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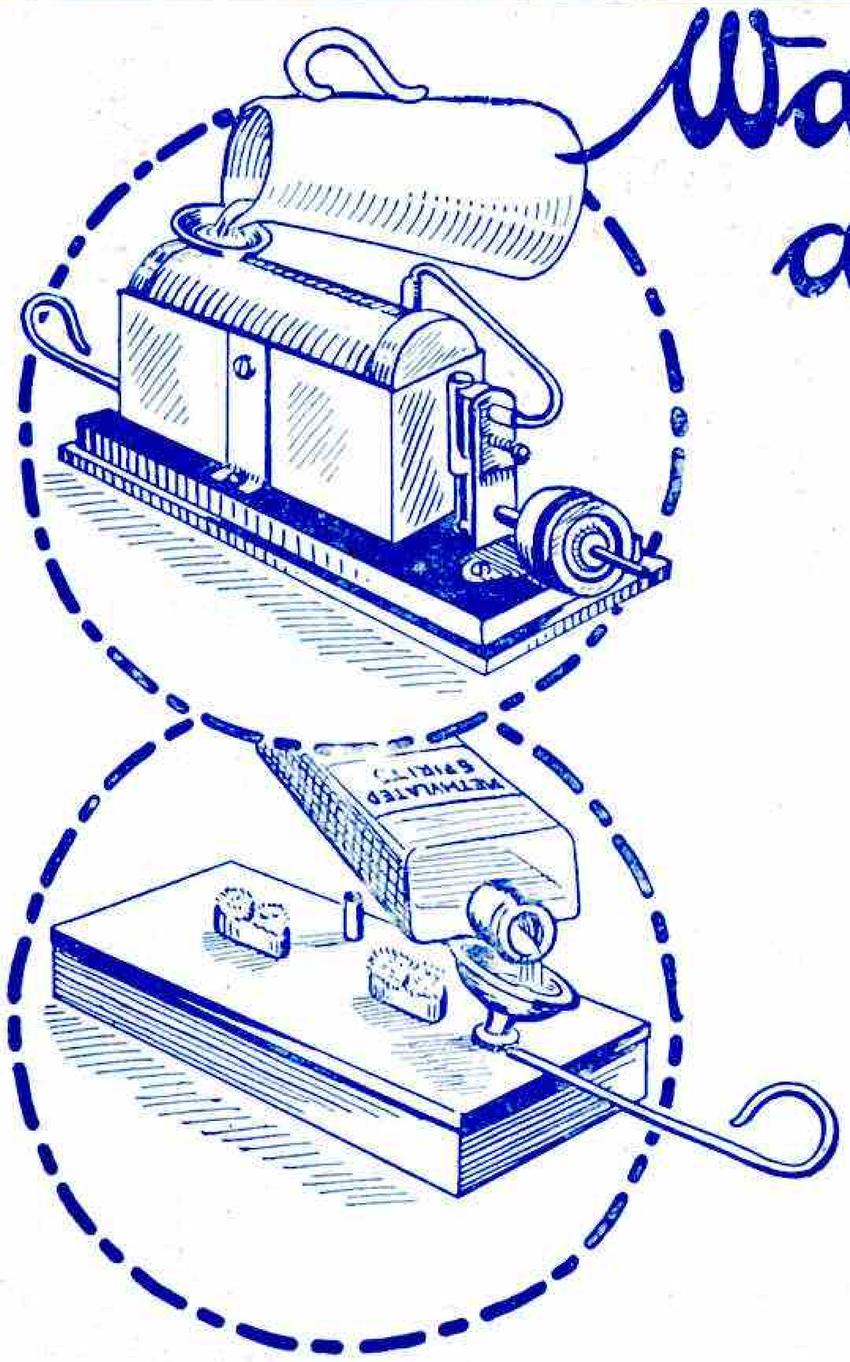

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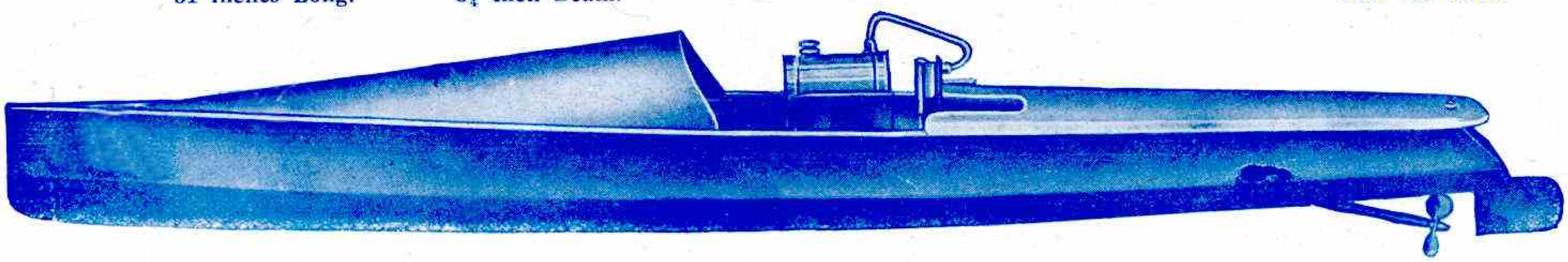

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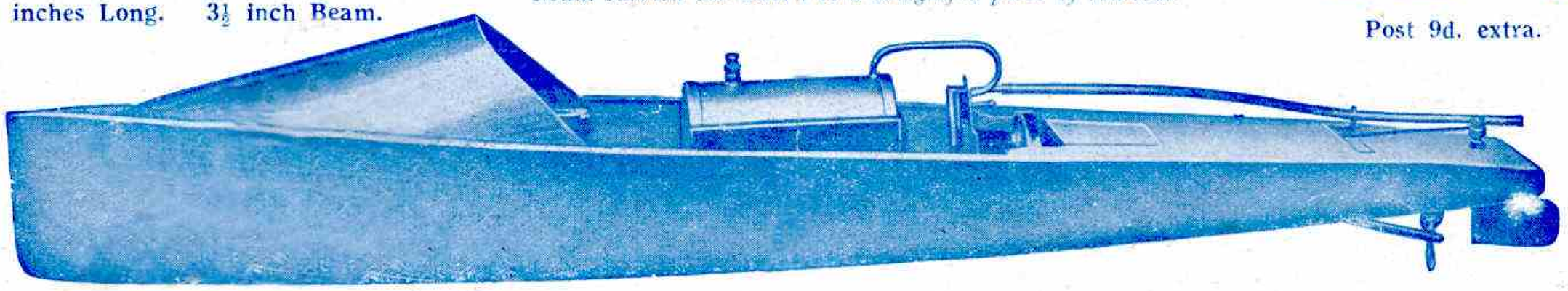

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EDITORIAL OFFICE
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LIVERPOOL

Vol. X, No. 4

MECCANO MAGAZINE

PUBLISHED IN THE INTERESTS OF BOYS

April 1925

THOSE of our readers who order the "*M.M.*" from newsagents outside London may experience some difficulty this next month or two in obtaining their copies. This is on account of the fact that certain wholesale newsagents in the provinces have decided to discontinue handling the Magazine for reasons that I need not enter into here. These wholesale firms supply the retail newsagents from whom the Magazine is obtained by a number of our readers. If any reader has any difficulty in this connection I shall be glad if he will ask his newsagent to write to me on the matter, and I shall be pleased to arrange for supplies of the Magazine to be sent to any newsagent who may be unable to obtain them through the usual channels. This does not apply to London newsagents, nor to newsagents in Scotland and Ireland, as our connection with the wholesale firms in these districts remains unbroken. The "*M.M.*" may, of course, be obtained from any Meccano dealer and as there is a Meccano dealer in practically every town there should be no difficulty whatever in every reader obtaining his magazine regularly, from one source or the other.

Obtaining the "M.M."

Our next month's issue will contain several attractive features, including a very interesting article dealing with the shipping of locomotives overseas in vessels specially designed for the purpose. This matter will also form the subject of the coloured cover, which is now being prepared by our artists. The instalment of "Lives of Famous Engineers" will deal with I. K. Brunel's connection with the G.W. Railway and will be of particular interest to those of our readers who are keen on matters connected with railways. No doubt many readers will know that for a considerable period the G.W. Railway used a wide-gauge line and even continued to use this in spite of the fact that all other railway companies in this country found the narrower and present gauge more serviceable. The fact that the gauge of the G.W. rails differed from that of other companies meant, of course, that their locomotives and rolling stock could not be used on any other line, nor, for the same reason, could the rolling stock of other companies be used on the G.W. lines. Our article will describe the advantages of the broad gauge track and will also deal with the conversion of the G.W. track from its original gauge to the present standard gauge.

Next Month

In our May issue we shall describe a very neat and interesting new Meccano model of Platform Weighing Scales. These scales will actually weigh and the model, if carefully made, is capable of giving very accurate results. In the present issue we commence a new feature, the "Photographic Page" which I feel sure will be appreciated by thousands of our readers. The Photographic Competitions in the past have been among the most successful of all of the Competitions I have arranged, and I look forward to an increased number of entries in the competition announced in this issue. Future Photographic articles will take our readers through the whole process of exposing, developing, and printing and the various methods and different processes will be described in detail, to enable our readers to experiment for themselves if they feel so inclined. There will be a number of other interesting articles in our May issue and our regular features will, of course, be included also.

Get Out Your Cameras

By the time this issue is in the hands of our readers they will no doubt be anticipating the impending holidays and making their plans to spend Easter under the best conditions. Of course, a great deal depends upon the weather, which at this time of the year is somewhat unsettled. Whatever the weather may be, however, it does not matter to the Meccano boy. If it is fine he is out in the open air actively enjoying himself either walking, cycling, or doing one of a dozen other things, the names of which end in "-ing,"—an ending, I remember, that always implies motion! If it is wet, Meccano boys are busily employed indoors inventing new models, or improving existing models. Those who possess Hornby Trains find even greater pleasure at hand in laying out their track and running a miniature railway of their own. There is so much to do at Easter, either indoors or out, that we very often forget the many beautiful and interesting things that are associated with this time of the year. For instance, I wonder how many people remember that Easter is a religious festival of great antiquity and that at this date the Romans kindled the sacred fire in the Temple of Vesta every year, which act signified the commencement of the Roman year.

The Coming Holidays

In many other countries, too, the dawn of the new year and the end of the reign of winter was celebrated at Easter. All over the land bonfires were lighted from the sacred flame kindled by the priests on Easter Eve. This custom is carried out even to-day in many parts of Europe, particularly in Germany where the bonfires are kindled year after year on the same hills, called for that reason "Easter Mountain." The peasants believe that only those fields that are reached by the light of the bonfires will be fruitful during the ensuing year. When the fires die down everyone—including even the children—leaps over the dying embers, and often the cattle are driven through them as a protection against disease! In the old days Easter was also celebrated by a general merry-making, which included games, songs, dances, theatrical performances and so on. The cakes that were made for these special occasions were the forerunners of our "hot-cross-buns" and Simnel Cakes. The Middle Ages saw the introduction of the custom of presenting brightly-painted eggs to friends—a custom that survives to-day, but in most parts of the country chocolate eggs are given. In parts of Northumberland and Durham ordinary hens' eggs are boiled in brightly coloured dyes and painted with grotesque patterns. On Easter day all the children may be seen going to the different parks or the fields, each taking their eggs, which are rolled and tossed about until they break, when the contents are eaten by their owners. As the eggs are boiled as hard as possible they sometimes stand a good deal of knocking about, but occasionally some practical joker substitutes for his friend's egg an egg that has scarcely been boiled at all. This naturally causes a bewildering surprise to the owner of the egg, and the results—which can easily be imagined—sometimes occasion a great deal of fun!

Strange Easter Customs

Change of Address

Subscribers should immediately notify the Editor of any change of address. Send a Postcard *giving the old and new address*, so that records may be kept up-to-date.

New Baltic Tank Locos

Notable Additions to the L.M.S.

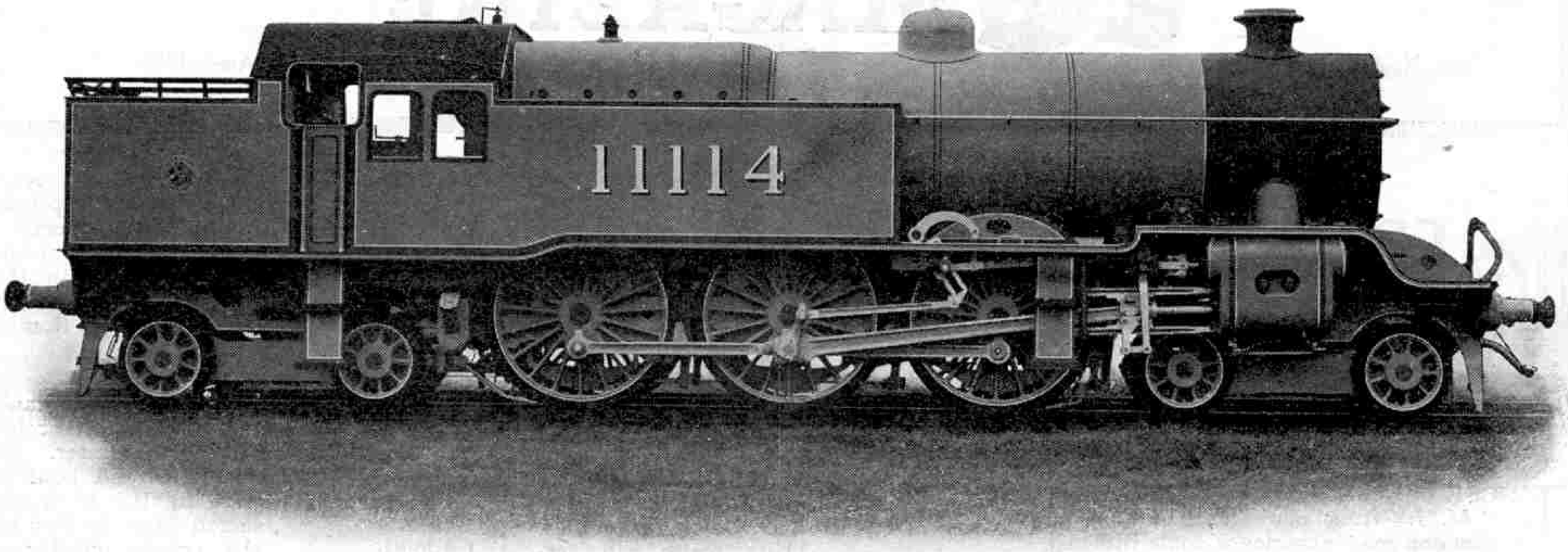


Photo courtesy] **Four-cylinder "Baltic" Express Tank Engine (4-6-4) No. 11114, built 1924** [*L.M.S. Rly. Co.*

AS every reader of the "*M.M.*" knows, considerable economy in running costs is effected by the employment of tank engines, as compared with tender engines. This applies more particularly, of course, on comparatively short runs, where smaller quantities of water and coal are necessary for each trip. A tank engine has the further advantage that it may be run as readily backwards as it is run forwards, a fact that enables it to be used independently of turntables, thus effecting yet further economy in both time and money.

The Only Four-Cylinder Tank Locos

These considerations have no doubt had a good deal to do with the recent development of this type of loco, and the consequent design of a new and unusually powerful type known as the "Baltic" (4–6–4). Some of the locos of this type not only carry tanks having a water capacity of 2,000 gallons, but are also fitted with water-scoops for picking up whilst running in either direction. They are thus able to travel a considerable non-stop distance over routes where water troughs are placed between the rails, the length of the run being limited only by the capacity of the coal bunker, which in many types is as much as 3½ tons.

Several of these "Baltic" tank engines designed to haul heavy suburban passenger trains, have recently been added to the rolling stock of the London, Midland and Scottish Railway. Built to the designs of Mr. George Hughes, chief engineer to the Company, these locos are the largest of their class, and are the only four-cylinder tank engines in the country. Already several have been completed at the L.M.S. works at Horwich and will replace the 4–6–0 tender engines now working the heavy residential traffic on the Western Division, such as is found on the routes linking Manchester with Blackpool, Southport, and Buxton.

We reproduce a photograph of the four-cylinder L.M.S. "Baltic" No. 11114, the fifth of this class to be built. A careful study of the illustration reveals a striking similarity to the Horwich-built 4–6–0 express tender locos. As a matter of fact, the loco is in many particulars a replica of the 4–6–0 type locos, but with an extended frame at the rear end to carry the coal-bunker and an additional bogie.

Loco Standardisation

Efforts have been made to standardise these two types of locomotives as far as possible, with the result that the boilers, "motions," and "front ends" of each type are interchangeable. This standardisation, or interchangeability of parts, is in accordance with the general trend of modern industry, for the numerous advantages of such methods are almost daily being discovered in all big manufacturing operations. Low cost and greater rapidity of production; economy in machining costs; quicker and less costly repairs whilst running, resulting in a consequently lower maintenance expense; and ease in assembling are a few of the ends achieved by applying mass-production methods to railway locomotive construction.

Every boy who owns a Hornby Train already knows something about the advantages of interchangeability, so it is quite unnecessary for us to enlarge upon the merits of standardised parts.

The L.M.S. Baltic engines are fitted with a "top and bottom" header superheater, designed by Mr. Geo. Hughes, of the L.M.S., in which separate cast-iron headers are provided for saturated and superheated steam. The advantage of this type of superheater is that the saturated steam is not allowed to exert a cooling effect on the superheated steam, which may happen when both are in the same header. The steam passages throughout have been kept as short and direct as possible thus ensuring a minimum of wasted power.

Patent Pressure-Release Valves

One of the most interesting features of the L.M.S. "Baltics" is Mr. Hughes's patent pressure-release valves, incorporated in the piston valves. These patent valves are designed to relieve excessive pressure within the cylinder caused by trapped steam, air or water.

In high-speed running, as well as in running with steam off, the excess steam or air compression is liable to become very great. Sometimes this causes "knocking" at the cross-heads, or in more serious cases may even result in fractured cylinder-covers and burst joints.

Those of our readers who possess a bicycle-pump must have noticed that if they extend the plunger and then place a finger over the outlet, it is impossible to force the plunger back to its original position, owing to the "air-cushion" formed within the inflator. Practically the same thing happens in the cylinder of a locomotive when running with steam shut off, and the opposition of trapped air to an advancing piston is one of the evils that the new ball release valve is designed to eliminate. The valves are so arranged that the moment the pressure in the cylinder exceeds that in the steam chest, they automatically open an outlet between the latter and the cylinder.

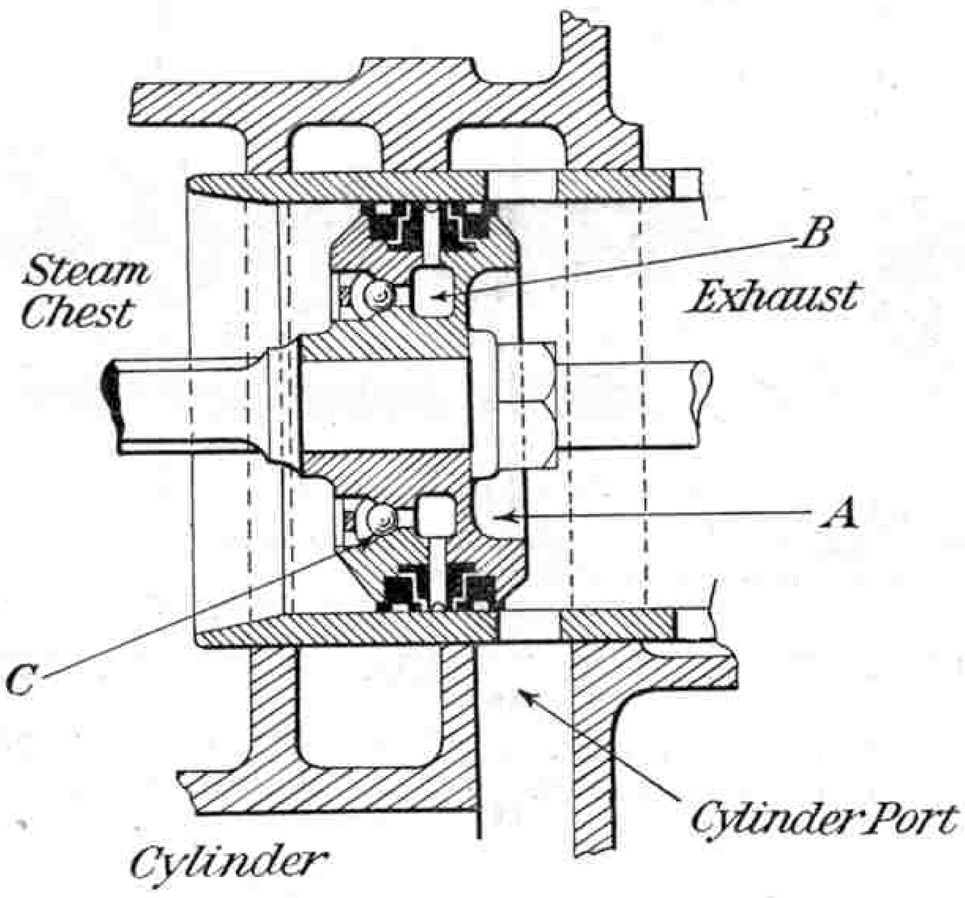


Fig. 1. The Patent Pressure Release Valves fitted to the Piston Valves of the new L.M.S. "Baltic" Locos

How the Valves Work

The operation of the valve is quite simple and may be easily followed with the help of the accompanying sectional diagram (Fig. 1) which shows the ball release valves set in the piston valve.

The valve (A) is in the exhaust position and steam is about to be admitted at the other end of the cylinder (not shown in our diagram). Whilst the loco is running normally under steam the ball valves (C) are held against their seatings by the pressure in the steam chest, which pressure naturally exceeds that in the cylinder. Now supposing that the loco is "coasting" with steam cut off. A little more than half-way through the piston stroke the valve "A" closes the cylinder port, with the result that air is trapped before the oncoming piston, and subjected to great pressure—or rather, that would be the case were it not for the action of the ball valves. The air, under pressure, rushes through channels (B) in the periphery of the piston valve (A) and escapes into the steam chest by throwing the balls (C) off their seatings, for the steam chest pressure is no longer sufficient to hold them there when the steam supply is cut off. The same process prevents excess compression of steam during high-speed running and water-logging in the cylinder, as already stated.

Loco Weighs 100 Tons

The principal dimensions of the new L.M.S. "Baltics" are as follows: Cylinders (four, single expansion): 16½ in. by 26 in. Length of boiler between tube plates: 14 ft. 8 in. Grate area: 29.6 sq. ft. Boiler heating surface: 1997 sq. ft. Superheater surface: 430 sq. ft. Working pressure, 180 lbs. per sq. in. The driving wheels have a diameter of 6 ft. 3 in., and the bogie wheels 3 ft. 0⅜ in.

At 85 per cent. of the boiler pressure the engine exerts a tractive effort of 28,879 lbs., and in working order weighs only 3 cwt. short of 100 tons.

The Trial Trip of No. 11110

Ten of these locos. will be constructed at Horwich and their numbers are to be 11110–11119. The first "Baltic" to be completed (No. 11110) ran with notable steadiness on its trial run and notwithstanding its long wheel-base (40 ft. 4 in.) it was able to negotiate with ease curves of 4 chain radius. The trial took place between Bolton and Hellifield on a stretch of line that is particularly severe. The load was 10 bogie coaches and dynamometer car, representing a net weight behind the drawbar of 304 tons. During the run the engine showed up to advantage, negotiating the six miles of 1 in 72 and 1 in 74 from Astley Bridge to Spring Vale tunnel on the outward run in 11 mins. 50 secs. without being pushed in any way, the cut-off being in the neighbourhood of 35 per cent. and the regulator being approximately half open. On the inward run the distance of 6½ miles up the reverse side of the same bank from Blackburn to Spring Vale tunnel, running bunker first, was covered in 12 mins. 35 secs. from a standing start at Blackburn. A speed of 58 miles an hour was attained between Newsholme and Hellifield, and it was noticed that the engine rode most smoothly; in fact, all through its trials it has shown a remarkable freedom from oscillation, and ability to take curves.

Origin of the name "Baltic"

The word "Baltic," as applied to a locomotive wheel arrangement, is one of the few such designations that have not come to us from America, and its origin is a little obscure. The L.M.S. Company tell us that to the best of their knowledge the name was first applied to the 4–6–6 Tender Engines built for the Nord Railway of France about 1912. Only two engines of this class have been built and they remain the sole examples of the "Baltic" Tender Engine in the world, even to-day.

Strictly speaking, the names describing a wheel arrangement such as "Atlantic," "Pacific," "Baltic" should only apply to tender engines, and it will be found that neither 4–4–2 nor 4–6–2 Tank engines are ever referred to by the terms "Atlantic" and "Pacific." For some unknown reason, however, this rule has been broken in the case of the 4–6–4 Tank engine, and the word "Baltic" has become the accepted title for this type.

The "Baltic" wheel arrangement is practically unknown in America, whether for tender or tank engines, and it is refreshing to find something in this line which was not done in America first. The "Baltic" tank

(*Continued on page* 183)

Lives of Famous Engineers

XV
Isambard K. Brunel *and the* CLIFTON SUSPENSION BRIDGE

Last month we completed our account of the life of Sir Marc Isambard Brunel, and now we must turn to the remarkable engineering career of his only son, I. K. Brunel, remembered chiefly for his association with the Great Western Railway and the "Battle of the Gauges." He was a pioneer of steam navigation and his work in this connection culminated in the building of the famous "Great Eastern."

ISAMBARD KINGDOM BRUNEL was born at Portsmouth on 9th April, 1806. Shortly afterwards Sir Marc removed to London, and took a house in Lindsay Road, Chelsea. Young Brunel's first recollections were of this house and in 1814, when he was eight years of age, he commenced his education at a private school in the neighbourhood of his home. Later he was sent to another private school at Hove, where he soon began to show signs that he had inherited his father's engineering genius.

An interesting story is told of him at this time. He had been keenly interested in watching the erection of some houses opposite the school and he had noticed that the building was being very badly done. One day wild weather set in, and towards night the wind became so violent that Brunel felt convinced that the badly built walls of the houses would not be able to withstand the strain. Accordingly he made a bet with his school mates that the walls would fall before morning and he won his bet, for the buildings collapsed during the night.

In 1820 Brunel went to Paris to study at the College Henri Quatre, mainly for the purpose of improving himself in mathematics and brushing-up his French. He remained at Paris until the middle of 1822, and during this period he occupied all his holiday intervals in visiting as many engineering works as possible. He sent drawings and descriptions of all of them to his father.

Commences his Engineering Career

Brunel returned to England and in 1823 he entered his father's office as assistant engineer. At that time Sir Marc was turning his attention seriously to the Thames Tunnel scheme. When work commenced on this gigantic undertaking Brunel took his share in the operations and up to 1828, when work was stopped by an irruption of the river, he toiled unceasingly along with his father. In this work he displayed great engineering skill and inventiveness, together with remarkable powers of physical endurance. The story of the Thames Tunnel has already been told in our issue last month, so that there is no need to say anything further about it or the part Isambard played in the successful completion of the work.

Isambard Kingdom Brunel

For nearly two years after work on the Thames Tunnel had come to a standstill Brunel was without regular professional work. During that time he employed himself in scientific research, in which he associated himself with Faraday and others. In the autumn of 1829 he heard that designs were required for a suspension bridge across the River Avon at Bristol and he immediately made up his mind to compete.

Clifton Bridge Competition

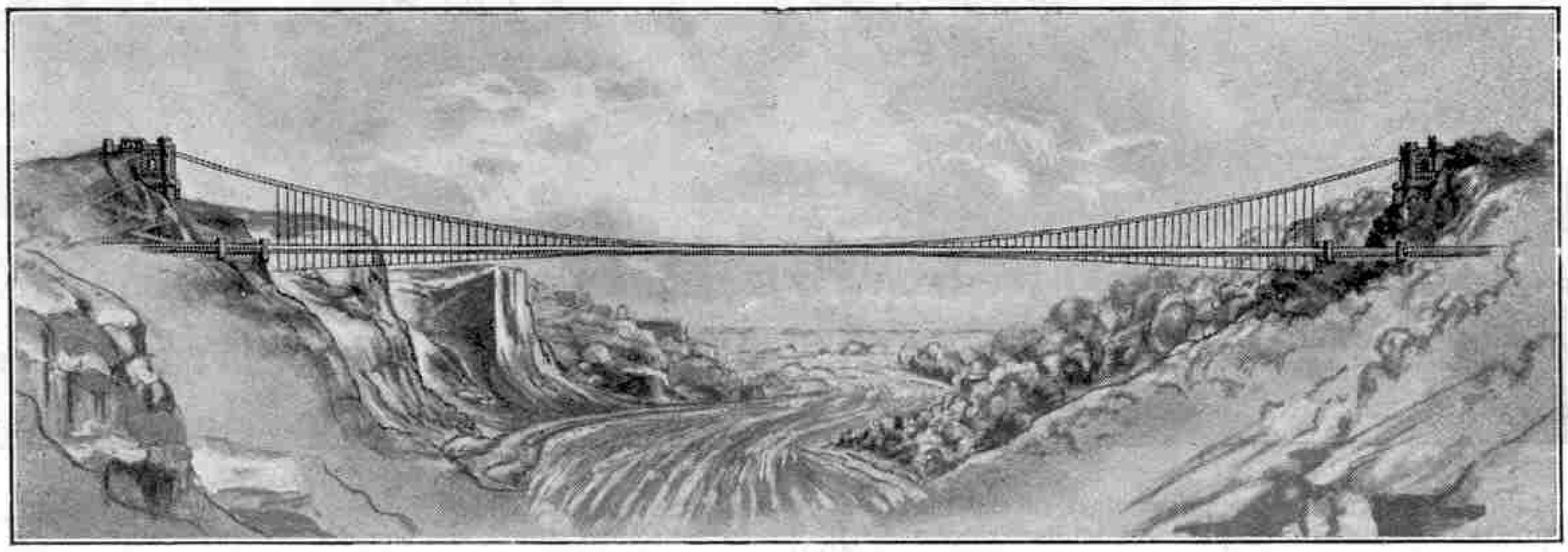
The bridge scheme originated in 1753, when Alderman William Vick bequeathed £1,000 to the Society of Merchant Venturers of Bristol with instructions that the money was to accumulate at compound interest until it reached £10,000, when it was to be used for the erection of a stone bridge across the Avon from Clifton Down to Leigh Down. By 1829 the accumulated money amounted to nearly £8,000, and a committee was appointed to consider the best method of carrying out Alderman Vick's wishes. The idea of a stone bridge was soon abandoned, however, for an estimate that was obtained put the cost at £90,000. The committee then advertised for designs for a suspension bridge.

Brunel's plans

Brunel promptly went to Bristol to examine the locality, and selecting four different sites within the limits laid down by the committee he sent in a separate design for each site. The first design was for a bridge of 760 ft. span between the points of suspension. In order to obtain a height of 215 ft. above high water mark, which was the least that the levels permitted, towers 70 ft. in height were to be built on the cliffs to carry the chains. The total length of chain, including the land-ties, was about 620 ft. Brunel himself did not approve of this plan, and only suggested it as being rather more economical in construction than his other plans. A second design for a bridge of 1,180 ft. span between the points of suspension was also not recommended by him in the report that accompanied his designs. The two other plans are more interesting. The site chosen was one where rocks rose almost vertically for a considerable height above the proposed level of the

bridge, and the chains therefore were to be hung directly from the rock, piers and land-ties being rendered unnecessary.

In his report to the committee Brunel dismissed as unnecessary the idea of breaking the span into two or three lengths, and calculated that the cost of building a pier from the water's edge to a sufficient height above the bridge to carry the chains would be at least £10,000. He thus recommended confidently the adoption of spans far exceeding in length any that had previously been constructed. He also suggested many improvements in the suspension chains.



Brunel's drawing of the proposed Clifton Suspension Bridge, submitted in the first competition (1829) and rejected

Telford's Adverse Decision

Twenty-two plans were submitted to the committee, and of these only those of Brunel and four other competitors were selected for consideration. Brunel's friends were confident of his success, but Telford, the designer of the famous suspension bridge across the Menai Straits, who had been asked to advise the committee, pronounced against Brunel's plan.

Telford thought that the maximum span admissible was that used in his Menai Bridge, that is under 600ft., and he was emphatically of opinion that Brunel's proposed bridge would collapse in a high wind. Upon hearing of this decision Brunel asked and obtained permission to withdraw his plans from the competition, and Telford then reported to the committee that none of the remaining designs was suitable.

The only course that then remained for the committee was to request Telford himself to prepare a design, and this he did. His plan consisted of a suspension bridge of three spans, the chains being supported at the intermediate points by tall stone piers rising from the banks of the river. This design was received at first with great enthusiasm, but the more closely the committee examined it the less they liked it, and finally they determined to announce a second competition.

Brunel succeeds in Second Contest

On this occasion there was a new referee and Telford appeared as a competitor. The site of the bridge previously selected by Telford was fixed, but the committee left it to the competitors to decide whether there should be one unbroken span or intermediate piers. Thirteen designs were sent in, five of which, including those submitted by Telford and Brunel, were reserved for further examination. Telford's design was put aside "on account of the inadequacy of the funds requisite for meeting the cost of such high and massive piers as were essential to the plan which that distinguished individual had proposed."

Brunel's design was placed second, but subsequently the referee changed his views. He obtained an interview with Brunel, and certain explanations he then received induced him to place Brunel's design first as being superior to any of the others in regard to strength. The committee immediately accepted their referee's advice, adopted this plan and appointed Brunel their engineer.

Elevation of Clifton Suspension Bridge, on which the construction of the Bridge was commenced in 1836

I. K. Brunel's Signature

Delay through Lack of Funds

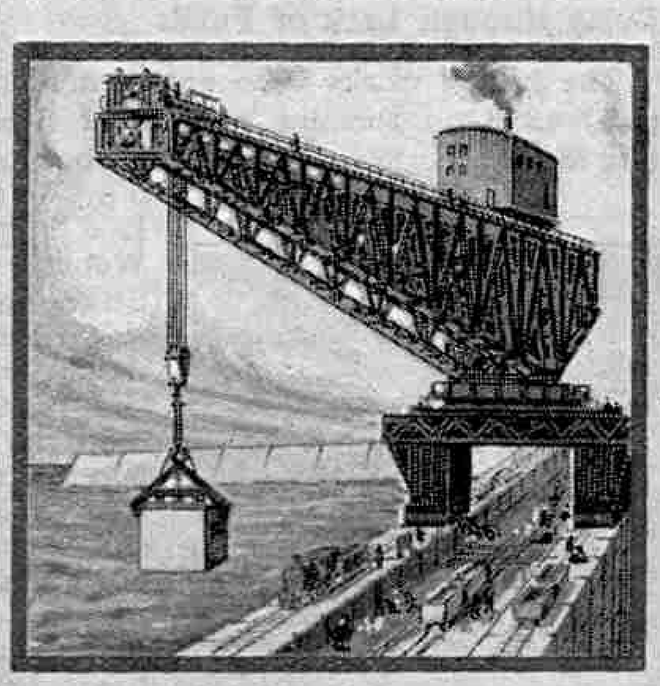
The bridge works were not commenced until 1836 on account of lack of funds, but finally the first stone of the abutment on the Leigh Woods or Somerset side of the river was laid by the Marquis of Northampton, President of the British Association, which was then holding its annual meetings in Bristol. Brunel intended in the construction of the bridge to have followed out the ideas embodied in his report of 1829, and would have preferred to have only one chain on each side of the bridge, such chains being of much greater strength than those usually adopted. In deference to public opinion, however, he put two chains, although he doubted very strongly whether they would expand equally. He endeavoured to lessen the effect of unequal expansion by arranging a stirrup at the top of each suspending rod so as to maintain an equal hold on both chains at all times, and so cause each chain to bear its proportion of the load.

In order to reduce the action of the wind on the bridge Brunel brought down the main chains in the centre nearly to the level of the platform and intended to apply the system of brace chains at a small angle to check vibration. There were also to be two curved chains lying horizontally, and attached beneath the platform, so as to resist the lateral action of the wind. He introduced movable saddles to carry the chains on the top of the towers, with rollers running on perfectly horizontal roller beds. By this arrangement no pressure except a vertical one could come on the towers. He also devised means, by levers and hydraulic presses, for relieving the rollers and roller beds from pressure in the event of their requiring renewal.

Brunel's Architectural Scheme

Brunel intended his bridge to be a handsome and imposing structure and he decided to adopt the Egyptian style of

(*Continued on page* 191)



Giant Block-Setting Cranes

Their Work in Constructing Harbours and Breakwaters

IN our last instalment we gave some particulars of the building of the Admiralty Harbour at Dover, and whilst a good deal more might be said about this very interesting work, the space at our disposal limits us. We must dismiss the subject by saying that in the Dover Harbour we have an excellent example of how, for the time being, man has won a victory over the sea. The great breakwaters have withstood sixteen winters of furious storms, and the huge waves have not damaged them in any way. The additional harbour thus reclaimed from the sea, as it were, was of incalculable value to the Allies during the War, not only as a port from which troops and munitions might be embarked to France, but also as a base for the Dover Patrol. Here, too, warships, torpedo boats and other craft that were concerned in protecting the Cross-Channel traffic from attack by enemy warships, found refuge.

The Uses of Goliath Cranes

Before leaving the subject of Goliath cranes, which were specially used in the building of Dover Harbour, we must mention that in addition to placing the huge concrete blocks in position these cranes were employed to operate huge clam-shell grabs, used for clearing the sea-floor. These grabs were capable of bringing up 5 tons of material at a time.

In many places the ground was too hard for the grabs to get a bite and then a solid block of iron, with three projecting teeth, was used. These "breakers" as they are called, were also operated from the Goliath cranes. On being lowered at speed they crashed to the sea-floor, splintering the chalk into large pieces that were gathered by the grab.

The Goliaths were also employed to lower the diving-bells from which the divers set the blocks, telephoning to the crane-man the exact direction so that he could move the crane exactly as required and so set the block in the desired position.

Mighty Titan Cranes

Another and larger type of crane used in connection with harbour construction work is that known as the "Titan," for the construction of which Messrs. Stothert & Pitt Ltd., of Bath, are famous throughout the world.

The Titan crane has a jib of the cantilever type and the load trolley runs along its upper boom, the whole jib turning on a live ring in a similar manner to that of the large jib cranes. Usually the Titan crane is steam operated although cranes have been made for use with electric power where current is available.

Titan cranes are frequently constructed of such a size that they weigh 500 tons or more and they have been built to operate loads up to 60 tons. Recently the writer saw under construction, at Messrs. Stothert & Pitt's works, a huge Titan made for the Union of South Africa for Harbour Construction at Table Bay, capable of handling a 50-ton load, and we hope at a later date to be able to give full particulars and to illustrate this remarkable crane, which will make a splendid subject for a Meccano model.

The Titan type of crane was evolved when the block-system of breakwater construction came into general use. As in the case when Goliath cranes are employed, the massive concrete blocks are cast in special yards near the scene of operations, and are wheeled on special trucks along the pier or gantry to a position near the crane. This picks up the blocks and swings them out into the position in which they are to be fixed in the breakwater. The blocks are then keyed together, as has already been explained in these pages, in order that they may present a solid front to the devastating action of the waves.

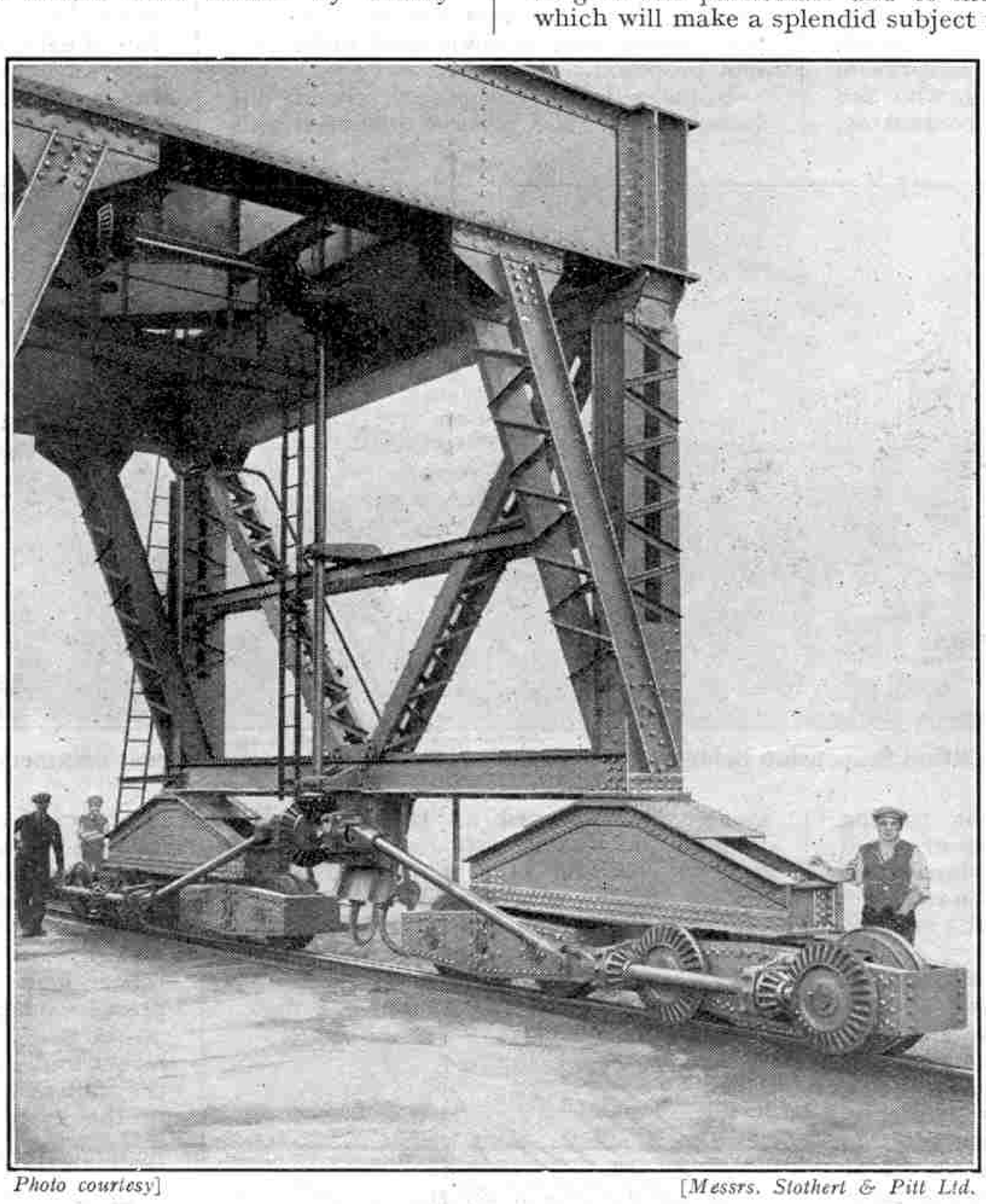


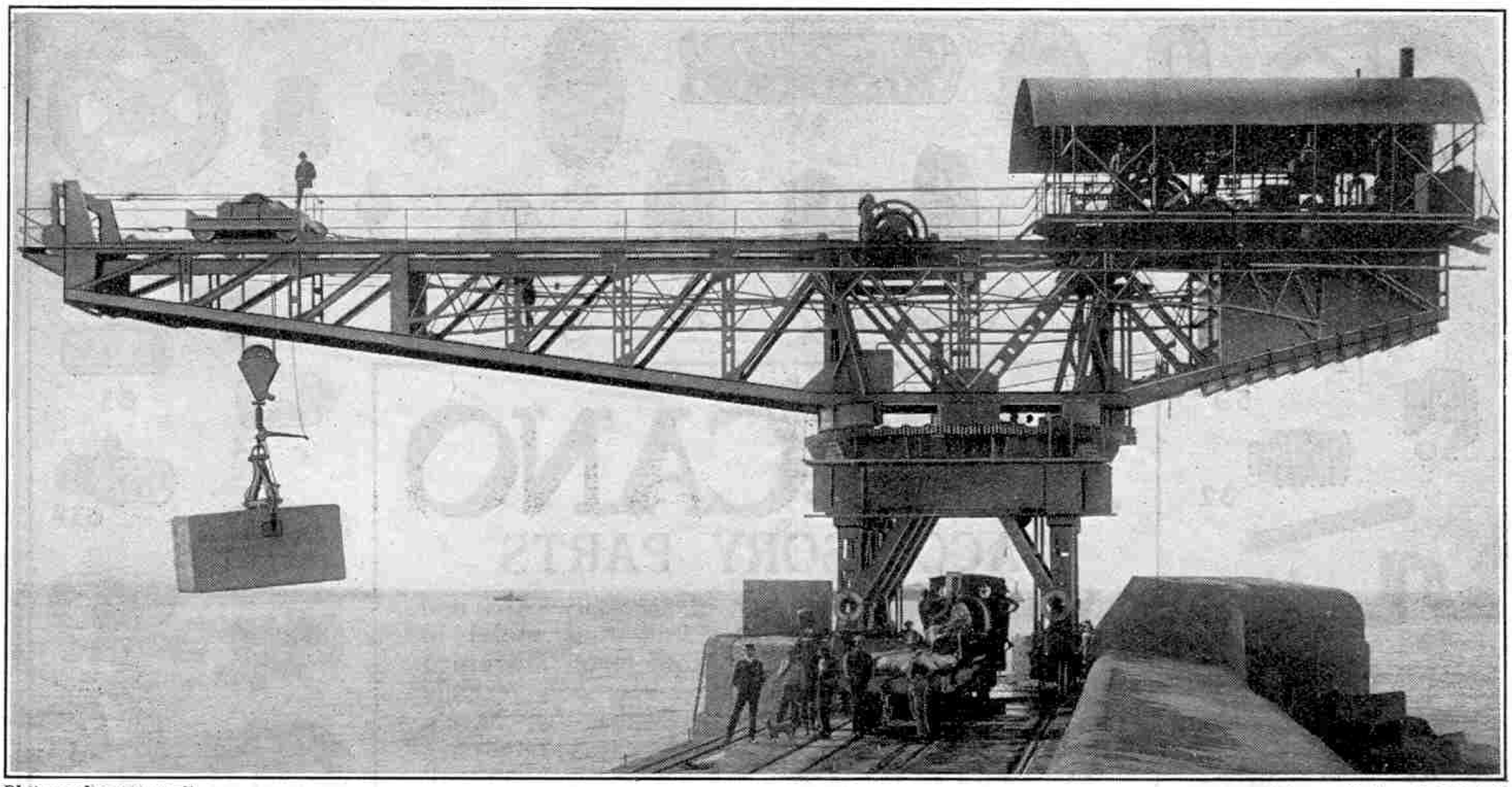
Photo courtesy [*Messrs. Stothert & Pitt Ltd.*

Our illustration shows the travelling motion of a Titan Crane. The details will be useful to model-builders, and the further information in the accompanying article will also assist them.

Details of Titan's Mechanism

The Titan crane has the advantage of being mobile, so that it is possible to move it along the pier as the construction of a breakwater proceeds. Even more important is the fact that it is also practicable to withdraw it shore-wards for shelter in bad weather.

These cranes are capable of handling concrete blocks up to 60 tons in weight over a radius of 100 ft. or more. They do this by means of the long cantilever arm that is mounted on a turntable, which itself rests on a massive under-carriage. The under-carriage is mounted



Photograph courtesy of [*Messrs. Stothert & Pitt Ltd.*

This giant Titan crane was built for the Union of South Africa and was erected at Port Elizabeth, South Africa, for work on the breakwater. The crane is described in the accompanying article.

on flanged wheels, running on a special track and driven by means of crown wheels fixed on the inside of the bogie. A bevel gear, which meshes with the crown wheel, transmits motive power from the main engine mounted on the cantilever arm.

The details of this power transmission are clearly shown in the accompanying illustration. Those of our readers who contemplate building a model of one of these Titan cranes will be interested to notice that the motion may be perfectly reproduced in Meccano. Practically identical parts to those illustrated are provided, including the two universal joints shown between the bevel wheel, which meshes with the vertical drive from the steam engine, and the driving rod, which is at an angle and brings the power to the crown wheels mounted on the inner side of the bogie.

The Eight-Wheel Mounting

It will be noticed that in the case of the crane illustrated the drive is taken to two pairs of wheels, one of which is the foremost pair and the other the rear pair. The drive from the same rod is transmitted to each of the two crown wheels in a very simple manner by means of small bevel wheels. The other pairs of wheels, the innermost on each bogie, are loose wheels and not connected with the driving mechanism in any way. An exactly similar arrangement is carried out on the other side of the track, the front and rear pairs of wheels being driven, and the two inner pairs being loose.

The practice of driving four wheels out of eight on each side of the track is simply one of convenience and depends largely upon the weight of the crane. In the lighter cranes it is not necessary to have four wheels to each bogie. Probably the Meccano model-builder will find that two pairs of wheels, one of each pair of which is driven, will be sufficient for the purpose, although it is to be admitted that two bogies giving eight wheels a side do considerably assist in giving a good appearance to the model.

Massive Roller Bearings

The cantilever arm and superstructure of all Titan cranes revolves on a ring of live rollers, which in the case of a large crane may have a path of between 30 and 40 ft. in diameter. The bearings are formed by a series of turned steel rollers held in position by a suitable frame and revolving on machined pathways between the upper and lower circular girders. The tops of the rollers can just be seen in the accompanying illustration, above the segment of the large toothed wheel, and immediately below the lower framework of the cantilever arm where it rests upon the massive metal mounting.

The whole of this revolving structure is centred by means of a large central pivot, consisting of a steel rod of considerable diameter. The revolving motion is transmitted from the engine, or—in the case of an electrically-equipped crane—from the electric motor, which occupies a corresponding position on the opposite end of the cantilever arm to that from which the load is operated.

A Counterpoise Necessary

Incidentally, it may be remarked that the weight of the engine or electric motor, as the case may be, helps to balance the load, but its weight alone is not sufficient and so a massive weight has also to be introduced to act as a counterpoise. In our illustration this weight is clearly shown immediately beneath the engine housing.

Model-builders will probably find that the weight of the Meccano Electric Motor will be a sufficient counterpoise for any reasonable load, but if they contemplate building a specially large model, that will be called upon to tackle heavier loads than usual, they will find that the Meccano 4-volt Accumulator makes an excellent additional counterpoise, and that it may be easily built into place without looking unsightly. Failing this, a useful counterpoise can be made by incorporating an ordinary flat iron in the design. Very often it can be arranged so that it is almost inconspicuous, especially if the sides of the cantilever arm are closed with strips or short pieces of braced girders.

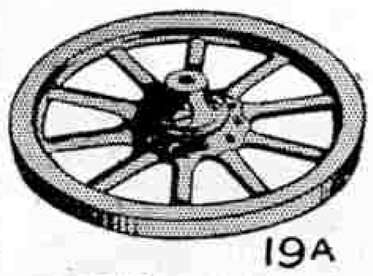
Crab Requires 4-inch Steel Ropes

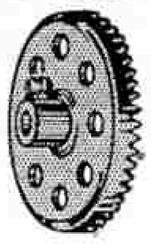
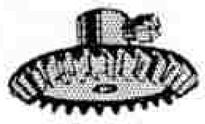
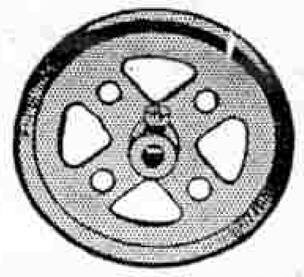
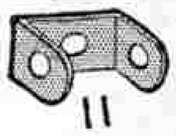
The motion from the engine is transmitted through a chain of spur- and bevel-gears, which finally engage in the segmental spur track, formed around the exterior of the roller path. In some cranes the gears are thoroughly protected from the weather by covering them with heavy metal casings, but this is not always found necessary.

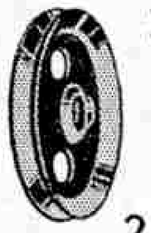
As previously explained, the same engine drives the travelling motion of the crane in a similar manner by rod and gearing. The gears are engaged or disengaged by the engine-man, who, of course, also controls the hoisting and lowering of the load and the movements of the trolley. This trolley—which is sometimes called the "crab" and is also known as a "Jenny"—is drawn along the cantilever arm by steel ropes and a lifting rope 4″ in circumference passes over it to the hoisting block. The lowering arrangements in the crane illustrated are controlled by a patent system and hydraulic brakes, which enable the heaviest weights to be lowered within limits of a fraction of an inch with absolute precision.

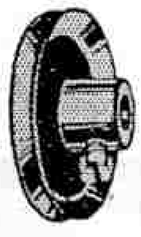
Titan cranes have been built by Messrs. Stothert & Pitt Ltd., Bath, for and used in the construction of some of the best known harbours in the world including Colombo, Madras, Gibraltar, Fishguard, Peterhead, Seaham, Tynemouth, Table Bay, Gisborne, Vera Cruz, Antofagasta, Port Elizabeth, East London, etc.

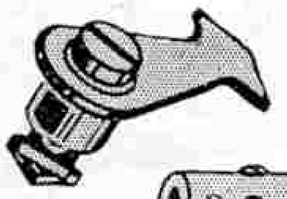
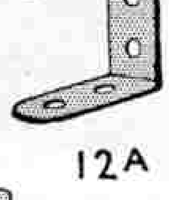
(*Continued on page* 167)







MECCANO

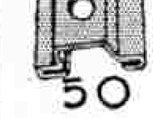
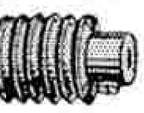
ACCESSORY PARTS

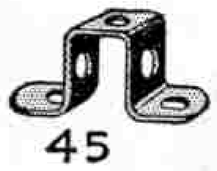
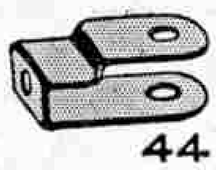
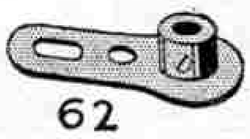
WE illustrate a selection of accessory parts that every Meccano boy will find useful in building the larger and more interesting models. Many of these parts have been only recently introduced, and although we know that they have a universal use (were it otherwise they would not have been added to the system) we may not yet know all their applications. There are endless possibilities in the employment of Meccano parts; indeed, we wonder if there is now a mechanical movement known to engineering that any boy cannot duplicate with Meccano.

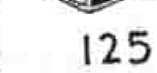
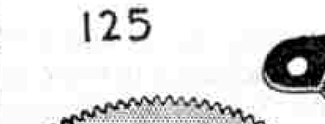
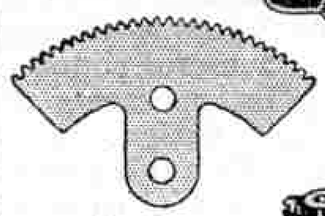
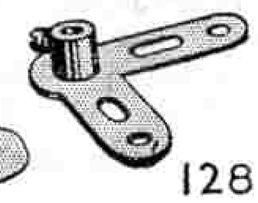
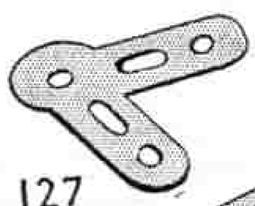
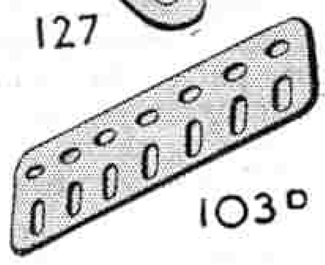
			s.	d.
10.	Flat Brackets	½ doz.	0	2
11.	Double Brackets	each	0	1
12A.	Angle Brackets, 1"×1"	„	0	1
19A.	Wheels, 3", with set screw	„	0	8
20.	Flanged Wheels	„	0	6
	Pulley Wheels :			
19B.	3" dia., with set screw	each	0	8
22.	1" „ „ „ „	„	0	4
22A.	1" „ without set screw	„	0	2
24.	Bush Wheels	„	0	6
25.	¾" Pinion Wheels ...	„	0	6
26.	½" „ „ ...	„	0	4
27.	Gear Wheels, 50 teeth...	„	0	9
27A.	„ „ 57 „ ...	„	0	9
28.	1½" Contrate Wheels ...	„	0	9
29.	¾" „ „ ...	„	0	6
30.	Bevel Gears	„	0	10
31.	1" Gear Wheels, 38 teeth	„	1	0
32.	Worm Wheels	„	0	6
33.	Pawls (complete) ...	„	0	4
43.	Springs	„	0	2
44.	Cranked Bent Strips ...	„	0	1
45.	Double Bent Strips ...	„	0	1
50.	Eye Pieces	„	0	2
57B.	Hooks (loaded)	„	0	5
59.	Collars and Set Screws	„	0	2
62.	Cranks	„	0	3
63.	Couplings	„	0	6
63A.	Octagonal Couplings ...	„	0	8
63B.	Strip Couplings	each	0	8
63C.	Threaded Couplings ...	„	0	6
64.	Threaded Bosses ...	„	0	2

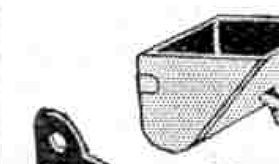
			s.	d
94.	Sprocket Chain	per length	0	6
96.	Sprocket Wheels, 1" ...	each	0	3
101.	Healds, for Looms ...	doz.	0	9
108.	Architraves	each	0	2
109.	Face Plates, 2½" diam.	„	0	4
113.	Girder Frames	„	0	2
114.	Hinges...	per pair	0	4
115.	Threaded Pins	each	0	2
116.	Fork Pieces	„	0	3
118.	Hub Discs (5½" diam.)	„	1	3
119.	Channel Segments (8 to circle, 11½" diam.)	„	0	4
120.	Buffers	„	0	2
120A.	Spring Buffers ...	per pair	0	8
123.	Cone Pulleys	each	1	3
124.	Revsd. Angle Brackets, 1"	½ doz.	0	10
125.	Revsd. Angle Brackets, ½"	„	0	
126.	Trunnions	each	0	3
126A.	Flat Trunnions	„	0	2
127.	Simple Bell Cranks ...	„	0	3
128.	Boss Bell Cranks ...	„	0	4
129.	Rack Segments, 3" diam.	„	0	6
130.	Triple Throw Eccentrics	„	1	3
131.	Dredger Buckets ...	„	0	2
132.	Flywheels, 2¾" diam....	„	2	3
133.	Corner Brackets... ...	„	0	3
136.	Handrail Supports ...	„	0	3
137.	Wheel Flanges	„	0	4
138.	Ship's Funnels	„	0	4
139.	Flanged Brackets, Right	„	0	2
139A.	„ „ Left	„	0	2
140.	Universal Couplings ...	„	0	9
144.	Dog Clutch	„		8

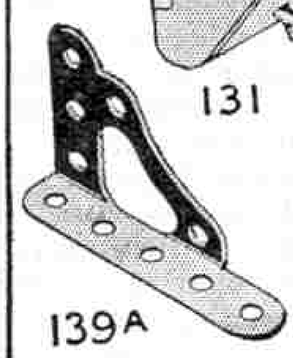
You may obtain Meccano Parts from your Dealer

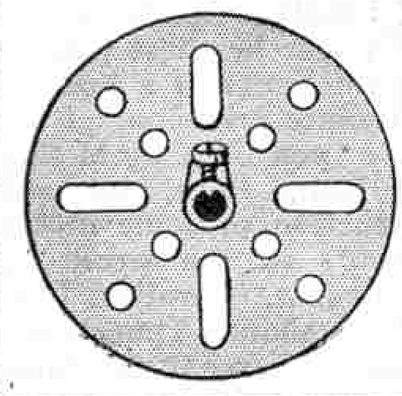
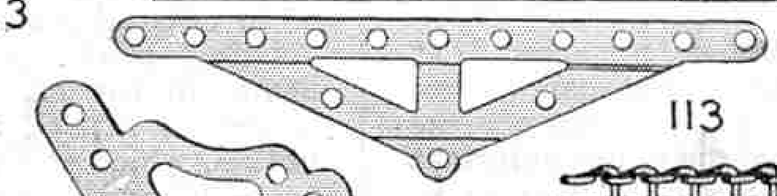
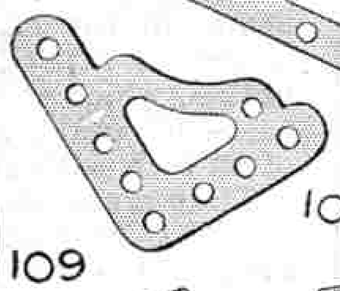
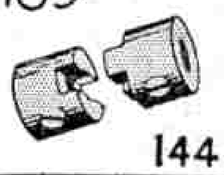
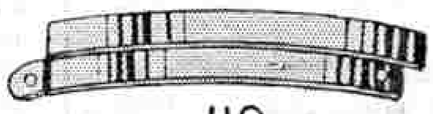
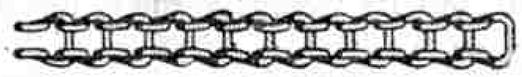



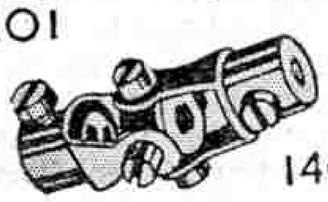
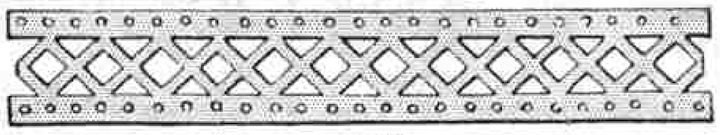
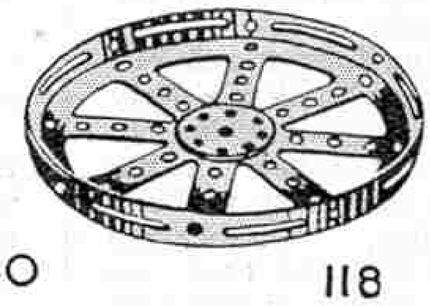
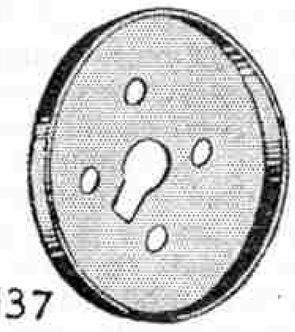








A NEW MECCANO MODEL

Model No. 618. Bagatelle Table

THIS is an excellent model that will provide amusement for many evenings. What happens is that a marble is placed in front of the cue, and the handle turned. A spring is released, the striker hits the marble a vigorous blow with his cue, and the marble shoots to the top of the table. Here it may drop into one of the holes, in which case the score is credited to the player operating the handle. Meantime the player continues to turn the handle and the marble is aufomatically returned to the table in position for the striker to hit it again with his cue. Should the marble drop down one of the "Stop" holes, the player loses his place, which is taken by another participant in the game.

Constructing the Model

The construction of the model is made clear by the accompanying figures, and the following detailed description will make the operating mechanism quite clear.

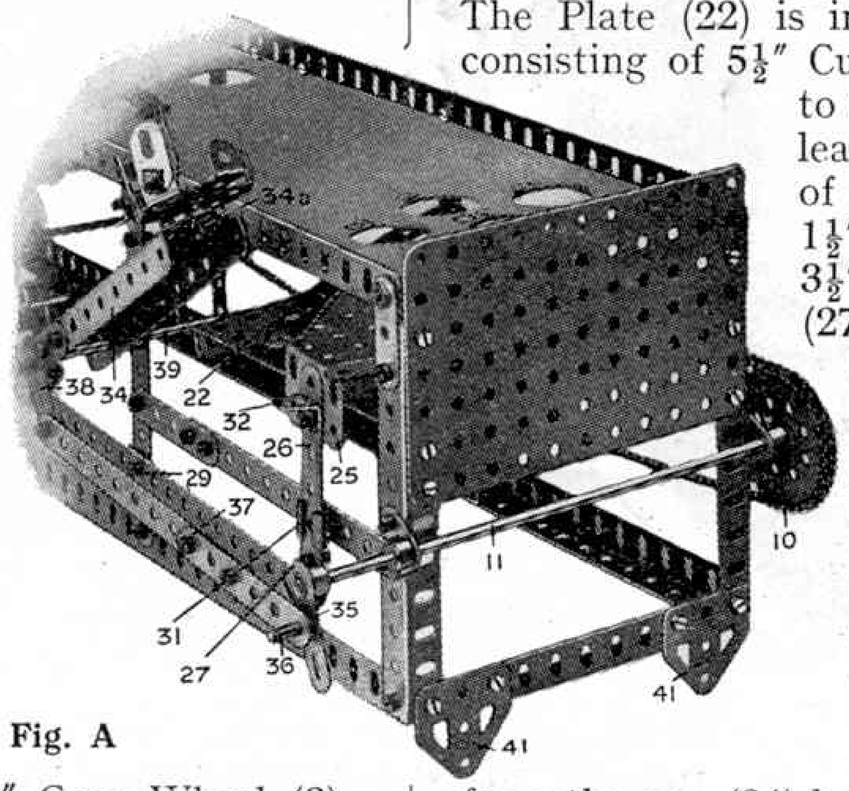


Fig. A

The operating handle (1 Fig. C) drives a $\frac{1}{2}$" Pinion (2) engaging a $1\frac{1}{2}$" Gear Wheel (3). This engages another $1\frac{1}{2}$" Gear Wheel (4) on the Axle Rod of which is a 1" Sprocket Wheel (5) coupled by a chain to a 2" Sprocket Wheel (6) on the Axle Rod (7). On the further end of rod (7) is another 2" Sprocket Wheel (8) connected by Chain (9) to a third 2" Sprocket Wheel (10) on the rear Axle Rod (11).

The pusher-rod (12), by means of which the marble is driven from the point "a" (Fig. C), is carried from a $5\frac{1}{2}$" vertical Rod (13) which is connected to an 8" Rod (14). At the front end of the latter is a 2" Rod (15) arranged vertically, and a Spring (16) tends to pull the pusher-rod forward to strike the marble. The pusher-rod is depressed against the spring by the action of two 1" Rods (17), upon which are mounted $\frac{1}{2}$" Pulley Wheels (17a) carried from two Couplings secured on two 2" Rods (18) which enter the central Coupling (19). The Axle Rod (7) passes completely through the Coupling (19).

The Operating Mechanism

As the Rods (17) rotate, the Pulleys (17a) bear against the Rod (15) and depress the pusher-rod rearwardly until released, when the spring pulls the pusher-rod sharply forward to drive the marble from the point "a" along the table (20) towards the holes (21, Fig. D). When the marble falls into any one of the holes (21) it drops on to the Plate (22, Figs. A and B) formed of two $5\frac{1}{2}$" Flanged Plates bolted together. The Plate (22) is inclined one hole down, and guides consisting of $5\frac{1}{2}$" Curved Strips (23, Fig. B) connected to the plate by Double Angle Brackets, lead the marble (24 Fig. C) to the end of the plate, where it is retained by a $1\frac{1}{2}$" Flat Girder (25 Fig. A) carried on a $3\frac{1}{2}$" Strip (26) pivotally connected at (27 Fig. C) by locked nuts to a $12\frac{1}{2}$" Strip pivoted at (29) and weighted at (30) with $2\frac{1}{2}$" Strips.

The Strip (26 Fig. A) is guided in an Eye Piece (31), and an Angle Bracket (32) is bolted near the top of the Strip. The pocket (33) consists of three $1\frac{1}{2}$" $\times \frac{1}{2}$" Double Angle Strips at the end of an arm (34) formed by two $5\frac{1}{2}$" Angle Girders. The pocket is carried from the arm (34) by a 1" Triangular Plate (34a), the two base holes of which are bolted in the end holes of the Angle Girders. The pocket is bolted to the apex hole of the Triangular Plate, with three washers beneath the pocket to set it up.

The Automatic Return

The arm (34) is rocked from the Rod (11 Fig. C) by a Crank (35) and a Threaded Pin (36), on which engages the end hole of a $5\frac{1}{2}$" and 3" Strip (37) overlapped three holes. The other end of the Strip is connected to a Boss Bell Crank (38) bolted to the arm (34) and secured to the Rod (39).

As the Axle Rod (11) rotates, the arm (34) is permitted to fall, and in so doing makes contact with the Angle Bracket (32) and depresses the Stop Plate (25), permitting the marble to drop from the plate (22) into the pocket (33). Further rotary movement of the rod (11) again raises the arm (34)

(Cont. on p. 167)

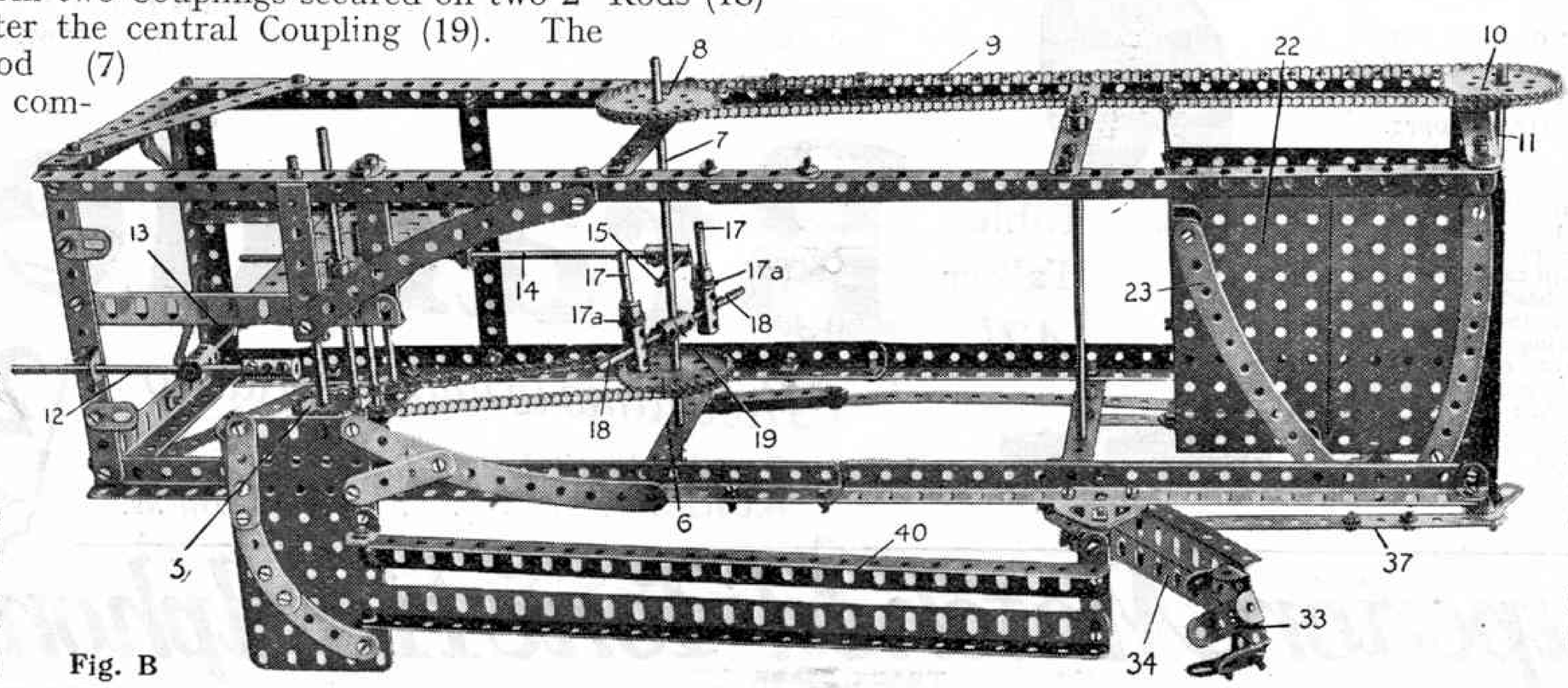


Fig. B

Brandes Superior
"Matched Tone"
Headphones

PRICE

20/-

British Manufacture
(B.B.C. stamped).

All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.

Brandes Superior *Matched Tone* Headphones are admirably versatile. It's hard to imagine them fitting snugly to the tenderest curly head and yet fulfilling their duty on the head of the expert who sits down to long hours of serious experiment. So comfortable and with a rugged strength of construction to protect their delicate adjustment, they are excellent for family use. Primarily designed for long-range telephony from expert technical knowledge, their *Matched Tone* feature brings in the most distant signals with purity and strength. The experimenter finds that they bring the best results in trans-Atlantic and trans-Continental reception. One gentleman writes from Walton-on-Thames: "I received Australia on Brandes, and consider they are the most sensitive 'phones I have used. I am much pleased with their general performance." *Ask your Dealer for Brandes.*

. . . . every one of these advertisements will show an added advantage in the construction of Brandes Headphones.

Look at the illustration above. See how snugly the 'phones fit the head. A gentle pressure on the crown, a firm clasp to the ears, and the rest of the headband is held well away from the hair. This means long-wearing comfort and the shutting out of extraneous sounds. Strength and firm beauty of line typifies their finished construction.

Table-Talker 42/-

The *Table-Talker* is another Brandes quality product at moderate price. Its full round tones are wonderfully clear and pleasing. The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound balance. Gracefully simple of line, it is finished a shade of neutral brown and is twenty-one inches high.

Brandes

The Name to know in Radio

Brandes Limited, 296, Regent Street, W.1
WORKS : : : : : Slough, Bucks.

Superior "Matched Tone" Headphones

TRADE MARK

with the marble in the pocket, until the marble is deposited into the chute (40) and is returned to the point "a" (Fig. C).

Meanwhile, on the rising of the arm (34) the weighted strip (28) again raises the Plate (25) closing the outlet from the inclined Plate (22). The bearings for the Axle Rod (11) are formed by two 1" Triangular Plates secured to the rear vertical Angle Girders.

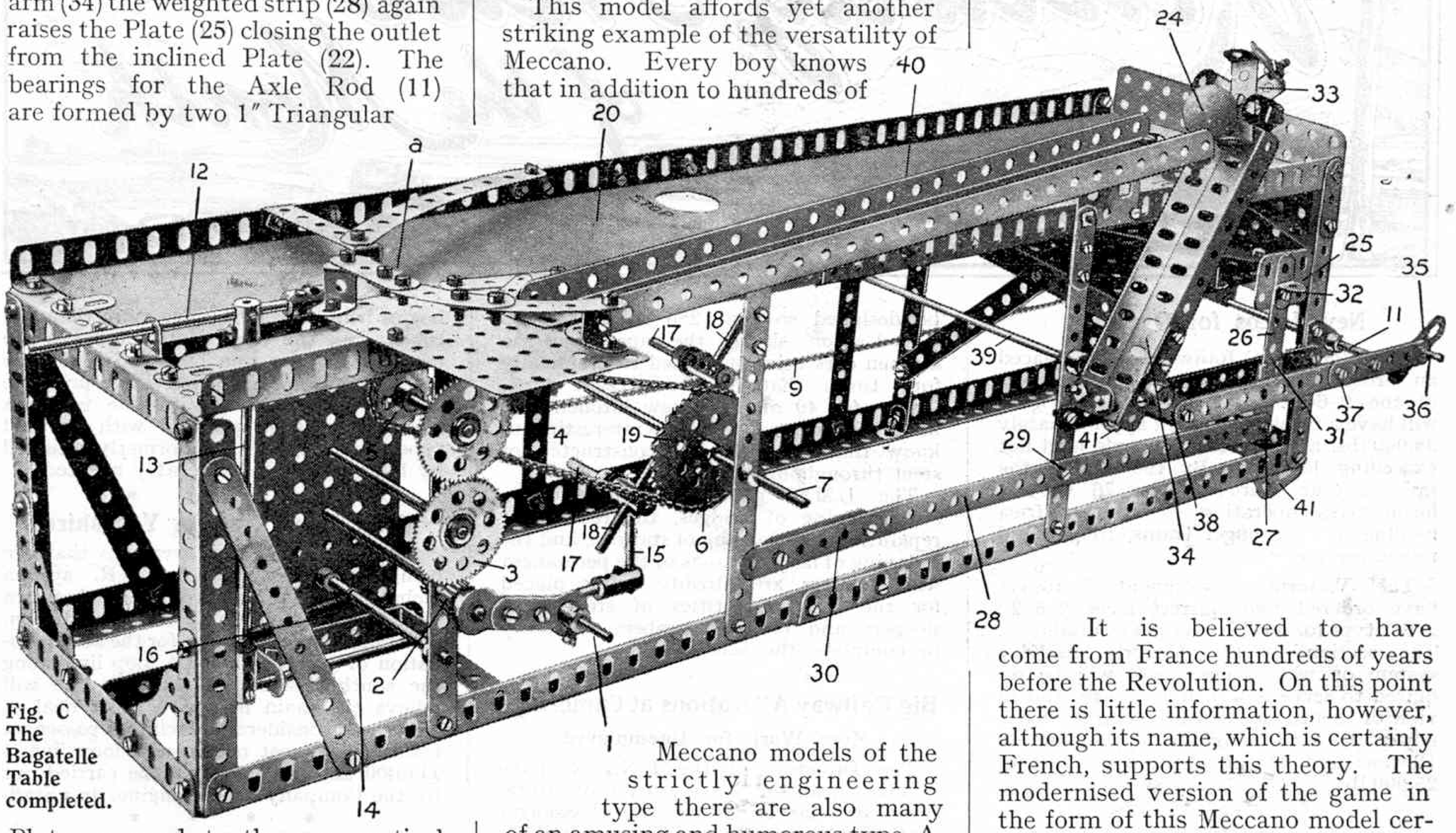


Fig. C The Bagatelle Table completed.

Figure D shows the shape and size of the cardboard table. The holes (21) should be made only slightly larger than the marble used, which, by the way, is not included in the Meccano Outfits. The table is given a slight incline towards the pusher-rod end by forming at the other end two feet with two Flat Trunnions (41) bolted to the lower 5½" Angle Girders.

Parts required:

1 of No.	1		6 of No.	38	
10 „ „	2		1 „ „	43	
2 „ „	2A		1 „ „	46	
1 „ „	3		3 „ „	48	
1 „ „	4		2 „ „	48A	
6 „ „	5		1 „ „	50	
4 „ „	6		2 „ „	52	
6 „ „	6A		1 „ „	52A	
10 „ „	8		1 „ „	53A	
11 „ „	9		9 „ „	59	
6 „ „	10		3 „ „	62	
5 „ „	11		7 „ „	63	
9 „ „	12		1 „ „	70	
1 „ „	12B		3 „ „	77	
4 „ „	13A		4 „ „	89	
2 „ „	14		2 „ „	90	
1 „ „	15		3 „ „	95	
2 „ „	15A		1 „ „	96	
1 „ „	16		1 „ „	103H	
3 „ „	17		2 „ „	108	
2 „ „	18A		1 „ „	111A	
1 „ „	18B		1 „ „	115	
1 „ „	26		1 „ „	125	
2 „ „	27A		3 „ „	126A	
134 „ „	37		1 „ „	128	

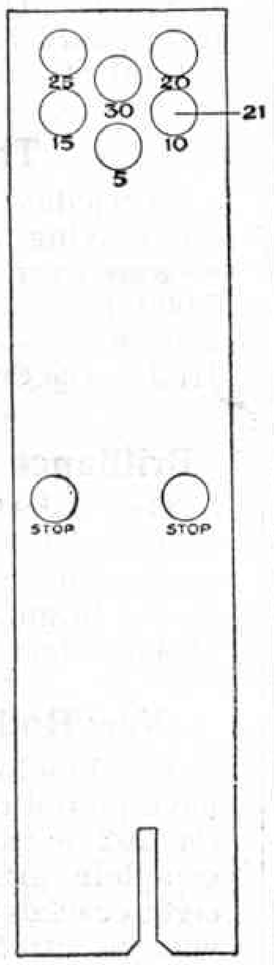


Fig. D

Origin of Bagatelle

This model affords yet another striking example of the versatility of Meccano. Every boy knows that in addition to hundreds of Meccano models of the strictly engineering type there are also many of an amusing and humorous type. A glance through the complete Manual brings to light such models as Drop the Nigger, St. George and Dragon, the Meccano Family, Box Ball Alley, Silhouettograph, the Wrestlers, Galloping Donkey, etc. Such models as these provide many hours of fun and, indeed, some may be called pastimes in themselves. In this class of model pride of place must be given to the Bagatelle Table.

As in the case of many of our games—such as billiards, chess, and draughts—the origin of the Bagatelle game is unknown, but in all probability it is extremely ancient. It is believed to have come from France hundreds of years before the Revolution. On this point there is little information, however, although its name, which is certainly French, supports this theory. The modernised version of the game in the form of this Meccano model certainly gives endless fun, whatever its origin!

The mechanical side of the apparatus is very ingenious in that the ball, whilst in play, is not touched by hand unless it falls in one of the "stop" holes.

NEXT MONTH:—

PLATFORM SCALES

Giant Block-Setting Cranes—(*Continued from page* 163)

The Titan illustrated at the top of this page is a splendid example of this type of crane. Erected at Port Elizabeth, South Africa, it has played an important part in the construction of the harbour-works and breakwater.

Details of the Titan Illustrated

The total weight of the crane is 261 tons. The overall length of the cantilever arm is 119 ft., the height of the top portion of the cantilever arm from the ground being 40 ft. The length of the arm from the centre to the nose—that is the end at which the load is operated—is 78 ft. 9 in., so that the tail—or the portion of the arm on which the engine-house is situated—is 40 ft. 6 in. in length from the centre of the arm. The crane arm revolves on a roller path, which has a diameter of 24 ft., and the arm is capable of being slewed through one complete revolution in three minutes.

This crane is capable of lifting a maximum load of 40 tons and the arm can move this load over an area the maximum radius of which is 65 ft. The total height of lift of the load is 30 ft., and the load may be lowered 58 ft. below the level of the track. The crane is thus capable of lifting a load over a total height of 88 ft.

A two-cylinder steam engine is used, the diameter of the cylinders being 11 in. and the stroke 18 in.

The crab runs on four wheels and a lifting rope of 3¾ in. circumference is used. The crab has a slow speed of 22 ft. per minute and a quick speed of 45 ft. per minute. Its hoisting speed on slow gear when lifting its maximum load is 8½ ft. per minute. Its speed when racking on low gear with maximum load is 22 ft. per minute.

The crane runs on 16 wheels, each of which is borne on springs. The width of the track from centre to centre of the rails is 17 ft.

New Locos for Overseas

The Rhodesian Railways have placed an order for four Garrett Locomotives of the 2–6–2 : 2–6–2 type. These locos will have a tractive effort of approximately 35,000 lbs. and a maximum axle load not exceeding 13 tons. By the end of the present year there will be 76 Garrett locomotives operating in South Africa hauling fast passenger trains, freight and mixed service.

The Victoria Government Railways have ordered two Garrett locos 2–6–2 : 2–6–2 type for service over heavy gradients. The section of the Victoria Railway system on which these locos will be required to serve is 2 ft. 6 in. gauge, and in view of this the locos will be exceptionally powerful, each weighing approximately 18 tons and having a tractive effort of 25,000 lbs.

* * * *

Articulated Passenger Trains

The L.N.E.R. have decided to build all their new passenger trains on the articulated principle. This principle, which has already been described in the "*M.M.*," is based on the fact that the ends of two coach bodies are made to rest on one bogie. Some months ago the L.N.E.R. ordered 29 complete trains and suburban coaches on the articulated principle. These are being built by the principal carriage-building firms in this country. Each train will consist of 10 coaches in two units of five, and a complete train will seat 872 passengers.

* * * *

L.M.S. Developments

It is announced the L.M.S. are to spend £14,000,000 on extensive schemes in renewals, extension and maintenance. Only part of the work will be done by the Company's own workmen, the remainder being carried out by outside firms. The work includes the construction of entirely new trains ; new sleeping cars ; and new rolling stock for mineral and live-stock traffic. Some 30,000 new wagons are to be built, including a number of refrigerator cars and special wagons for the transport of motor vehicles and for handling grain in bulk.

Over 235 new locomotives are to be built, including 220 large passenger and freight locos, and nearly £5,000,000 will be spent on the building of 2,600 passenger coaches, the majority of which will be of the corridor type. New restaurant cars, embodying the latest developments, will be designed so that 250 meals can be served at one sitting, the capacity of the kitchen cars being increased to practically four times that of the present type. Orders for 40 of these new kitchen cars have been placed and it is interesting to know that they will be constructed of steel throughout.

The L.M.S. plans also include the strengthening of bridges, the rebuilding, repainting and cleaning of stations, and the re-laying of large sections of the permanent way. Orders are already being placed for the large quantities of steel rails, sleepers and crossing timbers necessary to complete the scheme.

* * * *

Big Railway Alterations at Cambridge

More Work for Unemployed

The Directors of the L.N.E.R. have sanctioned an extensive scheme of alterations at Cambridge. The Passenger Station platform is to be considerably lengthened, and the old Newmarket line, which has been used for the storage of carriages, is to be handed over to the Corporation for a new arterial roadway. This will greatly assist the development of the University town and provide work for unemployed for some time ahead. The new scheme also provides for the concentration of signalling work, the provision of new up and down goods yards, and the entire re-arrangement of the railroads at this centre.

* * * *

Famous Loco for America

The Stephenson engine, which has occupied a site on the island platform at Newcastle Central Station for many years has been taken to pieces. It is going first to Darlington and then to America for exhibition during the railway centenary. Workmen began to dismantle the old engine last month.

* * * *

More Comfortable Travel on the L.N.E.R.

Further to our note last month regarding articulated trains we are now able to announce that the L.N.E.R. have decided to construct all new trains—including main line Sleeping Cars, Restaurant Cars, and Suburban trains—on the "articulated" principle. The L.N.E. Railway is the first British railway to adopt this new method of construction, which means a great advance in comfortable travel. As most of our readers know, in the articulated system buffers between carriages are dispensed with, the wheels and bogies being made to serve more than one coach, i.e., the ends of two coaches are made to rest on one bogie. In addition to exceptional comfort this principle enables more carriages to line up at a platform than is possible with the old type carriages, the space formerly occupied by buffers being considerably reduced.

* * * *

New Loop Line for Yorkshire

Alterations and improvements that are being made on the L.N.E.R. system include an additional route line between Barnsley Junction and Penistone Station, a distance of about a mile, for the accommodation of goods traffic. A loop line along the south side of the existing line will relieve the main line of a great deal of traffic and considerably facilitate passenger traffic. The cost of the new loop line is £11,000 and the work will be carried out by the Company's own Engineering Staff.

* * * *

Sale of Government Locomotives

The L.N.E.R. have just completed the purchase from the Government of 48 locomotives of the 2–8–0 type. These engines will be used for heavy mineral traffic after being reconditioned at the Company's Gorton shops.

* * * *

Travelled a Million Miles

Mr. John Goy, of Bourne, South Lincs., has retired after 41 years' service on the L.N.E.R. During 34 years as a passenger train guard he travelled 135,000 journeys, a total of 1,077,544 miles.

* * * *

The Day's Work

Every day on the L.N.E.R. 7,000 engines are moving 21,000 coaches and 300,000 wagons over 7,000 miles of track. Over 5,000 horses help the delivery of goods, and 40 vessels ply from Harwich and Hull to the Continent and on the Clyde.

* * * *

Brilliance of New Signal Lamps

The latest automatic signal lamps that have been installed on the Marylebone section of the L.N.E.R. are visible even in the brightest sunlight up to a distance of 4,000 feet.

* * * *

New Rolling Stock for L.N.E.R.

The London & North Eastern Railway have placed orders amounting to £540,000 for 202 passenger carriages including six complete articulated suburban trains of eight coaches each. All these new carriages will be fitted with electric lighting and steam heating.

Keeping Goods Dry in Winter

BY OUR SPECIAL CORRESPONDENT.

During one of the very heavy showers of rain that have been so frequent this winter, I was standing at a station of a big main line railway when a long goods train of 50 wagons rattled through. The wind was blowing the rain in all directions, and as I watched this heavy train on its journey I began wondering how the goods, so carefully packed in warehouse and factory, were kept dry, and whether the heavy tarpaulin covers really succeeded in keeping out the wet.

A few days later I was able, through the courtesy of the officials of the L.N.E.R., to visit one of their many factories devoted to the production of wagon sheets and covers. For the sake of convenience these hives of industry are situated in various parts of the L.N.E.R. system from King's Cross to Aberdeen, but the methods employed in turning out and repairing the thousands of tarpaulins used on the L.N.E.R. are the same in each case. The story of how these damp-resisters are made to meet all demands is full of interest.

I found that out of the hundreds of thousands of tons of goods, a large proportion of which is foodstuff, carried each year, a very small part gets damaged in transit owing to bad weather. This is only when the tarpaulin covers are temporarily removed in loading and unloading the wagons.

I noticed gangs of expert workmen handling the finest quality of canvas of approved thickness, 36″ wide. This is sliced into lengths which are sewn together on huge sewing machines specially constructed and which carry two needles instead of one. Ring holes are cut, strengthening pieces added and the tarpaulin in embryo is sent to the waterproofing plant. Huge rollers grip the cloth and a swinging brush forces linseed oil and vegetable black into the heart of the material. Drying follows, when the proofing process is repeated. Six times in all the sturdy canvas goes through the mill, when it assumes a leathery texture that will keep out frost and damp.

A workman artist then stencils the magic initials "L.N.E.R." on its surface. It is given a nice long number and the cryptic signs 1/25—1/26 are stamped on the corners with red lead paint. This ensures ready knowledge of the age of the cover without reference to the long number, and the second sign is an indication to the staff that it is due back for re-proofing in the first month of 1926.

Six years is the average life of these damp-resisters, each of which weighs something like 1 cwt. when new. If they were heavier one porter would not be able to handle them and here lies the test of the sheet-maker—lightness with durability.

Little ropes are tied through the ring holes and the new sheet is ready to cover soap, candles, groceries, flour, provisions, pianos, or any other of the thousand-and-one items of interest carried in railway wagons. The sheets that cover the nation's food must always be kept up to A1 standard.

A regular examination goes on daily and defective sheets are at once sent to the repair factory where, by ingeniously hauling up the whole to cover a sort of proscenium, two experts in the darkness caused by the sheets soon spot and mark with chalk all the tiny holes and slits that may let moisture through. Gangs of men then seize the defective tarpaulins and literally sit on the holes—darning the little ones and patching the larger tears. Once through the proofing plant and the job is complete.

I didn't see any tar in the tarpaulins, but I certainly came away impressed with the care taken of my "bacon and eggs" by the goods department of the L.N.E.R.

Steel Grain Wagons for South Africa

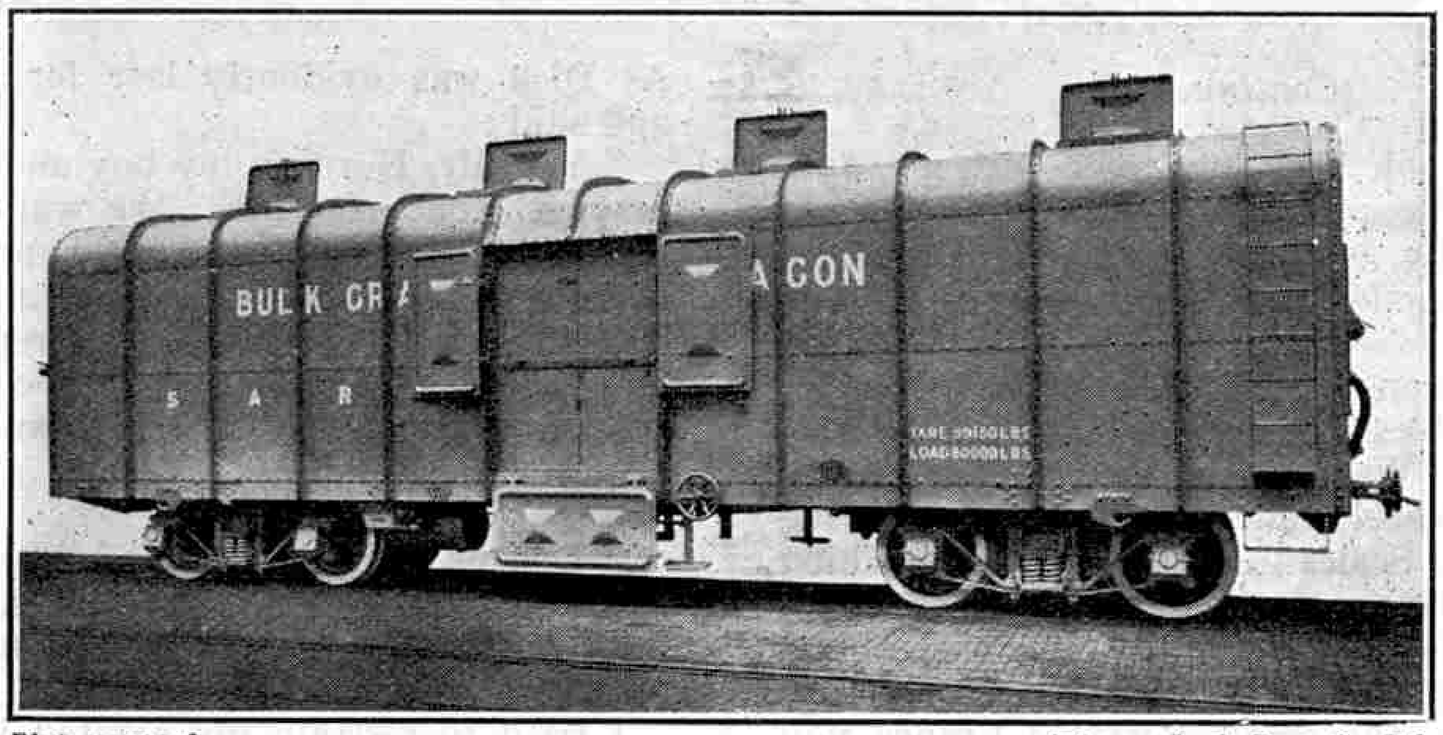


Photo courtesy] [*Messrs. Leeds Forge Co. Ltd.*

Our photograph shows an all-steel 40-ton Bogie Wagon built by the Leeds Forge Company Ltd., for use on the South African Railways. Of these wagons, 350 have been ordered for use in conveying grain in bulk from the farming districts to South African ports. The wagons are specially designed to suit the elevator system now being installed at the main up-country stations, and at the ports of Cape Town and Durban.

The wagons are built for the 3 ft. 6 in. gauge, and arranged for end- or bottom-discharge. They are constructed with pressed steel underframes and body parts, and the principal dimensions are :—

Length over buffers	39 ft. 11½ in.	Height over all	12 ft. 0½ in.
Length over body	36 ft. 11½ in.	Width over all	8 ft. 10 in.
Centres of bogies	24 ft.	Diameter of wheels	2 ft. 10 in.
Bogie wheelbase	5 ft. 9 in.	Size of journals	10 ft. by 5 in.
Load	80,000 lbs.	Tare weight	39,150 lbs.

Rails a Hundred Years Ago

When we are comfortably seated in the "*Flying Scotsman*" and moving along from King's Cross to Edinburgh at the rate of 70 or 80 miles an hour, we do not perhaps realise the contribution that the rails themselves make towards the comfort of modern travel.

In view of the Railway Centenary Celebrations this year a few particulars about the evolution of rails may be of interest to readers of the "*M.M.*"

Wooden rails were used for horse-drawn traffic 250 years ago, but iron rails came into general use when George Stephenson laid the Stockton and Darlington Railway. This was the first Passenger Railway in the world, and was opened for traffic in September 1825. The rails were 15 ft. in length and had upper flanges 2¼ ins. in width and weighed about 25 lbs. per yard. A heavier pattern was used in 1829 for the Liverpool and Manchester Railway, the upper flange being 2¼ ins. in width whilst the rails were 2½ ins. in depth at the ends, and 3½ ins. in the centre. Double-headed wrought iron rails were used in 1842, 15 ft. in length and weighing 68 lbs. per yard, and secured in chairs by wooden keys much in the same way as at present. An interesting reference to these keys is made in the Rule Book of the Stockton and Hartlepool Railway, 1841, which tells us that "every platelayer to pay a fine of 2/6 for each key along his length which should be found out, and a like amount to be paid by every engine-driver for stopping at any beer house on the line."

In 1835 Joseph Locke introduced a type of double-headed rail, but on account of its inherent defects the present bull-headed type was gradually evolved, and its acknowledged superiority soon resulted in universal adoption.

In 1875 a bull-headed rail, 24 ft. in length and weighing 83 lbs. per yard, was introduced and this was followed in 1896 by rails weighing just over 100 lbs. The modern rails which carry the "*Flying Scotsman*" and which are used on the main lines of the L.N.E.R. at the present time are all of finest steel, 45 and 60 ft. in length, 2¾ ins. in width on the top flange and weigh 95 lbs. per yard.

Dick's visit to MECCANOLAND

Where dwell the Happy Boys

(*Continued*)

NEXT morning I took Dick into town with me, and, calling at the Meccano offices, asked if we could see Mr. Hornby. The attendant conducted us into the Meccano model-room, and asked us to wait there.

What a sight! Dozens of different Meccano models were displayed on tables arranged around the room—Towers and Bridges; Wagons and Cranes; an electrically-operated Big Wheel, taller than Dick; Moving Stairways; Platform Scales; Drilling and Punching Machines; Machine Guns; and a Motor Chassis that seemed to be a perfect miniature of the real thing. The Cranes were of every imaginable type, from huge Ship-yard Gantries to the small Portable Cranes you see on railway platforms. All the models were the finest little pieces of mechanism I had ever seen, and they worked in a most realistic manner. The Cranes hoisted real loads, the Scales weighed, the drills of the Drilling Machines turned, and so on.

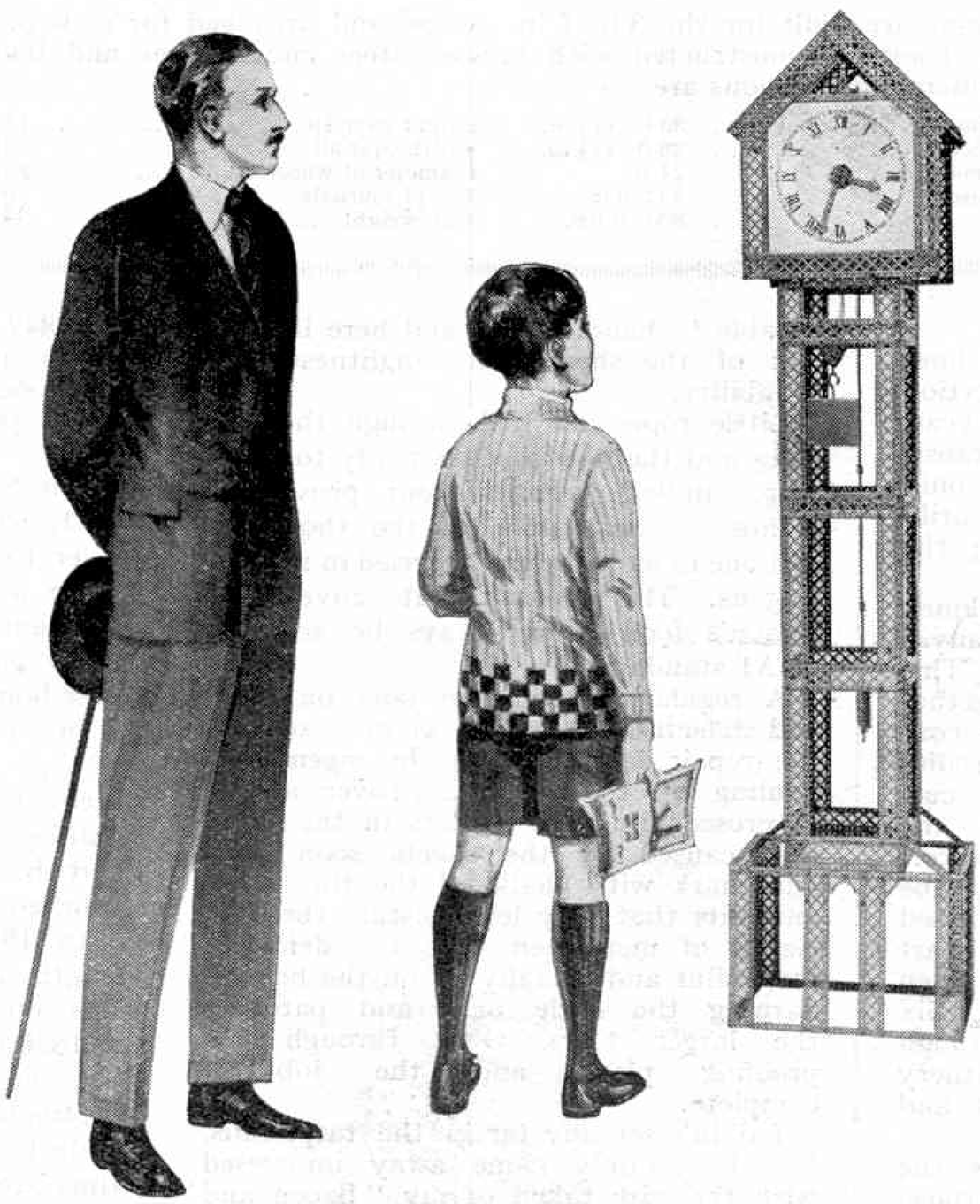
I noticed Dick standing spellbound in front of a Meccano Clock, watching the pendulum tick off the seconds in business-like style.

"Look! Dad," he exclaimed, "it's a real clock and it keeps time. I wish I could build one like that. I wonder if I could?"

"We'll have a try at it together when we get home!" I assured him, "and perhaps Alan will come over to give us a hand."

Just then the door opened, and an alert, well-built man of about middle age entered. He took no notice of me but crossed over to Dick. I could tell by the kindly smile of approval at the boy's look of wonder and fascination that here, sure enough, was a friend of all the boys who crossed his path. I felt at once that this must be Mr. Hornby, the inventor of the world-famous toy.

"You wanted to see me, didn't you?" he asked Dick.



Dick . . . in front of the Meccano Clock, watching the pendulum tick-off the seconds . . .

As Dick was evidently lost for words, I came over and said:

"Yes, Mr. Hornby, my boy and I are under the spell of your wonderful toy. We want all the information we can obtain about it, first hand, if we are not trespassing too much upon your time."

"Not a bit," was the genial reply. "Nothing gives me greater enjoyment than to spend an hour with boys, talking to them about model-building."

"Tell us about Meccano!"

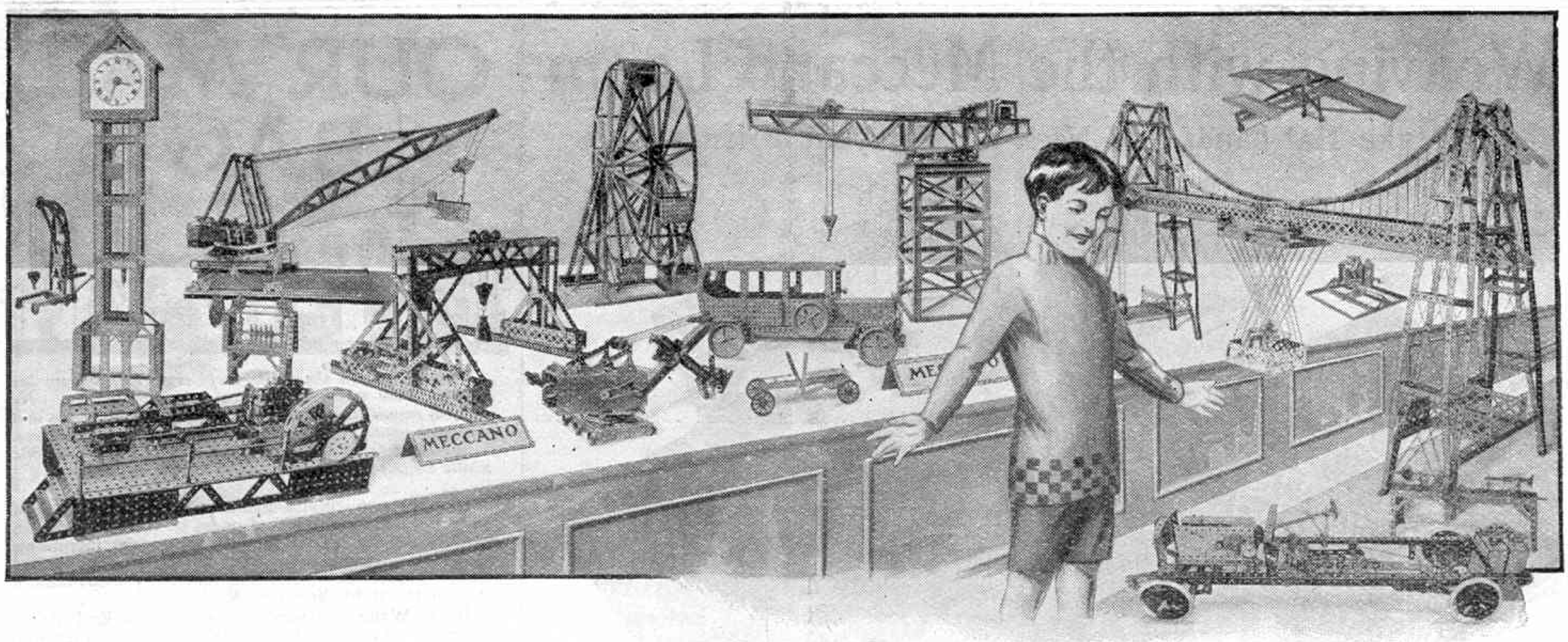
"Tell us about Meccano!" ventured Dick, whose courage was rapidly coming back. "How long did it take you to invent it, and did anybody help you, and did you . . . . "

I tried to restrain my excited boy, but Mr. Hornby laughed in the kindliest sort of way and said: "That's all right, youngster; it was 'wanting to know' that caused Stephenson, Edison, Marconi and many others to become great and famous men. 'Wanting to know' and 'finding out' are qualities I like to see in any boy, and"—looking at me approvingly—"Dick has both, I see. Come along into my office, where we shall not be disturbed, and I will tell you some interesting things about Meccano."

We followed him into his cosy well-furnished office, where he quickly made us very much at home.

A Live Paper for Live Boys

"I won't go into the history of Meccano," he said, reflectively; "for that is a very long story and it would take me a long time to tell. It has already been printed in our Magazine, and thousands of our readers have asked that it may be told again in that paper, so, perhaps, some day we shall re-print the story. By the way, I must tell you about the *Meccano Magazine*, the Meccano boys' paper, which is published on the first of each month. Its pages are brim full of just those articles that you would like, Dick.



Dick in the Model Room

For instance, in this month's issue there is an article on the life of a famous engineer, an article on Electricity, a description of a Giant Crane, with pages of Inventions, Radio and Stamps. In fact everything in which boys are interested is dealt with in our Magazine. Our great aim is to see that every boy gets full value out of his Meccano Outfit. Here we describe fine new Meccano Models, and give helps and hints on model-building generally."

"How topping," Dick exclaimed, "but where can I get the *Meccano Magazine*?"

"You may order it from any newsagent or bookseller or it will be posted to you direct from the works, if you wish," replied Mr. Hornby. "At present it goes to over 50,000 boys all over the world. It reaches every civilised country, and I strongly suspect," he continued, looking at me with a merry twinkle in his eye, "that there are as many fathers who read it as there are Meccano boys!"

A Meccano Prize Winner

Our illustration shows W. Malcolm, of Edinburgh, and his Meccano model of an Aeroplane with which he won the Second Prize (Silver Medal) in the Amateur Class at the Edinburgh Industrial Exhibition.

Every Boy Loves Engineering

"Meccano," continued Mr. Hornby, "has now taken its place in every country in the world as the great constructional hobby for boys. Nearly every boy has a natural inclination towards the mechanical. That is the reason why railway engines and clockwork and mechanical toys have always had such enormous sales. These toys, however, had serious drawbacks. They broke easily, each one was limited to a single movement, and when the boy became tired of this one movement that was the end of his fun. I think the reason why Meccano has superseded these mechanical toys is fairly obvious. The boy selects the toy he would like to play with—a crane, a wagon, or a bridge—and builds it himself with his Meccano parts. The only tool he needs is his screw-driver (even this he finds in his Outfit), and in a very short time he has before him the toy he wants, strong and unbreakable, ready to give him hours of intense enjoyment. When he grows tired of his crane, or whatever model he has built, he takes it to pieces, and with the same parts makes a bridge, a wagon, or some other model that appeals to him.

"There is no end to the fun any boy can have with Meccano, and the number and variety of models that he can build is unlimited. Why, a boy can have a new toy every day in the week all his life through if he wishes! And every boy derives just as much pleasure from putting his model together as in playing with it."

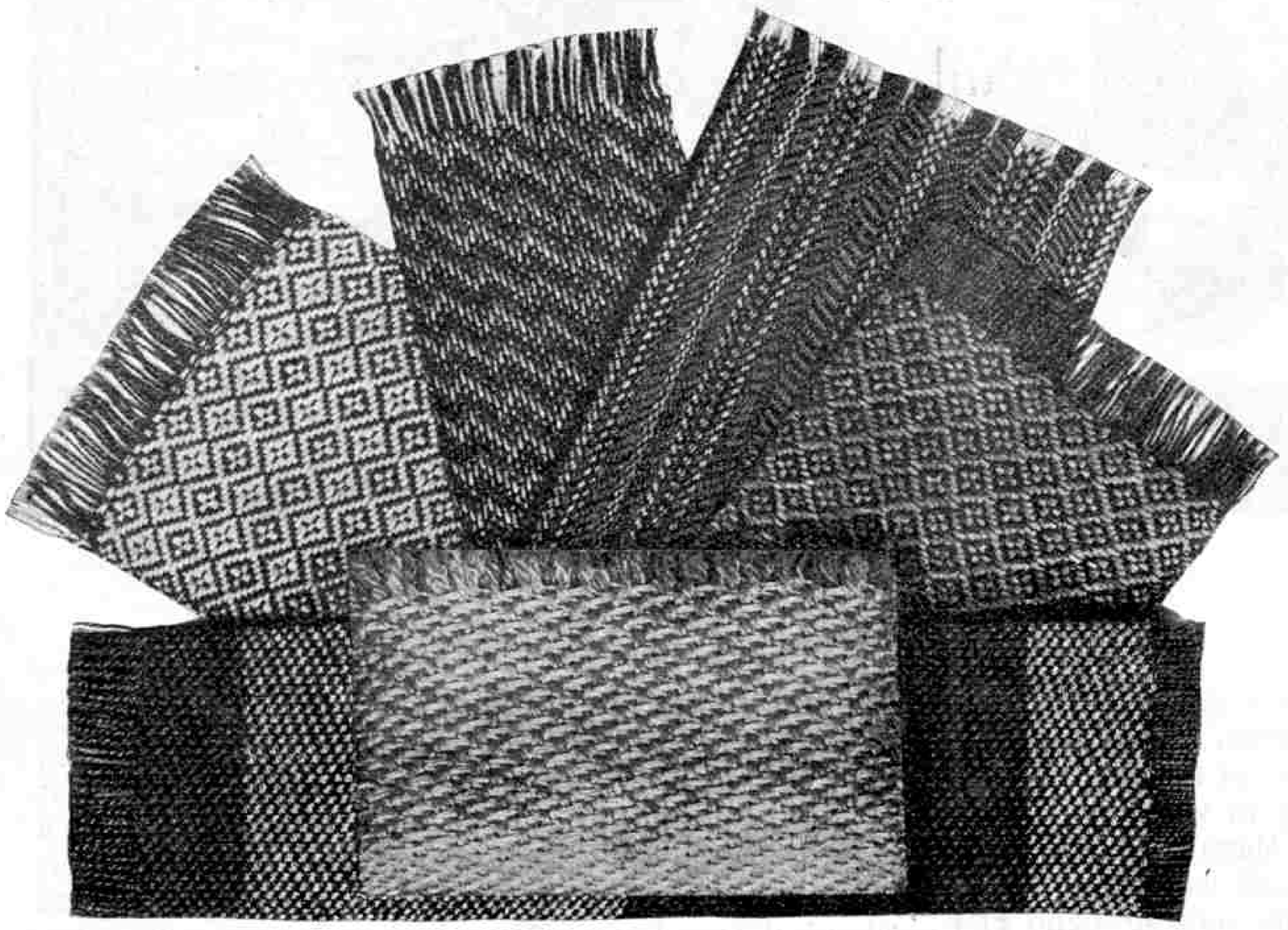
"I suppose, though," I interrupted, "before a boy begins building with Meccano he should have a little engineering knowledge; otherwise, how is he going to put together a clock or a motor-car, or any of those other marvels we saw in the model-room a little while ago?"

"Not at all," replied Mr. Hornby. "Even if a boy has never seen a machine in his life, he can build any of the hundreds of models shown in our Book of Instructions. I don't suppose that many boys start on the big models. They get loads of fun from the simpler ones, and while they are building these they are acquiring skill in putting the parts together and becoming familiar with the names and uses of all the various parts, so that when they come to the bigger models they have no trouble whatever.

(To be continued)

Weaving with the Meccano Loom

Make Hat-bands and Neck-ties for your Friends



The above illustration shows some of the beautiful material that may be made with the Meccano Loom. Unfortunately, it is not possible to reproduce the finished product in colours, so that the illustration gives but a poor idea of the attractive appearance of the finished fabric, the patterns of which are worked in blue, orange, gold, red, etc.

These fabrics were woven entirely on a Meccano Loom from silks such as you buy in the hank or in bobbins. They represent only six of the infinite number of patterns obtainable, the designs of which depend entirely upon the mechanical skill and the artistic ability of the person working the Loom.

If it is desired, fabrics that are entirely plain may be woven, or a simple or intricate pattern introduced at will, in any chosen colour. The width of the material depends upon how you construct your Loom. On all Meccano Looms the fabric may be woven to any desired length, however, for when the threads of the warp are exhausted they may be joined to more threads carried on a second beam, and the process continued indefinitely. Similarly, when the weft in the shuttle has all been used, a new shuttle may be slipped into position in an instant and the weaving continued. The process need not be completed at one operation, as weaving may be stopped at any time and re-started when required, without the continuity of the material being broken.

Weaving with the Meccano Loom is delightfully simple. All that is necessary is to turn a crank handle—the model does the rest. There is a certain knack in turning the handle, however, but this is soon acquired. Perhaps the only difficulty is to get the edges of the material even, but this comes easily after a little practice.

Fabric woven with the Meccano Loom makes beautiful hat-bands or neck-ties. Tastefully woven, these make excellent gifts for your friends. Imagine their surprise when you tell them the fabric is made to your own design on a model loom of your own construction.

You cannot buy the Meccano Loom, for it is built of Meccano parts—the same Meccano parts that make the Clock, the Chassis, and hundreds of other Meccano models. It is great fun building the Loom and even greater fun weaving with it. Full instructions for building the Loom are contained in a well-illustrated leaflet on art paper, price 4d. post free from this office.

The Story of Metals—(*cont. from page* 189)

very suitable for the manufacture of spoons, forks and similar articles. It soon tarnishes, however, and for that reason it is usually electro-plated. German silver has a high electrical resistance and on that account is largely used for making resistance coils.

Copper is very largely used in the world's coinage. The British bronze coinage is composed of 95 per cent. copper, four per cent. tin and one per cent. zinc. Silver and gold coins both contain copper as a hardening alloy, "standard silver" having 7.5 per cent. copper and "standard gold" 8.33 per cent. Nickel coins used in the British colonies and elsewhere contain 75 per cent. copper and 25 per cent. nickel.

NEXT MONTH:—

THE STORY OF LEAD

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.

R. J. Brown (Walthamstow).—"I hope that you will increase the number of pages in the '*M.M.*' with the New Year, even though this means increasing the price. I would not miss it for anything, no matter what the price is." You will find the present issue a step in the right direction, R. J.

D. S. Waite ("Eversley," 4, Elmers End Road, Anerley, London, S.E.20).—We are very interested in the magazine called the "*Club*" which you, assisted by your friend, are publishing. We feel sure that if any of our readers are interested they will write to you.

T. Farrell (Colombo, Ceylon).—We have written you separately regarding Electric Furnaces and the firm who manufacture them, and have also sent you a copy of our August issue, which contains information that should be of use to you. If we can help you further, let us know.

H. J. Sharood (Halifax, N.S.)—We received a long letter from A. V. King, of H.M.S. "*Hood*," in which he told us of the kindness of yourself and your mother when he visited Halifax. We hope you may meet again.

H. C. Ferdinands (Kinala Lumpur, Malay States).—The "*M.M.*" subscription rates have been sent to you, and on hearing from you again we will post copies to your friends. We send our warmest greetings to you all.

A. R. Lyell (Karong, Hawthorn, Vic.)—"I attend Scotch College, which as everybody knows, is the finest school in the world." We didn't know it before, Andrew, but no doubt you are right. We will endeavour to find a suitable correspondent in Scotland for you.

Roy Collins (St. Leonards, Tasmania).—Q. "What is the difference between a sigh, a motor car, and a donkey?" A. The first is "Oh! dear," the second "too dear," and the third is "you dear!" Did you intend that for us, Roy, or did you just wish your effort to go into the Puzzle Page?

R. Cain (Manchester).—"On the new L.M.S. poster, showing the interior of a cotton mill, a weaver is shown putting on her clogs. She is fastening one on her foot and the other clog on the floor has the fastening on the same side as the clog already on her foot." You certainly have sharp eyes, Robert, and the fact that you have detected an error in this poster shows also that you are observant. As to the reason for the error—why, even artists are human and we all make mistakes sometimes!

A. Colefax (Newcastle).—Sorry, Arthur, but never having been a tramp we cannot give you the information you require! We learn, however, that some of the strange signs that tramps chalk on doors and gates for the guidance of those of the fraternity who follow are:—A boot (this needs no explanation)! A triangle ("spoilt by other tramps,") A diamond ("safe for a meal at the back door,") Circle and cross ("the owner will give to deserving cases,") A square ("general hostility to tramps.")

R. Barker (Grimsby).—Thanks for photo of your Eiffel Tower used as a Christmas tree and festooned with lanterns and novelties. It looks wonderfully well, and was quite a brainy idea.

J. B. Ash (Middlesbro-on-Tees).—We are always glad to hear from parents of Meccano boys, especially those who themselves take a hand in the glorious work of building models. We much appreciate your enthusiastic comments on Meccano and Hornby Trains.

B. Roy (Calcutta, India).—We welcome you as a new-comer to Meccanoland, and we hope you will spend many happy years in the country. Your photos will be entered in the Overseas photo competition.

J. J. Smith (Grange, S. Aus.)—Many thanks for photos of South Australia's largest locomotive. We are pleased to know that your prize arrived in perfect condition. We receive many letters from Australian readers, and we read them all with much pleasure.

L. O'Brien (Johannesburg, S.A.)—Thanks for your news and interesting letter. We hope you will pass your Matric. safely. Your radio queries are being dealt with by the Radio Editor.

A. Hewitt (Holyrood, Ontario).—We are glad to hear from you and to know that you have found a good job and are happy in it. Let us hear from you often.

"Nothing New Under the Sun"

An Iron House Built 100 Years Ago

OUR article last month, describing the recently-invented method of building steel houses on the Meccano principle, dealt with what was supposed to be one of the latest inventions. The old saying that "there is nothing new under the sun" is amazingly confirmed in this case, for further investigation shows that the idea of steel houses is not nearly as modern as one might think.

Advantages of All-Metal House

In this connection it comes as something of a shock to find that at Tipton, in Staffordshire, there is an iron house that is so old that no one can be found to say how old it is! No one knows why it was made of iron, or who was the clever engineer who forestalled modern inventors. This is to be regretted, for we feel sure the name of the inventor would have merited record and his reasons for using metal, instead of stone or brick, would have provided interesting reading.

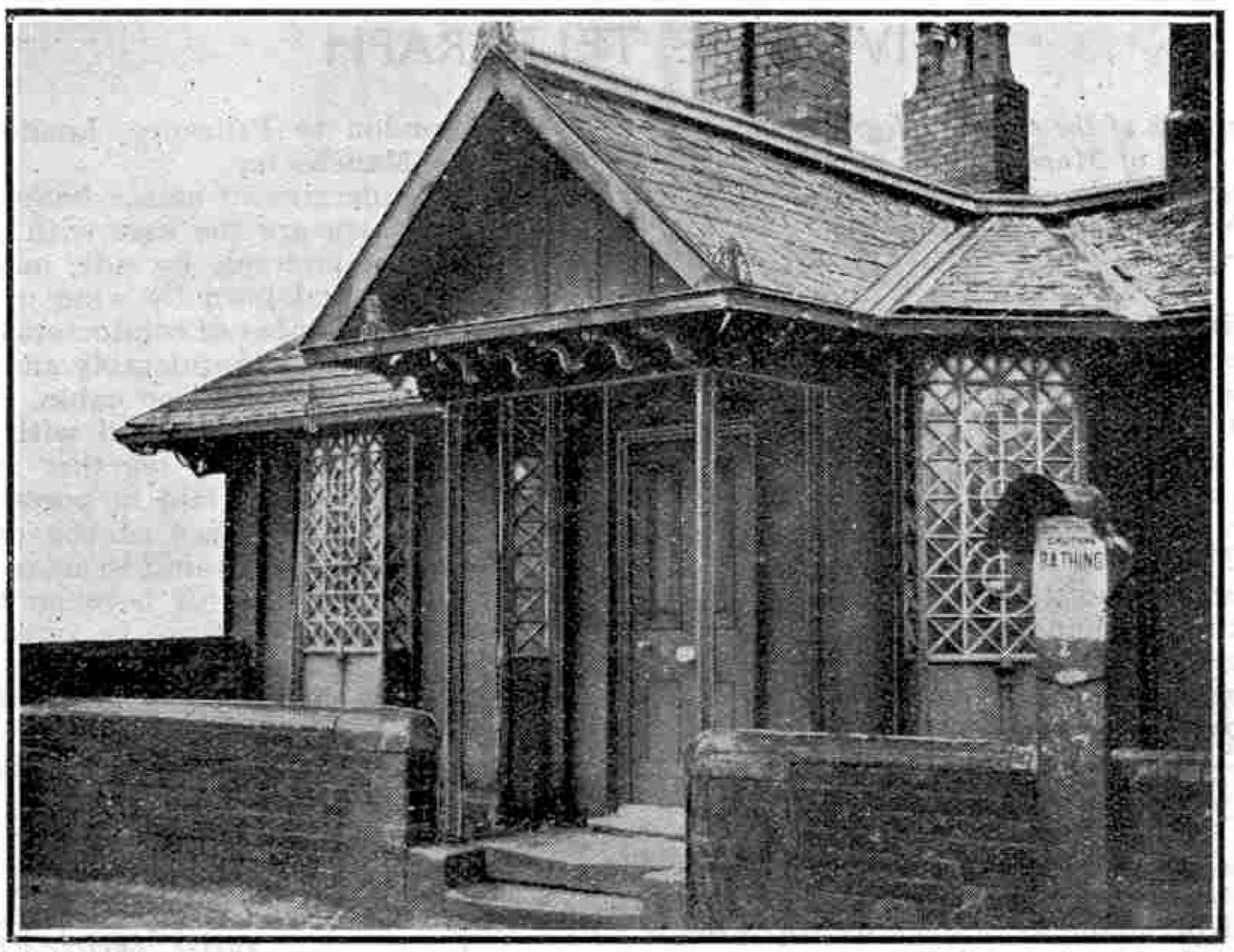


Photo courtesy] ["*Birmingham Gazette*"

The Old Iron House at Tipton, Staffs.

This old iron house at Tipton is the property of the Birmingham Canal Navigations Limited, and is situated at the side of No. 1 Lock, Tipton Green. It is occupied by Mr. Jones, one of the company's lock-keepers, and his wife, who declares that it is the most comfortable house she has ever lived in.

"It's as dry as a bone," Mrs. Jones told an interviewer, "cool in summer and as warm and cosy in winter as anybody could wish. What is more it is vermin-proof, for vermin never think of trying to bore their way through these iron walls!"

Why the House is Dry

The house is of the bungalow type and contains four rooms—two bed-rooms, a sitting-room and kitchen. The walls are of iron and sunk in a concrete foundation. Iron girders support a slate roof and everything else in the house is of iron, even the window frames.

The iron plates of the walls are flanged, the flanges in the interior being used to take wooden laths to support the plaster. Between the plaster walls and the iron outer walls is a cavity, which probably explains why it is that the house is so dry and comfortable.

When the house was new, ornamental iron-work extended around the eaves, but nearly all of this has now fallen away except in one or two places. No doubt this iron work formed a target for stone-throwing youngsters for many years, in times long past, and this fact may account for its disappearance.

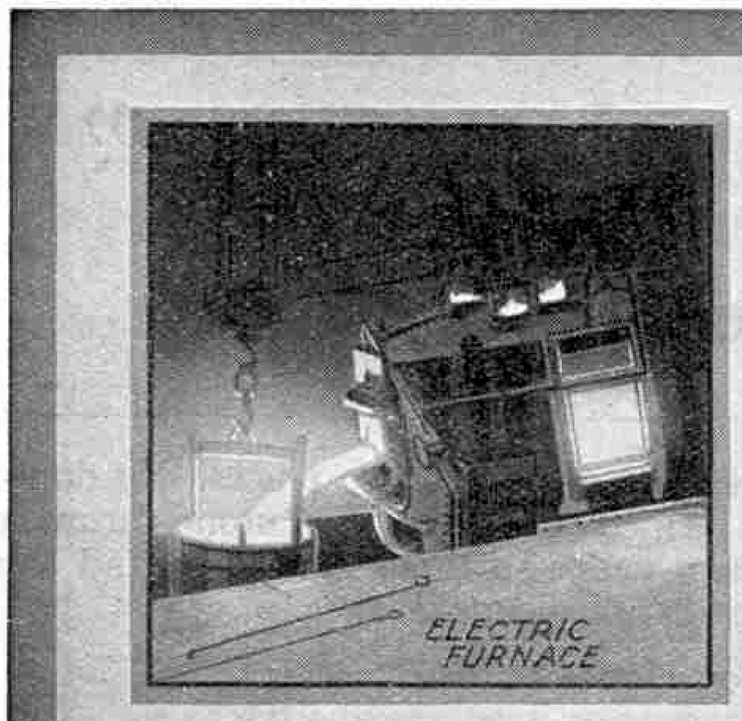
Was it once a Toll-House?

It is impossible for anyone to say how long it is since the iron house was erected. The records of the Birmingham Canal Navigations Ltd. go back to about 1790, but it is not mentioned in them. Even "the oldest inhabitant" of Tipton cannot help declaring that the house has always "stood where it is now!"

There is a tradition in the district, however, that the Iron House has not always stood where it is to-day, and that it originally stood on the West Bromwich to Birmingham Road, where it served as a toll-house. Mr. Henshaw, the Manager of the Birmingham Canal Navigations Ltd., has kindly informed us that he thinks this statement is probably correct, as "a drawing—dated 1871—shows the house in question to resemble the type of toll-house used about this period. Many of these toll-houses were done away with about 1870 and it is probable that the old drawing was made when the house was transferred from its original site to where it now stands at Tipton Green locks."

It has been suggested by someone that if the Iron House was originally a toll-house perhaps the idea in building it of iron was to permit of it being moved from place to place along the canal. It would be built at a time when the canals were being developed and a movable house would certainly be a great advantage, but—if the Canal Company really bought the Iron House when it stood on the Birmingham to West Bromwich Road, this explanation scarcely holds water. Instead it merely explains why the Canal Company bought the house, and we are no nearer to the original idea of the builder of the house.

Whatever may be the explanation, it is very interesting indeed to find this early example of the most recent development in house construction. It must be very gratifying to those who are so strongly recommending the construction of steel houses to find that an iron house, built over 100 years ago, is not only habitable to-day but is in practically as good a condition as it was when it was first erected.



Electricity

XIV. THE TELEGRAPH

Last month we traced the growth of the electric telegraph from its earliest days up to the time of Morse. This month we deal with the apparatus and methods employed in telegraphic communication at the present day.

* * * *

EVERYONE is familiar with the tall telegraph pole, and its cross arms supporting white "pots" or insulators. These insulators are made of porcelain or coarse earthenware. They vary in shape, but their essential features are shown in Fig. 1, which is a sectional drawing of the Cordeaux type of insulator.

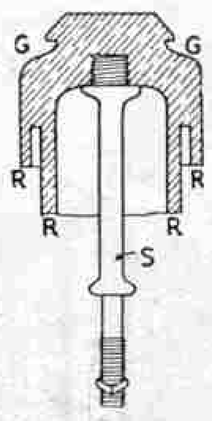


Fig. 1. Cordeaux Insulator

The peculiar shape of this insulator is designed to prevent line leakage in wet weather. The wire is attached around the groove G, and it is obvious that moisture would have to creep up the insides of the two overhanging roofs R, as well as to cover the outsides, before the wire would be electrically connected by a film of moisture to the iron stem S by which the insulator is attached to the cross arm of the post.

Overhead Lines

Telegraph poles are generally red fir trees, creosoted to preserve the wood, and embedded from two to four feet in the ground. There are from 15 to 22 poles for every mile of line. Each pole has an inverted V-shaped roof of metal to protect its top from moisture. A lightning conductor or earth wire, extending from the top to the ground, is also fitted.

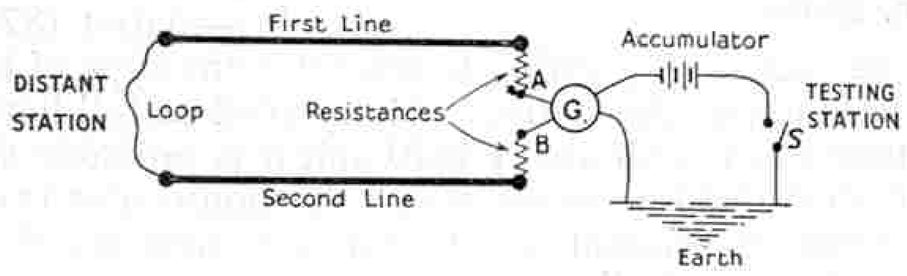


Fig. 2. How Telegraph Lines are Tested

Iron wire is used for telegraph lines in the majority of cases, owing to the high cost of copper wire. Five different gauges of iron wire and four of copper wire are in use, the gauge to be employed in any particular case being determined by the length and nature of the circuit.

Underground Cables

Underground cables have been much used in place of overhead lines during the past fifteen years. Many towns in this country are doing away with their existing overhead lines and laying underground cables in their place. Trunk lines also are now being laid underground in increasing numbers. The four longest underground trunk lines are those from London to Edinburgh, London to Penzance, London to Liverpool and London to Manchester.

Underground cables have many advantages, the chief of which are the ease with which a large number of lines can be laid side by side, and the fact that they are safe from breakdown by wind or snow.

The number of conductors enclosed in each underground cable varies considerably and as many as 1,200 wires may be contained in one cable. The individual copper wires are separately covered with a loose layer of paper and then loosely laid together and enclosed in a stout lead pipe, which is laid in porcelain pipes buried about 2 ft. below the surface of the ground. The purpose of the paper covering is not to act as the insulator, but to separate the wires, the air between them then acting as a most efficient insulator. In order to achieve this end it is essential that the paper is wrapped loosely about the wires and that the wires shall not be laid tightly together. The paper form of covering has been found to be very serviceable so long as the lead pipe remains in perfect condition. If the pipe becomes punctured or cracked, however, and moisture enters, the whole of the wires inside are thrown out of order through breakdown of the insulation. When a fault of this kind has been located it is usually necessary to insert a short length of new cable.

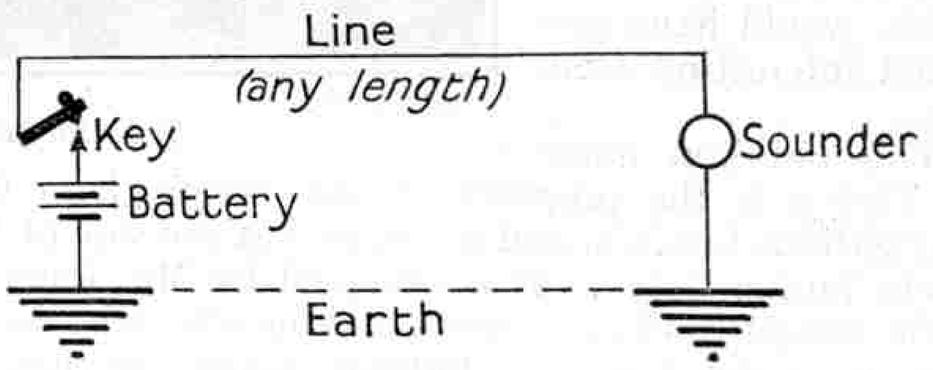


Fig. 3

Whilst the porcelain pipes are laid, in short lengths of about a yard, a rope is threaded through them and a gap made every 100 yards or so. The rope is attached to one end of the lead cable which is then hauled through the pipes by pulling the rope at one of the gaps.

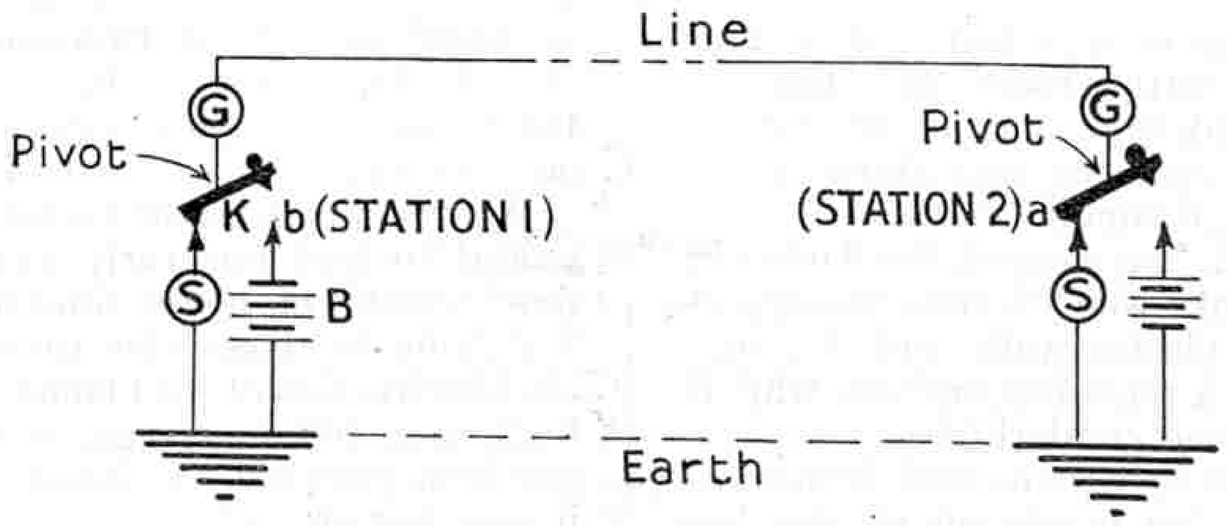


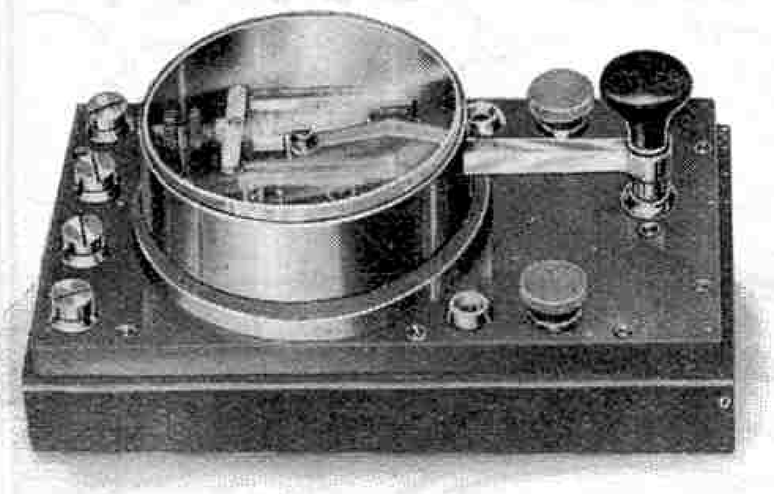
Fig. 4

How Telegraph Lines are Tested

All important telegraph lines are tested frequently to detect electrical faults. The lines are tested in pairs, the two being looped together at the distant station by a short length of wire. At the testing station resistances,

usually of 10,000 ohms each, are connected as shown in Fig. 2. At G is a galvanometer, an electrical instrument for measuring weak currents by means of a moving pointer.*

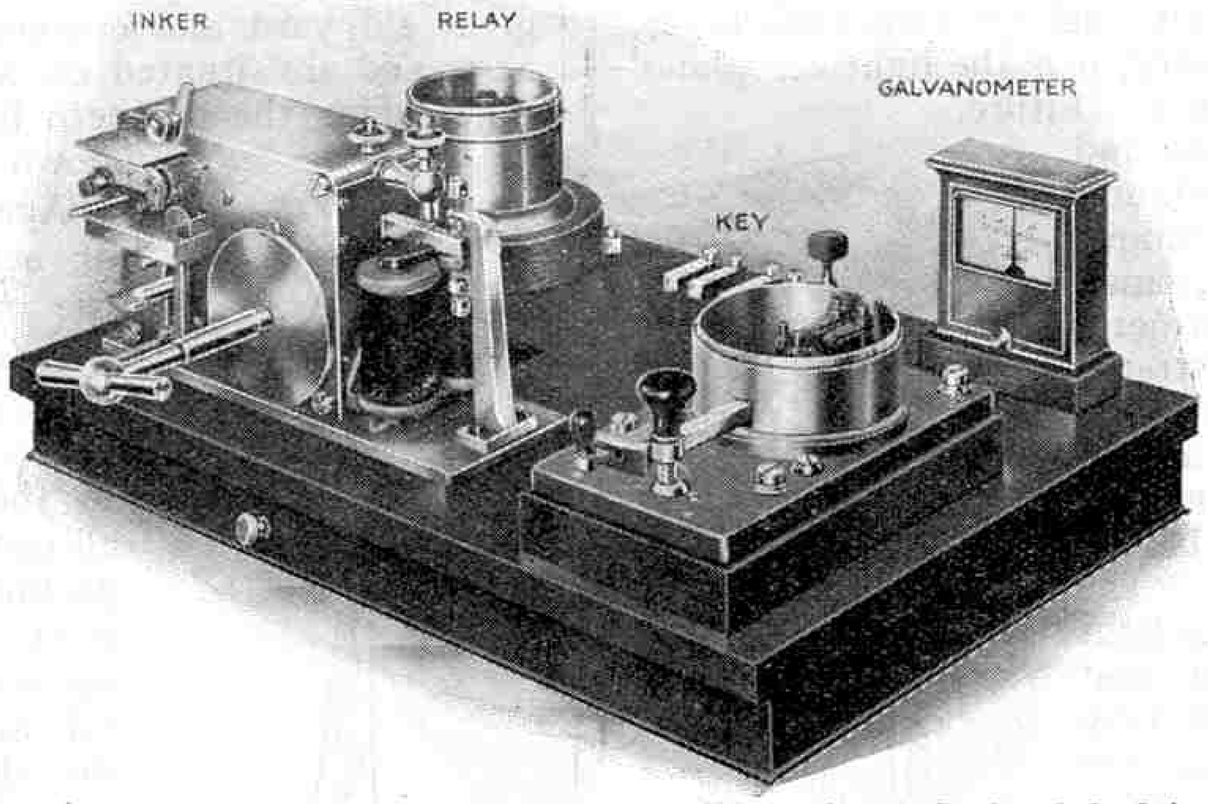
The type of galvanometer used for testing telegraph lines has two coils wound in opposite directions. The wire A from one resistance passes around one coil and then goes to the accumulator as shown. The wire B from the other resistance goes to the other coil and is then connected to earth and also to the other terminal of the accumulator through the switch S.



Photos courtesy]

Reversing Key

When the current is switched on it passes first through one coil of the galvanometer and tries to deflect the needle in a certain direction. It then passes on to the distant station and back to the testing station through the second wire, and so to the other coil of the galvanometer where it tries to deflect the needle in the opposite direction. Thus there are two forces acting on the needle each trying to move it in a different direction, and if as much current returns to the station as is sent out there will be no movement of the needle at all. If one of the wires is faulty, however, some of the current will leak away to earth. The needle will then be deflected, the amount of deflection varying according to the magnitude of the fault. A bad line thus indicated is at once cut out of service and steps are taken to have the leak discovered and rectified, for only in this way can an efficient telegraph service be maintained.



Courtesy] [*Messrs. Siemens Brothers & Co. Ltd.*

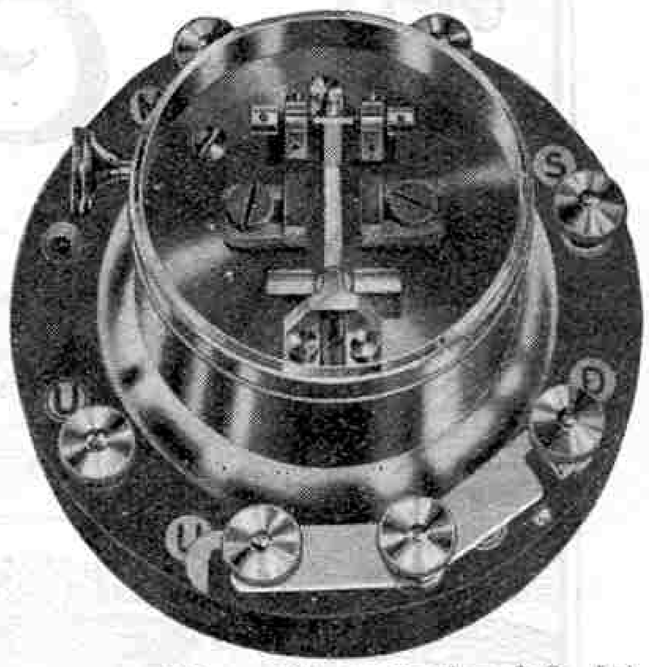
Double-current Simplex Set with Inker

Modern Telegraph Circuits

As we saw last month, the early telegraphs required a large number of wires, and even the first commercial apparatus erected in this country required six connecting wires. To-day there is only one wire, technically known as the "line," connecting the sending instruments with the receiving instruments, and at each end there is an earth connection so that the earth acts as a return for the electric currents.

The object of the complex modern telegraph instruments is to economise in the number of lines required for a certain amount of traffic, for although the lines are perhaps the simplest item of the equipment, yet they are sufficiently costly to make it more economical to provide elaborate apparatus than extra lines. The simplest circuit would be one consisting merely of a sounder, a battery and a key in series, as shown in Fig. 3. When the key is pressed in accordance with the Morse signals to indicate a particular letter, the sounder will make corresponding clicks as described last month.

The first advance on this arrangement, which only provides for one-way communication, was made when the apparatus was so constructed that the key at one station worked the sounder at the other, but left its own sounder silent. This circuit is known as the open circuit single-current system and is shown in Fig. 4. When the key K at station 1 is pressed down on to stop "b," the current from the battery B flows along the line and through the sounder S at station 2 to earth by way of the rest "a" of the key, whence it returns through the earth back to battery B. Thus the key K at station 1 operates the sounder S at station 2, and in an exactly similar manner the key at station 2 operates the sounder at station 1. The galvanometers G are used merely as a check to make sure that the currents are passing through the line.



[*Messrs. Siemens Brothers & Co. Ltd.*

Polarized Relay

This system is one of many known as "open circuit" on account of the fact that no battery is connected to the line when the stations are not transmitting. "Single-current" working signifies that the current always travels round the circuit in the same direction and is not reversed as in "double-current" working, now to be described.

Relay Working

When the circuit is very long it is necessary to use a powerful battery if ordinary sounders are to be worked at the receiving end. It is more economical, however, to employ a local battery to work the sounder and to arrange a relay to control this battery. The process is very similar to the relay working described in the article on "Electric Bells" in our issue for December last. Fig. 5 shows the connections. Instead of passing directly through the sounder to earth as in the previous circuit, the currents pass through the windings of the electro-magnet M and cause the latter to attract the armature A, thus completing the second circuit containing the sounder S. Only one station is shown in the figure the second being an exact duplicate of the first.

This type of circuit is in great use throughout America, but in England an instrument called a "polarized relay" is employed in a circuit on the double-current system. In this system a current is sent through the line continuously, and its direction of flow is reversed when the sounder is required to work. Thus the reversals take the place of the pulses of current used in single-current working. The relay consists of a small permanent magnet

(*Continued on page* 183)

* The principle of the galvanometer was explained in the "*M.M.*" for July last.

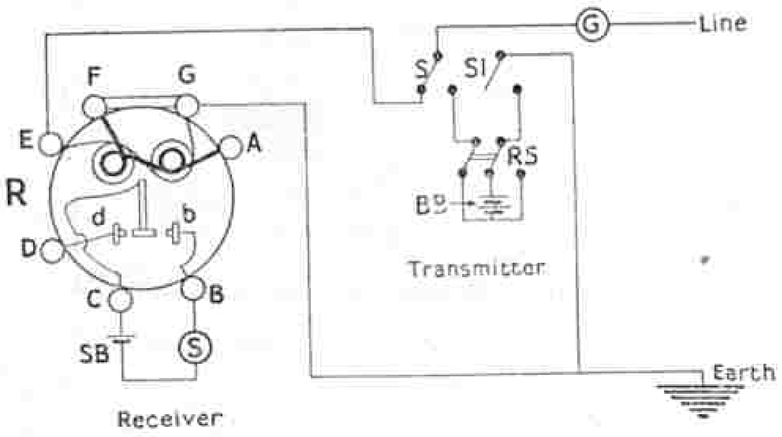


Fig. 7

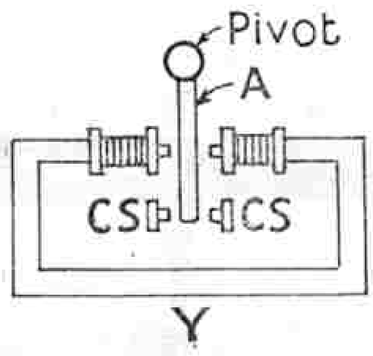


Fig. 6

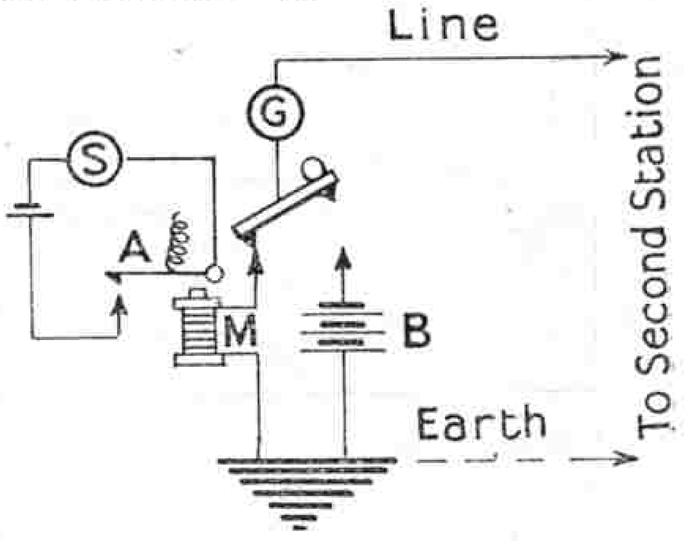
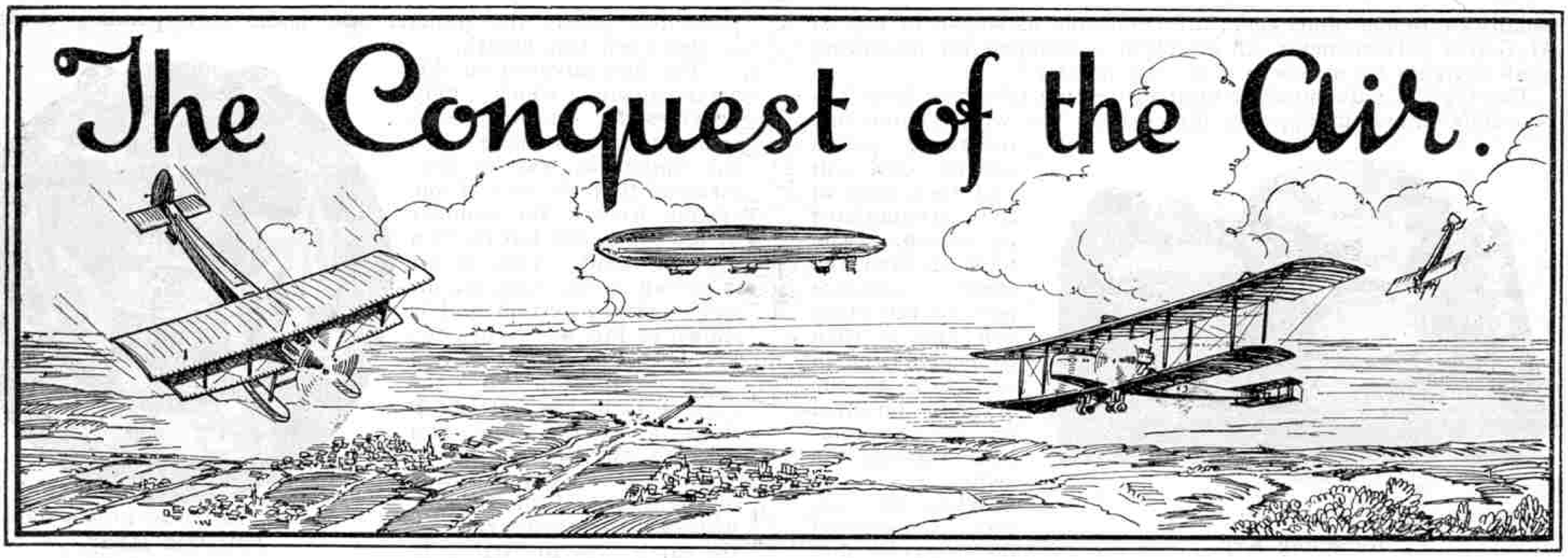


Fig. 5

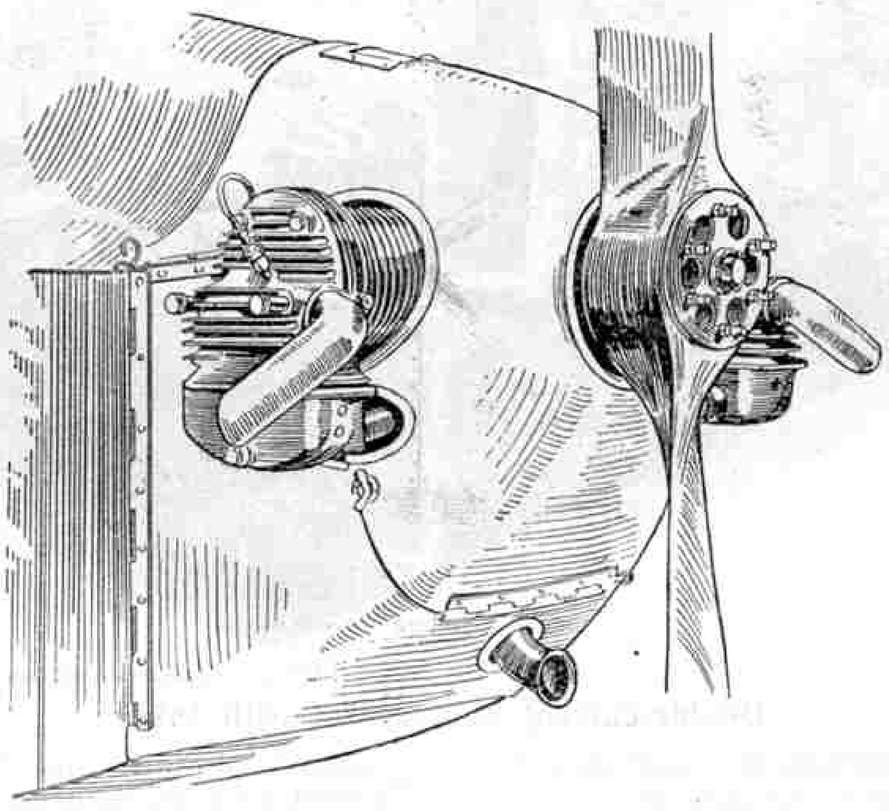


II. THE BEARDMORE "WEE BEE I" AT THE LYMPNE TRIALS

Last month we gave some account of the Air Ministry's contest for light aeroplanes held at Lympne, and described the performance of the Beardmore "Wee Bee I," the winner of the first prize of £2,000. In this article this fine little monoplane is described in detail.

AN increasing amount of attention is being paid to light aeroplanes, for although the larger machines will always be necessary, it is the light aeroplane that will be most useful in the future.

Apart from flying schools and light aeroplane clubs, for instance, the light aeroplane offers unique opportunities for the sportsman who wishes to run his own aeroplane. It is not too great a stretch of the imagination to anticipate the time—which cannot be at any very distant date—when privately-owned aeroplanes will be as common as motor cars. The small size of the engine of a light aeroplane keeps both first cost and running expenses down to a very low figure, and it should not be any more costly to run a light aeroplane than to run a two-seater car.



Courtesy] [*"Flight"*

The "Bristol-Cherub" in position and cowled-in

Giant Airships, "Flying-Boats," and Light Monoplanes

To come now, to *"Wee Bee I,"* or to give the machine its correct series number, the "W.B.XXIV." The machine is built by Messrs. William Beardmore & Co. Ltd., of Dalmuir, Scotland. With this firm, aeroplane-building is but a branch of a great shipyard and engineering works that cover 110 acres and are situated on a strip of land stretching 1¼ miles along the northern bank of the Clyde, ten miles down the river from Glasgow.

Apart from the construction of aeroplanes and seaplanes of the ordinary type, of which the Company made many during the war, Messrs. William Beardmore also gave special attention to the great possibilities of the all-metal system of construction. As builders of the famous airships R.34, R.36 and two former rigids, the firm has had extensive theoretical and practical experience in the design and construction of aircraft units in duralumin, which —as most of our readers know— is a specially light metal of great strength and of particular value in the construction of aircraft. This experience has been of great value in the construction of the large "flying boats" for which the firm is famous, as well as in the more recent departure of very light monoplanes.

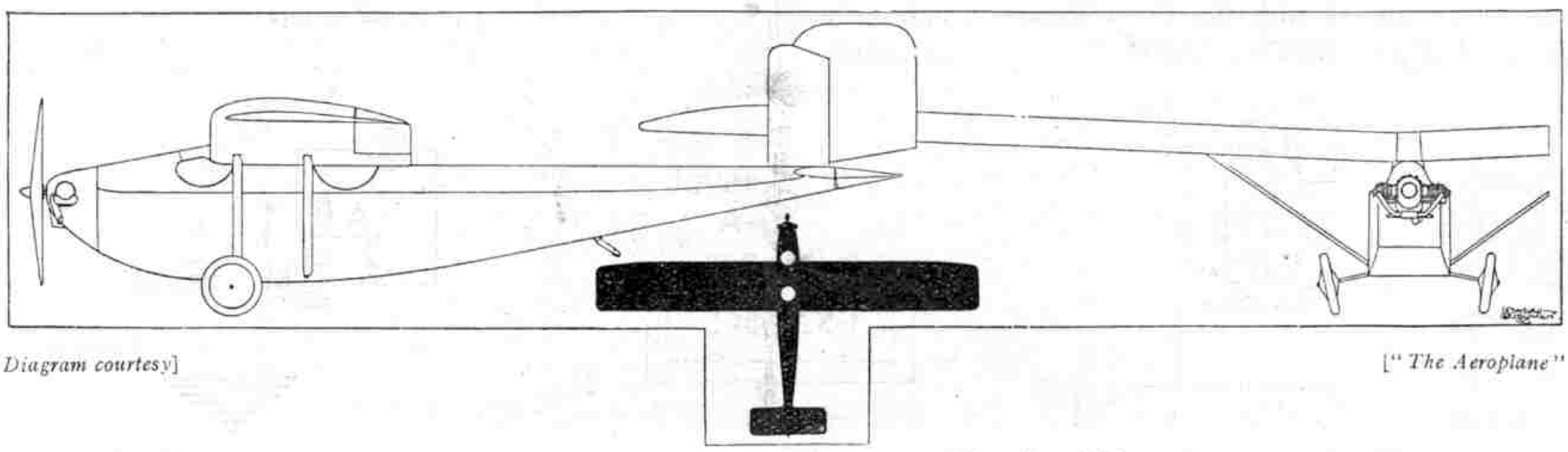


Diagram courtesy] [*"The Aeroplane"*

Plan and elevation of the Beardmore "Wee Bee I"

"*Wee Bee I*" is a thick-wing monoplane of very clean design, every effort having been made to reduce to a minimum any projections that might adversely affect the performance. The machine is not a cantilever monoplane, however, as its wing is divided in the centre, each plane being braced by two struts from the lower longerons of the fuselage. Apart from this fact there is no external bracing anywhere, either in the tail or in the under-carriage.

"Stream-lined" Pilots

The cross-section of the fuselage is the smallest possible to reduce head resistance, and altogether "*Wee Bee I*" comes very near aerodynamic perfection. As we stated last month, she has an extremely good top speed, having done 80 miles per hour in the Lympne trials, and this with a minimum of horse-power, which, in fact, is so low that the machine had a greater reserve of power than any other in the Air Ministry Competitions.

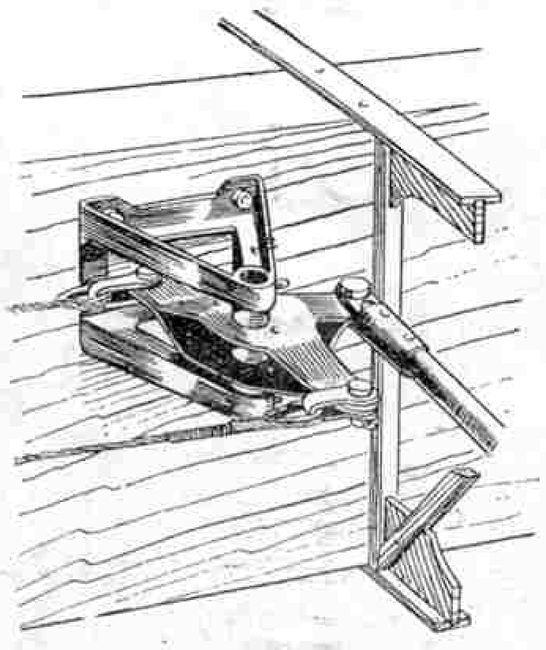
The fuselage is built on six spruce longerons, with formers or bulkheads of spruce and three-ply, the whole being covered with $\frac{1}{16}$ in. birch three-ply.

The deck fairing, instead of being arched, as is usually the case, is "hollow-ground." It thus roughly conforms to the shape of a man's head and shoulders, and enables an excellent view to be obtained without serious craning of the head or unnecessary contortions on the part of the occupant. Thus, the pilots are streamlined, and they are able to look past the fairing by moving their heads slightly to right or left, as the case may be.

Cockpits and Controls

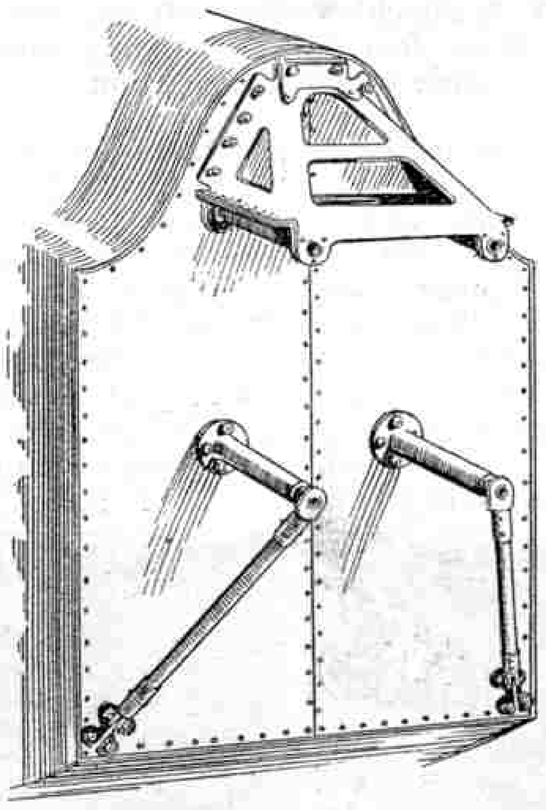
Two cockpits are arranged, one aft of the wing, or rather aft of the rear spar, and one ahead of the front spar. There is a square opening in the trailing edge through which the pilot enters, and which is covered during flight by a celluloid window. The front cockpit is entered by swinging upwards a small hinged portion of the leading edge of the wing. When the pilot is in place the leading edge is brought down in line with the rest of the wing and locked in position. The view from both cockpits is very good, particularly so from the front one, from which there is practically an unobstructed view, if the pilot leans his head slightly to left or right. This position is ideal, particularly for landing.

The controls and the instruments are of the usual type, and it is interesting to learn that the machine is capable of being flown from either seat. When being flown solo, with the pilot in the front seat, it adds to his comfort and ease of control if a small weight is carried in the rear cockpit for trimming purposes. In the case of the pilot-owner, this weight would probably be made up by the owner's luggage, in which case the machine would not be carrying any unnecessary load.



Courtesy] ["*Flight*"

Aileron Crank, with push-and-pull rod



Courtesy] ["*Flight*"

The neat Engine-mounting

Wings, Ailerons and Elevator

The monoplane wings are practically of orthodox construction in that they each have the usual two main spars of box section, with three-ply walls. Both flanges and walls taper in thickness towards the tips, being proportioned to the shear and bending movements along the span.

There is no internal drag bracing in the wing, at least in the ordinary sense of the term. This function is performed by the three-ply covering that extends along the entire leading edge up to the front spar and near the root as far out as the strut attachments—in fact, this three-ply covering extends back to behind the rear spar.

The ailerons are of high aspect ratio, and are hinged to a false rear spar or stringer. They are operated by crank levers through short push-and-pull rods, no control pulleys being employed.

The tail unit is also of interest. The fin is in two sections, located by dowel pegs, and the tail plane has but a single spar, built integral with the rear portion of the fin. The front portion of the fin is integral with the fuselage structure.

The elevator is hinged along the top edge, and the opening underneath is covered with a duralumin flap so that there is no gap at the hinge line. As in the case of the ailerons, the elevator is operated by a short push-and-pull rod, from cranks on a lay shaft.

Ingenious Engine-Mounting

The under-carriage consists simply of a single bent tube passing through the fuselage and anchored by suitable fittings at the sides. The axle is of chrome-nickel steel, and specially designed to allow of sufficient flexibility to absorb landing shocks. It is supported in the fittings on trunnions, which allow it to flex freely. One trunnion is rigidly fixed to the axle so as to resist torque loads and in order to locate the axle endwise. The trunnion on the opposite side takes uploads only, and is free to slide on

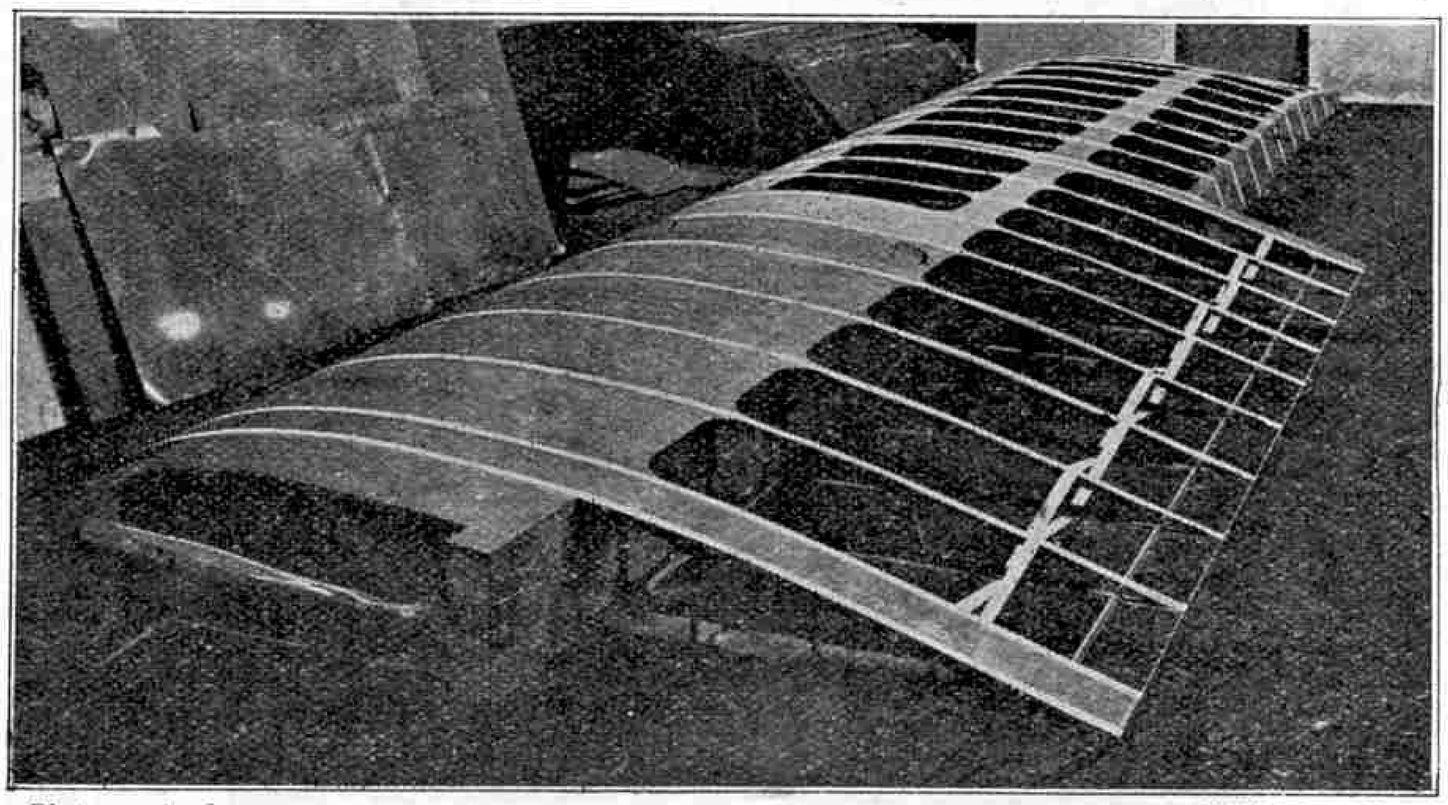


Photo courtesy] ["*The Aeroplane*"

Details of Wing Construction

the axle.

The mounting of the Bristol "Cherub" engine is ingenious, and has proved very satisfactory in practice. The weight of the engine is taken by a pyramid support of sheet duralumin, while the vertical position is maintained by two lower struts, also of duralumin. The lower supports are steadied by steel tubes running to the lower corners of the engine bulkhead.

The engine is readily accessible, as are also the usual petrol and oil connections, etc. A cowling surrounds the whole engine except the cylinder heads. The air in-take is particularly clean and unobstructed, and carries out the designer's idea of reducing head resistance to a minimum.

Photo courtesy of] ["*Flight*"

The Designer (Mr. W. S. Shackleton) on left and the Pilot (Mr. Maurice W. Piercey) of "*Wee Bee I*" exchanging congratulations at the close of the Competition

An Interview with the Pilot

Mr. Maurice W. Piercey, who piloted "*Wee Bee I*" to victory at the Lympne trials, is very enthusiastic about his game little mount, and in an interview he gave us some interesting details of its behaviour.

"I realised," he said, "that the severest part of the trials was the high speed test, and I determined to get that over as soon as possible—on Monday, the opening day. The test consisted of 10 laps of 12½ miles each. Although the wind force was 28 m.p.h., and conditions extremely bumpy, the fine little machine brought me round at an average speed of 70.11 m.p.h. On the first day I had finished the hardest test of all, and nobody else attempted this test until the Wednesday.

"On the Tuesday I carried on for my 10 hours' reliability test of lapping the course at the most convenient speed and piling up mileage. On Wednesday I had a shot at the low speed test, which I did at 40.67 m.p.h., and as this was the lowest figure at that time, I left it at that.

"It was remarked that my machine was the most controllable of the lot, and it certainly felt so. We had to do 500 yards at a height not exceeding 20 ft., and such was my faith in "*Wee Bee I*" that I kept down to about 5 ft. off the ground the whole way. After that I went on lapping for the rest of the day, until evening, when I had a shot at the taking-off and landing test. I did the first take-off from 250 yards, and I left it at that, as this gained me 200 points right away, 450 yards being allowed. It was dark by the time I did the landing test, but the machine came to rest well within the 150 yards allowed.

"It was on this day that engine trouble first appeared, through the oil jet that sprays on to the starboard big-end bearing becoming choked. We quickly cleared the jet and put fresh oil in, but sufficient damage had been done to handicap me for the rest of the week and finally stall me altogether within the last two minutes on Saturday.

The Big-end Gives Way

"On Thursday I went on and I set out on the 125-mile run. when 2½ miles from the finishing have taken me only one minute the big-end gave way altogether. I at once stopped my stop-watch, and it was showing 46 minutes 35 2/5 seconds for the last 60 miles covered.

"Everyone had hard luck with engine trouble that week, but I think no one had worse luck than I had. Really this fine little machine never had a chance of showing its real paces, because of engine trouble.

"I find "*Wee Bee I*" wonderfully manœuvrable, and so very good at turns that I never had to waste a second on turning. Its chief feature, however, is its extraordinarily high aerodynamic efficiency. Although the normal gliding angle of the average type of machine is not as good as 1 in 10, the Beardmore, with full load, will glide at 1 in 15—an astonishing performance. With such a machine, if the engine 'conks' or if you stall by mistake, the machine just falls a few feet, and gently settles into an easy glide. It is as safe as a house."

"What do you think of the prospects of the "*Wee Bee I*" we asked.

"As to that, there should be a great future for this little outfit for club flying, for training, and similar utility purposes. It is light on controls without being sensitive. The lateral stability is excellent and the landing is very easy, the actual touching speed being below 35 m.p.h."

Our article on the Lympne trials last month has aroused considerable interest, as is evidenced by our mail bag during the past month. From the thousands of letters we have received already this year we know that aeroplanes are of great interest to our readers, and we are arranging to print an article on aeroplanes as a regular feature whenever space permits. Later we shall tell the complete story of the aeroplane from the earliest times in a series of illustrated articles.

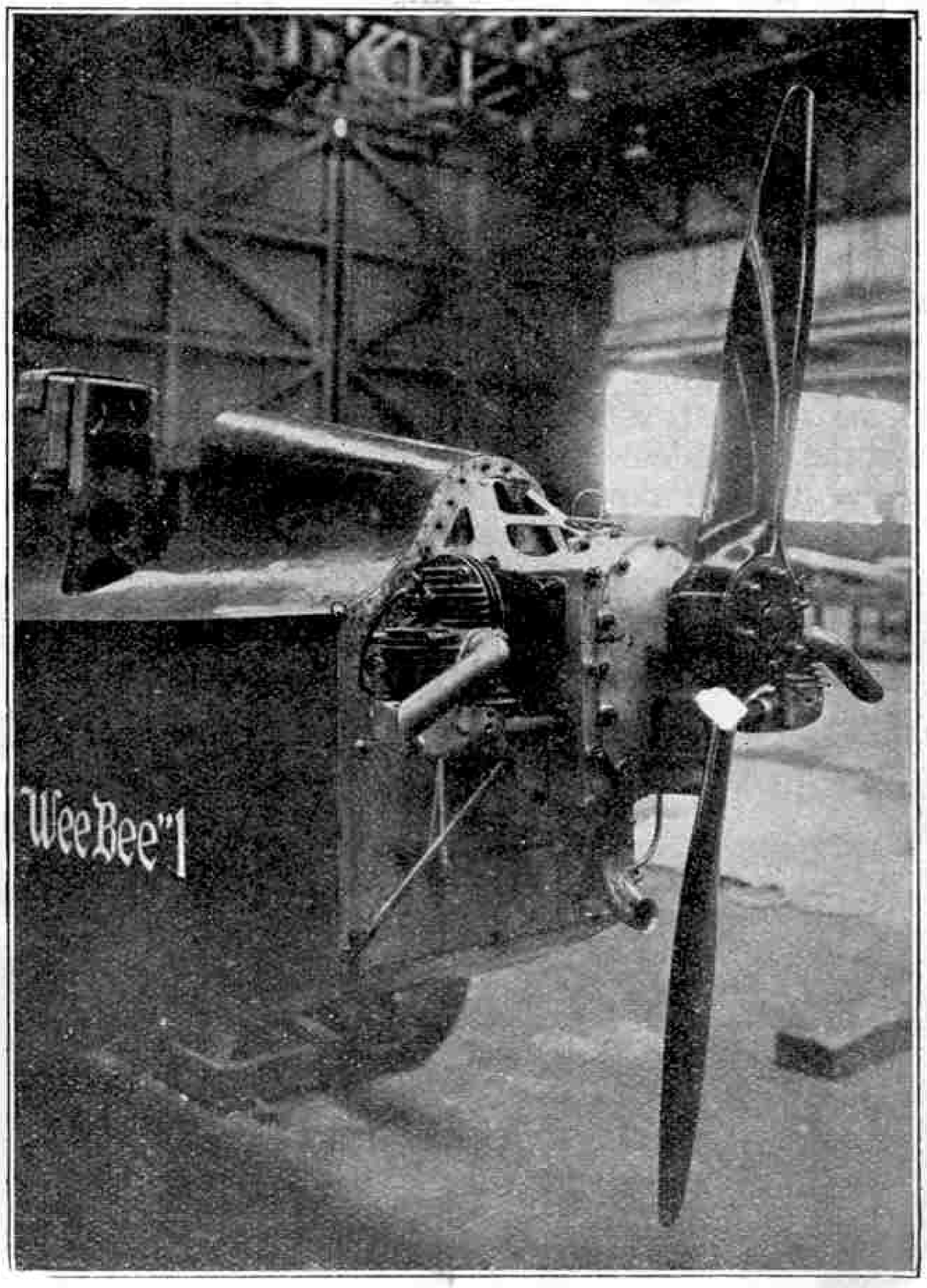


Photo courtesy of] ["*The Aeroplane*"

Mounting of the Bristol "Cherub" engine in the "*Wee Bee I.*"

BRIGHT IDEAS

These columns are reserved for dealing with suggestions sent in by Meccano users for new parts, new models, and new ways of making Meccano model-building attractive. We are always pleased to hear from any Meccano boy who has an idea which he considers will be useful in the Meccano system.

W. Harvey (Thornton Heath, Surrey).—It is not possible to provide a variety of sizes of one particular piece. This would only be unnecessary duplication. (2) For what do you suggest the double bent strip would be useful ?

J. French (Bristol).—(1) A double boss on the Pulley is unnecessary for the purpose you mention. (2) Washers may be employed to centralise the wheel and so prevent the rim from coming in contact with the bearing strip.

Albert F. Hare (Fulham, S.W.)—We are considering the introduction of a worm wheel with a wider pitch thread.

Ernest Hambin (Haselbury, Somerset).—A spur gear does not hold any advantages over our present type of Gear Wheel. Helical gears would no doubt be useful. We are going into the matter.

P. A. Acton (Port Sunlight, Cheshire).—A bent strip such as you suggest has not yet made its introduction necessary to general construction. We shall bear it in mind, however.

A. A. Caswell (West Kirby, Cheshire).—We should like to hear of any application of the $12\frac{1}{2}'' \times 3\frac{1}{2}''$ flanged plate you suggest.

Stewart Watherspoon (Waterloo, Liverpool).—(1) We regret we do not quite see your difficulty in the matter of the bearings for the propellers in your model. From your sketch it appears to us that the wooden pieces you mention are more in the nature of engine casings than bearings. (2) A bucket may be constructed from existing parts, see the High Speed Ship Coaler Model for instance.

W. D. Butler (Redditch).—(1) The introduction of perforated rods and special wheels with pins to suit the rods would obviously duplicate the whole of the wheel and rod series. This could not be entertained, from the point of view of cost alone. (2) A very firm fastening can be obtained by filing a small flatted surface on the rod at the point of contact with the set screw in the wheel. This method is capable of sustaining abnormal strain.

Frank McPherson (Queensborough, Nr. Leicester).—We are considering the addition of a boiler element to the Meccano series.

Eric Kirkham (Burslem).—From your sketch and description we gather that your free wheel action is obtained by throwing the gear wheels out of mesh by means of a lever. This principle is employed in our model of the Drop Hammer No. 641.

John C. Griffiths (E. Dulwich, S.E.)—A flanged wheel without boss may be employed in certain instances, but it is necessary to have fixed wheels in some cases where the drive is transmitted to the axle.

F. W. Lamb (Sunderland).—(1) Decorated flags for models may be obtained from almost any fancy dealer. It would not be worth our while to manufacture them. (2) A ready-made double crank shaft does not lend itself very well to good construction. A very good crank head may be made from existing parts, as in the Small Horizontal Engine Model published in the June number of the "*M.M.*" (3) We do not see any special use for cone pinions.

J. W. Bennett (Liverpool).—Four types of pulley blocks are illustrated on page 78 of our complete Manual. Any of these may be used as an alternative to the cranked bent strips.

J. Salter Chapman (London, W.)—We have introduced Dog Clutches to take the place of the leather-lined wheels you suggest in so far as an auto clutch is concerned. We do not think there is any scope in the part you mention when used in the capacity of a friction drive.

W. W. Breedheet (Trowbridge, Wilts.)—Siding points and an engine shed are already on our list. We may possibly be able to bring them out this year. Your suggestion regarding G.W. marking is noted.

J. W. Davies (Stourbridge).—In our revised models we have eliminated practically all strip mutilations. Strips and rack strips made of spring steel such as you suggest are therefore unnecessary. Your suggestion for lengthening the 6" Rod by half an inch is good.

Harold V. Small (Finsbury).—We fear that our type of electric motor is too intricate to be assembled otherwise than by ourselves.

H. Collins (Peckham Rye, S.E.)—The curious girder construction you mention may be effected by existing parts, but for what do you consider it would be useful ?

H. Ellis (Tooting, S.W.)—(1) A variety of curved strips would be valueless unless they catered for definite purposes. (2) A double crank shaft is under consideration.

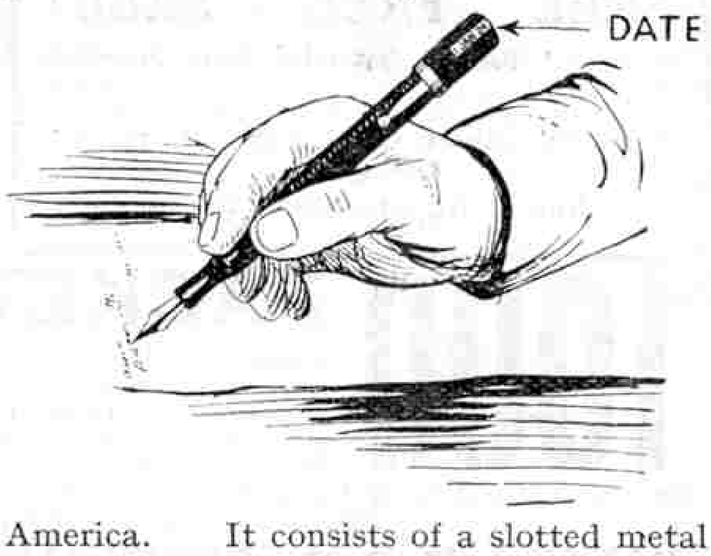
OUR BUSY INVENTORS

RECENT INTERESTING PATENTS

Every day new inventions and ingenious labour-saving devices are being brought into existence. From time to time the most interesting of these will be described and illustrated in these columns. Readers are invited to send particulars (accompanied, if possible, with photos, sketches, or cuttings) of any interesting inventions or devices that may come to their notice. Payment at our usual rates will be made for any contributions used.

A Fountain-Pen Calendar

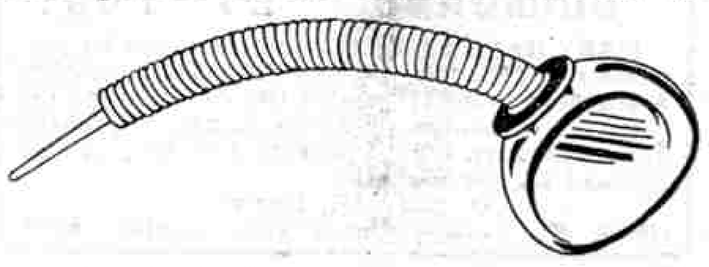
An invention which should prove valuable to those with bad memories is a fountain-pen calendar recently introduced in



America. It consists of a slotted metal cap with a roll of paper on the inside. On this paper are printed the days of the week and dates. The strip is perforated, and through a second slot, normally covered by a pivoted metal bar, the paper may be pulled forward until the correct date appears.

A Flexible Oil Can

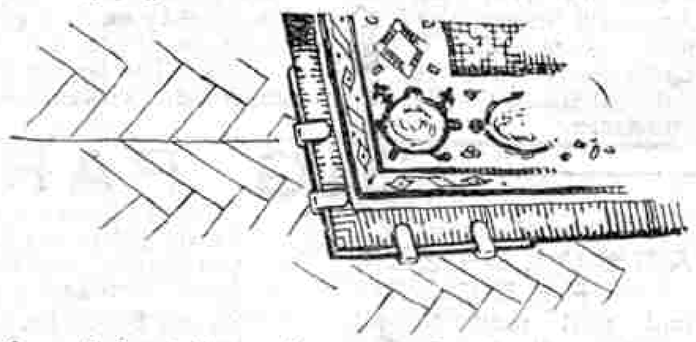
An oil-can that will reach awkward places without difficulty has recently been placed on the market. Instead of



the usual rigid metal nozzle, a flexible tube has been fitted and this may be bent and pushed into out-of-the-way corners and yet allow a clear passage for the oil. A handy pattern is being made specially for cyclists and motor-car owners and is to be sold in several different sizes.

A Household Hint

A useful domestic invention is a device for preventing carpets and rugs from curling up at the corners. This consists



of a thin triangular metal plate that is fastened to the floor and clipped over the carpet as shown in the accompanying illustration. By using metal plates the material will always lie flat, and, apart from giving a more tidy appearance to the room, there will also be less chance of people being tripped up in passing.

A Hole Boring Spanner

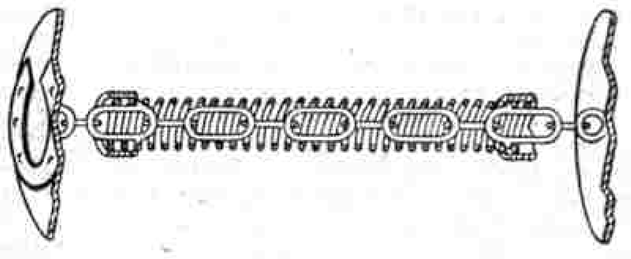
At present, the cutting of a round hole in metal or wood is a somewhat laborious task, and the larger the hole the more difficult the job becomes. With the aid of a new tool, however, holes from one-and-a-quarter to six inches in diameter may be easily and neatly made in almost any sort of material. A small device used in the same manner as a spanner is employed, and a ratchet handle permits the cutter to be used in any position, against a wall, overhead, in corners, or even on the floor. A great deal of pressure is unnecessary, as a turn of a large nut applies heavy pressure to the cutting knives. The total weight of this handy tool is only five pounds so that it can be easily carried about in an ordinary tool-kit.

Solderless Connections

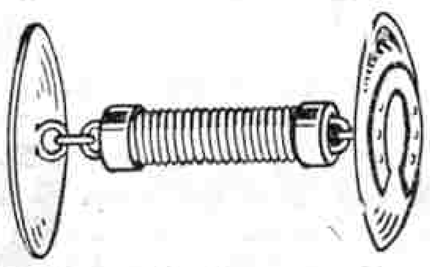
Wireless enthusiasts will welcome this method of connecting wires, which, while giving reliable contact, does not need the application of a soldering iron. The device consists of a brass clip connection with curved sides that act as springs, holding the wires firmly in place. When the two wires are in place they are locked together by means of a nut and bolt as shown. The inventor claims that his new fastener is proof against vibration and that once secured the wires cannot be pulled loose.

Expanding Cuff-Links

In order to save time and trouble connected with unbuttoning and rolling up



the shirt sleeves before washing or tackling a job, an inventor has patented an expanding form of cuff-link. The two sides are held together by a series of coil springs that stretch to allow the sleeve to be pushed a considerable distance up the arm without having to unfasten the cuffs. The links are easily inserted and are manufactured in several neat and attractive designs.



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(See also page 182)

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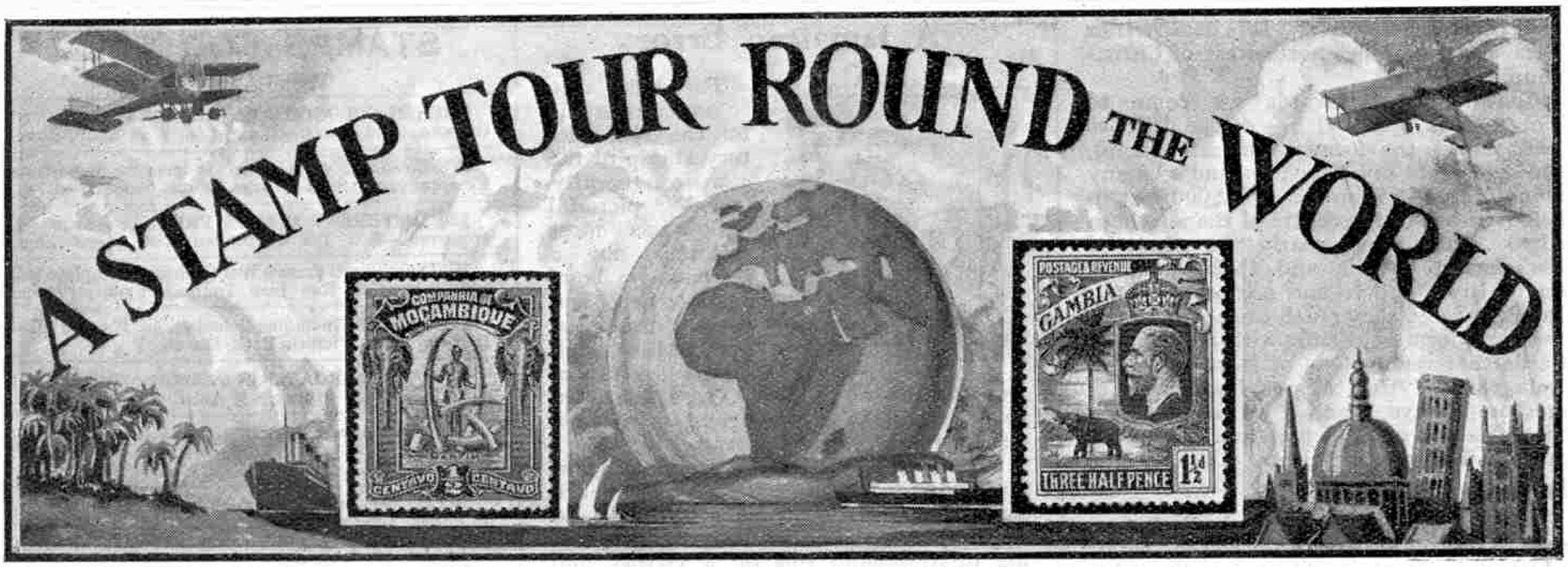

VIII. BORNEO, BRUNEI AND NEW ZEALAND

CONTINUING southwards from Formosa we pass the Philippine Islands on our left and at length arrive at Borneo, the fourth largest island in the world. Our ship passes into Sandakan Harbour on the north-east coast of British North Borneo and waits there while we board our fleet of aeroplanes and fly inland to explore Mount Kinabalu. This is depicted on the 18c. values of the 1894 and 1897 issues and it is interesting to note that as first issued the inscription at the sides of this value of the 1897 issue incorrectly read "Postal Revenue" and that it was shortly afterwards reissued with the inscription amended to "Postage & Revenue." The 24c. value of this issue, showing the arms of the colony, was also the subject of a mistake, for when first issued the words "Postage & Revenue" were omitted. These were inserted and the stamp was reprinted at same time that the 18c. was corrected.

Kinabalu is the highest mountain in Borneo and is the central feature of the range of mountains running parallel to the west coast of the island about fifteen miles from the coast. It is 13,700 ft. in height and is composed of granite and igneous rocks.

The Stamps of Brunei

From here we continue our flight for an additional 150 miles southwards to Brunei, the capital of the small British protected state of the same name with an area of about 4,000 square miles. The issues from 1907 to 1924 show a view on Brunei River where it flows past, or rather under, the city of Brunei. This is the capital of the state and is prettily situated on the river, the houses being built on slender piles composed of palms. Access to the mainland and to the various parts of the town is obtained by means of boat or canoe, although a few neighbouring huts are connected by planks.

Stamps of the type mentioned were first issued in 1907 in a complete series from 1c. to 1 dollar, all being printed in two colours. From 1908 to 1924 single colours were gradually substituted on grounds of economy. In 1922 nine values were overprinted "Malaya-Borneo Exhibition, 1922," and in 1924 four values appeared on the new script watermarked paper. For a design with so varied and recent a history very few copies are seen, owing probably to the small size of the colony's post bag.

The Malaya-Borneo Exhibition Issue

The first issue is now fairly scarce, the

lowest-priced being the 2c. (priced at 1/–) and the highest-priced the 1 dollar (priced at 12/–). Most values are priced the same whether used or unused. The four low values of the next series are quite common but there is a sudden increase in scarcity when the 5c. value is reached. The Exhibition issue is priced low unused at present owing to the small demand but it is very scarce indeed when postally used. The script values are also low in price when unused and used specimens have scarcely found their way on to the market as yet.

A general view of the city of Brunei is shown on the two values of the 1924 issue, the 6c. of which is illustrated here. This value is printed in black, the 12c. being in ultramarine. Both are recess-printed in sheets of sixty stamps on paper watermarked with the script CA and crown and perforated 14.

Brunei formerly included the whole of the northern part of Borneo and the southern part of Palawan, an island now included in the Philippine group. During the last century it has so diminished in size that it is now of little importance compared with the other states of Borneo.

New Zealand

We now return to our ship and commence our long voyage to New Zealand, a distance of over 5,000 miles.

New Zealand was discovered in 1642 by Abel Jansen Tasman, a Dutch navigator who accidentally found the islands when sailing in his boat the "*Heemskirk*." He did not land, however, and it was left for Captain James Cook, whom we have already mentioned in connection with the Cook and the Hawaiian Islands, to be the first white man to set foot on what is now so prosperous a British colony. This was in 1769, and by visiting the islands many times and sailing completely round them he was able to map them out with fair accuracy. In 1825, exactly one hundred years ago, colonization began. The British Government granted home-rule in 1852 and constituted it a Dominion of the Empire in 1907.

Mount Ruapehu and Lake Taupo

Our ship makes its way to Wellington, the capital of the islands, situated on the south-western coast of North Island, and thus near the centre of the group. While still only half way down the western coast of North Island, however, we board our aeroplanes once again and leave the ship so that we may visit Lake Taupo and Mount Ruapehu, both situated close together in the centre of North Island. Lake Taupo and Mount Ruapehu were pictured on the 1d. value (illustrated here) of the 1898 and 1899 issues and the 4d. of the 1900 issue.

Ruapehu is a beautiful volcanic cone, rising to a height of over 9,000 ft. and intermittently active. Northwards of this, Lake Taupo covers an area of nearly 240 sq. miles and is situated in the centre of a plateau covered with pumice. This prevents anything being grown in this district, which, however, attracts large numbers of visitors, for here are the hot pools so beneficial to sufferers from gout and rheumatism.

Reminiscent of the Fjords

From here we turn southwards and passing over our ship, now safely anchored in Wellington Harbour, we continue until we reach Otira Gorge, shown on the 5d. value of the 1898 to 1902 issues. This gorge is the finest in the country and lies on the chief route from the east to the

west coast of the island. It is near Arthur Pass, about 70 miles north-west of Christchurch.

Continuing southwards we come to Mount Cook (½d. and 5/– of the 1898 to 1902 issues, the former illustrated here), the greatest of New Zealand's many mountains. It is well over 12,000 feet in height and is in the centre of the Southern Alps. These cover nearly the whole of the central portion and their branches stretch from end to end of South Island. In many cases they reach the coast on the west and form bold cliffs with magnificent fjords that remind one of Norway. It is from the sea that Mount Cook appears most impressive, for then we are best able to realise its great height and to see its graceful but rugged shape.

Milford Sound

Further south we come to Lake Wakatipu and Mount Earnslaw (illustrated here), which formed the subject for the 2½d. value of the series already mentioned. Wakatipu is 54 miles in length and the chief of the deep lakes that fill many of the mountain valleys. It is somewhat like the letter Z in shape and at the northern end is Mount Earnslaw, a rugged snow-capped mountain over 9,000 ft. in height.

Milford Sound, shown on the very handsome 2/– value of the same series, is on the west coast near Mount Earnslaw. It is the most famous of the many sounds on this coast. In places it is no wider than 500 yards, while the cliffs rise vertically above the calm waters to a height of 5,000 ft. Many streams hurl themselves over the edges of these cliffs and form magnificent waterfalls, the largest being nearly 2,000 feet in height, the second highest in the world.

NEXT MONTH:—

AUSTRALIA AND SOUTH AFRICA

Gibbons' Stamp Catalogue (Part II.)

(Messrs. Stanley Gibbons Ltd., 391, Strand, London, W.C.2).

(Price 10/–, postage 9d. U.K., 1/1 abroad).

Messrs. Stanley Gibbons send us a copy of part II. of their 1925 catalogue, dealing with stamps of foreign countries. The publication of this catalogue has been long awaited by collectors, for nearly three years have elapsed since the last edition was published. In the meantime there has been a very large number of new issues and prices have altered considerably. The new edition no longer excludes the war-time issues of ex-enemy states and the catalogue is therefore of special interest, containing, as it does, all the ex-enemy issues and the enormous number of new issues of the past three years. The catalogue itself has been generally revised and an entirely new list of the stamps of Persia is included. This catalogue is indispensible to all collectors and is used all over the world as a standard book of reference.

It is interesting to know that in future both Part I. and Part II. of Gibbons' catalogue will be published at the beginning of October each year, so that collectors will be able to commence each winter stamp session with a new stamp catalogue before them.

A Jamaican Error

The artist who engraved the die for the 2½d. Victory stamp of the Jamaican recently-issued pictorial issue was most certainly not a Meccano boy! The artist had been presented with a photograph of the "return of a contingent from the war" and instructed to enclose it in a frame and so make a design for a Victory stamp.

Very unwisely, from his point of view, he decided to include a Union Jack in each side panel. But in drawing the left-hand flag he placed it upside-down, thus signifying distress—and this on a victory and peace stamp!

There are several possible reasons for his having done this. One might humorously suggest that the artist was a keen fighter, and was distressed to find the War over at last, or that he was pro-German, and was distressed at the result! Most probably, however, he was not aware that there are correct and incorrect ways of flying the British Flag. Had he been a Meccano boy, he certainly would have known better!

A Curious Mistake

The King Edward issue of the Dominion of Canada is the subject of a most unusual error that was never corrected. As the error was only discovered a short time

before the set was to be withdrawn from sale it was not thought worth while going to the expense of preparing new plates, and thus it is that every copy of all the stamps in the set has the error.

The mistake was made by the designer, and is found in the crowns that appear in the upper corners of the stamps. Heraldry tells us that the crowns on these Canadian stamps are crowns of the pattern worn by queens and not those of the pattern worn by kings. The difference between the two kinds may be easily seen if a King Edward Canadian stamp is compared with a King George Canadian stamp. The crowns in the upper corners of the current issue are kings' crowns, the most obvious difference between the two patterns being in the width.

The dies, from which the printing blocks for these stamps were made, were by Messrs. Perkins, Bacon & Co., and the error in design only goes to show that even a firm well-practised in the art of engraving is liable to make mistakes.

A Useful Stamp Album

We have recently received copies of the Atlas Stamp Album published by Messrs. Stanley Gibbons Ltd. (391, Strand, London). This album, which is made in two styles with paper covers (price 1/–) and stiff boards (1/6), contains 113 pages ruled for stamps. Each page is arranged to take 30 stamps, spaces being included for all the most recent stamp-issuing countries. The first portion of the album is devoted to Great Britain and British possessions, and this section is followed by foreign countries.

STAMPS FOR SALE

(*See also page* 180)

BRITISH COLONIALS ON APPROVAL, one third Gibbons, good copies.—Barlow, 18, Wish Road, Hove.

FREE.—Sheet 50 Unused to genuine applicants for approvals. Send postage.—Croft, Adel, Leeds.

100 DIFFERENT STAMPS FREE. Send for ½d. approvals.—Cox, 135, Cambridge Road, Seven Kings.

Mint Surcharged French War Orphans. Complete Set, 4/6.—Girant, 8 Rue Jean Tournes, Lyons, France.

1,000 STAMPS including Colonials, 6d. Postage 2d.—Miss Noble, 16, Victoria Park, Dover.

GENUINE BARGAINS IN STAMPS. Surprise gift with approvals.—Butler, 46, Antill Road, Bow, E.3.

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FREE. Forty different stamps including Lord Byron. Postage 1½d.—Howell, 20, Trilby Road, Forest Hill, London.

CHEAP SETS ON APPROVAL, 50 cent. Cuba, 1910 cat. 5/–, free to all sending postage.—W. W. Rixon, 22, Rathmore Road, London, S.E.7.

Six Revolutionary Crete Free to "Big Discount" approval applicants.—H. Scott Johnson, C.P.A., Room C, 49, Felden St., S.W.6.

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FREE. Packet of 100 different Stamps and 100 Stamp Mounts to all Collectors requesting approvals. Above free packet contains some really good stamps. Send postcard now to—W. Gosling, 93, Wherstead Road, Ipswich.

50 (INCLUDING 20 COLONIALS) FREE to all applicants for approvals. Purchasers remitting 2/– or over will have a choice of various other fine gifts.—Empire Stamp Co., 2, West Bank, Stamford Hill, N.16.

"THE PHILATELIC MAGAZINE," 46, Victoria St., London, S.W.1. Best stamp newspaper. Order from your newsagent. 3d. fortnightly, or send 4d. for specimen and bonus form worth 2/6. Album catalogue free.

FREE Any one of the following sets to genuine applicants for approvals. 6 Mint Hayti 1904, 15 Ruthenia and Ukraine, 22 German Provs. and Prussia, 14 Soviet Russia and Danzig, 8 Mexican Civil War Issues (cat. 3/3). Ask how to increase your collection for nothing.—Alban Simmons, Hillside, New Barnet.

BUY BRITISH COLONIALS. Trans-Jordania, Gambia Pictorial, British Honduras (War), Seychelles, Dominica Pictorial, Jamaica Pictorial, Antigua, Nigeria, Malta Pictorial, Mauritius, Cochin. Post free 7d. Iraq scarce ¼ anna included if approvals wanted. Big Bargain Packet, 500 Mixed Colonial and Foreign, 10d. post free.—Morris & Co., Stamp Dealers, Bletchley.

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BOOKS

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Readers frequently write to me asking if I can recommend books that are both of interest and of use. In this column I hope to review books that I consider specially appeal to Meccano boys. I do not actually supply these books, which may be obtained either through any bookseller or direct from the publishers.—EDITOR.

"Engineering Wonders"
(By Ernest Protheroe).
(The Epworth Press, price 2/–).

This book will interest all Meccano boys, for it tells of many engineering achievements in which they are particularly interested. It includes a chapter on railroad engineering, describes railways at home and abroad, and also train ferries. Types of bridges are dealt with also and some account of famous bridges is given, including the Tay, Forth and Tower bridges. Tunnels, Canals, Reservoirs and Barrages are also described, and Docks, Harbour-works and Lighthouses. The last two chapters deal with girdling the earth by means of submarine cables and land telegraph lines and Power and Speed. Altogether a very readable little book.

"Wireless World and Radio Review"
(Wireless Press, London. Price 4d. weekly).

The contents of the *Wireless World* during the past month have been even more interesting than usual. For instance, No. 290 contains an interesting description of the new home of the London Broadcasting Station on the roof of the Selfridge Building in Oxford Street. In this issue also Mr. F. H. Haynes continues his articles on making an all-range receiver and there is a well-illustrated article on the ideal set for long range reception. In the following issue Mr. Haynes describes the building of a loud-speaker set, specially designed to eliminate distortion, and Mr. R. D. Bangay contributes an article for the special guidance of beginners, in which he explains the purpose and action of the wireless detector and describes the process by which aerial currents actuate telephone receivers.

"Conquest"
(Iliffe & Sons Ltd., London, 1/– monthly).

The most attractive feature of the March number of "*Conquest*" is an article by Dr. J. H. Fleming on hydro-electric supply stations in Switzerland. This article, which is to be continued next month, is written in an attractive non-technical style and is excellently illustrated by photographs. The preparation at the London Hospital of gut for the use of surgeons in stitching up wounds is a remarkable instance of the excellent results that may be obtained by persistent scientific experiment, and the two pages in which the Editor describes this enterprise are all too short. Other articles of particular interest deal with St. Paul's Cathedral; the banana industry, the mainstay of Central America; and with the dangers of non-scientific frontiers, which are so often the cause of serious national enmity.

New Baltic Tank Locos—(*cont. from p.* 159)

particularly is a British development, and in this field the L.M.S. is especially well represented, having 29 such engines of four different designs.

Baltic Tanks in the United Kingdom

In this country the first "Baltic" tanks to be built were in 1913, for the London Tilbury and Southend Railway, now incorporated in the L.M.S., and a number of these engines are working to-day between St. Pancras and Bedford. The London Brighton and South Coast Railway followed in 1914 with its handsome "Charles C. Macrae" class, whilst in 1921 the Furness Railway turned out some similar engines, but smaller in size and noteworthy in being the only examples of their class to have inside cylinders and no superheaters.

In 1922 the North British Locomotive Company built for the Glasgow and South Western Railway six "Baltics" of great size, and these cope very successfully with the heavy Clyde Coast traffic running out of Glasgow.

Finally, in March 1924 appeared the first of the Horwich "Baltic" Tanks, unique in having the 4-cylinder arrangement.

The name "Atlantic" was given to the 4–4–2 type, because the first engine of that arrangement to be built, ran between Camden and Atlantic City in U.S.A.—hence the "Atlantic." The first 4–6–2 engines appeared simultaneously on the West Australia and New Zealand Railways, and the type became known as the "Pacific." This term was singularly appropriate in that, continuing marine nomenclature, it also gave a clue to the place of origin of the type. The first 2–8–2 engines were built in America for use in Japan, and for this reason the name "Mikado" has been identified with this wheel arrangement ever since.

Electricity—(*continued from page* 175)

A, Fig 6, pivoted between the poles of two electro-magnets. On both sides of this armature A are contact screws CS, and according to the direction of the current flowing in the coils the armature touches one or other of the contact pieces. In Fig. 6 no attempt is made to show the actual arrangements of the magnets, these really being upright to save space and to shorten the yoke Y.

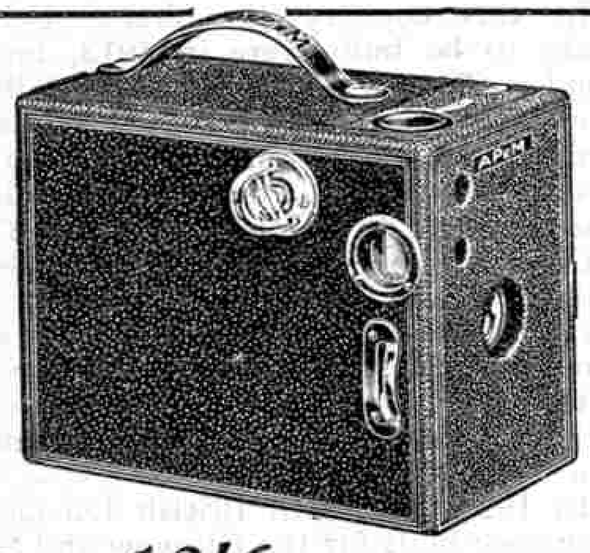
Fig. 7 shows the connections at one station for double-current working and at R is seen in plan a view of the relay with the connections to the various terminals. The same instrument is used in several circuits. The armature A, Fig 6, is not usually itself a permanent magnet, but its magnetism is induced by a large permanent magnet placed close by. This arrangement is adopted on account of the fact that small permanent magnets are liable to have their polarity reversed by lightning.

How the Circuit Works

The electro-magnets of the polarized relay have two coils of wire wound on each. These are shown in Fig. 7, where the thick line passing round both bobbins from terminal A to terminal F represents one winding and the thin line from E to G represents the other. Terminals F and G are joined by a brass strip. The connections for B, C and D are clearly shown.

NEXT MONTH:—
Simultaneous Messages on One Wire

British Goods for British Boys!—



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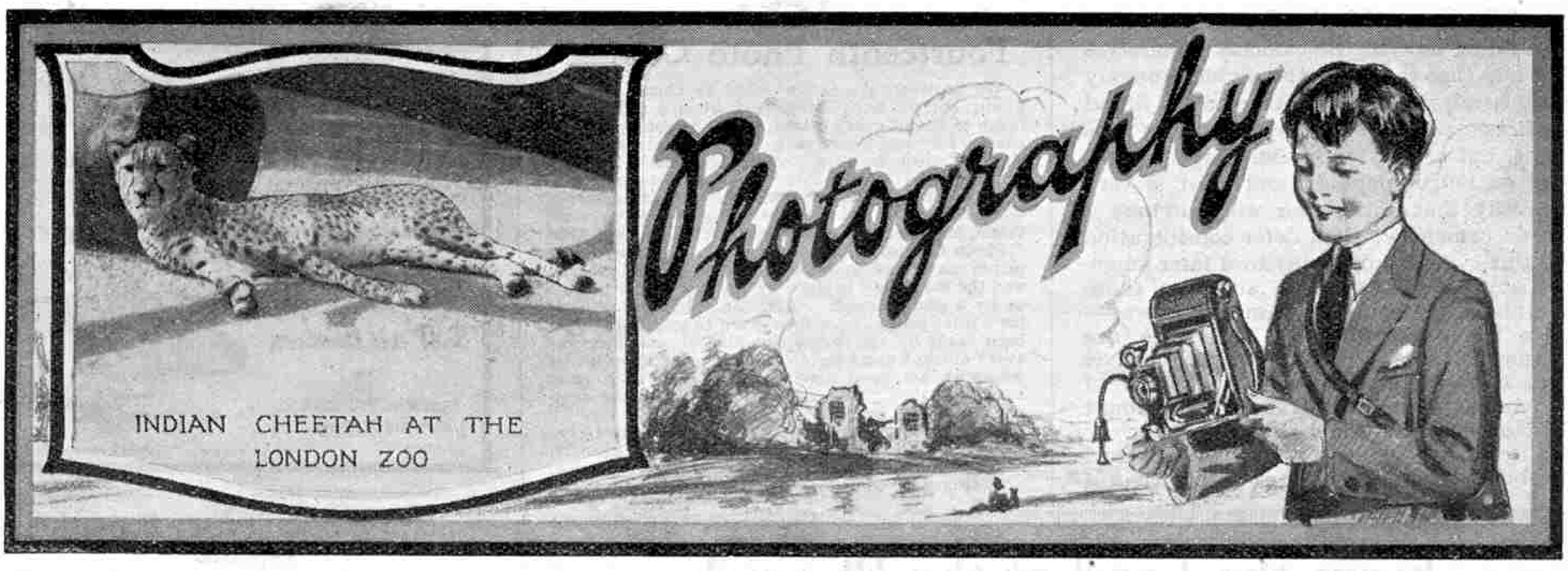
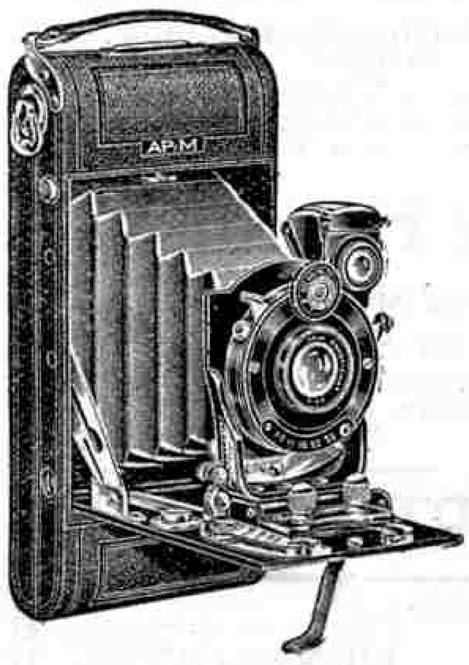


I. The Choice of a Camera

ALL through last Spring and Summer we were receiving almost every day requests for a Photographic Page to be included in the "*M.M.*" We were quite willing to include such a page but owing to pressure on our space it was impossible at that time. This year, however, the increase in the number of our literary pages has relieved the pressure to a certain extent and this month we commence Photography as a regular feature. In our future issues we shall deal with all branches of photography, commencing in this issue with some information on the "Choice of a Camera."

Recording Holiday Memories

There can be no doubt as to the great value of photography as a hobby. In one respect, indeed, it is unique, for it is not only a hobby in itself, but it may be applied with great success to almost every other hobby. Indeed, photography is a necessity in many hobbies and in many branches of work also, so that a boy who makes himself thoroughly familiar with the various photographic operations and processes may find this knowledge of the greatest use to him in later years.

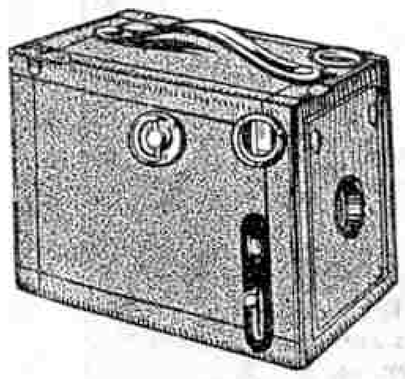


Folding Camera for Films

The range of possibilities within reach of a fairly successful amateur photographer is almost unlimited. His hobby enables him to make permanent records of his friends and of the happy days spent with them, either at home or when out cycling or walking, or perhaps on a holiday at the seaside or elsewhere. By means of his camera a photographer is able to bring home at the end of a holiday a record that is not only permanent but actually grows in interest as time passes. Without these photographs the memories of a holiday become dimmer and dimmer and finally fade away.

Make Your Hobby Pay

It may be as well to refer here to one objection frequently made against photography as a hobby, and that is its expense. As is the case with almost every other hobby, photography costs money, because various things have constantly to be bought. Photography costs as much as it is allowed to cost, however, and no more, and expenditure can be regulated to a minimum, especially with small cameras.



Box Camera for Films

Further than this, an alert photographer who turns out fairly good work can find many opportunities for making a few shillings by means of his camera, and such sums go a long way towards making the hobby self-supporting. Sometimes his parents or some friends want to be photographed, or sometimes a cricket or football team ask him to take their photographs. Occasionally also the amateur may have a print accepted by some weekly or daily newspaper, and in all these ways pocket money may be made towards the expenses of the season.

Plates or Films

At one time the choice of a camera was an easy matter, but to-day the range of cameras available is so wide as to bewilder the beginner, unless he has an experienced friend to advise him.

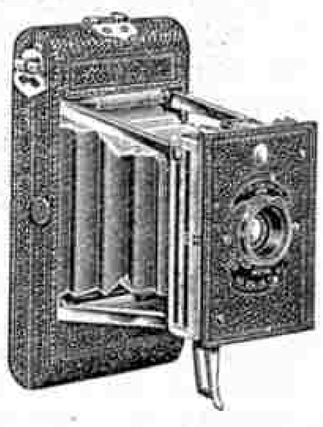
First of all the would-be photographer must decide whether he will use plates or films. During recent years roll films have become more and more popular, and to-day there are undoubtedly tens of thousands of photographers who have never used anything else. The difference between films and plates lies in the fact that in one case the sensitive emulsion is supported on a base of celluloid, and in the other case upon glass. The lightness and portability of films enables a large supply to be carried when necessary on a photographic outing, whereas a similar number of plates would not only be bulky but very heavy. Roll films have also the great advantage of being easily loaded into the camera, and unloaded after exposure, in full daylight, whereas a dark-room is required to change plates. The development of films and plates also differs in many respects. Some cameras are equipped for using both plates and films as required, and these are certainly useful. The choice is largely a matter of personal taste, for if properly used there is nothing to choose between films and plates so far as the quality of the respective results is concerned.

In addition to roll films there are also flat or cut films which, in the form of the Film Pack, combine to some extent the advantages of both films and plates. Flat films are not used, however, to anything like the same extent as roll films.

Size of Camera

Another matter to be decided before the camera is purchased is the size of plates or films to be used. In the days when glass plates had the field to themselves the most popular sizes for amateur work were $\frac{1}{4}$-plate ($4\frac{1}{4}'' \times 3\frac{1}{4}''$) and $\frac{1}{2}$-plate ($6\frac{1}{2}'' \times 4\frac{3}{4}''$). Comparatively few amateurs now use the $\frac{1}{2}$-plate size, and the most popular sizes to-day are $\frac{1}{4}$-plate and $3\frac{1}{2}'' \times 2\frac{1}{2}''$. Film packs are generally used in sizes varying from $2\frac{3}{8}'' \times 1\frac{3}{4}''$ to $5'' \times 4''$, but of course there are many other sizes. Perhaps the widest range of all, at any rate in small sizes, is obtainable in roll films, and there are several intermediate sizes between $2'' \times 1\frac{1}{2}''$ and $4\frac{1}{4}'' \times 3\frac{1}{4}''$. Larger sizes, with the exception of postcard, are not very extensively used by average amateurs.

One of the recent developments in photographic apparatus has been in the direction of the so-called "vest pocket" camera. Certainly rather a large vest pocket would be necessary to accommodate some of these cameras, but none the less many of them are exceedingly small and very fascinating to look at and handle. The beginner, however, would do well to avoid these very small cameras, as a considerable amount of experience is required to get the best results from them. Generally speaking the most useful sized camera is the $\frac{1}{4}$-plate for plates and $3\frac{1}{4}'' \times 2\frac{1}{4}''$ for films.



Vest Pocket Camera for Films

Coming now to the cameras themselves we find that these may be divided roughly into hand and stand instruments. Stand cameras were used exclusively at one time, but except for special purposes they are no longer popular, and as it is very unlikely that a beginner will purchase a stand camera we shall defer consideration of this type of apparatus to a later stage.

Cameras for roll films and also those for plates are made in two main patterns—box form and folding. As a rule the former type is cheaper, and although it has certain limitations it is capable of producing first-class work. If the amount of money to be spent on the camera is very limited, the beginner is strongly advised to buy a box form camera rather than a folding one, because the greater complexity of the design and construction of the folding camera makes it necessary to pay a good price if the instrument is to be of any use. The box form on the other hand is so simply designed that it can be turned out in large quantities at a cheap rate without the sacrifice of any efficiency.

A folding camera of good quality, either for roll films or for plates, is probably the most useful all-round instrument. It is impossible to give any definite idea of the cost of such a camera as, quite apart from the quality of the camera itself, this depends to a very great extent on the type of lens and shutter fitted.

It is a good point to buy British-made cameras. There are manufacturers in this country who turn out excellent cameras, so that there is no necessity for purchasers to buy foreign-made apparatus.

The three Cameras illustrated in the previous page are made by the A.Pe.M., who are presenting free a fine booklet to all Meccano readers interested (see advertisement on page 184).

NEXT MONTH :—

LENSES AND SHUTTERS

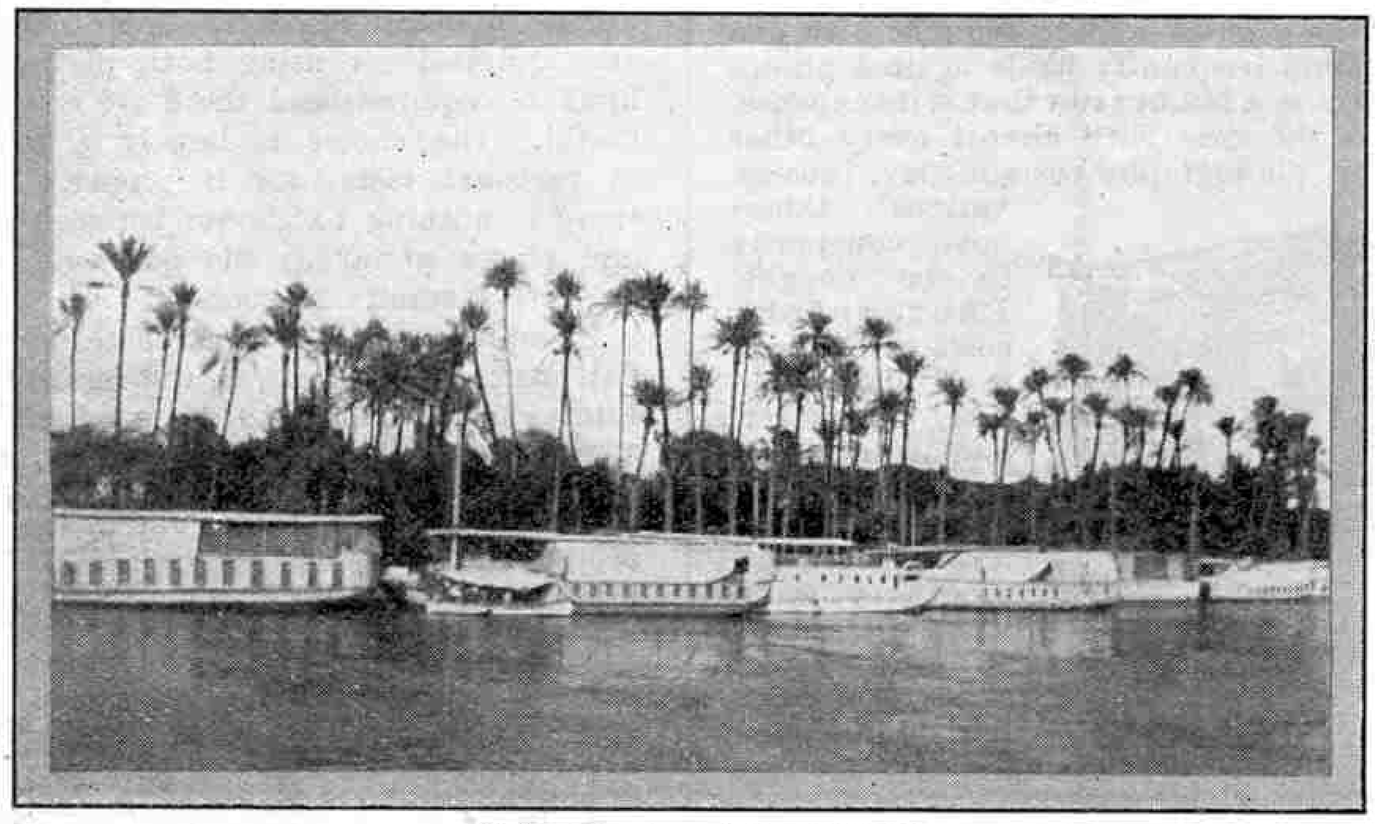
Fourteenth Photo Contest

We have always endeavoured to choose for our photo competitions subjects that are within the reach of almost every reader, and this month we have chosen for our Fourteenth Contest a subject that should appeal to every photographic reader without exception. This subject is "MY BEST PHOTOGRAPH." Each competitor should look through his negatives, select the one that he thinks is the best he has ever taken, and send in a print of it, marking his envelope "Photo Contest" in the top left-hand corner. The prints may be of any size and made by any process, and the work may be done by the competitor himself or by a photographic dealer. In the event of a tie for a prize preference will be given to prints that have been made by the competitor himself, and therefore every entrant must state on the back of his print by whom it has been made. In addition each print must bear the name, address and age of the competitor, clearly written.

Four prizes are offered—Photographic goods to the value of £1/1/– and 10/6, to be chosen by the winners, as first and second prizes respectively in each section.

Closing date 30th May (Overseas: 31st August).

From the Land of the Pharaohs



"The Banks of the Nile"

Photo by Aly A. Shawky and awarded First Prize (Section B) in our Tenth Photo Contest

Tenth Photo Contest

OVERSEAS RESULT

Judging by the number of entries received in this contest, photography is as popular as ever with our Overseas readers. The subject of this competition was "A Beach or Riverside Scene," and many extremely interesting photographs were submitted.

In Section A (under 16 years of age), the winner is B. W. Roy, of Calcutta, who has been awarded a Meccano No. 1 Radio Receiver for his splendid snapshot of a bathing scene at Calcutta. The second prize (Meccano Goods value 5/–) was won by D. Morrison, Australia, with an interesting river study. In section B (over 16) a similar first prize has been despatched to Aly A. Shawky, of Egypt, and second prize to Chan S. Fong, of Singapore.

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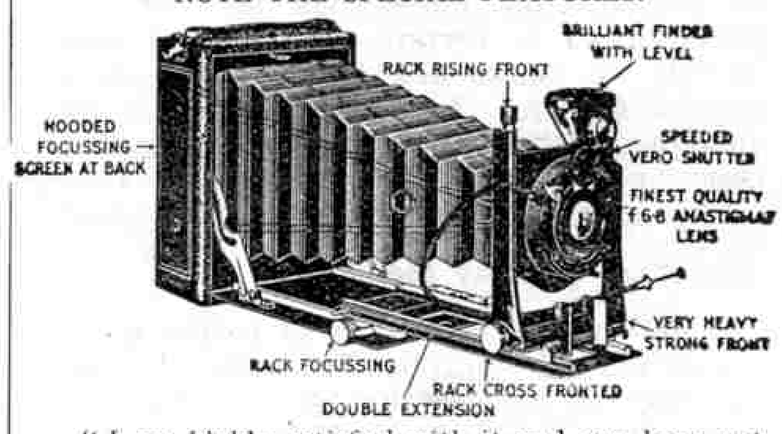

"I am highly satisfied with it and you have not overstated your description."—S. D., Newcastle.

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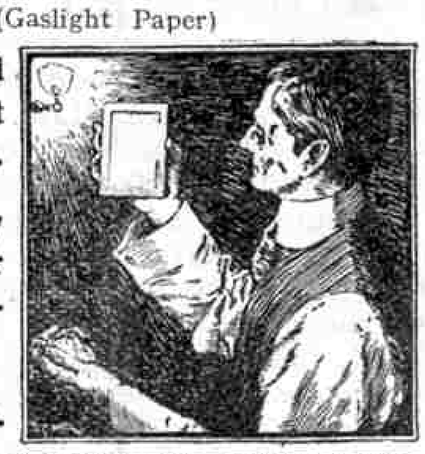

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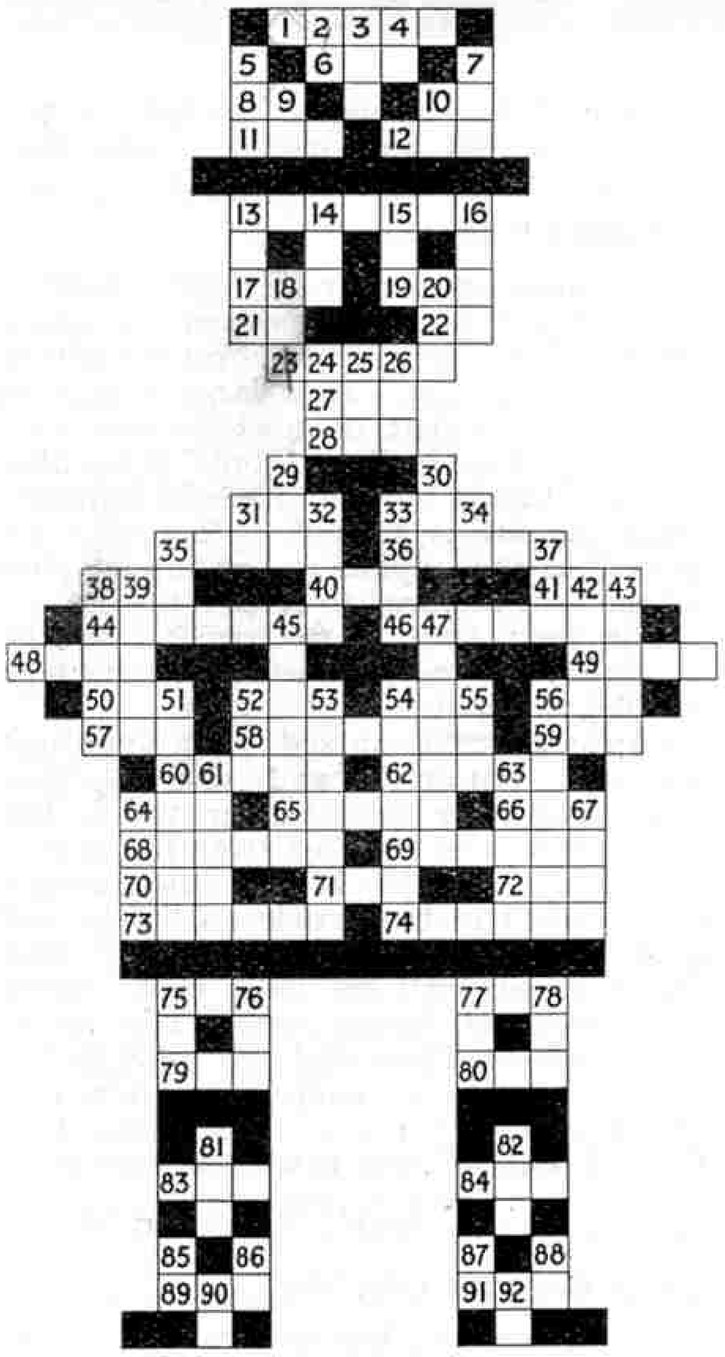
April Puzzle Competition

First Prize : Meccano Goods value £1:1:0
Second Prize : Meccano Goods value 10/6
Third Prize : Meccano Goods value 5/–

EVERY reader who wishes to enter for this competition must send in the solution of the Cross Word Puzzle No. 77 together with the solutions of *four* other puzzles selected from this page. An original Cross Word Puzzle is not required.

Closing date—31st April.

Puzzle No. 77

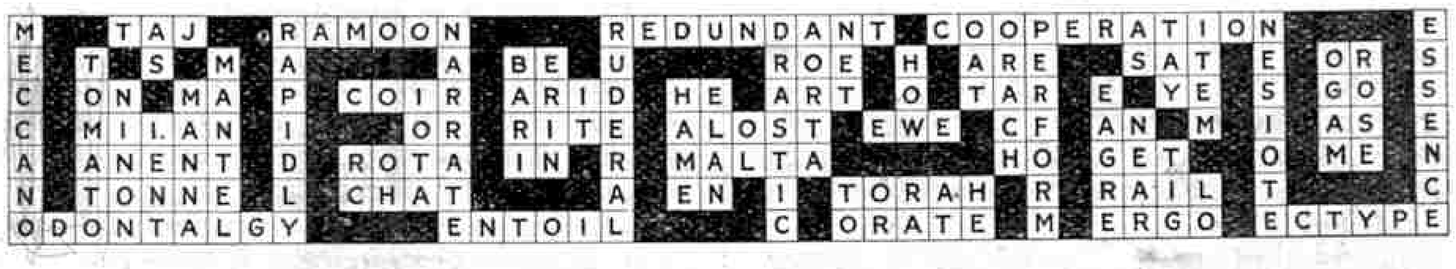


HORIZONTAL : 1. A hen-coop ; 6. A colour ; 8. A bone ; 10. Preposition ; 11. Refuse coal ; 12. A perennial Polynesian herb ; 13. A load ; 17. To expose hemp to moisture ; 19. A fish ; 21. Personal pronoun ; 22. Denial ; 23. Ghastly ; 27. Spanish word for river ; 28. Eternity ; 31. Juice from fruit of olive tree ; 33. Completely ; 35. South Indian weight ; 36. To choose ; 38. Belgian town ; 40. Decay ; 41. A son ; 44. Construction ; 46. One who sets in motion ; 48. Rolling frame for winding yarn ; 49. Low hill of sand ; 50. To increase ; 52. Established (abbrev.) ; 54. Australian bird ; 56. Induration of the membranes of the eye ; 57. Strong scented ; 58. Water channel between the arena and cavea of a Roman hippodrome ; 59. Concreted sugar ; 60. An Italian town ; 62. Pertaining to a form of colic ; 64. Form of address ; 65. Expel from ; 66. A hindrance ; 68. To please ; 69. A Portuguese coin ; 70. To go ; 71. To cease ; 72. Turf ; 73. Flowers that bloom in late summer and autumn ; 74. Comes in ; 75. A piece of work ; 77. To trouble ; 79. A service-book ; 80. A kind of gin ; 83. An English river ; 84. Goddess of mischief ; 89. A grimace ; 91. Kind of sorcery.

VERTICAL : 2. Denoting presence ; 3. Fan for grain; 4. Denoting presence ; 5. London Guildhall effigy; 7. Extinct bird of New Zealand ; 9. Adverb ; 10. Small pacific tree of the lily family ; 13. Mode of being ; 14. Behind ; 15. Kind of boat ; 16. Plant of the arum family ; 18. A fish ; 20. Conjunction ; 24. An English river ; 25. Spanish word for river ; 26. Produced by electrolysis ; 29. Concealed ; 30. Wet soft earth ; 31. Preposition ; 32. A musical instrument ; 33. A food plant ; 34. As far as ; 35. A vehicle ; 37. A small bird ; 38. To show contempt ; 39. A Laplander's sledge ; 42. A leguminous plant with leaves like clover ; 43. To trim ; 45. Began again ; 47. Uproars ; 51. Wide-spreading dominions ; 52. Contraction of ever ; 53. Journeys ; 54. Of either gender ; 55. Practice ; 56. A bull-fighter ; 61. Decision ; 63. To use wrongly ; 64. Tale in Iceland literature ; 67. Things long and slender ; 75. Striking-face of a steam hammer ; 76. Inclined hutch for washing ore ; 77. Any distinctive doctrine ; 78. Dry stalk of hemlock ; 81. Well-known tool ; 82. Genus of small American lizards ; 85. Part of verb to be ; 86. Aloft ; 87. Preposition ; 88. Chinese mile ; 90. Gold ; 92. Of minor importance.

Answers to Last Month's Puzzles

No. 69.



No. 71. 1. Swallow ; 2. Jay ; 3. Puffin ; 4. Chaffinch ; 5. Moorhen ; 6. Heron ; 7. Robin ; 8. Kingfisher ; 9. Wren ; 10. Nuthatch.

* * * *

No. 72. The fish was 6 ft. long ; head 9 in. ; tail 27 in. ; back 36 in.

* * * *

No. 73. The handkerchiefs cost the draper 3½d. each.

* * * *

No. 74. Hay ; say ; sad ; dial ; solid ; load ; lad ; sail ; the whole ; holidays.

* * *

No. 75.

CANDID
OSTLER
WOOLLY
PALLID
ENGAGE
RATTAN

No. 76. The figures were 1, 2, 3, 4, 5, 6 ; or one tooth, Ree, for 5/6.

No. 70.

Puzzle No. 78.

The names of several familiar flowers are hidden in the following story :—

"Stop ! stop ! ink will stain your coat" said tabby. "I don't care. Oh, what larks !" purred the little white cat, trying to jump on to the table where were bread and butter, cups and saucers, as well as an inkstand. Tabby shut her mouth with a snap. "Dragons, or even wild boys shall not make me speak again," she thought. "If that beautiful jug, full of cream fresh from the cow, slips down, I will not stir a paw." The little white cat, looking sedate and prim, rose to reach the ink, but she did not speed well in her venture. The bottle broke, and on to pussy's coat of snow dropped a sable stream.

* * * *

Puzzle No. 79.

"How many miles did you motor yesterday and the day before ?" inquired Mr. Brown of his neighbour. The neighbour replied : "The number of miles I motored yesterday was the number I motored the day before with the figures reversed, and the difference is one-eleventh of their total.

How many miles did Mr. Brown's neighbour motor on each of the two days ?

Puzzle No. 80.

On a farm in France there were working 100 men, women and children, and they received altogether 100 francs for their work. Each man received five francs, each woman one franc, and each child one-twentieth of a franc. How many men, women and children were at work ?

* * * *

Puzzle No. 81.

H A N N A H
H A N N A H
H A N N A H
H A N N A H
H A N N A H
H A N N A H

It is required to find how many times "Hannah" may be found in this square. Counting is allowed backwards and forwards and diagonally or "zig-zag," but the same letters cannot be repeated in the counting until the word is made. The result will surprise our readers.

* * * *

Puzzle No. 82.

Arrange the numbers 1 to 25 inclusive in the form of a square so that the total of each line, horizontal, vertical or diagonal, will be 65.

The Story of Metals

III COPPER.

LAST month we dealt with the mining of copper ore in various parts of the world, and now we come to the processes through which the ore must pass in order that the metal may be obtained.

The chief ores used in the extraction of copper vary greatly in composition, but may be divided roughly into three classes when considering the means to be adopted for obtaining the metal in a pure state.

The first class includes the ores mined near the surface of the ground, such as ruby ore and malachite. These ores are made up largely of metallic copper and oxide or carbonate, with very little iron or sulphur.

The second class, found at a lower level, includes ores containing sulphur, such as copper pyrites and purple ore, and those containing both sulphur and iron in various proportions. It is curious that the ore chalcopyrite, which gives the best yield of copper, is almost always found at the bottom of a "lode" or deposit.

In the third class are those ores that contain only a small percentage of copper, but which can be worked profitably by cheaper methods so as to obtain copper compounds or even the metal itself.

The presence or absence of sulphur in the ore largely determines the method to be applied in extracting the metal. Most of the copper used throughout the world is got from copper pyrites and chalcopyrite, but the removal of sulphur and iron makes the process both difficult and tedious.

The Blast Furnace

In working ores made up of metallic copper with oxide and carbonate, the blast furnace is used in the same way as for the smelting of iron. The ore is charged into the furnace with coal which combines with the oxygen in the oxide to form the gas carbonmonoxide. In this way the copper oxide or carbonate is reduced to the metal, which collects in the bottom of the furnace and is drawn off at intervals. Any sulphur present is burned away and the iron is removed by forming a slag with silica, which is added if necessary.

The illustration on the next page shows a small circular water-jacket copper furnace, and the diagram below that illustration depicts a vertical sectional view of it. The jacket is made of the best "flange" steel, the sheets being either riveted or welded together as preferred, and fitted with tuyères, the latter serving the same purpose as in the blast furnace for iron described in our June 1924 issue.

The jacket is surrounded with a removable wind-box to which the blast-pipe is connected. This arrangement ensures equal distribution of the blast to each tuyère and hence the perfect delivery of air to every part of the charge, thereby producing a very uniform melting zone. The tuyères are entirely within the water space of the jacket and are thus protected from the action of the heat, so that they do not burn out or cause any trouble whatever. Peep-holes with removable mica coverings are placed in the wind-box opposite the tuyères. Water-jacket furnaces of this type have the advantage of simplicity, strength, perfect water-circulation and high capacity, and they will run for months without a stoppage.

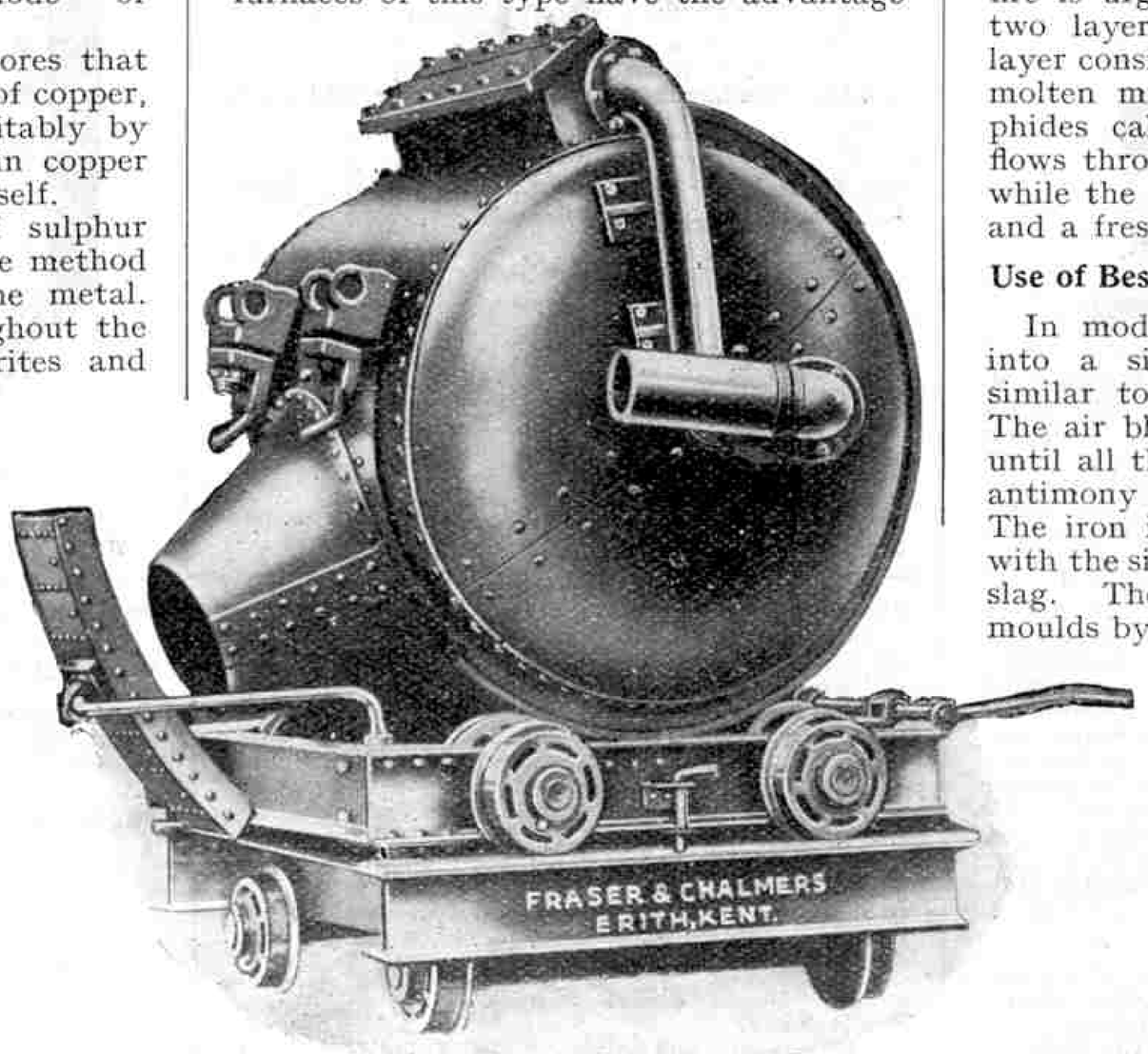


Photo courtesy [*Messrs. Fraser and Chalmers, Erith*

Hand-tilted Copper Converter

"English" Process

The most important method of extraction is the "English" process, by which the metal is obtained from ores containing sulphur and iron. If a large excess of sulphur is present it must be removed, and this is done by "calcining" or burning the ore either in kilns or in special furnaces. Once the fire is started little fuel is required, as the sulphur in burning supplies all the heat required to calcine the ore.

The next step is to concentrate the ore—that is to reduce the bulk as much as possible without loss of copper.

Calcined ore is mixed with unburned ore and limestone and charged into a reverberatory furnace, in which the flames from the fire pass over the charge spread out on the bed of the furnace as described in the article on "*Iron and Steel*" in our issue for June 1924. The fire is urged until the mass melts, when two layers of liquid form. The upper layer consists of iron slag and below it is a molten mixture of copper and iron sulphides called "matte." The slag overflows through a hole in the furnace wall, while the matte is tapped off at intervals and a fresh charge is added.

Use of Bessemer Converter

In modern practice the matte is run into a silica-lined Bessemer converter, similar to the converter used for steel. The air blast is turned on and continued until all the sulphur and any arsenic and antimony present have been burned off. The iron is converted to oxide and this, with the silica of the furnace lining, forms a slag. The copper is then poured into moulds by tilting the furnace.

In works where a Bessemer plant cannot be afforded, the treatment of the matte is carried out by mixing it with roasted ore and silica, and heating with a current of air in a reverberatory furnace. This burns off the sulphur and removes the iron as a slag just as in the Bessemer converter.

When the process is finished the molten metal is drawn off and flows into moulds or into small pits in the floor, forming "billets" or ingots when cold.

Wet Processes

Where the percentage of copper in the ore is low, the foregoing methods cannot be used as they are too expensive, but by employing a wet process the copper can be obtained with profit.

In the most commonly used wet process the ore is ground with common salt or sodium chloride, and the mixture roasted in a furnace. When cool the mass is extracted with water and a solution of copper chloride is obtained, from which the copper salt may be obtained by evaporating to dryness, or the metal may be deposited by throwing scrap iron into the solution, when the copper forms a coating on the iron.

Refining by Electrolysis

As a result of the introduction of electricity into chemical processes the copper is now separated by electrolysis, as this process is much simpler and gives a pure product. In each of the processes already described the resulting metal is always impure because the ores used contain many substances beside copper, including arsenic, antimony, lead, silver, gold and nickel in varying quantities. The first two are got rid of along with the sulphur in the furnace, but the others remain in the impure metal. The quantity is usually small, but in the electrical method of refining the gold and silver are recovered and form a valuable by-product.

In refining by electrolysis a thin sheet of pure copper called the "cathode" is suspended in a vat containing copper sulphate solution, and is connected to the negative pole of a dynamo. The ingot to be purified is also suspended in the solution, but it is joined to the positive pole of the dynamo, forming the "anode." When the current is switched on the copper in the ingot slowly dissolves and forms copper sulphate, while copper is deposited as metal on the thin copper cathode. Finally the whole of the copper is deposited on the cathode in a pure form and a solid block of metal results.

The quantity of electricity sent through the solution must be very carefully regulated so that only copper is deposited on the cathode, the impurities falling to the bottom as a sludge which contains the gold and silver, together with lead. The iron and nickel go into solution as sulphates, but are not deposited so long as any copper remains in the solution in the vat. The sludge is sold to works specializing in the extraction of precious metals.

The metal obtained by the electrolytic process is of excellent quality, and as it is of the highest degree of purity it can be used for every purpose without further treatment.

Courtesy [*Messrs. Fraser & Chalmers, Ltd.*

Copper Blast Furnace, circular type

Copper Alloys

We have now seen something of the history, mining and extraction of copper, but our account of this metal would not be complete without reference to some of its important alloys such as brass, bronze, gunmetal, etc.

Brass, its History and Preparation

Brass is an alloy of copper and zinc in various proportions. The word brass occurs fairly frequently in the Bible from the time of Job onward, but it is almost certain that the metal there referred to is bronze.

There is no evidence that brass, as we know it, was in use before the time of the Romans. The Romans used a metal called "*oricalchum,*" which apparently possessed the composition and properties of brass, and as the Roman Empire was extended by conquest after conquest, so the knowledge of the art of preparing this alloy spread throughout Europe.

In Great Britain the earliest traces of brass occur in the mediæval "brasses" found over the tombs of people who were prominent in the ecclesiastical, military or civil world. Proof that brass was being manufactured in England at the time of Henry VIII. is furnished by an Act of Parliament which prohibited the export of the metal, under very severe penalties. It is interesting to learn that this prohibition was not withdrawn until 1739. From the time of Queen Elizabeth the production of brass extended steadily and by 1721 it was estimated that the brass industry employed about 30,000 persons.

In the preparation of brass the copper is first melted, the zinc and other ingredients being added afterwards. The surface of the metal is covered with charcoal in order to prevent oxidation, and also to assist in the reduction of the copper oxide which is always found to some small extent in ordinary commercial copper. After the alloy has stood in the furnace for some time it is cast into ingots or moulds. If sheet brass is to be prepared, however, the metal is cast into strips which are passed cold through rolls.

The proportions of copper and zinc in brass vary according to the purpose for which the alloy is intended. A large proportion of zinc increases the lightness of the colour, but has the effect of reducing the tenacity and ductility of the alloy. A typical brass consists of from 63 to 72 per cent. copper with 27 to 34 per cent. zinc. The addition of from two to four per cent. of iron gives a very hard and tenacious metal. Brass rod to be used for turning contains a small quantity of lead, which has the effect of preventing the metal from tearing under the action of the turning tool.

Muntz Metal

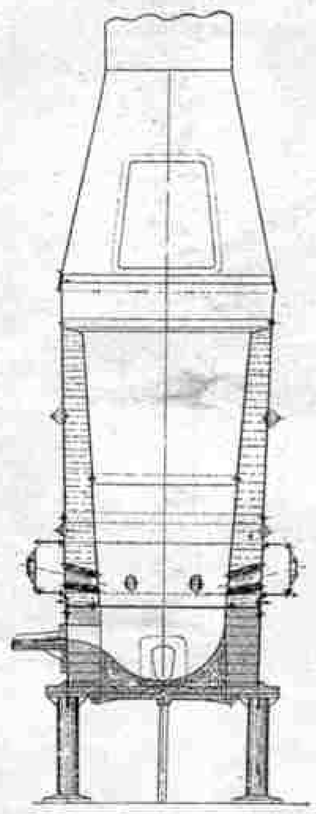
Muntz metal is a kind of brass containing approximately 60 per cent. copper and 40 per cent. zinc. It can be rolled either hot or cold, and one of its chief uses is for sheathing wooden ships, for which purpose it is considerably cheaper than copper.

Bronze, Ancient and Modern

Bronze is essentially the alloy of copper with tin. The proportions of the two metals vary for different purposes, but a typical bronze, such as is used for bearings for heavy axles, consists of from 80 to 90 per cent. copper, 7 per cent. zinc and from 8 to 12 per cent. tin. Phosphor bronze, which is largely used for the working parts of machines and for telephone wires and wireless aerials, contains a very small quantity of phosphorous, which has the effect of greatly increasing its tenacity and hardness.

The composition of the bronzes of classical antiquity varied greatly at different times, the proportion of copper ranging from 67 to 95 per cent. Analysis of coins shows that the Greeks used an alloy of copper and tin for their bronze coins until about 400 B.C., from which period they began to use lead with increasing frequency. The Romans also used lead in their bronze coins but they gradually reduced the amount of it, and under the Emperors Caligula, Nero, Vespasian and Domitian their coins were of pure copper. Later, however, the alloy with lead was resumed.

Vast numbers of bronze statues were produced by the sculptors of antiquity, but very little of this work remains to-day uninjured. The fragments that remain however show that these castings were wonderfully perfect. The quality of Greek workmanship, for instance, may be gauged from the bronzes of Siris in the British Museum on which a thin plate of bronze may be seen in some places beaten out nearly half an inch until it reaches the thinness of notepaper.



Sectional Elevation of Copper Blast Furnace

Other Alloys

Gunmetal is an alloy of copper and tin together with small quantities of lead and zinc. This metal requires to be cast very carefully to prevent separation of its constituents and their compounds. Formerly it was largely used for casting ordnance, but is now chiefly employed for making castings for various engineering purposes.

German silver or nickel silver is really a brass containing from 15 to 25 per cent. of nickel. It forms a white, tough metal that takes a good polish, and it is

(*Continued on page* 172)

A Giant Electric Shovel

Rotating Monster that Handles 14,000 cubic ft. per Hour

The keen interest aroused by our previous articles dealing with giant mechanical shovels indicates that these huge implements are very popular with our readers. This is not surprising, for, in addition to their extremely interesting mechanism, there is something about one of these great shovels when at work that suggests a huge giant devouring his prey mouthful by mouthful—a fascinating spectacle !

AMONG the many interesting types of mechanical shovels is the Clère Rotating Shovel, invented and manufactured in France. This shovel embodies a wheel composed of a number of buckets, generally six, forming a solid whole and turning about a fixed axis of rotation. The characteristic feature of the invention lies in the special shape given to the buckets, the edge being specially curved. This permits material to be lifted no matter in what position the shovel may be, whether working laterally to right or to left, or straight forward. Each bucket has its surface curved in such a way that the material is continually sliding towards the emptying channel, and this movement, combined with the rotation of the bucket-wheel, causes the emptying of the material towards the external face of the shovel at the same time as it is lifted above the axis of rotation.

The emptying begins when the bucket is slightly above the axis of rotation and finishes before the emptying edge of the emptying channel has passed the edge of the chute hopper. The material received by the chute hopper is then fed on to a suitable transporter belt.

A Typical Shovel

We are able to illustrate a typical Clère shovel. The edge is of hard-tempered steel—the working part of which is sharpened—and it is riveted on to the buckets. In the case of very hard ground, teeth are added, the shape of which varies according to the nature and composition of the material to be worked. It is claimed for this shovel that it forms an indestructible whole of which no part is subjected to wear on account of friction, and that therefore it has a great advantage over bucket excavators in which the buckets are linked together by shackles and trunnions.

The principal dimensions of the Clère shovel—its diameter and width—are determined by the output per hour demanded of the apparatus. The theoretical capacity of the shovels varies between 700 and 14,000 cubic feet per hour for shovel diameters of from 6½ ft. to 19½ ft.

The evacuation of the material handled by the shovel is effected by means of a transporter of almost any type—a belt of Balata or rubber, a toothed metallic transporter, etc.—travelling horizontally or ascending. When it is necessary to raise material to an exceptional height the total length of the apparatus may be too great, and in certain special cases it may be necessary to empty the shovel by means of chain and buckets.

Wide Range of Movements

The Clère shovel shown in our illustration is arranged as a revolving crane resting on a truck running on an ordinary track. This truck supports the upper part of the apparatus, which essentially comprises two elements, the shovel proper and the transporter belt. The whole of this upper part borne by the truck is capable of being completely rotated, and the shovel itself can be raised or lowered in relation to the ground upon which the truck rests. The travelling movements of the apparatus—the swivelling of the upper part, rotation of the shovel and movement of the transporter—are all mechanically obtained from one motor. The actual raising of the shovel, however, is effected by hand. The control levers are all assembled at a convenient point from which the engineer has a clear view over the whole machine.

The possible methods of working the shovel are very varied. In consequence of the rotating movement of the whole of the upper part of the machine, it is possible to work either in prolongation of the track or laterally to it, which permits of the digging-out of trenches of any desired width.

Work in Narrow Galleries

Another type of Clère shovel is modified by the addition of a second transporter that may be swivelled at will independently of the first one, which is fed by the shovel. This modification has been applied to the Clère machines in order to permit of their use in narrow galleries. The machine advances to the end of the track and digs alternately from left to right, so as to excavate the whole breadth of the gallery. The overhanging earth is made to fall in by hand or by mine according to its hardness. The rear transporter is of sufficient length to permit of the placing of three wagons on each loading track so that work may be carried on uninterruptedly.

For certain purposes it is desirable to get rid of the necessity of using the truck travelling on rails, and this may be accomplished very

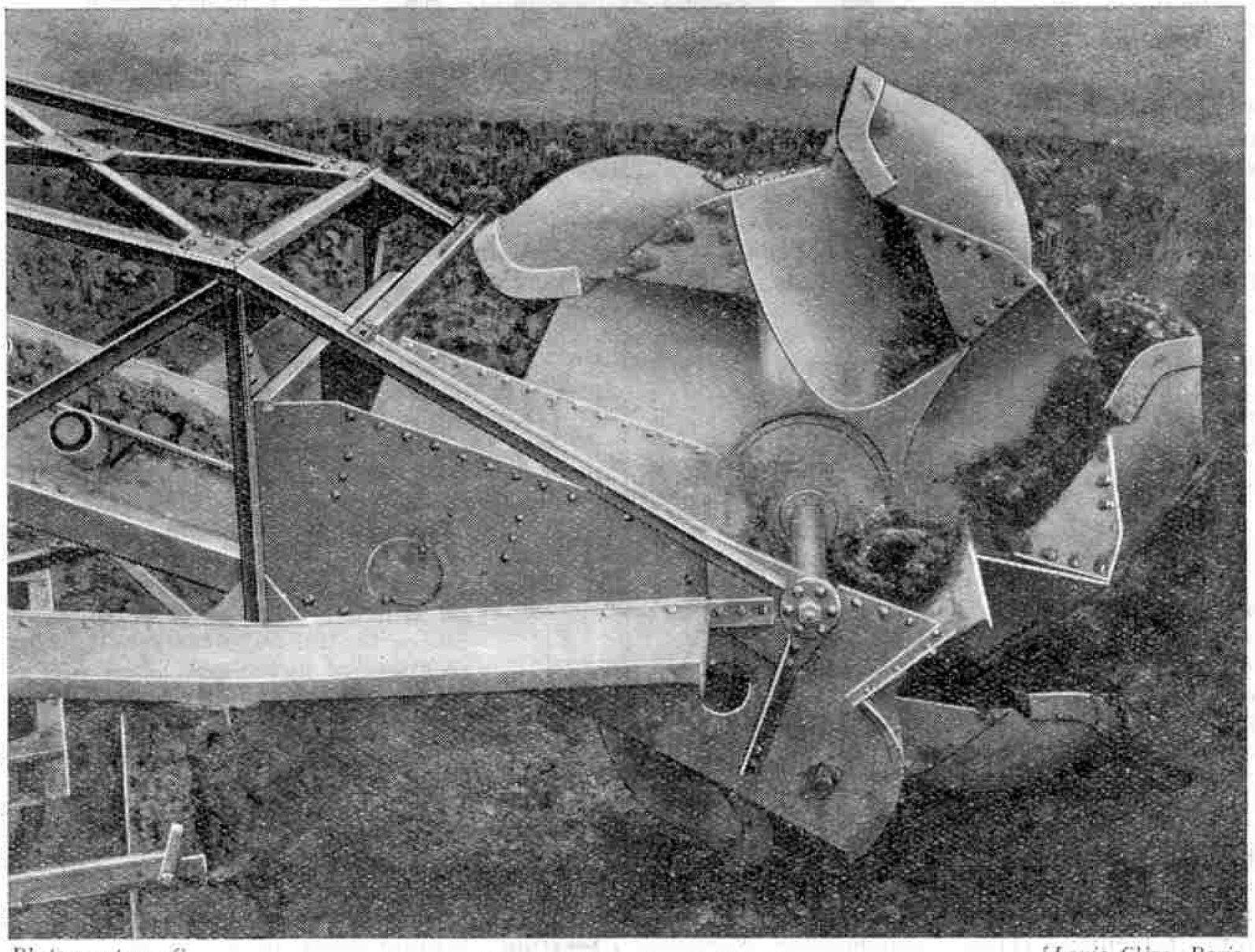


Photo courtesy of [*Louis Clère, Paris.*

Shovel Wheel at Work

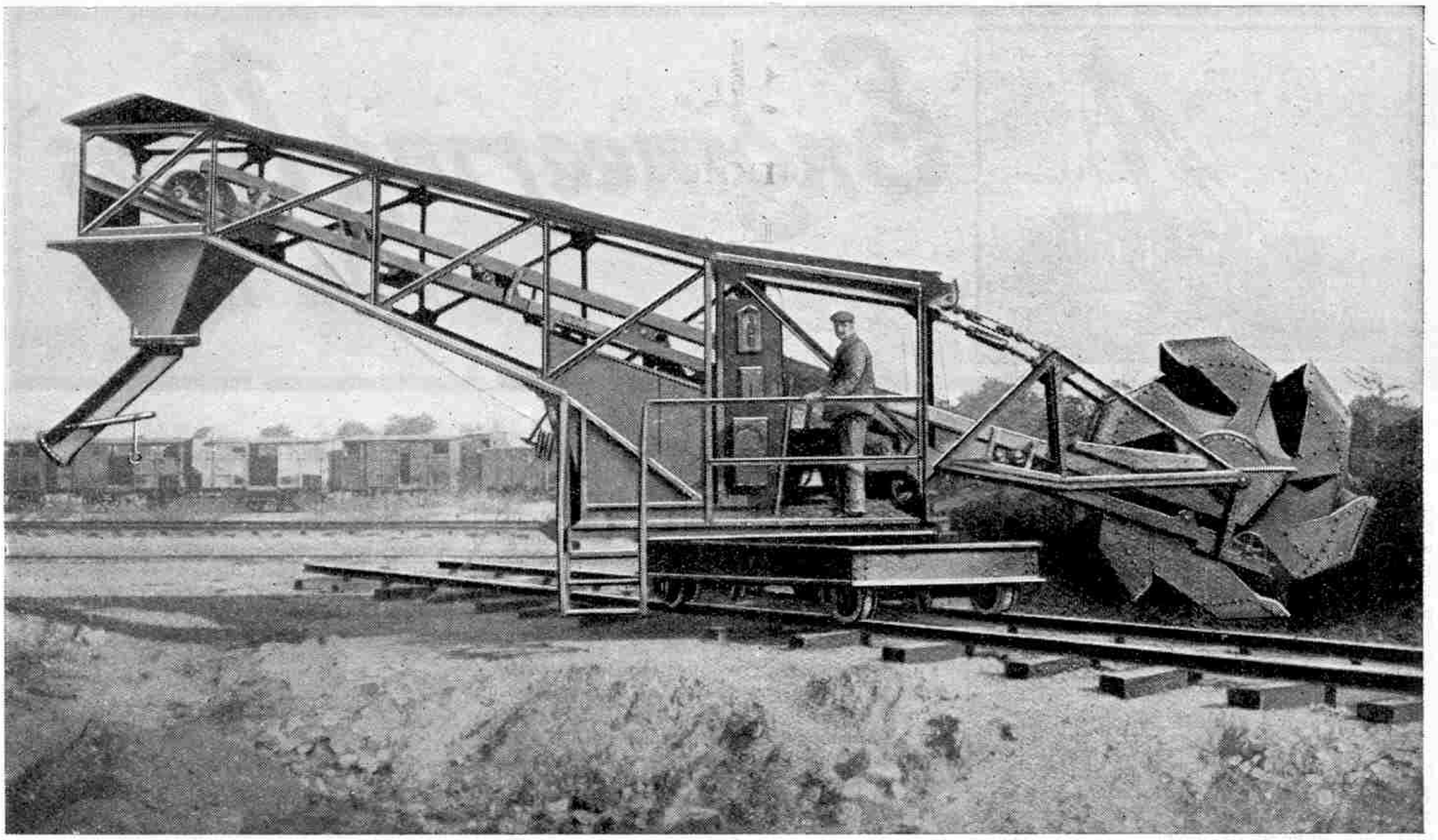


Photo courtesy of] **A Typical Clère Shovel** *[Louis Clère, Paris*

effectively by mounting the shovel on a caterpillar in the well-known manner of the "Tanks." Except so far as the method of transport is concerned, the arrangement of the apparatus remains the same as in the type travelling on rails.

Shovel Mounted on Gantry Crane

Large outputs are required in certain kinds of work, such as the construction of canals and railways or in mining operations, and for such purposes the Clère shovel is mounted on a gantry crane. Two men only are required to manipulate this apparatus. The motors working the shovel, the transporter, the winch and the rotating movements of the crane are placed in an upper cabin, while those working the travelling movements of the crane are placed in a lower cabin. The engineer of the lower cabin feeds the compressor and the closing hopper, while the engineer of the upper cabin is in charge of all the other manipulations.

In cases where the apparatus is opposed to a job offering too great a resistance, or has to lift blocks of too great dimensions, safety devices are provided in order to avoid the breakage of the wheel or any other part of the shovel. These safety devices consist of suitable couplings and maximum and minimum releases, which are brought into operation as required.

We are able to illustrate the Clère shovel at work, and our photograph gives an excellent idea of the manner in which it eats its way into the material with which it has to deal.

Lives of Famous Engineers—

(*Continued from page* 161)

architecture. Some idea of the elaborate character of his proposals may be obtained from the following account given by his brother-in-law, Mr. John Callcott Horsley, R.A. :—

"His conception of the towers or gateways at either end of the bridge was peculiarly grand and effective, as may be seen from his sketches still existing. They were to be purely Egyptian; and, in his design, he had caught the true spirit of the great remains at Philea and Thebes. He intended to case the towers with cast iron, and, as in perfect accordance with the Egyptian character of his design, to decorate them with a series of figure subjects, illustrating the whole work of constructing the bridge, with the manufacture of the materials—beginning with quarrying the iron ore, and making the iron, and ending with a design representing the last piece of construction necessary for the bridge itself. The subjects would have been arranged in tiers (divided by simple lines) from top to bottom of the towers, and in the exact proportion of those found upon Egyptian buildings.

"He made very clever sketches for some of these proposed figure subjects, just to show what he intended by them. I remember a group of men carrying one of the links of the chainwork, which was excellent in character. He proposed that I should design the figure subjects, and he asked me to go down with him to Merthyr Tydvil, and make sketches of the iron processes. We accomplished our journey, and all the requisite drawings for the intended designs were made."

Works Temporarily Abandoned

The Leigh abutment was not completed until 1840, great delay being caused by the failure of the contractors. This delay led to an expenditure far in excess of the original estimates. In 1843 the whole of the funds raised, amounting to about £45,000, were exhausted, and there still remained to be completed the ornamental additions to the piers, half of the ironwork, the suspension of the chains and rods, the construction of the flooring and the finishing of the approaches. Great efforts were made to raise further subscriptions but without success, and in 1853, when the time limit for the completion of the bridge had expired, the works were closed in and the undertaking was abandoned.

Bridge Completed After Brunel's Death

Several proposals for completing the bridge were made in Brunel's lifetime, but it was not until about a year after his death that the superstructure was actually commenced. In 1860 some of the most prominent members of the Institution of Civil Engineers formed a company to carry on the construction of the bridge, on account of their "interest in the work as completing a monument to their late friend Brunel, and at the same time removing a slur from the engineering talent of the country." Work was carried on with great vigour and the bridge was finally opened on 8th December, 1864.

Although we thus see that Brunel did not complete the Clifton Suspension Bridge, his connection with it gave him the opportunity of making a name in his profession. In subsequent years he used to say that his success was due to his victory in the second competition for designs for this bridge.

NEXT MONTH :—

Brunel and the G.W.R.
THE BATTLE OF THE GAUGES

Engineering News of the Month

World's Largest Airship

Rapid progress is being made with the construction at Cardington, Bedford, of the R101, the world's largest airship, which will fly on the Empire air route to India. The engines, seven in number, will burn heavy gas oil fuel, and will produce a total horse power of 4,210. It is expected that the airship's maximum speed will be about 70 miles per hour.

* * * *

London's Oldest Machine

A steam-driven beam-engine at King's Cross (L.N.E.R.) is on the verge of its 120th birthday. It is believed to be the oldest piece of machinery in London still regularly developing power. Every day the old engine is hard at work providing power for the "shop" machinery. "Her action has been much admired by modern engineers," an official said recently, "and never in 120 years has the piston worked more than 1/32nd of an inch out of the vertical." The Company bought her second-hand from a wood sawyer in 1850 for £500, and since then she has always kept up at least a 48-hours' week.

* * * *

New Cement Works

Portland cement is playing such a great part in engineering that it will be of interest to all our readers to learn that the foundation stone of the largest Portland cement works in the United Kingdom was laid at Bevans, Northfleet, last month. The new factory will have a productive capacity of 10,000 tons of cement a week, or 500,000 tons a year—nearly one-sixth the total cement production of Great Britain. The installation of modern plant and the fact that the raw materials are on the spot, will, it is claimed, enable cement to be produced more cheaply at Bevans than at any other works in the country.

* * * *

No Palace of Engineering this Year

We feel sure that all our readers will read with regret the announcement that pride of place in the Palace of Engineering at Wembley is this year to be given to a display of housing, which is being organised by a special Committee. The exhibit will show the practical uses for the various new methods and materials now recommended for the building of houses and side by side with the display of houses will be exhibits devoted to such details as heating, lighting, ventilating, etc.

However interesting a Housing Exhibit may be—and no doubt it will be very attractive in its way—it cannot approach in interest the magnificent display of British engineering products that occupied the same space last year. It is doubtful, indeed, if there has ever been such an exhibit and it will certainly be a long time before we are privileged to see another like it.

It is pleasing to learn, at the same time, that this year the railway companies hope to show in some part of the Palace of Engineering large transport exhibits, which will illustrate the results of 100 years' progress. It is also hoped that there will be a representative display of water transport, in which the most important of the big steamship companies will take part. Further details will be announced on this page as soon as they are available.

* * * *

Four new steamers are being laid down at the Baltic Shipbuilding Yards, Leningrad. They will be used by the Soviet Government for the export of timber.

* * * *

Tunnelling on Mountain

Work will shortly be begun on a tunnel 16 ft. in diameter and 15 miles in length under Ben Nevis. This tunnel is being cut to carry the waters of Lochs Treig and Laggan to a new powerhouse at Fort William, for the Lochaber hydro-electric project of the North British Aluminium Company. The tunnel will cost something like £1,750,000, and the scheme will find employment for between 2,000 and 3,000 men for over three years. Large works for the production of aluminium, in connection with which extensive electrical energy is utilised, will ultimately be built at Fort William.

* * * *

Unroofing a Tunnel

A difficult engineering task is being carried out in the demolition of Chevet Tunnel, on the L.M.S. railway between Leeds and Sheffield. The tunnel, which is over 700 yards in length, is now being unroofed to allow another two sets of metals to be laid between Chevet and Snydale Junction in order to eliminate a very awkward "bottle neck."

The line is one of the busiest on the system, tapping the heart of the Yorkshire coalfield and some 240 trains pass through the tunnel every day. The total length of tunnel that is being widened is three and three-quarter miles.

The work entails the cutting of a passage through nearly 80 ft. of solid sandstone, as the rail level is about 94 ft. below the surface. Giant shields are placed beneath the arched roof to prevent bricks from falling on to the metals.

Flooded Under-Sea Mine

About half-a-million gallons of fresh water have been flowing daily into the Ellington Colliery, Northumberland, from some mysterious source beneath the North Sea. The inrush is completely under control, and, except that 40 men who were in the district when the burst occurred have been removed to other districts, the colliery is working as usual, and output is being fully maintained. Twelve hundred men and boys are employed in the pit, which belongs to the Ashington Coal Company.

It is supposed that this vast quantity of water has been stored in some huge receptacle existing in the strata between the sea and the mine galleries.

* * * *

Mammoth Water Tower

A notable scheme now in hand at Goole, in Yorkshire, is the construction of a ferro-concrete water tower, which will be the largest of its kind in the country. It will have a capacity of 750,000 gallons, against the capacity of 30,000 gallons of the town's present tower.

The new tower is part of a big undertaking to provide new waterworks at Pollington, where three connected wells will be augmented by a new bore-hole, 500 ft. in depth, and 3 ft. in diameter.

The height of the new tower will be about 147 ft. from the ground, and the tank 20 ft. in depth and 90 ft. in diameter. In the base alone there will be 30 tons of ironwork, the total weight being about 4,000 tons.

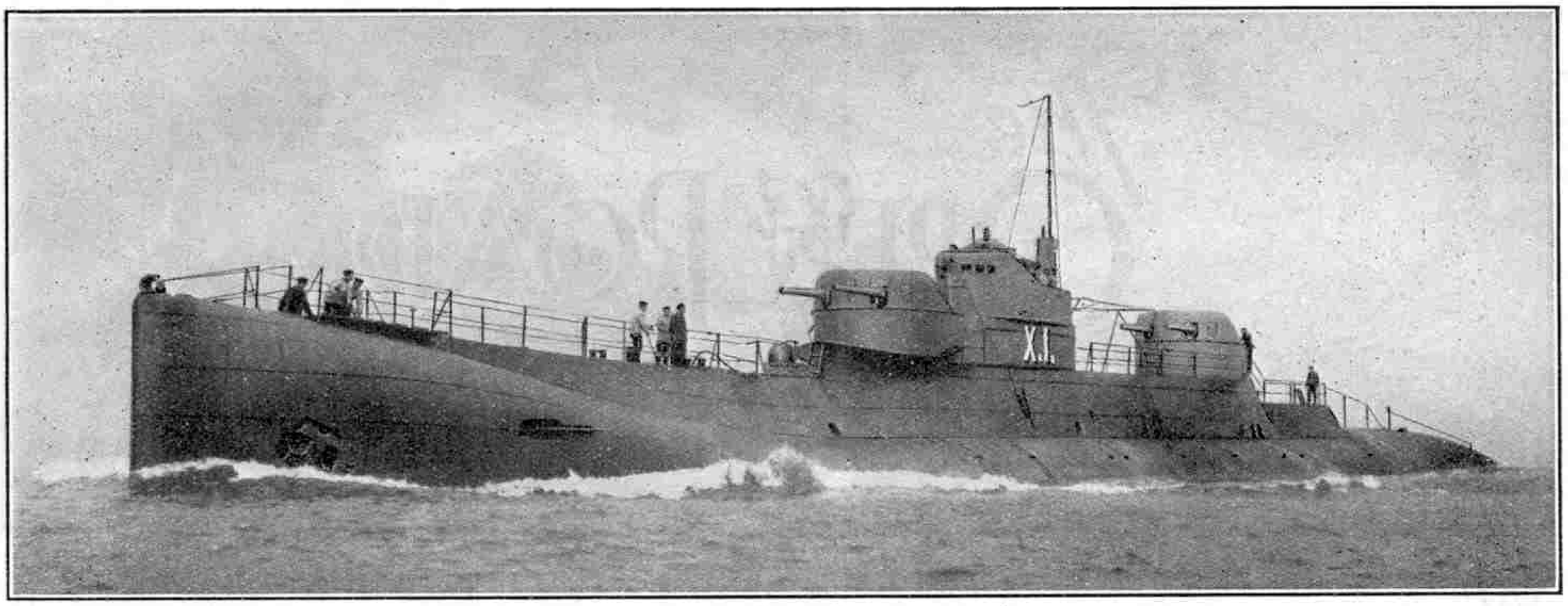
* * * *

A Sliding Hill

Following on the news of the moving mountain in Wales, it is now announced that two villages—Feetham and Low Row—in Swaledale, North Yorkshire, are in danger of being carried into the valley by the slipping of the hill-side above them.

The main road from Reeth to Kirkby Stephen is threatened, although at present it is still possible to use it. In some places the earth coming down the hill-side to the road resembles waves rolling on to the beach.

The movement is said to have been going on for 35 years, but has only recently become threatening. Perhaps some explanation is to be found in the fact that in Swaledale lead mines are believed to have existed in the reign of King John and the district where the landslide has occurred is riddled with mines.



Britain's New Submarine

Recently there arrived at Portsmouth the submarine X.1, reputed to be the largest and fastest submarine in the world. She is of an entirely new type, and having been built at Chatham in secret, has recently been engaged on tests.

Her dimensions are :—Length 350 ft., Beam 39¾ ft., Draft 17 ft. Her displacement is 2,780 tons on the surface and 3,600 tons submerged. Details as to the construction and performance of the submarine have not been published, but we understand she has a high turn of speed. She is said to have been designed as a commerce-raider, but she would be equally serviceable for many other purposes. She carries a crew of 100, each member of which has been specially chosen for proficiency, because submarines of such length and enormous weight as the X.1 require very careful handling.

Apart from her imposing size, there are several remarkable features, including two turrets, each containing a pair of guns so mounted as to be clear of the water even in stormy weather. The number of her torpedo tubes, and other details, have not yet been officially announced. She is the first submarine to have a canteen on board.

The building of the X.1 is particularly interesting in view of the fact that a German, Professor Flamm, some time ago took occasion to cast doubt on the skill of British submarine designers, alleging that they were baffled by the problem of the construction of large submarines. Professor Flamm himself designed two submarines, one of 4,000 tons and the other—which he called a "diving cruiser"—of over 7,000 tons—neither of which have yet been built.

Other countries are also building large submarines, as for instance the V2, recently built for the United States. This vessel is 341½ ft. in length and of 2,164 tons displacement on the surface. Her speed is 21 knots, and armament one 5" gun and six torpedo tubes. She carries a crew of 80. France is also building two large submarines, "*Vengeur*" and "*Redoubtable*," each of which has a displacement of 3,000 tons.

Proposed New Bridges

Several new bridges are proposed in the London area, the most important of which is necessitated by the present condition of Waterloo Bridge, to which further reference is made below.

One proposal is for a new bridge at Aldwych, whilst another is for a bridge at St. Paul's. There has been some talk, too, of the possibility of moving Charing Cross Station to the south side of the River. This scheme, which is entirely in the air at present, would be a gigantic engineering task and the expense involved would be colossal. Its completion would, however, make way for a new bridge at Charing Cross, the approaches for which would pass either under or over the Strand. A plan has been put forward for a bridge over the Strand with approaches reaching ground level near the National Gallery. The reason that makes it necessary for any new Charing Cross bridge to pass under or over the Strand is that the influx of cross-river traffic into the Strand would hold up the east and west traffic to such an extent that a bridge on any other plan would be impossible.

* * * *

Waterloo Bridge

The special Committee appointed to report on the bridges of the Thames have recently stated that in their opinion Waterloo Bridge should be demolished. This decision has given rise to considerable discussion, as Waterloo Bridge is one of the best known bridges in the world. The Committee state that they "would have been willing to make sacrifices in traffic improvements to save so famous and beautiful a bridge, but this would be useless. It must now be held as established that the old bridge is worn out and must be taken down to prevent it from falling down."

Waterloo Bridge was built by the famous engineer Rennie, and the special Committee recommend the construction of a new bridge with not more than five arches and of a sufficient width to carry six lines of vehicular traffic.

The Chief Engineer of the London County Council has ordered the closing of Waterloo Bridge entirely from the 1st May to the 30th June to permit the launching of the girders for the large span of the temporary bridge.

* * * *

Coal Transporters for the Sudan

Large engineering projects are being commenced shortly in the Sudan. These include a bridge over the Nile, tramway and waterworks schemes, and the erection of an important coal-handling plant. This latter structure at Port Sudan will comprise four of the largest electrically-driven travelling and slewing bridge transporters in the world. Erected on the "Temperley" principle, they will each have a length of 425 ft., span 215 ft. and lift of 45 ft. above the ground. The transporters will be fitted with high-speed grabs of 2 tons capacity, and will be used for loading and unloading steamers and barges, the coal being either distributed over the storage ground or delivered into the wagons of the Sudan Government Railways. It is claimed that the equipment will form one of the most important modern coaling installations.

* * * *

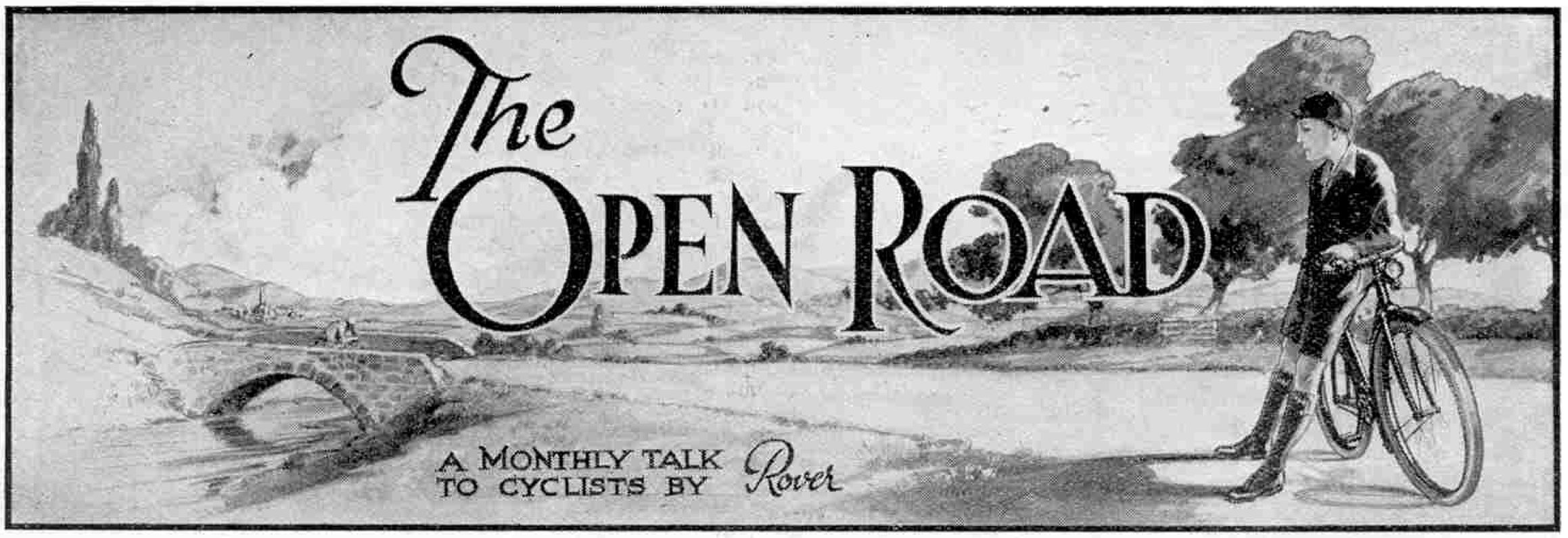
Berengaria's New Record

During the voyage from New York which finished at Southampton on the 6th March, the Cunard Liner Berengaria accomplished the fastest day's steaming of her career. From noon on the previous Sunday to noon the next day she covered a distance of 579 miles at an average speed of over 25 knots. She made the whole crossing at an average speed of over 23½ knots.

* * * *

Canal Drained Dry

In the construction of a culvert through the Trent and Mersey Canal, between Burton and Wellington, an old water-course was disturbed, and started a leakage in the bottom of the canal. In spite of the efforts of workmen, hastily summoned, the leakage rapidly increased until the bottom of the canal gave way. The surrounding fields were flooded and the whole length of the canal was drained dry. The borough surveyor, in conjunction with the canal engineer, at once grasped the importance of the situation (which entailed a fine of £50 a day for each day the canal was closed), and by great energy built up a concrete retaining wall well past the danger zone and thus enabled the canal to be used again.



WE know from our mail bag that a very large number of our readers own bicycles, and it is very evident that an even larger number would like to own them! Many of our readers tell us that they have "great expectations" this spring, and this applies more particularly to those readers who are lucky enough to have birthdays during the next month or two.

A Fine Recreation

Of course, we know that every one of our readers would prefer a motorcycle to a "push-cycle!" It is so much more interesting to sit in the saddle and control an engine than it is to be the engine yourself. However, motorcycles are beyond the reach of all but a favoured few, although in this connection we hope in the near future to give some details of how a motorcycle works and other information for which we have so often been asked. Sitting on a motorcycle becomes very monotonous on a long day's run, and the push-cyclist has the benefit of knowing that he is giving healthy exercise to all his muscles, whereas the motorcyclist must of necessity get off his machine now and again to stretch his cramped limbs.

There is no finer recreation than cycling and it has the benefit of being economical, for beyond the first cost of the bicycle, the machine occasions very little expense and this is chiefly concerned with tyres and such parts as usually wear out. The cyclist too, has a splendid opportunity of gathering a considerable amount of useful knowledge of the countryside, whereas the attention of the motorcyclist is mainly occupied with watching the road ahead and controlling his machine.

A Holiday Tour

Now that spring is here and the days are lengthening, all cyclists are beginning to think of the runs they intend to have in the near future and many are also turning their thoughts towards longer jaunts. They look forward to the time when they can leave home for a few days and enjoy an extended tour in some particularly beautiful part of the country, and those who have already experienced glorious days spent in this manner always feel the call of the open road when the sun is shining.

No doubt, to the majority of our readers the suggestion of an extended cycling tour sounds somewhat of an adventure—and an adventure it certainly is. You map out your tour beforehand, and plan to ride through an unknown country, like some explorer of old. From your maps and guide books, which you will find in every reference library, you get some idea of what the scenery will be like and of the chief objects of interest. So far as you are able you deal with facts, but you can also give your fancy full play. In imagination you can picture the sights you will see. You can think in advance of the delights of the mid-day halt under the cool shade of some woodland trees, and a bread-and-cheese lunch. You know that, if you are fortunate, you will be able to enjoy a dip, during the heat of the day, in some inviting stream or river, or if your tour is planned near the coast, a bathe in the sea.

Whether all your plans bear fruit in the actual tour is another matter, for a good deal—in fact everything—depends upon the weather. If you are sufficiently fortunate to get the Clerk of the Weather in a reasonable frame of mind, however, it is very certain that a cycling tour will afford you endless fun, healthy recreation, and a beneficial supply of fresh air, and you will return home with the feeling that if only the school sports were to be held the next day, you would create some new records in the high jump!

Choosing Your Route

Although Easter is generally a little early for a tour away from home, sometimes a very enjoyable holiday may be spent at this time of the year. Whitsuntide, which comes six weeks later, is better. Certainly the country is then more interesting, for as a rule the trees are bursting into leaf and everything is beautifully fresh and green, giving promise of even better times to come.

In planning a tour the first thing, of course, is to decide where to go. Even this preliminary step is interesting and liable to cause a certain feeling of excitement. Of course, if you are to have company on the tour your friend or friends will have to be consulted as to where the tour is to be. There are many other details to be discussed also—the question of expense, the duration of the tour, the distance to be ridden each day, and such points. It will also have to be decided whether the tour shall start from home or whether the train will be taken to the starting point.

Personally, the writer always favours getting as far away from home as possible and always takes the train from Liverpool to some distant point. On one occasion, for instance, a very enjoyable tour started from York and ended at Carlisle. Another commenced at Bristol and ended at Oxford. Probably, when the cyclist lives in a large town, or in some industrial area, it is better to save the time and energy required to get into the country by taking the train to, say, ten or fifteen miles beyond the outskirts of the home town, if not further afield. So much depends on the actual situation of the cyclist, however, and the funds available.

A Meccano Cyclist

Our photograph shows J. H. Boreham, who is an enthusiastic cyclist and was until quite recently secretary of the Grimsby Central Meccano Club. A Special Merit Medallion has been awarded to him for his excellent work on behalf of his late club and the Guild in general.

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Don't Go Too Far !

In planning a tour care should be taken not to arrange too long a tour in a limited time. If you feel you are riding against time, you lose more than half the pleasure and return fagged out. The "mile average" should be adjusted so as to give sufficient time to enjoy the surrounding scenery, to visit places of interest, and to partake of refreshments in comfort. If it is intended to tour in a hilly district, such as North Wales or Derbyshire, the mile average must, of course, be lower than in the case of a flat district. Don't make it the main object of the tour to pile-up the mileage but arrange so that, if you come to a fine stretch of moorland you can, if you wish, lie in the heather and have an hour's sleep !

Be sure to arrange to have one or two companions. The interest of the ride is very greatly increased by companionship, and toiling up long hills is not half so wearisome as it would be alone and if by any chance you get into difficulties of any kind a friend at hand is invaluable. It is probably more satisfactory to have only one companion on a tour, or two at the most. All kinds of complications arise if there are four or five members of the party and accommodation is more difficult to obtain for a large party.

It is advisable to make a note of the nearest railway stations along the route, in case of accidents, or if the weather should suddenly turn very bad. In such circumstances the knowledge that a railway station is not far distant will relieve a good deal of anxiety, both for yourself and for your parents ! A railway guide is helpful, too, and should always be included in the small supply of personal luggage.

A Camping-Out Tour

Now, the kind of tour you can plan depends largely on how much money you have to spend. For instance, if you have been able to "save up," or if you have had a "special allowance" promised to you for the purpose of the tour, you can plan your tour to enable you to enjoy the luxury—on tour—of sleeping between sheets each night, if you wish to do so. On the other hand, if funds are low, you will of necessity have to plan a camping-out tour.

Either tour can be made very enjoyable, especially the camping-out tour—which is very good fun if only the weather is kind—or you can, of course, plan a tour that is a combination of the two. So you see, a cycling tour can provide you with a great deal of adventure, and the very fact that you don't know where or how you will sleep each night, adds a spice of romance to your trip.

For the first kind of tour you can obtain a list of hotels, or of accommodation, in the towns you propose to visit, from the Cyclists' Touring Association, the Automobile Association, or from the Michelin Guide, and with pencil and paper you can not only compile a suitable list but you can also reckon up, to within a few shillings, what the accommodation will cost you.

For the camping-out tour all you require is a mackintosh-sheet to lie on, and some form of waterproof covering to form a sleeping tent. Even these are not necessary if you decide to take your chance and sleep in barns—for which you can generally get permission from some kind farmer. Straw makes fine bedding—warm and comfortable—and the barn provides the overhead shelter. Specially light waterproof, suitable for tents, may be obtained at any of the large London stores—the whole thing weighs only a pound or two, and is fixed up over a long stick resting at each end on a couple of crossed sticks. These handy tents are not intended to give protection against rain, of course, but simply serve to protect the sleeper from the heavy dews.

Preparing the Cycle

In regard to food—you can buy this ready to eat in the towns and villages en route or, if you prefer, you can cook your own by the camp fire. The latter method is the more fun, of course, but don't carry too many kettles and frying-pans—you will find they get heavier every mile !

Before starting on a tour your cycle should, of course, be thoroughly examined, oiled, and overhauled to the last detail. This is so obvious a necessity that it seems almost unnecessary to mention it, but taking into consideration the number of cycling breakdowns that occur on tour it appears that these preliminary precautions are by no means always carried out.

In particular the brakes should be carefully examined and adjusted, for in an emergency the life of the rider may depend upon their being in efficient condition. The slightest rattling in any part of the machine should be investigated and the cause remedied, as a rattle—in addition to being a constant annoyance—is often a warning that some more serious trouble is beginning to develop. The free-wheel should be cleaned by rinsing with paraffin, or better still, being taken apart and thoroughly overhauled.

It may be safely assumed that every cyclist, except perhaps a few very absent-minded ones, will remember before a tour to clean and fill their lamps and to fill their oil-cans with good lubricating oil.

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NEXT MONTH :—
TYRE-TREATMENT ON TOUR

The Secretary's Notes

Sectional Work in Clubs

Last month I referred briefly to the fact that during the past year there had been a growing tendency among the larger clubs to form sections devoted to individual subjects. In almost every case where this policy has been adopted the result has been to strengthen the club as a whole and to increase the enthusiasm of individual members very considerably. Although Meccano forms the basis upon which all Meccano clubs are built, yet it was never intended that the activities of clubs should be confined to Meccano. Boys' tastes differ, and whereas one may be perfectly content to spend the whole of his time on club evenings with Meccano, another may have wider interests and wish to divide up his time among a variety of subjects. Several keen Leaders have realised this and have formed their clubs into sections, each dealing mainly with one subject. These sections meet on certain nights but the general club night, on which all sections unite, is not allowed to be interfered with in any way.

Two Successful Experiments

Among the clubs that have successfully adopted the section system is the Holy Trinity (Barnsbury) M.C. which, after carrying out experiments last session, has now adopted the following sections : — Model Railway Building, Engineering, Fretwork, Radio, and Motor and Dynamo Construction. Each section has its own particular sub-leader who helps and instructs all new members, and many of the articles made in the various sections are sold and the profits devoted to buying material for further work or to helping to meet club expenses. The Rolleston (Burton-on-Trent) M.C. has adopted rather a different plan which, however, has worked very well. The club has been formed into senior and junior sections. The senior section, of course, takes matters more seriously, lectures being particularly popular. The juniors have the option of being present at these lectures, but if they are not interested in the subject or if they are getting tired they are perfectly at liberty to retire and build models or play games as they think fit. This arrangement ensures that each boy shall have the opportunity of availing himself of everything in the club's programme, and yet at the same time effectually prevents any member losing enthusiasm by being compelled to attend lectures, etc., in which he is not interested.

Funds for Club Outings

The majority of Meccano Clubs take every opportunity of paying visits to places in which their members are interested—gas or electricity works, engineering shops, factories, docks, etc.—but the number of such visits is generally strictly limited by financial considerations. It is obvious that the expenses of these outings cannot be met by club funds, for although the cost per individual member is small, the total amount in the case of a fairly large club is very considerable. On the other hand individual members often find that, when the time comes to make some pre-arranged visit, they cannot go because they are unable to pay their share of the expenses. In order to overcome this difficulty several clubs have adopted a very excellent scheme. A savings bank is opened purely for the purpose of accumulating funds for such visits. Each member pays in at regular intervals a small sum—it may be only a copper or two—and this money, gradually increasing, soon becomes sufficient to meet the expenses of the various visits decided upon. When the time for a particular visit arrives, each member is able, if he so wishes, to draw from the bank sufficient money to pay his share of the cost of the outing, and in this manner quite a number of visits may be carried out without any difficulty on the ground of cost. I strongly recommend all club Leaders to consider seriously the adoption of a savings bank scheme of this kind as by so doing they will greatly increase the scope of the club's activities. If desired, of course, the savings bank may be used to accumulate funds for other purposes, but in every case it will be found that the money thus saved is a great source of strength to the Club.

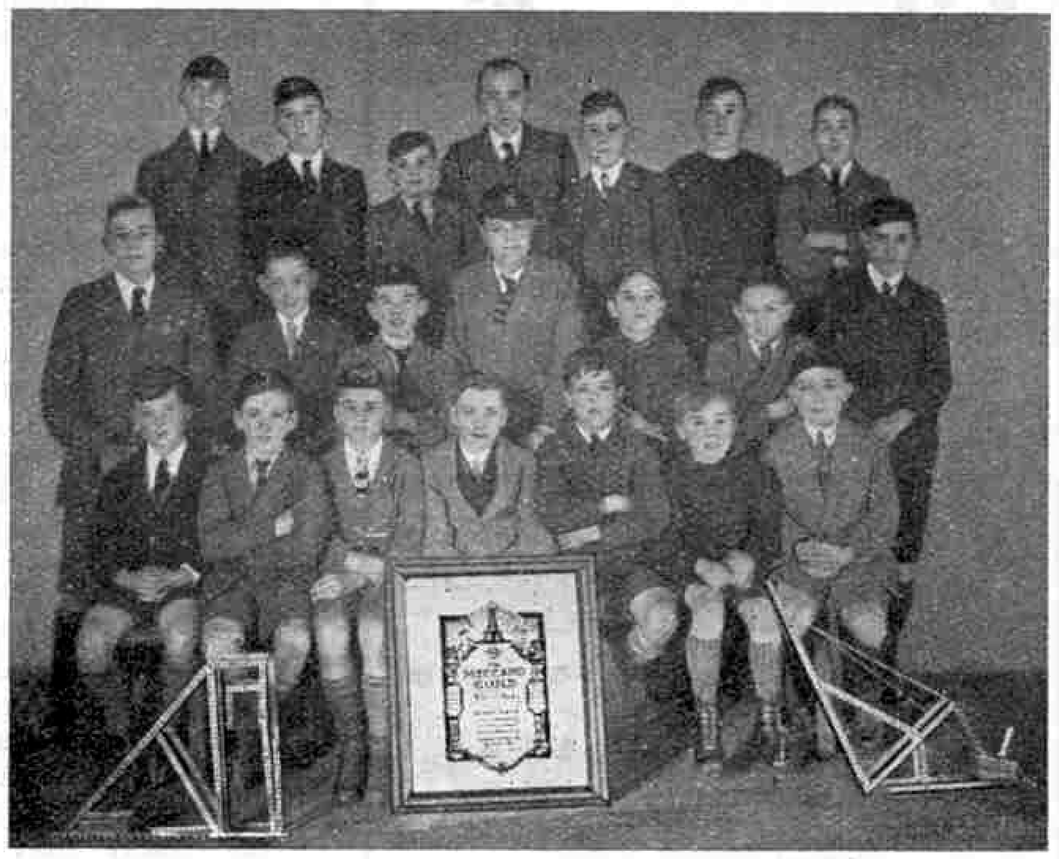
Special Merit Medallions

I have received recently a number of inquiries regarding the allotment of Special Merit Medallions, and as it is very desirable that there should be no uncertainty on this point I wish to make the facts quite clear. Two Special Merit Medallions are alloted to each club for each Session. One of these Medallions is awarded to the member who reads the best paper at the club meetings during the Session, and the other to the member who carries out the best all-round work for the club during the Session. Formerly the Medallions were awarded only for the two winter Sessions, but now that the spring and summer Sessions are firmly established, Medallions are awarded for these Sessions also. I should like all club Leaders to encourage their members to compete for the Special Merit Medallions, for not only are they well worth winning, but also the spirit of emulation produced in trying to win them has a remarkably good effect in increasing the vitality of the club as a whole.

The Medallions which are here illustrated, are very beautiful in both design and finish and have been produced specially for us by a well-known firm. On each Medallion will be engraved the name of the recipient. I trust that all Club Leaders will help me to make this valuable part of the Meccano Club work a great success.

Redruth Meccano Club

The Redruth M.C. was started in January 1924 and became affiliated with the Guild in February of the same year. Recently the club was divided into two sections called respectively "The Nuts" and "The Bolts," and the Leader goes under the appropriate name of "The Spanner." In addition the club has a Library, Savings Bank, Museum, Sports Team and an Ambulance Class, the last-named having recently been absorbed into the local Cadet Corps of the Ambulance Brigade. The club also publishes an interesting monthly paper called "The Popular Magazine," which has a good circulation. Steady progress has always been maintained by the club under the excellent Leadership of Mr. A. Williams, who is keenly interested in the boys and their hobbies.



The secretary, L. Trenberth, is also a most enthusiastic worker and has recruited many members to the Club, the total membership of which now stands at 40.

CLUB NOTES

Skelmanthorpe Wesleyan M.C.—The attractive programme for the second Session included three addresses on "Sports Ten Years Ago," by a local schoolmaster; "A Recent Trip around the Canary Isles," by Mr. T. Field; and "Curiously-shaped Coins of other Countries" by the President of the Yorkshire Numismatic Society. It is hoped shortly to commence a Gymnasium. An exhibition of Meccano Models and Hornby Trains was held and the money collected divided equally between the Club and the Sunday School. Affiliation was granted in February. Club roll: 18. *Secretary*: A. Field, King Street, Skelmanthorpe, nr. Huddersfield.

St. Mary (Newington Butts) M.C.—The 5th Annual Club Party was well attended by members, who thoroughly enjoyed themselves. At the conclusion an enjoyable Concert was held, and during the interval the Rev. C. R. J. Day, M.A., Vice-President, presented Special Merit Medallions to G. Burton and T. Imms for the best lecture and best all-round work respectively. Twenty prizes were awarded to other members. During the evening ten new members were enrolled. Other club activities include a lantern lecture by the Leader, Mr. Treves, on "London's Underground." Owing to the increased membership it has been necessary to take larger club rooms. Club roll: 134. *Secretary*: Mr. C. Curle, 37, Pullens Flats, Peacock Street, Kensington, London, S.E.11.

Southall M.C.—Are still unfortunately without a club room, but it is hoped to get the club attached to a Section of Scouts who are trying to obtain funds to build their own club house. Should this materialise, a room has been promised to the club. Mr. Carpenter, the Leader, is keeping in touch with all the club members and hopes to arrange rambles and cycling outings during the summer. Club roll: 12. *Leader*: Mr. E. C. Carpenter, 56, Hammond Road East, Southall, Middlesex.

United Schools (Melton Mowbray) M.C.—Mr. C. R. York, the Leader, has resigned, and Mr. Moalds has taken over the Leadership. A concert has been arranged in which six of the members will give a sketch entitled "Honesty." The old club room has been vacated, as a larger and well-furnished room has been procured from the Wesleyan Chapel. Club roll 24. *Secretary*: H. White, 25, Bayswater Road, Melton Mowbray.

Newcastle-on-Tyne M.C.—Became affiliated with the Guild in February. Meetings are held fortnightly and the programme includes Model-building Competitions, Papers by Members, Lectures, and the formation of Stamp Collecting, Fretwork and Cycling sections. A Cricket Team is also being formed. Club roll: 22. *Secretary*: J. Stoddart, 71, Walker Road, Newcastle.

Holy Trinity (Blackburn) M.C.—Members have been busy constructing models for the local Sale of Work, when quite a number of excellent models will be on show. A wireless set is to be fitted up and it is hoped that this will help to raise funds. Club roll: 28. *Secretary*: H. Jepson, 11, Pine Street, Blackburn.

Redruth M.C.—A lecture on "Different Sources of Electricity" has been given by H. Lidley, and P. Dungey is to give a talk on "Motors." The club Library contains a number of interesting books which can be borrowed by members. There is also a "Scrap Library" containing about 200 books, papers and magazines, and the subscription rate is a penny per week. Club roll: 40. *Secretary*: L. Trenberth, Tunnel Stores, Redruth.

Great Baddow (Chelmsford) M.C.—Recently a large model of a Crane was built and a lecture given on its several working parts. Other activities include Model-building, Lectures, Games and a talk by the Leader. A Special Merit Medallion has been awarded to C. E. Rawlinson for the best paper written during the Session. Club roll: 14. *Secretary*: G. T. Kemp, 5, King Edward Terrace, Beehive Lane, Baddow Road, Chelmsford.

St. Barnabas (Barnetby) M.C.—Have held a successful social in the school room. An excellent musical programme was arranged and refreshments were provided during the interval. There were 33 persons present, and it is probable that the object of the social, which was to encourage boys to join the club, was achieved. Club roll: 24. *Secretary*: R. H. Ward, Laurel Villas, Victoria Road, Barnetby, Lincs.

Bromley County School M.C.—Are busy building a large Suspension Bridge designed by a member, A. M. Taylor. It is proposed to hold a Bazaar at which a display of Hornby Trains will be the chief feature. Club roll: 10. *Secretary*: H. Seale, 14, Broadway, Bromley, Kent.

South Park M.C.—Members now pay twopence per month to cover club expenses. Owing to the small size of the club room the membership is limited to 35. The programme includes Model-building, Speed Competitions, Lectures, Debates, Hornby Train Night, Games and Tournament, etc. Club roll: 35. *Secretary*: N. Tweddell, 103, Breamore Road, Seven Kings, Essex.

Accrington M.C.—Members recently paid a visit to the Holy Trinity (Blackburn) M.C. when a most enjoyable evening was spent in playing games, after which supper was served. It was arranged for the Holy Trinity Club to return the visit, and a right royal welcome was assured them. A club magazine has been started and a duplicator that has been purchased is working very well. Club roll: 26. *Secretary*: V. Waterhouse, 45, Ramsbottom Street, Accrington.

Meads (Eastbourne) M.C.—A Social Evening was held to which the local Girl Guides were invited, in return for their help at the club's Concert last October. Merry games were played and a local gentleman told some amusing stories. Members exhibited models they had recently made and prizes were awarded for the best, first prize going to L. Cross for his model of a "Flying Boat." Club roll: 19. *Secretary*: F. Laycock, 10, Victoria Place, Eastbourne.

Meccano Club Leaders

No. 20. Mr. A. D. Cecil

Mr. A. D. Cecil, Leader of the Westcliff and District Meccano Club, has always shown keen interest in boys and Meccano and has succeeded in making his club a great success. He has been instrumental in establishing a football team that has achieved a great reputation in the district, and the local paper has made a point of reporting every game played. The members of the team have become so enthusiastic that it is their wish to play "all comers" within a distance of five miles.

The club was started in May 1923, and by August of the same year such marked progress had been made that affiliation with the Meccano Guild was granted. Two girls have now joined the club and it is hoped that more will follow so that a girls' section may be started.

Ilfracombe M.C.—Have been fortunate in obtaining a new club room in the Oddfellow's Hall and members are now working with renewed energy. An interesting programme was drawn up, including Model-building, Lectures, Debates and a Mock Trial. The President, Miss Mais, arranged a Social Evening for the members and paid all expenses. Club roll: 26. *Secretary*: W. Webber, 14, Springfield Road, Ilfracombe.

Davenport M.C.—Make a feature of inviting local gentlemen to give lectures. Mr. B. Varly has given a most interesting talk on "Money," and other lectures promised include "Safety First on Railways," by Mr. S. Stoker, and "Bridges, Ancient and Modern." It is proposed to hold a Draughts Competition. Club roll: 35. *Secretary*: A. D. Stoker, 124, Bramhall Lane, Stockport.

Luton M.C.—A programme has been made out to carry the club's activities well into the Summer Session. After each meeting, the Leader, Mr. Burgoyne, gives a short talk on any happening of interest that has occurred during the week. A special "Hobbies Evening" has been arranged, on which any members bring anything of interest they wish, including steam engines, electrical apparatus, etc. Club roll: 26. *Secretary*: L. Goldsmith, 69, Tennyson Road, Luton.

King Edward (Birmingham) M.C.—An interesting Lantern Lecture on India was given by Major Phillips, D.S.O., F.R.G.S., M.A. This lecture was thrown open to the whole school, and Dr. Baker, Head Science Master, showed the slides. Further activities include an address by the Leader, Mr. McMaster, a Mock Trial, and a Model Railway Layout for which several members were expected to bring their own model railway equipment so as to make a good display. Club roll: 16. *Secretary*: F. J. Fowler, 55, Grantham Road, Smethwick, Suth Staffs.

Chalmers Church (Alloa) M.C.—A Lantern Lecture with local views, given by Mr. R. Kinmont, assisted by Mr. J. Fordyce, the Club President, proved a great success. A gratifying response was made by Church members and friends and a useful sum was raised by the small charge for admission. Mr. J. Snaddon has kindly consented to become assistant Leader. Club roll: 64. *Secretary*: W. Henderson, 13, Paton Street, Alloa, Scotland.

Marsh St. (Walthamstow) M.C.—An interesting paper was read by W. C. Knight on various types of railway locomotives, and other activities include lectures by the Leader, Mr. Gandy, on the "History of the Submarine Cable," etc. It is proposed to hold an Exhibition in conjunction with the Church Bazaar. Became affiliated last month. Club roll: 13. *Secretary*: C. W. Redfern, 34, Church Hill Road, Walthamstow, London, E.17.

Holy Trinity (Barnsbury) M.C.—Good progress has been made during this session and the newly-established sections are working well. Recent activities include Games, Model Railway Layout, Lantern Lecture on Models, and Talks by the Leader and by the Patron, the Rev. S. C. Rees Jones, on the work carried out by the club last year. The club room has just had its "spring clean" and is looking quite smart. Club roll: 29. *Secretary*: S. A. G. Bone, The Rosary, Kent Hill Road, South Benfleet, Essex.

South Africa

Simonstown Meccano and Wireless Club.—At the final meeting of last session Mrs. J. R. Langland, wife of the Municipal Electrical Engineer of Simonstown, presented prizes of Meccano parts to the successful competitors in the Model-building contest. Books were presented to the two successful girl members, who built models of a Crane and a Railway Bridge respectively. Club roll: 23. *Secretary*: Mr. R. G. Randall, c/o Municipal Office, Simonstown, South Africa.

Clubs not yet Affiliated

Louth M.C.—An interesting session has included a Lecture on Electricity, Model-building, Games, Wireless and Physical Drill. It has been decided to arrange the club's programme monthly in order to enable the committee to introduce improvements resulting from the experience of each month. It is hoped to obtain affiliation very soon. Club roll: 11. *Secretary*: H. Bell, 10, Dyas Terrace, Charles Street, Louth.

Christ Church (Stratford, E.15).—Arrangements have been made to visit the South Kensington Museum and other places of interest during the Spring, and a Savings Bank has been introduced to enable each member to save up for these outings. Other activities include Model-building, an Exhibition, Address by the Vicar and papers on "Steam Engines and Electric Light" by R. H. Bently, "Manufacture of Coal Gas" by J. E. Bently, "Our Ships" by H. Hoods and "The Meccano Guild" by A. Minter. Club roll: 15. *Secretary*: Mr. R. H. Bently, 81, Abbey Lane, Stratford, London, E.15.

Edgeley (Stockport) M.C.—Members have been busy preparing for their Exhibition. The club is well organised and in a sound position. Club roll: 14. *Leader*: Mr. G. McLeod, 13, Avondale Road, Stockport.

Lytham (Lancs.) M.C.—Mr. J. Culey has consented to become the Leader and meetings are held every fortnight at his house. Members are looking forward to their club becoming affiliated with the Guild, which, it is hoped, will take place shortly. Club roll: 10. *Secretary*: S. N. Culey, The Cottage, 20, East Beach, Lytham.

Mansfield (Notts.) M.C.—There was a good attendance at the club's Exhibition and Concert, at which several splendid models were displayed. The proceeds amounted to just over 9/- and owing to this success it is intended to hold another display soon. The Leader, Mr. Gash, is forming a Cricket Club and an Ambulance Class. Club roll: 26. *Secretary*: H. R. Wright, 20, Marlbrough Terrace, Mansfield, Notts.

The Sunshine Lodge (Canada) M.C.—Lance Clark, Mount Tolmie, B.C., Canada, has succeeded in starting a club and Mr. Hallwright, 916, Tolmie Avenue, Victoria, B.C. has accepted the Leadership. Those interested should communicate with either Mr. Hallwright or Master L. Clark.

Sea Point (South Africa) M.C.—Have held an interesting Model-building Race, divided into senior and junior sections, the winners being G. Boyle and K. Mills respectively. Mr. Barrett, President of the Observatory M.C. was asked to act as President until the annual meeting. *Secretary*: K. Scaife, 2, Arthurs Road Villas, Sea Point, South Africa.

Siena (Italy) M.C.—Meetings are held regularly every fortnight, and great preparations are now going forward for a Model Exhibition to be held shortly. Members are very enthusiastic and hope to obtain affiliation soon. *Secretary*: Valentino Bruchi, 39, Via Ricasoli, Siena, Italy (Tuscany).

Sliema (Malta) M.C.—The Lyceum Troop Scouts have kindly lent a suitable room where many enjoyable evenings are spent. The syllabus includes Lectures, Outings, Visits to Places of Interest, Model-building, Wireless and Papers by Members. Club roll: 21. *Secretary*: E. Bonnici, 25, Prince of Wales Road, Sliema, Malta.

Southport M.C.—At the first official meeting Mr. W. Bowker was elected Leader and E. Williamson secretary, with W. Leontieff and M. Yates on the committee. Mr. Gresswell explained the objects and aims of the Meccano Guild and promised on some future occasion to lecture on the "Meccano Chassis." A club room has been lent by the Southport Boy Scouts and the members are anxiously looking forward to becoming affiliated with the Guild. Club roll: 10. *Secretary*: E. Williamson, 10, Delamere Road, Ainsdale.

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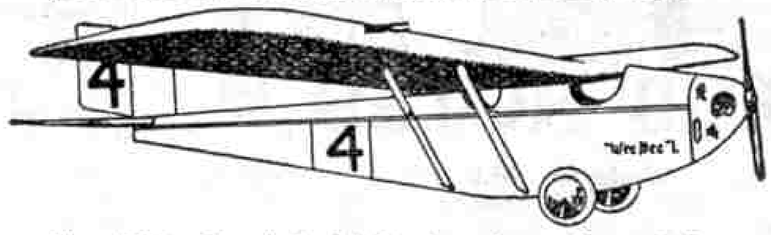

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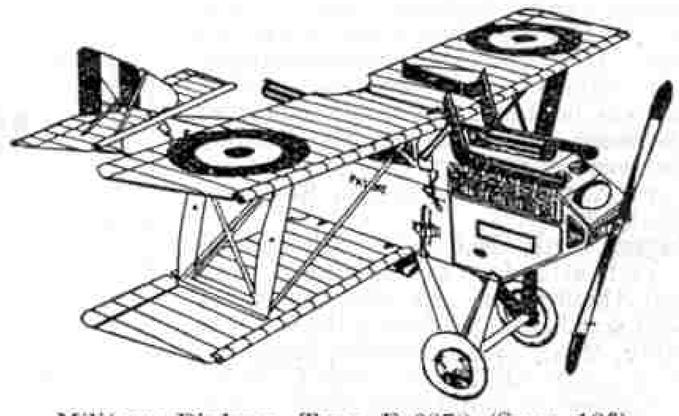

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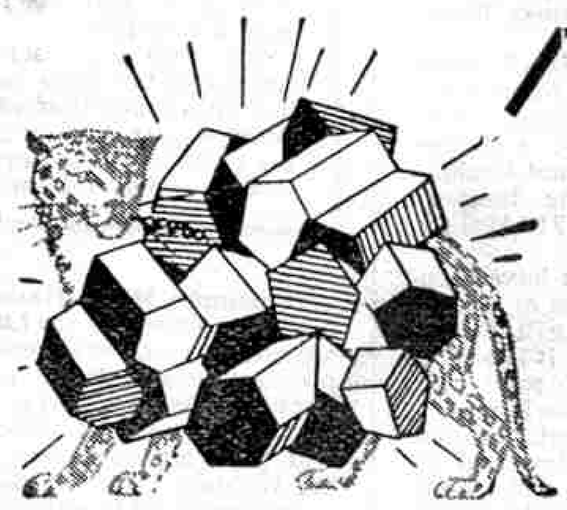

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Competition Corner

"Seven Modern Engineering Wonders of the World"

Essay Competition

This month we are adopting one of the proposals submitted in our "Suggestions" competition—an Essay Contest on the subject: "THE SEVEN MODERN ENGINEERING WONDERS OF THE WORLD." This contest should be of interest to almost every one of our readers, and therefore we hope to have an unusually large number of entries.

Each competitor must select the seven engineering structures or works that appear to him to be the most wonderful of their kind in modern times. Having made his choice, the competitor must then take each of his seven "wonders" in turn and write a brief description of it, at the same time stating why he has made this particular choice. We draw special attention to the last-mentioned point. It is not sufficient merely to describe seven remarkable engineering structures; the reasons for selecting these particular seven must be given.

The competition will be divided into two sections, (A) for those of 16 years and over and (B) for those under 16. Four prizes will be awarded—Meccano goods to the value of £1/1/– and 10/6 for the first and second in each section respectively.

Essays must not exceed 1,000 words in length and must be written legibly on one side of the paper only, with the competitor's name, address and age *on the back of each sheet.*

After this competition has been decided we intend to publish the names of all the engineering works selected by competitors and then arrange a voting competition to determine the first seven in the opinion of the majority of our readers.

Closing date 30th May (Overseas: 31st August).

Fifth Drawing Competition

Last month in commenting upon the entries for our Third Drawing Competition, the subject of which was "An Electric Tram," we remarked that the average quality of the drawings submitted was distinctly inferior to that of the locomotive drawings in the previous contest. Our Fourth Contest, however, the subject of which was "A Petrol Motor Bus or Motor Lorry," showed a big change, the entries being more numerous and of a quality closely approaching that of the locomotive contest. Apparently our readers are most keenly interested in self-propelled vehicles, and therefore we are announcing this month as the subject of our Fifth Drawing Competition, "A STEAM WAGON OR LORRY." Drawings may be made either in pencil or ink but colours are not to be used.

The competition will be divided into classes A and B for those of 16 and over and those under 16 respectively. Again we are offering four prizes—Drawing or Painting Materials, or Meccano products if preferred, to be selected by the winners, to the value of 10/6 and 5/– respectively for the first and second in each section.

Closing date 30th May (Overseas: 31st August).

Results

"Suggestions" Contest

Our "Suggestions Competition" announced in the February "*M.M.*" produced a large number of interesting entries. Many of the suggestions had to be turned down at once, however, because they were either unpractical or in some way undesirable for a magazine like ours. The four readers who put forward what appear to us to be the most practical suggestions are P. A. Dunslow (London), G. S. Marsh (Blackpool), H. Parker (Buckley, nr. Chester) and G. Stacey (Herne Bay). These four readers have therefore been awarded a Meccano Radio Receiver or a pair of Double Headphones as desired.

The suggestions of the above-named readers, briefly summarised, are as follows:—

1. A list of a certain number of Meccano parts to be published in the "*M.M.*" and prizes offered for the best original model made from these parts. The author of this suggestion, P. A. Dunslow, lays stress on the great advantage of competitions run on these lines in that they would test severely the ingenuity of the competitors, since every part would have to be used to its greatest advantage.

2. G. S. Marsh sends in the following suggestions:—(a) A voting competition to determine what the readers of the "*M.M.*" consider to be "The Seven Modern Engineering Wonders of the World." (b) A competition for Guild members only, the subject to be "The Best Club Motto." (c) A voting competition to determine the six best models in the Manual, the contest to be divided into two sections, junior and senior. (d) A painting competition, the subject to be "My Hornby Train."

3. H. Parker suggests a series of puzzle pictures drawn to represent the names of models in the Meccano Manual.

4. G. Stacey breaks new ground in suggesting a contest with the subject "The Best Meccano Limerick." As an alternative he suggests that a verse of three lines should be printed in the "*M.M.*" and a prize awarded for the best fourth line. Another suggestion put forward by this reader is that a prize should be offered for "The Best Anecdote about Meccano."

Some of the competitions suggested would naturally take some time to work out but it is possible to start one or two of the others without preparation, and elsewhere on this page we announce a contest on one of G. S. Marsh's suggestions to determine "The Seven Modern Engineering Wonders of the World."

Third Drawing Contest

We were delighted to see so many entries for this competition, which has more than proved what excellent artists many of our readers are. It was a most difficult subject, but the details in most cases were excellently drawn, and it took a considerable time to adjudge the winners. Finally it was decided to award the prizes as follows:—Class A, first prize (Meccano products value 10/6), N. Edgar (Blaydon-on-Tyne); second prize (Meccano products value 5/–), R. Brown (Greenock). In Class B similar prizes were awarded to A. Lumley (Chester) and W. G. Allen (Northampton) respectively.

"My Favourite Railway and Why I Prefer It"

The entries received from boys of all ages for this essay competition were very encouraging, not only in point of numbers but also on account of their excellent quality. It was rather unfortunate that some essays, otherwise good, had to be turned down because the writers, while describing a particular railway, did not give the slightest reason for preferring this particular line. The railways chosen ranged from the Hornby system to the largest group in the country. The Great Western, L.N.E.R. and L.M.S. groups were chosen in approximately equal numbers by the majority of the competitors, but apparently the Southern Railway is not quite so popular. Four prizes were offered in this contest and were awarded as follows:—Section A, first prize (Meccano goods value £1/1/–), R. W. Davies (Wrexham); second prize (Meccano goods value 10/6), E. Wright (Plumstead, London, S.E.18). Section B, first prize (Meccano goods value £1/1/–), W. Russell (Lewes); second prize (Meccano goods value 10/6), A Ray (Totterdown, Bristol).

Second Cross Word Puzzle Contest

Our cross word puzzle competitions appear to be still growing in popularity and if the same rate of increase is maintained we are afraid the next thing will be a scarcity of dictionaries! Although we endeavoured to make this contest much more difficult than the first, we could not baffle our competitors, the majority of whom solved the puzzles correctly. As in the case of the first competition of this sort, the most important part with which we had to deal was the puzzles invented by the competitors themselves. The three prizes offered in this contest were finally awarded as follows:—First prize (Meccano goods value £1/1/–), P. Malden (Kidderminster); Second prize (Meccano goods value 10/6), A. Hunter (Kirkcudbrightshire); Third prize (Meccano goods value 5/–), E. L. Bennett (Bury).

Overseas Result

Hornby Railway Essay Contest

The Overseas entries for this competition were not so numerous as those from Home readers but they were certainly equal in merit. As in the case of the Home section the greatest fault in the majority of the entries was that of making the layout too complicated and over-crowding it with accessories.

After careful consideration it was decided to award four prizes as follows:—Section A, First prize (Meccano goods value 10/6), Aly Ahmed Shwaky (Cairo, Egypt); Second prize (Meccano goods value 5/–), Serji M. P. Sammie (Trichinopoly, India). Section B, First prize (Meccano goods value 10/6), Delbert K. Upton (Fairlight, Sask., Canada); Second prize (Meccano goods value 5/–), George Cripps (Queensland, Aus.)

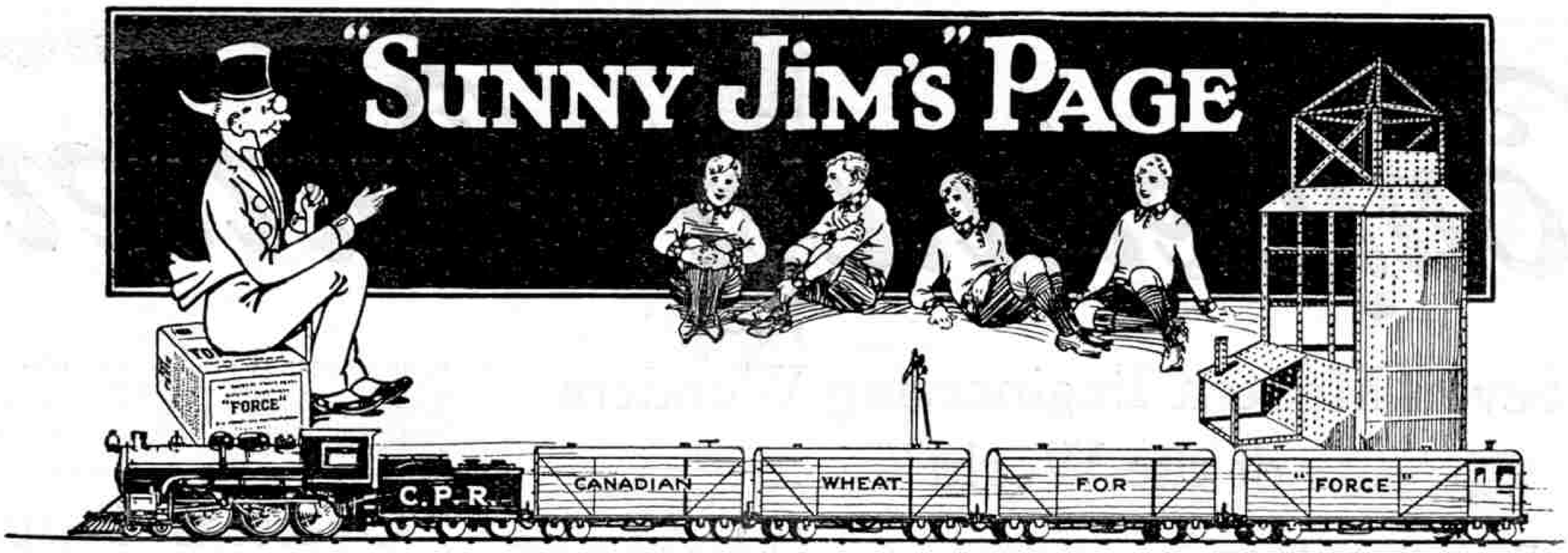
Competition Closing Dates:

HOME.			
Essay (March)	...	...	**30th April.**
Thirteenth Photo	...	...	**30th April.**
Essay (April)	...	...	**30th May.**
Fourteenth Photo	...	...	**30th May.**
Fifth Drawing	...	...	**30th May.**
OVERSEAS.			
Eleventh Photo	...	...	**31st May.**
Cycling Hints	...	...	**31st May.**
"My Favourite Railway" Essay			**31st May.**
Third Drawing	...	...	**31st May.**
"Suggestions"	...	...	**31st May.**
Twelfth Photo	...	...	**30th June.**
Fourth Drawing	...	...	**30th June.**
Essay (March)	...	...	**31st July.**
Thirteenth Photo	...	...	**31st July.**
Essay (April)	...	...	**31st August**
Fourteenth Photo	...	...	**31st August**
Fifth Drawing	...	...	**31st August**

Meccano Writing Pads

In response to numerous requests, we have now prepared special Writing Pads in two sizes, each consisting of fifty sheets of tinted bank paper, with cover and blotting paper.

Meccano Writing Pads may be obtained direct from this office. They are just the thing to use when writing to your friends, for the special notepaper shows at once that you are a Meccano boy. Prices: Large, 1/– each (post free); Small, 6d. each (post free).



A TRIP OVER THE "FORCE" MILLS

We are now going to accompany Harry and Dick on their trip over the wonderful mills that turn wheat into "FORCE."

"Come along," said "Sunny Jim." He took our two friends to an automatic elevator, which was taking the wheat from the railway trucks and hoisting it to the top of the building.

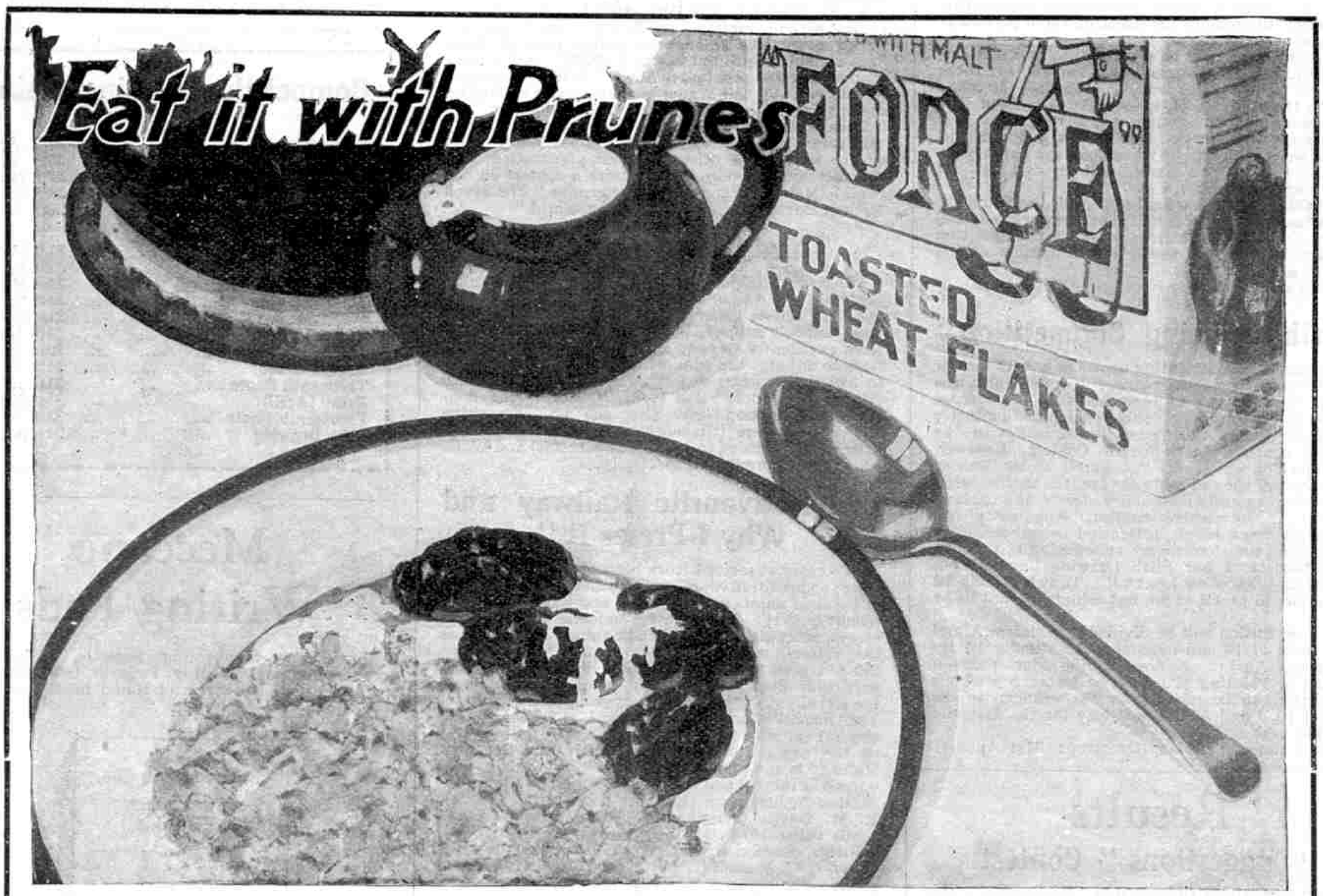
"Let's take the lift and follow it up," shouted Harry. They did so, and were soon watching the wheat being cleaned. It was then placed into huge revolving ovens.

They saw the barley malt added, and then round and round turned the big steam cookers.

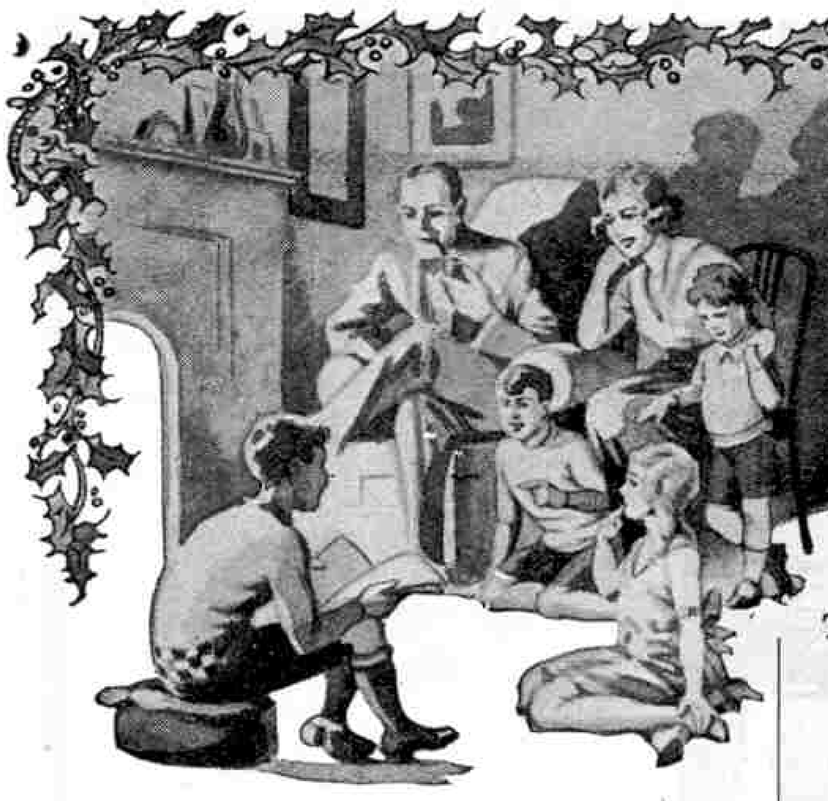
Cooking over, the little steam cooked grains were rolled into flakes, and carried on a travelling belt to the electric ovens.

"Sunny Jim" and the two boys gathered round. "This," said "Sunny Jim," is a conveyor belt that takes the flaked "Force" from the electric ovens to the packing machine. "Here it comes," said Harry, as the crisp flaked "FORCE" began to appear on the belt, and was soon racing off to the huge bin where it is stored for packing.

They then watched the automatic machinery packing "FORCE" into the familiar yellow wax papered packets, which were then passed down a conveyor, put into cases, and shot down a chute to the store room.



WOULD YOU LIKE A FREE SAMPLE OF "FORCE"? Send your name to "Sunny Jim," Dept. Mc. 7, 197, Gt. Portland Street, London, W.1., and he will send you one.



Fireside Fun

THE answers to the previous month's puzzles have taken up a great deal of room on this page recently and have crowded out many jokes and riddles to the disgust of many of my readers. I have therefore decided to keep this page exclusively for "Fireside Fun," and commencing with this issue the answers to puzzles will be found on the "Puzzles" page.

Last month's Cross Word Puzzles have tried severely the ingenuity of my readers and I hear that many dictionaries are becoming worn out! The Cross Word Puzzle for this month is not so difficult and it only needs a little perseverance until the two or three awkward corners are fixed up. After that the remainder of the puzzle is straightforward.

For this month's competition I am only giving one Cross Word Puzzle to solve, and I am not requiring an original puzzle from competitors. As will be seen from the instructions on the "Puzzles" page, each entrant must solve the Cross Word Puzzle and four other puzzles to be selected from those on the page. In this way I hope to encourage readers who are not keen on Cross Word Puzzles and who do not care to have to concoct original ones in order to compete.

AMBIGUOUS!

Sergeant (purple with rage): "What did you mean by firing then? Do you know you only just missed me?"

Recruit: "I say Sergeant, I'm awfully sorry!"

* * * *

Pat: "I've lost my dog, what can I do about it?"

Mike: "Advertise for him, of course."

Pat: "What's the use, my dog can't read advertisements!"

This Month's Short Story

Speed limit,
Road hog.
Police got him,
He's in quod!

* * * *

Smith: "My father smokes six ounces of tobacco every week."

Brown: "That's nothing, my uncle smokes fifty hams every week!"

* * * *

Tim: "What are you drawing, Billie?"

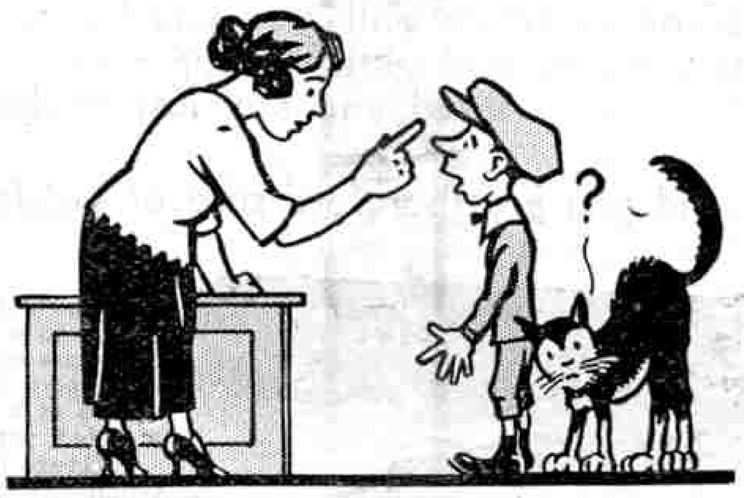
Billie: "A dog, of course."

Tim: "But it hasn't got a tail."

Billie: "Oh, its tail is still in the ink bottle!"

* * * *

A HOPELESS CASE!



Mother: "For goodness sake stop asking questions. Don't you know that curiosity killed the cat?"

Bright boy: "Is that so mother? What did the cat want to know?"

* * * *

Small boy (to grocer): "Please sir, Mother says this jam is full of stalks."

Grocer: "Can't you read? It says on the label 'Dobson's Jams, Branches Everywhere.'"

* * * *

Teacher: "Tommy, how many bones have you in your body?"

Tommy: "Nine hundred."

Teacher: "Then you have a great many more bones than I have."

Tommy: "That is because you didn't have fish for breakfast as I did."

* * * *

Bill: "Even a policeman can't arrest the flight of time."

Sam: "I'm not so sure. I've seen a policeman enter a doorway and stop a few minutes."

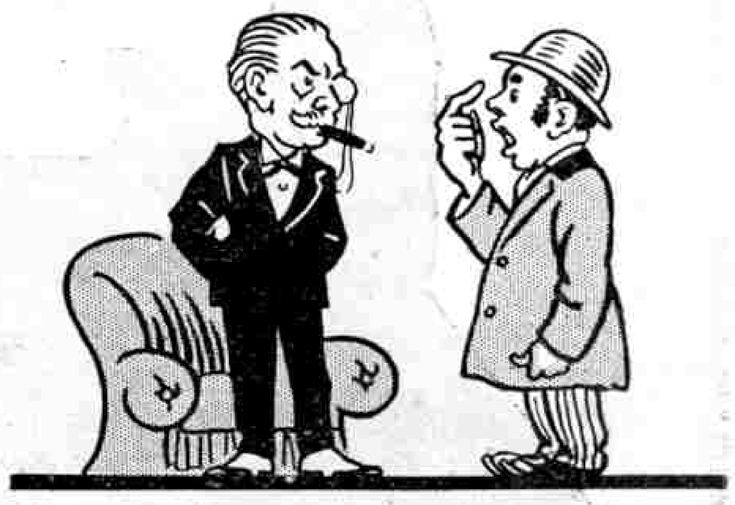
* * * *

Billy: "Something happened to me yesterday that will never happen to me again if I live to be a hundred."

George: "What was it?"

Billy: "I was fourteen years old."

PROOF POSITIVE!



Master (to manservant): "Did you deliver that letter to Mr. Smith?"

Manservant: "Yes sir, but its no use writing to him, he's blind."

Master: "Blind! What on earth do you mean?"

Manservant: "Well sir, he asked me three times where my hat was, and I had it on my head all the time!"

* * * *

Billie, staying at his uncle's farm, rushed into the house, out of breath and excited. "There's a mouse in the milk pail," he gasped.

"Well, Billie," said his uncle, "did you take it out?"

"No, uncle," said Billie, "I know better than that. I threw the cat in!"

* * * *

Drill Sergeant (to recruits): "What on earth is the matter with you all? That line is as crooked as a dog's hind leg. Fall out all of you, and have a look at it!"

* * * *

Q. If a forest were burned down, what trees would remain?

A. The ashes.

* * * *

Q. Why would lawyers make good soldiers?

A. Because they are always ready to charge!

* * * *

Boss: "Did you hand that parcel to Mr. Johnson?"

Boy: "No, he was out."

Boss: "But I told you to wait for him."

Boy: "Yes, but the door was locked and a notice on it said 'Return immediately,' so I ran back here as fast as I could."

* * * *

Visitor: "Do people often fall over this cliff?"

Guide: "No sir, only once."

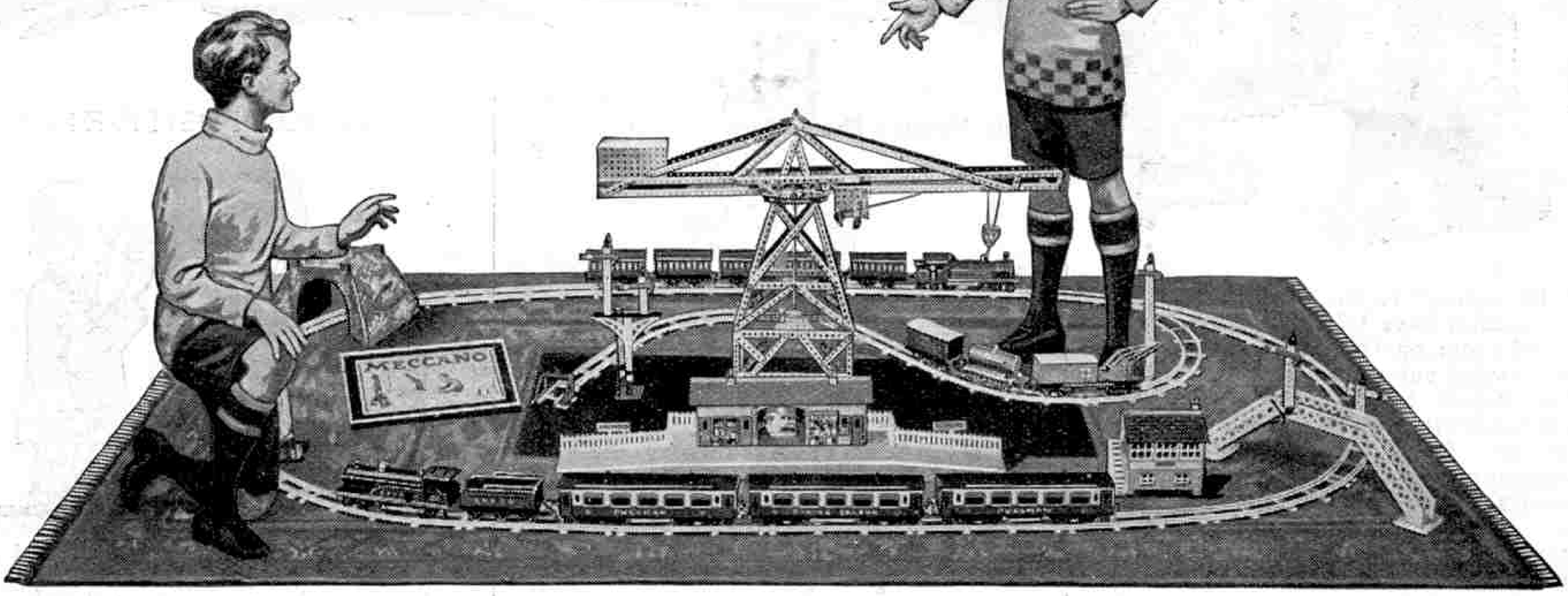
* * * *

Sailor: "Yessir. The big ship is a man-of-war and the little one is a tug."

Old Gent: "Ah yes, I know. You mean a tug-of-war."

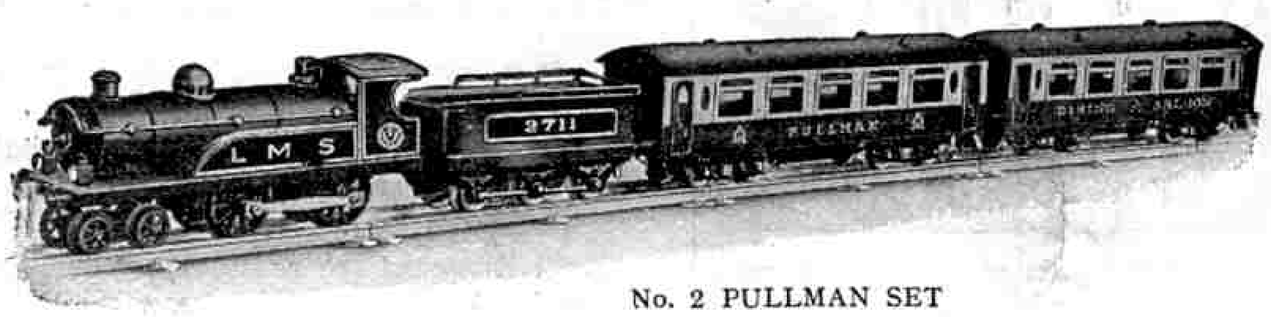
HORNBY CLOCK WORK TRAINS

THE TRAINS WITH THE GUARANTEE



YOU can have any amount of fun playing with a Hornby Train. Shunting, coupling-up the rolling stock and making up trains will give you hours of pleasure. Hornby Trains are beautifully finished, strongly made, and will last for ever. One of their most valuable features is that all the parts are standardised, and any lost or damaged part may be replaced with a new one.

Every train is guaranteed, and you are therefore sure of satisfaction if you buy a Hornby.



No. 2 PULLMAN SET

No. 2 Pullman Set

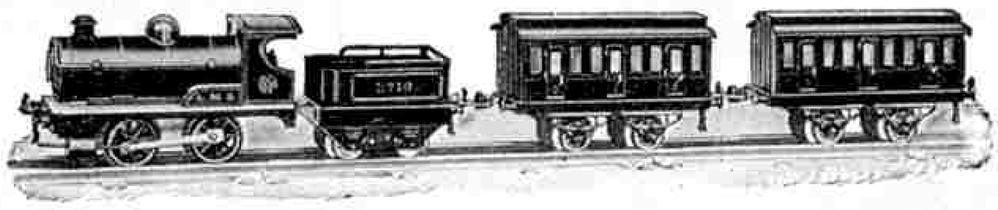
The No. 2 Loco with Tender measures 17 in. in length. The Loco is fitted with superior mechanism and the accurately-cut gears ensure smooth running. Loco, Tender and Coaches are superb in appearance and finish, enamelled in colours and stoved at a high temperature to ensure durability. The Loco is fitted with reversing gear, brake and governor.

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each set contains Loco, Tender and two Coaches, with set of rails to form a circle of 4 ft. diameter. Price 60/-.

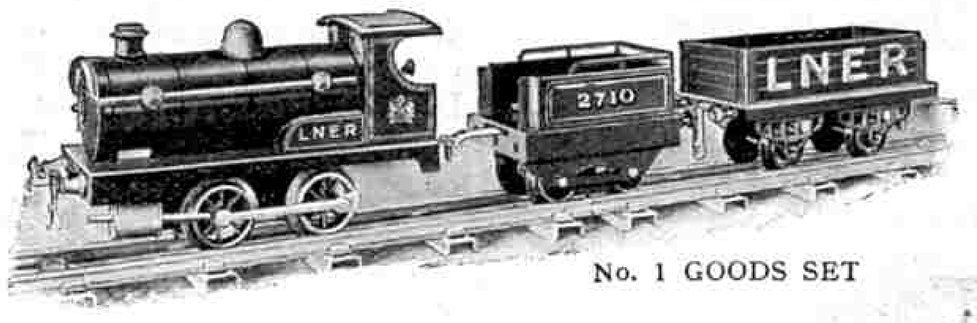
No. 1 Passenger Set

The Loco is fitted with reversing gear, brake and governor. Loco, Tender and Coaches are superb in appearance and finish, enamelled in colour and stoved at a high temperature to ensure durability. The doors of the Coaches open.

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each set contains Loco, Tender, two passenger coaches and set of rails consisting of two straights and curves to form a circle of 2 ft. diameter. Price 30/-



No. 1 PASSENGER SET



No. 1 GOODS SET

No. 1 Goods Set

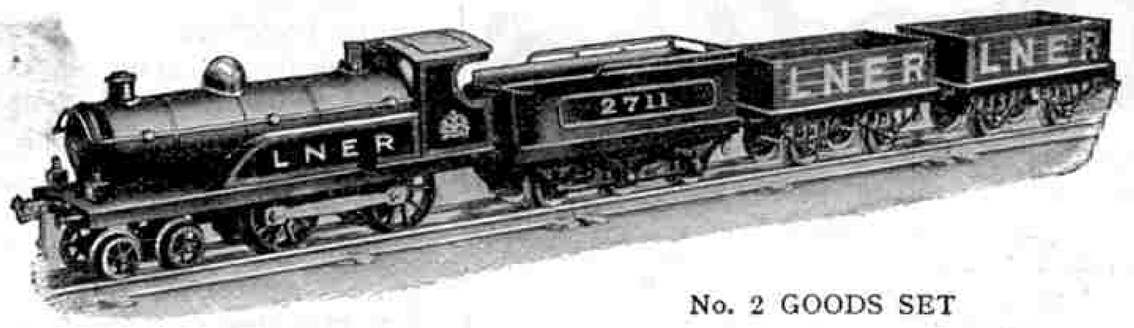
Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each Loco is fitted with reversing gear, brake and governor. Each set comprises Loco, Tender, one Wagon, and set of rails as in the No. 1 Passenger Set. Price 22/6

No. 1 Hornby Loco	Price 15/-	Hornby Passenger Coach	Price 5/-
" " Tender	" 2/6	No. 1 Hornby Wagon	" 2/6

No. 2 Goods Set

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling stock. This set contains Loco, Tender and Rails as in the No. 2 Pullman Set, and two Wagons. Loco fitted with reversing gear, brake and governor. Price 37/6

No. 2 Hornby Loco ...	Price 22/6	Hornby Pullman or Dining Car ...	Price 15/-
" " Tender	" 3/6	No. 2 Hornby Wagon	" 2/6



No. 2 GOODS SET

Ask your Dealer to show you the Hornby Trains

MECCANO LTD., BINNS ROAD, LIVERPOOL

ROLLING STOCK AND ACCESSORIES

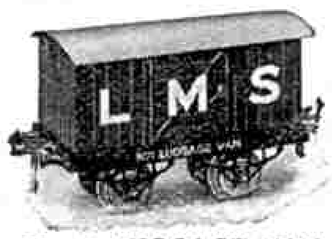
(HORNBY SERIES)

There are now 50 different train accessories—Stations, Signal-boxes, Lamps, Wagons, Level-Crossings, Foot-Bridges, Turntables, etc. Further accessories will be added to the system from time to time, and will be announced in the pages of the "*M.M.*"

All Hornby Rolling Stock and Accessories are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains and all have the uniformly beautiful finish that is the great feature of the Hornby series. With these accessories you can build up a most realistic railway system, and the splendid range of rails, points, and crossings make possible endless variety in rail layout. Hornby Trains are British made, and your dealer will be able to show you specimens of the new products.

SIDE TIPPING WAGON
Excellent design and finish.
Price **3/6**

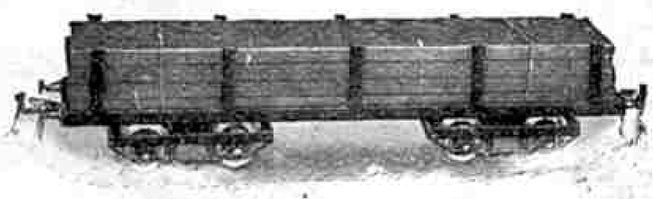
No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2 ft. radius rails only. Price **5/–**



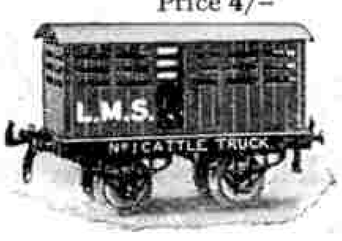
No. 1 LUGGAGE VAN
Representative colours.
Price **4/–**

No. 2 LUGGAGE VAN
Finished in colour. Fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**

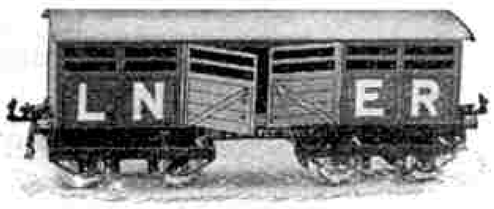
SECCOTINE VAN
Price **4/–**



No. 2 TIMBER WAGON
Beautifully enamelled in colour and stoved. Suitable for 2 ft. radius rails only. Price **4/6**



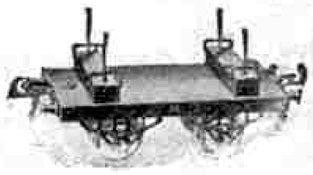
No. 1 CATTLE TRUCK
Fitted with sliding door. Very realistic design.
Price **4/–**



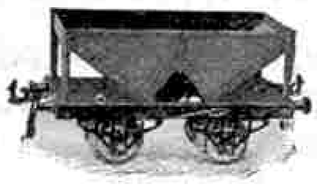
No. 2 CATTLE TRUCK
Splendid model fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**

MILK TRAFFIC VAN
Fitted with sliding door, complete with milk cans. Price **4/6**

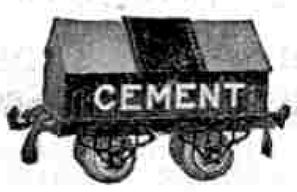
ROTARY TIPPING WAGON
Finished in colour.
Price **4/–**



No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **2/–**



HOPPER WAGON
Mechanically unloaded. Finished in colour. Price **4/–**

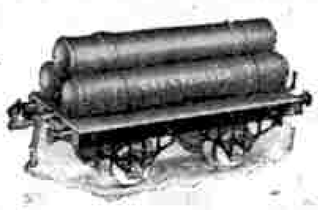


CEMENT WAGON
Finished in colour.
Price **4/–**

GUNPOWDER VAN
Finished in red.
Price **4/–**

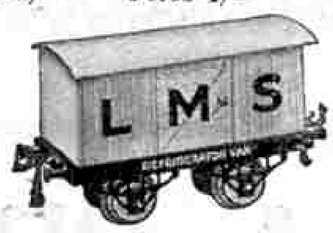
BISCUIT VAN
Price **4/–**

No. 1 TIMBER WAGON
Beautifully enamelled in colour and stoved. Price **2/–**



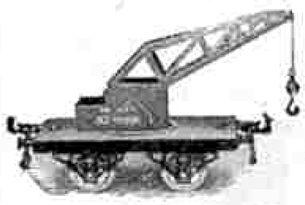
GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **3/–**

PETROL TANK WAGON
Finished in colour.
Price **3/–**

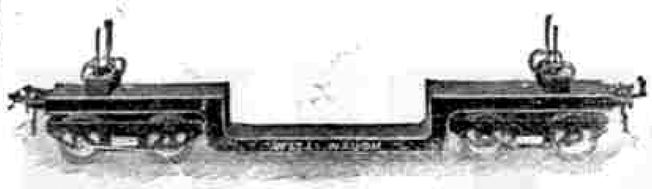


REFRIGERATOR VAN
Enamelled in white, lettered black. Price **4/–**

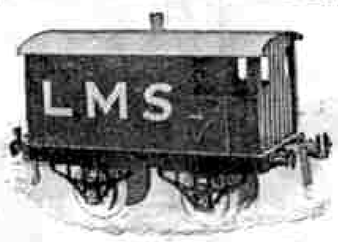
SNOW PLOUGH
Finished in grey, with revolving cutter driven from front axle.
Price **5/6**



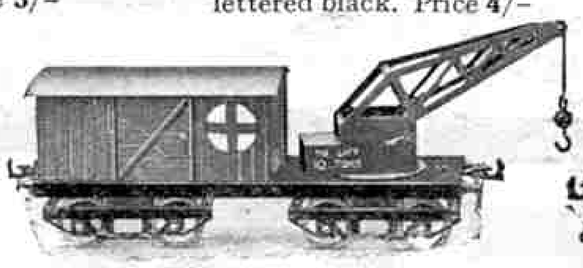
CRANE TRUCK
Working model. Finished in colours.
Price **4/6**



TROLLEY WAGON. Finished in colour. Suitable for 2 ft. radius rails only. Price **6/–**

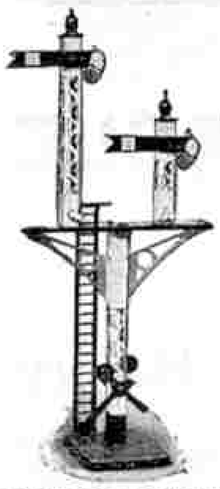


BRAKE VAN
Finished in colour.
Price **4/–**



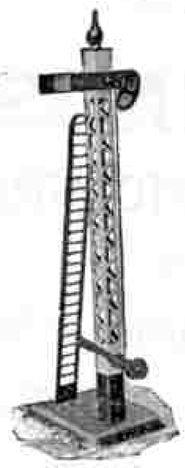
BREAKDOWN VAN AND CRANE
Excellent finish. Beautifully coloured. Suitable for 2 ft. radius rails only. Price **7/–**

GUARD'S VAN
Price **5/–**

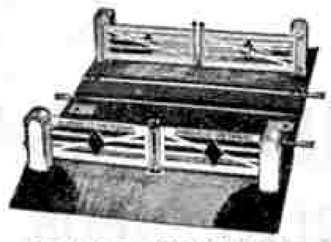


JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14 in. in height. Price **5/6**

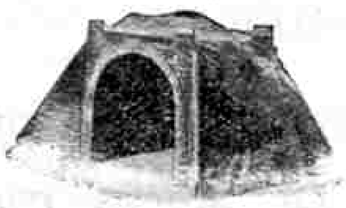
SIGNAL CABIN
Dimensions: height 6½ in., width 3½ in., length 6½ in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired. Price **6/6**



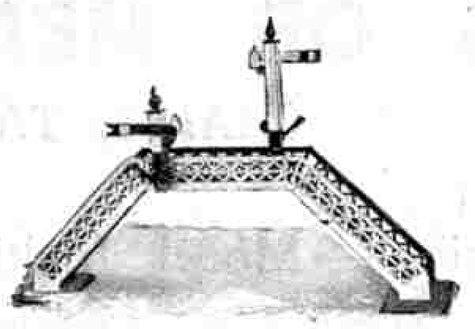
SIGNAL
Price **2/6**



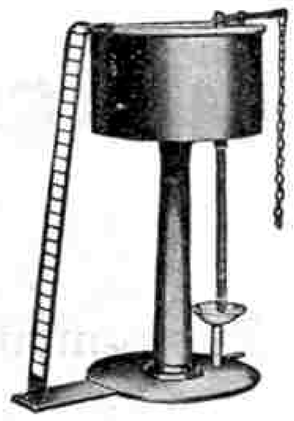
LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7½ in., with Gauge 0 Rails in position.
Price **6/6**



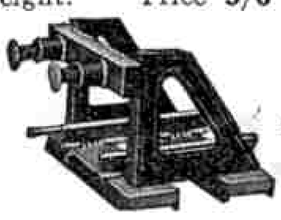
TUNNEL
Price **7/6**



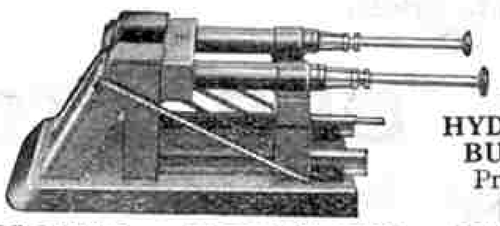
FOOT-BRIDGE
No. 1. With detachable signals. Price **6/–**
No. 2. Without signals. Price **3/6**
Signals, per pair **2/9**



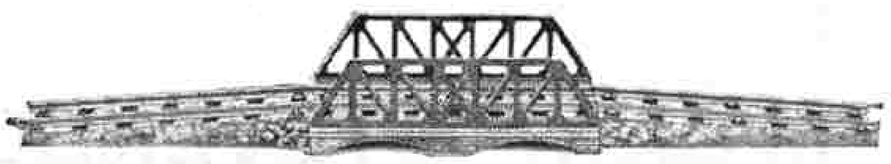
WATER TANK
Brightly coloured in red, yellow and black, 8½ in. in height, with flexible tube and pump lever.
Price **6/6**



SPRING BUFFER STOP
Price **1/6**



HYDRAULIC BUFFERS
Price **5/–**



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JAEGER
Pure Wool

The New "Meccano" Jersey

A Jaeger "Meccano" Jersey is made in the special "Meccano" pattern. It wears splendidly and prevents the frequent chill when a boy gets hot, as every boy will sooner or later. The "Meccano" Jersey appeals to every boy at once as well as to the "grown-ups" who study the health and happiness of children.

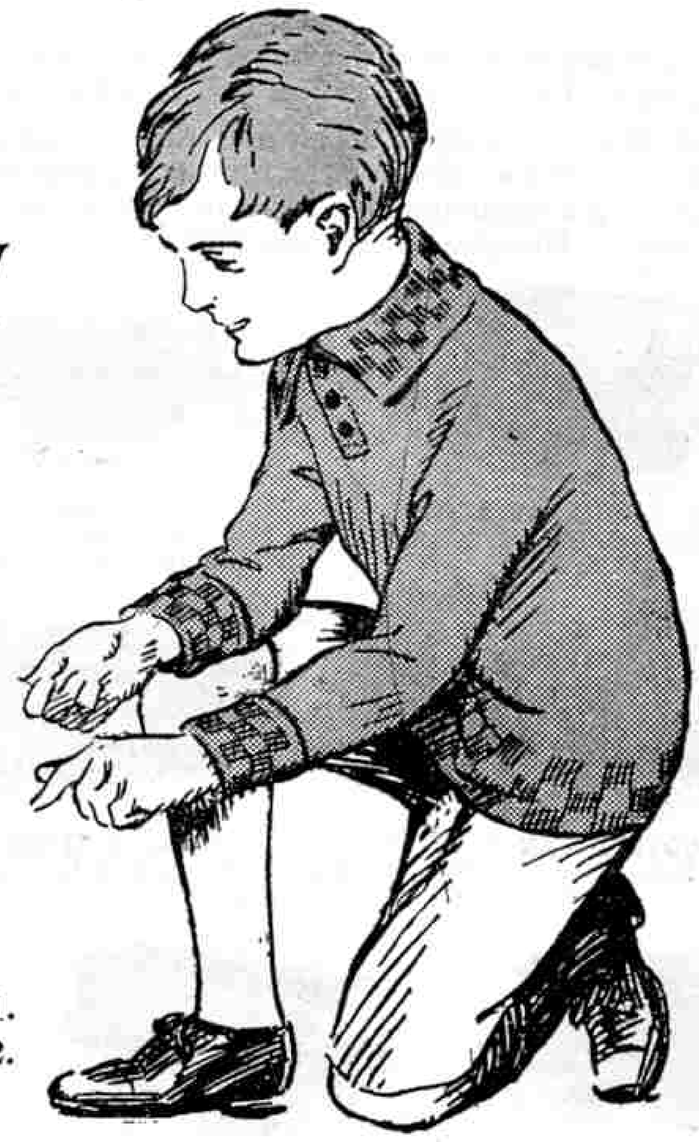
24″	26″	28″	30″ Chest
8/3	9/–	9/9	10/6

Light Fawn/Brown, Navy/Saxe,
French Grey/Mole, Mid Grey/White,
Brown/Light Fawn

Three-quarter Hose, Turnover Tops to match

3, 4	5, 6, 7	8, 9, 10
2/9	3/3	3/9

Obtainable only from Jaeger Depots and Agents.
(*Write for the address of your Local Agent*).



JAEGER HEAD RETAIL DEPOT : 352/54, OXFORD ST., LONDON, W. 1.
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BRANCHES : AUSTRALIA—Melbourne, 325, Flinders Lane. Sydney, 38/44, York Street.
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MAKES OR MENDS THINGS INNUMERABLE

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Photo-mounting — Model Making — Bookbinding — Mounting of Natural History Specimens — Renovation of Silk, Linen, Lace, &c., &c.

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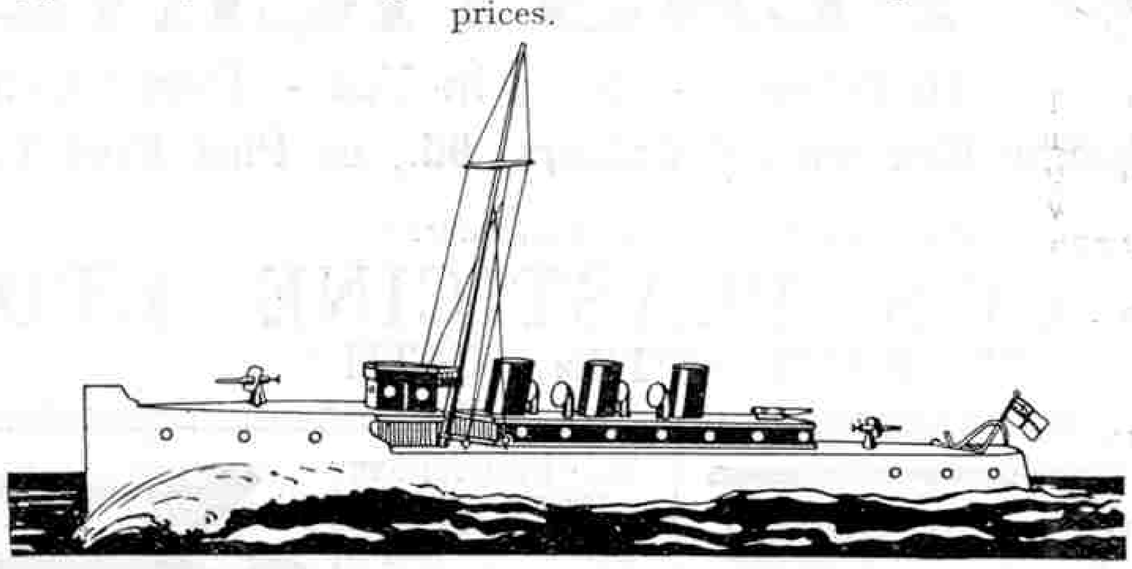
Write for a free booklet about Seccotine.

ZIP! There she goes—

Cutting through the water at a tremendous speed. You can tell at once by the long graceful sweep of her hull and the steady powerful hum of her engine that she's a **Bassett-Lowke Model Boat.** For realistic racing craft, which will hold their own against all comers, you can't do better than a sterling British-made Model Boat. Here is a unique opportunity of securing this season's Boats at exceptional prices.

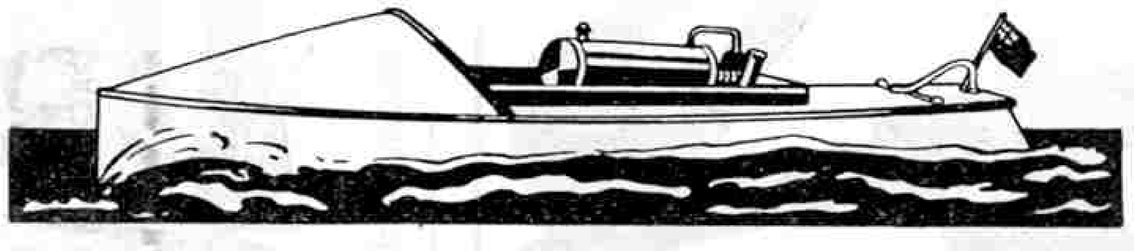


A WARSHIP FOR 50/-

This sounds too good to be true, but fifty shillings will buy a fine working model of a Torpedo Boat Destroyer, 26 inches long, produced by the House of BASSETT-LOWKE LTD.

MORE THAN THAT,

this T.B.D. is a scale model in appearance, and works under its own power, clockwork or steam. It is constructed and finished with all the care and attention associated with all "LOWKE" productions.



"DIXIE" MOTOR BOAT

A beautiful little model 21 inches long. Made with either Clockwork or Steam Drive. Spray-hood and hull hand painted; decking hand polished.

NEW SEASON'S PRICES

Model "Dixie," with clockwork movement and single-screw	**25/-**
Model "Dixie," with steam engine and single-screw	**25/-**
Model "Dixie," with clockwork movement and twin-screws	**29/6**
Model Revenue Cutter or Police Boat, with clockwork movement	**35/-**
Model T.B.D., 26 ins. long, with clockwork movement and single-screw	**50/-**
Model T.B.D., 26 ins. long, with steam engine and single-screw	**50/-**
Model T.B.D., 26 ins. long, with clockwork movement and twin-screws	**63/-**

DELIVERY IMMEDIATELY FROM STOCK.

Send for Abridged Price List No. 17 free on receipt of post card, to

BASSETT-LOWKE LTD., NORTHAMPTON

London Branch . . 112, HIGH HOLBORN, W.C.1.
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BRITISH MADE **LOTT'S BRICKS** OF STONE

A NEW BOX "O.A." FOR MODEL RAILWAY BUILDERS IS NOW READY

Price 3/3

The box is self contained and complete with designs, bricks, and roofs for 12 Models, three of which are illustrated below.

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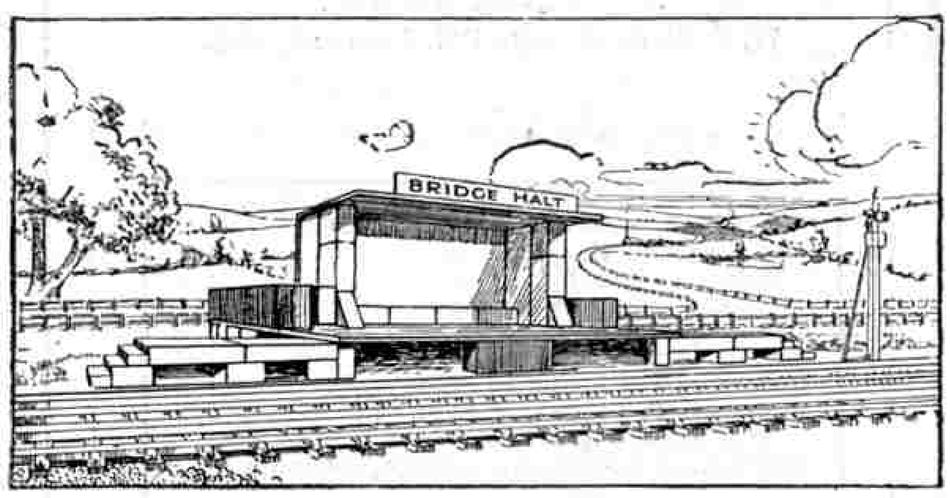
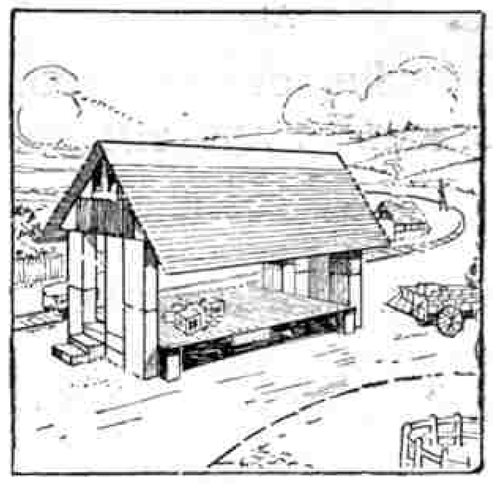


HALT



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Some London Stockists :

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The above new plans can be obtained separately price 4d. post free, also roofs and odd bricks, by those who already have the more advanced boxes in Series B.

LOTT'S BRICKS LTD., WATFORD, England

ROLLER SKATES

For Boys and Girls.

Every Pair Guaranteed.
Strong, Rigid, Adjustable to any size, and beautifully finished. They are exceptional value.

"A joy to own, a pleasure to use."

No. 3 with Threaded Clamps and Case-hardened Steel Wheels are only **5/-** pair
No. 6 with best Ball-bearing Wheels, **10/-** „
No. 7 „ „ and Block Heels, as illustrated **11/-** „

Postage and Packing 9d. pair extra.

Send at once to

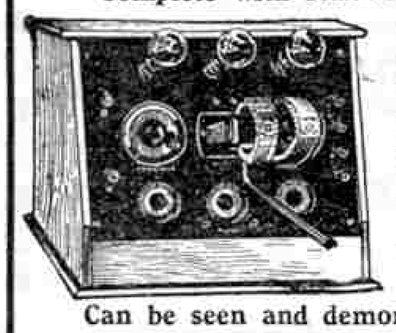
Bateson's Sports Depôt, Blackpool

3 VALVE SET £5

Compare this price with other advertisements or at your local Dealer or Stores.

Cabinet of solid Mahogany with sloping front, Ebonite panel, British made. Receives all B.B.C. Stations and will work Loud Speakers. Size 14 ins. × 12 ins. × 9 ins.

Complete with following accessories—



Sterling Dinkie Loud Speaker, Valves, Lead-in and Aerial Wires, Accumulator, H.T. Battery, Coils, Insulators, Plugs, etc. The whole complete Wireless Outfit Tested and Guaranteed.

£9 15 0

Can be seen and demonstrated any time.

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HOBBIES LTD.

GREAT SALE

Until April 15th.

FRETWORK OUTFITS, TOOLS, MACHINES AND TIMBER.

Discount 3d. in 1/-.

O.K. FRET MACHINE.

Price 37/6. Sale Price **28/1½**

£2,000 Pounds worth of new

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(except fixed priced goods).

3d. Discount in 1/-.

C. LUCAS,

35, MANCHESTER STREET, LIVERPOOL.

A FEW THINGS WORTH SENDING FOR. Folding Pocket Magnifier with Compass, 1/-. Scholars' Microscope with Muslin Insertion, 1/-. Solid Brass Long Range Tourist Telescope, 2/6. Postage 2d.—Bateson's Sports Depôt, Blackpool.

MODEL WITH HARBUTT'S PLASTICINE

10 Colours - Clean in Use - Ever Plastic

Sample Rainbow Box with 6 Colours, 9d., or Post Free 1/-

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HARBUTT'S PLASTICINE LTD.

99, BATHAMPTON, BATH

Find it in Books!

BOOKS ON ANY SUBJECT SUPPLIED.

State full title, author and publisher. Cash with order (including postage—any surplus returned).

S. COMFORT, The Book Store BURY, LANCS.

The JOYS OF RADIO!

Your Crystal Set may be improved 100% if you use Mercite Super Crystal.

Mercite gives ideal results because it is pure natural mineral. It faithfully preserves the rhythmic strains of music, or the mellow tones of a scientific lecturer.

Mercite gives ideal results because it is sensitive at every spot, and has a guarantee, which is an Englishman's bond.

Ask your dealer for Mercite in the sealed glass tube, 1/6, or send direct postal order, and a large Crystal will be sent post free.

ALBERT GLENDINNING,

71, Earle Road, Edge Hill, Liverpool, Eng.

Mention your dealer's name and quote "Meccano"

THE LATEST JOKES!
etc., can be obtained at HERBERTS.

The Breakfast Egg Joke	9d.
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ALL POST FREE. P.O.'s or Stamps from
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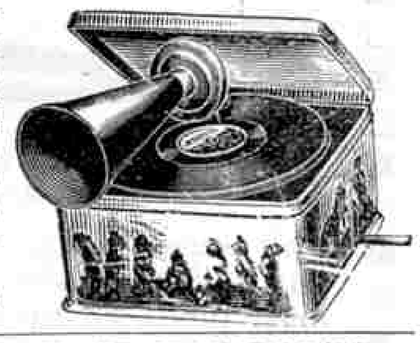
MAKE YOUR OWN ELECTRIC LIGHT **5/- only.**

These wonderful Dynamos light brilliantly a 4–6 volt lamp, and are very easy to work. **5/-** Post 6d. *Note New Address:*

GREENS (Dept. N.), 65, Long Acre, London, W.C.2.

The **"PYGMYPHONE"** —the gramophone that plays just like a large machine — complete with one double-sided record, **4/6** post free. Also the well-known 25-Shot Automatic Pea Repeater, **2/6** post free.

R. DILNOT,
125, Chiswick High Rd., London, W.4.

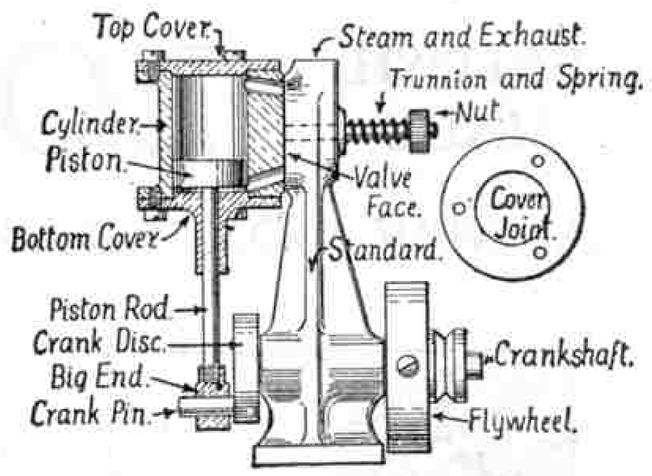


MAKE GRAMOPHONES.

Our 64-page Catalogue tells you for **3d. how to do it** and what accessories to choose. **Motors** in 25 sizes, from **9/-**; Tone arms, **4/-**; Speakers, **2/-**; Headphones, **10/6** pair; Cabinets from **9/-**. Gramophones from **25/6**. Carr. paid.

The Regent Fittings Co., D.78
120, Old St., London, E.C.1.

Established 21 years. Telephone: Clerkenwell 2923.



"Thank you for sending the S.T. Boiler. The engine, bought at Wembley, was soon coupled up and ran perfectly. My little boy was so pleased to see that it was powerful enough to drive a Meccano Crane."

Thus writes a customer. Above is the drawing sent with the instructions for building and we *guarantee* the engine will work.

S.T. Engine Parts ... 5/- } *Post Free*
Finished Boiler 8/- }

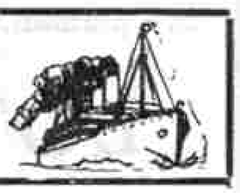
Send stamp for list 12M or 6d. for complete 80-page catalogue.

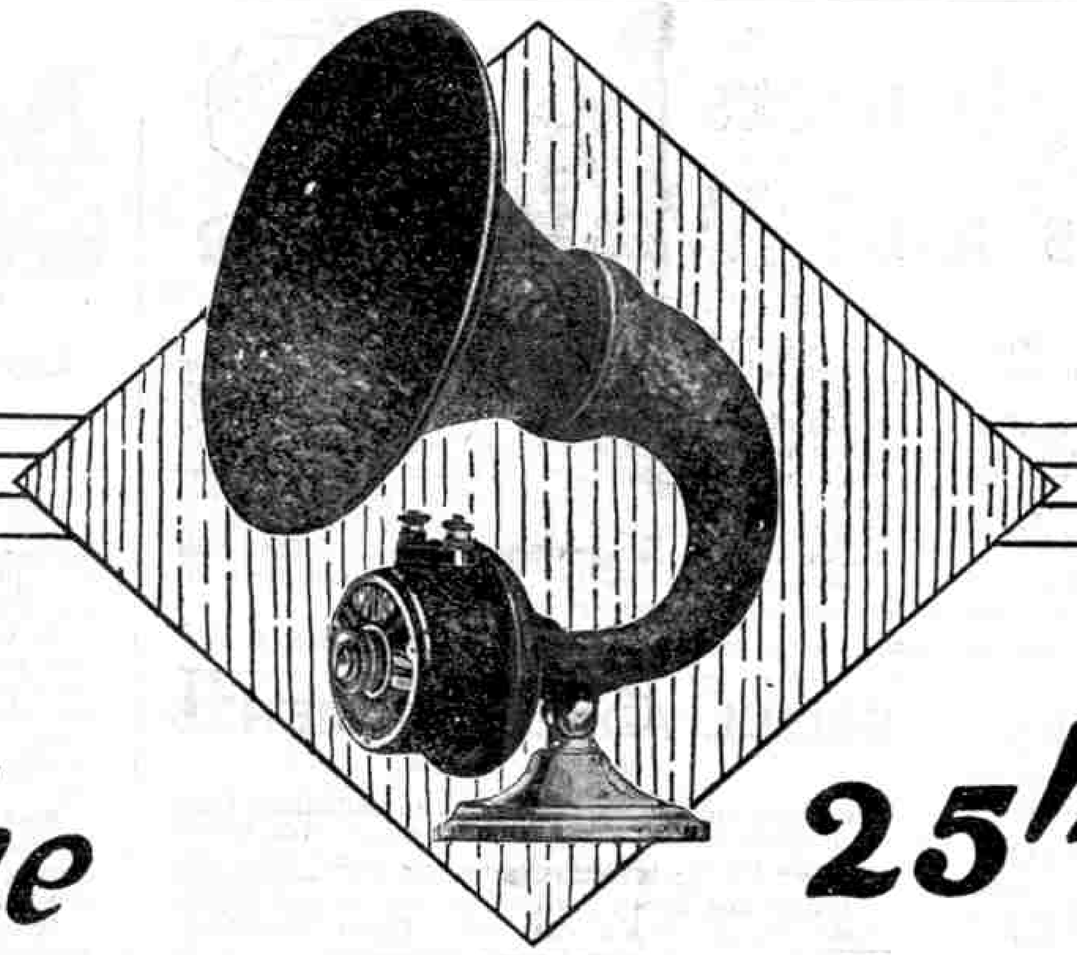
Stuart Turner Ltd.

HENLEY-ON-THAMES

MODEL SHIPS' FITTINGS

Send 6d. for Scale Drawing of Splendid Ocean Liner and List of Realistic Fittings. **A. Rodway, 102, Long Street, Birmingham.**





The **25/-**

AMPLION DRAGONFLY

A Real "Baby" Loud Speaker

IT has achieved the most outstanding success since the inception of Wireless Broadcasting. Although a "Baby" in size and appearance, the performance of the Dragonfly—costing only 25/—is comparable with that of many large Loud Speakers much higher in price, *particularly where it is associated with a receiving set of suitable power and efficiency.* This miniature instrument bears the AMPLION trademark and embodies the unique constructional details and patented features of the standard AMPLION "Dragon" Models.

It emphasises to the full the real meaning of "*efficiency for size*" and "*value for money.*"

The World's Standard **AMPLION** Wireless Loud Speaker

From AMPLION STOCKISTS and Wireless Dealers everywhere.

If you feel in any way dissatisfied with the performance of your AMPLION, please write explaining the circumstances to the House of Graham—Service Section, when practical suggestions will gladly be made.

Demonstrations gladly given during broadcasting hours at the London Showrooms :—
West End : **25-26, Savile Row, W.1.** *Suburban :* **79-82, High St., Clapham, S.W.4**

Patentees and Manufacturers :—

ALFRED GRAHAM & CO. (E. A. Graham) St. Andrew's Works, Crofton Park, London, S.E.4.

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Compagnie Continentale AMPLION, Bruxelles.
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Readers' Sales and Wants

If you have anything to sell or wish to buy anything take advantage of the service offered by a small advertisement in these columns.

The "*M.M.*" is read by approximately 100,000 people every month. It circulates in every country where the English language is spoken. If you wish to sell your duplicate stamps, your rabbits, or your tools, or to purchase a loud speaker, a steam engine, a model yacht, or a hundred-and-one other things, you will be able to do so through the columns of the "*M.M.*"

The rates are one penny per word, with a minimum of 1/– (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

If a Box Number is used, 4d. should be added to cover the cost of postage of the letters to the advertiser from this office. The letters will be posted one week after the advertisement appears, and a second batch a month after the advertisement appears. They will be sent more frequently if additional postage is included with the advertisement.

IMPORTANT.—Advertisements dealing with any article in the Meccano catalogue cannot be accepted.

PLEASED ADVERTISERS

We are getting far more enquiries than is usually the case. N. & Co.

I find your periodical very satisfactory. W.D.Ltd.

The business resulting from the February advertisement was so good that I had to miss your March issue—in fact, replies are still coming in. E.W.P.

I am satisfied with the results of my previous advertisement. H.J.H.

The small space we had with you brought in a fair number of replies. H.P.Ltd.

From my second advertisement in your paper I obtained about one hundred and twenty replies—including thirty-two from abroad. I shall have no hesitation in coming to you again next season. S.H.C.

We have received quite a number of orders for our apparatus this morning as a result of your advertisement. P. & T.Ltd.

I am a confirmed advertiser now in the "*M.M.*" and so far have had very satisfactory results. A.W.N.

We have no hesitation in asserting that our clients are convinced that your Magazine is one of the best pullers in which they advertise. B.D. & Co. Ltd.

We know from the results attained by our advertising in your Journal that your readers are most keenly interested in our goods. A.R.

I had great success with the last advertisement I inserted in your columns. L.F.

Recent advertisements in the "*M.M.*" have brought us satisfactory results, both numerically and in regard to the class of readers replying. S.G.Ltd.

We really are getting splendid results. F.Co.

I do not doubt for one moment that ½" in your paper equals ½ page in many purely philatelic journals. S.H.C.

My insertion in your November number produced very satisfactory results. E.C.C.

READERS' SALES

(*Rate:* 1*d. per word, min.* 1/-).

Strong Electric Motor, 4 volt, 7/-.—H. Wilson, 1, Clement Road, Wimbledon.

Two Fishing Lines, Telescope, 300 Cigarette Cards, 142 Boys' Books, Magic Lantern, Steam Engine with Whistle. What offers?—Write, E. Young, 30, Lyndhurst Drive, Leyton, E.10.

New Model Liner, complete with Electric Engine and Accumulator, very fast boat, 2ft. 10in. long, £4, carriage paid.—Andrew J. Umphray, Leraback, Foula, Shetland.

For Sale. Wireless valve panel; long arm, variable condenser (.00035 mfds.); loose valve coupler. Also Vol. 2 "Kodak" Magazine unbound. Good condition. What offers?—Desmond Heap, Southern Avenue, Burnley.

For Sale. Gilbert Motor, quite new, cost 6/6.—Apply Howard, 1, Mount Road, Fleetwood.

Children's Encyclopædias, 17 vols. for sale, 1909–1921; also Model Engineers, Nos. 1036–1115; Children's Newspapers, Nos. 1–150; Shocking Coil; Foreign Stamps. What offers. Write for particulars.—E. Heffer, 85, Northgate, Wakefield, Yorkshire.

"Meccano Magazines," 20 onwards. What offers.—Lomax, 12, Henry Street, Church, Accrington.

"Meccano Magazines," Nos. 11–35. What offers.—Ratcliff, 19, Old Deer Park Gardens, Richmond, Surrey.

Cinema. Oak base, 6½ spools, flex lamp (220 volts) with two thousand feet of films and 30 slides. New Christmas. Cost £8. Take £5 or offers.—Enquiries, Cornish, 16, Mina Road, Merton Park, London.

For Sale. Dynamo unused, 6 volts, 4/6. Also Variometer, Edison Bell, Condenser Cap, .0005, Set Cymosite Crystals all perfectly new. The lot 7/6.—House, 24, Woodman Terrace, Skipton.

Slide Valve Steam Engine for sale, can be seen running by appointment, suitable for driving Meccano Models, 31/6.—J. Hulme, 51, Peter Street, Blackburn (1½ Stroke).

SMALL ADVERTISEMENTS

(*Rate:* 1/- *per line*).

Patents, Advice, Handbook and Consultations Free. B. T. King, C.I.M.E., Regd. Patent Agent, 146a, Queen Victoria Street, London, E.C.4. 38 years' reference.

British and Exotic Fertile Ova, Larvae and Pupae. Lists Stamp.—Rose, Alexandra Road, Tonbridge.

POWERFUL HORSE SHOE MAGNETS guaranteed to lift one pound weight. Finished bright red, 2/3 each, Postage 3d.—Batesons' Sports Depôt, Blackpool.

Remarkable Offer. 5,000 Sex and Pole Indicators, Post free, 9d. each.—Walton's Emporium, Hebden Bridge.

LIVING LARVAE OF BUTTERFLIES AND MOTHS. ½d. stamp for lists.—V. Heath, 51, Woodville Road, King's Heath, Birmingham.

BOYS' STRONG HANDSOME NICKEL SILVER WATCHES, Luminous face, 4/6. Plain face, 3/11. Postage 3d. Reliable Swiss Lever Timekeepers. **Guaranteed 5 years.** Chains presented free.—W. P. Service, 19b, Rhodesia Rd., Stockwell, London.

MAIL ORDER ADVERTISING, for 7/10 inclusive. Sell your goods to eager provincial buyers through 56 influential newspapers. Prospectus: Central Press, (Series Dept. 55), 190, Strand, London, W.C.2.

MODELS OF 17/6 SWAN, WATERMAN AND ONOTO SELF-FILLING FOUNTAIN PENS with Pocket Clips, 5/– each, postage 2d. State Fine, Medium or Broad Nib.—Bateson's Sports Depôt, Blackpool.

HOME CINEMATOGRAPHS AND FILMS. Great bargains. Lists free.—Pictures, 109, Kenlor Road, Tooting, London.

CINEMA FILMS, 100 ft. 1/–, 1,000 ft. 6/–, delivered. —Phillips, 64, Ewart Street, Brighton.

HOME CINEMATOGRAPH MACHINES AND FILMS. List free.—Cinema, 83, Gibbon Road, Kingston, London

CINEMATOGRAPH FILMS, Machines, Accessories, Bargains. 100 ft. Film and List 1/–.—Tottenham Film Exchange. Offices, 2, Ascot Rd., S. Tottenham, N.15.

WHY PAY HIGH PRICES FOR CORRESPONDENCE COURSES? I can supply you with any course on any subject at from 50–300% of original cost. State requirements.

R. CLEMOES, St. Budeaux, PLYMOUTH.

MODEL RAILWAY CLUB

Exhibition of Members' Work

KINGSWAY HALL, KINGSWAY, LONDON, W.C.
Friday, April 17th, 1925, from 2—10 p.m.
Saturday, April 18th, 1925,
from 10 a.m. — 10 p.m.
Admission—Adults 1/3; Children (under 12) 6d. (including tax).

Are You Building a Valve Set?

Yes! Then you need our book of Complete Wireless Circuits, 3/9 post free. All Wireless Parts in stock. Headphones from 11/6. Loud Speakers from 22/6. Transformers, 7/6. Valves, all the best. Basket Honeycomb and Concert Coils. Fixed and Variable Condensers, 1/– up. Switches, Variometers, Cabinets, etc. List Stamp. All goods guaranteed.

PICKERINGS, 76, HUDSON STREET, PRESTON.

IF YOU PLAY THE VIOLIN

It is well to avoid being without a complete set of strings and have difficulty in obtaining a string when needed.

We will send a complete set of 6 reliable strings, containing 1 "G," 1 "A," 1 "D," and 3 "E" strings complete, post free

FOR **2/6** FROM

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MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICES:—

BINNS ROAD, LIVERPOOL.

Telegrams: "Meccano, Liverpool."

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 3d. per copy. It will be mailed direct from this office, 2/– for six issues and 4/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest; payment will be made for those published. Whilst every care will be taken of those submitted, the Editor does not accept responsibility for any loss or damage. A stamped addressed envelope should be sent where the contribution is to be returned if unacceptable.

Binding Cases. Spring-back Binders to take a number of "*M.M.'s*" are supplied, covered with imitation leather and lettered in gold, price 3/– each (post free).

Meccano Writing Pads. Fifty sheets of tinted bank paper, each printed with Meccano boy at head, 1/– (post free) large size, and 6d. (post free) smaller size.

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Readers' Sales and Wants. Private advertisements (*i.e.*, not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

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Display. Quotations for space bookings, and latest circulation figures, will be sent on request.

Press Day, etc. Copy must be received not later than 10th of each month for publication in following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher Copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 4d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Obtaining the "*M.M.*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 3d. per copy, or mailed (post free) direct from Liverpool, 2/– for six issues, or 4/– for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms.

CANADA: Meccano Ltd., 45, Colborne Street, Toronto.

AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.

NEW ZEALAND: Messrs. Browning Ifwersen Ltd., P.O. Box 129, Auckland.

SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), Textile House, Von Brandis St., Johannesburg.

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WITHOUT PREVIOUS EXPERIENCE
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RODWAY, 102, Long St., Birmingham
Mention "Meccano."

CUT THIS OUT. **'Meccano' Pen Coupon, Value 3d.**

Send 5 of these coupons with only 2/9 direct to the **Fleet Pen Co., Fleet Street, E.C.4.** You will receive by return a splendid British 14-ct. Gold Nibbed Fleet Fountain Pen value 10/6 (Fine, Medium, or Broad Nib). If only 1 coupon is sent the price is 3/9. 3d. less for each extra coupon up to 4 (Pocket Clip 4d.) Satisfaction guaranteed. Your own name gilt letters, either pen 1/– extra. **Lever Self-Filling Model with Safety Cap, 2/– extra.**

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THEY'RE BRITISH MADE AND WORLD FAMOUS

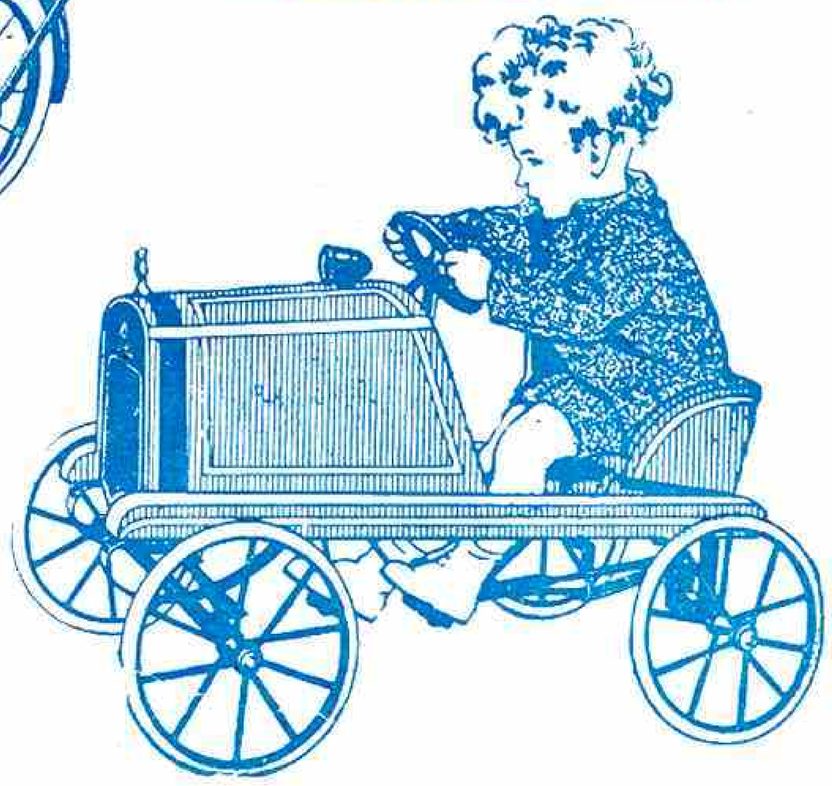
Lines Bros. Toys are made at the largest Toy Factory in the world by skilled British Craftsmen. Each Toy is well finished and soundly constructed, and the value is the finest the Toy World has ever seen.

For your protection as well as our own, Lines Bros. Toys are marked with the famous Red Triangle Trade Mark. Every toy that bears this Trade Mark is made to give you complete satisfaction, and your children countless months of happiness.

Look for the Triangle Trade Mark on all these toys

The Fairycycle Association

The new Fairycycle Association will appeal very strongly to children everywhere. It has been formed in their interests, and of course, membership, while it is quite free, is confined to all purchasers of the Fairycycle. Full particulars will be gladly sent on application.



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Here is the very thing for the tiny chap. It is painted a gay, bright red, with nickel-plated handlebar and stem; rubber pedals, etc.

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The Fairycycle is a real Cycle—not a make-believe. It is beautifully constructed, and runs ever so easily. It is perfectly safe too.

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New Model Price **42/-**

Similar to Model A but includes new Patent combined Stand and Carrier; a great improvement.

These prices apply only in Great Britain.

Obtainable from all good Toy Shops and Stores.

Sole Manufacturers:

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Cricket, Cycling, Camping, "Cup-hunting"
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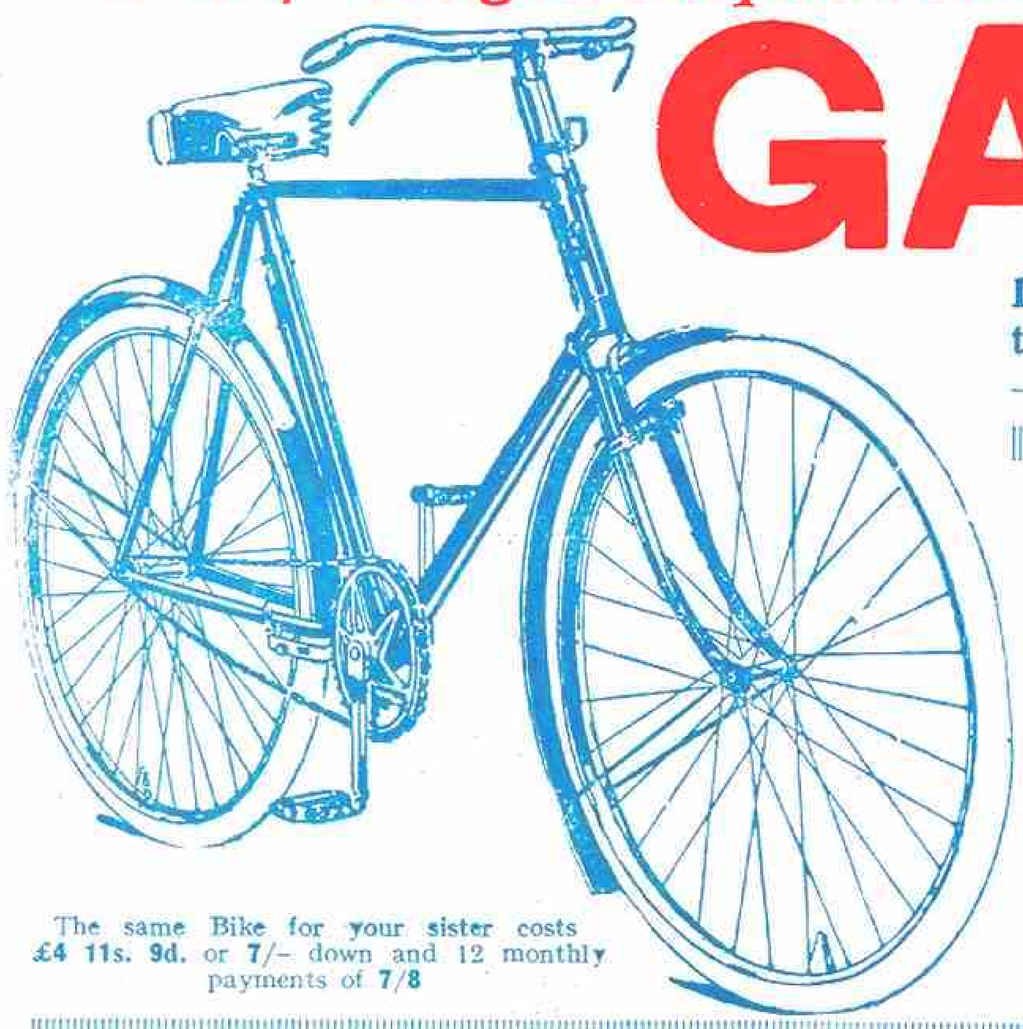


The same Bike for your sister costs **£4 11s. 9d.** or **7/-** down and 12 monthly payments of **7/8**

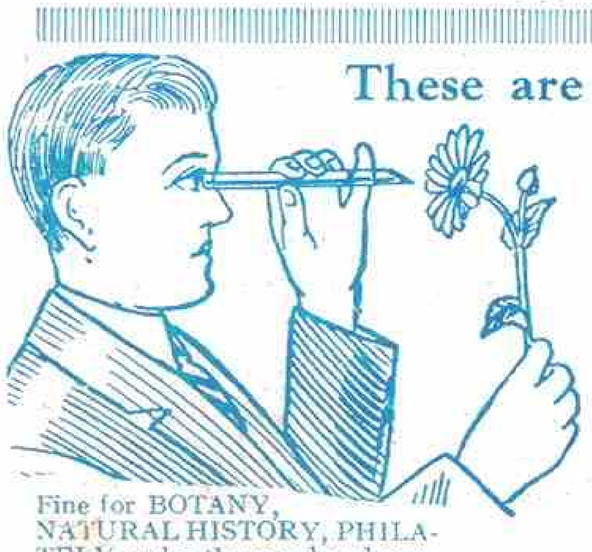
Ride a "Popular" Bicycle

and get the utmost enjoyment from your Summer runs. Thoroughly reliable machines, they are fitted with our celebrated "Holborn" Cord Non-Skid Tyres and all fittings are of splendid quality. Frames are finished three coats of best black hand-polished enamel, artistically lined. Nickel plated Handlebars. 22in., 24in. and 26in. frames. Cash Price **£4 : 5s.**

Get Dad to get you one on Easy Terms

7/- DOWN secures delivery! Simply pay your first deposit, take possession of your machine, and settle balance in 12 Monthly Payments of **7/-**

These are Good!



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Fine for BOTANY, NATURAL HISTORY, PHILATELY and a thousand-and-one other purposes. No "Meccano" Boy can be without one this Summer. Order yours right away before stocks run low. Post free. Price **5/-**

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—and get amazing beauty from the most unpromising material. By means of this wonderful invention you can produce glorious designs from bits of string, rags, leaves, tinsel —any old thing. Simple, easy to use, and requires no elaborate preparation. A wonderful asset to artists, designers, etc., etc. Post 4d. Price **4/11**

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·177 or ·22 Calibre.

This Air Pistol is supplied in Box containing "Webley" special Pellets, spare Barrel Joint, Washers, and Cleaning Rod.

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All Pistols before leaving the Factory are mechanically tested for accuracy up to 10 yds.

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Do., Card Dial, 1 9/16 diam. (no stop) **1/3**

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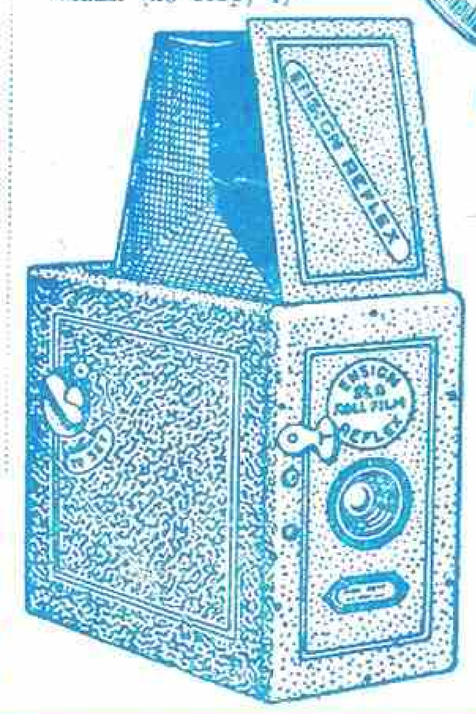

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Get one of these Reflex Roll Film Cameras. Daylight loading for standard size Films, 2¼×3¼ British made by HOUGHTON. Takes beautiful pictures. List Price 38/6. Gamages Price to "Meccano" Boys **21/-**

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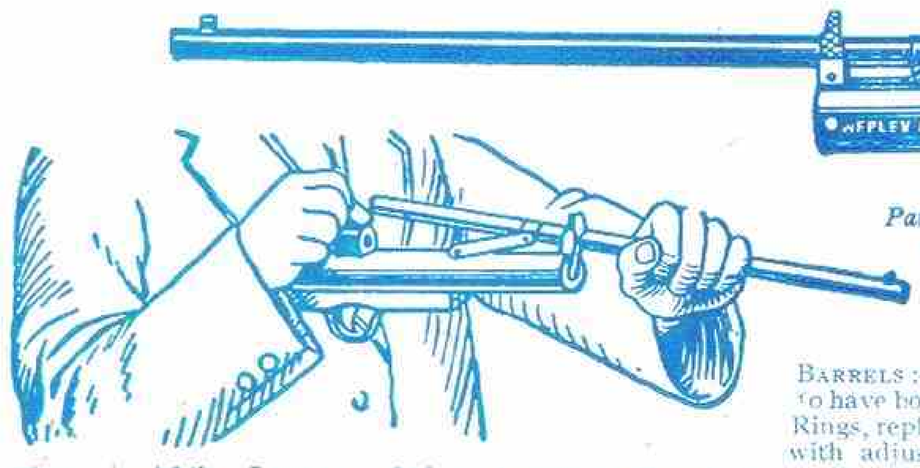
Gamages stock all Hornby and Meccano Parts and will send them carriage paid to any address in the United Kingdom.

Hundreds of Meccano Readers are ordering this Webley Air Rifle!



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Only the best wrought materials are employed, and all component parts are interchangeable and easily obtainable. ·177 or ·22 Bore. BARRELS:—Rifled, and, being interchangeable, it is possible to have both calibres in one rifle. PISTON:—Fitted with Patent Rings, replacing the ordinary leather washer. SIGHTS:—Fitted with adjustable foresight laterally and backsight vertically. WEIGHT:—5½ lb. LENGTH:—34 ins. Length of Barrel, 19 ins. Complete Booklets, giving complete Instructions for Air Rifle and Pistol, post free on request.

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