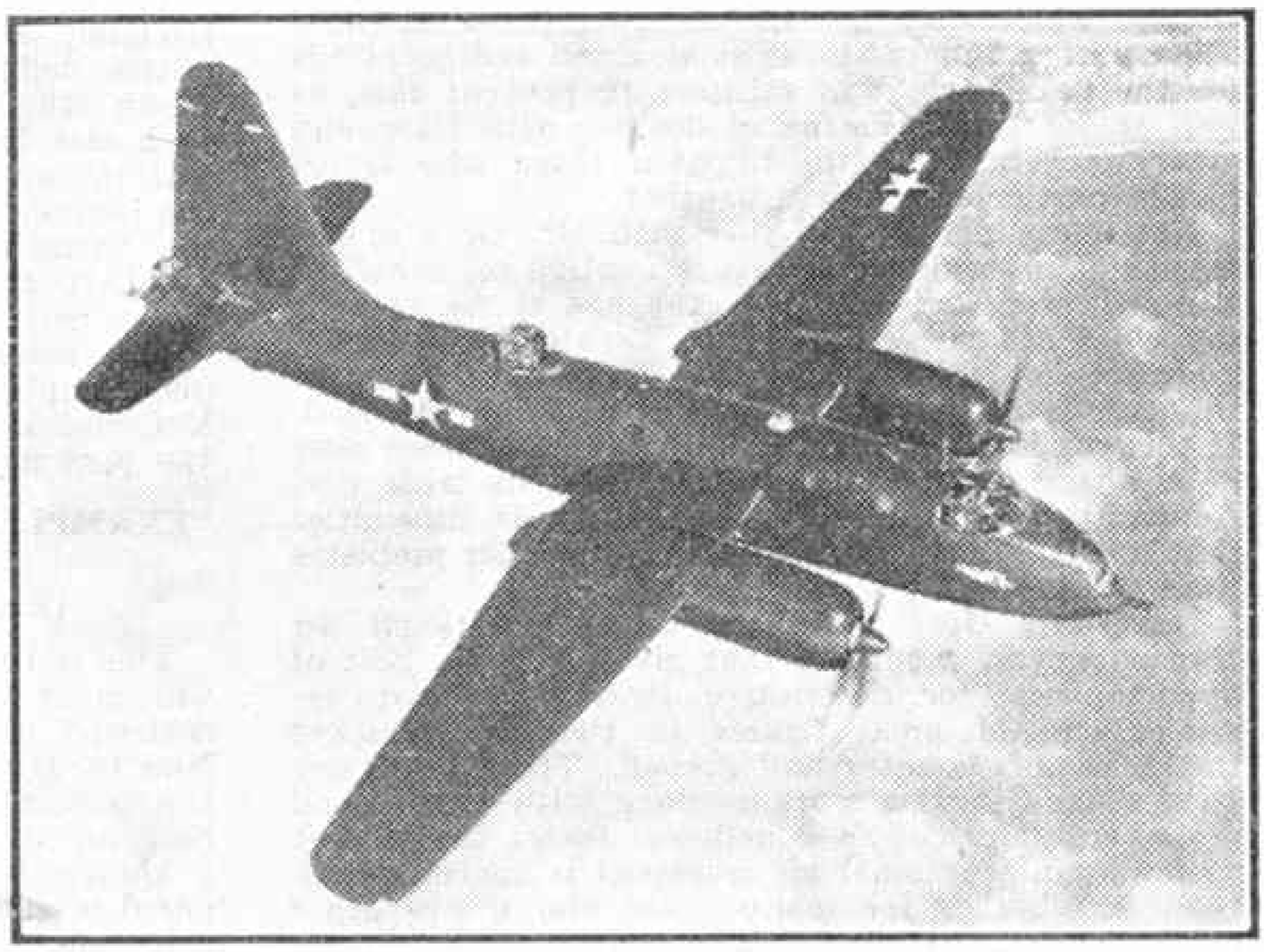
American Overseas Airlines have begun a weekly air service between the United States and Scandinavia.



Lockheed P2V Patrol Bomber, described on this page. Photograph by courtesy of Lockheed Aircraft Corporation, U.S.A.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller.

"THE CIVIL AIR WAR"

By C. G. Grey

(Harborough Publishing Co. 12/6 net)

Readers of the "*M.M.*" know Mr. Grey as the contributor of many splendid articles on aircraft and on aviation generally, and have learned to enjoy and appreciate his views and the lively and interesting way in which he presents them. He has been associated with aviation from its very earliest days, and has known personally all the great figures in its history, so that his knowledge of it is unrivalled.

The title of the author's latest book is surprising, for we do not associate civil aviation with war, but he justifies it fully, apparently on the ground that there is no progress without fighting for it. He points out that we have not yet conquered the air by a long way, and are likely to be at war with it for years to come before we make flying safe. Then there is a war between the air transport interests of all the nations that can afford to run air lines, and another between the transport interests in this country. With all of these wars the author deals in turn, and in addition he takes up the problem of the airship, which he champions in the face of fierce opposition from those who favour the aeroplane. On all these "wars" he writes vividly, with many amusing stories that drive home the points that he wishes to make.

In dealing with the first of his wars Mr. Grey writes forcibly on the needless dangers of the air, for he believes that air transport cannot be fully successful until flying ceases to be an adventure. He gives a formidable list of accidents and of important people killed in them, and then turns to the steps that he thinks necessary to achieve safety. These include the production of aircraft that will get off the ground with a short run and land with one still shorter, and the use of fuel less inflammable than petrol. Mr. Grey has long been the advocate of aeroplanes that do not burn up on crashing, and he quotes Sir Roy Fedden's statement that if enough money were spent on developing Diesel engines these could be made equal to the best of those using petrol. Greater freedom from fire may come with the jet engine, which uses heavier oil than petrol engines. The collision danger also is in his mind and he pleads for the development of schemes to prevent this, as well as for better means of dealing with icing and other dangers that still threaten those who travel by air, particularly in bad weather.

Not many people will side with Mr. Grey in the second of his wars, which he is fighting on behalf of the neglected airship. Here the gas to be used is the chief difficulty. To fly in an airship lifted by hydrogen is to invite trouble, and without ample supplies of helium the airship is probably doomed. If this gas is made more readily available there may be a future for the airship in spite of its large size, comparative frailty and lack of handiness, difficulties that might be overcome if design and other problems were tackled really seriously.

Next Mr. Grey turns to the international air transport war, a subject that gives him the best of opportunities for descriptive writing and for reminiscences of great figures in the air transport world, in this country and abroad. There are many good stories in this section, along with much good sense, and Mr. Grey's conclusion seems to be that as far as international air transport is concerned we need not bother for many years about any other rival than the United States, with whom an air transport war can be carried on in the most friendly spirit. Mr. Grey is against international ownership and control of air transport; he does not think that any group of Governments could possibly agree on the problems that this control would bring.

Finally we come to the civil air war in our own country. Here the author tells us the history of the British air lines almost from the beginning, always in his own entertaining but penetrating way. He discusses such matters as steamship interests, flying boats and aerodromes, and criticises strongly the White Paper of March 1945, in which the Coalition Government presented the general policy on which this country's flying services were to be developed and operated. Unfortunately Mr. Grey's book was written before the Coalition Government had left office. Its schemes have now been replaced by other plans, so that his criticisms of the "White Flag Paper," as he calls it, have lost much of their point. This does not deprive his story of its interest, however, and readers generally will enjoy what he has to say.

The author looks forward to the time when air transport of passengers, mail and goods will be as regular as ground transport, and quotes the opinions of many well-known people on various angles of the problems concerned, either to agree or disagree with them. One cannot always agree with what he himself advocates, but all his suggestions and comments are worthy of the most serious consideration, and everyone interested in air topics—and to-day that means almost everybody—should read his book. In doing so they will acquire much useful information in a very agreeable and entertaining way.

"THE RAILWAYS OF NORTHERN IRELAND"

By W. P. McCormick

Mr. McCormick is a keen railway enthusiast who has made a careful and detailed survey of the railways of Northern Ireland and of their locomotives. In order to make this complete in every respect he has not hesitated to cross the border into Eire when dealing with lines of both broad and narrow gauges that are situated partly in one country and partly in the other, and the result is a very full and useful story.

The author begins with the Great Northern Railway (Ireland) and the L.M.S. Northern Counties Committee, following these with the Belfast and County Down railway and with other and smaller lines. In each case he gives a general account of the railway, and of its track and operations, and then deals with the locomotive stock. Brief descriptions are given of the various classes, followed by complete lists of numbers and names. Railcars and Diesel-engined locomotives are included.

The book is illustrated by means of excellent photographs. It can be obtained from Mr. W. P. McCormick, 19, King's Road, Knock, Belfast, price 1/9 post free.

"EXAMPLES IN ENGINEERING DRAWING. VOL. II"

By H. Binns

(English Universities Press. 6/- net)

This is the second volume of a series of three that will cover the entire subject. The first volume was reviewed in the "*M.M.*" for January of last year. Now the student is expected to go further in producing the finished working drawing. All dimensions are to be given in their correct positions and he must have a knowledge of tolerances, while he should be prepared to give schedules when required and to indicate machining details. The examples themselves are well arranged and graded, and the necessary instructions and information are given clearly and well.

The Spring Feeling.

Photography in April

By John J. Curtis, A.R.P.S.

READERS who have recently been able to beg, borrow or buy a camera will be looking forward to making their first exposures during the Easter holidays. No doubt they will welcome a few hints from an old stager.

My first piece of advice concerns every photographer. Whether the camera has been recently bought from a shop, or has been put away in a drawer or cupboard for weeks, or perhaps months, it should be thoroughly cleansed from dust that may have collected inside, which will inevitably find its way on to the film or plate, causing spots on the negatives.

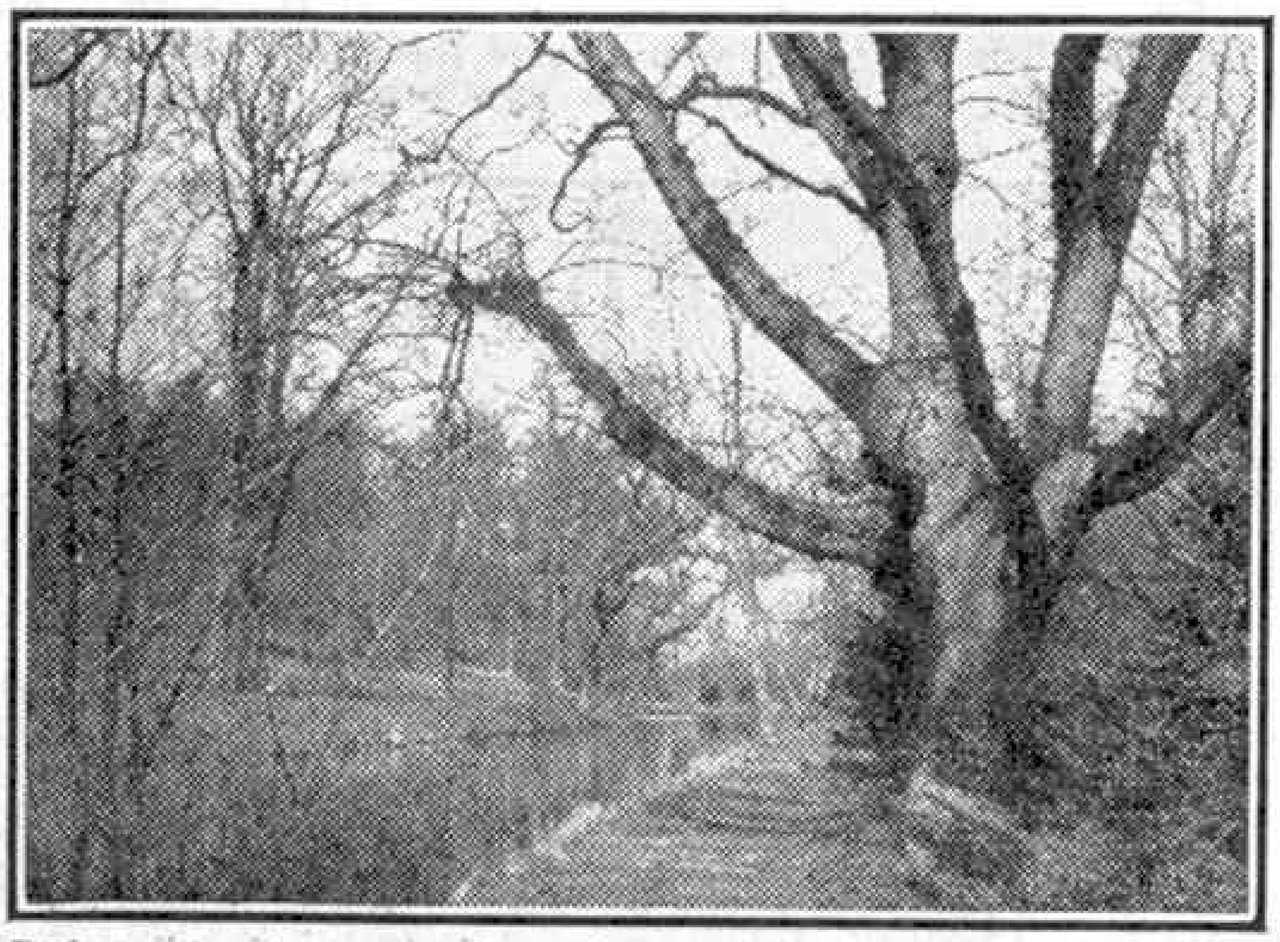
Now we come to the most important point of all, the exposure. The value of the light this month is twice that of January, and only half that of July. If you had used a film such as the Selochrome or H.P.2 at mid-day on 15th January on an ordinary landscape scene with F8 stop, the exposure would have been about 1/75th of a second. On 15th April with the same conditions only 1/150th would be required; and on 15th July not more than 1/300th would give correct exposure. From this you will see that this month is about half-way between the minimum and maximum of the year's light values.

Many beginners are misled by the apparent brilliance of April sunshine into thinking the light is stronger than it actually is. The only safe way is to make use of an exposure meter, or of light tables such as those provided in the "Wellcome" calculator; the cost of such a guide is covered many times over by the reduction of wastage in films. If, however, you have neither meter nor light tables, it is always best to give a little longer exposure than your guess suggests.

A Windy Shore. This photograph and the top one on this page are by B. Chulindra, Rock, nr. Wadebridge.

On a bright sunny day in the country in April subjects for pictures come thick and fast wherever you go. Special attention should be given to the trees. They are not crowded with foliage as in full summer, and interesting pictures can be made of groups of trees along a woodland path or in some similar position.

April is often a wonderful month for clouds, and if you use Panchromatic films and a light filter you will be able to get some of these into your landscapes.

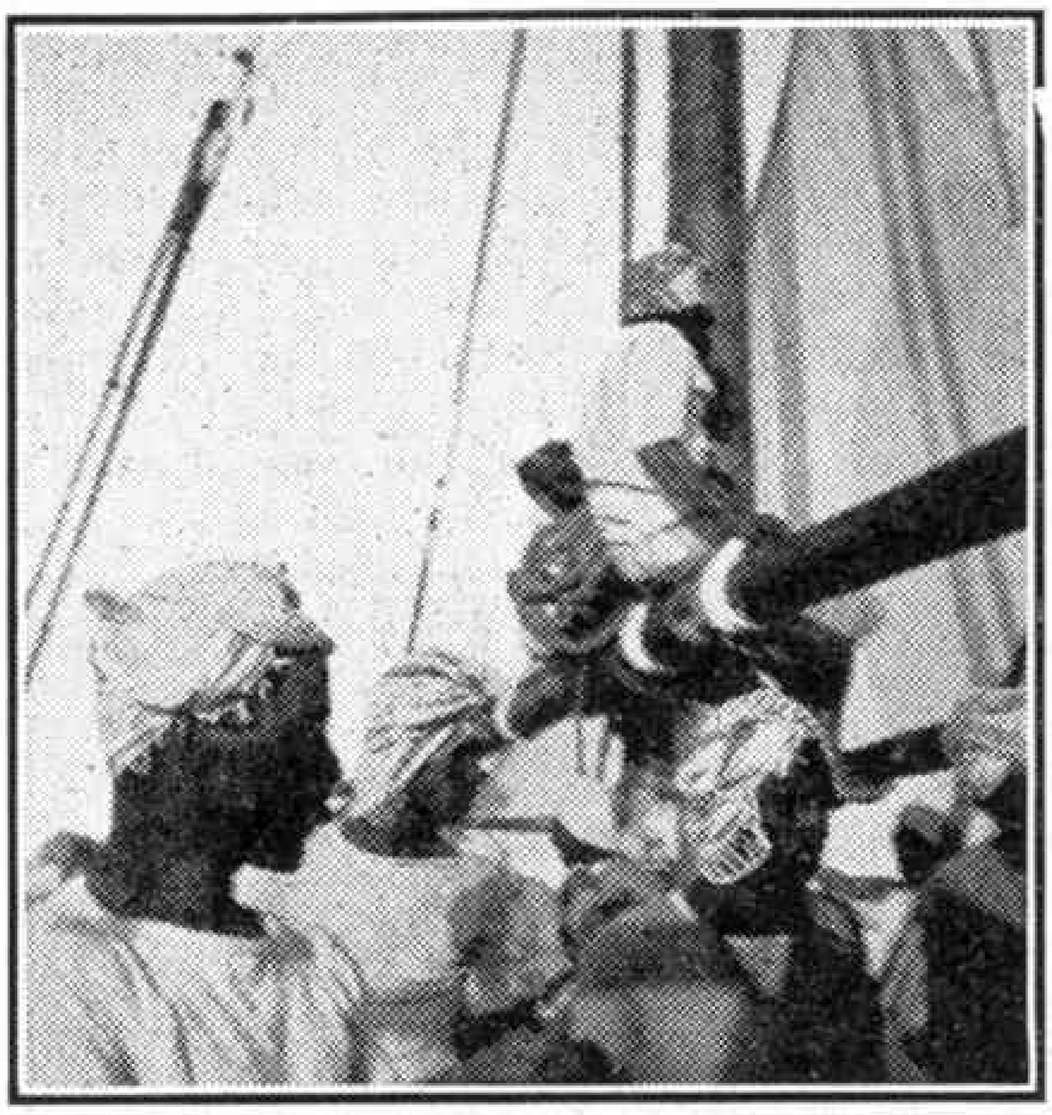


Before the leaves arrive. A peaceful picture by J. Durey, Newcastle-on-Tyne.

Jewels of the Deep

By J. Belgrave

ANYONE who has owned or seen any pearls must have wondered where they came from? If so, here is one answer. Many pearls come from the Persian Gulf, where the little island of Bahrein is one of the chief centres of the pearl industry. This is a very old one. Bahrein pearls have been famous



The crew of a pearling dhow, with the pullers who haul the divers to the surface with their load of shell.

all over the East for the last 30 centuries, and there are many references to them in ancient manuscripts and writings. Unfortunately pearling has been declining lately, but the Shaikh of Bahrein, who does not want the oldest industry of Bahrein to die out, is encouraging it in all the ways that he can, and it looks as if it is going to come into its own again. Bahrein itself is about 30 miles long and is connected by a mile long causeway with Maharrog, a second island. It is here that the captains of the pearling dhows live, and when the boats are in they look like sleepy gulls on an English beach.

The pearling boats are of a type that has been used for the last two thousand years, the larger kinds having two masts, and the smaller, one. They are rigged with lateen sails, which are triangular in shape, and are small compared with English standards. They are classified according to their types of bows, and it is unusual for them to have cabins, but in the stern a sort of tent is rigged up for the higher members of the crew. Below deck are the tanks in which fresh water is kept. The craft have oars, but these are only used for getting into position for diving, and not for travelling.

These sturdy boats can stand up to all sorts of weather, and are of wood all through. They are not much different from the dhows that ply the coasts of the Indian Ocean and the Persian Gulf in search of trade. They are all built locally, and always on the beach can be heard the click-clack of hammers on their wooden hulls, as the sailors prepare them for the pearl season.

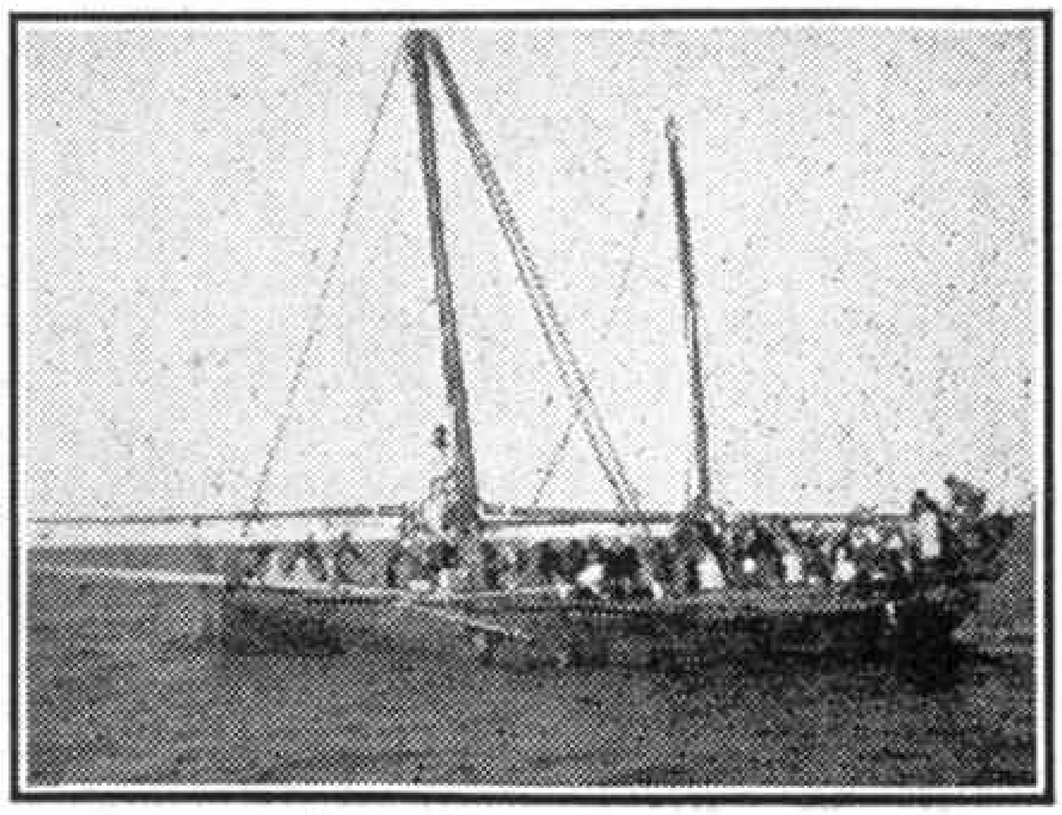
The actual diving is always done at the same time each year, between April and October, and there is always great excitement when the fleet sets out. This is a beautiful sight, with the glistening white sails of the dhows reflected in the sparkling green sea against a background of light blue sky. The crew of an average sized dhow consists of 100 divers and pullers. The latter are paid less than the divers, and it is their job to pull the divers up by ropes when they are exhausted.

The diving goes on day and night, and the men take the work in shifts. When they are diving they wear only a loin cloth, net bag and nose clip; they stay under for about a minute, and are then pulled up with their bags full of crusted pearl shells. These are tipped out on deck, where more men are busily opening, and every now and then there is an exclamation as some beautiful prize is discovered. It is lucky for the divers that there are no under sea menaces. It is unusual for sharks to attack them, and they are unarmed. They live on very slender fare when they are diving; a little rice and local flat bread is all they eat during the diving season.

When the dhows return home in October, the divers, the pullers and the captain receive pay in certain fixed proportions, which have been the same for hundreds of years. The captain receives five parts, and the divers two to the pullers one. The actual amount of money that is paid out varies from year to year.

When the fleet arrives in port, the captains go round the town with their pearls in little bags, and the buying and selling is usually done in secret by a sort of deaf and dumb alphabet with hands under cloth. Quite a lot of the best pearls are bought by rich Indian merchants who export them to India and the Continent, where they are fetching high prices. Much local work also is done with pearls and mother of pearl, and some very beautiful pieces of work have been made by the Arab craftsmen. Persian Gulf pearls are of the best quality and all different shades and colours can be bought.

Bahrein is not the only port in the Persian Gulf from which pearling vessels come, although it is the main one. From Muscat, Kati and Oman dhows set out each year for the pearl banks, which are mainly situated along the west coast of Hasa and Oman, but there are extensive banks round Bahrein itself, and it is there that most of the Bahrein craft go. These banks are in very shallow water, so that it is easy to find the beds, and in the diving season one sees a mass of ships with the muscular brown bodies of the divers glistening in the sun, as they swarm up and down the sides of the boats. And it is these men who deserve the praise which anyone has felt like giving to any pearls they have seen.



A small pearling dhow.

Club and Branch News

WITH THE SECRETARY

PLAN SUMMER EXCURSIONS NOW

At the moment preparations for Easter Exhibitions, or for Open Nights in cases where a full scale display is not given, will be occupying most of the attention of Club officials and members alike, but they should spare a little time for thinking about the summer programme.

The outdoor season calls for a change in proceedings. After two Winter Sessions in the Club room members will be delighted to transfer their operations to the open-air, and schemes should be set afoot for games, and for excursions to places of special interest, such as engineering works or railway stations. Distance does not make an excursion, and care should be taken to include in the list of outings as many places as possible in the immediate neighbourhood of the club room, so that a few evening meetings of this kind can be arranged.

On Saturdays, when members have more time, longer journeys can be made, by bus or train, and a proportion of these can quite well be devoted to pleasure trips, in which fun and instruction can be cheerfully combined. If a camping holiday can be arranged to extend over a week-end, or even a week, so much the better. This should be easier now than in wartime, when campers pitching their tents in odd places would have been looked upon with suspicion, but it must be remembered that a good camping site chosen by an old hand is really a necessity if a camp is to be a success.

PROPOSED BRANCHES

LEEDS—Masters Scholefield and Holden, Bracken Edge, Stainburn Avenue, Leeds 7.

EXETER—Mr. J. Brown, 3, Brook Green Terrace, Well Street, Exeter.

SHOTTON—Mr. J. A. Edwards, 5, Chester Close, Shotton, Chester.

MANSFIELD—Mr. P. Kerry, 2, Avondale Bungalows, Peaks Hill, Mansfield, Notts.

BRAY—Mr. N. Betson, "Glencoe," Herbert Road, Bray, Eire.

PROPOSED CLUBS

BATH—Mr. E. G. Ogilvie, 2, The Circus, Bath, Somerset.

WIGAN—Mr. J. V. Oldfield, 109, Mesner Road, Wigan, Lancs.

CONNAH'S QUAY—Mr. W. J. Roberts, "Mayfield," Primrose Street, Connah's Quay, Nr. Chester.

CORK—Mr. B. Buckley, 3, Windsor Villas, Highfield Avenue, Cork, Eire.

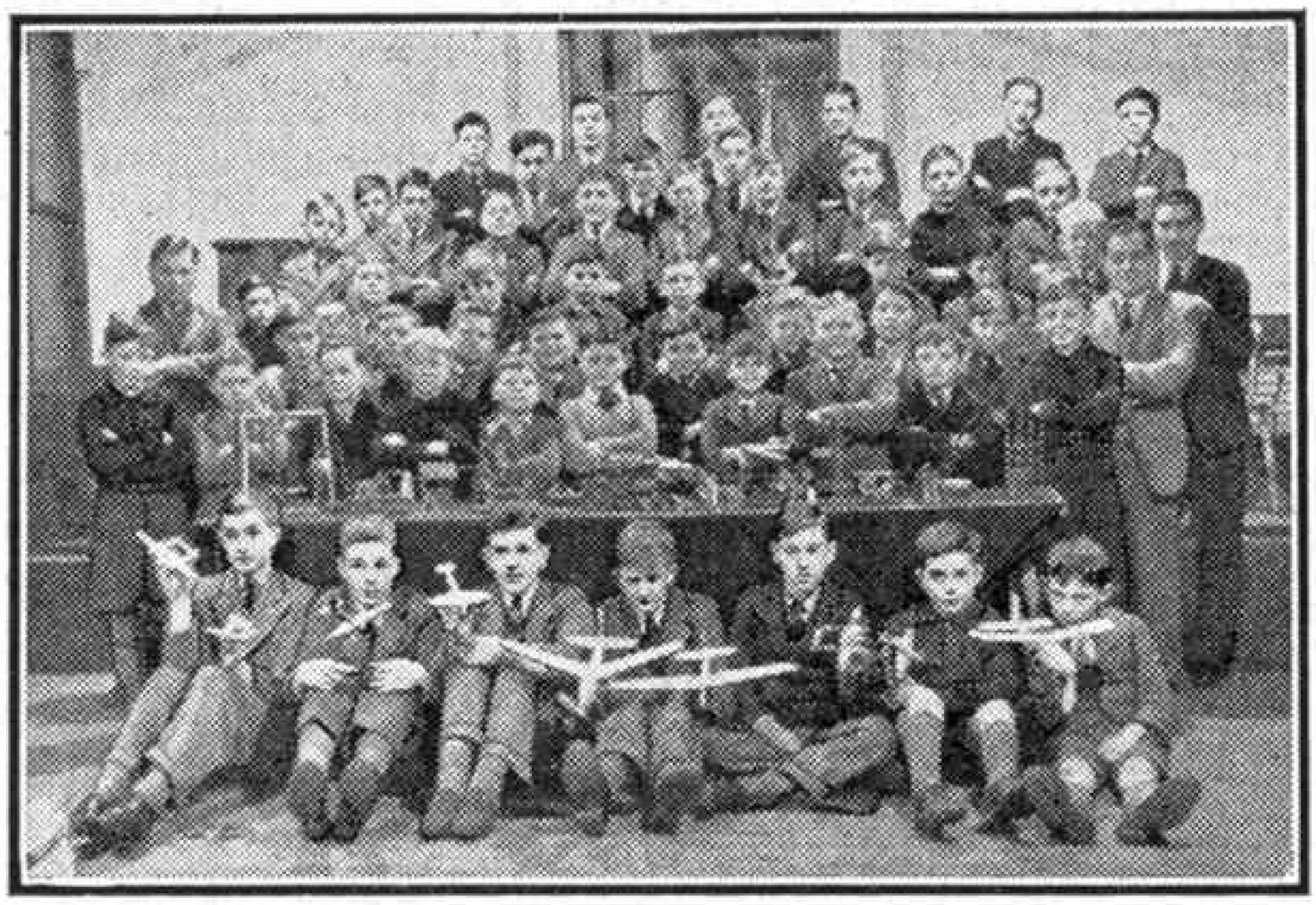
RECENTLY INCORPORATED BRANCHES

487. PERSE SCHOOL (CAMBRIDGE)—Mr. D. Smith, 18, Sedley Taylor Road, Cambridge.
488. LOWER EDMONTON—Mr. R. J. Alder, 86, Forest Road, Lower Edmonton, London N.9.
489. BRISTOL RAILWAY CIRCLE—Mr. C. R. Clinker, 3, Duchess Road, Bristol 8.

CLUB NOTES

ST. OSWALD'S M.C.—New members continue to join and good progress is being made. Model-Building is the chief pursuit and an Exhibition is to be held this month. A Hornby Train Layout has been built up and interesting Track Nights are held on it. Table Tennis and other Games are played. Club roll: 35. *Secretary:* D. R. C. Pavey, 37, Croft Road, Norbury.

HORNSEA M.C.—The usual crowded programme is being followed, all Sections being very active. Constructional work, especially with Meccano Parts, is particularly popular, and other activities have included fine Lantern Lectures, Film Shows and Football and other games. Club roll: 46. *Secretary:* P. Hobson, 1, Marlborough Avenue, Hornsea.



A fine group of members of the Huntingdon M.C. Mr. J. C. Deaves, Leader, is seen on the left of the photograph, and Mr. A. P. Read, Treasurer, and Mr. A. G. Goakes, Secretary, are on the right. This Club was affiliated to the Guild in October last year, and has made splendid progress. The chief activity is Meccano Model-building and the construction of aeroplane models also interests members greatly.

SUDBURY M.C.—This newly-affiliated Club is holding regular meetings and membership is increasing steadily. Model-building meetings are arranged regularly, and Hornby Railway and Stamp Collecting Branches have been organised. Talks have been given by Mr. R. W. Ellison, B.A., and Mr. H. J. Crick, L.N.E.R. Stationmaster. Club roll: 19. *Leader* and *Secretary:* W. T. King, Tregarthen, Abbey Road, Sudbury.

BRANCH NEWS

BANBURY—More rails have been obtained with which to enlarge the layout, and a locomotive and a large engine shed also have been added. Members have made useful accessories from cardboard, including a signal provided with electric lighting. *Secretary:* D. Hopkins, 348, Warwick Road, Banbury, Oxon.

BRISTOL RAILWAY CIRCLE (JUNIOR SECTION)—Meetings are held twice weekly, with a business meeting and discussion monthly. Members have contributed models to a Joint Model Club Exhibition in Bristol. Good work has been done in track construction, and a fairly extensive layout is now available for operations. *Secretary:* C. J. Faulkner, 54, Ashton Road, Bristol 3.

Among the Model-Builders

By "Spanner"

CASTOR FOR MOBILE CRANES

J. E. Meggett, Ipswich, has designed a novel castor unit for use in connection with model mobile cranes. This is illustrated below, and has several interesting features.

Two 1″ × ½″ Angle Brackets are bolted to a 57-teeth Gear and attached to these are two 1½″ Strips 1. Two ¾″ Bolts pass through these Strips and are screwed into a Collar 2, being held in place by nuts tightened against the Collar. The drive from the motor is taken to a Rod 3 that passes through the boss of the 57-teeth Gear and carries a ½″ × ½″ Pinion 4. The Pinion drives a 1½″ Contrate 5 that is mounted on one of the ¾″ Bolts and held in place by a Collar. The axle of the road wheels passes through the Collar 2 and carries a ½″ Pinion 6 that meshes with the Contrate. The castor is steered through a Worm arranged to mesh with the 57-teeth Gear, but this is not shown in the illustration.

A MARVELLOUS MECCANO CLOCK

Many types of clocks have been built in Meccano, including Grandfather Clocks, an excellent example of which was described in a special leaflet published some years ago. Unfortunately that leaflet is no longer available, but model-builders have been busy building clocks of one kind or another to their own ideas. One of the best that has come to my notice is a remarkable Astronomical Clock built by Mr. L. R. Dougal, London S.W.20. This model is illustrated at the top of this page and is constructed entirely from Meccano parts with the exception of a few pieces of cardboard and a "ping-pong" or table tennis ball. In addition to showing the time of day in hours and minutes, the clock includes a complicated mass of mechanism and dials that record the day of the week, the date, the phases of the Moon, high water at London Bridge, and the signs of the Zodiac, together with other astronomical data. In addition the clock strikes the hours, and on the first stroke of midday and midnight an angel appears from a small door at the top of the case. This figure is withdrawn automatically during the next hour.

Standard gearing is used throughout the gear trains with the exception of one star wheel of 31 teeth in the date mechanism, and this was cut from cardboard and painted with hard enamel to strengthen the teeth.

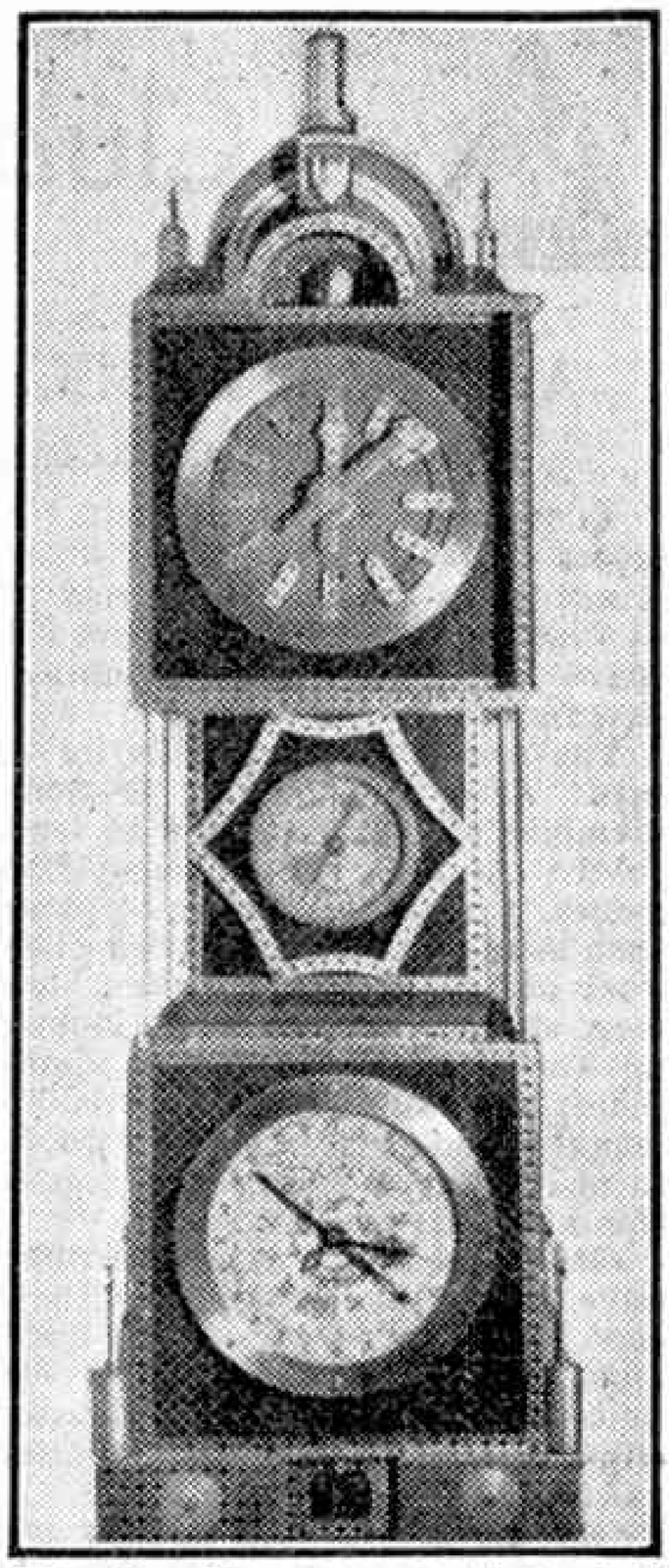


Fig. 2. The astronomical clock designed and built by Mr. L. R. Dougal, London S.W.20.

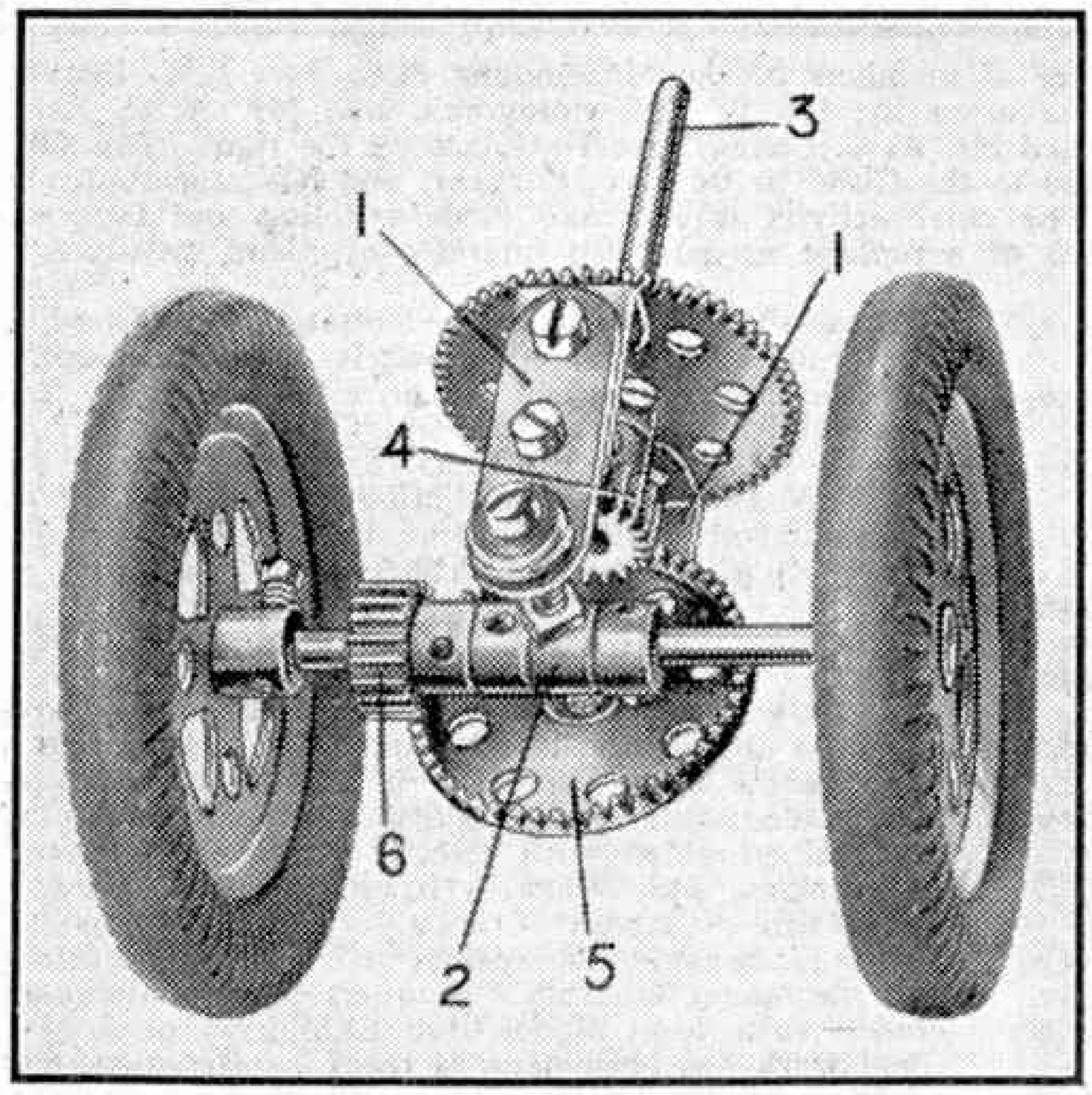


Fig. 1. A novel castor mechanism for mobile cranes.

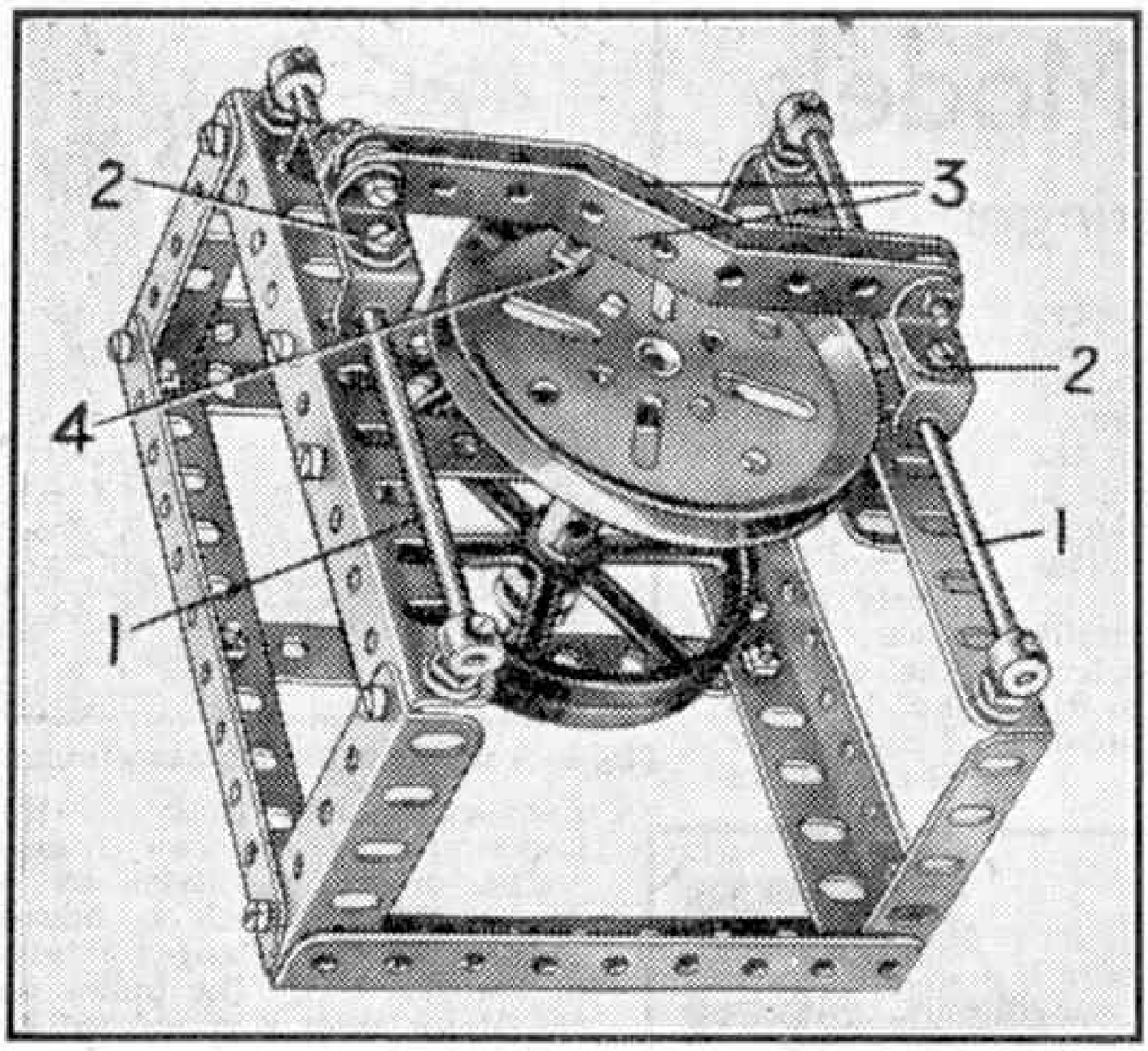
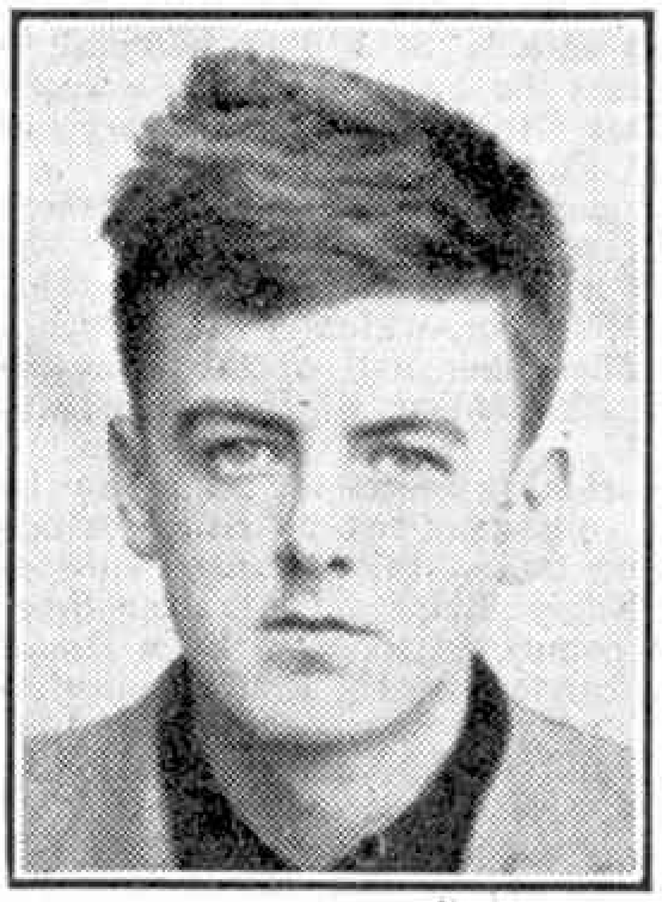


Fig. 3. The novel motion converter referred to on this page.

The outer case is about 4 ft. in height and is modelled on a case designed by Schuster of Nuremburg, a clockmaker of the 16th century. The clock is driven by a synchronous motor operated from the supply mains through a standard transformer.

Lunations are indicated by a sphere, one half of which is painted dark blue and blends with a background of a similar colour upon which bright yellow stars are fixed. Shafting with universal joints couples the sphere with the index showing the ages of the Moon and to the gear train. A worm on the date index shaft drives a 12-toothed motor pinion and is connected to the Zodiac index by vertical shafting.

The blue, red and gold colours of the clock and its nickel fittings make it a pleasing piece of furniture in addition to its primary purpose of providing useful and interesting information. It is, in short, one of the most attractive models we have seen recently.



C. Morley, Liverpool, a prize-winner in a recent Meccano Competition.

A NOVEL MOTION CONVERTER

The mechanism shown in Fig. 3 is a novel device for converting reciprocating motion into circular motion, and is the work of K. Keene, Carlisle.

A framework consisting of Angle Girders of various sizes fastened together in the manner shown in Fig. 3 is used to carry the mechanism. The upper Angle Girders carry 5″ Rods 1, which are locked in Collars carried on bolts, and along them slide 1½″ × ½″ Double Angle Strips 2. Angle Brackets are bolted to the last-mentioned parts and they carry between them two 4½ Strips 3, bent to the shape shown. The ends of the Strips are held by ½″ Bolts and are spaced apart by four Washers. A 3″ Pulley fitted with a Threaded Pin 4 is fastened on a Rod journalled in 4½″ strips, the Threaded Pin being arranged to engage between the bent 4½″ Strips. It will be seen that when the slide is moved to and fro the 3″ Pulley is made to revolve.

The device can also be used to convert circular motion into reciprocating motion by using the shaft of the 3″ Pulley as the power input shaft. An example of the use of the mechanism is in operating the work table of a model planing machine.

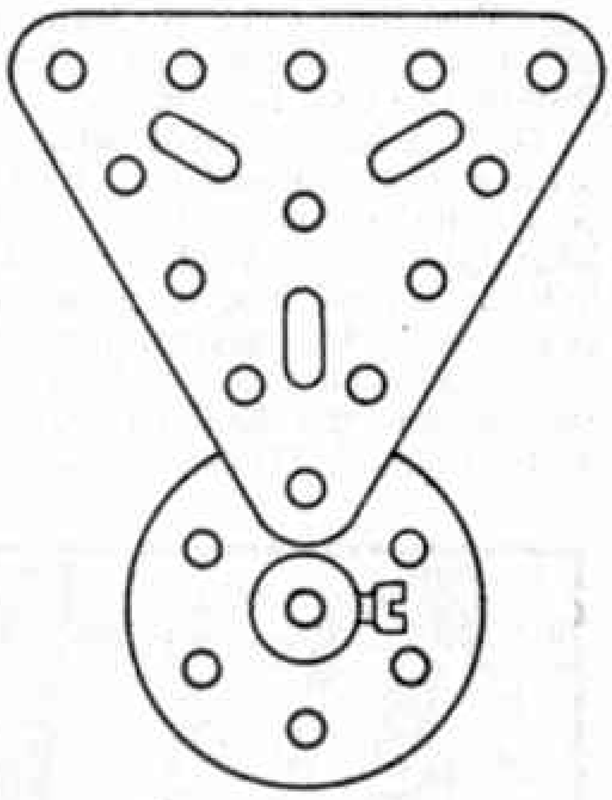


Fig. 4. An example of the use of a six-hole wheel as suggested by Mr. E. Armitage, Liverpool.

READER'S IDEAS FOR MECCANO PARTS

Mr. E. Armitage, of Liverpool 19, has thought out many novel schemes for new mechanisms and parts, and some of these have already been referred to in the "*M.M.*" Still another scheme is shown in Fig. 4. This concerns the Sprocket Wheels. Mr. Armitage suggests that one of these, such as the 1½″ or 2″ Gear, should be drilled with six instead of eight holes as at present. If this was done, the part could be used as a boss for six Triangular Plates (Part No. 74) in forming a large heavy wheel. The other Sprockets would retain eight holes.

New Meccano Models

Automatic Saw—Wringer

THE automatic log saw shown in Fig. 1 is begun by forming a rectangular base from two 12½" and two 5½" Angle Girders. To these are then bolted three 5½"×3½" Flat Plates in the positions shown.

The next operation is to bolt in position on the baseplate two 5½"×2½" Flanged Plates 1, Fig. 2, which form the gear-box sides. To the upper flanges of these Plates is bolted a 3" Strip 2 and two Trunnions 3.

At the front end of the base are bolted vertically two 12½" Angle Girders 4 and 5, which are bridged at their upper ends by 5½" Angle Girders. Two 9½" Angle Girders 6 and 7 are used to brace the Girders 4 and 5.

The saw frame consists of two 4½"×½" Double Angle Strips 8 joined at their ends by 2½" Strips. At their lower ends the Double Angle Strips are extended by 3½" Strips as shown. The saw, a 2½" Gear, is mounted on a Rod 9 journalled in the 3½" Strips and carrying also a 1" Pulley. The saw frame is suspended freely on a 6½" Rod 10 journalled in Architraves bolted to the upright 12½" Girders; and fixed to the Rod is a 1" Pulley 11 and a Sprocket 12. The Pulley 11 is connected by a Driving Band to the 1" Pulley on the Rod 9.

The driving mechanism is arranged as follows. A Rod 13 is journalled in a hole of the baseplate and in the 3" Strip bolted across the top of the gear-box. In assembling the parts care should be taken to ensure that the Rod 13 revolves quite freely. A Worm on this Rod engages a ½" Pinion on a horizontal Rod 14, which is mounted in the sides of the gear-box and carries on its rear end a 2½" Gear Wheel 15. On the upper end of Rod 13 is a Contrate, which meshes with a ½" Pinion on a Rod 16, which is journalled in the Trunnions 3. Rod 16 carries also a 1" Pulley and a 3" Sprocket. The Sprocket is connected by Chain to the Sprocket 12.

The 2½" Gear 15 drives the saw frame to and fro by means of a connecting Rod 17, one end of which is held in a Handrail Support pivoted freely to the Gear, while the other is held in a further Handrail Support pivoted freely to the lower end of the saw frame.

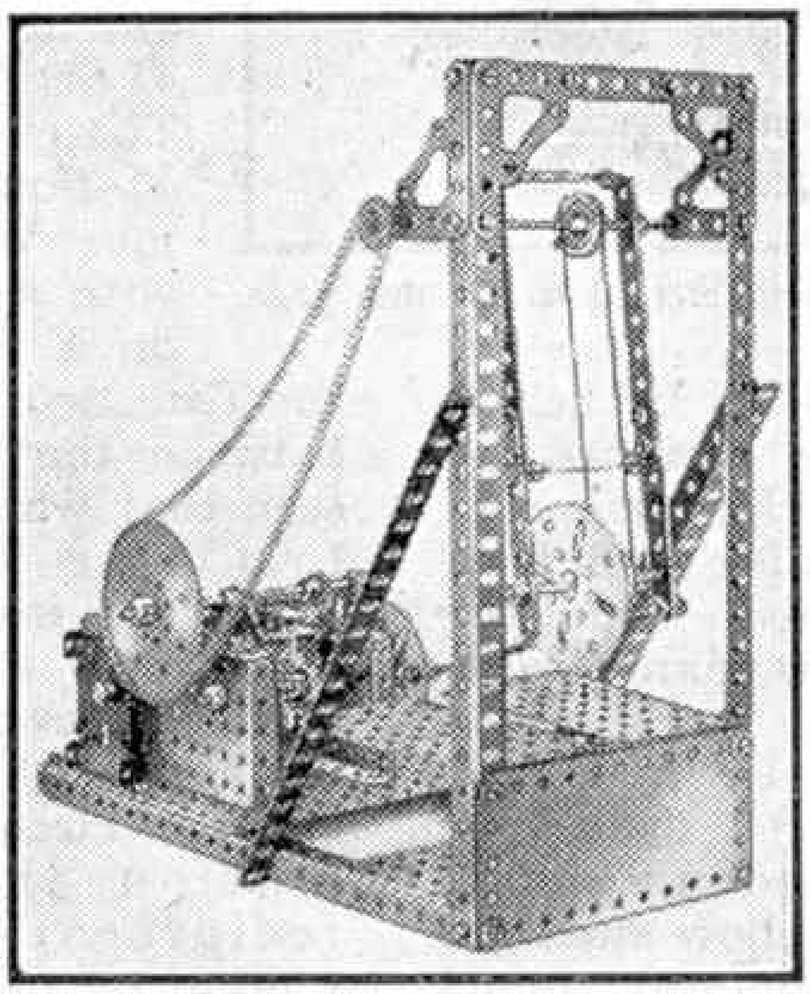


Fig. 1. An automatic sawing machine, driven by a Magic Motor.

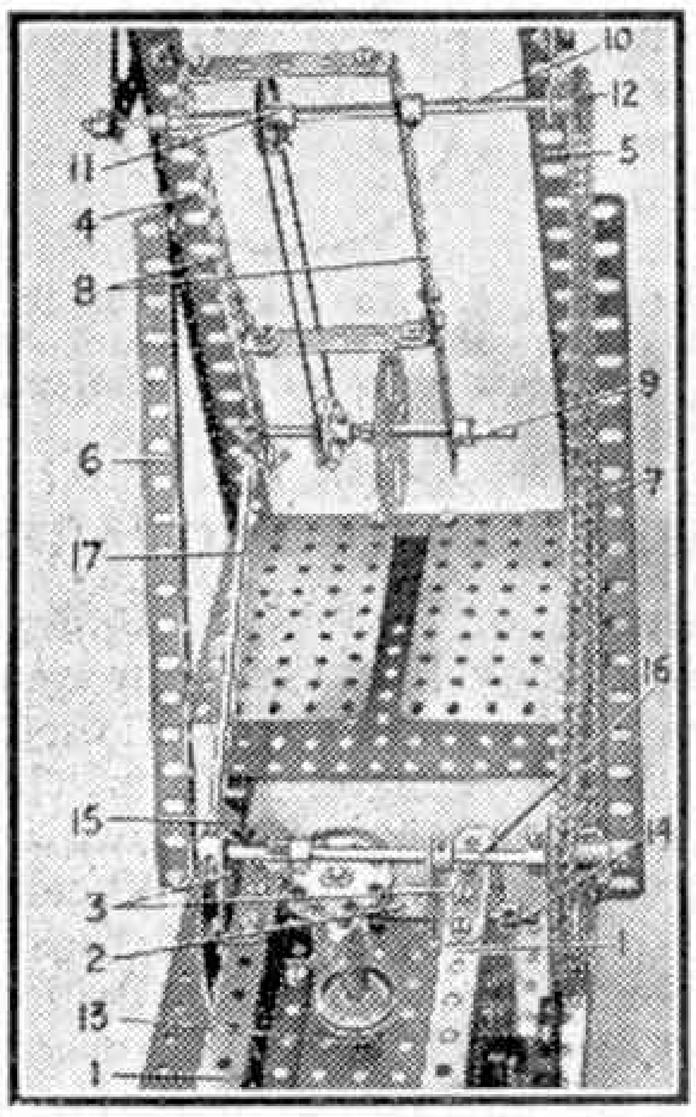


Fig. 2. A close up view of the sawing machine showing mechanism.

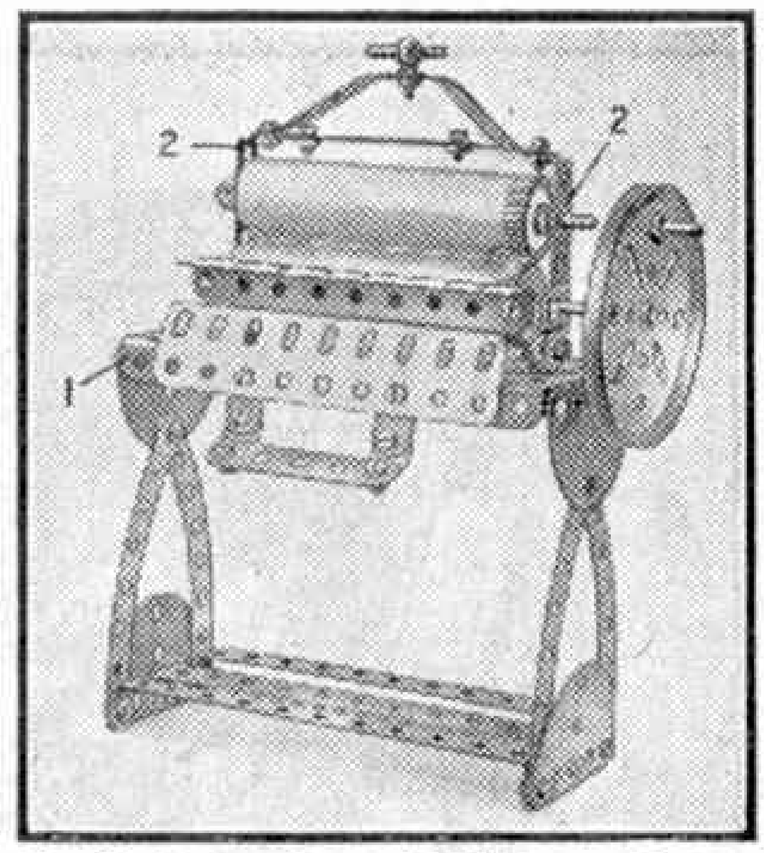


Fig. 3. A simple model clothes wringer.

The model is driven by a *Magic* Motor, which is bolted to one of the Flanged Plates of the gear-box. The pulley on the Motor shaft is connected by a Driving Band to the 1" Pulley on Rod 16.

Parts required to build model Automatic Saw:—2 of No, 3; 2 of No. 4; 4 of No. 8; 2 of No. 8A; 3 of No. 9; 2 of No. 14; 1 of No. 15a; 2 of No. 15b; 1 of No. 16; 3 of No. 22; 2 of No. 26; 2 of No. 27c; 1 of No. 28; 1 of No. 32; 52 of No. 37a; 50 of No. 37b; 2 of No. 48a; 2 of No. 48c; 2 of No. 52; 2 of No. 53a; 8 of No. 59; 1 of No. 94; 1 of No. 95b; 1 of No. 96a; 4 of No. 108; 2 of No. 126; 1 of No. 192.

CLOTHES WRINGER

Construction of the clothes wringer shown in Fig. 3 will be clear from the illustration. The bed of the machine is a 5½"×2½" Flanged Plate 1 and to this are bolted two 2½" Double Angle Strips 2 that form bearings for the rollers. The ends of the Double Angle Strips are joined by two 3" Strips overlapped.

The rollers are Wood Rollers and are mounted together with 1" Gears on Rods. The Rod of the lower roller is fitted with a 3" Pulley carrying a Threaded Pin that forms the handle. A splash board consisting of a 4½" Flat Girder is fitted to the front flange of the Flanged Plate.

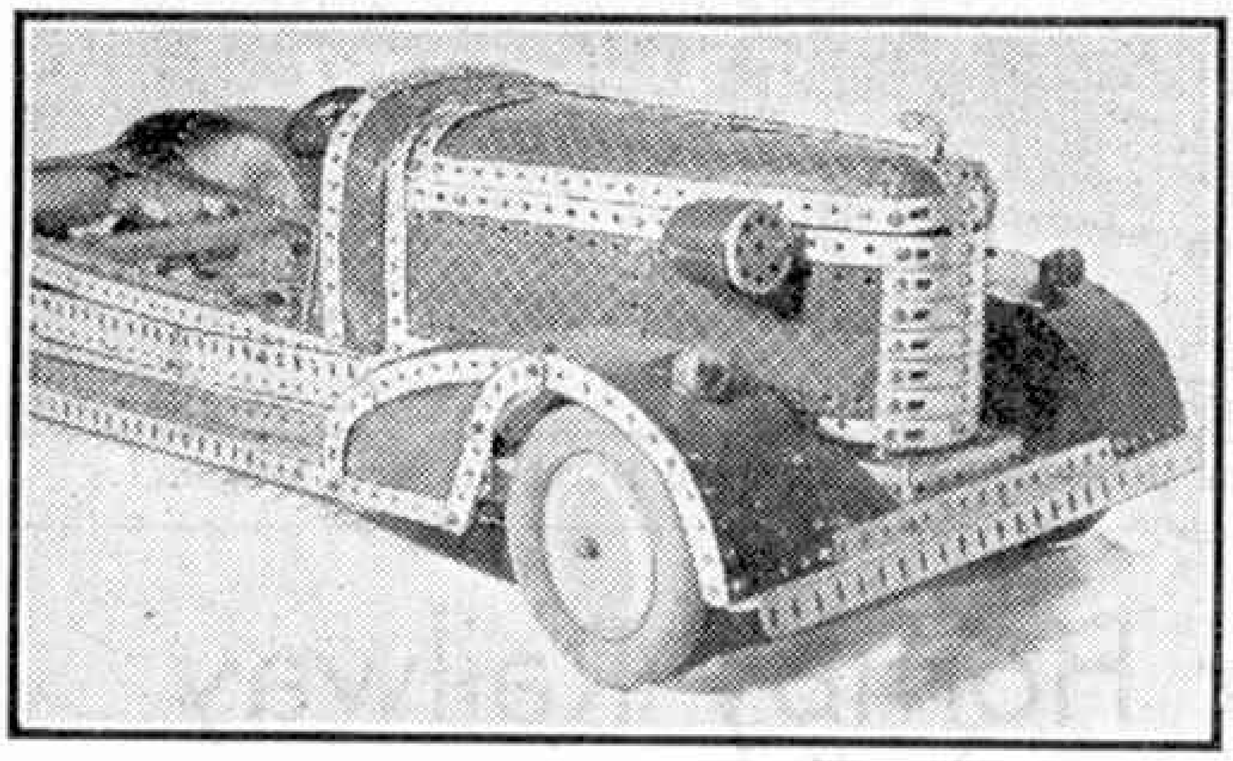
The model is fitted with a feeding-in table, which is hinged to allow it to be swung away from the lower roller to permit access for cleaning. The table consists of a 4½" Angle Girder, which is fitted with a Hinge at one end. The other half of the Hinge is bolted to a Flat Bracket fixed to the right-hand Double Angle Strip 2.

A dummy spring tensioning device for adjusting the pressure on the rollers, consists of two 2½" Strips, which are bent as shown and bolted to the upper ends of the 2½"×½" Double Angle Strips 2. At their inner ends these Strips are connected together by a Handrail Support, which carries a 1" Rod forming a handle.

Parts required to build model Clothes Wringer:—2 of No. 4; 1 of No. 5; 1 of No. 9a; 3 of No. 10; 2 of No. 12c; 1 of No. 14; 1 of No. 15; 1 of No. 18b; 1 of No. 19b; 2 of No. 3; 27 of No. 37a; 26 of No. 37b; 3 of No. 48d; 1 of No. 52; 4 of No. 59; 4 of No. 89b; 1 of No. 103c; 2 of No. 106; 1 of No. 114; 1 of No. 115; 1 of No. 136; 4 of No. 214.

Meccano Model-Building Competitions

By "Spanner"



The bonnet of the fine motor chassis built by G. P. Alcock, Hartford.

"Christmas" Contest Results

(HOME SECTION)

The prize-winners in the "Christmas" Model-building Competition (Home Section) are as follows:

First Prize, Cheque for £2/2/-; G. Alcock, Hartford; Second, Cheque for £1/1/-; R. P. Walford, Bovey Tracey; Third, Postal Order for 10/6, A. C. Langham, Southampton.

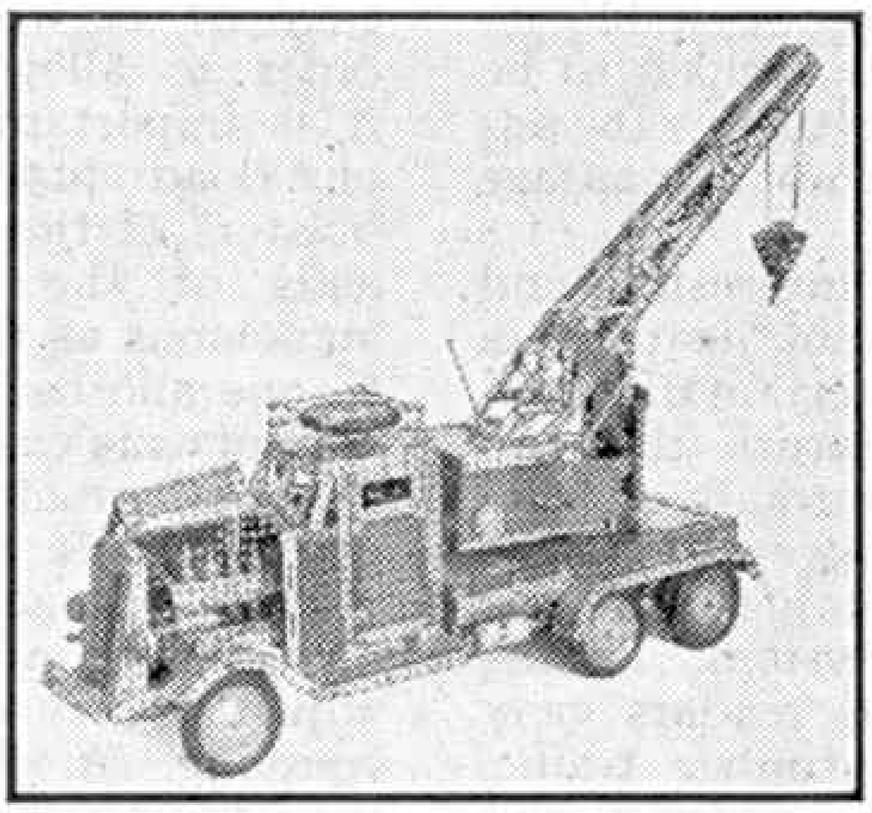
Consolation Prizes of 5/-: B. Pitkin, Luton; J. E. Matthews, Fillongley; L. A. Kirk, Nottingham; A. Reeve, Melton Mowbray; E. Hardy, Northwold.

A fine model motor chassis built by Gordon P. Alcock, Hartford, was awarded First Prize. This model is shown in two of the illustrations on this page, and possesses several interesting and novel features. The frontal appearance of the model and its modern type hinged bonnet are most pleasing.

The basis of the engine unit is a 20-volt Electric Motor, which is built up to represent an actual 4-cylinder engine. It is equipped with air cooling fan, dynamo and drive, exhaust manifold, carburettor, plugs and oil filter.

The gear-box and clutch layout is particularly neat, the gear-box providing 3 speeds, forward, neutral and reverse. It is operated through a change lever working in a "gate." Second Prize went to R. P. Walford, Bovey Tracey, whose entry consisted of a complete dragline cableway excavator. It is not possible to describe this model without the aid of adequate illustrations, which the space at my disposal prevents, but I can assure readers that it is most interesting and well built and well worthy of the high place awarded to it in this contest.

Third Prize was awarded for two fine model cranes constructed by A. C. Langham, Southampton. Unfortunately the photographs submitted were not suitable for reproduction.



A powerful mobile crane, mounted on a fully-detailed chassis. It was built by J. E. Matthews, Fillongley, and won a prize in a recent Contest.

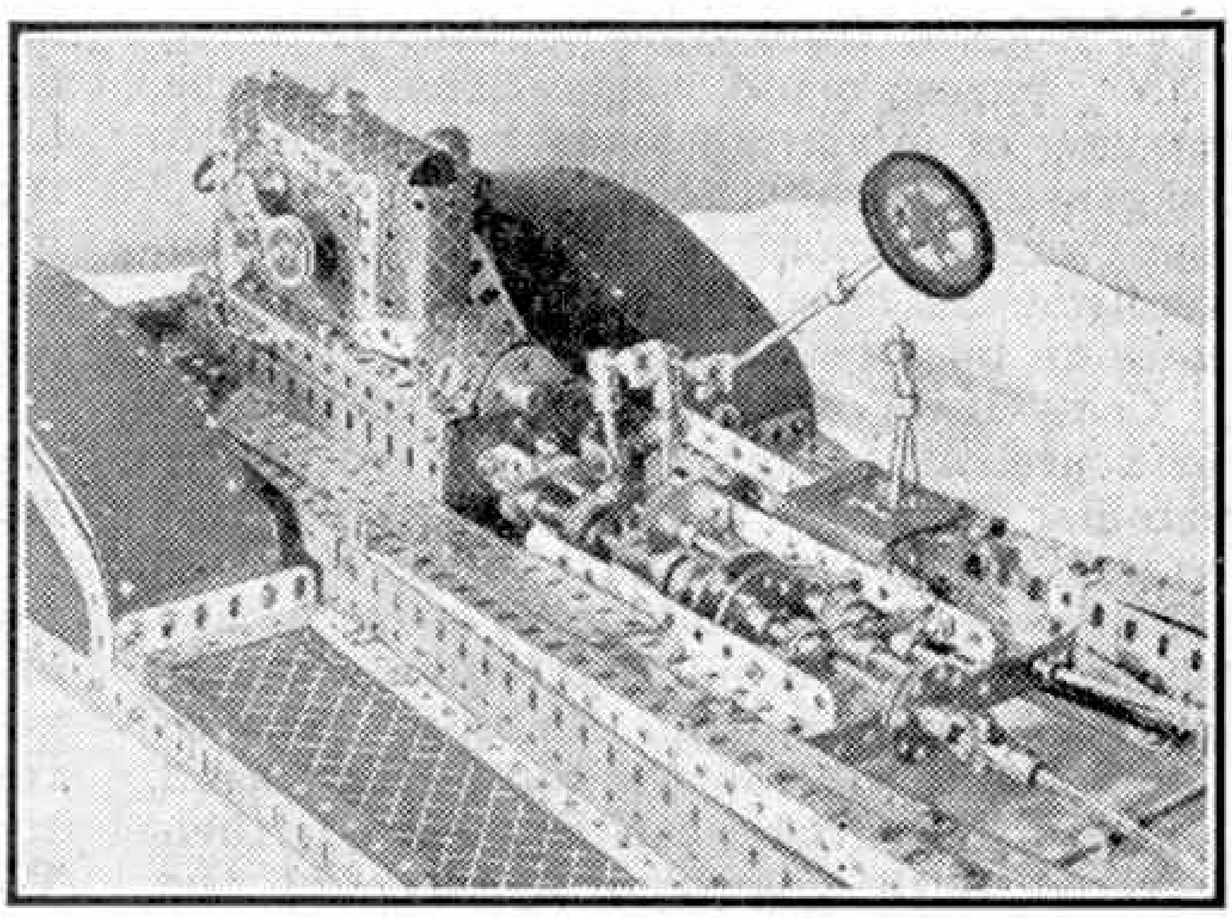
April "General" Model-Building Competition

In this competition prizes are offered for models of any kind built entirely from Meccano parts. All a competitor has to do is to think of a suitable subject, choosing one that is as new and original as possible, and then set to work to build it in Meccano. Any number of parts may be used, but all models submitted must be the competitor's own handiwork, both in design and construction.

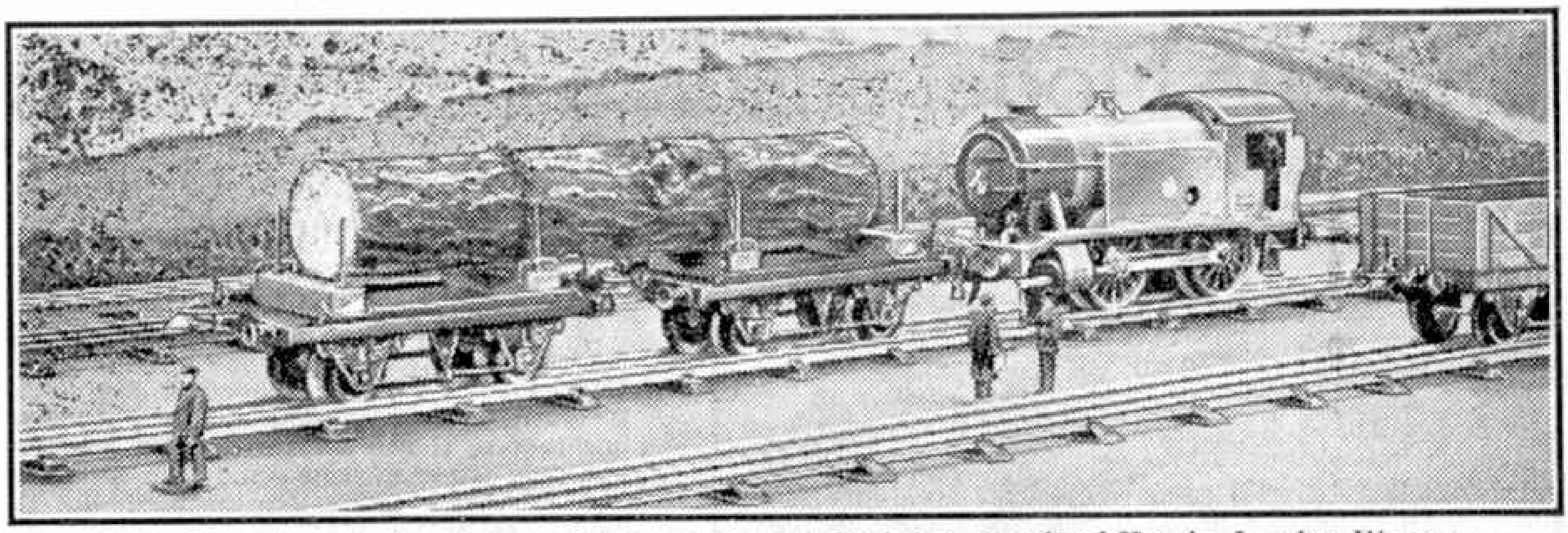
The competition will be divided into two Sections: (A) for readers of all ages living in the British Isles; (B) for readers of all ages living Overseas.

When the model is completed a photograph or a good sketch of it must be sent to *"April General Model-Building Contest,"* Meccano Ltd., Binns Road, Liverpool 13. More than one model may be submitted, but no competitor may win more than one prize. The competitor's age, name and address must be written on the back of each photograph or drawing submitted, together with the name of the competition and letter A or B indicating the Section for which the entry is eligible. It should be clearly understood that actual models must not be sent.

Prizes will be awarded in each Section of the competition as follows: First, Cheque for £2/2/-; Second, Cheque for £1/1/-; Third, Postal Order for 10/6. There will also be a number of consolation awards and Certificates of Merit. Readers living in the British Isles must forward their entries before 30th May. The closing date for Section B is 30th September next.



The engine unit and gear-box of G. P. Alcock's prize-winning motor chassis.



A goods yard scene showing a miniature tree trunk loaded on a pair of Hornby Lumber Wagons.

Fun With Your Hornby Railway

Logs and Other Loads

WE have from time to time in these pages made suggestions for the making of miniature loads for the freight wagons of Hornby goods trains. To have our wagons more or less empty is not realistic, as it suggests that the railway does no business at all!

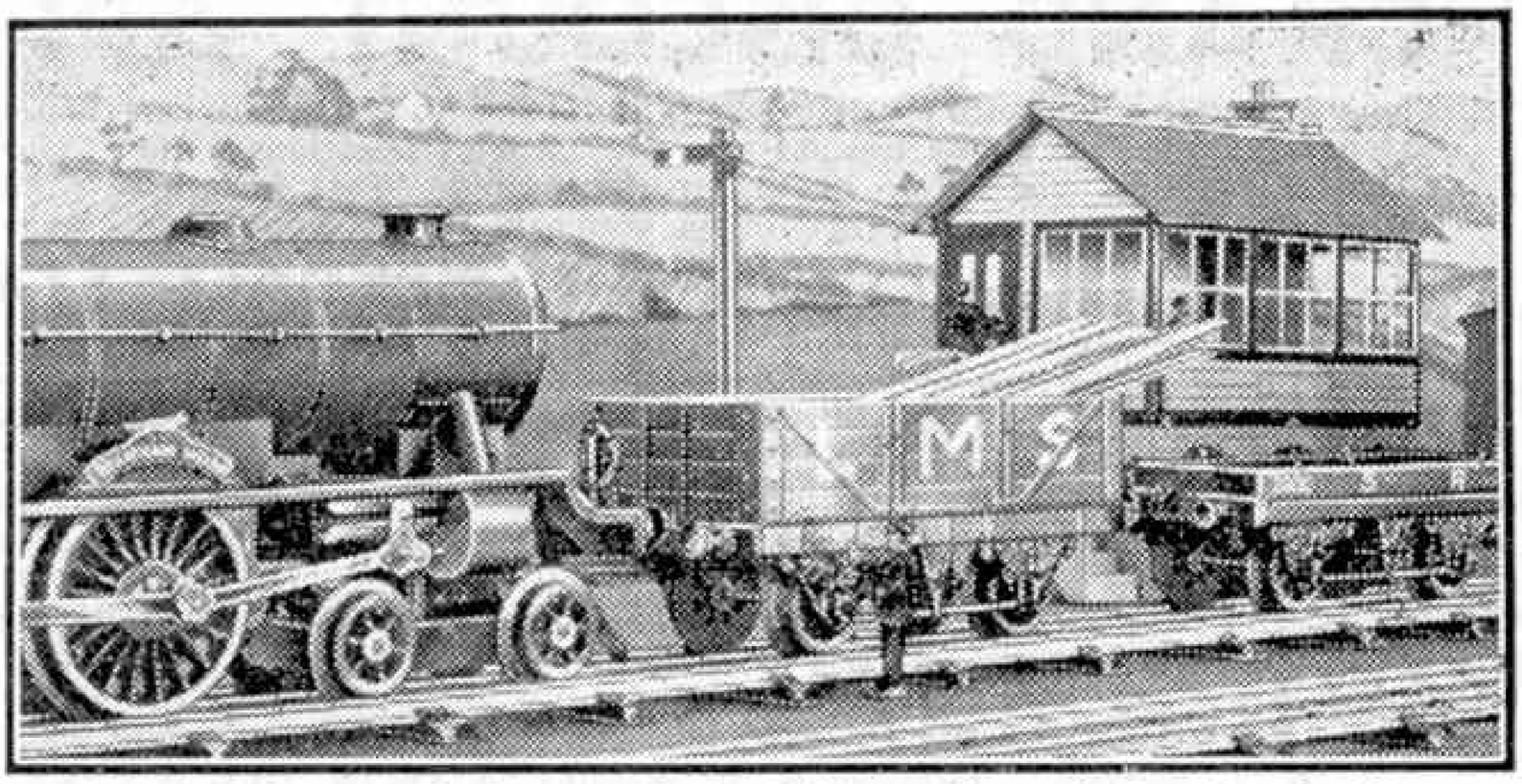
Coal—if we can get it—sand and poultry grit are all suitable for use with the familiar "false bottom" method of providing loads for ordinary open wagons. This involves the making of a cardboard shape like a box lid that will fit neatly into the open wagon. Its upper surface should be just below the top of the wagon sides. This surface can be painted, then covered with glue and a layer of the selected "load" spread over it. Any loose material should be shaken off when the glue is set. Loads made in this way are clean to handle and are not liable to cause a mess if the wagons happen to be derailed and possibly overturn. In addition they have the important advantage of being light in weight.

Of other loads timber is interesting and its carriage is an important feature in real practice, especially in certain districts. When reproduced in miniature this can be quite attractive, and normally special Lumber and Timber wagons for the purpose provided with suitable loads are available in the Hornby System. At the present time, while some readers may have suitable wagons for timber traffic, many others have not. In addition not many of these wagons will still be carrying their original loads! So it is necessary to make do with whatever vehicles we have and it is not difficult to provide miniature loads. Lengths cut from branches of bushes or small trees can be used to represent miniature tree trunks. It is important, however, first to obtain permission to do the necessary woodcutting otherwise there is sure to be trouble!

Two of the accompanying photographs show miniature logs of this kind, which represent to scale quite considerable tree butts. Either of these can be carried on the bogie-fitted Timber or Lumber Wagon of the No. 2 pattern, but where these are not available another means for their transport has to be found. As an alternative we can use a pair of No. 1 Lumber Wagons. These are coupled together and our miniature tree trunk is supported on the bolsters provided for carrying the load. Our miniature tree should be a nice easy fit between the stanchions and in order to allow curves to be negotiated it is important to see that the ends of our load just barely reach the outer bolsters of the pair of wagons. Then the ends of the log will clear the outer stanchions as the vehicles move relatively to one another when rounding a curve.

Miniature chains can be used for securing the load or alternatively "rope" lashings can be made from string if we have no chain. In actual practice chains are almost invariably employed, and they are adjusted very often by means of a screw coupling. A small-size paper clip can be used to represent this.

If we have no Timber or Lumber Wagons at all it is still possible for us to deal with this kind of traffic provided we have a



Miniature timbers made from spills loaded over the end of a Hornby Wagon. Owing to the projection of the load a Flat Truck is used as a runner wagon.

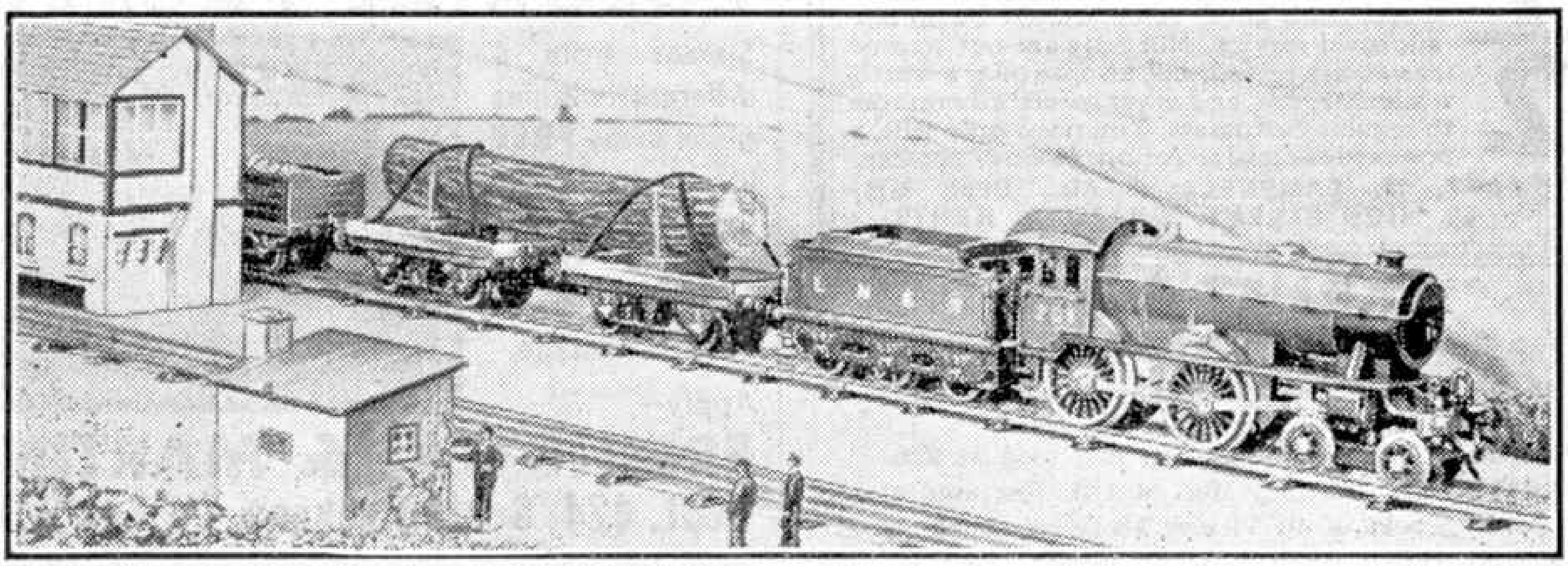
couple of the standard Flat Trucks. A pair of these can be used and they can be adapted to run as a twin timber unit of the kind familiar on full-size railways. Each wagon requires a cross member or bolster. These can be made from a strip of wood about ½ in. square in section, each cut to such a length that it is not tightly held between the two sides of the vehicle. To keep the load in place we require stanchions and these can be imitated by thin nails or lengths of wire fitted into holes near to the bolster ends. Each wagon has one of these bolsters placed centrally.

The log should be lightly secured as before and the wire loops or eyes that are fitted to the sides of the Flat Truck are useful in providing points of attachment for the securing chains. If the log is a good fit between the stanchions it will remain nicely in place in spite of any "rough shunts," although strictly speaking special care should be taken when bulky loads such as this are being moved as is done in actual practice. The loaded unit will be quite flexible enough for 2 ft. radius curves as long as the bolsters are not made a tight fit between the wagon sides.

Poles of moderate length and sawn timbers may sometimes be seen carried in open wagons. It is often necessary to leave part of the load projecting over the end of the vehicle, and in this case the precaution is taken of running an additional "runner" wagon coupled to that which is carrying the load. This ensures that in the event of any disturbance of the load the projecting ends of the timbers will not tend to cause any damage. Quite frequently timber carried in this way is sheeted over with a wagon tarpaulin so that those whose miniature railway equipment still includes one of these handy little accessories can imitate this practice.

For the timbers themselves a handful of wooden "spills" is recommended. These are fairly easily obtainable and provided that the coloured ones are not used they look quite natural. They are light in weight too, which is another point in their favour. Spills as bought, or "borrowed" from the household stock, will probably need cutting shorter to suit the length of the wagon in which they are to travel.

As an alternative, strips of fairly thick card can be cut to the length and width required to represent planks. These can be painted or not according to the type and colour of the card used. Cutting should be done with a sharp penknife or a razor blade, not with scissors.



Two Flat Trucks adapted as described in this article are used to carry the realistic load forming part of this train.

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For other Stamp Advertisements see also pages 168 and vii.

Stamp Collecting

Sailing Ships on Stamps

By F. Riley, B.Sc.

SAILING vessels on stamps are both numerous and varied in type, and there would be little difficulty in compiling a really attractive and representative collection at comparatively little cost. The examples vary from small native vessels in great variety to a fully rigged sailing ship. The stamps themselves come from countries in almost all parts of the world, so that the collection has interest, not only as a record of sailing vessels, but also because it gives vivid glimpses of life in different countries. Great Britain of course cannot figure in our collection, but fortunately the British Empire makes a very strong contribution to it.

The collection might well begin with representations on stamps of native sailing craft of all kinds. For instance, we may make a start with Nile boats, with their triangular sails, on Egyptian stamps of 1914, and it is interesting to find on other Egyptian stamps, a series of three issued in 1926, a picture of an Egyptian sailing ship of ancient times.

The three-cornered lateen sail of the Nile boats is characteristic of many sailing vessels of the Middle East. The best known example on stamps is seen on each value of Aden's first issue, in 1937. This series of 12 stamps shows the native dhow of Adenese waters. We find the same triangular sail on dhows sailing the Indian Ocean farther south, featured on the stamps of the Mozambique Company, and on Lake Victoria, pictured on the stamps of Kenya, Uganda and Tanganyika, in the issue of 1935-36. The last-named stamps are in two colours, and are very attractive indeed. Similar native craft ply on Lake Nyassa, and we find them again as far east as North Borneo, where a Malay dhow figures on the 8c. stamp of 1894 and again on the same value in the issue of 1897.

Further examples of native vessels that could well be included in our collection come from China, the home of the junk, the strange-looking but very efficient vessel that plies in Chinese waters. The first appearance of a junk on a Chinese stamp came with the issue of 1913, the 10 lowest values of which show a typical junk. The design was repeated, after redrawing, eight years or more later. Indo-China, a country that is very prominent in the news these days, also provides us with a junk picture on the lowest values of the issue of 1931-38; and in the Philippine Islands, also in the Far East, a very interesting stamp shows us native craft used by pearl fishers. Besides illustrating the small sailing vessels used, the design of this stamp gives a glimpse of the pearl fishers themselves, bringing up shell from the bottom of the ocean. This stamp is the 8c. violet in the 1935 issue.

Returning to the Mediterranean, we can find splendid stamps for our collection in the issues of Malta. A Gozo fishing boat is seen on the 4½d. stamp in the 1899 issue, and the companion stamp, of 5d. value, shows an ancient Maltese galley with a Maltese flag. Both these stamps undoubtedly must figure in our sailing vessel collection, and if possible we should include the 2/6 value of the 1926-27 issue, a very fine example in black and vermilion, again showing a Gozo fishing boat. This stamp is a little expensive, but it is too good to be omitted if it can be obtained.

Now let us look around for larger vessels. A good place with which to make a start in this is Newfoundland. As would be expected of this country, which has great interests in the fishing and sealing industries, ships are well represented on its stamps, and with one exception the examples are all sailing vessels. A fine schooner was pictured as long ago as 1866, and this was followed by an Atlantic brigantine 21 years later. In 1897 came a stamp, 8c. in value, illustrating the fishing dories characteristic of Newfoundland fishing.

The sealing and fishing fleets of Newfoundland were illustrated on 25c. and 30c. stamps of the issue of 1932, and fishing smacks are the principal features of the design of the 60c. value of 1933.

The neighbouring French colony of St. Pierre and Miquelon has provided interesting fishing boat stamps in the 1f. 10, 1f. 50 and 3f. values of 1922. The three lowest values in this series depict a typical fisherman of the islands, which lie to the south of Newfoundland. Canada also has turned her attention to fishing vessels in her stamp designs; the 50c. of 1925 illustrates the fishing smack "*Bluenose.*"

Of other New World examples of sailing vessels on stamps the most interesting are those of Bermuda and Jamaica. From Bermuda in 1910-19 came an entire series of 15 stamps, ranging in value from 1½d. to 1/-, illustrating an old-time sailing vessel, and this re-appeared in smaller form on a series of nine stamps issued in 1920-21. Other stamps from Bermuda show the harbour of Hamilton, the capital, with shipping in it, and there is a fine representation of a yacht on the 2d. value of 1936. From Jamaica we get a really handsome stamp showing Port Royal, the great harbour of the island, in 1855, full of shipping, but the vessels all have their sails furled.

From the West Indies we can travel right round to the Pacific for our next example, which takes the form of a fully rigged sailing ship. This appears on the three highest values of a series of stamps issued in New Caledonia, the French colony east of Australia, in 1906-7. There is another New Caledonian issue with a sailing ship design in it. This was used on the highest values, a very long series, of the issue of 1928-40, and the design also carries portraits of La Perouse and De Bougainville, famous French navigators and explorers of the 18th century, who made long voyages of discovery in the Pacific Ocean.

This brings us to the close of our brief survey of sailing vessels on stamps. Not all that are available have been mentioned, owing to lack of space, but sufficient has been said to show how extensive and attractive this part of our ship collection can be made. Next month steamships on stamps will complete the story.

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For other Stamp Advertisements see also pages 166 and vii.

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

"VICTORY" stamps still hold the field among British collectors, and of course colonial stamps are the ones most in fashion. By common consent those of Australia are considered the best up to the present, but if advance illustrations are anything to go by the forthcoming New Zealand set will be considered the most beautiful. Soon after these words appear the latter set will be issued, and we hope to illustrate one or two of them later.

The Australian set consists of three values, two of which we are illustrating. They have been printed in Australia, by the line engraved process and strangely enough, for they are not unattractive, Australian collectors have had some very pungent things to say about them.

Collectors would be interested in the news that Great Britain is to have one victory stamp for certain, and according to the Postmaster General two "if there is time." Well, Well.

We are illustrating a stamp emitted a few months ago in its present colours by South Africa. Just study the stamp, and note the part of the building between the two towers. Would you say it was convex or concave? Actually the centre of the building is convex, but it seems to vary every time one looks at the stamp, and an indignant collector has written to the authorities complaining that the stamp gives the wrong impression. Do you agree?

It would hardly be a record of new stamps, if we didn't have one from the U.S.A. to illustrate. This month we are able to show the 4th and last of the series issued in honour of the late President Roosevelt. The colour is light blue, too light to show up well a rather attractive design, but it is a stamp that will be much sought after by collectors. As a matter of fact, even in our own country U.S.A. commemorative stamps are probably more popular than any others which are emitted either at home or abroad, and this is due entirely to the fact that the stamps in question are attractive and cheap. The U.S.A. Post Office, by providing what is wanted, makes hundreds of dollars profit, and collectors all over the world get something they really like. And yet there are still people in official circles who are allowed to go on preventing our own Post Office doing likewise.

Recently one of the stamp papers printed a paragraph from one of its regular contributors to the effect that startling changes in current colonial stamps were perhaps to be expected in the near future. Of course such a statement caused a good deal of comment and collectors wondered what was in the wind. Well, a little bird has whispered that the King's portrait on colonial stamps is to be changed. The portrait used on recently issued stamps does differ a good deal from that used at the beginning, but whether the early stamps will be changed remains to be seen. Just in case, it might pay collectors to fill up what gaps they can.

The Crown Agents advise that the old set of Brunei to the 1 dollar is to be used, with changed colours for the 2c. orange, 6c. grey, 8c. red, and a new value 15c. blue, "as soon as practicable after the restoration of the Civil Administration in that Territory." The new colours were being prepared before Brunei was overrun, but they were never placed on sale and as few collectors have the rest of the set, not much harm will be done by placing the set on sale again. It will be surprising if this Brunei set does not prove a best seller.

What is turning out to be one of the most interesting sets issued for a long time is the new set for Falkland Dependencies, which was mentioned last month. There are eight stamps in the set, and they have been printed by Messrs. de la Rue, the frames by recess and the centres by lithography. No frame varieties have been found, but several interesting ones exist in the map. The stamp illustrated here shows a break in the circle, latitude 80. This appears six times on the sheet—Nos. 4, 9, 24, 29, 44 and 49—owing to the fact that the litho plate of 60 stamps has been made with six repetitions of the die, which consisted of two rows of five stamps. Another variety shows an extra island in the top left hand corner of the map. This exists on No. 29 of plate 1. Stamp No. 2 of the same plate, shows the "I" of Shetland Is. missing. There are other small varieties, and altogether the dot and dash devotees are able to have a royal time with this set.

And now for the monthly tip. We have been forestalled by Gibbons' with the stamp we intended to mention. That was No. 180 of Australia, 3d. blue perf. 15 x 14. The catalogue lists this stamp at 6d. mint. It is well worth a dozen times that sum—it is common enough used—but the mint price has now been raised to 8/6, so the secret is out. In compensation No. 152 of Bahamas, the 2d. grey George VI issue, can be tipped. This is catalogued 2/6 mint and 3/- used, but is actually cheap at three times the price. Just watch it rise.

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.

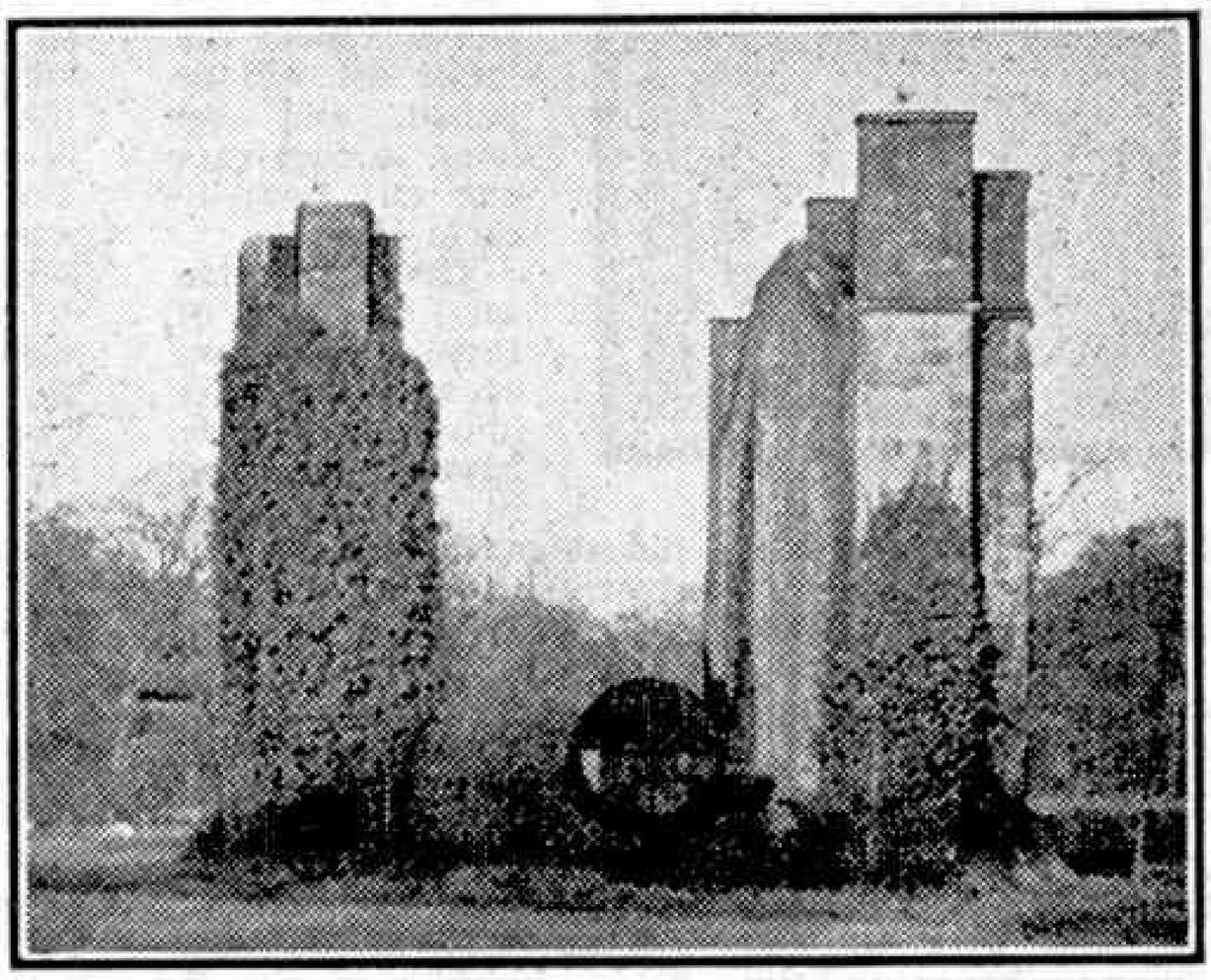
THE ROSSE TELESCOPE

The Rosse telescope to-day presents a sad contrast to its appearance when, as the largest telescope in the world, it made the Irish midland town of Birr an important centre of astronomical interest.

The telescope was erected by the 3rd Earl of Rosse in the demesne of Birr Castle, and was completed in 1842. All the work was done in the Castle workshop by local artisans under the personal supervision of the Earl. The instrument was a reflector and its colossal mirror or speculum, which was 6 ft. in diameter, weighed 4 tons. It was composed of an alloy of tin and copper. The tube which housed it was correspondingly immense, with a length of 56 ft. and a diameter of 7 ft. It had an interesting and ingenious device to counteract the movement of our planet, and an automatic arrangement to move the observer and so allow him to continue his investigations undisturbed. These features were unique at the time when the telescope was erected.

For well over half a century Lord Rosse's instrument retained its proud position, but after the 1914–18 war it fell into disuse. The machinery and fittings were removed, while the mirror was sent to the Kensington Museum, London. To-day all that remains to tell of its former glory are the tall, ivy covered walls that supported the structure, and the long tube, which lies between them. Shrubs and weeds grow on it and around it and it presents a picture of desolation.

G. V. Oakley (Birr).



All that remains of the Rosse telescope, once the largest in the world. Photograph by G. V. Oakley, Birr, Eire.

ROCK CLIMBING IN LAKELAND

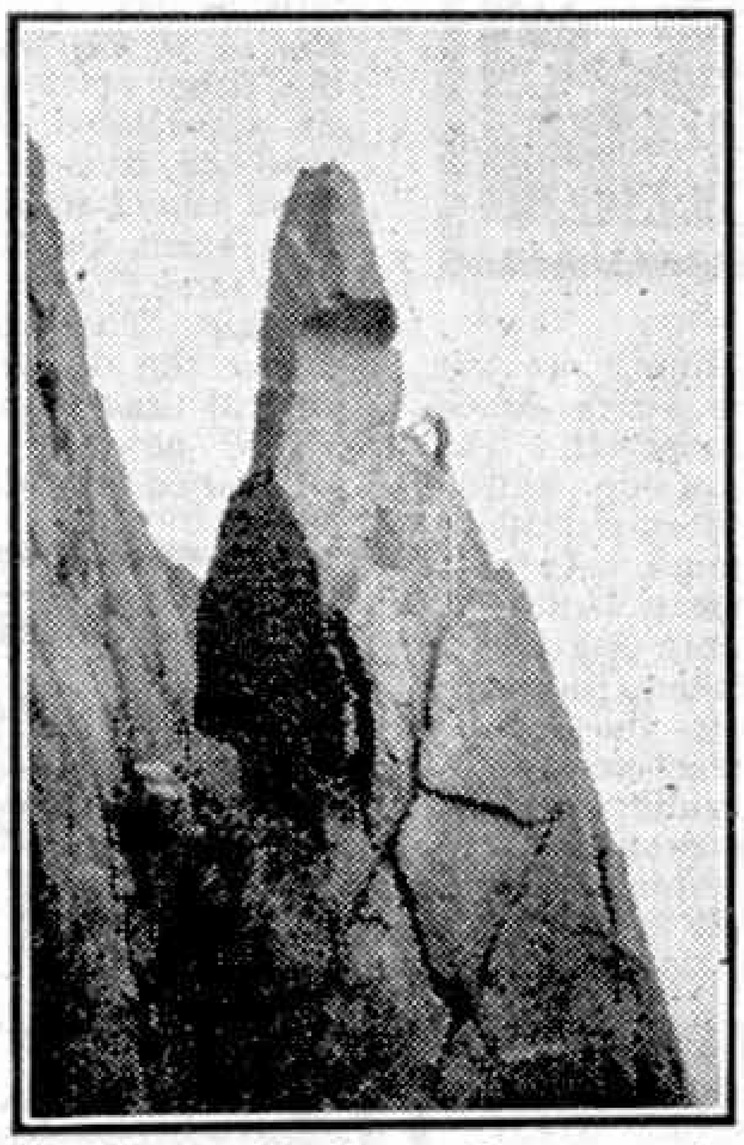
The Lake District affords plenty of opportunity for the rock climber. In it the best centre for this sport is Wasdale, where the climber has Scafell, Pillar Rock and Great Gable within easy reach.

Napes Needle, on Great Gable, which is seen in the accompanying illustration, is one of the favourite climbs and scores of climbers ascend it each year. It was first climbed in 1886 by W. P. Haskitt-Smith, and its photograph has done much to popularise English climbing. In fact it was an enlargement of it in a London shop which induced O. G. Jones to visit Lakeland and write his book *"Rock Climbing in the English Lake District."*

The climb as it is to-day is more difficult than it was when first discovered, owing to the fact that important foot holds have been worn away with the scrapings of countless climbing boots. To prevent further wearing away of the holds climbers are asked to ascend in "rubbers," and not in standard nailed boots.

More evidence of the rock's popularity with the climber are the polished sides of the Wasdale Crack. These are due to the rubbings of innumerable tweeds and other clothing. This crack is the one just below the climber seen in the photograph, and its smoothness is shown by the lighter colour of the rock.

The old saying that "two's company, three's a crowd" aptly fits the situation when on the summit of the "Needle." Four persons have been known to be on the summit at one time, however, and the top boulder is said to tilt considerably with such a party on it.



The Napes Needle, a famous rock climb in the Lake District. Photograph by A. Kirk, Blackburn.

The shape of the "Needle" is so striking that its photograph is said to have been sold in Chamounix, at the foot of Mont Blanc, as the Auguille de Nuquel

A. Kirk (Blackburn).

A PIONEER LOCOMOTIVE

Outside the Otago Early Settlers' Museum is the *"Josephine,"* one of the first locomotives to operate in New Zealand. It was built by the Vulcan Foundry Ltd., Newton-le-Willows, Lancashire, and arrived in New Zealand on 5th August 1872. After service on the Dunedin-Port Chalmers line it was used by the Public Works Department. Eventually it was sold to be scrapped, but it was saved from this fate, and in 1926 was placed in the South Seas Exhibition alongside later locomotive creations. Afterwards it was moved to its present position.

The *"Josephine"* is a Fairlie engine, with a boiler at each end and a cab in the centre. For some years its cab was the Mecca of amateur drivers, but eventually it was closed to avoid damage.

G. Ditchfield (Dunedin, N.Z.).

Competitions! Open To All Readers

A Locomotive Cross-Number Puzzle

CLUES ACROSS

1. A Highland "Royal Scot"
5. Stood down, disbanded
9. A British King
11. S.R. oldest class
12. Has famous "Castle"
14. I.O.W. engine
15. Novel in name
16. Surrey town
17. On Whom the Bell Tolls!
18. Of "Paradise Lost"
19. Founder of Pennsylvania
21. Sea bird
22. English county
24. Competitor
27. Famous Admiral
29. Supply corps for Army
31. A little grey shaggy dog
35. Brisbane's state
37. Long-legged bird, not L.N.E.R.
39. A Yorkshire Hunt
40. Army Co-operation Aeroplane
41. Large expanse of water
43. Beheaded Monarch
44. "Forthampton Grange"
45. "Chesford Grange"
47. Ulster regiment
48. Both good plugs
51. For ex-soldiers
52. Most famous blue engine
56. "Faendre Hall"
58. "Sir Lionel"
59. Argyllshire clan
60. World's greatest city, but not streamlined
61. West Country County Town
62. Norman city
63. Eastern shipping line

CLUES DOWN

2. A1. at Lloyd's
3. An N.B. "Sentinel"
4. "Croagh Patrick" plus eight
6. Military School of Music
7. Chief of "Shaef"
8. County sign
9. Field game
10. The second "Springbok"
13. Famous for building stone
15. "Plowden Hall"
16. Northern Irish river
20. Australian Island state
23. Famous liner, torpedoed
25. Scott character
26. I.O.W. town
28. Plate battle destroyer
30. I.O.W. Castle
32. Deer locomotive family name
33. "Wipers!"
34. "Without a name and doesn't puff"
35. Canadian Rockies
36. "Llanthony Abbey"
38. K.C., but not King's Counsel
41. Leader at Jutland
42. S.R. No. 102 Plus Manor
43. The Mountain "Madigan"
46. Largest of "Our Dear Islands"
49. A "King Arthur" Queen
50. Cromwellian trooper
52. Arthurian wizard
53. "Sir Sagramore"
54. "Sir Balan"
55. Famous Architect with nothing in front
56. Three figures of "Isinglass"
57. County town of Salop
59. Famous portrait painter

Here is a locomotive cross-number puzzle, the work of one of our readers, R. H. Cropper of Dewsbury. The clues indicate the name or class of the engine concerned, but it is the corresponding number that fits in the appropriate squares in the crossword. Thus the clue 1 across points to "H.L.I.," the L.M.S. "Royal Scot" with the number 6121, and it is this number that is placed in the four squares covered by the clue.

There are two sections to the competition, for Home and Overseas readers respectively, and in each prizes of 21/-, 15/- and 10/6, together with consolation prizes, will be awarded for the best solutions. In the event of a tie for any of the prizes neatness and novelty will be taken into consideration. Entries should be addressed "*April Locomotive Puzzle, Meccano Magazine, Binns Road, Liverpool 13.*" Closing dates: Home Section, 31st May; Overseas Section, 30th November 1946. *The diagram on this page must NOT be cut out. Make a copy of it for your entry.*

Transport Aircraft Drawings

For our second puzzle this month we are continuing our series of transport drawing contests. What is wanted in this contest is a drawing of some form of transport aeroplane, as distinct from fighter or bomber aircraft, and if they wish, entrants can draw transport aeroplanes of the past or those of the future.

This competition should be as popular as previous drawing contests in the transport series. Two months is allowed for the completion of entries in the Home Section, which should be forwarded to "*Aircraft Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13,*" not later than 31st May. In the Overseas Section the closing date will be 30th November, and in each section there will be the usual prizes of 21/-, 15/- and 10/6, for the best entries in order of merit. Consolation prizes will be given for other good efforts.

April Photographic Contest

This month's photographic contest is the 4th of our 1946 series, and in it, as usual, prizes are offered for the best photograph of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of each print must be stated exactly what the photograph represents. A fancy title may be added if the entrant desires.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed: "*April Photo. Contest, Meccano Magazine, Binns Road, Liverpool 13.*" There will be separate sections for Overseas readers.

In each section prizes of 15/- and 7/6 will be awarded. Closing dates: Home Section, 30th April; Overseas Section, 31st October.

The French Aircraft Industry—

(*Continued from page 136*)

"*M.M.*" of January last. It is an all-metal two-seater, with a tricycle undercarriage, and powered by a 140 h.p. Renault 4 P engine. It is stated to be very manœuvrable, and the all-round view from the cockpit is excellent. The same company have also built a number of autogyros for the French Post Office, but when this contract is completed no more will be made, as the design is considered to be out of date.

That spirit is now prevalent throughout the French aircraft industry. It was inevitable that four years of "go-slow" policy and design work under the worst possible conditions should have hampered the development of French aircraft. But everyone is working with new vigour and determination now that the Germans and the collaborationists have been dealt with, and they feel sure that their new designs will include some world-beaters. They probably will, if enthusiasm and ingenuity are sufficient to overcome all the difficulties that are the inevitable aftermath of total war.

How Railway Rails are Made—

(*Continued from page 147*)

from easy to renew the permanent way. Renewals must of necessity be made when traffic is suspended, which is usually during the early hours of the morning. On some railways, however, where traffic is heavy and frequent, even this is not always possible, and the work can only be done on Sunday mornings during a short period between the stopping of the last train on Saturday night and the starting of the first train of the ordinary Sunday morning service. The work is not, therefore, carried out under the best conditions and being necessarily hurried, much has to be done in a short time, and costs more. Hence it is vital that the layout shall fit when it is delivered to the site, or great expense and waste of time and labour will result.

The first cost of manganese steel rails as compared with ordinary steel rails is high, but their exceptional strength, resistance to abrasive wear, and consequent long life, with all the saving arising from there being no need to keep renewing them—renewals being in themselves a most costly item in the upkeep of the railway track—make them by far the more economical in the long run.

Sometimes rails have to be laid down in tunnels of considerable length, and on occasion the question arises whether there will be much corrosion as a result of drippings of water from the tunnel roof. In such cases it is not uncommon for rails to be tested for corrosion by hanging them in a tunnel and leaving them for a long period. The rails are usually chosen at random from stock, and regularly they are taken up and weighed to see just how much weight they have lost as a result of corrosion. In one such test, manganese steel rails lost in a period of 2½ years only about 1 lb. as compared with 5 lb. 4 oz., lost by rails of ordinary carbon steel.

As an example of the length of time a set of manganese steel rails will last, it may be mentioned that on one of London's underground railway systems a particular layout had to take an average number of 998 trains a day. When made in carbon steel rails this layout had to be completely renewed every three to six months. When manganese steel was substituted, the same layout lasted seventeen years and one month!

Extremely intricate mathematical calculations have to be made by the expert engineers when designing these complicated switches and crossings, and their calculations all have to be expressed ultimately as detailed working drawings made by skilled draughtsmen.

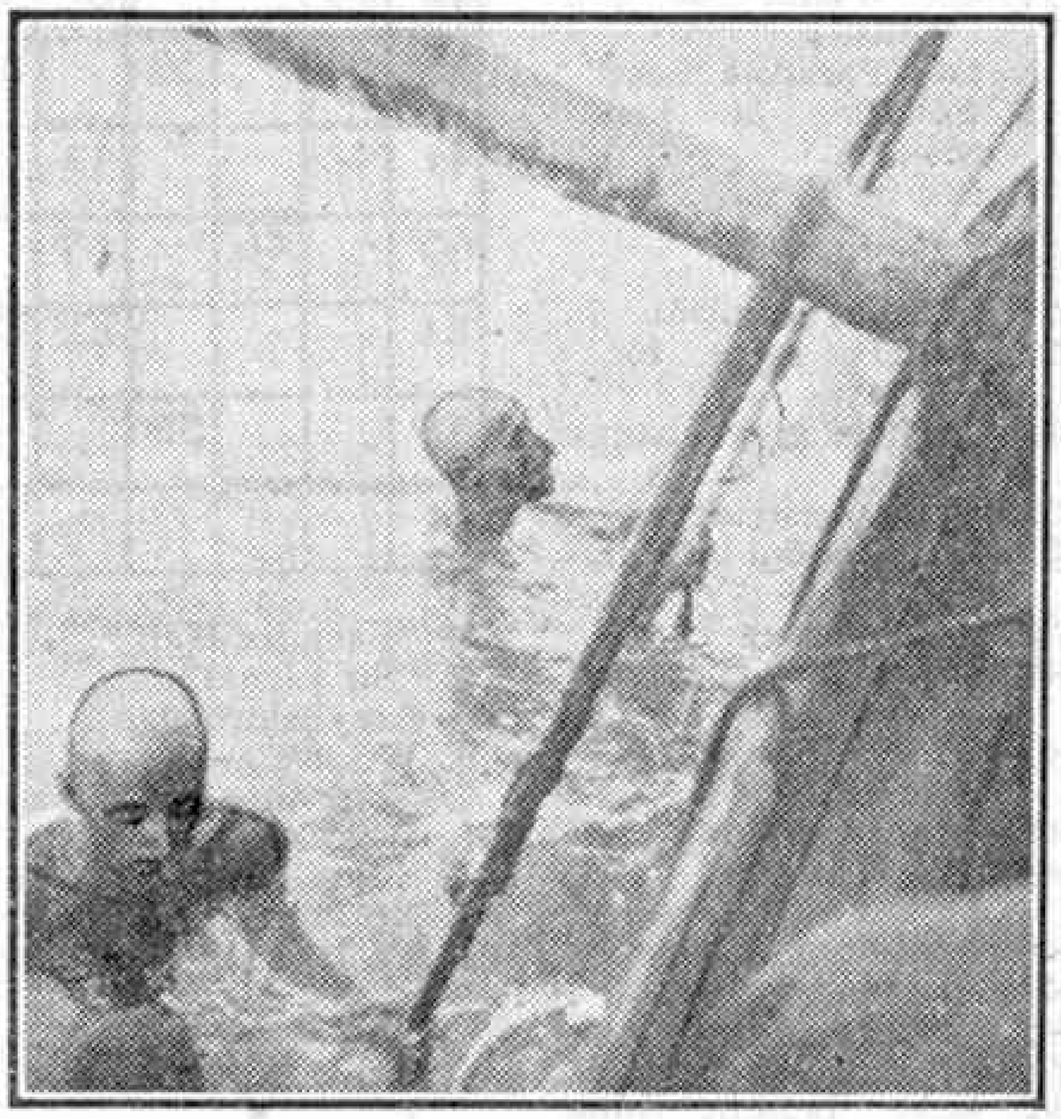
"M.M.s" December 1934 to April 1942, good condition; also "B.O.P.s" March 1937 to December 1945, good condition. What offers?—Green, 25, Neville Avenue, Anchorsholme, Blackpool.

COMPETITION RESULTS

HOME

October "Signal" Contest.—1st Prize: A. R. Williams, Gosport; 2nd Prize: R. A. Barham, Brighton; 3rd Prize: W. G. Cochrane, Darlington. Consolation Prizes: H. A. Sanderson, Doncaster; F. Mills, Kearsley, Lancs.; I. MacIntosh, Burton-on-Trent.

October "Drawing" Contest.—1st Prizes, Section A: J. Gibson, Carstairs Jct., Lanarkshire; Section B: D. Warner, Kineton. 2nd Prizes, Section A: P. M. de Souza, Woolhampton; Section B: E. S. Howard, Hayes. 3rd Prizes, Section A: A. Wade, Leicester; Section B: G. Fleming, Seahouses. Consolation Prizes: K. R. Pargeter, Stourbridge; P. Hancock, Edinburgh; A. Grant, Aberdeen; J. Sutherland, Aberdeen; R. Selwyn, Cinderford; R. Watson, Chingford, E.4; J. Holmes, Teddington; R. A. Mozley, South Elmsall, Yorks.



Pearl divers of Bahrein at work. An article on the pearling industry of this island appears on page 158.

November "Locomotive" Contest.—W. Smith, Glasgow; 2nd Prize: B. Carter, Shipley; 3rd Prize: A. Groves, Leytonstone, E.11. Consolation Prizes: D. Gilbert, Bromley; J. Onley, Birmingham 26; P. Ward, Rugby; H. R. Simpson, Birmingham.

OVERSEAS

December 1944 "Advertisement Letter Square" Contest.—D. B. Kibblewhite, Wellington, N.Z.; 2nd Prize: F. Jowett, Ontario, Canada; 3rd Prize: G. Stokes, Port Elizabeth, S.A. Consolation Prizes: Issa Said, Palestine; D. Ratcliffe, Natal, S.A.

December 1944 "Transport Drawing" Contest.—R. Harris, Auckland, N.Z.; 2nd Prize: F. Jowett, Ontario, Canada; 3rd Prize: T. Beadle, Dunedin, N.Z.; Consolation Prize: E. Hohls, Natal, S.A.

February 1945 "Locomotive" Contest.—J. Markham, Ontario, Canada; 2nd Prize: E. Fitzgerald, Durban; 3rd Prize: W. J. Hobjoy, Sydney, Australia; Consolation Prize: H. Ekwensi, Kano, B.W.A.

February 1945 "Missing Word" Contest.—E. Sykes, Cleveland, S.A.; 2nd Prize: G. Stokes, Port Elizabeth, S.A.; 3rd Prize: J. Old, Levin, N.Z.; Consolation Prize: N. Middleman, Umtali, S. Rhodesia.

February 1945 "Photo." Contest.—1st Prize, Section A: L. Waterman, Johannesburg, S.A.; Section B: R. W. Wilson, Rondebosch, S.A. 2nd Prizes, Section A: F. W. Sunbury, Canberra, Australia; Section B: P. Johnson, Alberta, Canada.

Fireside Fun

"What do you mean by letting that prisoner out of the building. Aren't all the exits guarded?"

"Yes, sir. He must have slipped out through one of the entrances."

* * * *

"The old clothes lady is here, Jack."

"Tell her I've got all I need."

* * * *

Mother: "If you wanted to go fishing, why didn't you ask me first?"

Son: "Because I wanted to go fishing."

* * * *

Billy: "We just waste time in our maths. class."

Father: "That's strange. What do you mean?"

Billy: "Well, the teacher took nearly half an hour solving an equation on the blackboard, with all of us helping, and we found at the end that the thing he was looking for was nothing."

* * * *

Sandy: "Noo, Mary, dae ye ken the difference between a taxi and a tram?"

Mary: "No, Sandy. I give it up."

Sandy: "Weel, then, we'll tak' a tram."

* * * *

"When are you going to get your hair cut, John?"

"Oh, when I get time, Mary."

"In that case they'll do it free."

* * * *

THIS MONTH'S HOWLER

Marconi is used for making puddings.

* * * *

"Now keep it out till I've finished speaking."

BRAIN TEASERS

WHAT'S IN A NUMBER?

Our two puzzles this month have been submitted by readers. The first is an interesting but simple code teaser. Here is a very well-known 10-word quotation from Shakespeare, in which each letter is represented by a number.

13.23 49.43 23.17 25.23.13 13.23
49.43 13.37.51.13 35.15 13.37.43
19.11.43.15.13.35.23.25

Can you say what the quotation is and explain the code used? B.I.N.

* * * *

THIS LOOKS IMPOSSIBLE

A man who had collected 319 books kept them in a book case with the same number of books on each shelf. How many shelves were there? This may look impossible at first glance, but in reality it is very easy. T.K.C.

* * * *

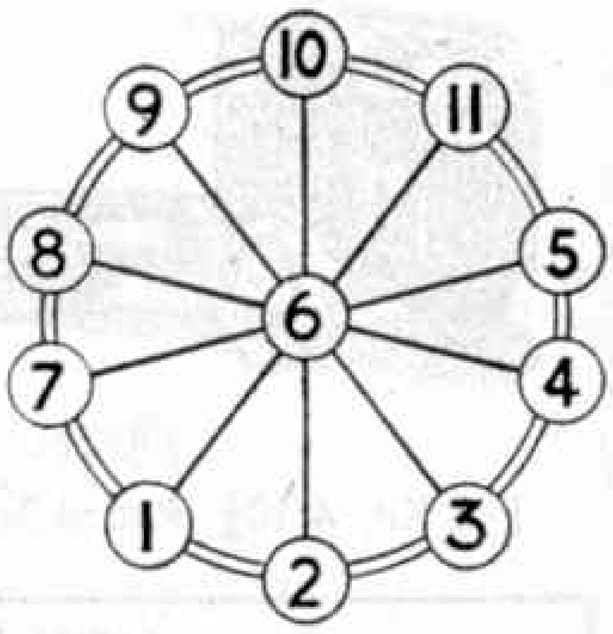
"Whatever is the matter, John?"

"Nothing really, Dad, 'cept Nurse has bathed Tommy twice and missed me."

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

The answer to the merry-go-round of our first puzzle last month is shown in the accompanying diagram.



The list found in the pocket of the mystery man of our second puzzle was really a message in cypher. The number after each alleged city name indicated which letters from the name were to be taken to form the corresponding word in the solution. Thus, numbering the letters in Scrawpnaw in order, we find that the 5th letter is W, the 8th is A, the 3rd is R, the 1st is S, the 4th is A and 9th is W, making up the name WARSAW. When the same trick is carried out with the remaining names the message WARSAW DEFENCE WEAK ATTACK NORTH REGION is revealed. Thus the mystery man was a spy.

To solve our third puzzle weigh any six of the medallions against the rest. The lighter batch of the two will contain the counterfeit. Then weigh three of these against the remainder. Finally weigh one of the lighter three against another. If one of these is light it is the counterfeit; if they weigh the same then the counterfeit must be the one left over.

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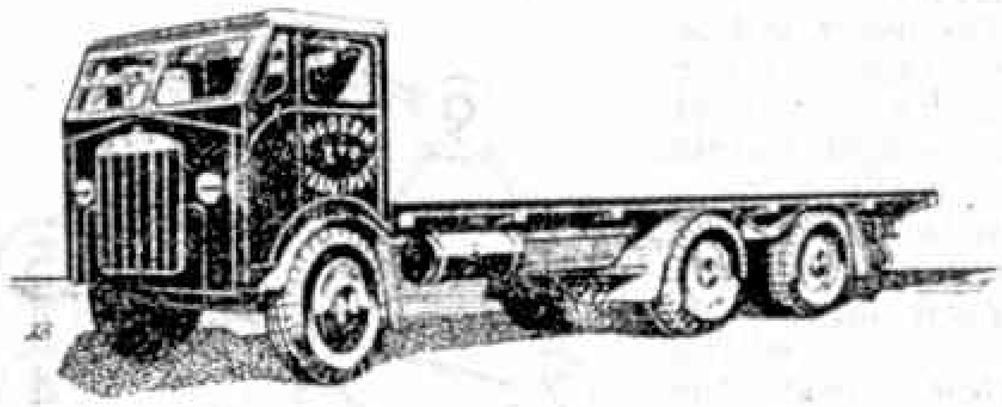

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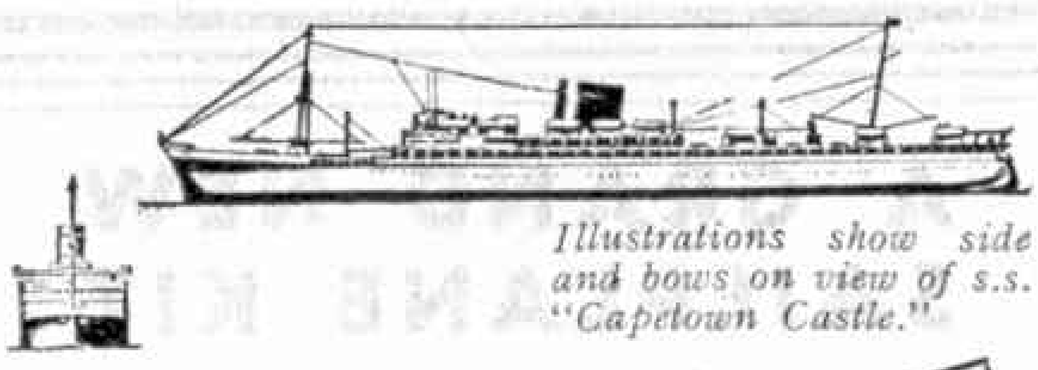

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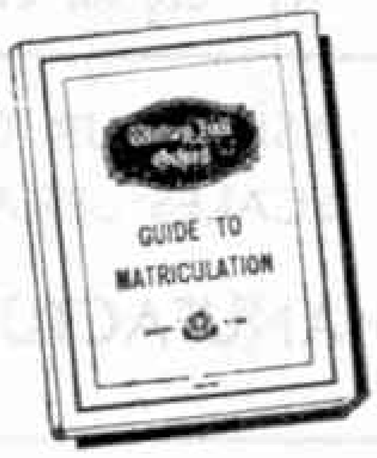

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Electrical Engineering
Engineer in Charge
Eng. Shop Practice
Fire Engineering
Fuel Technology
Garage Management
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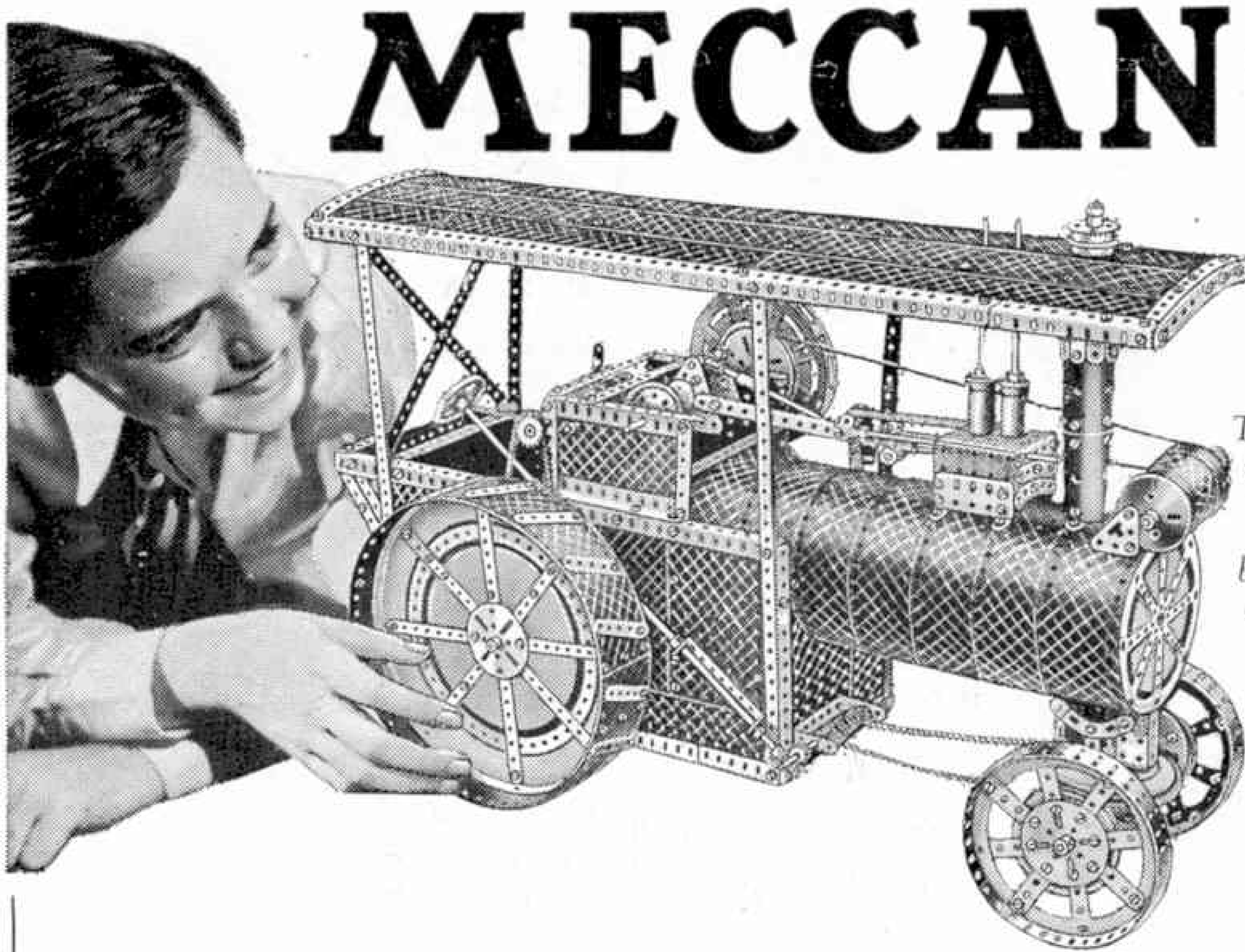

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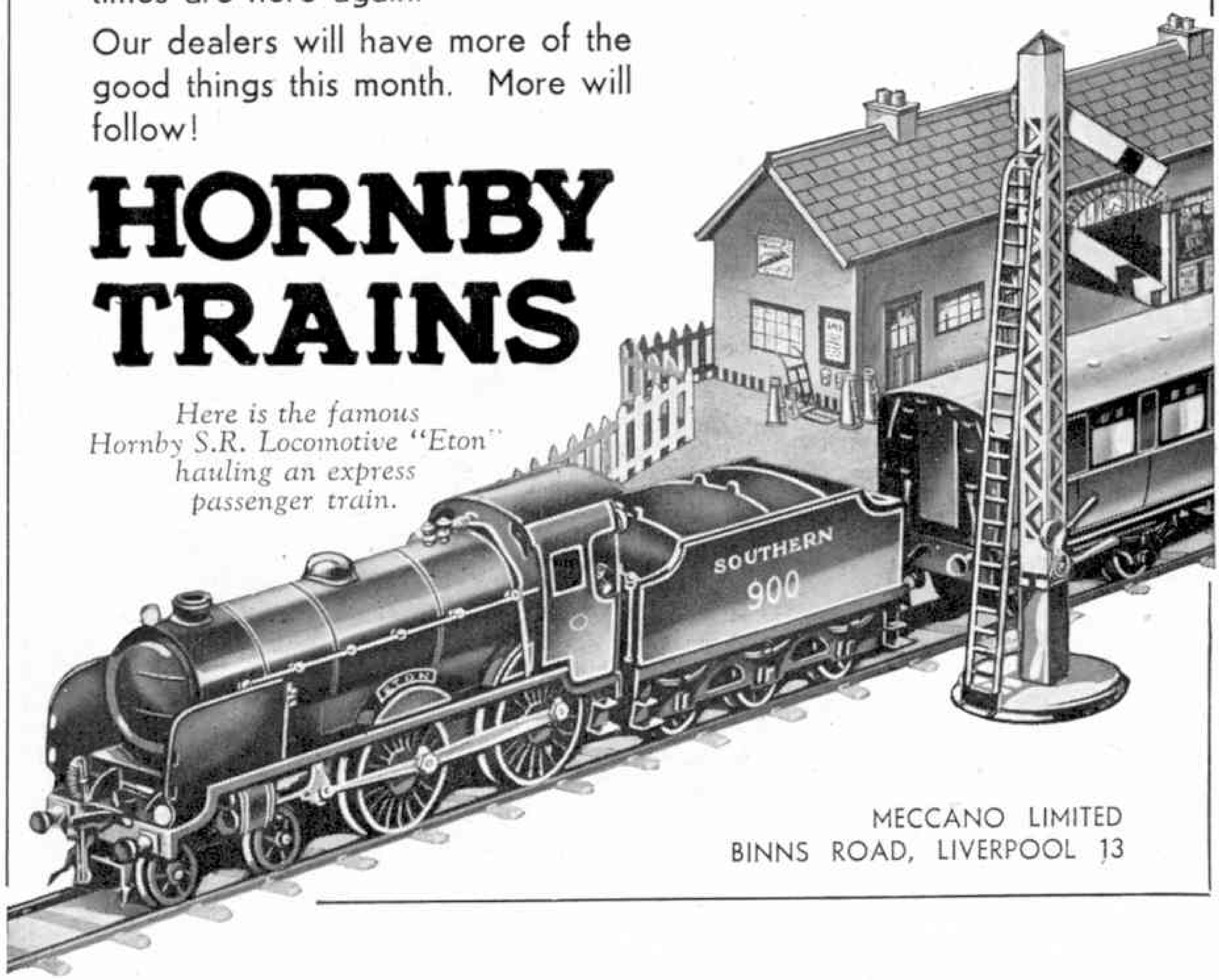

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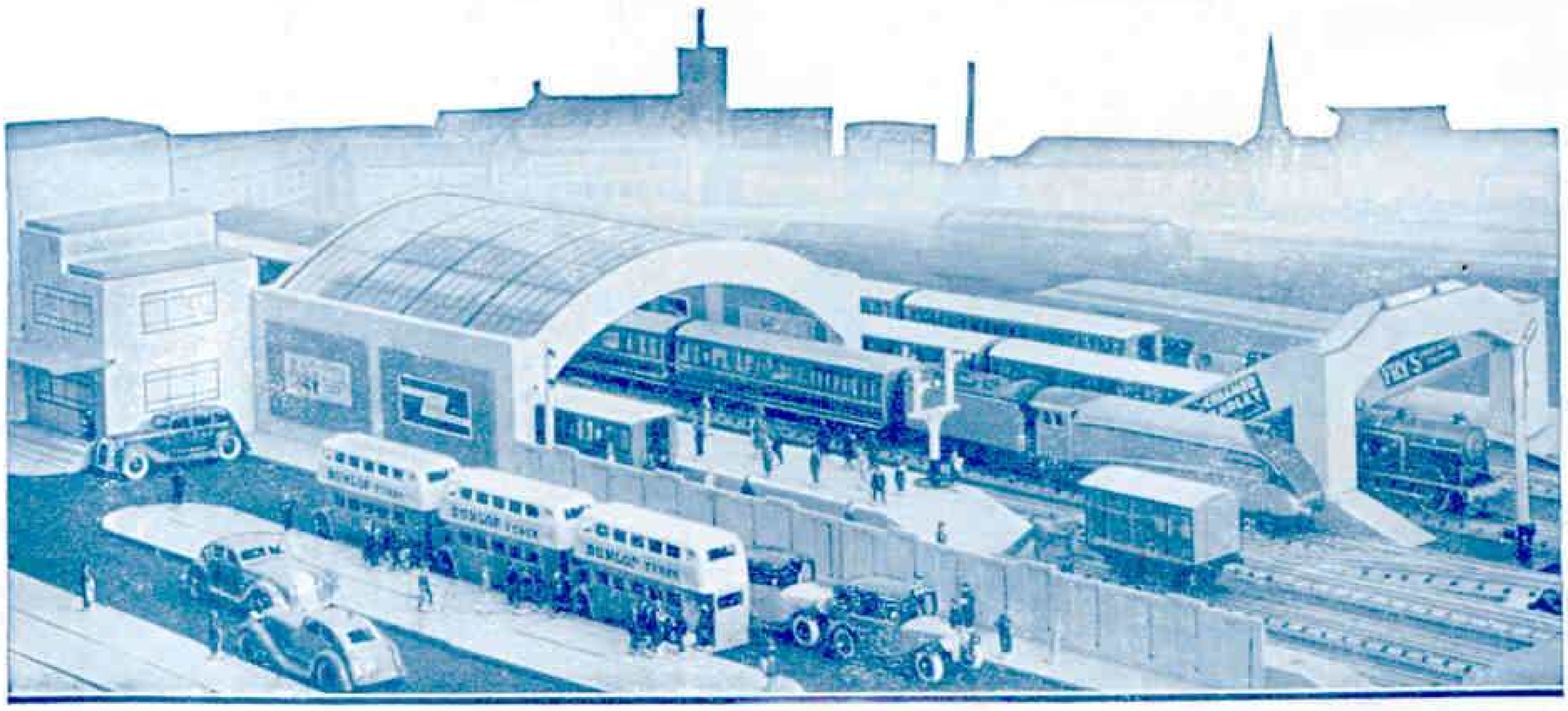

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