VOL XV. No.3. MARCH 1930.

MECCANO MAGAZINE

BUILDING A GIANT LOCOMOTIVE (see page 178)

6D

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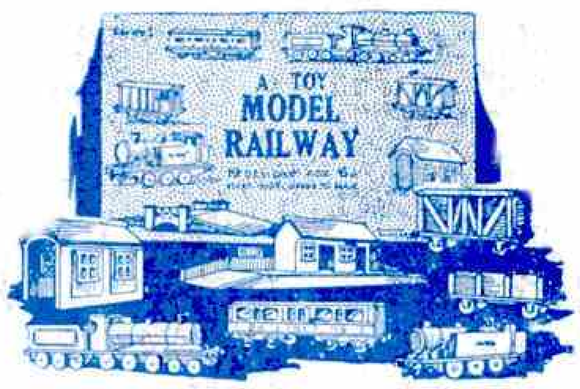

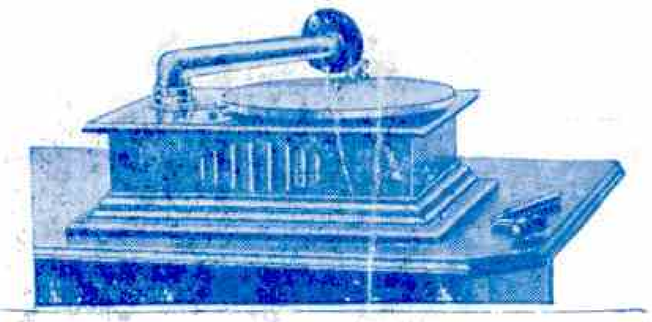

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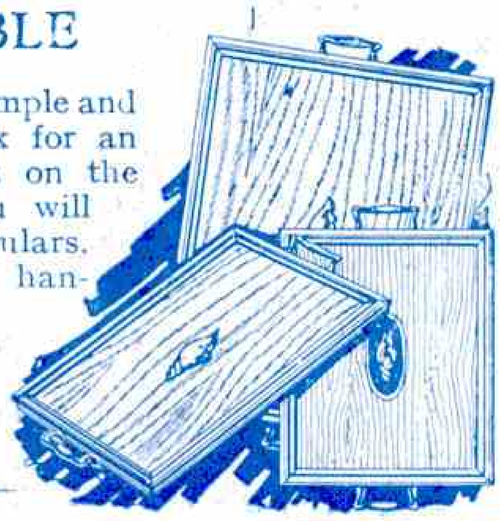

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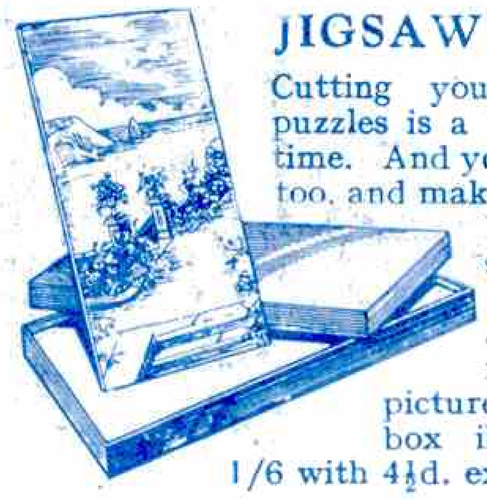

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NEXT MONTH: BUILDING WITH STEEL. PUBLISHED: 1st APRIL

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With the Editor

First Fight between Ironclads

I am sure that many of my readers have followed with great interest the proceedings at the London Disarmament Conference and have sympathised with the desire, that seems to be universal to put an end to the race to build up armaments. The schemes for reducing the number of war vessels of all kinds that have been discussed during the Conference arouse interest in the first ironclad battleship, particularly as on the 5th of this month it will be 68 years since this historic vessel left the dockyard at Norfolk, U.S.A. She was not an ironclad in the modern sense of the word, being in fact, only a wooden 40-gun frigate, called the *"Merrimac,"* that had been converted into the world's first armoured vessel by simply covering her decks with bar iron. She carried four rifled guns, two of 7 in. and two of 6 in. bore, in addition to six 9 in. smooth bore guns, but the weapon upon which she most relied was a cast iron ram. It was anticipated that with this she would be able to sink any vessel that ventured to oppose her.

At that time the American Civil War was raging and the *"Merrimac"* had been equipped by the Confederates in the hope that by means of this vessel they would gain superiority at sea over their Northern opponents. Unfortunately for them, their strange vessel very soon came into conflict with another, equally remarkable, that had been built by the Federals. This was the *"Monitor,"* a low-lying vessel also protected by armour that was described by the wits of the time as "a cheese box on a raft." The most remarkable feature of the *"Monitor"* was a revolving turret on which the guns were placed in the expectation that these could be brought to bear upon any point of the compass.

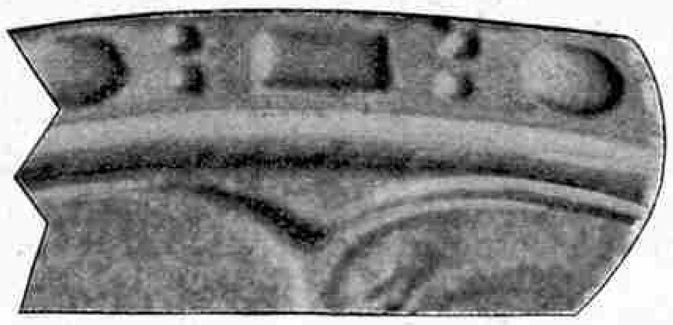
An Historic Battle

The combat between the two began at 9 a.m., 9th March, 1862, and for three hours the vessels hammered away at each other with very little effect. The *"Merrimac"* could not use her much vaunted ram, for her greatest speed was only five knots and her opponent easily eluded her; the *"Monitor's"* revolving turret became jammed and she was unable to make full use of her guns. Thus each vessel was deprived of her principal weapon, and the first naval combat between ironclads ended indecisively. From a wider point of view the victory undoubtedly went to the *"Monitor,"* however, for the *"Merrimac"* never again ventured out to try conclusions with "the cheese box on a raft."

Much of the interest that this historic fight has to-day arises from the fact that the *"Monitor"* was designed by Ericsson, the Swedish engineer, who was one of Stephenson's rivals during the Rainhill trials. In partnership with Braithwaite, Ericsson entered the *"Novelty"* in opposition to Stephenson's *"Rocket"* and two other engines. The majority of the judges of the trials were strongly predisposed in favour of Ericsson's engine, which on its first trial occasionally travelled at a speed of 24 m.p.h. Trouble soon developed however. First the bellows used for creating the blast in the firebox collapsed and later the pipe from the forcing pump burst. The owners of the *"Novelty"* pleaded successfully to be allowed another opportunity of showing what their locomotive could do, but again a breakdown occurred, and the engine was ruled out of the competition. Meanwhile the *"Rocket"* had passed triumphantly through all tests and Stephenson's locomotive was adopted for use on the Liverpool and Manchester Railway, the centenary of which is to be celebrated in September of this year.

At Rainhill, Ericsson perhaps came nearer to success than is usually imagined. He certainly was an ingenious and resourceful engineer, as his later career in America shows. Undoubtedly his greatest triumph was the *"Monitor,"* and the revolving gun turret with which he equipped her afterwards became a recognised feature of battleship construction.

No. 16. WHAT EVER IS IT?



Here is the sixteenth puzzle in the series. Can you identify this mysterious looking object? To the first reader to send an exact answer, or to the reader who gets nearest, I will send an autographed copy of my book "Engineering for Boys."

Solutions should be written on postcards only and addressed "Editorial Competition, No. 16, Meccano Magazine, Old Swan, Liverpool." Post your entries to reach me before 31st March.

Invention of the Police Whistle

The recent death at Birmingham of Mr. Joseph Hudson, is an event that will arouse the interest of boys throughout the world. Possibly many of my readers had not heard of Mr. Hudson during his lifetime, but it is certain that his products are not unknown to them, for he was a manufacturer of whistles. He is best remembered as the inventor of the police whistle. Prior to 1884 a policeman who wished to call assistance used a rattle for the purpose. Mr. Hudson invented a whistle that was specially suitable for police use, and its superiority to a rattle was so marked that it was almost universally adopted.

To-day the firm that Mr. Hudson founded turns out a million whistles in a year. These are made in no fewer than 600 different patterns, each of which is carefully adapted for a particular purpose, and a special feature is made of whistles suitable for referees of football matches. It is interesting to learn that one of the earliest whistles made by Mr. Hudson was used during his travels by H. M. Stanley, the famous explorer who did so much to make Central Africa known to us.

Mystery Photograph No. 15

There was an extraordinary amount of wild guessing at the solution of our fifteenth mystery photograph, and barely 50 readers detected the trace of perfume that hung around the reproduction of a bulb and metal top of a scent spray.

There is usually one entrant willing to credit our staff photographer with acrobatic agility. This month's tribute to that gentleman's physical fitness is the statement that he had taken "a bird's eye view of a drinking fountain!" Mooring caps for giant airships, loud speakers, rear views of electric fans and bowl radiators, shaving mirrors, and motor headlamps, fob seals, door handles and fountain pen stands, were other brain waves, but the palm for the month's really bright idea must go to a Birmingham boy who penetrated the haze of mystery and discovered an invention for seeing through fog!

The first correct entry was from Norman Scott, 4, Glenbank Terrace, Lenzie, Glasgow, to whom an autographed copy of my book *"Wonders of Engineering"* has been sent. Consolation prizes have been sent to 25 other competitors.

Building a Giant Locomotive

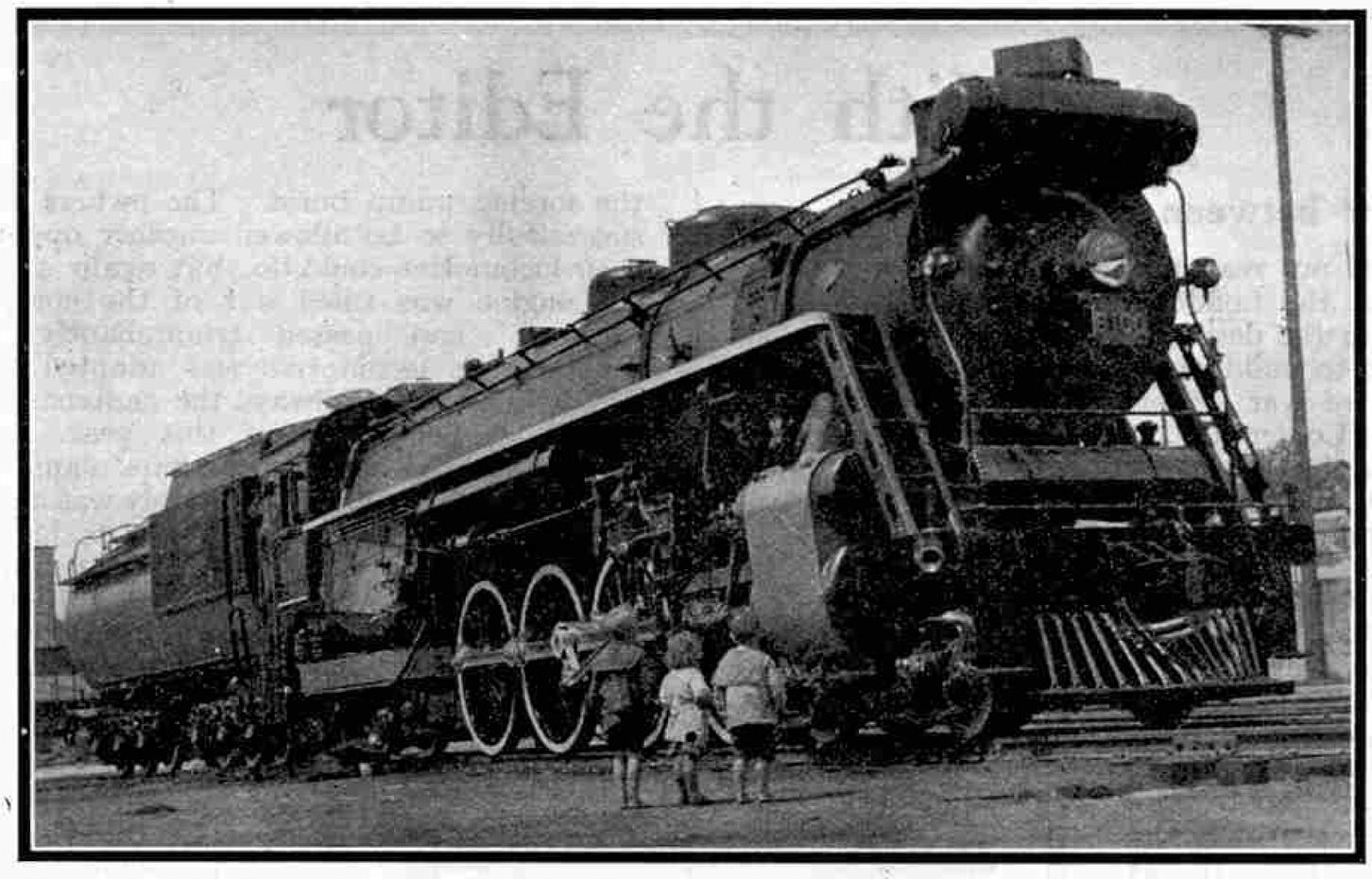
THE enormous development of engineering during the past one hundred years or so has resulted, inevitably, in a process of subdivision and specialisation. At one time machines and mechanisms were so simple in design and so crude in construction that the village blacksmith could tackle, with reasonable prospect of success, almost any job of mending if not of making. Skilled mechanics in the present-day sense did not exist.

The result of this state of affairs was that when James Watt commenced his series of inventions that were to lead up to the wonderfully efficient steam engines of to-day he experienced the utmost difficulty in finding men capable of carrying out his ideas. On many occasions he was baffled and thrown into despair by the clumsiness of his workmen, and this is not to be wondered at when we learn that the cylinders cast for his engines were sometimes found to be more than one-eighth of an inch wider at one end than at the other!

Other inventors encountered similar difficulties, and it is probable that many a brilliant idea came to nothing from this cause. One striking example is provided by an American inventor, John Stevens, who as early as 1804 had devised a screw propeller for steamships. The failure of his plan was due almost entirely to the fact that at that time there were in America neither the tools nor the workmen to construct his engine. Stevens had to revert to the paddle wheel and thus the development of the screw propeller was put back for many years.

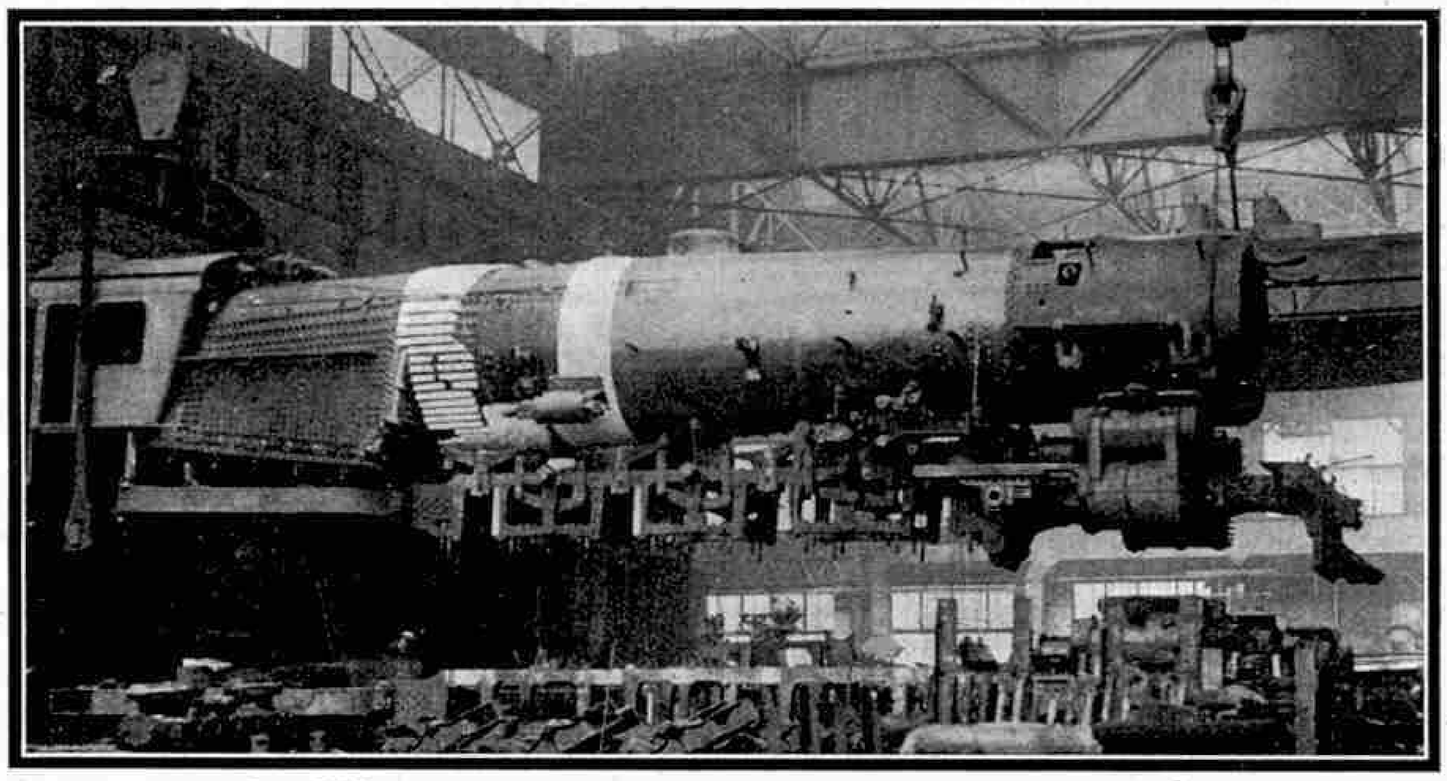
Gradually the need for more accurate workmanship became realised and engineers began to encourage their workmen to specialise in particular jobs, to take pride in their work, and to acquire the utmost possible manual skill. Then came the development of machine tools, which led up to the production of machines that not only could turn out work of an accuracy that could not be equalled by even the most skilful workmen, but also could repeat a job as often as required without the slightest variation. Finally there came into existence huge engineering works containing many different departments, in each of which a particular class of work was done by machinery specially designed for the purpose and working within limits of accuracy that would have truly amazed even the most expert mechanics of a previous generation.

In no branch of engineering has this specialisation become more prominent than in the building of locomotives, and this is particularly the case with the monster engines that have been developed in Canada and the United States, where the designer has not been hampered by narrow restrictions such as are imposed by bridges and tunnels in this country. Take, for instance, the "6100 Northern" type locomotives of the Canadian National Railways, one of which in process of construction is shown this month on our cover. These huge engines have been designed for either passenger or fast freight service, and they are capable of hauling a steel train of 16 Pullman coaches at a speed of 90 m.p.h. Some idea of the nature of the job of building them may be gained from the fact that they are 15 ft. 3 in. in height, 39 ft. 10¾ in. from the tip of the "cow catcher" to the tail of the tender, and weigh, with booster and empty tender, 289¼ tons!



No. 6100, the first of the famous C.N.R. class of passenger and fast freight locomotives. For this and the other illustrations to this article we are indebted to the courtesy of the Canadian National Railways.

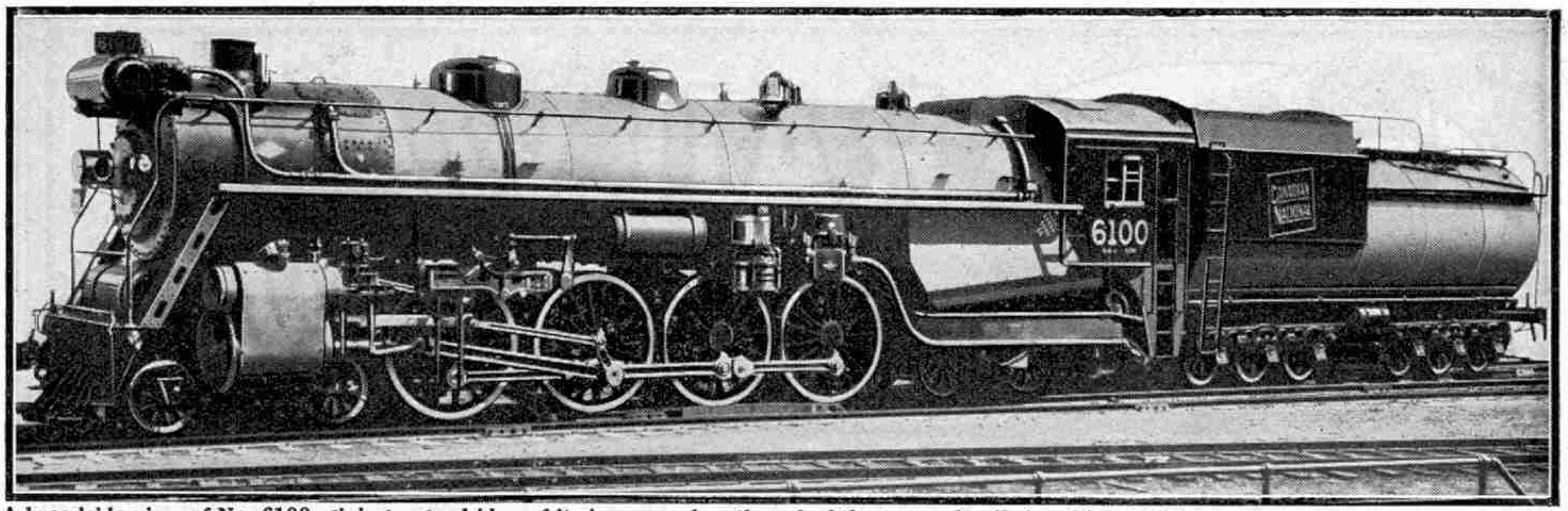
The largest individual item in the make-up of a locomotive is the boiler; let us consider that of a "6100," which has an external diameter of 7 ft. 6 in. Both its inner and its outer casings are made of a special quality of silicon steel. The plates of which it is built up are curved to the required cylindrical form by passing them through bending rollers and are then assembled ready for drilling, which is carried out by machines working at very high speed. Then comes the riveting, for which hydraulic riveters are called into service. When the boiler is completely assembled the various mountings are placed on it and the ordinary and the superheater tubes are fitted in.



A "6100" type locomotive in the early stages of construction.

Then comes the question of strength. The boiler is intended to carry a pressure of 250 tons per sq. in., but it is not sufficient merely to test it to this pressure; a margin for safety must be allowed. The boiler is therefore given certain tests, first hydraulic and afterwards steam, at considerably higher pressures than those it is ever likely to be called upon to withstand. In boiler making there can be only one policy and that is "safety first."

When the boiler has passed safely through its various ordeals, and has been lowered on to the locomotive frames and secured in position, it is given a heat-resisting coat and then jacketted with special steel, which forms the outer covering that we see when we are admiring the finished locomotive. The heat-resisting coating, or "lagging" as it is called, protects this outer jacket from the heat of the boiler and also serves to retain heat in the boiler.



A broadside view of No. 6100, giving a good idea of its immense length and of the many details in which it differs from standard British practice.

The whole operation of boiler making is highly specialised and affords a good example of a series of processes that have been developed by the sheer necessity of having to produce bigger and still bigger boilers, and at the same time to produce them quickly and at the lowest possible cost.

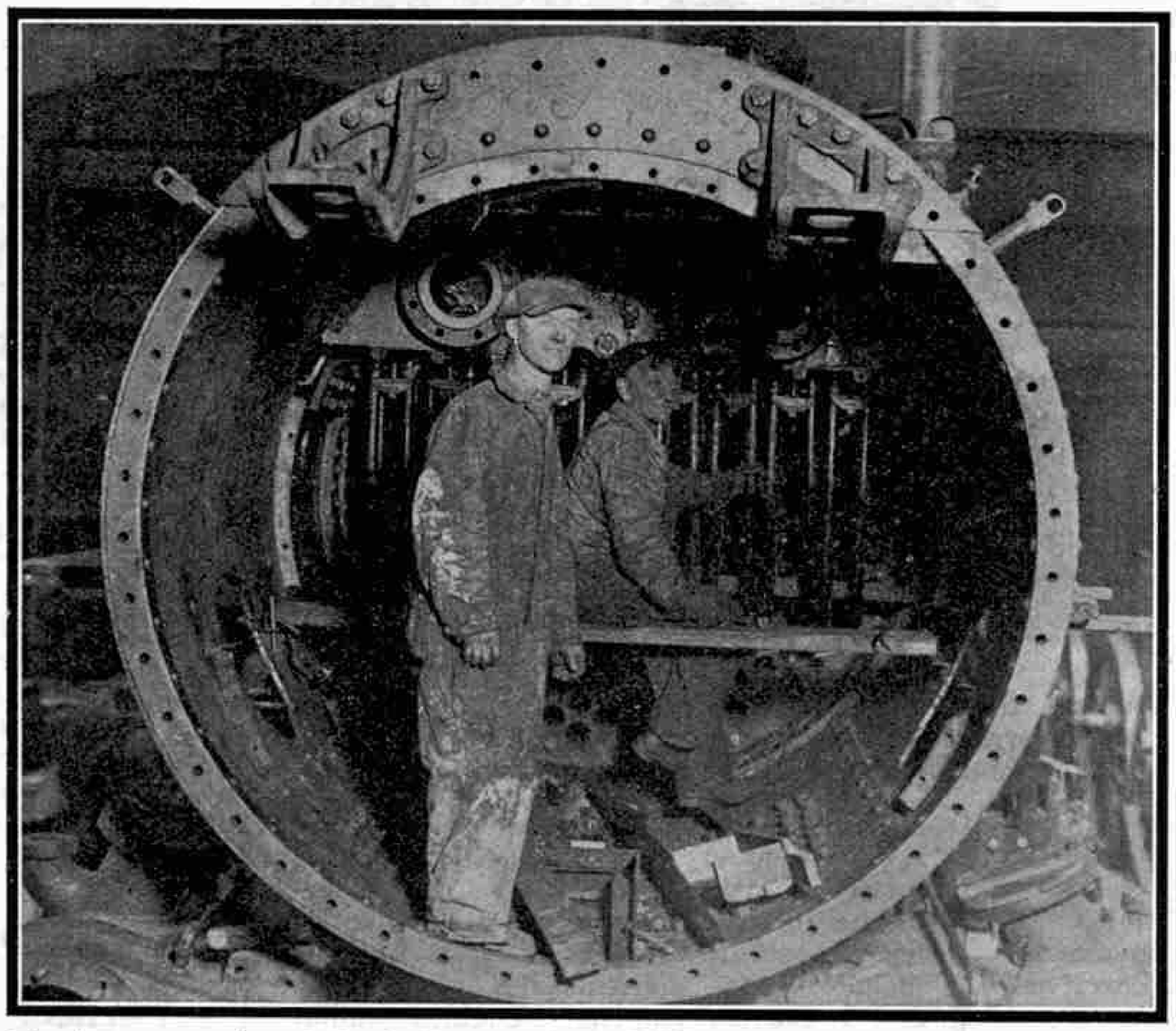
So it is with the building of every portion of the locomotive. Manual labour is reduced to the minimum, every possible operation being carried out by specially devised machines that never tire, never become erratic or careless in their work—and never go on strike! In the old days heavy material had to be "man-handled" in the literal sense. Much hard labour was carried out with hammer and cold chisel, and setting-up operations involved the combined efforts of many men working with block and tackle and hand haul. Back-breaking work of this kind is now almost entirely eliminated in all well-equipped works.

When a locomotive has passed successfully her preliminary trials she returns to the sheds to receive her coats of paint and the various finishing touches that are necessary before she takes up active service. She already has a grey coat that has been applied to protect the metal from oxidization, and this coat forms the foundation of the final painting. In pre-war days British locomotives were famous the world over for their handsome livery and perfection of finish. Since the war, unfortunately, the urgent necessity of cutting down expenses in every possible direction has resulted in the substitution of much plainer painting schemes, and the days of such handsome locomotives as those of the old Caledonian Railway are a thing of the past.

A move in the reverse direction was made by the Canadian National Railways last year when they adopted a colour scheme of bright green, vermilion, and black for their locomotives of the "6100" class. This marked a new departure in Canadian railway practice. The first engine to appear in the new colours was No. 6138, which hauls the "*International Limited*" between Montreal and Chicago. The colour scheme is light green for the boiler, tender, tank and wheels; black for the cab, smoke box, coal hopper, and feed-water heater; and bright red for the buffer beams at each end, the wheel spokes, and the fluting of the driving rods. It will be interesting to watch the growth of this scheme.

In spite of their bulk and the strength of their component parts, even such monsters as the "6100's" are subject to certain ailments and require periodical overhauling. Hospital treatment of a locomotive is clearly a serious undertaking. The work must be carried out with the utmost thoroughness, and yet at the same time it must be done as quickly as possible because every hour that a locomotive is out of action means loss to its owners. The repairing of a locomotive differs in certain important respects from the building of a new one, and in consequence railway companies have developed repair sections quite distinct from their constructing department. The Canadian National Railways do not build their own locomotives but, having received one from its builders, they tend it with the utmost care throughout its working life. In order to be able to deal promptly with all locomotive ailments the company have erected at Point St. Charles, Montreal, a series of huge repair shops lavishly equipped with the most up-to-date plant and machinery for all purposes.

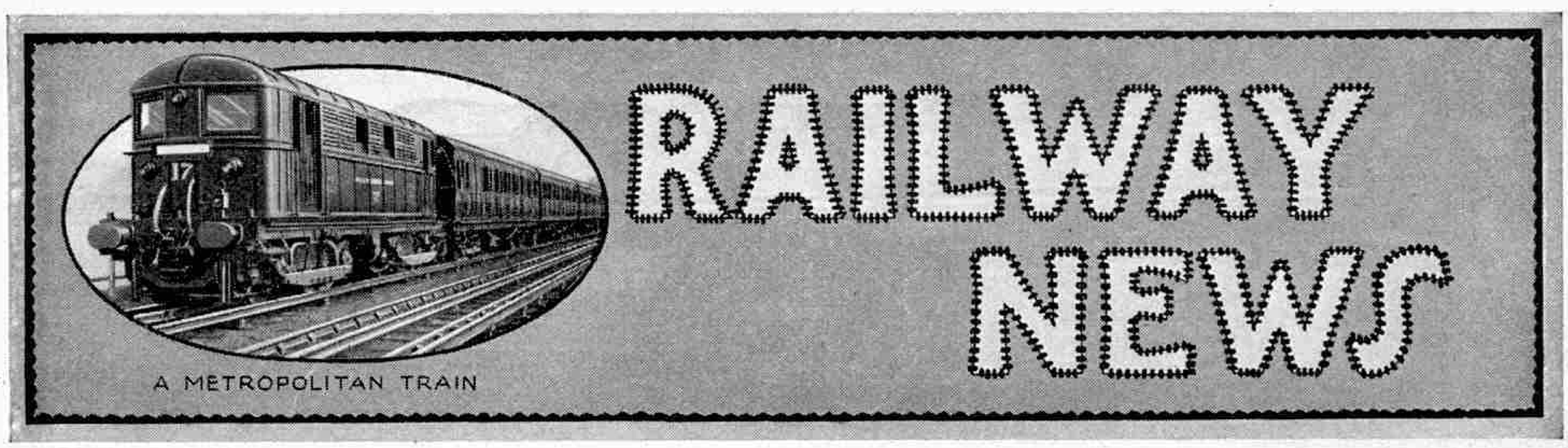
The shops are grouped under one roof and the huge building that accommodates them is 1,056 ft. in length and 265 ft. in width. It is built in the form of a number of extensive bays in which the departments have been arranged in accordance with a carefully thought-out plan. The largest department, of course, is the locomotive erection shop which is 755 ft. in length, 85 ft. in width, and 56 ft. in height to the roof truss. It is served by a 200-ton overhead electric travelling crane and is provided also with one 10-ton auxiliary crane and two 15-ton overhead electric cranes, one of which serves an additional bay situated in front of the 34 locomotive pits. This bay is reserved for all locomotive front end work, such as repairs and rebuilding of boiler tubes; superheater equipments, feed water heaters, Westinghouse air brake work, etc.



The immense size of the boilers of the "6100" type locomotive may be seen from this photograph, which shows workmen fitting superheater tubes.

The blacksmith and forge shop at one end of the building extends across all the bays and is equipped with down draught forges, oil gas furnaces and powerful steam hammers. The furnaces and hammers are served by two 4,000 lb. and two 6,000 lb. self-supporting jib cranes, while the shop also contains a 10-ton overhead electric crane. Another important department is the boiler shop, which is a continuation of the two erecting shop bays. The main bay is 216 ft. in length and has a 40-ton overhead electric crane that is built on the same runways as the 200-ton crane in the erecting shop and, therefore, can pass from the boiler shop through the entire erecting shop without interruption to any other work in hand.

A feature of all the shops is the scientific manner in which the lighting has been arranged. The area of glass used amounts to over 119,000 sq. ft., and windows represent 39.5 per cent. of the entire side walls! The interior of the building is coated with aluminium paint to within 5 ft. of the floor, the remainder being finished in black.



New Giant Locomotives for C.P.R.

The illustration on this page shows the first of a new class of oil-burning locomotives of the 2–10–4 type constructed by the Montreal Locomotive Works for the Canadian Pacific Railway. These powerful engines are the largest in the British Empire. They are intended for hauling passenger and goods trains over the Rocky Mountains section. The combined weight of locomotive and tender is a little more than 334 tons, and is thus 80 times that of the "*Rocket*." It is interesting also to note that the cost of the Canadian locomotive is 45 times that of Stephenson's engine, and it develops 85 times as much power.

The cylinder dimensions of the new locomotive are 25½ in. by 32 in., and the boiler pressure is 275 lb. The tractive effort is 77,200 lb., and this is increased to 89,200 lb. by the use of the booster.

The oil-fired boiler contains more than two miles of tubing and is constructed wholly of nickel steel. The firebox plates and stay bolts are of a new nickel steel with low carbon content that has shown good results in extensive experiments.

An unusual feature of the locomotive is that the cylinders and underframes are cast in one solid piece. This great casting includes the main frame, cradle frames and all cross ties in addition to the cylinders and weighs nearly 30 tons. The advantage of this system of construction is that far greater rigidity is obtained than is possible in locomotives that are built in the ordinary manner.

Courtesy] [*Canadian Pacific Railway*

A new oil-burning locomotive of the 2–10–4 type now employed on passenger service on the Canadian Pacific Railway. The tractive effort of this giant engine is 77,200 lb. increased to 89,200 lb. by the booster.

G.W.R. Improvements

Among the numerous improvements that the G.W.R. are planning to carry out in the immediate future, there are several that will help to secure a more favourable course for the "*Cornish Riviera*" and other high-speed expresses that use the main line between London and the West. Deviations are to be made at Westbury and Frome in order to abolish the speed restrictions that at present are in force at these places. Also the much-used section between Cogload Junction (where the lines from London and Bristol meet), and Norton Fitzwarren (the junction for the Ilfracombe and Minehead lines), is to be quadrupled. Taunton station will be reconstructed and the locomotive depot there enlarged.

S.R. Engines and Rolling Stock

A further express engine of the 4–6–0 "Lord Nelson" class has been turned out from the works at Eastleigh. It is No. 865, "*Sir John Hawkins*," and completes the order for engines of this type that was put in hand last year.

The locomotives of the 3-cylinder 4–4–0 "Schools" class, authorised last year for use between London and Hastings and other coastal stations, are now nearing completion and it is expected that they will be put in service shortly.

The 1930 building programme at Eastleigh, Ashford, Brighton and Lancing includes the construction of twenty 2–6–0 express passenger engines similar to the "U" class now in service. Ten 3-cylinder goods engines also will be built during the present year.

The building of a large amount of new rolling stock has been authorised, including 300 corridor coaches—a number of these are to have a corridor down the centre—and 16 restaurant cars. In addition 40 luggage vans, 40 general utility vans and 50 special passenger-train cattle vans will be constructed. The wagon programme provides for nearly 2,000 trucks of various types, including 25 refrigerator vans and 75 special meat vans.

L.M.S. Locomotive News

Work on the new series of 2–6–0 mixed-traffic engines is now well in hand at Crewe, and the first five to be completed are numbered 13150-4. One of the series—No. 13178—will be the 6,000th engine built at Crewe Works. The 5,000th engine was built in 1911, and was one of the 4–4–0 "George the Fifth" class. It was specially numbered 5000 and named "*Coronation*."

Additional engines of the L.N.W.R. types that have been adapted for working on the Midland division are as follows:—"Prince of Wales" class, Nos. 5649, 5748, 5773, 5837; "George the Fifth" class, Nos. 5211, 5360; "Experiment" class, No. 5496.

More locomotives of the 4–4–0 "Renown" class—rebuilt Webb 4-cylinder compounds—have been withdrawn for scrapping. They are:—5113, "*Colossus*," 5123 "*Cæsar*," 5133 "*Collingwood*," 5170 "*Trafalgar*." Two of the L.T.S. 4–6–4 tanks—Nos. 2193 and 2194—also have been broken up at Crewe.

The small narrow-gauge engines, that did much useful service in conveying material about the works at Crewe are being withdrawn. Only two—"*Billy*" and "*Pet*"—now remain and these are doomed soon to disappear. "*The Locomotive*" calls attention to the remarkable fact that the boilers of these tram engines have not been replaced since they were built and that the same boiler has been used for the same engine throughout. One or two of the engines have seen seventy years service. This is, indeed, a wonderful record.

Beardmore-Caprotti Valve Gear for L.N.E.R. Locomotives

Two L.N.E.R. 4–6–0 express locomotives of the Great Central type—Nos. 6166 and 6168—have recently been rebuilt. They have been fitted with new cylinders and Beardmore-Caprotti valve gear. The advantages claimed for this valve gear are that it secures a freer running engine, with reduced wear on the surfaces and a decided saving in fuel and cylinder oil. Engines so fitted cost less for repairs and in addition they spend less time in the sheds out of service.

This valve gear has been tried with success on the L.M.S. It will be interesting to compare the results obtained on the two railways.

G.W.R. Notes

Some further engines of the 4–6–0 "Hall" class passenger locomotives have been completed at Swindon. They are named as follows:—No. 4968, "*Shotton Hall*"; No. 4969, "*Shrugborough Hall*"; No. 4970, "*Sketty Hall*"; No. 4971, "*Stanway Hall.*"

The following new tank engines also have been put into service:—Nos. 5107 to 5110 of the 2–6–2 type, and Nos. 5780 to 5787 of the 0–6–0 type. Tank engines of the 0–6–0 type also have been received from the North British Locomotive Co. Ltd., their numbers being 7725 to 7736.

Last year the mileage run by Great Western locomotives reached the highest figure in the history of the railway, being over ninety-seven million miles, or about two million miles more than in the previous year.

The G.W.R. have adopted a new style of decoration for all third-class corridor and restaurant car stock. The upholstery of the compartments is in grey and black moquette, with grey predominating. The floors are covered with brown linoleum, with black line border. The interior panelling is finished in walnut colour, and the ceilings are of white enamel. In addition, the seats are half-an-inch wider than previously. The arm rests are lower by one inch. Alterations to the first-class compartments include an increase in comfort by sloping the seats further backward, and raising slightly the arm-rests.

The Company's building programme for the present year includes 161 new passenger coaches, 30 milk and perishable traffic vehicles, 2,771 freight wagons, 10 "King" class engines, 20 "Hall" class locomotives, 70 tank engines, and a new steamer for the Fishguard-Rosslare route.

On the main line between Paddington and Southall the latest type of light signals are to be substituted for the old style of semaphore arm and oil lamp signals. This should have the effect of greatly facilitating traffic working over this busy stretch of line.

L.N.E.R. Locomotive News

Some additional engines of the J.39 class 0–6–0 goods, have been built at Darlington works. Their numbers are 2780-4, 1418, 1425 and 1429. New 2–6–0 engines, Nos. 1389, 1391, 1394 and 1395 have been completed at Doncaster and sent to work on the North Eastern section. No. 2429, a 4–4–0 engine of the former Hull and Barnsley Railway, has been fitted with a domed boiler.

Engine No. 352, "*Leicestershire*" of the "Shire" class recently made a noteworthy run on the 8.55 a.m. express from Leeds to Glasgow. York was left 7 min. late, and in spite of permanent-way checks at Tursdale Junction, Browney and Relly Mill, Newcastle was reached on time. Exactly 85 min. were occupied on the journey of 82 miles 9 chains, giving an average speed of 58 m.p.h., exclusive of any allowances for starting and stopping, or for the checks *en route*.

The locomotive building programme for this year also comprises 35 six-coupled tender engines, 15 passenger engines, 4–6–0 type, 15 of 4–4–0 type and 20 0–6–0 tank engines.

Double-heading on the steeply graded L.N.E.R. "Waverley" route between Edinburgh and Carlisle. The heavy express is hauled by 4–4–0 No. 9412, "*Laird o' Monkbarns*" piloted by a 4–4–2 No. 9904, "*Holyrood.*"

Photos] [*R. B. Haddon*

Pacific No. 2748, "*Colorado*" at the same point on the "Waverley" route as the train shown in the upper illustration on this page. This powerful locomotive is hauling with ease a load greater than that requiring two engines of older types.

Sea Breaches G.W.R. Main Line

During the wild weather that prevailed early in January a breach was made in the G.W.R. main line between Dawlish and Dawlish Warren, where it runs alongside the sea. The heavy seas undermined the sea-wall and washed out the earthwork that carried the railway, leaving both lines suspended in the air.

For several days no traffic could pass along this line. Local traffic had to be diverted via the Teign Valley line, and the "*Cornish Riviera Express*" and other through trains were compelled to travel between Exeter and Plymouth by the Southern Railway route. This led to some interesting locomotive working. The "*Cornish Riviera Express*," for instance, was worked by the usual enginemen, who had the usual engine of the "King" class from Paddington to Exeter. Arriving at the latter station, they had to leave their "King" and walk to the other end of the train, where an engine of the 4–4–0 "Bulldog" class awaited them. With this they completed the journey to Plymouth, accompanied on the footplate by a Southern Railway driver as pilot.

Repairs to the damaged line were pressed forward with all possible speed but under great difficulties as the violent seas continued. Enormous numbers of granite blocks were used, set in quick-drying cement mortar and with concrete backing. Within a week the line was re-opened for traffic but for some time only a single line—the "up" line—was available.

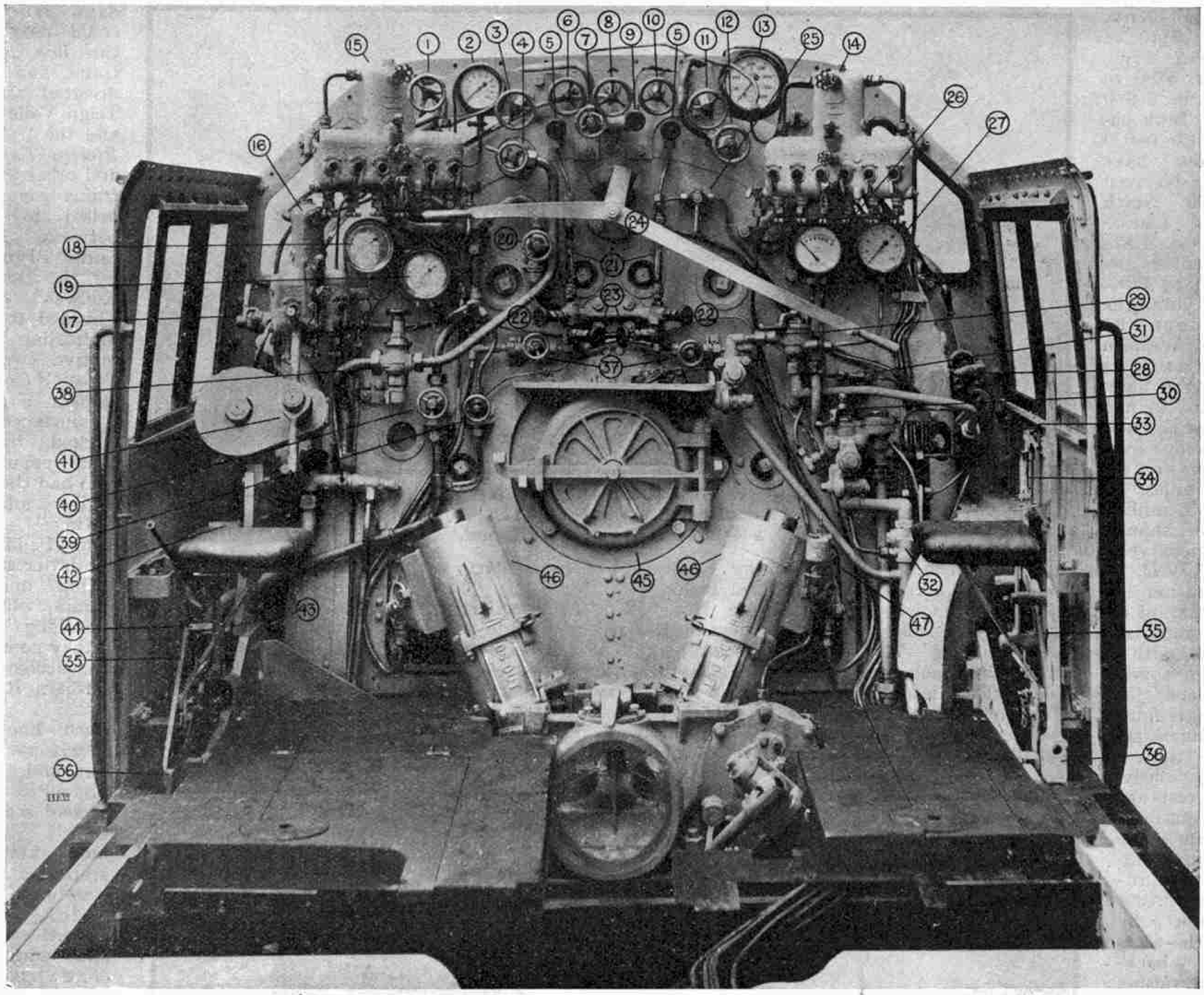
L.M.S. Banana Vans

The L.M.S. have ordered 100 vans to be specially built for the conveyance of bananas. These will bring the total number of banana vans in use on the L.M.S. up to 1,700.

During 1930, 12,000 freight wagons of various types are to be built by the L.M.S. at a cost of £1,500,000. The vehicles to be constructed are of many types, including 20-ton steel hopper wagons, cattle wagons and meat vans in addition to the usual open and covered goods wagons.

"Garratt" Express Locomotives for New Zealand

Interesting Features of Design



View of cab of one of the three "Beyer-Garratt" 4-6-2+2-6-4 type express locomotives that have been built for the New Zealand Government Railways. A key to the various reference numbers in the illustration is given on the opposite page.

AMONG the most interesting additions to the New Zealand Government Railways locomotives are three "Beyer-Garratt" 4-6-2+2-6-4 type express locomotives built last year by Beyer Peacock & Co. These are remarkable engines in every respect, and they represent yet another advance in "Garratt" locomotive design and construction.

Each locomotive is equipped with six cylinders—that is to say, each group of wheels is driven by three cylinders—to which superheated steam is distributed by piston valves actuated by Walschaerts gearing. The Gresley system is employed for actuating the inside valve by means of a combining lever, and the valves work with a maximum cut-off of 50 per cent. Steam reversing gear is fitted.

Full advantage is taken in this design of the opportunity afforded by the "Garratt" system of construction for employing ample boiler and firebox proportions. The boiler barrel has an outside diameter of 6 ft. 6 in., its length being 12 ft. It contains 43 superheater flue tubes $5\frac{1}{4}$ in. diam. outside, and 224 fire tubes $1\frac{3}{4}$ in. diam. outside. The firebox is of the round-topped pattern and has a grate area of 58.3 sq. ft., this grate being arranged with rocking firebars, mechanically operated. The ash-pan is of the hopper type with cleaning doors at the sides and below. Feed water is supplied to the boiler by a top feed device, and three Ross patent "pop" safety valves are mounted above the firebox.

The firebox is fitted with two Nicholson thermic syphons, and firing is effected by means of a Duplex mechanical stoker.

This locomotive represents a very interesting and skilful piece of designing work and may be said to embody the latest developments in "Garratt" locomotive practice. Considerable difficulties necessarily arise with the 3 ft. 6 in. gauge, owing to the limited space between the frames, and also in this instance to the very limited

height that was available to the designer.

The working in of the mechanical stoker has been obtained in a very satisfactory manner, the coal bunker being fitted on the boiler cradle, which latter has been extended to accommodate it. The restricted height of the engine, 11 ft. 6 in. from rail level, also had the effect of emphasising the difficulties encountered in designing the cab owing to insufficient head-room; but here as elsewhere matters have been satisfactorily arranged.

The locomotives are intended for working heavy mail trains on the New Zealand Railways, to replace double heading and banking. The specification called for the ability to negotiate three chain curves, and also for the achievement of a speed on the level of 50 m.p.h., and the negotiation of grades of 1 in 40.

The six cylinders of the locomotives are 16½ in. in diameter by 24 in. stroke. The total heating surface is 2,794 sq. ft.; the boiler pressure 200 lb. per sq. in., and the tractive effort at 75 per cent. boiler pressure 51,580 lb. The bunker coal capacity is six tons and the combined water capacity of the tanks 4,000 gallons.

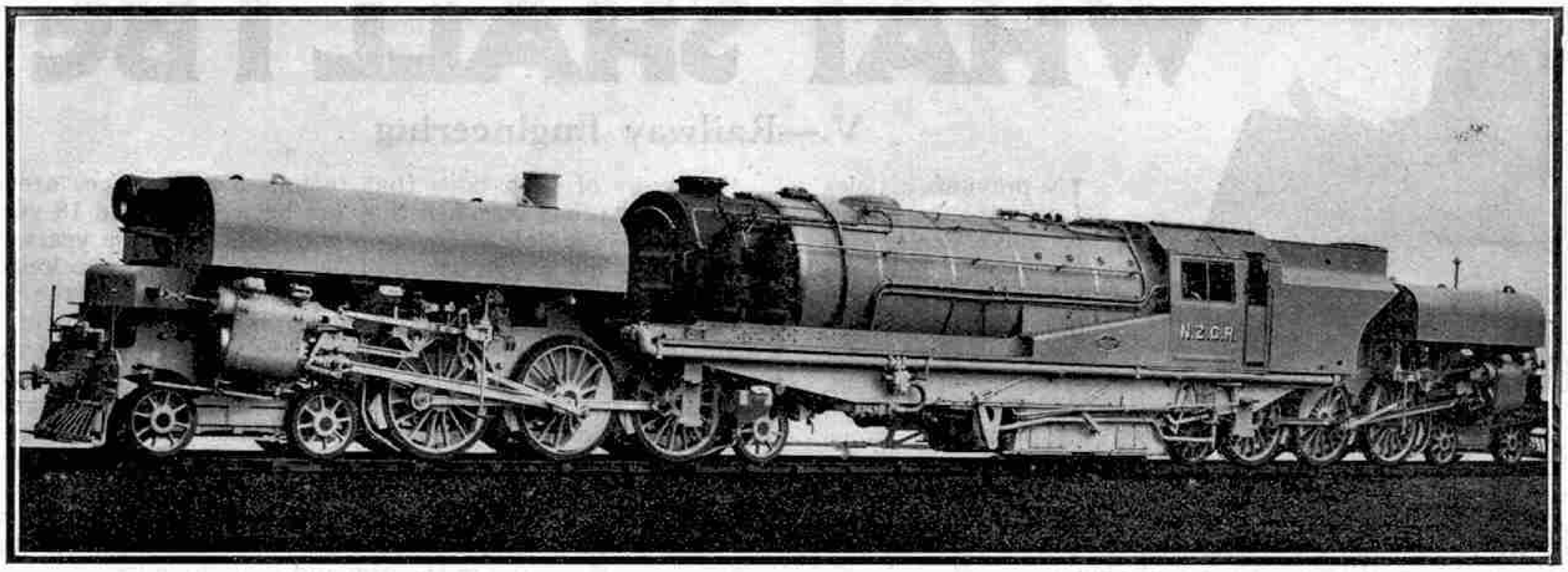
The "Garratt" is a particularly interesting example of the articulated type of locomotive. The primary purpose of such locomotives in general is that of providing for safe and easy negotiation of difficult curves. The "Garratt" possesses this valuable feature to the full, but its main object is to provide a range of power that cannot be attained with locomotives of the conventional type. Another point of importance is that the "Garratts" are "double-enders" in reality as well as in appearance, for they run equally well in either direction and thus make long turntables unnecessary.

A "Garratt" locomotive may be described as consisting of two separate engine units connected by a frame carrying the boiler. These units are placed one at each end of the boiler frame so that the latter is left quite free for the accommodation of the boiler. The result of this arrangement is that the size of the boiler is limited only by the loading gauge, as the fuel and the water are carried on the engine frames. There are no axles beneath the firebox, so that this can be made of any depth and form within reason, with correspondingly good steaming qualities and fuel economy.

Coal and water are carried in a tank surmounting the engine unit at the footplate end of the locomotive, while the front unit carries only a water tank. The two water tanks are connected by a levelling pipe carried along the outside of the frame. This pipe, together with the main steam pipes from the boiler to the engine units, is fitted with a special swivel-jointed connection.

On account of their peculiar characteristics these locomotives have proved themselves of particular value on narrow gauge railways, where conditions make it very difficult to attain the necessary speed and hauling power with locomotives of the ordinary type. The first "Garratt" was designed and built in 1909 by Beyer Peacock & Co. Ltd., for the 2 ft. gauge line of the Tasmanian Government Railways. Since that time the progress of this type of locomotive has been very rapid, notably on the 3 ft. 6 in. gauge South African railways. "Garratts" have also proved themselves of great value for haulage work in the yards of large works where, owing to the limited space available, the conditions are liable to be very severe as regards gradients and curves, while the loads to be hauled are usually heavy.

For the information and illustrations contained in this article we are indebted to the courtesy of the Editor of "*The Beyer-Peacock Quarterly Review.*"



One of the New Zealand Railways "Beyer-Garratt" locomotives.

References to the numbers on the "Beyer-Garratt" cab illustrated opposite

1. Westinghouse Pump Steam Cock.
2. Steam Heating Gauge.
3. Exhaust Injector Steam Cock.
4. Carriage Heating Steam Cock.
5. Water Gauges: Steam Valves.
6. S.F. Lubricator Steam Cock.
7. Do. Do.
8. Blower Steam Cock.
9. Turbo-Generator Steam Cock.
10. S.F. Lubricator Steam Cock.
11. Injector Steam Cock.
12. Drifter Valve.
13. Steam Pressure Gauge.
14. "Detroit" Sight Feed Lubricator.
15. Do. Do.
16. Do. Do.
17. Rocking Grate Operating Valve.
18. Mechanical Stoker: Pressure Gauge.
19. Do. Do.
20. Do. Distributor Main Steam Valve.
21. Glass Water Gauges.
22. Do. Do. Water Valves.
23. Do. Do. Washout Valves.
24. Regulator Handle.
25. Air Sanding Valve.
26. Duplex Pressure Gauge. } Air Brake.
27. Single Do. } Air Brake.
28. Sellars' Injector.
29. Driver's Brake Valve.
30. Do. Do.
31. Cylinder Cock Operating Valve.
32. Brake Valve Isolating Cock.
33. Brake Release Valves.
34. Reversing Lever.
35. Blow-Down Valve Operating Levers.
36. Drop Grate Operating Levers.
37. Mechanical Stoker Distributor Valves.
38. Carriage Heating Reducing Valve.
39. Mechanical Stoker Engine Steam Valve.
40. Mechanical Stoker Engine Auxiliary Steam Valve.
41. Hand Brake Gear.
42. Operating Rod for Ashpan Bottom Doors.
43. Operating Rod for Ashpan Front Damper Doors.
44. Operating Rod for Ashpan Rear Damper Doors.
45. Firedoor.
46. Mechanical Stoker Distributing Heads.
47. Mechanical Stoker Oilcup.

WHAT SHALL I BE ?

V.—Railway Engineering

IN previous articles in this series we have dealt with the manner in which a boy may enter upon a career in Mechanical or Electrical Engineering, and have explained in detail the steps by which he obtains the necessary training. This month we propose to consider engineering from the railway point of view. The engineer is very greatly concerned with this form of transport. For instance, the building of locomotives and wagons is a special branch of Mechanical Engineering, and similarly the construction and upkeep of track, bridges and tunnels is the work of the Civil Engineer. In the present article we describe the prospects of careers in these two branches.

Locomotive building is carried on by the railway companies themselves and also by many firms, who make engines of all kinds for use at home and abroad. In the works where these are built a very large number of skilled tradesmen are employed. They include pattern makers, moulders, fitters and turners, and entry into such trades is secured in exactly the same manner as in any ordinary engineering works. Boys between the ages of 14 and 16 are apprenticed to one of the trades carried on, and they serve in this capacity for five years, or until they reach the age of 21. They are known as trade apprentices and in most instances it is the usual practice to fill any vacant positions of this kind that occur from among the sons and relatives of those already employed.

It must be borne in mind that the training received by a trade apprentice is limited in character, for only in rare cases is a boy following this course able to transfer from one shop to another. He qualifies in one trade, and in it he may rise to the position of inspector or shop foreman. This carries with it a certain amount of responsibility, but trade apprentices have very little opportunity of filling the higher and more remunerative posts that are attainable in the Locomotive Engineering industry.

The wages paid to trade apprentices vary considerably, but in general from 8/- to 10/- per week is paid at the commencement of service. If satisfactory progress is made this rises to a maximum of 20/- to 25/- per week in the final year, after which of course the now fully-trained apprentice becomes a tradesman and receives the usual trade union rate of pay.

Boys who have received a good education at a public or secondary school may enter the profession with better prospects than those who only take up a trade apprenticeship. It is from the ranks of such boys that technical apprentices are recruited. These are taken on when they are between 16 and 18 years of age, and they complete their apprenticeship after five years of service, or when they are 21 years of age, whichever is the longer period. A point of some importance is that in some cases the practice of recruiting apprentices from the sons and relatives of workmen already employed is not followed in the case of technical apprentices.

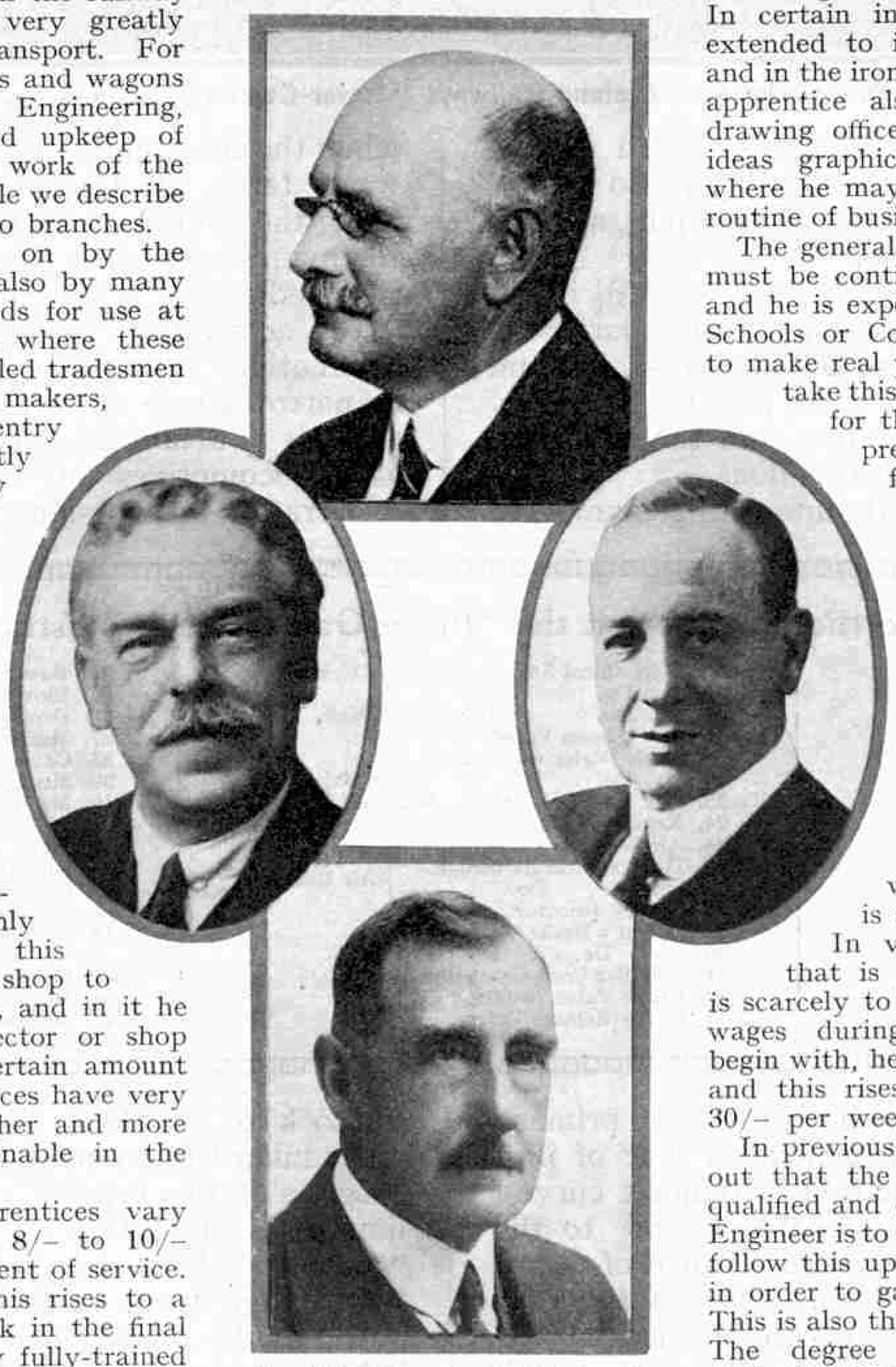
During their five years in the works technical apprentices pass through the departments in which turning, fitting, erecting and other operations are carried on. Thus they receive thorough practical tuition in each of the trades concerned and acquire a sound knowledge of Locomotive Engineering as a whole. In certain instances the course of training is extended to include work in the pattern shop, and in the iron and brass foundries. The technical apprentice also may be allowed to enter the drawing office, where he learns how to express ideas graphically, or even the general office, where he may make acquaintance with the usual routine of business.

The general education of a technical apprentice must be continued while he is serving his time, and he is expected to attend classes at Technical Schools or Colleges. The apprentice who hopes to make real progress in his chosen career should take this portion of the training very seriously, for the courses arranged at such schools prepare students for the examination for the National Certificate in Engineering. This is a valuable diploma, and to obtain it should be the aim of a technical apprentice in any branch of engineering.

There is always the possibility that a brilliant and persevering student may take an external degree in Engineering of London University after studying at a Technical School or College. The possession of such a distinction, in conjunction with practical training in a high-class engineering works extending over five years, is a proof of ability and character.

In view of the value of the training that is given to a technical apprentice, it is scarcely to be expected that he will earn high wages during the apprenticeship period. To begin with, he may expect 10/- to 12/- per week, and this rises to a maximum of from 27/- to 30/- per week in the final year of his service.

In previous articles in this series it was pointed out that the best method of becoming a fully qualified and competent Mechanical or Electrical Engineer is to obtain a degree at a University and to follow this up by taking a student apprenticeship in order to gain the necessary works experience. This is also the case with Locomotive Engineering. The degree courses arranged by University authorities give a student the opportunity of obtaining a thorough instruction in the theoretical and scientific foundations of engineering. Consequently when a student who has obtained a degree also becomes familiar with workshop practice, he is capable of filling one of the higher

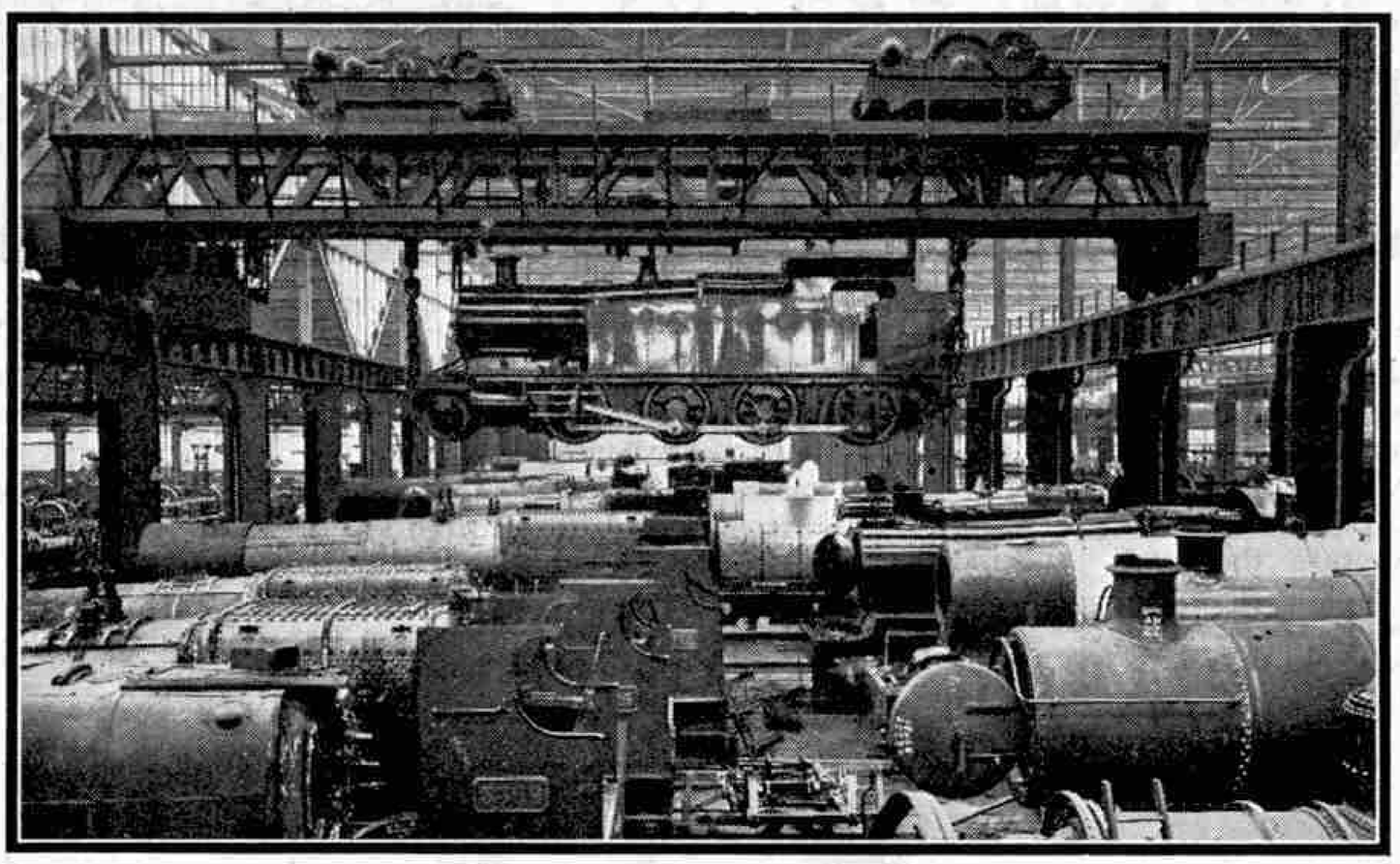


The Chief Mechanical Engineers of the four chief British Railways. Top: Sir Henry Fowler, K.B.E. (L.M.S.R.). Left: Mr. H. N. Gresley, C.B.E. (L.N.E.R.). Right: Mr. C. B. Collett, O.B.E. (G.W.R.). Bottom: Mr. R. E. L. Maunsell, C.B.E. (S.R.).

and more remunerative posts that the industry affords. This may be on the staff of a firm of manufacturers of locomotives, or in the department of the Chief Mechanical Engineer of a railway company in this country or abroad.

It may be remarked that practically all those who hold leading positions in the Locomotive Engineering world are members of the Institution of Mechanical Engineers. Apprentices with the necessary qualifications should not hesitate to become Students of this Institute, for such a step will be helpful to them in many ways. Full details of the Institution may be obtained from the Secretary, Institution of Mechanical Engineers, Storey's Gate, St. James' Park, London, S.W.1.

Any boy who wishes to take up a career in Locomotive Engineering should study carefully the account we give of this occupation and then make enquiries regarding apprenticeship schemes from as many firms that make locomotives as possible in order that the final choice may be made with full knowledge of the conditions. In following this up by making application for apprenticeship, full details regarding education should be given. In addition, evidence of physical fitness should be produced, a step that is decidedly in the interests of both employers and apprentices.

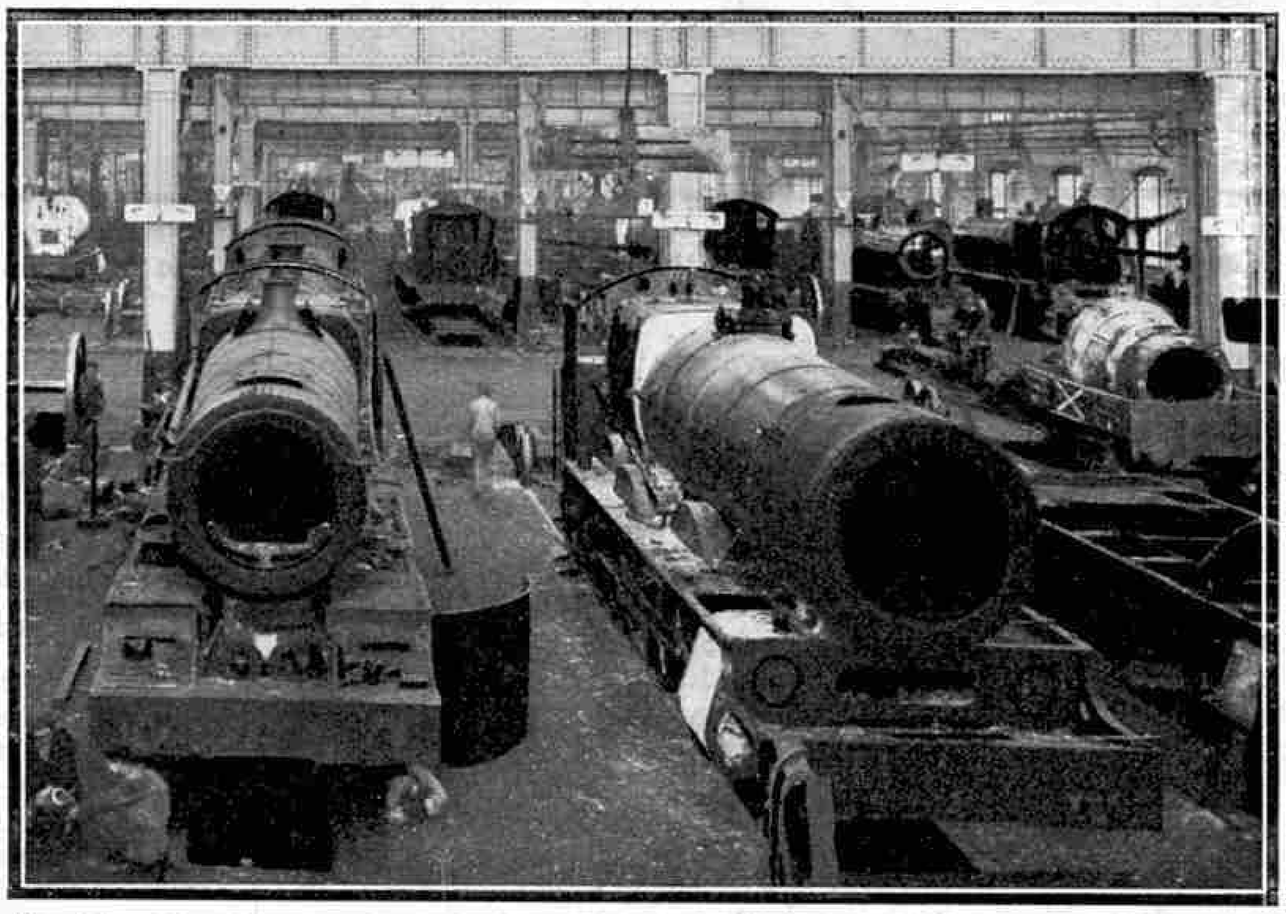


A view in one of the Shops at the Swindon Locomotive Works of the Great Western Railway, showing an overhead travelling crane lifting a 2–8–0 tank engine.

The steps to be taken on completion of a period of apprenticeship also deserve consideration, and it must be emphasized that a boy should not enter this, or indeed any industry, until he has thoroughly examined the prospects, and is satisfied that the openings to be found in it will suit him. The exercise of a little forethought in this respect may prevent disappointment in after life.

The prospects of a trade apprentice are limited in character, for usually he is able only to secure a position in shops similar to the one in which he has been trained. The technical apprentice has a wider field in which to look for openings. He may be retained by the firm with which he has served during the training period and may find the prospects of advancement very bright. Alternatively he may look around for a position in which he may gain further experience and a wider knowledge of locomotives and their construction.

Many good appointments offer themselves abroad. Positions of this kind may be obtained in several ways. They may be advertised, or a young man who is willing to go abroad may be recommended to the controlling officials of a railway by a well-known locomotive engineer. As a rule, appointments of this kind involve some responsibility and it is necessary that the man who takes one of them should have a complete practical knowledge of every branch of Locomotive Engineering. Very often firms who complete contracts for the construction of locomotives for use in Africa, South America, or elsewhere abroad, send out with the locomotives men who have been engaged in their construction in order to ensure that they are properly run. This often leads to securing a good appointment, for naturally such men are best suited for places on the permanent staff of the railway on which the locomotives are employed.



The Erecting Shop at Swindon. For permission to reproduce the photographs on this page we are indebted to the G.W.R.

Locomotive construction is not the only department of railway work in which engineering is concerned. The task of providing a well-laid track or permanent way and keeping it in the best condition is as important as that of building powerful engines, and indeed, the size of these is limited by the capacity of the track on which they are to run. An interesting instance of this is the inability to run "Royal Scots" on the L.M.S. line from Chester to Holyhead because of their large axle weight.

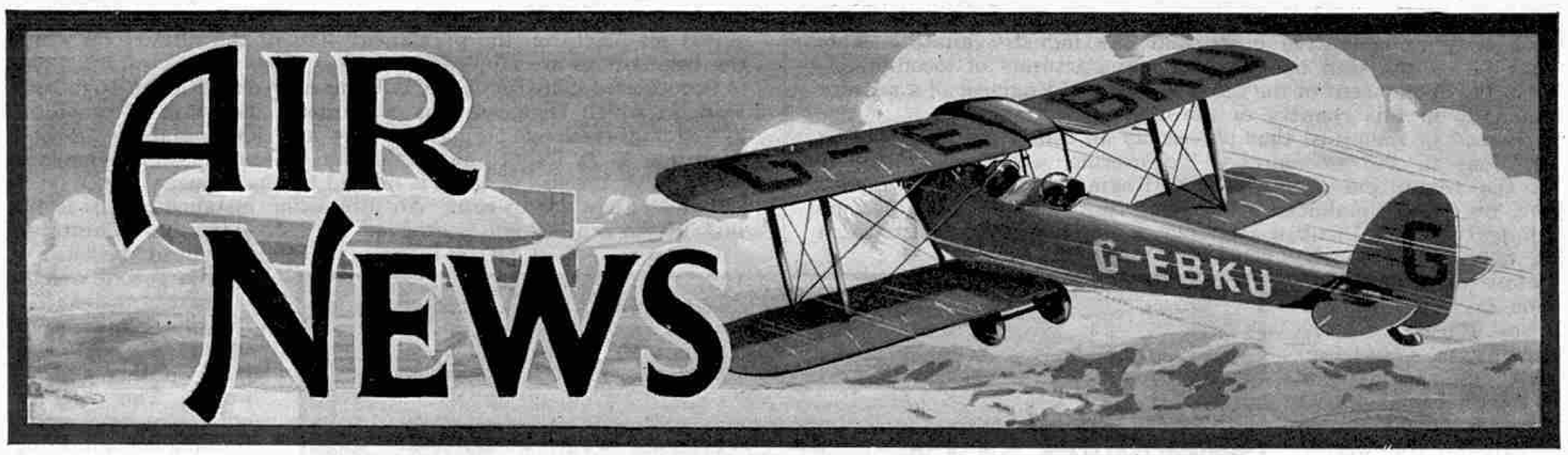
There is no definitely recognised manner in which a boy may take up this class of work. The chief requirement is a sound training in engineering. To-day railway companies expect all who aspire to responsible technical positions in their engineering departments to have a University degree in Civil Engineering, or to have passed the examinations qualifying for Associated Membership of the Institution of Civil Engineers.

In the case of the Southern Railway young men who have secured an engineering degree may become "Cadets," as they are called, in the engineering department. In many respects the position of a Cadet is similar to that of a student apprentice in an engineering works. He serves for three years, during the first year of which he receives no salary. After 12 months' service he becomes a Supernumerary Permanent Way Inspector and may receive a salary of up to £100 per annum. In his third year a Cadet ranks as Junior Engineer Assistant, and his earnings may rise to £200 per annum.

If a Cadet wishes to be retained in the Company's service at the conclusion of his three years' term of service, he must pass the examination for Associate Membership of the Institution of Civil Engineers. He then becomes an Engineering Assistant. Afterward his progress will depend upon himself and he will obtain promotion to higher grades in the service in accordance with merit and seniority.

Naturally only a certain number of Cadets may be appointed in any one year and those who have the necessary qualifications should make application as soon as possible. This must be done on a form that may be obtained from the Secretary of the Company.

Although the possession of a degree is essential if the higher posts in the engineering department of a Railway Company are aimed at, it is possible to enter this department in other ways and with quite good prospects. For instance, a boy may enter the drawing office as a junior assistant. At first he will have many menial duties to carry out, but if he shows any aptitude for the work he will eventually find opportunities for improving his position. It is also possible to enter the Permanent Way Inspector's Offices as a junior clerk. The work carried out in there is quite interesting and the position may offer good prospects to a boy who is enthusiastic and keen to make progress. Naturally there is very keen competition for openings of this kind.



Testing Aeroplane Ribs

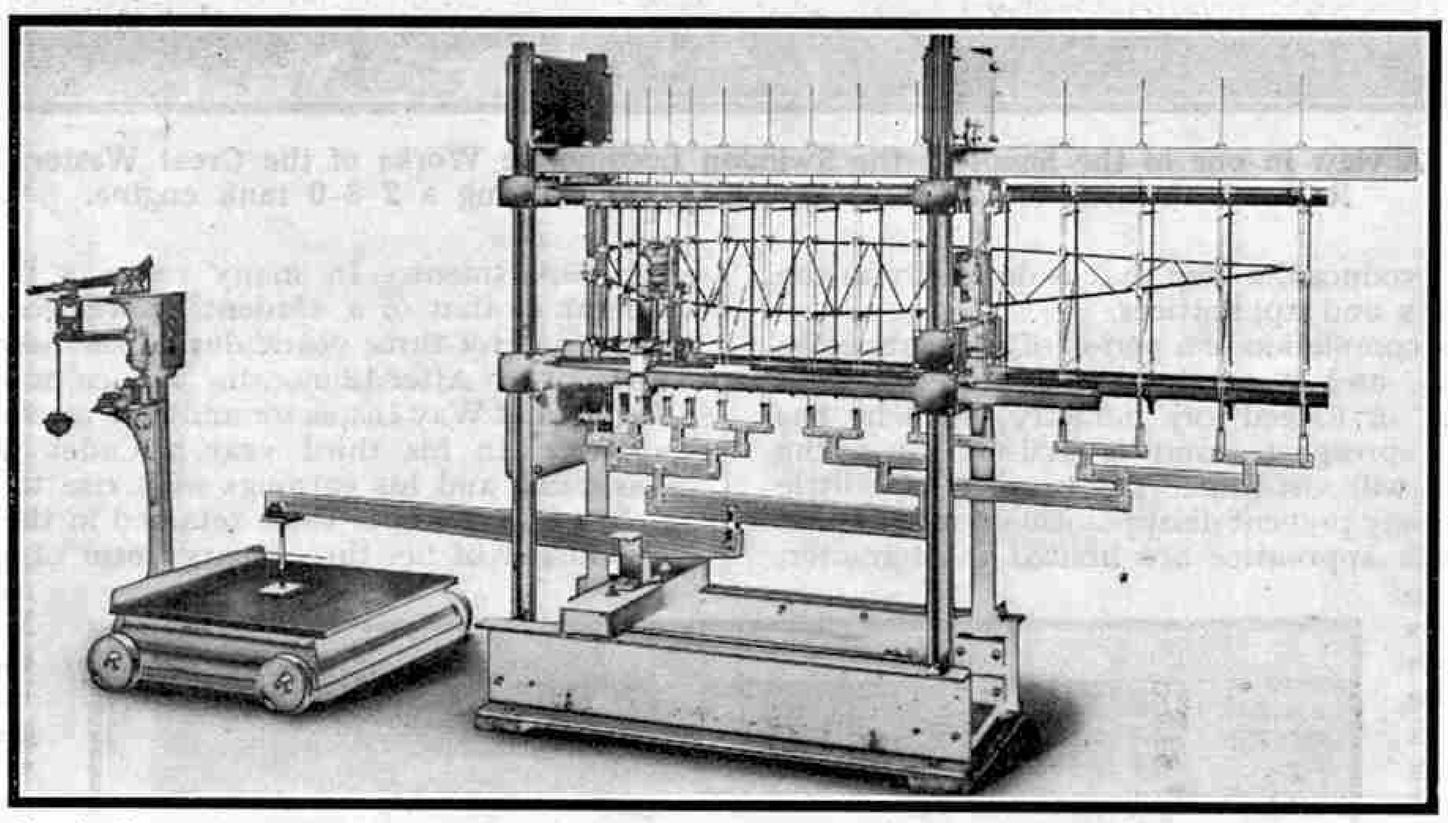
The accompanying illustration shows an apparatus recently designed and erected at the Whitley Works of Sir W. G. Armstrong Whitworth Aircraft Ltd., for testing the ribs to be used in aeroplanes.

In testing such a structure the load should be applied in the manner in which it is actually imposed when the part is in service. For this reason the apparatus has been arranged to apply loads at a series of points along the rib. The loading positions are spaced closely in the region near the leading portion of the rib, where the highest air pressure is met with.

The rib to be tested is supported in a framework that takes the place held in an aeroplane by the fabric and stringing. This framework is free to move vertically and a downward pull is exerted on each unit of it by a series of levers, the lengths of which are such as to apply the required load at each point. The weight of the framework and levers is supported by adjustable springs.

Short lengths of spar are fitted in the rib and rest on rigid supports, though free to pivot on them. The reaction to the applied load is given by these supports.

Above each unit of the frame is an adjustable device that permits only a small downward movement. If a rib gives way under the load applied the distortion remains quite local, therefore, and is not communicated to other parts of the rib. This enables careful inspection to be made of the point where failure of the rib takes place and the weak place may be strengthened if the rest of the rib is to be further tested.



Courtesy] [*Sir W. G. Armstrong Whitworth Aircraft Ltd.*

The remarkable machine, described on this page, on which ribs for use in aeroplane wings are tested.

Enlargement of the "*R101*"

A new gas bag is to be fitted to the State airship, "*R101.*" The new bag will contain about 500,000 cu. ft. of gas, and the addition of the new frame-section that will be required to accommodate it will increase the total length of the ship to 800 ft. The bag will bring the total capacity of the vessel up to 5,500,000 cu. ft., and thus it will be the largest airship in the world, until the completion of the U.S. Navy airship "*ZRS-4.*"

New Distance Record

A new closed circuit distance record has been set by two French aviators, MM. Costes and Codos, who flew in a Breguet XIX type machine named "*Question Mark.*" The attempt was started from an aerodrome at Istres near Marseilles, and for 52 hrs. 34 mins. the machine flew in a circuit between Marseilles and Avignon, covering in that time a distance of 4,978 miles. This distance exceeds by 218 miles that covered in 1928 by Captain Ferrarin and the late Major del Prete, the previous holders of the record.

An interesting feature of the flight was that a special trolley was fitted to the tail skid in order to facilitate the take off, at the time of which the aircraft's all-up weight was 13,640 lb. Immediately prior to leaving the ground the rear trolley was detached from the machine. The total length of time required to take off was 38 seconds.

London-Cape Town Air Mail Service

An aerial survey of the route from Egypt to Cape Town is now being made in readiness for the opening of a new air service for mail and passenger traffic between London and South Africa. A service between London and Egypt is already in operation, and this will be extended until Cape Town is reached. When the full length of the route is regularly being flown it is expected that the journey will occupy eight days as against the 17 days now required by the fastest steamers.

Air Mail Service in Arctic Regions

A new air mail Service has been put into operation in Northern Canada. The region served by it is the Mackenzie River basin, and throughout the winter mail is carried by aeroplanes that are fitted with skis in order to make use of the frozen surfaces of the lakes of the far north as landing grounds. The service is operated by Commercial Airways Limited.

This development will put an end to the almost complete isolation of Northern Canada formerly caused by the winter freeze-up. The new service replaces a long winter trek by dog team from McMurray, on the Athabaska River, to Aklavik, in the delta formed by the Mackenzie River on the shore of the Arctic Ocean. The distance between these two places is 2,000 miles, and 12 intermediate posts have been established. The trip from McMurray to Aklavik occupies about six days in all, but the actual flying time is only 20 hours. To traverse the same distance by dog team requires no less than two months.

Great interest was displayed in the opening of this Arctic Air Mail service, and no fewer than 120,000 letters were despatched from Edmonton to McMurray for transfer to the mail machines on their initial flights.

New South African Flying Record

Sir Pierre van Ryneveld, Director of the Air Force of the Union of South Africa, has made a new record non-stop flight from Cape Town to Pretoria. The machine in which the flight was accomplished was of the Westland "Wapiti" type equipped with "Bristol" Jupiter engine, and the journey of 850 miles was completed in 6 hrs. 10 mins. at an average speed of more than 140 m.p.h.

The previous record for a flight between the two cities was held by the same pilot, who in 1928 flew from Cape Town to Pretoria in 7 hrs. 25 mins., and made the return journey in 7 hrs. 20 mins. On that occasion Sir Pierre used a D.H.9 machine fitted with a 450 h.p. Jupiter engine.

The Saro "Cutty Sark"

An interesting light cabin flying-boat produced by Saunders-Roe Ltd., of East Cowes, Isle of Wight, is the Saro "Cutty Sark." The machine is of the cantilever monoplane type and has been designed so that it is possible to fit it with one engine of 200 h.p., two engines, each of 105 h.p., or three engines developing a total of 240 h.p. The usual practice is for the boat to be fitted with two 105/115 h.p. Cirrus-Hermes engines. These are carried in nacelles situated above the wings, a position in which they sustain no damage from sea-water, even in quite heavy seas.

The hull of the "Cutty Sark" is of the all-metal type and may readily be repaired by any of the ordinary methods. The wing is of wooden construction, and is fitted with several water-tight compartments. It contains the main petrol tanks, the maximum capacity of which is 40 gallons, and the normal capacity 36 gallons. Fuel from these is pumped to smaller tanks at the back of the engine nacelles from which it is fed by gravity to the engines.

The "Cutty Sark" has a wing span of 45 ft. and a wing surface area of 320 sq. ft. It is 11 ft. 2 in. in height and 34 ft. 4 in. in overall length, and the hull measures 32 ft. by 4 ft. The machine weighs 2,246 lb. when empty and 3,200 lb. with a normal load, but in exceptional circumstances an additional 200 lb. may be carried. The power loading varies between 15.3 and 16.2 lb. per horse power, while the wing loading is from 10 to 10.6 lb. per sq. ft.

This flying boat has an operating range of 340 miles at a normal cruising speed of 85 m.p.h., and for short periods is capable of travelling at a maximum speed of 105 m.p.h. Four passengers may be accommodated in the totally-enclosed cabin, behind which is a luggage compartment. A small locker in front of the cabin accommodates spares.

Airship Mooring Mast on Skyscraper

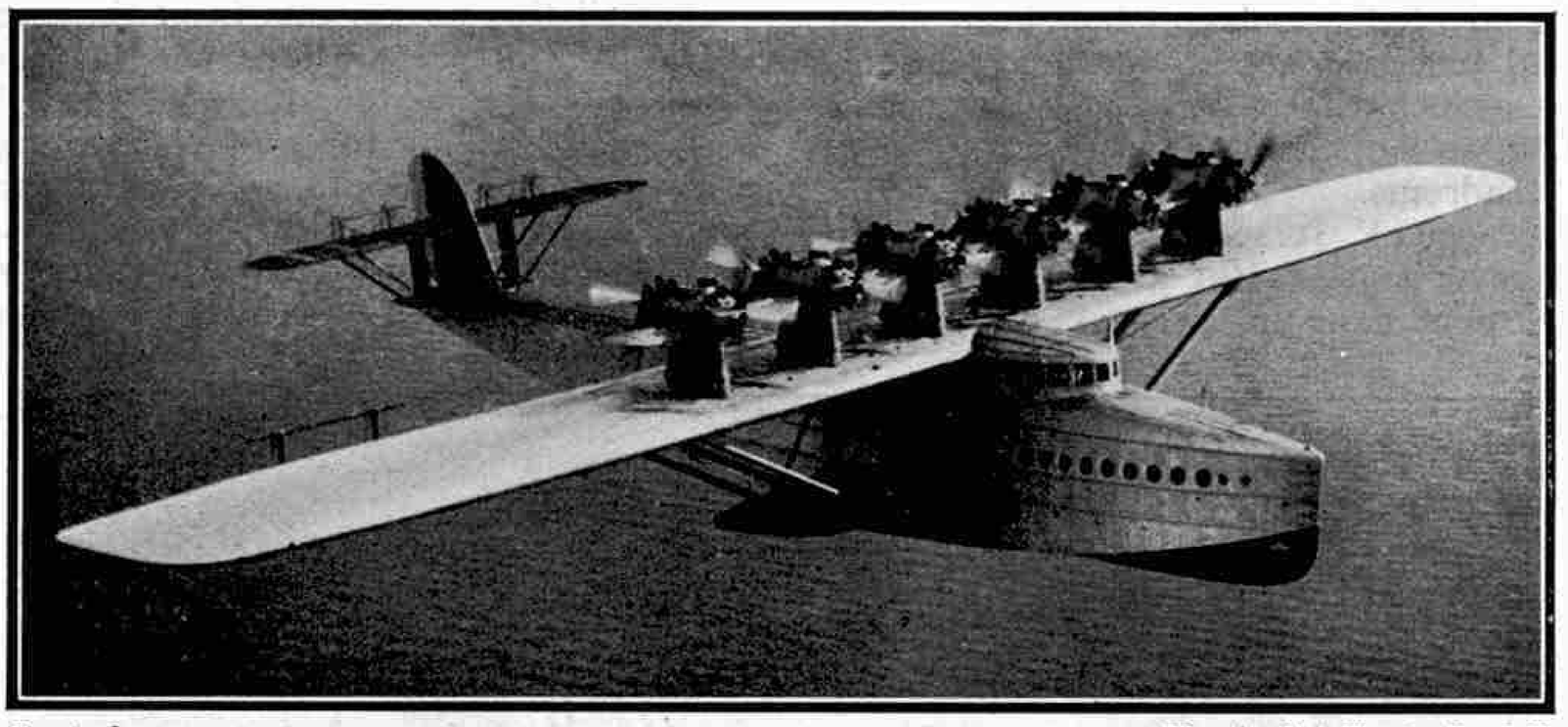
On page 14 of the "*M.M.*" for January last, details were published of a skyscraper that is to be constructed on the site of the former Waldorf-Astoria Hotel, New York. This will be known as the Empire State Building. It is now stated that an airship mooring mast 200 ft. in height is to be erected on it. The building itself is to be 1,100 ft. in height, and thus the top of the mast will be 1,300 ft. above street level.

The mast will be constructed so that it will be capable of holding an airship when a 50 m.p.h. gale is blowing. If the scheme is put into operation airship passengers will be able to disembark right in the centre of the city, instead of leaving these vessels on the outskirts and completing their journeys by rail or road, thus losing time that may be valuable.

New Air Liners for Belgian Company

For a number of years the Belgian "Sabena" Company have employed Handley-Page W8F type aeroplanes in operating their air lines in Europe and the Belgian Congo. These are now being replaced by triple-engined Fokker F VII-3m. type monoplanes, and the first batch of the new machines has already been delivered.

The change of type is disappointing to the British Aircraft industry, but it is gratifying to note that the Fokker machines are equipped with "Bristol" Titan engines constructed under licence by a Belgian firm. These engines are of the five-cylinder air-cooled radial type, and at 1,870 r.p.m. they develop 220 h.p. In design and construction they follow "Jupiter" practice.



Courtesy] [*Dornier Metallbauten G.m.b.H.*

The Dornier "*DO.X*" in flight over Lake Constance. This flying boat, which is the largest heavier-than-air machine yet built, was described on page 922 of the "*M.M.*" for December last.

Change in Air Mail Route to India

Eventually machines of the India Air Mail Service will fly to Alexandria by way of Cologne, Nuremburg, Uskub, Salonika, Athens and Crete. From Alexandria the present route to Karachi will be followed. The change in route shortens the journey by about 100 miles, but its chief purpose is to avoid crossing Italy. The decision to make the alteration is the result of the failure of Imperial Airways Ltd. to arrange satisfactory terms for a renewal of their agreement with the Italian Government.

In India itself the Air Mail Service has been extended from Karachi to Delhi via Hyderabad, Imperial Airways Ltd. having secured a contract from the Indian Government to operate the new service for two years. At the end of that period it is expected that the line will be taken over by the State. The extension is very interesting for it forms an additional link in the projected service between London and Australia. The next portion that will be put into operation is that to Calcutta and Rangoon for which a service will shortly be established. The line eventually will be extended to Australia by way of Rangoon and the East Indies.

THIS MONTH'S AIR STORY

"What was the cause of the crash?"
"I got into an air pocket."
"And was there a hole in it?"

World's First Regular Airship Line

A company has been formed in America with the object of establishing what probably will be the world's first regularly operated airship service. The initial operations will extend from a point on the Pacific Coast of the United States to Hawaii, but when a sufficient number of airships are available the service will be extended to Manila in the Philippine Islands. For this reason, a mooring mast only is to be erected at Hawaii, and large hangars to accommodate the airships are to be built at the United States terminal, and probably also at that in the Philippine Islands.

The airships to be used will have capacities of 6,500,000 c.ft., and will be similar to the vessels now being constructed for the United States Navy by Goodyear-Zeppelin Corporation. A description of these giant airships appeared on page 924 of the "*M.M.*" for December, 1929. Those to be constructed for the airship line would be capable of making the journey between the United States and Hawaii in one-and-a-half days, and only four-and-a-half days should be occupied by the flight across the Pacific Ocean to Manila.

British Light Aeroplanes

We are frequently asked by readers for a list of light aeroplanes manufactured by British firms. There are 14 of these and below we publish their names, together with those of three light seaplanes, and one light flying boat also made in this country.

Name	Manufacturer
Autogiro	Cierva Autogiro Co. Ltd.
"Avian"	A. V. Roe & Co. Ltd.
"Bluebird"	Blackburn Aeroplane & Motor Co. Ltd.
Civilian Coupé	Civilian Aircraft Co. Ltd.
"Elf"	George Parnall & Co.
"Gadfly"	Glenny & Henderson.
"Martlet"	Southern Aircraft Co. Ltd.
"Moth"	De Havilland Aircraft Co. Ltd.
"Phœnix"	Boulton & Paul Ltd.
"Robin"	A.B.C. Motors Ltd.
"Spartan"	Simmonds Aircraft Ltd.
Sports Coupé	Desoutter Aircraft Co. Ltd.
"Swift"	Comper Aircraft Co. Ltd.
"Widgeon"	Westland Aircraft Works.

Light Seaplanes and Flying Boat

"Bluebird"	Blackburn Aeroplane & Motor Co. Ltd.
"Cutty Sark" (F.B.)	Saunders-Roe Ltd.
"Moth"	De Havilland Aircraft Co. Ltd.
"Mussel"	Short Bros. (Rochester and Bedford) Ltd.

Handley-Page Slots for Sweden

Arrangements have been made between Handley-Page Ltd. and the Swedish Government for the equipment of all Swedish aircraft with Handley-Page slots.

My First Adventure in a Seaplane

What Meccano boy has not wished he could have a ride in a seaplane? Here is the story of one whose wish came true, and what a thrilling flight he had. The 'plane fell in the—but read it yourself!

FOR weeks I had been worrying my friend, Lieutenant Henderson, a veteran aviator and war ace, to take me for a flight in a seaplane. And now, at last, the much coveted permission had been given. The lieutenant had just telephoned me that he would take me up at 4 o'clock that afternoon. He was to call for me at 3.30, so we should have plenty of time to get to the seadrome.

How the time dragged! It seemed as though half-past three would never come. But at last it did, and with it came the lieutenant in a sports model car. Needless to say, I was all ready to go as soon as he arrived, and it took us only a few minutes to drive to the big air station, which was on the water-front only a mile or so beyond the city boundary.

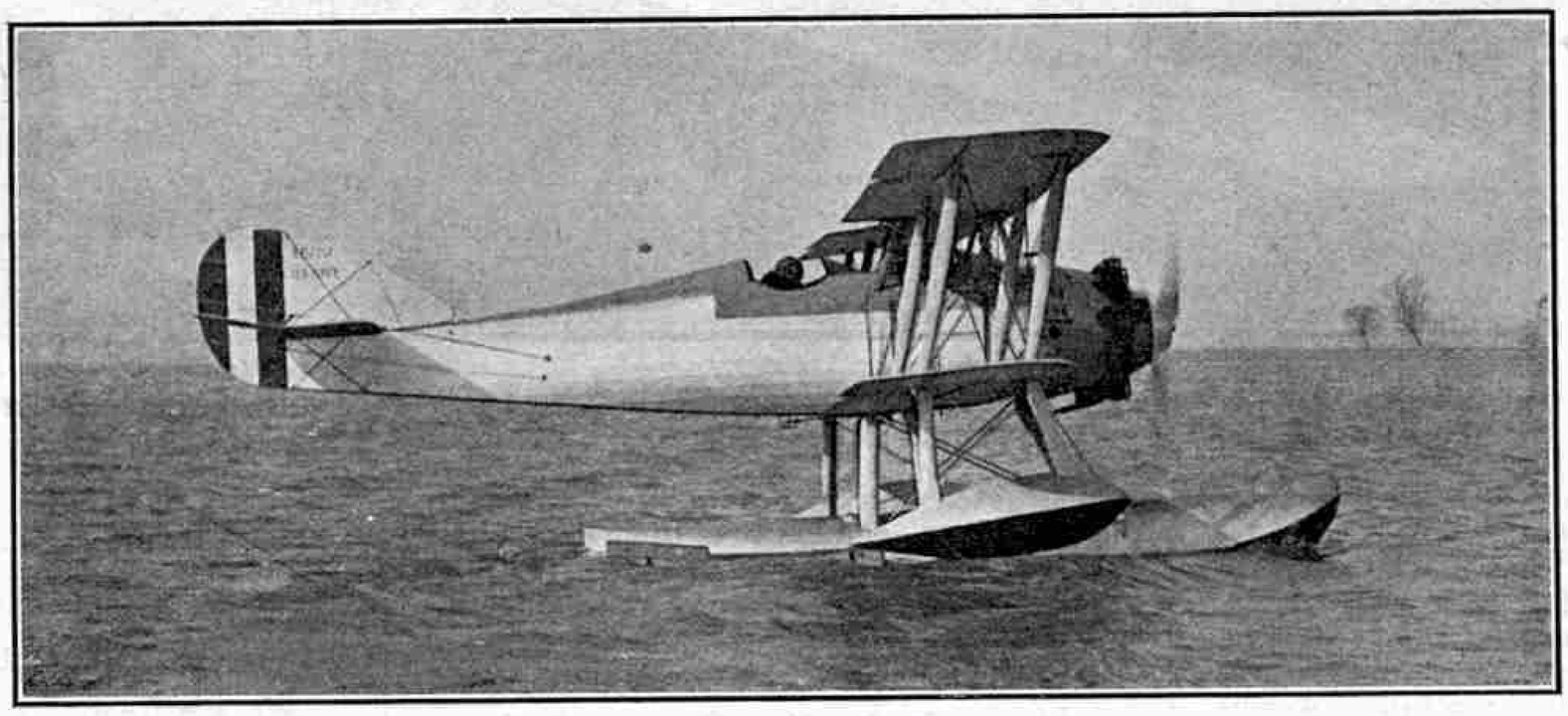
The seaplane assigned for the flight was of the naval observation type. As we approached her I could not help giving a cry of admiration. She rested so lightly on the water and looked for all the world like a monster dragon-fly, her silvery fuselage shimmering in the sunlight. A mechanic was busy warming up her powerful engine, while some other mechanics were testing each guy wire and strut to make sure that everything was in perfect condition.

In size our 'plane is a pigmy among aircraft. Her wing span is only 34 feet and she is but 28 feet long over all. But the great power of her engine—a 200 h.p. air-cooled—can send her along at a speed of 120 miles an hour—two miles a minute! They told me that she can readily be converted into a land 'plane by substituting undercarriage and wheels for the pontoons with which she is equipped for the water. 'Planes of this type are used primarily as ship-board spotting 'planes; they are carried on battleships and cruisers, and launched into the air by means of a catapult. Notwithstanding her small size, she has a "flight endurance"—that is, can carry enough fuel to keep her so long in the air—of four hours.

I lost no time in getting into a suit of flying togs, fixed a helmet on my head and climbed into the observer's seat, behind the lieutenant, who had already gone aboard and was testing the controls. The safety belt was snapped into place, and I was ready for the flight. The mechanics cast off the mooring lines, called out, "all free, sir," and we were off.

Immediately a terrifying din broke out. It seemed to me as though all the machine guns on earth were firing at once, and it was some seconds before I realized that all this noise came from the engine on our 'plane. During the preparations she had been idling slowly, but now the lieutenant had "given her the gun," and she was swishing the propeller through the air at 1,500 revolutions a minute. We were "taxi-ing" out over the water, our speed increasing every second.

The 'plane seemed to ride right on the crest of the waves, and then gradually, without any apparent reason, the water below us seemed to fall away. As I peered over the side I saw it drop down, down. Only then did it dawn on me that we were rising from the water. The sudden realization that I was really flying in the air, supported only by the fragile wings that extended on each side, gave me a thrill that I will not soon forget. Yes, I was actually flying!



"We were 'taxi-ing' out over the water, our speed increasing every second."

Up we went, higher and higher. Now the 'plane tilted to one side at an angle that must have been at least 45 degrees, and we made a graceful curve in the air. What interested me was the fact that I felt just as secure in my seat at this precarious angle as though we were flying in a horizontal position. I realized then the great power of centrifugal force—that mysterious natural phenomenon which acts on a body moving in a curve and tends to throw it outwards from its circular course. It was this power that held me fast to my seat and kept me from danger of falling out of the 'plane.

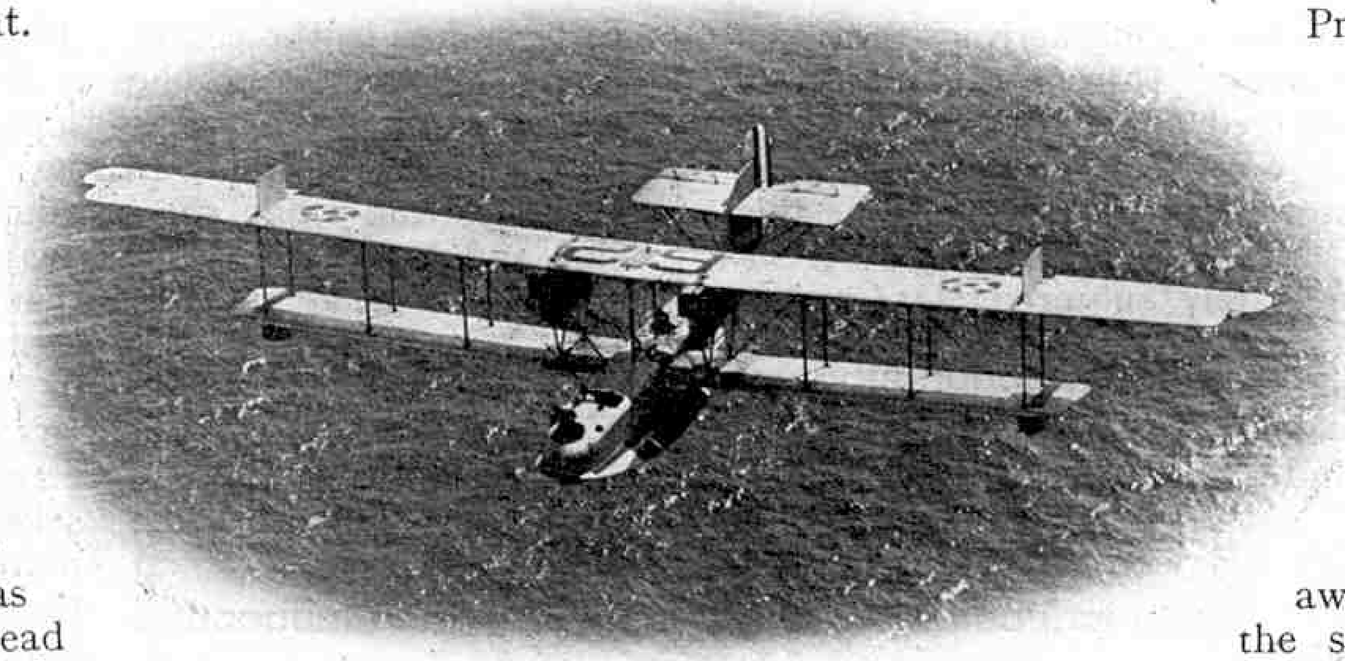
I wondered how the pilot made the 'plane bank and presumed that there must be some manipulation of the wings to effect this result. I decided to watch the wings carefully the next time we banked to see if I could detect how it was done. The tips of the wings had hinged sections called ailerons, and when we banked again I noticed that the pilot raised the aileron on one wing by means of a control in the cockpit. This reduced the supporting surface of that wing and increased the resistance of the air above, and this wing was thus forced down. At the same time, the aileron on the other wing was lowered, which made it offer resistance to the air on the under side of the wing and so force that wing upward. These movements, together with the turning of the rudder,

made the 'plane swing in a curve with the lower wing innermost. Presently the ailerons straightened out again and the 'plane came back to horizontal—we had stopped circling and were again flying "on an even keel."

Incautiously I peered over the side and was greeted by a blast of wind that almost blew my head off. I jerked my head back quickly, you may be sure, and was thankful for the protection that the windshield offered.

As I looked around, what a beautiful sight met my eyes! Far below was the clear blue ocean, dotted by myriads of little white caps of foam that gleamed and sparkled in the sunlight. Here and there was a speck on the surface—motorboats, I presumed. Farther off were several large steamers and sailing boats, looking like little toys from this great height.

I turned to look at the coast line, stretched out at my left. The shore was spotted with towns, spread out as though on a relief map, and it was quite easy to trace the railways from town to town, as they appeared like thin threads of silk glistening in the sunshine. Far off in the distance was the city, with the railway lines and highways radiating from it in all directions—just like a spiderweb, I thought. How I wished that all Meccano boys could be with me, to see this wonderful view and enjoy the novel experience.



"We passed slightly above on the right . . . . and with a roar from its mighty engines it disappeared."

Now we banked again, turning in the direction of the seadrome. Scarcely had we straightened out when I noticed a speck far off in the sky coming towards us. Rapidly it grew in size and the speck of only a moment ago was transformed into a giant seaplane. What a monster it was! Fully three times the size of our 'plane, it rode the air with perfect grace. It was a beautiful sight and my readers can gain some little idea of it from the illustration on this page. We passed above and slightly to the right of it and with a roar from its mighty engines it disappeared beneath us. I heard later that it was a naval patrol 'plane with a wing-spread of 103 feet and driven by two engines of 400 h.p. each. It is capable of carrying a useful load of over two tons, and has a speed of 89 miles an hour.

Suddenly the monotonous roar of the engine, to which I had now become accustomed, ceased. "Something has happened to the engine," I thought, and quick as a flash there rushed before my mind the many accidents I had heard of, caused by stalling engines.

The 'plane seemed to hesitate a moment and shiver, then it pitched downwards. Now I was looking directly into the water more than a thousand feet below. Down we went, down, down, gaining speed every second until I could scarcely breathe. The water seemed to be rushing up to meet us. Surely nothing could stop this wild dive, hurtling through the air. This was the end, I thought, and gripping the sides of the 'plane, I shut my eyes and waited for the crash.

A second passed—then a terrific noise greeted my ears, I opened my eyes in surprise, and found that we had flattened out a few feet above the sea, and the roar of the engine's exhaust was the deafening noise that had so scared me! With infinite relief I gazed around and marvelled at the ability of my pilot to ward off what seemed certain death. My musings were soon cut short, however, for with an impish grin on his face the pilot turned around and waved a hand. I realized then that he had been having a little fun at my expense. Great fellows, these pilots!

Presently another seaplane drew alongside and the two ships flew side-by-side for a short time. Then, without any warning, our companion 'plane made a slight dip, and from beneath its fuselage dropped a torpedo. With a mighty splash it entered the water and sped away, travelling just below the surface. I followed the course of the torpedo by the wake that its churning propellers made, but as our 'plane made a big sweep towards the shore I soon lost sight of it. I learned later that the torpedo 'plane was one of several attached to the Naval Air Base near-by.

While I had been trying to follow the course of the torpedo we had been climbing higher, and now we were a thousand feet or more above the sea. The pilot had again shut off the engine and we started to volplane, or "coast" in huge circles, each one bringing us a bit nearer to the surface of the water. This continued until we were scarcely more than a hundred feet up, when the pilot straightened out the 'plane and made a perfect landing—if alighting on the water may be called that. He had calculated so accurately that I could scarcely tell when the 'plane touched the water. We were a hundred yards or more from the shore and it took a very short time to taxi over to our starting place and have the 'plane made fast. It did not take me long to get out and remove my flying togs, but it was some time before the stinging of the wind left my face.

So ended my first adventure in the air. The pilot told me that we had been in no danger of crashing during the hasty drop, as he had the 'plane in complete control and could have straightened it out at any time during the fall. How he actually did it is a miracle to me, and I was thankful that his judgment was so accurate that he did not allow the 'plane to fall too near the sea before bringing it out of its headlong dash. This first flight gave me some thrills that are still very vivid in my mind and I hope that the opportunity to go aloft will soon come to each reader of the "*Meccano Magazine*," so that they will be able to enjoy the pleasures of airplaning. I can assure them that they will find their first trip a decidedly exhilarating experience and one that will not soon be forgotten.

A WONDERFUL GANNET ROOKERY

The Nursery at Cape Kidnappers New Zealand

by Horace S. Cottrell.

At Cape Kidnappers in New Zealand is one of the most wonderful bird rookeries in the world. From September onward throughout the southern summer it is the nesting place of the Gannet, a bird similar to the Solan Goose that in Great Britain nests on Ailsa Craig, the Bass Rock and St. Kilda.

In this article the author gives a fascinating account of bird life in this wonderful nursery in the Southern Pacific Ocean.

THEY met in a shoal of fine young herrings away out in the Southern Pacific. During the month of August they journeyed and fished together, and then one fine day early in September Mrs. Gannet said to her mate: "I know a perfectly splendid nesting place."

"Where is it?" immediately enquired Mr. Gannet.

"Cape Kidnappers in New Zealand. It lies high above Hawke Bay, which swarms with herrings and garfish," she replied.

So off they flew.

One evening, when the sun was sinking with fiery crimson glory behind the snow-capped Ruahine Ranges, the young couple arrived at the Cape. That night they rested side by side on the pinnacles.

With the first flush of dawn they awoke to survey their summer home. They found an area of about an acre standing 200 ft. or more above the sea. On the north, south, and east sides there was a steep and sudden drop to the seashore, just ideal to take off from; for Gannets cannot rise from a flat surface, but launch themselves into the air from some elevated position. They found that about 1,500 nests occupied the level portion of the nesting ground, while the remainder were perched on a little hill that rises on the western side. The prospect pleased them immensely, and Mrs. Gannet in particular was most enthusiastic.

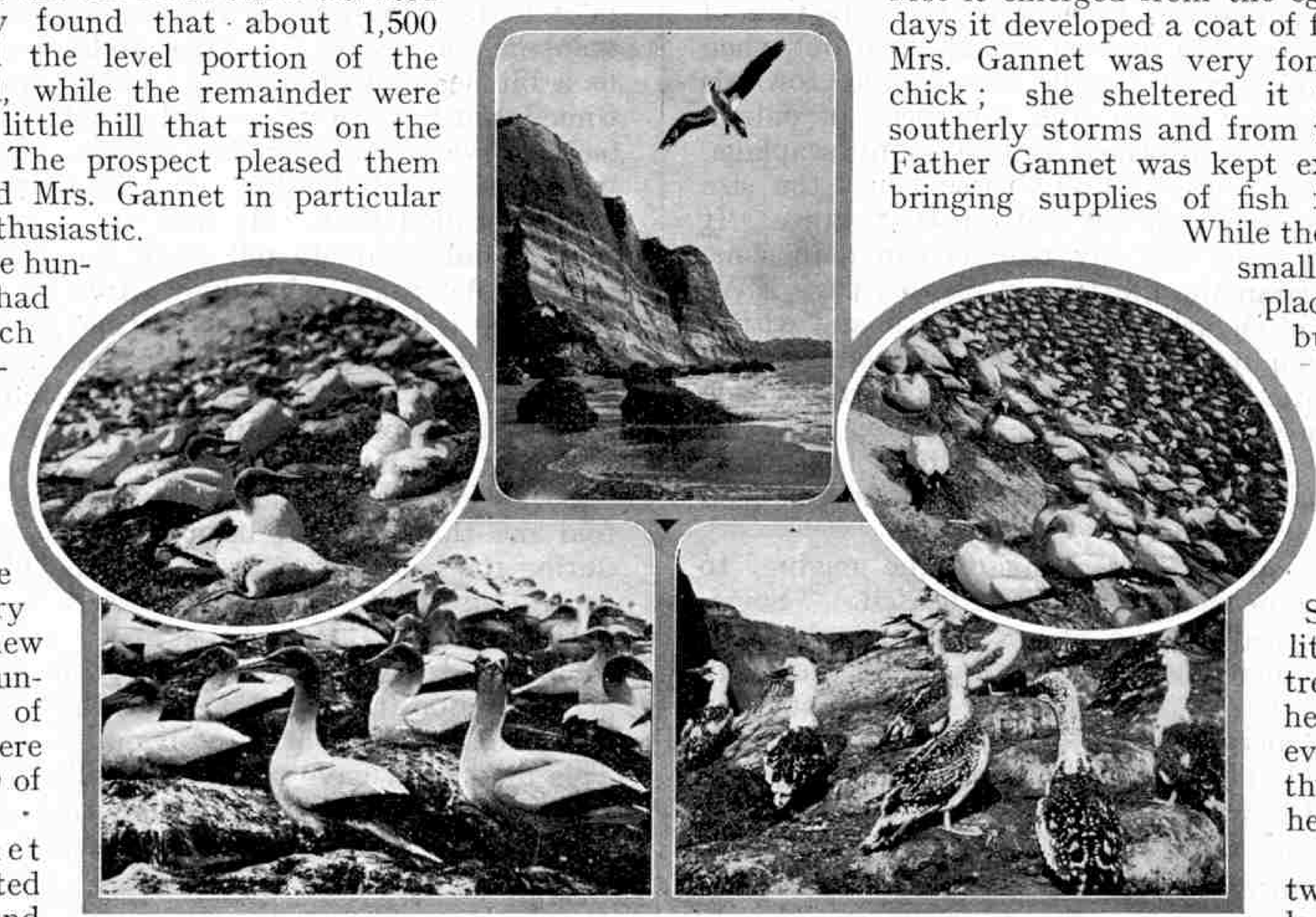
Already some hundreds of birds had congregated, each pair immediately securing a nest; the favourite positions being on the northern edge of the plateau. Every day dozens of new birds arrived, until by the end of September there were over 4,000 of them.

Mrs. Gannet carefully selected a nest; a mound about six inches in height with a little hollow in the centre. Here she laid her only egg. Her mate secured supplies of dry seaweed for the nest, and went on fishing expeditions, bringing home for her good big herrings. Sometimes he would take a turn at incubating while she scrambled to the edge of the cliff and launched herself into the fresh morning air. Then for a while she would course along the sea shore beside the Stratered Bluffs, or turning south would circle Bare Island, and then return. Unerringly she selected her own nest and mate from among the thousands of others, and landed in beside him. He was clearly delighted to see her again, and they caressed one another with their bills, gently entwined their necks, and gave many other demonstrations of affection.

The nest was never deserted except under extreme provocation. Occasionally "humans" visited the ground, but the sitting birds, with splendid courage, would only leave their nests when actually molested.

In the third week in November a chick appeared. It was a quaint little dark-grey, naked, thing when first it emerged from the egg, but in a few days it developed a coat of fine white down. Mrs. Gannet was very fond of her little chick; she sheltered it from the cold southerly storms and from the blazing sun. Father Gannet was kept exceedingly busy bringing supplies of fish for the family. While the chick was very small the food was placed near the nest, but when she became bigger she had to obtain her food in the orthodox manner by diving into father's crop. She made funny little gurgling, tremolo noises in her throat, and every now and then she flapped her little wings.

When she was two weeks old she looked exactly like an animated powder puff. At



(Top) The stratified cliffs passed en route to the Gannet rookery at Cape Kidnappers, Napier, New Zealand. (Top left) A colony of Gannets at the Cape. (Top right) Nesting Gannets. The nest is a simple mound of seaweed. (Lower left) Full grown Gannets have white body feathers and black feathers in their wings and tails. (Lower right) The chicks do not become mature until they are three years old. In the meantime their plumage is speckled.

the age of four weeks she was as big as her parents, and then a strange thing happened. Through her fluffy coat of down, white-tipped, dark-grey feathers began to push their way.

Before long Miss Powder Puff became greatly interested in Master Speckle in the nest just opposite. At seven weeks old he presented quite a handsome appearance in his fine speckled coat, and he was much admired by Miss Powder Puff. One day she discovered that by slipping over the side of the nest and mocking Master Speckle, she could start a really good argument, which occasionally ended in a fight. She had seen her elders fighting in the nests close by, and quite naturally she thought it was the right and proper thing to do.

When the sun rises over the sparkling, tranquil waters of the Pacific Ocean and tips the pinnacles of Cape Kidnappers with golden glory, the Gannets awake to life. There are sleepy squeals and gurglings, and then a great burst of cries from the throats of the adult birds and their chicks. The free birds take to the wing and circle above the nesting ground. The sight from the hilltop overlooking the sea is wonderfully inspiring. The thousands of majestic sea birds on the wing, the glory of a summer sea, and the bright freshness of the new day combine to produce a scene never to be forgotten.

Many of the birds set off in search of the morning meal, while others perch themselves on the cliffs. Those in charge of the nursery attend to their morning toilet. They preen their feathers and go through many strange movements as if indulging in some kind of gymnastics. The speckled chicks bestir themselves, stand on tiptoe and practice the movements of flying.

It is a glorious sight to see the Gannets fishing. They fly calmly along until they sight some fish swimming near the surface. Then suddenly they inflate the air cells that lie beneath the skin, in order to relieve the concussion, clap their wings close beside their bodies, and descend like a meteor on their victims.

When Miss Powder Puff was about four months old she thought it was quite time to be fishing for herself. She had conducted careful experiments and exercises in flying, and so one fine morning she bade good-bye to the old home, and launched herself into the air.

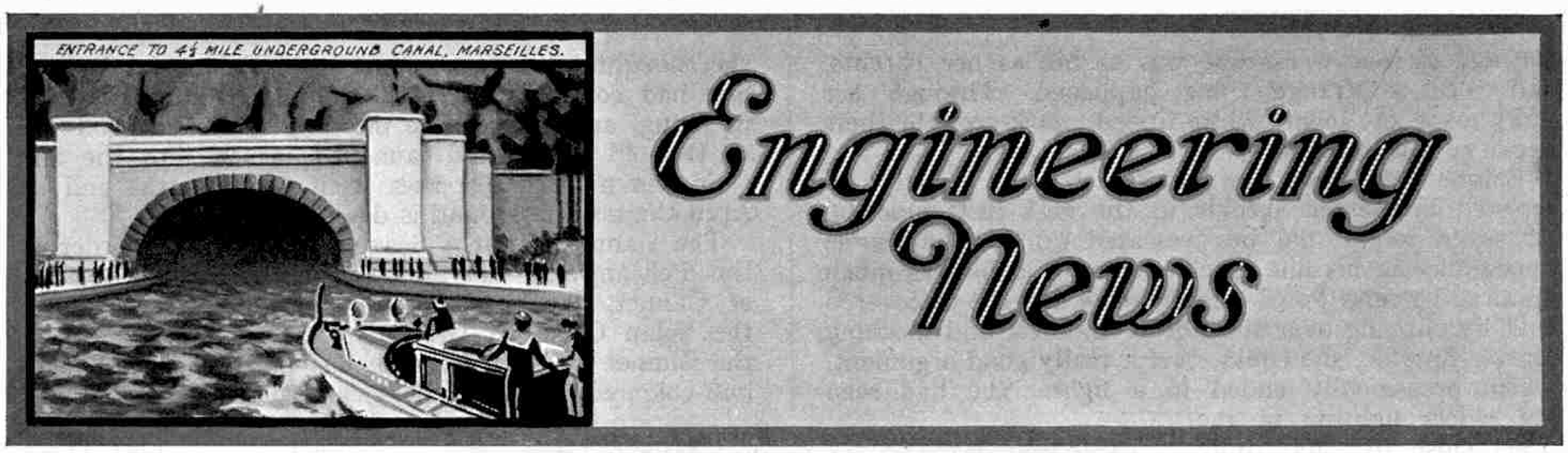
So the nursery disperses itself, and by the end of April the nesting ground is deserted.

The Gannet is not a Seagull, but is of the order of the Pelican and the Shag. There are eight species of Gannet, the best known being "*Sula Bassana*," the Solan Goose of Great Britain. "*Sula Serrator*," the Gannet of New Zealand, has pure white plumage, buff-coloured head and neck, and black wing and tail feathers; he is, indeed, a very handsome bird. There are nesting grounds at White Island, Barrier Island, Gannet Island, and Three Kings, as well as at Cape Kidnappers; but this Cape has the distinction of being the only place in the world where the Gannets nest on the mainland. This unique Gannet nursery is reached from Napier by a journey of 14 miles by road, and an interesting six-mile walk along the seashore at low tide.

(Top) The pinnacles of Cape Kidnappers. The colony of Gannets at this place is the only one in the world on the mainland. (Left) Narrow path leading to the rookery. (Right) A onely Gannet asleep on the muddy shore. (Bottom) The birds are quite fearless, and the approach of human beings does not scare them from their nests.

The Solan Goose of Great Britain nests chiefly on the St. Kilda group of islands, and the number of birds breeding there has been estimated at 200,000. One of their favourite haunts is Stack Lee, a huge pillar of rock rising about 300 ft. above the sea. During the breeding season this rock is covered with Geese in such numbers that it appears to be transformed into a snow-white pillar and is visible from a distance of from 30 to 40 miles.

The nesting season of the Solan Goose is during the northern summer, the birds returning to their breeding quarters during March and leaving in August. When engaged in building their nests they are inclined to be unscrupulous and occasionally steal the grass and other materials gathered by their neighbours during the temporary absence of the latter, a practice that leads to retaliation and many fierce combats. The birds take heavy toll of the fish in the waters surrounding the islands, their total haul amounting to millions.

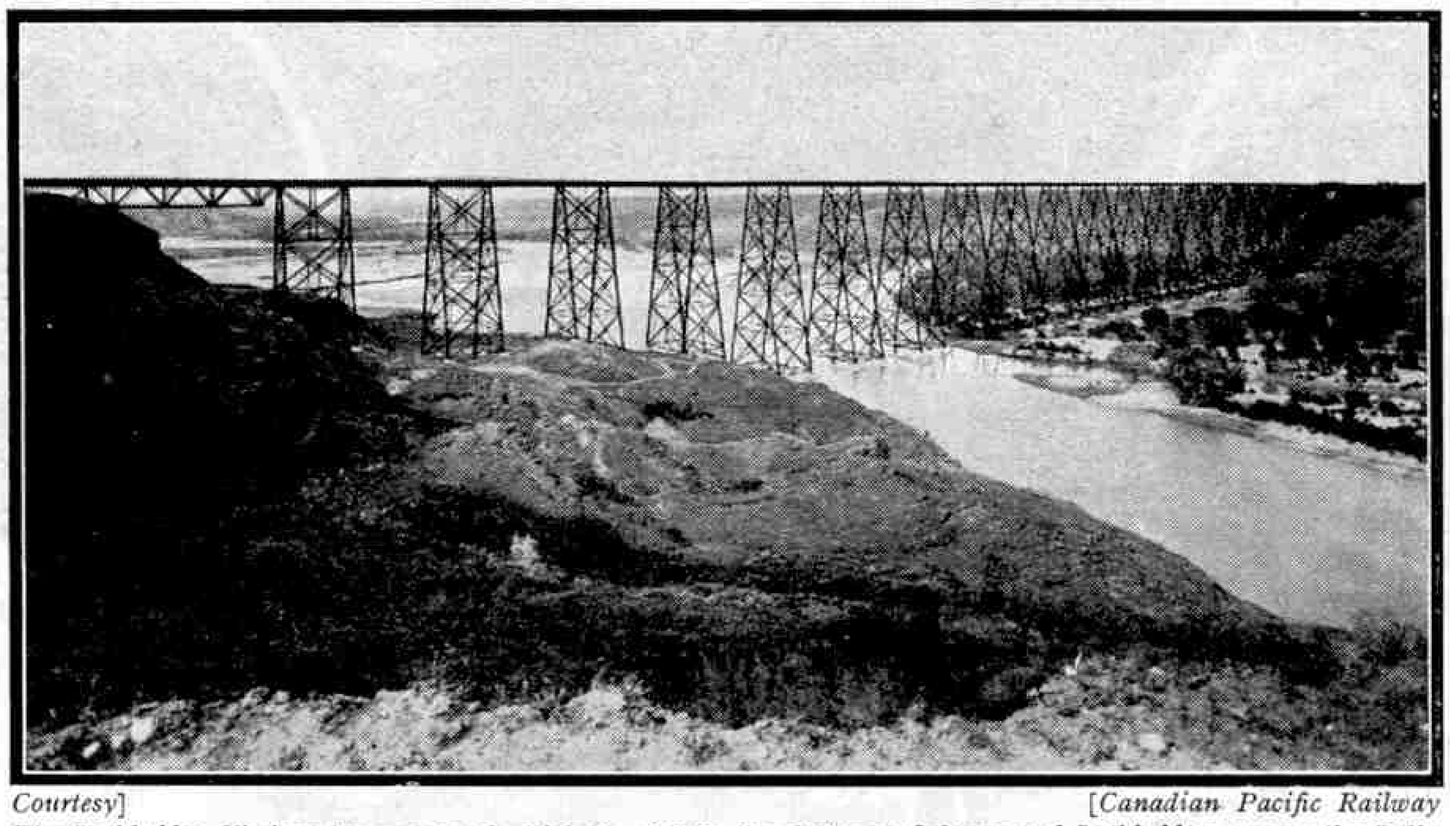


Railway Viaduct a Mile in Length

The illustration on this page shows the Lethbridge Viaduct built in 1909 across the Belly River in Southern Alberta by the Canadian Pacific Railway. The Viaduct is 5,327 ft. in length and cost about £300,000. The track is 314 ft. above water level.

The structure includes 44 trough plate girders, each 67 ft. in length; 22 girders 100 ft. in length and 1 truss span that has a length of 167 ft. It is supported on 33 steel towers and the weight of metal used in it is more than 11,000 tons. Merely to transport the steel used in its construction required 645 cars.

The Lethbridge Viaduct and a companion structure, 1,900 ft. in length, that carries the line over the Old Man River are of immense benefit to the train service on the route between the important cities of Calgary and Lethbridge. When they were put into service 20 wooden trestle bridges having a total length of 2.8 miles were cut out, and the Lethbridge Viaduct itself saves more than 5 miles in distance and reduces gradients very considerably.



Courtesy] [*Canadian Pacific Railway*

The Lethbridge Viaduct by means of which the C.P.R. line between Calgary and Lethbridge crosses the Belly River in Alberta. This is more than a mile in length.

World's Largest Lifeboat

The largest lifeboat in the world has been constructed by John I. Thornycroft & Co. Ltd., for operation in the English Channel. The vessel is 64 ft. in length, and is capable of a maximum speed of about 18 knots, which is the highest speed ever accomplished by a boat of this nature. It is propelled by two 12-cylinder internal combustion engines, each developing 375 b.h.p., and the tanks fitted are capable of carrying sufficient fuel to give a cruising radius of about 100 miles.

The lifeboat is to be stationed at Dover, and in addition to normal shipwreck work, will go to the rescue of any cross-Channel aeroplanes that may be forced down into the water. It is equipped with up-to-date wireless apparatus, and is provided with two cabins for the convenience of people rescued.

The next largest lifeboats used in the English Channel are fitted with engines developing a total of 160 b. h.p., and giving a maximum speed of 10 knots.

Liner's Auxiliary Electric Machinery

An interesting experiment is being made with s.s. "*City of Hongkong*," an Ellerman liner of 18,480 tons displacement that is engaged on service between Manchester and India. This vessel is fitted with reciprocating steam engines of the quadruple expansion type that develop 4,400 b.h.p. at 80 r.p.m. These have now been augmented by auxiliary turbo-electric machinery in which the exhaust steam from them is utilised. The current thus produced actuates an electric motor, the power of which is transmitted to the propeller shaft.

During exhaustive trials undergone by the "*City of Hongkong*" in the Irish Sea, it has been found that the new system possesses many advantages over ordinary means of propulsion. The chief of these are increased flexibility and a decrease in fuel consumption that in this instance amounted to no less than 23 per cent. This is a remarkable saving and the use in this manner of exhaust steam promises to arouse great interest among marine engineers and shipbuilders.

Automatic Traffic Signals

The Police authorities at Manchester have now introduced a novel traffic signal to enable pedestrians to hold up traffic when they wish to cross the street at places other than junctions. On pressing a button on the signal post, a green light allowing traffic to pass is changed to orange and then to red. The red light shows for a period of 15 seconds, after which the signal cannot be operated again until 45 seconds have elapsed.

Bridging the Estuary of the Dee

Much interest has been aroused by the suggestion that an embankment and bridge should be constructed across the estuary of the River Dee, which separates Cheshire from North Wales. A section of the proposed embankment would extend over each side of the estuary to the main navigation channel, and this would be spanned by a bridge nearly three-quarters of a mile in length. The deck of the bridge would be at a height sufficient to allow the passage of vessels similar to those now using the waterway, and a double railway and a roadway 40 ft. in width would be laid along it. It is estimated that the cost of construction would be £3,000,000.

If the scheme is put into operation, access to North Wales would be greatly improved, especially from Liverpool and the North of England. In some quarters a bridge across the estuary is regarded as a necessary supplement to the tunnel between Liverpool and Birkenhead that is now being driven under the bed of the River Mersey. The value that the proposed bridge would have is shown by the fact that its construction would save a detour of about 25 miles that is now necessary in travelling from Liverpool to North Wales.

Putney Bridge to be Widened

It is reported that work on the widening of the bridge across the River Thames at Putney is to be started shortly. According to present intentions the width between the parapets is to be increased from 44 ft. to 74 ft. When the work is completed the central roadway will measure 51 ft. in width, and will give sufficient room for six streams of traffic. A double track for electric tramcars will be laid down.

The first stage of the work will be the extension of the supporting piers on the downstream side of the bridge. When this has been completed, the actual widening of the bridge itself and of the approaches will be undertaken. It is expected that the work will occupy about three years, and that the total cost will be approximately £433,000. The scheme will provide employment for a considerable number of men.

Hoisting Gear for Canal Lock

In order to speed up traffic on the Grand Canal between Berlin and Stettin, it has been decided to erect a ship hoisting gear at the Niederfinow lock. When complete this will be the largest and most important structure of its kind in the world. By its means barges and canal boats up to a total weight of 1,000 tons will be raised or lowered a vertical distance of 120 ft. in five minutes.

The illustration on this page shows the structure as it will be when completed. The hoisting gear has been designed by the Imperial Administration of Waterways. Its erection will occupy about four years, and the cost of the actual structure will be about £500,000.

Dock Improvements in Portugal

An extensive national scheme of dock improvements is to be carried out in Portugal. The scheme involves Lisbon and eight other ports. Provisional plans already have been passed by the Portuguese Government, and the work will probably occupy several years at a cost of approximately £4,505,000. The contract for the work at the port of Vila Real-de-Santo Antonia, amounting to a value of about £562,500, has been awarded to a firm of British engineers.

Second Longest Tunnel Completed

After having been under construction for nearly 13 years a railway tunnel 11½ miles in length under the Appenines has been completed. It has been constructed at a cost of about £11,500,000 to give direct railway communication between Bologna and Florence, and will shorten the time required by travellers from the North of Italy to reach Florence and Rome by about two hours.

The new tunnel is little more than half-a-mile shorter than the Simplon Tunnel, and is the second longest in the world. Work on its construction was begun as long ago as 1913. The outbreak of the War brought operations to a standstill and they were not resumed until 1920. Throughout the whole of its length the course of the tunnel is perfectly straight.

Some idea of the work involved in the undertaking may be gathered from the fact that about 1,850 men were constantly employed in the construction of the tunnel. Nearly 2,000,000 cu. yds. of material were excavated and the quantity of dynamite used in blasting operations amounted to 967 tons.

Floating Dock for Africa

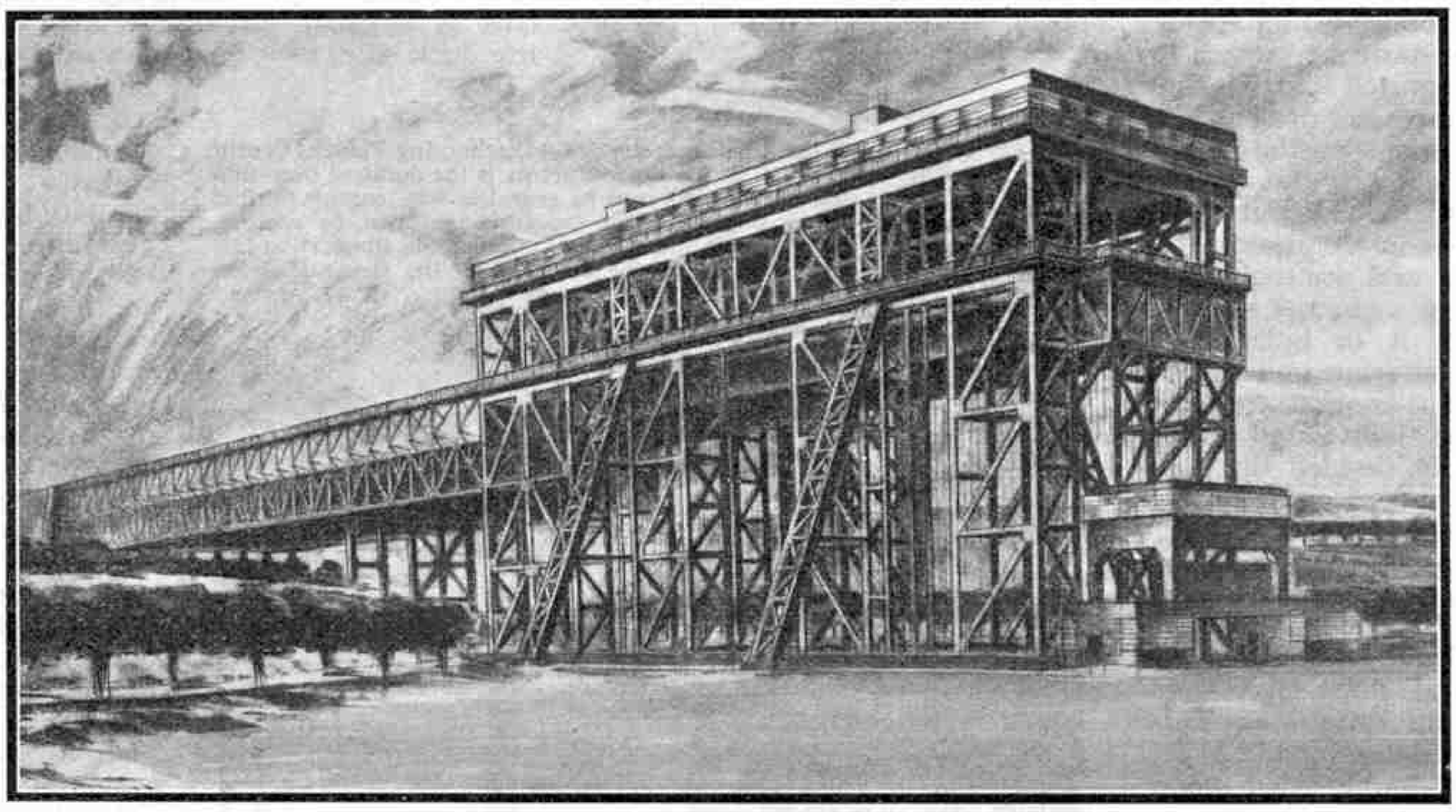
A large floating dock has now been erected at Leopoldville, the chief port of the Belgian Congo, Africa. The dock is able to lift vessels displacing up to 600 tons, and more than 425 tons of steel has been employed in its construction.

New Engineering Laboratory for America

The Westinghouse Electric and Manufacturing Company have decided to erect a huge new engineering laboratory at their works at East Pittsburg, U.S.A. This will be 11 stories in height, 225 ft. in length and 80 ft. in width, and an extension 125 ft. in length also is to be built to connect the new laboratory with one for direct current research that already is in existence.

The cost of the work is estimated at about £300,000, and it is claimed that when completed the buildings will house one of the best equipped electrical laboratories in the world. Current from generators large enough to supply the requirements of a town of 10,000 inhabitants will be used for experimental work and a surge generator is to be provided in order to produce high voltage discharges, or artificial lightning, for testing insulating materials. Another feature of the laboratory will be a room in which weather conditions of all kinds may be produced in order to give a thorough trial to types of apparatus intended for outdoor service.

It is interesting to note that what is claimed to be the largest shaft ever machined has been made for use in a generator that is to be installed in the laboratory. This weighs 62½ tons and has a maximum diameter of 53 in. The forging from which the shaft was machined was made from an ingot that had a diameter of 82 ins. and weighed nearly 130 tons.



Courtesy] [*Demag A-G.*

Design for the hoisting gear to be erected at the Niederfinow lock on the Berlin-Stettin Canal. It will be capable of lifting a weight of 1,000 tons in five minutes.

Electric Switch Weighs 135 Tons

What is claimed to be the largest electrical circuit breaker ever constructed has been made in America. It is built in three steel tanks, one for each pole, and these, with their entrance bushings, stand 26 ft. in height. The inside diameter of each tank is 10 ft., and about 22,000 gallons of oil are required to fill the three of them. The total weight is 135 tons.

This enormous circuit breaker is insulated to withstand a pressure of 250,000 volts, the highest voltage for which an American oil circuit breaker has ever been built. The line in which it is connected operates at 220,000 volts, but is so greatly over-insulated that it will withstand 900,000 volts before flashing over!

New Australian Floating Dock

A floating dock that possesses several novel features has been built at Walsh Island, Australia. The dock is capable of lifting vessels of 15,000 tons displacement and is intended for service at Newcastle, New South Wales. It has been built in three sections, each 210 ft. in length, giving a total overall length for the dock of 630 ft. Each section is 113 ft. in width, and the dock is 50 ft. in depth.

An interesting feature of the structure is that if one portion of it is damaged, repairs to it may readily be carried out after lifting it in a small dock composed of the remaining sections. A further advantage is that other sections may be added, and if the dock requires enlargement a fourth portion will be constructed to make the total length 710 ft., and to give a lifting capacity of 18,000 tons.

The dock is equipped throughout with electrical apparatus, direct current at 220 volts being provided by three 230 k.w. Metropolitan-Vickers generators. Each of these is driven by a two-stroke airless injection four-cylinder engine of the Crosshead type that develops 360 b.h.p. at a normal speed of 275 r.p.m. Six main pumps are installed, two for each unit. Each of these is rated at 119 b.h.p., the speed range being from 350 to 580 r.p.m. With the complete output of drain pumps in operation 27,750 tons can be discharged in 190 minutes.

In the construction of the dock special attention has been paid to stability and general seaworthiness in order that it may be capable of proceeding to the scene of a wreck under its own power, even in bad weather.

Navigation During Fog

An interesting method of providing a vessel endeavouring to navigate a river during foggy weather with bearings is being subjected to a series of practical tests at the Cumbrae Lighthouse on the River Clyde. The apparatus consists of a standard type foghorn and a wireless transmitting outfit that are operated simultaneously.

At night time or during foggy weather the wireless outfit transmits a series of short buzzes. These are sent out at intervals equal to the time taken for sound to travel through a distance of one mile, starting at the same time as the foghorn. The signals are picked up by the wireless operators on board any ships in the vicinity, who count the number of buzzes until the corresponding blast of the foghorn is heard. Since these signals are received practically instantaneously—the speed of wireless waves is 176,000 miles per second—the number of them heard in the interval gives the distance of the foghorn in miles.

Modern Grain-Handling Plant

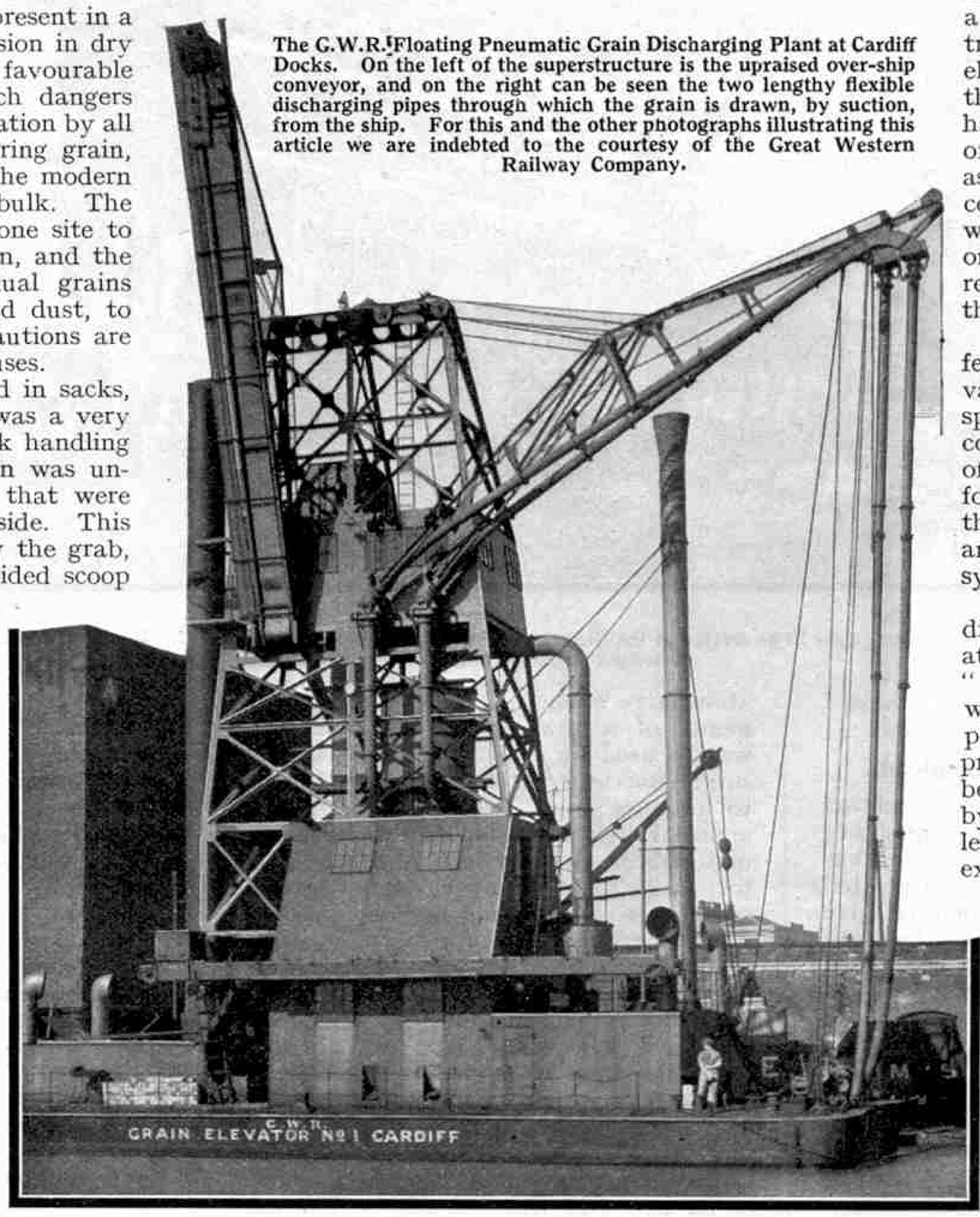
A G.W.R. Installation at Cardiff

LARGE quantities of grain, in addition to rice, paddy, pulse and various kinds of seeds, are imported into this country every year from abroad. Special precautions in respect to the handling of this grain are compulsory under the Merchant Shipping Act, and they relate not only to the shipping of the cargo, but also to the risk of explosion when stored.

The grain has to be stored in special hoppers, as otherwise it would heat up and ferment, which would, of course, spoil it. When finely disintegrated particles of carbon or carbohydrates are present in a confined space and in suspension in dry air, the conditions are very favourable for a violent explosion. Such dangers have to be taken into consideration by all engaged in handling and storing grain, and more particularly so in the modern method of handling it in bulk. The grain, in being moved from one site to another, is in constant motion, and the friction between the individual grains gives rise to minutely divided dust, to deal with which special precautions are taken at the storage warehouses.

Formerly grain was shipped in sacks, but handling it in this way was a very laborious process. When bulk handling was first introduced the grain was unloaded by shovel and skips that were lifted by cranes on the quayside. This method was followed later by the grab, which consisted of a double-sided scoop having a capacity of about two tons. This also was handled by the quay cranes, special gear being provided for the purpose of opening and closing the grab.

In order further to speed up the handling of grain special elevators were next introduced and are still in use. These elevators consist of a continuous belt, arranged vertically and provided with buckets at intervals, and suspended and balanced on an arm that projects from the quayside building. The discharge from the elevators is run down a chute into the building, where it is conveyed by band conveyors to the various stores. In operation the foot of the elevator is lowered by the arm into the bulk grain, when it dredges up the grain, as in the case of a dredger.



The G.W.R. Floating Pneumatic Grain Discharging Plant at Cardiff Docks. On the left of the superstructure is the upraised over-ship conveyor, and on the right can be seen the two lengthy flexible discharging pipes through which the grain is drawn, by suction, from the ship. For this and the other photographs illustrating this article we are indebted to the courtesy of the Great Western Railway Company.

More recently an improved type of elevator has been introduced, depending upon pneumatic action; and elevators of this kind are now employed at most ports for discharging grain from vessels to the shore. With this type of elevator long flexible pipes are lowered into the ship's hold, and the grain to be discharged is sucked up and delivered by a bucket elevator to the weighing room. Here it is weighed and discharged aft by means of a belt conveyor, or, if so desired, is discharged to port or starboard through adjustable chutes. These pneumatic elevators are built up to capacities of 400 to 500 tons per hour, either floating or fixed on the quayside or portable on rails.

The Great Western Railway Company's floating pneumatic grain plant at Cardiff Docks is a striking example of this type of grain elevator. It was built by the well-known firm of Henry Simon Ltd., Manchester, to the requirements of Mr. C. B. Collett, Chief Mechanical Engineer of the G.W.R., and is capable of handling grain with ease at the rate of 120 tons an hour.

The chief characteristic of a floating plant is its mobility, and in the case of the Cardiff installation the discharge apparatus and power plant are mounted upon a single pontoon, so that if necessary the entire plant can be towed alongside a grain-laden ship in any part of the dock, instead of berthing the ship alongside the elevator. This is a great advantage over a stationary elevator built on the dock side, as it enables a ship to be discharged direct into any of the grain warehouses, a special portable appliance transferring the grain from the elevator to the conveyors in the buildings without any extra handling. A further advantage of this type of plant is that, as it is operated by suction, corners of the ship's hold that would be inaccessible to bucket or other form of elevator are reached easily and cleared of their cargo.

The plant has many notable features, including vacuum pump valves of special design; a special arrangement of the conveyor for taking the grain off a ship; portable conveyors for automatically transferring the grain to the warehouses, and a special dust-collecting system.

It is equipped with two discharge pipes, each provided at the intake end with a "Simon" patent nozzle fitted with auxiliary air valve. These pipes are built on the telescopic principle so that they can readily be shortened as required, while by adding additional flexible lengths of piping they can be extended any distance into the holds of a grain ship. The discharge pipes are carried on booms that can be luffed or slewed through a wide angle, necessitating only very slight movement of the elevator during the unloading of even a large cargo of grain.

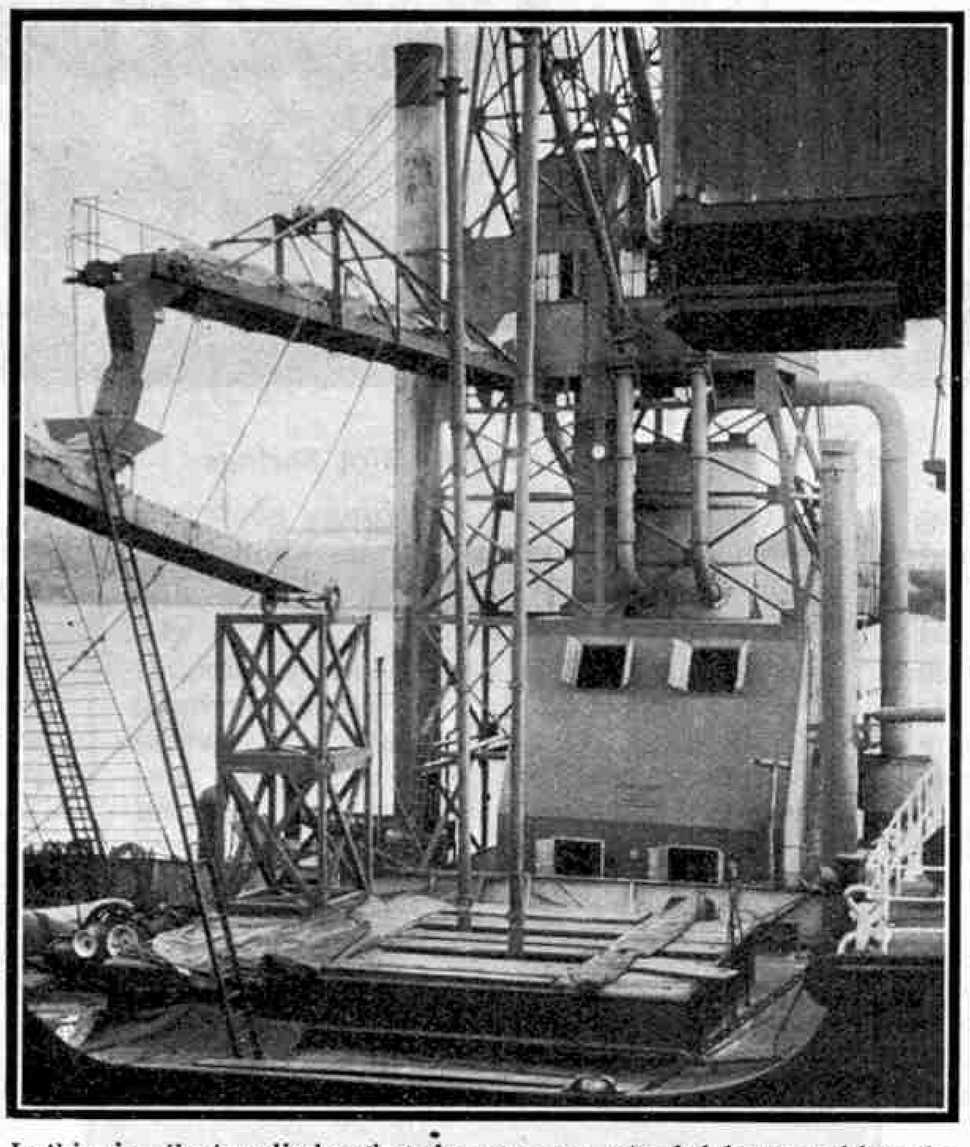
The telescoping of the pipes is effected by means of electric winches with friction clutches worked from an elevated control cabin on the pontoon, from where the pipe booms—which are attached to the superstructure by means of a swivel and ball joint—are similarly operated. Where the boom pipes join the telescopic pipes the former are fitted with swivelling ball joints, and a renewable plate that can be changed without dismantling the pipes is provided in the bend where the pipe is most liable to wear quickly.

The constructional details of the plant can be most clearly expressed by describing it in operation. As the elevator is generally moored on the side of the ship farthest from the quay, the grain is carried across the deck of the ship by means of a special conveyor fixed to the superstructure of the elevator. The grain, after being sucked from the ship's hold, through the pipes, enters a circular steel receiver built above the sub-structure, from which it is released by a special type of seal so arranged that the grain is released without destroying the vacuum. This circular receiver contains a cyclone dust collector that clears the air of all dust before it is returned to the vacuum pumps. The dust accumulated by the

cyclone is released by means of a rotary dust seal designed to prevent any sudden and violent inrush of air.

The grain is dropped from the receiver, by way of the tipper, into a hopper that is suspended above an Avery automatic weighing machine that automatically measures the quantity of grain that passes on into the warehouse. The weighing machine is capable of weighing up to 3,000 lb. per tip, and in addition to being equipped with a residue weigher it has two automatic counters for registering the weighings. When the machine is nearing the balance, the main supply of grain is cut off and a small dribble hopper supplies just sufficient grain to complete the weight. While the grain is being weighed a supply for the next weighing is passing up the discharge pipes to the receiver, so that the business of weighing the grain does not hinder the operation of the plant. To ensure accuracy in the weighing, should the elevator have a list, the whole of the weighing apparatus is kept hanging exactly level by the simple expedient of suspending it in a swinging frame.

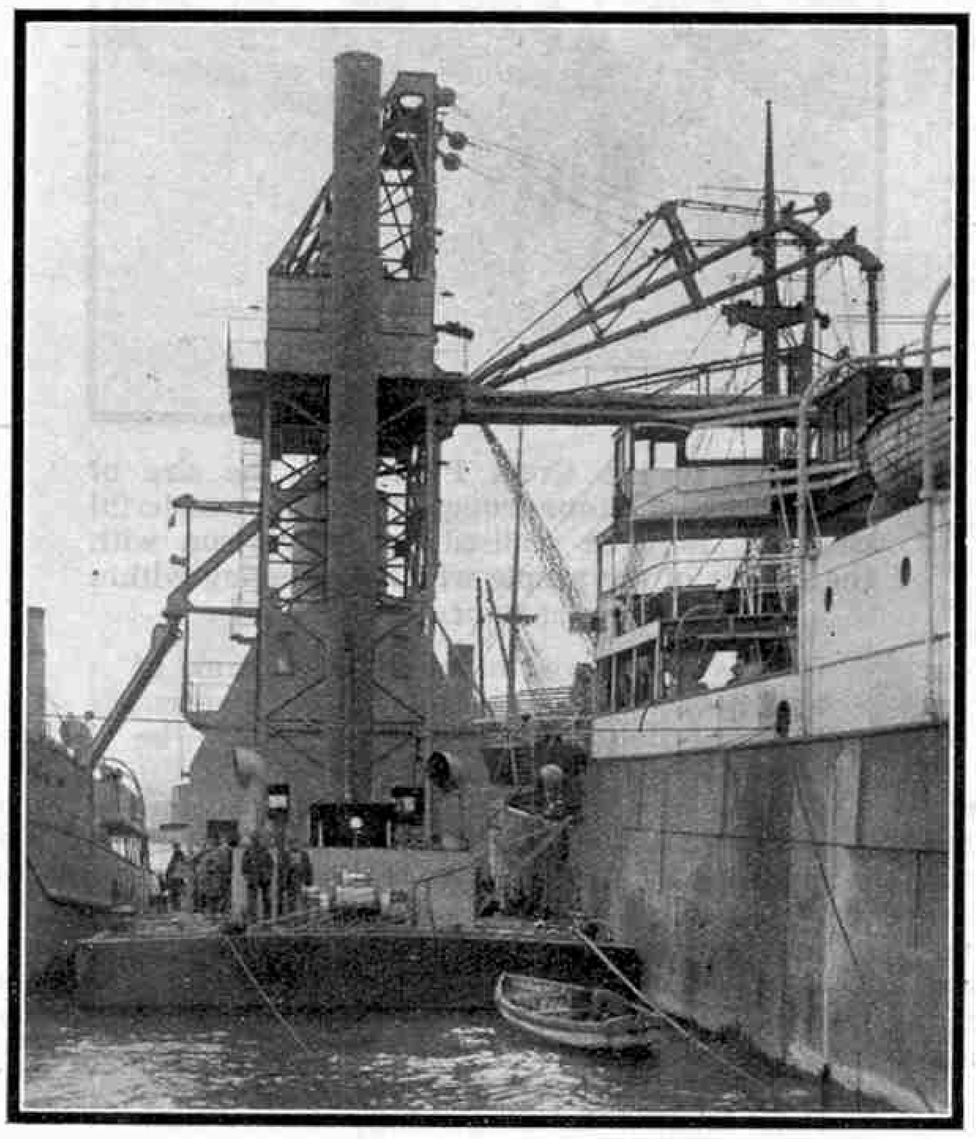
From the weigher the grain drops down to a second hopper from which it is transported by means of a bucket elevator to the top of the superstructure. If the grain is to be delivered into barges alongside the elevator, the material is shot down an inclined swivelling telescopic spout that is operated by a hand winch at the weigh cabin. The grain is passed down to the waiting barges from the opposite side of the pontoon to the pipes that suck up the grain from the steamer's hold.



In this view the two discharging pipes are seen extended downward into the hold of the grain ship. To the left the over-ship conveyor is shown in use.

As already mentioned, the grain may be discharged direct into the grain warehouse instead of into barges. This is accomplished by means of a conveyor 40 ft. in length, attached at its inner end to the elevator in such a manner that it can be raised or lowered to counterbalance the rising of the ship out of the water as the cargo is withdrawn. This conveyor is held up vertically against the crane post when not in use, but when required for service is let down over the deck of the vessel. The grain is carried by the conveyor belt, which is two feet in width, and runs on flat steel rollers. In order to keep the grain in the centre of this belt, and to prevent it from spreading, curving rollers are fixed at suitable intervals along the belt. A gangway fitted with handrails extends the length of the conveyor, and at the outer end a tightening gear is fixed.

From the belt the grain is delivered by means of a telescopic spout to a portable conveyor known as an "over-ship" conveyor, which is supported on a trestle on the deck of the ship. The far end of this conveyor is rested on another trestle that moves along the quay. In the case of ships with a beam not exceeding 45 ft. it is possible for the portable conveyor to be dispensed with, the over-ship conveyor delivering direct to the hopper on the travelling trestle. This trestle is a light steel structure mounted on four wheels, and is arranged to travel along the crane rails on the quay.



The elevator at work transferring a cargo of grain from the ship on the right to a coasting steamer.

The grain is emptied from the portable conveyor into a hopper at the top of this trestle by means of a second telescopic spout. From the hopper the material passes on to yet another conveyor that operates from the trestle to a portable hopper at the entrance to the warehouse. When the portable hopper is reached the grain is divided into two or three streams and passes into lines of portable conveyors inside the warehouse. These conveyors transfer it to what are known as portable bulk pilers, which discharge it wherever it may be required on the storage floors of the warehouse. It will be seen that by this method of portable conveyors and trestles grain can be brought from the grain ship, through the discharging plant, across the quay, and deposited actually inside the grain warehouse without extra handling and without interfering in any way with the passage of railway wagons along the quay and docks.

The movements of the pipes, tipper, conveyors, and other parts of the plant are all directed by one man from the cabin by means of electric controls. This cabin is sheeted-in and has windows on all four sides, so that the operator has a clear view of the deck and holds of the grain ship. A steam-driven generating set installed in the pontoon provides electric power and also electric light for the plant, plugs for portable lights being fixed in various convenient positions.

The engine-room is situated in the forward end of the pontoon and the engine is of the triple-expansion type, running at a speed of 135 r.p.m., and is direct coupled to the vacuum pumps. The marine type boiler has a working pressure of 180 lb. per sq. inch, and is situated in the after part of the pontoon, with coal bunkers at each side.

The pontoon bearing the structure is rectangular in shape, tapering slightly at the sides and ends in order to clear the dock walls below water-line. It is built of steel plates and angle frames and has a moulded depth of 12 ft., is 78 ft. 9 in. in length and 30 ft. in breadth. It is protected on all sides by timber fenders, and has nine watertight compartments. A centrifugal pump operated by steam and controlled by valves in the engine-room empties or fills ballast tanks installed in each of the four corners of the pontoon, for trimming it when the conveyor and pipes are in working position. A pendulum that indicates the trim of the ship is fitted on the engine-room bulkhead. The engineer's cabin is situated amidships, while the crew are accommodated aft.

The introduction of elevators of the type described in this article has greatly speeded up the work of unloading grain and the contrast between their use and the methods previously employed is amazing. Formerly the grain was laboriously filled into sacks, which were then lifted by winches from the hold to the deck of the vessel being unloaded and the grain was weighed before being delivered overside into barges or on to the quay. From there the sacks were carried or conveyed by handtrucks into the warehouse.

To-day the huge nozzles are simply lowered into the grain, and this is sucked out at a tremendous rate. The pipes suspended from the arms of the elevator are flexible and thus the nozzles may readily be moved about in order to take up the grain from all parts of the hold. It is fascinating to watch the manner in which they cause a pile to disappear, the last portion being swept up from the corner as easily as dust is collected by a modern vacuum cleaner. An equally important task performed by the elevator itself is the removal of foreign matter, which cannot pass through the auxiliary air valve and grids provided.

Cost of Building the Great Pyramid

Nearly 5,000 years ago the building of the Great Pyramid of Cheops required the labour of 100,000 men for a period of 20 years. An engineer has calculated that to-day the work could be done in the same time by 21,366 men. This reduction is a measure of the efficiency of the plant and machinery that now would be used.

It is astonishing to reflect that the Egyptians were able to build the Great Pyramid with the aid of the comparatively crude mechanisms they possessed. It is estimated that the huge structure contains 2,300,000 blocks of granite. Most of these weigh from 50 to 60 tons, and in spite of their immense size many were raised to a height of 500 ft. above the ground.

The same engineer has estimated that to-day the cost of building a pyramid as large as that erected for Cheops would be nearly £66,000,000. For the same sum 12 model towns, each accommodating 20,000 inhabitants, could be built. Every factory in these towns would be fully equipped with machinery, while the houses would be completely furnished.

Coffee Transported Through Pipelines

Most readers will know that crude oil is transported over enormous distances through pipelines, but that is not the only material that is conveyed across country in this manner. In Venezuela, South America, more pipelines are used for the purpose of transporting coffee beans than for the conveyance of oil.

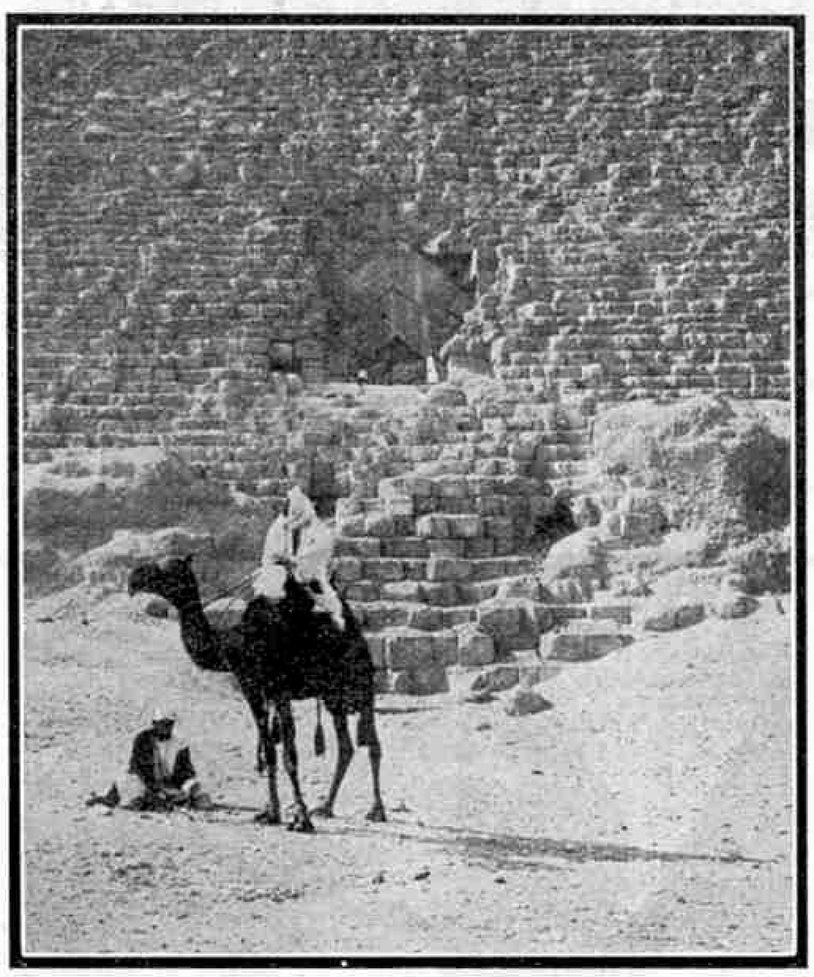
The reason why the Venezuela coffee planters make liberal use of this means of conveyance is that the best coffee in the State is grown on lofty plateaux. The pipelines extend from the plantations to the shipping depots situated in the valleys far below. Many of them are four or five miles in length, and in their descent they cross mountain streams and deep chasms.

The coffee beans are conveyed in native carts to the head of the pipeline. There they are emptied into a trough from which they are carried downward through the pipe by a stream of water, their swift descent terminating in a trough with a perforated base. The beans are removed from this trough, dried, threshed, and then packed in sacks to await shipment.

Through a pipeline a load of coffee beans can be transferred from a lofty plantation to a shipping depot five miles away in less than three-quarters of an hour. Practically the only other means of transport available is by mule cart over winding mountain roads, and if made in this manner a journey of five miles would take half a day.

Harnessing Iceland's Hot Springs

Iceland is a land of strange contrasts, for it is as well known for its hot springs and geysers as it is for its glaciers and snow-covered mountains. A Russian who recently settled in that country thought that the ground in the neighbourhood of hot springs would be sufficiently warm to enable him to grow vegetables and flowers. He bought a small tract of land from which flowed many small streams of hot water, and began to create a garden. Unfortunately the vegetables that he tried to rear quickly ran to seed and the flowers grew too rank to be of any value.



Entrance to the Great Pyramid. The size of the blocks of stone composing this wonderful structure may be realised by comparison with the figures of the people who are standing within the entrance itself.

The Russian did not abandon his project, for he quickly realised that his plants were weedy because the ground was too warm in comparison with the air above it. To-day he uses the hot water that bubbles up from below the soil to heat the pipes of a row of rough greenhouses, and in the genial atmosphere thus created he successfully forces both vegetables and flowers. These find a ready market in Reikjavik.

This ingenious plan recalls the exploits of Commander Forbes, who threw a breast of mutton into the boiling waters of the Strokh, an Icelandic geyser. Forty minutes later the thoroughly cooked mutton was ejected.

World's Costliest Metal

Until a few years ago a considerable proportion of the world's supply of radium came from the United States, but the discovery of richer ore in the Belgian Congo has made it impossible to produce radium from the American source at a competitive price. The Congo ore from which radium is produced is said to be 26 times as rich in the metal as that found in America, but the price of radium has fallen only to one-half of its former value, and at present £340,000 would be required in order to purchase only an ounce of the precious metal.

There are many reasons for the continued high price of radium. The process by which salts of the metal are extracted from the ore in a state of purity is very tedious, and working expenses are increased by the cost of the precautions that must be taken to protect workers from the effect of the penetrating radiations it produces. In addition, provision has to be made for the fact that the supply may give out at any moment, when, of course, the revenue of the producing company would cease and the expensive plant would become useless.

Fortunately for those who suffer from cancer, and others to whom applications of radium would be beneficial, there is now a chance that the price will fall. It has long been known that the metal occurs in Czecho-Slovakia, and in fact it was in pitchblende from Joachimsthal in that country that radium was discovered by Professor and Madame Curiè in 1903. This supply is in the hands of the Government of that State, and so far practically none has left the country. It is said that there would be no difficulty in increasing the output if the demand should warrant it, and in that case the price would fall.

Even greater hopes are based on the discovery of new radium mines in Portugal that are so productive that it is expected that an annual supply of very nearly one ounce may be obtained from them! This may seem a ridiculously small output in comparison with that of copper or tin, or even of diamonds; but from a medical point of view the estimated annual output of radium from Portugal would be of almost untold value.

By Rocket to America

A proposal to shoot a postal packet by rocket from Europe to America has been made by Professor Oberth, the Hungarian rocket expert. The professor expects that the flight of the strange missile would occupy only half-an-hour, and he regards the experiment as a preliminary to a journey by rocket to the Moon.

Butter Made From Fish Oil

The possibility of making butter from fish oil instead of from milk is one that probably has not occurred to many "*M.M.*" readers; yet it is from fishes that the Indians of northern British Columbia make their butter.

During March each year for about two or three weeks millions of little silver fishes about eight inches in length, called oolichans, swarm up the rivers of British Columbia. These fishes are little more than solid fat, and when dried are used by the Indians as candles, from which fact they have been given the name of candle fish.

Every year thousands of Indians take part in the catching of the fishes in the necessary number, for the oolichan butter is one of the mainstays of the inhabitants along the coast and also inland. The fishes are captured in enormous quantities in nets, and are then emptied into huge, roughly-hewn bins of cedar logs, and left to soften in the sun. From the bins the fishes go to great water-tight cedar boxes. Water is added, and the whole then brought to the boil by dropping in red hot stones in quick succession. As the water boils the oil rises to the top and is skimmed off and placed in smaller boxes, each holding from five to 20 gallons. Occasionally tins are used, but as a general rule wooden boxes are preferred. The oil is left to cool and set, and if it has been well made it is pure white when hardened and practically indistinguishable from lard. Some of the Indians adopt the easier and quicker method of boiling the oil in kettles or pans over an ordinary fire, but many of them declare that better results are obtained by the old method.

The butter made in this manner serves the same purpose to the Indians as blubber to the Eskimos. Many different kinds of berries and crab-apples are preserved in the oolichan butter by the Indians, and stored away for use during the winter. In its liquid state the butter is used over porridge and is eaten with salmon eggs, herring eggs, seaweed cakes, and other native delicacies.

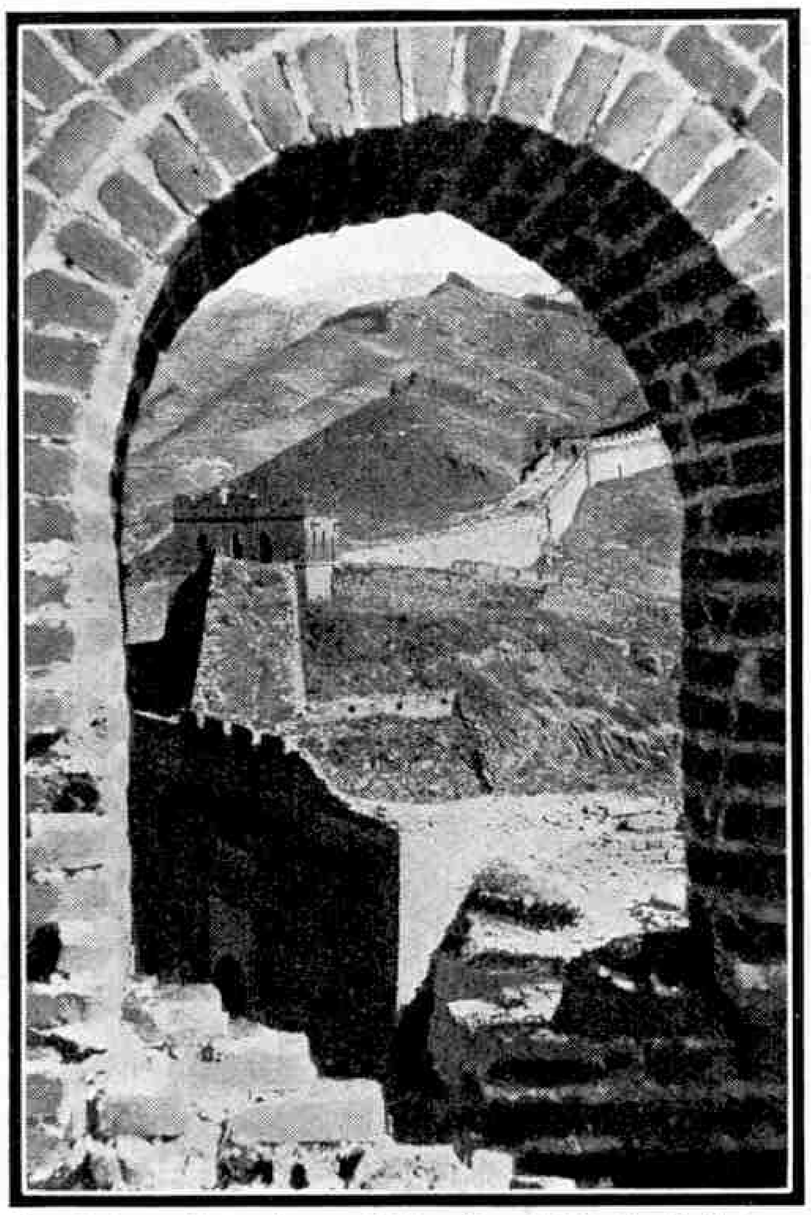
It is a remarkable fact that the whole year's supply must be made in two or three weeks, for it is only during this time that the fishes run up the river. It is not only the Indians who are aware of the approach of the fishes, but gulls, eagles, seals, sea-lions, and fin-back whales all seek to devour their fair share of the fatty little creatures that are such a dainty to them. Many a whale has let his greed overcome his better judgment to such an extent that he has found himself grounded in the shallows. It has been estimated that the gulls alone consume about 15,000 tons of fishes during the short time in which they are in the river. After the two or three weeks have expired the fishes return again to the sea and are seen no more until the following March. It is remarkable that although this process has gone on year after year for centuries, the supply still continues.

Unsurveyed Continents

It is not often realised how little of the earth's surface has been thoroughly surveyed. Europe, India and the United States have been accurately charted, but surveys of the remainder of the land area of the world, including millions of square miles of the British Empire, are far from being complete.

How New York is Heated

It is interesting to know that a considerable portion of the city of New York is heated by means of a regular hot water system! The radiator in which the hot water circulates is the East River, into which pours an enormous volume of water from the electric light and power plants situated on its banks. In these plants about 400,000 tons per hour of cooling water are required, and the discharge of this quantity into the East River, after it has acquired waste heat, raises the temperature of the water in the river to as much as 10°F. higher than that of the surrounding waters.



An interesting view of the Great Wall of China. This is 25 to 30 ft. in height, and from the coast to its western end is 1,500 miles in length.

Naturally the air above the East River is warmed by the water. It thus becomes lighter and rises, with the result that a continual circulation of air is set up, cold air from the city descending to the river to become warm, then rising, and finally falling back over the city as it cools. In addition to heating the air over the city the warm water from the power stations also helps to keep the East River open to navigation, even in the most severe winters, by preventing the water from freezing.

Payment According to Size of Passenger!

An American motor omnibus company has come to the logical conclusion that passengers should pay fares in accordance with their size; and consequently it issues tickets for two classes of passengers—those who are more than 3 ft. in height and those who are less, the latter paying half fare. A height gauge is fixed on the door of each vehicle and anyone wishing to travel at the low rate must pass under the gauge before he is allowed to do so. This arrangement may not be popular with parents of children of more than average size, but it prevents disputes.

English Becoming a Universal Language

A hundred years ago English was the language used by about 20,000,000 people. To-day it is the native tongue of no fewer than 160,000,000 people, and 60,000,000 inhabitants of other countries are able to make use of it. The total of 220,000,000 users gives the English language first place among the world's great tongues, and it appears to have the best chance of becoming universal.

During the same period the number of people who speak or understand German has risen from 32,000,000 to more than 100,000,000. It is curious to note that the number of those speaking Romance languages do not show such great increases. For instance, during the present century the Italian-speaking population has increased from 21,000,000 to 45,000,000, and only 18,000,000 people have been added to the 32,000,000 who speak Spanish. The third Romance language shows a still smaller increase for, as a native tongue, French to-day is spoken only by 45,000,000 people, an increase in 100 years of less than 13,000,000.

Most other languages show increases in the number of people who use them. The only well-known language that shows a decrease is Turkish, and during the past 100 years the number of those who speak this tongue has declined from 30,000,000 to 24,000,000.

Mystery Ships of 250 Years Ago

The proverb that there is nothing new under the Sun has received still another illustration in the discovery that the mystery ships used in the War were by no means an entirely new invention! It is now known that in 1673 a shipbuilder named Phineas Pett constructed for the British Admiralty of the time a small boat of the type then called a "fly-boat." In outward appearance she resembled an ordinary ship of 150 tons burden, but in reality she was much heavier and carried 40 guns and a crew of 200 men. She was called the "*Kingfisher*" and was launched at Woodbridge in Suffolk.

According to an account printed in a newspaper of the time, the "*Kingfisher*" was disguised in this manner in order to cheat the Turks into the belief that she was a harmless trading vessel! Thus the spectacle of apparently simple merchant vessels enticing the unsuspecting crews of foreign warships to their doom probably was anticipated 250 years ago.

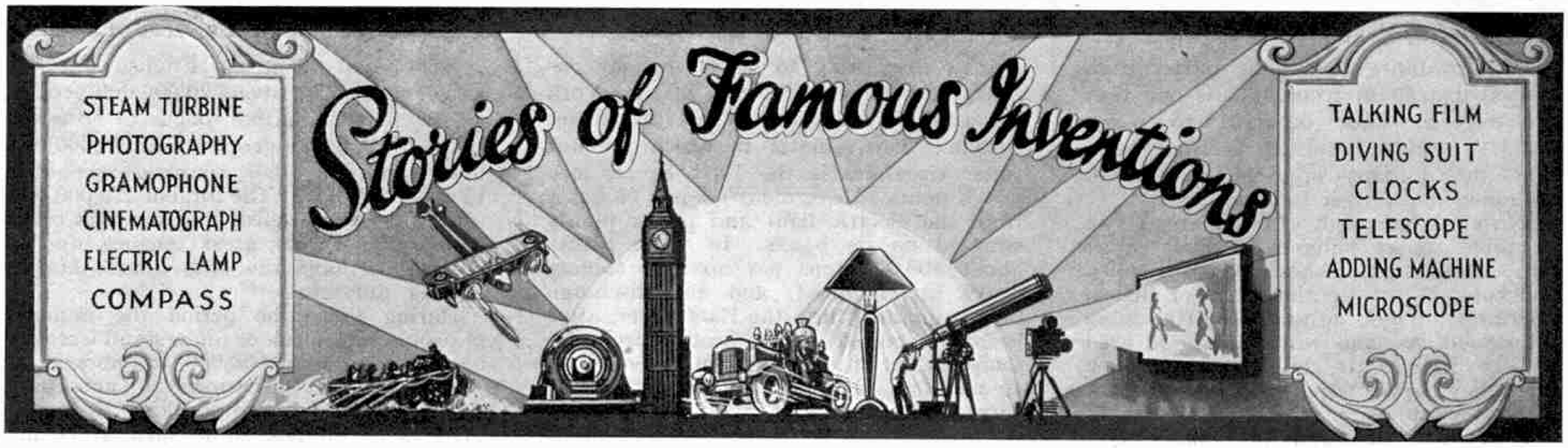
Newspapers 2,000 Years Old

During excavations at Ostia, an ancient seaport only a few miles from Rome, several fragments of newspapers, 2,000 years old were discovered. Unlike our modern newspapers, they were made of lasting material, for the news of Cæsar's day was carved on a marble slab!

Needless to say, no newsboys stood in the market place with bundles of newspapers for sale! Instead, a single copy of the daily journal was exhibited for all to see. It is interesting to note that the Government then controlled the press, and news was suppressed or distorted in order to serve the purpose of the rulers of the Roman Empire.

* * * *

The weight of mails from the United States that is carried across the Atlantic Ocean in one year is now 40,000,000 lbs. When loaded with mails to her full capacity, the "*Leviathan*" would require nine trips to transport this amount to Europe.



THE ELECTRIC TIME RECORDER

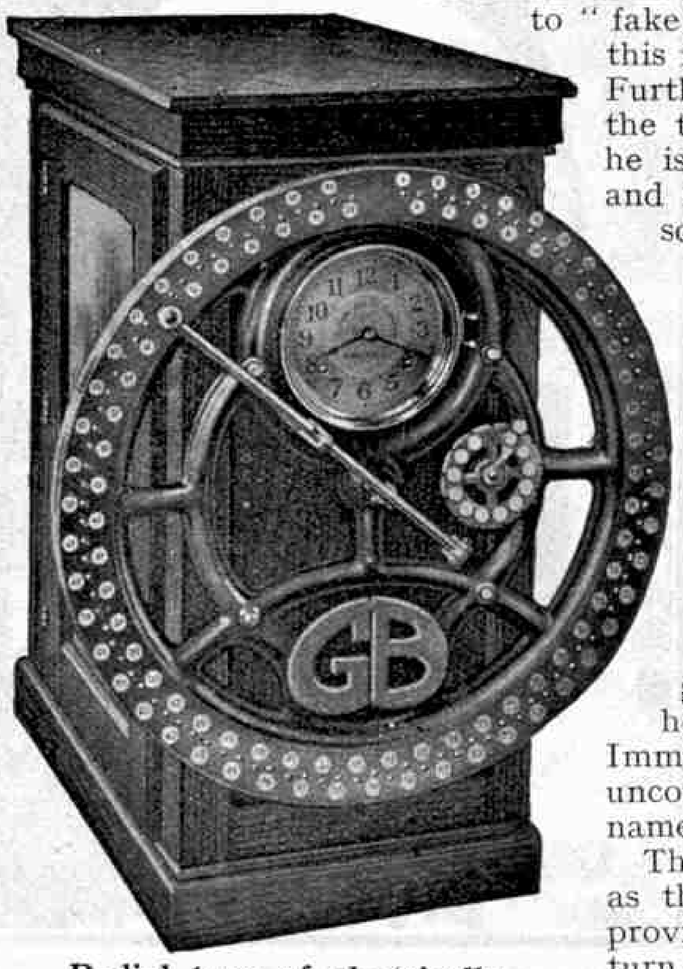
IN the early days of industry, factories were so small that the employees were each known personally by the employer. It was thus a simple matter to note the punctuality or otherwise of each worker and to administer reproof where necessary. The state of affairs in a huge modern factory is very different, however. In the first place, personal supervision in the old sense is no longer possible; and in addition, the importance of punctuality has increased enormously. In an early factory the number of employees was so small that even if each one happened to arrive a minute or so late nothing serious was involved; but the loss of a minute by each worker in a present-day factory becomes an extremely serious matter for the firm. Take for example the case of a factory employing 1,500 people. If each one of these employees were to arrive only one minute late there would result a total loss of 25 hours' working time!

Various schemes have been evolved for recording accurately the working time of each member of a large staff. There is very little information available regarding the earlier systems which, although very crude, were probably fairly satisfactory in the conditions then existing. Until comparatively few years ago brass discs or checks and hand-written time-sheets were in general use. A series of large boards painted black and divided by white lines into a number of squares were mounted in a convenient position in the factory time office. The squares were numbered consecutively, and each contained a hook upon which was hung a metal check engraved with a number corresponding to that of the square. When employees arrived at the factory they removed their checks from the boards. At the official time for commencing work the time office doors were closed and the time-keeper noted all latecomers who entered to remove their checks, and he recorded their degree of lateness in an attendance register. The checks that were left hanging on the boards, therefore, indicated those employees who were absent from work.

On leaving the factory at the mid-day break the employees deposited their checks in a long open box as they passed from the time office. This box was divided by partitions into several compartments, each of which bore the first and the last numbers of one of the check boards. At the lunch hour the time-keeper tabulated in his register the numbers of the checks deposited in the compartments and then restored them to their respective hooks on the boards in readiness for the return of the employees for afternoon duty. At the end of the day's work the checks were again deposited by the employees in the box and replaced on the boards by the time-keeper. This system was successful up to a certain point, but it had many disadvantages. The most important of these was that an employee could not see the record compiled by the time office, and when, on pay day, he found that deductions had been made on account of late arrivals at work, he was inclined to suspect injustice on the part of the firm.

Subsequently a machine was invented that automatically stamped the time record of employees. This was a great improvement, but it had the serious defect that it was possible for a man to punch his time in the wrong hole. Thus if employee No. 50 accidentally punched in hole 49, employee 49 was credited with the day's wages of employee 50, who was recorded as being absent. In later types of machine this defect has been eliminated.

The modern time recorder registers accurately the time of each workman on his own time card. It is impossible for a workman to "fake" his record in any way, and knowledge of this fact does away with any temptation to do so. Further, the workman is able to see for himself the time that the machine has recorded and, as he is able to compare this time with the clock and check its accuracy, he is satisfied as to the scrupulous honesty of the record.

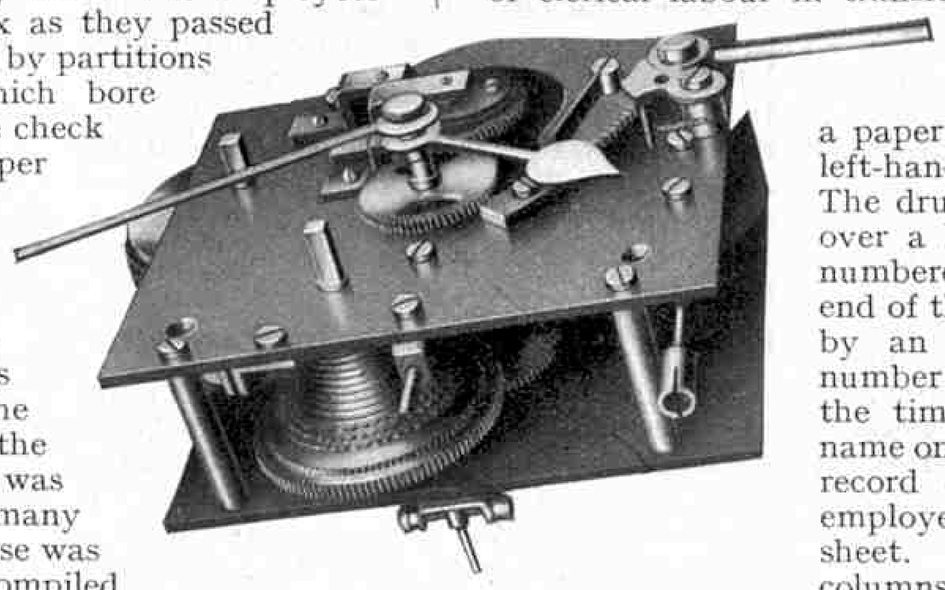


Radial type of electrically-controlled Time Recorder.

The various types of time recorders now in use may be divided into three groups—tape machines, sheet or radial recorders and carding machines.

The tape machine group includes signature and key recorders. The recording mechanism of the signature machine consists of a paper tape that passes over engraved wheels connected directly to the clock movement. To operate the machine an employee turns a handle that causes a hammer to press the tape against the engraved wheels with the result that the date, hour and minute are recorded upon the tape. Immediately this information is recorded a slot uncovers and allows the employee to sign his name against the recorded time.

The key recorder operates on the same principle as the signature machine, but instead of being provided with a handle that each employee must turn, it has a slot in front to receive the special key with which each employee is provided. Each key is engraved with the owner's factory number, and by inserting this key in the machine and giving it a half-turn the employee records his number and the time of arrival or departure. This machine, like the signature recorder, is best adapted for employees who receive a fixed wage. Its use in respect to part-time and piece-work employees entails a considerable amount of clerical labour in transferring the numbers and times to the attendance register.

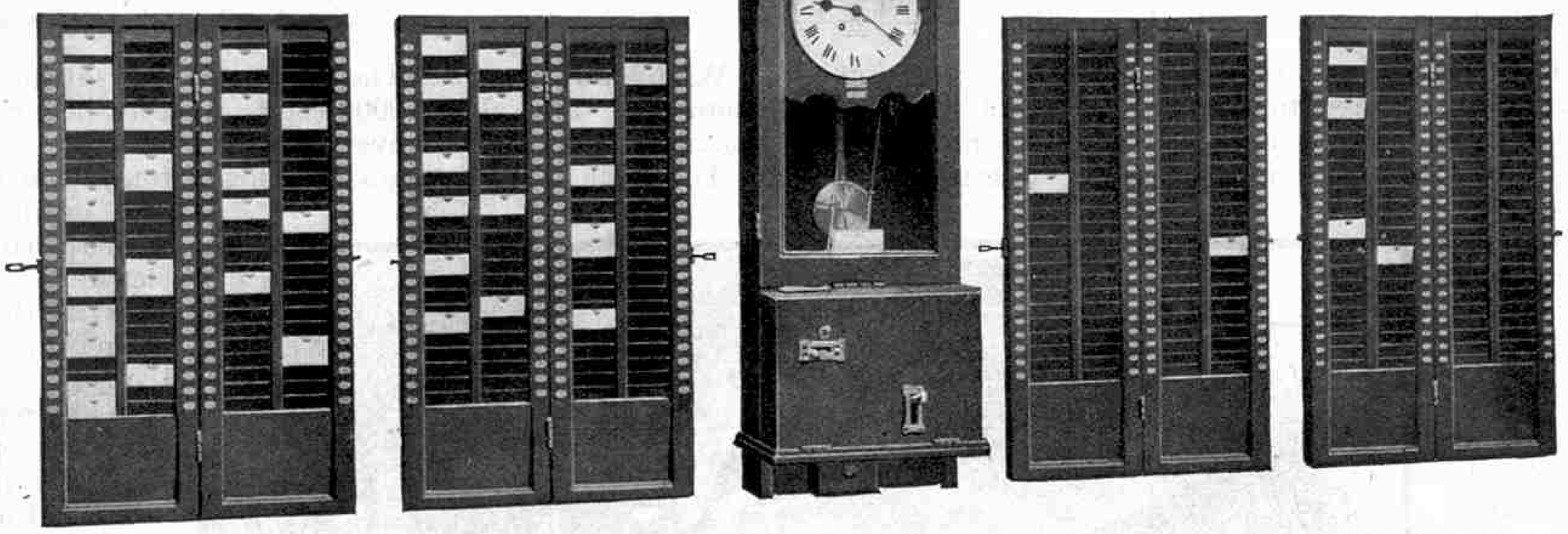


Fusee and Chain Movement Mechanism.

The sheet or radial machine consists of a covered drum on which is fixed a paper sheet bearing in column form at the left-hand side the names of the employees. The drum is revolved by a lever that rotates over a large iron ring containing a series of numbered holes. A peg is attached to the end of this lever, and when this peg is inserted by an employee in the hole bearing his number it causes the type motor to impress the time in the space exactly opposite his name on the sheet. In this manner a complete record of the attendance times of all the employees is obtained mechanically on one sheet. This sheet contains also analysis columns in which may be entered the hours worked and the usual details of wages due, and can be transferred in its entirety to a loose-leaf binder so as to form a complete wages book. The disadvantage of this machine is that it is limited in size, and if the staff should exceed the capacity of any machine considerable further expense must be incurred.

Machines of the third group, the card recorders, have certain advantages over the machines just mentioned. With a machine

of this type an employee, instead of recording his time upon a sheet or tape inside the machine, places a card in a slot and operates a lever that causes the card to be imprinted with the hour and minute and, if necessary, the day, date and month also. The cards, which are made out weekly by the office staff and have written on them the employees' names and rate of pay, are contained in the numbered pockets of large racks mounted by the side of the recorder. Generally there are two of these racks, one marked "out" and the other "in." When an



The Time Recorder shown in the centre of the above photograph is of the key-operated type. The four racks, enumerating them from the left, accommodate Job Cards Ahead ; Time Cards "Out" ; Time Cards "In" ; and Job Cards in Progress. The Job Cards have reference to a costing system used in conjunction with the Gledhill-Brook clocks

employee enters the factory he walks to the "out" rack, removes his card and, passing to the recorder, registers his time. While he is doing this the next arrival is removing his card from the rack, and as the first man moves on and places his card in the "in" rack the second man is registering at the machine. In this manner a continuous procession of employees register their time uninterruptedly and pass to their work without having to waste time by forming a queue before the machine. When the employees leave the factory at the conclusion of their work a similar process takes place but in the reverse direction. This system allows between 45 and 50 men to register at the machine every minute without any crowding or confusion.

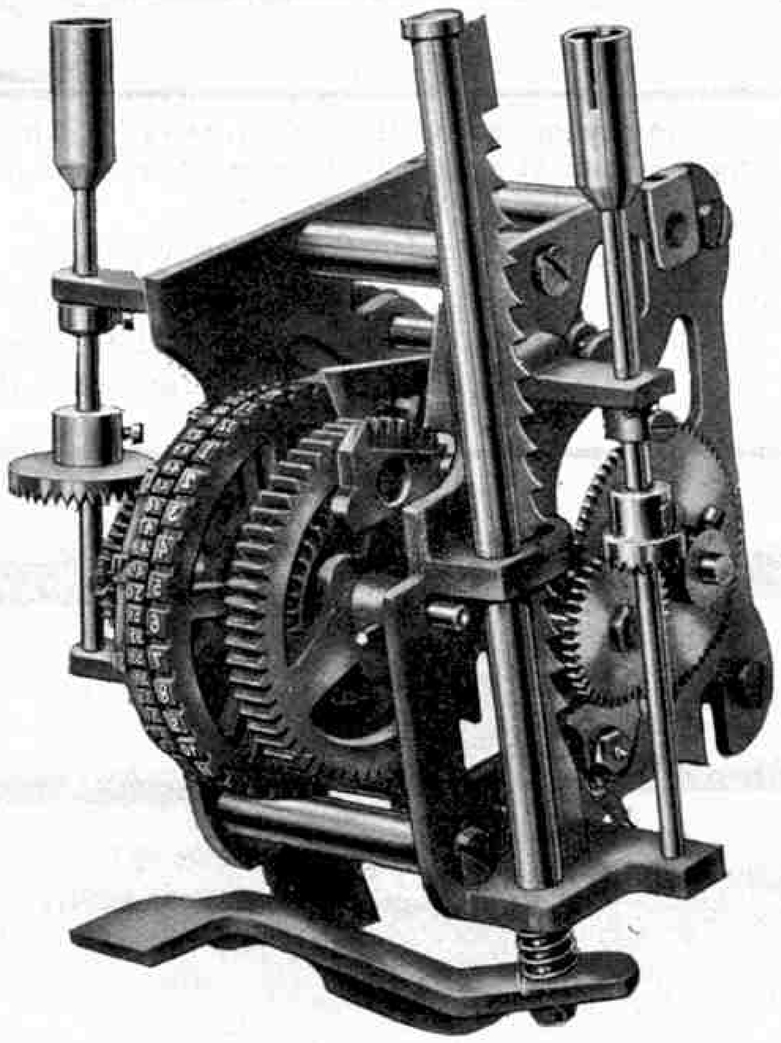
In the Gledhill-Brook time recorders, which operate on the card system, the clock movement is driven by a fusee and chain drive. This, it is claimed, is superior to the alternative method of driving the clock movement by means of two powerful springs.

When a coiled spring was first adopted as the motive power for a clock, about the year 1500, it was found that a serious difficulty existed. As the spring unwound itself and lost its tension the speed of the wheels became slower and slower, and consequently the clock would not keep accurate time. This problem was a very serious one, but a solution was found in 1525 by Jacob Zech of Prague. He surmounted the difficulty by placing the mainspring in a drum that revolved as the spring uncoiled. To the drum was attached one end of a tiny chain, which wound on to a kind of conical roller, called a "fusee." When the spring was fully wound the chain lay at the small end of the fusee where it had very little leverage on the clock mechanism. As the spring unwound and its force became less, the chain came off a larger radius of the fusee and a greater leverage was obtained by the spring, thus compensating for the loss of energy due to its uncoiling. It is interesting to note that the first clock made by Zech on the fusee and chain principle is now in London in the possession of the Society of Antiquaries of England.

The fusee and chain drive installed in the Gledhill-Brook time recorder is subjected to severe tests at the manufactory. First the chain is tested by a dead load much greater than any tension to which the chain is likely to be subjected in actual service, and it is afterward examined minutely for the slightest flaw or sign of weakness. The wheel train is afterward assembled in the frame and the chain is attached to the fusee. The train is then tested for internal friction by hanging weights to the fusee chain until the wheels slowly revolve, and comparison with standard tests then indicates any excessive friction.

Another test applied at this point consists of hanging a carefully calculated weight on the fusee chain and timing it over a fall of a given distance. The time is then compared with a standard, and any inequalities of drive are thus indicated. The movement is then fitted with a spring, finished off, and wound up. A spring balance is attached to the minute hand in order to apply a retarding force to it. The maximum force that can be applied without stopping the clock is then ascertained, and this indicates the available driving force—the equivalent of the engineer's "brake horse power." Similar tests are applied to the important type wheel drive connected with the clock movement.

When all the necessary tests have been passed successfully the recorder is regulated by Greenwich time and then undergoes a month's running test, after which it is passed to the packing room. Before a recorder is despatched a complete specimen card is stamped in it and this, together with a history card containing details of the results of all the tests, is filed away for reference.



Patent Time Printing Mechanism and Day Change incorporated in Gledhill-Brook Time Recorders.

Other interesting features of the Gledhill-Brook time recorder are the patent time printing mechanism and day change. The characters for printing the hour and minute figures are machine-cut from the solid, and are ranged around the arms of two wheels known respectively as the hour and the minute wheels. There is a positive drive to each wheel, and this ensures that the time recorded on a workman's card is identical with that indicated by the clock dial, even if the hands are turned backward. The card-lifting mechanism is operated in positive gear with the day printing wheel, so that it is impossible for the day letter recorded by the machine to differ from that already printed on the time card. The day letters are printed by the recorder in an upright position for "a.m." time and horizontal for "p.m." time, which effectively prevents any unauthorised manipulation of the card so as to print a day ahead.

By a special attachment to the recording mechanism it is possible to obtain all the "lates" and "overtimes" printed in red, so that the wages of the men may be made out accordingly.

In large factories and workshops it is desirable to have a uniform time throughout the building. To achieve this all time recorders, office dial clocks, etc., are fitted with an electrically-driven movement and are included in an electric circuit connected to a master clock. This clock is so designed that an electrical impulse is sent through the circuit every half-minute, and this impulse moves the minute hands forward the correct amount so that all the clocks show the same time. The exact correct time is, of course, given only at the moment of impulse.

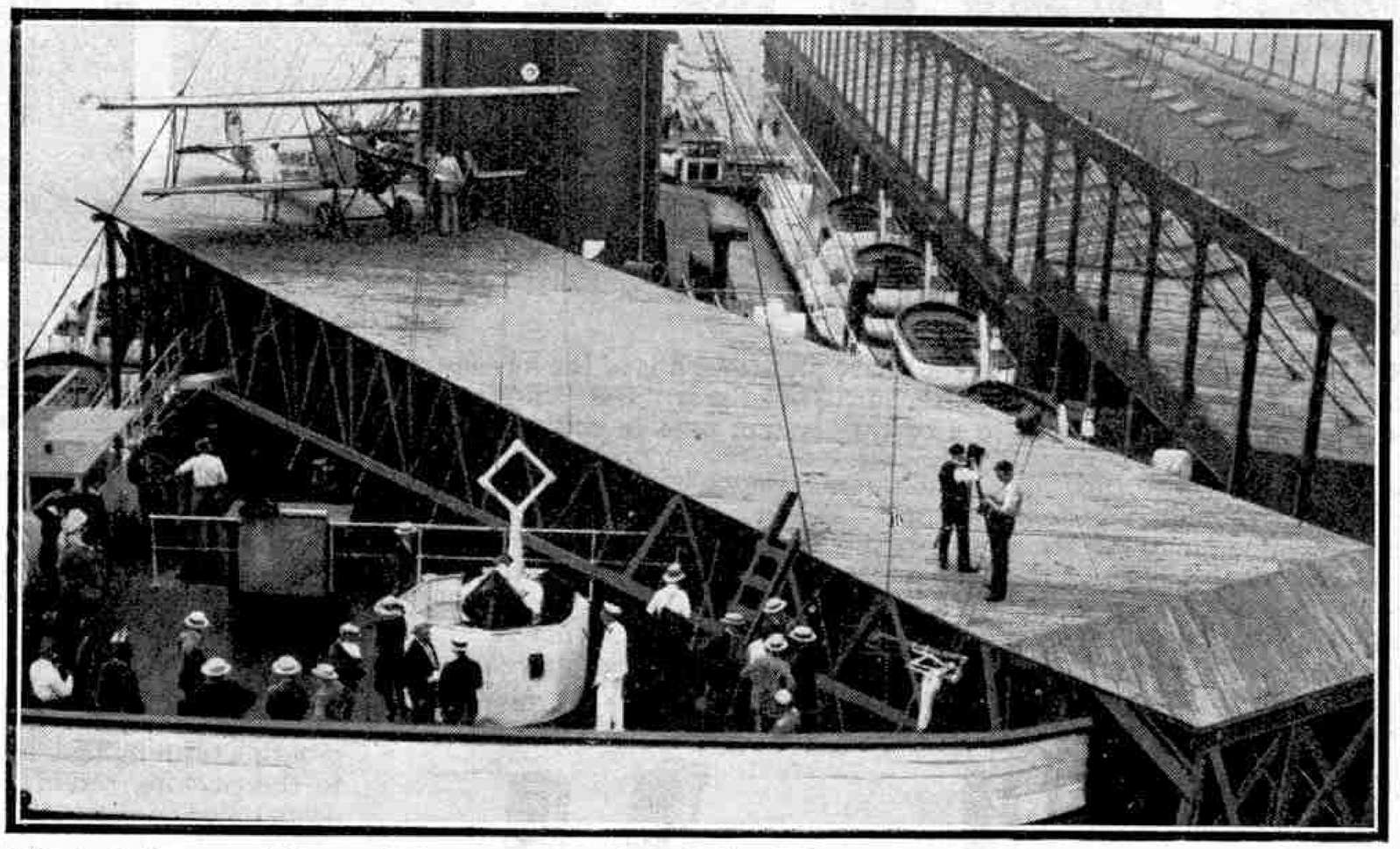
An alternative arrangement that is (Continued on page 228)

Speeding Up The Mails

From Ship to Shore by Seaplane

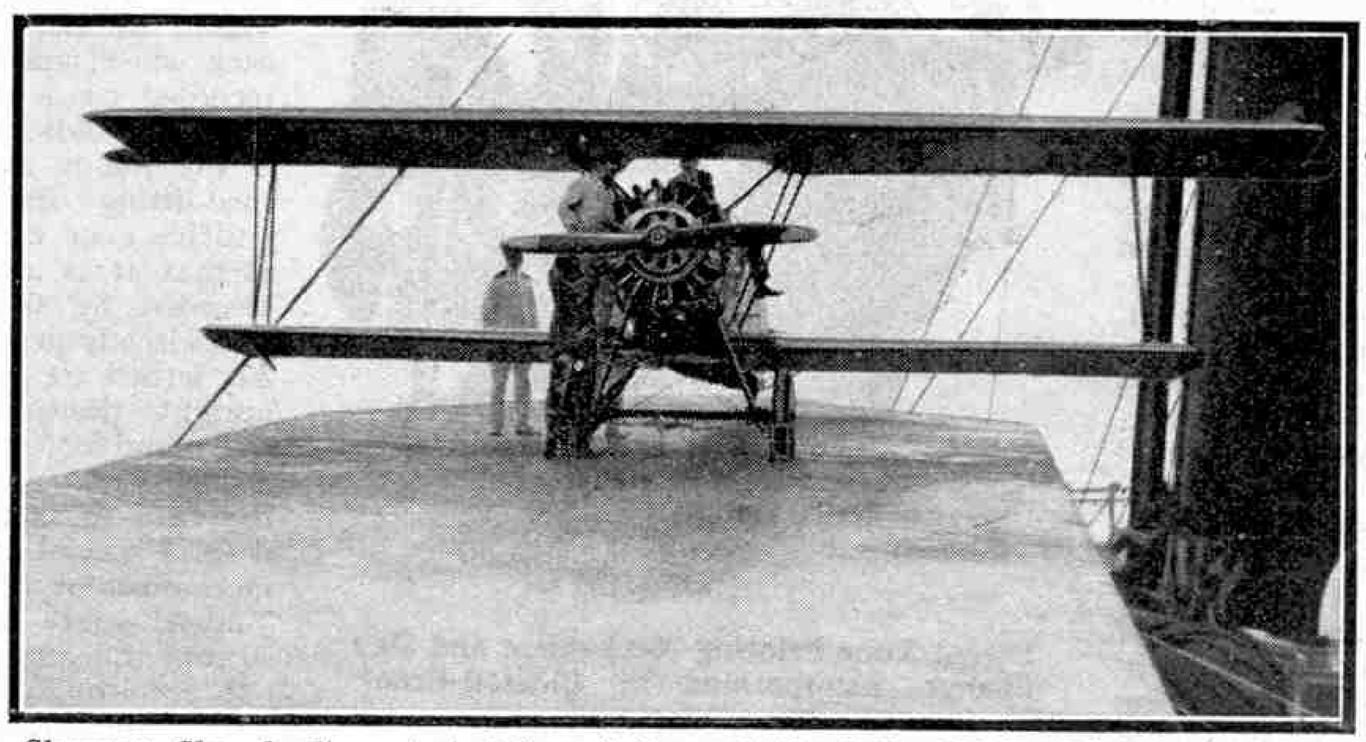
DURING the past two years a great deal of attention has been devoted to the conveyance of mails to and from ocean-going steamships by means of aircraft, while the vessel is some hours' journey from land. By this means the delivery of urgent letters may be expedited by as much as 24 hours.

It may surprise readers to learn that the first successful ship-to-shore flight was carried out as long ago as 10th January, 1912. The feat was accomplished by Lieut. C. R. Samson, who took off in a Short biplane from a specially erected staging on board H.M.S. "*Africa*," while she was in Sheerness Bay. After circling round the ship and flying over the bay for a short time, Lieut. Samson made for Eastchurch, where his safe landing completed the historic experiment.



View of the specially-erected runway on board the "*Leviathan*." The enormous size of this structure, which is one of its great drawbacks, is well indicated.

In our March 1928 issue we described an experiment of this nature that was conducted on board the famous German-built American liner "*Leviathan*," on which a slightly sloping, fairly broad runway 114 ft. in length, extending from the starboard side of the first funnel to a short distance over the bridge, was constructed. When the aeroplane was ready to take off, the vessel steamed at about 15 m.p.h. dead into a breeze of about the same velocity. This gave an approximate wind velocity in relation to the ship's speed of 30 m.p.h., enabling Clarence D. Chamberlin, the well-known American airman, to take off in a Fokker biplane equipped with a Wright "Whirlwind" engine. The experiment was satisfactorily completed, and about 900 letters were rushed to the mainland for early delivery.

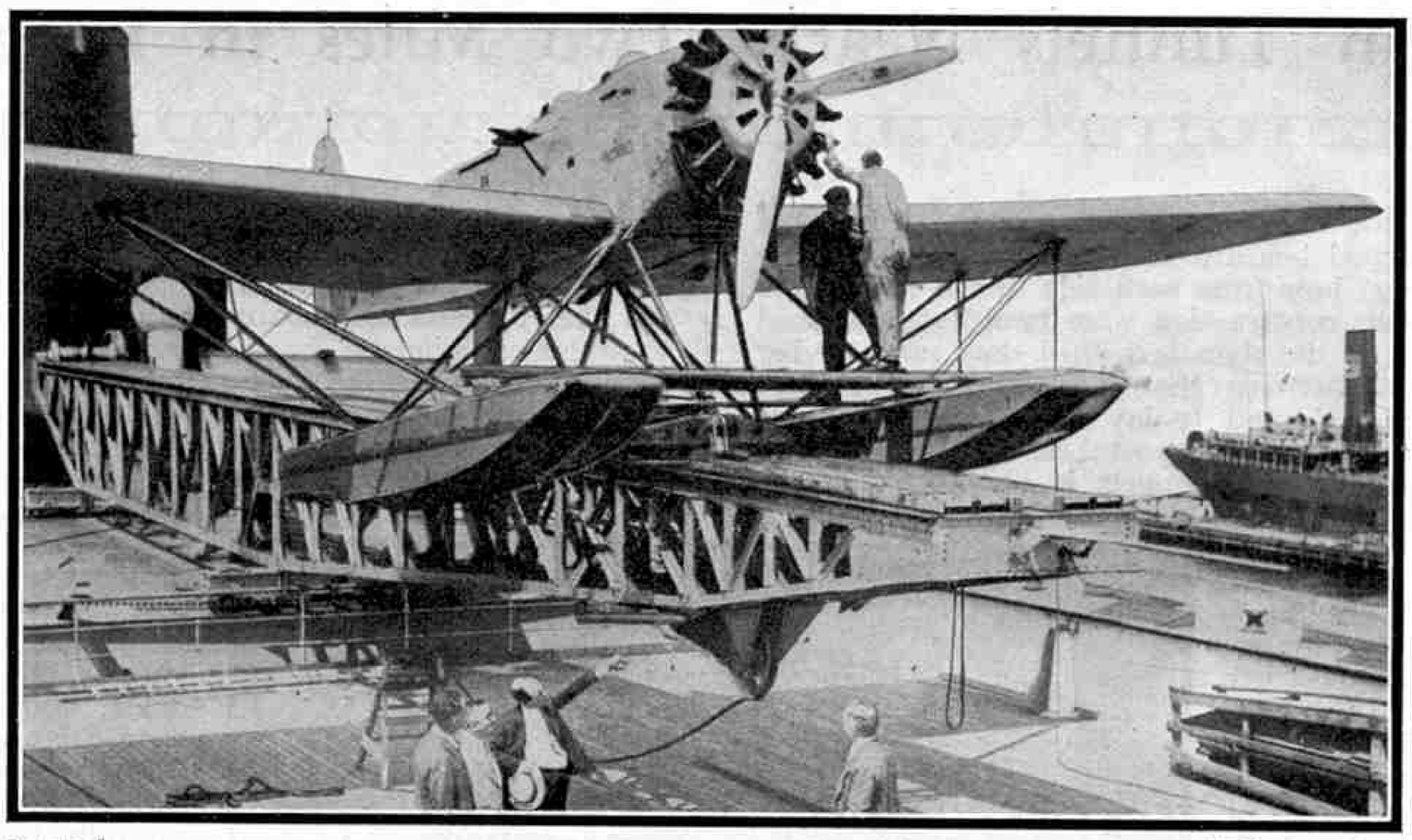


Clarence Chamberlin entering the pilot's cockpit of the Fokker biplane in which he made the first ship-to-shore flight from the "*Leviathan*."

The main disadvantages of using a runway in order to enable an aeroplane to leave a vessel lies in the inconvenience caused by its bulkiness. Another point against it is that, naturally, a land machine has to be used, and if, after leaving the ship, any failure were to take place, the machine would have to be flown into the water, where it would quickly sink, with the probable loss of pilot and mechanic, together with the mails on board. This danger could be reduced somewhat by the use of aircraft specially constructed so that the whole of the undercarriage could be detached rapidly from the fuselage and dropped into the sea. The fuselage would have to be water-tight so that it would act as a small boat, and it could be propelled landward by the airscrew. Aeroplanes of this type have actually been constructed for experimental purposes by M. Levasseur, a French engineer.

Apparatus that makes possible the delivery and collection of mails without the necessity for either the aeroplane or the steamship to stop has been fitted in the "*Leviathan*," in place of the runway first used. This apparatus consists of a V-shaped trap, closely resembling the bow section of a boat, the wide end of which has been left open. The trap is mounted on a turntable fastened to the deck in such a manner that the

trap may easily be moved round according to the direction of the prevailing wind. On approaching the ship the pilot of the mail machine lowers a steel cable to the end of which a heavy steel ball is attached, and flies low over the trap in such a manner that the ball enters the open end. The ball is then guided along a slot into a small cup-like receptacle. There it engages a coupling arrangement, which is lifted out of the slot by the cable as the aeroplane continues on its course. Attached to the coupling is a mail bag. A sudden jerk when the cable took the weight of this bag would make the aeroplane difficult to control, and therefore a catapult is incorporated in the device. This shoots the mail bag forward into the air at the moment when the coupling is lifted, with the result that the strain is applied gradually. The cable is raised and lowered by means of an electrically-operated reel that is capable of hauling up a heavy mail bag with great speed.



Courtesy] ["The Aeroplane"

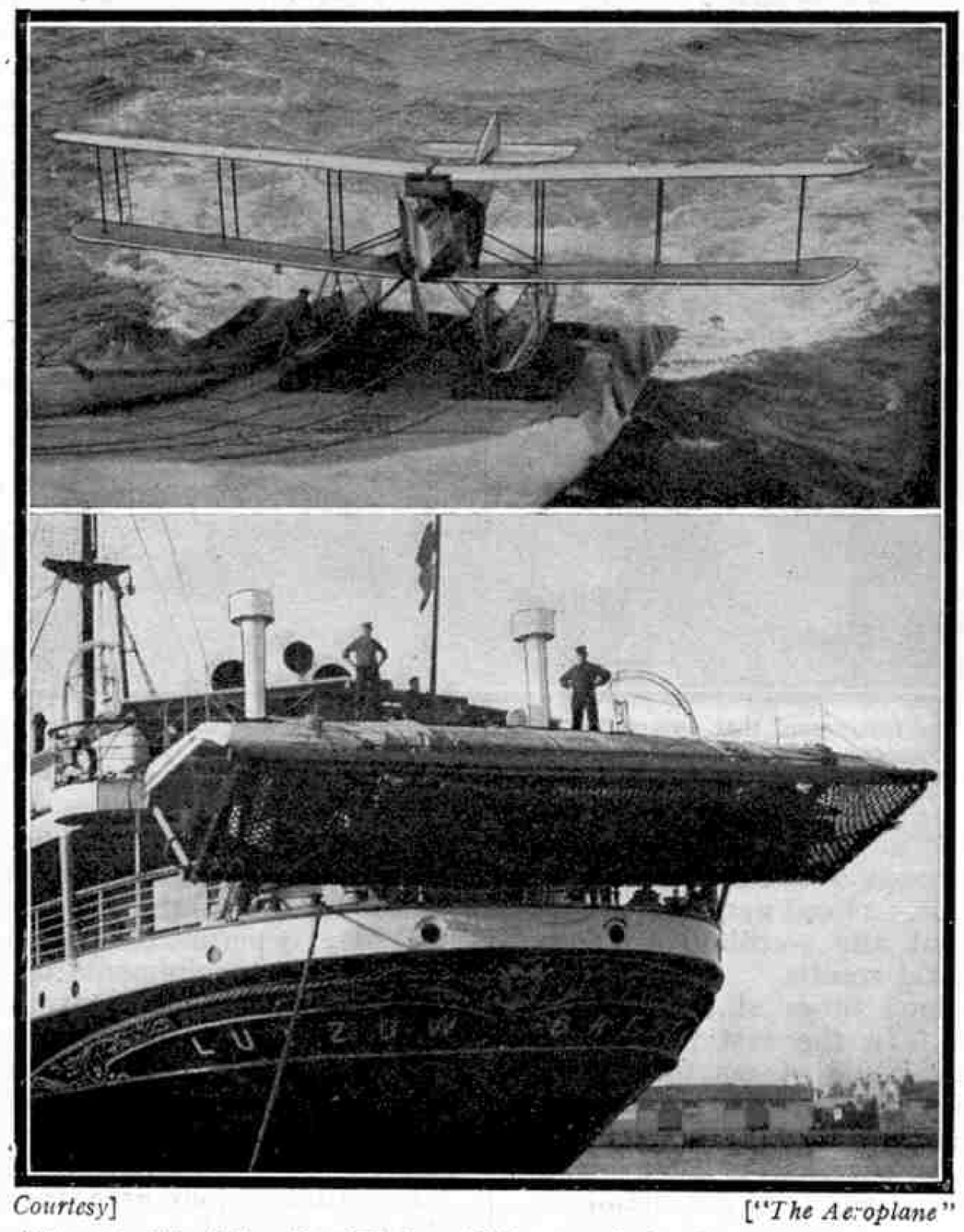
An interesting view of the catapult apparatus on board the "*Bremen*," with the "Heinkel" monoplane in position. The unusual three-bladed airscrew should be noted.

If, owing to some mishap, the steel ball were to become jammed while the apparatus was in action, the result would be disastrous to the aeroplane. In order to avoid any danger of this kind an automatic release is fixed that ensures that the cable is pulled loose from the machine before it is possible for any damage to be done.

The apparatus is arranged so that one lot of mails may be delivered and another picked up in the same operation.

Another alternative to the use of runways on mail-carrying vessels was demonstrated in a mechanical catapult that was fitted on the French liner "*Ile de France*," and was capable of hurling a flying-boat or a seaplane into the air. There was no opportunity for this apparatus to be tested, however. Shortly after the inauguration of the service, a flying-boat that had been catapulted from the liner made a forced landing near the Scilly Isles and was adrift for 10 hours before the crew were saved. After this accident the service was discontinued, but it is expected shortly to come into operation again.

A catapult operating on similar principles has been installed on the German liner "*Bremen*." In this case the catapult is situated on the top deck of the vessel between the two funnels. It consists essentially of a circular turntable that may be rotated in order to face the wind. This is attached to a narrow platform over 60 ft. in length, which holds rails along which a skid carrying the seaplane is shot by means of cables operated by a compressed air piston and toggle mechanism.



Courtesy] ["The Aeroplane"

(Above) The Kiwull "Watersail" extended; the aeroplane has just taxied on to the end of it. (Below) The Watersail furled.

Before the catapult is used to launch a machine it is carefully tested. When this operation is to be carried out the shooting action of the skid causes a heavy flywheel to rotate. The number of revolutions of the flywheel are recorded on a revolution indicator, and in this manner the condition of the apparatus is tested. If the catapult is in perfect order the seaplane—a Heinkel HE 12 type low-wing monoplane, equipped with a 500 h.p. Pratt and Whitney "Wasp" engine—is placed in position on the skid, one float being on each side of the skidway. On being set in motion the skid rapidly attains its maximum speed. As it approaches the end of the platform it is braked, and an automatic release enables the seaplane to soar up into the air. The speed of the machine on leaving the catapult is about 68 m.p.h.

Still another method of launching seaplanes from moving vessels has been designed. This is known as the Kiwullsche "Stausegal," or "watersail," and is the invention of a German engineer named Kiwull. It consists of a piece of canvas about 98 ft. in length and nearly 33 ft. in width. This canvas is braced by cross-pieces of wood on the underside, and terminates in a length of wire netting. The apparatus is strung from

(*Continued on page 204*)

Burrowing 30ft. Under the Hudson River

Twin Tunnels Nearly Two Miles in Length

LAST month we told the story of the boring of the twin tubes of the Holland Tunnel beneath the Hudson River at New York. We explained how from each side of the stream the giant shields used in their construction were forced steadily and surely through the mud of the river bed until they met, having made two clear passages between New York and Jersey City. There they were abandoned, and to-day they form the outer linings of the central sections of the two tubes.

The interior appearance of the tunnels is very striking, for they are brilliantly lighted and kept in perfect order. Each one is 29 ft. 6 in. in diameter—a size sufficient to allow an ordinary two-storey house to be drawn through! They are each designed to carry a double line of traffic, one tube being devoted to the use of vehicles passing from New York to Jersey City and the other to traffic in the opposite direction. In addition to the roadway, which is 20 ft. in width, there is a sidewalk 2 ft. 6 in. in width.

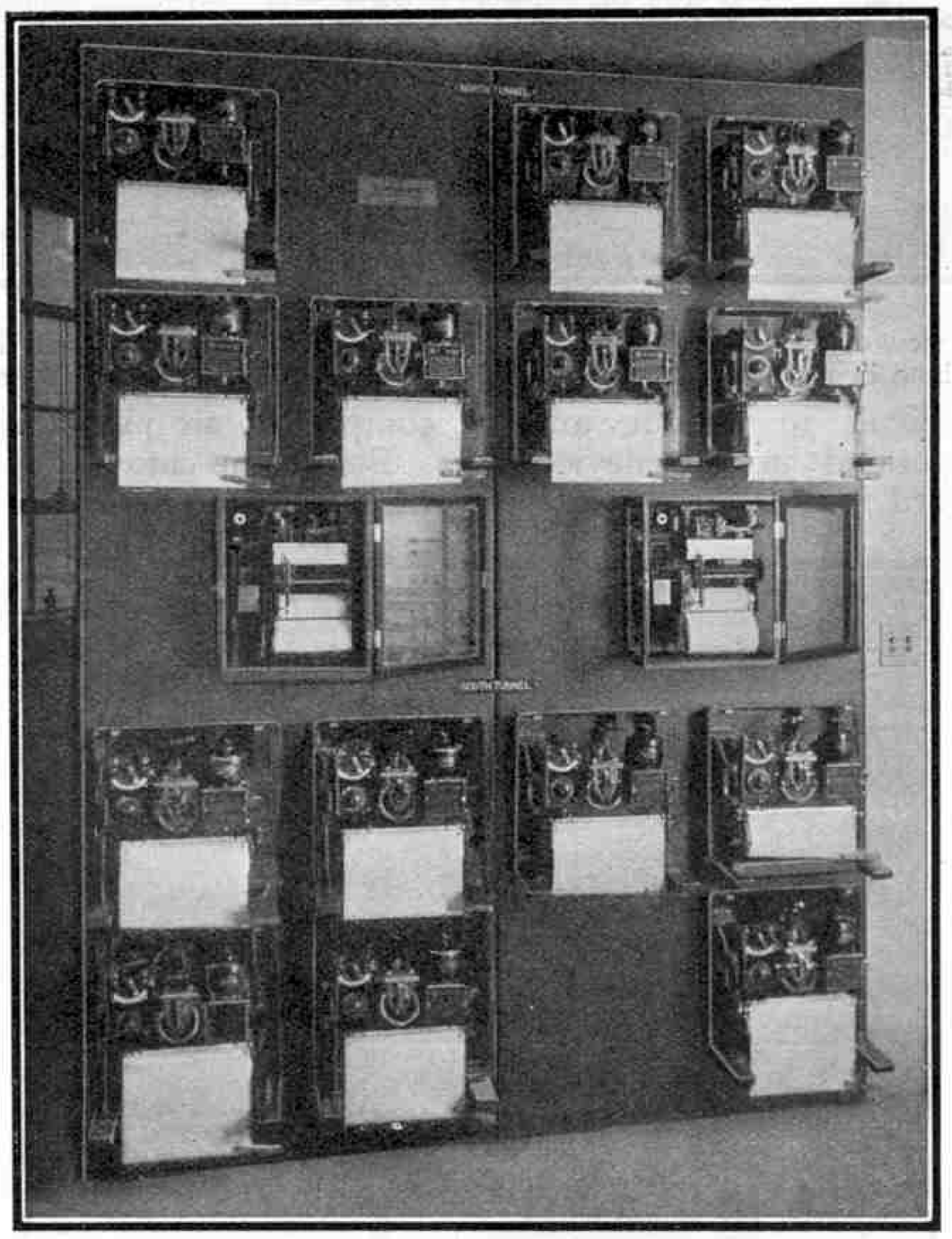
Very great care has been taken to provide easy access on both sides of the river. Open spaces of considerable area have been cleared in front of the entrances in order to enable cars to approach without confusion, and without causing any interference with other traffic; and equal care has been taken to avoid congestion at the exits.

In many ways the most interesting thing about the tunnel is the ventilation system. For the first time engineers had to face the problem of the presence in a long tunnel of a considerable amount of poisonous gas. All previous tunnels had been bored or built for railway traffic, or the use of horse-drawn vehicles. In the case of the Hudson Tunnel, however, it was expected that as many as 3,800 motor cars and lorries would pass through in one hour, and the engines of each of these vehicles would produce a certain amount of carbon monoxide. This gas is one of the most insidious of poisons. Usually its victims are quite unaware of its presence for it has no smell, and its first effect is to produce a drowsiness that is not likely to arouse suspicion. Its deadly nature has been proved over and over again in cases where a motorist has remained in a closed garage in which a car engine was running, and without any warning has been overcome by the fumes, often with fatal results.

How to deal with this gas in the long tubes of the Hudson Tunnel presented a very big problem. In the first place very little was known in regard to the proportion of gas that could safely be allowed to accumulate in the atmosphere. Quite clearly nothing could be left to chance, and therefore tests to settle this matter were carried out on a large scale, partly in a gallery in a Pittsburgh coal mine and partly in two specially built gas chambers at Yale University.

The object of the test in the gallery of the coal mine was to find out exactly how much poisonous gas a really inefficient motor car could produce. Old cars and trucks of all kinds were driven round and round in the confined space of the gallery, and the exhaust gases analysed. Similar tests were made also on open roads, and the astonishing fact was discovered that as much as 14 per cent. of the gas shot out by the engine of a motor vehicle might be carbon monoxide. Of course a really efficient motor car in proper condition does not produce this quantity of carbon monoxide, but in planning tunnels such as those under the Hudson River it was not sufficient to hope for the best; it was necessary for the engineers to prepare for the worst.

These experiments showed what was to be expected when the tunnel was opened to traffic, and the next step was to ascertain exactly how much poison gas could be safely allowed to remain in the atmosphere. It was for this purpose that the special test chambers at Yale University were built. One of these was gas-tight and of small dimensions, being about half the size of an ordinary bathroom. In it students who had volunteered for the task were made to breathe air containing various amounts of carbon monoxide, and its effects upon them were carefully noted.



The instrument that automatically and continuously records the percentage of poisonous gas in the air of the tubes of the Holland Tunnel. For this and other illustrations to this article we are indebted to the courtesy of the New York State Bridge and Tunnel Commission.

The percentage of the gas absorbed by the students' blood was carefully tested, the chamber having a special sleeve through which each in turn could thrust his hand in order that a few drops could be taken from him. In addition their heart beats were counted, and the time when they began to feel dizzy was measured; while after each experiment the students were made to run up and down four flights of stairs before being finally examined by doctors. In addition large scale tests were made in a chamber 30 ft. square. In this 20 men sat, while the engine of an old Ford car did its best to make the atmosphere as poisonous as possible.

Headaches, sickness, dizziness and general weakness were the lot of the students who volunteered for this work, but it was largely due to their self-sacrifice that the safe minimum percentage of carbon monoxide in the atmosphere of the Holland Tunnel was determined. The experiments were conducted by Professor Henderson, who came to the conclusion that not more than four parts of the gas in 10,000 parts of air should be allowed to remain in the atmosphere of the underground roadways. This gives an ample margin of safety, for exposure for one hour to an atmosphere in which this proportion is increased by two parts would cause nothing more serious than painful headaches.

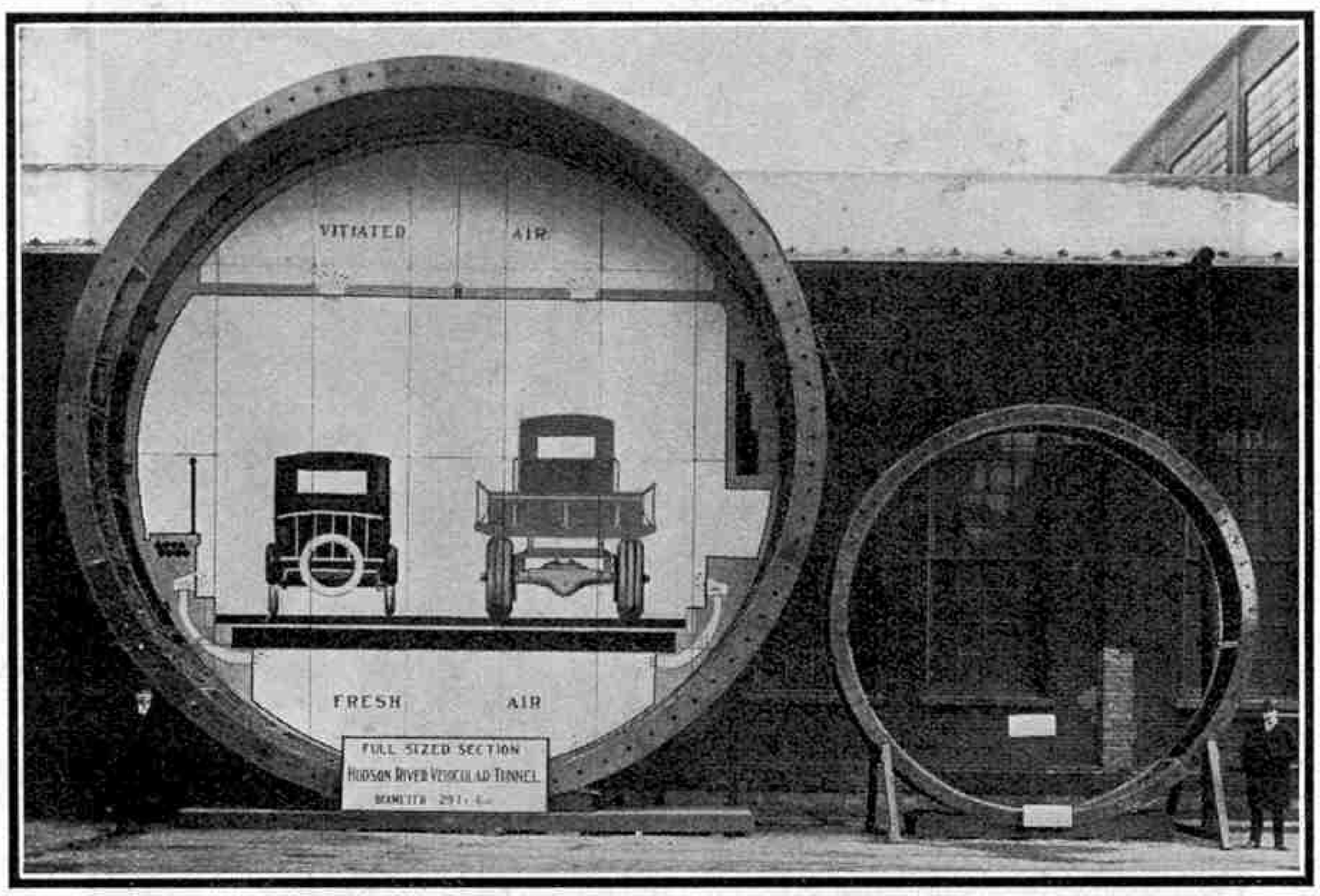
These experiments placed the engineers in possession of the ventilation requirements of the tunnel. In former tunnels these had been met quite naturally by sweeping a steady stream of fresh air through from one end to the other. But the length of the Holland Tunnel is almost 1¾ miles, and the speed of an air current that would keep the percentage of carbon monoxide in its atmosphere below the prescribed limits would have to be not less than 72 miles per hour! In other words, if the usual system of ventilation were used, the convenience of being able to pass from New York to Jersey City in six minutes, instead of waiting for hours in a queue for a ferry-boat, would have involved making the passage in a roaring gale!

Quite apart from the discomfort of a ventilation system of this kind, there was also the danger of fire. If two motor vehicles collided and caught fire the flames of the burning petrol would be fanned by the gale, and thus the interior of the tube would become a roaring furnace.

The problem was solved in a very efficient manner by dividing

the tunnel into seven sections, each of which is ventilated separately, and making the upper and lower portions of it into ducts for fresh air and foul gas respectively.

The cross section of each tube is circular, but naturally the roadway must be flat. The space between the roadway and the bottom of the tunnel is left open, and into it a powerful current of fresh air is forced by machinery situated in special buildings erected at four points along the length of the tunnel—one on the edge of the water at each side of the river, and the other two near the exits. A similar space at the top of the tunnel is reserved for the withdrawal of foul air, and thus the necessary circulation of air between the bottom and top of the tunnel is obtained.



The rings used in the construction of the Holland Tunnel compared with those of railway tunnels under the same river. The manner in which fresh air is introduced into the Holland Tunnel and vitiated air removed is shown in the full size drawing within the rings on the left.

The ventilating air current falls far short of the gale that would have been necessary if it had passed straight along the tube. The openings through which it enters the roadway are wide and are situated in the side walls; while those through which it finds its way into the exhaust duct are placed along the middle line of the roof. The passage of the air is marked by a gentle breeze only, and cars and huge motor lorries pass through the two tubes in constant succession throughout the day and well into the night with far less discomfort than would be experienced by their drivers and passengers in traversing the dusty thoroughfares of a large city.

Although the current of fresh air passes through the tunnel itself in a very gentle manner it begins its career as a regular hurricane in the four huge buildings or "breathing towers." There the vitiated air is drawn out from the overhead ventilation duct by fans that pour it into the outer atmosphere through chimney stacks on the roof, and is replaced by pure air directed into the lower duct by another battery of whirling vanes.

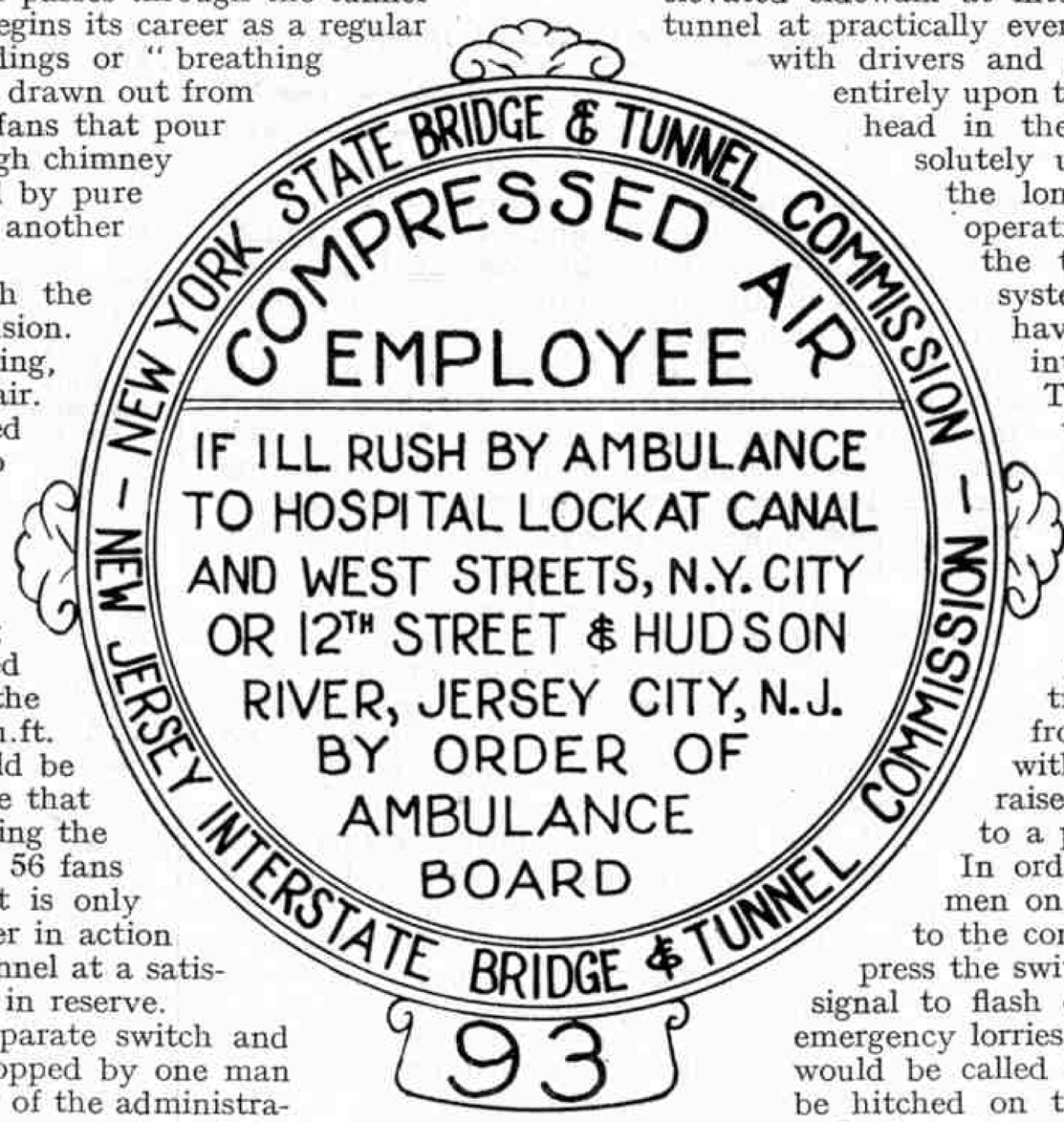
These fans by means of which the tunnel breathes are of huge dimension. There are 84 of them, 42 for inhaling, and 42 for getting rid of foul air. When in action they are whirled round at a speed of from 205 to 419 r.p.m., and it would take 6,000 h.p. to drive them all at once. If only 56 of the fans were at work 3,700,000 cu. ft. of air would be changed every minute; and during the six minutes allowed for the passage of each vehicle the stupendous quantity of 22,200,000 cu. ft. of air containing exhaust gas would be removed. It will be seen therefore that there would be little risk of poisoning the drivers or passengers! In practice 56 fans are not required, however, and it is only necessary to keep a smaller number in action in order to renew the air of the tunnel at a satisfactory rate; the others are kept in reserve.

Each fan is controlled by a separate switch and may be brought into action or stopped by one man situated in a room on the top floor of the administration building. This room is the very centre of the life of the Holland Tunnel, for in it are thousands of switches, by means of which the operator controls, not only the hurricane of fresh air that he directs into the ventilation duct, but also every lighting or signal lamp. On entering the room the eye is immediately attracted by a giant switchboard, 20 ft. in length and 7 ft. in height, on which are small switches and lamps connected with every circuit in the whole length of the tunnel, and in the four buildings also. The board is so long that it has been necessary to make it curved in order to enable the controller to keep an eye on the instruments and lamps mounted on it.

In front of this board stands the official in charge, and from it he learns at a glance which of the 84 fans is working, and whether any have broken down or are running too slowly. Another set of lamps tells him if any of the traffic signals are not working correctly; while still others flash to him the results of continuous automatic analyses of the air in the tunnels, different lights indicating the varying percentages of poisonous carbon monoxide it contains.

There is also a special bank of lamps that are very seldom lighted, for when any of these flash out the controller knows that somewhere in the sump of the tunnel water is accumulating. The position of the light shows where the water is, and it is only the work of a moment to bring into action powerful pumps to remove the small fraction of the Hudson River that has leaked through the joints. This happens very seldom, however. The tunnel is too well constructed and its plates of cast iron with their concrete lining are too stout to admit any quantity of water that can become dangerous before steps can be taken to remove it.

In addition to the traffic control policemen who patrol the elevated sidewalk at intervals of 1,000 ft., there are in the tunnel at practically every moment of the day 380 vehicles with drivers and passengers. Their welfare depends entirely upon the control exercised by the directing head in the control building. They are absolutely under his orders, for he can bring the long line to a standstill by merely operating a control switch, and he directs the traffic by means of an extensive system of illuminated signals that have been erected along the tubes at intervals of 240 feet.



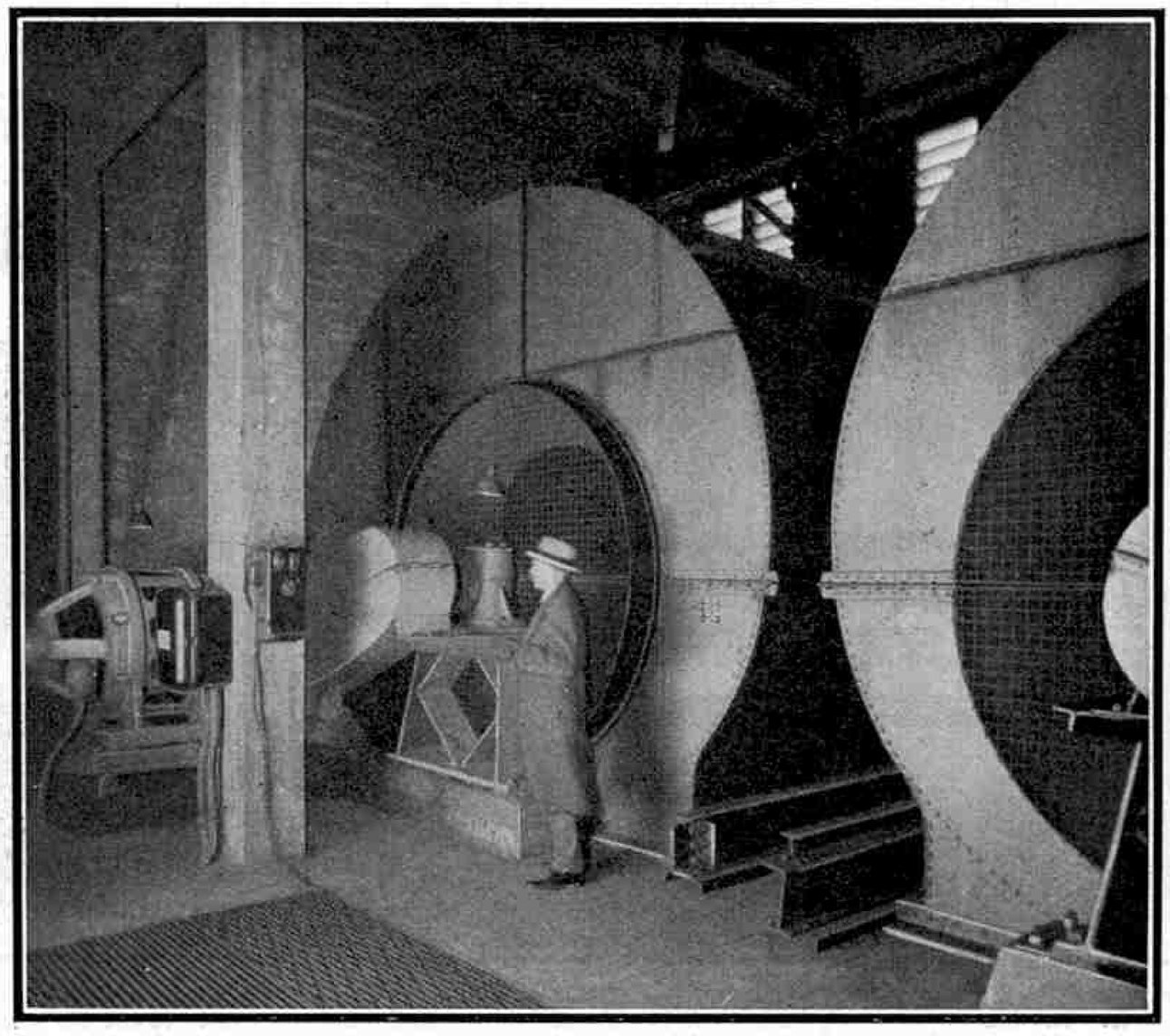
As part of a scheme to protect tunnel workers from attacks of caisson disease, those employed in the construction of the Holland Tunnel were compelled to wear the special badge reproduced above.

The ordinary signals order the driver to stop or proceed; in addition there is a traffic signal that is entirely new and can only be seen in the twin tubes of this wonderful tunnel. This is the "Stop Engine" sign. If a mishap due to collision or any other cause should result in a complete traffic block, the exhaust fumes from a number of stationary vehicles with engines running would quickly raise the percentage of carbon monoxide to a point approaching the danger limit. In order to avoid this one of the policemen on duty would immediately telephone to the control room and the controller would press the switch that causes the "Stop Engine" signal to flash out. In the meantime one of the emergency lorries stationed at the ends of the tunnel would be called for, and when it arrived it would be hitched on to the crippled vehicle or vehicles and drag them out of the tunnel. Immediately the obstruction is out of the way the controller switches off the "Stop Engine" signal, and orders the traffic to proceed.

An even greater danger than carbon monoxide is fire. Sometime there might be a collision between two vehicles followed by a great blaze as petrol streamed over the roadway. Unless such a fire were tackled instantly it might

lead to a frightful disaster among closely packed vehicles in the confined space of the tunnel. A water main extends throughout each tube, but water is of little use in fighting a petrol blaze. Sand boxes are placed at frequent intervals, therefore, and in addition there are cabinets placed 125 ft. apart, in which are kept extinguishers that, at the touch of a knob eject a fire-suffocating foam of a type that has been found by experiment to be most useful in extinguishing petrol fires. To these cabinets the traffic police would turn immediately an outbreak occurred.

When a fire breaks out panic is very often the cause of more deaths than the fire itself, as has often been demonstrated in fires in theatres and cinemas. The police who patrol the Holland Tunnel have been specially trained to deal with trouble of this kind. Before the tunnel was opened for public traffic motor cars were drenched with petrol until this formed great pools on the floor of the tunnel and then were set on fire. The police saw for themselves how effectively the foam quenched the blazing petrol and how the smoke was carried away by the stream of air.



One of the 84 giant fans that may be used to supply fresh air to the atmosphere of the Holland Tunnel. When 56 of these are working 3,700,000 cu. ft. of air are pumped through per minute.

The tunnel was opened to the public on 13th November, 1927, but in the short period of its existence it has already justified the confidence of those who advocated its construction. In a sense it may be said that the formidable barrier presented by the Hudson River has been completely abolished and Manhattan Island has become part of the mainland. Before the construction of the tunnel it cost more to carry a bale of cotton from a pier in Jersey City across the Hudson and East Rivers to a warehouse in Brooklyn than it did to bring it from far away South Carolina, where it was grown. This cost has been enormously reduced, and in addition time has been saved. The passage from one side of the river to the other now occupies six minutes, and there is practically no waiting; whereas when ferryboats provided the only means of transit, motor trucks often stood in line for hours waiting to deliver or receive goods at the piers on each side of the river.

The problem of transit across the Hudson River is only partially solved, however, even by the wonderful Holland Tunnel, which cost nearly £10,000,000 to construct. Already traffic through the twin tubes is showing signs of reaching the practical limit, and there is no doubt whatever that within a very short time it will become necessary to construct more tubes under the river through which ordinary vehicular traffic may pass. The wonderful work of Clifford M. Holland and his assistants and successors has shown the way, and in time communication between New York and Jersey City will be as easy as if the Hudson River did not exist.

Speeding Up the Mails—(*Continued from page 201*)

the stern of the vessel, a large amount of the wire netting being immersed in the water.

The seaplane carrying the mails slides down the canvas, enters the water and takes off in the ordinary manner. When returning to the ship the machine taxis on to the end of the canvas and is hauled aboard by sailors, after which the "slipway" is rolled into a comparatively small and compact bundle and slung from the stern of the ship, during which operation it is not necessary for the ship to be stopped. This apparatus scores over the catapult by its simplicity and cheapness, and by the fact that the returning seaplane may be taken on board without the necessity of having a crane on the ship, and without causing the expense and delay that would be involved if it were necessary that the vessel should heave to.

The pull exerted on the "slipway" by the passage of the netting through the water is so strong that it is possible for men to descend and carry out repair work on the seaplane when it is at rest on the bottom of the slipway.

No doubt other devices for transferring mails from ship to shore will be introduced. Those already invented and undergoing trial probably require to be improved in several directions if they are to become really practicable. At present it is not certain that they would be suitable for use in rough weather, and until they have become absolutely reliable in action, even in heavy seas, speeding up the mails by their means must remain erratic in character.

Familiar London Landmark Disappears—

(*Continued from page 205*)

iron boiler plates riveted together and attached to cross girders supported by longitudinal tubular girders of ⅜ in. iron, 2 ft. 3 in. in depth and 1 ft. 6 in. in width. The original flooring consisted of wood blocks laid on asphalt, the sidewalks being of stone paving set in cement and carried by wrought iron brackets riveted to the longitudinal girders. The bridge formed the subject of a report by Sir Benjamin Baker, and for many years before its demolition its use had been restricted to foot traffic, as it was not considered safe for vehicles. The diagonal bracing somewhat spoilt its appearance, and from an artistic as well as from a structural standpoint, the new bridge is an improvement.

At one period the only means of communication between Westminster and Lambeth was by the Lambeth ferry, which naturally was of considerable importance. It had an elaborate tariff ranging from 2/6 for a coach and six horses to 1/– for a horse and chaise. The opening of Westminster Bridge in 1780, and of the first Vauxhall Bridge in 1816, deprived the ferry of much of its importance.

Welds and the Microscope

An interesting folder reaches us from the Alloy Welding Processes Ltd., dealing with the microscopical examination of the structure or constitution of metals and alloys. This is a study of comparatively recent origin for 50 years ago practically nothing was known of it.

There are some very interesting illustrations in the booklet, a copy of which will be sent free to any reader on mentioning the "Meccano Magazine" and requesting Bulletin No. 62. The firm's address is Ferry Lane Works, Forest Road, Walthamstow, E.17, and applications should be sent there.

OUR CRICKET BAT CONTEST

With the approaching of the closing date, the rate of flow of entries in our Cricket Bat Contest is increasing. From certain questions that have been put to us, we find that a certain number of would-be competitors are waiting until the last moment before sending in their entries. They have in mind the fact that first class cricket is in progress in Australia and that new records made there may affect the accuracy of their answers to the competition questions. There is nothing to be gained by delay, however, for the records standing on 1st December, 1929, will be the basis of judging. Of course, we shall not disqualify any competitor who has already submitted newly-created records.

For the benefit of new readers we must explain that during their visit to Liverpool last summer to play the Lancashire County Cricket XI, the South African Cricket tourists visited the Meccano factory, and, at the request of the Editor, autographed a specially-chosen cricket bat for presentation as a prize in an "*M.M.*" contest. Subsequently the bat was autographed by the Lancashire XI, and also by Mr. Frank Hornby, inventor of Meccano and Managing Director of Meccano Limited.

Full details of the bat and the competition that is being held to decide which Meccano boy shall become the fortunate owner, were given on page 955 of the December "*M.M.*" Competitors are not required to rely upon their own unaided efforts; they may enlist the help of parents, uncles, cousins and friends. We are looking forward to a bumper entry, and every Meccano boy who is at all interested in cricket should attempt to win this splendid bat. The fact that there is only one bat should make competitors all the keener to do their utmost and, in any event, there are dozens of splendid consolation prizes to be won. There are just over four weeks still available, for the closing date is not until 31st March.

In the meantime the bat, together with a photograph of the South African team, taken on the occasion of their visit to the factory, will be on view in the windows of prominent Meccano dealers in various parts of the country.

During March 1930, the bat is on view as follows:—

4th to 8th March—W. Boyes & Co. Ltd., Ouse Bridge, York.

11th to 15th March—Sheard Binnington & Co., 44, High Street, Doncaster.

18th to 22nd March—W. Murray, 22, Sheffield Road, Barnsley, Yorks.

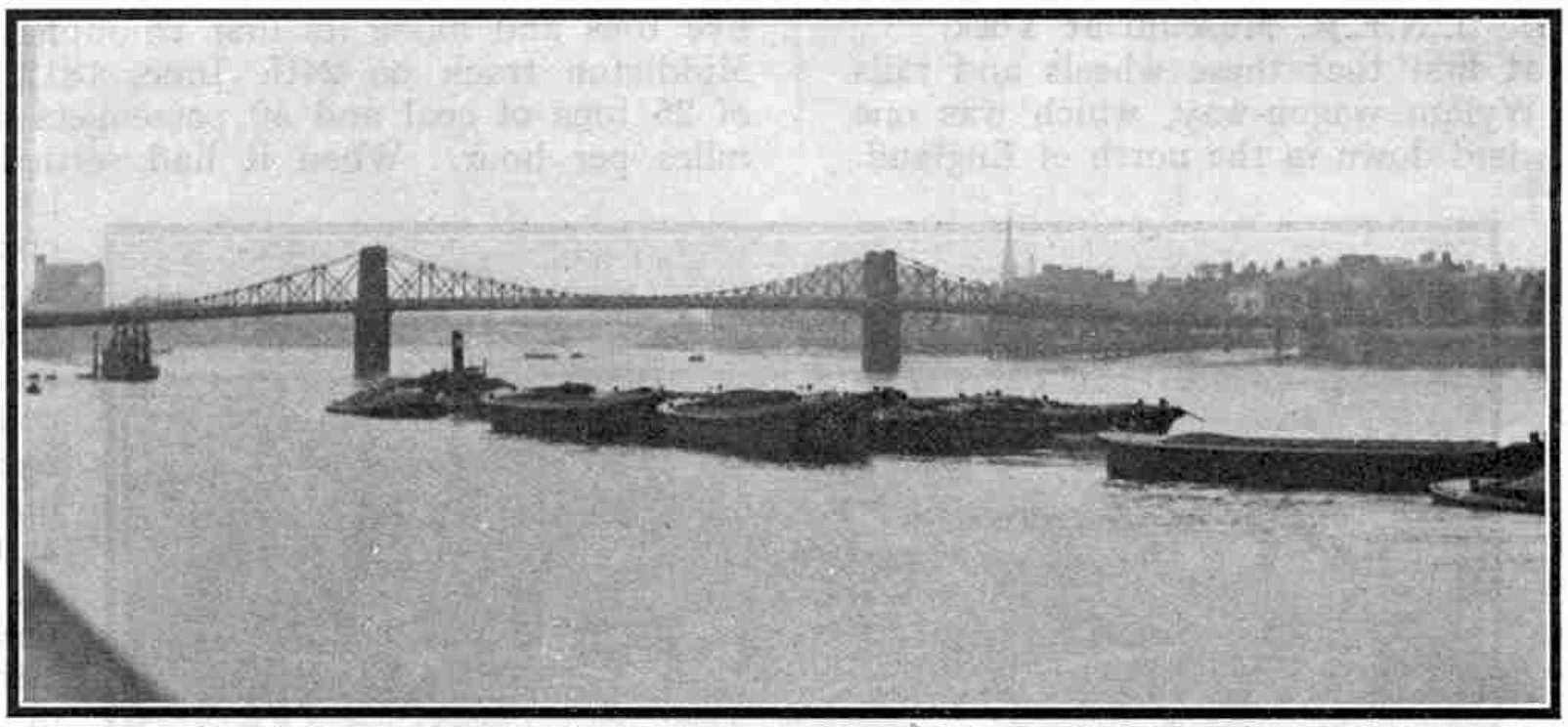
25th to 29th March—Sheffield Photo Co. Ltd., 6, Norfolk Row, Fargate, Sheffield.

Familiar London Landmark Disappears

Demolition of Lambeth Old Bridge

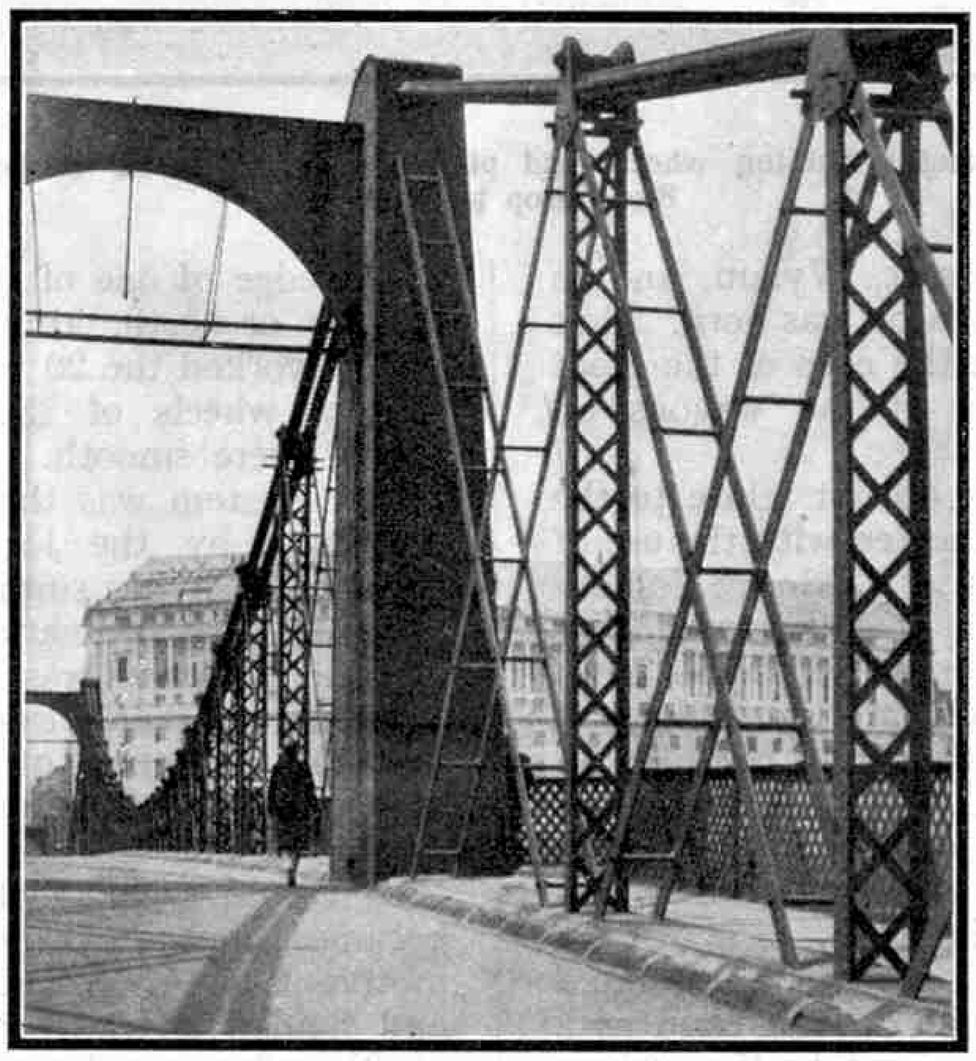
By R. D. Gauld, M.Eng., A.M.Inst.C.E.

A SHORT time ago a long familiar London landmark disappeared when the old Lambeth Bridge was pulled down. A contract had been let for the building of a new bridge, and the first step was the erection of a temporary footbridge across the river. As soon as this was ready, the old bridge was demolished to make room for the new one. It has practically vanished now, but a short account of what was in some ways a unique bridge, may be of interest.



The suspension bridge across the River Thames at Lambeth that has been demolished to make way for a modern structure. The bridge was a familiar landmark for about 70 years.

Lambeth Bridge was designed by the famous bridge engineer, Mr. P. W. Barlow, and was erected under his supervision in 1862–3, at a cost of £48,900, including the approaches. During that time it was the largest bridge in the country having wire ropes as main members. It had three equal spans of 268 ft. clear or 280 ft. centres of piers, and the cables formed three complete catenary curves (a catenary is the curve formed by a hanging chain or wire due to its own weight alone). The cables were anchored in the Middlesex and Surrey shores and were carried by four pairs of towers, two of which stood in the river, and the other two on the shore line. The total width of the deck of the bridge was 32 ft. of which 20 ft. was roadway, with a 6 ft. footpath on each side. Provision was made for widening the structure at some future date, but this was never done. The suspension system formed a division between the roadway and the footwalks.



Looking across the old bridge from the Surrey approach span.

The river piers each consisted of two cast iron cylinders braced together at the top by a small arch. These cylinders were 12 ft. in diameter, of metal $1\frac{1}{4}$ in. in thickness and they were sunk through the gravel of the river bed into the underlying clay for a distance of 8 ft. They were lined with brickwork, this being 3 ft. in thickness.

Each pier carried a pair of towers connected at the top by an arch. They had a box section and were formed of wrought iron boiler plate, the arched bracing also being of wrought iron. Each tower was 10 ft. by 5 ft. at the bottom and 8 ft. by 3 ft. at the top. The land towers were 28 ft. in height, and the river towers 32 ft.

The minimum section of iron in each tower was 240 sq. in. There were four cables each having seven strands and each strand seven ropes, while each rope had seven wires 3/10 in. in diameter. Each cable therefore had 343 wires and a cross section of 24 sq. in. The dip of the centre span of the cables was 24 ft.

Lambeth Bridge differed from most suspension bridges in having the cables fixed to the tops of the towers, which, consequently, under certain loading conditions might have to sustain heavy bending stress. The weight of each span when carrying a live load of 70 lbs. per sq. ft. was estimated at 560 tons. Vertical rigidity was achieved by the use of diagonal ties and vertical struts riveted to the horizontal roadway beams, and fixed to the cables by saddles secured with gibs and cotters. Another peculiar feature of the bridge was that structurally it was independent of the shore anchorages on account of the fixity of the cables at the towers. Substantial anchorages were provided, however, consisting of concrete and brickwork laid in Portland cement and bonded with hoop iron, the overall dimensions being 51 ft. by 33 ft. by 23 ft. The estimated weight of each anchorage was 2,000 tons.

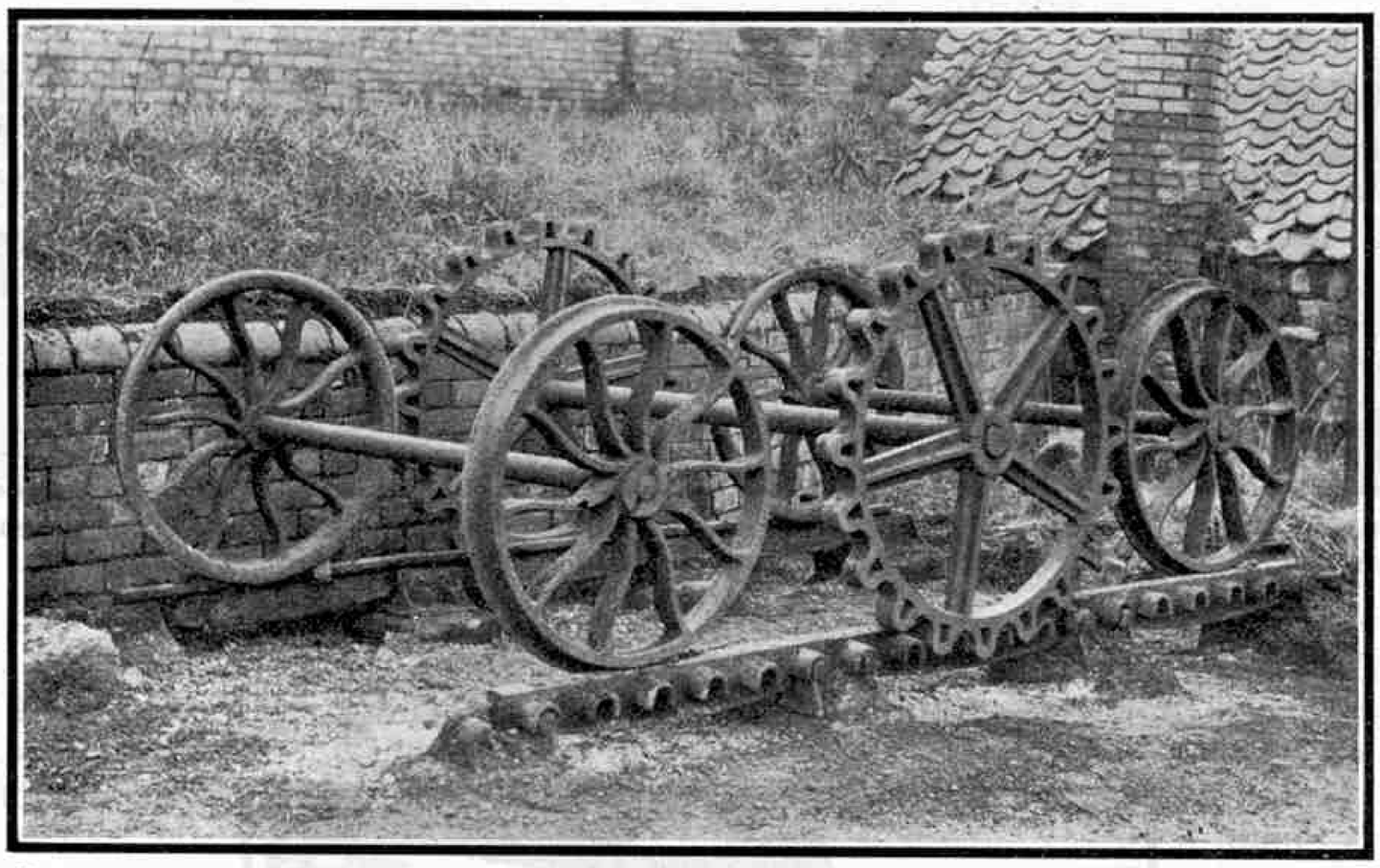
The deck consisted of wrought (Continued on page 204)

Blenkinsop Engine Relics

An Interesting Chapter in Railway History

DURING the progress of dismantling operations at Spencers Steel Works, Newburn-on-Tyne, there were discovered some interesting relics in the shape of rack rails, two pairs of flanged running wheels, and a pair of large pinions engaging with the rack rails. These were found by Thos. W. Ward Ltd., of Sheffield, and were presented to the L.N.E.R. Museum at York.

It was believed at first that these wheels and rails were relics of the Wylam wagon-way, which was one of the earliest to be laid down in the north of England. It connected the colliery at Wylam, where George Stephenson's father worked, with the village of Lemington on the banks of the Tyne, where coal was loaded into keels or barges and floated down the river to be shipped for the London market. On it cauldron wagons were drawn by horses at a very slow pace, only five journeys being made in two days by one man and his horse, the man being allowed 7d. for each journey. After leaving the colliery the line ran past High Street, Wylam, and in front of the cottage in which Stephenson was born. Thus one of the earliest sights that met the eyes of the great railway pioneer was the passage of the wagons on the old tramway.



Courtesy [*Thos. W. Ward Ltd.*

Rack rails, flanged running wheels and pinions believed to be connected with a Blenkinsop locomotive.

It now appears that these relics do not relate to the Wylam road, but are probably connected with the use of a Blenkinsop engine on the Kenton or Coxlodge Colliery line that ran to the coal staiths at Wallsend. This Blenkinsop engine was in service from September 1813 to May 1815. Apparently the rack rails show signs of having been in use, and therefore they may be originals. According to the curator of the L.N.E.R. Museum the pinions are probably a set that was cast from the original pattern at the Tyne Iron Works at Lemington, which were dismantled a considerable time ago.

The name of John Blenkinsop will always be associated with the first steam locomotive that drew a train as a commercial undertaking. He was agent to the owners of the Middleton Colliery, Leeds, and he designed an engine, in conjunction with Matthew Murray who ultimately built it, for hauling coal from the colliery to the coal staith some 3½ miles distant. He adopted a rack and pinion system with the idea of improving upon Trevithick's 1803 locomotive, the first steam railway locomotive in the world, which was liable to slip on the rails. The Blenkinsop locomotive cost £380 to build, including a premium of £30 that was paid to Trevithick in consideration of his patent right. The engine was named the "*Prince Regent*," weighed five tons and made its first triumphal journey on the Middleton track on 24th June, 1812, hauling a load of 25 tons of coal and 40 passengers at a speed of 3½ miles per hour. When it had settled down to work its load was increased, and for something like 24 years it ran regularly on the short colliery railway, sometimes working up to as much as 10 miles an hour. At least four of these locomotives were built. Two of them blew up with fatal results in 1818 and 1834 respectively, and as the remainder became worn out they were broken up and replaced by horse traction.

Blenkinsop's rails were smooth at the top, but half an inch below the upper edge of one of them, and outside it, was a series of lugs or teeth, almost semi-circular in shape, upon which worked the 20 rounded projections of the spurred driving wheels of the locomotive. The four carrier wheels were smooth. Among the many disadvantages of this system was the very considerable friction to be overcome by the locomotive itself, and the heavy expense of laying suitable track, which cost £352 more per mile than ordinary track.

Great curiosity was shown by the public in the performance of Blenkinsop's locomotives, and the colliery line was the centre of attraction. It is on record that visitors used to cheer lustily as the snorting little engines clanked along at their very slow speed. In 1816 the then Grand Duke Nicholas of Russia, who afterwards became Emperor, inspected the railway, and the locomotive then in operation rose nobly to the occasion and hauled a train of 30 loaded wagons at a speed of 3¼ miles per hour. A greater feat was achieved on 16th January, 1829, when one of these locomotives hauled a 38-wagon train, totalling 140 tons in weight, at a speed of from two to 3½ miles per hour. This load record was never beaten by the Blenkinsop engines employed at the colliery.

An Elizabethan Knight Errant

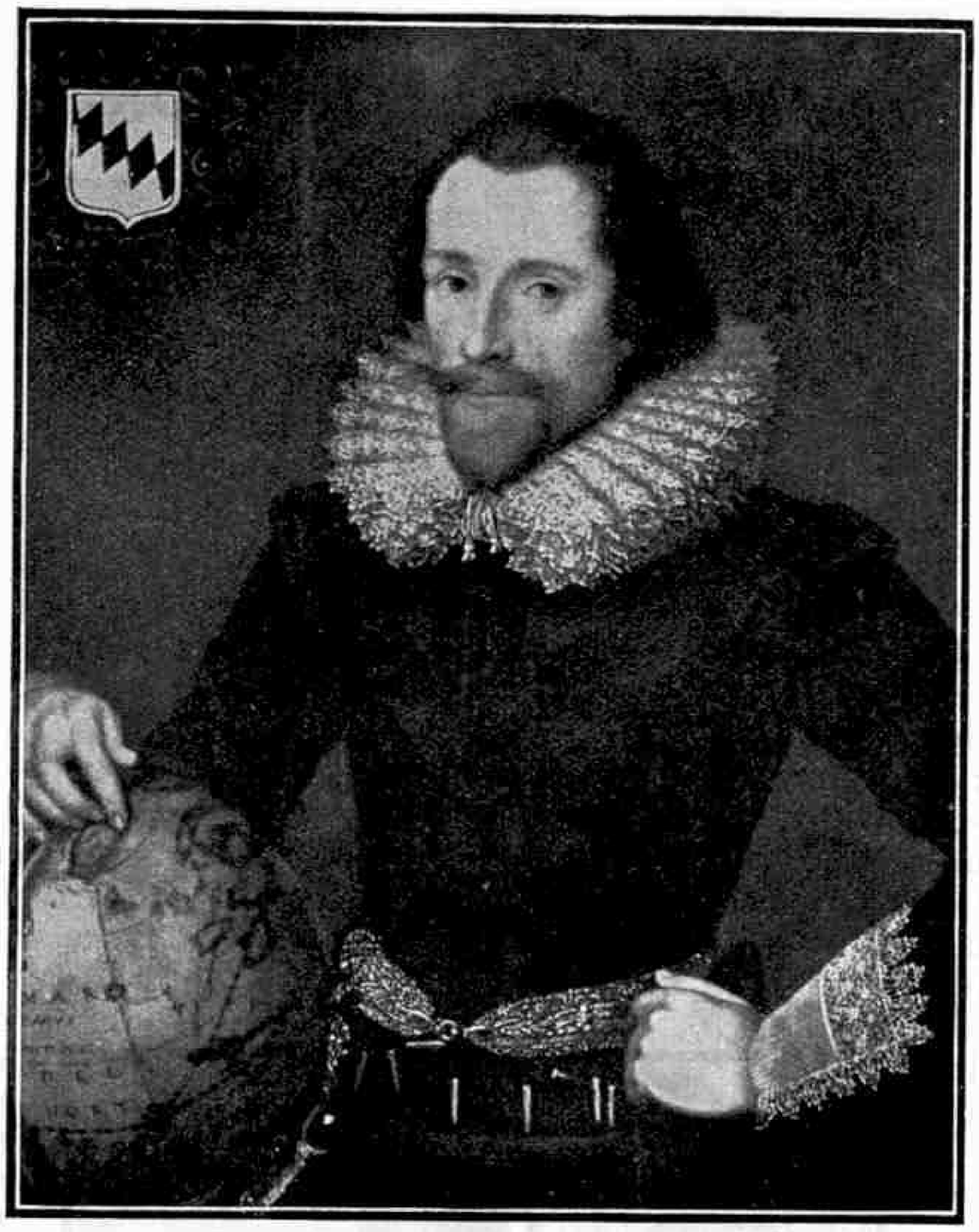
The Life of Sir Walter Raleigh

SIR WALTER RALEIGH is undoubtedly one of the most interesting figures in history. He combined qualities of the most extremely opposite nature, and it is very difficult to pass upon him a verdict that is really adequate. For this reason a new volume in the "Golden Hind" series is particularly welcome as it gives a really impartial picture of a man and his period.*

Of all the great figures of Elizabethan times that of Sir Walter Raleigh is certainly the most fascinating. He made wonderful voyages of exploration and discovery to Central America, where he fought Spaniards and captured and ransacked Spanish ships and cities, and he took a prominent part in a raid on Cadiz that delayed and hampered the preparations of the Spanish King for a desperate effort to conquer England. He was much more than a mere sailor and free-booter, however. He was also a poet and a courtier, and was equally at ease in camp and in the most elegant surroundings.

Raleigh began life as a soldier and won great distinction in warfare with the Irish rebels, in which the qualities of subordinate officers had greater opportunity to show themselves than had the skill and generalship of their leaders. In warfare of this kind Raleigh was thoroughly at home.

"His feats of bravery are almost legendary. On one occasion an ambush was laid for him at a ford between Youghal and Cork by the Seneschal of Imokillie, through whose country he was to pass. Raleigh, riding carelessly ahead of the rest of his company with his guide, was trapped, but succeeded in escaping over the river. Looking back, he saw one of his followers floundering in mid-stream, his horse having thrown him. The man desperately cried out to be saved. Raleigh dashed back and with his pistol and quarter-staff held off 20 men until his own half-dozen stragglers came up, when the ambush-raiding party fled."



Sir Walter Raleigh: The most romantic figure of the Elizabethan Period.

After Raleigh had distinguished himself by innumerable exploits of this nature there came to him a wonderful rise in fame and fortune. From Ireland he was recalled to England by Queen Elizabeth who had taken a great fancy to him. The usual story of the origin of his favour at Court is that he attracted attention by laying his cloak on the ground in order to save the Queen from the necessity of walking through a puddle. Mr. Waldman prefers the simpler and more probable explanation that the Queen saw him and was attracted by his appearance.

Another well-known legend of which the author disposes is that which connects Raleigh with the introduction of the potato. So far from Raleigh having brought this plant from Virginia to Europe, as is popularly supposed, the potato actually was unknown in North America until more than 100 years later! It really originated in Peru and Chile and was transported to Europe by the Spanish conquerors. It may be mentioned here that the credit of having introduced tobacco undoubtedly does belong to Raleigh. It was brought to England in 1585 by vessels returning from an attempt to establish a colony on the American coast, and it was Raleigh's example that made smoking a general habit.

At Court Raleigh became Captain of the Guard, and was thus in command of the Queen's bodyguard, as well as being one of her chosen counsellors. His activities were tremendous, for in addition to his Court duties he sent vessels to harry the Spanish treasure ships as they crossed the Atlantic Ocean, and he took a share in fitting out expeditions to explore Newfoundland and to search for the North West Passage. His most persistent efforts were directed towards founding a colony in what is now known as Virginia. Although a permanent settlement was not made, he may be regarded as one of the founders of the British Empire, for he was the first to endeavour to substitute colonisation for mere raiding of the type in which Drake distinguished himself. The blame for the failure cannot be laid on Raleigh. It is quite clear that this was due to the fact that he did not personally superintend the establishment of a settlement, and this was impossible, for the Queen would not hear of his leaving England.

It was not until several years after the defeat of the Armada that Raleigh succeeded in obtaining permission to take an active part in voyages that he had planned; and to the majority of readers the most interesting portion of this book will be that describing his voyages to Guiana and two expeditions he undertook in conjunction with the Earl of Essex. In one of these expeditions Cadiz was captured, but the other, which had for its object the interception of the Spanish treasure fleet, ended in failure.

We have not space in which to follow Raleigh's share in all these expeditions, but his romantic search on the banks of the Orinoco for the golden city of Manoa cannot be passed over. For generations explorers suffered terrible hardships, and in many cases lost their lives in searching for this mythical city, in the existence of which Raleigh believed to the end of his days. Raleigh's own journey of more than 250 miles up the river was of a heartbreaking character, as the following description by Mr. Waldman graphically indicates.

"The hardships suffered were almost beyond belief. One hundred men packed together, sleeping on bare boards, their clothes periodically soaked by tropical rain and dried stiff by the burning sun, their provisions either undressed meat which decayed rapidly in that fierce temperature, or local fish whose odour rose to heaven—'I will undertake that there was never any prison in England that could be found more unsavoury and loathsome,' wrote the commander."

As the men laboriously pulled their flat-bottomed boats against the swift current under these terrible conditions, Raleigh cheered them on by telling them stories of the country of which they were in search, where the meanest kitchen vessels were made of precious metals. Unfortunately all these endeavours and hardships were in vain, for when he arrived in England once more he brought with him very little gold, but many stories of men whose heads grew out of their breasts, oysters that grew on trees, a hill of diamonds, and other wonders! Many of these "Travellers' Tales" were so absurd that they aroused derision and unbelief, but it is pleasing to find that Mr. Waldman absolves Raleigh of intent to deceive, and even explains how he was misled.

Raleigh was fated to make another visit to South America in search of the mythical gold mines, but not until he had spent 13 years in the Tower on suspicion of having (Continued on page 250)

* "Sir Walter Raleigh." By Milton Waldman. John Lane. The Bodley Head, 12/6 net.

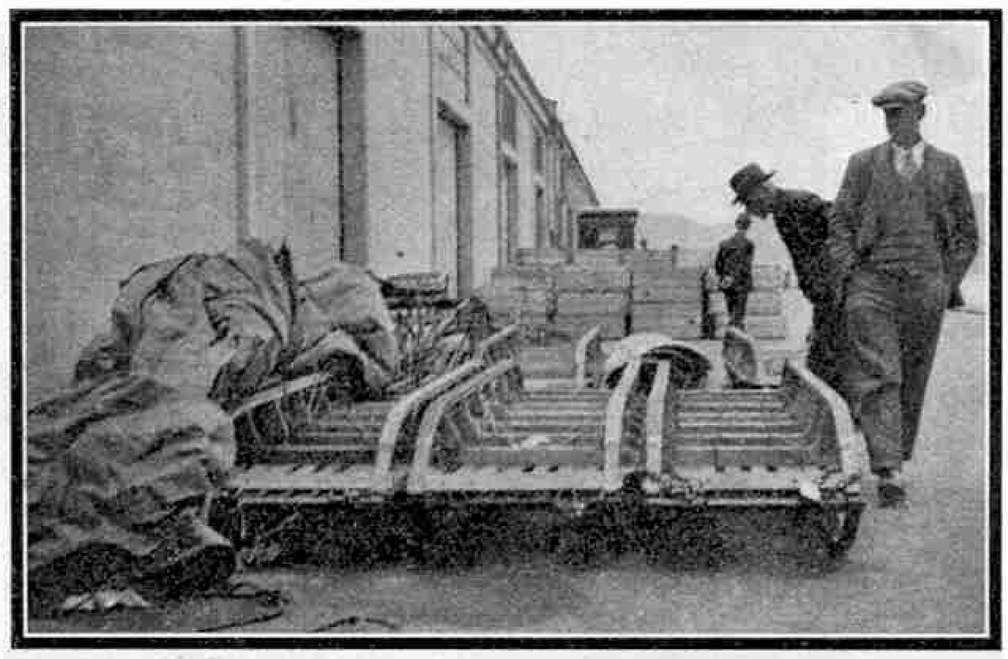
FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

The Byrd Antarctic Expedition

The last port of call of the ships of the Byrd Antarctic Expedition was Dunedin, where I live. Their visit caused great excitement in the city, and I was very sorry when the time came for their departure to the frozen regions in the south.

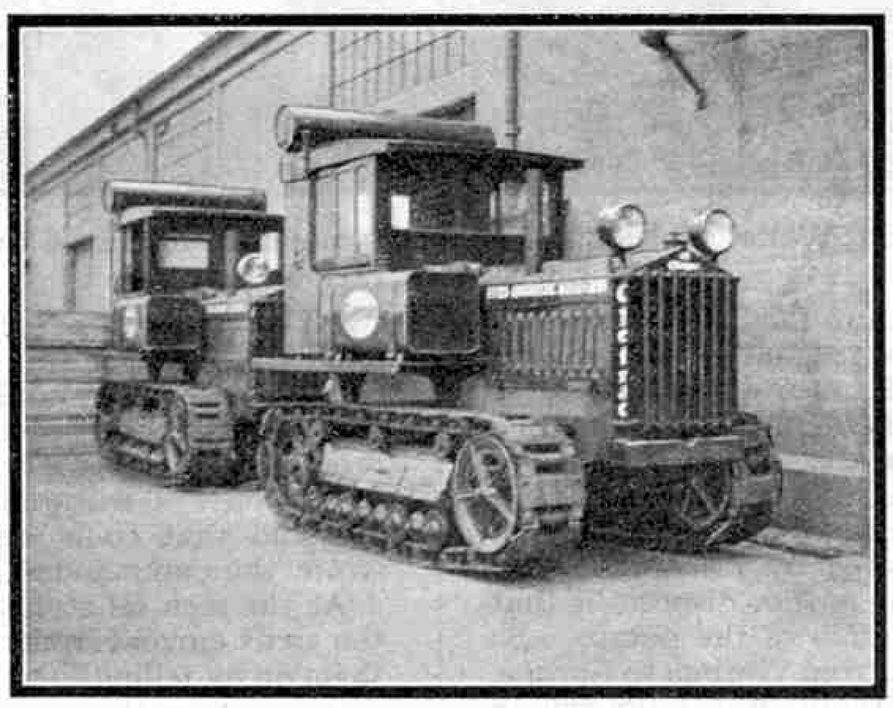
During the stay of the vessels in Dunedin Harbour I had opportunities of seeing something of the means to be adopted in making long journies over the Great Ice Barrier and the Antarctic Continent. Previous expeditions relied almost entirely on sledges hauled by men or by dogs. The American explorers have taken sledges with them, and have a very large number of dogs, but they are also using aeroplanes and tractors.



Sledges for use in the Antarctic by members of Commander Byrd's Expedition.

For travel over great distances Commander Byrd relies upon aeroplanes. Of these he has four at his disposal. The actual machine used on the memorable flight to the South Pole was a triple-engined all-metal Ford monoplane capable of taking off with a big load and of climbing to a great height. These qualities were necessary, for an enormous quantity of petrol had to be carried in order to complete the flight to the Pole and back, and a large portion of the aerial journey had to be made over a plateau that itself is 10,500 ft. above sea level.

The two electric tractors taken interested me very greatly. These are employed on heavy haulage work and in order that they may travel readily over ice and snow they are equipped with caterpillar tracks. The driving power is derived from huge 12-volt accumulators that have a capacity of 120 ampere-hours. The total weight of the accumulators is 131 lbs., the acid alone weighing 22 lbs., and they have been specially constructed to withstand the low temperatures in which they are to work.



The Cletrac motors of the Byrd Antarctic Expedition. Their caterpillar tracks enable them to haul sledges over frozen surfaces.

The Byrd Expedition is the largest and most completely equipped that has ever visited the Antarctic regions. It is composed of men who have been specially chosen for the work and among these are several Eskimos whose duty it is to make fur clothing for the other members of the Expedition. As an instance of the thoroughness with which preparations have been made, it may be remarked that at the headquarters of the Expedition a complete machine shop has been erected and this is manned by experienced craftsmen. Their services are essential in keeping in condition the tractors and the aeroplanes of the Expedition.

T. MacLachlan (Dunedin).

Mining and Digging for Amber

Amber is the fossilised resin of ancient coniferous trees. Specimens have been found on the east coast of Great Britain but the most abundant source is the Baltic Sea, on the shores of which large quantities are often washed up during storms.

Formerly amber was merely collected or brought up from the bed of the Baltic Sea by trawling in shallow waters. To-day it is obtained by mining operations ashore. The change followed from the discovery that the amber came from a bed of "blue earth" that extended beyond the confines of the Baltic Sea itself, continuing under cliffs that form part of its southern coast.

Mining has been in progress on the shores of the Baltic Sea since about 1860. A shaft is carried down to the seam of "blue earth," which is from 13 ft. to 20 ft. in thickness, and galleries are driven through it, all amber encountered being transferred to bags. Each man surrenders his haul on leaving the workings and the amber is washed and graded before being despatched to the works at Königsberg.

Instead of conducting ordinary mining operations of this kind, giant excavators are sometimes used to clear away the "blue earth" and the soil above it. The earth containing the amber is then loaded directly into railway wagons for transport to the washing plant.

Surface working is slowly taking the place of mining because of the risk of accident while tunnelling through the "blue earth."

Amber has been highly prized since very early days. Beads of the material have been discovered in the royal tombs of ancient Greece and even in prehistoric ruins in many lands.

E. M. Hutchins (Pokesdown).

A Brazilian Snake Farm

During a holiday spent in Brazil I visited the only snake farm in South America. This is situated a few miles from the industrial city of Sao Paulo and is a place of extraordinary interest.

In order to prevent the snakes from biting him as he walked among them the attendant who conducted me round wore thick leggings, and he was armed with a long staff forked at one end by means of which he could pin to the ground any snake that he wished to pick up. The creatures were housed in small concrete huts, similar in shape to the igloos inhabited by Eskimos, and their enclosures were surrounded by concrete walls 3 ft. in height. The farm was divided into two sections, one for non-poisonous snakes and the other for the venomous ones. For additional security the enclosure in which the latter were kept was surrounded by a ditch 2 ft. in width that was kept full of water.

Poisonous snakes in front of the huts in their enclosure on the snake farm at Sao Paulo, Brazil.

During my visit several boxes containing young snakes arrived. These had been captured in the jungles and swamps on each side of the Amazon and they were seized by the attendant and quickly placed into the appropriate section of the farm.

Naturally the poisonous snakes attracted my attention more than the others, although the latter have many points of interest. For instance, I was surprised to learn that a little time before my visit one of them had swallowed a poisonous reptile whole!

The chief purpose of keeping snakes in this manner is to extract the venom, from which an antitoxin for use in cases of snake-bite is made. The attendant showed me how the venom was obtained. By means of his forked stick he pinned a poisonous snake to the ground and grasped it behind the head in such a manner that the fangs could not reach him. The snake was furious at such treatment and was ready to bite at anything. It was allowed to vent its wrath on a thin cloth stretched over a container and the poison sacs in its head were pressed in order to force out as much venom as possible. The antitoxin is made by injecting increasingly large doses of the diluted venom into horses and making an extract from the blood of the animals so treated. When used promptly it is very effective in preventing fatal consequences from a bite by a poisonous snake.

The need for a cure for snake bite is very urgent, for in many parts of the world snakes are a very serious menace indeed. In India more than 1,000 persons are said to die annually from bites, chiefly from cobras, and in the West Indies the dreaded fer de lance is responsible for many deaths among the labourers on the sugar plantations.

W. A. SMITH (Dundee).

Wonderful Ruins at Zimbabwe

I had often read accounts of the Zimbabwe ruins in Southern Rhodesia, and had been very greatly interested in them. When an opportunity of actually seeing them was given me, therefore, I had no hesitation in accepting it. They are situated 17 miles from Fort Victoria, the nearest railway terminus, and are approached through country that is rugged but impressive.

On arrival a glance showed the ruins to be built of granite blocks, each of these being a little larger than an ordinary brick. Their builders used no mortar, but most of the blocks were trimmed with metal tools in order to make them fit well. The building was excellently done, the walls being smoothly rounded off at the gateways.

The chief building is called the "Acropolis" and occupies a commanding position on Zimbabwe Hill. There are two paths by means of which it may be reached. One of these is of modern construction and although very steep presents little difficulty. The second was used by the people who erected the buildings and is much steeper. It is so narrow that those making their way up must go in single file.

Everything seems to indicate that the "Acropolis" was a kind of fortress, for the ancient path passes through gaps between huge boulders where defence would be easy. In addition the walls are very thick and strong, and in those places where there appears to be the least possibility of an ascent of the hill being made a wall has been built in order to make the summit inaccessible.

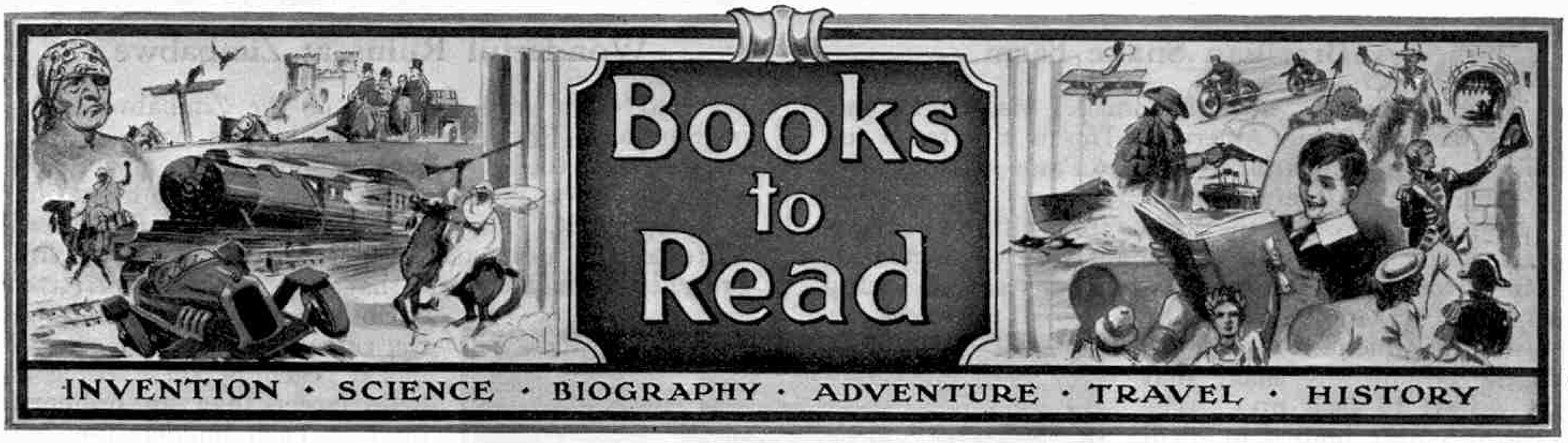
North Entrance to the Elliptical Temple at Zimbabwe, Rhodesia.

The climb up the hill is very stiff, but the view from the top is ample compensation. Down below may be seen fragments of ancient buildings in what is called the "Valley of Ruins." Although the buildings are greatly dilapidated many sections of the walls are in perfect condition in spite of the absence of mortar.

One of the most interesting of the ruins is the Elliptical Temple. This is surrounded by a wall, from 22 ft. to 32 ft. in height, that at one place is 15 ft. in thickness at ground level and 10 ft. at the top. This wall is very nearly half a mile in length.

When the buildings now in ruins were erected is still a mystery, their age having been variously estimated at from 400 to 4,000 years. At one time it was believed that they were the work of Phœnician gold seekers, and tradition has associated them with King Solomon's Mines, but it is now thought that they were built by natives at some time between 600 A.D. and 1300 A.D. They are the most striking relics of a vanished race of miners who extracted enormous quantities of gold from Rhodesia and the Transvaal.

G. W. STEWART (Durban).



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"Learning to Fly"

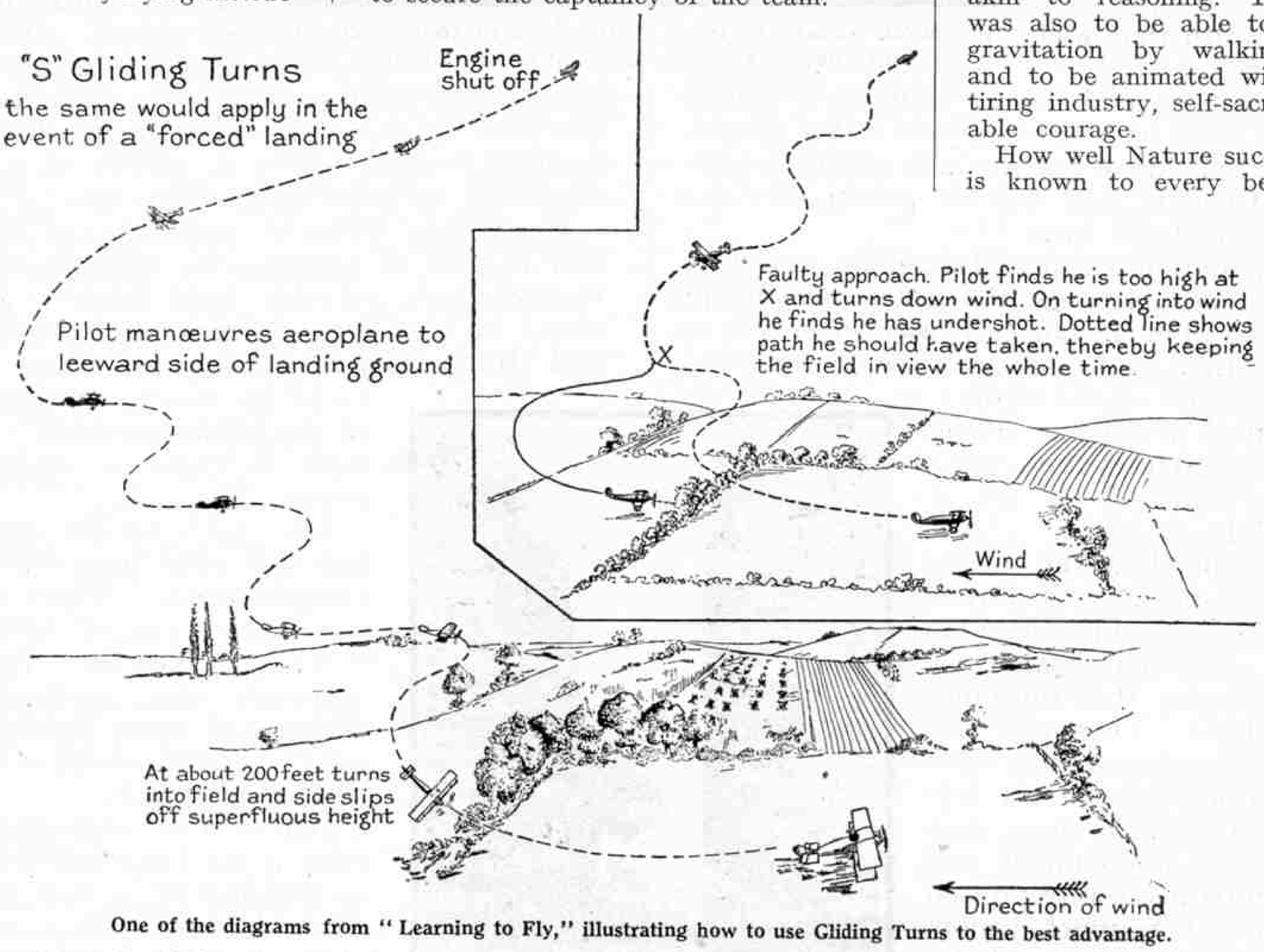
By F. A. Swoffer. (Pitman. 7/6)

This course of elementary flying instruction will interest those of our readers who are students of the practical art of flying, even though they may not themselves have an opportunity of putting into practice what they have learnt. The book describes the effect of each actual movement of the controls in the air, and it explains the subject in the simplest manner possible, avoiding all technicalities.

The method used is the one taught by all recognised instructors, and we are told that there is no hard and fast rule as to the actual sequence of instruction, which depends entirely upon the discretion of the instructor and the aptitude for flying that is shown by the pupil.

In his foreword Air Vice-Marshal Sir Sefton Brancker of the Air Ministry expresses the opinion that he has "never seen the rudiments of handling an aeroplane more lucidly or simply explained. A careful study of its contents previous to and during practical instruction should be of very great value to a prospective pilot, and should assist both owners and clubs to avoid unnecessary crashes and consequent waste of time and money."

Mr. Swoffer is the chief instructor of the Hampshire Aeroplane Club and writes with a thorough practical knowledge of his subject. The book is well illustrated with diagrams and photographs, and is provided with a very good index.



One of the diagrams from "Learning to Fly," illustrating how to use Gliding Turns to the best advantage.

"The Abbeygate Cricket Cup"

By Alfred Edgar. (Fredk. Warne & Co. Ltd. 1/- net)

This swiftly moving story tells how a boy who has lost the respect of his schoolfellows not only regains it, but becomes one of the heroes of his school. Dick Rutherford plays so badly in an important cricket match that the majority of the onlookers, including one of the Masters, are convinced that he has deliberately let down the School in revenge for his failure to secure the captaincy of the team.

The real explanation of Dick's lapse is, of course, quite different, but the boy does not seek to make any excuses. How he redeems his character in a thrilling motor car race at Brooklands must be read in the book itself. The story is not long, but from page to page it grows in interest and excitement, and it is quite certain that very few boys will be able to lay it down until they have reached the end.

"The Story of the Hive"

By Canning Williams. (Black. 6/-)

The author tells us in his preface that for nearly half a century he has been a lover of bees, and from the very interesting account he has given in this book we can well believe this statement. Bees are particularly wonderful insects as will be gathered from the statement that Nature when fashioning the bee had to construct a creature of beautiful form and fleet of wing with the 300th part of an ounce of living matter. This creature had to have wonderful faculties of sight, smell, and touch; to be able to gather liquids and solids, and to secrete a plastic material with which to build its home; to be provided with a weapon, and to have high architectural ability and powers akin to reasoning. The tiny creature was also to be able to defy the law of gravitation by walking upside down, and to be animated with a spirit of untiring industry, self-sacrifice and indomitable courage.

How well Nature succeeded in her task is known to every bee keeper, and is further amplified by this book. We are not only taken through the hive, but also through the life of the bee from the time it is a tiny egg to the time when its day's work is done. Swarming; the killing of the queen; nectar and pollen gathering; wax formation; the building of combs; the honey harvest; and many other things that go to make bee lore, are dealt with in an interesting manner.

The only fault we have to find with the book is that—with the exception of the frontispiece—there are no illustrations. This is to be regretted, as the subject is one that can provide many interesting illustrations, which would have added very considerably to the general interest of the book.

"Flags of All Nations"

(Brown, Son & Ferguson Ltd. 1/6 net)

Flags have a wonderful fascination for boys of all ages. It makes little difference whether they are national flags or those used for signalling at sea, for in each case their pictorial manner of telling a story makes a strong appeal.

Undoubtedly the best form in which to display reproductions of flags is to group them together on a large sheet. This plan has been adopted by the compilers

of the booklet, and the contents are so well arranged and described that an unknown flag may easily be identified, and that of any country quickly found.

An astonishing number of flags are represented in their correct colours. The flags and badges named on the accompanying list number 294, and in addition the sheet gives the flags and pennants used in naval signalling, together with those of the International Code of signals. An interesting feature is the inclusion of illustrations of the chief types of sailing ships, and a complete guide to the yards and both standing and running rigging.

"Ju-Ju and Justice in Nigeria"

By F. Hives and G. Lumley
(The Bodley Head. 12/6)

This book gives an interesting account of the experiences of Mr. Frank Hives, a District Commissioner on the upper reaches of the Cross River in Nigeria, in the days when that country was hardly touched by the civilising influences of Trade and Government. Mr. Hives, with a mere handful of native police, had a vast district to govern, where savage customs, and especially ju-ju, or the fetish of the priests, kept the natives in the most abject slavery and terror. He had many narrow escapes, on one occasion being shown the pot in which he was to be cooked, and on another being saved by a terrific thunderstorm from a very unsavoury death!

There is a thrilling account of how he broke up a ju-ju ceremony in full swing and captured the officiating priest, and how another time he discovered that the god of a certain ju-ju was a gigantic crocodile kept in a pit who was appeased by human sacrifice. There is a chapter on the dispensation of justice in the primitive Courts which is human and amusing, while the description of the Aro people is of historical interest, especially to students of the occult.

The book is throughout a record of courage and resource and is set down in a simple, direct style. It will, we feel sure, be read with interest by "*M.M.*" readers.

"British Locomotives: Their Evolution and Development"

By G. Gibbard Jackson
(Sampson Low, Marston & Co. Ltd. 6/- net)

Mr. Gibbard Jackson has written several books on railways and locomotives, but it may be confidently said that this is the best of them all. It covers practically the same ground as some of his earlier books but is considerably fuller and more detailed. Its title accurately indicates its scope. The opening chapter describes the early experiments which brought the steam locomotive into being, and the twenty-two chapters that follow, trace its gradual development on all the principal British railways. In pursuance of this plan, eight chapters are allotted to the story of the locomotive on the lines now comprised in the L.M.S. group; eight more are given to the L.N.E.R.; two to the G.W.R.; and four to the Southern. Thus, in turn, all the leading types and classes are passed in rapid review, with much in the way of apt comment and interesting personal reminiscence on the part of the writer.

The illustrations add greatly to the value and attractiveness of the book. The outer paper "jacket" has an artistic representation of the "Royal Scot" Express, L.M.S.R. Within the book are two coloured plates and a large number of excellently printed black and white reproductions of photographs that well represent the whole range of British locomotive history.

A District Commissioner's House in Nigeria (from "Ju-Ju and Justice in Nigeria" reviewed on this page).

We regret that a careful reading of the book reveals numerous errors, which detract decidedly from its value. In several cases it is plain that the printer has been at fault, but there is no excuse for the surprising number of slips in grammar that have been passed unchecked. More serious, however, is the

Police-Corporal Kenner, of Nigeria (see above).

fact that on page after page, and often more than once on the same page, inaccuracies occur in respect to the dimensions given or facts stated. This is much to be deplored in a work of this nature, where accuracy is so essential.

It is not within our purpose to detail these errors, but we may, perhaps, call attention to one or two rather strange statements made by Mr. Jackson. He writes, for instance (on p. 236), of Mr. Stroudley on the L.B. & S.C.R., building the "Abergavenny" with *decreased* dimensions as compared with the earlier "Grosvenor," and proceeds to draw the astonishing conclusion that "*this was possibly due to the fact that Stroudley required a slightly more powerful machine!*" In every essential respect the later engine was the smaller and, therefore, the *less* powerful machine.

He affirms, again (on p. 200), that Mr. Collett, in building his "Kings" for the G.W.R. altered the diameter of the driving-wheels from the usual 6 ft. 8½ in. to 6½ ft. "*with the idea of securing more adhesion!*"

On p. 245, he writes of Southern trains "speeding *southward* from Waterloo. To Exeter, for instance!"

Another surprising statement occurs on p. 148, where, of Mr. Holden on the G.E.R. it is said: "like other designers, he found that, whereas the coupled engines were faster downhill, the single-drivers climbed the gradients more easily and more quickly." This is very misleading. The truth is that here, as indeed all through his book, Mr. Jackson has made use of the late Mr. E. L. Ahrons' masterly work: "The British Steam Railway Locomotive." Unfortunately, however, he has been too hurried in his reference. Mr. Ahrons wrote as follows: "C. Rous-Marten had a number of curious experiences with these and the similar 2-4-0 engines, in that he generally found that the single engines with similar loads climbed the banks faster than the coupled engines, but that the latter attained greater speeds downhill."

These are rightly described as "*curious* experiences" and Mr. Jackson is quite wrong in representing them as normal. In other instances, too, he seems to have misread Mr. Ahrons.

Mr. Jackson has a ready, colloquial style which makes for easy reading, but at times he is apt to become somewhat careless in expression. He greatly overworks the adjective "fine." At the top of p. 89, e.g., it occurs no less than four times in eight lines! Many readers will wonder why on p. 232, line 2, he speaks of certain engines as "extraordinary good," and two lines later speaks of others as "extraordinarily good."

We hesitate to write in this critical strain about a book that contains so much that is excellent. We know from experience how difficult it is to attain absolute accuracy in such a work. But Mr. Jackson himself declares that "truth must be served"; and he will surely agree that his readers may reasonably expect him so to check his manuscript and read his proofs as to avoid the very plentiful crop of errors that has been allowed to be printed between the covers of this book.

Interesting New Books

We hope to deal with the undermentioned books in an early issue.

"That Boy Buckle"
by St. John Pearce (Ward Lock & Co. Ltd. 3/6)

"My Picture Book of Dogs"
The Golden Picture Books
(Ward Lock & Co. Ltd. 1/6)

"Don Quixote"
by Miguel De Cervantes
(Ward Lock & Co. Ltd. 6/-)

"Motorists' Electrical Guide"
by A. H. Avery (Sir Isaac Pitman & Sons Ltd. 3/6)

"The Wireless Manual"
by Capt. Jack Frost
(Sir Isaac Pitman & Sons Ltd. 5/-)

Further Comments on the "Autumn" Model-Building Contest

By Frank Hornby

Details of More Prize-winning Models in the Home Sections

LAST month the full list of prize-winners in the "Home" Sections of the "Grand Autumn" Model-building Contest was published, and I gave a short description of a few of the prize-winning models in Section A. Now that space permits, I wish to describe some of the fine entries received in Section B, together with one or two more of the out-standing winning models from Section A. I hope to be able to publish the results in the Overseas Section next month. I can assure readers that some very fine models have been submitted by Meccano boys and girls abroad, so that next month's article should be of great interest to model-builders, if only on account of the opportunity it offers to compare the work of Meccano-ites overseas with that of enthusiasts nearer home.

Reverting to the "Home" Sections, mention must first of all be made of some of the entries in Section B. One of the finest is the realistic model ship entered by A. McGregor. The model represents one of the most modern Norwegian whaling vessels. It is built to scale and is mounted on wheels so that it may travel on the ground. Some idea of its imposing dimensions may be gained from the fact that the overall length from stem to stern is 3 feet 9 inches! The hull is well constructed from Strips and Flat Plates, and the amount of realistic detail incorporated in the superstructure is noteworthy. Those readers who are familiar with vessels of this type will appreciate the sound planning of the various hatches, windlasses and deck house. The companion ways also are well placed and assist considerably in producing a realistic effect.

The deck and bridge fittings include a windlass for hoisting or lowering the anchor, a binnacle and helm on the bridge, and a large winch for hauling captured whales. It will be seen from the illustration that the winch rope drums have been formed from 1" Pulleys and the effect is very good indeed. At the rear of the deck house, which forms part of the superstructure, a comprehensive steering gear is fitted and this operates the rudder. One of the most interesting features of the model is the gun from which, in an actual whaler, the harpoon is fired. The gun is mounted on a platform situated in the bows of the ship, and a gangway from the navigating bridge to the platform is provided for the use of the gunner. The constructional details of the various portions of the superstructure are fairly well shown in the illustration accompanying this article.

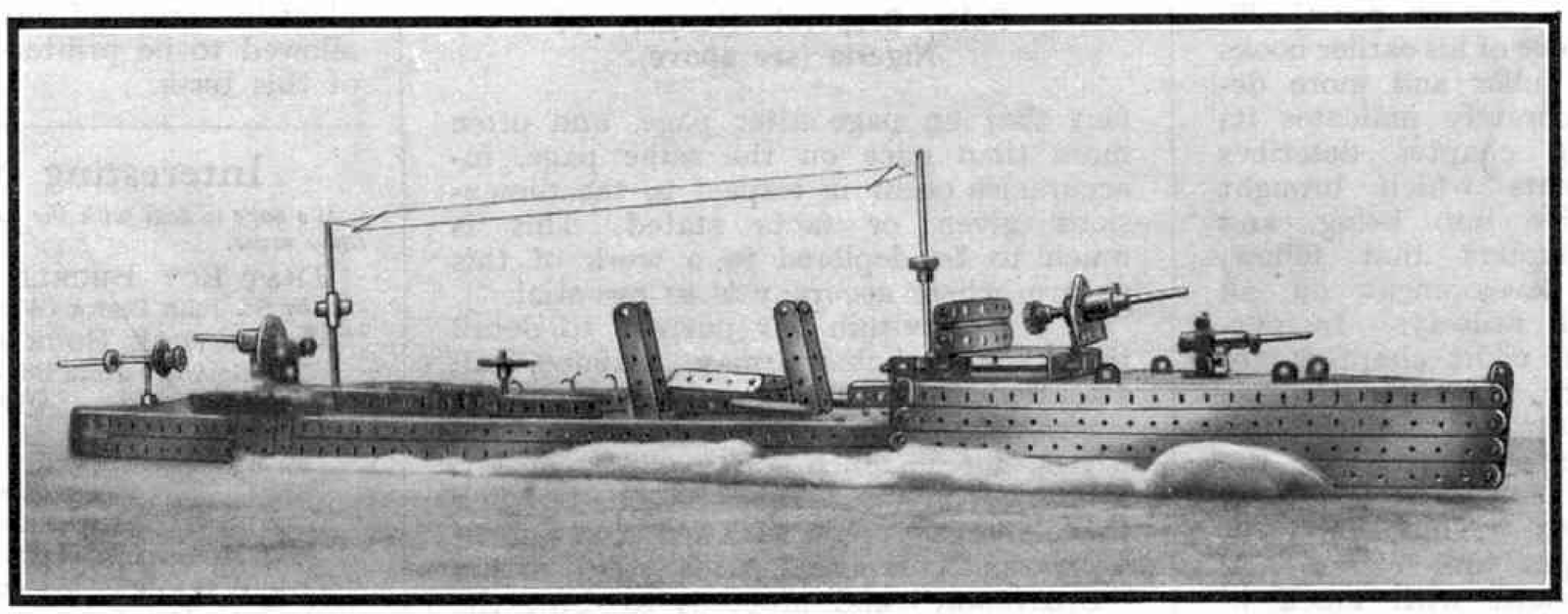
Douglas Furneaux, who tied for the biggest prize in Section B, well deserved the award for his model of a Canadian National Railway locomotive. It is fashioned on the lines of the well-known "6300" class engines and it will be seen from the illustration that it is of the 4-8-4 type. The use of standard Meccano parts for locomotive building is well shown in this model and the general characteristics of the prototype are cleverly reproduced. A Flanged Wheel is used to imitate the dome-shaped sand box—a feature generally found on the outside of the boilers of trans-atlantic engines. So far as the constructional details of the model are concerned there is little at fault, but it must be mentioned that the wheels of the bogies appear too small in proportion to the drivers; model-builders will know how much little discrepancies of this nature detract from the finished appearance of a model.

Prize-winners in the "Autumn" Contest (Section A). Top: J. B. Frost; Centre Left: Eric Campbell; Centre Right: C. Wilson. Bottom row (left to right): T B. Paisley, D. M. Walbourn, and F. de Nolhac.

It is only occasionally that I find among competition entries models designed for use in conjunction with Hornby Trains, and therefore I was particularly interested in an entry that combined the pleasures of Meccano model-building with the fun of operating Hornby Trains. The entry in question was a large piece of work constructed jointly by J. and C. Fairrie. The complete model comprises an elevated electric railway with ten feet of track, arranged to work in conjunction with an aerial ropeway for the purpose of conveying goods from an imaginary factory and discharging them into either a waiting ship or railway trucks. It is not my intention to describe the model here as I hope to make special reference to it in a future issue of the "*M.M.*," for I feel sure that the model will be of great interest to Meccano boys and Hornby Train enthusiasts. Members of the H.R.C. especially will do well to watch closely for it.

In every "*M.M.*" model-building Contest large numbers of entries are always to be found representing more or less stereotyped subjects, such as motor cars, aeroplanes and locomotives, and it is therefore pleasing to be able to state that the "Autumn" Contest produced a greater variety of the more unusual type of models than any previous contest of recent years. Amongst these less common subjects may be placed the Tandem Steam Roller, constructed and entered in Section B by P. R. Nichols. The model is shown in one of the accompanying illustrations and I am sure that readers will admit that it is a splendid piece of work for a boy not yet 14 years of age. Points of special interest are the neat arrangement of the various controls and the good use made of Meccano Dunlop Tyres to represent the road rollers (although I am afraid such rollers would not be very practical). Considered as a whole, Nichols' model is one of great merit. Note, for instance, the Triangular Plate and Wheel Flange employed as a guard for the chain drive. Small details of this nature savour of genius and originality!

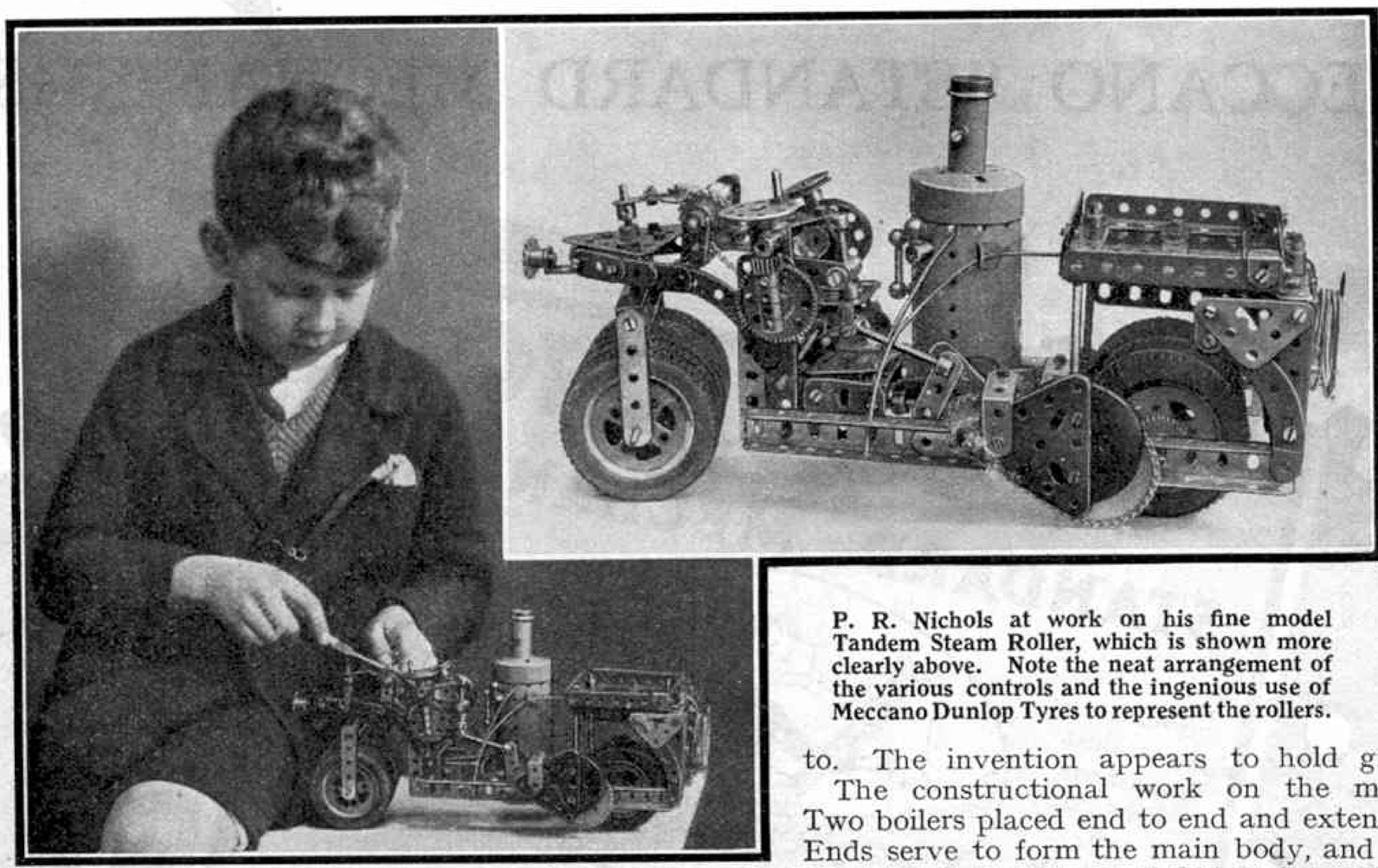
Here and there amongst competition entries are usually to be found a few models possessing qualities that immediately classify them for special consideration. Sometimes a model may owe its distinction to a particularly well designed portion only of the complete structure or again it may be simplicity of construction or undeniable realism that puts the hallmark of distinction on a model. Among the entries in the Autumn Competition several models



A splendid model of H.M.S. "Amazon" constructed by Derek Walbourn, who was awarded a prize in Section A.

possessing such outstanding qualities were examined. One of them is shown in the accompanying illustration of D. Stoneley's model of a street tramcar, which was entered in Section B.

A close examination of the model will reveal exceptionally good constructional details that have been so well blended together as to give the completed tram a fine solidly-built appearance. It is operated by an Electric Motor that is fitted snugly in the chassis and its movement is controlled by means of handles from the driving platforms at each end. The handles are connected with the brake lever of the Motor by lengths of string. The string is fixed by a Spring Clip to the lower end of the 3½″ Rod of each control handle, and its other end is then tied to the Motor brake lever, so that a turning movement applied to the control handle results in a pull on the String, which in turn pulls the brake lever of the Motor to the off position. A second piece of string, also attached to the 3½″ Rod and to the Motor brake lever is so arranged that by turning the control handle in the opposite direction the brake lever is pulled back to its original position. The interior of the car is equipped with two longitudinal rows of seats, one row being placed along each side of the car. Each row of seats comprises a 12½″ Angle Girder, to a flange of which is bolted a 12½″ Strip.



P. R. Nichols at work on his fine model Tandem Steam Roller, which is shown more clearly above. Note the neat arrangement of the various controls and the ingenious use of Meccano Dunlop Tyres to represent the rollers.

Ships are always popular subjects for model-building competitions, and many such models were to be found amongst the "Autumn" Contest entries. Derek M. Walbourn's model of a destroyer is a particularly fine effort and it is evident that he took considerable pains in constructing an accurate model. It was entered in Section A. Special interest attaches to this entry as it is a reproduction of the destroyer H.M.S. "*Amazon*," an illustration of which appeared on page 893 of the "*M.M.*" for November, 1928. Those readers who are able to refer to the illustration mentioned will find Walbourn's model to be a very accurate copy, and well worthy of the prize awarded to it. The "*Amazon*," Britain's largest and fastest post-war destroyer, was built by John I. Thornycroft & Co. Ltd., at Southampton in 1927. The vessel is 311 feet in length and displaces 1,330 tons. She is capable of a speed of 37.96 knots.

The model is exceptionally well built and possesses the characteristic outline of its prototype. A really fine effect has been attained by the use of cotton wool to represent the waves created by the vessel's progress through the water. I should like to mention in passing that the illustrations of engineering masterpieces that appear in each issue of the "*M.M.*" afford splendid subjects for reproduction in Meccano and I would like to find more competition entries representing actual machines, ships, locomotives, or other engineering works, that are illustrated and described in the "*M.M.*"

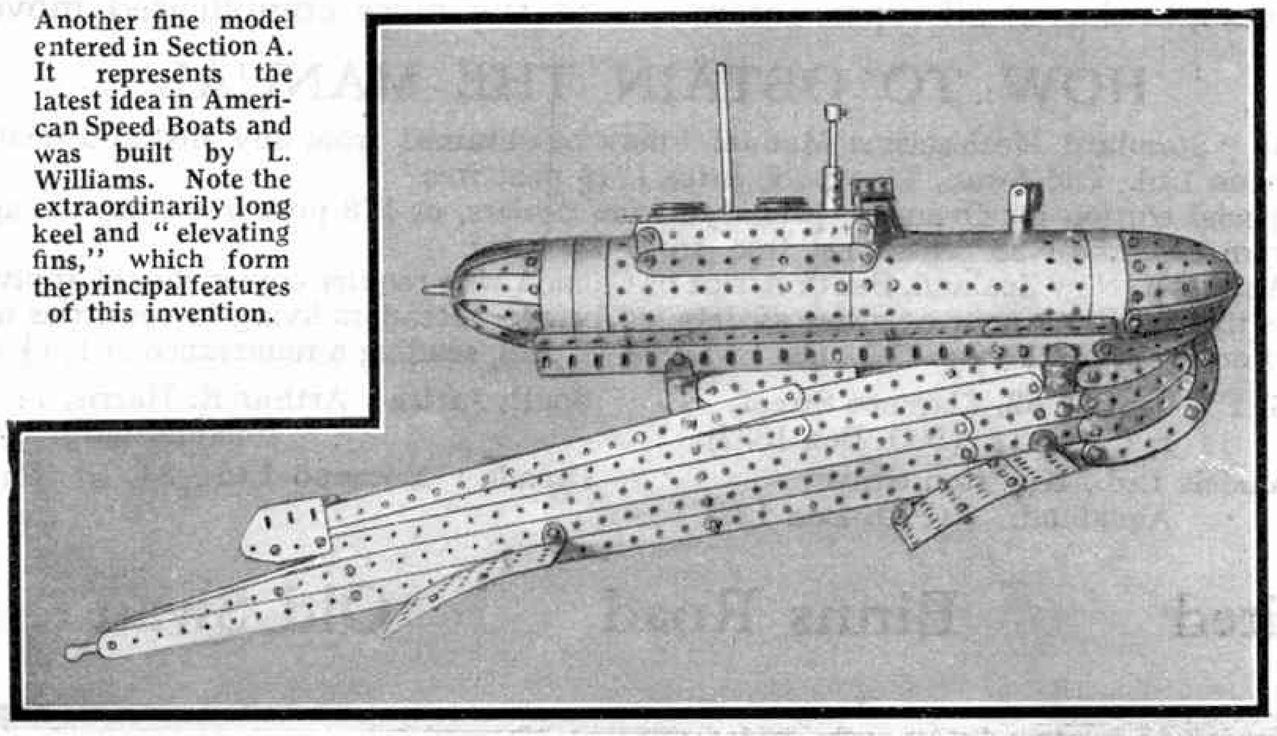
While on the subject of ships, mention must be made of L. Williams' prize-winning entry (Section A) illustrated herewith. The model represents a new type of American speed boat known as the "*Hydro Flyer*." This unique invention was illustrated and described on page 547 of the July, 1929, "*M.M.*" The body of the boat is of the normal type and can be completely enclosed, but the keel is much deeper and longer than is usual and projects rearward almost as far again as the length of the boat. Along the sides of the hull are submerged fins, in shape somewhat like the wings of an aeroplane. When not in motion the model rests on the surface of the water just like an ordinary boat but when the propeller is set in motion the pressure of the water on the fins causes the vessel to rise out of the water until the greater part of its bulk is in the air! Resistance to its progress is thus considerably reduced, and consequently a very high speed may be attained. Many other unusual features also are incorporated and those readers interested will find these described in the "*M.M.*" referred to. The invention appears to hold great possibilities.

The constructional work on the model is noteworthy. Two boilers placed end to end and extended with three Boiler Ends serve to form the main body, and the prow is brought to a point by means of 2½″ Strips. The long tail is built up separately and may be parted from the main body simply by removing two ¾″ Bolts.

An excellent utility model secured a prize in Section A for H. G. Clements, who entered a dexterously constructed miniature machine hacksaw of the type used in engineering workshops, where it fulfils a very useful purpose in rapidly cutting unequal sections of bar iron or other material.

The model is of the type in which the material to be cut is held in a vice at right angles to and below the blade of a reciprocating saw. The saw blade is held in a heavily weighted frame of inverted U-shape so arranged that by sliding a weight along a balance arm attached to the frame, the pressure on the saw blade may be adjusted according to the requirements of the material being dealt with.

In the model two speeds are provided, either of which may be brought into operation by moving a lever placed in a convenient position. The saw frame is composed of Architraves and Strips, and slides on two 6½″ Rods mounted between Triangular Plates. In the top holes of the latter is an 8″ Screwed Rod projecting rearwards from the saw frame. This Rod carries a suitable balance weight composed of Wheel Flanges bolted back to back and the space between them filled with nuts and bolts to give added weight. The vice consists of a 5½″ Flanged Plate with a 3½″ × 2½″ Flat Plate sliding between its flanges and operated by a Screwed Rod that works in a Threaded Boss secured to the 3½″ × 2½″ Plate. The vice jaws comprise 2½″ Double Angle Strips and a 2½″ Angle Girder, which grip the work very firmly.



Another fine model entered in Section A. It represents the latest idea in American Speed Boats and was built by L. Williams. Note the extraordinarily long keel and "elevating fins," which form the principal features of this invention.

I was particularly impressed with a working cinematograph entered by S. Darnell. Unfortunately the photograph submitted was not sufficiently distinct for reproduction and a brief description of the main features of the model must, therefore, suffice. But for the fact that some of the parts used in the construction were not standard Meccano accessories, this model would certainly have carried off a bigger prize.

The machine is hand-operated, a moderately heavy flywheel formed by a Hub Disc being fitted to ensure smooth working. The intermittent motion,

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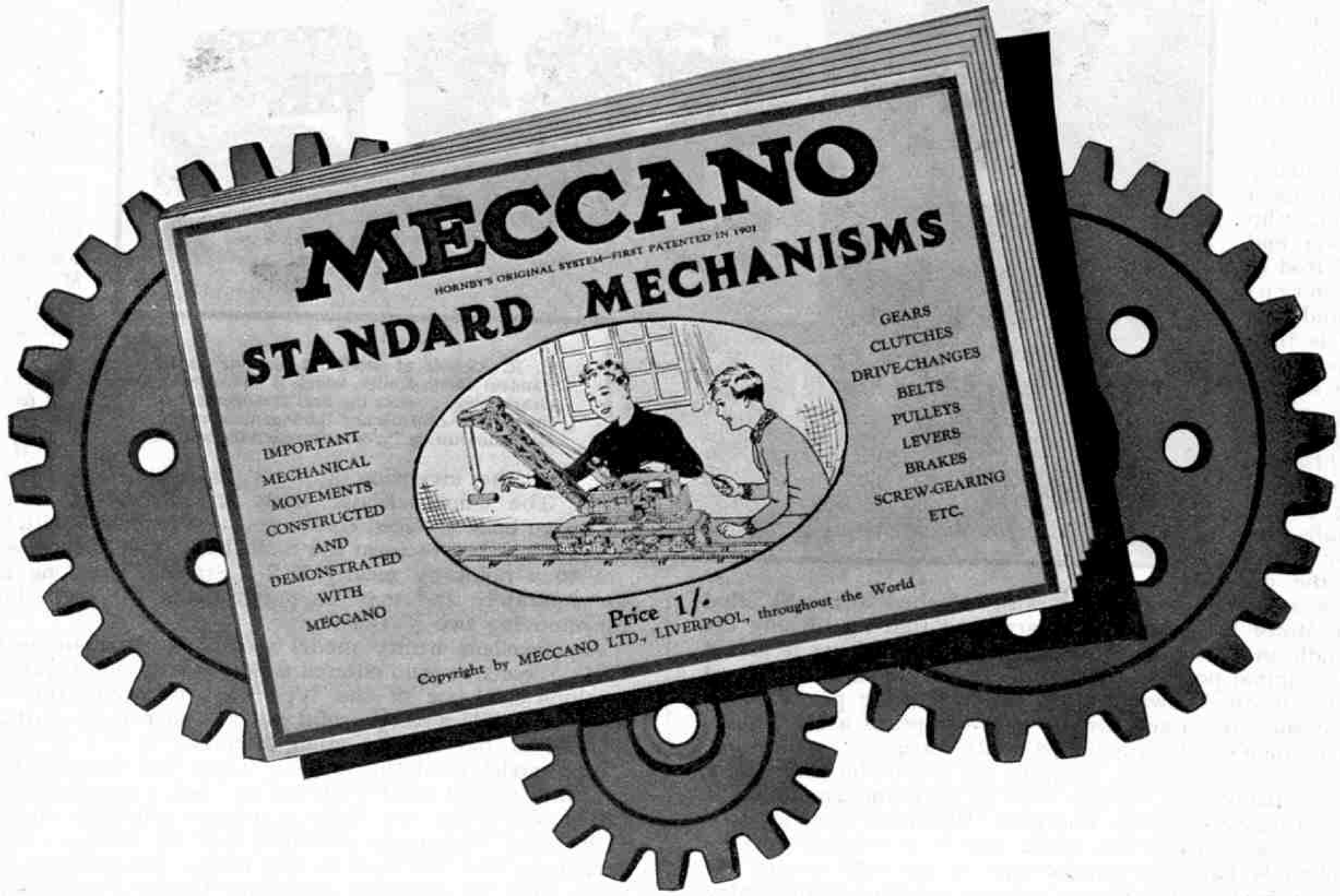
MECCANO "STANDARD MECHANISMS"



The great development of the Meccano system during the last few years has made possible a large number of new mechanisms and movements, a splendid selection of which are included in the latest edition of the Meccano "Standard Mechanisms Manual." Every model-builder should make a point of adding one of these manuals to his equipment.

The Meccano "Standard Mechanisms Manual" is full of information that is invaluable to every keen Meccano boy. It deals with gear boxes, clutches, drive-changing mechanisms, belt and pulley mechanisms, levers, brakes of all types, screw mechanisms and a large number of other movements.

Considerable space is devoted to particulars of the many new mechanisms that can be devised with the aid of the Socket Coupling, elongated Pinions, Bevel Gears, etc. The uses of the Roller and Ball Bearings are also dealt with fully. In addition, electric braking and governing devices have been included, and these form valuable additions to the range of existing mechanisms. The book contains over a hundred beautiful half-tone illustrations, which greatly simplify the construction of the more complicated movements.

HOW TO OBTAIN THE MANUAL

The Meccano "Standard Mechanisms Manual" may be obtained from any Meccano dealer, price 1/–, or direct from Meccano Ltd., Old Swan, Liverpool, price 1/1½ post free.

There is a special edition for Overseas, price 1/6 from dealers, or 1/8 post free from the agents (Canadian price 35 cents from dealers or 38 cents post free, from Toronto).

Readers in Australia, New Zealand, South Africa or Canada who require copies should apply to their dealers or should address their orders to our agencies as detailed below. Readers living in countries other than those mentioned should order from Meccano Ltd., Old Swan, Liverpool, sending a remittance of 1/1½ with their order.

Australia : E. G. Page & Co., 52, Clarence Street, Sydney. (P.O. Box 1832).

New Zealand : Models Ltd., Kingston Street, Auckland. (P.O. Box 129).

South Africa : Arthur E. Harris, 142, Market Street, Johannesburg. (P.O. Box 1199).

Canada : Meccano Ltd., 34, St. Patrick Street, Toronto.

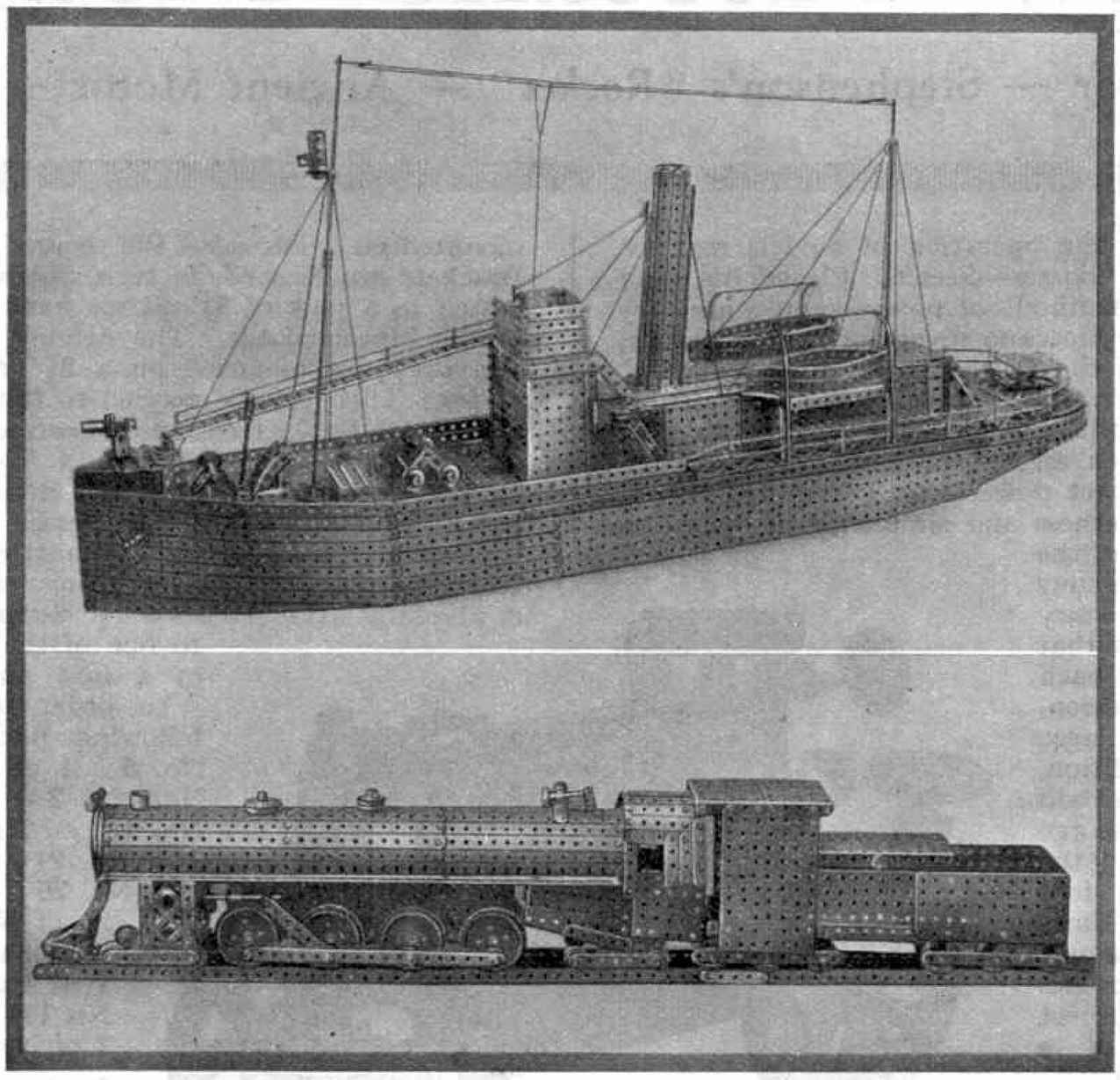
Meccano Limited Binns Road Old Swan Liverpool

which is of the Maltese Cross type, was bought as a complete unit. It consists of two toothed wheels mounted one at each end of a drum and at such a distance apart as to engage accurately with the "steps" of the film. At one end of the drum the Maltese Cross proper is fitted. The usual type of shutter is employed and this of course flashes across the lens just as the film is drawn through the "gate," thus cutting off the light from the screen, and eliminating the "ghost" effect that would otherwise be produced by the intermittent motion of the film. The shutter is driven by Sprocket Chain from the gear box, the latter comprising a 57-teeth Gear engaging a ½" Pinion, on the Rod of which is mounted the Maltese Cross intermittent drive mechanism.

Screw gear is provided both for focusing the lens, and for raising or lowering the lens and film "gate" in relation to the position of the picture being projected. In "threading" the film through the projector it is passed over seven guide rollers which keep it at correct tension. The film spools are built up from Meccano parts and cardboard. The machine is capable of projecting a reasonably clear picture approximately 3 ft. by 2 ft.

Reverting once again to Section B, I must refer to a rather novel entry submitted by Philip Rodgers. It represents an automatic mechanical toy in which sand is employed to produce the motive power. The apparatus includes a hopper formed from Sector Plates and provided with a hinged door. The hopper is suitably supported at the head of a set of inclined rails so that the sand may be poured through the hinged door or "chute," into a truck that runs on the rails. A length of cord is attached to the truck and is then led over a Pulley situated at the top of the incline, and thence through a Single-sheave Pulley Block, and tied finally to the framework at a suitable point beneath the sand hopper. A heavy weight is attached to the Pulley Block; it is necessary that the weight is approximately twice as heavy as the empty truck. Under the influence of the weight the truck is hauled up the incline until it comes beneath the hopper, the door of which is automatically released as soon as the truck is directly below the sand chute. The sand then pours into the truck until the combined weight of the truck and sand overcomes the pull of the load weight attached to the Pulley Block. The truck then commences to travel down the incline, automatically releasing the hopper door as it moves away and thus shutting off the flow of sand.

At the foot of the incline are placed Curved Strips, on reaching which the truck is "tipped." When relieved of its load of sand it is again drawn up the incline by the weight, and the foregoing sequence of operations is repeated until the hopper has discharged all its sand. The model is constructed entirely from standard Meccano parts and possesses a very neat appearance. In operation it is fascinating to watch and provides hours of enjoyment for its builder.



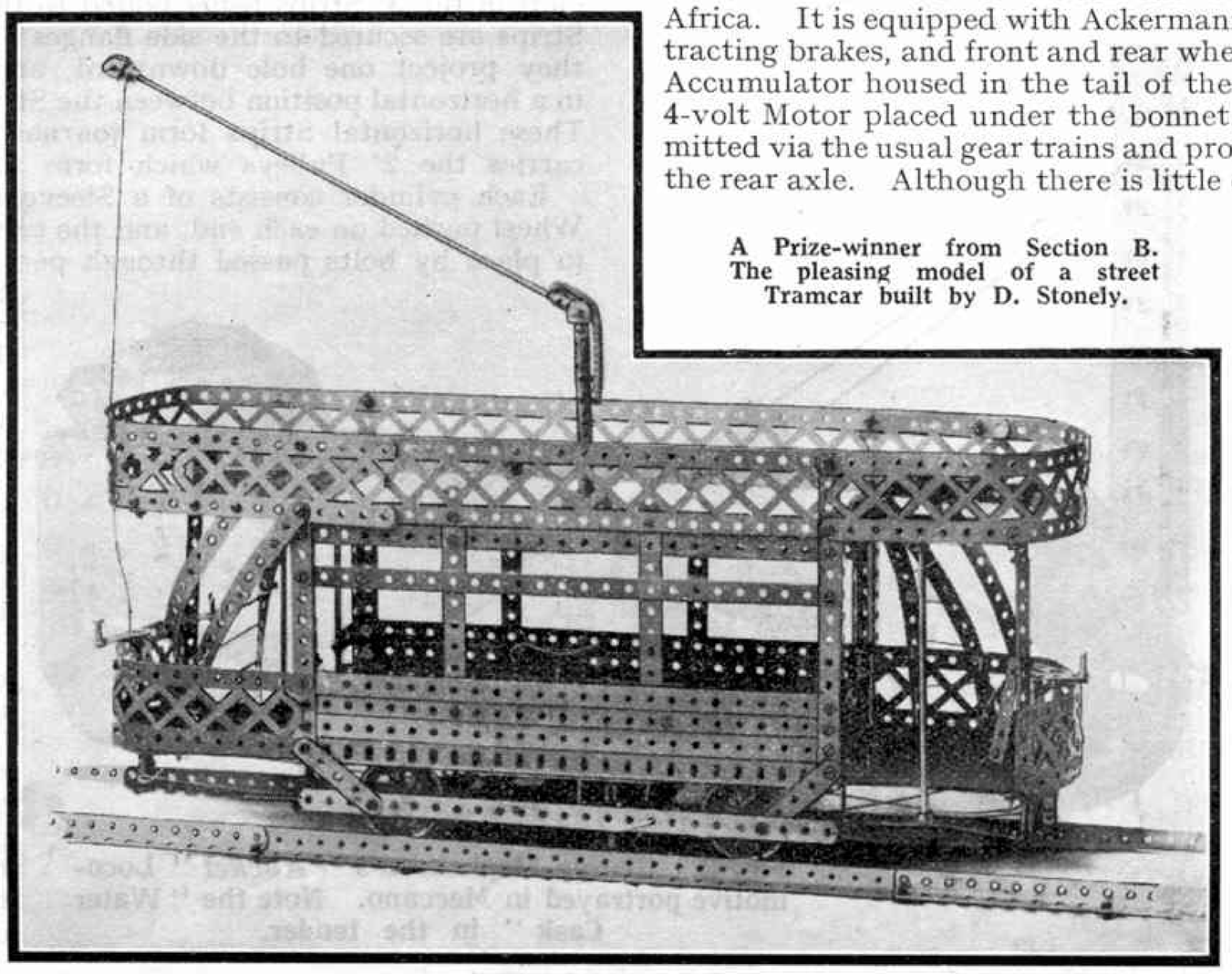
Top: A remarkably realistic model of a Norwegian Whaler, built by A. McGregor. Bottom: D. G. Furneaux should be proud of his achievement in constructing this model of a C.N.R. "6300" type Locomotive.

In passing it might be mentioned that adaptations of this model could be used in conjunction with a Hornby Train layout, for discharging wheat or other suitable material into the trucks of a freight train, ready for transportation. Readers who are interested in ships and dock work, might carry out experiments with a model of this type in loading or unloading cereal or other suitable cargoes.

Jack Edwards secured his prize in Section B with a realistic model motor lorry of the type used for conveying petrol. The large cylindrical tank common to vehicles of this class is neatly constructed from a number of Strips bolted to the peripheries of Hub Discs, the familiar manhole doors being represented by 1⅛" Flanged Wheels secured flange downwards by bolts to the uppermost Strip of the tank. The remainder of the constructional details are quite commonplace and do not need description.

As is usually the case, Meccano motor cars were much in evidence. A neat and well-proportioned representation of Captain Campbell's famous racing car "Bluebird" secured an award for its joint builders, T. B. Paisley and F. de Nothac. The model was illustrated in last month's "*M.M.*" The cigar-shaped body of the prototype is reproduced excellently and one can well imagine Captain Campbell setting up a land speed record with the original of this speedy-looking model. The dimensions of the body of the actual car are 28 feet in length and 24 inches in width, and these figures are proportionately represented in the model, thus adding greatly to its realistic appearance.

The Meccano car was modelled on the "Bluebird" after she had been re-conditioned for the famous tests at Verneuk Pan in South Africa. It is equipped with Ackermann steering gear, external contracting brakes, and front and rear wheel springs. A 4-volt Meccano Accumulator housed in the tail of the body supplies current for a 4-volt Motor placed under the bonnet. The Motor drive is transmitted via the usual gear trains and propeller shaft through bevels to the rear axle. Although there is little of outstanding interest as far as the mechanical arrangements of the model are concerned, I think readers will agree that for general construction, proportion, and neatness of finish, this model is worthy of the prize awarded to it.



A Prize-winner from Section B. The pleasing model of a street Tramcar built by D. Stonely.

The success of this contest is proved by the fact that there is still a very large number of interesting models I have been unable to mention, although I have now devoted two articles to this Contest. Next month, I hope to publish the complete list of prize-winners in the Overseas Section together with illustrations of the principal models submitted.

New Meccano Models

Farm Tractor — Stephenson's "*Rocket*" — Ancient Motor — Hand Car

FORMS of motive power for the operation of models may be divided into three main classes—Steam, Electricity, and Clockwork. All of these methods of power supply are now catered for in Meccano, by the Meccano reversing Steam Engine, the 6-volt Electric Motor, and the Clockwork Motor.

Although steam and electricity may hold many unquestionable advantages in matters of realism and efficiency, they both take second place to clockwork when an entirely self-contained and, at the same time, highly compact power unit is required.

It is undoubtedly its compactness and simplicity of operation that make the Clockwork Motor the general favourite as a driving agency for the smaller mobile or stationary models, and the two examples that are illustrated this month, each fitted with this means of propulsion, should prove popular with a large number of constructors. In addition, the majority of model-builders will be eager to build the model of George Stephenson's famous engine, the "*Rocket*," illustrated at the foot of this page, while the model Hand Car, which forms the final example in our selection this month, provides a simple yet interesting subject owing to the introduction of a certain amount of mechanism.

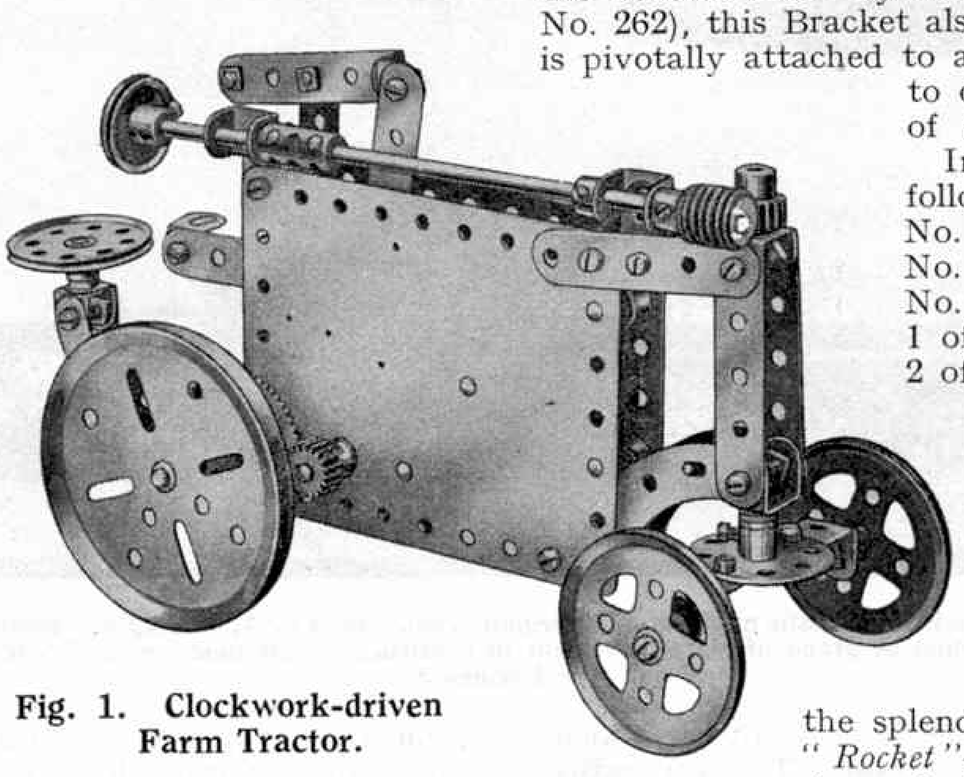


Fig. 1. Clockwork-driven Farm Tractor.

The Farm Tractor

As will be seen from the illustration (Fig. 1) the model farm tractor is quite simple in construction, for the Clockwork Motor performs the dual function of power unit and "chassis" or frame of the tractor.

The framework carrying the steering column should first be secured to the front of the Motor plates. This consists of two $2\frac{1}{2}''$ Strips bolted to the plates in a horizontal position, and two vertical $2\frac{1}{2}''$ Strips. A Double Bracket is slipped in between each of the latter Strips at top and bottom, and the Strips are further held to the frame by two $2\frac{1}{2}''$ Curved Strips. A $3\frac{1}{2}''$ Axle should next be slipped through the centre holes in the Double Brackets. This Rod carries a $\frac{1}{2}''$ Pinion at its upper end and a Bush Wheel at the lower, the boss of the Bush Wheel being spaced away from the Double Bracket by means of three Washers. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is bolted to the Bush Wheel and a 2″ Pulley is secured pivotally to each end of the Angle Strip by a $\frac{1}{2}''$ Bolt, which is passed through the boss of the Pulley and locked to the Angle Strip by two nuts.

The front Axle is steered by rotating a 1″ Pulley mounted on a compound shaft consisting of a 2″ and a $3\frac{1}{2}''$ Rod connected together. The compound shaft is journalled in Double Brackets secured to Flat Brackets that, in turn, are bolted to the sides of the Motor, and a worm secured on its outer end meshes with the $\frac{1}{2}''$ Pinion on the steering column.

The operator's seat, which consists of a $1\frac{1}{2}''$ Pulley, is mounted on a Threaded Pin secured to two Angle Brackets. The Brackets are secured, in turn, to two $2\frac{1}{2}''$ Curved Strips that are bolted to a pair of $5\frac{1}{2}''$ Strips fixed in the bottom rows of holes of the Motor plates. The driving wheels consist of 3″ Pulleys and they are mounted on a $2\frac{1}{2}''$ Axle journalled in the Motor plates. This Axle is coupled to the driving spindle of the Motor by means of a 3 : 1 reduction gear consisting of a $\frac{1}{2}''$ Pinion on the Motor spindle meshing with a 57-teeth Gear Wheel mounted on the road shaft. An Angle Bracket is secured to the end of the brake control and a Reversed Angle Bracket is secured to the reverse lever by a lock-nutted bolt (Standard Mechanism No. 262), this Bracket also being held rigidly to a $2\frac{1}{2}''$ Strip that is pivotally attached to a $1\frac{1}{2}''$ Strip, and the latter is connected to one of the Motor side Plates by means of a bolt and lock-nuts.

In order to construct the model, the following parts will be required:—5 of No. 5; 1 of No. 10; 2 of No. 11; 2 of No. 12; 2 of No. 15a; 1 of No. 16; 1 of No. 18a; 2 of No. 19b; 2 of No. 20a; 1 of No. 21; 3 of No. 22; 1 of No. 24; 2 of No. 26; 1 of No. 27a; 1 of No. 32; 25 of No. 37; 6 of No. 37a; 3 of No. 48a; 1 of No. 53; 3 of No. 59; 1 of No. 63; 2 of No. 90a; 2 of No. 111; 2 of No. 111c; 1 of No. 115; 2 of No. 126a; 1 Clockwork Motor.

Stephenson's "*Rocket*" Locomotive

There will be few model-builders who will not be eager to construct the splendid little model of George Stephenson's "*Rocket*"—the first passenger locomotive—shown in Fig. 2. Although the number of parts used in the model is by no means excessive, quite a surprising degree of realism has been achieved, and the whole bears a very close resemblance to its quaint prototype.

The "frame" of the engine consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to which is secured the boiler and also the supports for the cylinders. A $2\frac{1}{2}''$ Strip is bolted to each side flange so that it projects three holes to the rear, and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is bolted between the free ends of these Strips. A 3″ Strip and a Flat Bracket are also held to the ends of each of these Strips, the top ends of the 3″ Strips being bolted to the $2\frac{1}{2}''$ Strips 4. The latter Strips are secured to the side flanges of the Flanged Plate so that they project one hole downward, and $2\frac{1}{2}''$ Strips are connected in a horizontal position between the Strips 4 and the Flat Brackets. These horizontal Strips form journals for a $3\frac{1}{2}''$ Axle Rod that carries the 2″ Pulleys which form the rear pair of wheels.

Each cylinder consists of a Sleeve Piece having a $\frac{3}{4}''$ Flanged Wheel pushed on each end, and the complete cylinders are secured in place by bolts passed through perforations in the sides of the Sleeve Pieces. Each piston rod consists of a $2\frac{1}{2}''$ Axle Rod pushed into the bosses of the Flanged Wheels on the cylinder, and carrying an End Bearing on one end. The connecting bar is a $2\frac{1}{2}''$ Strip and is secured pivotally in the "fork" of the End Bearing by a bolt and two lock-nuts. The free end of the Strip is attached to the face of its respective driving wheel by a $\frac{3}{8}''$ Bolt rigidly secured to the Wheel by two nuts; two Washers should be placed on the shank of the bolt between the Strip and the first nut to space the connecting Rod at the

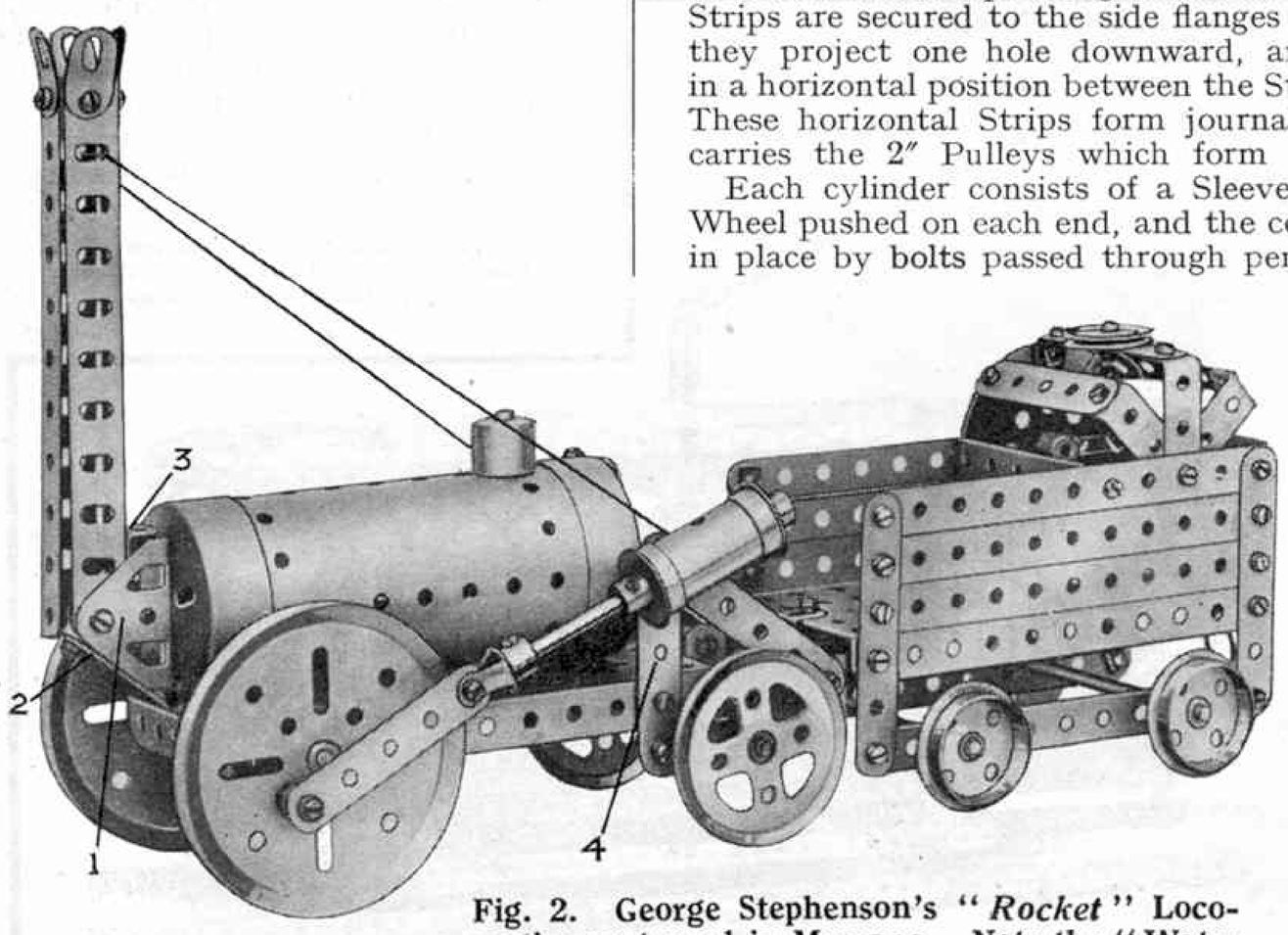


Fig. 2. George Stephenson's "*Rocket*" Locomotive portrayed in Meccano. Note the "Water Cask" in the tender.

correct distance to clear the flange of the wheel.

The chimney consists of two 5½″ Angle Girders held to the front end of the boiler by means of two Trunnions 1. An Angle Bracket is secured on the bolt holding the Angle Girders to the Trunnions and carries the 1½″ Strip 2. A further Angle Bracket 3 is bolted to the chimney in the position shown, and serves to fill in the space between the Trunnions 1.

The rear of the tender is composed of three 2½″ × ½″ Double Angle Strips, and three similar Strips are employed to form a partition dividing off the coal bunker from the "water barrel." The barrel ends are formed by a Face Plate and three 2½″ × ½″ Double Angle Strips arranged in radial formation, and bolted to the sides of the tender. Three 2½″ Strips are secured to the Face Plate by means of Angle Brackets and their other ends are secured to the three Double Angle Strips.

In building the model the following parts will be necessary :— 8 of No. 2 ; 4 of No. 3 ; 2 of No. 4 ; 11 of No. 5 ; 1 of No. 6a ; 2 of No. 9 ; 6 of No. 10 ; 10 of No. 12 ; 4 of No. 16 ; 2 of No. 17 ; 2 of No. 19b ; 4 of No. 20 ; 2 of No. 20a ; 4 of No. 20b ; 1 of No. 22a ; 56 of No. 37 ; 6 of No. 37a ; 8 of No. 38 ; 1 of No. 40 ;

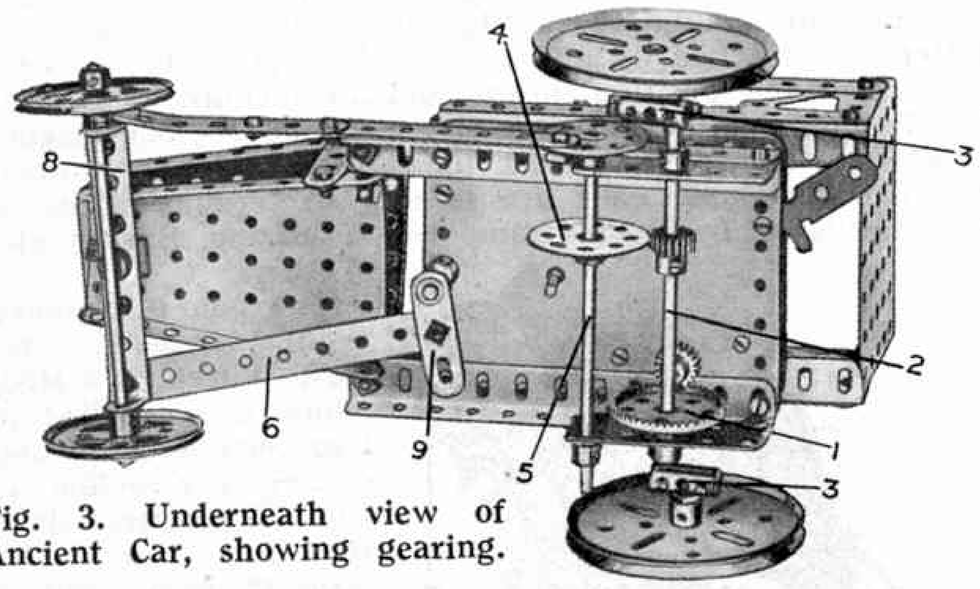


Fig. 3. Underneath view of Ancient Car, showing gearing.

9 of No. 48a ; 2 of No. 52 ; 1 of No. 57 ; 2 of No. 59 ; 1 of No. 109 ; 1 of No. 111 ; 5 of No. 111c ; 1 of No. 116a ; 2 of No. 126 ; 1 of No. 147b ; 1 of No. 162 ; 2 of No. 163 ; 1 of No. 164 ; 1 of No. 166 ; short length of string.

Ancient Motor Car ; an Amusing New Model

The terms "tin lizzie" and "boneshaker" are generally associated with a certain well-known make of automobile famed for its low cost. In Fig. 5, however, we illustrate a motor car that, on being set in motion by the Clockwork Motor incorporated in it, will give the "Meccanitians" who form its occupants, a shaking and jolting far greater than anything that the vehicle previously referred to could provide !

On winding the spring of the Clockwork Motor incorporated in the chassis and setting the model on the ground, it will proceed to make a series of remarkable movements all of which take place simultaneously. The rear wheels, whilst driving the model forward, also move vertically and impart a curious "wobbling" motion to the car ; the front axle oscillates from side to side and the "driver" pivots about the steering column, as if he were actually steering the car ! Last, but not least, the "passenger" rocks in all directions, obviously very much affected by the erratic behaviour of this weird vehicle !

The frame of the car consists of a Clockwork Motor to which are attached two 5½″ Angle Girders, as can be seen in the underneath view (Fig. 3). A 3½″ Strip is secured across the ends of the Girders and a Sector Plate is bolted to this Strip. Two 5½″ Angle Girders are bolted to the upper surface of the Clockwork Motor, and two 2½″ × 3½″ Flanged Plates are bolted between these Girders. An Architrave and 3½″ Strip are secured to each side flange of the rear Flanged Plates and a 3½″ × ½″ Strip is bolted to the front Flanged Plate to provide a seat for the "driver." The bonnet of the car consists of a Sector Plate supported by a pair of 2½″ Strips and a Channel Bearing, to which it is held by an Angle Bracket.

The operating mechanism should next be assembled. The 3″ Pulleys forming the rear wheels are mounted on Threaded Pins screwed into the centre threaded holes of Couplings 3. These Couplings are rigidly mounted on each end of a 4½″ Axle Rod 2 forming the back axle. The latter carries a ½″ Pinion and a 1½″ Contrate Wheel 1 which engages with a ½″ Pinion secured on the driving shaft of the Motor.

The Rod 5 should next be mounted in position. This Rod carries a 57-teeth Gear Wheel 4 which engages with the ½″ Pinion on the back axle. The Rod 5 also carries a Bush Wheel to which is pivoted a compound 6½″ Strip composed of two 3½″ Strips bolted together. The other end of this Strip is secured by a bolt and two lock-nuts (Standard Mechanism No. 262) to an Angle Bracket 7 (see Fig. 5), which, in turn, is bolted to a 3½″ × ½″ Double Angle Strip 8 (Fig. 3), in which is journalled the front axle. A Double Bent Strip is attached to the centre of the Strip 8 to form a reinforced bearing for a 1″ Axle Rod about which the Strip 8 pivots ; this Rod is held in place by a Collar secured on each end.

A 4½″ Strip 6 is pivoted to the Angle Strip 8 by a bolt and two

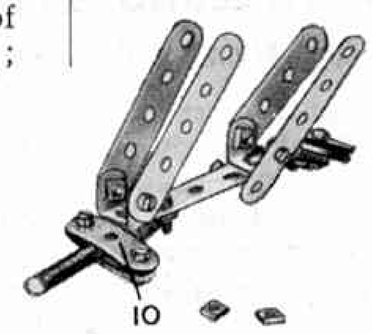


Fig. 4. The "passenger" removed from the car. Note spring mounting.

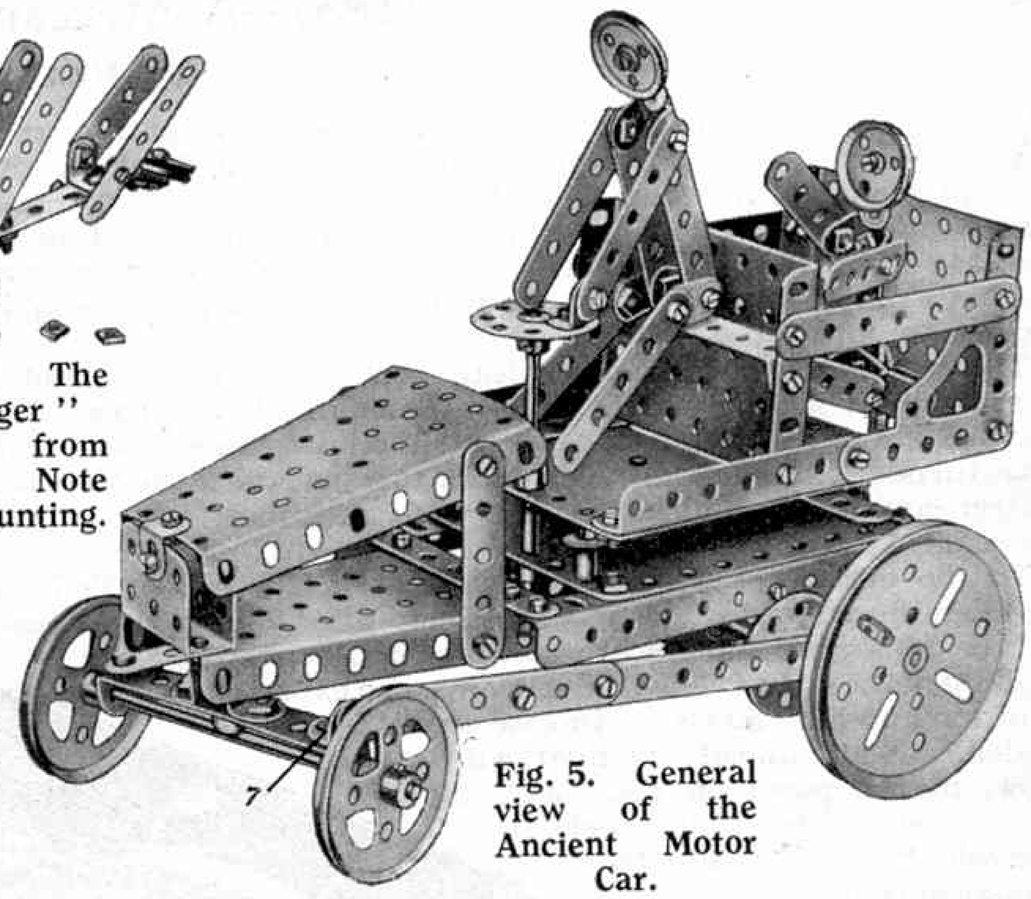


Fig. 5. General view of the Ancient Motor Car.

lock-nuts, and also is attached to the Crank 9 by a similar means. The Crank 9 is fastened to a 3½″ Axle Rod that is journalled in the side plates of the Motor and carries a Bush Wheel on its upper end to represent the steering wheel.

The driver of this remarkable vehicle is built up from 2½″ Strips and Flat Brackets and is attached pivotally to the face of the Bush Wheel by an Angle Bracket. The second occupant of the car (who in Fig. 5 is obviously showing signs of terror and distress at the rough treatment he is receiving from the car !) also consists of 2½″ Strips, a Double Bracket being used to attach his limbs to his body ! A Spring (part No. 43) is secured to the 2½″ Strip forming his body by means of a bolt and nut and two 1½″ Strips 10 are clamped to the Spring by means of ⅜″ Bolts. The protruding shanks of the bolts are then pushed through holes in the 3½″ × 2½″ Flanged Plate forming the back of the car and held tightly to the latter by nuts.

In order to build the Ancient Motor Car the following parts will be required :— 2 of No. 2a ; 3 of No. 3 ; 13 of No. 5 ; 2 of No. 6a ; 4 of No. 9 ; 4 of No. 10 ; 4 of No. 11 ; 3 of No. 12 ; 1 of No. 15 ; 2 of No. 15a ; 1 of No. 16 ; 1 of No. 17 ; 2 of No. 19b ; 2 of No. 20a ; 2 of No. 22a ; 2 of No. 24 ; 2 of No. 26 ; 1 of No. 27a ; 1 of No. 28 ; 57 of No. 37 ; 14 of No. 37a ; 8 of No. 38 ; 1 of No. 43 ; 1 of No. 45 ; 2 of No. 48b ; 2 of No. 53 ; 2 of No. 54 ; 10 of No. 59 ; 1 of No. 62 ; 2 of No. 63 ; 2 of No. 103f ; 2 of No. 108 ; 5 of No. 111c ; 2 of No. 115 ; 1 of No. 160 ; 1 Clockwork Motor.

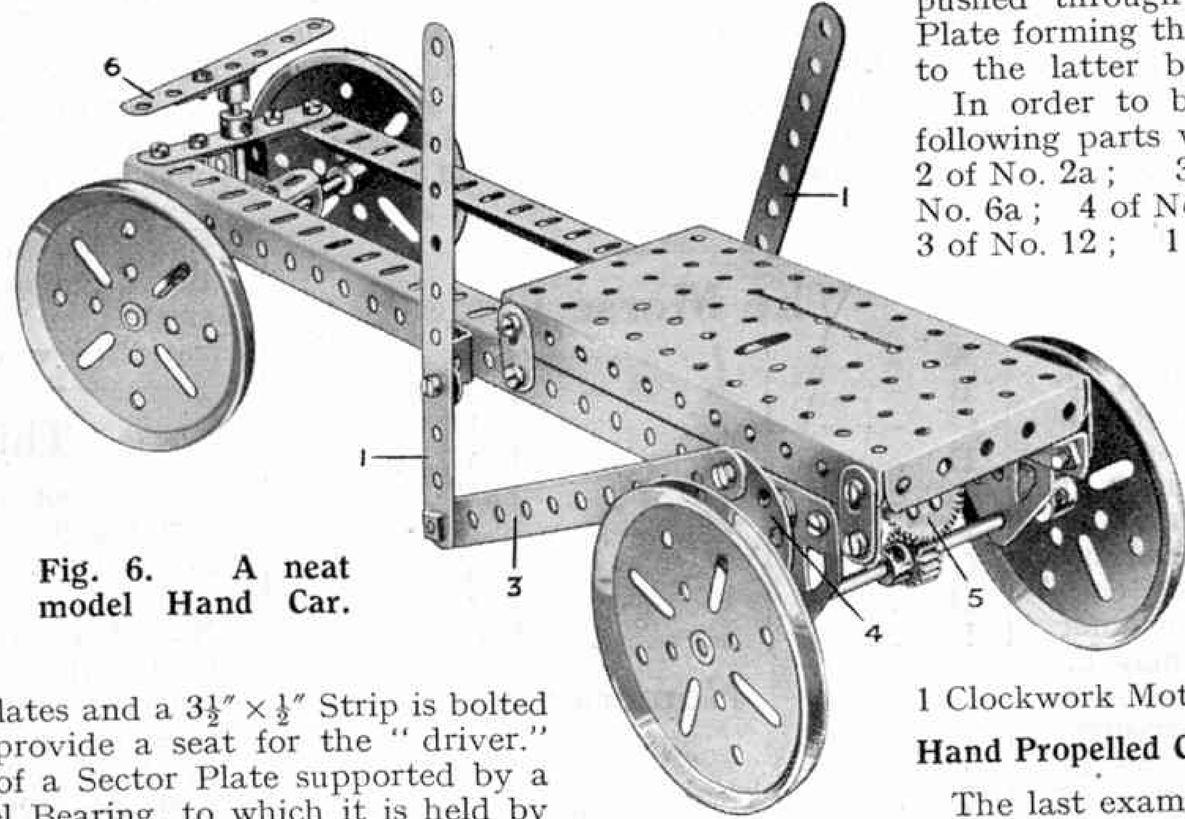


Fig. 6. A neat model Hand Car.

Hand Propelled Car

The last example to be described this month is, unlike the previous model, quite orthodox in appearance and operation ! It represents a type of small hand-driven pleasure car that has doubtless provided many hours of (Continued on page 228)

Suggestions Section

Edited by "Spanner"

The ideas printed in the "Suggestions Section" should prove a real help to thousands of Meccano enthusiasts. Often we receive letters from readers who describe how they have solved some knotty problem or evolved an interesting model after studying some of the ideas that have appeared. We shall always be pleased to receive further contributions for the "Suggestions Section." Cash payments are made for all Suggestions published (excluding those mentioned in the "Miscellaneous" Suggestions column). Contributions should be accompanied by clear photographs or drawings and should be addressed to "Spanner," c/o The "Meccano Magazine."

(185)—A Meccano Telegraph Recorder

(G. Hooper, Wallasey, Cheshire)

As most "*M.M.*" readers are aware, messages sent by land, cable, or wireless telegraph are always rendered in the Morse Code, in which the letters of the alphabet are represented by groups of long and short sounds or flashes of light, the long notes being known as "dashes" and the short ones as "dots." The dots and dashes are formed into easily recognisable groups to make the letters.

The code is really not hard to learn and a little time expended in studying it will be well repaid by the hours of enjoyment that may be obtained in transmitting and receiving messages to and from friends. An ideal installation for this purpose is the Meccano Buzzer and Key, both of which were described fully in the February, 1928, "*M.M.*"

To the owners of wireless sets interest in the Morse Code is considerably enhanced, for it is possible—after a little practice—to hear the ships communicating with each other through the medium of the code. The thrill may even be experienced of picking up an "S.O.S." In case some "*M.M.*" readers are not already familiar with it we show, in the panel on this page, the Morse Code with its alphabetical equivalents and also the numerical code.

It will be realised that great care must be taken in sending on the Morse "key" so as to preserve the relative lengths of the dots and dashes and also the spaces between each individual letter. The dots should be regularly beaten out with up-and-down movements of the wrist, with the tips of the first and second fingers resting on the knob of the key. A dash should be thrice as long as a dot and there should be the space of a dot between each letter. When learning it is advisable to lift the hand completely off the key at the end of each word.

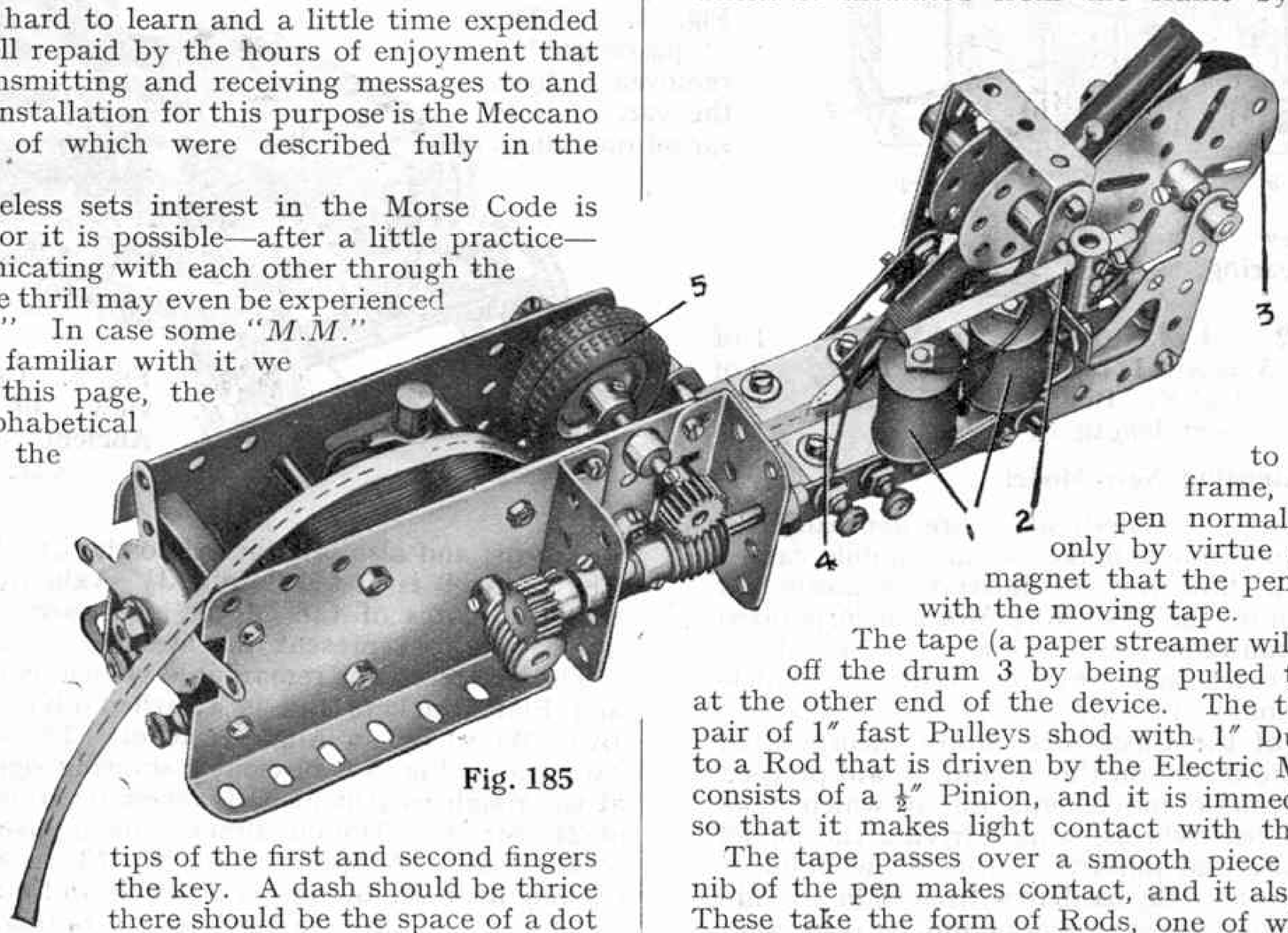


Fig. 185

It will soon be found that to become a proficient sender requires a considerable amount of practice, preferably with a partner. The latter usually tells the sender that his sending is bad even if it is not! With the aid of the apparatus shown in Fig. 185, however, the amateur operator is freed from such unreliable criticisms and is able actually to see his own efforts. Thus he may correct at once any fault in his style that becomes apparent.

The apparatus consists essentially of a pen, actuated by an electro-magnet so that it may be made to press lightly on a travelling strip of paper when a current flows through the turns of the magnet. As the paper ribbon is in continual motion, the pen makes long or short impressions according to the time that the key controlling the energising current of the magnet is held down. The aid of a friend may be sought to read the messages as they come through on the tape. On such occasions it is advisable that the partners be in separate rooms so that the temptation to communicate verbally is removed!

Two Meccano Bobbins, wound to capacity with 26 D.C.C. Wire, are mounted on Pole Pieces, which are secured to two $1\frac{1}{2}''$ Strips placed face to face. The latter are attached by a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket to the base of the model in the position shown, and are inclined at a slight angle to the horizontal. The end of the winding of one magnet is connected to the commencement of the winding of the other, and the two remaining ends are secured to terminals, one of which is insulated from the frame by Insulating Bushes and Washers.

The pen is clamped rigidly between two Bush Wheels on a Rod, which is journalled in two vertical Strips and carries a Coupling in which is secured a short Rod 2. The latter projects over, and a short distance above, the pole faces of the magnets. A short piece of Spring Cord, attached to the Coupling and to the frame, serves to maintain the pen normally raised, so that it is only by virtue of the attraction of the magnet that the pen is brought into contact with the moving tape.

The tape (a paper streamer will do excellently) is wound off the drum 3 by being pulled through a pair of rollers at the other end of the device. The top roller 5 consists of a pair of 1″ fast Pulleys shod with 1″ Dunlop Tyres and secured to a Rod that is driven by the Electric Motor. The second roller consists of a $\frac{1}{2}''$ Pinion, and it is immediately below the second so that it makes light contact with the tyres.

The tape passes over a smooth piece of cardboard, where the nib of the pen makes contact, and it also runs under two guides. These take the form of Rods, one of which is journalled in the bottom holes of the vertical strips carrying the pen rod, and the other is mounted in Flat Brackets that are attached to the Motor end of the base. Care should be taken to see that when the Rod 2 is attracted by the magnets, the pen rests only lightly on the tape. Also the fountain pen should be of a reliable make, and care must be taken to see that the ink flows freely.

It will be found a great advantage to incorporate a Resistance Controller in the Motor circuit, so that the speed of the tape may be varied to suit the speed at which the message is transmitted, for this is liable to considerable variation when beginners get busy!

The Morse Code

A	. –	J	. – – –	S	. . .
B	– . . .	K	– . –	T	–
C	– . – .	L	. – . .	U	. . –
D	– . .	M	– –	V	. . . –
E	.	N	– .	W	. – –
F	. . – .	O	– – –	X	– . . –
G	– – .	P	. – – .	Y	– . – –
H	. . . .	Q	– – . –	Z	– – . .
I	. .	R	. – .		

Numerals

1	. – – – –	6	– . . . .
2	. . – – –	7	– – . . .
3	. . . – –	8	– – – . .
4	. . . . –	9	– – – – .
5	. . . . . or .	0	– – – – – or –

This Month's Awards

G. Hooper will receive half a guinea for Suggestion No. 185, P. North will be awarded 7/6 for Suggestion No. 186, and the two contributors responsible for No. 187 will each receive 7/6. Each contributor mentioned in the "Miscellaneous Suggestions" column will be presented with a special Meccano Certificate of Merit and, in addition, those concerned with No. 78 and 80 will be paid 2/6, while the senders of 79 and 81 will receive copies of the latest edition of the Standard Mechanisms Manual.

(186)—Novel Free Wheel Device

(P. North, Clapham, S.W.4)

From time to time we have mentioned in the "Suggestions Section" several types of free wheel mechanisms, all of which depended for their action upon a pawl or pawls engaging with the teeth of a ratchet wheel, but with the device shown in Fig. 186, an entirely new principle is employed.

A Coupling 3 is secured to a Rod, which also has a Flanged Wheel 1 mounted freely on it. The Flanged Wheel 1 is spaced away from the Coupling by four Washers and is attached to a 1" Gear by a Socket Coupling. The 1" Gear meshes with a second similar Gear secured on a Rod that carries also a 2" Sprocket.

In each of the end transverse bores of the Coupling is secured a Threaded Pin in such a manner that the square shanks are on opposite sides and the flats of the shanks are turned at an angle to the longitudinal axis of the Coupling. Two Collars are free to "float" inside the Flanged Wheel. When the Coupling is turned in a certain direction the Collars will be found to jam between the flange of the wheel and the inclined edges of the Threaded Pin shanks, so locking the Flanged Wheel to the rotating Rod. When, on the other hand, the Coupling is turned in the reverse direction, the Collars ride idly and the Rod is free to rotate independently of the Flanged Wheel.

In practice a device of this kind has important advantages over the ordinary ratchet and pawl mechanism, in that it is quicker and smoother in action and there is less wear and tear.

These advantages render it particularly suitable for use in, say, the Meccano model of the Constantinesco Torque Converter. In the existing model a pawl and ratchet device is employed, and under certain conditions of working the pawl may fail to make proper engagement with a new tooth of the Ratchet. But with P. North's apparatus the slightest reverse movement of the Flanged Wheel locks the two parts of the free wheel together.

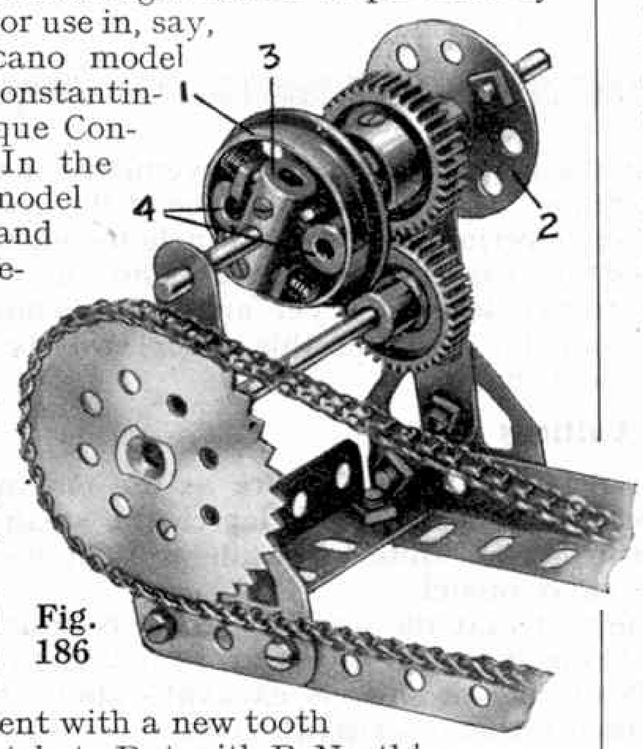


Fig. 186

(187)—Tachometer or Speed Indicator

(R. Coppin, Swindon, and R. L. Taylor, Bristol)

In practice it is often desired to ascertain the speed in revolutions per minute at which a rotating piece of machinery may be running, and to this end an instrument termed a tachometer—or to give it a more familiar title—a revolution indicator is employed. Such a device finds a place on the instrument board of every aeroplane, as it is of the utmost importance to the pilot to know at any instant the revolutions the engine is making. Although some pilots can tell this by the note of the engine, the use of a tachometer is much to be preferred.

In the case of an alternator (a dynamo that produces current of an alternating nature) it is necessary to know the revolutions per minute of the machine in order that the frequency may be ascertained. Knowing the speed and also the number of field poles, it is a simple matter to work out the number of complete cycles of current that take place in one second, and thus arrive at the frequency.

The demonstration model tachometer shown in Fig. 187, whilst not following the lines of an actual instrument, nevertheless functions in a remarkably efficient manner. It may be calibrated and put to practical use.

The Rod 1 is driven from the Motor through a reduction gear having a ratio of 2 : 1, and carries at one end a "spider" (taken from a Universal Coupling) to which two short lengths of Spring Cord are attached by bolts. Each length of Spring Cord carries a Collar, and its other end is fastened to a second "spider" on a Rod 2. A Crank 3, secured to the pointer shaft, has a Threaded Pin in its end hole that locates between two Collars secured a short distance apart on the Rod.

When the Rod 1 is rotated quickly the weights fly out, owing to centrifugal force, thus sliding the Rod 2 longitudinally in its bearings and moving the Pointer 4. The sliding movement of the Rod depends on the extent to which the governor weights are extended, which depends, in turn, on the speed of rotation of the Motor. It is an easy matter to calibrate the instrument by attaching a train of gears to the armature spindle so that the last gear rotates at a countable speed. The r.p.m. of this gear, multiplied by the gear ratio, will give the speed of the Motor under test.

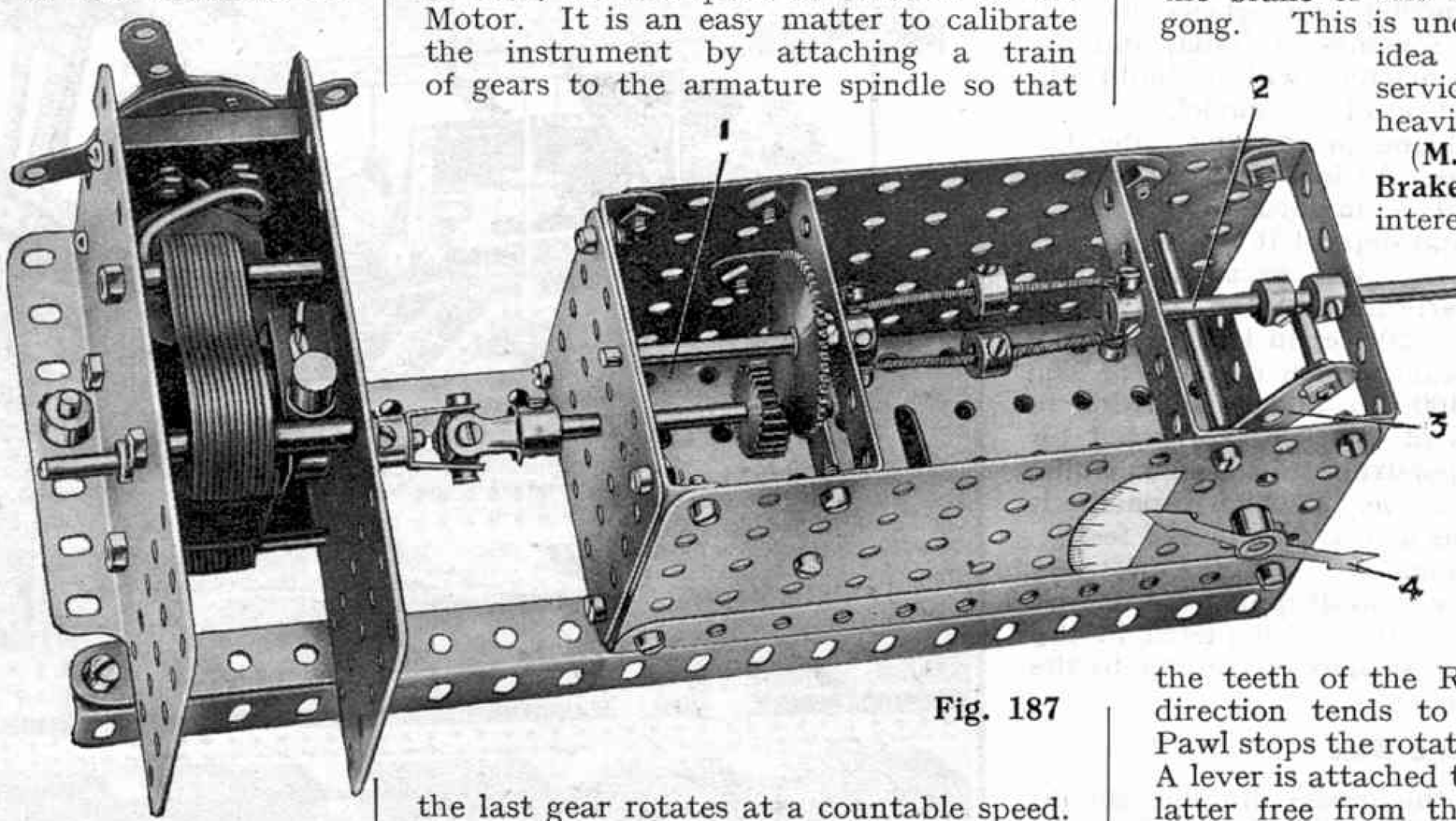


Fig. 187

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.78). Testing Device for Punctures.—Meccano boys who are cyclists must have often experienced the demoralising effect of mending a puncture, replacing the inner tube and inflating it, only to discover the tyre flat after the lapse of a short time, owing to a very slow air leak. In order to save such a sore trial of the temper, R. Betham (London, N.W.11) has constructed a testing device. The instrument may be likened to a pair of callipers, and a scale is provided to indicate the movement of the 5½" Curved Strips forming the legs. Normally the latter are held together by a piece of elastic or length of Spring Cord, but when it is desired to test a tube, the Strips are pulled apart and their tips placed on each side of the inflated tube. Any decrease of the air pressure due to a leak is indicated by the movement of the Strips across the scale.

(M.79). New Gear Change Device.—An interesting device for automatically changing gear when the Meccano Motor to which it is connected, is reversed, was sent in by F. McCullagh (Strandtown, Belfast). This suggestion employs the change speed device described in the "Suggestions Section" of the October, 1929, "*M.M.*" (No. 177), but in a slightly modified form. The elastic indicated at 5 in the original model is dispensed with and the cord from the Collar 9 is changed over to the other arm of the lower Double Arm Crank 10.

(M.80). An Alarm Clock "booster."—An alarm clock possessed by R. Russell (Whangarei, New Zealand) made so little noise that it was regarded as useless. With the aid of the Automatic Gong (model No. 4.31 in the Manual of Instructions) the clock was given a new lease of life, however. A cord was attached to the winding key of the alarm mechanism and to the brake lever of the Clockwork Motor of the gong in such a manner that, when the alarm commenced to ring and the alarm winding key to rotate, the cord was wound on to the key, thus pulling off the brake of the Motor and starting the gong. This is undoubtedly an ingenious idea and it may prove of service to others who sleep heavily!

(M.81). Automatic Backing Brake for Motor Chassis.—An interesting device suggested by W. Snowdon (Newcastle-on Tyne) is designed to prevent the possibility of a motor chassis running backward. A Ratchet is secured to the cardan shaft and a Pawl engages with it. When the car is running in a forward direction, the Pawl trails idly over the teeth of the Ratchet, but when the direction tends to become reversed the Pawl stops the rotation of the cardan shaft. A lever is attached to the Pawl to raise the latter free from the Ratchet when it is desired to travel backwards. We suggest that the Pawl should be raised automatically when engaging reverse gear.

A Working Model of a 300-ton

Mammoth Meccano Dragl

THERE can be little doubt that amongst the many Meccano achievements of the last few years, the production of the series of " Super " models ranks as one of the greatest. The series embraces a very wide variety of engineering subjects and includes such universally famous examples as the Meccano Block-setting Crane, the Chassis, and the Ship Coaler.

This month we commence the constructional details of yet another splendid Meccano Super Model—the Dragline. The instructions for building this model will be completed in a further instalment that will appear next month.

Machines that Make Canals and Railway Cuttings

The " dragline " type of excavator is used largely in such work as the making of canals and railway cuttings, etc. In construction it is somewhat similar to the steam shovel (or mechanical navvy, as it is sometimes termed), but differs considerably in its method of operation, as is shown clearly in the Meccano model.

The name " dragline " is derived from the fact that the digging bucket is dragged towards the machine on a flexible rope, instead of being mounted on an arm pivoted to a jib, as in the case of an ordinary steam shovel. While steam shovels excavate above the level of the ground on which they stand and advance into the excavation as the work proceeds, a dragline excavates below the level on which it stands and travels backwards when it has excavated all the material within reach. Owing to its construction and method of operation it is possible to place a dragline some distance away from the scene of the excavation, and because of this feature a dragline is of exceptional value where the ground is too soft to allow a steam shovel with its short jib to stand.

As an example of the great practical value of this type of excavating machine, it will be of interest to mention that during the construction of the Panama Canal, draglines, used in conjunction with steam shovels, did the work of thousands of labourers at a fraction of the cost. Apart altogether from the fact that their upkeep was nothing like the amount that would have been required for wages if men had been employed, they helped considerably in solving the difficult problem of housing and feeding. The Panama Canal was cut through a practically uninhabited zone, and it was therefore necessary to erect large numbers of shelters and temporary houses for the workmen. Even when every conceivable form of labour-saving device was used, it was still necessary to employ over sixty thousand men. These men, with their wives and families, had to be housed and fed in what was practically a desert area. This in itself was a very big task, but if it had not been for the employment of wonderful mechanical devices such as steam navvies and draglines, the number of labourers required would have been so enormous that it would have been practically impossible to find accommodation for them, which only goes to show how great a part mechanical devices really played in the construction of this famous canal.

The Prototype of the Meccano Model

The Meccano model has been designed to resemble as closely as possible the largest dragline in the world. Its huge prototype was built by Ruston and Hornsby Ltd. (Lincoln), for service in connection with irrigation schemes in India, and the following details of this machine will no doubt add interest to the construction of the model.

When fully equipped and in working order the machine weighs 300 tons. In less than one minute it will dig seven or eight cubic yards of material—a single bucket load—and deposit it 200 feet away from the point whence it was excavated. This means that it would nearly fill an 8-ton coal wagon in one cut! The jib is 120 feet in length and the drag-rope from the bucket $1\frac{3}{4}''$ in diameter. The main engines develop 400 h.p. and, in addition to these, separate engines of 200 h.p. are fitted for slewing the jib and superstructure. The machine may also be used as a crane, in which capacity it will lift a load of 22 tons at a radius of 125 feet.

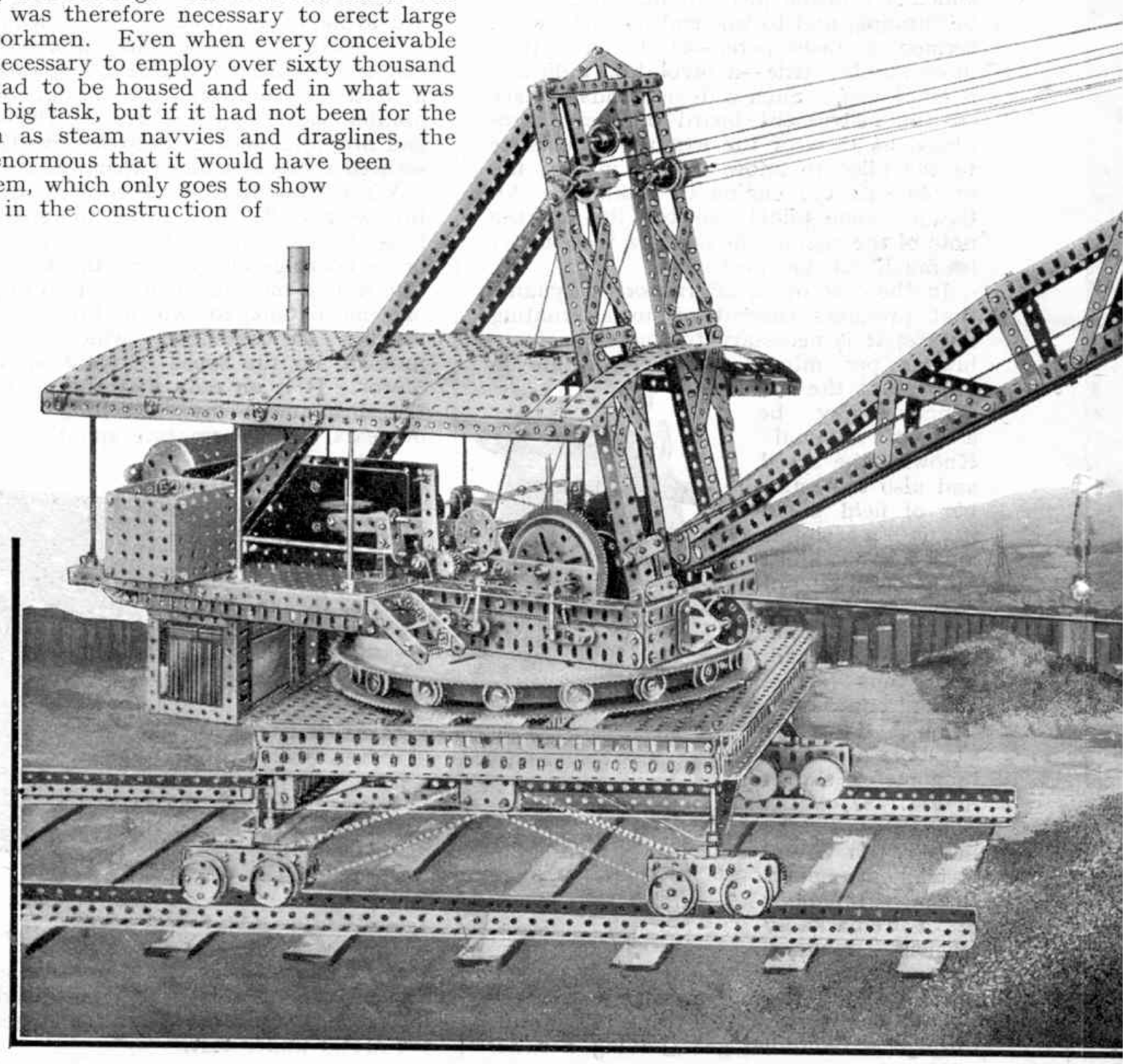
The cycle of operations—i.e., digging, slewing, discharging, slewing back, and dropping the bucket in readiness for another cut—is completed in the short period of 45 to 55 seconds, according to the material being excavated.

Building the Model : The Base

The construction of the model dragline should be commenced by building the base (Fig. 3). Each of the sides are exactly similar; they are composed of four $12\frac{1}{2}''$ Angle Girders 1 bolted to a

Parts Required to Bui

14	of	No. 2	5	of	No. 12b	10	of	No. 2
11	,,	,, 2a	1	,,	,, 13	3	,,	,, 2
15	,,	,, 3	2	,,	,, 13a	2	,,	,, 2
5	,,	,, 4	4	,,	,, 14	2	,,	,, 2
8	,,	,, 5	8	,,	,, 15	2	,,	,, 2
10	,,	,, 6	2	,,	,, 15a	2	,,	,, 3
20	,,	,, 6a	3	,,	,, 16	555	,,	,, 3
4	,,	,, 7	5	,,	,, 16a	8	,,	,, 3
16	,,	,, 7a	1	,,	,, 16b	14	,,	,, 3
2	,,	,, 7b	14	,,	,, 17	6	,,	,, 4
26	,,	,, 8	10	,,	,, 18a	1	,,	,, 4
2	,,	,, 8a	3	,,	,, 18b	2	,,	,, 4
8	,,	,, 8b	2	,,	,, 19b	6	,,	,, 4
21	,,	,, 9	16	,,	,, 20	1	,,	,, 4
2	,,	,, 9a	2	,,	,, 21	1	,,	,, 4
10	,,	,, 9b	2	,,	,, 22	14	,,	,, 5
13	,,	,, 9d	9	,,	,, 22a	3	,,	,, 5
2	,,	,, 9e	1	,,	,, 23	2	,,	,, 5
6	,,	,, 9f	5	,,	,, 24	1	,,	,, 5
18	,,	,, 10	5	,,	,, 25	3″	,,	,, 5
20	,,	,, 11	10	,,	,, 26	82	,,	,, 5
22	,,	,, 12	1	,,	,, 26a	4	,,	,, 6
6	,,	,, 12a	9	,,	,, 62			



·ton Excavator in Use in India

gline Excavating Machine

o Build the Model:—

of No.	27	13	of No.	62b	2	of No.	113
„	27a	4	„	„ 63	6	„	„ 115
„	„ 27b	9	„	„ 70	1	„	„ 125
„	„ 30	9	„	„ 72	8	„	„ 126
„	„ 31	2	„	„ 76	2	„	„ 126a
„	„ 32	8	„	„ 77	2	„	„ 133
„	„ 37	1	„	„ 79a	1	„	„ 136
„	„ 37a	2	„	„ 82	2	„	„ 144
„	„ 38	57″	„	„ 94	1	„	„ 147a
„	„ 40	5	„	„ 96	3	„	„ 147b
„	„ 45	5	„	„ 96a	1	„	„ 148
„	„ 47	5	„	„ 103	2	„	„ 160
„	„ 48	4	„	„ 103a	1	„	„ 162
„	„ 48a	6	„	„ 103b	5	„	„ 163
„	„ 48c	10	„	„ 103d	2	„	„ 164
„	„ 52a	2	„	„ 103f	1	„	„ 167
„	„ 53a	2	„	„ 103g	2	„	„ 170
„	„ 55a	1	„	„ 103h	1	6-volt Electric	
„	„ 57	3	„	„ 103k		Motor	
„	„ 58	22	„	„ 111c			
„	„ 59						
„	„ 62a						

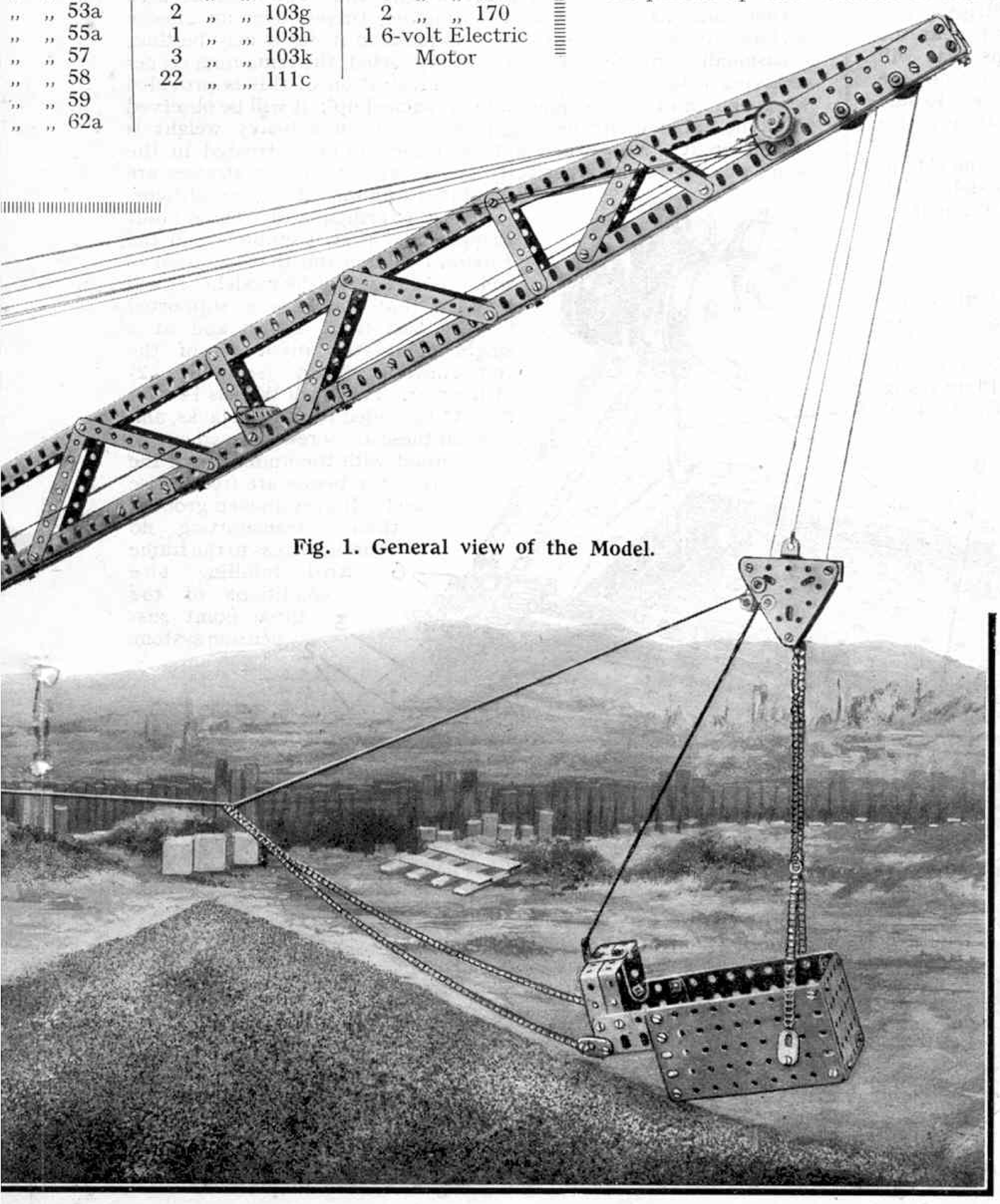


Fig. 1. General view of the Model.

$12\frac{1}{2}''$ Flat Girder so as to form an H-section girder of great strength, and they are connected together at the corners by $1'' \times 1''$ Angle Brackets.

Four $12\frac{1}{2}''$ Angle Girders 2 are secured to the top of the frame thus formed and a Geared Roller Race 3 is bolted thereto by means of $\frac{3}{8}''$ Bolts, three Washers being placed on the shanks of the bolts between the Angle Girders and the Race, for spacing purposes. A $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate is attached at each corner in order to fill in the spaces left by the Race at the corners of the base.

The bogies at the front end of the machine (which is the far end in the illustration under consideration) are mounted on $3\frac{1}{2}''$ Rods 4 passed through the holes in the Angle Girders 1 at each corner and retained in position by Collars; the Rods are supported further by means of $5\frac{1}{2}''$ Strips bent as shown and bolted to the $12\frac{1}{2}''$ Girders.

Secured halfway along the Angle Girders 1 are two Channel Bearings placed one on either side; in each of these Channel Bearings is journalled two $1\frac{1}{2}''$ Rods carrying two $\frac{3}{4}''$ Sprockets 5 and two $\frac{1}{2}''$ Pinions 6. An $11\frac{1}{2}''$ Rod 7, also journalled in the Channel Bearings, is further supported near its centre by 2″ Strips that are bolted to Trunnions secured to a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate that is bolted across the centre pair of Girders 2 by $\frac{3}{8}''$ Bolts. The Trunnions are packed up with Washers so that the end holes of the 2″ Strips shall be in alignment with those in the Channel Bearings and allow the Rod 7 to turn freely. The latter Rod carries at either end a $\frac{1}{2}''$ Pinion that meshes with both the Pinions 6 on the Rods carrying the $\frac{3}{4}''$ Sprockets 5. A $\frac{7}{8}''$ Bevel, secured to the Rod 7, meshes with a second Bevel on the vertical Rod 8 that passes up into the gear box and forms the pivot about which the superstructure turns.

Compensating Beam and Bogies

Fig. 2 shows clearly the details of the compensating beam and the bogies attached thereto. As all four bogies are similar in construction, a description of one will suffice. The frame of the bogie consists of two $3\frac{1}{2}''$ Flat Girders held together by three Double Brackets, to two of which the Crank 9 is bolted. The drive for each bogie is taken off the $\frac{3}{4}''$ Sprocket 5 (Fig. 3) by means of Sprocket Chain to the 1″ Sprocket Wheel mounted on a short Rod that is journalled in the bogie side frames and which carries a $\frac{3}{4}''$ Pinion. The latter meshes with the 50-teeth Gear Wheels 11 secured on the wheel axles. By this means it will be seen that the drive is transmitted to all the sixteen wheels, a fact which ensures the maximum adhesion and reduces wheel slip to a minimum.

The compensating beam consists of two $12\frac{1}{2}''$ Angle Girders 12 between the flanges of which is bolted a $12\frac{1}{2}''$ Flat Girder. To the lower edge of the Flat Girder four $5\frac{1}{2}''$ Angle Girders are bolted flanges outward, the space between their centre ends being filled in by a $1\frac{1}{2}''$ Angle Girder on each side of the Flat Girder. As will be seen the Angle Girders are arranged on the slant, in order to give the maximum depth in the centre of the beam and a taper towards each end, this shape in practice giving a girder great strength and rigidity. Extra strength is given to the lower flanges of the compensating beam by the addition of a $12\frac{1}{2}''$ Flat Girder bolted along the bottoms of the $5\frac{1}{2}''$ and $1\frac{1}{2}''$ Angle Girders. A Threaded Crank 13, bolted to the underside of the flange of the Girder 12 at each end, carries in its bore a 1″ Threaded Rod having a Bush Wheel 14 secured to its upper end.

Construction of the Jib

The jib should next be constructed, this being shown clearly in the general view of the model (Fig. 1).

Each bottom longitudinal member of the jib is built up from two $18\frac{1}{2}''$ and one $9\frac{1}{2}''$ Angle Girder, each of the former overlapping the latter by four holes. Each top longitudinal member is composed

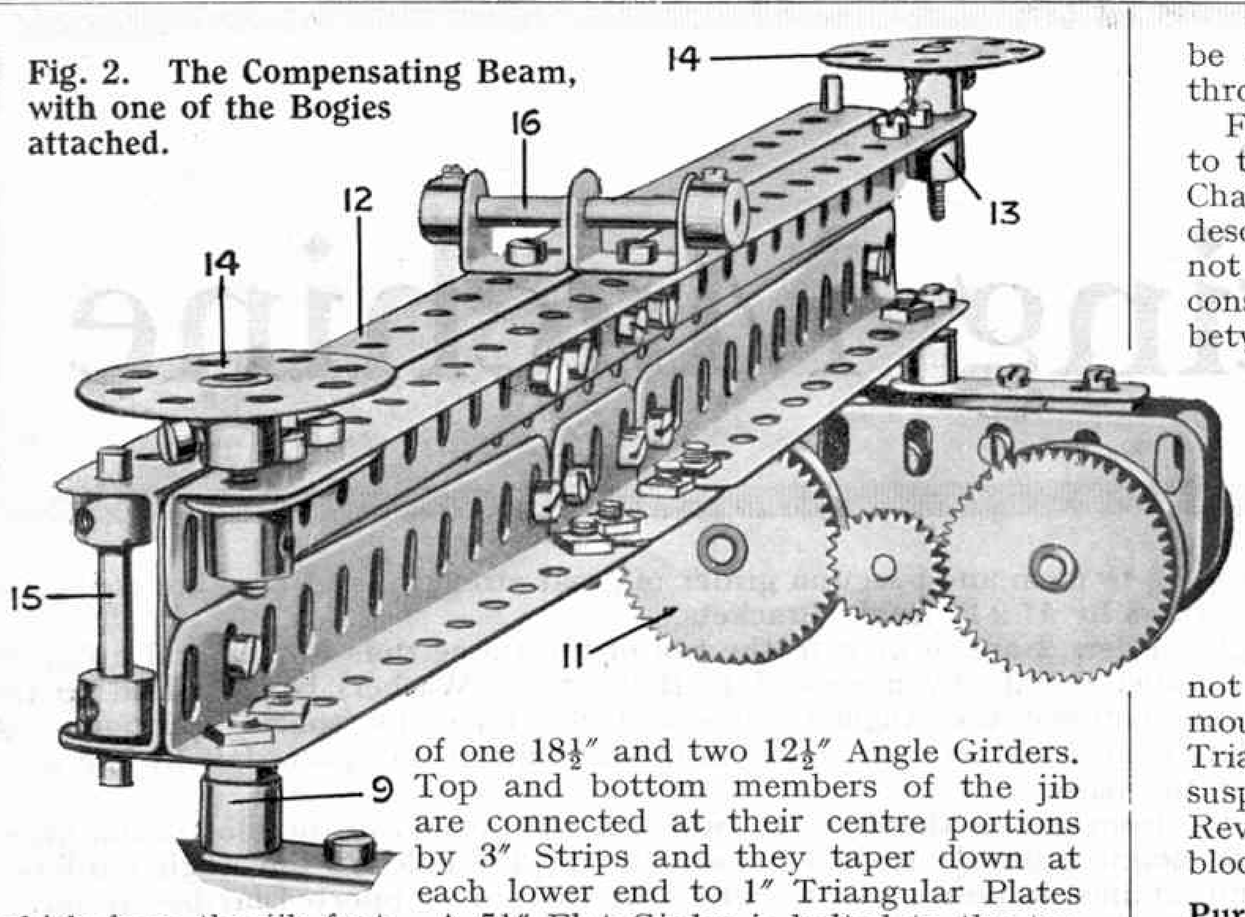


Fig. 2. The Compensating Beam, with one of the Bogies attached.

of one $18\frac{1}{2}''$ and two $12\frac{1}{2}''$ Angle Girders. Top and bottom members of the jib are connected at their centre portions by 3″ Strips and they taper down at each lower end to 1″ Triangular Plates which form the jib foot. A $5\frac{1}{2}''$ Flat Girder is bolted to the top and bottom members at each side of the jib head and these Girders form bearings for the jib head pulley spindles. The luffing cord Pulleys that can be seen mounted against the outside faces of the Flat Girders are secured on a $3\frac{1}{2}''$ Axle Rod, whilst the 1″ loose Pulleys secured between the Flat Girders at the jib head are mounted on $2\frac{1}{2}''$ Rods.

As will be seen the jib is adequately braced by Strips. The cords are attached to points halfway up the jib and near the jib head, their lower ends being secured to $1\frac{1}{2}''$ Strips that will eventually be placed on the jib pivot pin. The purpose of these cords is to prevent the swaying of the jib from side to side and thus take abnormal stresses off the jib pivot. In practice the cords are composed of very strong wire rope.

After the jib has been completed it should be laid on one side in readiness for the final assembly of all the units of the model, which procedure will be described in detail in the final instalment of this article.

The Drag Bucket and Pulley Block

The units that should next receive the builder's attention are the drag bucket and the pulley tackle that supports it, these parts being seen in the general view (Fig. 1).

The sides of the bucket are composed of $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates and a similar Plate is used for the bottom, this latter Plate being secured to the sides by means of $4\frac{1}{2}''$ Angle Girders. The back of the bucket consists of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate, $2\frac{1}{2}''$ Angle Girders being used to hold it to the sides.

Since in actual practice a machine of this type is often required to excavate material of a relatively hard and congealed nature, serrations or "tines" are provided on the front bottom edge of the bucket so that the latter can exert a "slicing" or cutting action on the work and thus increase the efficiency of the machine. These "tines" have been represented in the Meccano bucket by securing three 2″ Strips to the $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate, forming the bottom of the bucket, so that each Strip projects one hole.

A 2″ Flat Girder should next be secured to each side of the bucket and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Double Angle Strips are secured between these Girders as shown in Fig. 1. A $1'' \times \frac{1}{2}''$ Angle Bracket should be bolted to the centre of the Angle Strips and a Flat Bracket pivotally attached in the end slotted hole of each Flat Girder (see Standard Mechanism No. 263).

The ends of a length of Sprocket Chain should next be attached to these Flat Brackets by means of bolts passed through the end loops of the Chain and held in position by nuts.

Flat Brackets are also attached by means of lock-nutted bolts, to the side walls of the bucket, and a further length of Sprocket Chain is attached to these Brackets in a similar manner to that described previously. In order that the supporting chain will not foul the upper walls of the bucket, a cross-piece or "yoke" consisting of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip should be secured between the separate lengths of chain. This Angle Strip is held to the Chain by bolts forced through the links of the latter and secured by nuts. Washers should be placed under the head of each bolt to prevent damage to the links of the Chain.

The pulley block consists of two $2\frac{1}{2}''$ Triangular Plates, held apart by a Double Bracket bolted at each corner. Two 1″ Triangular Plates are secured to the $2\frac{1}{2}''$ Plates as shown, and form journals for a 1″ Axle carrying a $\frac{1}{2}''$ loose Pulley. The bolts used to hold the 1″ Plates in place should have Washers placed under their heads, so that their shanks do not foul the main sheave. This sheave consists of a $1\frac{1}{2}''$ Pulley mounted on a 1″ Axle Rod journalled in the centre holes of the Triangular Plates. The Pulley block is secured to the bucket suspension chain by means of a short piece of cord or wire, and a Reversed Angle Bracket is attached to the upper portion of the block to provide a fixing lug for the free end of the hoist cable.

Purpose of the Compensating Beam

Although the functions of the jib and drag bucket will be clear to readers, the purpose of the specially-constructed compensating beam will not be so obvious, and before concluding this month's instalment of the constructional details, we are appending a brief explanation of its principle.

If an object carrying a great weight and supported at each corner, such as the base of the dragline, travels over an uneven surface, abnormal stresses will be induced in it, for it may be that, occasionally, only three corners are supported, the remaining corner receiving little or no support. An illustration of this is provided when one leg of a four-legged table is packed up; it will be observed how the table is strained and twisted when a heavy weight is placed on it. Now when a three-legged table is treated in the same way, it remains perfectly steady and no undue stresses are exhibited under these conditions.

It is this principle of "three point suspension" that is employed in the Ruston Dragline and that has been so well brought out in the model. It will be seen that the base is supported by the two front bogies and at a single point—the pivot 16 of the compensating beam (see Fig. 2) at the rear. The Bush Wheels 14 with their 1″ Threaded Rods form jacks, and when these are screwed down out of contact with the underside of the base, the bogies are free to rise and fall over uneven ground, thereby transmitting no undue stress to the frame and fulfilling the conditions of the three point suspension system.

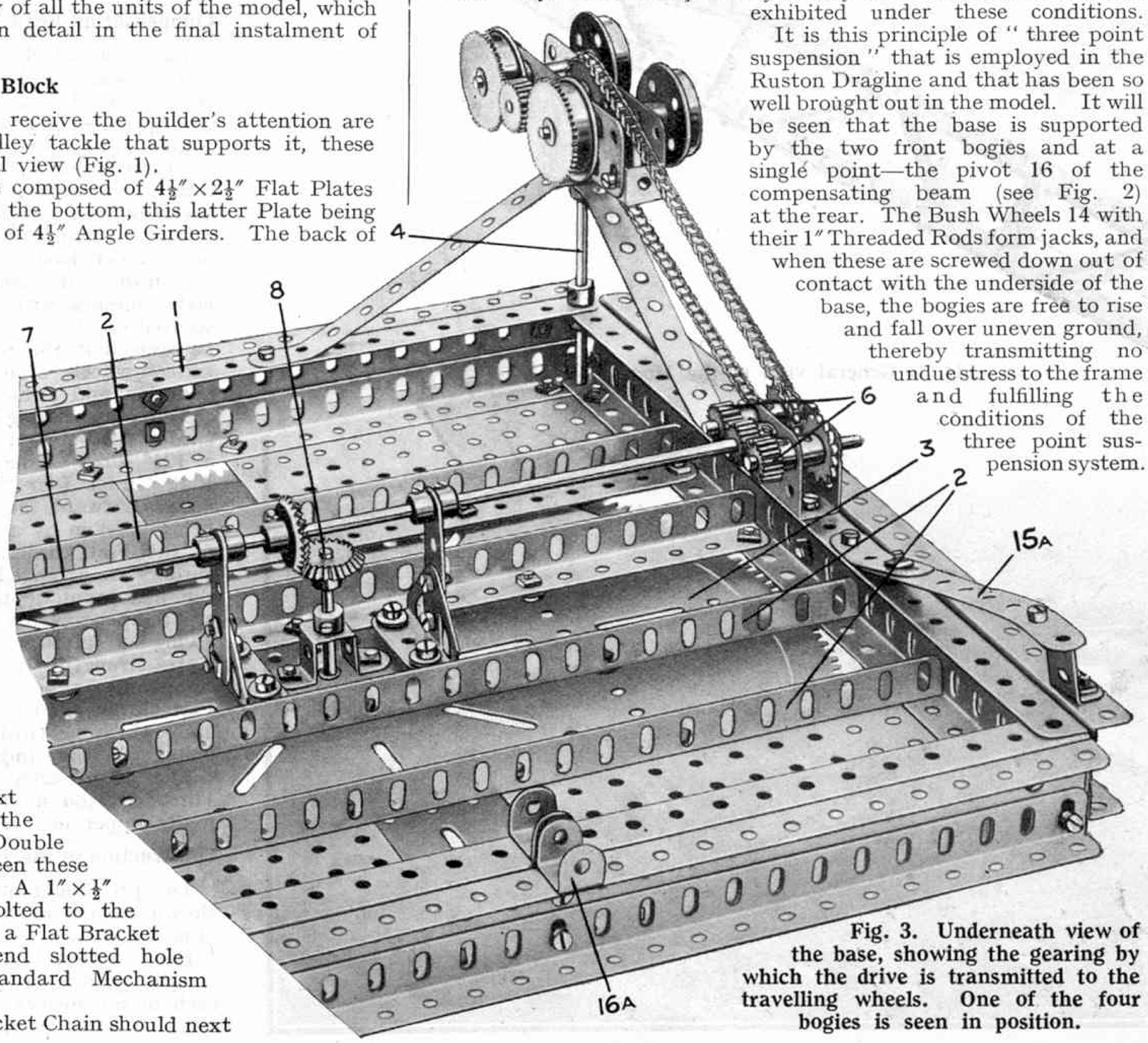
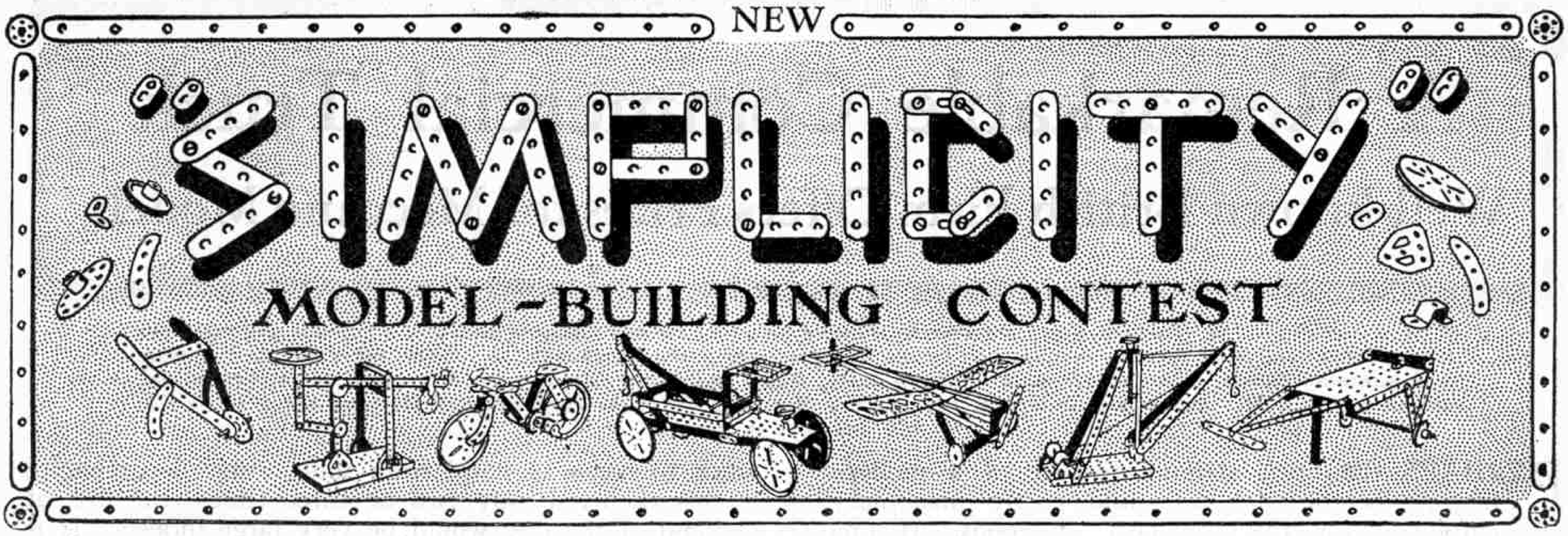


Fig. 3. Underneath view of the base, showing the gearing by which the drive is transmitted to the travelling wheels. One of the four bogies is seen in position.



MORE BIG PRIZES FOR SMALL MODELS

THE contest that we announce this month is the outcome of the great success that attended the "Second Simplicity" Contest announced in the December, 1929 "*M.M.*" Judging from the enormous entry in that Contest, it is fairly evident that "Simplicity" Contests are one of the most popular of all forms of Meccano model-building competitions.

In many previous contests we have noticed that many of the models submitted have been unnecessarily complicated, and could easily have been constructed from a much smaller number of parts. We decided, therefore, to organise a contest in which the prizes will be awarded to those boys who succeed in constructing the most ingenious models with the smallest possible number of parts.

There are no entrance fees to be paid or forms to fill in. Any type of model may be entered. When the model is completed simply take a photograph of it, or if this is not possible, make a good drawing and send it to "Third Simplicity" Model-building Contest, Meccano Ltd., Old Swan, Liverpool. Actual models will not be accepted. The competitor's age, name, and full address must be clearly written on the back of each photo or sheet of paper submitted for consideration.

Entries will be divided into three Sections as follows: Section A, for boys or girls over 14 years of age residing in the British Isles; Section B for boys or girls under 14 years residing in the British Isles, and Section C for Overseas readers of all ages.

31st May, 1930, is the last day on which entries may be received from competitors residing in the British Isles. Overseas closing date: 31st July, 1930.

Photos of prize-winning models become the property of Meccano Ltd., but photos of unsuccessful entries will be returned if a stamped addressed envelope of the correct size is enclosed with the entry.

More than one model may be entered in the competition, but all entries from any single competitor must be sent under the same cover. No single competitor can win more than one prize; if he submits two or more entries they will be considered jointly.

Meccano boys should remember that in this competition the object is not to build the smallest models possible, but models in which the fewest possible number of parts are used, consistent with a realistic effect.

THE PRIZES

The Prizes to be awarded in Sections A and C are as follows:-

First Prize: Cheque for £2-2s.
Second Prize: Cheque for £1-1s.
Third Prize: Cheque for 10/6.
Twelve Prizes, each consisting of Meccano products to value 5/-.
Twelve Prizes, each consisting of a Meccano Engineers' Note Book.

The Prizes in Section B are as follows:—

First Prize: Meccano products to value £1-1s.
Second Prize: Meccano products to value 10/6.
Third Prize: Meccano products to value 7/6.
Twelve Prizes, each consisting of a complete Instructions Manual.
Six Prizes, each consisting of a Meccano Engineers' Note Book.

A limited number of Certificates of Merit will be awarded in each Section.

SECOND "PARTS REQUIRED" COMPETITION

The "Parts Required" Contest announced in the Magazine for December 1929, proved very popular and we have decided to organise a second competition of the same type. This time readers are invited to test their skill in making a correct estimate of the Meccano parts used in building the model Motor Lorry illustrated on this page. In sending in their entries competitors should state the Meccano catalogue number of each part and the quantity required. Catalogues may be obtained on request from Meccano dealers.

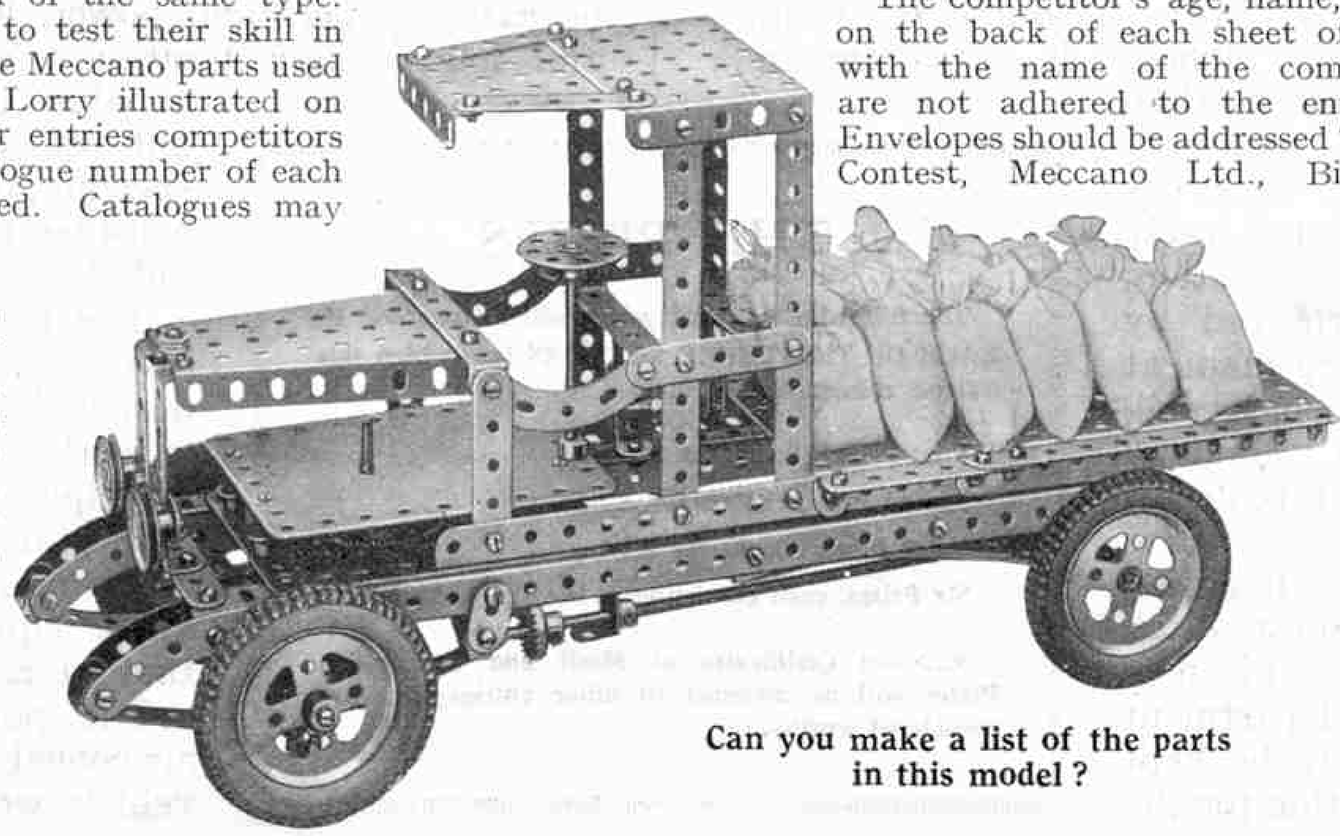
Entries will be divided into two Sections: Section A, for readers residing in the British Isles, and Section B, for readers residing Overseas, and the following prizes will be awarded for the correct or nearest correct lists: First Prize, Meccano or Hornby goods to value 21/-. Second Prize, Meccano or Hornby goods to value 15/-. Third Prize, Meccano or Hornby goods to value 10/6.

In addition there will be a number of consolation prizes and Meccano Certificates of Merit for other competitors whose lists are the next nearest correct.

The competitor's age, name, and address must appear on the back of each sheet of paper sent in, together with the name of the competition. If these rules are not adhered to the entry will be disqualified. Envelopes should be addressed "Second Parts Required" Contest, Meccano Ltd., Binns Road, Old Swan, Liverpool.

Closing Dates: for Section A, 30th April; Section B, 30th June.

In entering this contest it is simply a matter of skill in estimating correctly the parts embodied in the model. Some portions of the model cannot, of course, be seen in the illustration, and each competitor must calculate the necessary parts by basing his estimation on the manner in which he personally thinks the model is constructed.



Can you make a list of the parts in this model?

A Remarkable Commercial Truck

Well-known British Firm Offers Prizes for Meccano Models

R. A. Lister & Co. Ltd. (Dursley, Glos.) are offering splendid prizes for the best Meccano models of a popular and ingenious type of commercial truck that they manufacture for use in engineering works, warehouses, etc., for the rapid transport of goods with minimum labour. This article, with its illustrations, should enable any Meccano boy to produce an excellent model, and we hope "M.M." readers will do their best to convince Messrs. Lister of the adaptability of Meccano and of the skill of Meccano boys in general!

PERHAPS the most striking feature of a modern factory is the elaborate and costly machinery employed for the transport of goods. If one could glimpse for a moment a busy factory of only twenty or thirty years ago, one would be struck by the number of employees engaged solely in moving material from one stage of manufacture to another, or in carrying the finished product from the machines to the stores, thence to the packing room, and so on. To-day mechanical conveyors pass the materials from one machine to another or from one department to another, or if the goods are very heavy and the continuous conveyor is not practicable, some kind of mechanically-driven truck moves the material from the machines to any point required with extraordinary ease and speed.

There is no doubt that if modern industrial methods tend to eliminate initiative or personal skill on the part of the operative, they do enable him to carry out the day's duties with a minimum of physical exertion. Indeed, to the uninitiated the amount of skill and money expended to simplify and "mechanise" even the smallest processes in manufacture is always a source of wonder. But the saying "time is money" is more true in a factory or engineering works than anywhere else. The secret of success in any industry that has attained world fame is very largely a matter of proper organisation, which can only be achieved by making good use of every moment of the working day, by conserving the workers' energies, and by having always the right tools for each particular job.

In engineering works handling heavy goods, the smallest hitch in organisation may lead to enormous waste. A whole department of skilled mechanics may be kept idle a few moments waiting for the work to come to hand from some other department; if this occurred only two or three times, the loss at the end of the day would be very large indeed. It is with a view to avoiding such losses that the wonderful machinery for goods handling and conveying is employed.

One of the most interesting features of this branch of engineering to the Meccano boy is the ordinary commercial truck. Any boy who has visited a factory, shipyard, warehouse, or even a big railway station will be familiar with this form of mechanical transport and will have observed that the truck usually consists merely of a flat wooden platform mounted on wheels and driven by a small power unit, which may be either petrol or electric. In this article we are able to describe the famous "Lister Auto-trucks," which are petrol-driven. These vehicles form excellent subjects for Meccano models and that is why Messrs. Lister are offering a splendid set of prizes for the best models of them produced by Meccano boys.

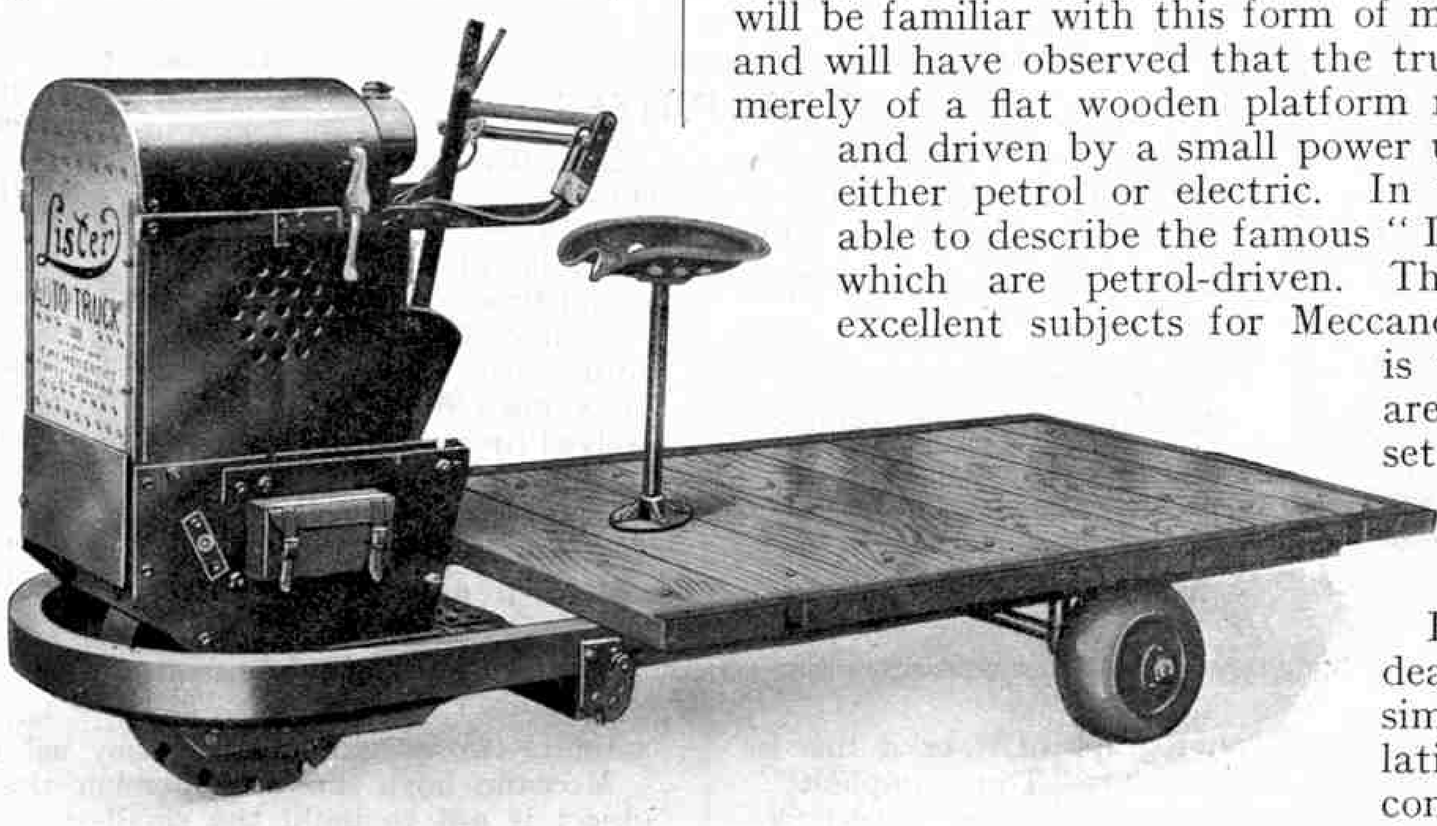


Fig. 1. This Standard Fixed Platform type Lister Auto-truck forms an excellent subject for a Meccano model.

Before going on to deal with the few simple rules and regulations that govern the competition, we will describe the principal features of the Lister truck, as this information will assist competitors in designing their models.

Details of the Lister Auto-truck

The principal features of any successful truck must be ease of operation, power, low cost of maintenance, and low loading position. Also the truck must be capable of manœuvring in and out of congested areas easily, speedily, and safely. All these considerations are more than provided for in the Lister truck.

The Lister truck is available in several different models, each designed for some particular class of work but similar in fundamental principles. We illustrate in Fig. 1 the standard model, and the following particulars of this will apply equally well to the others that we reproduce.

The power unit is a 600 c.c. air-cooled engine, and the whole vehicle weighs only 8½ cwt.; yet

THE PRIZES

The following splendid prizes will be awarded IN EACH OF THE THREE SECTIONS into which this unique competition is divided :—

First Prize, cheque for £3-3s.

Second Prize, cheque for £2-2s.

Third Prize, cheque for £1-1s.

Six Prizes, each consisting of cheque for 10/6.

Meccano Certificates of Merit and Consolation Prizes will be awarded to other entries that are considered worthy.

it can carry a load of one ton up a gradient of 1 in 14. On a level an extra two tons can be comfortably drawn by employing one, two or more trailers.

The most noteworthy feature is the fact that the drive is taken through a single wheel that is mounted in front of the truck immediately beneath the engine. This wheel forms with the engine a single unit capable of swivelling completely round upon a specially designed pivot, or "steering ring." This arrangement not only makes the transmission extremely simple, but gives the truck a truly wonderful manœuvrability. By manipulating the front wheel the truck can be turned round in little more than its own length—a feature which is particularly valuable in crowded goods yards and workshops. No reversing gear is provided, nor is it necessary, for when it is required to run backward, the engine is merely swung through an angle of 180 degrees!

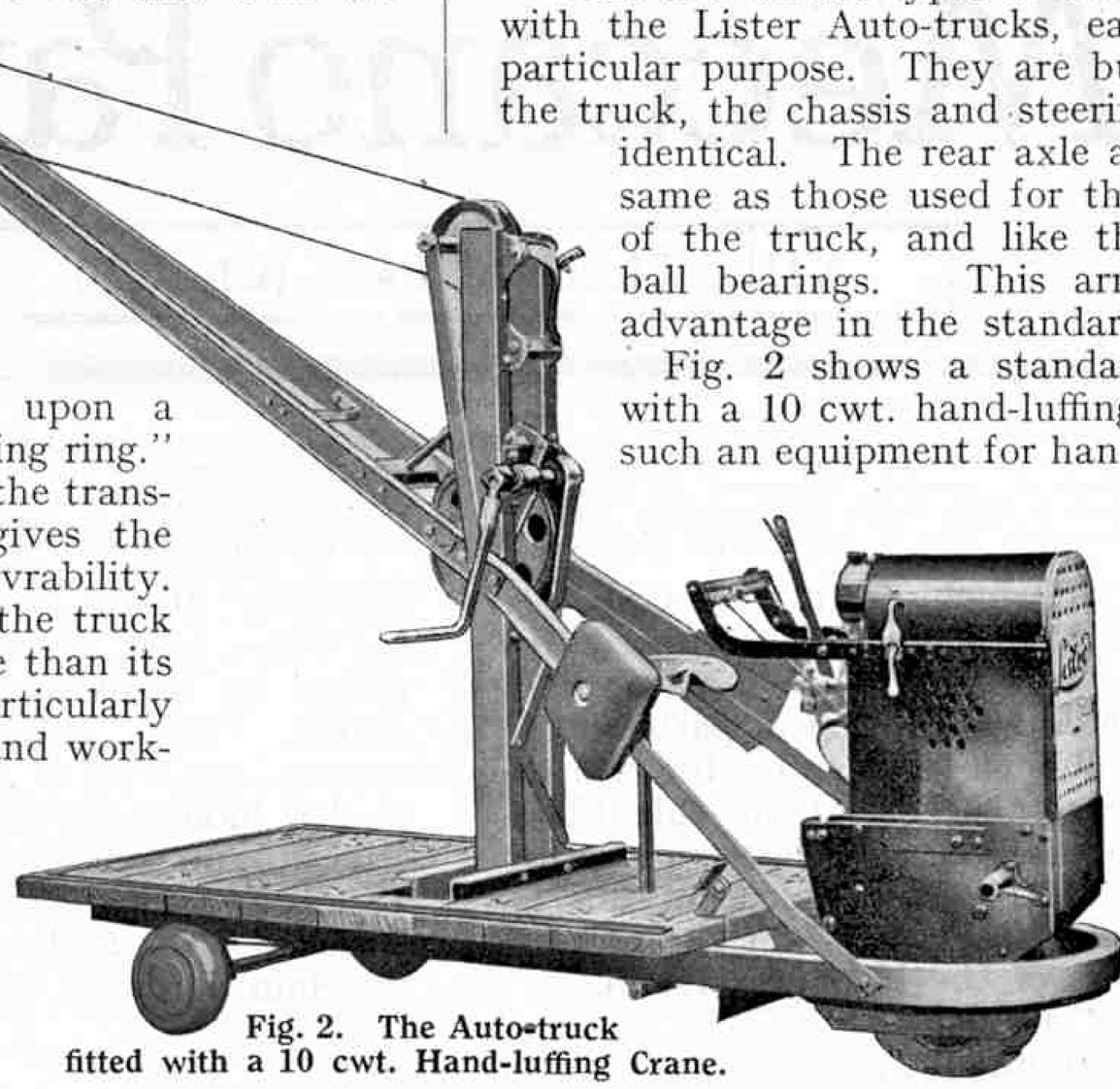


Fig. 2. The Auto-truck fitted with a 10 cwt. Hand-luffing Crane.

Controlling the truck is simplicity itself. The handlebar, by means of which the entire engine unit may be turned around on its pivot, carries a simple lever throttle control and beneath it is a conveniently placed pivoted bar controlling the clutch. As soon as this bar is released it makes contact with the safety switch that shorts the magneto, thus making accidents impossible.

The front wheel turns upon a ball-bearing hub that is mounted on a fixed axle which, in turn, is supported between frames secured to a circular channel ring. This ring rotates with its channel outward on three or more rollers, which form the supports for the chassis. The front wheel is driven by chain drive from a shaft that is connected to the engine through a secondary shaft, in which the clutch is incorporated.

Two independent expanding brakes are fitted. One is operated by foot from the driver's seat to the rear wheels by adjustable rods, and the other by a ratchet lever on to the front wheel. The lever is fitted in a convenient position and can be operated by the driver, no matter in what position the steering handle may be. The petrol and oil supplies are contained in welded steel tanks mounted at the top of the engine unit and held in position by a hinged hood having instantaneous fasteners. The rear axle does not rotate but is firmly fixed to the two axle seats attached to the side members of the frame. The wheels are mounted on ball bearings.

The frame is a one-piece U-shape of rectangular section, giving ample strength, and is tied by means of two cross members and by the top steering ring. It will be noted that all three wheels are fitted with solid rubber tyres and the front wheel has herring-bone grooves, ensuring a good grip on all roads and surfaces. The seat is of the revolving bucket type.

There are various types of trailers used in connection with the Lister Auto-trucks, each designed for some particular purpose. They are built on lines similar to the truck, the chassis and steering arrangements being identical. The rear axle and the wheels are the same as those used for the rear wheel assembly of the truck, and like those, are mounted on ball bearings. This arrangement is of great advantage in the standardisation of the parts.

Fig. 2 shows a standard Lister truck fitted with a 10 cwt. hand-luffing crane. The value of such an equipment for handling all kinds of goods will be obvious, and those Meccano boys who are not content with building the truck alone may find the crane an interesting addition to their models.

Another type of Lister truck, specially designed for drawing a trailer, is shown in Fig. 3. The mechanical features of this truck are similar to those of the other models, but the chassis has been shortened to give greater mobility when drawing a train of trailers. As will be seen, the trailer has two wheels only and is attached pivotally to a point above, and a little in front of, the rear axle of the truck. A screw-operated brake acting on the rear axle of the trailer is brought into operation by a handle situated within convenient reach of the driver.

We have no doubt that Meccano boys will be able to build some very realistic and successful models of the Lister truck if they really try, and we hope every "*M.M.*" reader will put forward his best work in order to show the firm of Lister what Meccano boys can do. Of course, it is not expected that competitors will reproduce every mechanical detail accurately, but it should be possible to build a model to show the essential features, such as the steering, etc. Models need not necessarily be power-driven. There are no special building difficulties, and the boy with quite a small Outfit should be able to produce a model equally as realistic as any put forward by competitors owning the most elaborate sets.

How to Enter the Competition

Here are full particulars of the competition.

1. You may enter a model of any one of the three types of Lister truck illustrated. No restrictions are laid down as to the quantity of parts that are to be used, but as every Meccano boy knows, it is not by any means the quantity of parts used that will decide the best model.

2. Any model submitted must be the competitor's own unaided work, and the judges claim the right to require (*Continued on page 250*)

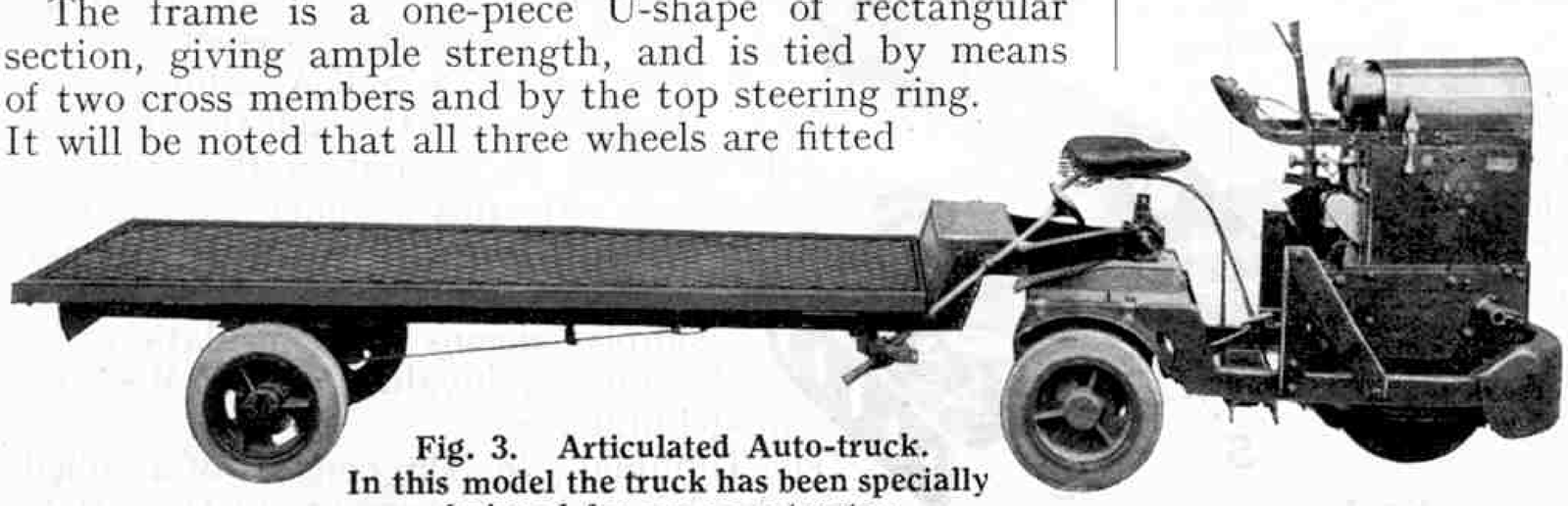
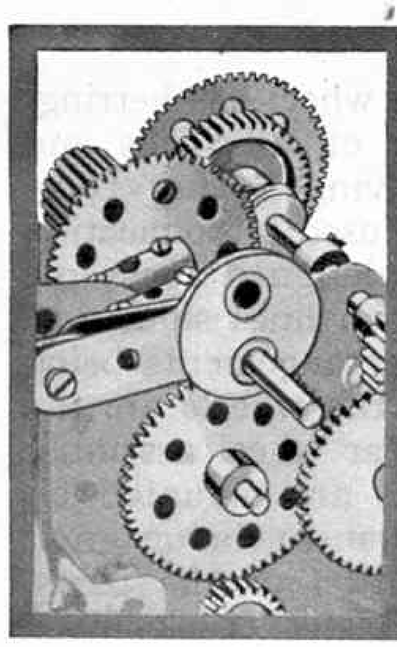
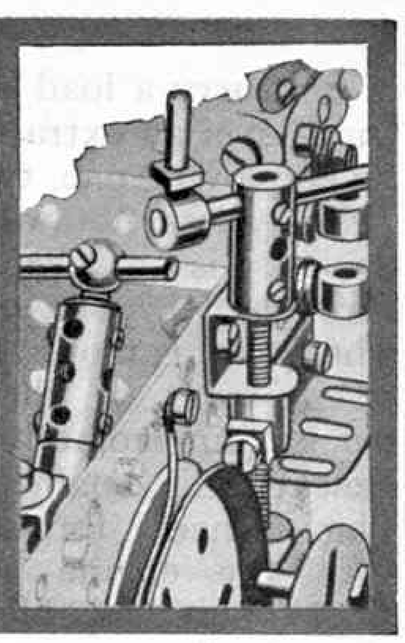


Fig. 3. Articulated Auto-truck. In this model the truck has been specially designed for use as a tractor.



HOW TO USE Meccano Parts

XIII.—Electrical Parts (Class T)



For the purpose of this series of articles we have grouped all the Meccano parts into two main sections, termed the Structural and Mechanical Sections, and these sections have been further divided into a number of separate classes. The complete grouping is as follows. Structural Section: Class A, Strips; Class B, Girders; Class C, Brackets, Trunnions, etc.; Class D, Plates, Boilers, etc.; Class E, Nuts and Bolts, Tools and Literature. Mechanical Section: Class M, Rods, Cranks and Couplings; Class N, Wheels, Pulleys, Bearings, etc.; Class O, Gears and Toothed Parts; Class P, Special Accessories; Class Q, Miscellaneous Mechanical Parts; Class T, Electrical Parts; Class X, Motors, Accumulators, etc.

LAST month's article, which dealt with Class Q, "Miscellaneous Mechanical Parts," completed the description of the "regular" Meccano accessories, and we now come to the special electrical parts which comprise Class T. As will be noted from the list printed in the centre of this page, each part in this Class is numbered above 300, although the last number in the regular accessories is 171; the object of this is to make a more marked division between the regular and electrical components of the Meccano system.

Part No. 301, Bobbin, is designed for use in the construction of small electro-magnets and solenoids. It is about 1″ in length and its centre, which is of brass, is bored to fit round a Meccano Axle Rod. The ends are of fibre and are ¾″ in diameter.

Solenoids and Magnets

Fig. 6 shows two solenoids, formed from Meccano Bobbins, used to impart reciprocating motion to the "piston rods" 3 and 4 of a small horizontal engine. Each Bobbin is wound with several layers of No. 26 S.C.C. Wire and is covered with a strip of brown paper as extra protection. The Rods 3 and 4 are free to slide in the centre bores of the Bobbins, and matters are so arranged that current is supplied to the coils of wire alternately, thus imparting motion to the piston rods and thence to the crankshaft of the engine. Solenoids constructed in this way can be used for innumerable purposes in Meccano model-building. For example, an electric railway signal may be brought to the "off" position by supplying current to a solenoid that operates the signal arm through a "plunger" and suitable lever mechanism as shown in Fig. 2.

A very useful electro magnet may easily be formed by winding a Bobbin to capacity with 26 S.C.C. Wire and inserting in its centre a Core or Pole Piece (part No. 308). The latter consists of soft iron and may be secured in position by the nuts supplied with it. A great advantage of the electro magnet lies in the fact that the Pole Piece is magnetised only whilst current flows through the coils. Hence, if a magnet of this type is attached to the lifting hook of a model crane, metal objects can be picked up or dropped merely by closing or opening a switch. Other obvious adaptations for the electro magnet—such as in bells, buzzers, relay switches and electric indicators, etc.—will immediately suggest themselves to Meccano boys. The special Pole Pieces should always be used for the magnet core, for if the ordinary Meccano steel Rods are employed they will be found to retain the magnetism after the current has ceased to flow through the coils.

Parts in Class T: Electrical Parts

Part No.			Price s.	d.
301	Bobbin	each	0	4
302	Insulating Bush	doz.	0	6
303	Insulating Washer	,,	0	3
304	6 B.A. Bolts	,,	0	6
305	6 B.A. Nuts	,,	0	3
306	Terminal	each	0	1
307	Silver-tipped Contact Screw	,,	0	5
308	Core or Pole Piece	,,	0	3
309	Coil Cheek	,,	0	3
310	Lamp Holder	,,	0	3
311	Best Metal Filament Lamp (6 volt)	,,	0	10
312	27 Gauge Bare Iron Wire, per length of 30″	,,	0	1
313	26 Gauge S.C.C. Copper Wire, Reels of 50 yds.		2	3
314	23 Gauge S.C.C. Copper Wire, Reels of 25 yds.		2	0
315	22 Gauge Bare Copper Wire, Reels of 4 yds.		0	3

Fig. 4 shows a Meccano electro magnet incorporated in a buzzer. The magnet is seen at 1, with the end of the Pole Piece at 2 just beneath the vibrating lever or "armature" 3. This illustration also shows two Silver-tipped Contact Screws at 4 and 5. These screws are cut with 6 B.A. Thread and are ½″ in length overall. They should always be used where a rapid make-and-break is required, for they ensure perfect contact and do not "soot up" like ordinary screws. The gap between the contact points may easily be adjusted by turning one of the screws.

The 6 B.A. Bolts and Nuts (parts Nos. 304 and 305) are supplied so that Meccano parts can be bolted together and yet insulated from each other by using these bolts in conjunction with the special Insulating Bushes and Washers (parts Nos. 302 and 303). These latter parts are similar except that the Insulating Bush has a small "shoulder" which fits inside a standard Meccano hole. Whenever it is necessary to insulate a bolt from a Meccano Strip, an Insulating Bush should be placed on one side of the Strip, with its shoulder inside a hole in the Strip, and an Insulating Washer on the other side; a 6 B.A. Bolt should then be passed through the two and secured by its nut in the ordinary way. In this manner the bolt is prevented from making contact with the metal of the Strip. This simple means of insulation is, of course, invaluable in Meccano model-building.

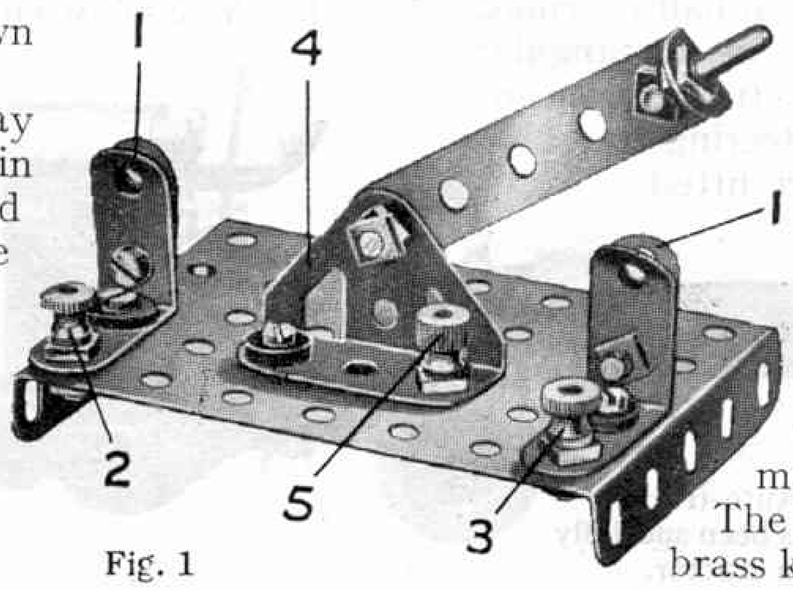


Fig. 1

The Terminal (No. 306) consists of a milled brass knob bored and tapped to fit the 6 B.A.

Bolts. Fig. 4 shows two terminals mounted on the shanks of bolts at 6 and 8. It will be noted that an Insulating Washer is placed under the terminal 6; an Insulating Bush is used on the other side of the plate, so that this terminal is insulated from the model. Terminal 8 is in metallic contact with the model.

Fig. 1 shows a two-way Meccano switch. In this the switch arm is attached pivotally to a Trunnion that is insulated from the base plate in the manner just described, and the two contact pieces 1 carrying the Terminals 2 and 3 are also insulated. Hence, by engaging one or other of the latter with the switch arm the electric circuit can be led from terminal 5 to terminal 3 or, alternatively, from terminal 5 to terminal 2.

Fig. 3 shows a 6 B.A. Bolt 5 used as the contact stud in a Meccano Morse key, or tapper. The bolt is insulated from the base plate, but the key 4 is in metallic contact with it. One wire is attached to the bolt 5 and another to the base plate, so that the circuit is completed whenever the bolt 8 of the key touches bolt 5.

The Coil Cheek (No. 309) consists of $\frac{1}{8}''$ fibre and measures $1\frac{1}{4}''$ square. An oblong perforation is cut in its centre, so that Meccano Strips can be passed through it, and four small holes are provided to admit wire. The object of the part is, of course, to facilitate the construction of large magnetic coils, such as that required in the Meccano Shocking Coil, which was illustrated and described in the March, 1928, *"M.M."*

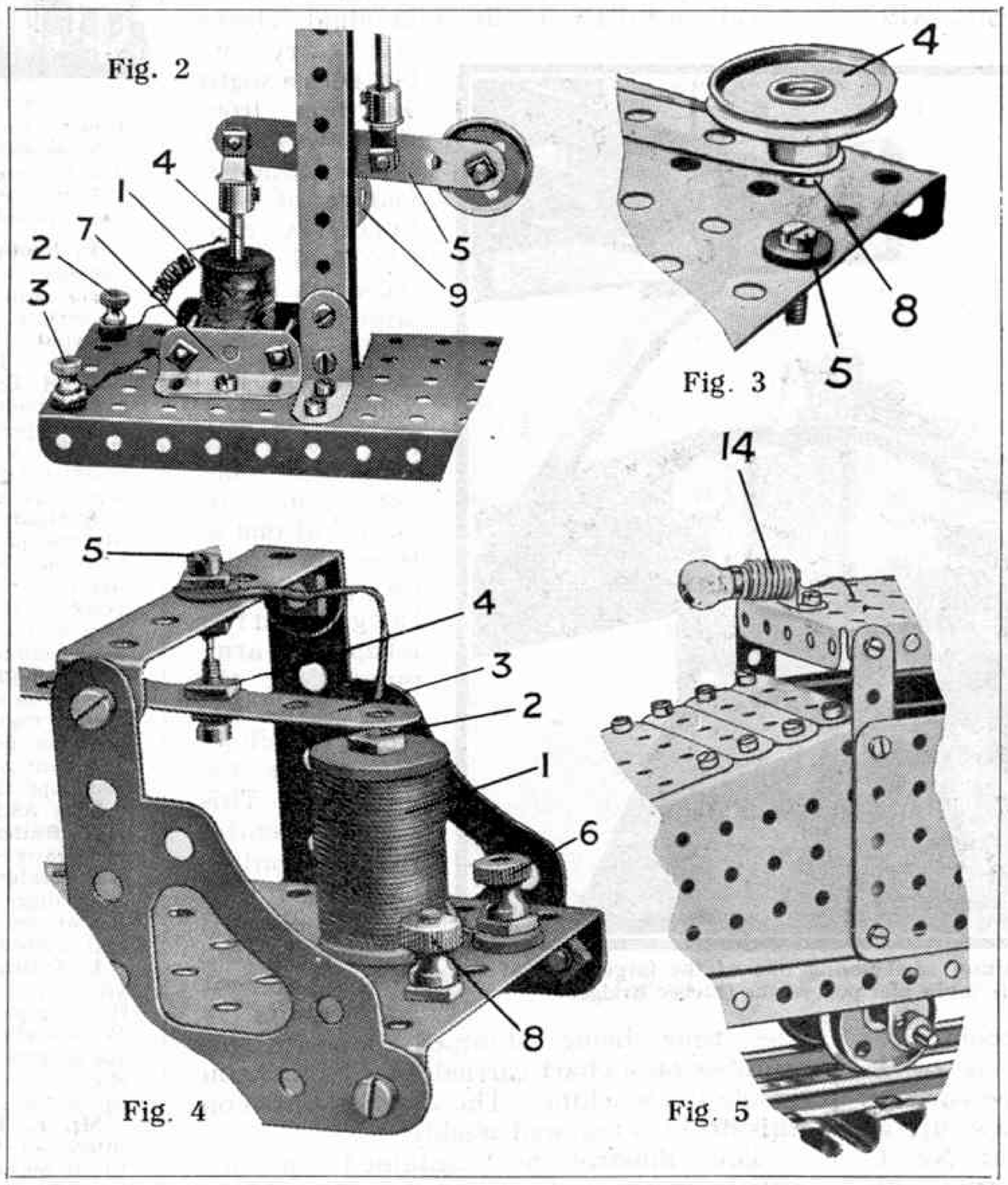


Fig. 2 Fig. 3 Fig. 4 Fig. 5

Illuminating Meccano Models

The Lamp Holder (No. 310) is designed to form a screw socket for the Meccano 6-volt Lamp (No. 311). Its end is of fibre and it should be secured to Meccano models as follows. A 6 B.A. Bolt is passed through the small perforation in its end, and then through a hole in a Meccano Strip, and an Insulating Bush is placed on the shank of the bolt so that its shoulder fits into the hole in the Strip. The bolt can then be secured by a nut or Terminal. When the latter is screwed up tight, the metal of the Lamp Holder will be in contact with the Strip, so that the electric current may be conducted to the lamp by attaching one wire to the 6 B.A. Bolt (the head of which presses against the contact in the end of the lamp itself), and another wire to the Meccano Strip.

Fig. 5 shows a Lamp and Holder mounted in the front of a model electric locomotive, the Holder 14 being bolted to an Angle Bracket. Current is led to the Lamp by an insulated wire slipped under the nut on the 6 B.A. Bolt by which the Holder is secured, and returned to the source of supply through the Holder itself and through the frame of the model.

As will be seen from the list of parts in Class T, there are four kinds of wire included in the Meccano Electrical Parts (Nos. 312-315). The 27 gauge Bare Iron Wire is intended for use when it is required to insert a resistance in an electric circuit, such as in the construction of electric speed controllers, etc. The 26 gauge Single Cotton Covered Copper Wire is usually employed in constructing electro magnets, bobbins, etc., although it can be used for ordinary connecting purposes. The 23 Gauge Copper Wire is intended for making all kinds of electrical connections in Meccano models, and the 22 gauge Bare Copper Wire is supplied for use where a conductor wire is required, such as in electric locomotives and similar models.

It can scarcely be necessary to give Meccano boys instructions on the subject of wiring their models. We should like to remind them, however, of the importance of the following. All connections should be made as tight as possible—that is, when connecting a wire to some part of a model it should not be merely twisted round a Strip, but secured by a nut and bolt. Insulated wire should never be allowed to rub against metal, else short circuits will quickly occur.

Another point to remember is the fact that wire exerts a certain resistance against the flow of the electric current, just as a water pipe resists the flow of water through it by the friction created between its walls and the moving liquid. In ordinary Meccano model-building, the resistance likely to be exerted by the wiring is negligible, especially if the Meccano 23 gauge Wire is used, but in exceptional cases where the current is directed over considerable distances, such as in Morse Telegraph Instruments, electric signals and indicators, etc., a considerable loss of current will result if thin conductor wire is used, and the Motor, bell, or whatever it is required to energise, will fail to function properly. The resistance in the conductor can, however, be decreased by increasing the diameter of the wire or, if a larger wire is not obtainable, by connecting additional lengths of wire in parallel with the first.

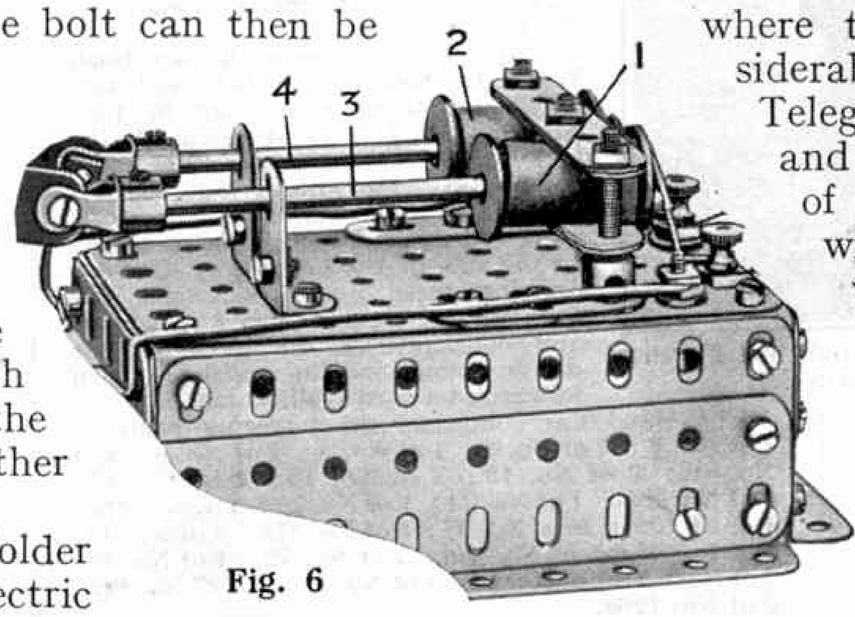


Fig. 6

H.R.C. Junior Section—(*Continued from page 233*)

the station and come to rest at the platform. The pleasure of being able to do this makes us repeat the performance several times, and thus enables us to make sure that we really have discovered how many turns we must give the key.

Next we try the locomotive with two coaches instead of three, and then with only one coach. Then a little time should be devoted to similar experiments with other rolling stock behind the locomotive, and over shorter distances. A little patience is required to carry through the trials, but finally they are completed, and we are now in a position to make the locomotive do exactly what is required of it.

Useful information of this kind should be noted down in a convenient place. For instance, a Meccano Engineer's Pocket Book may be used. Its pages are of squared paper and thus it is an easy task to set out the details in tabular form.

When the capabilities of our locomotive have been ascertained, operations of a more interesting character may be carried out. For instance we may draw up a simple timetable and despatch our No. 1 Special Locomotive with its train of Pullman coaches from the station at the prescribed time with the knowledge that at the end of its run it will glide into the station and stop at exactly the right place alongside the platform.

Meccano Boy Wins Distinction

The accompanying photograph shows Jack Sims, an enthusiastic Meccano boy who lives at Colorado Springs, U.S.A. A little time ago Jack became interested in wireless and built himself a Receiver with Meccano Parts. It worked so well that experts who examined it pronounced it perfect.

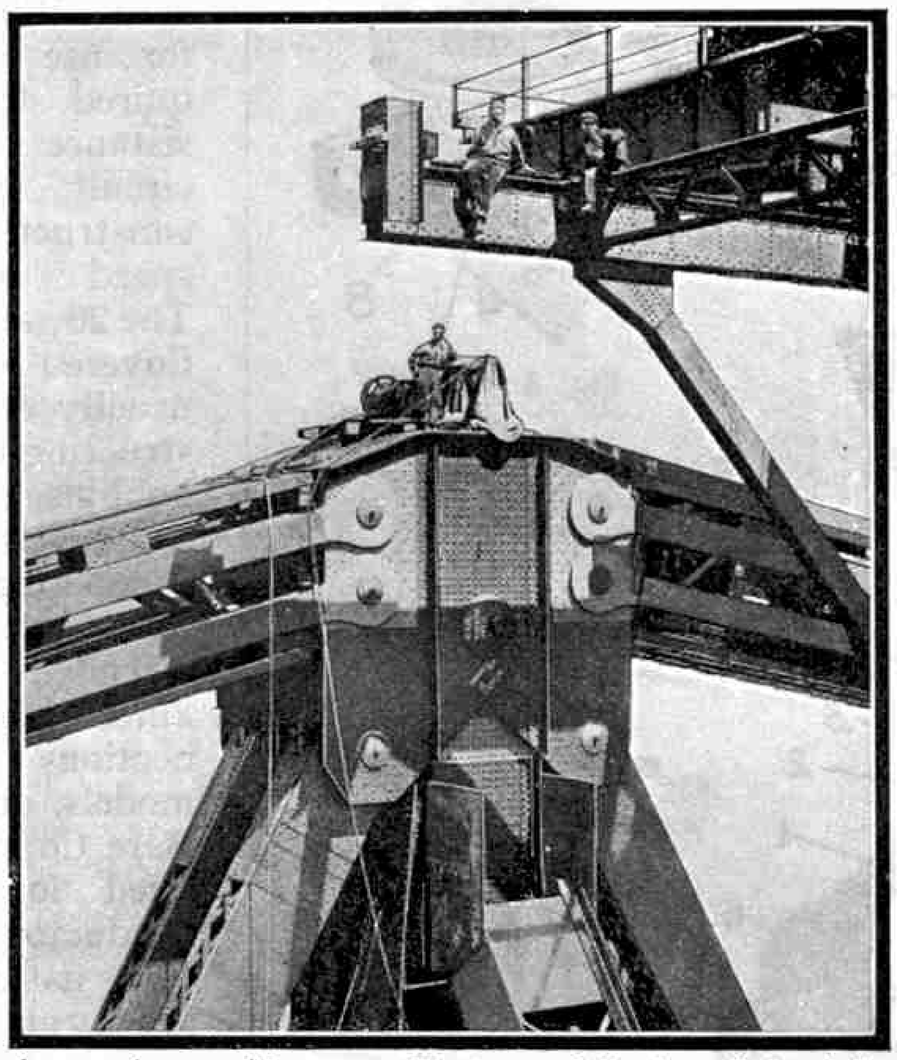
Jack tunes in generally on station KFFQ, but he can receive several other programmes as well. He writes that his Meccano Radio Set has given him and his friends a great deal of pleasure.

So great was the interest aroused by the receiver that the "*Colorado Springs Gazette*" printed a three-column article about Jack and his Meccano model. We congratulate Jack on his work and hope he will continue to derive great pleasure from his Meccano Outfit.

Jack Sims and his Meccano Radio Set.

Famous Inventions—(*Continued from page 199*)

used in some factories allows each clock to work under its own pendulum or spring, while an electrical control mechanism sets the clock "dead right" at every impulse. Under this scheme every clock has to be wound up in the ordinary manner and this might be considered a disadvantage. The system has the virtue, however, that if anything should go wrong with the electrical installation the individual clocks still carry on, but with a slight variation from the correct time.



A precarious position—assembling one of the large links at the top of the main pier post of the Quebec Bridge.

The principal feature of electrically controlled time recorders is the large front wheel containing 100 or 150 numbered holes. An employee times himself "on," "off," "in" or "out" at one of these machines by pressing a large radial plunger arm, pivoted at the centre of the wheel, in the hole opposite his number. This action operates the recording mechanism that is connected directly to the clock movement and results in the time being stamped opposite his number on a chart carried on a large drum inside the machine. The chart mounted on this drum is renewed weekly.

The illustrations contained in this article are reproduced by courtesy of The Gledhill-Brook Time Recorders Ltd. —JOHN MARSH.

New Meccano Models—

(*Continued from page 217*)

enjoyable outdoor recreation for many of our readers.

The frame of the car consists of a pair of 12½" Angle Girders spaced apart at the front by a 2½" Strip and at the rear by a 5½"×2½" Flanged Plate secured to the Girders by Flat Brackets. The rear wheels, which consist of 3" Pulleys, are mounted on a 3½" Axle Rod that also carries a ½" Pinion, and the rear axle is journalled in Flat Trunnions bolted to the side Angle Girders. A second 3½" Axle is journalled directly above that forming the rear axle, and carries a Bush Wheel 4 at each end, and a 57-teeth Gear Wheel 5 that engages with the ½" Pinion on the rear axle.

A 5½" Strip 3 is pivoted to each Bush Wheel by means of a bolt and two nuts, and these Strips are in turn connected to further 5½" Strips 1, the lock-nut mechanism (S.M. 262) again being used. Each of the 5½" Strips 1 is pivoted by a standard bolt to a Reversed Angle Bracket that is bolted to the side of the chassis, so that by drawing these Strips backward and forward, the Gear Wheel 5 is rotated and consequently the back axle is driven round, and the model propelled forward in a most realistic manner.

The Hand Car comprises the following parts:—4 of No. 2; 1 of No. 3; 1 of No. 5; 2 of No. 8; 4 of No. 10; 2 of No. 15; 1 of No. 16; 1 of No. 17; 4 of No. 19b; 1 of No. 24; 1 of No. 26; 1 of No. 27a; 4 of No. 35; 26 of No. 37; 5 of No. 37a; 4 of No. 38; 1 of No. 45; 1 of No. 48a; 1 of No. 52; 1 of No. 59; 2 of No. 62; 1 of No. 63; 1 of No. 111c; 2 of No. 125; 2 of No. 126a.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

B. Booth (Ashton-under-Lyne).—By this time we suppose you will have seen the new Hornby Double Track, and we should like to hear your opinion of it. It certainly adds enormously to the possibilities of a layout. We are glad that you consider the "*M.M.*" articles "100 per cent. excellent."

G. M. Boyes (Lee, London, S.E.).—You have certainly made good use of the short time you have had your typewriter, and we congratulate you on the results. Your suggestion that the smallest office boy is on certain occasions chastised with a 12½ in. Strip is ingenious, but not in accordance with the facts!

B. Stuart (Armagh).—We are sorry to hear that you are not proposing to enter our model-building competitions because you think nothing ingenious is likely to come out of your brain. This is the wrong point of view. Have confidence in yourself and set to work on a model, and we are sure that you will find ideas coming to you as you build.

F. S. Kydal (Arbroath).—We are surprised that you have been so long in writing but we do not intend to start "raging!" This is certainly a case of better late than never because your letter is very interesting and your good opinion of the "*M.M.*" very welcome. We hope that you and your father will soon make "King Asthma" take to his heels!

H. Rutter (Consett, Co. Durham).—You will have been interested to see that your article on Howns Gill Bridge was used on the "Readers' Page." Your suggestion for a "Queries" section is interesting, but we cannot adopt it at present as readers' questions and answers would take up far too much space.

L. O'Brien (Johannesburg, S.A.).—We hope that your wish to see the Sydney Harbour Bridge when it is completed will be realised. After all, why not? We already have published short articles dealing with the progress that has been made with the bridge, and it will be very interesting to watch the gradual building-up of the great arch.

Mr. E. T. Myers (Illinois, U.S.A.).—You will be interested to note that recently we devoted space to photography. You will understand, we feel sure, how difficult it is for us to find room for articles on all the subjects that our readers would like, and at the same time still to keep Meccano and Hornby Trains the principle feature of the "*M.M.*" We have some good articles in store on scientific topics.

P. E. Lopresti (Warley, Essex).—"My best friend tells me the "*M.M*" is all trash. I have the greatest difficulty in refraining from hitting him." This is a terrible tragedy, Peter, and we quite sympathise with your feelings. But continue to treat the culprit kindly and we feel sure that you will soon convert him to different views!

A. Brookes (Hawera, N.Z.).—We were glad to hear from you again, Arthur, and enjoyed reading your letter. Yes, we think that Britain will regain the Atlantic record and will add it to the other speed records already held.

I. Takahashi (London).—"I am a Japanese reader of the "*M.M.*" and always enjoy reading it." We hope that you will continue to enjoy the articles, and you will be interested to know that we have many readers in your native country. We are glad to learn that your prize arrived safely.

R. S. Young (Southsea).—You were very fortunate to have a holiday of six months in the Mediterranean. It was a wise precaution to have your "*M.M.*" forwarded to you and we are not surprised to hear that the engineer officers of H.M.S. "*Barham*" enjoyed reading it—the Navy is quick to recognise a good thing!

P. Harris (Felixstowe).—Your father tells us that he bought your first Meccano Set when you were two months old, and we have been wondering if this constitutes a record! We shall have to revise our "Best Age" slogan to read: "The Younger the Better!" We are not surprised to learn that you built small trucks and crawled around the floor with them before you could walk.

W. Livingston (Dalbeattie).—We are sorry to learn that you have been run over by a bus and compelled to spend a month in bed, but delighted to learn that during that time your great comfort was the "*M.M.*" We feel rewarded for our efforts when we read letters such as yours.

E. Hemery (Cirencester, Glos.).—Your suggestion in regard to music will certainly have our consideration, but it is difficult to find room for articles on all the subjects that our readers would like.

In this page, month by month, we reply to suggestions regarding improvements or additions to the Meccano system. We receive many hundreds of these suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Suggestions submitted for consideration in this section must be written on a separate sheet of paper and the name and address of the sender must appear on each sheet used. Envelopes should be addressed to "Suggestions," Meccano Ltd., Binns Road, Old Swan, Liverpool.

GUN BARRELS.—We agree that the introduction of gun barrels would increase the realism of model Meccano artillery but the chief objection to the adoption of your idea is that such a large number of sizes and types of guns are constructed in Meccano that a very large range of barrels would be necessary to meet all requirements. Under the circumstances, therefore, we consider it better to employ existing Meccano parts, when it is required to represent this article. For example, Meccano Axle Rods can be used in very small models, while if a larger gun barrel is required a number of Couplings can be mounted on an Axle Rod, thus giving the necessary increase in diameter. In very large models, a number of Sleeve Pieces joined end to end to form a long tube make an excellent representation of a gun barrel, or several Angle Girders can be bolted together to represent this part, as in the Meccano Spring Gun described in the "*M.M.*" for December, 1928. (*Reply to Roland Vigier, Le Havre*).

A PULLEY BLOCK FALLACY.—Your proposed alteration to the Meccano Pulley Blocks is interesting but, we regret to say, impracticable for technical reasons. The idea that the lug of a pulley block should be placed central with respect to the sides of the block, is a common fallacy which the inspection of an actual block will at once disprove. Fig. 1 shows a single sheave block having the sides of the block bent inward at the top so as to provide a central lug (incorrect), while Fig. 2 illustrates the Meccano Single Pulley Block with lug at side (correct). When using the pulley shown in Fig. 1 on a crane for instance, the cord will generally be placed over two pulleys at the jib head in addition to the one on the block, and consequently the length connected to the lug will cross the other cords, and there will thus be a tendency to twist. The trouble will of course be accentuated considerably when a two or three sheave pulley block is employed. When using the Meccano Block (Fig. 2) the separate lengths of cord comprising the complete pulley system are all parallel to each other, and free movement is thus ensured. (*Reply to A. J. Hunter, Preston, Victoria*).

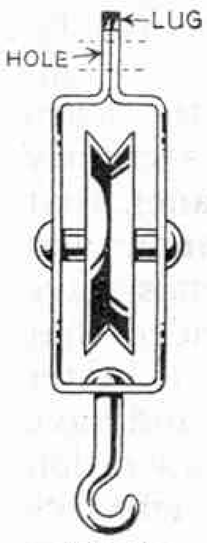
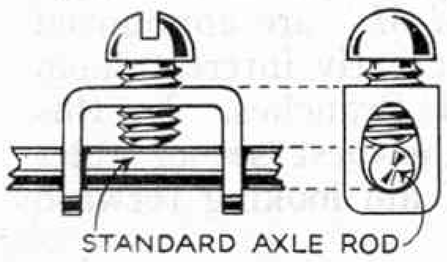


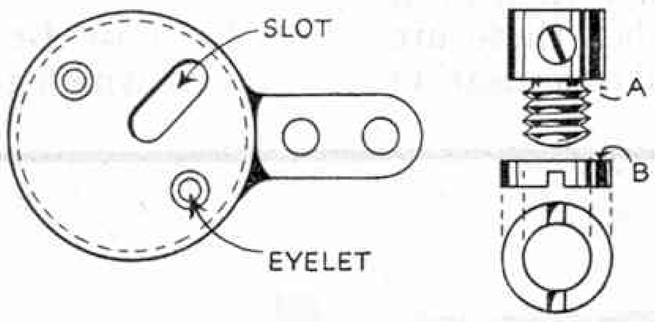
Fig. 1

INSULATED SCREWDRIVER.—We were interested in your suggestion that the shaft of the Special Screwdriver (part No. 36b) should be covered with celluloid, so that the tool could be used in electrical models without the danger of "shorts" being caused by the metal blade. The relatively few number of electrical models that are built, however, would hardly justify this addition, as the fitting of a celluloid sleeve would of course necessitate an increase in the cost of the complete tool. Why not fit a length of cycle valve tubing over the shaft of your driver? (*Reply to R. L. Booth, Dublin*).

SCREW CLIP.—Your suggested form of screw clip which we illustrate below is quite ingenious, but it would not be suitable for inclusion in the Meccano system. A clip of this type would not provide as good bearing surfaces as the present Meccano Collar owing to the fact that the action of rotating the set-screw so as to lock the clip to a Rod would tend to buckle or bend the sides of the U-pressing which forms the bearing walls. In matters of cost your suggested clip might be a little cheaper to produce than the existing Collar, but the difference would be very slight. Furthermore, the tapping of the threaded hole in the horizontal portion of the pressing so as to admit the set-screw, would be a practice far below the standard normally employed in the Meccano system. We would remind you that when cost is an essential factor, the Meccano Spring Clips used in conjunction with Washers, form quite good bearing stops in light machinery. (*Reply to K. L. Green, Southsea*).



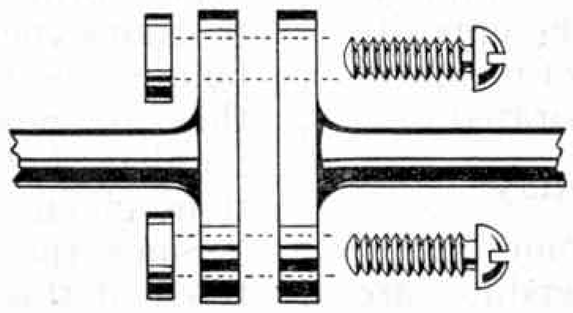
REVISED ECCENTRIC.—To be able to adjust the Triple Throw Eccentric so that an indefinite number of "throws" could be obtained between certain limits, might be useful in certain models, and your proposed method of doing this is quite ingenious. As shown in the accompanying sketch, the three tapped bosses fitted to the existing Eccentric would be removed from the sheave, and a slot cut in the sheave as shown to admit a brass bush A having a plane bore and transverse tapped hole and set-screw, so that a standard Axle Rod could be slipped in and held in place. The



bush itself would be secured in any required position in the slot by means of a locking ring B that would be screwed on to the threaded outer surface of the Bush A. The chief objection to this idea is that it would not provide a positive connection between the sheave and the bush, and there would be a tendency for the latter to work loose and slip when any considerable force was applied to the eccentric shaft. Perhaps readers can think of a means of overcoming this difficulty? Suggestions will be appreciated. (*Reply to R. Timmins, Hayes*).

INTERNAL TEETH GEAR.—The introduction of an internal gear or "ring" wheel is now receiving the attention of our production staff and a definite announcement regarding this part will be included at the earliest possible moment. (*Reply to W. Baker, Riverside, Calif., U.S.A.*).

FLANGED SHAFTS.—We are afraid that a series of rods of different lengths having perforated flanges cast or welded to them at each end (see sketch) would not be practical for inclusion in the Meccano range. We are well aware that shafting of this type is often used to couple the propeller of a ship to the crankshaft of the engine, and in other types of transmission shafting where a large torque is to be transmitted, but you must remember that parts of this type are units designed for a special engineering use and they



do not come within the range of adaptability and utility necessary in the Meccano system. Furthermore, as a very great torque is never required to be transmitted in Meccano machinery, the advantages of the flange would not be felt, and standard axles fitted at each end with a Bush Wheel should serve equally well, especially if two set-screws are screwed into each of the bosses of the Bush Wheels. (*Reply to C. A. Lea, Birmingham*).

LOCOMOTIVE CHIMNEYS.—We were interested in your idea that we should introduce correct model steam locomotive chimneys provided with lugs or some other means of fixing to a model. From opinions received from a number of model-builders in the past, it does not appear that there would be much demand for these parts if introduced, constructors generally using the Chimney Adaptor, Flanged Wheels or other existing accessories. We shall be pleased, however, to hear from any readers who hold views contrary to the above and the general consensus of opinion will be most useful in deciding on our future policy in the matter. (*Reply to R. S. Miller, Glasgow*).

PIPE SECTIONS.—We have inspected your design for new Meccano parts and find these interesting. Your proposed metal tubes, or pipes, fitted at each end with circular perforated flanges, so that they might be bolted to each other, are quite novel, but we are afraid that they would be of little use in the Meccano system. As has been mentioned previously in these columns, Meccano parts are quite unsuitable for use with water or liquids of any kind and your suggested tubing would not therefore form a practical addition. We are aware, however, that there would be a number of applications for sleeves or tubes that could fit over the standard axles and be employed in a somewhat similar manner to the Socket Coupling in gear boxes, etc., and we are therefore making a note of the idea for future reference. (*Reply to Guy Brunet, Versailles, France*).

4-6-VOLT CONVERSION.—Although it is possible to set the armature of the new Meccano 6-volt Motor in motion by coupling it to a 4-volt Accumulator, very little power and speed will be developed and a 6-volt unit should always be used so as to obtain the maximum efficiency from the Motor. If you already possess a 4-volt Meccano-Seco Accumulator, there is no need for you to buy a new one of the 6-volt pattern, as the 4-volt unit can be converted quite easily by coupling it in series with a 2-volt cell. The red or positive terminal on the 4-volt unit should be connected to the black or negative terminal on the 2-volt cell by means of a length of heavy gauge wire. The remaining black and red terminals should then be coupled to the Motor terminals. A special 2-volt Meccano Accumulator for making this conversion costs 10/6 and may be obtained direct or through your dealer. (*Reply to C. Stokes, Finchley, N.3*).

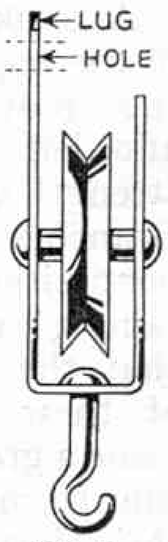
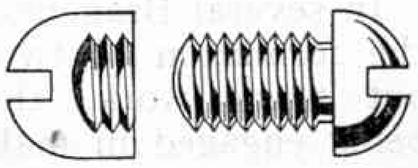


Fig. 2

MECCANO SAW.—We do not consider it advisable to introduce special saw blades for use in Meccano models. The only model that we can call to mind where special saw blades would be of use is the Log Saw (Super Model No. 10). In this model, Rack Strips have been used to represent the actual saws, and these serve their purposes quite well, as it is obviously impossible to put the machine to practical use. It might be possible, however, to cut very thin fretwood or cardboard by substituting Hack Saw Blades for the Rack Strips, and we suggest that you experiment with this idea in building your model. At the same time, we would point out to you that the Circular Saw (part No. 159), is a compact and practical accessory that may be used for cutting thin wood if suitably driven by the Meccano Electric Motor, or other source of power. (*Reply to D. Capelle, Lille, France*).

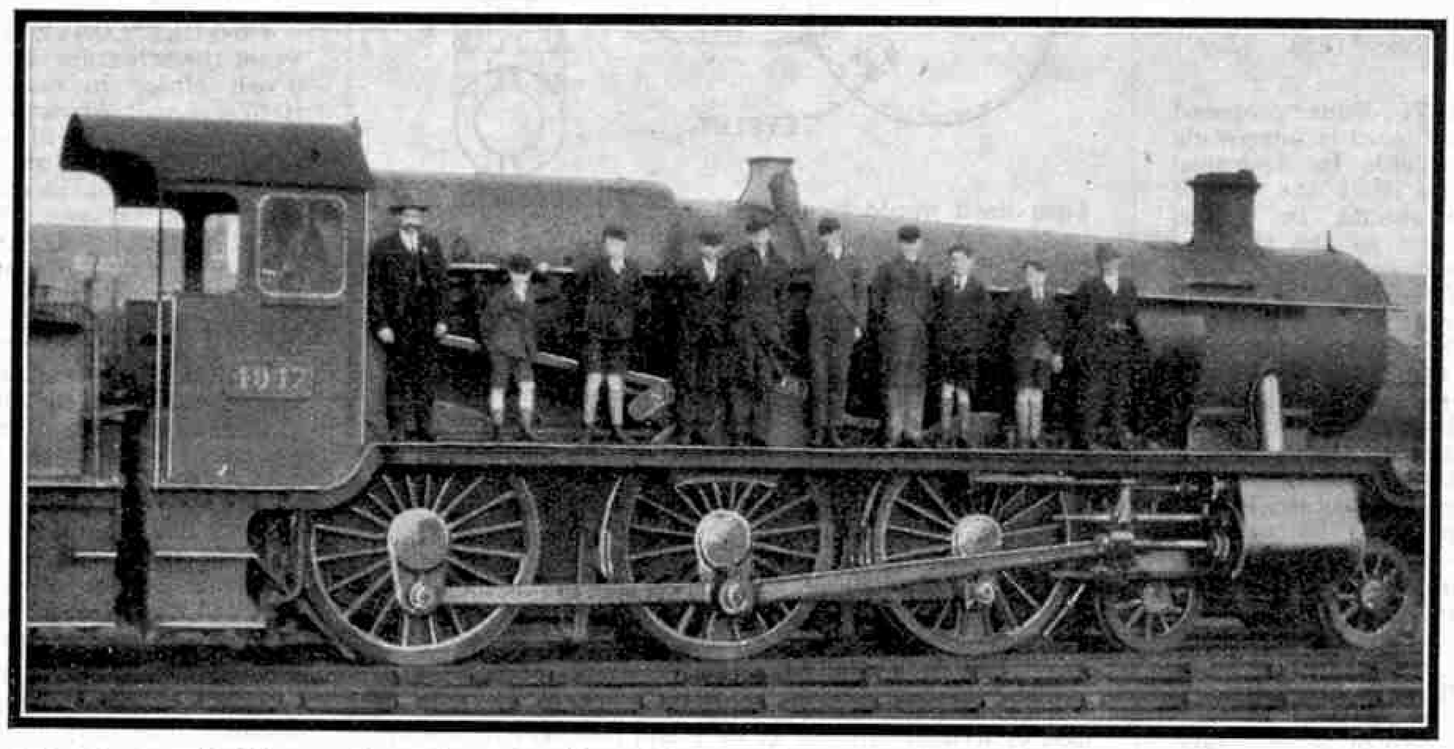
NEW NUT.—We are pleased to hear that you consider the new style of Meccano bolt such a great improvement, and we were quite interested in your suggestion concerning the Meccano nuts. Your scheme (which we illustrate herewith for the benefit of other readers) would be to discard the existing pattern of nut and in its place employ a "bolt head" nut similar to the sketch. This would consist of a short circular piece of metal having a tapped hole cut in it for half its length and slotted to take a screwdriver as shown. The finished article would certainly be much neater than the existing pattern of nut, but it would not be so adaptable, the number of strips or plates, etc., that could be secured together being dependent on the length of the internal threaded portion. The use of a nut of this type would also prevent the "lock-nut" and other mechanisms being employed. In the case of such a vitally important unit as the nut, we think it best to sacrifice artistic value in order to provide the maximum of adaptability and mechanical utility. We regret therefore that onhe strength of the above we cannot give any further attention to your idea. (*Reply to D. C. Miller, Stoke Newington*).



Wonderful Growth of H.R.C.

Since its foundation very little more than a year ago the Hornby Railway Company has made amazing progress, and its popularity among miniature railway enthusiasts is increasing daily. At the beginning of the present year the number of members had reached the very satisfactory figure of 11,000. Since then even greater interest has been shown, and to-day there are more than 15,000 members of this wonderful organisation of Hornby Train owners.

A striking proof of the popularity of the movement is afforded by the strength of the local Branches. The opportunities for obtaining more fun that the formation of these gave became a great attraction to members of the Hornby Railway Company immediately after the announcement of its formation. Branch after Branch was established, and an extraordinary large proportion of these quickly became eligible for incorporation with the parent Company. Now the century has been reached, and on the opposite page is reproduced a photograph of a group of members of the hundredth Branch to become incorporated.



Members of Gloucester Branch, No. 26, on the running plate of G.W.R. No. 4947, "*Nanhoran Hall.*" During their visit to the locomotive shed where this photograph was taken, their "prowl around" led them to explore the interior of the firebox.

Keeping Branch Members Busy

From Branches that already have become firmly established splendid increases in membership are reported, and in certain cases these have been so large that some difficulty has been experienced in keeping every member busy in track work! Naturally all wish to take part in these operations, and where the numbers have increased very quickly members are apt to crowd around the layout. This is the case even where a larger track is built up, and the temptation to help on with the good work that confronts onlookers occasionally leads to accidents and to a certain extent causes track work to be haphazard and confused.

In several Branches this problem has been solved by the formation of two sections. Each in turn carries out track work, the remaining section meanwhile being engaged in making accessories such as retaining walls, cuttings and embankments. This plan ensures that every member gets a fair share of track work. It also has the advantage that those not actually running trains are doing something to improve the layout and preparing for further realistic railway operations on a more extensive scale.

Prevention of Track Accidents

In most Branches a fund has now been established out of which to pay for the replacement of locomotives or rolling stock accidentally damaged while in use on the Branch track, members contributing small sums weekly. I have been interested to learn from the secretary of one Branch that the Chairman and other officials have wisely decided that prevention is better than cure, and have put into operation a very effective scheme to prevent damage of this kind. Rules that must be followed in handling material and operating trains have been drawn up and copies printed in large type now hang in prominent positions near the layout. There they are always before the members of the Branch at a time when they are most needed, and they have now become so familiar that members automatically obey the instructions given on them.

Since the scheme was introduced accidents on the track of this particular Branch have decreased both in number and in seriousness, and the general condition of the rolling stock has been maintained in a very satisfactory manner. The instructions have been compiled from the useful information and advice given on the H.R.C. pages of the "*M.M.*" and in the various leaflets and booklets issued to members.

No difficulty would be experienced by the officials of any other Branch in compiling a similar list, and on page 241 of this issue of the "*M.M.*" are announced details of a competition that will greatly interest them and indeed all members of local Branches. In this contest prizes are awarded for the best set of rules for safe working submitted, and I am looking forward to a very large entry.

Branch Notes

LENTON SANDS.—At one meeting three trains were involved in a collision. Interesting events followed, the case was brought before a court of enquiry, the secretary acting as Board of Trade Inspector. One driver was severely reprimanded and another cautioned for not keeping at the prescribed distance from the locomotive in front. Secretary: F. W. Byron, 125, Harrington Drive, Lenton Sands, Nottingham.

CHISWICK.—Wood has been purchased out of Branch funds and a raised track is being constructed. Two members who have already distinguished themselves as carpenters have been given charge of this section of Branch work. Locomotive speed and power tests have been held with very interesting results. Secretary: C. P. Griggs, 25, Elliott Road, Chiswick, W.4.

GLOUCESTER—Successful outdoor track operations were held, during which electric light signalling was introduced. Two very interesting lectures were given by railway officials. One was on "*The Locomotive*" and included a description of Westinghouse and vacuum brakes. The other was on "*Signals*," and was very comprehensive, dealing with all types of signals, interlocking frames, track-circuiting, etc. Secretary: G. T. Clark, 66, Falkner Street, Gloucester.

BLACKPOOL (SOUTH SHORE).—A much larger club room has been secured and more extensive trackwork is now carried on. A Hornby No. 2 Special, L.M.S. Compound, has been added to the stock and accomplishes useful work at the head of a Pullman express train. Secretary: R. V. Bentley, 9, Bamton Avenue, Watson Road, South Shore, Blackpool.

EXHALL.—Track work is very efficiently carried out, timetable working being strictly followed. One member controls the points and signals from the cabin while others run the locomotives. At most meetings as many as twenty-five elaborate train movements are run through. The track is being electrified in order to accommodate Hornby Electric locomotives. Secretary: M. C. C. Melville, Exhall Vicarage, Nr. Coventry.

NEW EARSWICK (YORK).—After careful track tests and a consultation between the directors it was decided to relay certain parts of the Branch track. Two stations were re-built and the track relaid, careful attention being given to the screwing down of the points. Tests showed that the operations had been successful, locomotives travelling at high speed without undue rocking over the points. The main line is being ballasted throughout with chicken grit. Secretary: Samuel Bruce, 67, Rowan Avenue, New Earswick, York.

SPRINGBOIG (GLASGOW).—Many new members have been enrolled and the already considerable stock of the Branch greatly augmented. More ambitious plans for layouts can now be experimented with. Secretary: David Ross, 86, Hermiston Road, Springboig, Glasgow, E.2.

PORTSLADE-BY-SEA.—A debate to decide which railway the Branch should represent ended in a decision in favour of the L.M.S. This will necessitate the recolouring of several of the locos. Construction of lineside features continues, one member designing scenery while others build bridges, cranes, etc., from Meccano parts. Secretary: H. G. J. Flowers, 38, St. Aubyns Road, Portslade-by-Sea.

ST. CHADS (WITHINGTON).—A visit was paid to the Longsight Engine Sheds, the members being taken round the coaling stage, turntable, repair shops and running sheds. The working of a water pick-up was also demonstrated. Secretary: R. Mackley, 24, St. Chad's Road, Withington.

The first century! Members of the Ashleigh (Bexley) Branch, Chairman, Mr. F. W. Harmer, A.M.I.C.E., Secretary, A. F. C Harmer. This was the hundredth Branch to become incorporated with the Hornby Railway Company.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership, and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

AUDENSHAW—Lewis Millar, "Briarfield," Elmfield Road, Audenshaw, Nr. Manchester.

BEDFORD—H. M. Darlow, 1, Burnaby Road, Bedford.

BLACKBURN—J. West, 3, St. Andrew's Street, Blackburn.

CHORLTON-CUM-HARDY—G. M. P. McKellan, 497, Wilbraham Road, Chorlton-cum-Hardy.

COLNE—Jack Cox, 26, Atkinson Street, Colne.

DOLGELLEY—A. Owen, "Llys Owain," Dolgelley.

EXMOUTH—E. Nunn, "Addicombe," Windsor Square, Exmouth, S. Devon.

GT. YARMOUTH—V. A. Frost, 30, Century Road, Southtown, Gt. Yarmouth.

HOVE—K. B. Stump, 17, Windlesham Gardens, Hove, Sussex.

KEIGHLEY—A. Booth, 29, Aireville Street, Utley, Keighley, Yorks.

LEICESTER—H. S. Bevans, "Gracedieu," Bankhart Avenue, Leicester.

LEICESTER—H. Mansfield, St. Albans, Westminster Road, Stoneygate, Leicester.

LITTLE SUTTON—A. Wilkinson, 11, Queens Road, Little Sutton, Wirral.

LUTON—S. Hewson, 38, Beechfield Road, Lansdowne Road, Luton.

MAIDSTONE—A. A. Smith, 348, Loose Road, Maidstone, Kent.

NETHERFIELD—J. Bingley, 1, Matlock Street, Netherfield, Notts.

NEW BARNET—Brian G. Brockis, "Runton," Clifford Road, New Barnet.

NEWMILLERDAM—Gilbert Greenall, "Lake Side," Newmillerdam, Nr. Wakefield, Yorks.

NEWPORT, MON.—R. V. Allbright, 2, Palmyra Place, Newport, Mon.

POOL-IN-WHARFEDALE—Oswald Tankard, Fountain Valla, Pool-in-Wharfedale.

MAIDENHEAD—J. A. Owen, "Windrush," Furze Platt, Maidenhead.

OVERSEAS

ARGENTINA—Sr. don Francisco Gallo, Calle No. 10, Berazategui, Buenos Aires.

ARGENTINA—Ronnie Hurst, Juramento 1903, 4th Floor "A," Buenos Aires.

AUSTRALIA—W. Jamieson, 92, Osborne Street, Williamstown, Victoria, Australia.

FRANCE—N. Franco, 56, rue Lafayette, Paris.

SOUTH AFRICA—N. Lupton, 115, St. John's Street, Bloemfontein, O.F.S.

Further H.R.C. Incorporated Branches

96. DANE COURT SCHOOL (PYRFORD)—T. Colclough, 73, Burton Court, Chelsea, London, S.W.3.
97. FIRST EDINBURGH—A. McKerrell, 64, Argyle Crescent, Portobello, Edinburgh.
99. WEST BERGHOLT—Reginald Hart, Old Rectory, West Bergholt, Essex.
100. ASHLEIGH (BEXLEY)—A. F. C. Harmer, "Ashleigh," Manor Way, Bexley, Kent.
101. WOODBOROUGH (NOTTINGHAM)—C. P. Foster, Woodborough Manor, Nottingham.

OVERSEAS

95. KEW (AUSTRALIA)—I. H. Chenoweth, 18, High Street, South, Kew, Victoria.
98. SOUTH KOGARAH—H. M. Walsh, 220, Prince's Highway, Kogarah, Sydney, Aus.

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

Hornby Railway Company

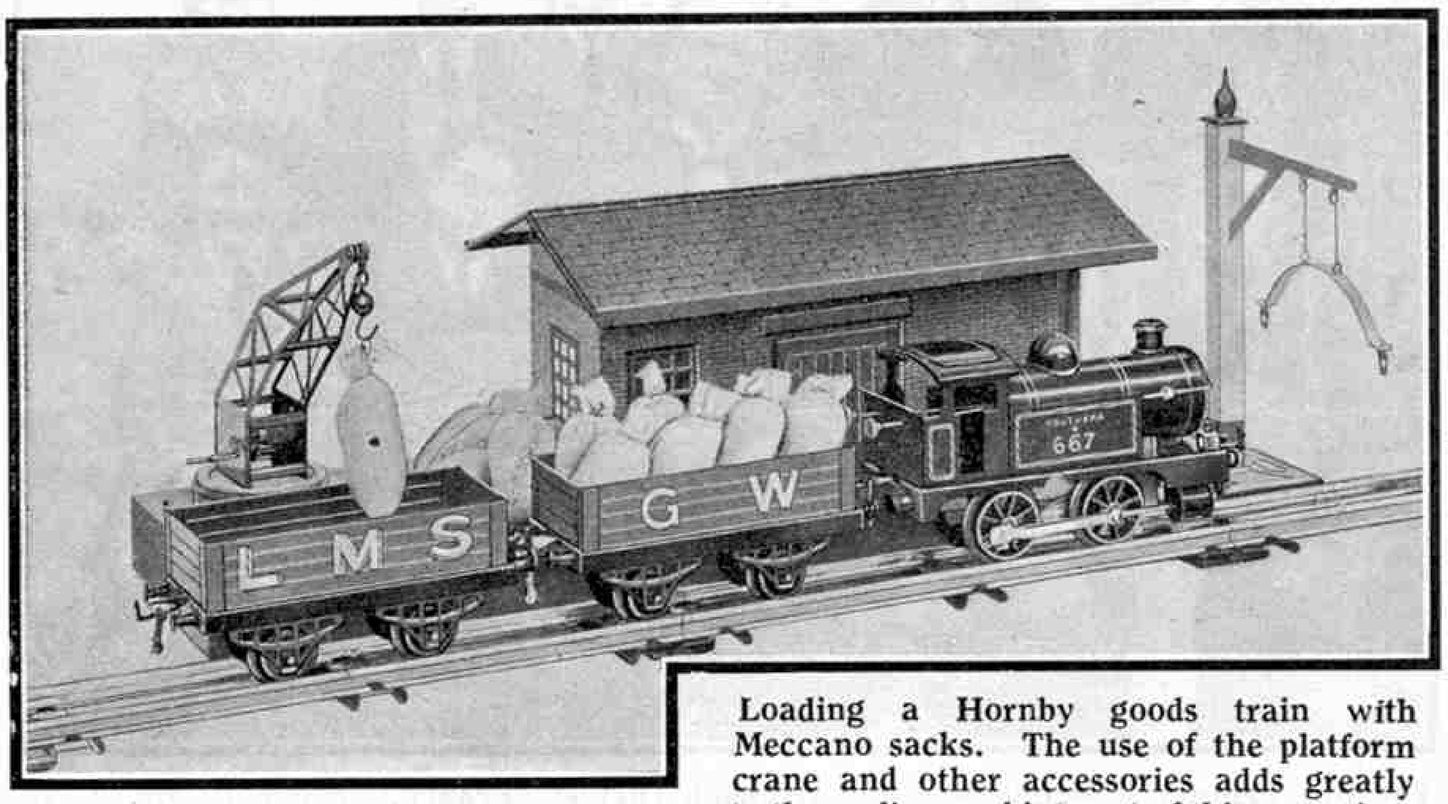
JUNIOR SECTION

XV.—Extending a Simple Layout

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

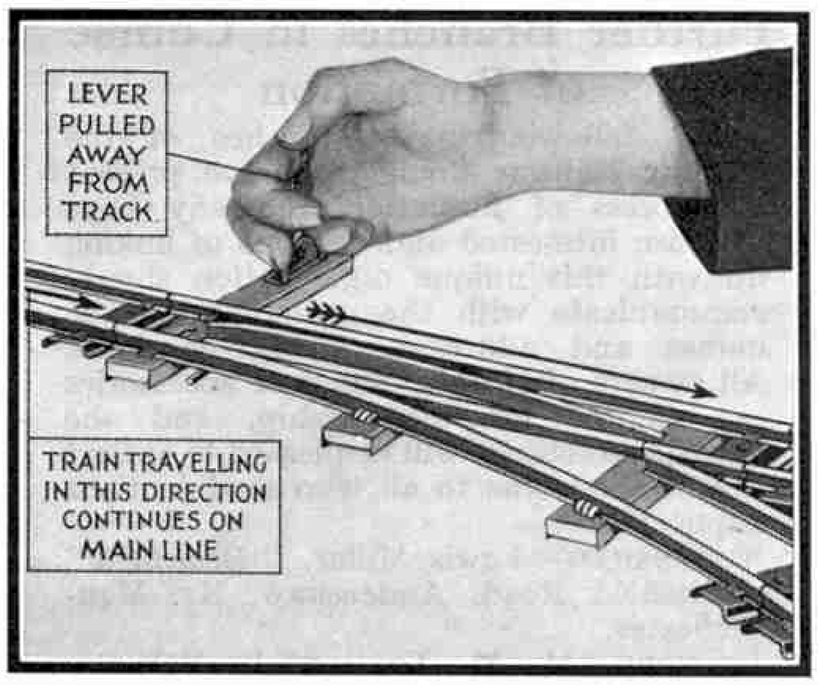
LAST month we dealt with the elements of model railway operation in order to enable beginners to commence the hobby in the best possible manner. Those who have followed the directions given will have found no difficulty in running their Hornby trains at a satisfactory speed round a simple oval track, and also will have the satisfaction of knowing that their locomotives and rolling stock are being maintained in condition to give good service.

Running a No. 1 Special Pullman Set round the track supplied is an occupation that may eventually become monotonous, however, and very soon even the youngest enthusiast longs to carry out more ambitious operations similar to those that he has seen performed on real railways. There is no difficulty in satisfying such a longing. Perhaps this is most easily done by extending the track. The mere addition of rails is scarcely sufficient, for the only effect is to increase the length of run available. What we are searching for is realism and variety, and fortunately the employment of points enables us to plan operations of an extremely interesting character.



Loading a Hornby goods train with Meccano sacks. The use of the platform crane and other accessories adds greatly to the realism and interest of this operation.

The purpose of points is to enable a train to be switched from one track to another. They consist of two movable rails called "switch blades," or "switch tongues," which are placed on the inner side of running or "stock" rails. The switch blades are pivoted in the centre and may be moved from side to side by means of a rod operated by a lever. In one position of the lever the rails are set so that the direction of the train passing over the points is not affected. In this case the lever is pulled away from the track. When it is pushed towards the track, however, the curved rails of the point are brought into line with those of the main track, and a train passing over the points then is switched in the new direction.



Right hand points set to allow a train to continue on the main line.

The simplest forms of ordinary points are of two kinds, called respectively right-hand and left-hand points. The former divert a train to the right and the latter to the left.

Let us suppose that we have acquired a pair of points, one right-hand and one left-hand, and that in addition we have obtained an even number of straight rails with which to extend the oval layout dealt with last month. The first step is to disconnect the six curved rails on one end of the track and to fix the points at the ends of the semi-circle that these make, care being taken that the curved rails of the points are within the track. We than add the extra straight rails to the straight portions of the points, equal numbers of rails being placed at the two ends, and finally connect these with the straight rails of the original layout.

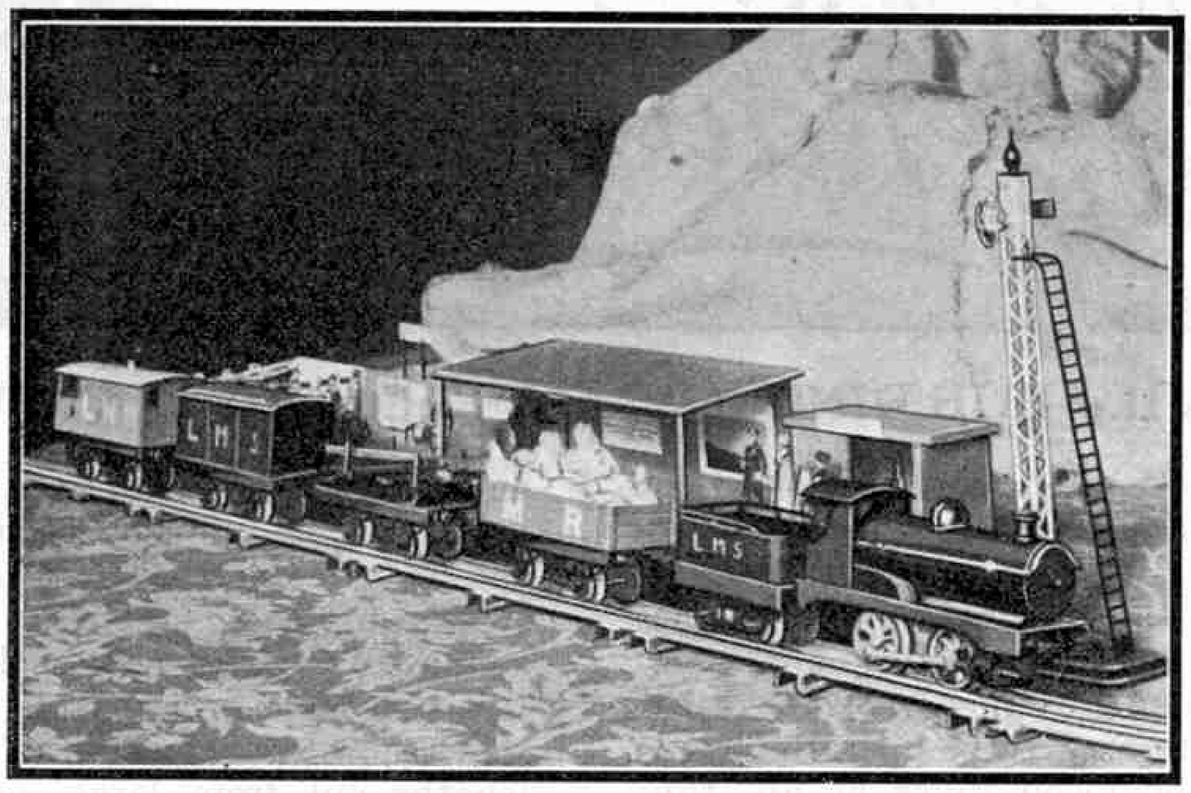
When we have done this we find that we have an oval track with longer straight portions and with short lengths of curved rail bent towards the interior of the layout. It will be found that four curved rails will be of sufficient length to fill the space between these short lengths, and the addition of these gives us the track shown in Fig. 1 on the opposite page.

It is easy to see that by these simple alterations we have greatly increased the amount of fun that we may obtain. We now have two tracks round each of which we may run trains. By doubling the number of tracks we have more than doubled the number of available runs, however, for we may start a train on a straight portion of the layout, allow it to make a circuit of the outer track, and switch it on to the inner track before letting it come to a stop once more at the station.

Success in carrying out the operations possible on such a layout depends very largely on careful and intelligent use of the points, and the beginner should pay as much

attention to them as to his locomotives and rolling stock. He should see that the switch rail fits quite close to the stock rail, for if it does not the wheel flanges of his locomotive may get between the switch blade and the stock rail, or may strike and mount the blade. The points should never be set by pulling at the end near the "frog," as the junction of the straight and curved rail is called, for this is sure to strain the blades and make them unserviceable.

Another point of importance is that points should not be oiled, even if they appear to be stiff. If a little difficulty is experienced in moving them this probably means that they will remain as set, whereas if oiled they are liable to become too free, and to slip when a train is passing over them. This probably would result in derailment. A little practice will soon enable the beginner to become an expert in point manipulation, and if he takes care to steady the base by means of three fingers, using only the thumb and first finger to operate the lever, he will be able to make the necessary changes quickly and easily without disturbing the run of the train.



The Hornby No. 1 Locomotive has backed on to the goods train, and is ready to pull out when the signal shows "line clear."

After a layout such as that described has been built up and we have learned how to change the points quickly and easily, the next step is to plan out operations of an interesting character. Quite good fun may be obtained by simply running a train around the oval and circular portions, switching from one to the other as desired, and at the same time this will give good practice.

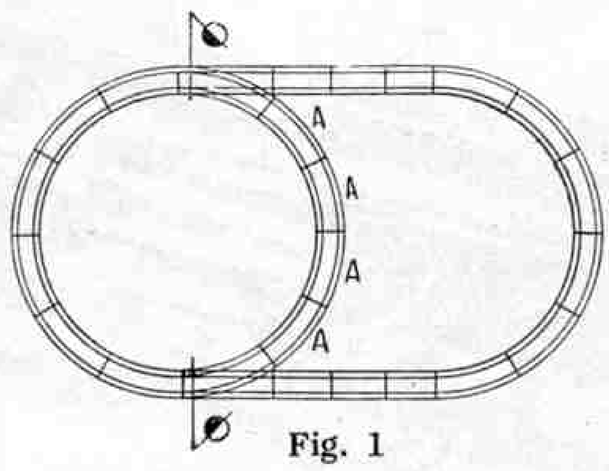
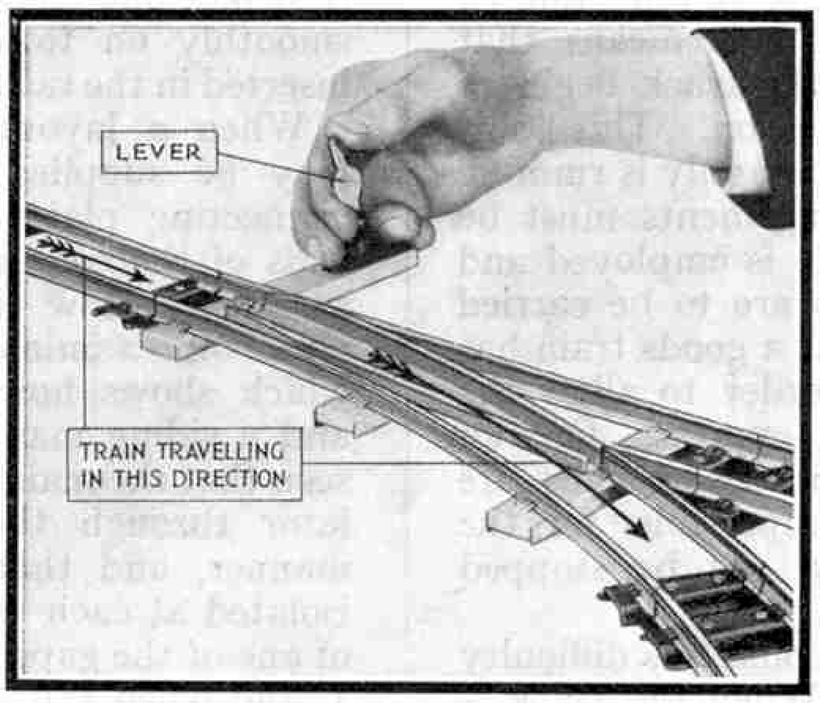


Fig. 1

Just as running a train round a simple oval track becomes monotonous, however, so also in its turn running round two tracks will lose its attraction unless interesting variations are introduced. Real railways exist for a more definite purpose than merely running locomotives and coaches along their tracks. The trains are there for the convenience of passengers and they start from definite places at fixed times. It very soon becomes the ambition of junior model railway enthusiasts to plan their own proceedings on similar lines, and we must now see how this may be done.



Switching a train over to a branch line.

The first step is to fix upon a position for a station, and on our layout the best place clearly is on one of the straight portions. For the time being we may be content with one station, and from it we despatch our train, the locomotive at the head of it being wound up to the full, with the intention of bringing it to rest at the station after traversing a devious course around the oval and circular paths provided.

It is just as important that we should bring the train to rest at a definite point as it is that we should start it from a certain position. There is no difficulty in doing this, for all that is necessary is to insert a brake rail at a convenient point approaching the station. As the train makes its last circuit the trip piece on the brake rail is raised. When the locomotive passes over it the brake mechanism is brought into operation, and the train pulls up in the station in very realistic style.

It will be found that in more extensive operations a train may be required to come to rest at one of many points. For instance, on certain occasions it may be necessary to bring it to a standstill on approaching the points because signals forbid its further passage. Similarly in shunting operations a locomotive may be required to run over a short distance only. It could always be stopped by the use of a brake rail in the manner already described, but on a smaller layout this eventually would mean fixing brake rails in large numbers along the track.

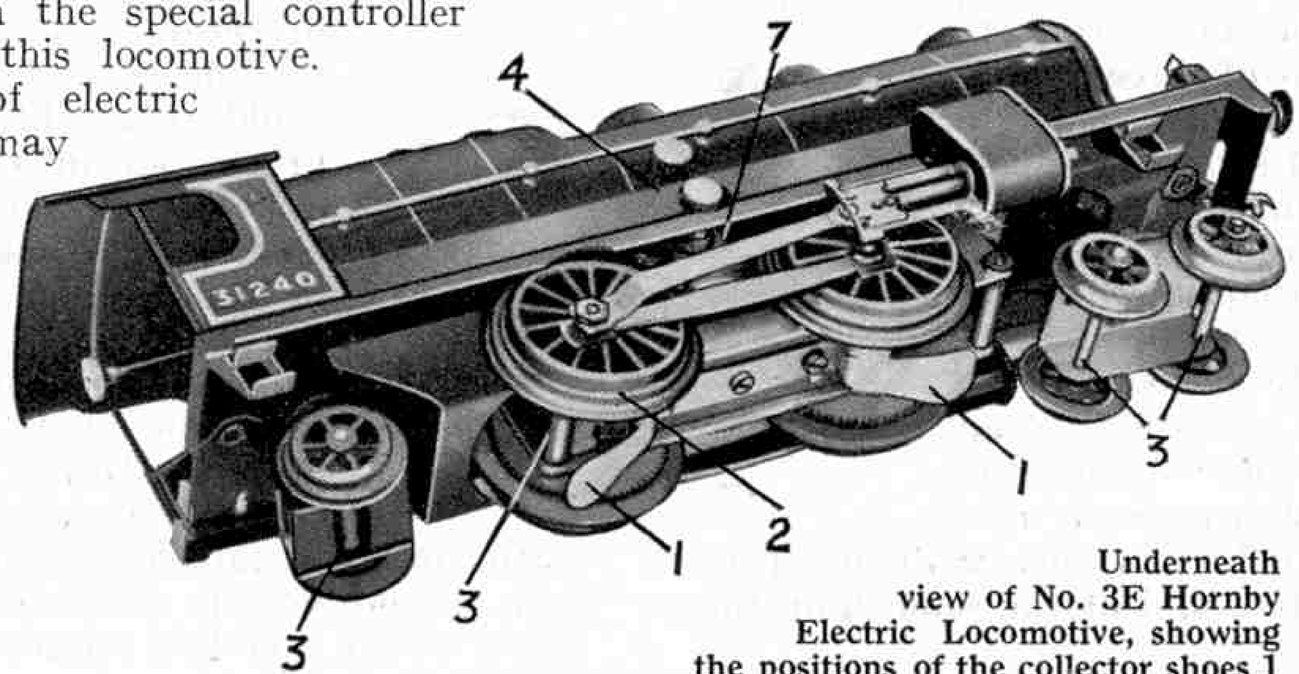
This we may avoid by learning exactly what our locomotive is capable of doing, and how many times the winding key must be turned in order to enable the engine to cover a certain distance. It is a matter for great satisfaction when we know exactly how far a locomotive with a train behind it will run when the key is wound a certain number of times. When he has succeeded in reaching this stage a miniature railway enthusiast feels that he has acquired the mastery over his layout and its workings, and it is worth while going to a little trouble in order to obtain the necessary knowledge.

The best plan is to discover first how many circuits of the oval track our locomotive will complete on one winding, when it has a full load of three Pullman coaches behind it. At the end of its run it may come to rest in the station, but it is more likely that it will overshoot the platform or fail to reach it. If it races past we return the locomotive to the station and try again, this time giving the key half or a quarter of a turn less. If it has stopped short of the station we may reduce the number of turns a little further. A few experiments on these lines will quickly enable us to give the key the exact number of turns required to cause the locomotive to roll gently into (Continued on page 228)

XVII.—BUILDING UP AN ELECTRIC LAYOUT

LAST month we dealt with the electric locomotives of the Hornby system, explaining how they are used and also how they may be kept in good running order. Locomotives of this type lend themselves to track operations of a very interesting character. They may be started or stopped by means of the resistance controller, and in performing these operations it is not necessary to handle the locomotives at all, thus adding greatly to the realism of track work. In the case of the Hornby Permanent Magnet Locomotive, reversing also may be carried out in an equally simple manner, all that is required being to change the position of one of the levers in the special controller provided for use with this locomotive.

Another advantage of electric locomotives is that they may be run for any desired length of time without winding. They may be used to haul non-stop express trains, therefore, and the ease with which their movements may be controlled makes them equally suitable for local trains that are brought to a standstill at every station.



Underneath view of No. 3E Hornby Electric Locomotive, showing the positions of the collector shoes 1 and the commutator 7. The end of the armature shaft 4 also may be seen.

In planning a layout for use with electric locomotives it must be remembered that the centre rail is continuous. This means that all electric locomotives standing on the track begin to move as soon as the current is switched on. This point is of little importance when a single train only is running on a smaller track, but special arrangements must be made when more than one locomotive is employed and shunting or side-tracking movements are to be carried out. For instance, let us suppose that a goods train has to be diverted into a loop line in order to allow the passage of a following passenger express. On an ordinary electric track, in which the centre rails are connected together, this would be impossible, for the locomotive of the goods train could not be stopped except by lifting it off the line.

Fortunately it is quite easy to overcome this difficulty by isolating portions of the track. When the track is divided into sections, and switches are provided for controlling the current in these, a locomotive in any one section may be moved, while those in the remaining portions may be allowed to remain stationary.

In order to isolate sections of the track all that is necessary is to leave gaps at certain points between the ends of the conductor rails. These gaps may be made quite simply by withdrawing the spikes that connect the centre rails of adjacent portions of track and separating these slightly. If this is done, however, connecting plates cannot be used at the joints. For this reason it is advisable to substitute for the spikes short pieces of wood of suitable diameter. Short lengths cut from large matches are suitable for this purpose. These help to hold the rails firmly in position, and also prevent the ends of the centre rails from accidentally being brought into contact with each other. The gaps between the ends of the running rails are bridged by spikes in the ordinary way, and there will be little prospect of causing derailments.

An alternative method is to insert a quarter rail of the ordinary non-electric type at a point where a gap in the conductor rail is to be made. If this method is adopted it may be found that the front collector shoe of an electric locomotive is so low that it strikes one end of a conductor rail instead of running smoothly on to it. In that case a spike should be inserted in the rail and bent into a gentle downward curve.

When a layout is divided in this manner current may be supplied to the sections by using separate connecting plates. A simpler method is to join the ends of the conductor rails by wires that pass through switches. How this may be done will be made quite clear on examination of the accompanying diagram, which shows how a layout that includes a loop line and a siding may be divided into sections. It will be seen that the main line rails are connected to the accumulator through the resistance controller in the usual manner, and that the centre rail of the loop line is isolated at each end. The conductor rails on each side of one of the gaps are connected by wires through switch 1, and when this is closed an engine that is standing in the loop immediately begins to move. It will be noticed that in order to make connection it is only necessary to bridge the gap at one end.

The siding is treated in a similar manner. An electric locomotive standing in it remains stationary when switch 2 is open, but will commence to move immediately

the switch is closed. In the arrangement shown, a locomotive may be run on the loop line without affecting an engine that is standing in the siding, and similarly a train of coaches or wagons may be backed into the siding while one in the loop remains stationary.

The arrangement shown in the diagram is, of course, suitable for a simple oval or circular layout with a station at one point. If a more extensive layout is used it may be desirable to divide the main line itself into sections, and there is no difficulty in doing this. Each section may be supplied with current by means of a separate connecting plate, and any sidings or loops in it may be dealt with in the manner already indicated.

In wiring a layout in the manner suggested care should be taken to avoid short circuits produced in the wires themselves. Those used should be well insulated. The rubber-covered wire supplied with Hornby Electric Train Sets is very suitable for the purpose. The leads should be arranged neatly and in such a manner that they do not get in the way. On a permanent layout it is an excellent plan to pass them through little clips fastened to the base-board, while those used on a track that must be pulled up at intervals should be bound together in pairs. The switches required are of the simple single-throw type that may readily be obtained at small cost from any electrician.

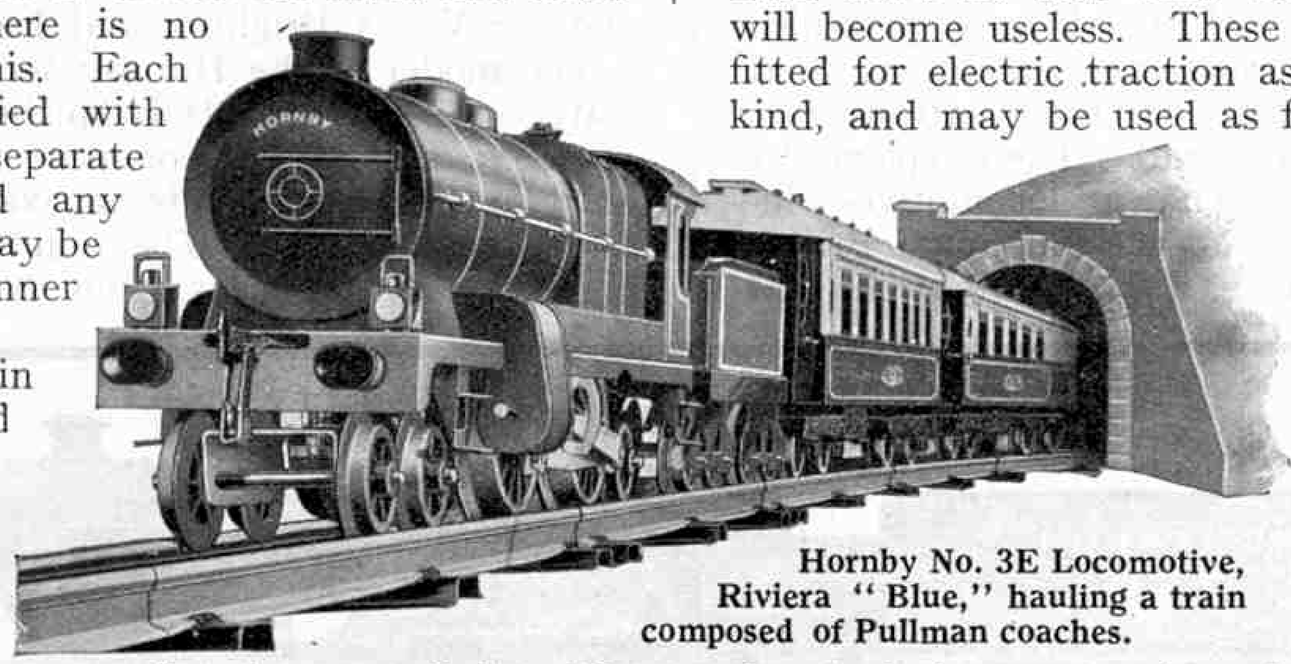
In running trains over an electric layout a little judgment is necessary in order that the locomotive may be brought to a standstill exactly where required. This is best acquired by experiment, and practice will very soon make the electric railway enthusiast quite expert in controlling the movements of his locomotives and railway stock.

The ease with which electric locomotives may be run makes a miniature electric train very attractive. If a Hornby Train enthusiast is already in possession of a layout of the ordinary type on which clockwork trains are run, however, he may hesitate before deciding to electrify his system because of the expense and trouble that he may think will be incurred. As a matter of fact there is no difficulty in making the change and the cost of converting the track is very small. Special conductor rails have been introduced into the Hornby system for this purpose and the sleepers of ordinary track are now provided with slots to enable these to be inserted without difficulty.

The price of the conductor rails is 1/- per dozen, and insulators for use along with them are 3d. per dozen. Clips for securing the rails to the sleepers also will be required, and these cost 6d. per dozen. The additional parts may be obtained direct from Meccano Limited, or ordered through any Meccano or Hornby Train dealer. Those who wish to change from clockwork to electric working should remember that three clips and three insulators are required for each conductor rail added and should take care to order the full number required.

Points and crossings specially fitted for electric operation should be used, for those designed for clockwork layouts cannot readily be adapted by the average Hornby Train owner.

Enthusiasts who wish to build up an electric layout need have no fear that their clockwork locomotives will become useless. These travel as readily on rails fitted for electric traction as on those of the ordinary kind, and may be used as freely as on ordinary non-electric track. In fact, a miniature railway on which both clockwork and electric trains are employed provides scope for very interesting operations. For instance, a train hauled by an electric locomotive may be left more or less to its own devices while shunting work is carried on, or a slow train is run on a branch line by means of a second engine, which may be of the clockwork type.



Hornby No. 3E Locomotive, Riviera "Blue," hauling a train composed of Pullman coaches.

One great advantage of this is that more time is available for rewinding the clockwork locomotives and for making the necessary changes to the points.

Those who are in possession of both types of locomotives may derive a great deal of fun by arranging that their clockwork engines are used to handle traffic on a separate portion of the layout. In that case the electric locomotives work only on the remaining section of the track, taking charge of the trains on their arrival at a suitable junction point. In order to increase the interest of operations of this character the route over which electric haulage is employed may be constructed with slight gradients on both up and down lines.

It may be noted that locomotive exchanges of this kind actually are carried out on the Metropolitan Railway. Certain through trains from the country to London are hauled by steam locomotives over part of the journey, and for the final portion of the run to the City they are taken over by electric locomotives. These, of course, are the prototypes of the well known Hornby Metropolitan Electric Locomotives.

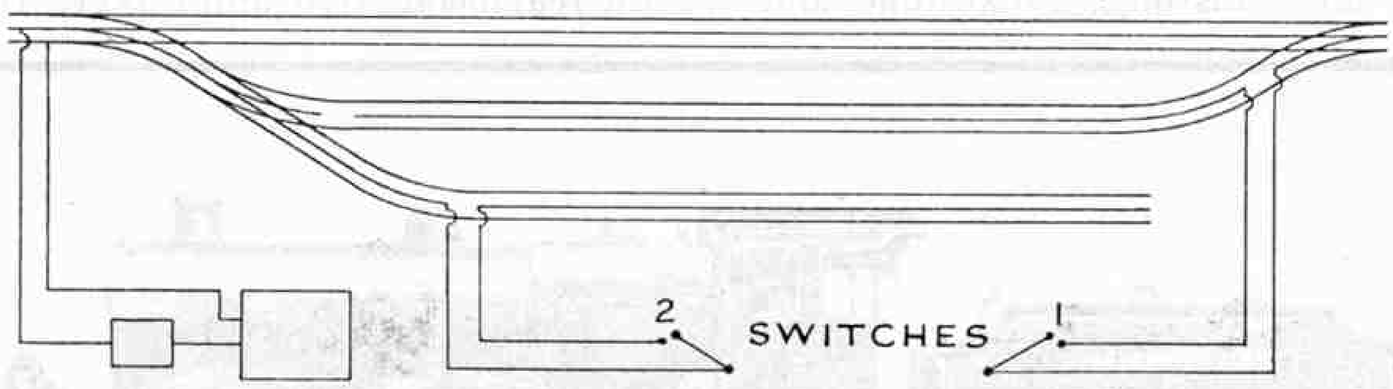


Diagram showing how current may be supplied to loop lines and sidings in order that shunting operations may be carried out.

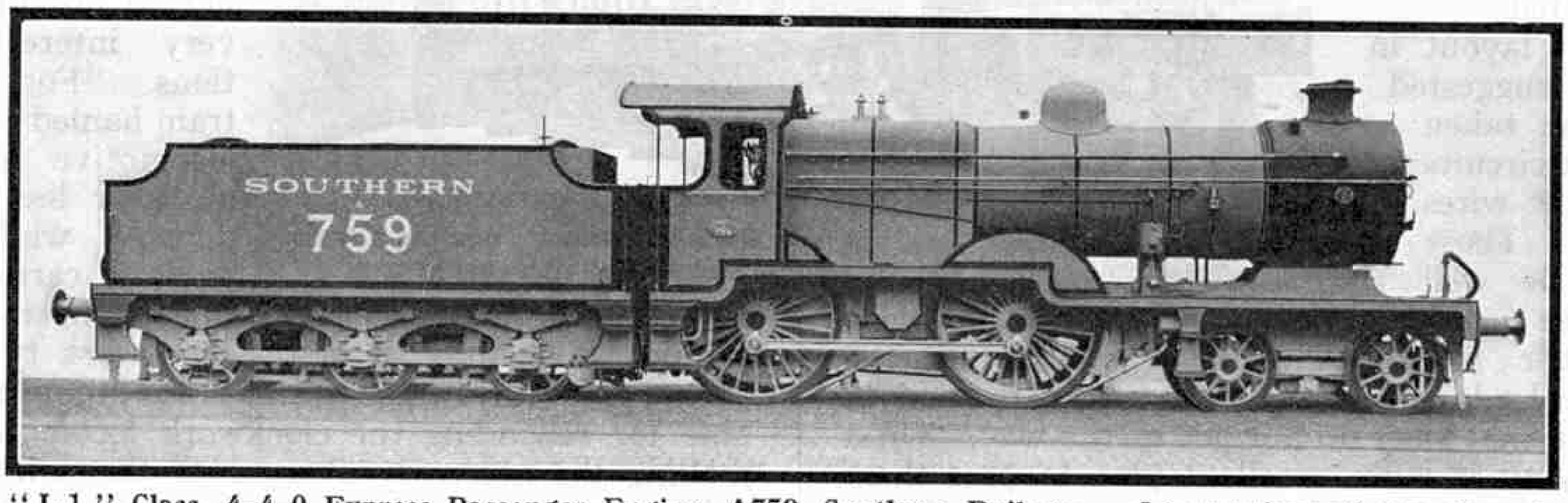
It is interesting to note that Pullman buffet cars are in use on certain trains of the Metropolitan Railway. This is a feature that readily may be reproduced on a Hornby layout, and the Hornby Pullman cars give a very pleasing appearance to trains made up and run in this manner.

Since current is readily available on an electrically-operated layout there is no difficulty in providing for the illumination of station buildings and signal cabins. A scheme for doing this was fully described on page 724 of the "*Meccano Magazine*" for August, 1929. In the article appearing in that number the wiring up of Hornby lamp standards also was dealt with in order to enable owners of electric layouts to light up goods yards. Current may be used for many other purposes, including point detection.

S.R. "L.1" Class in the Hornby Series

By "Tommy Dodd"

IN previous issues of the "*M.M.*" I have described the No. 2 Special Passenger Locomotives that aroused so much interest on their introduction last year into the Hornby series. These splendidly built reproductions of well-known locomotives include a representative of each of the four main British Railway Groups. For instance, a miniature of No. 234 "*Yorkshire,*" the first of the "Shire" class, represents the L. N. E. R., while the L. M. S. engine in the series is a model of one of the famous Midland Compounds now so numerous on the L.M.S. System.



"L.1" Class, 4-4-0 Express Passenger Engine, A759, Southern Railway. Locomotives of this class do fine work on the very fast Charing Cross, Folkestone and Deal services.

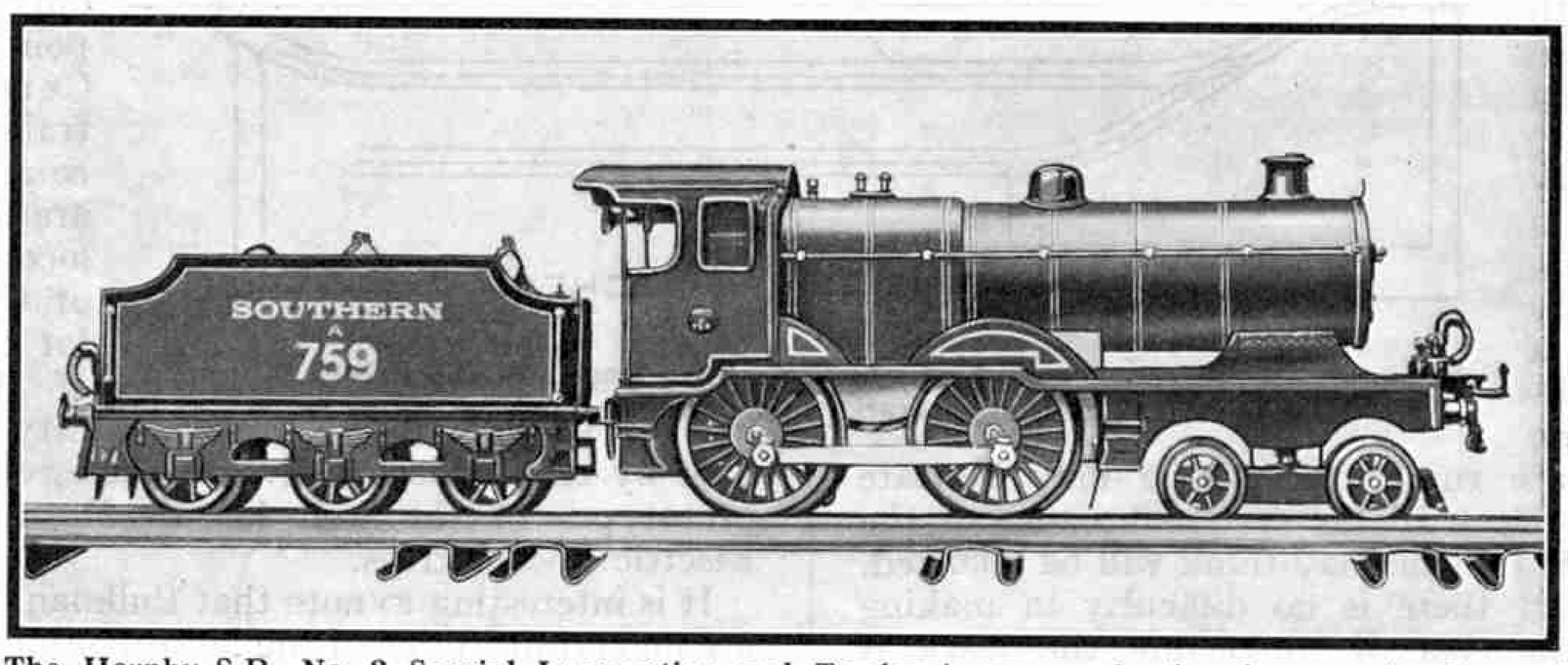
The Southern Railway locomotive represented in the Hornby No. 2 Special series is A.759, an engine of the "L.1" class. The first batch of these engines was delivered to the Southern Railway by their makers, The North British Locomotive Co., Glasgow, in 1926. They were designed for work on the steeply-graded Eastern Section of that line, and since their introduction have been chiefly used for hauling trains between Charing Cross and Hastings, Folkestone and Deal. These include such well-known trains as the "*Folkestone Flyer*" and the "*Kent Coast Express.*"

There are 15 locomotives of the "L.1" class, and they are numbered from 753 to 759 and from 782 to 789. As is customary with Southern Railway locomotives they carry a letter in addition to a number. In this case the letter A is used to denote that the locomotive belongs to the Eastern Section of the Southern Railway, and it was selected for this purpose because it is the initial letter of Ashford, where the locomotive works and headquarters of the section are situated. Similarly the appearance of the letters B or E on a Southern Railway locomotive shows that it belongs to the Central or Western Section, the locomotive works of which are those of the former L.B.S.C. and L.S.W. at Brighton and Eastleigh respectively.

The model in the Hornby series of A.759 has many features of interest. It is finished in the correct shade of green, and both locomotive and tender are neatly lined in black and white in exactly the same manner as the real engines. The number is prominently displayed on the tender, and on the side sheets of the cab may be seen a representation of the small cast iron number plate that is typical of Southern Railway practice.

This engine differs from the other No. 2 Special Locomotives in not having outside cylinders. It has the commodious cab, with side windows and extended roof that is characteristic of the locomotives of the Southern Railway "L.1" class, and the large Belpaire firebox is surmounted by neat safety valves of the Ross-Pop pattern.

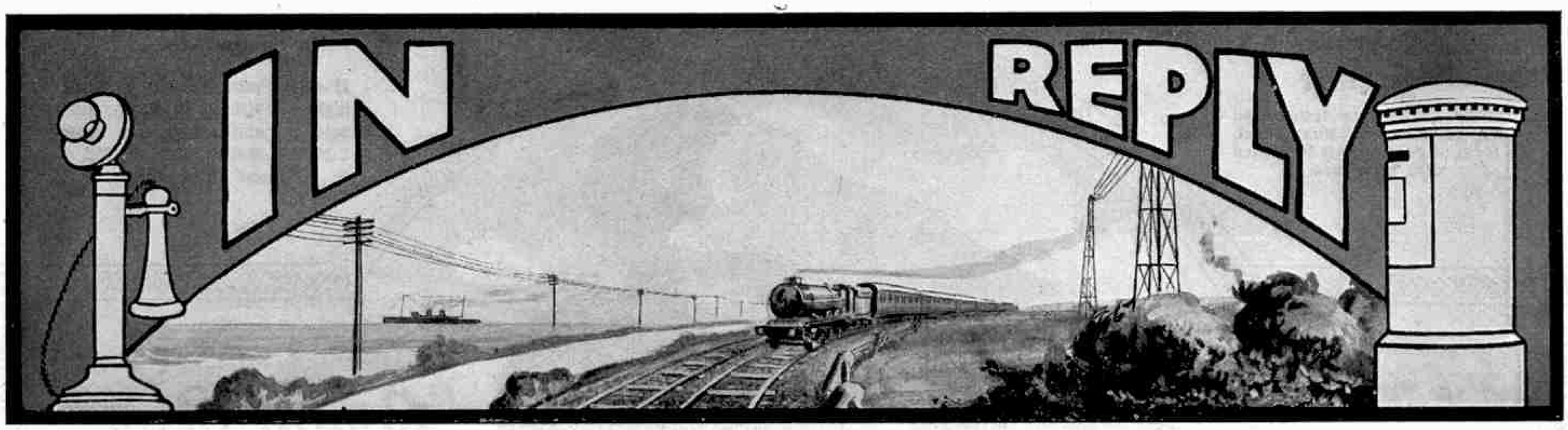
A specially attractive feature is the cast cab floor and the firebox back-plate. This adds valuable adhesive weight to the superstructure. The floor is ribbed exactly like that of the real locomotive, and this greatly improves the appearance of the inside of the cab.



The Hornby S.R. No. 2 Special Locomotive and Tender is a reproduction in correct colour of the Southern Railway engine of the "L.1" Class illustrated above.

The tender is fitted with a sloping coal slide and division plates that prevent the fuel from being shaken where it is not wanted—into the water filler. In shape the exterior resembles that of the Maunsell flat-sided six-wheeled tender fitted to the real locomotives, and to the Ashford pattern "Moguls" or 2-6-0 locomotives. Dummy springs are neatly embossed in the wheel frames. The axles revolve in real axle boxes, and the wheels fitted are of the spoked cast type that are specially made for these tenders in order to ensure smooth running qualities.

As is the case with the No. 2 Special Locomotives already dealt with, an outstanding feature of the engine is its extraordinary length of run, and the mechanism has a surprising capacity for hard work.



Suggested Hornby Train Improvements

ADDITIONAL BRAKES ON LOCOMOTIVES.—Your proposal that Hornby locomotives should be fitted with an extra handbrake to operate real blocks on the driving wheels is interesting. The present brake is quite efficient, however, and the extra cost of the addition you suggest would scarcely be justified by the improvement in appearance. (*Reply to J. Langham, Horwich*).

HOLLOW WINDING SPINDLE.—We note your suggestion that a hollow winding spindle should be made standard on Hornby clockwork locomotives, the key being made to fit inside. This would avoid the necessity for extending the spindle outside the housing, but the "unsightly keyhole" to which you object would remain. In any case no special advantage would result from the alteration you propose. (*Reply to F. Watson, Leeds*).

SMOKE DEFLECTORS.—The addition of smoke deflectors to the Southern Railway locomotives in the Hornby Series would not improve their appearance, and we do not think their introduction would be popular. Those who wish to fit up their locomotives in this manner would have no difficulty in doing so. (*Reply to V. Simpson, Weybridge*).

METROPOLITAN TYPE ELECTRIC MOTOR COACH.—A coach of this type would be an interesting and attractive vehicle but at present we cannot undertake its manufacture. We shall keep the idea before us however. (*Reply to E. Molesworth, Manningtree, Essex*).

"SINGLE-DRIVER" EXPRESS LOCOMOTIVE.—The majority of Hornby Train owners prefer models of modern locomotives and rolling stock, and we do not think that your suggestion to introduce "single-wheelers" is really practical. In use they would be troubled by wheel slip, for our present motors need four-coupled driving wheels in order to develop their power satisfactorily. (*Reply to D. Ward, Doncaster; R. James, Leicester; and others*).

ROUND BUFFERS.—Your suggestion that round buffer heads should be fitted to Hornby locomotives is quite interesting. We agree with you that round-headed buffers would be more correct. The oval ones were introduced in response to numerous requests for non-locking buffers. (*Reply to P. O'Flynn, Ireland*).

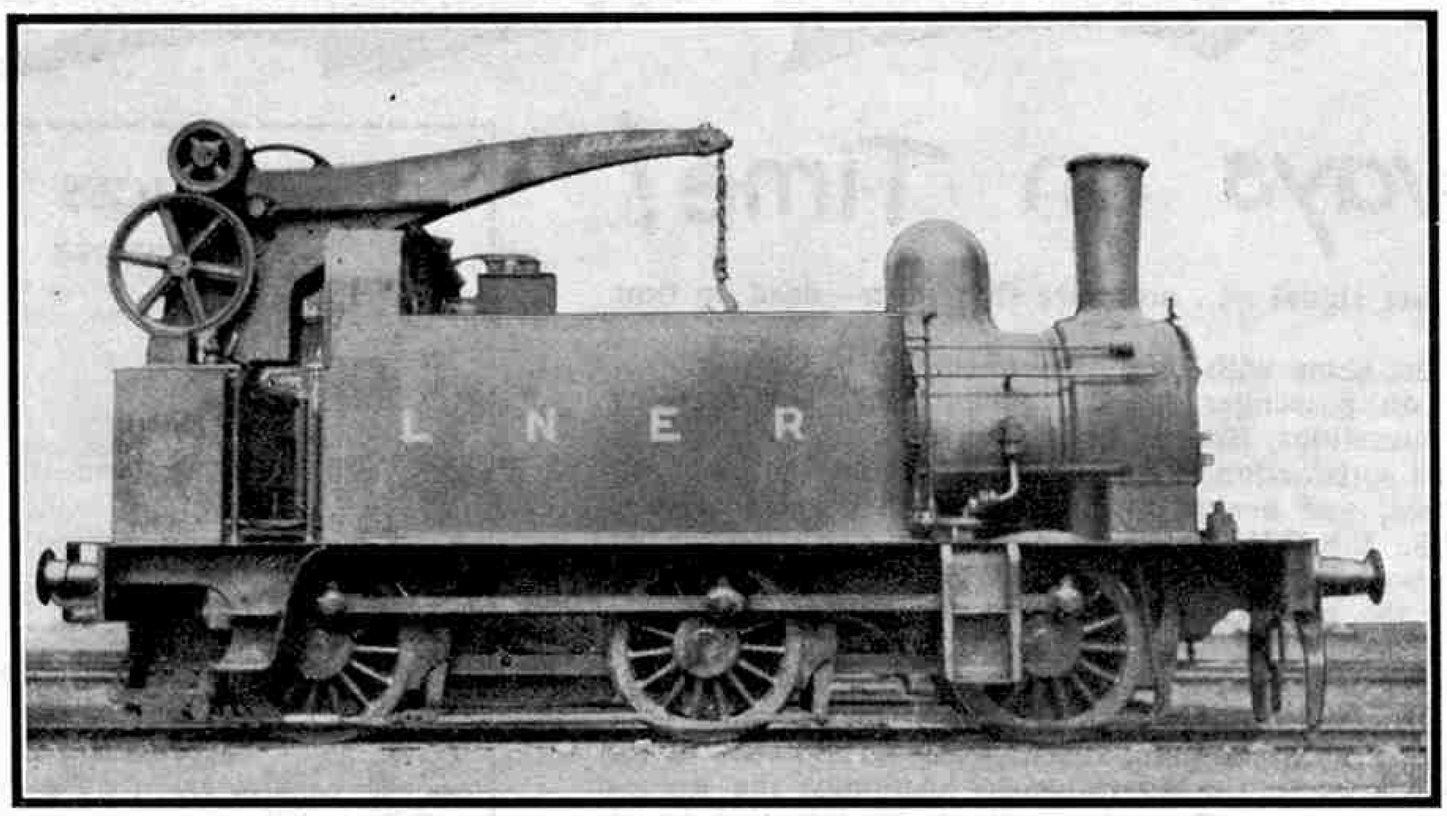
L.N.E.R. HIGH-PRESSURE LOCOMOTIVE.—We do not think that at present the introduction into the Hornby Series of a model of this locomotive is practicable. A six-coupled mechanism would be necessary, and the cost of production of this locomotive would be high because of its unusual shape. (*Reply to G. Russell, Darlington*).

TRANSFORMER TROLLIES.—A miniature trolley wagon for the conveyance of exceptional or bulky loads would be an attractive addition to the Hornby series, but there are a number of objections to its introduction. The chief difficulty would arise from the large amount of room such a vehicle would occupy. This would be too great except on large layouts. (*Reply to G. Morton, Barrow*).

"SENTINEL-CAMMELL" STEAM RAIL COACH.—We have received many requests that these vehicles should be reproduced in the Hornby series. Until they come into more general use on real railways, we do not think they would be sufficiently popular to warrant the expense involved in their production. (*Reply to P. King, Whitby*).

PETROL WAGONS TO HOLD LIQUID.—We do not see any advantage in constructing our Tank Wagons to hold liquids. This would increase the price of the vehicles, as they would have to be made of non-rusting material such as brass, and special joints would be necessary in order to prevent leakage. (*Reply to J. A. Clay and E. Epprecht, Margate, Kent*).

"SOMERSAULT" SIGNAL.—This type of signal, which is widely used on the G.N. section of the L.N.E.R., would be an interesting addition to the Hornby Series. It would appeal only to L.N.E.R. enthusiasts, however, and as it could not be adapted to the present Hornby standard we do not consider it practicable to undertake its manufacture. (*Reply to H. Warren, Hitchin*).



L.N.E.R. (G.E. Section) Crane Locomotive "C," attached to Stratford Works. This engine was built in 1868 by Messrs. Ruston & Proctor, together with four others of the same type. Two have since been scrapped, and those remaining were converted into crane locomotives. They are believed to be the second oldest locomotives in service on the L.N.E.R. This photograph was taken by a reader, A. Crawshaw, London, W.12.

WESTINGHOUSE PUMP FOR "SHIRE" LOCOMOTIVES.—Fitting a dummy Westinghouse Pump to our "Shire" Locomotives undoubtedly would improve their appearance and would add realism. We shall give careful consideration to this proposal. (*Reply to F. Gibson, Dundee*).

"GARRATT" LOCOMOTIVES.—We realise the attraction of the "Garratt" locomotives, and will keep in mind the possibility of the introduction of a locomotive of this type. It would be costly to make, however, and its length also would give rise to difficulties on curves. (*Reply to A. Stokes, Weymouth*).

"SCOTT" CLASS L.N.E.R. LOCOS.—These 4-4-0 locomotives are attractive, but as their use is restricted to the N.B. section of the L.N.E.R., they are not likely to be sufficiently popular to justify the expense involved in their introduction. This also applies to the 4-4-0 locomotives of the Caledonian and Highland sections. The Hornby "Shires" and the Standard Compounds are quite representative of Scottish practice, for they are in general use on Scottish sections of the L.N.E.R. and L.M.S. (*Reply to A. E. Duncan, Dundee*).

G.W.R. & S.R. "MOGULS."—We are interested in your suggestion to introduce reproductions of the 2-6-0 locomotives of these Companies. A necessary preliminary is the introduction of a six-coupled mechanism, but we shall bear your proposal in mind. (*Reply to A. E. Slater, Exeter*).

NEW NAMES FOR PULLMAN CARS.—Pullman Cars bearing the names "*Zenobia*" and "*Alberta*" are now available, the second of these being the name of the composite car. Other Pullman Cars probably will be introduced from time to time. (*Reply to J. Searle, Peterborough*).

LONGER WELL WAGON.—Your suggestion that the length of the Well Wagon should be increased by two or three inches has many points in its favour, but it is doubtful whether the result would justify the increased cost. In addition the larger vehicle would be unable to negotiate curves of 2 ft. radius without the couplings becoming locked. (*Reply to R. Palmer, Middlesbrough*).

VANS FOR SPECIAL TRAFFIC.—We do not think that special vans for banana, fish and meat traffic would be sufficiently popular to justify their introduction into the Hornby system. We shall keep the suggestion before us, however, and give it consideration when planning additions. (*Reply to W. Fields, Coventry*).

IMPROVED SIGNAL GANTRY.—A signal gantry on which the distant signals at present mounted are replaced by home signals certainly would be more in accordance with real practice, and your suggestion will be given careful consideration. (*Reply to E. Dickenson, Rickmansworth*).

No. 1 SPECIAL ELECTRIC LOCOMOTIVES.—Your suggestion that we should introduce a No. 1 Special Locomotive fitted with a 6-volt electric motor is interesting, and will be carefully considered. It seems to us that the new permanent magnet electric tank locomotive would meet your requirements. (*Reply to R. O. Green, York*).

PLATELAYERS' HUT.—We are interested in your suggestion that a scale model of a platelayers' hut should be introduced. This is at present under consideration, and until a decision is made the watchman's hut already on sale might suit your requirements. (*Reply to B. Ridley, Wood Green*).

FLAT-TOPPED RAILS.—Flat-topped rails such as you suggest possibly would produce better running because of the improved adhesion, but the change would add considerably to the cost of manufacture. The possibility of making rails of this type will be given further consideration, however. (*Reply to C. E. Foster, Preston*).

DOUBLE TRACK VIADUCT.—We do not think that a double track viaduct such as you suggest would be popular, but if the demand for such an accessory increases we may give the matter further consideration. (*Reply to T. E. Bates, Norwich*).

FINISH OF GOODS ROLLING STOCK.—We agree that the gilt lettering of our goods vehicles is scarcely in accordance with actual practice, white letters being the rule. In making revision of our goods stock we shall keep this point in mind and possibly changes will be made on the lines you indicate. (*Reply to B. H. Farmer, Swindon*).

No. 2 SPECIAL ELECTRIC TANK LOCOMOTIVE.—You will be interested to learn that there is a possibility of the introduction of a No. 2 Special Tank Locomotive fitted with electric motor. This should supply your requirements, and in the meantime the No. 1 Permanent Magnet Type Locomotive is available. (*Reply to E. C. Chambers, Tunbridge Wells*).

LOCOMOTIVE COALING STAGE.—A coaling stage of the type used in locomotive yards would be an attractive accessory, but owing to its size such a building would be expensive and the provision of an inclined track also would become necessary. We are interested in the proposal, however, and shall give it consideration. (*Reply to W. Ainsworth, Carnforth*).

Guarantee

Hornby Trains are tested and their efficiency is guaranteed. A form of guarantee is furnished with each loco.

Hornby Trains are richly enamelled, highly finished in four different colours, and lettered to represent L.M.S., L.N.E.R., G.W. or S.R. locos and rolling stock.

"Royal Scot"

Always on Time!

"That's her signal . . . and here she comes—dead on time as usual!"

It's just the same with Hornby Trains.

Whether on passenger service, goods traffic, or carrying out shunting operations, Hornby Locos may be depended upon to give the utmost satisfaction. They are British-made throughout, fully guaranteed, and beautifully enamelled in correct railway colours—L.M.S., L.N.E.R., G.W., or S.R. You can't help being thrilled when you see a Hornby Loco dashing along the track, smoothly over the points, steadily round the curves, full speed ahead on the straight.

Your miniature railway is exact in every detail when it is constructed with Hornby Rolling Stock and Accessories. There are Passenger Coaches, Pullman Cars, Trucks, Wagons and Vans of the same types as you see on the big railways. Amongst the Accessories there are Stations, Tunnels, Bridges, Signals and Level Crossings, all made in perfect proportion and all beautifully finished in colours.

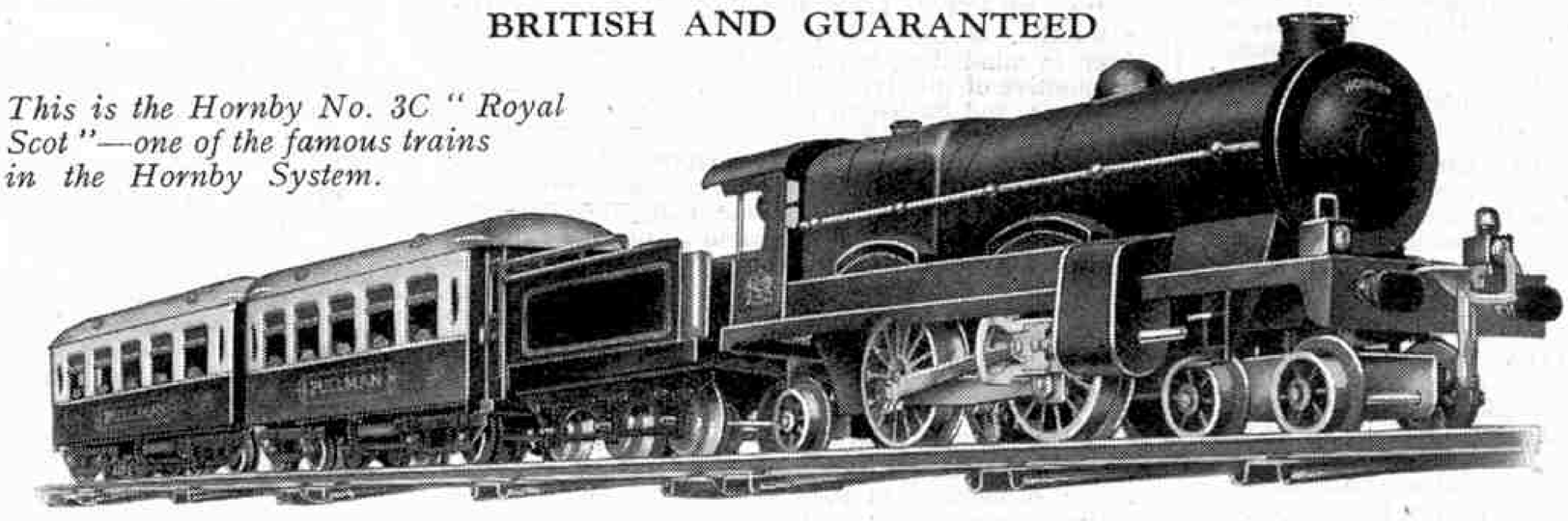
PRICES

CLOCKWORK	
M0 Passenger Set	6/–
M1 Passenger Set	7/6
M Goods Set	8/6
M2 Passenger Set	9/–
No. 0 Goods Set	15/–
No. 0 Passenger Set	15/–
No. 1 Goods Set	20/–
No. 1 Tank Goods Set	22/6
No. 1 Passenger Set	25/–
No. 1 Special Goods Set	32/6
No. 1 Special Passenger Set	35/–
No. 2 Mixed Goods Set	40/–
Metropolitan Train Set—C	55/–
No. 3C Riviera "Blue" Train	62/6
No. 2 Special Pullman Set	67/6
No. 3C Pullman Set (L.N.E.R., L.M.S., G.W. or S.R.)	67/6
ELECTRIC	
No. 3E Riviera "Blue" Train	80/–
No. 3E Pullman Set (L.N.E.R., L.M.S., G.W. or S.R.)	85/–
Metropolitan Train Set L.V.	95/–

HORNBY TRAINS

BRITISH AND GUARANTEED

This is the Hornby No. 3C "Royal Scot"—one of the famous trains in the Hornby System.



Manufactured by MECCANO LTD., OLD SWAN, LIVERPOOL

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

Hornby Railway Company

More Fun from Hornby Trains

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

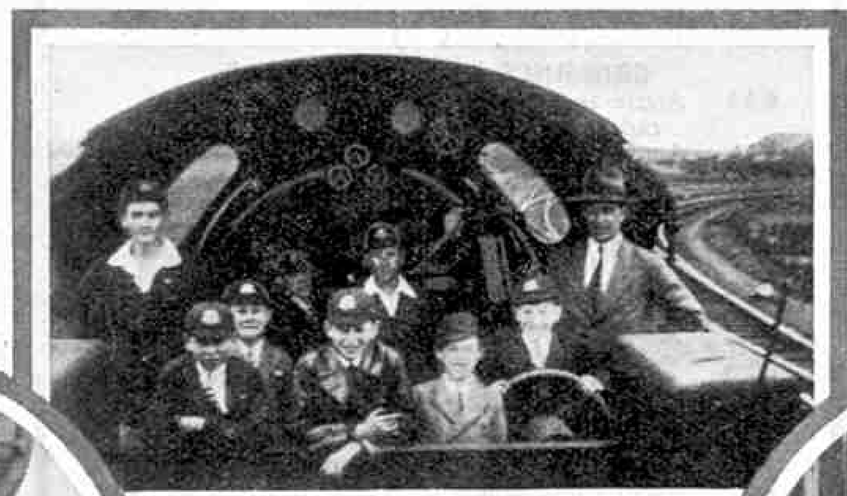
IT is now ten years since the introduction of Hornby trains brought a new joy into the lives of thousands of boys in all parts of the world. In those days the Hornby railway system was on a small scale, but every year saw the addition of new locomotives, rolling stock, and points and crossings of all kinds with which to build up more interesting layouts. Along with the wonderful growth of the system went an increase in the numbers of the great army of Hornby Train owners and also in the enthusiasm with which they pursued their hobby.

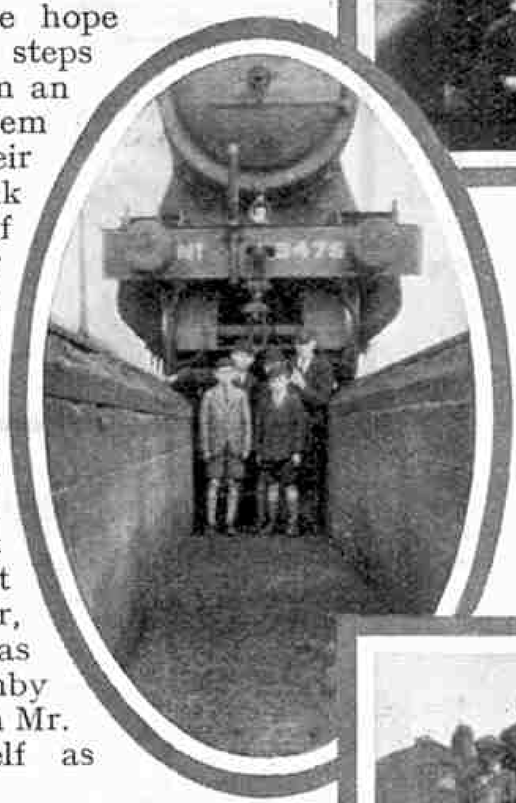
Every one of the thousands of owners of Hornby Trains thoroughly enjoys the fun of running his splendidly appointed trains, headed by replicas of famous locomotives. But soon after their introduction the possibility of getting even more fun from them began to be realised.

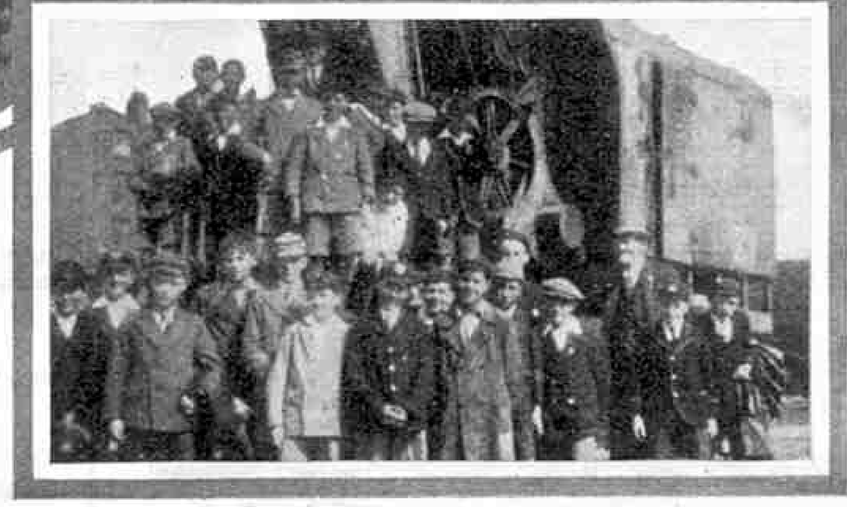
An Organisation of Miniature Railway Enthusiasts

As is the case with most good things, the pleasure of running a miniature railway is greatest when it is shared with others who are equally enthusiastic, and in many letters from owners of Hornby railways the hope was expressed that steps would be taken to form an association to advise them and look after their interests. Mr. Frank Hornby, the inventor of Meccano and Managing Director of Meccano Limited, was equally desirous that everything possible should be done to enable boys to run their miniature railway systems to the greatest advantage. The result was that in October, 1928, the foundation was announced of the Hornby Railway Company, with Mr. Frank Hornby himself as President.

The new organisation was immediately successful in uniting the great army of Hornby Train enthusiasts. Its formation has stimulated the interest of miniature railway owners to such an extent that in the 18 months that have elapsed since its foundation, the membership has risen to more than 15,000. To-day boys are joining in increasingly large numbers, and during the last two months no fewer than 4,000 additional members of this splendid association have been enrolled.







Members of local Branches of the Hornby RailwayCompany have splendid opportunities of visiting engine sheds, goods yards, stations and other places of railway interest. The accompanying photographs—four of many forwarded to the Headquarters of the H.R.C.—show happy groups of members inspecting locomotives on interesting visits of this kind.

How to Join the Hornby Railway Company

Every boy who possesses a Hornby Train Set may become a member of the H.R.C. and thus become entitled to wear the badge of membership, which is beautifully enamelled in colours and has as its central feature a tiny representation of a train. All that he has to do is to fill in the application form—a copy of which is enclosed in every Train Set, or may be obtained from the Secretary of the H.R.C., Liverpool—and to return this together with a remittance of 6d. to pay for the cost of the badge. Immediately on receipt of the completed form the applicant is enrolled as a member of this great organisation, and a handsome certificate to that effect is forwarded to him along with his badge.

Members of the H.R.C. are entitled to many privileges. The chief aim of the Company is to enable its members to get as much fun as possible from their miniature railways. This can best be done by helping them to make their layouts and operations as realistic as possible. Competent railway experts on the staff at Headquarters therefore are continuously engaged in advising members how to improve their layouts, or how to make their operations more interesting and railwaylike, and generally how to make the best possible use of the material at their disposal.

The Secretary of the Company is in continual touch with members, and always is ready to assist and advise them in any difficulty, even if this is not directly associated with miniature railway activities. In addition, members may join the Correspondence Club, by means of which they are put into direct touch with enthusiasts in other parts of the world.

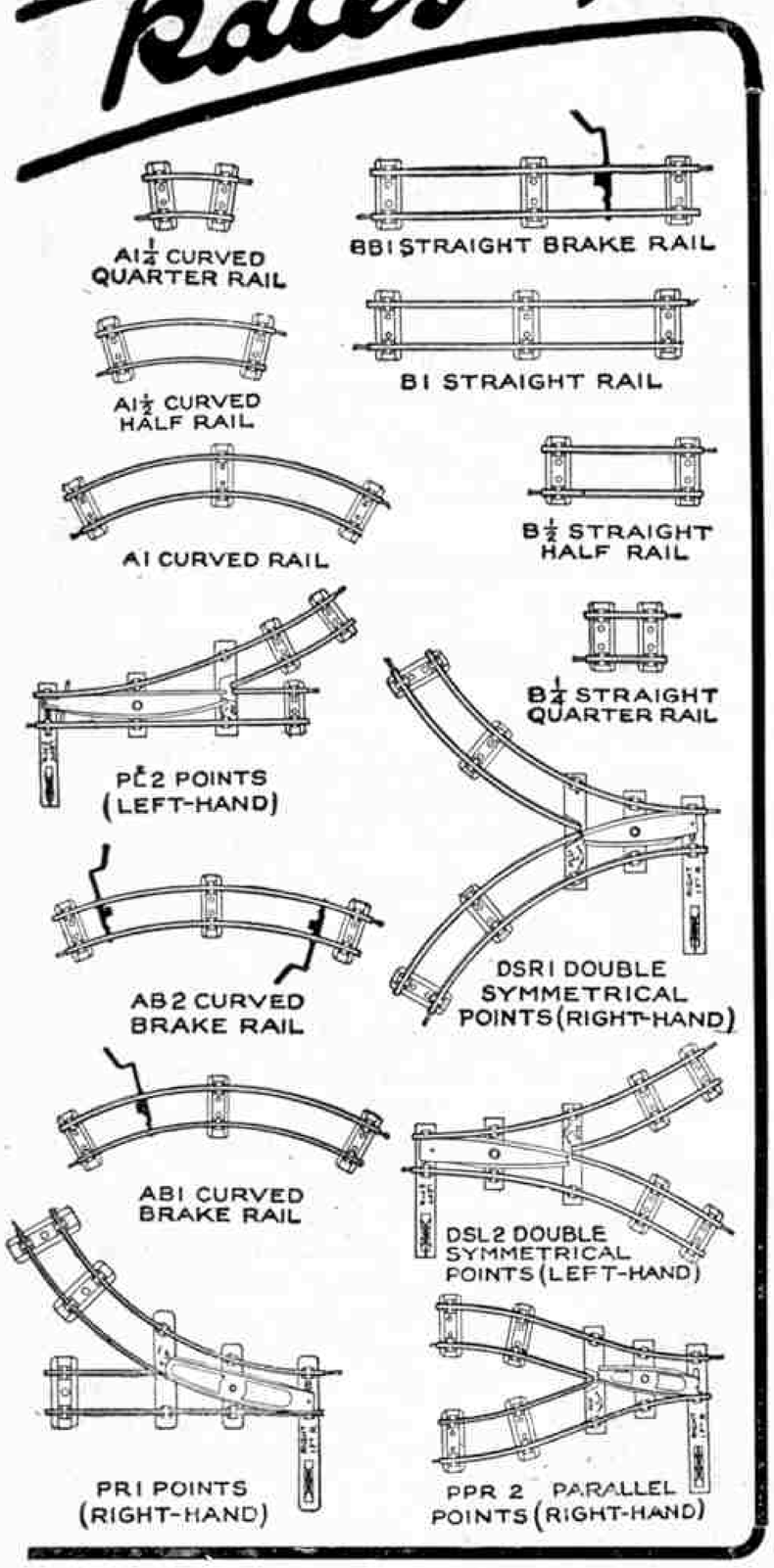
Local Branches of the H.R.C.

The scope for enjoyment of the miniature railway hobby may be increased enormously by joining one of the many local Branches that have been formed in various parts of this and other countries. These are composed of Hornby Train owners who meet together for the purpose of carrying out railway operations on a more extensive scale than is possible for a single individual. With their combined resources large and interesting layouts are formed, and on these trains of all kinds are run exactly as are the trains on real railways. There is no limit to the amount of pleasure and interest that may be obtained in this manner. Every member of the H.R.C. should take steps to join a conveniently situated Branch immediately, or if one does not exist in his neighbourhood he should endeavour to find other enthusiasts to help him to found one.

The fun that members of local Branches of the H.R.C. may obtain is not limited to operations on the track laid out in the Branch meeting room. The four photographs reproduced on this page are proof of this. At the Headquarters of the H.R.C. an enormous number of similar photographs have been received, all of which have been taken during visits of members of local Branches to goods yards, engine sheds, and other places of railway interest.

A lone railway enthusiast usually must be content with what may be seen in stations and from the lineside, but members of the H.R.C. have the interest of responsible officials of the great railway companies. These cordially support the organisation and are eager to forward its chief objects. Consequently members have been given wonderful opportunities of learning the inner details of railway working. On their visits they have descended into the fireboxes of the giants of the Iron Road, have peered into their smokeboxes, gone into the pits underneath them in order to probe into their mechanism and generally have been given a thorough insight into railway operation and maintenance. Privileges such as these are valued highly by every boy interested in railways, and they are freely at the disposal of members of local Branches of the H.R.C.

HORNBY SERIES
Rails Points and Crossings



Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. They make possible an almost endless number of realistic and railway-like layouts. Only the finest materials obtainable are used in their manufacture.

For Clockwork & Steam Trains

CURVED RAILS—1-ft. radius

A1	Curved rails	per doz.	4/6
A1½	Curved half rails	"	3/6
A1¼	Curved quarter rails	"	3/–
AB1	Curved brake rails	each	6d.

2-ft. radius

A2	Curved rails	per doz.	4/6
A2½	Curved half rails	"	3/6
A2¼	Curved quarter rails	"	3/–
AB2	Curved brake rails	each	6d.
DC2	Curved rails, double track ...	½ doz.	7/6

DOUBLE SYMMETRICAL POINTS

For 1-ft. radius curves

DSR1	Double symmetrical points, right	per pair	5/–
DSL1	Double symmetrical points, left		

For 2-ft. radius curves

DSR2	Double symmetrical points, right	per pair	5/–
DSL2	Double symmetrical points, left		

PARALLEL POINTS

PPR2	Parallel points, right	per pair	5/–
PPL2	Parallel points, left		

CROSSINGS AND CROSSOVERS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each	2/–
CA2	Acute-angle crossings (for 2-ft. radius tracks)	"	1/9
CR1	Right-angle crossings (for 1-ft. radius tracks)	"	2/–
CR2	Right-angle crossings (for 2-ft. radius tracks)	"	1/9
COR2	Crossovers, right hand	per pair	12/–
COL2	Crossovers, left hand		

POINTS—For 1-ft. radius curves

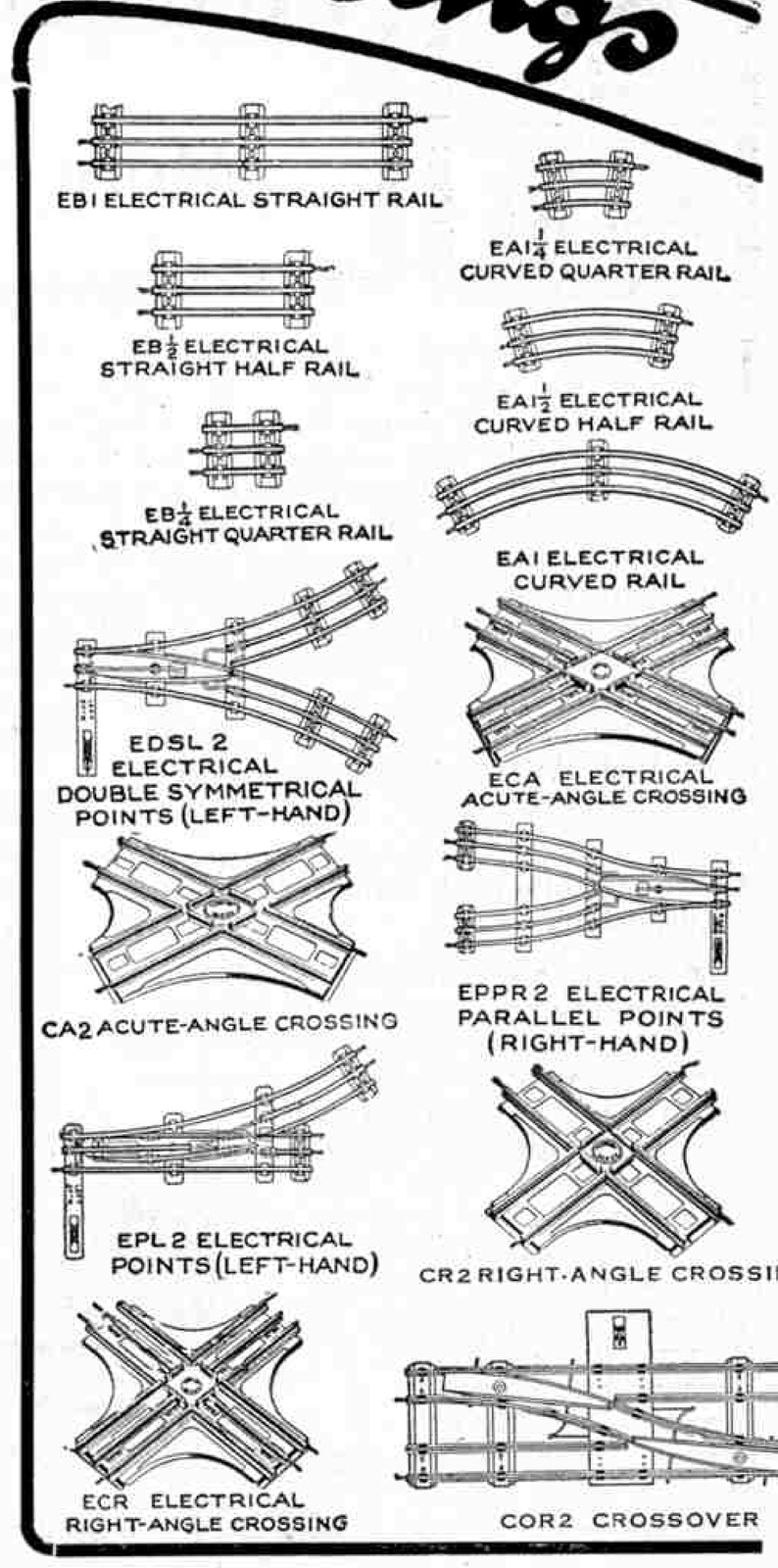
PR1	Right-hand points	per pair	4/–
PL1	Left-hand points		

For 2-ft. radius curves

PR2	Right-hand points	per pair	4/–
PL2	Left-hand points		
PSR2	Points on solid base with ground disc and lamp, and adapted for Hornby Control, right ...	per pair	8/6
PSL2	Points on solid base with ground disc and lamp, and adapted for Hornby Control, left ...		

STRAIGHT RAILS

B1	Straight rails	per doz.	4/–
B½	Straight half rails	"	3/–
B¼	Straight quarter rails	"	2/6
BB1	Straight brake rails	each	5d.
BBR1	Straight brake and reverse rails	"	1/6
DS1	Straight rails, double track ...	½ doz.	6/6
RCP	Rail connecting plates	"	4d.



ELECTRIC STRAIGHT RAILS

EB1	Straight rails	per doz.	7/–
EB½	Straight half rails	"	4/6
EB¼	Straight quarter rails	"	4/–
EDS1	Straight rails, double track ...	½ doz.	8/6

ELECTRIC CURVED RAILS

1-ft. radius

EA1	Curved rails	per doz.	8/–
EA1½	Curved half rails	"	5/–
EA1¼	Curved quarter rails	"	4/6

2-ft. radius

EA2	Curved rails	per doz.	8/–
EA2½	Curved half rails	"	5/–
EA2¼	Curved quarter rails	"	4/6
EDC2	Curved rails, double track ...	½ doz.	9/–

Rails for Electric Trains

ELECTRIC CROSSINGS

ECA	Acute-angle crossings	each	4/–
ECR	Right-angle crossings	"	4/–

ELECTRIC POINTS

For 2-ft. radius curves

EPR2	Right-hand points	per pair	10/–
EPL2	Left-hand points		

ELECTRIC POINTS

For 2-ft. radius curves

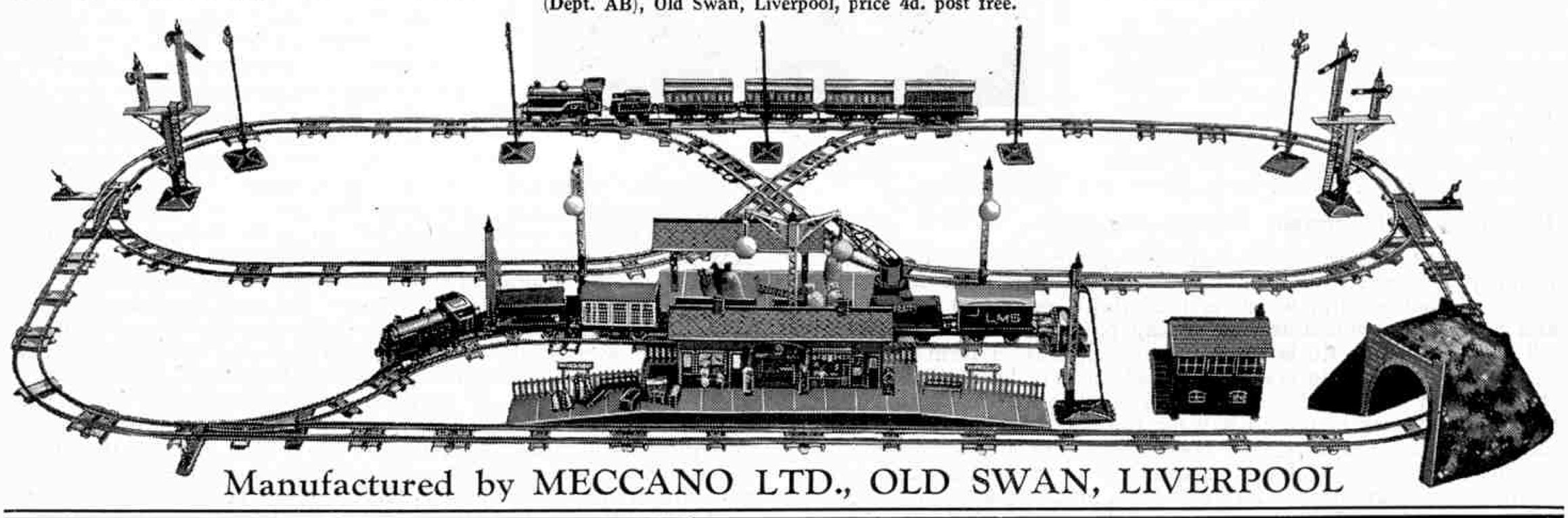
EDSR2	Double symmetrical points, right...	per pair	12/–
EDSL2	Double symmetrical points, left		

For 2-ft. radius curves

EPPR2	Parallel points, right	per pair	12/–
EPPL2	Parallel points, left		
TCPL	Terminal connecting plates (low voltage)	each	1/6

Electrical Points for 1-ft. radius curves are not supplied.

The realistic miniature railway layout shown below is only one of many that can be constructed with Hornby Rails, Points and Crossings. Many interesting illustrations and much useful information is given in a booklet entitled "How to plan your Hornby Railway." This booklet is obtainable from your dealer price 3d. or from Meccano Ltd. (Dept. AB), Old Swan, Liverpool, price 4d. post free.



Manufactured by MECCANO LTD., OLD SWAN, LIVERPOOL

H.R.C. COMPETITION PAGE

Second Locomotive Name and Number Contest

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

On the H.R.C. Competition Page of the issue of the "*M.M.*" for December last we gave a list of names and numbers of well-known locomotives, the letters and digits of which had been thoroughly jumbled together in order to act as a disguise. Readers were asked to discover the true names of the locomotives and to give them their proper numbers. Into this task they entered with such zeal and enthusiasm that a record number of entries were sent in. These showed that the members of the H.R.C. have a very extensive knowledge of the chief locomotives in use on British railways, and we have decided to test this knowledge further by means of a similar competition.

The disguised names, with the mixed-up numbers, of the locomotives chosen for our present competition are given in the panel on this page. Each represents a well-known locomotive belonging to one of the four railway groups, and in order to assist new members to realise exactly what is wanted we give the solution of the first on the list. When rearranged "*Fysnigntscalmo*" becomes "*Flying Scotsman,*" and once this has been settled it immediately becomes clear that the number must be 4472 instead of 7424.

Each of the 48 names given must be dealt with in this manner, and both number and word must be given in the solutions in addition to originals. The first line in the solution should therefore read as follows:—

7424 "*Fysnigntscalmo*" = 4472 "*Flying Scotsman*"

When the list is completed, or when as many correct names and numbers as possible have been filled in, the competitor's name, address and membership number should be written on the sheet, which should be put in an envelope and sent to Headquarters clearly marked "Second Name and Number Contest" in the top left-hand corner.

No.	Name	No.	Name
7424	Fysnigntscalmo	781	Elailovsagr
1016	Souiluisrtl	7419	Cuddieneadrigg
1144	Neda	6318	Iiioolnfelanshrrmnd
874	Vniiev	4073	Aamdrs
1059	Teodoothlrpvrs	2140	Atraba
3519	Niufrnelg	3269	Locrmmaeaemlg
9053	Bgjreb	308	Sirfiseakarlelehry
9928	Cnrdnestreua	38	Rtldnaopibel
1358	Nakchioj	6156	Lavour
4005	Andlodunl	4472	Prandgarade
7033	Oahrtb	6125	Oooermsamtn
547	Grtinkneetheg'i	9154	Moneane
0089	Hamauicodnltl	6355	Praollllsimwitiit
738	Llkngpnrioice	8466	Nacobeie
3133	Eauspgs	897	Meterrechisi
3996	Uyrf	4106	Rocnet
6505	Drenifapth	8356	Lafaba
5126	Ioumnr	845	Wardoffhamfiengho
497	Ssrrreedamtciio	7926	Interstokew
867	Nilabris	8299	Aaistmnl
5133	Uaokctnq	8604	Bustlelitnca
3265	Andereopnplt	254	Ecnarilemsirag
9355	Aaielnchrs	3159	Bolterhuntd
5909	Cccleuhub	8951	Dicreferkynaesb

The Contest will be divided into two sections—Home and Overseas. Prizes of Hornby goods (or Meccano if preferred) to the value of 21/–, 15/–, 10/6, and 5/– respectively, will be awarded to the four competitors in each section who submit lists containing the highest number of correct solutions. A number of consolation prizes also will be awarded, and competitors should send in their entries even if they have been unable to find the correct names and numbers in every case. In the event of a tie for any prize neatness will be taken into consideration in making a final decision.

Envelopes should be plainly addressed and must be posted to reach Headquarters at Binns Road, Old Swan, Liverpool, on or before 31st March, 1930. The closing date for the Overseas section is 30th June, 1930. The omission of the H.R.C. number from any entry will cause it to be disqualified. This is an important condition to which competitors should pay special attention.

"Safety First" on Hornby Train Layouts

On page 230 of this issue of the "*M.M.*" is an account of an excellent scheme that is in operation in a local Branch of the Hornby Railway Company. Its object is to reduce the risk of accident when trains are being run on the Branch layout. Briefly the plan is this: a number of what may be called "Safety First" rules have been drawn up, and these are printed in large type on cards that are hung in convenient positions near the layout. There they are always in front of members, who cannot fail to see them whenever they are engaged in track work.

Naturally other Branches will be desirous of following this excellent example, and in order to help them to make their regulations as complete and effective as possible, we are this month offering prizes for the best set of 12 rules of this kind. These should be framed with a view to guarding against damage caused by accidents, and also to prevent wear and tear due to faulty handling.

This competition is very simple, but it should make a very strong appeal to the miniature railway enthusiast, whether he is a member of a local Branch or not, for practical experience will have taught him how to ensure a long and useful career for his locomotives and rolling stock. Competitors also will obtain valuable assistance from articles published in recent issues of the "*M.M.*"

To the sender of the set of rules that is judged the best will be awarded Hornby railway material (or Meccano goods if preferred) to the value of 15/–. Similar prizes to the value of 10/6, 5/– and 2/6 respectively will be awarded to the three next best entries in order of merit.

Entries should be addressed so as to reach Headquarters at Binns Road, Old Swan, Liverpool, on or before 31st March, 1930. The Overseas closing date is 30th June, 1930. Envelopes should be clearly marked "Hornby Railway Company Safety First Contest."

Competitors must mark their membership number on their entry.

H.R.C. Competition Results

HOME

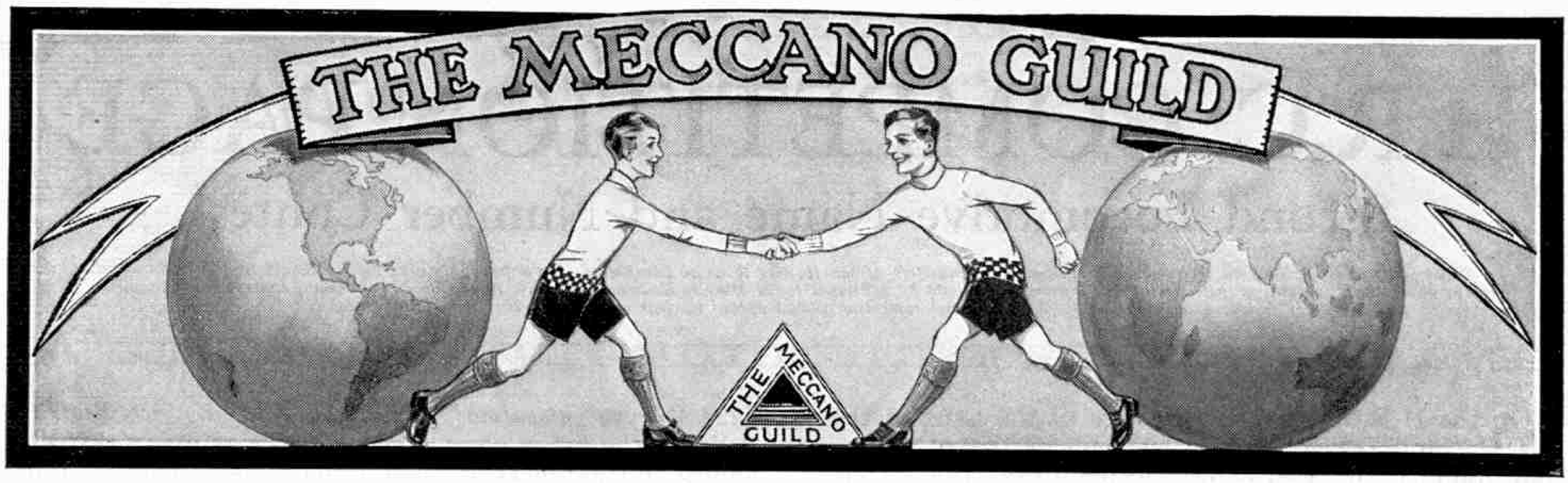
October "My Favourite Railway Station" Contest.—First: L. Garnett (2641), London. Second: R. Mirams (9034), Birmingham. Third: J. Everitt (542), London. Fourth: K. Stockley (10201), Preston.

November "Voting Contest."—First: B. Rees (10959), Rhyl, N. Wales. Second: L. Grugeon (4023), Chiseldon, Wilts. Third: D. G. Brock (3451), Fulham, London. Fourth: E. P. Phillips (2595), Abbotskerswell, Nr. Newton Abbot.

December "Locomotive Drawing Contest."—First: J. C. Moncrieff (4599), Perth. Second: D. D. Porter (10440), Birkenhead. Third: A. F. Poyser (11568), Gloucester. Fourth: J. Bragg (7975), Birmingham. Consolation Prizes: L. W. S. James (749), Glasgow, S.2; E. C. Burrage (7037), London, N.4; E. Jones (2998), Bedford.

OVERSEAS

September "Fascinating Locomotive Problem."—First: Basil Bradfield (9740), Cape Town, South Africa. Second: A. Abdulrahim (10438), Karachi, India. Third: R. B. McMillan (9592), Melbourne, Australia. Fourth: A. G. Saunders (9822), Hamilton, New Zealand. Consolation Prize: Walter Fagg (8557), Milton, Otago, New Zealand.



With the Secretary

Looking Ahead

It may appear a little early in the year to be thinking of summer programmes, but it is by no means too soon to commence making the necessary arrangements for excursions and out-door work generally. Now that practically all Meccano clubs continue to meet throughout the year Leaders and secretaries have become accustomed to plan the programme for the outdoor sessions as carefully as that followed in winter. This serves the double purpose of ensuring that last-minute arrangements will be avoided, and of giving the members a feeling that the coming months have something definite in store for them.

Summer activities of Meccano clubs may take several forms. Where possible a cricket team should be run and now is the time to begin arranging the fixture list. A club camp is always an attractive feature of the summer programme, and if this is to be made a success preparations should be taken in hand as early as possible. Many other forms of outdoor sport and recreation also may be considered and even if nothing else can be arranged long rambles may be taken and visits made to places of interest. No attempt should be made to carry out a very elaborate programme. It is much more satisfactory to concentrate on one or two popular events than to fail by being too ambitious.

Arranging the Summer Programme

During the month of March a general business meeting to wind up the affairs of the two winter sessions usually is held. At this meeting the suggested programme should be laid before members for their approval, and they should be invited to submit any bright ideas they may have. The last-named point is one on which I wish to lay great stress. The success of a club depends largely on the loyalty of members, and they should be taken into the confidence of the officials whenever possible, and they should be encouraged to think out ideas for brightening club life generally.

I hope shortly to learn from secretaries full details of the programmes that have been arranged for the summer months. I shall be particularly glad if they will notify me of their intentions in regard to a club camp, for several clubs may be willing to co-operate in this respect. To arrange a combined camp usually ensures a really merry and successful holiday.

The number of Meccano clubs that regularly spend a short period under canvas has greatly increased during the past few years and members of these are well acquainted with sites suitable for a holiday spent in this manner. So much depends on the choice of a suitable position that the selection of a camp site should be made with the greatest care, and generally speaking, the more time taken over preparations the better.

Meccano Club Secretaries
No. 18. Andreas Thiele

Since February 1929, A. Thiele has been the secretary of Odin M.C., a very successful Danish club that was affiliated in March, 1927. Members are enthusiastic model-builders and enter with great keenness into the competitions that are arranged frequently, constructing models that are distinguished by thorough workmanship.

Visits to Meccanoland

During last summer a number of clubs paid very enjoyable visits to the factory of Meccano Limited at Binns Road, Liverpool, and those Leaders who wish to arrange an excursion of special interest may be recommended to follow this example. In Liverpool itself there are many attractions and a tour of the Docks, including an inspection of a transatlantic liner, forms an interesting preliminary to an afternoon in Meccanoland.

In order to enable me to make proper arrangements for their reception secretaries of clubs must give at least four weeks' notice of a proposed visit to the factory. In addition, the number of members who are to form the party should be given, and in no case must the stated number be exceeded. I shall be glad to receive enquiries from secretaries of any clubs whose members are thinking of making such a visit.

Coming Events

The Annual Exhibition of the Harehills (Leeds) M.C. will be held on Tuesday, 25th March, in the club room at Spencer Hall, 46, Frankland Place, Roundhay Road, Leeds. Last year's Exhibition was extremely successful, many splendid models and an excellent Hornby Railway layout being on view. This year an even more extensive display will be made and visitors are promised a very interesting time. The charge for admission is 4d., children 2d., and the Exhibition opens at 6.30 p.m.

The Harpenden and District M.C. also are holding an Exhibition this month in the County Council School, Harpenden. The date is 13th March, and proceedings will commence at 6.30 p.m. A small charge for admission will be made.

The officials of both clubs will be very pleased indeed to welcome Meccano boys living in the neighbourhood of the club room, and in each case a special invitation is extended to members of other Meccano Clubs.

Proposed Clubs

Attempts are being made to form Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below :—

BERWICK-ON-TWEED—N. H. Leach, 20, Tweed Street, Berwick-on-Tweed.
BURNLEY—J. Jackson, Fair Hill, 29, Brooklands Road.
GLOUCESTER—Mr. L. A. Johns, Upleadon C. of E. School, Gloucester.
MORLEY—R. Atkinson, 35, Ingle Avenue, Victoria Road.
SOUTH BENFLEET—B. Bruhl, The Nest, Rosebury Avenue.
WALLASEY—Ronald Robins, 13, Surrey Street, Poulton.
WHITSTABLE—N. Weight, "Sans Gene," Gloucester Road, Tankerton, Whitstable.

CLUB NOTES

Harwich M.C.—Operations have again been extended, the club being divided into twelve Hobbies Sections. The joint Leaders now number six, the Treasurer having been promoted to this position. Mr. M. Richmond, one of the Leaders, has formed a Woodwork Section and has installed a lathe in the club room. A Lantern Lecture, "*The Centenary o Railways*," was given, the slides being loaned by the L.N.E.R. Club roll: 65. *Secretary*: Mr. E. W. Ward, Osborne House, Pepys' Street, Harwich.

Greenock Academy M.C.—Interesting visits recently paid included one to Greenock Dockyard, where members made a tour of a ship under construction, and a second to the Observatory at Paisley. A Debate was held on the proposed road bridge across the Firth of Forth and a very successful Exhibition was organised. Club roll: 60. *Secretary*: L. Langtry, 81, Newton Street, Greenock.

Bideford M.C.—Has now secured affiliation. The programme includes Model-building, Papers by members, and Lantern Lectures. Successful Model-building Evenings held included special Competitions for Commercial Light Motor Vans and for Inventions. Club roll: 13. *Secretary*: H. L. Farr, Lavington House, Bideford.

Herne Bay M.C.—Good use has been made of the club lantern, a splendid series of eight Lectures having been arranged. Meccano and Fretwork Competitions are held regularly, and Games Nights continue to be well attended. The Annual Social Evening was well organised and very successful. Club roll: 43. *Secretary*: C. W. Russell, 4, Clifton Villas, Herne Bay.

Wallingford County Grammar School M.C.—Mr. L. Moody, President of the Club, gave an extremely interesting Lecture on "*India*." Members have constructed many large models, including a Transporter Bridge and Meccanograph, and these were displayed at an Exhibition at which a good sum was raised. The balance of club funds is to be devoted to the purchase of Meccano parts. Club roll: 21. *Secretary*: C. W. Turner, The Manse, 22, St. Mary's Street, Wallingford.

Lindisfarne College M.C.—The Exhibition was a great success. The splendid models exhibited included a Workshop, High-speed Ship Coaler, Tractor, Derricking Crane and Motor Chassis. The train layout attracted special attention, steam, clockwork and electric trains being run on it. A Baby Ciné display was given at one meeting, and at others papers were read by members on "*Loading a Tramp Steamer*," "*Television*," "*A Visit to the Scilly Isles*," and other interesting topics. Club roll: 40. *Secretary*: H. H. Sebel, 27, Seaforth Road, Westcliff-on-Sea.

Victoria (Glasgow) M.C.—A Lantern Lecture on the "*Western Highlands of Scotland*" was given and at other meetings Debates have been held and preparations made for the successful Annual Exhibition. A joint meeting with Morison Memorial M.C. was devoted to talks on "*Stamps*" by Uncle Phil, of the B.B.C. Station at Glasgow, and Mr. Henderson. As a result a Stamp Section is being organised. Club roll: 49. *Secretary*: R. Hannah, 52, Thornwood Avenue, Glasgow, W.1.

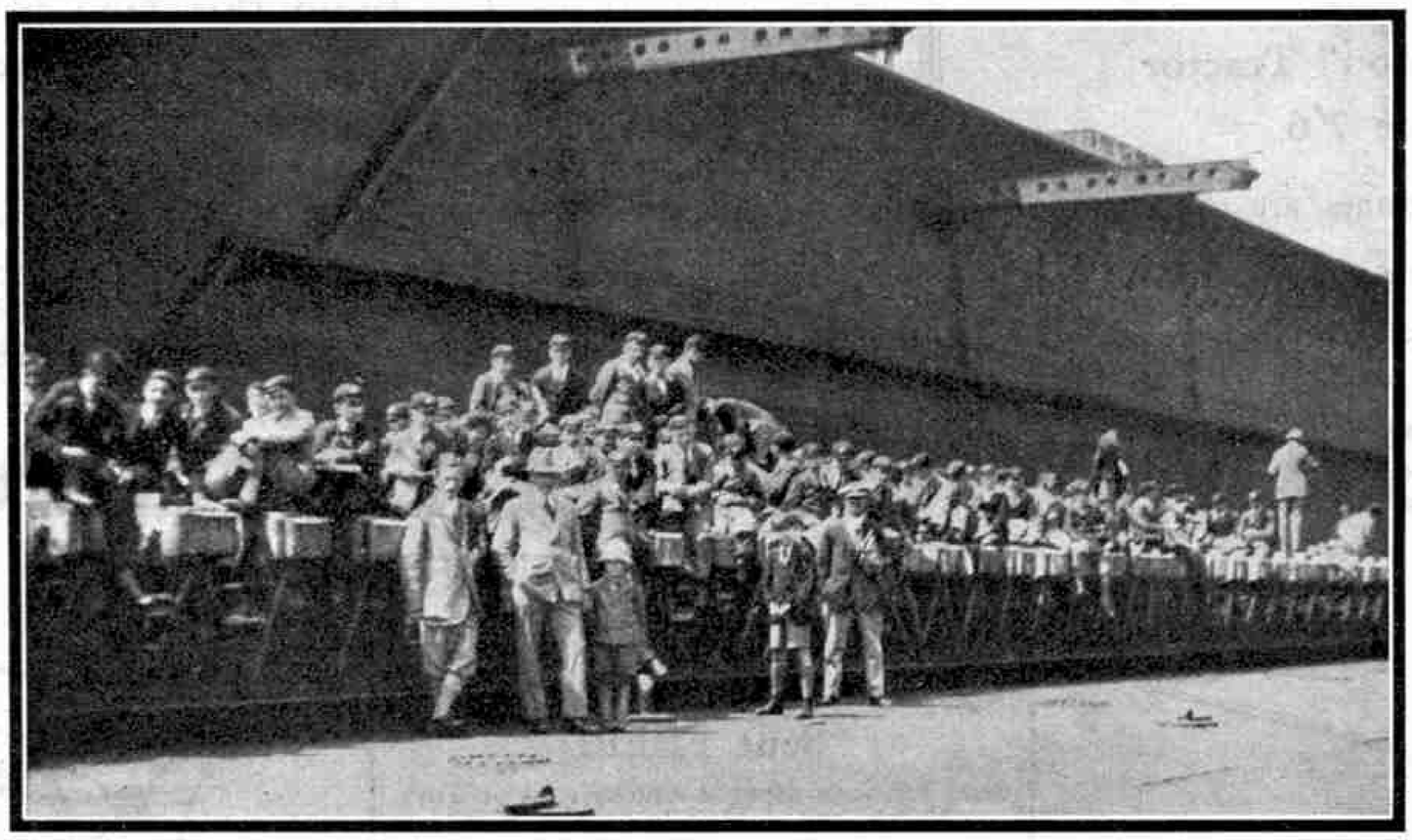
Ramsey M.C.—A small Exhibition of models was held, one of the attractions being the Meccanograph on loan from Headquarters. Model-building Nights are held regularly and in addition a lecture on "*Lives of Famous Inventors*" has been given. Club roll: 8. *Secretary*: C. Butcher, Princes Street, Ramsey, Huntingdon.

St. Columba's (Sunderland) M.C.—Models constructed by members were exhibited at the School Social, where they aroused great interest. A talk on "*Burning under Water*" by a member was very enjoyable. Three members of the club have gained scholarships at Sunderland Junior Technical School. Club roll: 23. *Secretary*: T. Crute, 28, Ridley Street, Southwick, Sunderland

Winchmore Hill Collegiate School M.C.—The outstanding events of last session included a Talk by the President on "*Keenness*," and a Lecture on "*Iron Ore*" by Mr. T. Moreton, one of the joint Leaders. The President's talk stimulated the eagerness of members considerably. At another meeting an interesting Lantern Lecture on "*The Centenary of the Railways*" was given. Club roll: 28. *Secretary*: R. B. Truscott, Palmers Green, London, N.13.

Weymouth Central School M.C.—A splendid model of the Tower Bridge was constructed for display at the Y.M.C.A. Exhibition at Portland. Outdoor meetings have included Rambles on the cliffs, and Games Evenings and Sing-Songs have been held. Club roll: 15. *Secretary*: A. H. Brake, 2, Charles Street, Weymouth.

Orwell (Milnathort) M.C.—Mr. D. H. Sands gave interesting talks on "*Levers and their Applications*" and "*Bridges*." The first of these was illustrated by demonstrations on a Meccano model of a Platform Weighing Machine. Club roll: 33. *Secretary*: Miss E. D. Hepburn, Rutherburn, Milnathort.



Members of the Royal Grammar School (High Wycombe) M.C. in the giant floating dock at Southampton. Mr. S. A. Watt, Assistant Leader, is on the left of the front row, and next him is standing Mr. G. A. Grant, the energetic Leader of the club.

Middlesbrough M.C.—A special feature of this club's programme is "Members' Night," when ordinary members are allowed to conduct a meeting on their own lines, often with amusing results. At other successful evenings Air Rifle Contests and Debates have been held, and Papers read by members. A Club Orchestra has been formed and gives excellent performances at Parties and on Open Nights. An interesting visit was paid to the Middlesbrough Fire Station. Club roll: 74. *Secretary*: A. Bradley, 95, Deepdale Avenue, Marton Grove, Middlesbrough.

Solihull School M.C.—Talks on "*The Structure of the Locomotive*" and "*The Racing Car*" were given by Mr. G. R. Sanders. Model-building Nights have been very successful and a very pleasant Social Evening was held. Club roll: 17. *Secretary*: L. V. G. Watson, Solihull School, Solihull.

Hampstead and Cricklewood M.C.—The club magazine is to be enlarged and published four times annually. A lantern has been purchased and slides loaned by the De Havilland Aircraft Co. have been shown. Instructive lectures on "*Stamps*" and "*Aircraft*" were very interesting. New members are required and boys who wish to join should write to the secretary for further details. Club roll: 12. *Secretary*: R. Zizolfo, 2, Minster Road, Cricklewood, London.

Wallington County School M.C.—Among models recently constructed were Kerr Stuart Diesel Locomotives, a Travelling Crane and a Beam Engine. The Diesel Locomotives were run on a short length of Meccano track. Hornby Train Nights are a regular feature of the programme and strict working to timetable is always followed. Club roll: 13. *Secretary*: H. Bond, "West View," Plough Lane (N), Wallington, Surrey.

St. Peter's and St. John's (Exeter) M.C.—Meetings continue to be interesting and activities are of a varied nature. Table Tennis is the most popular indoor recreation, and the "Hodder Cup" tournaments are keenly contested. The club magazine, "*The White Triangle*," continues to maintain its high standard. Club roll: 35. *Secretary*: L. Phillips, 48, Northemhay Street, Exeter.

St. John's (Oval) M.C.—Meetings have included Talks, Debates, Model-building Competitions, Hornby Train Nights, and Games Tournaments. A visit was paid to the printing offices of the "*Daily Sketch*." A very successful Visitors' Night has been held and several novel Competitions have been arranged. Club roll: 16. *Secretary*: L. G. Butler, 46, Smith Street, Camberwell, London, S.E.5.

Australia

Ravensthorpe M.C.—Excellent progress is being made and meetings for Model-building, Lectures, etc., are well attended. During last session an Exhibition and Concert were held. In connection with the Western Australia Centenary celebrations a special Parents' Evening was arranged. A Meccano Model Display, a Hornby Train Demonstration and a musical programme helped to make the Evening a great success. Club roll: 15. Leader: Mr. J. Blake, Ravensthorpe, Western Australia.

Denmark

Odin M.C.—The Exhibition was very successful, visitors being greatly impressed by the display of models. Prizes of Meccano parts were awarded for the best entries. A Meccanograph attracted much attention, designs made on it selling readily. In a recent Competition members built models of small motor cars, and the strength of these was proved by throwing them on the ground! Club roll: 10. *Secretary*: Mr. A. Thiele, Langelinie, 53, Odense, Denmark.

India

George Town (Madras) M.C. — Members visited H.M.S. "*Enterprise*" and also the French cruiser "*Tourville*," on which the mechanism of torpedoes was demonstrated and explained. Ordinary meetings have included a talk on "*Electric Wiring*" by Mr. P. Jambulingam. Club roll: 22. *Secretary*: Mr. S. N. Thangavelu, 42, Nambulier Street, George Town, Madras.

New Zealand

Dunedin M.C.—On Model-building Evenings members combine their resources to build the Meccanograph and other large models. A Debate on "*English v. New Zealand Railways*" was keenly contested. An interesting visit was paid to the Dunedin Power Station, where the City Engineer explained everything very carefully to members. Club roll: 11. *Secretary*: T. MacLachlan, Art Studio, 66, Albany Street, Dunedin, Otago.

South Africa

Reitz M.C.—At a Picnic a Meccano Bridge was built over the narrowest part of the Haaksh River and a Hornby Railway track was laid across it, the result being very realistic. An interesting visit was paid to the farm of the father of one of the members. The machines employed were closely examined and members have built interesting models of them. A Stamp Section and a Club Library have been started, and it is proposed to publish a magazine. *Secretary*: Mr. J. Kuttner, Reitz, O.F.S.

Malvern Wesleyan M.C.—The programme includes Model-building on a very extensive scale, Competitions, Debates, Cross-country Runs by moonlight, Games of all kinds. Prizes for the session were distributed at the Christmas Fancy Dress Party by the Rev. W. Miles, President of the Club. Leader: Mr. E. Sykes, P.O. Box 8, Cleveland, South Africa.

Information!!

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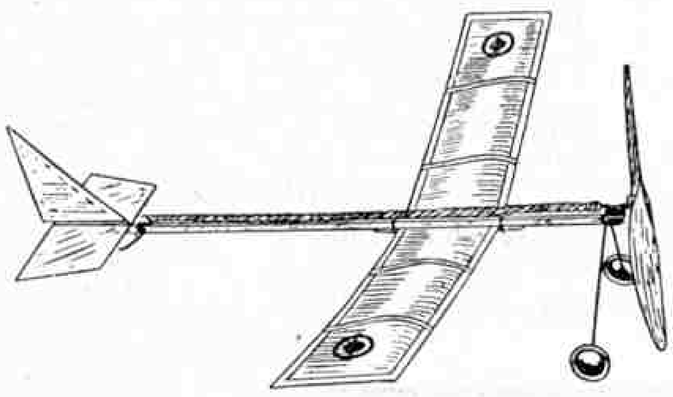

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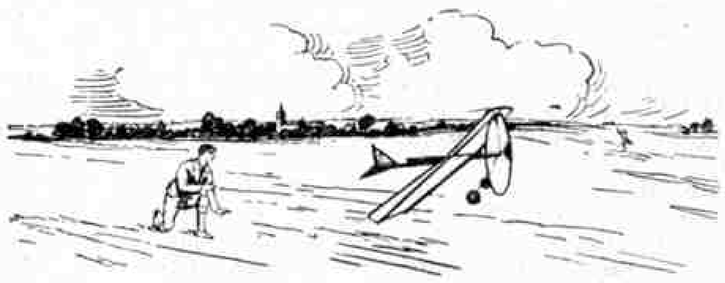

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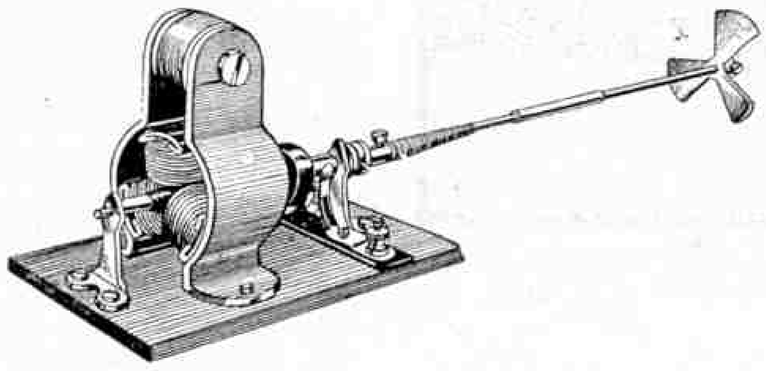

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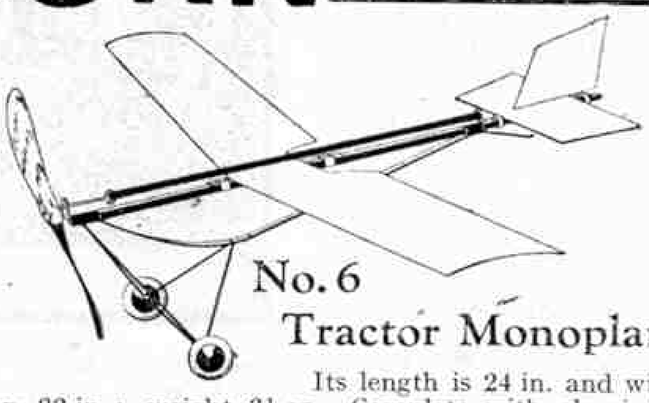

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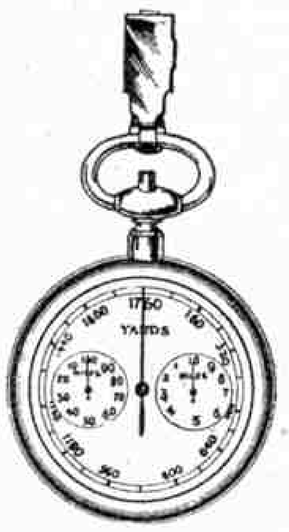

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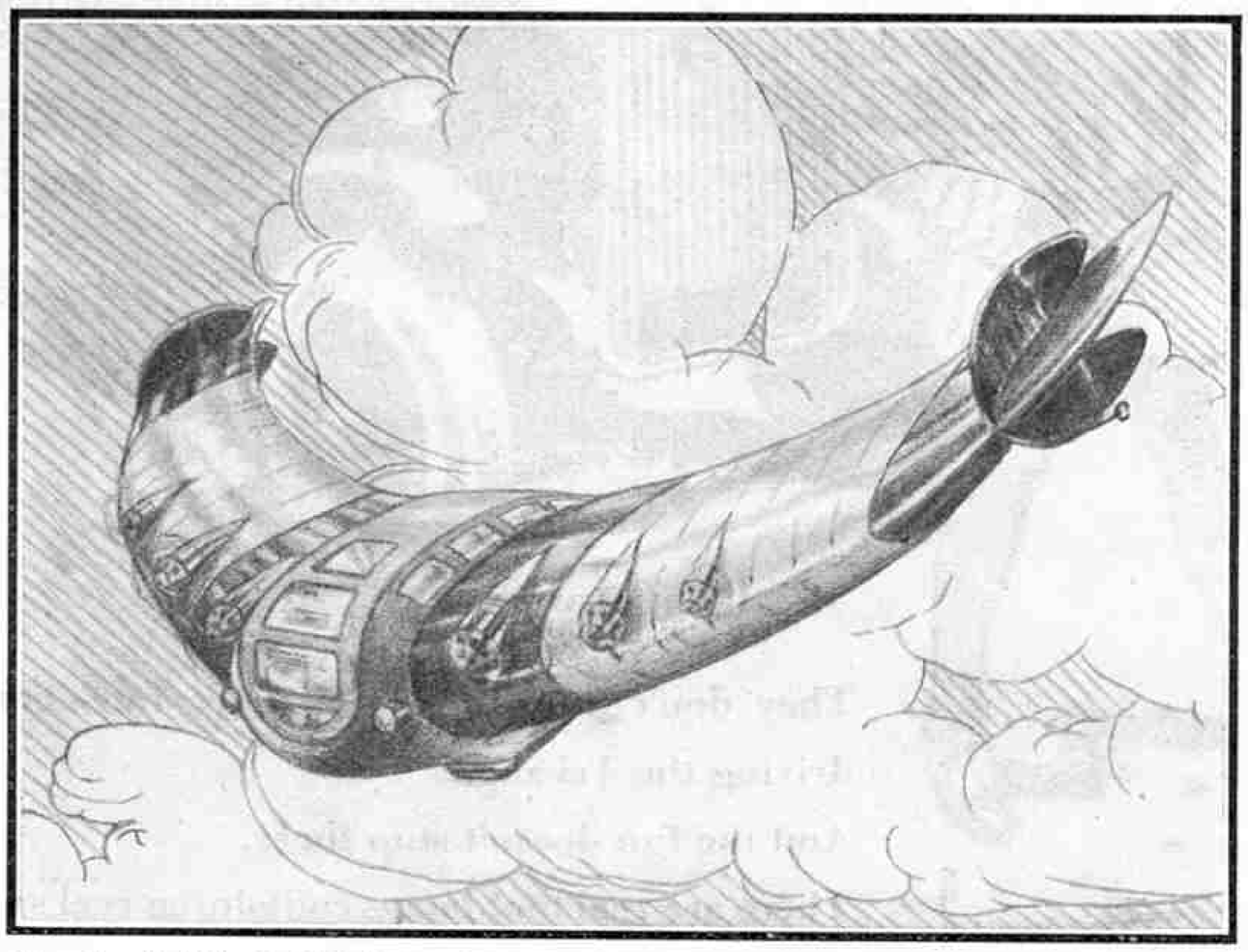
Competition Page

30th Drawing Contest: A British Warship

In recent weeks newspapers have been full of news centring round the International Conference on Naval Disarmament. This was called for the purpose of discussing many questions regarding the great fighting fleets that have been the pride of the maritime nations and its work is of especial interest to the British Empire.

In looking round for a suitable subject for a drawing contest, it seems to us that there is nothing even remotely approaching the Warship as the topic of the moment, and therefore we have chosen *"A British Warship"* as our subject. Some years ago a similar subject proved wonderfully popular and, no doubt, many readers who took part in that competition will welcome the opportunity to improve upon their earlier effort.



The Pterodactyl of 2000 A.D. A striking pictorial forecast submitted by C. P. Plantin, Westcliff-on-Sea, in the 29th Drawing Contest.

The expression "warship" may be interpreted to cover every type of armed vessel attached to an up-to-date Navy. Thus entries may depict battleships, battle cruisers, cruisers, destroyers, submarines, aircraft carriers, and so on. Overseas readers, outside the British Empire, may be more familiar with ships of other Navies than the British, and for their benefit the Overseas Section will be open for drawings of warships of any nationality. Readers who prefer to submit paintings, or drawings in colour rather than in black and white, are at liberty to do so.

The entries, as usual, will be divided into two sections, A for those from competitors aged 16 and over, B for those under 16. Prizes of Artists' Materials or Meccano Products (to be chosen by the winners) to the value of 21/- and 10/6 respectively, will be awarded to the best and second best entries in each section. There will also be a number of consolation prizes.

Competitors may submit as many entries as they wish, but they must place their name, age and address on the back of each. Unsuccessful drawings will be returned if a suitable stamped wrapper is sent for the purpose.

Entries should be addressed to "30th Drawing Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must be sent to reach this office not later than 31st March. Overseas closing date, 30th June.

CAN YOU COUNT?

Our recent puzzle pictures, consisting of pictures made up entirely of numerals, have proved amazingly popular and very obviously our readers rather pride themselves that they can count correctly. Counting is not too easy when figures of all shapes and sizes, jumbled together in a haphazard manner, have to be tackled, but we wonder if the task is easier when particular words scattered throughout the pages of a magazine or book are to be numbered. This month we are giving our readers an opportunity to find this out for themselves, and at the same time to win a prize.

We are very curious to know just how many times the word Meccano is used in this month's *"M.M."* The number must be enormous, and as an inducement to readers to take a census, we offer prizes of Meccano Products (to be chosen by the winners) to the value of 21/-, 15/-, 10/6 and 5/- respectively to the four competitors who submit the most nearly accurate counts. Consolation Prizes will be awarded to the competitors who come next in order. In the event of a tie for any of the prizes preference will be given to the entry that is displayed in the most novel manner.

Entries must be written on post cards, and no competitor may submit more than one estimate.

The post cards must be addressed to "Word Census, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must be sent to reach this office not later than 31st March. Overseas closing date, 30th June.

COMPETITION RESULTS

HOME

Figure Face Contest.—Our artist deliberately set out to create a teaser with his Figure-face puzzle, but several boys arrived at the correct solution, and dozens more came very close. The correct figure, of course, cannot be published until after the Overseas Section has closed. The prizes were awarded as follows:—1. E. Lamin (Dogmersfield, Hants.); 2. R. Crook (Gloucester); 3. T. Wade (Ashington); 4. J. J. Hanly (Limerick). Consolation Prizes: A. Aubrey (Medstead, Hants.); R. Bennett (Birmingham); W. J. Cayley (West Croydon); C. Dunkley (Kettering); W. J. Green (Honiton); B. Harrington; (Crawley Town); J. Hutton (Eye, Suffolk); P. Hyde (Langley); K. Keeping (Exeter); L. Marshall (Highgate, N.19); R. Pennycook (Liverpool); J. A. Queenan (Ealing, W.3); G. Rowe (Salford); G. Savage (Ealing, W.5); C. F. Sayer (E. Dereham); B. Towlson (Beeston); W. G. Vivian (Manningham).

OVERSEAS

Cricket Opinion.—First Prizes: Section A, C. J. W. Muller (Cape Town, S.A.); Section B, D. G. Tees (Durban, Natal, S.A.); Second Prizes: Section A, S. Matthews (Victoria); Section B, K. Sampson (Sydney).

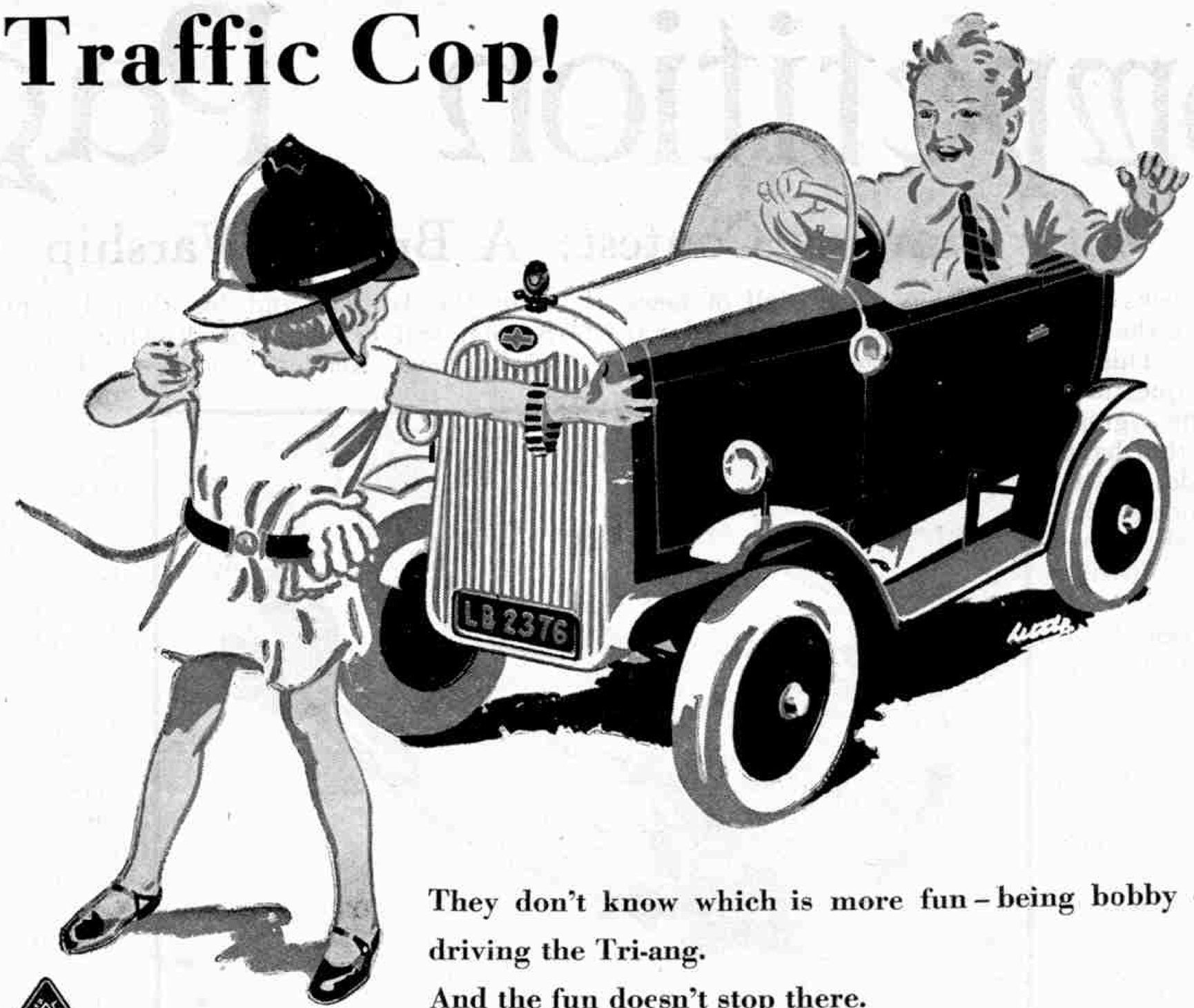
Figurewords.—The solution to this competition is as follows:—Collars, Pinions, Ratchet, Springs, Spanner, Girder. Quite a large number of boys succeeded in arriving at the correct solution and the judges were compelled to follow their usual rule in such circumstances, of awarding the prizes on the basis of neatness and novelty of presentation.

The prizewinners' names are as follows:—1. D. Smithson (Transvaal, S.A.); 2. F. W. Jones (Winnipeg); 3. R. Figgins (Gibraltar); 4. G. C. Israel (Invercargill, N.Z.). Consolation Prizes: T. de Mulder (Schaerbeel, Belgium); R. P. Peewman (Lichtenburg, S.A.); G. Tardrew (Johannesburg, S.A.); B. D. Joshi (Almora, India); J. Sheffield (Auckland, N.Z.); M. W. Morten (Napier, N.Z.); B. W. Monk (Adelaide, S. Australia); J. Longbottom (Taranaki, N.Z.); R. J. Ramikhetvala (Bombay).

28th Drawing Contest.—First Prizes: Section A, J. B. Hughes (Victoria, B.C.); Section B, D. Adams (Sydney, Australia). Second Prizes: Section A, F. Johnson (Sydney, Australia); Section B, G. Brown (Taranaki, N.Z.). Consolation Prizes: A. H. Bonea (Natal, S.A.); MacL. Morgan (Cremorne, Australia); G. Nixon (Transvaal, S.A.).

October Crossword Puzzle.—1. P. L. Brathwaite (Hastings, N.Z.); 2. S. Niven (Durban, S.A.); 3. J. M. Gooch (Victoria, Australia); 4. R. G. Henderson (Croydon, N.S.W.). Consolation Prizes: H. S. Dhek (Almora, U.P., India); B. D. Joshi (Almora, U.P., India); R. A. Wragg (Ragputana, India).

Traffic Cop!



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And the fun doesn't stop there.

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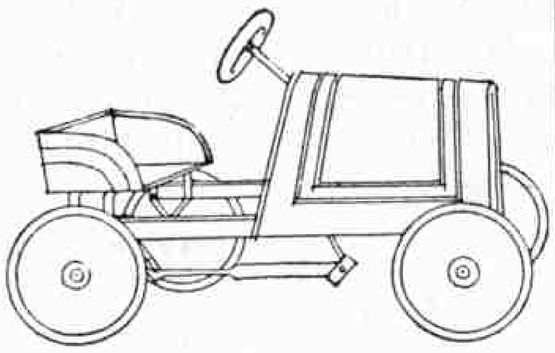
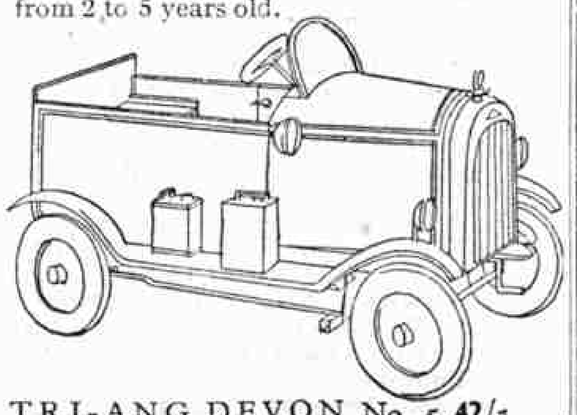
(Illustrated above).

Scale model Chevrolet radiator. Easy running double crank drive, 9in. steel disc balloon wheels. Rubber tyres and pedals. Accessories include 4 lamps and motometer. Side door opens.



TRI-ANG LIZZIE. No. 3 15/-
All-steel body. Easy running double crank drive. 8 in. rubber tyred wheels. 6 in. steering wheel. Lamp. Rubber pedals. Recommended for motorists from 2 to 5 years old.



TRI-ANG DEVON No. 5 42/-
Ball-bearing double crank drive and back axle. Black stove enamelled radiator. 11 in. steel disc balloon wheels. Rubber tyres and pedals. Accessories include 4 lamps, windscreen, licence holder, motometer, starting handle, oil can and petrol tin. Side door opens.

ANOTHER WORLD'S RECORD!

"How deep is this lake?" asked the interested visitor.

"Well, sir," said the guide, "we don't know the actual depth, but last year a young Australian came here for a swim, dived in and didn't come up to the surface again."

"And weren't you able to rescue him?"

"No, but next day we received a cable from Australia asking us to send his clothes on!"

* * * *

WHAT DID THEY MEAN?

First Welshman: "What time is, I daresay?"

Second Welshman: "Don't know, I shouldn't wonder!"

* * * *

The teacher was doing her best to explain the points of the compass to her class.

"Willie Jones," she said, "step out here for a moment."

Willie did as he was bid. "Turn round and face the North," ordered the teacher. Willie turned round and faced it. "Now, what is on your right hand?" A flush crept over Willie's face. "Please, miss," he confessed, "it's toffee. I hadn't time to wash it off before the bell went."

* * * *

WHALE-BONES

"You boy, over in the corner!" said the brutal examiner, fixing his eye on the nervous-looking pupil. "Answer this," he barked. "Do we eat the flesh of the whale?"

"Y-y-yes, sir," faltered the scholar.

"And what do we do with the bones?"

"P-please, sir," responded the nervous one, with chattering teeth, "we l-leave them on the s-side of our p-plates."

* * * *

"Waiter," said the customer, "This water isn't fit to drink. Just look at the dirt in it!"

The waiter held up the glass to the light. "It's all right, sir," he said, "the water's quite clean. It's the glass that's dirty!"

* * * *

BENEATH NOTICE

A somewhat dwarfish sportsman was shooting on the moors, accompanied by a ghillie, who by his stalwart proportions presented a singular contrast to his employer. The midges pestered Donald sorely, and the sportsman wishing to have his joke at the ghillie's expense, remarked: "How is it, Donald, that these insects annoy you so much, and never interfere with me?"

"Ay, well, sir," replied Donald, looking down at the pigmy specimen of humanity before him, "I'm thinking, sir, that mebbe they hivna noticed you yet."

REALLY ANTIQUE

Customer: "And can you guarantee this chair as being really antique?"

Dealer: "Antique, madam? There is no doubt about that. Why, it was so worm eaten when I bought it that I had to have a new back, a new seat, and three new legs made for it."

* * * *

The traveller was working in a new district, and orders were very scarce indeed. On entering one shop he presented his card, only to be informed that there was nothing in his line that was wanted.

"Will you permit me to show you our leading articles?" begged the traveller.

"No," was the reply. "We really can't spare the time at present."

"Well, sir," persisted the salesman, dejectedly, "would you mind if I opened my bag here and took a look myself? I haven't seen them for nearly three weeks."

* * * *

SAFETY FIRST

Jones: "What's the idea of the luggage—going away?"

Smith: "No. The church is giving a jumble sale, and I'm taking my clothes to the office until it's over."

* * * *

Teacher (after natural history lesson): "Now, Willie Jones, what do you think is the most wonderful bird you've seen?"

Willie: "The chicken, miss."

Teacher: "The chicken! What makes you think that?"

Willie: "Because it's the only one you can eat before it's born and after it's dead."

* * * *

A visitor in the village noticed that one of the inhabitants of the place was treated with deep respect by the others.

"I observe," remarked the visitor to an aged resident, "that you all treat that man with marked deference."

"Yes," was the answer, "he's one of the early settlers."

"Early settlers?" asked the other, "Why, he can't be above thirty!"

"That may be true," replied the old man, "but he pays all his bills promptly on the first of every month."

* * * *

Kind Old Lady: "What is the matter, little man?"

Tommy: "Mother scolded me for jamming my fingers."

Kind Old Lady: "Oh, how cruel. Here's a penny for you. Where did you jam them?"

Tommy: "In the jam jar."

* * * *

Father did not seem to be enjoying his meal. "This lettuce tastes very funny," he said. "Are you sure it has been washed properly?"

"Oh, yes," said his little daughter. "I washed it myself in the bathroom, and used scented soap, too!"

* * * *

Bobby came home one afternoon with his clothes full of holes. "What in the world has happened to you?" cried his mother.

"Oh, we've just been playing at grocers, and I was the cheese," replied Bobby.

* * * *

Teacher: "What is an organiser?"

Willie: "The man who makes the music in church."

NOT TOO PLEASED

"I had to kill my dog last night."

"Was he mad?"

"Well, he didn't seem any too pleased about it."

* * * *

The amateur mechanic had purchased a second-hand car, and after spending a Saturday afternoon working on it, stood back to contemplate his handiwork.

"You wouldn't think it was second-hand, would you?" he proudly asked a friend.

"Goodness, no," said the friend. "I thought you'd made it yourself!"

* * * *

An elderly lady walked into a railway booking office at Chicago and asked for a ticket to New York.

"Do you wish to go by Buffalo?" asked the booking clerk.

"Certainly not!" she replied. "By train, if you please!"

* * * *

The Browns lived at the corner house of a new road, and consequently were frequently annoyed by people ringing the door bell to ask where other people in the road lived.

At last the son of the house decided to put an end to this nuisance.

"I don't think there will be any more trouble," he said, one day, after spending a whole morning working away in the shed.

"Why, what have you done?" asked Mrs. Brown.

"Oh," returned the lad blandly, "I just hung out a little sign I thought of the other day: 'Nobody lives here 'cept us.'"

* * * *

Mistress (interviewing new maid): "Are you an early riser?"

Maid: "Yes, mum. Why, in my last place, I was up and made all the beds before the rest were awake."

* * * *

"Listen, Peter!" said Auntie Jane. "the clock is striking five—one-two-three-four-five."

"Oh, ours doesn't do that," retorted Peter. "Ours only says one-one-one-one-one."

* * * *

"Johnny," said the teacher, "What was George Washington famous for?"

"Please, miss, his memory," replied Johnny.

"His memory! What makes you think that?"

"Because they erected a monument to it, teacher."

* * * *

Little Nephew: "Uncle, are you really a cannibal."

Uncle: "A cannibal! Why do you think that?"

Nephew: "Well, mother says you're always living on somebody."

* * * *

A PERFECT ALIBI

Mother: "Johnnie, I have just been told that instead of going to Sunday School this morning you played football."

Johnnie: "It isn't true mother, and I've got a string of fish to prove it."

* * * *

Little Freddie went into the draper's shop. "If you please," he said, "mother wants a tape measure."

"Certainly," said the assistant, "How long does she want it?"

"Oh," replied the little boy, "I think she wants to keep it."

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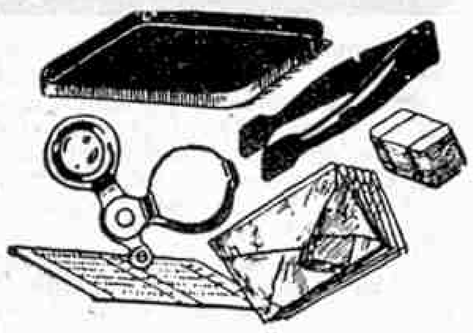

AIRWAYS ARE MAILWAYS

PHILATELY does not begin and end with the mere amassing of quantities of stamps of widely ranging varieties and values. It involves the study of stamps and the reason for the existence of particular varieties; it is essential to consider the postal customs of different countries and, not the least important, the methods of transporting mail matter.

In early postal days all correspondence had to be carried by mail coach or by messengers mounted on horseback. Later came the railway and with its speedier travel the death knell of the mail coach was sounded. Overseas mail, until comparatively recent days, had no alternative means of transport to the mail steamer, but as surely as night follows day, the aeroplane and airship will supersede the slow moving steamer as the bearer of the Overseas mail. In fact, the time is fast coming when all mails will be carried by air over both land and sea, except on the shortest journeys. Obviously, then, the days of the special air mail stamp, as such, are numbered, for soon all stamps will be air mail stamps and the rarer stamps will be those used for mail that has been carried in other ways than by air.

With this prospect before us, it becomes very clear that a consideration of the development of aerial transport as revealed by stamps would make a very appropriate commencement to a review of the air mails of the world. By great fortune Brazil's newly issued air mail series, several specimens of which are illustrated this month, fills in the early pages of the story with designs commemorating the records of Santos Dumont, one of the great pioneers of flying. It only remains for France to present a commemorative of the Paris balloon posts to enable stamp collectors to compile a complete record of the progress and development of aerial transport.

It was in 1897 that Santos Dumont commenced his efforts to solve the problem of sustained flight, and, although he was a Brazilian subject, most of his experimental work was conducted from a tiny workshop in the Rue du Colisee, Paris. After several experiments with balloons he decided to attempt to drive an elongated balloon with a small motor cycle engine. This was in fact his first airship.

The envelope of this dirigible was 82½ ft. in length, 11 ft. in diameter and had a capacity of 6,354 cubic ft. In spite of several somewhat alarming incidents during its first flights the ship proved completely successful, and thus encouraged, Santos Dumont set out to develop his ideas. With his sixth ship, *N6*, which had a lifting power of slightly more than half-a-ton, a capacity of 22,239 cu. ft., and a 12 h.p. motor for motive power, he won a prize of £4,000 for the first flight from St. Cloud, around the Eiffel Tower, and back to the starting point within 30 minutes! It is this flight that is illustrated in the design of the Brazilian 200 reis stamp, which shows the airship in the act of rounding the Eiffel Tower. The stamp also shows the date of this momentous feat, 19th October, 1901.

Contrast this tiny ship with the *Graf Zeppelin*, illustrated on Germany's special trans-Atlantic air mail stamp, used to frank the mail that was carried by the "*Graf Zeppelin LZ127*" on its experimental flight across the Atlantic to America and back in September, 1928. This airship has a total capacity of 3¾ million cu. ft., a lifting capacity of 129 tons, excluding the weight of its crew of 26 persons, and is driven by five Maybach engines developing a total of 2,650 h.p.! The amazing progress of a mere quarter of a century is strikingly epitomised by these two stamps.

The U.S.A. have been the butt of many pointed comments recently because of the frequency with which commemorative stamps have been issued in recent years, but it is due to one of those issues that we are able to include in this review a stamp that pictures the first flight of a power-driven heavier-than-air machine. In connection with the International Civil Aeronautics Conference held on the 25th anniversary of the first aeroplane flight, America issued two commemoratives, one of which showed the historic Wright biplane that accomplished the epoch-creating feat.

Orville and Wilbur Wright, the heroes of the flight, became interested in aviation in 1896, after reading of the tragic death of Lilienthal, the German air pioneer. Their earliest efforts consisted solely of work with gliders, for they were convinced that much of the theory of the early experimenters was unsound. It was not until 1903 that any attempt was made to produce a power-driven machine, but in proof of the accuracy of their own theories, their first machine, equipped with a 25 h.p. motor driving two propellers fitted at the rear of the machine, achieved complete success. This was on 17th December, 1903.

The appearance of the machine is very accurately portrayed on the 2c. stamp issued on 13th December, 1928, in connection with the Aeronautical Conference, but visitors to London may see the machine itself, for it has found a permanent home in the South Kensington Science Museum.

Following the Wright brothers' success Santos Dumont turned his attention to heavier-than-air machines as a diversion from his work on airships. His theories were entirely independent, but once again he proved successful, for the box-kite-like biplane illustrated on the Brazilian 500 reis air stamp, attained a speed of nearly 30 m.p.h. during a short first flight in Paris on 12th November, 1906, and proved very conclusively that the aeroplane had reached the practical stage.

(*Continued on page 251*)

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***Meccano Magazine*, Old Swan, Liverpool.**

A Remarkable Commercial Truck—

(*Continued from page 225*)

proof of this if desired.

3. The ages of the competitors will be taken into consideration when deciding the awards.

4. Photographs or drawings of the models should be submitted. The actual model will not be accepted. If a competitor is unable to obtain good photographs of his model, this will be no hindrance to him provided that his drawings are clear and neatly executed. Any points not perfectly clear in the drawings or photographs should be described briefly. Neither photos nor drawings need be the competitor's own work.

5. Photographs or drawings will be returned if a stamped addressed cover of the necessary size is sent with the entry, except in the case of prize-winning entries, which become the joint property of R. A. Lister & Co. Ltd., and Meccano Ltd.

6. Each separate photograph submitted must bear the competitor's name, address, age, competition section (A, B, or C) and name of the Contest ("Lister Truck" Competition).

7. Entries will be divided into three different sections as follows: Section A, for boys residing in the British Isles and over 14 years of age; Section B, boys residing in the British Isles, and under 14 years of age; Section C for Overseas Competitors of all ages. The list of prizes is shown in the panel on page 224.

8. Members of the staffs of R. A. Lister & Co. Ltd. and Meccano Ltd. are not allowed to compete.

9. The entries will be judged jointly by R. A. Lister & Co. Ltd. and Meccano Ltd. The judges decision must be accepted as final.

10. The closing dates for the competition are as follows: for Sections A and B, 30th April; for Section C, 31st July, 1930. The results will be published in the "*M.M.*" as soon after the closing dates as possible, and the principal prize-winning models will be described.

An Elizabethan Knight Errant—

(*Continued from page 207*)

taken part in Spanish plots against the life of James I. Again he failed to obtain any practical result, and in the course of the expedition his son was killed in an attack on a Spanish camp. In the deepest dejection the old man returned home, and there he paid with his life for his failure to bring back the treasures he had promised.

The charge made against Raleigh of plotting against James was utterly ridiculous, but throughout the trial there was a strong bias against him and he was found guilty. He undoubtedly realised the strength of this bias, but nevertheless he bore himself with calmness and dignity under the bitter attacks of the Attorney-General, Sir Edward Coke. The nature of the whole trial is clearly indicated by a comment passed subsequently by one of the judges who had assisted. "English justice," he declared, "had never before been so degraded as at the trial of Raleigh."

The story of the remarkable changes in Raleigh's position is very attractively told by Mr. Waldman, who has followed the fortunes of his hero from the time when he was "an ambitious adventurer, with his wits, his courage, and his looks as his principal assets"; through the period when he was a rich and powerful statesman and explorer, to the last phase of all, when he was a humble prisoner in the Tower. Throughout his life Raleigh retained his adventurous and questioning spirit, and even in his darkest days in the Tower he occupied his time with scientific experiments and in compiling "*A History of the World*" that for several generations was one of the most popular of English books.

It is typical of Raleigh's spirit that although opportunities to escape were offered on several occasions during his return to England to meet his fate after the failure of his last voyage, he declined to take advantage of them. His courage remained unshaken to the end, and he was able to conduct himself on the scaffold with the same spirit as he had displayed in the most prosperous moments of his varied career. This is well shown in the passage in which Mr. Waldman describes the end of his hero's life:—

"The executioner spread his cloak out and Raleigh knelt upon it. The former asked him to lie facing the east, to which he whimsically replied: 'What matters it which way the head lie, so the heart be right.' He refused to be blindfolded, with the remark, 'Think you I fear the shadow of the axe, when I fear not the axe itself.' When he was ready he stretched out his hands, the agreed sign to strike, but apparently the headsman was too overcome and the blow did not follow. 'What dost thou fear? Strike, man, strike!' came from the figure on the block. In response the axe was raised and when it fell he was dead."

In laying down this book one feels with its author that Raleigh's death was the greatest triumph of his life. The impression it made was overwhelming, and the verdict of the bystanders was well expressed by one who was heard to say: "Where shall we find such another head to cut off?" The manner of his death recalled the brilliance of his life, and his countrymen began to see him as the last knight-errant of the great age of Elizabeth. The martyr who had been soldier, sailor, statesman and artist became the inspiration of the Puritan rulers of the following age, and for centuries has served as a pattern of romantic patriotism.

Stamp Collecting—(*Continued from page 249*)

It seems a far cry from those early experimental machines to the great mail-carrying aeroplanes with which we are so familiar to-day. Probably neither the Wright Brothers nor Santos Dumont imagined even for one moment that within less than 15 years, aeroplanes would be maintaining regular traffic routes and covering them with almost monotonous regularity at speeds four to five times greater than anything the adventurous pioneers dared to imagine.

Our earliest illustration of an actual mail-carrying machine shows the twin-engined Vickers "Vimy" biplane that forms the design of the 15c. stamp of Newfoundland's current series. This machine, piloted by Alcock and Brown, made the first trans-Atlantic non-stop crossing as long ago as June, 1919, and carried a small bag of mail from Newfoundland to Ireland. Flown covers from this flight are among the most valuable of aero-philatelic gems. The Vickers "Vimy" machine was an old wartime-built R.A.F. bombing 'plane that was adapted for the purpose of the transatlantic flight. It provides an interesting contrast with the great D.H. "Hercules" machine shown on the Egyptian current air mail stamp that typifies the aircraft used on the London-India air service.

In many parts of the world, particularly where big tracts of forest land, intersected by rivers and streams, lie undeveloped, it is to the seaplane and flying boat that the mail services of the future will be entrusted. Unfortunately, we cannot include seaplanes in our collection yet, for there is not a specimen available. Flying boats, however, have a representative in the Spanish 1926 Red Cross issue. This series employed two designs, one of which, illustrated here, shows the flying boat "*Plus Ultra*" in the course of its flight across the South Atlantic in 1926.

In our Stamp Notes in the February "*M.M.*" we referred to a beautiful new

air mail issue from Japan. This particular stamp makes a very fitting conclusion to our story, for it is representative of the most up-to-date types of aeroplane. It shows a Kawasaki-Dornier all-metal monoplane flying over Lake Ashinoko, while in the background rears the head of Fujiyama, the sacred mountain.

In an earlier paragraph we expressed the view that soon all mail matter will be carried by air. For some considerable time past we have been studying this topic, and it is our intention to deal with it in a series of short articles. Each month we shall take up the story of air mail in one country or group of countries, and suggest lines upon which development may be expected to occur.

Stamp Gossip

A Japanese Commemorative

It is some months since Japan figured in the list of new issues, but the newest issues from the land of the Rising Sun certainly have been worth waiting for. They surpass even the usual high standard of Japanese production, and, incidentally, provide a curious combination of ancient and modern.

The first of the two issues appeared on 2nd October, in connection with an event that is bound up by legend with the very foundations of the Japanese Empire. Tradition has it that when the Goddess of the Sun founded the land of Nippon she sent her grandchild to be the protective spirit, and gave him three treasures, a gem bead as an inspiration of humanity, a mirror for wisdom and a sword for courage. These three things have been the emblems of the Imperial Japanese family since the time of the first Emperor, Jimmu, and the sacred mirror is still preserved in a shrine at Ise.

Every 20 years, in observance of the tenets of Shintoism, the Japanese national religion, which demands absolute cleanliness from all believers, the sacred mirror is taken from the shrine in which it has been reposing, and placed in a completely new abode made of white pine wood.

The 58th observance of this ancient ceremony occurred during 1929, and in commemoration two stamps showing the new shrine were issued. These stamps are of special interest, in that for once in a way the Japanese have disdained the use of European symbols to indicate the value of the stamps, but for the guidance of readers who buy the issues the lower value, 1½ sen, is coloured violet, and the higher, 3 sen, carmine.

Passing from the antiquity and beautiful reverence of the Shrine of Ises ceremony it seems almost an unbelievable gap to bridge to the second of the new stamps, for it depicts one of the most modern of mankind's creations, an all-metal Dornier aeroplane. A full reference, with an illustration of this stamp, appears in our stamp article this month.

One Hundred Years of Freedom

In celebration of the centenary of freedom from Turkish dominion, Greece has issued a commemorative series of stamps consisting of nine values, ranging from 25 lepta to 50 drachma.

The designs of the seven lower values are given over to portraits of the leaders in the struggle, while the two higher values, 25 drachma and 50 drachma, show incidents in the revolution.

We are indebted to Mr. G. Stampados (Athens) for preliminary details of the designs, and hope to make further reference to this issue at a later date.

An Appreciation

We take this opportunity of making acknowledgment to Stanley Gibbons Ltd., for their courtesy in loaning the stamps from which the illustrations used with our Stamp article and the Stamp Gossip have been prepared.

New Zealand's Pun

Charity stamps among British Colonial issues are very few, and for that reason New Zealand's recent Tuberculosis Fund issue will be particularly interesting. We fear, however, that its principal claim to fame will lie in the atrocious pun perpetrated in its slogan "Help Stamp out Tuberculosis."

The stamp is of the penny denomination, and was sold at twice its face value, the second penny being devoted to the Charity Fund. It was first issued on 11th December, and was available for use for one month only.

Possibly it is the colour, carmine, that is responsible but we cannot help thinking that the printer of this issue has let the designer down very badly. Nurses, traditionally, are pretty, but the contrasts of the colour of the new stamp have combined to produce an anæmic lady whose beautiful features are, to say the least, very sadly marred.

Englishman Honoured by Australia

It is the intention of the Australian authorities to honour the memory of Captain Charles Sturt, the famous explorer, with a special commemorative stamp to celebrate the centenary of Captain Sturt's journeys of discovery into the interior of Australia. The date of the stamp's appearance and its design have yet to be decided upon, however.

Captain Sturt's name, although he was an Englishman, is probably more familiar to our Australian readers than to English boys. He joined the army at an early age and went out to Australia with the old 39th Regiment. Soon he became intensely interested in the geographical discoveries that were exciting the country and in 1828 he decided to form and head an exploration expedition of his own.

His first journey resulted in the discovery of the Darling River. Later, a second expedition was formed and in the course of this Lake Alexandrina was located. The privations suffered by Sturt during this expedition affected his health very seriously and, in fact, he was almost blind when his mission was completed. Despite this handicap, in 1844 he insisted on leading a third party. The difficulties encountered were even more appalling than those met with in the earlier expeditions, and when eventually the party returned their leader's eyesight had failed completely.

In 1851 Captain Sturt was voted a pension by the South Australian legislature and he retired to England and died at Cheltenham on 16th June, 1861.

His life was a glorious example of Service before Self.

HORNBY SERIES

HORNBY ROLLING STOCK

GAUGE 0

Hornby Rolling Stock includes almost every type n use on the big railways, and a selection of the splendid range available is illustrated on this page. The various items are modelled on realistic lines and are beautifully enamelled, mostly in the correct colours of the L.N.E., L.M.S., G.W. or Southern Railways.

Ask your dealer to show you the full range of Hornby Rolling Stock.

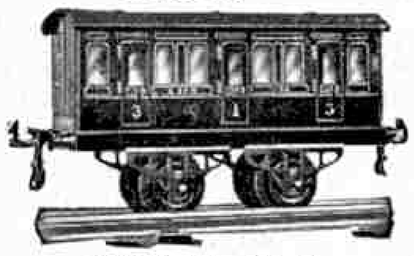
PETROL TANK WAGON "PRATTS"
Finished in green.
Price **2/6**

MOTOR SPIRIT TANK WAGON "B.P."
Finished in yellow.
Price **2/6**

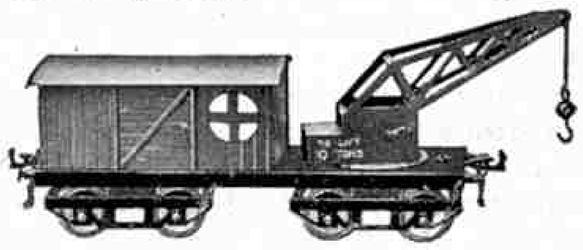
PETROL TANK WAGON "SHELL"
Finished in red.
Price **2/6**

PETROL TANK WAGON "REDLINE"
Finished in blue and red.
Price **2/6**

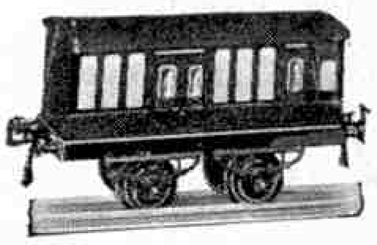
BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/-**



***HORNBY No. 1 PASSENGER COACH**
Realistic in design and fitted each side with opening doors. Price **2/6**

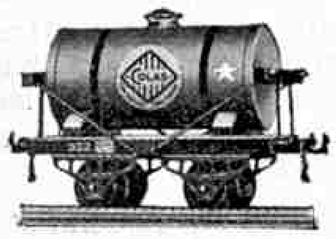


***BREAKDOWN VAN AND CRANE**
Beautifully coloured in brown and blue, with opening doors. Suitable for 2-ft. radius rails only. Price **6/3**



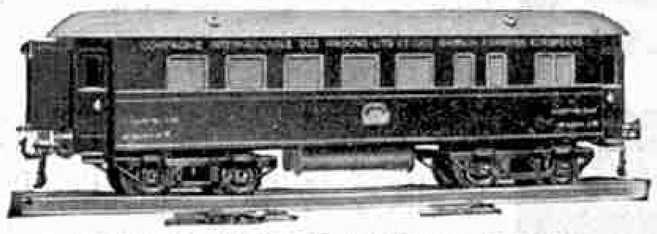
GUARD'S VAN
Realistic design, fitted each side with opening doors. Obtainable in L.N.E.R., L.M.S., G.W. or S.R. colours. Price **3/-**

WAGON (French Type)
Lettered "Nord."
Highly finished in colours. Price **3/3**



BITUMEN TANK WAGON "COLAS"
Finished in blue.
Price **5/3**

ROTARY TIPPING WAGON
Finished in orange. Price **3/-**

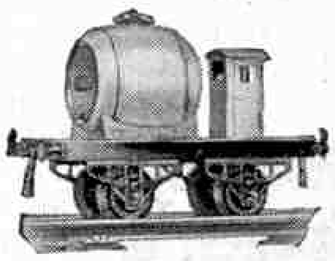


RIVIERA "BLUE" TRAIN COACH
"Dining" or "Sleeping."
This is a beautiful model, substantially built and well finished. Suitable for 2-ft. radius rails only.
Price **14/-**

***GAS CYLINDER WAGON**
Finished in red, lettered gold. Price **2/6**

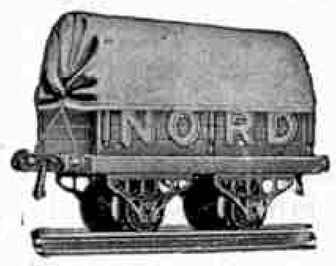
MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **6/-**

SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/6**

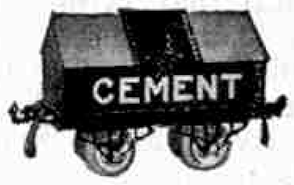


WINE WAGON, SINGLE BARREL
An interesting model of the single-barrel type of wine wagon used in France. Finished in red and green.
Price **4/-**

HORNBY No. 2 SPECIAL PULLMAN COACH COMPOSITE
As supplied with No. 2 Special and No. 3 Pullman Train Sets. One part is designed for passenger accommodation and the other for conveyance of luggage. Suitable for 2-ft. radius rails only.
Price **16/-**

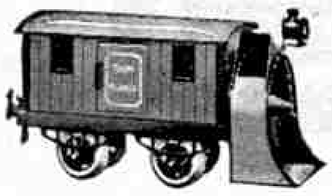


COVERED WAGON (French Type)
This new wagon is fitted with frame and sheet. French type, lettered "Nord." Price **3/-**

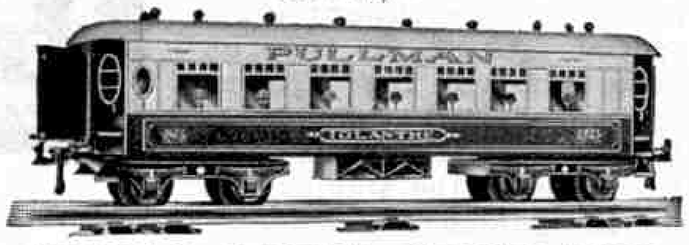


***CEMENT WAGON**
Finished in red.
Price **3/-**

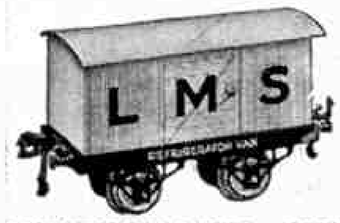
***TIMBER WAGON No. 1**
Beautifully enamelled in green and red. Price **1/9**



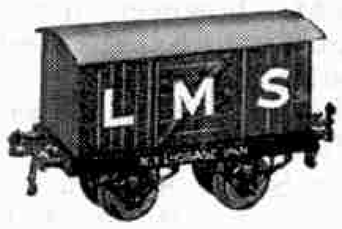
***SNOW PLOUGH**
With revolving plough driven from front axle.
Price **5/6**



HORNBY No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No.3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **15/-**

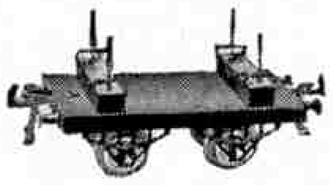


***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors.
Price **3/9**



***LUGGAGE VAN No. 1**
With opening doors.
Price **3/6**

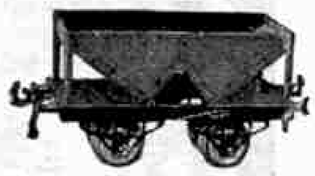
***GUNPOWDER VAN**
Finished in red, with opening doors. Price **3/6**



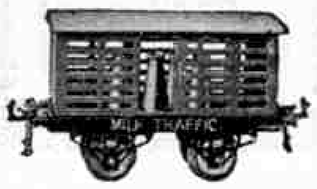
***LUMBER WAGON No. 1**
Fitted with bolsters and stanchions for log transport. Price **2/-**

***TROLLEY WAGON**
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **4/6**

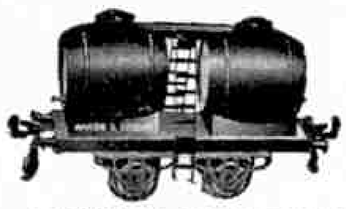
***CRANE TRUCK**
Finished in brown and blue. Price **3/6**



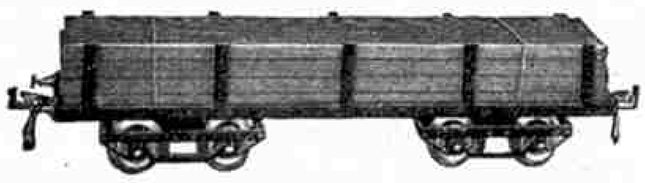
***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**



***MILK TRAFFIC VAN**
Fitted with sliding door, complete with milk cans.
Price **3/6**



WINE WAGON, DOUBLE BARREL
An attractive model, artistically enamelled in red and green. Price **5/-**



***TIMBER WAGON No. 2**
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **3/6**

BRAKE VAN
Finished in brown, with opening doors. Obtainable in N.E. or S.R. lettering. Price **3/6**

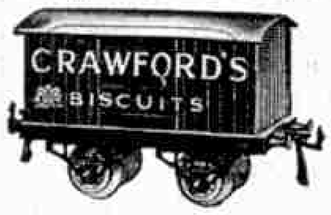
BRAKE VAN
Finished in Grey, with opening doors. Obtainable with L.M.S. or G.W. lettering. Price **3/6**

JACOB'S BISCUIT VAN
Finished in crimson lake, with opening doors.
Price **3/6**

CARR'S BISCUIT VAN
Finished in blue, with opening doors. Price **3/6**

***LUMBER WAGON No. 2**
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
Price **4/-**

**Lettered L.M.S., L.N.E.R., G.W., or S.R.*



CRAWFORD'S BISCUIT VAN
Finished in red, with opening doors. Price **3/6**

SECCOTINE VAN
Beautifully finished in blue with opening doors.
Price **3/6**

Manufactured by MECCANO LIMITED, BINNS ROAD, OLD SWAN, LIVERPOOL

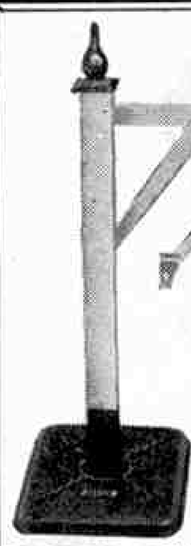
HORNBY SERIES

HORNBY ACCESSORIES

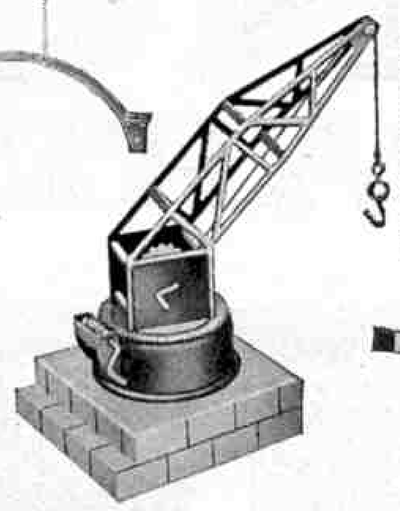
HORNBY SERIES

There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic Accessories the most elaborate model railway system may be constructed and operated in exactly the same manner as a real railway.

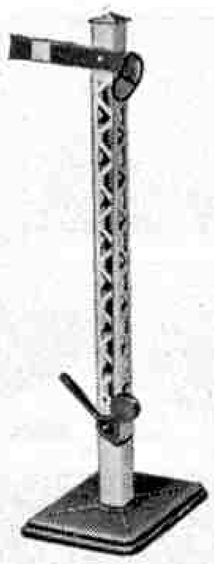
A selection of Hornby Accessories is illustrated below. Your dealer will be pleased to show you the full range.



LOADING GAUGE
Price 2/3



PLATFORM CRANE
This is a useful accessory. The Crane revolves on its base and is fitted with a crank and ratchet mechanism for controlling the load. Price 4/9



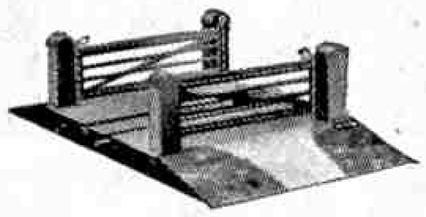
SIGNAL No. 1
Price 3/3 per pair. One "Home" and one "Distant."

RAILWAY ACCESSORIES No. 1
Miniature Luggage and Truck.
Price per set 1/6

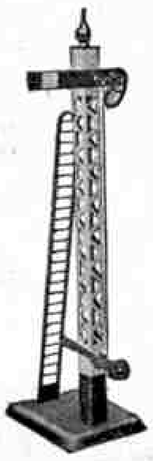
RAILWAY ACCESSORIES No. 3
Platform Machines, etc.
Price, per set 1/6

RAILWAY ACCESSORIES No. 2
Milk Cans and Truck.
Price, per set 1/6

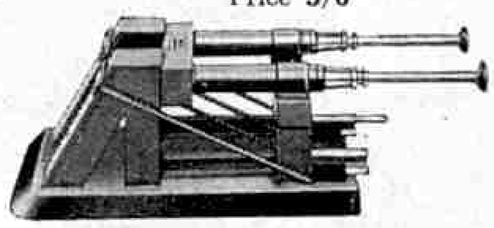
TELEGRAPH POLES
Price, per pair 4/-



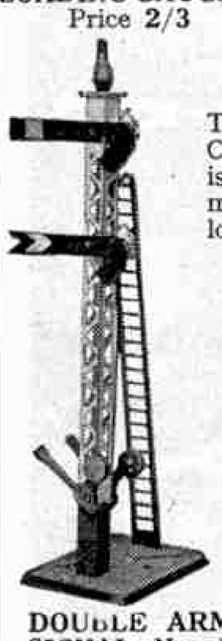
LEVEL CROSSING No. 1
This model is realistic in appearance and beautifully enamelled in colours. It is suitable for a single track only and has gauge 0 rails in position.
Price 3/6



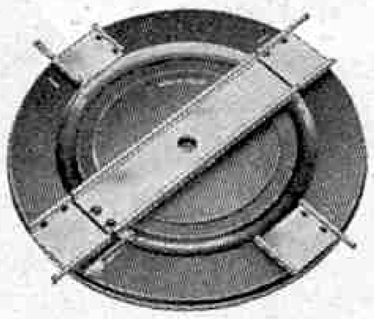
SIGNAL No. 2
Price 2/6 each.
"Home" or "Distant."



BUFFER STOPS No. 2 (HYDRAULIC)
Price 5/6

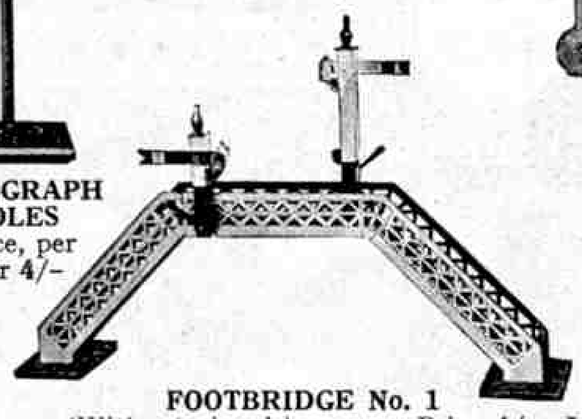


DOUBLE ARM SIGNAL No. 1
Price 4/3 per pair.
DOUBLE ARM SIGNAL No. 2
(As illustrated.)
Price 3/- each.

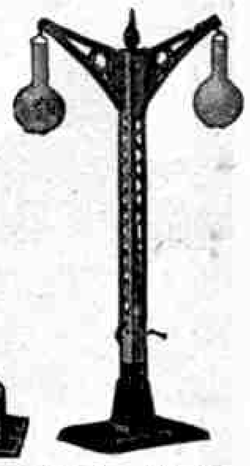


TURNTABLE No. 1
Price 2/9

RAILWAY ACCESSORIES No. 4. This set comprises all the pieces that are contained in Railway Accessories Nos. 1, 2 and 3 ... ... Price 3/9

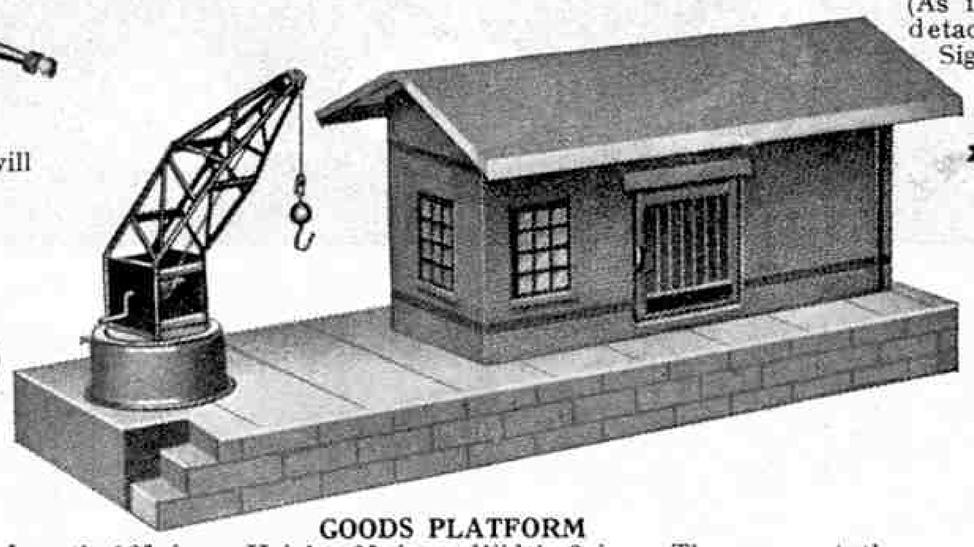


FOOTBRIDGE No. 1
(Without signals) ... Price 4/-
FOOTBRIDGE No. 2
(As illustrated), complete with detachable signals Price 7/6
Signals only, per pair 3/9



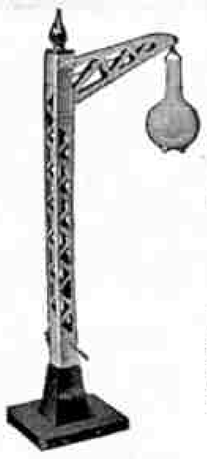
LAMP STANDARD No. 2 (DOUBLE)
Electric flash-lamp bulbs may be fitted into the globes.
Price 4/6

OIL CAN No. 1
This miniature Oil Can will give every satisfaction.
Price 6d.

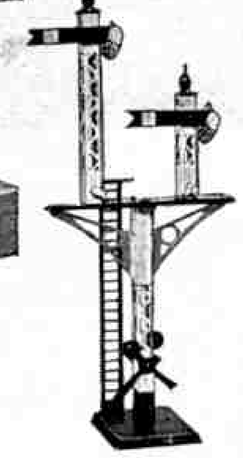


GOODS PLATFORM
Length 16¾ ins. Height 6¾ ins. Width 6 ins. The crane at the end of the platform revolves on its base. It is enamelled in colours and is fitted with a crank and ratchet mechanism for controlling the load ... ... Price 12/6

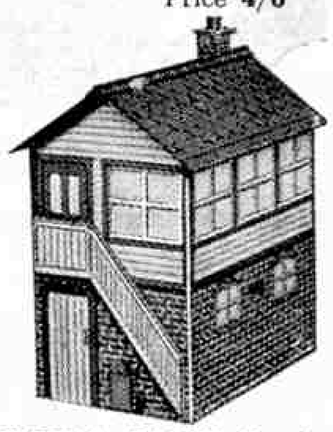
TARPAULIN SHEETS
Strongly made. Lettered L.M.S., N.E., G.W. or S.R. The above illustration shows one of the Tarpaulin Sheets fitted to a Hornby Wagon.
Price 6d.



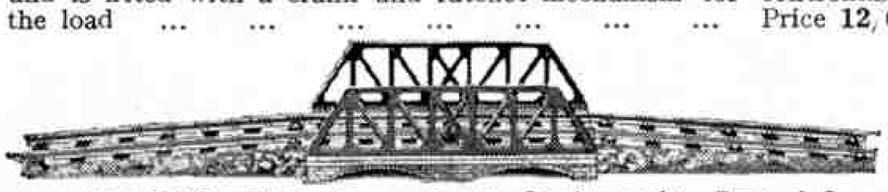
LAMP STANDARD No. 1 (SINGLE)
An electric flash-lamp bulb may be fitted into the globe. Price 3/6



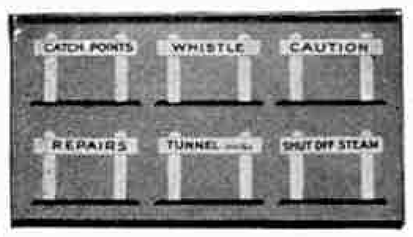
JUNCTION SIGNAL
"Home" or "Distant" Signal arms operated by levers at base. Very realistic model, standing 14 ins. in height.
Price 6/-



SIGNAL CABIN No. 1
Dimensions: Height 6 ins. Width 4½ ins. Length 6 ins. Finished in colours ... Price 2/9

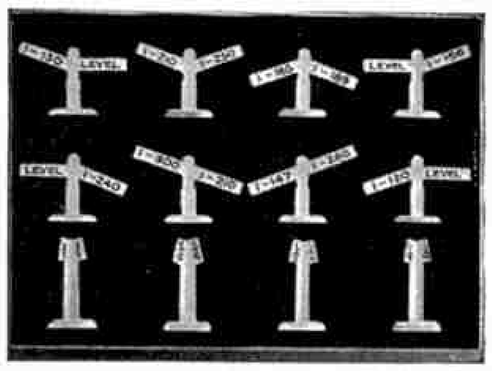


VIADUCT. Price 7/- **Centre Section only.** Price 4/9
ELECTRICAL VIADUCT. Price 8/-
Centre Section for Electrical Viaduct. Price 5/3

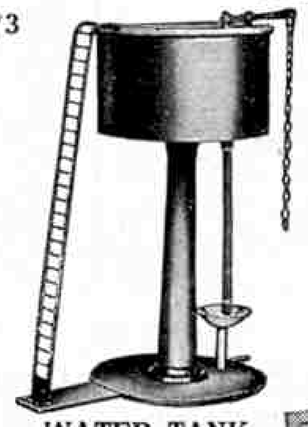


RAILWAY ACCESSORIES No. 8
Notice Boards.
Price, per set 2/3

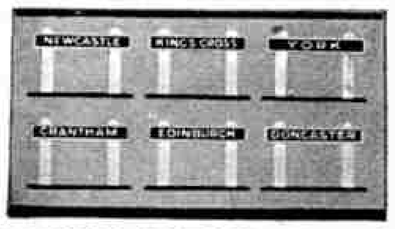
RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker ... Price 1/6



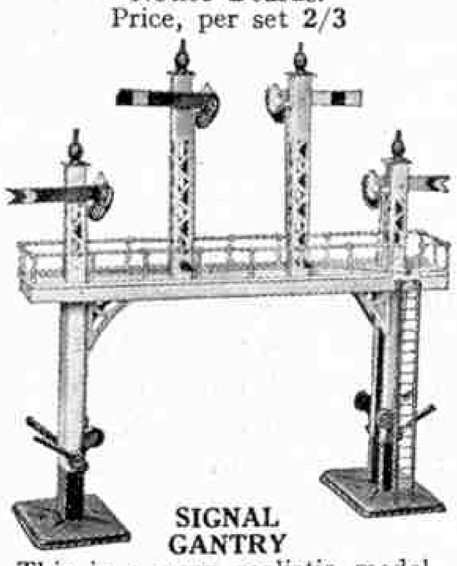
RAILWAY ACCESSORIES No. 5
Gradient Posts and Mile Posts. Price 2/-



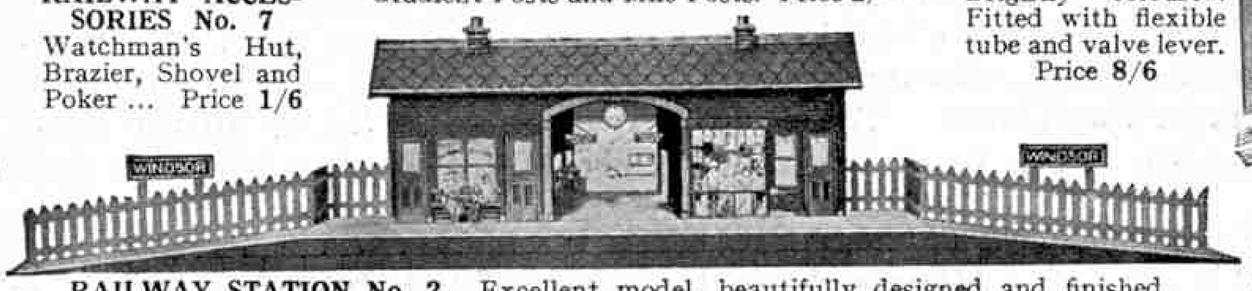
WATER TANK
Brightly coloured. Fitted with flexible tube and valve lever.
Price 8/6



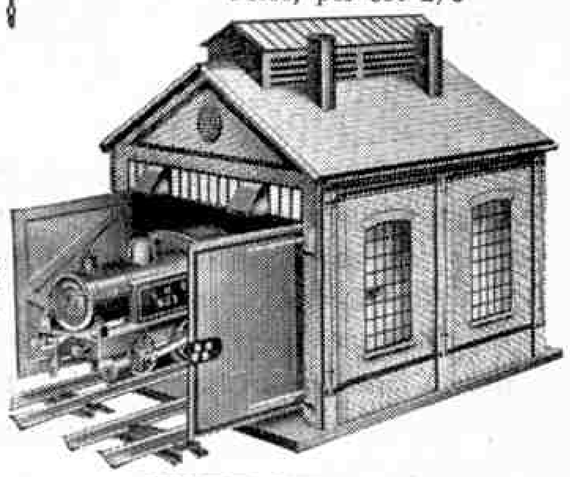
RAILWAY ACCESSORIES No. 9
Station Name Boards.
Price, per set 2/6



SIGNAL GANTRY
This is a very realistic model, the signal arms of which are operated by levers at the base of the standards. Attractively finished in colours. Price 10/-

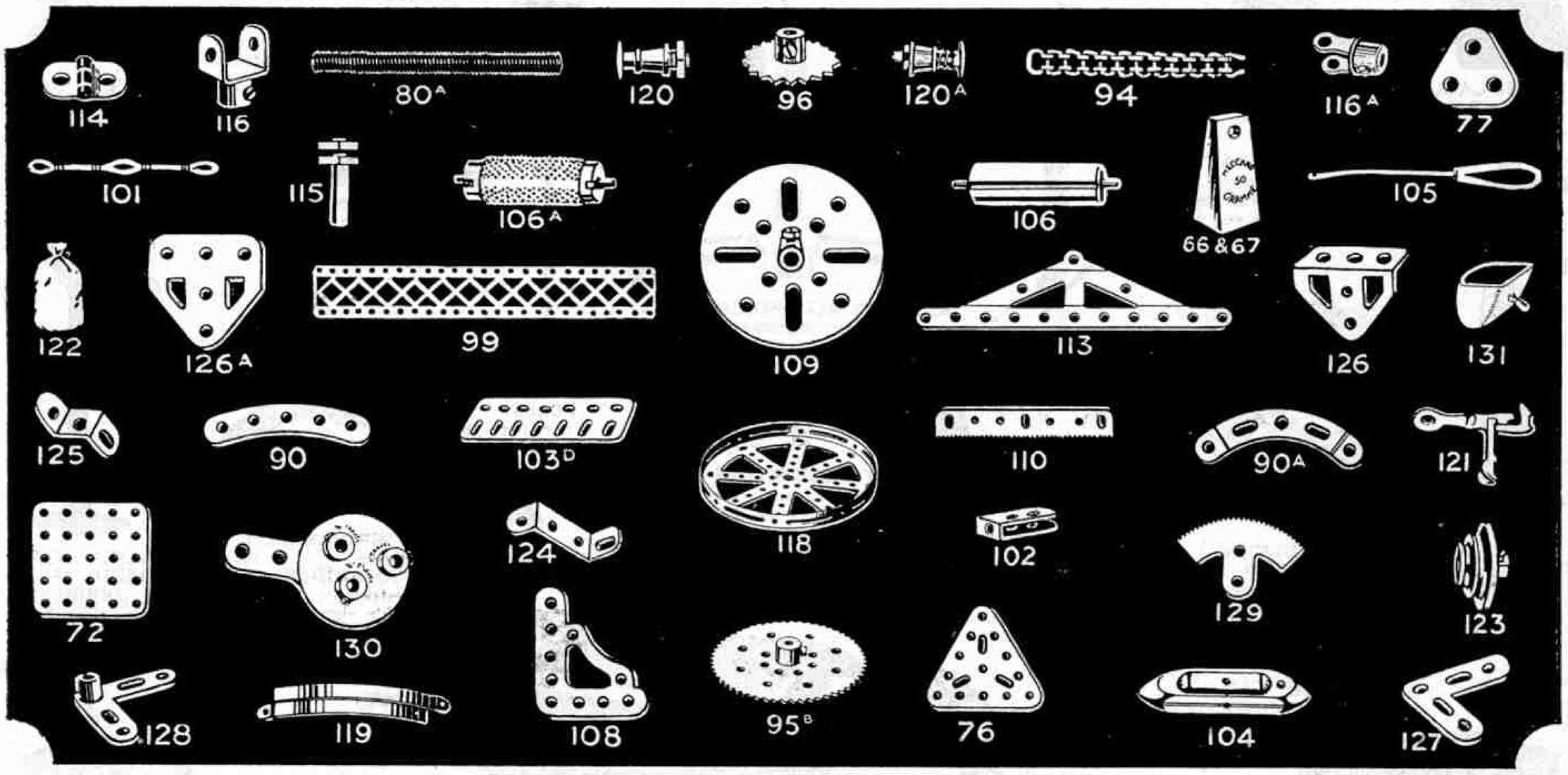


RAILWAY STATION No. 2. Excellent model, beautifully designed and finished. Constructed in three sections, which are detachable. Dimensions: Length 2 ft. 9 ins., breadth 6 ins., height 7 ins. ... ... Price 12/6



ENGINE SHED No. 1
This Shed is beautifully finished in realistic colours. It will accommodate Locomotives and Tenders of the M series, No. 0 and No. 1 types ... Price 15/-

MECCANO
ACCESSORY PARTS



No.		s.	d.
66.	Weights, 50 grammes ... ... each	1	0
67.	" 25 " ... ... "	1	0
68.	Woodscrews, ½" ... ... doz.	0	3
69.	Set Screws ... ... "	0	3
69a.	Grub Screws, 5/32" ... ... "	0	4
69b.	" " 7/32" ... ... "	0	5
70.	Flat Plates, 5½" × 2½" ... ... each	0	4
72.	" " 2½" × 2½" ... ... "	0	2
76.	Triangular Plates, 2½" ... ... "	0	2
77.	" " 1" ... ... "	0	1
78.	Screwed Rods, 11½" ... ... "	0	6
79.	" " 8" ... ... "	0	5
79a.	" " 6" ... ... "	0	4
80.	" " 5" ... ... "	0	3
80a.	" " 3½" ... ... "	0	3
80b.	" " 4½" ... ... "	0	3
81.	" " 2" ... ... "	0	2
82.	" " 1" ... ... "	0	1
89.	5½" Curved Strips, 10" radius ... "	0	2
89a.	3" " " cranked, 1¾" radius, 4 to circle "	0	2
90.	2½" " " 2⅜" radius ... "	0	1
90a.	2½" " " cranked, 1⅜" radius, 4 to circle "	0	1
94.	Sprocket Chain ... ... per 40" length	0	6
95.	Sprocket Wheels, 36 teeth, 2" diam. each	0	5
95a.	" " 28 " 1½" " "	0	4
95b.	" " 56 " 3" " "	0	6
96.	" " 18 " 1" " "	0	3
96a.	" " 14 " ¾" " "	0	3

No.		s.	d.
97.	Braced Girders, 3½" long ... ... ½ doz.	0	9
97a.	" " 3" " ... ... "	0	8
98.	" " 2½" " ... ... "	0	8
99.	" " 12½" " ... ... "	2	6
99a.	" " 9½" " ... ... "	2	0
99b.	" " 7½" " ... ... "	2	0
100.	" " 5½" " ... ... "	1	0
100a.	" " 4½" " ... ... "	0	10
101.	Healds, for looms ... ... doz.	0	9
102.	Single Bent Strips ... ... each	0	1
103.	Flat Girders, 5½" long ... ... ½ doz.	0	10
103a.	" " 9½" " ... ... "	1	2
103b.	" " 12½" " ... ... "	1	3
103c.	" " 4½" " ... ... "	0	9
103d.	" " 3½" " ... ... "	0	7
103e.	" " 3" " ... ... "	0	6
103f.	" " 2½" " ... ... "	0	5
103g.	" " 2" " ... ... "	0	4
103h.	" " 1½" " ... ... "	0	4
103k.	" " 7½" " ... ... "	1	0
104.	Shuttles, for looms ... ... each	5	0
105.	Reed Hooks, for looms... ... ... "	0	4
106.	Wood Rollers ... ... "	1	6
106a.	Sand Rollers ... ... "	1	9
107.	Tables for Designing Machines ... "	1	6
108.	Architraves ... ... "	0	2
109.	Face Plates, 2½" diam. ... ... "	0	4
110.	Rack Strips, 3½" ... ... "	0	2
110a.	" " 6½" ... ... "	0	3

No.		s.	d.
111.	Bolts, ¾" ... ... 2 for	0	1
111a.	" ½" ... ... 3 for	0	1
111c.	" ⅜" ... ... doz.	0	3
113.	Girder Frames ... ... each	0	3
114.	Hinges ... ...per pair	0	4
115.	Threaded Pins ... ... each	0	2
116.	Fork Pieces, Large ... ... "	0	3
116a.	" " Small ... ... "	0	3
117.	Steel Balls, ⅜" diam. ... ... doz.	0	6
118.	Hub Discs, 5½" " ... ... each	1	3
119.	Channel Segments (8 to circle, 11½" diam.) ... ... "	0	4
120.	Buffers ... ... "	0	2
120a.	Spring Buffers ... ...per pair	0	8
120b.	Compression Springs ... ... each	0	1
121.	Train Couplings ... ... "	0	2
122.	Miniature Loaded Sacks ... ... "	0	2
123.	Cone Pulleys ... ... "	1	3
124.	Reversed Angle Brackets, 1" ... ½ doz.	0	4
125.	" " " ½" ... "	0	3
126.	Trunnions ... ... each	0	2
126a.	Flat Trunnions ... ... "	0	1
127.	Simple Bell Cranks ... ... "	0	1
128.	Boss Bell Cranks ... ... "	0	3
129.	Rack Segments, 3" diam. ... ... "	0	5
130.	Triple Throw Eccentrics ... ... "	1	0
131.	Dredger Buckets ... ... ½ doz.	1	0

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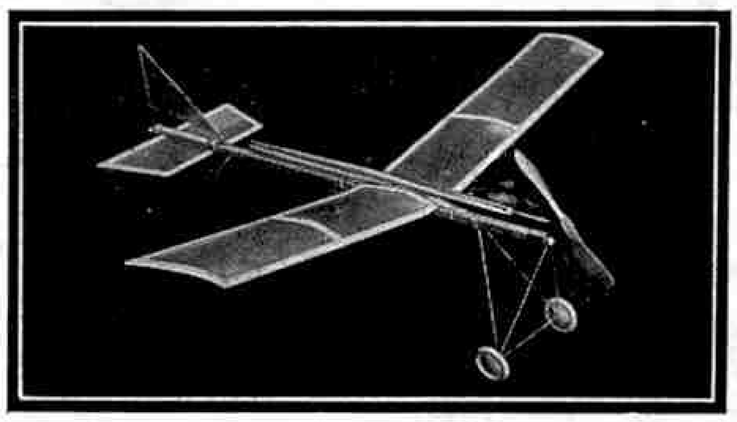

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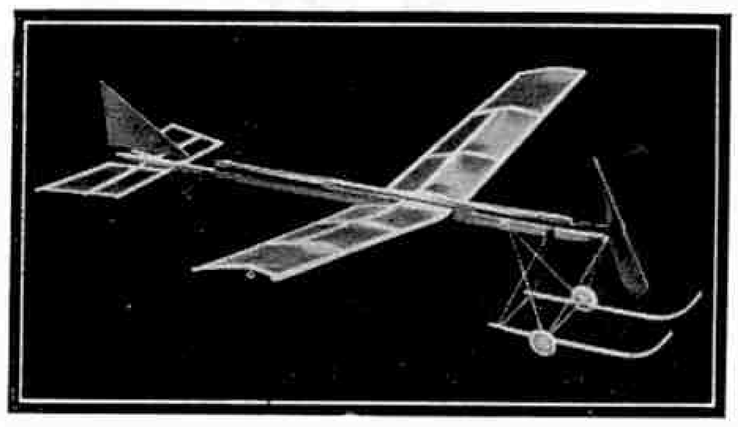

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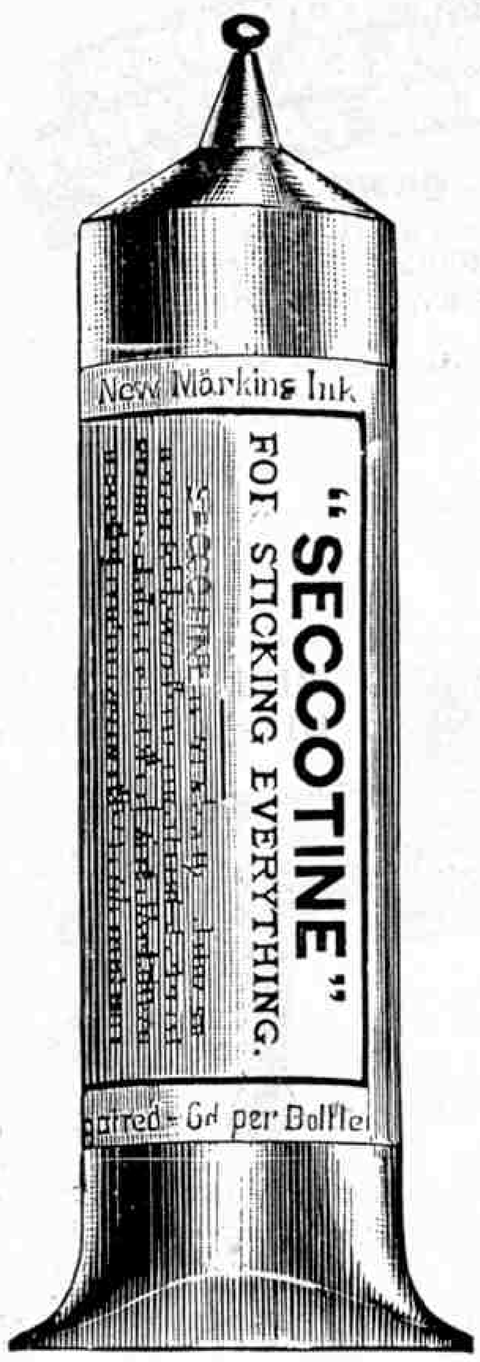

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The World's Great Adhesive. Registered Trade Mark.

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¾ Hose. Turnover Tops to match, 2/9 for size 3, to 3/9 for size 10.

Colours—Navy, Steel Grey, Fawn, French Grey, Saxe, Brown Mixture, Fawn Mixture, Saxe Mixture,
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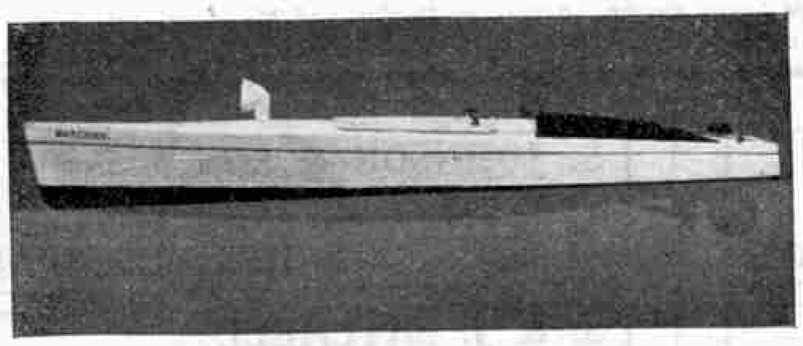

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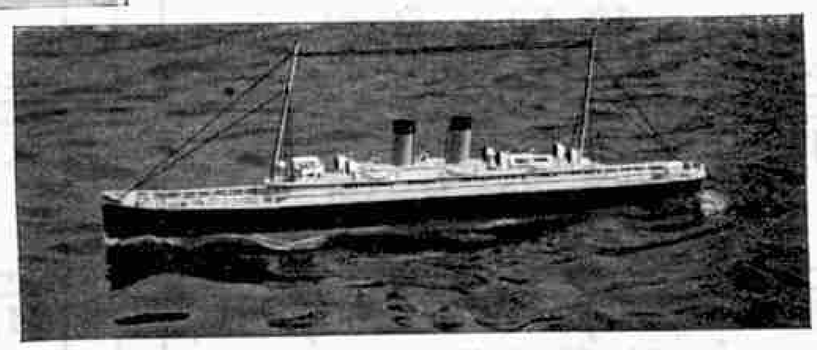

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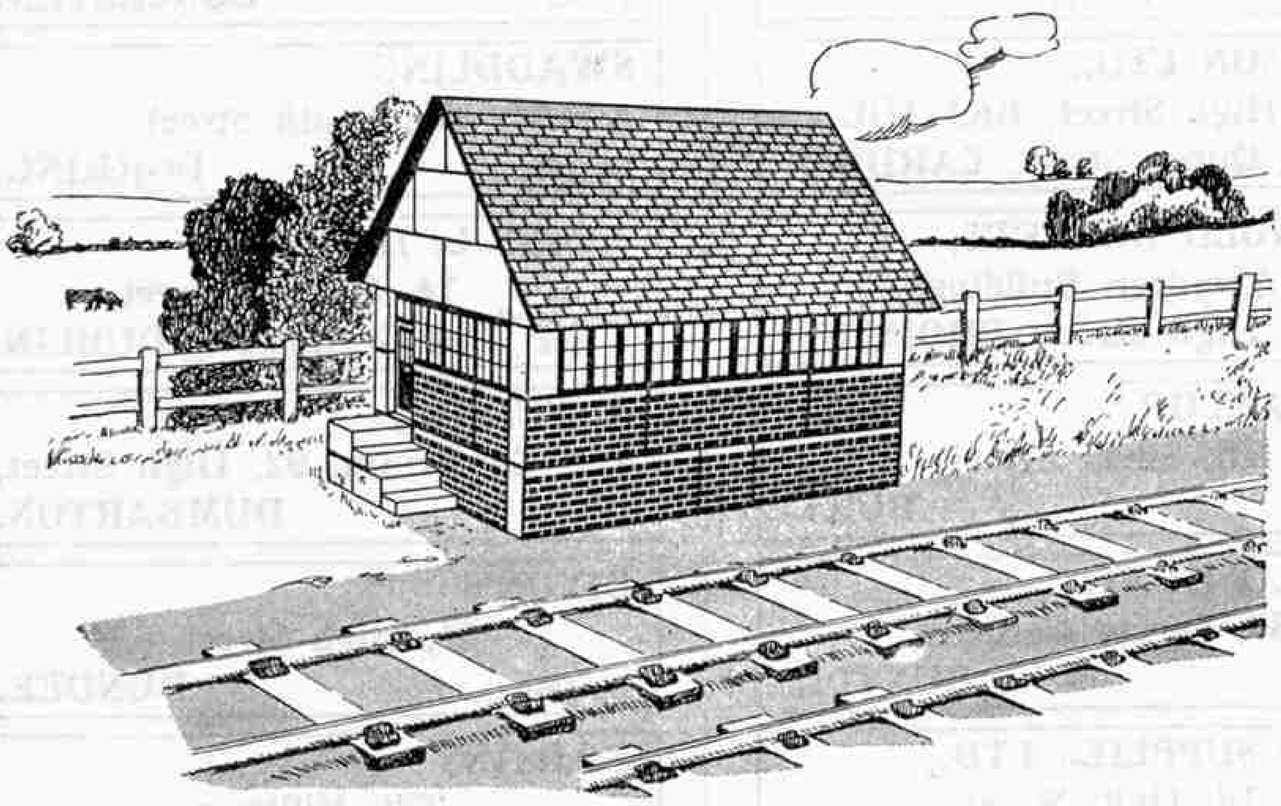

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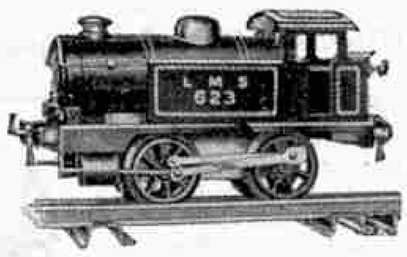

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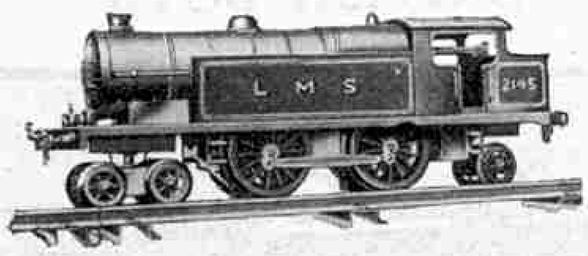

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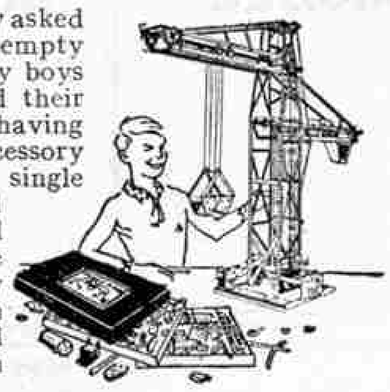

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" 0A	8d.	3d.
" 1A	8d.	4d.
" 2A	1/4	6d.
" 3A	1/5	6d.
" 4A	1/2	6d.
" 5A	2/5	9d.
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" 7	145/-	*

* Carriage Forward.

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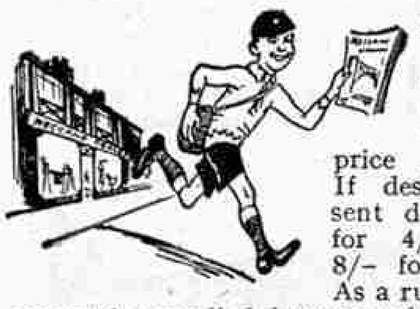

The "*M.M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall, price 6d. per copy. If desired it will be sent direct, post free, for 4/- for six, or 8/- for twelve issues. As a rule back numbers cannot be supplied, because only sufficient copies are printed to fill standing orders. To prevent disappointment, therefore, place a regular order with your dealer, newsagent, or the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

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Binding cases for back numbers of the Magazine may be obtained from Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These are supplied in two sizes (1) for six copies price 3/6 and (2) for twelve copies price 5/3, post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown here. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding 6 or 12 copies. These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

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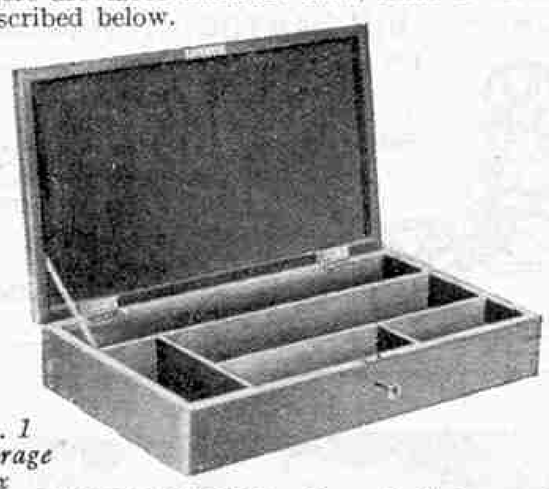

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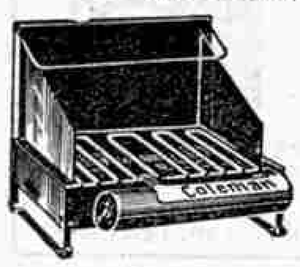

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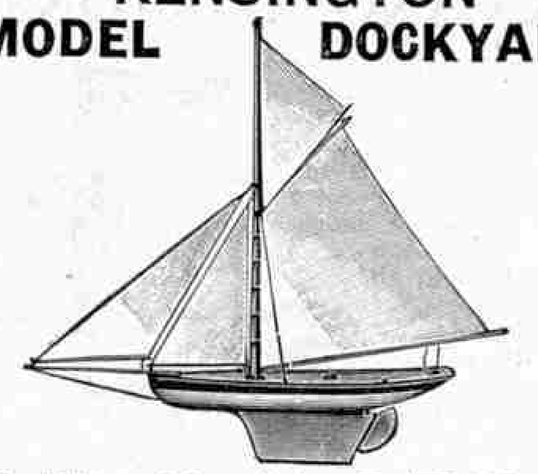

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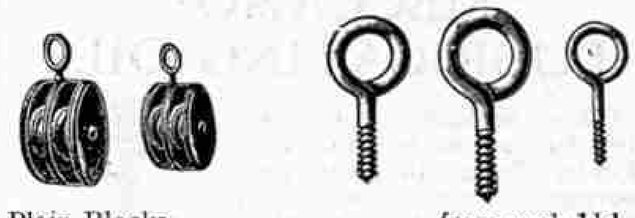

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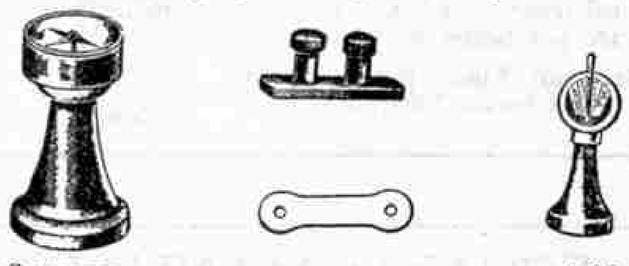

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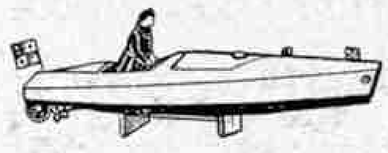

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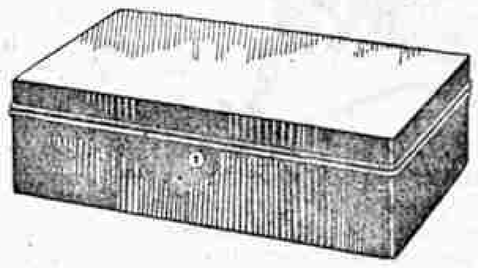

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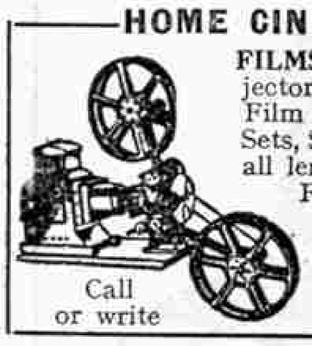

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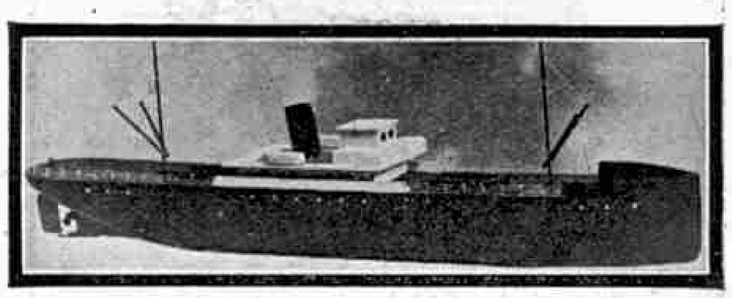

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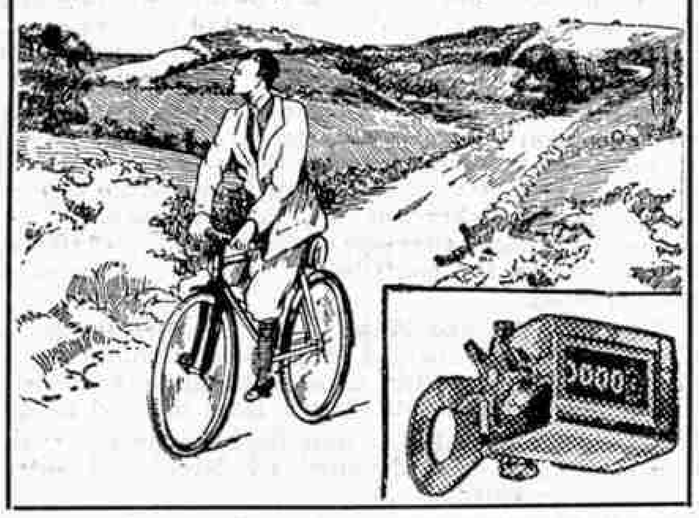

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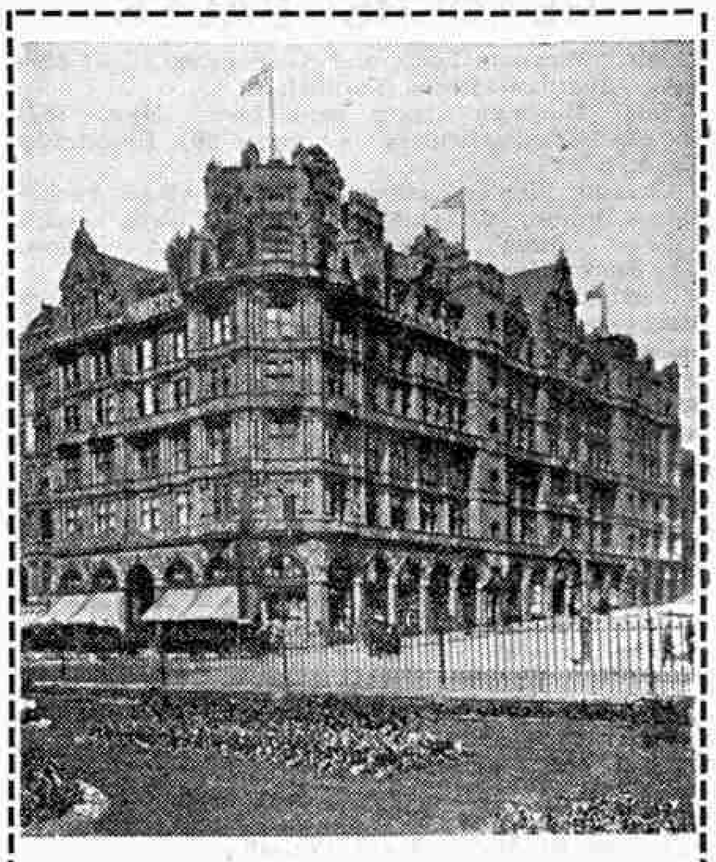

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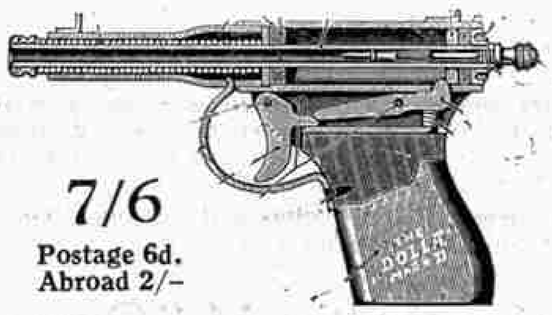

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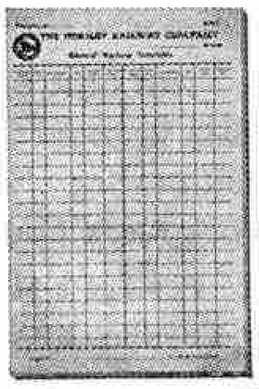

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Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

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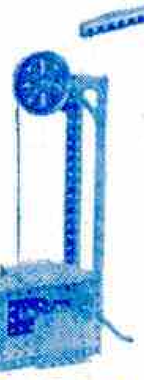
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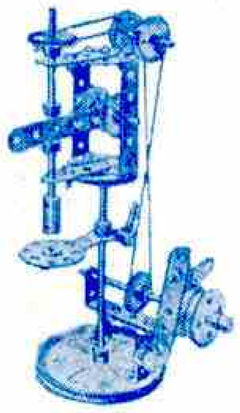
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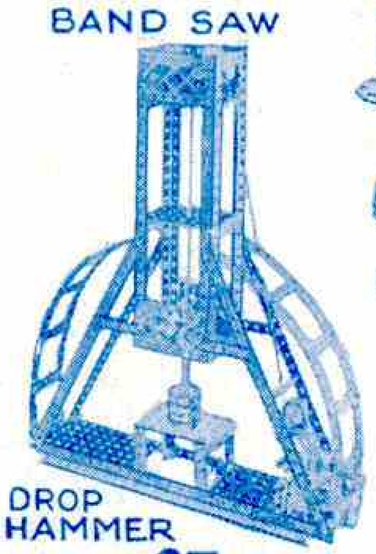
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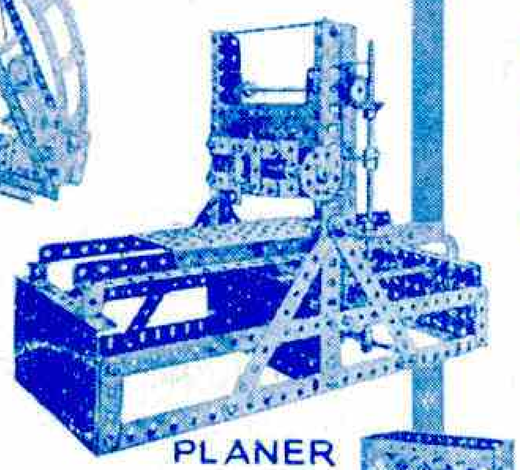
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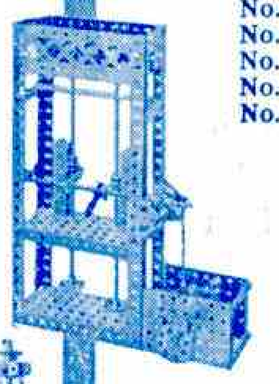
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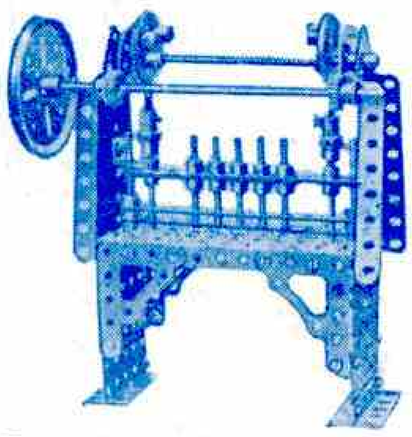
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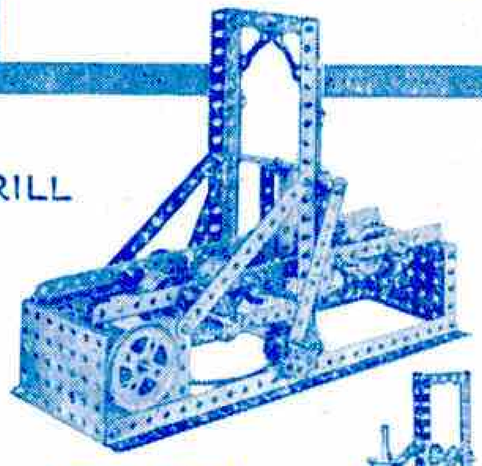
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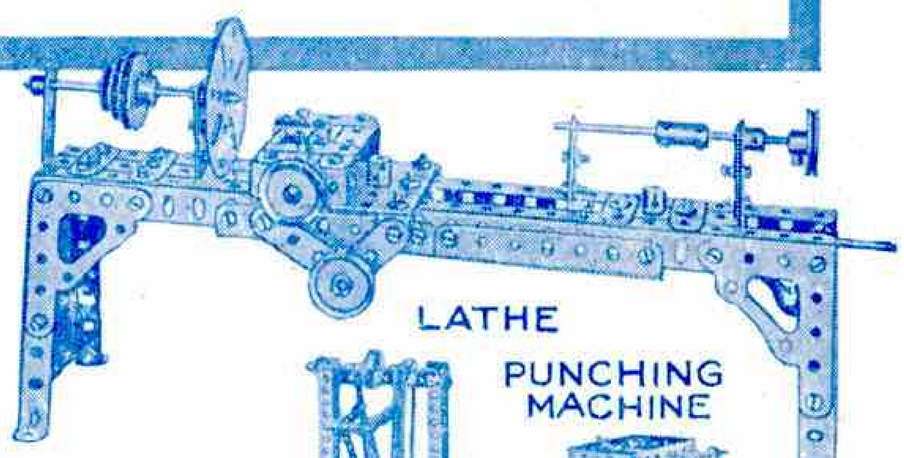
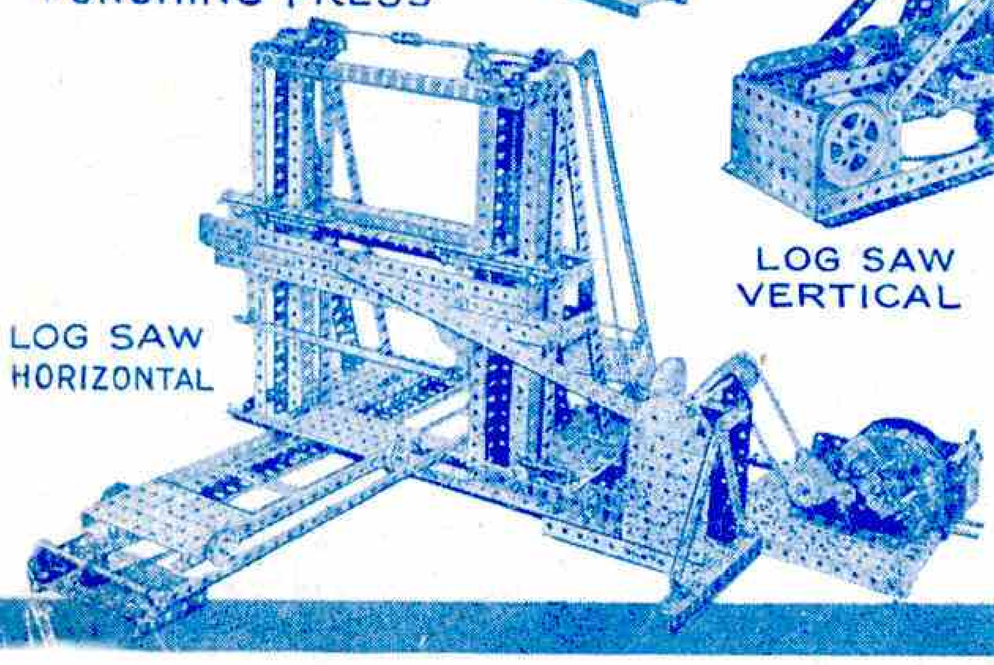
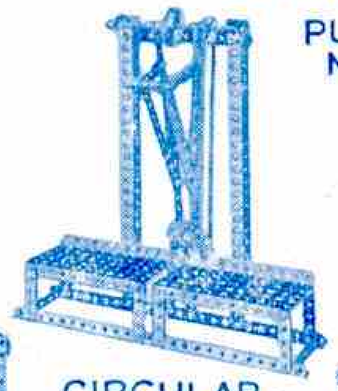
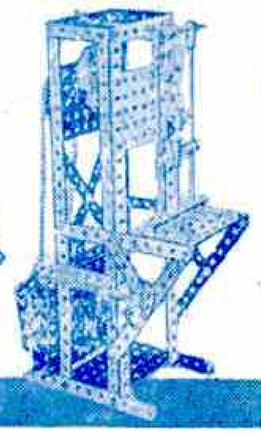

LATHE


LOG SAW HORIZONTAL

BORING MACHINE

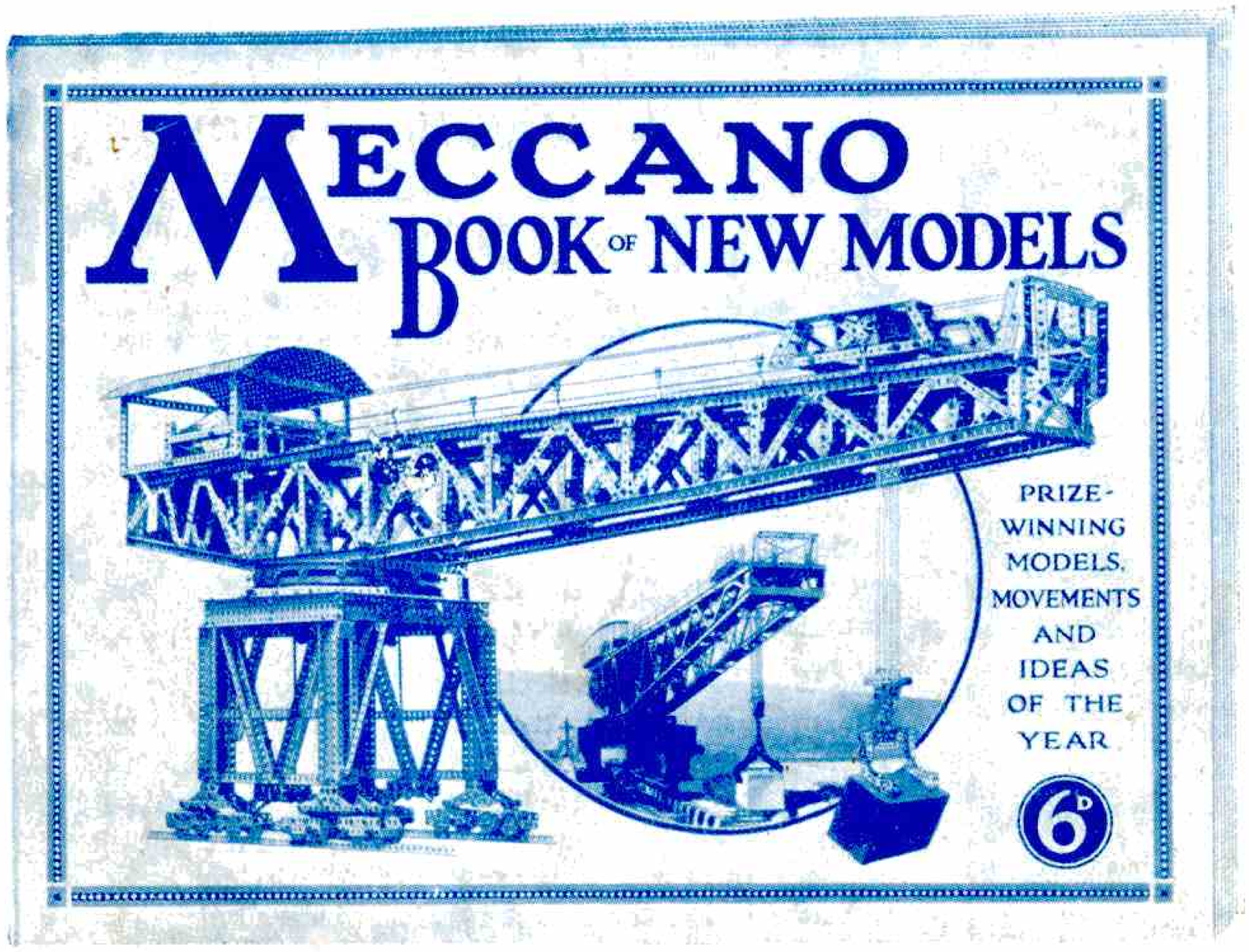
ELLIPTIC LATHE


CIRCULAR SAW

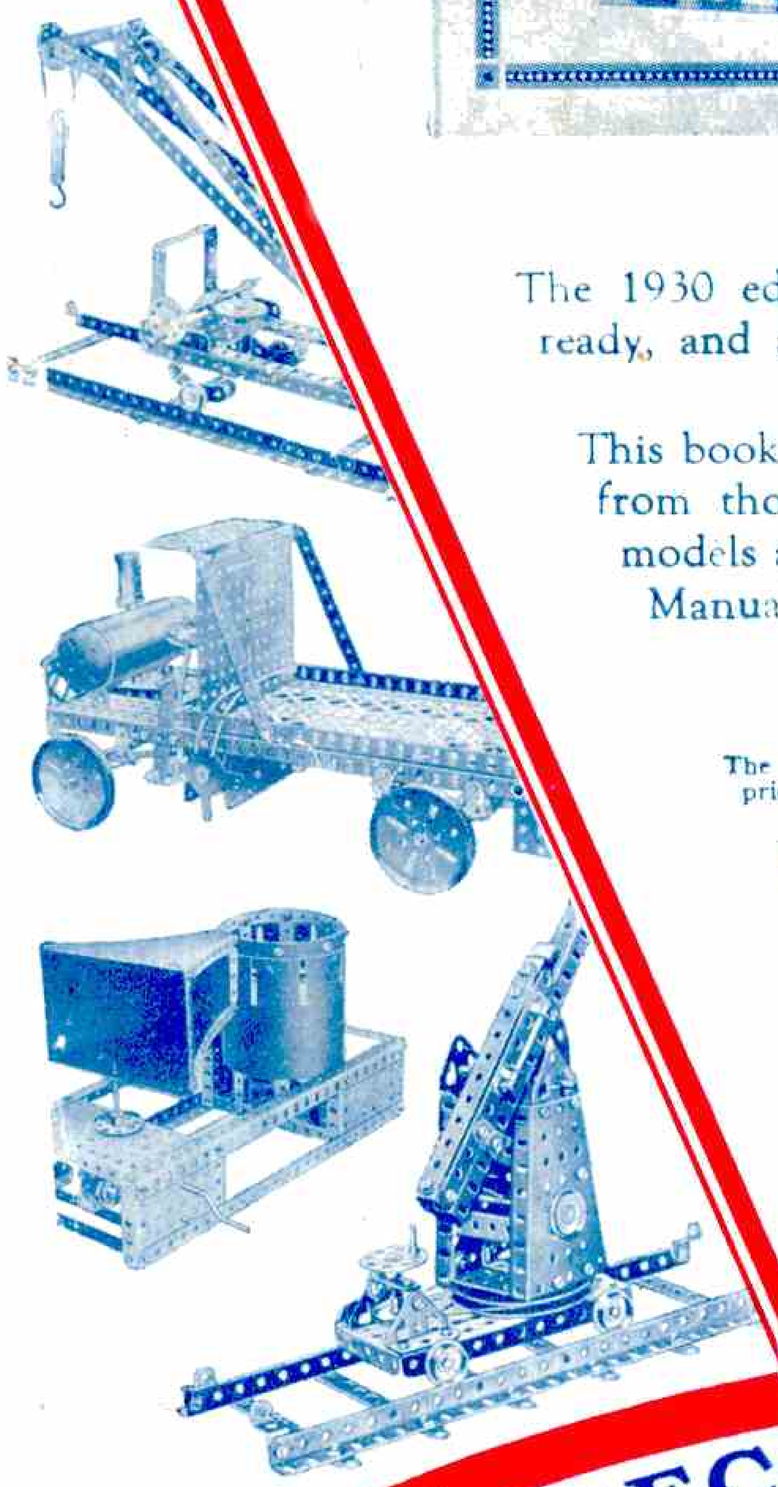

PUNCHING MACHINE

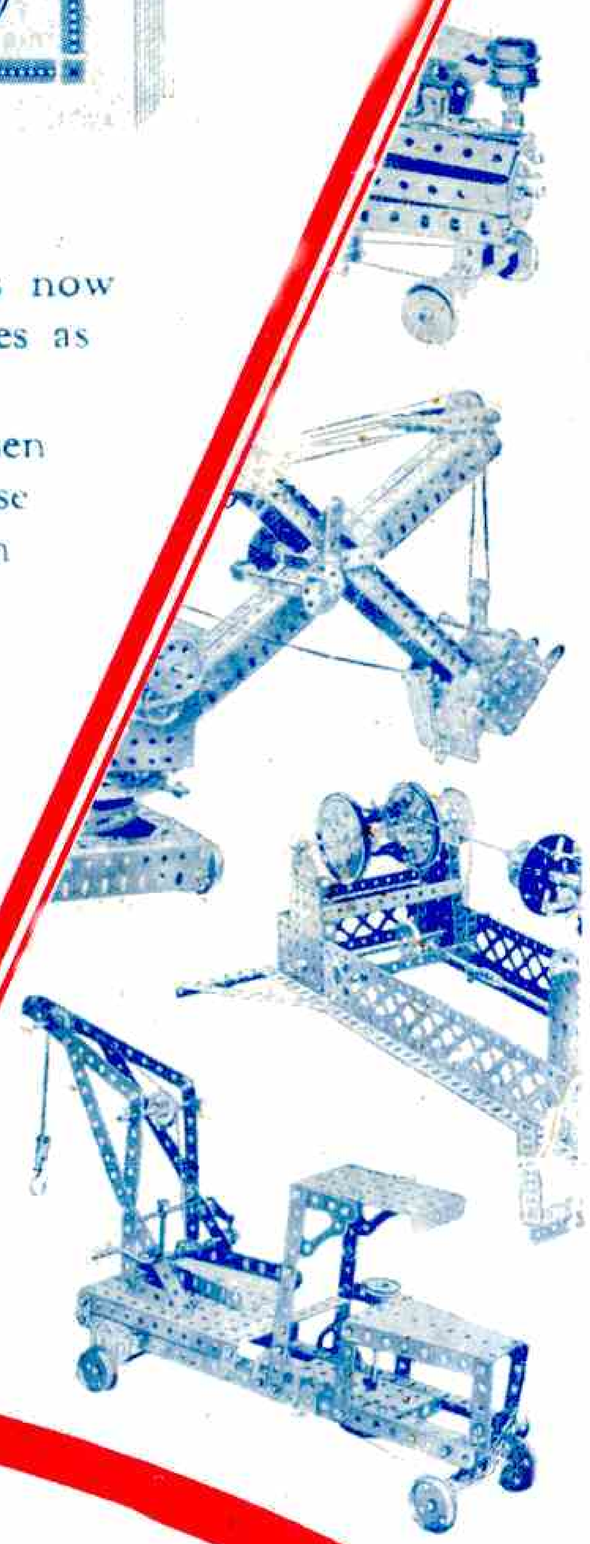
All the latest Meccano achievements

NEW
Clutches
Gear Boxes
Braking Devices



NEW
Cranes
Locomotives
Movements
Ideas





Good News This Month!

The 1930 edition of the Meccano Book of New Models is now ready, and all keen Meccano boys should obtain their copies as early as possible.

This book is brimful of new models and ideas, carefully chosen from thousands of entries in recent competitions. These models are supplementary to the models in the Instruction Manuals, and the majority of them are published for the first time.

How to Obtain the Book

The 1930 Book of New Models may be obtained from any Meccano dealer, price 6d., or direct from Meccano Ltd., Dept. 71, Old Swan, Liverpool, price 7d. post free.

There is a special edition for Overseas, price 9d. from dealers or 10d. post free from the agents (Canadian prices—15 cents from dealers, or 20 cents post free, from Meccano Ltd., Toronto).

Readers in Australia, New Zealand, South Africa or Canada who require copies should apply to their dealers or should address their orders to our agencies as detailed below. Readers living in countries other than those mentioned should order from Meccano Ltd., Old Swan, Liverpool, sending a remittance of 10d. with their order.

Australia: E. G. Page & Co., 52, Clarence Street, Sydney (P.O. Box 1832).

New Zealand: Models Ltd., Kingston Street, Auckland (P.O. Box 129).

Canada: Meccano Ltd., 34, St. Patrick Street, Toronto.

South Africa: Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).

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