MARCH 1926

MECCANO MAGAZINE

VOL. XI. No 3

Coaling a Liner

(see page 146)

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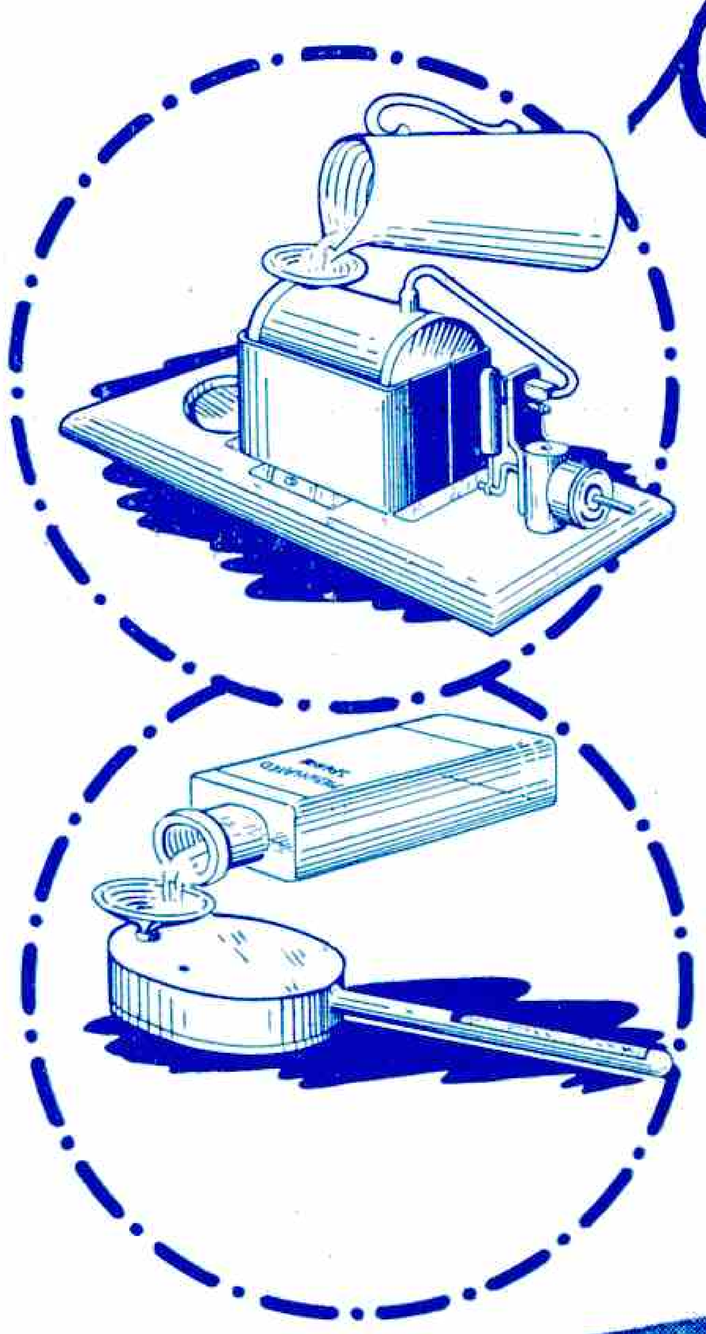

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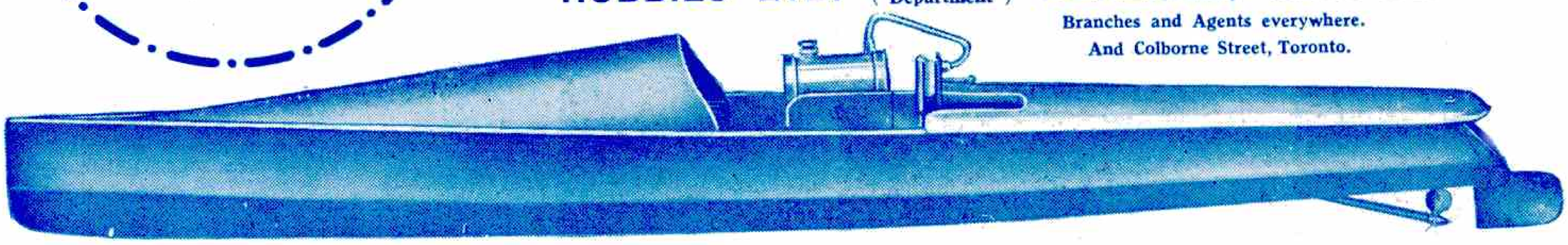

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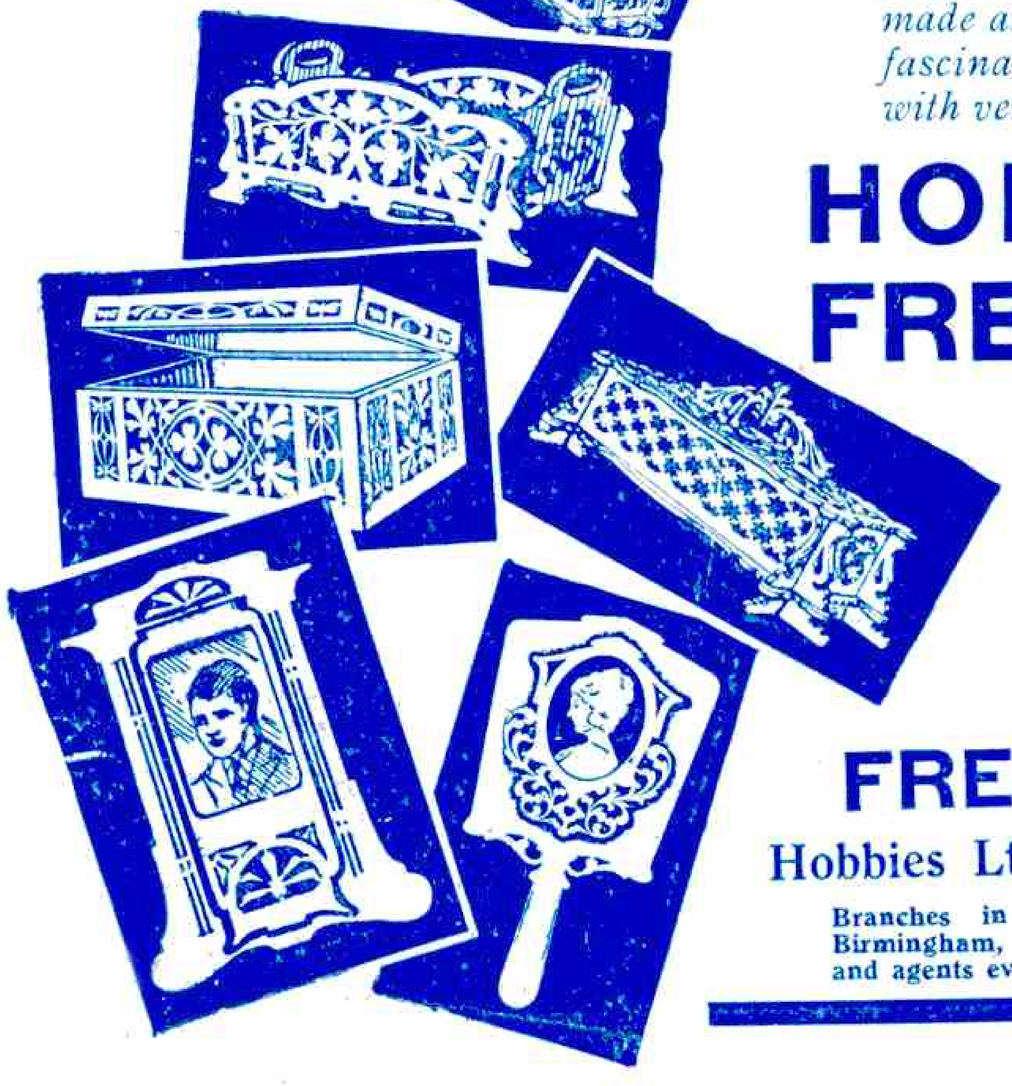

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EDITORIAL OFFICE
Binns Road,
LIVERPOOL

MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

Vol. XI. No. 3.

March 1926

With the Editor

Electrical Engineering in 1925

Continuing my brief review of last month, dealing with the main achievements during 1925 in the principal branches of Engineering, it must be mentioned that progress in Electrical Engineering was very considerable. Several new power stations were built, the most notable being that at Barking. The plant at this station, which was opened by the King in May, consists of two 40,000 and two 20,000 k.w. Parsons' turbo-generators. A 50,000 k.w. turbo-generator set was also built by Parsons for the Chicago Power Company; two 25,000 k.w. alternators, for Newcastle-on-Tyne power station; and several other large turbo-generators and smaller sets for home use and use in countries overseas.

The B. T. H. Co. supplied a 20,000 k.w. set for Nottingham, and a 10,000 k.w. and two 15,000 k.w. sets for London.

The General Electric Co. was at work on one of the largest electrical plants in this country at Nechells Power Station, Birmingham. When this contract is completed there will be five 22,500 k.v. ampere sets at this station. The company also supplied alternators, each of 15,000 k.v. amperes to Battersea, Portsmouth, Southampton, Sunderland; a 15,000 k.v.a. alternator to Woolwich; and 7,500 k.v.a. alternators to Darlington, Glasgow and Harrogate.

The Metropolitan-Vickers completed important contracts, including one 40,000 k.w., one 30,000 k.w., and two 35,000 k.w. generators, all of which were fitted with multi exhaust-blading in the low pressure cylinder. They were also at work on a machine of 12,500 k.w. designed for the extraordinarily high-speed of 3,600 revs. per minute.

The English Electric Co. claims to have produced—in a 20,000 k.w. machine installed at Bradford—the largest single line turbine constructed for the high-speed of 3,000 revs. per minute.

There were considerable developments in wireless during the year, more particularly so in amateur long-distance transmission on short waves. The interesting fact was discovered that with suitable wave lengths below 25 metres, signals received over long distances are even stronger by day than by night—the opposite to the general experience with the longer wave lengths. Mr. Marconi conducted transmissions between Australia and the Argentine on wave lengths between 12 and 30 metres, maintaining communication during the whole 24 hours and using only a small fraction of the power required by commercial stations even when only transmitting over so comparatively a short distance as 1,000 miles. As a result of the experiments, new beam stations are to be erected by the Marconi Company, both at home and abroad.

In regard to progress in high speed working it is interesting to record the fact that during 1925 an experimental transmitting plant worked at the enormous speed of 3,000 words a minute! If such speeds become commercially possible, the transmission of photographs by wireless, at present a very slow process, would become an interesting and practical proposition.

Civil Engineering

The greatest work to be noted during the year in this section was the completion of the Sennar Dam, of which particulars were given in the "*M.M.*" for July. It is very satisfactory to know that this great scheme was conceived and executed entirely by British engineers.

The gradual failure of Waterloo Bridge—dating from early in 1924—came to a climax last year, and the bridge had to be closed. A temporary steel structure, built to take the weight of the traffic, was opened in August and a fierce fight has since raged in connection with rebuilding or replacing the bridge. Some wish for a wider bridge with a tramway, others desire to retain Rennie's famous structure, noted all over the world for its beauty. At the time of writing there seems to be some idea that the L.C.C.'s "final decision" (to entirely rebuild the bridge) may be reconsidered.

In India a great irrigation scheme was commenced and some further particulars will be found in the article on page 160.

Air and Road Transport

Considerable progress was made during the year in aircraft design and manufacture. Several all-metal aeroplanes were built during the year, and there was a considerable advance in power and speed. Duralumin was made use of not only in the construction of all-metal flying boats, but also in the construction of metal hulls and metal floats, effecting an economy of 25% in weight.

A Handley-Page machine was built to carry 14 passengers, pilot and navigator and 1,150 lbs. of luggage. In this machine the water-cooled engines of the earlier type were replaced with air-cooled "*Jaguar*" engines, and the power thus increased from 850 to 1,200 h.p., giving an increase in the maximum speed from 105 to 116 miles an hour. A considerable number of Avro machines of the "*Bison*" type were supplied to the Air Force, to be used with the Navy on Fleet "spotting-duty." These machines are able to alight on a ship's deck, are fitted with folding wings, and carry a crew of four—pilot, wireless operator, observer, and gunner. At their Weybridge Works Messrs. Vickers' completed a 25-seater passenger aeroplane of the "*Vanguard*" type, and fitted with two Rolls-Royce "*Condor*" 650 h.p. engines driving four-bladed propellers, with a maximum speed of 113 miles an hour. When fully laden the machine weighs 8¼ tons and is able to climb 10,000 ft. in 23½ minutes. The "*Vixen*," a two-seater fighting, scouting, and bombing machine, has also been developed during the year. In its latest form it is engined with a Napier "*Lion*," has a maximum speed of 136 miles an hour, and climbs 10,000 ft. in 16 minutes.

So far as speed goes, a two-seater bombing machine was produced during the year, with a greater speed even than the single-seater fighting "Scouts." In September the world's record for speed was broken by the Supermarine Napier S.4, the speed being 226¾ miles an hour. This machine was subsequently wrecked in America when engaged in the Schneider Cup race, which event was won by a Curtis racer at 232½ m.p.h.—a speed three times that at which the race was won five years ago!

Some experiments were made during the year in connection with control of aeroplanes at low speeds, and some remarkable displays were given during the autumn. For instance, one machine carrying 10 passengers, was completely under control even though flying at below the minimum speed theoretically required, and an Avro machine remained in the air when flying at 27 miles an hour, although its theoretical minimum speed is 38 m.p.h.

A Great Inventor's Birthday

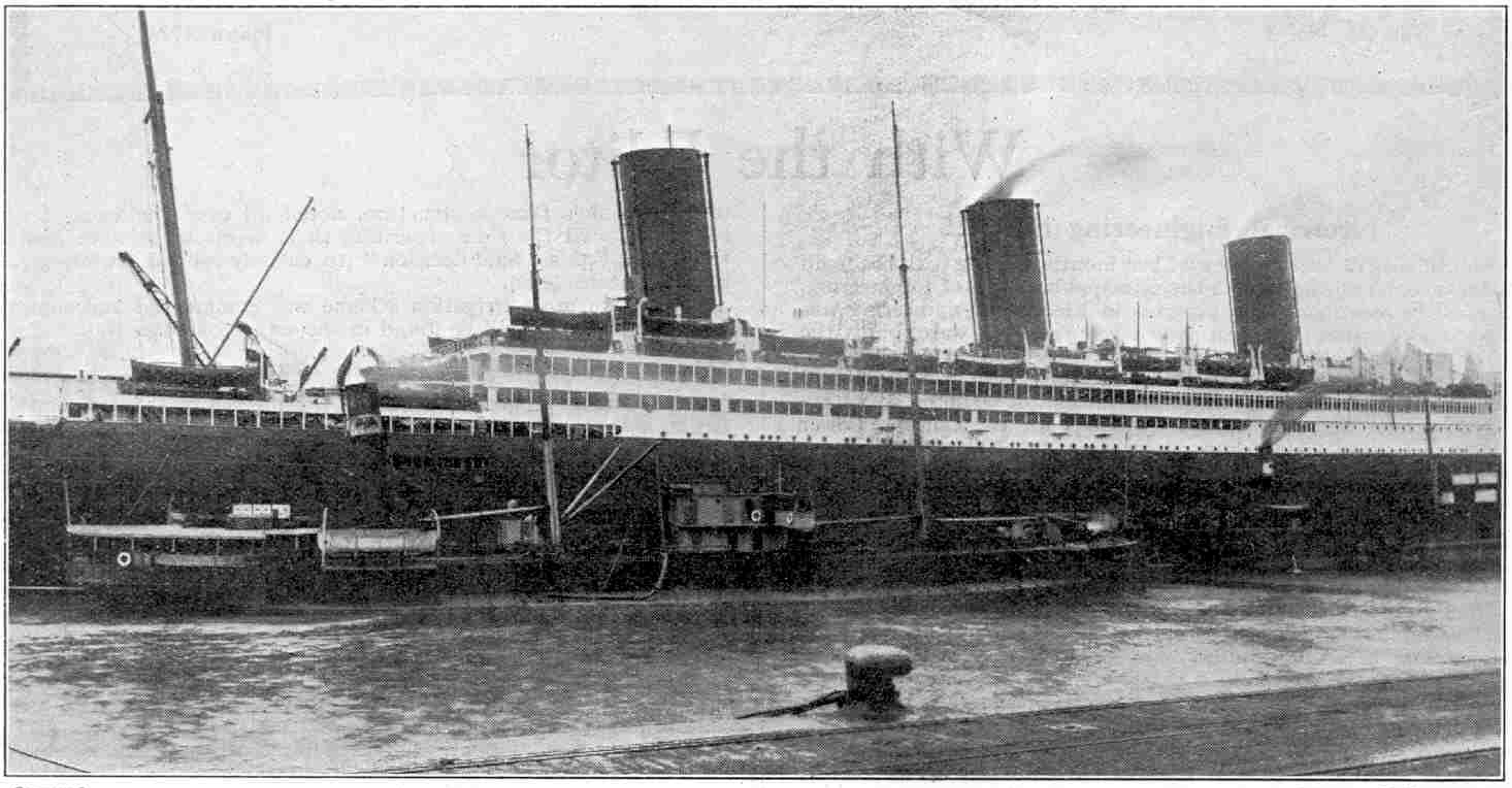
Last month T. A. Edison celebrated his 79th birthday. We have recently read about some of his early inventions in our articles on "Electricity," and I feel sure every reader of the "*M.M.*" will join me in wishing Mr. Edison "many happy returns."

Perhaps I may here remark that if there is one thing more than another that Edison dislikes it is being called a genius or a wizard. "Genius," he declares, "is one per cent. inspiration and ninety-nine per cent. perspiration." He believes that "the three great essentials to achieve anything worth while are hard work, 'stick-to-it-iveness,' and commonsense."

All his life Edison has been a tireless worker. Even now, in his 80th year, his day begins at 6.30 a.m. and he follows a programme carefully prepared overnight. For many years he regularly worked sixteen hours a day.

Oil: the Fuel of the Future.

Advantages of Liquid Fuel for Ships in Peace and War



Courtesy] [*Messrs. Shell-Mex Ltd.*

Bunkering the "*Berengaria*," the giant Cunard Liner

OUR cover this month, enlarged from part of a photograph sent to us by one of our readers, shows natives at work coaling the Orient liner R.M.S. "*Ormonde*" at Colombo, Ceylon. They load 6,000 tons of coal into the ship in 8½ hours, each native carrying half a hundredweight of coal in a basket on his shoulders. The baskets are emptied into chutes in the side of the ship, to the accompaniment of singing and a chanting of native songs.

By the time coaling is finished everything is covered with coal-dust, and as this is always the case with this method of coaling by hand it is no wonder that the operation is regarded as being a most objectionable proceeding.

Importance of Coaling Stations

A liner on a long cruise cannot carry sufficient coal to serve the full length of the voyage out and home, and must therefore call at a series of ports to take more fuel on board. The same remarks apply to warships, whose range is therefore limited—more especially so in wartime, when the number of ports at which they are able to coal is often reduced either by enemy occupation, blockade, or other warlike operations.

The question of re-fueling British ships, both in time of war and peace, is one that has to be very carefully considered because of the world-wide extent of the Empire. A great deal of thought has been given to the disposition and equipment of our coaling stations overseas. One of the most important of these stations is Malta, an island in the Mediterranean, where ships sailing from England to the East are able to obtain supplies of coal before passing through the Suez Canal to India, by way of Aden, or to Australasia.

Coal Superseded by Oil

Coaling a ship is a necessary evil to which all hands object, because it means so much dirt, not only to the officers and crew, but also to the ship itself. In the Navy particularly, officers and men are very proud of the "spick-and-span" appearance of their ships. In normal times a warship is as clean as the proverbial new pin—metal-work burnished and polished; decks scrubbed almost white, and paint-work washed and clean. Despite the fact that everything is sheeted over when the ship is coaling, it is necessary to have a thorough clean-down after the operation, for coal dust is very penetrating and finds its way into almost every crevice and corner.

In recent years the use of oil as a fuel has become increasingly popular and to-day practically all the principal passenger vessels are running on oil instead of coal. It seems likely that liquid fuel as an alternative to solid fuel will play a very large part in the future of engineering. No doubt the time will come when oil will entirely supersede coal, exactly as coal superseded wood.

Even at the present time oil is a serious competitor

of coal, over which it has many advantages. These include :—

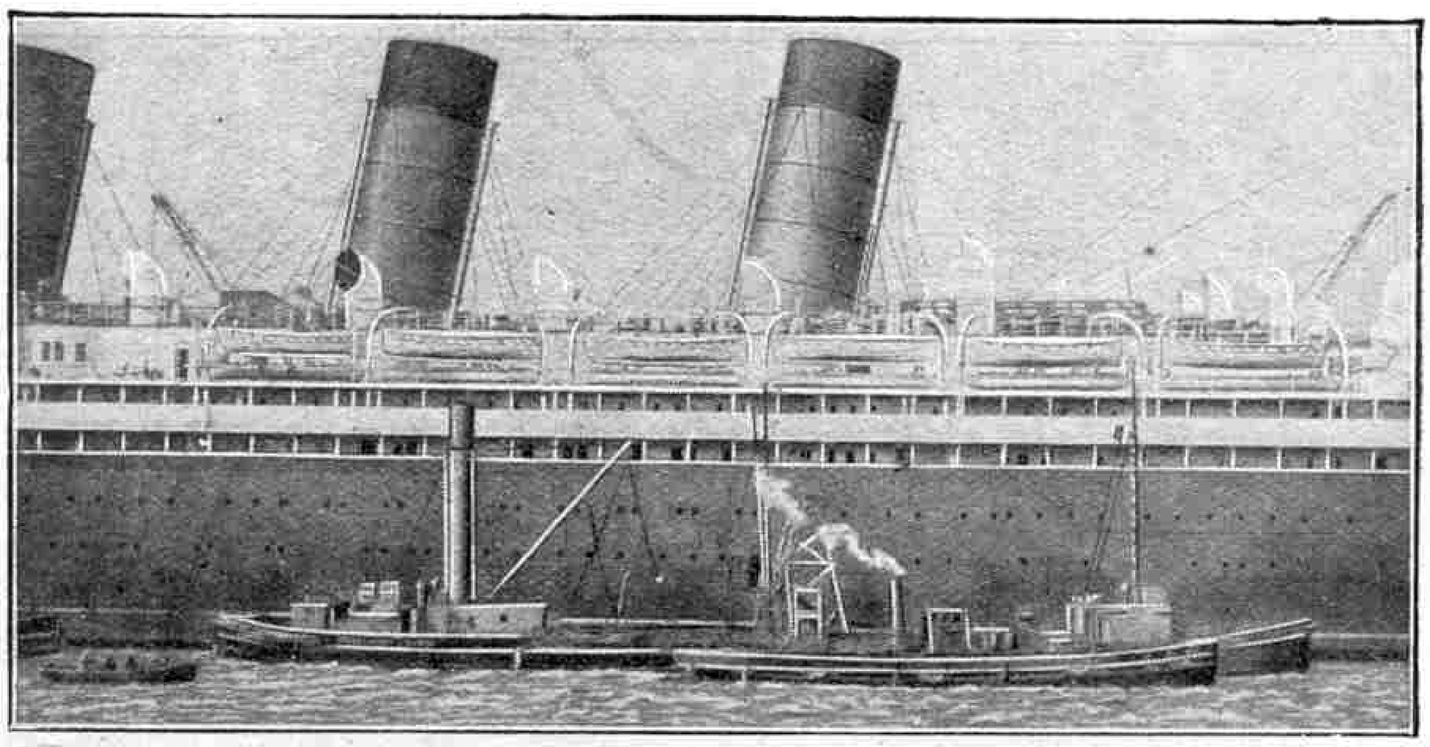
(1) Higher efficiency. Oil gives a boiler efficiency of 80% as compared with the 65% obtainable from a coal-fired boiler.

(2) The heating value of coal varies over a wide range. Oil is considerably more uniform in its heating properties, however, and has a constant heating value that seldom varies. There is also a great deal of loss with coal on account of dust, whereas with oil there is neither dust nor ash.

(3) There is also a great saving in space in the storage of oil, for no matter how carefully a ship is bunkered there are always innumerable little spaces left between the lumps of coal. Whereas a ton of coal occupies 45 cubic ft., a ton of oil only requires 38 cubic ft., thus effecting a considerable economy of space when thousands of tons are considered.

(4) Because of the perfect combustion with oil there is an entire absence of ashes under the boilers and almost no smoke from the ship's funnels. On the furnace plates of coal-fired vessels soot causes a loss of at least 12½% in the efficiency of the boilers after a 20-day voyage, with a corresponding effect on the speed of the ship. With oil this sooty deposit is not formed, and in the case of Atlantic liners this means that it is possible to lessen the time required for a voyage from England to New York by several hours.

(5) Perhaps the greatest advantage of all, however, is the ease with which liquid fuel can be handled. Oil may be pumped into the storage tanks of a ship through four, five or six pipe-lines simultaneously, and a single hose of 10 in. diameter is capable of discharging 90,000 gallons of liquid per hour. It will be seen, therefore, that six such pipe-lines can very quickly re-fuel the largest liner or warship. The actual weight of fuel required by an oil-fired ship is less than the weight required for a coal-fired ship, and in addition to this one ton of oil goes considerably further than one ton of coal. With the use of oil all the dirt and discomfort and strenuous labour inseparable from bunkering coal are eliminated. It is quite possible for 5,000 tons of oil to be put on board a ship in ten or twelve hours without the passengers knowing that bunkering operations are in progress. To bunker the equivalent amount of coal would necessitate two or three days' work and the proceedings would be made evident to everybody by reason of the accompanying noise and dirt.



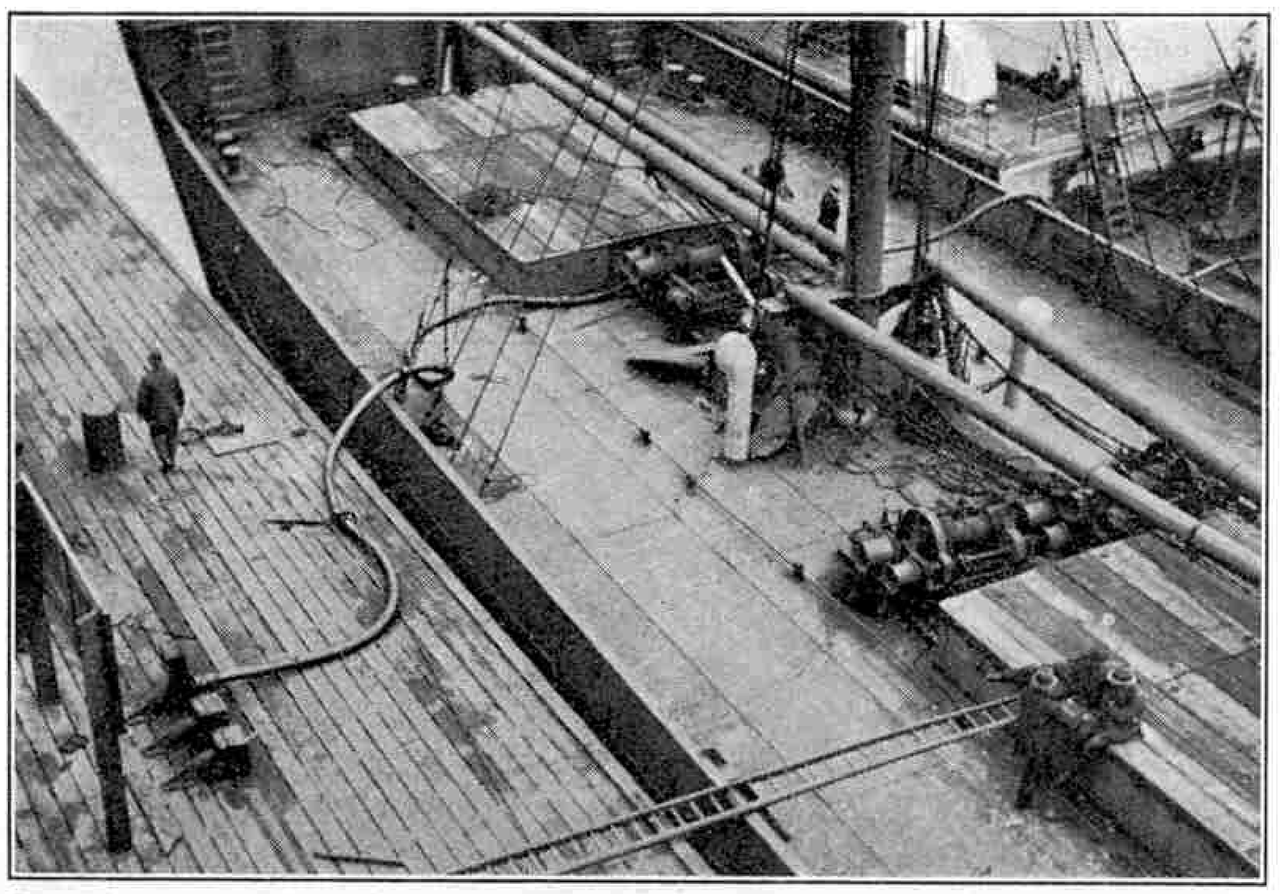
Courtesy] [*Messrs. Anglo-American Oil Co. Ltd.*

The Cunard Liner "*Mauretania*" refueling at Southampton

Economy and Earning Capacity

An oil-fired vessel has a great advantage over coal-fired ships in quickness of "turn round" and this, by reducing the number of days spent in port, tends to increased economy. The shorter time spent in port has made it necessary for the large oil-fired passenger liners running from Southampton to New York to speed up the arrangements for dealing with passengers' laundry and the provisioning of such vessels has also been speeded up proportionately.

At the busy time of the year a liner of the size of the "*Majestic*" or the "*Leviathan*" may perhaps have to remain in Southampton only for 36 hours, from the time of her arrival to the time of starting on the return trip. This quick "turn round" has the effect of enabling the ship to increase the total number of her journeys in a year, which naturally adds considerably to her earning capacity.



Courtesy] [*Messrs. Anglo-American Oil Co. Ltd.*

The S.S. "*Potomac*" bunkering on the Tyne

This photograph shows another advantage of liquid fuel. The boat taking fuel on board is in the outside berth and supplies are easily taken by running a pipe-line across the deck of the vessel in the inner berth

Oil Brought by Tankers

Fuel oil is brought into this country by specially constructed tank-steamers. In these steamers the storage space consists of a number of tanks riveted in the position usually occupied by the hold. Between the tanks is what is known as a "cofferdam," which is a space to prevent the contamination of the contents of one tank by another. Ships not fitted with cofferdams would be unable to carry different grades of oil at the same time, which limitation would be very undesirable.

The tanks are connected together by an elaborate system of pipe-lines, which enable the filling of the tanks at the refinery, and the emptying of the tanks at the ocean storage installation in this country, to be accomplished in the minimum of time.

Oil-tankers range in size from about 3,000 tons up to 15,000 tons, the average being about 10,000 tons, which has been found to be the most useful capacity from many points of view. It is possible to fill a 10,000-ton tanker in as short a space of time as 10 or 11 hours, and to discharge it in the same or very slightly more time.

The discharge pumps on board the tankers are usually placed as low down as possible, so that the oil flows by force of gravity to the pump, and is then pumped to the land storage.

Importance of the Burner

It is believed that the first to use oil as a fuel was a mechanic named Werner, who burned oil waste in an open furnace in Russia in 1861. The U.S. Navy investigated the subject in 1902 and their work helped forward considerably the use of oil as a fuel.

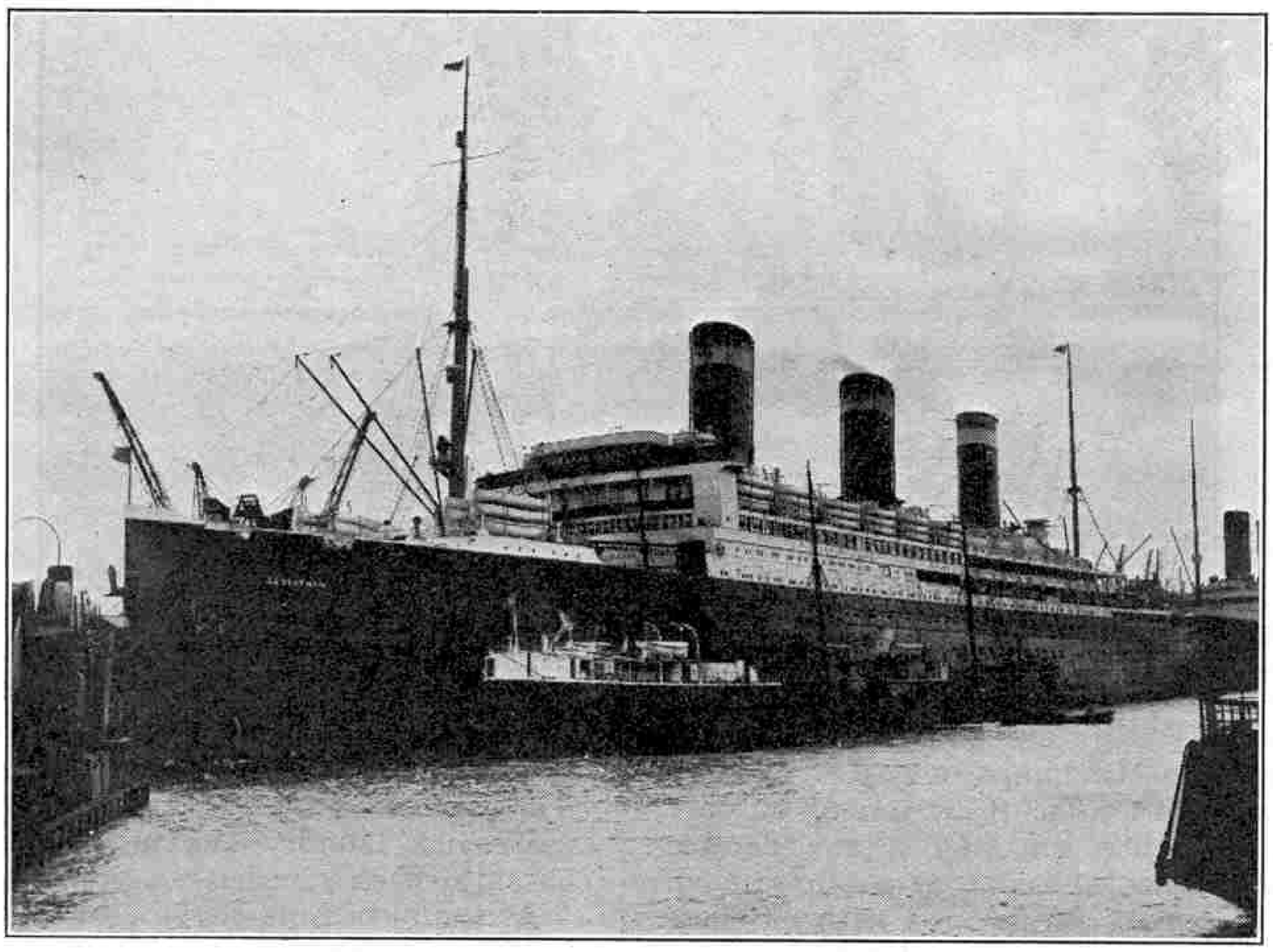
Since these early days many oil burners have been patented, and although some have been shown to be useless, others have been the means of developing highly efficient methods. In the satisfactory use of oil fuel, everything depends upon the efficiency of the burner. Its essential and most important feature is that the oil must be completely broken up, or "atomized" as it is called, to enable each particle of oil to receive a sufficient supply of oxygen so that it may burn completely. In theory 1 lb. of oil requires about 14 lb. of air to effect its combustion.

In the Stokehole of an Oil-Fired Ship

The boiler-room of an oil-burning vessel is very unlike the boiler-room of a coal-fired vessel. In the first place considerably fewer stokers are required. As an example it may be mentioned that in a vessel where 300 stokers would be necessary to handle coal-firing, some 40 or 50 men only would be required where oil is used.

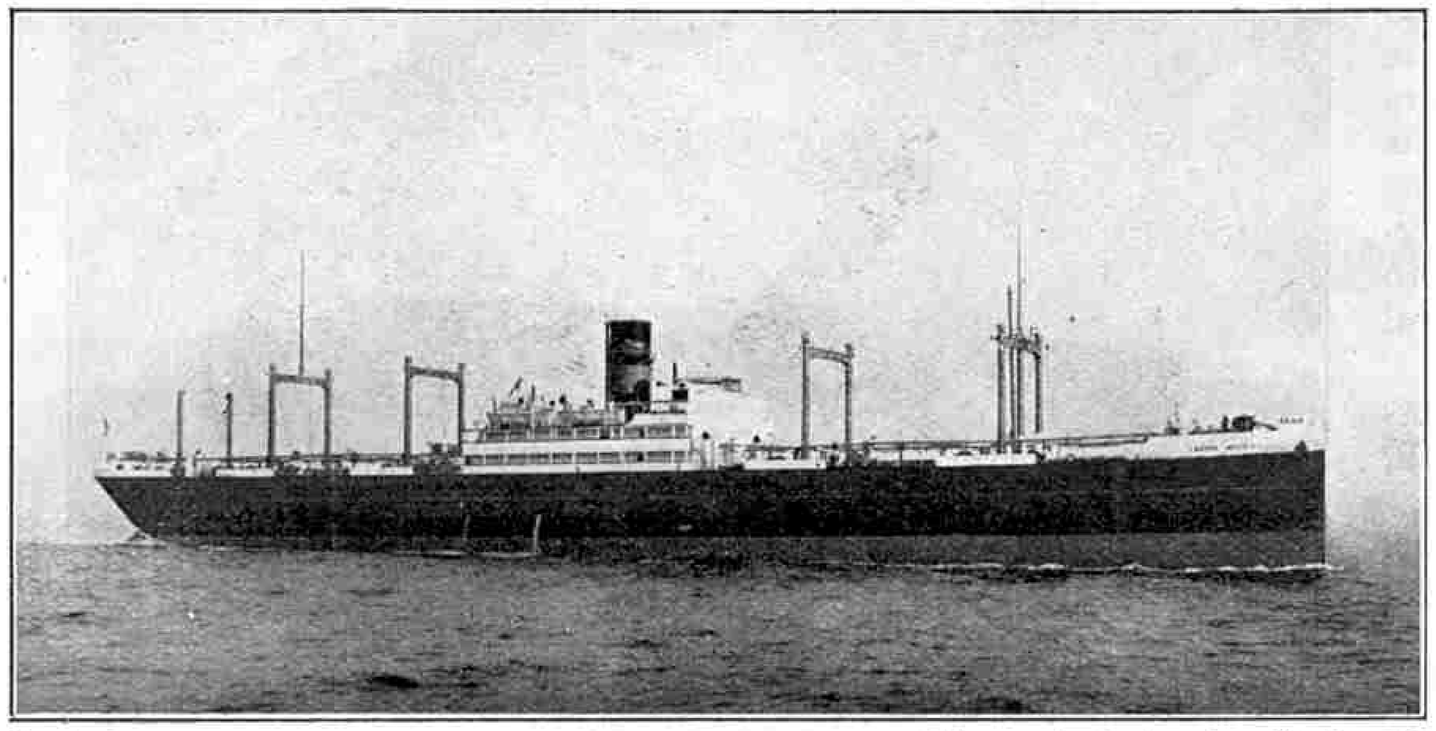
The firemen, as they are called on an oil-fired ship, wear clean overalls and the conditions under which they work are much pleasanter. The engine-room is kept very much cooler owing to the fact that the furnace-doors are never opened, as is the case on a coal-fired vessel when it is required to put more coal into the furnace.

The first duty of the firemen is to maintain a correct supply of oil through the burner, so that the requisite amount of heat is forthcoming. The temperature is taken by thermometers outside the furnace, and a "peep-hole," fitted with coloured glass to protect the eye from the glare, makes it possible to inspect the flames, which burn with a muffled roar. When the indicator rings, instructing steam to be raised or speed increased, the firemen turn control valves and the blast of oil and air is increased. Obviously, this form of control makes it possible to regulate the temperature to a very fine degree, and here again an economy is effected.



Courtesy [*Messrs. Anglo-American Oil Co. Ltd.*

Bunkering the "*Leviathan*," America's Largest Liner



Courtesy [*Messrs. Anglo-American Oil Co. Ltd.*

The S.S. "*Importer*" (7,895 tons), one of Messrs. Furness, Withy & Co.'s Largest Freighters, which runs on Fuel Oil

Oil Fuel in the Navy

The advantages of oil for naval purposes are numerous. In the first place it enables vessels to operate over a greater distance, and gives increased speed. With a coal-fired warship there are frequently dense volumes of smoke, which not only inconveniently reveal its position to the enemy but may also seriously affect the efficiency of its gun-power, as was instanced at one point in the Battle of the Falkland Islands. In the case of oil, however, as we have already mentioned, there is practically no smoke, for combustion is complete.

In the British Navy oil fuel was the subject of considerable experiment until 1913 when a Royal Commission reported :—

"There is no doubt that, with otherwise similar warships, the one that burns oil possesses a large excess of speed over that which burns coal. . . . The radius of action when using oil in place of coal is increased by at least 40%, for the same weight of fuel.

"The use of oil enables a fleet to re-fuel at sea with great facility. With coal this is impracticable, except under very favourable weather conditions. The special advantages to the British Fleet of not being forced to leave its fighting position in order to re-fuel need not be enlarged upon. The strength of the British Fleet is thereby increased by at least 25%, as so large a proportion of the coal-burning ships have to be absent re-fueling. This also leads to a large unnecessary expenditure of fuel, going to and returning from the coaling base, and additional wear and tear of machinery.

"Oil bunkers may be replenished without interfering with the fighting efficiency of the ship, and a few men suffice for the work. On the other hand, the operation of coaling is lengthy and laborious, necessitating the exertions of the whole of the crew, with the result that the men are physically exhausted by the operation and the ship is rendered for a time unfit to fight."

The Navy adopts Oil Fuel

The Commission pointed out other advantages of oil over coal, including the saving of labour necessary to remove ashes, clinkers, and soot ; the regularity of the heat, and the fact that oil fuel makes

(*Continued on page* 167)

The Young Engineer & Invention

By Dr. H. S. Hele-Shaw, F.R.S.

(Past-President of the Institution of Mechanical Engineers)

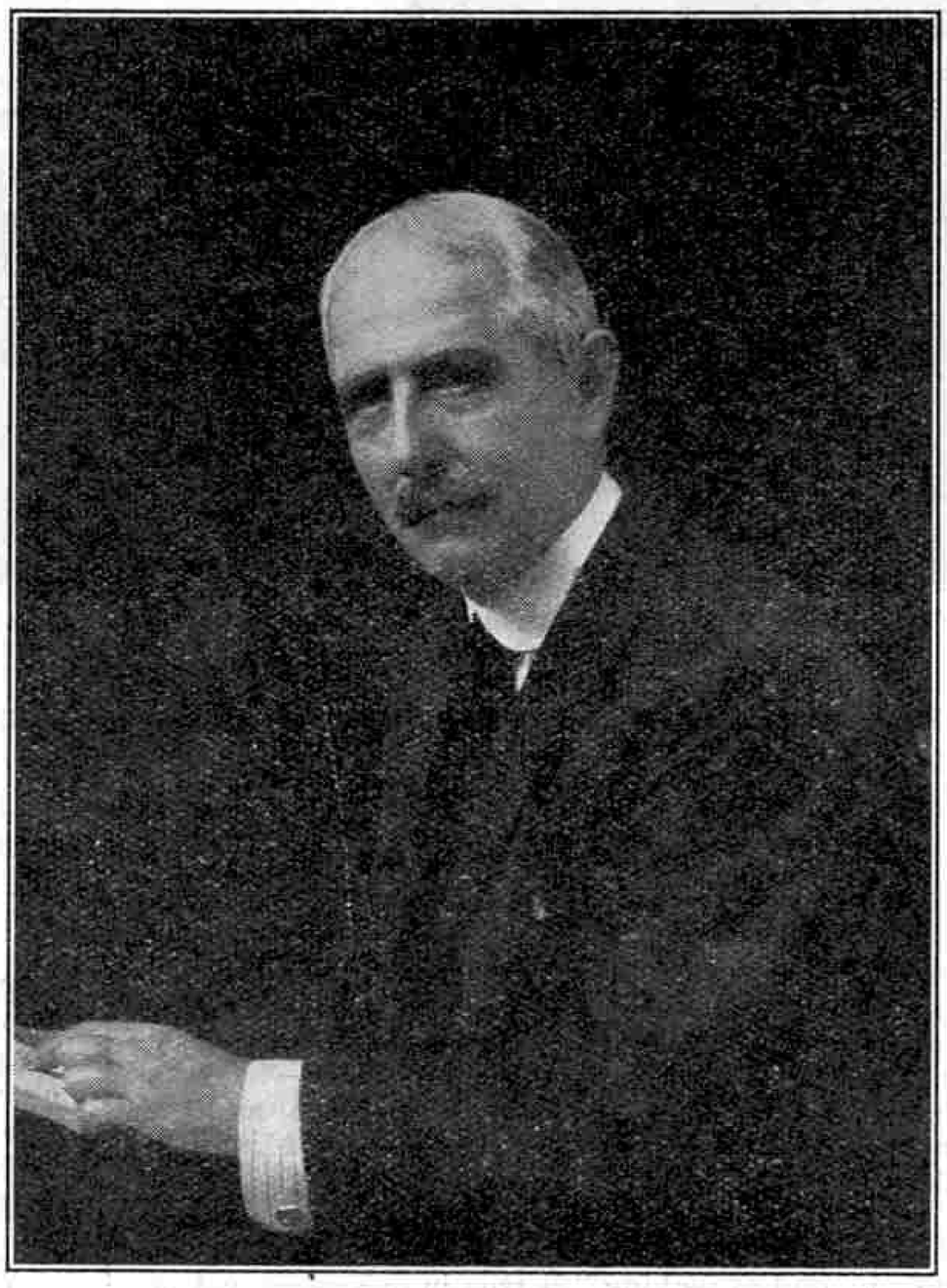
**Dr. H. S. Hele-Shaw, D.Sc., LL.D., F.R.S., M.Inst.C.E., M.I.Mech.E., F.R.Met.S., was born in 1854 at Billericay in Essex. In 1876 he was Senior Whitworth Scholar and he followed this up by winning the Watt Gold Medal and Telford Premium of the Institute of Civil Engineers. He was a Scholar and first Professor of Engineering at Bristol University College from 1881 to 1885 and in the latter year he became first Professor of Engineering at Liverpool University, acting in this capacity until 1904. Among his other appointments was that of Principal of the Transvaal Technical Institute, 1904-5. Dr. Hele-Shaw is a Gold Medallist of the Institute of Naval Architects and Past President of the Institute of Mechanical Engineers, the Institute of Automobile Engineers and the Society of Model and Experimental Engineers. He is the inventor of many successful mechanisms among which may be mentioned the well-known Hele-Shaw clutch, and he is the author of over 100 papers on mathematical, physical and engineering subjects.—*Editor.*

I HAVE read with the keenest interest the address by Mr. Reavell on "The Future of the Young Engineer," and your Editor has asked me to supplement this by a further article. It gives me much pleasure to follow the good example of my friend, who is to be the next President of the Institution of Mechanical Engineers.

Mr. Reavell speaks with authority and I can see that he, like myself, is an admirer of the philosophy of Epictetus. No doubt many of you will know that Epictetus was once a slave, lame, and suffering from very bad health. In such circumstances many men would have remained down, but there was something within Epictetus that enabled him, not only to gain his freedom but also—although he never aspired to wealth or fame—to become a great philosopher, whose teachings have been handed down through the ages. It is not surprising to find that one of his greatest sayings was: "There is only one thing which is fully our own and that is our will or purpose."

Mr. Reavell has spoken of the future that lies before the young engineer and pointed out various branches of mechanical engineering in which wonderful developments have taken place in recent years. He declares himself an optimist and believes that the future will bring forth even more wonderful things. Such development can result only from hard work, however, the hardest task of all probably being to lift ourselves out of the present in the endeavour to grapple with what is not yet accomplished. The idea underlying this is expressed by the word "Invention," and it is about invention that I want to say something in this article.

The primary and main object of the Institution of Mechanical Engineers is to encourage invention, although probably this is not known to the majority of its ten thousand members. The very first Article of its Constitution is as follows:—"To promote the Science and Practice of Mechanical Engineering and to give impulse to Inventions likely to be useful to the Members of the Institution and to the Community at large."



Dr. H. S. Hele-Shaw, F.R.S.

Now what is "Invention?" The definition of a great poet and thinker is, "Invention is the end of seeking," which means of course that it is the result of trying to overcome the difficulties of which Mr. Reavell has told you. It is not an exaggeration to say that no man can be an engineer without being an inventor. If he is not an inventor he is a mere copyist. Imitative work of this kind is possible for the very lowest types of mankind, and even monkeys and other animals are able to copy various simple objects.

Let us guard against making the very common mistake of thinking that a mere dreamer is a true inventor. This wrong notion has led thousands and tens of thousands, not merely to ridiculous and absurd ideas, but even to the ruin of themselves and their friends. Before you can invent a thing of any value you must have knowledge both of what is needed and of the means to carry out your ideas. It is said that the idea of the steam engine came to James Watt while he was a small child, sitting in front of the fire and watching the steam come out of the spout of the kettle. I have seen a very pretty picture of this fairy story! If you wish to know the true history of James Watt and the steam engine, read his life by Samuel Smiles. You will then gain some understanding of the long and weary road that leads to real invention.

I am a great believer in the value of model-making for the very young engineer because it forms the beginning of his workshop training. Without such training it is impossible ever to become a sound mechanical engineer. It was for this reason that I wrote for Mr. Hornby his first introduction when, 30 years ago, he began Meccano in quite a humble way.

Meccano is now of world-wide fame and has been a source of untold pleasure and education to hundreds of thousands of boys. Many of these boys are now eminent engineers, but they would never have become engineers at all if they had stopped at mere copying—even copying

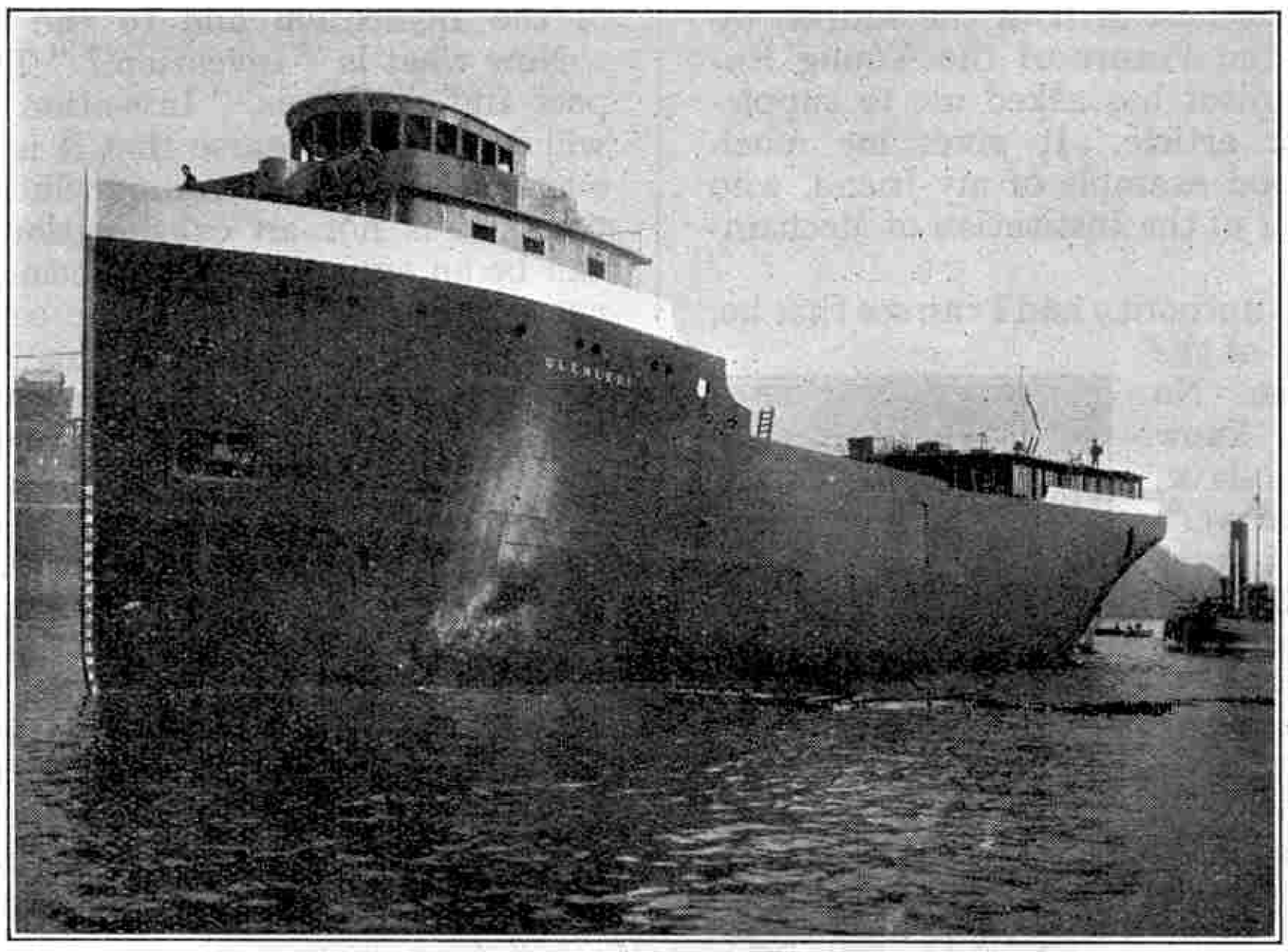
(*Continued on page* 150)

Cutting a Steamship in Two

How Engineers Propose to Overcome a Great Difficulty

THE "*Glenledi*," a steamship launched by Messrs. Swan, Hunter, and Wigham Richardson Ltd., at their Wallsend shipyard on the Tyne, possesses a number of interesting features.

In the first place she is being built to the order of the Great Lakes Transportation Company Ltd., of Midland, Ontario. Her engines are of the direct-acting, surface-condensing, triple-expansion marine type, steam being supplied from two boilers fitted for forced fraught. Both engines and boilers are being built by the North Eastern Marine and Engineering Co. Ltd., Wallsend-on-Tyne. Two state rooms and a large sitting room will be arranged, together with the captain's room, in a steel house on top of the forecastle as shown above.



This photograph of the "Glenledi" after her launch is reproduced by permission of Messrs. Swan, Hunter & Wigham Richardson Ltd.

The "*Glenledi*" is being built for service on the Great Lakes of Canada and will eventually be 379 ft. in length and will carry about 4,825 tons on 18 ft. draught in fresh water. The vessel's ultimate length is too great to allow her to pass through the locks of the Welland Canal, Ontario, and the difficulty is to be surmounted in a very interesting manner. The vessel has been reduced to the necessary size by omitting 144 ft. of the midship body. This portion, which will also be constructed at the builders' yard, will be taken out to the Great Lakes in the "*Glenledi*" herself. After passing through the Welland Canal she will be docked and cut in two when the midship portion will be built into position, thus completing the full dimensions of 379 ft.

It is perhaps of interest to mention that Messrs. Swan, Hunter and Wigham Richardson Ltd., have also launched another vessel specially designed for the Canadian Lakes, canals and the River St. Lawrence. The dimensions of this vessel, the "*Belvoir*," are 248 ft. in length between perpendiculars, 43 ft. 6 in. moulded breadth and 25 ft. moulded depth.

The Young Engineer and Invention—

(*Continued from page* 149)

the wonderful examples that are to be seen in the Meccano Manuals. The Meccano Model-building Contests are splendid for young engineers because, in the words of the announcement in the January "*Meccano Magazine*," they "offer a wide scope for inventiveness."

In entering for one of these competitions a boy has not only to think out an original design for the type of mechanism specified, but also has to make sure that his design can be carried out with the Meccano parts in his possession. Thus, in addition to the valuable experience he gains in mechanical designing, he learns to make the utmost use of the materials at his disposal—a point of the greatest importance to every engineer.

Year by year it becomes more difficult to discover something new in mechanical engineering and you must be prepared to find that your most brilliant ideas have been anticipated, perhaps hundreds of times. But you must not be disheartened on this account. It is far better training to think for yourself and try to put your own designs into practical shape than it is to imitate someone else. One day, when you have read and learned more and widened your practical experience, you will be able to break fresh ground and hear from an expert and authority on that particular subject:—"That's a splendid idea!" Praise such as this is very welcome, especially if it is won by hard work and much thinking.

The poet's definition to which we have already referred, that "Invention is the end of seeking," is true in one sense, yet in another sense invention is only a beginning. In almost every case, an idea—at any rate in relation to mechanical arts—is unlikely, however good it may be, to bring much result to the inventor unless it can be followed up and put into practical form. You need only read the lives of well-known inventors to realise that it was not so much their original ideas that made their fame and fortune, but rather what they did afterwards, often throughout their lifetime.

One word of warning in conclusion. Before spending too much time over an idea make quite certain that it is a sound one, for out of some 30,000 patents taken out every year probably only 200 or 300 in any way realise the hopes of their inventors.

New L.M.S. Steamers

To speed-up and develop the traffic between Belfast and Fleetwood, the L.M.S. have called for tenders for three new steamers to replace the existing boats. The specifications of the new steamers provide for additional passenger and cargo accommodation.

Virginian Railway Electrified

The electrification of the Virginian Railway has several features of interest. The line is wholely mineral and boasts the heaviest freight cars in the United States, the average weight of a fully loaded car being about 115 tons, the car itself weighing 40 tons. With steam propulsion a train weighing from 5,500 to 5,700 tons requires a 2–8–8–2 train loco and a 2–10–10–2 tank loco to assist it up a gradient of about 1 in 50 at the rate of 7 miles per hour. With electric traction a train of over 6,000 tons, propelled by two electric locos, has climbed the same gradient at the rate of 14 miles per hour. Another interesting feature is that wireless communication is provided between the loco and the brake van at the rear of the train.

FROM OUR READERS

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

An L.N.E.R. Loco Booster

A friend of mine, a driver on the L.N.E.R., took me to the sheds and on the footplate of an "Atlantic" explained to me the working of a booster.

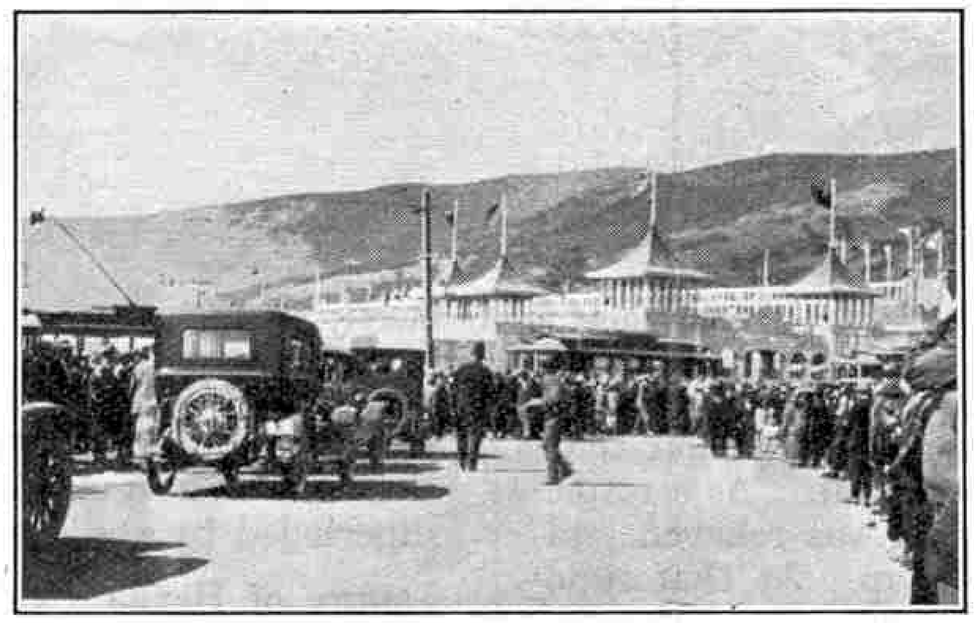
The object of a booster, he said, is to supply additional power for short periods during which the ordinary tractive effort of the loco needs to be augmented. The booster is a separate two-cylinder engine placed below the footplate and it converts the trailing wheels into a pair of driving wheels supplying independent and additional power. This extra power is applied only when actually required, as for instance at starting or on steep gradients. The extra demand upon the steam-producing capacity of the boiler is therefore temporary and can be met without any increase of the heating surface.

On an L.N.E.R. loco the booster is placed beneath the footplate at the rear of the trailing axle and it has two inside cylinders of 10 in. diameter by 12 in. stroke. The steam distribution is by piston valves with direct valve motion. On the driving shaft of the booster is a pinion wheel from which, through an intermediate or "idle" pinion wheel, power is supplied to the trailing carrying wheels through a third pinion wheel fixed on the trailing axle. The three pinion wheels are of different diameters so arranged that the revolutions of the trailing carrying wheels are less than those of the driving shaft. The diameter of the carrying wheels driven by the booster is 3 ft. 8 in. and consequently successful application of the booster is dependent upon a comparatively low speed.

The idler-gear is secured to the base of the booster by a rocking arm. When it is desired to use the booster gear, the driver, by means of a compressed air apparatus operating a piston attached to a bell crank, throws the idle pinion into mesh and establishes connection between the driving shaft and the carrying wheels. The driver then admits the steam to the booster cylinders by means of an air-operated regulator. When steam is cut off from the booster engine the idler-gear is thrown out of mesh by means of spring-controlled mechanism, and the trailing axle is thus relieved of the retarding action that would result from being in engagement with the booster driving apparatus.

VERNON HOWE (Bradford).

The Entrance Gates to Exhibition remind one of Wembley



The crowds of visitors on Opening Day

New Zealand's Wembley

The greatest Exhibition in the history of New Zealand was opened at Dunedin in November last and will remain open until April. The opening ceremony, performed by Sir Charles Fergusson, Governor-General of New Zealand, commenced with the singing of "God Defend New Zealand." The Governor-General then spoke and his concluding words declaring the Exhibition open were followed by a stirring fanfare of trumpets sounded by the band of the Argyll and Sutherland Highlanders.

The Exhibition covers 65 acres—about one-third the size of Wembley—and the exhibits are housed in seven great pavilions covering some eleven acres.* Foremost among the buildings is the British Pavilion with its Hall of Empire in which the greatness of the Empire is illustrated. The New Zealand Government Pavilion covers an area of 51,000 sq. ft., and houses the displays of fifteen Government departments. New Zealand manufactures are shown on an elaborate scale in a pavilion covering 113,000 sq. ft., and another great feature is the finest collection of art works ever seen in this Dominion.

Amusements are not by any means neglected and regular performances will be given in the Festival Hall by a splendid orchestra and a chorus of 400. The Amusement Park covers 25 acres and includes many excitements that have never before been seen in New Zealand.

The full title of the Exhibition is the New Zealand and South Seas Exhibition, but it may well be called "New Zealand's Wembley."

R. KIRK (Dunedin, N.Z.)

*See illustration on page 157

Lives of Famous Engineers

XXVI

JOHN SMEATON

BRIDGES, CANALS AND HARBOURS.

THE successful completion of Smeaton's Eddystone lighthouse attracted so much public attention that one would have expected the engineer's services to be in great demand. This was not the case, however, and for some years he had very little employment. The reason for this was not lack of confidence in his ability, but scarcity of public money.

Smeaton was consulted in regard to many projects, such as the opening-up and improvement of river navigations and the recovery of flooded lands in the Fen district and elsewhere, but in almost every case, after he had given his advice and prepared an estimate of cost, he was informed that the cost of the scheme was beyond local capacity to pay.

Old London Bridge

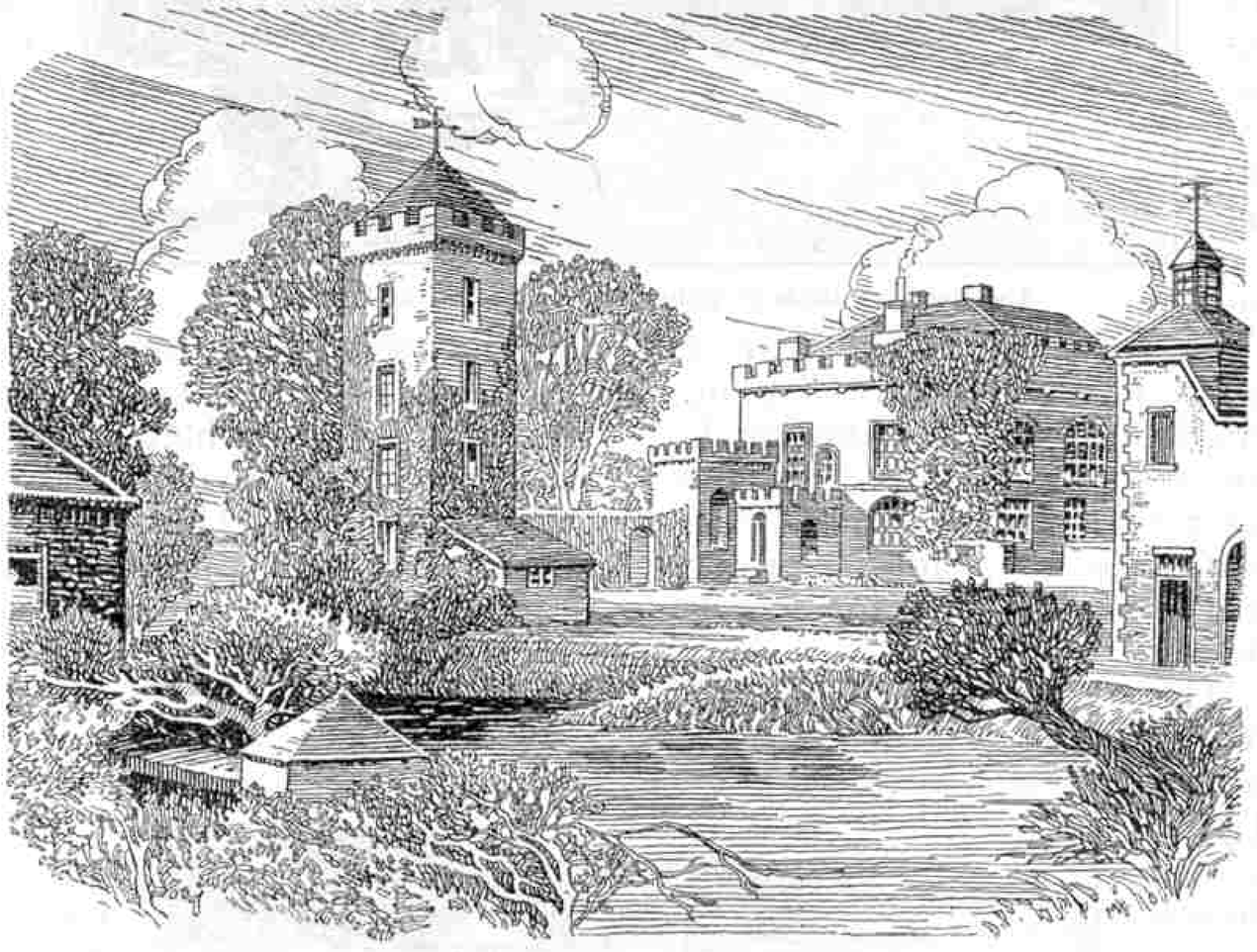
After carrying out successfully various small drainage schemes Smeaton was consulted by the Corporation of London in regard to the best means of improving and widening Old London Bridge, which was then in so shaky a condition as to cause great alarm to the public. The Corporation were seriously considering a project for rebuilding the bridge, but in 1754 the City Surveyor examined the foundations of the piers and expressed the confident opinion that they were sound and capable of a long life. As a result of the surveyor's report public alarm was relieved and the old bridge was merely patched up. At that time the bridge was still overhung with houses on each side, the roadway between being narrow and dark.

In order to improve the bridge, Sir Christopher Wren, the famous architect, suggested the removal of some of the piers and the throwing together of several of the arches. It was finally decided, however, to build another bridge at Blackfriars and at the same time to remove the houses from the old bridge, and both of these schemes were ultimately carried out. The great middle pier of the old bridge was removed and the two adjoining locks were replaced by a new arch.

It was soon found that, far from improving matters, this change was introducing a new element of danger, for the increased scour of the water under the new archway began to weaken the foundations of the adjoining piers. Public uneasiness was so great that few people dared to cross the bridge, and the Corporation, highly alarmed, summoned Smeaton in haste from his Yorkshire home.

After examining the bridge Smeaton advised the Corporation to buy back at once the stones of the city gates which had recently been taken down and sold, and to throw them into the river outside the "starlings"—rings of piles supporting the piers of the bridge—in order to protect them against the water. This advice was immediately adopted, the stones were tumbled into the river and in this manner the shaky old foundations were temporarily protected.

It is interesting to note that, in connection with the works at Old London Bridge, Smeaton designed a new pumping engine that was placed in the fifth arch and operated by the rise and fall of the tide. At that time this was an economical although an irregular source of power, but it was quickly superseded by the even more economical steam engine.



Smeaton's Home at Austhorpe, near Leeds

Failure of Hexham Bridge

Smeaton's most important work as a bridge-builder was carried out in Scotland and bridges built to his design at Perth, Coldstream and Banff were very successful. The only bridge erected by him in England, that across the Tyne at Hexham in Northumberland, was a failure. Scarcely was it finished when the foundations of one of the piers sank. Efforts were made to remedy this defect in various ways, but early in 1782 a violent

flood swept down the river and in a few hours Smeaton's bridge was a wreck. Writing of this disaster Smeaton said :—" All our honours are now in the dust ! It cannot now be said that in the course of thirty years' practice, and engaged in some of the most difficult enterprises, not one of Smeaton's works had failed ! "

The trouble with this bridge appears to have been due to Smeaton being satisfied to rest his piers upon gravel slightly below the bottom level of the river. The scour of the stream under the arches washed away the river bottom and thus undermined the work.

Forth and Clyde Canal

One of Smeaton's most important works was the designing and construction of the Forth and Clyde Canal. Brindley had been consulted with regard to this canal, but he was too busily employed in England to undertake the survey and this was placed in the hands of Smeaton.

He decided in favour of the most direct line across country. The Act authorising the construction of the canal was passed without difficulty and work commenced in 1768. The canal, which was about 38 miles in length and included 39 locks, involved the overcoming of a number of serious engineering difficulties. Rocks and quicksands had to be dealt with and the canal had to be carried over deep rivers and across many roads.

Before the canal could be completed to the Clyde, work came to a standstill for lack of funds, and twenty years elapsed before sufficient money could be raised to finish the operations. The canal, finally completed by a pupil of Brindley named Whitworth, was opened in 1790.

Dr. Roebuck and Carron Ironworks

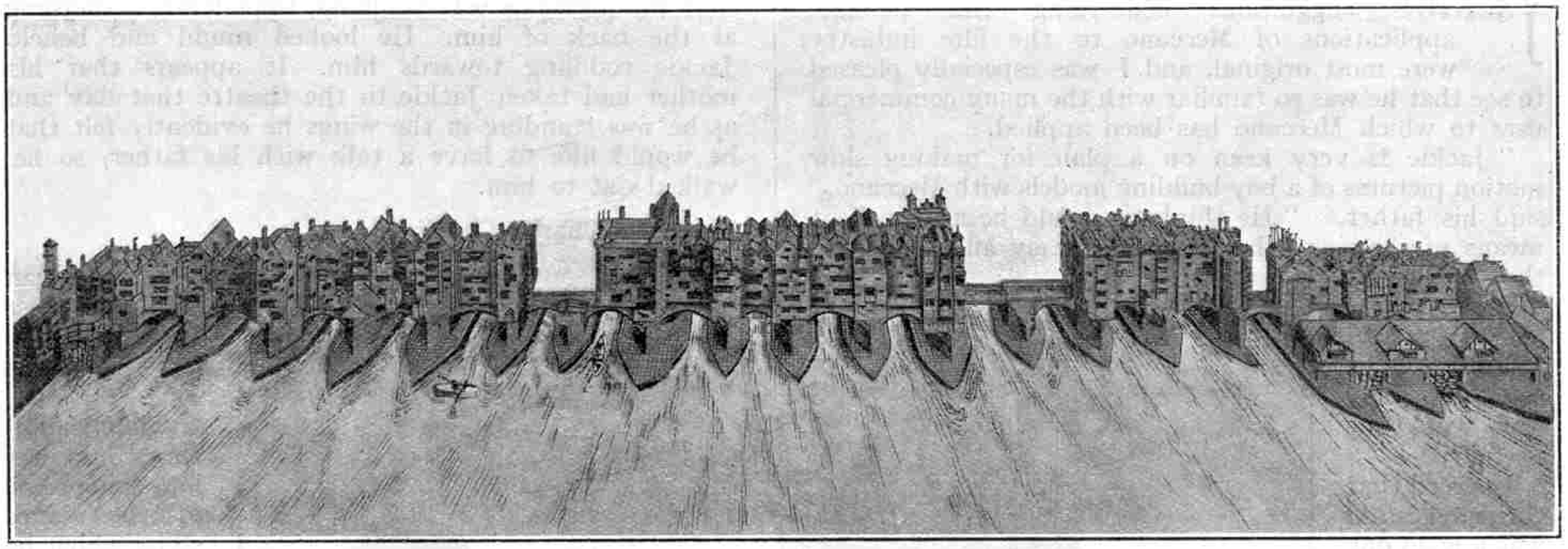
While in Scotland Smeaton made the acquaintance of Doctor John Roebuck, a physician and experimental chemist who was then struggling to carry on the Carron Ironworks near Falkirk, and coal mines at Borrowstonness.

Roebuck was born in 1718 at Sheffield, where his father carried on the manufacture of cutlery. The boy was strongly attracted to scientific pursuits and studied at Edinburgh University and at Leyden. In 1745 he settled in Birmingham as a doctor and while there he became interested in the various processes in the production of iron. He experimented diligently to devise some means of smelting iron otherwise than by charcoal, and gradually he evolved a method utilising ordinary coal, which he afterwards patented. Later he removed to Scotland and established on the banks of the River Carron in Stirlingshire the first Scottish ironworks.

At the time when Smeaton met Roebuck the latter was in need of a powerful blowing apparatus and about 1768 Smeaton constructed for him a thoroughly efficient machine for this purpose driven by a water-wheel. Roebuck subsequently became involved in serious financial difficulties and died in obscurity in 1794.

Ramsgate Harbour

Smeaton carried out a good deal of interesting work in connection with the designing of harbours, his greatest achievement of this kind being the harbour at Ramsgate.



Old London Bridge, as Shakespeare saw it (about 1600)

As early as the reign of Queen Elizabeth it had been proposed to construct a harbour of refuge for shipping in the Downs, the place favoured being Sandwich.

The subject was revived at various subsequent dates but nothing was actually done until 1748, when public attention was focussed on the matter by a great storm in the Downs, during which many ships broke from their anchors and were driven on shore. Some of these vessels found safety in the tiny haven at Ramsgate, and this fact appears to have brought about the realisation that Ramsgate was the proper place for a harbour of refuge.

In 1774 Smeaton was called upon to advise the Harbour Board upon the matter and ultimately the harbour was constructed to his designs.

Spurn Point Lighthouses

Between the years 1771 and 1776 Smeaton erected two lighthouses on Spurn Point at the entrance to the Humber. These lighthouses were illuminated by coal fires and in view of the enormous power of modern lighthouse lanterns it is curious to read Smeaton's own words : " Upon the 5th September 1776 the fires were kindled with stone coal, which exhibited an amazing light, to the entire satisfaction of all beholders ! "

Smeaton was not given to boastfulness in his writings and the success of these two lighthouses may be judged from his comment : " I had great satisfaction to find at Hull that the Spurn Point lights were in such credit

(*Continued on page* 167)

Jackie Coogan's Visit
to the American Meccano Factory

by Frank Hornby

During a visit to America, Mr. Hornby, the inventor of Meccano and Managing-Director of Meccano Ltd., was able to show Jackie Coogan over the Meccano factory at Elizabeth, New Jersey, U.S.A., and he concludes below an account of a pleasant chat with this "great little" film star. Jackie Coogan is undoubtedly the world's most popular boy, and I feel sure that many thousands of our readers who have witnessed his clever acting on the screen will be interested to read of the happy "off" hours that Jackie spends with Meccano and other boyish hobbies. On completing his tour of the American factory, Jackie was surprised to learn that there was a still bigger factory at Liverpool, and another at Paris, and he has made up his mind that he will certainly visit the Head Office of Meccanoland on his next trip to Europe.—EDITOR.

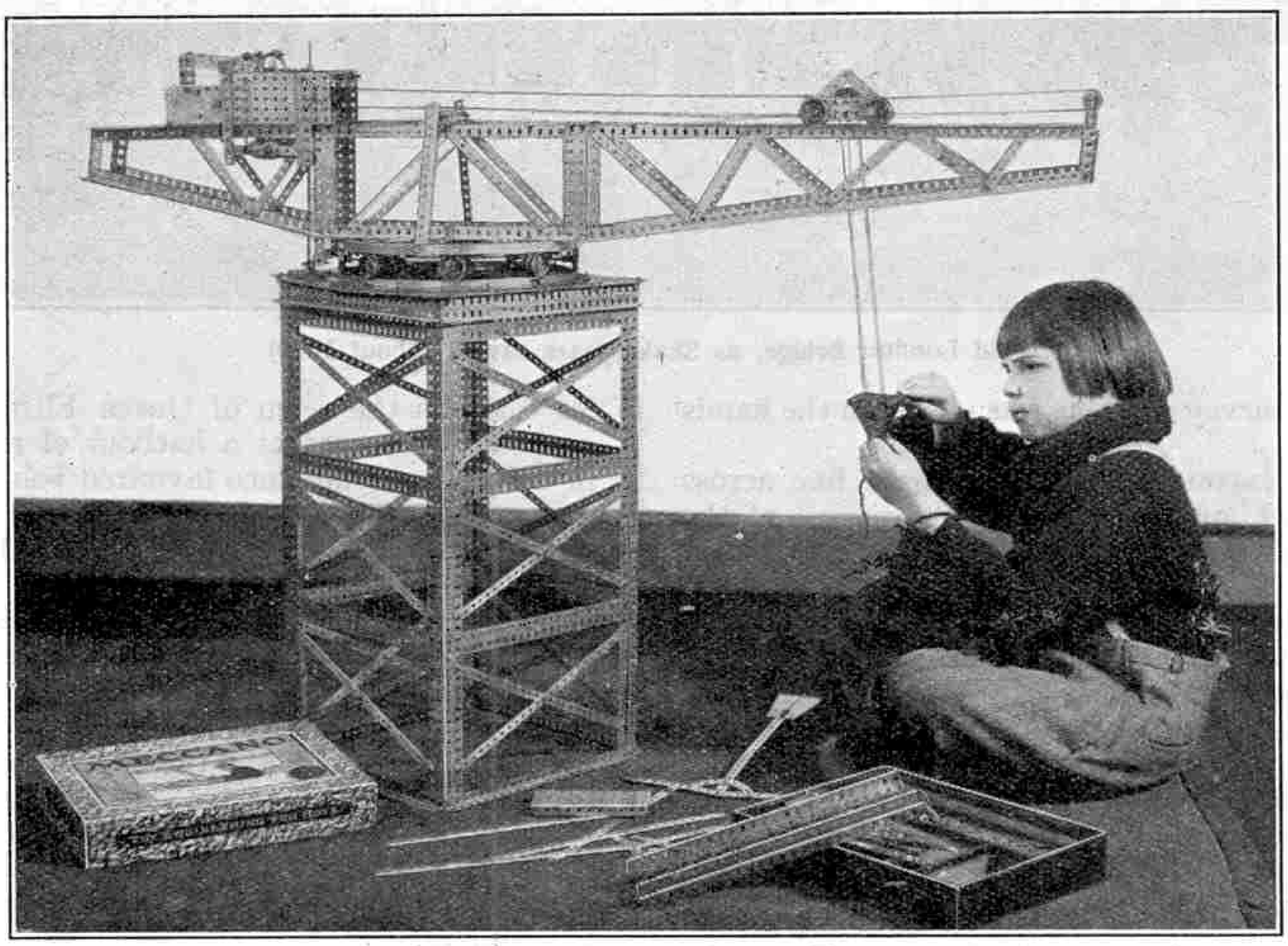
(*Concluded from last month*)

JACKIE'S suggestions concerning the possible applications of Meccano to the film industry were most original, and I was especially pleased to see that he was so familiar with the many commercial uses to which Meccano has been applied.

"Jackie is very keen on a plan for making slow motion pictures of a boy building models with Meccano," said his father. "He thinks it would be an excellent means of showing other boys how easy and delightful the work is. Don't you think, Mr. Hornby, that something like that would be useful?"

I agreed that the suggestion was a good one and that it might be worth planning out something of the kind.

All the while Mr. Coogan was speaking there was a grave expression on Jackie's face as he looked at us, glancing from one to the other, that showed he was anxious that his ideas should be taken very seriously. The long talk that we had together gave me all the clues I needed to his strong character and showed me plainly enough why his personality and genius have impressed themselves in so marked a fashion on his audiences all over the world.



Jackie Coogan at work on his Hammerhead Crane. The pulley block, apparently, calls for some serious thinking

How Jackie got his Start

I expressed the wish to know something of his short and wonderful career, and his father told me, with a twinkle in his eye, that his first appearance in a theatre was when he was twenty months old. Mr. Coogan himself was on the stage at the time, when he noticed that the audience was laughing, applauding something at the back of him. He looked round and beheld Jackie toddling towards him. It appears that his mother had taken Jackie to the theatre that day and as he was standing in the wings he evidently felt that he would like to have a talk with his father, so he walked out to him.

He Meets Charlie Chaplin

Mr. Coogan made the best of the situation, introduced his son to the laughing audience, and set him doing some of the dance steps which he had learned at home.

At the age of four he appeared on the stage with Annette Kellerman and it was while he was doing some of his dance steps in this performance that he attracted the attention of Charlie Chaplin.

For four years the comedian had wanted to film the story eventually called "The Kid," but he had postponed production time after time because he could not find the right child to play the name part. And here he recognised in Jackie Coogan the boy whom he had sought so long. A week or so later Chaplin called upon the Coogans in Los Angeles, and had himself introduced to Jackie by Sid Grauman, a well-known theatrical impresario who had known the Coogans in San Francisco.

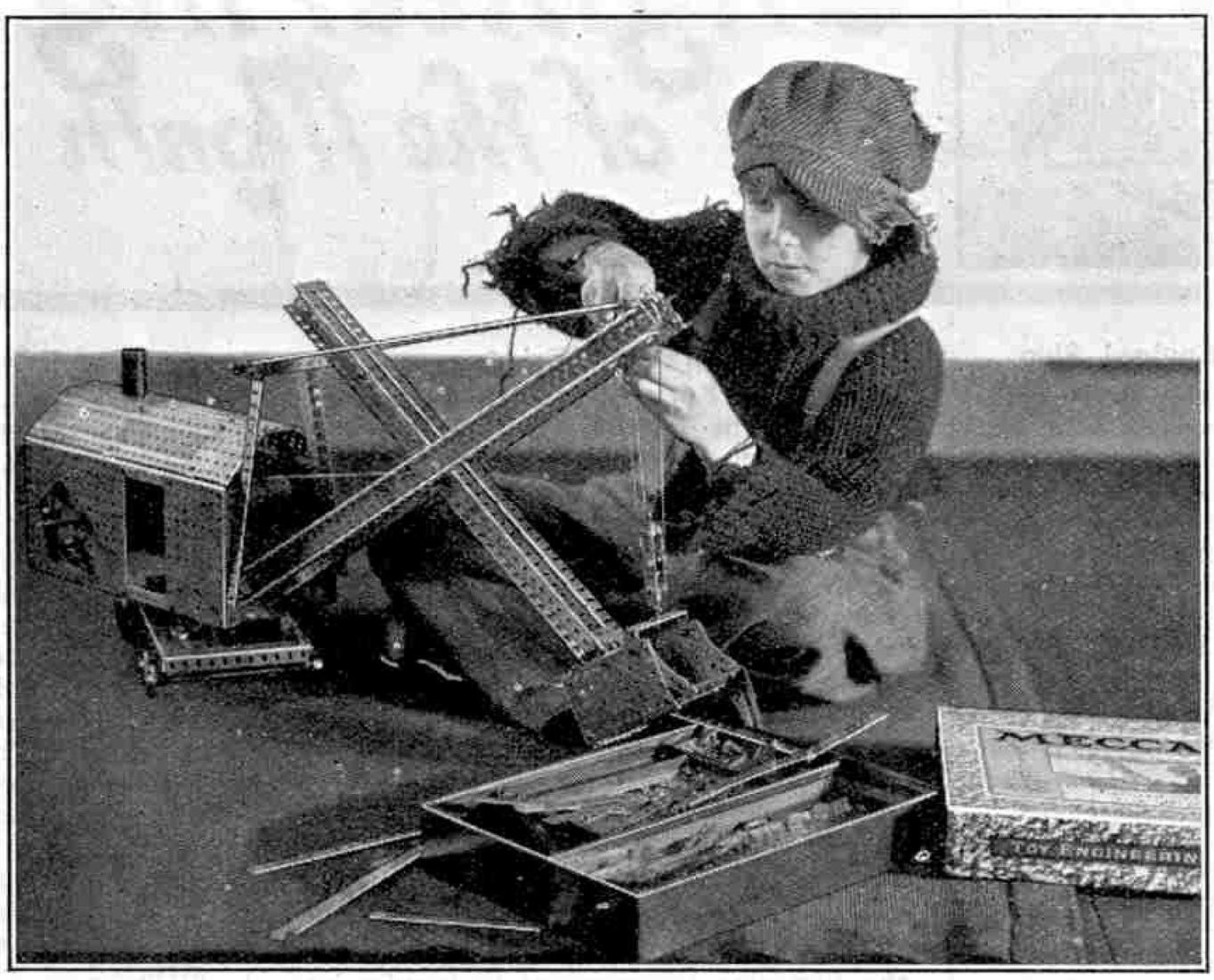
The history of the production of "The Kid" and Jackie's instantaneous success is no doubt common knowledge. Jackie's pictures since then are as follows: "Peck's Bad Boy," "My Boy," "Trouble," "Daddy,"

"Circus Days," "Oliver Twist," "Long Live the King," "A Boy of Flanders," "Little Robinson Crusoe," and "The Ragman."

Undoubtedly he occupies an unique place in the public's heart all over the world. Perhaps never in history has there been an individual, in any walk of life, so universally beloved as this youngster.

Jackie Inspects the Factory

We went through the Meccano factory and Jackie revelled in all that he saw. The giant power presses, noisily blanking out Rectangular and Sector Plates, filled him with wonder, and he was fascinated by the working of the safety guards with which they are all equipped. These guards are designed to prevent accidents to the operators of the presses and are so arranged that they automatically push the operator's hands out of danger as the ram of the press descends.



Putting the finishing touches to a Meccano Steam Shovel

From the presses we turned to the Automatic Department, and here the steady hum of the screw-cutting machines was in marked contrast to the clanking of the presses. Jackie marvelled at the automatic screw machines. To see a brass rod fed into the machine at one end and a completely fashioned worm wheel drop out at the other end every few seconds, seemed like a piece of magic, and I assured him that many people much older than he found the sight just as mystifying. For myself, I must confess that to this day these wonderful machines fascinate me.

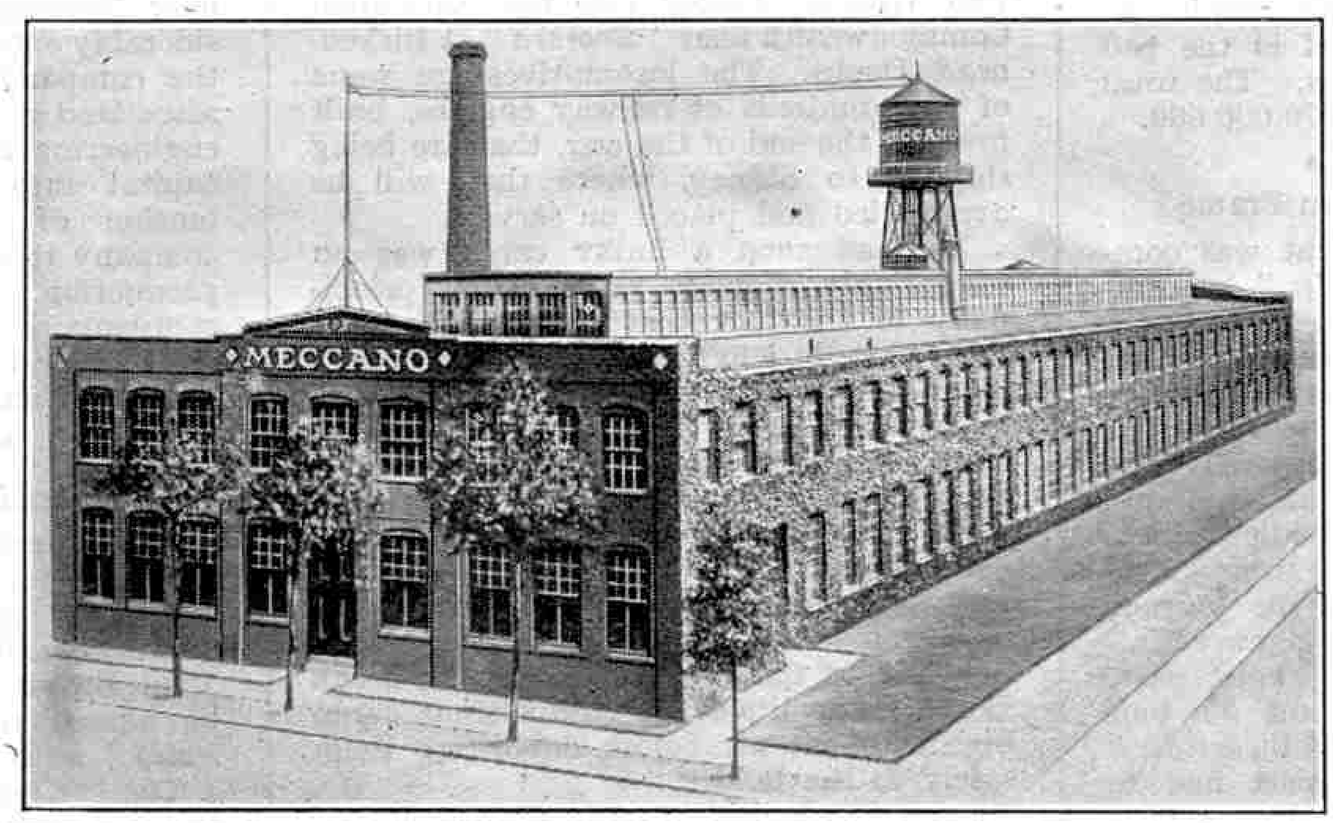
The drilling and tapping machines proved to be hardly less interesting and even the machines that assemble the set screws into the wheels so rapidly were not overlooked.

Jackie becomes a Nickel-Plater

In the Nickel-Plating Department Jackie felt like a little chemist and he plated a complete batch of work himself. He was handed a rack of parts ready for plating and, having immersed them in the hot cleaning vat, which not only removes dirt but adds a deposit of copper before the parts are plated with nickel, he exclaimed with glee at the quick change in the appearance of the parts. When he immersed them they were a dull steel colour; when he took them out they had a bright copper tint. Then he put the rack of parts in the nickel bath, rinsed them afterwards, dried them in heated sawdust, and with a roguish smile, turned to me and said, "That's easy, isn't it."

Jackie would have liked to linger a while in each department but time was pressing and we were able to make only a brief visit to the Packing Department. Here, however, Jackie saw to it that we stopped long enough to enable him to pack up a Meccano Outfit all by himself, from start to finish — a performance of which he was exceedingly proud. Like all other visitors to our factory, Mr. Coogan and Jackie were amazed at the precision and accuracy with which each little part of the Meccano system is produced.

Jackie was a little surprised to learn we have several other factories besides the one in Elizabeth and that the real home of Meccano is in Liverpool, where an enormous staff is employed by the firm, and that there is another large factory in Paris. On his next trip to Europe he intends visiting both of these factories. I mentioned that at Liverpool he would be able to watch the manufacture of Hornby Trains, in addition to that of Meccano. Then I told him the story of Hornby Trains and explained how they had grown in popularity until to-day they vie with Meccano for first place as the world's most popular toy.

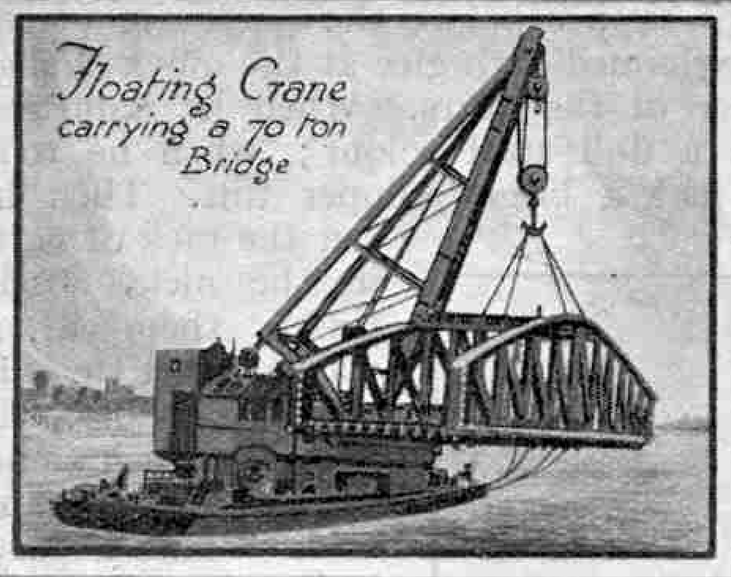


The Meccano Factory at Elizabeth, New Jersey, U.S.A.

"Say!" he exclaimed. "They must be dandy trains to do that!"

As we said good-bye, he told me that, although he had met kings and princes, had been entertained as no visiting potentate is entertained, had had gifts of all kinds lavished upon him, his greatest thrill had come to him on his visit to the Meccano factory.

THE END



Engineering News of the Month

World's Largest Diesel-Engined Ship

Built by Messrs. Armstrong, Whitworth & Co., to the order of the Swedish-America Line, of Gothenburg, the "*Gripsholm*" is in many respects unique. She is the largest Diesel-engined ship in the world and the largest Scandinavian vessel, having a gross tonnage of 23,500, a length of 574½ ft.; and a breadth of 74 ft. Her engines are of particular interest, being of the double-acting four-cylinder type, built by Burmeister and Wain, of Copenhagen. They give 13,500 shaft horse power and are identical with one that was run for some weeks at Copenhagen. After the necessary tests the engines were dismantled, shipped to the Tyne and re-erected in the "*Gripsholm.*" They are the largest ever fitted in a motor ship and are all in one compartment.

The "*Gripsholm*" has accommodation for 2,000 passengers and has a speed of about 17 knots. She has two funnels, but these, of course, are dummies, and are used as lift shafts.

* * * *

Channel Jetty Scheme

A plan has been laid before the Calais Chamber of Commerce by M. Jules Jaegar, a civil engineer, for the construction of a double jetty across the Straits of Dover. Each of the proposed jetties would be at two levels, the upper carrying a roadway about 40 ft. in width, and the lower two railway tracks. The weight would be supported by piles embedded in the bed of the Channel or in caissons. The total cost is estimated at about £70,000,000.

* * * *

"*Olympic's*" New Stern Frame

An unusual engineering feat was completed when the "*Wearsider,*" a comparatively small vessel arrived at Southampton on November 19th, bearing as her sole cargo the huge new stern frame for the White Star Liner "*Olympic.*" The frame was made at the Darlington Works, of the Darlington Forge Company, and in order to get it by rail to Middlesbrough, the load, which was over 20 ft. in width, had to be shifted twice on the journey and a signal post had to be removed.

The stern frame was in two parts weighing respectively 35½ and 35 tons and was put aboard the "*Wearsider*" at Middlesbrough. Each part had to be moved inch by inch by means of a 100-ton crane until in position.

The voyage from Middlesbrough to Southampton passed without incident and on arrival the two sections were transferred to the Trafalgar Dry Dock by a 150-ton floating crane. The third section was conveyed by rail, the entire structure weighing about 80 tons.

Waterloo Bridge

Sir Edwin Lutyens, in his recently issued report to the London County Council on the question of Waterloo Bridge, says :—

No matter what the Council's decision may be, the bridge, to be maintained, must eventually be rebuilt."

The report was drawn up in response to a request by the Council to Sir Edwin to prepare a design showing how the bridge could be widened, and also a report as to what effect the alterations would have on the appearance of the bridge, but Sir Edwin says that he has been unable to find that the bridge could be altered without marring its appearance.

* * * *

New Grain Elevators

The Parliamentary Board appointed by the Victorian Government to inquire into the handling of grain in bulk, recommends the construction of 132 elevators at country railway stations, and terminal elevators at Geelong and Williamstown, at a total estimated cost of £3,512,000.

The total storage capacity of these elevators will be 17,445,000 bushels, while they will be capable of handling a wheat crop of 40,000,000 bushels.

* * * *

Crane's Big Lift

Three large locomotives with their tenders, weighing altogether 270 tons, were recently loaded into the Australian Commonwealth liner "*Boorara*" at Birkenhead Docks. The locomotives are some of the hundreds of railway engines, built towards the end of the war, that are being shipped to Sidney, where they will be overhauled and placed on service.

To load such a bulky cargo was an exceedingly difficult task, owing principally to the fact that the engines were over 40 ft. in length, and the hatch openings only about 36 ft. in width. The locomotives were lifted bodily by the Mersey Docks and Harbour Board's floating crane "*Mammoth.*" They had to be tilted to an angle of 45 degrees to get them through the hatch openings, and then hoisted from the quay into the vessel moored alongside. When once adjusted to the requisite angle, the Dock Board crane lifted the cumbersome cargo high into the air before depositing them safely in the hold.

* * * *

Proposed St. Lawrence Dam

A dam across the River St. Lawrence, above Quebec and below Three Rivers, has been suggested so as to enable deep draught vessels to reach Montreal to load. Owing to the depth of the river being insufficient this is at present impossible during winter months.

The New Sydney Harbour Bridge

Work is steadily proceeding on the Sydney Harbour Bridge, the contract for which was secured by Messrs. Dorman, Long & Co., Middlesbrough, the estimate being £4,200,000. A great deal of preparatory work is necessary before the erection of the actual bridge can be begun. It will be built from both sides of the harbour practically without any scaffolding, powerful cables holding in position the great span of 1,650 ft. during its construction. The engineers are confident that even allowing for any swaying of the two ends caused by high winds it will not be more than five or six inches out when they come to make the connection of the two ends of the span. For testing the steel a special machine has been constructed at a cost of about £100,000 and the cranes necessary for lifting the girders into their places have each cost about £6,000 to build. The necessary girders will be carried by specially constructed barges from the factories to the bridge, where they will be lifted from these vessels by cranes to a height of about 400 ft. and then placed in position and secured by the riveters.

* * * *

Australian Works Extension

The works of the Commonwealth Steel Products Company Ltd., at Port Waratah, near Newcastle (N.S.W.) are to be considerably extended. According to a report the company will in all probability be associated shortly with several large British engineering firms, which will put £50,000 capital into the enlargement and extension of the plant. The Australian company then hopes to double its present production. The principal work of the company is the construction of locomotives and the manufacture of wheels, tyres and axles.

* * * *

New Australian Cruisers and Submarines

It is announced by the High Commissioner for Australia that the two new 10,000-ton cruisers to be built for the Commonwealth Government by Messrs. John Brown & Co. Ltd., Clydebank, will be named respectively H.M.A.S. "*Australia*" and H.M.A.S. "*Canberra.*"

The "*Canberra*" takes its name from the new capital city of the Commonwealth, while the "*Australia*" will be the second vessel of the Australian fleet to bear this name. The first, a battle cruiser, was sunk in April 1924 in accordance with the provisions of the Washington Treaty.

The two new 0 class submarines to be built by Messrs. Vickers Limited, Barrow, will be designated A01 and A02.

The New White Star Liner "*Laurentic*"

The new 18,700 ton White Star liner, recently laid down in Messrs. Harland & Wolff's yard at Belfast, is to be named the "*Laurentic*." She will be employed on the Canadian service and is the second vessel of that name.

The first "*Laurentic*" was built in Queen's Island in 1908, and was a vessel of 14,892 tons gross—sister ship to the "*Megantic*." At the outbreak of the war the ship was converted into an armed cruiser, being sunk by the Germans in Lough Swilly. For some years afterwards salvage operations were undertaken to recover bullion to the value of about £2,000,000, which was on board the ship when she sank.

* * *

Magpie Nest of Wire

Three times within a few days magpies caused interruptions in the trunk telephone line between Ulmarra and South Grafton, New South Wales.

The first time trouble occurred on the line the linesman noticed a magpie with a piece of wire in its beak, sitting on the line, near a telephone post. On climbing the pole, he discovered a partly-constructed nest, composed solely of galvanised wire, wire netting, copper wire, and barbed wire. The wires were so entwined round the trunk lines that the removal of the nest was a difficult task.

* * * *

Large Philadelphia Coal Loading Plant

The Reading Company at Port Richmond, Philadelphia, have recently installed a large coal car dumper, capable of handling 40 100-ton coal cars an hour. The cars are pulled up a 1 in 12 gradient to a dumper cradle, where they are hoisted vertically to the hopper. An operator is stationed near the top of the machine, in such a position that he can clearly see both the car and the ship that is being coaled. He controls the raising of the car, the hoisting machinery being operated by steam, while the movement of the pan is controlled by a 150 h.p. electric motor.

So that the flow of coal may be in the right direction an operator, stationed in a cab immediately over the ship's hatch, controls the telescopic chute. The pan and telescopic gear are hoisted clear of the vessel both before and after coaling by means of a 275 h.p. motor.

* * * *

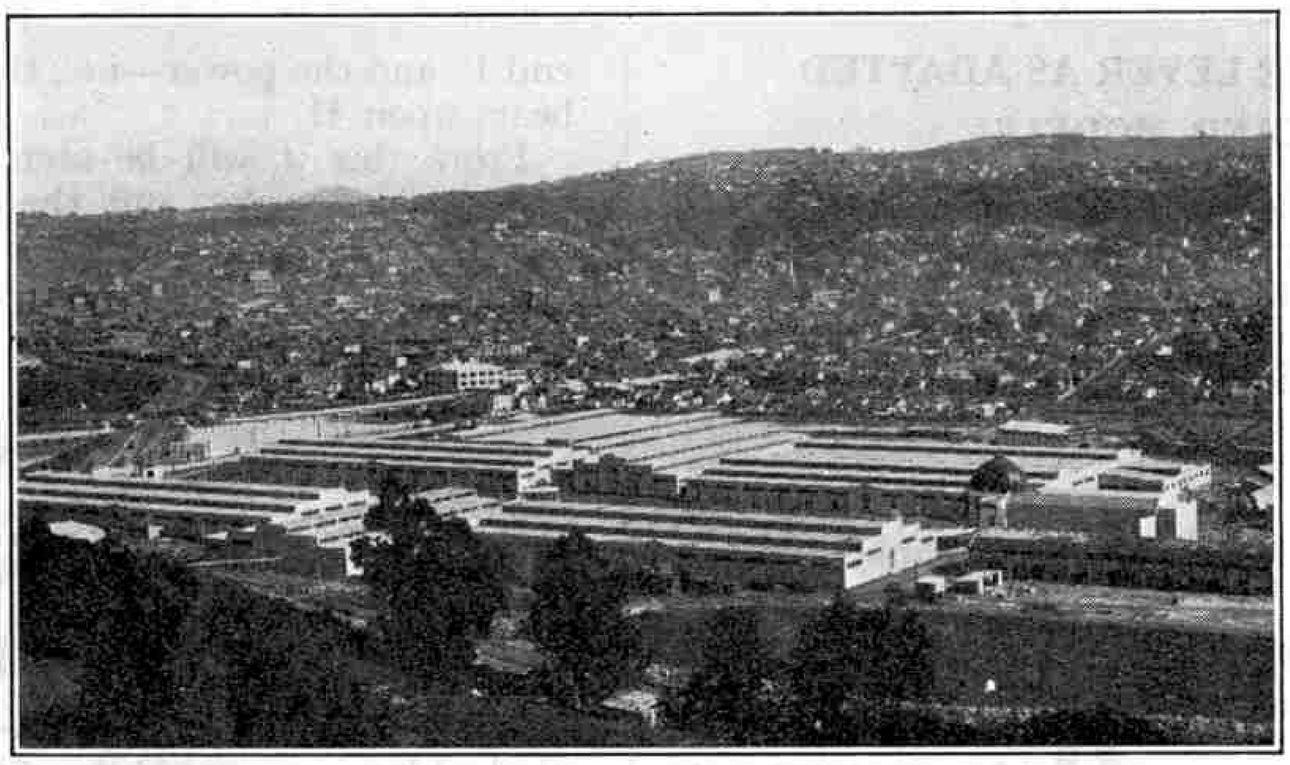
Bridging the Colorado

About £40,000 is the estimated cost of a suspension bridge over the upper gorge of the Grand Canyon of the Colorado river, a bill for which was recently introduced in the United States Congress to provide for an appropriation to defray the cost. The most suitable place for the erection of the bridge is where the walls of the canyon form a single narrow gorge, some 2,000 ft. above the water.

100,000 h.p. Steam Power Plant

The Southern Power Company, of Carolina, are to build a steam power plant of 100,000 h.p., as an insurance against loss of power through drought from the hydro-electric stations. Steam will be used at a pressure of 350 lb. per sq. in. The total capacity of the company's water plants is 600,000 kilovolt-amperes.

Wembley in New Zealand!



This photograph, which reminds one very forcibly of the buildings at Wembley, shows part of the Exhibition now being held at Dunedin, N.Z., and described on page 151. Doubtless, many of our overseas readers will visit the Exhibition and see here for the first time, some of the wonders of modern engineering.

World's Longest Concrete Span

What is claimed to be the longest single concrete span in the world is being completed at Schenectady, N.Y., as an integral part of the new Western Gateway Bridge which crosses the Mohawk River. The span, which is 212 ft. in length, crosses the river at a height of 52½ ft. above the water level. The bridge is almost a mile in length, and includes the first concrete arch ever built on a curve.

* * * *

New Corrosion Preventative

A new company (to be known as the Mond Tar By-Products Syndicate) has recently been formed for the purpose of marketing a new corrosion preventative. The formula was first discovered some years ago by a chemist in the employ of the South Staffordshire Mond Gas Company, who was endeavouring to solve the problem of the firm's high maintenance costs due to corrosion. When tests were made with the new paint the results exceeded all expectations. After three months on a surface registering a constant heat of 725°F. the paint remained unblistered, whereas other paints had lasted only five days. On the other hand a special variety of the paint was used on a surface that was required to be permanently moist, and it had not dried even after two years' exposure.

The main value of the new paint lies in its great corrosion preventing properties. It is difficult to arrive at an accurate financial estimate of the loss but some two-thirds of the world's annual supply of steel and iron is required to repair the wastage due by corrosion.

New Nile Bridge

Work has recently commenced on a new steel bridge to replace the existing one at Dessouk, on the banks of the Nile, about 40 miles south of Alexandria. The bridge will consist of eight spans of the single Warren girder type, each 200 ft. in length, a swing span to allow for river traffic passing under the bridge, and a short shore span 177 ft. 6 in. in length. The bridge will carry a single rail track, with roadways for wheel and foot traffic carried upon cantilever brackets at either side of the bridge.

Messrs. Dorman, Long & Co. Ltd., of Middlesbrough, are constructing the bridge on behalf of the Egyptian State Railways, having secured the contract in face of severe Continental competition. They are now engaged in dismantling the existing structure and preparing the piers to receive the new girders. The work is to be completed by the end of 1926.

* * *

Salvage Tug for New Zealand

The Dublin Dockyard Co. (Vickers-Ireland Ltd.) have been awarded a contract by the Wanganui Harbour Board (New Zealand) for the construction of a twin screw fire and salvage tug, the dimensions of the vessel to be 110 ft. by 24 ft. by 12 ft. The machinery will consist of two sets of triple expansion engines developing 800 h.p.

* * * *

Harbour Improvements at Buenos Ayres

The channel giving access to the port of Buenos Ayres is to be enlarged and deepened so that two large liners will be able to use the channel without interfering with one another. The estimated cost of the work is about £1,000,000.

The present channel is 30 ft. in depth and 328 ft. in width at the bottom, and these measurements are to be increased to 35 ft. deep and 492 ft. in width.

* * * *

Painting the Forth Bridge

The Forth Bridge is painted every three years. The extent of this task may be realised from the fact that the total area to be painted inside and outside is 145 acres. The whole of the outer surface of the bridge was covered five times during construction—once with boiled linseed oil, twice with red lead and twice with oxide of iron paint. The total building period was about seven years and at the busiest times no less than 4,600 workmen were employed. As might be expected, the building of such a huge structure involved many dangerous operations. During the whole period of construction 57 fatal accidents occurred and 106 serious but not fatal accidents.

The total cost of the bridge was over £3,600,000.

MECCANO STANDARD MECHANISMS

Section IV. LEVERS—(*Continued*)

This article is the fifth of a series explaining some new and interesting aspects of Meccano Model-building practice. Gear ratios, Belt and Rope Mechanism, and Pulleys have been dealt with already, and the following article concludes a simple demonstration of the principle of the Lever, which was commenced in last month's "M.M."

EXAMPLES OF THE LEVER AS ADAPTED TO MECCANO MODELS

THE properties of the lever have been known and appreciated by man since the earliest times. Indeed, the fundamental laws of mechanics probably all trace their origin from deductions arrived at from the first observations of its characteristics. Even as long ago as 200 B.C., man was fully aware of the capabilities of the lever. This is shown by the famous boast of Archimedes, the greatest mathematician and inventive genius of antiquity: "give me a fulcrum on which to rest it (the lever) and I will move the Earth."

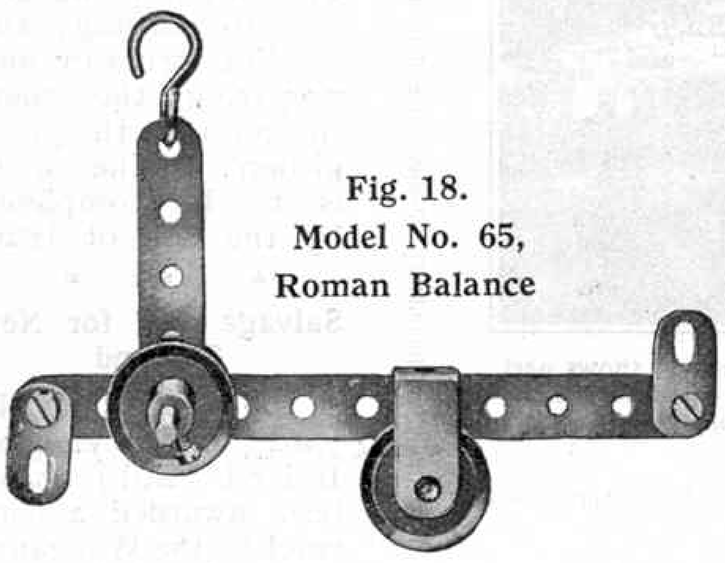


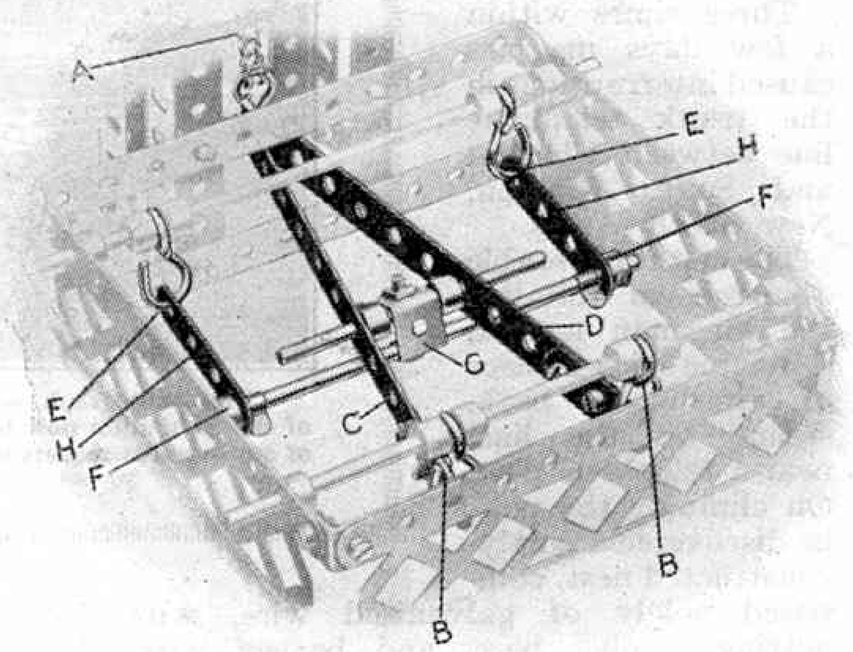
Fig. 18. Model No. 65, Roman Balance

Amongst the earliest forms in which the lever was brought to the service of man may be included the Roman Balance, or simple steelyard. This consists of a lever of the first order, with which a heavy load attached to the short arm may be balanced by a smaller weight sliding on the longer arm (Fig. 18). This simple contrivance has been employed throughout the ages, and at the present time forms the basis of the most elaborate and sensitive weighing machines.

Levers in Platform Scales

S.M. 51 shows the arrangement of levers in the base of the Meccano Platform Weighing Machine. The weight of the platform, which, for demonstration purposes, we will call the power, bears upon the first levers at C and D, between the load—represented by the force required to pull down the Sprocket Chain at A—and the fulcrum on a Hook B. In the smaller levers the fulcrum E is at one end, the load (or force required to pull down the centre link G) is at the other end F, and the power—i.e., the weight of the platform—bears upon H.

From this it will be seen that all these levers are of the third order and therefore the power must be greater than the load before they can be operated, as explained in last month's "*M.M.*" (see "Lever of the Third Order," page 87). Hence the Hook A must move through a greater distance than the power, and the pull upon the Hook (which we have taken as representing the load) must always be less than the weight, or power, imposed upon the platform of the scales.



S.M. 51. Levers in Platform Scales

The use of the apparatus therefore enables us to weigh a heavy load with accuracy by merely moving a small counterpoise along the steelyard until the pull upon the Hook A is counterbalanced. By noting the position of the counterpoise we are able then to determine the exact amount resting on the platform.

Application of Levers in Model of Drawbridge

The various applications of the lever as a means of modifying or transforming power are shown very clearly in a number of Meccano models, and the consideration of even the most obvious of its adaptations should be of no little interest to all keen model-builders.

An interesting example of the use of levers in bridges is furnished in the Meccano Drawbridge, Model No. 642.

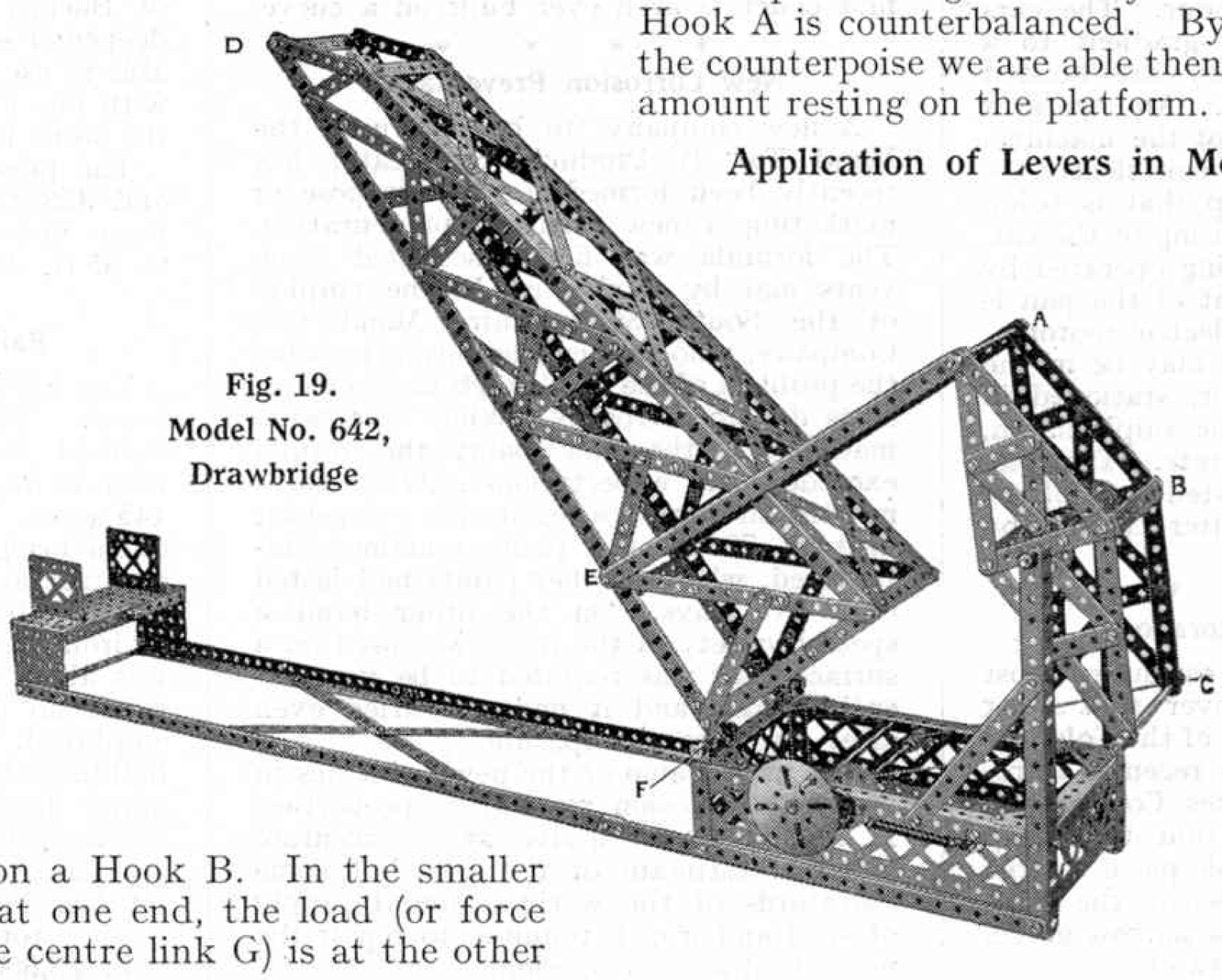


Fig. 19. Model No. 642, Drawbridge

As will be seen from

Fig. 19, there are two kinds of levers included in this model. A lever of the first order is shown at ABC, the fulcrum being at B, the load at A, and the power at C. DEF represents a lever of the third order, in which F is the fulcrum, E the power, and the load is represented by the weight of the arm DE. It will be noticed that with this arrangement of levers the bridge DF moves through a much greater distance from that traversed by the power C. The lever ABC merely transposes the force from C to A.

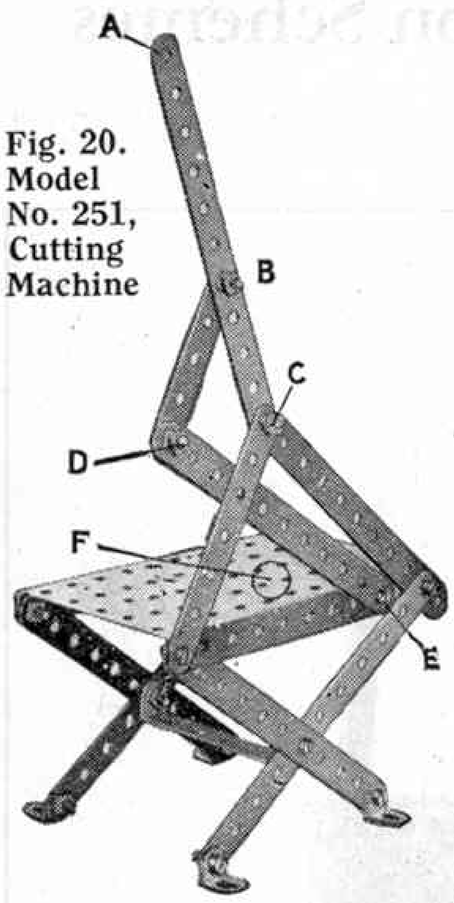


Fig. 20. Model No. 251, Cutting Machine

Cutting Machine

Two levers of the second order ABC, DE, are included in the Cutting Machine (Model No. 251 in the Instruction Manual). In the first lever ABC (Fig. 20) the power is applied at A, the fulcrum is at C, and the load lies between the two at B. In the second lever DE, the power is applied at D, while the fulcrum is at E. The load in this case is represented by the pressure of the lever arm against the material to be cut, which is placed in position at F.

A large increase in power is obtained from this combination of levers, and the model illustrated resembles the type of apparatus used in many workshops for the purpose of cutting through soild bars of metal by hand power.

Bale Press

Two pairs of levers of the second order are used in Model No. 430, Bale Press (Fig. 21), increasing the power applied at the points AB to a considerable extent.

These levers move about a common fulcrum at C and are all pivotly connected to a vertical sliding Rod D. The latter Rod presses the Plate E against the bale and this pressure represents the load on the levers.

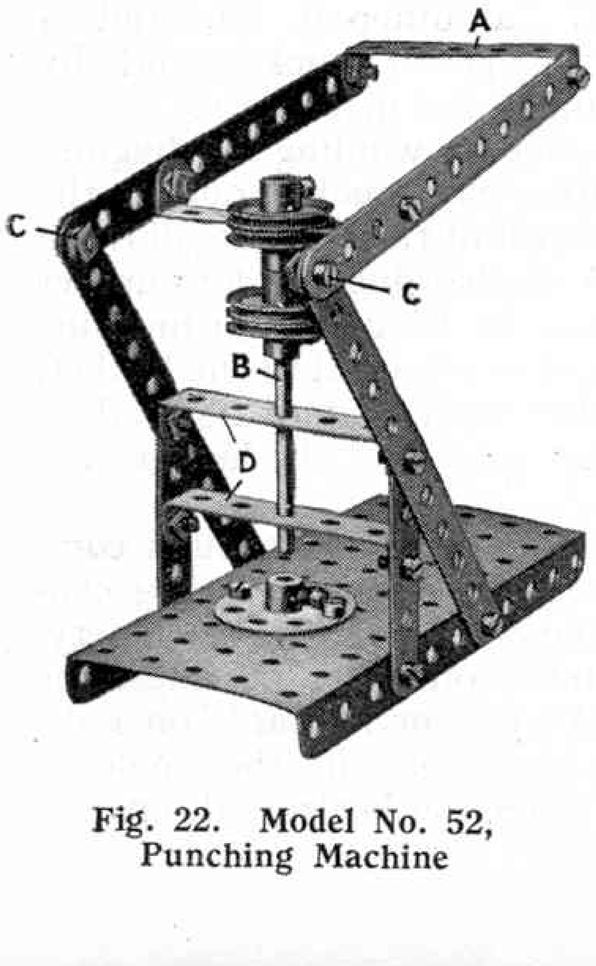


Fig. 22. Model No. 52, Punching Machine

There are many types of presses in use to-day by which cotton and other fibrous materials are compressed into bales of great density ; this, of course, results in big reductions in freight costs. The machines range in size and power from the hand-operated type, of which Fig 21 is a good example, depending upon simple leverage for their strength, to huge hydraulic presses, such as that illustrated in the "*M.M.*" for August, 1925 (page 381). The latter, it will be remembered, is capable of exerting a pressure of about 2,000 tons, and itself weighs 90 tons.

Punching Machine

A single pair of levers of the second order are employed for a similar purpose to that described in the previous example in the Punching Machine, Model No. 52 in the Instruction Manual, (Fig. 22). A power applied at A is brought to bear with increased force on a vertical shaft B, representing the punch.

The levers are pivoted by means of bolts and lock-nuts at the points C, and the punch slides in Double Angle Strips D.

Supposing a power equal to 3 lbs. is applied at A in this model, we can determine the resulting pressure on the Rod B by the following calculation. In Example 3 in this section (see page 86, February "*M.M.*") it was stated that the power is to the load as the distance of the load from the fulcrum is to the distance of the power from the fulcrum. In Fig. 22, it will be seen that the load, represented by the force required to press down the punch B, is applied, through a Double Angle Strip, to the fourth holes in the levers—that is, $1\frac{1}{2}$ ins. from the fulcrum C. The power is applied at a distance of 5 ins. from the fulcrum, or $3\frac{1}{3}$ times the distance of the load from the fulcrum. Therefore, according to the rule, the load is three-and-one-third times as great as the power, and since the power is 3 lbs. the load—that is, the pressure on the punch B—must be exactly 10 lbs. if we ignore altogether the very small amount of friction that is present in the model.

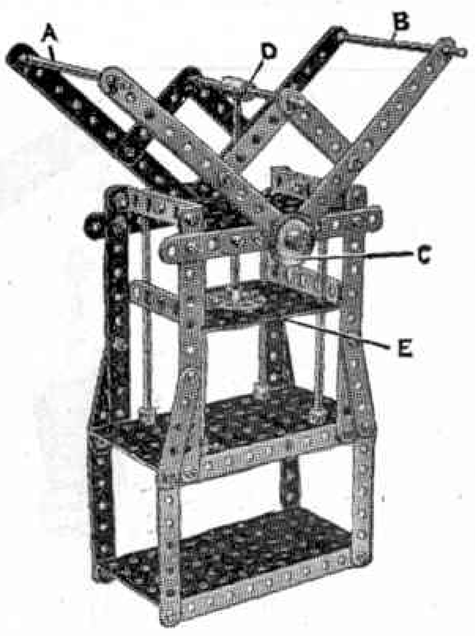


Fig. 21. Model No. 430, Bale Press

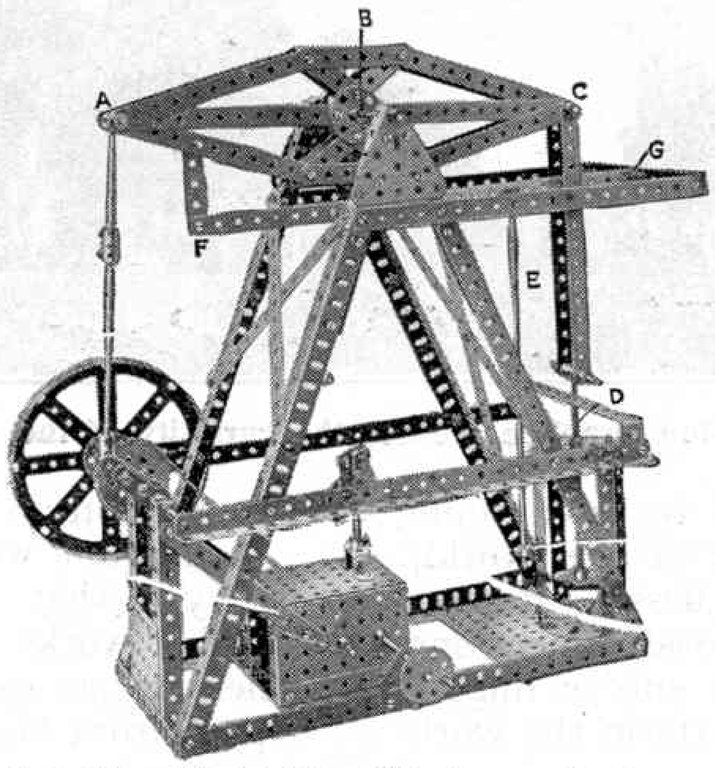


Fig. 23. Model No. 609, Beam Engine

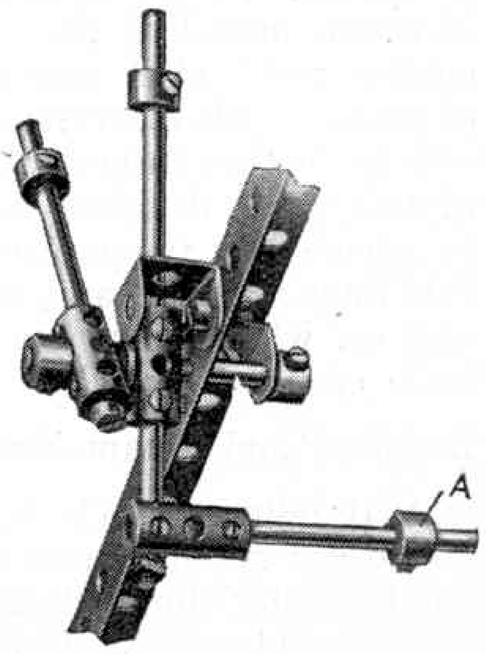
Beam Engine

A very interesting expression of lever mechanism is also found in the Beam Engine, Model No. 609. As will be seen from Fig. 23, a lever of the first order, ABC, is used in this model to transmit a reciprocating force at D to a circular force acting about a crank-shaft.

The valve rod E is operated by means of a lever of the second order FG. In the latter, F represents the power, derived from the movement of the first lever ABC, while the fulcrum is at G, to which the lever is pivoted by means of bolt and lock-nuts. The force required to move the valve rod E up and down represents the load.

Hand Levers

S.M. No. 52 illustrates the gear-change and brake levers fitted to the Meccano Motor Chassis.



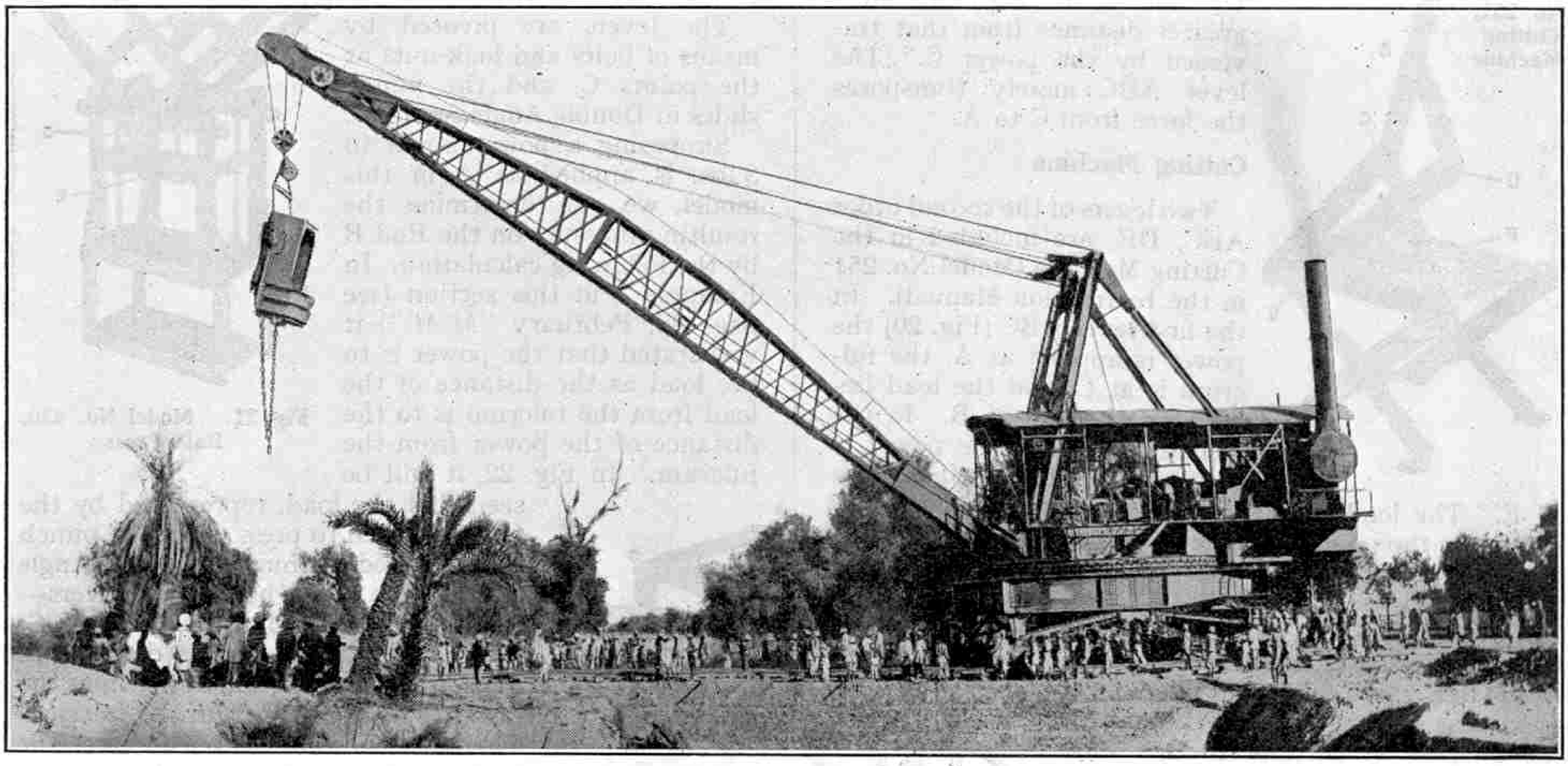
S.M. 52. Gear-Change and Brake Levers in Chassis

NEXT MONTH :—

Clutches, Reversing, and Drive-Changing Mechanism

A Triumph for British Engineers

Giant Draglines at Work in India on Huge Irrigation Schemes



A 350-ton Dragline arouses the curiosity of the natives

Excavators weighing 350 tons, with huge parts weighing 19 tons, doing the work of 8,000 coolies and excavating hundreds of miles of canals in irrigation schemes for the reclamation of millions of acres of barren desert makes us almost imagine we are living in the land of the Brobdingnags—the giants made famous by Swift in his "Gulliver's Travels." Yet these figures are no figment of the imagination and the huge machines, fully described in this article, are at work in India to-day on the greatest irrigation scheme the world has yet seen.

IN our issues of March and April 1924 we gave some details about the heaviest dragline in the world, then in course of construction by Messrs. Ruston & Hornsby Ltd., of Lincoln. The colossal dimensions of this giant excavator were amazing but only as huge a machine as this could be expected to perform the work required, it being intended for use in one of the largest engineering schemes that the world has ever known.

Our readers will remember that at the same time, we arranged a special model-building competition for the best Meccano model of the Dragline. From the number of entries received it was evident that the subject is one of considerable interest and we feel sure that our readers will be further interested to have news of the behaviour of this great dragline in India. We are now also able to give some particulars of the great work on which this huge machine and nine sister machines are engaged, and on which they are acquitting themselves with no little credit.

Dragline and Steam-Navvy Compared

A dragline, which is really a development of the steam-navvy or steam shovel, obtains its name from the fact that the bucket is dragged towards the machine on a flexible rope. It is in this respect that a dragline differs from a steam-navvy in which the bucket is mounted on an arm that pivots on a jib.

A dragline works in an opposite manner to a steam-navvy in that it excavates *below* the level on which it stands, works *towards* itself, and travels *backwards* when it has excavated all the material within reach. Apart from these four points of difference a dragline follows closely the construction of a steam-navvy — indeed, this latter machine can be converted into a dragline if necessary by fitting a different jib and a special bucket and by adding another winding drum to the machinery.

A dragline has two drums, one for winding the digging-rope and the other for lifting the bucket out of the excavation, regulating the depth of the cut and allowing the bucket to swing back for discharging and for another cut. The digging-rope passes in front of the machine close to the foot of the jib, and is attached to the bucket, the weight of which, together with that of its load, is taken by a hoisting rope that runs over the head of the jib.

The jib is of lattice-girder design and although comparatively light in weight, is of extremely strong construction. The jib, with the whole of the machinery, rotates on a platform mounted on roller bearings, the whole machine moving backwards or forwards on rails. A derricking gear, giving variations in the angle of the jib of from 25° to 40° from the horizontal, enables

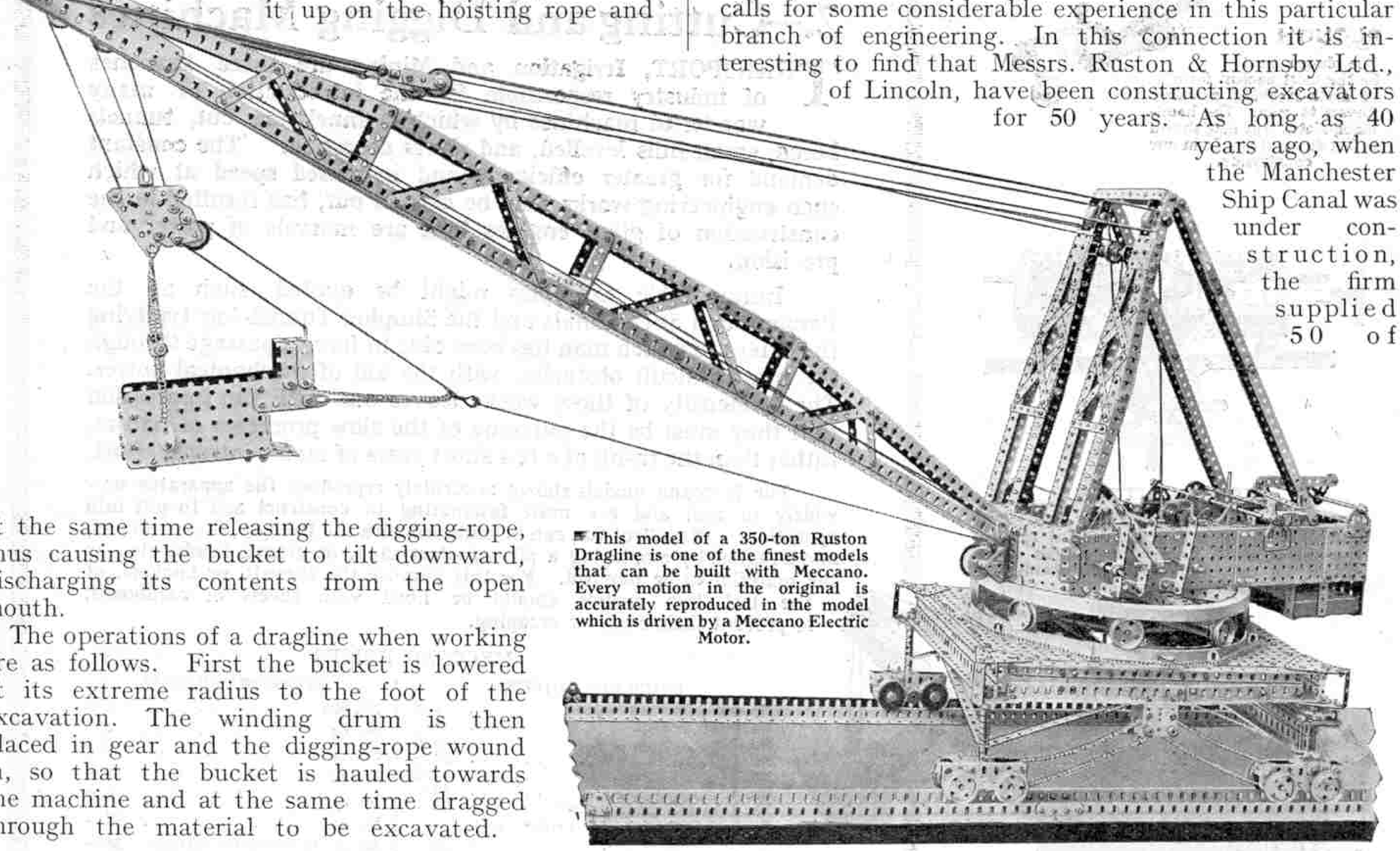
the working radius to be altered as required.

How a Dragline Operates

The bucket of a dragline is open at the front and at the top, and is not unlike a coal-scuttle in appearance. The digging-rope is connected to a cross-bar at the front of the bucket and the hoisting-rope is fixed to that part of the bucket that is farthest away from the machine.

The bucket is emptied by hauling it up on the hoisting rope and at the same time releasing the digging-rope, thus causing the bucket to tilt downward, discharging its contents from the open mouth.

The operations of a dragline when working are as follows. First the bucket is lowered at its extreme radius to the foot of the excavation. The winding drum is then placed in gear and the digging-rope wound in, so that the bucket is hauled towards the machine and at the same time dragged through the material to be excavated.



This model of a 350-ton Ruston Dragline is one of the finest models that can be built with Meccano. Every motion in the original is accurately reproduced in the model which is driven by a Meccano Electric Motor.

Discharging the Bucket

The thickness of the cut, or the depth to which the bucket is allowed to sink, is regulated by the tension on the hoisting rope. If the depth is correct the hoisting rope is allowed to unwind freely, but the cut may be made finer by braking the drum around which the rope is wound.

When the bucket is full, the clutch is thrown out of the drum winding the digging-rope, and the hoisting gear is engaged. The bucket is then lifted by the hoisting rope, and the digging-rope allowed to run freely so that the bucket swings towards the front of the jib, before being discharged as already described.

Draglines in the Fen District

Draglines are being increasingly used in railway and road construction and in dock and harbour works. Owing to the present high cost of manual labour, mechanical excavators show a considerable economy in this direction. In support of this, one particular case may be mentioned where the general cost of excavation by hand would have been 2/6 per cubic yard, but carried out by draglines the cost was only 4d. per cubic yard, thus showing a considerable saving.

Draglines are of particular service when the ground to be excavated is water-logged, as in the Fen District, where they are now being employed to clean out the ditches by which the water is drained away. They are also used in widening rivers, one such scheme now in progress in this country being that for widening the River Nene for seven miles between Peterborough and Wisbech. Draglines are, of course, also extensively used Overseas and are now at work in West Africa, Australia, and in the Sudan as well as in India as will shortly be described.

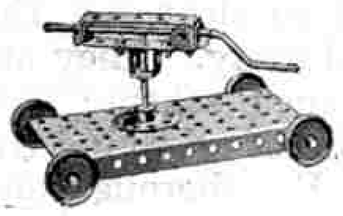
As might be expected the construction of a Dragline calls for some considerable experience in this particular branch of engineering. In this connection it is interesting to find that Messrs. Ruston & Hornsby Ltd., of Lincoln, have been constructing excavators for 50 years. As long as 40 years ago, when the Manchester Ship Canal was under construction, the firm supplied 50 of these machines to assist in the work. They have at least 50 excavators at work to-day at the ironstone mines near Scunthorpe, whilst 30 are employed excavating clay in the brickfields around Peterborough, where they are doing work that would otherwise require a large army of labourers to carry out.

Eight Tons at one Bite !

The draglines that are the subject of this article are the largest the firm have ever built—they are, indeed, the largest machines of their kind in the world. Each weighs 350 tons, the jibs being 120 ft. in length. The main engines are over 400 h.p. and separate engines of 200 h.p. are used for slewing the machine. The buckets have a capacity of 8 cubic yards, and each could fill an 8-ton coal wagon with one cut. The drag-rope used is $1\frac{3}{4}$ in. in diameter and a cutting-power of 30 tons is exerted on the bucket teeth. The coal bunkers have a capacity of 4 tons, and are filled by means of steam-operated hoists.

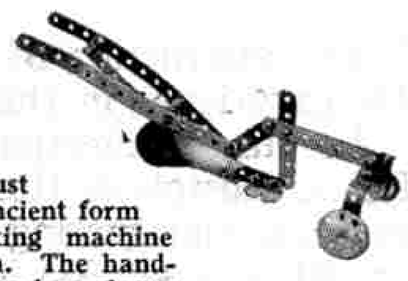
Each machine completes a cycle of operations in about 45 seconds, including digging, slewing, discharging, returning again to the original position, and dropping the bucket in readiness for another cut.

In the first place one dragline only was ordered for the Indian irrigation scheme but the first dragline delivered gave such satisfaction that the Indian



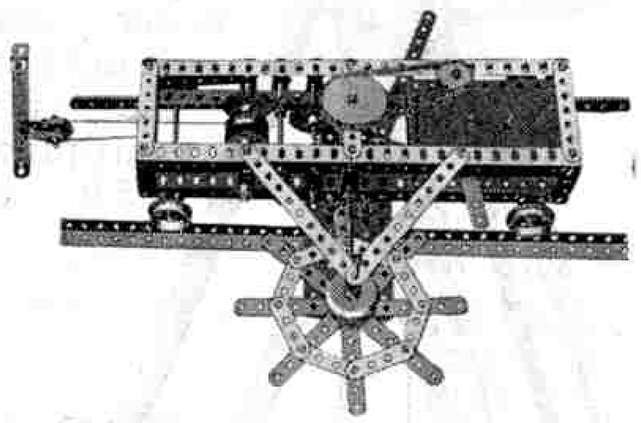
ROCK DRILL

This is a No. 0 Outfit model of a typical pneumatic rock drill, of the type used in mining and other work.



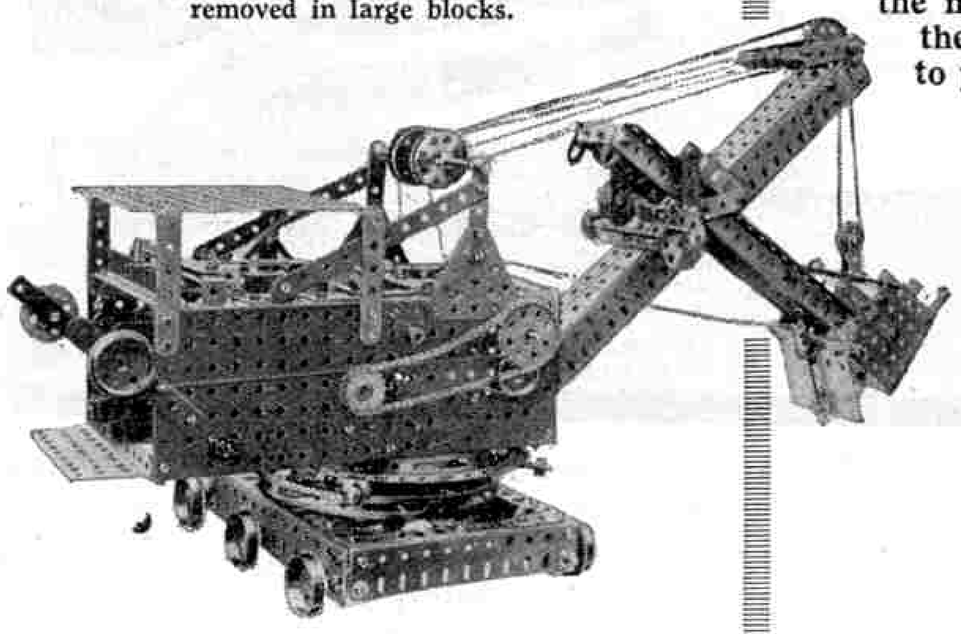
PLOUGH

The plough must be the most ancient form of earth-breaking machine known to man. The hand-manipulated type here shown is fast disappearing from our countryside.



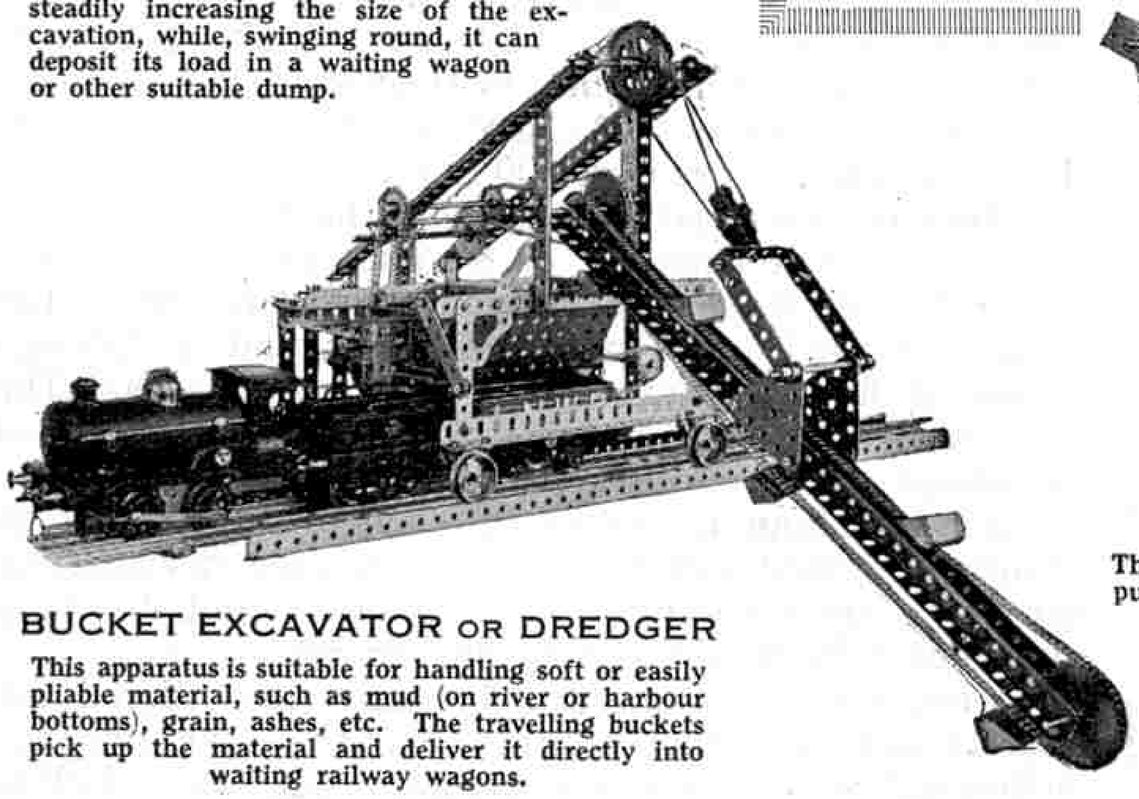
COAL CUTTER

This apparatus, by hauling on a rope, pulls itself along in a direction parallel to the coal-face, while its revolving cutters slice into the coal, which may afterwards be removed in large blocks.



STEAM SHOVEL

The Steam Shovel is employed in the construction of canals, railway cuttings, etc. Each stroke of its arm scrapes several tons away from the sides of the cutting, so steadily increasing the size of the excavation, while, swinging round, it can deposit its load in a waiting wagon or other suitable dump.



BUCKET EXCAVATOR OR DREDGER

This apparatus is suitable for handling soft or easily pliable material, such as mud (on river or harbour bottoms), grain, ashes, etc. The travelling buckets pick up the material and deliver it directly into waiting railway wagons.

MECCANO

ENGINEERING FOR BOYS

EXAMPLES OF MODEL CONSTRUCTION:

2.–Cutting and Digging Machines

TRANSPORT, Irrigation and Mining are three branches of industry responsible for the introduction of many wonderful machines by which channels are cut, tunnels bored, small hills levelled, and rivers deepened. The constant demand for greater efficiency and increased speed at which such engineering works may be carried out, has resulted in the construction of giant engines that are marvels of power and precision.

Innumerable examples might be quoted—such as the Panama and Suez Canals and the Simplon Tunnel—as typifying the extent to which man has been able to force a passage through the most difficult obstacles, with the aid of mechanical power. The immensity of these works leaves one with the impression that they must be the outcome of the slow processes of nature, rather than the result of a few short years of man's intrepid effort.

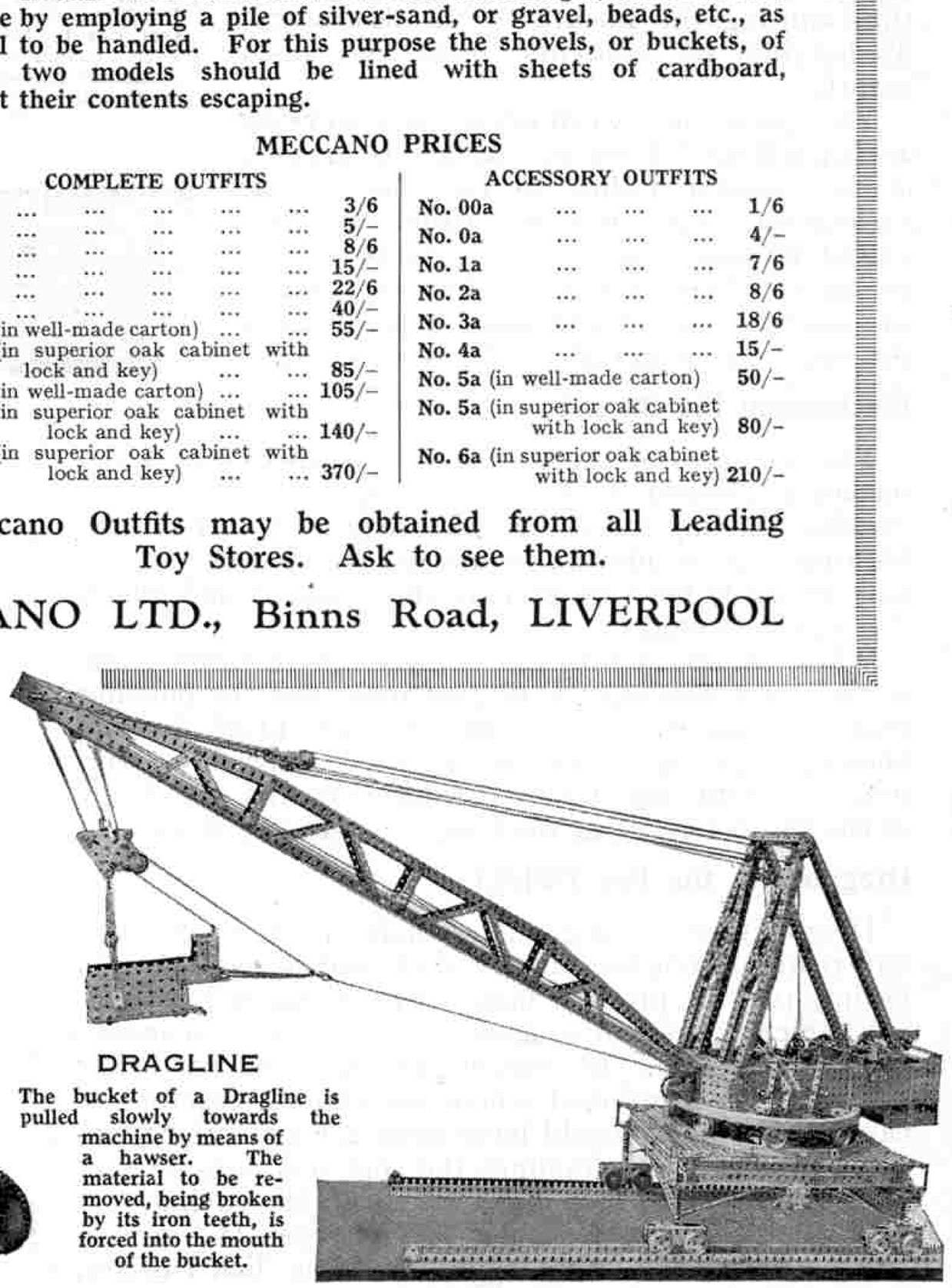
The Meccano models shown accurately reproduce the apparatus now widely in use, and are most fascinating to construct and to put into operation. Excellent fun can be obtained with the Dredger, Steam Shovel, and Dragline by employing a pile of silver-sand, or gravel, beads, etc., as the material to be handled. For this purpose the shovels, or buckets, of the last two models should be lined with sheets of cardboard, to prevent their contents escaping.

MECCANO PRICES

COMPLETE OUTFITS		ACCESSORY OUTFITS	
No. 00	3/6	No. 00a	1/6
No. 0	5/–	No. 0a	4/–
No. 1	8/6	No. 1a	7/6
No. 2	15/–	No. 2a	8/6
No. 3	22/6	No. 3a	18/6
No. 4	40/–	No. 4a	15/–
No. 5 (in well-made carton)	55/–	No. 5a (in well-made carton)	50/–
No. 5 (in superior oak cabinet with lock and key)	85/–	No. 5a (in superior oak cabinet with lock and key)	80/–
No. 6 (in well-made carton)	105/–	No. 6a (in superior oak cabinet with lock and key)	210/–
No. 6 (in superior oak cabinet with lock and key)	140/–		
No. 7 (in superior oak cabinet with lock and key)	370/–		

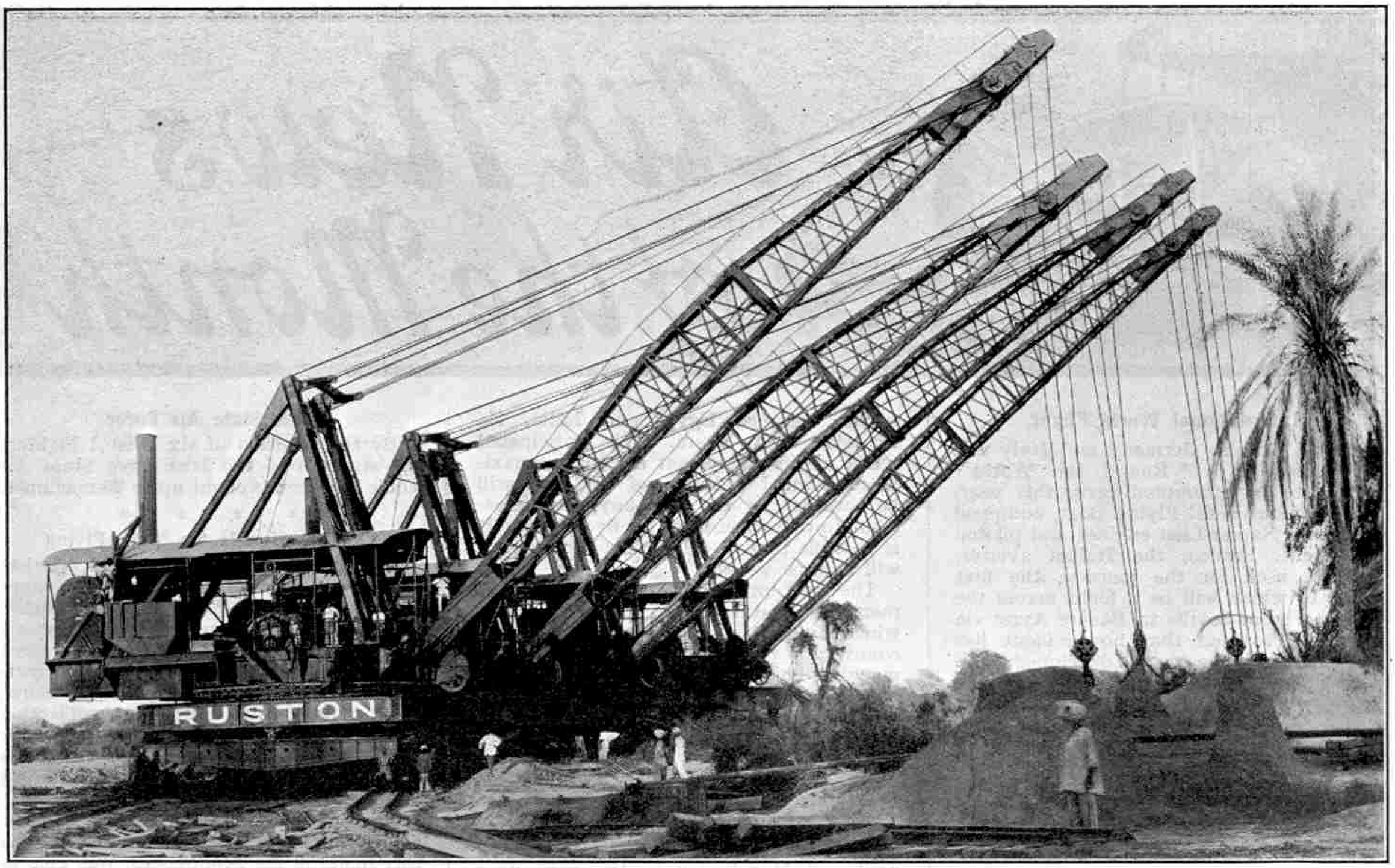
Meccano Outfits may be obtained from all Leading Toy Stores. Ask to see them.

MECCANO LTD., Binns Road, LIVERPOOL



DRAGLINE

The bucket of a Dragline is pulled slowly towards the machine by means of a hawser. The material to be removed, being broken by its iron teeth, is forced into the mouth of the bucket.



Four of the Ten 350-ton Ruston Draglines now working on the Lloyd Barrage and Canal Scheme in India

Government placed an order for a further three machines. More recently the manufacturers have obtained an order for six additional draglines, making ten in all and it is interesting to note in passing that the facilities of the Ruston Works are such that the last two new machines ordered were completed in seven weeks from receipt of the order !

A Great Engineering Work

The irrigation schemes that call for the use of these huge machines are situated (1) at Sarda, in the United Provinces; (2) at Oudh, (3) in the Sutlej Valley, and (4) in the Punjab.

The Sarda scheme includes the construction of a great canal system, for irrigation purposes. The work consists of the excavation of 478 miles of canals and branch canals, and no less than 3,370 miles of distributing channels ! When completed the scheme will provide for the irrigation of 1,368,000 acres of what is now waste-land. It is estimated that the total cost will be over £5,600,000.

It was on the Sutlej Valley scheme that the original dragline was first employed in India. The machine began work in April 1924 and on the average excavated 670,000 cubic ft. per day. Some idea of the economy effected in labour is provided by the fact that this amount of excavation represents the work of 8,000 coolies, who would not only have had to be paid but fed and housed as well ! When completed the Sutlej Valley scheme will irrigate 8,000 square miles, or 5,000,000 acres of desert. The cost of the work is estimated to be over £7,750,000.

The Largest Scheme of its Kind

Draglines are also being employed in the Lloyd Barrage and canals scheme at Sukkur, situated in the province of Sind. In this area the excavators are being used in the construction of 50,000 miles of canals, three of which are to be larger than the Suez Canal. The scheme will be the largest of its kind ever undertaken and when completed will give control of cultivation of over 7,500,000 acres, of which nearly 6,000,000 acres will be reclaimed sandy desert area, brought into cultivation for the first time.

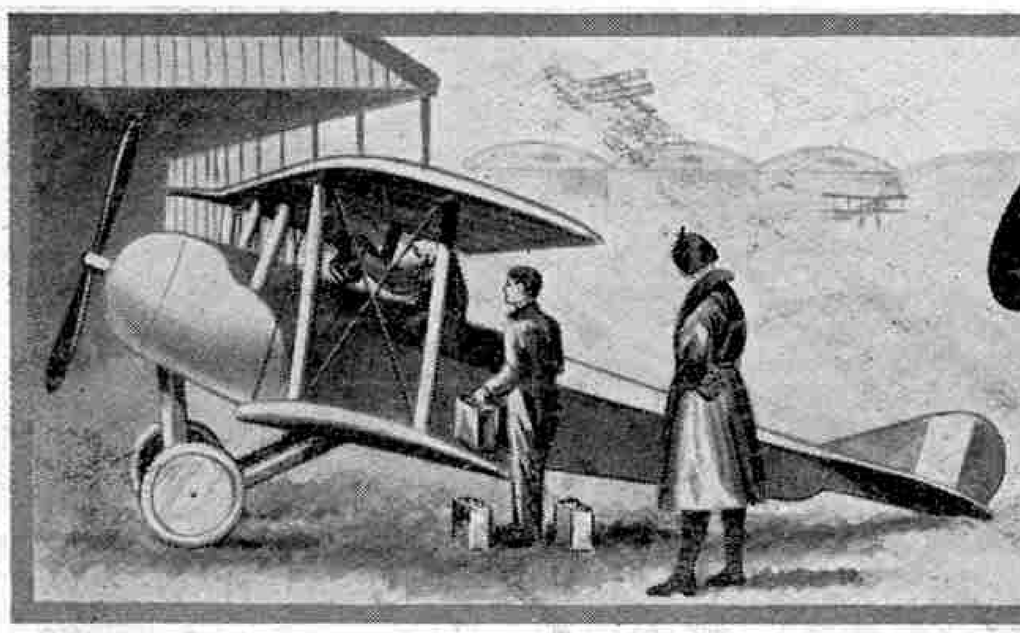
The new area brought under cultivation will be larger than the whole of the cultivated area of Egypt, and it is estimated that when complete this scheme alone will cause a total annual increase in the wealth of the country by nearly £19,000,000 !

To be the Largest Dam in the World

Included in the Sukkur scheme is the building of the Lloyd Barrage, a massive masonry dam across the River Indus to control the fluctuations of the river. Over the barrage will be a bridge of 56 spans, each 60 ft. in length and each fitted with a massive watergate 18½ ft. in depth and weighing 50 tons.

The Lloyd Barrage, which will be the greatest work of its kind in the world, eclipsing even the wonderful Assouan and Sennar Dams in Egypt, will be nearly a mile in length and the top girders of the bridge will be 770 ft. above the foundations.

Work on the Sukkur scheme commenced in October 1923 and although 20,000 men are employed, it is such a huge project that it is not expected that the contract will be completed before the summer of 1930 at the earliest. The total cost will be over £13,000,000, the Lloyd Barrage alone costing £4,500,000 and the canals £9,000,000. (*Continued on page* 175)



Air News of the Month

International World Flight

Great Britain, Germany and Italy will co-operate in a "Round the World" Flight to be attempted early this year. An all-metal Wahl Flying Boat, equipped with two Napier-Lion engines and piloted by Lieut. Franco, the Italian aviator, will be used for the journey, the first stage of which will be a flight across the Atlantic from Seville to Buenos Ayres via Recife. Provided that no accident has occurred or engine trouble developed up to this stage, the attempt to circuit the world will be continued at once.

The machine is capable of 125 miles per hour and can make a non-stop flight of 2,000 miles, carrying three tons of petrol. The engines mounted above the wings are an interesting feature in the structure of this machine.

* * * *

A Portable Hangar

An interesting hangar has recently been designed to the order of the Air Ministry. This hangar can be assembled in 2½ days. It is of steel construction, with the exception of the canvas roof and sides, and it is so light that when taken down it can be moved from place to place in a single railway wagon.

* * * *

Imperial Airways Services

During the first year of the company's existence, which ended on 31st March 1925, the machines owned by Imperial Airways Ltd., flew over 828,000 miles, carrying 11,000 passengers and 600 tons of mail and goods. Imperial Airways were then operating under an agreement with the British Government which stipulated that the company should complete a total flying mileage during the first four years of its existence of at least 800,000 miles per annum, and 1,000,000 miles per annum in subsequent years.

A new agreement has recently been concluded under which the company will be required to cover what appears to be the equivalent of the 1,000,000 miles per annum, namely, 425,000,000 h.p. miles. Taking the average horse-power of the machines at present employed by the company at 425, the two minima seem to be exactly equal. This method of computing the amount of work done would appear to encourage the use of more highly-powered machines. A point of special interest is that for every mile flown by marine aircraft 1½ miles will be counted for purposes of the agreement.

By the time these notes appear in print it is probable that Imperial Airways will have entered into another agreement with the Government for the operation of a fortnightly passenger, mail and freight service between Egypt and India, via Baghdad and Basra. The anticipated terms of this agreement are that a maximum annual subsidy of £93,600 will be earnable by the company, the agreement to remain in force for five years. It is possible that at a later date the service will become weekly.

The most interesting point of this agreement, as distinct from the one under which Imperial Airways operate in this country, is that it stipulates the type of machine to be used. Triple-engined machines are contracted for, probably on account of the isolated nature of the greater part of the route to be covered.

* * * *

Irish Air Service

There is every prospect of a revival of the air service between Belfast and Liverpool and Manchester in the very near future. It is hoped also that an air service between Dublin and Chester will be instituted, along with a service between Dun Laoghaire (previously known as Kingstown) and Holyhead.

* * * *

World's Greatest Airship

The construction of the world's greatest airship is now proceeding at Cardington, Bedford. Designs have been approved and in the vast sheds the erection of the huge structure which will form the airship's framework is proceeding. A village of bungalows has been built near the aerodrome to house the workmen.

The airship will have a capacity of 5,000,000 cubic feet, more than twice that of any previous airship in this country, and will carry passengers and mails between Great Britain, India, Australia, and the Near East. The cruises of R.33 last year were test flights in connection with the new ship, which will weigh 150 tons and will be able to carry 150 passengers and a crew of 45.

The ship will have many new features. One will be that passengers will be carried inside the envelope and not in cars beneath. This will give the passengers more space and will enable them to move about as on an ocean-going liner. It is hoped to complete the airship by 1927.

* * * *

"Spotting" for Fish

Aeroplanes used to locate shoals of fish off the Californian coast have increased the catch by 20 per cent. Trawlers are called to the spot by wireless and announcements regarding the catch are sent ashore by the same means, so that the market and the canneries may be prepared.

Free State Air Force

By the addition of six Bristol Fighters the strength of the Irish Free State Air Force has been brought up to 28 machines.

* * * *

Guiding Signals for Night Flying

An interesting new system of wireless receiving coils was fitted into the wings of a Vickers Rolls Royce, the air express of the Imperial Airways, to enable experiments to be carried out during recent night flights for urgent aeroplane merchandise between London and Paris. The experiments were in connection with a method by which pilots could be guided to their destination by variations in the strength of the signals received in their headphones. The Croydon Aerodrome continually repeated an automatic identifying signal, and the pilot, receiving this signal in his headphones, was able to manœuvre his machine until the strength of the signal indicated to him that he was flying in a direct line towards the transmitting station. Any deviation from the direct line was indicated to him by an immediate variation in the strength of the signals.

* * * *

The World's Longest Flight

Colonel the Marchese di Pinedo, accompanied by his engineer Signor Campanelli, has recently completed the world's longest flight in flying from Rome to Melbourne, thence to Tokio and then back to Rome, a total distance of 35,000 miles. The machine used was a Savoia Flying Boat, fitted with a 450 h.p. Lorraine-Dietrich engine, and the distance was covered in 107 days, including a halt of three weeks at Tokio.

* * * *

Payment by Aeroplane

With the aid of a seaplane of the Ontario Provincial Air Service the officials of Canadian Government's Indian Department were able to accomplish in three weeks the payment of their annual treaty money to 4,000 Indians located in the James Bay district. The work hitherto has taken nearly two months to complete.

* * * *

As in Days of Old

With a view to affording more adequate protection to machine gunners placed in the exposed cockpits of fighting aeroplanes, a proposal to provide armour is receiving consideration. At present the gunner presents a conspicuous target as a great portion of his body is exposed. A specially devised suit of chain mail and an armoured helmet that are both light and bullet proof, yet still allow free movement, are undergoing tests.

New German Combine

The amalgamation of the two German aerial navigation companies, the Aero-Lloyd and the Junkers Company, was effected towards the close of last year and the new company commence operations at the beginning of next month. The object of the fusion is stated to be to reduce costs and thus place the German passenger services in a better position in relation to their foreigncompetitors. This, of course, is true, but it is believed that the amalgamation has been engineered by the German Government in order to prevent further waste of money in unnecessary competition between the two companies.

* * *

Turkey Forming an Air Fleet

The Turkish Government has decided to form an air fleet. As a first step towards this end 50 aeroplanes of duralumin construction have been ordered from the Rohrback Works.

* * *

Woman Flies 2,000 Miles to Hospital

A thrilling story of how an Englishwoman's life was saved by a French airman in Nigeria has reached London. The wife of a British resident official was bitten by a mad dog and her life was in serious danger. The nearest hospital equipped for dealing with cases of rabies was 2,000 miles away at Daker, and it seemed hopeless to attempt to get the patient there in time. The effort was made, however, and a telegram explaining the position was despatched to the French Governor at Daker.

The authorities there immediately called up the Bamako Aeroplane Station and asked for two machines to be despatched immediately to Dosso in the northern part of British Nigeria, some 450 miles from Lagos, at which point the sick woman was waiting. The first machine to arrive took the patient on board and made the journey to Daker in just under two days. The necessary serum was promptly administered at the hospital. It proved to be in time and the woman's life was saved.

* * * *

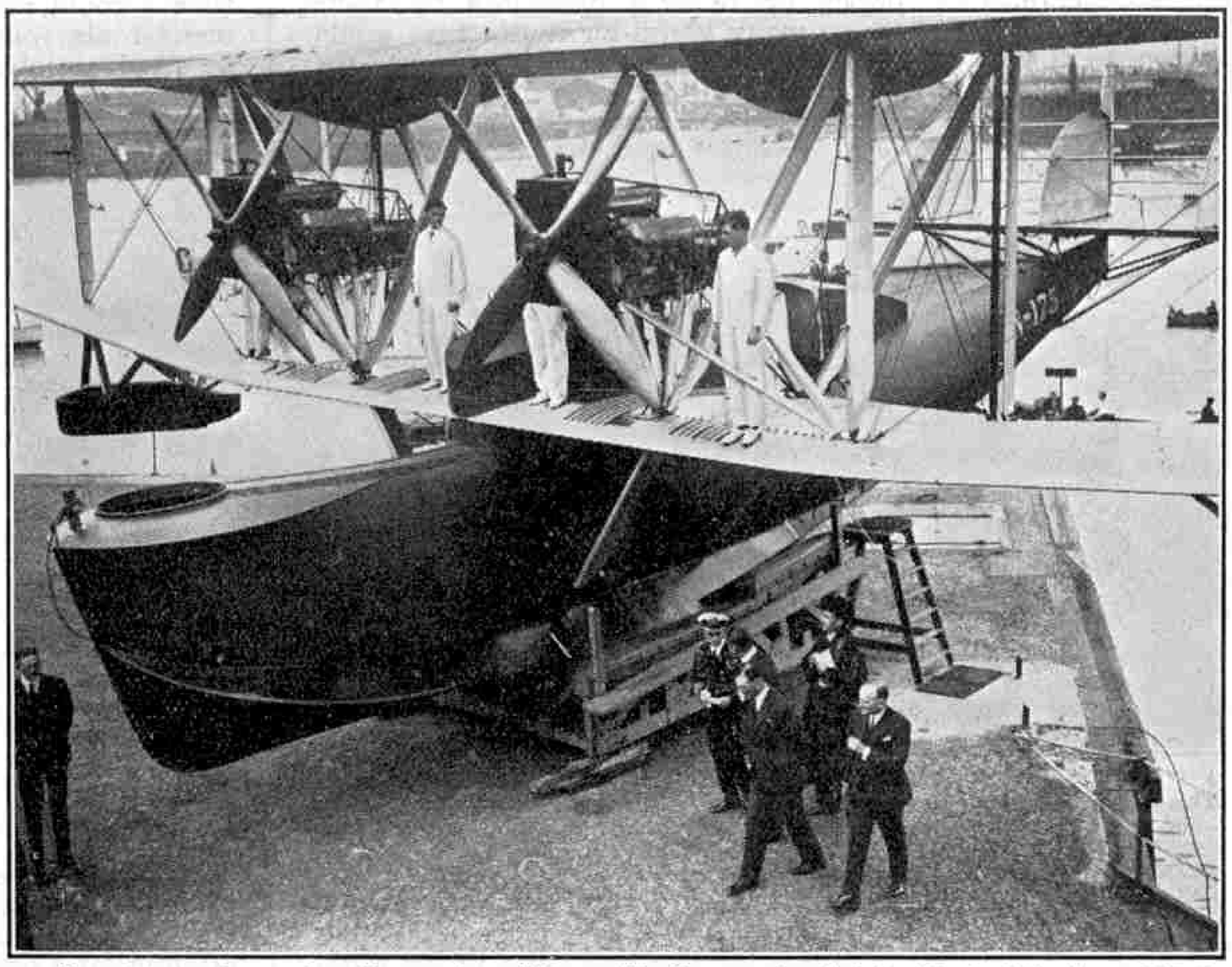
London-Athens Air Route

It is probable that in the early part of 1927 a regular air service between London and Athens will be in existence. The French Air Company has had the possibility of establishing a service between Marseilles and Athens under consideration, but such a line would be of little or no value unless it were linked up with the Paris-Marseilles service which, it is expected, will be opened at the end of this year.

Hendon Aerodrome

After very lengthy negotiations between Mr. Claude Grahame White, the famous pioneer of aviation, and the Government, an agreement has been concluded for the purchase of the Hendon Aerodrome by the Air Ministry. It is intended to use the aerodrome as the headquarters of the Aerial Defence Corps.

The Prince Inspects a "Swan"



Our photograph, reproduced by courtesy of Messrs. The Supermarine Aviation Works Ltd., shows H.R.H. The Prince of Wales inspecting, at Southampton, the Supermarine "Swan," a twin-engined flying boat of interesting design

Another Flight to the Pole

Another flying expedition to the North Pole has been organised by the Detroit Aviation Society, and will be commanded by Capt. G. H. Wilkins. A start will be made on the 21st of this month if the weather conditions are favourable. It is understood that in the event of the expedition failing to return, or to reach Spitzbergen, no rescue expedition will be sent out for at least two years, as the party anticipate that they will be able to obtain sufficient natural food on the ice floes.

Elaborate precautions will be taken to protect the aeroplane engines against the extreme cold and from the time that the machine leaves the Alaskan territory the engines will not be allowed to cool. While on the ground they will be blanketed with reindeer hides under which smokeless lamps will be placed.. It is stated that this expedition is being financed by Mr. Henry Ford, the famous motor car manufacturer.

* * * *

Saving Four Days

Mr. Allan Cobham, discussing the possibilities of the proposed aeroplane service between Cairo and Khartoum, said that it should be possible to maintain a day and night service. At present the mails take five days to cover the distance, but it could be done within a day by air.

Catapult Take-off

The Italian Regia Aeronautica have recently carried through several successful experiments in catapulting aircraft, and recently Lieut. Carra, flying a Macchi Flying Boat, was successfully shot off a barge at Spezia on four successive occasions. The machine was despatched by compressed air and in the short take-off of 45 ft. it attained a speed of 62 miles per hour.

The apparatus is almost identical with the type in use by the United States Air Service, and has been developed by Senor Gragnotto at the Naval Arsenal at Spezia. The experiments to which we refer are particularly interesting as they were the first in which a flying boat weighing 3,000 lb. was successfully catapulted.

* * *

New British Air Liners

The new Handley-Page works at Cricklewood have commenced the construction of the four new air expresses for Imperial Airways traffic between London and the Continent. Each of these machines will be equipped with two Napier engines, developing 1,000 h.p., and will be capable of carrying 16 passengers at a maximum speed of 120 miles per hour. It is anticipated that they will be available for use in the spring.

* * * *

The Holt Parachute

The first public demonstration of the parachute invented by Capt. H. S. Holt was given at the Stag Lane Aerodrome, London, recently, when Capt. H. Spencer, carrying the folded parachute in a pack on his back, dived head foremost from an aeroplane flying at a height of 1,000 ft. The pack opened after he had fallen a short distance and a small pilot parachute opened out, quickly followed by a larger "stock" parachute. This was followed by the main parachute, 17 ft. in diameter, and Capt. Spencer floated gradually to earth. Each of the parachutes opened smoothly and before the "diver" had fallen many feet.

Capt. Spencer, who is a parachuting pioneer, has made over 100 descents, and prefers the head-first dive to the backward fall that is favoured extensively by American airmen.

The Holt parachute is an all-British production and is the outcome of fifteen years' constant experimenting by the inventor, who was the first advocate of the "free" parachute packed upon the airman's back.

Over the African Deserts

The Great Flight from London to the Cape

BY the time these words appear in print, it is probable that Mr. Alan Cobham and his two passengers will have arrived at Cape Town, the goal of the great flight from London to South Africa. Starting on 16th November from Stag Lane Aerodrome, the De Haviland 50J successively passed over Paris, Lyons, Pisa, Athens, Sollum, Cairo, Assuan, Khartoum to Jinja, Kenya Colony. Thence, through the Tanganyika Territory to Broken Hill (where it arrived on 23rd January) the flight was by way of Livingstone, Buluwayo, Pretoria, Johannesburg, Bloemfontein to Cape Town, a total distance of over 8,000 miles.

The flight has been undertaken mainly as an experiment with a view to ascertaining the possibility of organising a regular air service between London and the Cape.

Courtesy ["*The Aeroplane*"

This photograph of the Assuan Dam was taken by Mr. A. B. Elliott (Engineer to Mr. Cobham). Both this dam and the Sennar Dam have been passed in the course of the flight towards the Cape in the De Haviland 50J

A Great Commercial Aviator

According to Mr. Cobham's last letter home, African natives have named him "The Great Master of the Bird"—a very picturesque title and surely one that is most appropriate! In addition to being an expert pilot, however, Mr. Cobham is also the world's leading commercial aviator. No other airman can claim so remarkable a record of experimental commercial flying or so great an experience of blazing aerial trails. The very idea of the London-Cape flight originated with him, and it may be said of his whole outlook that it is his aim at all times to bring aviation to the highest pitch of achievement from a commercial standpoint as distinct from purely military aims.

As has been stated already, the machine in use is a DH 50, with a "Jaguar" engine. It is an interesting point that the firms who, by the provision of equipment, have helped in the furthering of the flight to the Cape, have their names neatly but clearly lettered on the sides of the fuselage of the machine.

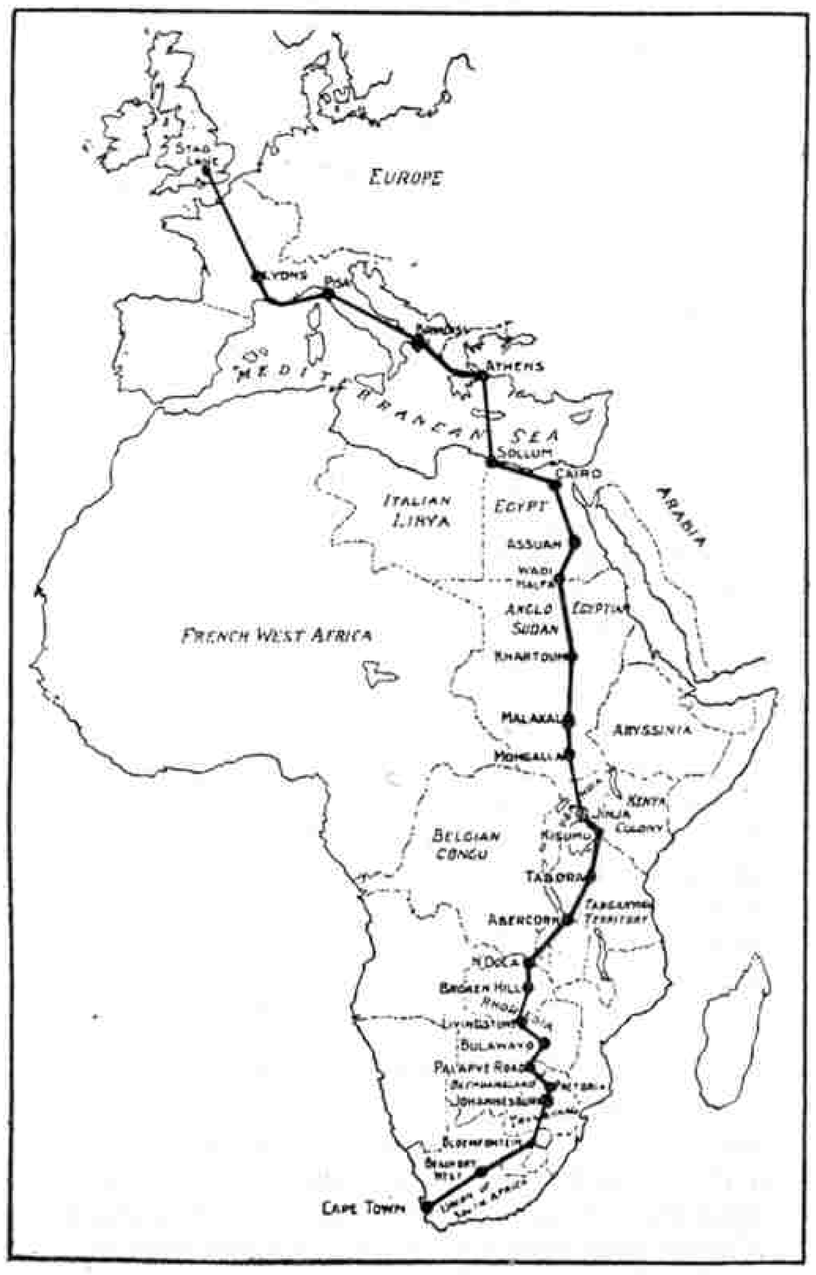
Importance of the Seaplane

The DH 50 "Jaguar" combination has run perfectly throughout the flight but it is interesting to hear something of Mr. Cobham's own conclusions from the experience gained. In a recent letter he wrote :—

"Undoubtedly the opportunities of running air lines between Cairo and Kenya Colony are very good from a practical point of view so far, and even in the wet season the service could be maintained with absolute regularity with seaplanes.

"As far as I can judge, nearly all the great commercial air routes up to the present are really seaplane jobs, i.e., there are so many useful air routes that would be perfectly safe every moment the machine was in the air, if it were a seaplane. And I think that this fact should be borne in mind by the manufacturer.

"There are so many parts of the world where it would be as safe to fly over the land in a seaplane as an aeroplane, such as a vast forest and swamps, etc. If I had time I could mention a dozen fine commercial air routes, but they would all be seaplane jobs."



Map showing the Route, London to Cape Town

A Narrow Escape

Accompanying Mr. Cobham in the flight are Mr. Emmott, the Gaumont Company's operator who is filming the flight, and Mr. A. B. Elliott, the engineer in charge of the machinery.

One of the many thrilling incidents that have occurred throughout the flight was the attempt to film the famous Victoria Falls on the Zambesi River. Arriving there on 30th January, Mr. Cobham circled four times over these famous waterfalls, which he described as being "the most marvellous sight that Nature offers." Several times the 'plane was flown within a few hundred feet of the gorge through which the Zambesi hurls itself. In one attempt Mr. Cobham ventured so low that the machine was enveloped in the column of spray that rises for hundreds of feet above the Falls. Water in the carburetter resulted in some anxious moments when the engine mis-fired and a forced landing was necessary to clean out the water. The Falls are over a mile in width and, as it took more than a minute to fly the complete length, a fine film should have been obtained.

The following interesting account of an incident of the flight is from the pen of Mr. A. B. Elliott, and is reprinted by permission of the Editor of "*The Aeroplane.*" Mr. Elliott was responsible for taking the "*Puma*" to Burma and back last year without trouble, and great credit is due to him for surmounting the difficulties encountered in the early stages of the present flight. The following "word-picture" shows that Mr. Elliott is evidently as skilled with the pen as he is with the spanner!

The Engineer Takes a Photograph

Two hours have passed since we left Khartoum and at 4,000 ft. we fly along with a fair following wind helping us towards Malakal, our next port of call.

Khartoum has faded away in the vista of the desert and we are following the Blue Nile, winding below us like a shimmering snake over a parched desert.

Inland each side of the water a few scattered palms fade away into an endless stretch of sand and a perfect sky.

In the cabin the Photographer dozes with his head on the petrol tank, the Engineer heaves a sigh, looks at his watch

and mutters, "Three more blooming hours," and proceeds to work the petrol pump. Presently the roar of the engine lessens, and a voice from the pilot's cockpit shouts along the communication channel, "Get ready for the Dam."

Feverish movements follow with the cinema camera and the Engineer opens and focusses other cameras.

We are much lower now and the heat is terrific—Engineer wonders how much higher the oil temperature will go and the Photographer prepares to traverse the Sennar Dam, the latest British engineering triumph in the Sudan.

A voice from the cockpit bellows—"All right?"

"No, get closer!" comes the reply.

We side-slip and several feet of film pass the lens.

The engine roars, we bank and climb, and luggage falls over on the Engineer!

It is the Engineer's turn with the camera on the other side. . . . We glide—and from the cockpit comes the query, "Got it?"

"No, not yet. Too much wing."

Again the question, "Got it?" "Yes!" roars back the Engineer.

Then, "Wait a minute, I'll give you another."

A little manœuvring, and the Engineer clicks the shutter again. "Just one more." "Can't," replies Engineer, "no more film!"

The engine roars, we soar again. Gee, it's hot to-day!!

The Dam fades away, and when those in the cabin sort themselves out, the Engineer is found to be sitting on his sun helmet and the Photographer has lost his camera handle!

A few minutes' work to change the film and to check up the cine film used, and we settle down, back to 4,000 ft. flying steadily. Half an hour later we are over the desert heading for the White Nile.

The Photographer dozes. Engineer works the pump, puts his feet out of the window, looks at his watch, and mutters, "Two more blooming hours!"

Lives of Famous Engineers—

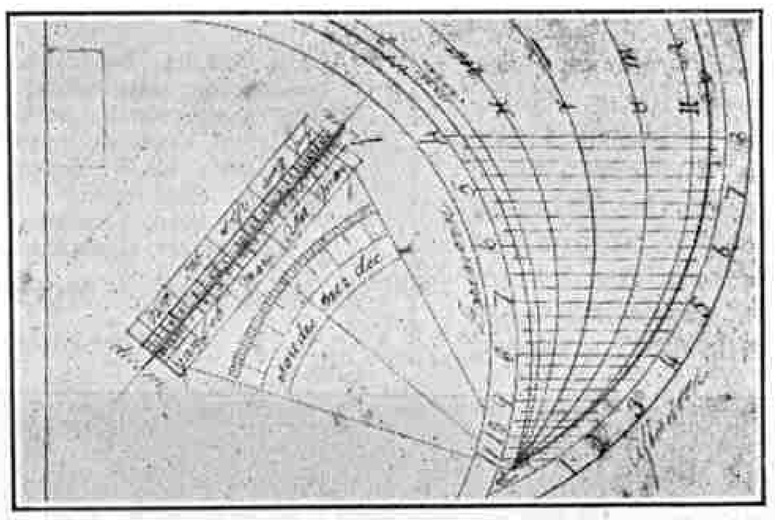
(*Continued from page* 153)

among the seamen that they were by them esteemed—on account of their clear and brilliant light—to be the best in Europe."

Throughout Smeaton's engineering career, Austhorpe, where he was born, continued to be his home. He erected across the yard from the house a four-storey building in the form of a square tower for his own private use. In the basement was his forge, on the first floor his lathe and on the second his models. The third floor was his study and the fourth was a lumber room and store room. In this tower he carried out a great amount of mechanical work and also prepared many papers on astronomical subjects for the Royal Society, of which he was a Fellow.

Smeaton earned a good income from his profession but never became wealthy. At the same time he had sufficient money for his moderate needs and nothing could persuade him to undertake new work, however lucrative, if he felt that he had enough on hand already. An instance of his independent spirit occurred when the Princess Dashkoff endeavoured to persuade him to go to Russia and enter the service of the Empress. Great financial inducements were held out to him but he refused to consider the matter. The Princess, who apparently believed that no one could withstand the temptation of wealth, was so struck with Smeaton's attitude that she exclaimed: "Sir, I honour you. You may have your equal in abilities perhaps; but in character you stand alone. . . . . My Sovereign has the misfortune to find one man who has not his price."

Towards the close of his life Smeaton felt that he would be doing a service to engineers and the public generally by publishing an account of his various engineering works. During his later years he spent a great deal of his time on this task, but the only part of it that he lived to finish was his account of the building of



The above form of sundial, from which the compass and movable thread are missing, was made by Smeaton and sent for our inspection by Mr. R. E. Bleasdale of Warwick, a direct descendant of the famous engineer. John Smeaton's daughter Anne married Mr. Bleasdale's great-grandfather, a Mr. Robinson, who was a schoolmaster at Lincoln's Inn Fields. The small block on the left is a reproduction of Smeaton's signature as it appears on the back of the above compass card.

the Eddystone lighthouse. He found the writing of this book very troublesome and in his preface he says: "I am convinced that to write a book tolerably well is not a light or an easy matter; for, as I have proceeded in this work, I have been less and less satisfied with the execution. In truth, I have found much more difficulty in writing than I did in building!" None the less, Smeaton's story of his lighthouse is told in a very effective manner and in reading it one obtains a vivid impression of his strenuous fight against tremendous difficulties, both on sea and on land.

As might be expected, the general public held Smeaton in high esteem as an engineer, but it is of more interest to us to-day to know that he occupied an even higher place in the opinions of other great engineers. James Watt, for instance, who spoke of him as "Father Smeaton," wrote to Sir Joseph Banks:—"In justice to him we should observe that he lived before Rennie and before there were one-tenth of the artists there are now . . . . his example and precepts have made us all engineers."

Robert Stephenson, speaking to Samuel Smiles (Smeaton's biographer) in 1858 said:—"Smeaton is the greatest philosopher in our profession this country has yet produced. The principles of mechanics were never so clearly exhibited as in his writings, more especially with respect to resistance, gravity, the power of water and wind to turn mills, and so on. His mind was as clear as crystal, and his demonstrations will be found mathematically conclusive. To this day there are no writings so valuable as his in the highest walks of scientific engineering; and when young men ask me, as they frequently do, what they should read, I invariably say, 'Go to Smeaton's philosophical papers; read them, master them thoroughly and nothing will be of greater service to you.' Smeaton was indeed a very great man."

The last professional work on which Smeaton was engaged was the passing of the Bill for the construction of the Birmingham and Worcester Canal. This Bill passed, but only by a small majority, and it caused Smeaton a great deal of anxiety and worry. Afterwards he returned to Austhorpe for rest, but he began to fail rapidly and died on 28th October, 1792, in his 68th year. He was buried in the old parish church at Whitkirk, where a tablet surmounted by a representation of the Eddystone lighthouse was erected to his memory.

The Fuel of the Future—

(*cont. from page* 148)

possible the very rapid production of steam. In this latter connection may be mentioned the fact that the speed of an oil-burning destroyer can be run up from 5 to 25 knots in two minutes, without any previous warning being given to the engine-room.

"The use of oil fuel instead of coal," the report concludes, "makes it possible in every type of war vessel to produce a ship that will fulfil given conditions of speed, armament, etc., on lesser dimensions and at smaller cost. Further than this, the great advantages that liquid fuel presents in the problems of naval design make it possible to obtain vessels of very high speed in relation to their dimensions, which would be wholly impracticable if coal were retained as the sole fuel."

In May 1921, as a result of the report of the Royal Commission, the Admiralty decided that in future the ships of the British Navy should be entirely oil-fueled. Our large coal-burning warships have therefore all been fitted to burn oil as well as coal, and to carry up to 1,000 tons of oil.

Bunkering Warships at Sea

One of the most important advantages of oil fuel to the navy must not be overlooked. This is the fact, mentioned above in the report of the Royal Commission, that re-fueling may be carried out while the warship is at sea, and even while she is travelling at speed. This makes the warship of very much greater service than formerly was the case. For instance, if a blockade is being maintained, as was done in the War, a considerable proportion of the ships engaged in maintaining the blockade have constantly to return to port to re-fuel. The result is that a large number of ships are required for the blockade, to include both ships on "sentry-go" and ships returning to and from the port to re-fuel, or to take up their place of duty in the line.

A new type of tank-steamer has been built for feeding the fleets at sea. These vessels, built with speed lines as fine as those of any yacht, are designed to follow the fighting ships. In actual practice, oil has been trans-shipped by the naval tank-steamer "*Petroleum*" while travelling at 12 knots, the tanker being towed by a hawser to which the oil-pipe is attached. The "*Petroleum*" carried 900 ft. of 5 in. diameter flexible bronze hose, and oil was pumped from tank to warship at the rate of hundreds of tons per hour. In this way more fuel can be taken on board from a tanker in an hour than the whole ship's company could handle in twelve hours if coal were the fuel.

Results of Meccano Model-Building Contests

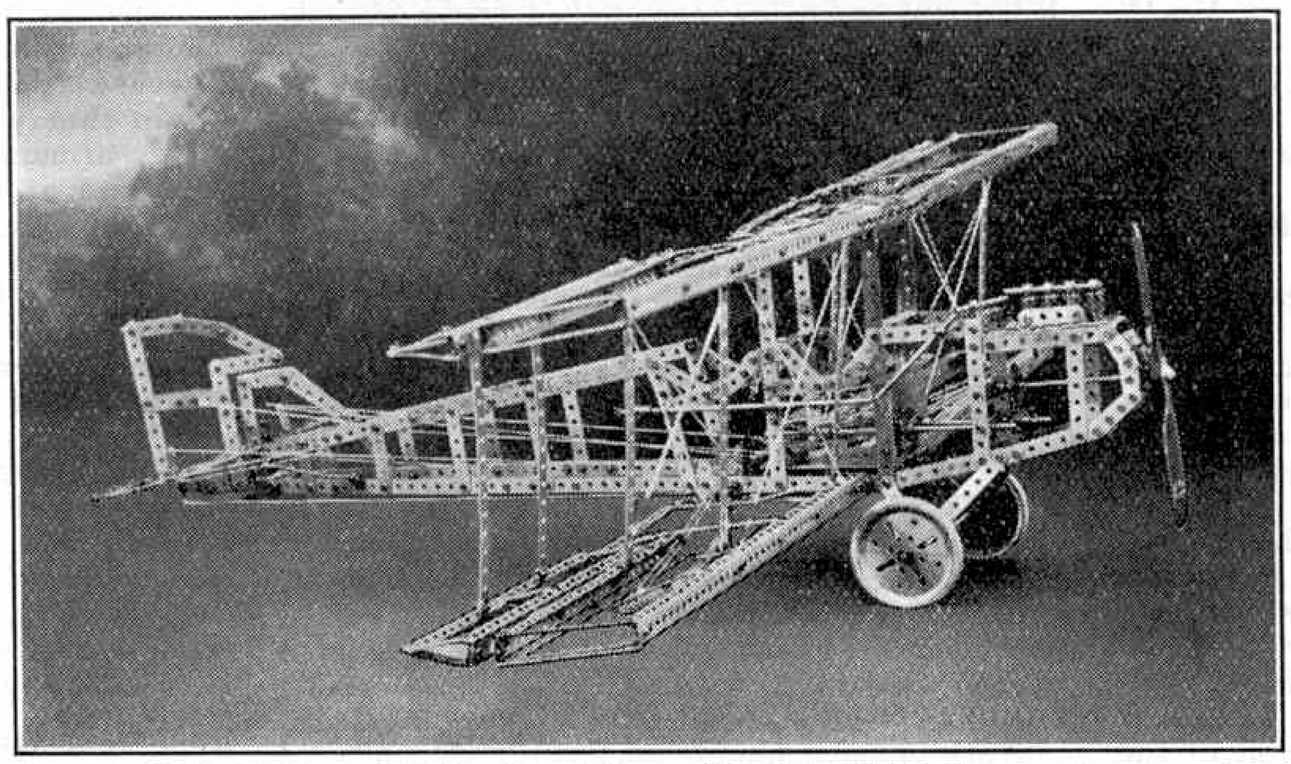
By Frank Hornby

Aeroplane Competition

THE construction of an aeroplane in Meccano is not an easy task. Nevertheless the recent Aeroplane-building Competition has proved that it is possible to reproduce the real thing in a most realistic fashion, providing sufficient time and thought is taken. It is admitted, of course, that the Meccano model cannot fly, but that need not detract from the amount of pleasure and instruction that may be obtained from its design.

The number of entries in the Aeroplane Contest exceeded those in the Locomotive Contest—which had already established a record—by over 25 per cent. This, I believe, is a sign that the great engineering achievements of the last twenty years or so are at last replacing the older favourites in our readers' estimation. I shall watch with interest the results of the Overseas Section, and of the Motor and subsequent competitions, for they should prove whether my theory is correct.

In view of the quantity of particularly clever entries received, I decided to award in addition to the prizes first announced a number of complimentary copies of "Meccano Standard Mechanisms," as a token of the judges' appreciation, to the competitors whose work closely approached prize-winning standard. I also append below the names of boys who have been specially commended for their work, to each of whom I am sending a Certificate of Merit. Incidentally I may mention that a similar certificate will be presented to certain competitors in the Locomotive and "0 Outfit" Model-building Competitions, the results of which were announced last month.



Awarded First Prize : De Haviland Type 60 ("Moth") two-seater aeroplane (T. R. Thompson)

Results

The entries were examined with utmost care, the good points of every model being noted and compared with those of its contemporaries. The final awards in Section A (British Isles) have been allocated as follows :

First Prize (cheque for £5/5/–) :
T. R. Thompson, "Watcombe," Grove Road, Ramsgate.

Second Prize (cheque for £3/3/–) :
C. P. Plantin, 36, Pembury Road, Westcliff-on-Sea.

Third Prize (cheque for £1/1/–) :
A. D. Drysdale, 3, St. Ronan's Terrace, Edinburgh.

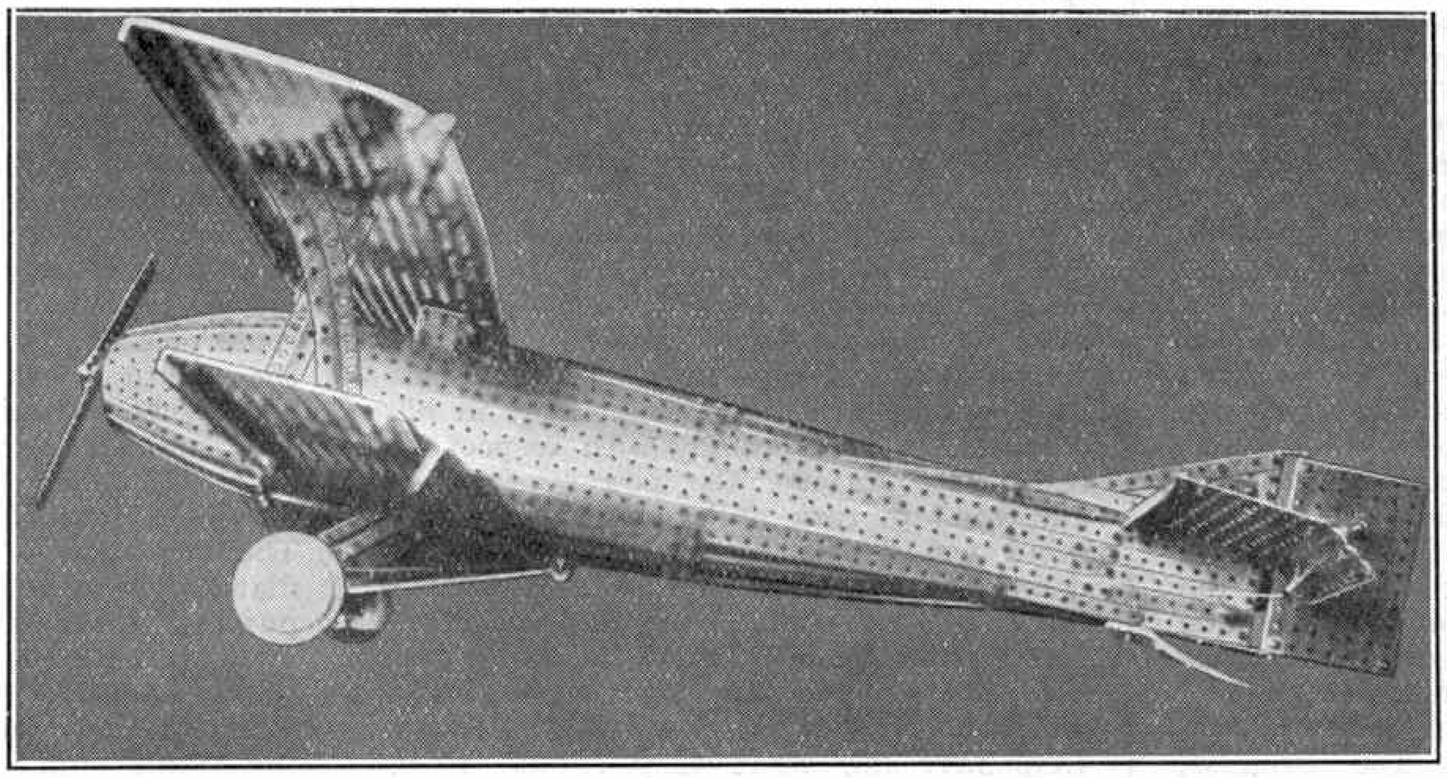
Prizes of 10/6 each :
P. D. Wing, Boston, Lincs. ; M. I. Rowlands, Trawsfynydd, N. Wales ; Roy Coombes, South Leigh, Nr. Witney, Oxon. ; Jack Wardle, Burton-on-Trent ; W. G. Nixon, Birmingham ; A. D. Frecker, Teddington, Middlesex.

Special commendation and complimentary copy of "Meccano Standard Mechanisms": S. Clarke, Wybunbury, Cheshire ; H. M. Gale, Fareham, Hants. ; Harold Frost, Coventry ; R. W. Batty, Clacton-on-Sea ; W. J. Scott, Olton, nr. Birmingham ; L. Brook, Rotherham ; P. G. Blandy, Nottingham ; R. Allum, Chard, Somerset ; W. J. Cleland, Peebles ; A. Batty, Birmingham ; L. W. Grey, East Ham, E.6 ; J. R. Damrel, Cheltenham ; Cecil Pegg, Burton-on-Trent.

A Fine D.H. "Moth"

T. R. Thompson's prize-winning effort represents the famous De Haviland Type 60 "Moth" aeroplane. It is an excellent example of Meccano construction, and is not only built to scale, but includes most of the necessary mechanical details. The propeller is driven from a Clockwork Motor built into the floor of the fuselage beneath the forward cockpit, with its winding spindle projecting beneath the aeroplane. The 3″ Pulley Wheels with Rubber Rings are mounted loosely on an 8″ Rod, the supporting Strips being splayed to the required position.

The rudder is of duplicate construction, as also are the wings, and is spaced by Double Brackets. It pivots about a 3½″ Rod mounted in a vertical position in the body of the 'plane. The wires (represented by cord) by which it is operated are connected to either end of a 2½″ Strip forming the pilot's foot lever. This is mounted pivotly to the frame of the Clockwork Motor in the floor of the pilot's cockpit. The elevators are attached to the tail planes by hinges, the operating cords being connected to 1″×1″ Angle Brackets, one on either side of each elevator. The control column, or joy-stick, consists of a 4½″ Strip pivotly mounted on a bolt passing through its third hole and entering a Coupling secured to a transverse Rod in the floor of the cockpit. The Strip is capable, therefore, of being moved either forward or backward, or to either side. The forward or backward movement operates the elevators, the cords from same being fixed to two Couplings mounted by their centre holes to the transverse Rod, one on either side of the joy-stick. The Couplings are in a vertical position, each of the two pairs of elevator cords being tied to the top and bottom holes of its respective Coupling. A movement of the joy-stick



Awarded Second Prize : A speedy single-seater chasing biplane (C. P. Plantin)

to either side operates the ailerons.

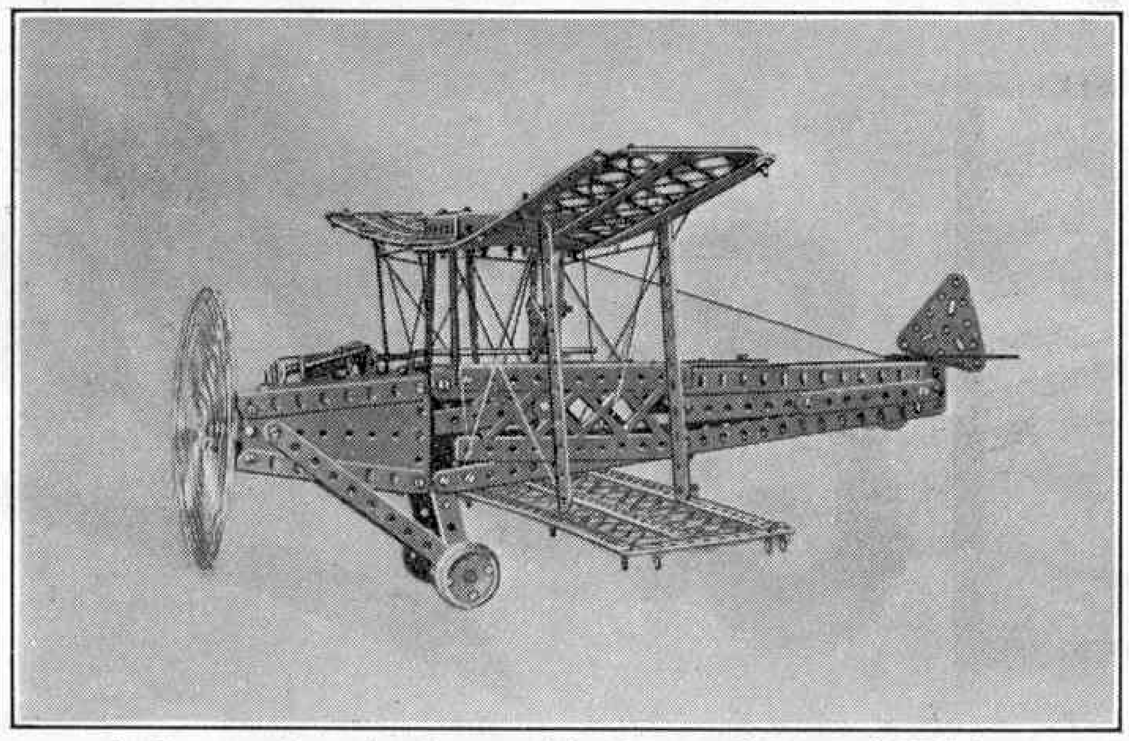
Differential Aileron Control

One of the most interesting features of the model is the realistic reproduction of the De Haviland Patent Differential Aileron Control. In actual practice this device has been evolved to obtain better and easier lateral control of an aeroplane at all speeds, especially round about stalling speed. It makes use of the fact that an upturned aileron gives better lateral control than a downturned one, and moreover up to a certain angle requires no effort to turn it up. On the other hand, to turn an aileron down at stalling speed requires an excessive effort with little or no increase of lift or lateral control. The De Haviland system allows the upturning aileron to have an increasing movement and the downturning aileron a decreasing movement, so obtaining a better controlling effect and additionally the upturning aileron, having an increasing gear over the opposite aileron, tends to pull it down and relieve the effort required by the pilot. This result is achieved by the use of cranks connected to the ailerons and rotated from the movement of the joy-stick by means of chain and sprocket gear, as is demonstrated in the Meccano model.

The Meccano Control Described

The ends of two lengths of Sprocket Chain are attached to the joy-stick, two holes above its pivot bolt. Each chain is then led round a $1\frac{1}{2}''$ Sprocket Wheel, which is pivoted to a $4\frac{1}{2}''$ Strip mounted diagonally in the outer end of each main plane, and thence passes back to the joy-stick, this time being secured in the second hole below its pivot. The ailerons are actuated by means of $2''$ Strips pivoted by bolt and nuts (see Meccano Standard Mechanism No. 262) to one of the holes in the Sprocket and to an $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket bolted to a $1'' \times 1''$ Bracket fixed to a $2''$ Strip in the centre of the ailerons. The latter are attached to the main plane by a $6''$ Rod passing through two Double Angle Strips, one $4\frac{1}{2}'' \times \frac{1}{2}''$ bolted to the ailerons, and one $5\frac{1}{2}'' \times \frac{1}{2}''$ carried on the main plane.

I should like to draw attention to the exhaust pipe, the tail of which is indicated in an original manner by a Centre Fork secured in a Coupling.

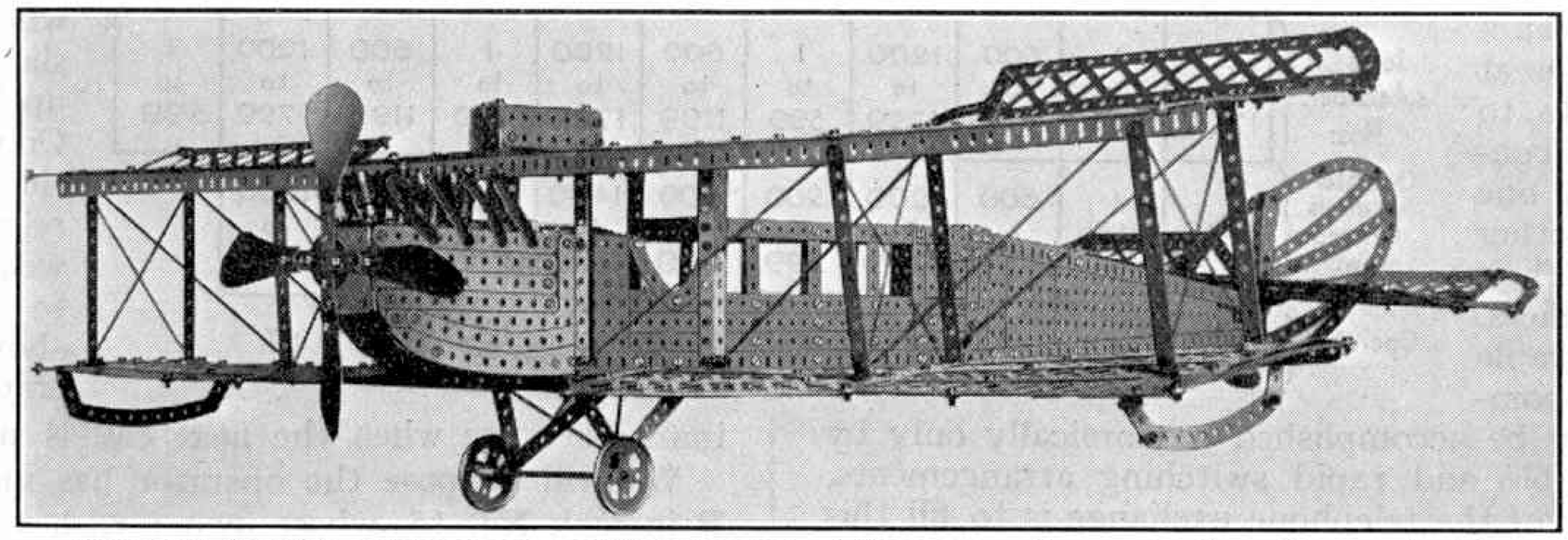


A clever prize-winning model of a small "scout" biplane (W. G. Nixon)

Single-Seater Chaser

I congratulate C. P. Plantin on his success in gaining second prize in this contest, for it will be remembered that he was the first prize-winner in the Locomotive-building Competition.

The model he submits, a single-seater chasing biplane, is built upon elaborate lines, and the construction is well planned and effectively carried out. The nose of the fuselage consists of a series of $5\frac{1}{2}''$ Strips converging upon a Face Plate, the alternate Strips being bolted by means of $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets, whilst the intermediate Strips are connected to the latter by Flat Brackets. The wheels consist of $2''$ Pulleys with rubber tyres and Wheel Flanges.

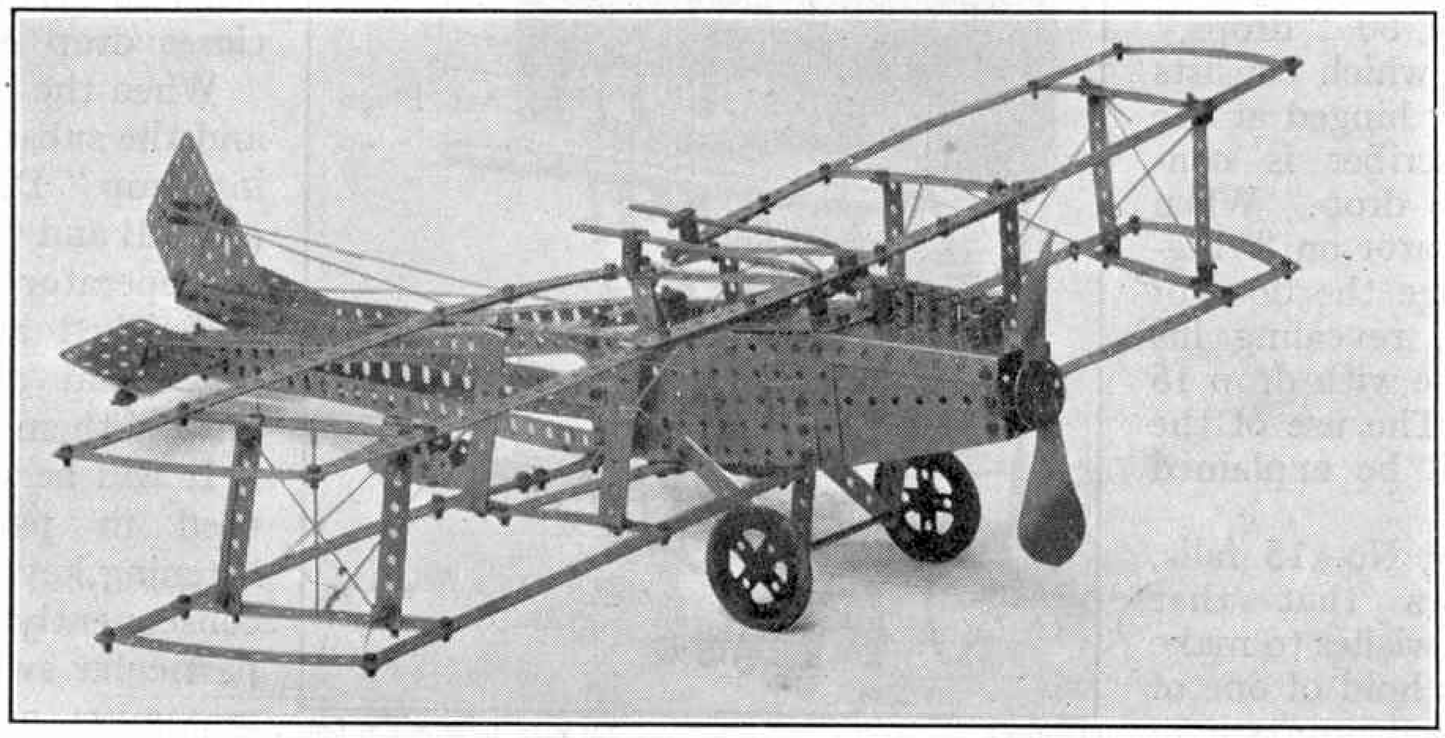


This model should be of interest as an additional example of Meccano aeroplane construction. It was entered by E. de Cecco, of Buenos Ayres, in a model-building contest held some time ago

The construction of the propeller is of special interest. Each blade consists of two $5\frac{1}{2}''$ and one $4\frac{1}{2}''$ Strips bolted by means of two Flat Brackets diagonally between two Bush Wheels, which form the boss of the propeller. The main planes are built up from a number of Flat Plates, with Angle Girders bolted along the leading edges. The ailerons consist of two overlapped $7\frac{1}{2}''$ Flat Girders, pivoted to the planes by means of Meccano Hinges. The elevators are formed from $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates pivoted in a similar manner to the tail, while the rudder is constructed from a $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate rocking upon a vertical Axle Rod. The various controls are all connected by cords to the pilot's cockpit.

Third Prize Winner

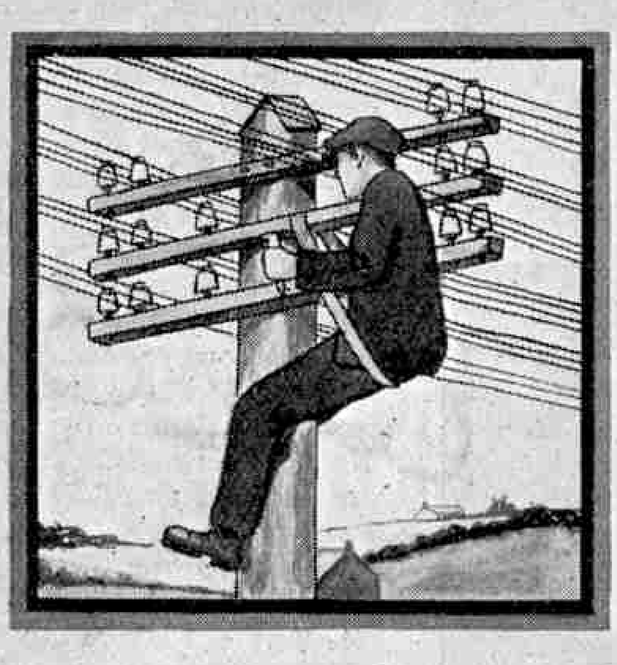
A well-proportioned and realistic model secures the third prize for A. D. Drysdale. The fuselage in this case consists of four $12\frac{1}{2}''$ Angle Girders meeting in the tail of the machine and secured at their other ends to two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates which form the sides of the cockpit (the floor being a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate). The engine housing is constructed from four Sector Plates bolted together. Six Couplings representing the engine cylinders are attached to the shanks of bolts inserted in the upper Sector Plate, and are secured to a $3\frac{1}{2}''$ Rod passing through the upper hole of each Coupling. The exhaust pipes are shown by two Crank Handles; these are held in a Coupling which is mounted on the rear end of the $3\frac{1}{2}''$ Rod mentioned. The tail planes consist of $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates pivotly mounted on a $5''$ Axle Rod passing through the $12\frac{1}{2}''$ Girders. The operating cords are attached to Cranks secured to a shaft which may be rotated from the joy-stick, and thence are led to two Angle Brackets bolted to each plane, one on either side. The rudder also consists of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate connected by means of Hinges to a $2\frac{1}{2}''$ Triangular Plate. The latter is bolted to two $12\frac{1}{2}''$ Strips secured to the fuselage.



Awarded Third Prize; Single-seater biplane (A. D. Drysdale)

A Nimble "Scout"

The other prize-winning models are all exceptionally well built. I was particularly struck with the realistic appearance of a model single-seater "scout" biplane by W. G. Nixon, which I am reproducing on this page.



Electricity

XXIV. THE TELEPHONE EXCHANGE

THE electric telephone was invented with the idea of enabling two people to talk to one another from a distance, when they had the necessary instruments connected together by two insulated wires. The modern telephone has gone a great deal further than this. To-day every telephone subscriber in Great Britain is able to call up and converse with any one of 900,000 other subscribers in their own homes or offices. Such a remarkable feat of inter-communication can be accomplished economically only by means of reliable and rapid switching arrangements, and the object of the telephone exchange is to fill this requirement.

The Exchange Switchboard

The two wires from each subscriber's telephone go to the exchange in his district and there terminate in a socket or "jack" mounted on a switchboard.

We illustrate on this page a small switchboard for 25 lines. The jacks, numbered 1 to 25, will be seen in the middle of the upright panel, and above them are 30 "drops," the front portion of which consists of a small metal door hinged at the bottom. Each subscriber is connected to a separate drop. When he operates his generator on "ringing up" the exchange the door of his drop falls open, revealing his number, as is the case with drop 15 in the illustration. The use of the five extra drops will be explained later.

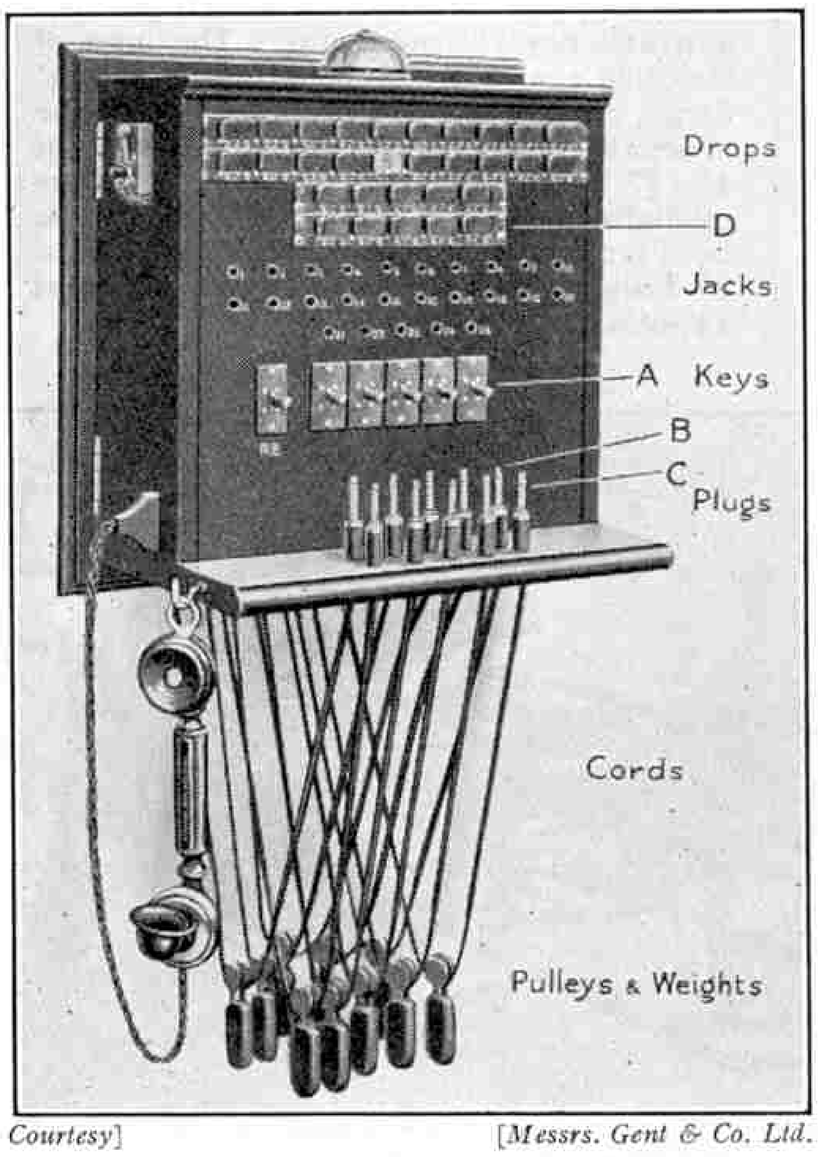
When a drop, say No. 15 falls, the operator knows that that particular subscriber wishes to make a call, and she takes hold of one of the back row plugs and inserts it in No. 15 jack. The plugs have two contacts, the tip and the sleeve, which match those in the jacks.. These plug contacts are connected to two insulated wires in the flexible cords that pass through holes in the horizontal shelf. As will be seen from the illustration, these cords are kept taut by lead weights on pulleys, so that when in use all the slack wire is taken up below the shelf. On removing a plug the operator merely releases it and the weight returns it to the position shown in the illustration, ready for immediate use when the next call is made.

Jacks of subscribers No's:	1200 to 1799	1 to 599	600 to 1199	1200 to 1799	1 to 599	600 to 1199	1200 to 1799	1 to 599	600 to 1199	1200 to 1799	1 to 599
Operator has drops for, and answers. No's:		1 to 199	600 to 799	1200 to 1399	200 to 399	800 to 999	1400 to 1599	400 to 599	1000 to 1199	1600 to 1799	
Operator		A	B	C	D	E	F	G	H	J	

We will suppose the operator has inserted the plug B in jack No. 15, whose owner wishes to make a call. She now presses the listening switch or key A corresponding to plug B, and asks the subscriber for the number required. Upon being informed, she releases the listening key and inserts plug C in the required number, if this is disengaged. Next she presses the ringing key R.B., which operates the bell on the called subscriber's telephone. The call is now completed and No. 15 can talk to the other subscriber. The operator then closes drop No. 15 by hand.

When the conversation is finished and the subscribers ring off, "clearing drop" D, which corresponds to plugs B and C, opens. This informs the operator that the conversation is finished and she removes both plugs and allows the weights to return them to their positions.

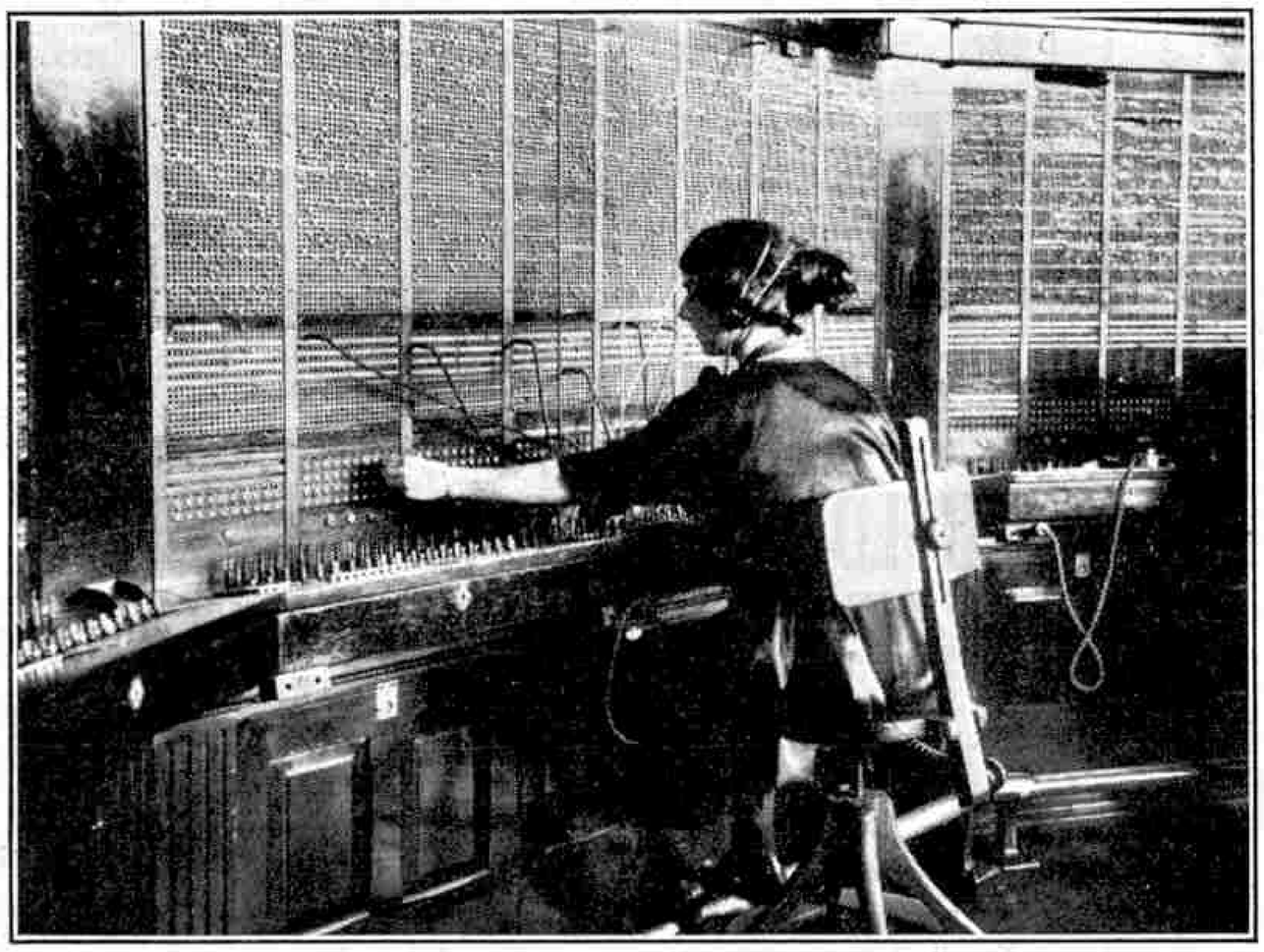
It will be seen that the plugs are used in pairs together with a listening key and clearing drop, and consequently in the case of the particular switchboard illustrated a maximum of five conversations is possible at one time.



Courtesy [*Messrs. Gent & Co. Ltd.*

Wall Pattern Switchboard for 25 lines

The wiring connections by means of which this switching is accomplished are shown in the accompanying diagram, which details the complete circuit between two subscribers A and B when they are in conversation with each other. For the sake of clearness the plugs P1 and P2 are shown just in front of the jacks J1 and J2 and the talking lines between the two subscribers are shown thick.



Typical Switchboard Showing Operator at Work

Details of the Circuit

Reading from left to right the various parts of the circuit are as follows:—the apparatus at the house of the subscriber A, who is the originator of the call; the two line wires connecting subscriber A with his jack J1 and calling drop D1 at the exchange; the circuit connected with the two plugs P1 and P2, known as the cord circuit; the jack J2 and drop D2 belonging to subscriber B, who possesses apparatus similar to subscriber A.

It will be seen that the apparatus at the subscribers' premises is the same as that described in detail last month, in which R is the receiver or ear-piece, M the microphone, T the microphone transformer, B the calling bell, G the hand generator for signalling the exchange and H the receiver hook. This, it will be remembered, is in circuit with the upper contacts when the receiver is lifted off for conversation and with the lower one when the receiver is replaced.

The calling drops D1 and D2 each consist of an electro-magnet which, when it is energised by the subscriber operating his generator G, releases a catch and allows the door to fall and reveal the number to the operator. These drops are connected across the subscribers' lines, and when a plug is inserted in the subscriber's jack J1 or J2 they are automatically disconnected, so as not to interfere with the conversation.

The jacks consist of a ring contact "a" and a spring contact "b." The latter is joined electrically to the tip of any plug that is inserted, while the former is joined electrically to the sleeve of the plug. The two plugs are shown diagramatically at P1 and P2. They are connected to each other through ringing keys R1 and R2. The contacts of these two keys are shown in the talking position. For ringing, both arms are moved from the top contacts to the lower, thus connecting the generator G1 across the line and ringing the bell at the subscriber's premises.

The clearing drop D3 is permanently connected across the talking portion of the cord circuit. The winding of the electro-magnet of this drop has a high resistance so that it has no ill effect upon the voice currents. The operator's listening key is shown at L. Her telephone outfit consists of the usual apparatus without a bell, generator or receiver hook.

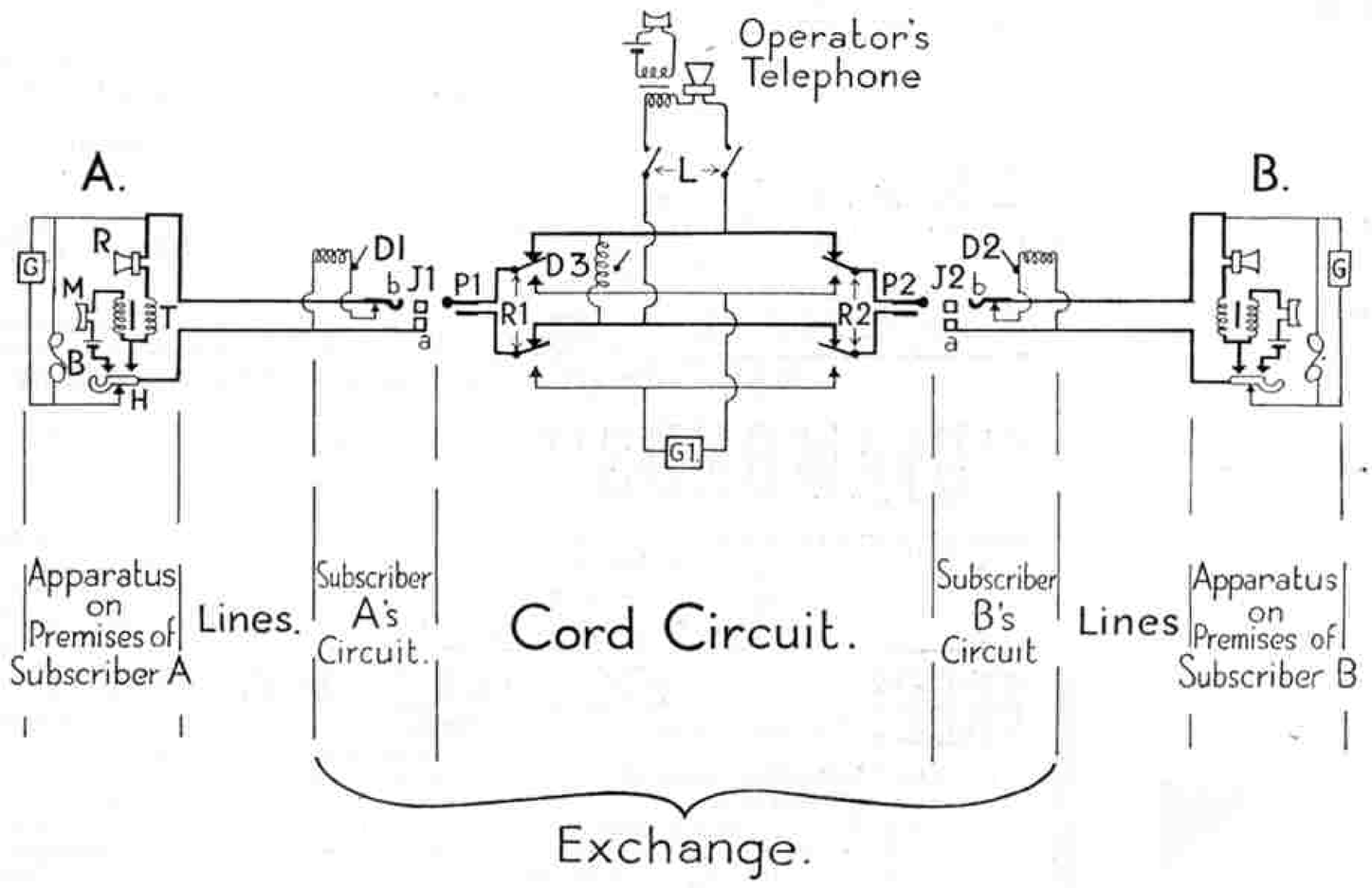


Diagram to illustrate the switching operations that are carried out in placing two subscribers in communication with one another

How the Circuit Operates

The procedure of making a call is as follows. Subscriber A, with his hook H down, turns the handle of his generator G, thus energising the magnet of his drop D1 at the exchange and causing the door to open. The operator inserts the plug P1 into the jack J1, thus disconnecting the drop D1, and presses the listening key L. Subscriber A by this time has taken up his receiver and he hears the operator say "Number, please." Upon being informed, she releases the key L, inserts plug P2 in the required jack J2 and presses the ringing key R2, thus operating the bell on the telephone of subscriber B and attracting his attention. When she releases the ringing key R2 the two subscribers are connected together and the conversation can take place.

When the conversation is finished the subscribers ring off, operating the clearing drop D3. The operator then removes both the plugs P1 and P2 and the call is at an end. It is important to notice that the cord circuit is not permanently connected to any subscriber and that it merely acts as a connecting link between any two jacks of the exchange.

(*Continued on page* 180)

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75/77, Judd Street, King's Cross, London, W.C.1.

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54 different BRITISH COLONIALS FREE

This fine collection contains scarce unused **Morocco** overprinted on British, obsolete **Malta War Tax, Mysore** overprinted on India very scarce, set **11 Canada** with 1888 and War Tax, **6 Ceylon** including scarce K.E., **Set New Zealand** with **Map** stamp and high values, **New South Wales, Victoria, Set Irish, 15 India Deccan and Gwalior,** set **Australia,** set **South Africa,** etc., etc. (usual price 6d.)

OFFERED FREE to all genuine applicants for approvals enclosing 1½d. stamp for cost of return postage. Mention **54** Packet.

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SET OF FIVE DIFFERENT AUSTRALIA KANGAROOS FREE (including 6d. & 1/- values) to applicants for our approval booklets of **King George Colonials, Pictorials,** and **Irish.** Fine postally used specimens at 1d., 2d. and 3d. each. Send 1½d. stamp for postage.

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69, QUEENS ROAD, CLIFTON, BRISTOL.
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"DIAMONDS" Thousands of "M.M." Readers have proved this; why not you?

MANY RARE STAMPS have been found by purchasers of **THE "DIAMOND" PACKET,** which is guaranteed to contain **1,000 Unsorted Stamps** from convents abroad. 1 packet, 1/3; 2 packets, 2/5; 3 packets, 3/6; 4 packets, 4/6; 5 packets, 5/6. All post free (abroad 3d. per packet extra).

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FREE! SCENIC PACKET **FREE!**

It contains only **Twenty Different** stamps, but there is **no Neurope Trash.** They are **all good ones** and include :—

6 Different **Mozambique Company,** depicting **Native Village,** African Native with trophy of **Elephant Tusks,** Field of Maize, **Railway Train** in E. Africa, Coat of Arms, etc.; **Six Guatemala** (Signing of Independence, Temple of Learning, Parrot, The **National Palace,** Statue of Columbus, the scarce **1 Peso** stamp, etc., **Algeria** (surcharged), Dahomey (gathering coconuts), Guinea (natives fording river), **Madagascar** (palanquin), Argentine (Pan-American Congress stamp), **Costa Rica** (statue to Juan Santamaria), Greece (**Postage Due**) and **Hyderabad** (Indian Native State). **Twenty Fine Stamps** in all, **Free** to you. Send 2d. for postage of my 60 p. Price List and 12 page list of Accessories (abroad 3d). Also **Three Scarce Cochin Free To Responsible Approval Applicants.** Write to-day to **EDWARD SANDELL, 10-11, FETTER LANE, LONDON, E.C.4.**

ENTIRE PARCEL FREE

Containing 54 Colonial and Foreign Stamps, catalogued 13/8, 100 Perfect Peel-off Mounts, Invisible pochette for preserving rare stamps, Strong Perforation Gauge, Vest Pocket Folder, latest copy of Stamp Bargains, particulars of Free 20/- collections, and a list of 40 other Free Gifts you can secure. **Absolutely free and post paid** to genuine approval applicants. **Send a postcard now.**

Only 1 lot allowed each applicant.

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Stamp Collecting

How Peru Gained Her Freedom

(Continued from last month)

ON 26th October San Martin re-embarked his force at Pisco and landed at Huacho, where he established his headquarters. From this shrewdly chosen position north of Lima he constantly made surprise attacks and various diversions on the Spanish forces, at the same time maintaining unbroken communication with his friends at Lima.

General La Mar (1896)

Meanwhile Lord Cochrane had been busily employed. On the night of 5th November he daringly ran alongside the Spanish frigate "*Esmeralda*" and despite a spirited resistance captured her and took her to Ancon, where she was renamed the "*Valdivia.*" Another expedition landed at Morro de Sama and advanced to the city of Tacna, where it was received with acclamation by the populace. From there it struck at the Spaniards, inflicting on them a heavy loss at Mirabe. It also crushed a Spanish detachment at Torrato and embarked on 22nd July at Arica for Pisco, of which it took possession on 2nd August.

Resignation of the Viceroy

The wisdom of San Martin in establishing himself so near to the capital was soon apparent. His proximity acted like a magnet upon the waverers and on 3rd December a complete Spanish battalion numbering 650 men, together with thirty-eight Peruvian officers and many cadets, joined his rapidly-increasing army. In addition to these wholesale desertions Pezuela was confronted with dissatisfaction among his own officers. This culminated in open revolt, and on 29th January the unfortunate Viceroy was collectively addressed by his generals and officers, who called upon him to resign his position and hand over his command to General Jose de la Serna. The strength of his insubordinate officers left Pezuela no alternative but to agree to the request.

General de la Serna was declared Viceroy by the officers and strange to say the irregularity was promptly legalised by Spain, who, genuinely alarmed at the course of events, despatched an emissary to Peru to ascertain the position and to propose a compromise.

Bolivar (1910)

A Maker of Nations : Bolivar

Meanwhile San Martin presented his terms of peace during an armistice of twenty days that followed these events. He called for the recognition of the Independence of Peru and the setting up of a provisional constitution pending the election of a Congress, and demanded that a Bourbon Prince should occupy the throne of Peru. These proposals were accepted by the new Viceroy but rejected by the Spanish Generals, and the negotiations fell through in May.

J. Suarez (1896)

Events now marched rapidly to a climax. The Royalists on the coast, having their communications cut off, were forced to evacuate their positions. Canterac, the Spanish General, marched into the interior in June, and the Viceroy left Lima on 6th July. On the night of 9th July San Martin entered Lima, and on 28th July proclaimed the Independence of Peru. He was himself unanimously chosen as Protector, a position he held until the following September when, the Peruvian Congress having been established, he resigned and retired into private life.

On 28th February 1823, after a period of government by a triumvirate, Don Jose de la Riva Aguero was elected the first President. Confusion reigned, however, for everything was in the transition stage. Aguero failed to cope with the burdens and difficulties of the situation, with the inevitable result that he was deposed. Simon Bolivar, the great soldier and nation-maker, was then asked to endeavour to create order out of chaos and to regularise a condition of things that had become fraught with peril to the new republic.

Defeat of the Spaniards

Bolivar (1893)

Bolivar arrived in Lima on 1st September 1823. He saw at once that as long as the Spanish Viceroy was still at large with an army the independence of Peru rested upon a precarious foundation, and he therefore immediately organised a force to attack him. The first encounter took place on 6th August in a cavalry action at Junin, when the Peruvians under Captain Suarez gallantly charged and defeated the Spaniards under Canterac, near the shores of Lake Chinchay-cocha. After this victory Bolivar proceeded to the coast, leaving the glory of the subsequent Battle of Ayacucho to his second in command, General Antonio J. de Sucre.

On 3rd December the Republicans lost the battle of Ceolpahuaica, and were pursued by La Serna. The two forces met again for the last time on 8th December on the plain of Quinua, and on this day South America reached the portentous hour of her destiny, decided by the Battle of Ayacucho.

Before the conflict General Sucre addressed the 6,000 men that formed his army. "Upon what we do to-day depends the destiny of South America!" he cried in clarion tones. His cosmopolitan force—Colombians, Peruvians, Bolivians, Chilians, Argentinos, Paraguayans, Uruguayans, Cubans, British, French, Germans, and even Spaniards and North Americans—all heard and understood, and willingly offered to sacrifice their lives if necessary to give to South America the priceless gift of freedom.

It was a dramatic moment. On the field of Ayacucho the would-be creators of a new world fought with passionate hope against the forces of a decadent world. It was in South America as it had been in North America—the uprising of new nations against the domination and authority of the old. Since the Declaration of Peruvian Independence by San Martin two years earlier the young Republic had not prospered, for Spain's power had not been irretrievably broken. The Spanish surrender to that independence had not been completed, and until unconditional surrender was made Peru could not regard her emancipation as secure for all time.

In the opening stages of the final and decisive battle on the 9th December the Spanish army of 10,000 men were victorious and the fate of Peru seemed sealed. The fight proceeded desperately, however, and slowly but surely that early and premature victory was turned into a great defeat. The Spanish forces lost on that

(*Continued on page* 175)

General Sucre (1904-6)

FREE GIFT to all asking approvals.—Purcell, Wykeham Park, Thame, Oxon.

100 Different Foreign Stamps Free ; send for ½d. Approval Sheets.—Cox, 135, Cambridge Rd., Seven Kings.

2 Mint South Africans 1926, gratis approvals. 1½d. postage.—Neave, 186, Cambridge Road, N.W.6.

FREE. Splendid Pictorial Syrian. 20 others. Postage.—Howell, 20, Trilby Rd., Forest Hill, London.

Free. 100 Stamps. Write for really cheap approvals. H. J. Huggins, 22, Bramfield Rd., Battersea, S.W.11.

100 FREE. 500 diff. Stamps, 2/– ; 1,000 diff., 5/6. —Hyde, 35, Avenue Road, Extension, Leicester.

1,000 FOREIGN STAMPS, Special Mixture, 1/–, post free.—Kelvey, 76, Oval Road, Erdington, Birmingham.

50 Stamps 7½d. post free.—H. Woollard, 44, Newport Road, Leyton, London.

Stamps, mixedforeign; 300 and free gift,6d.—Turner, 8, Wellington St., West, Higher Broughton, Manchester.

FREE. 50 Stamps to all applicants requesting approvals.—H. Watterson, 2, Elm Bank, Anfield, L'pool.

BRITISH COLONIAL AND FOREIGN STAMPS at 8d. in the 1/– discount.—J. McCallum, 56, Trefoil Avenue, Shawlands, Glasgow.

30 PICTORIALS FREE, to approval applicants. Rock bottom prices.—S. J. Huckle, 53, Birkenhead Avenue, Kingston-on-Thames.

Astounding Value. Send 1/– P.O. and postage for 100 British Colonials, all different, including high values and unused, or 150 Foreign and Colonials, same price. This cannot be repeated.—Scott, 154, Wellesley Rd., Ilford.

FREE ! 25 different Stamps to applicants for Approvals (from 6 a penny). Unused Victorian Newswrapper to every 5th applicant enclosing 1½d. postage. —Powell, 73, Bond Road, Surbiton, Surrey.

500 Series Yugoslav war Invalid Stamps at 8, 20, 30 dinars. Sold parcels of at least 50 series.—Zvonimir, Pavesie, Maksimirska 32, Zagrel, Yugoslavia.

Why Throw Money Away ? We can supply you with any well known Correspondence Courses at prices ranging from 50 to 300% of cost price. State requirements. Courses bought.—The Secretary, Ross College, St. Budeaun, Plymouth.

BARGAIN PACKETS.

100 diff.	4½d.	200 diff.	9d.	300 diff.	1/6
400 diff.	2/–	500 diff.	3/–	1000 diff.	4/6

Post Free. Perforation Gauge and Packet of Hinges free with each packet.

W. GOSLING, 93, Wherstead Road, IPSWICH.

5 DENIKIN ARMY FREE!

with 200 Different, including **BAHAMAS,** 3 Jugo-Slavia, Cayman, Bulgaria 1925, 2 levas, **BARBADOS VICTORY,** Ukraine, etc. ... ... **8d.**
500 DIFFERENT, including above **1/9**
12 MONTENEGRO, 1907, 1p. to 5 Kruna, Complete mint **1/–**

All Post Free.

L. W. CRAIG, 10, Rothwell St., LONDON, N.W.1.

3/6 COMPLETE SET OF PICTORIALS FREE

This beautiful complete set of very large Roumania Pictorials depicting the Queen weaving and bearing the motto "God guide our hand" (translated). Priced at 3/6, presented free to applicants for approvals. Send a Postcard Now.

F. J. HUTTON, Llancloudy, Llangarron, Herefordshire.

10 Mozambique Coy. New issue, Mint, all different, for 1½d., if you ask for our Approvals. Bargain Lots at 6d. per 100 post free.

MORRIS & CO.,
STAMP DEALERS, BLETCHLEY.

TRIANGULAR ECUADOR, FREE

with a fine packet of 100 specially choice varieties, and price list, for 1½d. postage. Above will be sent to all new applicants asking to see approvals. These contain a host of nice attractive stamps not usually met with. Only a limited number of the Ecuadors are available, write without delay.

H. LINDSEY, 27a, The Square, G.P.O. Box 10, St. Annes-on-Sea.

109 "AUTO" PACKET

Containing **West Indies, SUDAN, Wallis and Fortuna Island,** New Zealand, TRAVANCORE, Dutch East Indies, EGYPT (Sphinx), GREECE, German Occupation of Belgium, DANTZIG, fine pictorial French Australasia, **scarce DOMINICANA map,** fine engraved **BOSNIA and HERZEGOVINA,** Jugo-Slavia (Chainbreaker), and others making 109 all different. **Send a Postcard** requesting approvals. *First 100 applicants receive scarce Triangular Stamp Extra.*

R ALCOCK, 13a, Clarence Street, Cheltenham Spa.

ARTTS CCEGILLNOT AMPSST ADOTY-

What do these four jumbled words mean ? Send your solution, ask to see our approval sheets of Stamps, and enclose two penny stamps for postage, &c. If your answer is correct we will then send you **absolutely free** 50 Austria, *or* 20 Japan, *or* 15 New Zealand.

M. C. FLORICK,
179, Asylum Road, Peckham, London, S.E.15.

1,111 Try the Cheapest and Best 1,111

Method of adding to your collection.

When you buy PACKETS you buy DUPLICATES. I will send you a book of 1,111 different stamps from which you may select any 100 for 3/–. BUY ONLY THOSE YOU REQUIRE.

H. HARDY,
1,111 285, Archway Road, London, N.6. 1,111

FREE

To Applicants for Approvals
9 PICT. MOZAMBIQUE or
6 NEW PICT. TOGO.

ALBAN SIMMONS, Hillside, NEW BARNET

FREE 8 Newfoundland and "Gem" Stamp Case.

This interesting Collection from England's Oldest Colony includes Portraits of Queen Alexandra, Queen Mary, King George, Map of the Island, Caribou issue, View of South West Arm, Trinity, and Newfoundland War Memorial.

☛ **For 30 days only** (Colonies 60 days) the above interesting Collection and Case **Gratis** to every Stamp Collector sending **2d.** for cost of postage. Abroad **3d.**

Only one Collection allowed to each applicant, and cost of postage must be sent.

Ask for our PRICE LIST of Sets, Packets, Albums, &c. Gratis and Post Free anywhere. **ILLUSTRATED CATALOGUE and Guide to Stamp Collecting.** 42nd Edition. 116 pages. Full of information and Bargains. Over 18,000 varieties listed in Single Stamps and Sets. **Post Free 6d.** Established 1880.

ERRINGTON & MARTIN LTD., LONDON, E.9.

PHILS PHAMOUS PACKETS

1,000 Stamps	6d.	25 Irish	6d.
300 different	6d.	25 British Official	6d.
50 French Col.	6d.	20 Italian Col.	6d.
50 PortugueseCol.	6d.	25 Siam	6d.
40 Roumania	6d.	100 Brit. Col.	6d.
40 C. & S. America d.		25 Bulgaria	6d.

Postage 1½d.

PHIL, 20, Castle Street, DOVER.

BARGAINS WORTH HAVING!

Unused 1c. KEDAH FREE to approval applicants sending 1½d. stamp. 500 different, many unused, 3/6 ; 10 different Siam, 4d. ; 12 different, 6d. ; 20 Australasians, 1/–. All Postage extra.

A. Baxandall, St. Denis, Hauteville, Guernsey, C.I.

RILEY'S BILLIARD TABLES for the home.

Riley's "Home" Billiard Tables—to fit conveniently on any dining table. Prices from **£7,** or in monthly instalments. Riley's "Combine" Billiard and Dining Tables to suit any room. Prices from **£22 10s.,** or in monthly payments. **7 Days' Free Trial,** and Carriage paid.

Send for FREE Price List

E. J. RILEY LTD., Deal Works, ACCRINGTON.

Eswey Watches

THE "KENT" MODEL. A gentleman's full-size Pocket Watch. Every part interchangeable and fully guaranteed. Keyless Winding. Strong Nickel Silver Dustproof Cases, 5 years' warranty. White Dial with Seconds Indicator. Timed to 30 seconds a month. Send P.O. and have one **10/-** on 7 days' trial. Satisfaction or money back. Post Free.

An "Eswey" Silver Chain Presented Free.

Eswey Watch Co., 17, Cobbett Rd., London, S.E.9.

MECCANO WRITING PADS are supplied in two sizes, each consisting of 50 printed sheets of tinted paper with cover. Prices—Large, 1/– each, and small, 6d. each (post free), from Meccano Ltd., Binns Road, Liverpool.

Now Boys! What about a KODAK

Every boy wants a Kodak and nearly every boy can get his father or mother to give him one if he sets his heart on it.

You can make ripping pictures of your chums, sports, pets and happy moments, also compile an album that will always be full of interest and fun.

Send for complete list of Kodaks,
:: Brownies and accessories, ::
:: or for further information. ::

We do best quality Developing and Printing and all kinds of Repairs.

All goods sent post and packing free.

Woodhall's
256, Grange Rd.
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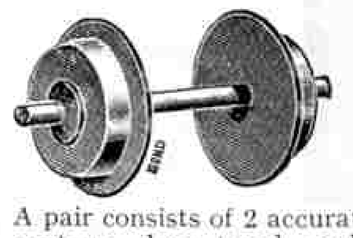
If you have any difficulty in getting Hornby goods or Meccano parts we can always supply per return.

Bond's Improvement for Gauge OO Railway Rolling Stock.

Fit your Coaches and Wagons with

BOND'S LATHE TURNED WHEELS.



4d. pair, 2 wheels on one axle. **3/9** dozen pairs, post 3d.

Two pairs for one Coach, **10d.** post paid.

A pair consists of 2 accurately turned wheels of correct contour, deep tread, and wide flanges, fitted to a polished steel axle.

"00" Locomotive will double its running distance and pull 25% heavier load when train is fitted with these wheels.

If you are interested in Models or Model Making get Bond's 1926 Winter List, post free 4d.

BOND LTD., 254, EUSTON ROAD, N.W.1.

IT WILL PAY YOU

to send for our Illustrated Catalogue which we send free upon receipt of a Card. Every day we are receiving repeat Orders from satisfied customers.

WHY NOT BE ONE !

FRANBERS,
163a, High Street, DERITEND, BIRMINGHAM.

Fountain Pen! 2/4

With 14 Carat Gold Nib, Iridium tipped, Lever Self-Filler, Safety Cap and Clip **2/4**

"Durable Model, Lever Self-Filler Safety Cap and Clip **1/–.** Money-Back Guarantee.

JACEE,

12, CLEVEDON ST., MOSTON, MANCHESTER.

STAMP PERFORATION GAUGE

If you are a stamp collector you should make a point of securing one of these Perforation Gauges, which enables you to find the size of perforation of any stamp quite easily. The price of the Gauge is 1d. post free, from the Editor, "*M.M.*," Binns Road, Liverpool.

ESSAY COMPETITION.

For the best essay on a new game "Gale Billiards," the inventor is offering a prize of 10/–, and the winner's name will be published in the "*M.M.*" for May.

See advertisement on page 215.

Stamp Collecting—(*contd. from page* 173)

fatal day 1,800 killed, 700 wounded and 2,000 prisoners, exclusive of officers, among whom was General Canterac. The Peruvian losses on the other hand amounted to only 310 dead and 609 wounded, while all their generals had covered themselves with glory. The names of Cordova and Lara, of the Englishman Miller, and of La Mar—who had successfully repelled every attack of the enemy—will never leave the pages of South American history.

When all was over and defeat was certain, La Serna, the last of the Spanish Viceroys, surrendered himself and his sword with the rights and powers of Spain in that world she had discovered and conquered 300 years before.

Peru was free at last!

* * * *

The stamp collector will find many stamps of South America that bear portraits of Bolivar, whilst some of those stamps bearing portraits of the men engaged in Peru's fight for freedom illustrate this article. Equally interesting stories could be told about other countries, the history of which is often well depicted in postage stamps.

Recent Issues

HUNGARY
Charity stamps

A series of three rather attractive charity stamps was issued by this country in the early part of 1924. The three values, 300, 500 and 1000 korona, are all of large size and of different design.

The 300 korona shows a boy carrying an arrow in his left hand and a bird in his right, one stamp journal considering him to represent Cupid; the 500 kor. shows a peasant woman reading to a child in a cradle; the 1000 kor. shows a youth being instructed in archery by a man whose right hand is evidently pointing out the target.

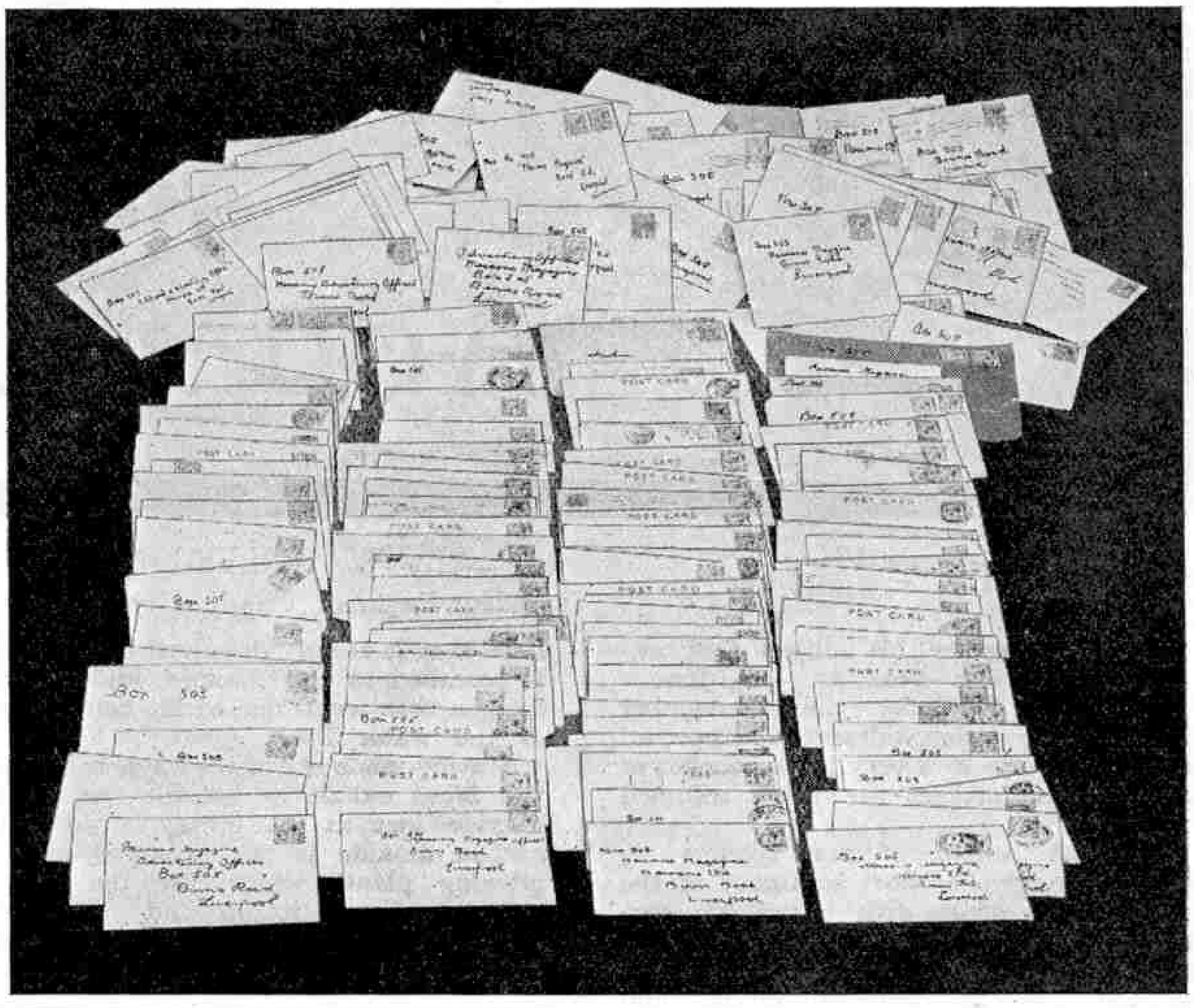
The inscription "A 100%-os felár közjótékoysági czélokra fordittatik" printed in black appears on the back of all values. The stamps are on paper watermarked Quadruple Crosses, perforated 12.

AUSTRIA
Charity series

The series of Charity stamps issued by Austria in 1924 does not reach the usual standard of this country so far as design is concerned, although the printing, apparently by photogravure or some similar process, leaves nothing to be desired. Each value is in a particular type and although no definite description has been circulated they appear to represent the various uses that will be made of the money raised by their sale.

The 100+300 k. value shows a lute being played to an injured man, the 300+900 k. shows a farmer and a blacksmith shaking hands, the 500+1500 k. a mother with her children, the 600+1800 k. a man, apparently penniless, receiving food and drink, the 1000+3000 k. a figure, apparently representing the fruit harvest floating over two cottages.

Over 150 Replies!



Our illustration shows a few of the replies to a recent advertisement in our "Readers' Sales and Wants" column. The photograph shows the first batch of replies that were sent to the advertiser (Box No. 505). There were over 150 letters when this photograph was taken and they came from all over the country and from Ireland, France, Belgium, Norway, and were received for several weeks subsequently.

There is no doubt that if you have anything to sell, or you are wanting to buy something, an advertisement in the "*Meccano Magazine*" will bring you a wide response.

A Triumph of British Engineering—

(*Continued from page* 163)

It can easily be understood that these huge Indian irrigation schemes call for the employment of the largest excavators in the world. As a matter of fact, the machines being used can excavate 10 tons at one cut and can load a train of 60 wagons in an hour! They differ from the native labourers in that their capacity for work is enormous, they never grumble about their pay, their tastes are inexpensive! They are even fitted with searchlights to enable work to proceed at night!

Difficulties and Dangers Overcome

In each of these draglines there are over 1,000 parts, the heaviest of which weighs over 19 tons. The work of assembly had to be done with inadequate lifting appliances and by native labour under the supervision of the firm's engineers. In these circumstances it is only to be expected that considerable difficulties presented themselves during the erection of the machines in India. Then there were difficulties of another kind—for instance, one of the engineers in charge dislocated his shoulder but carried on for a considerable time until help arrived. Another engineer nearly lost his life through being bitten by a snake whilst oiling a part of the machinery. The engineers had also to contend with the stifling desert heat, a blazing sun overhead,. a bad water supply, and the prevalence of malaria fever.

Notwithstanding all these difficulties, however, four of the excavators were erected in three months, which we all must agree is a very creditable performance in the circumstances. Even when the machines were finally erected the difficulties were not over, for the natives had to be educated to drive and operate them.

We feel that our readers will be interested in these particulars, because not only is the installation of the Ruston dragline a triumph for British engineers in the face of keen American competition, but also because these machines are assisting in works of such great importance. They are playing their part in making possible the cultivation of land to provide a new granary for India, and the result will be an important and valuable addition to the resources of the British Empire.

How to Start an Aquarium.

By W. COLES-FINCH
(Resident Engineer, Chatham etc. Water Co.)

THE articles on this subject that appeared last year in our June—August, October and November issues met with widespread approval and in response to a very large number of requests the articles are being resumed this month.

For the benefit of new readers we propose to give a short summary of the chief points dealt with last year, particularly in regard to certain matters that are of vital importance and make all the difference between success and failure. No hobby affords so much interest with so little trouble as aquarium-keeping, but we must be prepared to devote the necessary few moments each day to the welfare of our delicate pets, which otherwise would be faced with a lingering death.

The Tank

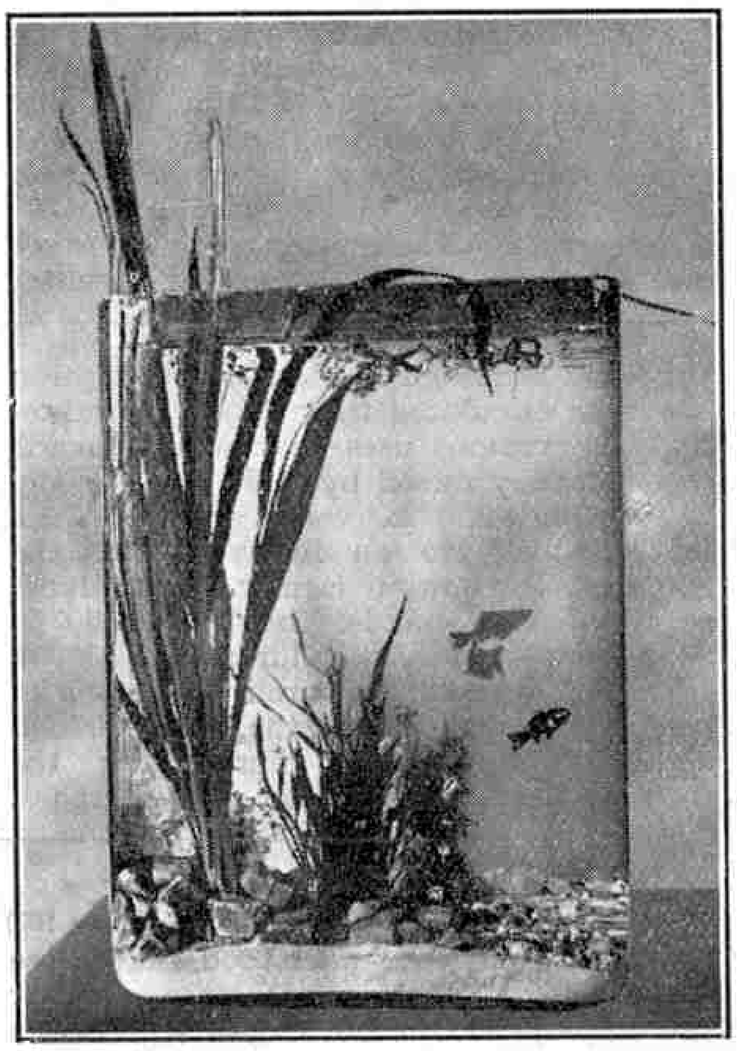
In our second article (July 1925) instructions were given for the building of a very suitable tank guaranteed to give no trouble from leakage, and readers who are anxious to construct their own tanks should refer to this article. Failing this, suitable tanks may be purchased ready-made or even a bell glass may be used. The familiar fish globes should be carefully avoided, however, for they are thoroughly unsatisfactory as regards the health of the occupants and they have the additional drawback that, when the fishes are looked at through the glass of the globe, they appear greatly distorted in shape.

Whether the bell glass or the more satisfactory rectangular tank be adopted, the one important point is that surface area must never be sacrificed to depth of water. The amount of the life-giving oxygen taken up by the water is in proportion to the area of the surface of the water exposed to the atmosphere, from which it will be clear that the fish globes just referred to are utterly unscientific in design.

How Fishes Breathe

The next matter of importance is that we should grasp the secret of how the fishes and plants in our tank breathe and live. The water received by the mouth of the fish is drawn to the gills and expelled through the gill openings. During this process the delicate membrane of the gills takes up some of the oxygen that is dissolved in the water, and thus the fish breathes. It is important to note that it is only dissolved oxygen that is breathed in this manner, and not the oxygen that forms one of the constituents of the water itself.

Having made use of the oxygen inhaled, the fishes exhale or breathe out carbon dioxide just as we ourselves do. This carbon dioxide is the principal food of growing plants which, by the aid of sunlight, break it up and utilise the carbon, along with water and a small quantity of mineral matter, to build



A Snap, sent by a reader, of an aquarium made in the glass container of a large disused accumulator

up their structure, afterwards giving out the oxygen that remains. Thus fishes breathe in oxygen and breathe out carbon dioxide, while the aquatic plants in the aquarium absorb the carbon dioxide and return oxygen to the water. In other words the fishes and plants in an aquarium supply one another's needs, and in order that life in the aquarium may proceed happily on sound lines a balance must be effected between the plant and the animal life.

If the fishes in the tank are too numerous or too large in proportion to the amount of plant life, the oxygen will be consumed more quickly than it is given off by the plants or absorbed from the air, and the water will become exhausted of oxygen.

Signs that Fishes are Suffering

When this condition arises the fishes are driven to seek air at the surface of the water. It is a pitiful sight to watch the little creatures, in desperate need of oxygen, swimming round and round the tank with their mouths at the surface of the water, and it is a sure sign that the fishes are suffering severely. One often sees fishes in this unhappy condition exposed for sale, and they should never be purchased. It is highly probable that, as the outcome of this unnatural form of breathing, they have already contracted inflammation of the gills, and this and other diseases consequent upon life under such unwholesome conditions are extremely likely to cause death to our pets and disappointment to ourselves.

Shading the Tank

In most cases the actual position in which a tank is placed depends to a great extent upon household arrangements, but in every case care should be taken to provide some means of shading the aquarium from direct sunlight during the heat of the day.

Fishes need both shade and seclusion and in their natural surroundings this is provided by trees and plants overhanging the pond or stream in which they live. It is usually a simple matter to provide the necessary amount of shade and by doing so we shall greatly increase the health and happiness of our fishes.

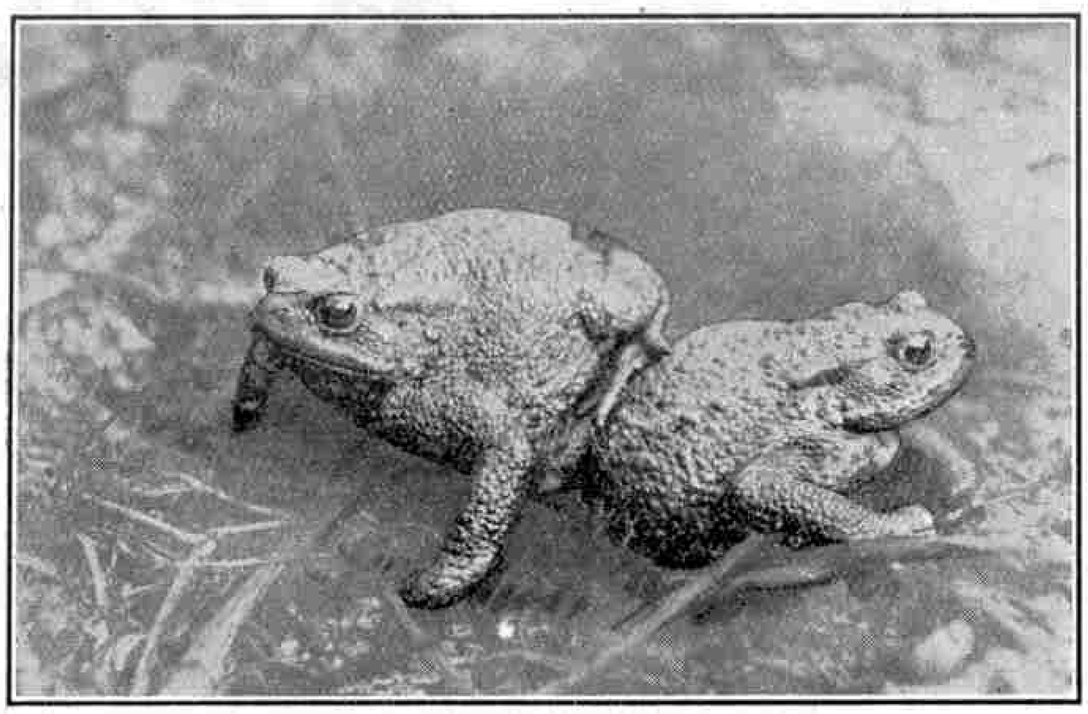
Stocking with Plants

When the tank has been placed in the position that it is to occupy, the bottom should be covered to a depth of $1\frac{1}{2}$ in. with scalded and washed coarse sand or pea-gravel. A local pond or stream should now be visited and suitable water plants collected. Sprays of these plants of convenient size should be washed clear of mud and gathered up into little bunches, each bunch being attached to a piece of broken flower pot which is buried in the sand to act as an anchor to the plant.

Now fill the tank carefully with clear spring, stream or rain water if possible, or failing these, water from the domestic tap. The water should be poured in gently so as not to disturb the plants at the bottom and any cloudiness produced

will settle in a few hours. By means of a thin rod or pencil assist the plants to spread themselves gracefully and naturally in the water. This is the first step in the preparation of a really efficient aquarium and on no account must fishes be introduced at this stage.

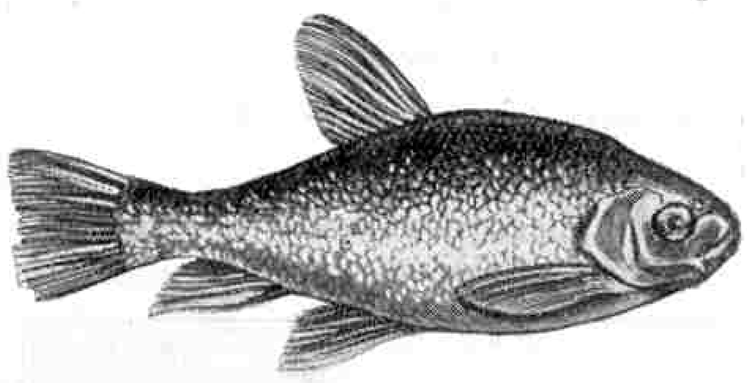
The plants should now be carefully watched and when they show by new growth that they are thriving and when, under the influence of light, silvery beads of oxygen rise from the leaves to the surface of the water, the time has arrived for our second step. Another visit to a pond or stream should be made and the various plants searched for water snails, a considerable number of which should be placed in the tank. These snails will act as the scavengers of our aquarium, for they eat the confervoid growth that forms on the glass as well as decaying portions of the water plant. A few days should now be allowed to elapse and then the time has arrived for introducing the fishes.



Brother Toads

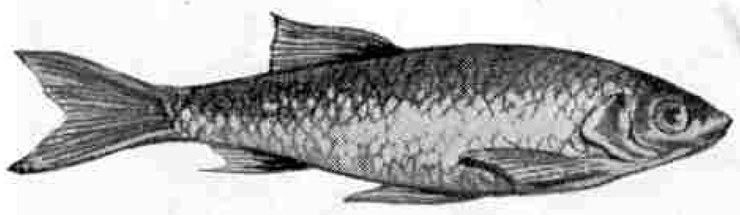
Suitable Fishes

It is at this stage that the beginner frequently makes his first serious error, namely, that of providing too many or too large occupants. The smaller the tank the smaller must be the inmates. Our idea should be that the tank shall represent in miniature a portion of a typical pond or stream with thriving plants and healthy fishes, and not be merely a vessel containing imprisoned fishes. If the fishes are small they have room to dart about, and a larger number of small fishes full of activity will give much greater pleasure than one or two large specimens that have barely room to move.



Tench
(*Tinca vulgaris*)

For a beginner I suggest the hardy Goldfish, until some experience is gained as to management, feeding, aeration of water, etc. I must seriously warn the reader, however, that often these fishes are, by reason of neglect, sick at the time of purchase and suffering from diseases for which there is no cure. Make all your purchases from reliable firms who understand the subject and provide healthy fishes.



Dace
(*Leuciscus vulgaris*)

At a later stage there may be introduced, if the tank admits of it, small specimens of Common Carp, Prussian Carp or Golden Orfe. These, together with a little school of Minnow, will provide a pleasing assortment. Still later, the Carp could give place to Dace, Gudgeon, Chub, Tench or Roach, reserving a separate vessel for the pugnacious Stickleback, which must not be overlooked. All these creatures were dealt with in last year's articles to which readers are referred.

How to Feed

We must now make a short reference to feeding, and it must be emphasised that very little food is actually required. Ants' eggs (kiln-dried), chopped shrimps, shreads of raw meat, hard boiled egg, very small worms or finely broken vermicelli may be given from time to time, but only in such small quantities that all is immediately consumed. If any small particles of food remain they must be removed and not left to foul the water. This is best done by means of a narrow glass tube used as a "pipette." The top end of the tube is closed by pressure of the finger and the other end is lowered into the tank until it is just above the particle to be removed. The finger is then lifted and water rushes up into the tube, carrying with it the offending particle. Once more the top of the tube is closed with the finger and tube and contents are then withdrawn from the tank.

Hot Weather Troubles

However carefully an aquarium may be stocked and managed there are times during spells of hot weather when the fishes show clearly, by swimming to the surface, that they are not obtaining sufficient oxygen in the water.

Immediate steps must be taken to remedy the trouble by revivifying the water in some manner. For this purpose the ordinary garden syringe is very useful. Fill it with water from the tank and discharge the water again into the tank with considerable force, holding the syringe a few inches above the surface in order that the returning water may carry with it the atmospheric air in a stream of bubbles. This should give immediate relief to the fishes, and afterwards about one-third of the water in the tank should be siphoned out and replaced by fresh water. This state of affairs should not arise in winter unless the tank is overstocked.

If the tank is sufficiently large, greater pleasure may be obtained and more fishes kept in healthy condition if town's water is laid on through a jet no larger in diameter than a darning needle, turned downward so that the stream impinges upon the surface of the water. This tiny pressure jet will carry with it a stream of silvery bubbles of air in which the Minnows will gambol in the most delightful manner.

Article V. of this series (November 1925) dealt with pond life as studied in the aquarium and introduced the great Warty Newt, the Common Smooth Newt and the Frog. Next month we intend to introduce our readers to that even more wonderful creature, the Water Spider, of which we shall show unique pictures taken at the expense of much time and trouble and patience. We shall describe the wonderful home it builds under water and how it lives and rears its young under water in a silken chamber filled with air, which it does to escape from birds and other creatures that would prey upon it otherwise.

In Reply

A reader writes:—"Will you please tell me if Portland Cement is bad for fishes? Catching the craze for an aquarium, I made one in the garden and lined it with cement. The fishes, which had been kept in jam jars, all died the day I put them in, though I could discover no reason. Would you try and tell me why?"

The writer of our Aquarium articles replies that the tragedy would be accounted for if the aquarium was filled and the fish put in as soon as the cement had set. He points out that the action of hardening in cement goes on for a long time, and that in the early stages the water would not be fit for fish, unless it were passing through as a stream. When the tank was finished several changes of water, once per day, should have been made for a time, and clean sand and plants then introduced until they assumed a healthy appearance. Then the snails should have been introduced and if these flourished and lived, then, and then only, should the fish have been introduced.

The Westminster Book of Bargains

The Westminster Photographic Exchange Ltd. (119, Victoria St., London, S.W.1), a well-known firm dealing in new and second-hand photographic apparatus and material, forward a copy of their latest catalogue, the "Book of Bargains." A glance through the 140 pages convinces us that the title in no way belies the book, for every item is backed by the firm's guarantee. In addition to an extensive list of apparatus for sale, the book contains some very valuable hints to beginners.

Our photographic readers will be well advised to apply for a copy (which will be sent without charge to anyone mentioning the "Meccano Magazine") at the address given above or at their branches 111, Oxford St., W.1, or 62, Piccadilly, W.1.

Gibbons' Stamp Catalogue

We regret owing to a printer's error the title of one of the books reviewed in our December issue was omitted from the foot of the second column on page 663, in some of the copies.

The review referred, of course, to Messrs. Stanley Gibbons' Catalogue "The Stamps of the World."

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The Story of Metals

VII. GOLD.

IN our articles under the heading "The Story of Metals" we have already dealt with Iron, Copper, Lead, Aluminium and Tin, the history of all of which we have seen to be full of interest. None of these metals, however, can approach gold in the fascination of its history. From the earliest times of which we have any record gold has been associated with religious ceremonies and with royal splendour, and above all it has always been the symbol of power.

It is probable that gold was the very first metal to be discovered by man. In many parts of the world it occurs in a pure state on or close to the surface of the ground, and its bright colour would quickly attract attention. Unlike copper, gold is of no value for making tools or weapons, and it came to be valued for its beauty when beaten into various forms of decorations and ornaments.

The Temple of Solomon

The Bible contains a large number of interesting references to gold, the first being in the second chapter of Genesis: "And a river went out of Eden to water the garden; and from thence it was parted, and became into four heads. The name of the first is Pison: that is it which compasseth the whole land of Havilah, where there is gold."

Perhaps the most striking Biblical references are those contained in the wonderful descriptions of the building of the Temple of Solomon. In the sixth chapter of the first Book of Kings, for instance, we read: "So Solomon overlaid the house within with pure gold: and he made a partition by the chains of gold before the oracle; and he overlaid it with gold. And the whole house he overlaid with gold, until he had finished all the house: also the whole altar that was by the oracle he overlaid with gold."

The Gold of Ophir

In the ninth chapter of the same book we are told: "King Solomon made a navy of ships in Ezion-geber, which is beside Eloth, on the shore of the Red Sea, in the land of Edom; and Hiram sent in the navy as servants, shipmen that had knowledge of the sea, with the servants of Solomon. And they came to Ophir and fetched from thence gold, four hundred and twenty talents, and brought it to King Solomon."

The source of this gold is to a great extent shrouded in mystery but there are some reasons for connecting Ophir with Zimbabwe in Rhodesia, where there exist great granite ruins and remains of ancient gold mine workings on a large scale.

Miners of a Vanished Race

The Zimbabwe ruins, in the heart of Mashonaland, were discovered by a wandering hunter in 1868. The largest of the ruins is in the form of a rough oval, 290 ft. in length by 220 ft. in breadth, more than half as long and almost as broad as St. Paul's Cathedral. The walls in places reach to a height of 35 ft. and are 16 ft. thick at their base. No mortar has been used in building, the whole being constructed of small, carefully worked granite blocks neatly fitted together. Close by are the ruins of a granite hill citadel and minor structures. The whole of the buildings are roofless.

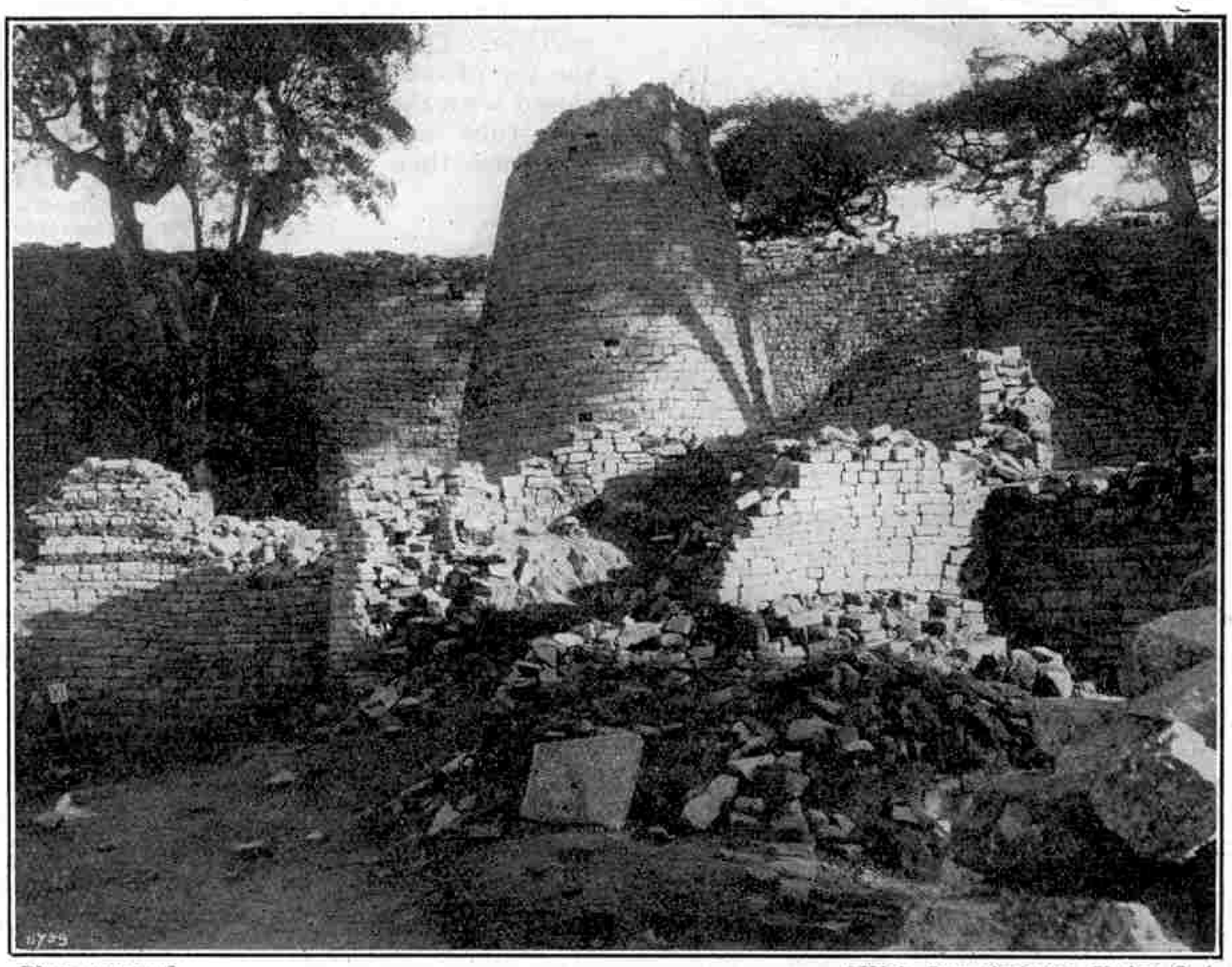

Photo courtesy] [*High Commissioner, Union S.A.*

The Conical Tower, Zimbabwe Ruins, Rhodesia

The most curious feature about these ruins is the

extraordinary preservation of many of the walls, upon which the original chisel marks on the granite are plainly to be seen. This fact has given rise to quite a heated controversy as to who built these structures. Basing their opinion on the fresh appearance of the granite, certain archæologists contend that the ruins are only some six centuries old and that they were built by Bantu tribes. On the other hand, other equally eminent experts are convinced that the structures were not only in existence, but disused, as far back as 1,000 years ago, and that the fresh appearance of the ruins to-day is due to the specially preservative climate.

It is at any rate certain that throughout Rhodesia and the Transvaal there exist hundreds of ancient workings in which, at some remote period, gold was mined extensively. Many of these workings have been examined with great thoroughness by skilled metallurgists and the unanimous opinion of these experts is that the unknown miners of antiquity were skilled at their work and handled hundreds of thousands of tons of ore. No doubt very many of the old workings still remain to be discovered, but from those already examined it has been estimated that the gold extracted by this vanished race of miners would be valued to-day at not less than £75,000,000! It is wonderful to think that the silent Zimbabwe ruins were once the scene of feverish human activity!

Photograph] [*"The Times" World Copyright*

Our photograph shows a life-size statue of King Tutankhamen, found in the famous tomb at Luxor. The statue and the various caskets, etc., are beautifully decorated with gold, and are among the finest examples of early Egyptian work in this metal. The design and craftsmanship show that the metal workers of those far-off days were genuine artists

King Solomon's Mines

There is a good deal more than mere fancy in the theory that in these ancient workings we see the remains of King Solomon's mines. It is quite possible that the Zimbabwe structures were built by Phœnicians sent by Solomon to obtain the gold for despatch to the coast, probably to Sofala, to be shipped from there to Palestine and Babylon.

This theory forms the basis of Sir H. Rider Haggard's fascinating romance, "King Solomon's Mines," in which we are given a wonderful description of excavations on a colossal scale in the mountains. Early in this book the hunter Allan Quatermain describes the ancient workings in the Transvaal as follows:—

"I was telling Evans one night, I remember, of some wonderful workings I had found whilst hunting koodoo and eland in what is now the Lydenburg district of the Transvaal. I see they have come across these workings again lately in prospecting for gold, but I knew of them years ago. There is a great wide wagon road cut out of the solid rock, and leading to the mouth of the working or gallery. Inside the mouth of this gallery are stocks of gold quartz piled up ready for roasting, which shows that the workers, whoever they are, must have left in a hurry. Also, about twenty paces in, the gallery is built across, and a beautiful bit of masonry it is."

Quatermain goes on to tell how Evans replied that he had found in the far interior a ruined city which he believed to be the Ophir of the Bible. All readers of this great romance know how Quatermain and his companions visited the mysterious Kukuanaland and what wonderful adventures awaited them there.

Alchemists and the "Philosopher's Stone"

The early chemists, who are known to us as "alchemists," were firmly convinced that it was possible to turn the common metals, such as lead, into gold. Their idea was that lead contains the same constituents as gold but that these are mixed with various impurities, and that if these impurities can be removed gold is produced. The removal of the impurities and the consequent transmutation of the metals was to be carried out by means of the "Philosopher's Stone," and therefore the energies of the alchemists were devoted to finding this wonderful substance. Needless to say, the "Philosopher's Stone" existed only in the imaginations of the alchemists, and therefore all their efforts were doomed to failure. It is curious that an Act of Henry IV. declared the attempted transmutation of metals to be a felony!

Although the alchemists thus failed in their main object, they laid the foundation of the modern science of chemistry to which the world owes so much, and it is particularly interesting to note that quite recently certain eminent chemists have claimed to have transformed one metal into another. Before these claims can be accepted, however, it will be necessary for the chemists in question to prove beyond doubt that the new metal did not already exist as an impurity in the original metal or in some part of the apparatus.

Cruelties in Quest of Gold

Throughout history we find that the desire for gold has led to treachery and deeds of violence. The power acquired by the possession of great quantities of this fascinating metal has proved a fatal lure, and in all ages has caused numbers of men to lose all sense of proportion and be prepared to sacrifice anything or anybody in order to obtain gold. The earliest Greek and Roman writers tell us of many such deeds of violence and the story is continued to-day in the columns of our morning newspapers.

(*Continued on page* 182)

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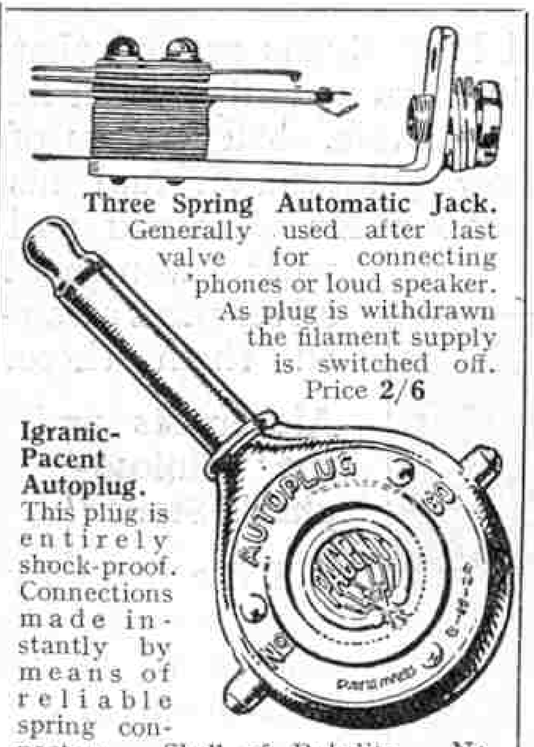

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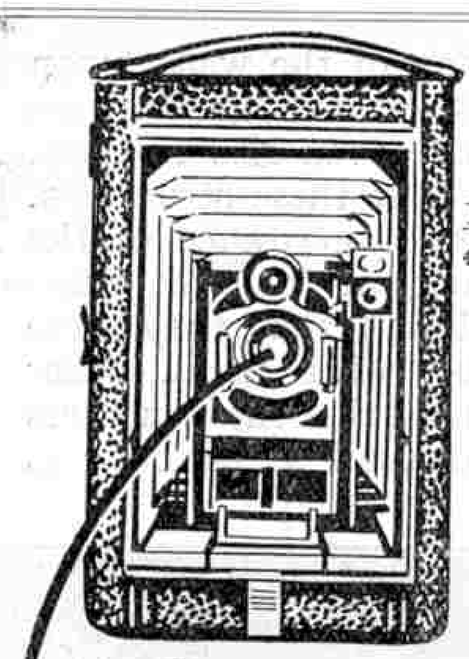

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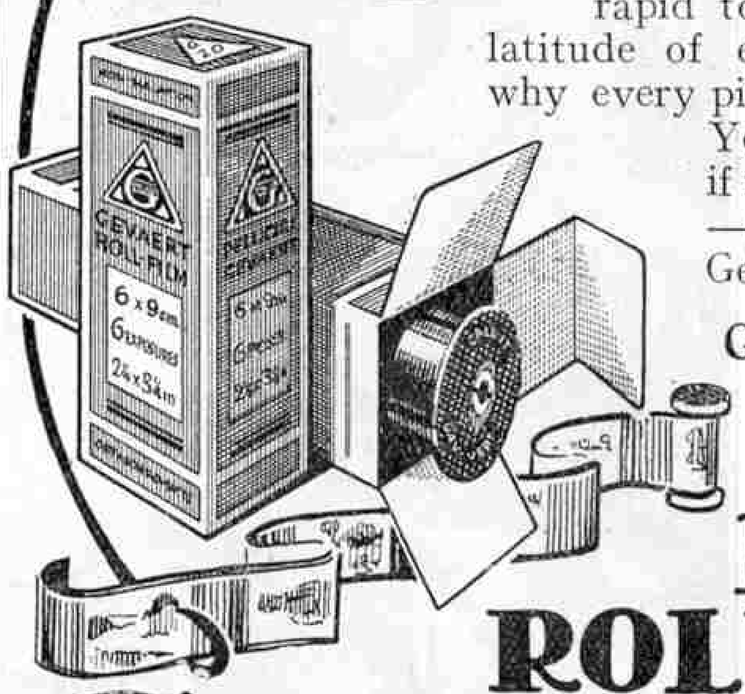


FAST ROLL FILM

(CALL IT GAY-VERT)

Gevaert

Electricity—(*continued from page* 171)

There are innumerable circuits for the exchange portion of the telephone apparatus, in the same way as there are very many for the subscribers' apparatus, as we explained in the article in this series last month. In the system shown it will be noticed that no provision has been made for an automatic record of the number of calls a subscriber originates, and in this case they would have to be written down by the operators for accounting purposes. In other circuits automatic meters are installed, however, and in some exchanges lamps instead of drops are used for signalling.

This circuit is for use with the local battery system in which there is a separate microphone battery at each subscriber's installation. With the central battery system the connections become much more complicated, although the method of operating is somewhat the same.

Exchanges Large and Small

One switchboard may be enlarged until there are about 200 lines terminated on it in 200 jacks, all of which are answered by the same operator, there being 200 calling drops provided. As this is the maximum number to which one person can be expected to attend with efficiency, it is usual to split larger switchboards into sections placed side by side.

Suppose there is a single switchboard of 200 lines, Nos. 1 to 199, and suppose further that the exchange grows so that a second switchboard is necessary containing lines Nos. 200 to 399. If the two boards are placed side by side it is obvious that any subscriber can be connected to any other, for if No. 50 wishes to speak to No. 350 on the other board, the first operator can stretch her cord in front of the second operator and insert her plug in No. 350's jack.

If the exchange grows still further, so that lines Nos. 400 to 599 are added in another section by the side of the second section, any subscriber whose lines terminates in this second section (lines 200 to 399) may be connected to any of the Nos. 1 to 599. But a subscriber belonging to the first section (lines 1 to 199) cannot easily be connected to Nos. 400 to 599, owing to the distance the first operator would have to stretch across the two other operators. In very large exchanges this difficulty is increased many times and it is overcome by means of a device known as a "multiple switchboard."

Multiple Switchboard for Large Exchanges

This is illustrated in the diagram on Page 170, which shows the lay-out of the jacks in an exchange with 1,799 subscribers. There are nine operators, A to J, each of whom is responsible for answering 200 lines as shown. Above the 200 drops in front of each operator there are 600 jacks which, together with the 600 on her left and the 600 on her right, cover the whole of the lines of the exchange, so that each operator can reach any number unassisted.

It will be seen that each set of 600 jacks, except the set Nos. 600 to 1199, is duplicated four times along the board. These jacks are connected in parallel with one another and the whole object is to enable any operator to reach any number. The drops are not multiplied, for only one operator is required to answer any particular line, although all must be able to call it.

The multiple system makes necessary a further addition to the switchboard circuit, for if, say, No. 1300 is engaging in a conversation put through by operator J, he must not be interrupted by being called by another operator further down the switchboard who cannot see that he is engaged by J.

This addition entails a slight modification in the design of the plugs and jacks and has the result of producing a click in the receiver of any operator who touches, with the tip of a plug, a jack belonging to a line that is engaged elsewhere.

Trunk Calls and Repeater Stations

Trunk calls, when a subscriber to one exchange wishes to speak to a subscriber belonging to another, are put through in different ways at different exchanges according to the method of working. Perhaps the most common system is for each operator to have before her a number of jacks that are connected to the neighbouring exchanges in the same way as the other jacks are connected to subscribers. The called exchange answers and is informed of the number required, and the call is put through in the usual way.

NEXT MONTH :—

AUTOMATIC TELEPHONE EXCHANGES

XII. ARTIFICIAL LIGHT PHOTOGRAPHY

ALTHOUGH the days are now rapidly lengthening, it is probable that few readers will be in a position to undertake much photographic work other than indoor during the next two or three weeks. For this reason our notes this month deal with various aspects of photography with artificial light, a branch of the hobby that is well within the capabilities of even the cheapest cameras.

Indoor photography is usually confined to portraiture and what is known as "still life"—flowers, fruit, a piece of valuable pottery or, last but not least, a Meccano model. In this article we propose to deal with the subject solely from the standpoint of portraiture, but the suggestions made regarding the best methods to adopt will be found equally useful to the boy who wishes to take a good photograph of his latest Meccano model.

Before discussing the relative value of the various forms of lighting, which range from gas to flashpowder, two points should be mentioned that hold good in every case. First, special care must be taken to prevent "halation," the fuzzy margin of white that often appears around a photograph of a white-clad person taken in strong light. Films do not give much trouble in this direction and as regards plates the trouble is almost entirely removed by buying them "backed," that is coated on the glass side with some substance to stop unwanted reflections. The second point is that both plates and films should be orthochromatic.

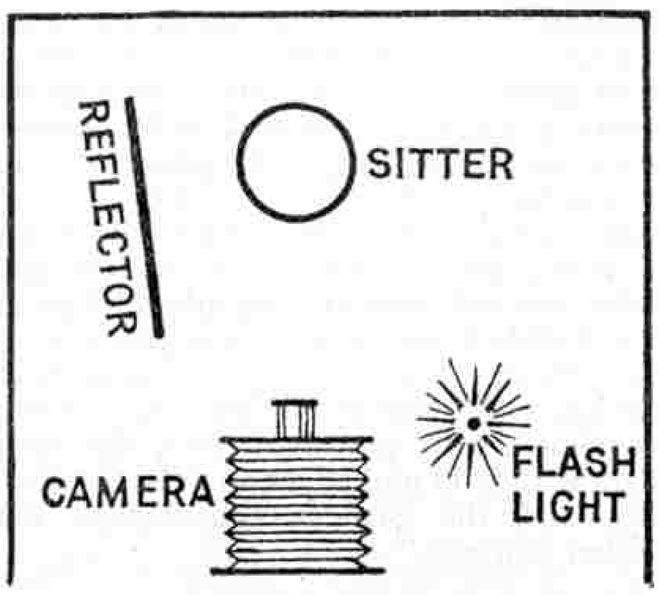
Harsh Lighting

The method of using the light by which the photograph is taken is the main factor that determines success or failure. Most artificial light failures are due entirely to what is termed "harsh lighting," with consequent objectionable shadows. When next you are in a strongly lighted room, half close your eyes and look at the face of anyone who happens to be standing near the light and in its full glare. You will notice that the face has an unnatural appearance and consists of brilliantly lighted portions and dense patches of shadow. That is the effect produced by "harsh lighting." Fortunately the trouble can be overcome in various ways—by moving the sitter further from the light, by placing a piece of white muslin or similar material between the light and the sitter to act as a diffuser; by employing a white reflector to throw light upon the darker side of the sitter's face, thus lightening the deep shadows; or by arranging the light so that it falls upon the subject from

an angle of 45 degrees from one side and from a height of not less than 4 ft. above the sitter's head.

Incandescent Gas

Using plates or films of high speed, and assuming that the supply of gas available is sufficient to provide a brilliant light, the exposures required with incandescent gas are not unduly long. A recent exposure was made upon a cluster of various kinds of fruit piled upon a stand, a type of photograph eminently suitable for photographing by artificial light. Two incandescent gas burners were used, their position being 4 ft. above the fruit stand and slightly to the front. The plate used was of the type usually spoken of as "extra rapid" (about 300 H. & D.), and the exposure, using stop F/16 (U.S.8), was 4 minutes.



In making a still-life study it is of the utmost importance to use a background that is "quiet," that is, without any pattern strong enough to draw the eye away from the subject of the photograph. If the background competes for prominence with the subject it is unsuitable for the purpose and should be discarded. In the photograph just referred to a plain grey-tinted card was used as the background, with marked success. If an emergency photograph has to be taken at a time when a quiet background is not obtainable, the bad effects of a conspicuous pattern may be reduced very greatly by placing the background well away from the subject, so that it is thrown out of focus.

Electric Light

Electric light possesses many advantages over gas, particularly in regard to portability. By means of a length of flex the light can be placed just where it gives the best results from a photographic point of view. The exposure required depends very largely upon the type of lamp used, and as a rule it is not possible to have special lamps and we have to employ the variety in ordinary household use. Just as in the case of gas, the light should be diffused and the lamp should be in such a position that no light from it shines directly into the lens. I heard recently of an interesting dodge to avoid trouble from harsh lighting. The photographer focussed his subject and opened the shutter and then, holding the lamp in his hand, walked slowly towards the sitter, held the lamp close to him for a few seconds and then walked back to the camera and closed the shutter. The whole operation occupied 30 seconds, of which 15 were spent in the "close up" lighting.

Magnesium Ribbon

One of the most valuable forms of artificial light photography is that known as flashlight. Three sources of light come under this heading, magnesium powder, magnesium ribbon and a special compound known as flashlight powder. In comparison with flashlight powder, magnesium

In the Land of Egypt

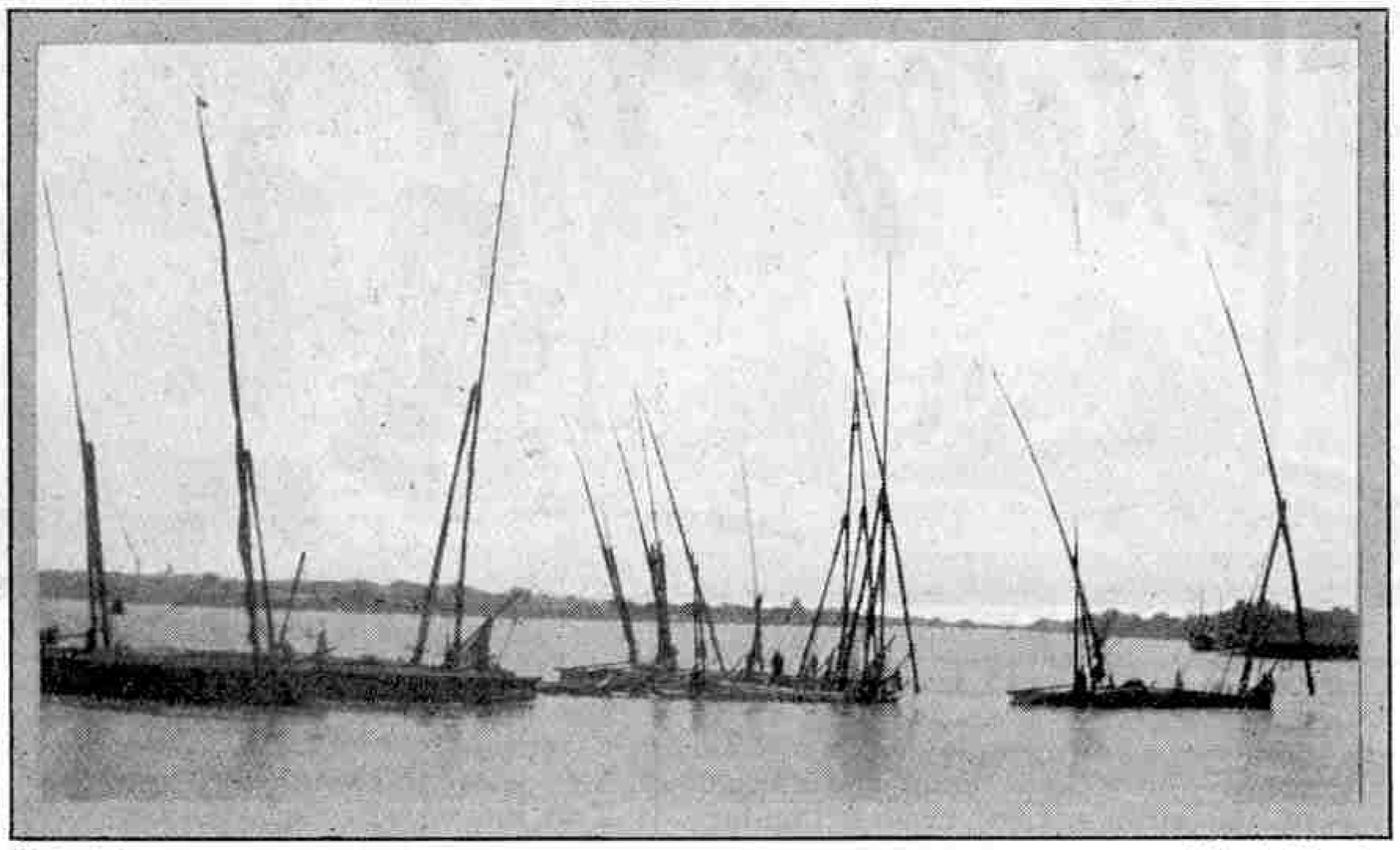


Photo by] [*Aly A. Shawky*

A Reader's snap of Native boats on the River Nile

powder is difficult to use successfully and is not recommended. Magnesium ribbon is the easiest to use but it has the disadvantage, as compared with flashlight powder, of requiring a long exposure. It has certain compensations, however, and for their first steps in flashlight photography readers are recommended to try magnesium ribbon. The ribbon may be purchased in special holders with an arrangement for feeding out the length required. If a detached piece of ribbon is used it should be held at one end in a pair of pliers, and after the other end is ignited the ribbon should be kept moving about to avoid hard shadows. Any difficulty that may be found in igniting the ribbon will be eliminated if the slight tarnish is first rubbed off. A sheet of tin or cardboard should be held under the burning ribbon to avoid trouble if a blazing piece should break off and fall.

Flashpowder

We now come to real flashlight photography, utilising flashpowder. As the name indicates, the exposure is extremely short, its duration being only the time required for the powder to burn. The only difference between the exposures required for a lens used at full aperture and for the same lens stopped down is that the flash is slightly longer owing to the larger quantity of powder that must be used. It must not be concluded, however, that flashlight photography is merely a matter of burning powder. Success depends mainly upon the position of the light in relation to the camera and the subject, and the diagram on page 181 will make the point quite clear.

Next month we shall deal with the practical use of flashpowder and describe some of the effects which can be obtained.

REPLIES TO PHOTOGRAPHIC QUERIES

During the past few weeks it has been suggested that it would be of considerable interest and help to our photographic readers if we published replies to photographic questions received. The idea is sufficiently good to merit a trial but we cannot, of course, undertake to answer all the questions put to us in this manner. Following the custom of the "Mail Bag" column, only questions of general interest will be answered on this page.

Story of Metals—(*continued from page* 179)

Montezuma's Treasure

Perhaps the most terrible instances of wanton cruelty and destruction for the sake of gold are to be found in the story of the conquest of Mexico and South America by the Spaniards. The expedition of Cortes into Mexico in 1518, for instance, although apparently romantic and picturesque when viewed to-day after the lapse of centuries, was a long succession of brutalities. The great Aztec Emperor Montezuma received Cortes in a friendly spirit, not realising that he came as a spoiler. Little dreaming what the terrible consequences would be, Montezuma made no attempt to conceal the wonderful wealth of his country, and the sight of so much gold in decorations, wearing apparel, etc., brought about his downfall. Throwing all scruples to the winds, the raiders determined to possess themselves of the Aztec gold and seized the capital after a siege of seventy-five days.

The Conquest of Peru

Even worse deeds were perpetrated in Peru by Pizarro. In his fascinating book "The History of Precious Metals," Delmar, in describing the arrival of Pizarro's adventurers says: "At a small island which they had passed the day before, the Spaniards had found and pillaged a native temple, containing a stone image and rich offerings of gold and silver pieces, wrought into the shape of hands and heads, a large silver jug, which held an arroba (four gallons of water), etc. At Tumbez, where they were received with wonderment and hospitality (the place was too strong to attack), they beheld a fortress with six or seven walls, aqueducts, houses of stone, and vessels of silver and gold. Being invited into the temple and palace (for Tumbez was a watering place where the Inca, Huayna-Capac occasionally dwelt), they perceived that the former was lined with plates of gold, the latter filled with gold and silver vessels, furniture, etc., and the gardens ornamented with golden statues."

Massacre of Cassamarca

The great Inca Emperor of Peru, Huayna-Capac, died in 1525 and a desperate struggle for power commenced between his son Atahualpa and his half-brother Huascar, who succeeded to the throne. Just about the time when Pizarro was travelling inland from the coast this violent civil war resulted in the victory of Atahualpa, who threw his brother into prison and became acknowledged as Inca. In the autumn of 1532 Pizarro set out for Cassamarca to meet the Inca, and on their march the Spaniards were well received by the inhabitants. In due course Pizarro arrived at Cassamarca and sent his brother and another Spaniard to Atahualpa to persuade him to visit the Spanish leader.

On the following evening Atahualpa entered the huge square of the town, accompanied by some 5,000 men who were either unarmed or very nearly so. The streets opening off from the square were taken possession of by Pizarro's men, fully armed and equipped with artillery. Through an interpreter Pizarro called upon Atahualpa to abandon his religion and become a Christian and to pay tribute to the King of Spain. In reply the Inca pointed out that it was impossible for him to pay tribute to a king of whom he knew nothing. Without any warning Pizarro gave the signal for attack and the Peruvians, taken by surprise and practically defenceless, were slaughtered in hundreds.

Pizarro's Treachery

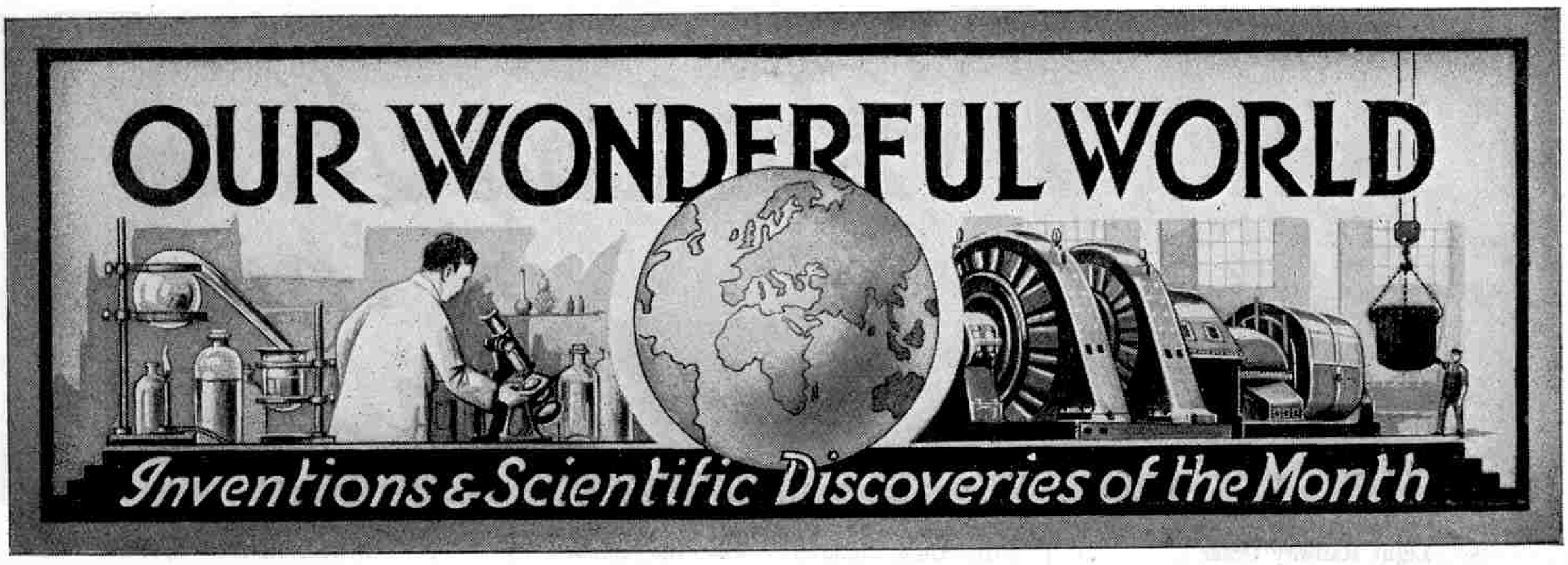
Atahualpa, we are told, offered to find as his ransom an amount of gold that would fill the cell in which he was imprisoned as high as he could reach. This offer was accepted and in due course Atahualpa handed over in gold and silver a sum estimated at £3,500,000. So far from keeping his word and releasing Atahualpa, Pizarro kept him in captivity and ultimately put him to death by strangling. Pizarro's career of plunder ended in 1541 when he was assassinated at Lima.

After the massacre at Cassamarca the search for gold was carried on throughout Peru with the utmost savagery and the unfortunate population were either slaughtered ruthlessly or reduced to a condition of abject slavery. It is stated that the population of Peru at the time of the Spanish invasion was about 15,000,000; two centuries later it had fallen to little over 1,000,000!

The Story of King Midas

Great writers and philosophers of all ages have done their utmost to show the foolishness of regarding gold as the only thing in life worth having, but perhaps this folly has never been more strikingly demonstrated than in the story of Midas, a legendary King of Phrygia. Midas had been kind to Silenus, the attendant of the god Bacchus. In return for this kindness the god granted him the power to turn into gold everything that he touched. Midas was overjoyed at the wonderful prospect of unlimited wealth thus opened before him, but he did not foresee one terrible consequence of his power—that his food would turn into gold! He thus found himself starving to death in the midst of his millions and he was obliged to beg the god to withdraw his gift.

Next month we shall describe the great gold-fields of the present day and tell the fascinating story of their discovery and growth.



Cinema Pictures in Colour

Films in natural colour, made by a new process, were recently exhibited. The process has been developed by Mr. C. Friese-Greene and the films shown are part of the colour records of a motor tour from Land's End to John o' Groat's. The series extends at present as far as the Lake District and the results are considered easily the best obtained so far in colour kinematography. It is interesting to learn that this British process may be run at a little more than the cost of the ordinary monochrome films, and at the same rate of production. The Friese-Greene process will probably prove to be the most momentous advance since the invention of kinematography.

* * *

Pictures by Wireless

Wireless inventions and discoveries continue to excite our wonder. We have scarcely taken in details of tele-vision before it is announced that the regular sending of photographs by wireless is in sight. Instruments for this purpose have now been designed that are so simple that any reader of the "*M.M.*" will be able to work one after five minutes' instruction. The instruments will be attached to wireless sets and the result will be that the owner will receive a photograph during the broadcasting programme. So at least says Mr. Thorne Baker, who has been experimenting for years with the transmission of photographs by wireless. A few weeks ago, at a meeting of the Royal Photographic Society, he sent photographs of the King and Queen by wireless across the room. A photograph was fixed to a cylinder and this was made to actuate a wireless transmitter, At the receiving instrument paper that had been immersed in a chemical solution was placed on a cylinder. The two machines were started, and in a few minutes a faithful reproduction was obtained.

One wonders how long it will be before we are able to listen to the broadcasting of opera and at the same time see the actual performance.

New Road Lighthouses

During the past few weeks a number of road warning lights have been installed on the Kentish main roads. Our illustration (a photograph that gained an award in our 20th Photographic Contest) depicts one of these road "lighthouses" placed at the Challock cross-roads on the London to Canterbury road. The light flashes each half second, showing a red light in each of the four directions. Burning day and night, it consumes compressed acetylene gas. To make the post more conspicuous in the glare of a motor's headlights it has been painted in black and white bands.

The New Type of Road Lighthouse on the London-Canterbury Road, at Challock

An interesting feature of the photograph is the association of this modern road beacon with an ancient well, seen on the right near the guide post.

* * * *

Fish-Skin Wear

In Paris fish-skin is now being used to ornament shoes and gloves. The gloves have a turnback cuff in scaly skin, while strips are used on the latest fashionable shoes. No creature is now safe from the demands of fashion!

Science Fights the Criminal

Inky finger-print identification is a thing of the past—or at least it will be, if the discovery of a French scientist is all he claims for it. He proposes to use X-rays to take finger-prints of criminals. Not only is the texture of the skin revealed more clearly by X-rays than in an ordinary photograph, but the X-ray picture shows the shape of the phalanges, which, it is claimed, differ in every individual. Many other new and valuable applications of the X-rays have been discovered. They are being used, for instance, to find out the genuineness of old china and of paintings reputed to be by old masters. At the National Physical Laboratory clinical thermometers are tested with X-rays in order to discover whether the correct kind of glass has been used in their manufacture.

One is reminded of the picture in "*Punch*" a short time ago showing a charming girl seated in the drawing-room with an X-ray apparatus at her side. On an admirer asking what it was for, she explained that it was to take interior views of "chocs," for she did so detest those with hard centres!

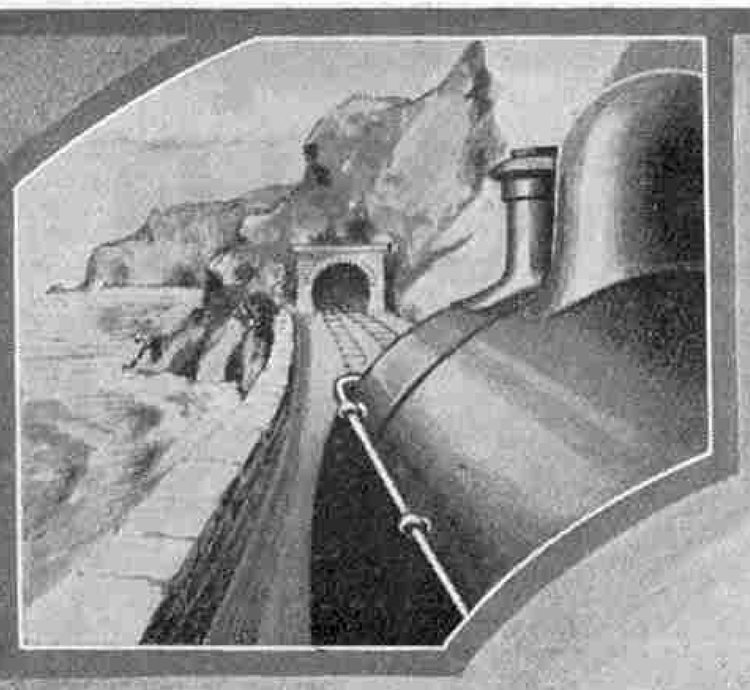
* * *

Transparent Steel

Transparent steel is the latest discovery of Professor Karl Müller of Berlin. Although a sheet of tissue paper is sufficient to stop atoms and Alpha rays of radium, they pass easily through this new steel.

The steel is as transparent as the fine optical glass employed for lenses; and the plates ruled with 2,500 lines to the inch and used to test the transparency of lenses, can be photographed clearly through it.

It is made by depositing a film of steel on a smooth surface and then removing the support. This leaves the film stretched on a frame, in which condition, despite its extreme thinness, it is so tough that it can be blown outwards like a soap-film and yet return to its frame without breaking. Further details are awaited with interest.



Railway News of the Month

Light Railway Order

A light railway order has just been made in connection with the Leek, Caldon Low and Hartington Light Railway. In itself this is a matter of small importance, but it is interesting in view of the Caldon Low railway being the oldest surviving Parliament-sanctioned line. Its authorisation was issued in 1776, the only previous sanction being that in respect of the Middleton (Leeds) tramway, in 1758.

* * * *

The Khyber Railway

The recently opened Khyber railway is providing one or two intriguing problems for its managers to solve. The railway cannot hope to pay its way for several years to come but, added to normal operating difficulties, the tribesmen of the districts through which the railway passes must be considered for subsidy purposes. If this is not done there is a chance that the tribal outlaws will deem it desirable to hold up the trains just as they have been wont, in the past, to blackmail innocent travellers by other means of transport.

To enable the construction of the line to proceed, the friendship of the tribesmen had to be purchased and it may be regarded as the literal truth that the Khyber railway is lined with silver. The hill men who worked as labourers insisted upon payment in silver ; paper money was not acceptable, but, as money is of little or no value to them, they followed the custom of their tribes and buried their pay. For five years this has been the practice, and it is probable that the wild country surrounding the route, amid the mountains dividing India from Afghanistan, will hold the coin for all time.

In the course of excavations many hoards of this type have been found and it is related that one workman turned up coins that had been buried more than three hundred years ago. Calling a mate, he hurriedly loaded up three donkeys with the treasure and the men were seen no more !

The Afridis evidently thought that in helping to build the railway they were on a life-time's job, for now that it is finished they claim the right of free travel. It was in vain that a guard attempted to prevent a party of them boarding his train at a wayside station. Tickets ? " They are of no consequence. Did we not help to build the line ? " Equally in vain was the guard's despairing appeal to the stationmaster. " I have to live with these fellows " was the answer. And the gang remained aboard.

On another occasion, at Nowshera, a tribesman, who was hustled off a train by a ticket collector, stabbed the official and killed two other men before he was overpowered. A railwayman declared, at the time the line was opened, that he would not be a guard on that line for double pay. And those who saw how the party armed themselves when going North for the opening of the line, will understand his view. The Khyber line certainly seems to offer the prospect of a lively time to its officials !

* * * *

New Names for L.N.E.R. " Directors "

Three more of the " Director " class 4–4–0 engines in Scotland have received names as follows :—6390 " Hobbie Elliott," 6391 " Wizard of the Moor " and 6395 " Ellen Douglas."

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Japan Adopts British Rails

The Japanese Government Railway Department has decided, after exhaustive tests ranging over a period of two years, to replace the American type rails now in use by British type rails, the latter having proved considerably superior. The authorities propose to effect a complete replacement during the next ten years, but it is highly improbable that any of the contracts will be given to England, since the work can be carried out in the Government works of Japan.

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Long Run by Train Ferry

Arrangements have just been completed by which goods trucks will be able to run from any part of this country through to Czecho-Slovakia, via the Harwich-Zeebrugge train ferry.

* * * *

New Station at Welwyn Garden City

The new L.N.E.R. station at Welwyn Garden City will comprise two 600 ft. island platforms, situated between the Hertford branch and the up slow lines, and the down slow and Luton branch lines. Connections will be made to the main express lines to permit the diversion of main line trains from the main line to the platforms. The main buildings will be in the Georgian style with red sandfaced bricks and will include a portico. The accommodation includes a booking hall 25 ft. square, booking and parcels offices and a cycle room, the whole being equipped with central heating. The complete premises will cover an area of about six acres.

British Railway Speeds

At a recent debate in the House of Lords concerning the high speeds on British railways, some interesting comparisons between our railways and those of other countries came to light. After wading through a welter of statistics one is able to declare that the average speed of our best trains exceeds that of equivalent trains in any other part of the world. The density of our own service is demonstrated when it is stated that whereas between Paris and Calais, a distance of 184 miles, there are only 46 stations and nine junctions, between Euston and Warrington, a similar distance, there are 59 stations and 52 junctions ! Within 15 miles of London, on the Southern Railway, there are 171 junctions and 272 stations.

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Considerable improvements are in hand at the L.N.E.R. Locomotive Depot, Whitemoor, March. In addition to a triangle for engine-turning purposes, a coaling plant operated by electricity is to be installed and further water facilities are to be provided. The total cost of the scheme is £43,000.

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British Rails for Overseas

The Government of Western Australia have accepted an English tender for 70 miles of railway rails and have reserved to themselves an option of taking an additional 100 miles at the same price, which is believed to be £100 per mile below an Australian firm's tender.

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Big American Railway Tunnel

The Great Northern Railway of America has commenced the cutting of a tunnel 7¾ miles long through the Cascade Mountains in the State of Washington. The tunnel will begin at Scenio on the western side and end at Burns on the eastern side. It will shorten the distance across the mountain track by 18 miles and lower the highest point reached by over 1,000 ft., at the same time saving one hour in running time. The total cost is estimated at £1,600,000, and a further £400,000 will be spent on electrifying the line when the tunnel is completed, which will be in 1928.

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Huge Wembley Figures

During the 1925 exhibition season nearly 3,200,000 passengers booked to Wembley from L.M.S. stations, and 1,140 special trains were run to cope with the traffic.

Pullman Train's Record Run

The famous Harrogate to King's Cross Pullman train has achieved a record run of 139 miles in 135 minutes. Between Doncaster and Retford, this express, which runs non-stop from Leeds, was delayed by signals for 12 minutes, but from Retford the journey of 139 miles was completed in 135 minutes, the train arriving to time. To accomplish this excellent performance the train must have travelled part of this journey at over 80 miles per hour.

In a recent message to the Staff of the L.N.E.R., the General Manager, Sir Ralph Wedgwood, emphasized the great importance of maintaining a punctual train service. "Punctuality is our first duty to the public," he said, "and a railway that is unpunctual, whatever its other virtues, can never win the esteem of the public it serves. The secret of punctuality is team work and attention to detail—everyone can help, by giving thought, and everyone can hinder, by taking things for granted."

Express Named

The Southern Railway's eleven o'clock train from Waterloo to the West of England has been named the "Atlantic Coast Express." This title has been chosen by the General Manager from large numbers of suggestions submitted in a competition organised by the Southern Railway Magazine.

New Turntable at Ilfracombe

The new turntable at Ilfracombe on the Southern Railway is one of four to be installed, the other three being at Redhill, Dover and Ramsgate. The turntable is capable of accommodating the company's biggest locos and is 65 ft. in diameter. It is operated by hand, ball bearings being fitted to ensure smooth working. In order to provide the necessary accommodation for the turntable it has been necessary to make a 35 ft. cut in a hillside.

* * *

Railway Orders

The confidence prevailing in engineering circles that trade is at length beginning to improve is strengthened by the activity of the railway companies in replacing old stock with new and adding to their resources generally. It is believed that the four large groups have under serious consideration development schemes involving a cost of nearly £60,000,000.

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Inner Circle Improvements

In furtherance of their new railway scheme, the Metropolitan Company have commenced extensive alterations at Edgware Road Station. The track layout is being entirely changed and the station structure is being demolished and replaced by a larger building having four platforms each capable of accommodating an eight-car train, in place of the existing two short platforms. Another important improvement consists of doubling the section of the Inner Circle line between Moorgate and King's Cross by electrifying the present steam line running parallel to the Circle in that section.

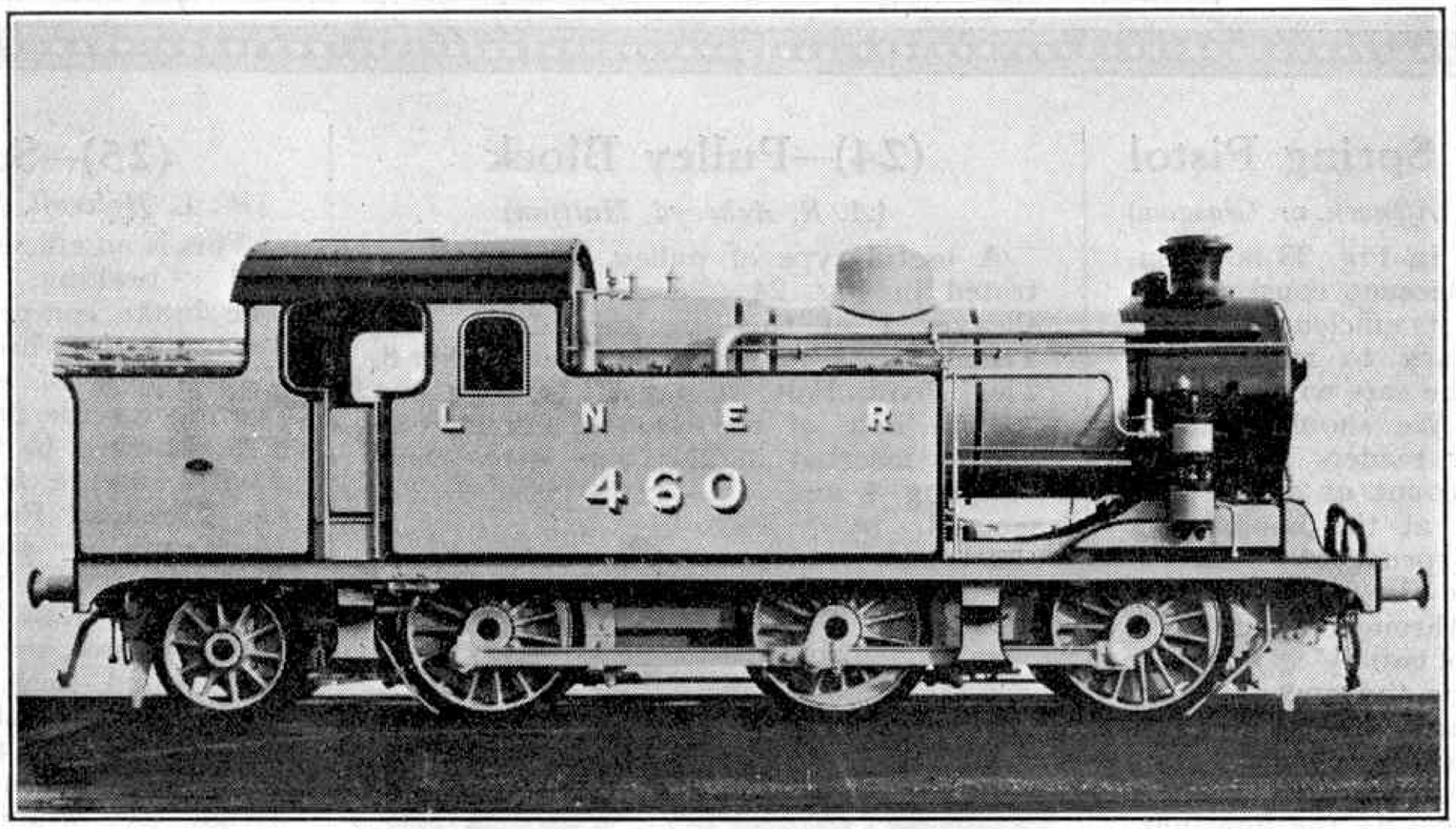
The forward nature of the company's policy is further emphasised by the rearrangement of the signalling systems on the Wembley Park and Harrow lines, the installation of the latest three-aspect colour light signals and the introduction of additional train sections. When these alterations are complete a speedier service will be put into operation, thus affording relief to the whole of the service prior to the opening-up of the new Edgware Road service.

* * * *

Tokio-Paris Through Route

An International Conference held at Moscow during December had under consideration the proposal to establish a through route from Tokio to Paris, via Russia. The length of the proposed route would be about 8,750 miles and the journey would occupy 14 days.

New Locomotives for Suburban Services



The L.N.E.R. are putting into service a number of new Tank Locos for their Suburban services. These locomotives, which are being built in the Company's works at Gorton and by Messrs. Stephenson & Co. Ltd., are an improved pattern of the Tank locos originally built for the G.E. Company.

The driver's position is now on the left-hand side, and the loco is built so that it is able to pass over the Metropolitan lines as well as over any part of the L.N.E.R. lines.

The locos weigh 62¼ tons and their total length is 34 ft. 11 in. They are superheated, have a tractive force of 20,512 lbs., and carry 1,600 gallons of water with 3¼ tons of coal.

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Australian Grand Trunk Railway

A commencement is about to be made with the construction of an Australian standard gauge railway that will enable the journey from Perth to Brisbane to be made without the existing inconvenient eight breaks of gauge. The first step, which has been decided upon only after discussions extending over many years, is being taken by the construction of a line from South Brisbane to Kyogle in the north-western part of New South Wales, and by strengthening the existing line from Kyogle to Grafton.

The new line will shorten the journey from Sydney to Brisbane by 97 miles and will save eight hours by eliminating the breaks of gauge. The original estimate for the construction of the complete line was approximately £3,500,000, but now it is anticipated that the total cost will be little short of £6,000,000.

* * * *

New French Express

As the outcome of a recent trial on the Paris-Calais route, two trains each made up of ten Pullman cars are to be placed in service in May. It is proposed to instal restaurant facilities similar to those provided on British lines and to reduce the present time schedule by twenty minutes.

Concrete Railway Sleepers

In a recent note we referred to experiments that were being conducted with concrete goods wagons. We now learn that one of the British Railway Groups is contemplating the laying of concrete sleepers on a through stretch of main line outside London.

The new type of sleeper consists of two concrete blocks joined together by a rod of mild steel. Each block is 24 in. long and 7 in. thick and is provided with plugs arranged to take the screws of the chairs carrying the rails. On the underside the blocks are slightly concave, and the edges are curved to suit the stroke of the platelayer's hammer in order to facilitate packing. The chair will rest on a layer of felt and it is claimed that travel over a track of this type will be less noisy than over any other.

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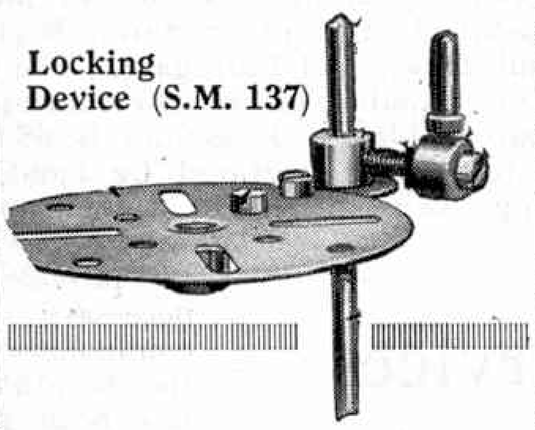
Railway Statistics

Reports issued respecting the month of August last show that the total number of passengers carried on the various railways during that month was 119,842,462, that is 746,404 less than the total for the corresponding month of the previous year. The total mileage covered by passenger trains was 774,471, while the total freight tonnage was 22,003,416, a decrease of over 4,000,000 tons in comparison with the previous year.



Suggestions Section

Edited by "Spanner"

(23)—Meccano Spring Pistol

(William McLauchlan, Giffnock, nr. Glasgow)

The weapon shown in Fig. 23 is an ingenious example of Meccano construction, and we can vouch for its efficiency in practice. It is unnecessary to remind our readers, we hope, of the care with which it should be handled. We should hate to hear of some of our readers coming to untimely ends on account of a set-screw that was missing, or at the hands of a Meccano Spring that sprung too soon!

The "barrel" of the pistol consists of an 8" Axle Rod passing through a Coupling 2 and through the ends of two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 3, forming the upper portion of the magazine chamber. It carries a Worm Wheel 4, which is secured by a 7/32" Bolt 5 in place of its grub-screw. This bolt serves as the foresight, and should be carefully adjusted in correct alignment with the muzzle-end of the barrel and with the backsight, formed by the upper hole of a $1\frac{1}{2}''$ Strip 6. A Meccano Spring 7, secured by one of its end loops to the bolt 5, is mounted on the barrel and opened out to form a compression spring. The loop at the other end should be cut away.

Meccano Collars, with set-screws extracted, may be used as bullets, or small pieces of wood of similarshape may be employed if desired. The gun is loaded by placing the bullet upon the barrel and pushing the Spring 7 back until the bullet passes the Collar 8. The latter is rigidly secured by means of a 7/32" Bolt 8a to a $6\frac{1}{2}''$ Rod 9, which is free to turn slightly in its bearings. The Bolt 8a is pushed in front of the bullet, so preventing the Spring 7 from expelling it from the barrel. Another Collar and Bolt 10 is secured to the Rod 9 and coupled by means of a Flat Bracket 11 to a bolt mounted in a Collar 12. This in turn, is secured to a 1" Rod inserted in a Coupling 13 pivotly mounted and spaced on either side by two Washers between $1\frac{1}{2}''$ Strips 14. A further Rod 15 forms a trigger, and a slight touch on this pulls the Bolt 8a clear of the bullet, so firing the pistol.

The pistol should possess a range of twelve yards or more with Meccano Collars used as bullets.

Parts required:

3	of	No.	2A	1	of	No.	32
1	„	„	3	20	„	„	37
	„	„	6A	9	„	„	38
3	„	„	10	1	„	„	43
1	„	„	11	1	„	„	48
2	„	„	13A	4	„	„	48A
	„	„	14	5	„	„	59
	„	„	18B	2	„	„	63

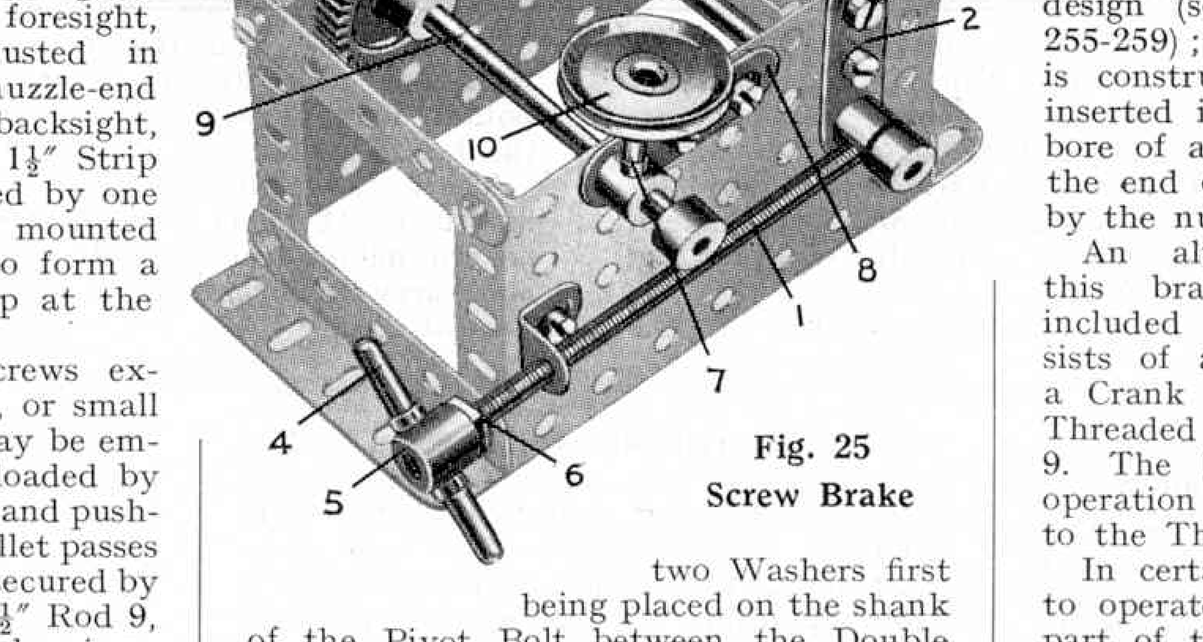


Fig. 23
Meccano Spring Pistol

(24)—Pulley Block

(A. R. Ackroyd, Halifax)

A useful type of pulley block is illustrated in Fig. 24 (see next page). The sheaves 1 of this are carried in Flat Trunnions 2 secured to a Double Bracket 3. The Pivot Bolt is passed through the central hole of the Double Bracket 3 and is inserted in the bore of a Strip Coupling 4 and secured by its set-screw,

Fig. 25
Screw Brake

two Washers first being placed on the shank of the Pivot Bolt between the Double Bracket and the Coupling. The Loaded Hook 5 is inserted in the slot of the Coupling and is secured by a 5/16" bolt passing through the latter. An important feature of this pulley block is the fact that the hook is free to swivel. In actual practice the loading hooks of the larger cranes and derricks, etc., are usually mounted on ball bearings.

(25)—Screw Brake

(W. L. Holcroft, East London, S. Africa)

This is an efficient device for the control and "braking" of revolving shafts. The brake comprises a Threaded Rod 1 engaging the threaded bore of a Crank 2, the boss of which forms a journal-bearing for the driven Rod 3. A handle 4 is attached to the opposite end of the Rod 1, and a few turns of this causes the Threaded Rod to enter further into the Crank, so gripping the Rod 3 with gradually increasing strength. The rotation of the Rod 3 may thus be checked to any degree, or it may be stopped altogether and held quite rigid, according to the extent of the pressure applied to it through the Threaded Rod 1. The handle 4 may be of any suitable design (see Standard Mechanisms Nos. 255-259); that shown in the illustration is constructed from two Threaded Pins inserted in either end of the transverse bore of a Threaded Boss 5 mounted on the end of Rod 1 and locked in position by the nut 6.

An alternative method by which this brake may be constructed is included in the illustration. It consists of a Threaded Pin 7 inserted in a Crank 8 in a similar manner to the Threaded Rod, and controlling a shaft 9. The braking effect is adjusted on operation of the hand-wheel 10, secured to the Threaded Pin.

In certain models it may be required to operate the brake from some remote part of the structure; this can be accomplished by extending the Threaded Pin as necessary by means of Couplings and Rods.

A brake of this description possesses a distinct advantage in that it may be applied with success to shafts that are required to slide to and fro in their bearings, as in gear changing mechanism, etc.

A Flat Bracket should be placed on the bolts between the Cranks 2 and 8 and the side plate, in order to ensure that the bosses of the Cranks are in correct alignment with the driven shafts.

Contributions Invited

Further contributions for the Suggestions Section are invited. Special awards of five shillings each will be paid for any suggestions published showing special merit, whilst the senders of all other contributions used (not including, of course, those mentioned under "Replies") will be presented with complimentary copies of "Meccano Standard Mechanisms."

(26)—Meccano Hand Levers

(*Alfred Proctor, Chingford, E. 4*)

An ingenious suggestion for a Meccano lever, suitable for use in gear changing or clutch mechanism, has been sent in by Master Proctor. The principal advantage of this lever is the fact that it is retained in position after movement by means of springs, and there is therefore no fear of its working out of place when the hand is removed.

The Axle Rod 1, forming the lever, carries two Couplings 2 and pivots about an Axle Rod 3. A Spring 4 is connected to a 2″ Rod 5 mounted in the Couplings 2, whilst a second Spring 6 is carried on the lower portion of the lever 1. The outer ends of the Springs are bolted to convenient portions of the framework of the model, so that they shall always be extended to a certain degree. As the lever is moved in either direction, the Springs slide on the two lengths of Axle Rod. One Spring slides up its respective Rod when the lever slopes towards it, whilst the other slides downward. The uppermost Spring, in consequence of its increased leverage, holds the lever in position until it is actually pulled over to its opposite position by hand, when the springs change places as described. A Bush Wheel 7 carries in adjacent holes two nuts and bolts 8, and is secured to the Rod 3 in such a position that the bolt heads, at certain points in the movement of the lever, strike the flange of the Angle Girder 9, so forming stops to prevent the lever springing too far in either direction.

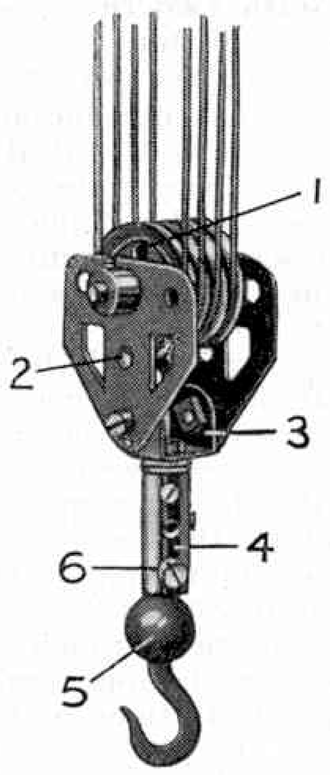


Fig. 24. Pulley Block

It will be noticed that we have included in the illustration two further levers. The operation of both of these is very similar to that just described, but they may be found more suitable for use in certain types of models. The first of these consists of a Rod 16 pivoting about a Rod 11, to which it is connected by the Coupling 12. A 2½″ Rod 13 secured in the transverse bore of the latter is arranged to strike one or other of the stops 14 as the lever moves to and fro. A Spring 15, slightly extended, is fixed to a Collar on the lever 10 by means of a 7/32″ Bolt 16, while its lower end is attached to a Rod 17. It will now be seen that if the lever be placed in a vertical position the pull of the Spring is neutral, but as soon as it passes the central or vertical position, the Spring pulls the lever over

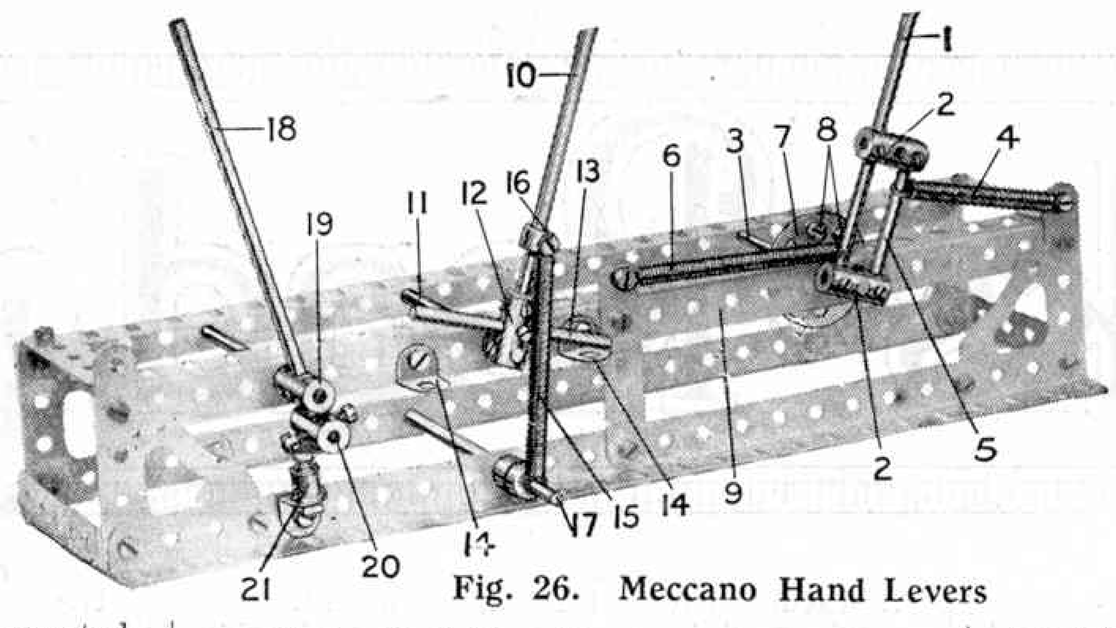


Fig. 26. Meccano Hand Levers

until the Rod 13 strikes one of the stops.

The third lever 18 passes through a Coupling 19 and carries a second Coupling 20. Two 7/32″ Bolts are mounted on opposite sides of the latter. The Coupling 20 presses upon a Spring Buffer 21, which is suitably mounted on an Angle Bracket below the lever. Here the thrust of the Buffer pushes the lever to one side or the other as soon as it passes the central or vertical position. The bolts mounted in the lower Coupling act as stops to prevent the lever moving too far.

(27)—Winding Gear

(*Fred Tomlinson, Junr., Rotherham*)

Master Tomlinson sends us a suggestion for a type of winding gear which may be adopted with advantage to the majority of Meccano cranes or similar models. The shaft of the winding handle 1, carrying a ½″ Pinion 2, is engaged at one end by a 3½″ Strip 4. The latter is bolted to the framework at 5 and is bent out a little to allow a Collar and Washer to be placed on the winding shaft between it and the frame of the gearbox. The Strip 4 thus serves as a Spring which tends to retain the operating shaft in such a position that the Pinion 2 is out of engagement with the Gear Wheel 3 on the winding drum shaft. Consequently in order to rotate the drum the hand wheel 1 must be pressed inward while it is rotated; immediately it is released the Strip 4 returns it to its former position, throwing the Pinion 2 out of gear with the Gear Wheel 3. On the other end of the drum 6 is mounted a Flanged Wheel 7 and Bush Wheel 8. These form a small drum about which the brake band 9 is wound. One end of the latter is tied to a Flat Bracket mounted on a Rod 10, whilst the other end is given a few turns round the Rod, and is secured to a bolt inserted in a Collar. On operation of a crank 11, the Rod 10 winds up the Cord 9, so exerting a braking effect on the winding drum. A Ratchet Wheel 12 is secured to the shaft of the latter and is engaged by a Pawl 13. The necessary pressure is imparted to the Pawl by a piece of Spring Cord 14. The cord 15 secured to the Pawl is connected to a weighted lever 16, it being guided over a 1″ loose Pulley 17 which revolves independently on the Rod 10. Normally the weighted lever 16 rests against a stop 19; this allows the Pawl to engage the Ratchet Wheel 12. If the arm 16 is thrown over, however, its weight raises the Pawl clear of the teeth of the Ratchet and so leaves the winding drum free to revolve. This arrangement is useful when it is required to allow a load to run down by its own weight. A piece of cord 18 serves to anchor the weighted lever to the frame of the gear box.

Master Tomlinson tells us that this apparatus is most successful in operation. The brake especially will be found to be very powerful. Indeed, our contributor tells us that he used the gear in a crane which, whilst screwed to the floor in the attic of his house, lifted a light chair through the well of the stair-case, and the brake proved capable of holding this load suspended in any position without the least sign of strain.

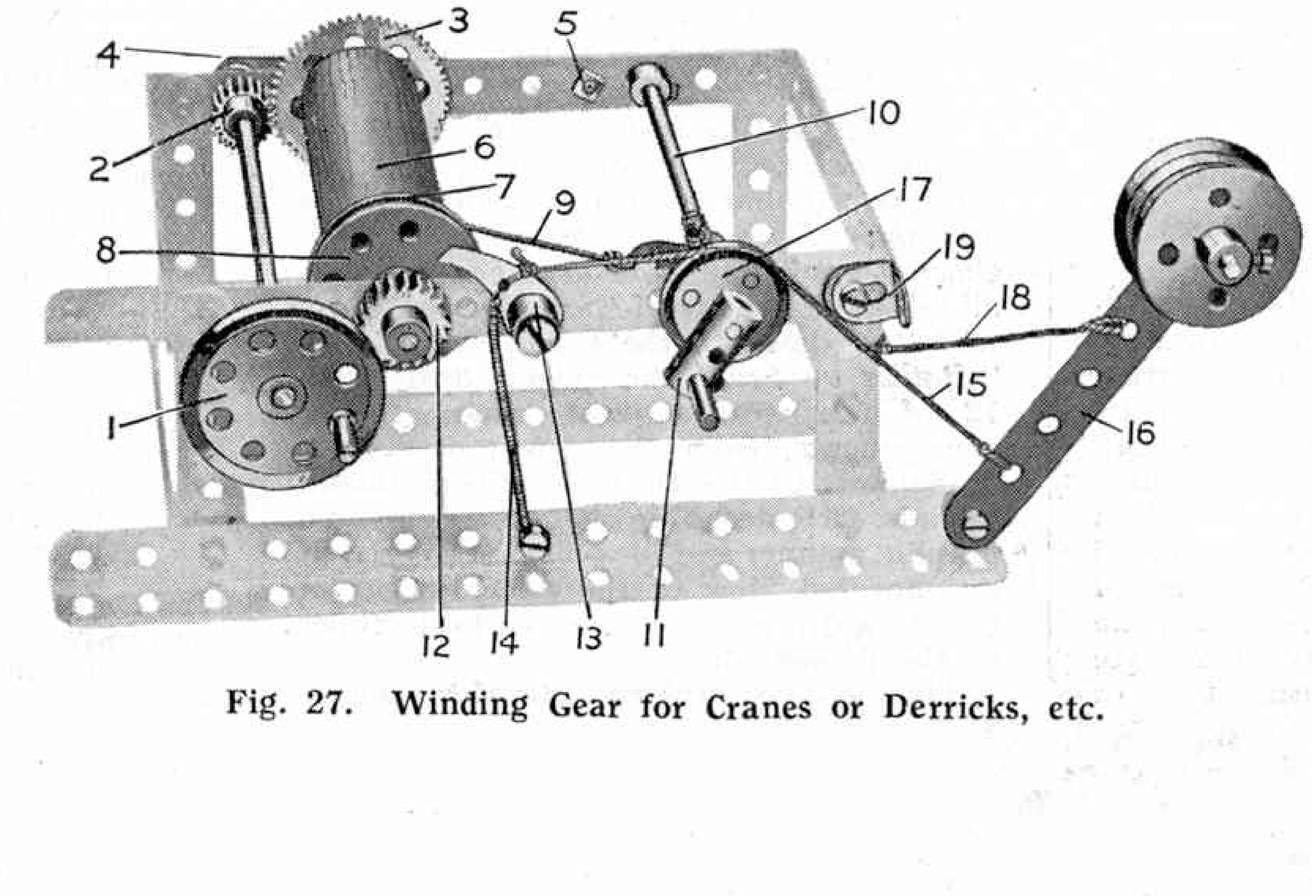


Fig. 27. Winding Gear for Cranes or Derricks, etc.

(28)—Spring Balance

(*E. Stanbrook, Hendon, N.W. 4*)

Fig. 28 represents a simple little contrivance with which small objects of about ½ lb. to 4 lbs. may be weighed. It consists of two Architraves 1 connected at their upper ends by a Spring 2 and pivoting about a Rod 3. Two 2½″ Strips 4 are connected by bolts and lock-nuts to their lower ends and are pivotly connected together in a similar manner at 5. A Hook 6 supported from a Flat Bracket attached to this bolt takes the article to be weighed. A piece of semi-circular cardboard, on which a scale has been drawn, is attached to one of the Architraves at 7. The movement of the opposite Architrave over the scale is used to indicate the weight.

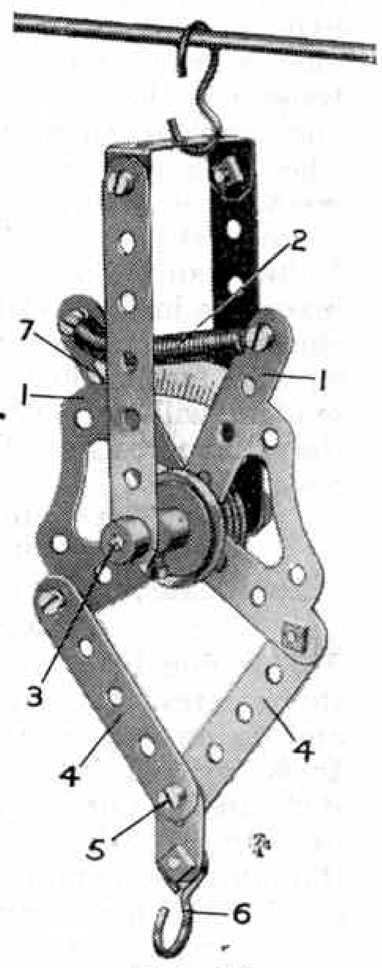


Fig. 28 Spring Balance

Suggestions for Coal Tippler

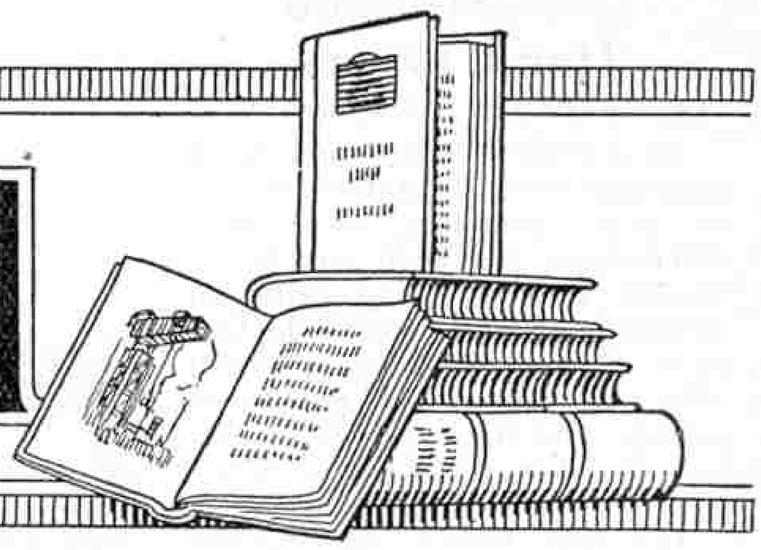
In the "*M.M.*" for December last, under suggestion No. 4, mention was made of an apparatus by which the contents of railway coal wagons may be unloaded at a minimum expenditure of both time and labour. We invited readers to send in suggestions for a Meccano model of such a device, and we have now received a number of interesting ideas on the subject. Readers who still wish to submit particulars of model "tipplers" are asked to do so not later than March 15th, as entries received after that date cannot be considered. The best model sent in will receive a small reward, and if suitable, will be featured in this Section.

This Month's Awards

Five shillings will be awarded to each of the contributors concerned for Suggestions Nos. 23, 25, 26 and 27, whilst the senders of Nos. 24 and 28 will each be presented with a complimentary copy of "Meccano Standard Mechanisms."

The "In Reply" feature appears on page 198.

Books to Read



Readers frequently write to me asking if I can recommend books that are both of interest and of use. On this page I review books that 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.

Masters of Science and Invention

F. L. Darrow

(Published by Chapman and Hall. 10/6).

This book, containing 350 pages and 50 portraits, should interest all readers of the "*M.M.*" who like to read of the lives of inventors and scientists. The author tells us of the lives and deeds of those who have won secrets from Nature and applied them to the uses of Man. The book covers almost every branch of science, including the story of the steam engine, which is told in the lives of Watt, Fulton and Stephenson. The story of invention in the textile industry, chemistry, electricity and every other branch, is equally fascinating and we feel sure that readers will not lay the book down until they have read it through from cover to cover.

The Outdoor World

By W. S. Furneaux

(Longmans, Green & Co., London. Price 6/6 net).

This fine book, of 411 pages, will be of the greatest value to the young collector and to anyone interested in outdoor life. It is written in a clear and intelligible style and has no less than 549 illustrations, including some fine colour plates. Although the common names are chiefly employed for naming the specimens of flowers, insects and animals, the Latin equivalents are also given.

Special sections are devoted to pond and stream life, sea-shore life, snails and slugs, insects, spiders, centipedes and similar creatures. Also to reptiles, British birds and mammals, seaweeds, fungi, mosses, ferns and wild flowers, grasses and trees.

In a book covering such a wide scope it is only natural that in many cases descriptions must be curtailed, but the book loses none of its value on this account. Everyone interested in nature will find the book extremely interesting reading, while as a work of reference it forms a valuable addition to the bookshelf.

Scientific Paradoxes and Problems

A. S. E. Ackerman

(The Old Westminster Press, 1925. 5/- net).

This book, which contains a hundred paradoxes and problems, has an interesting origin. At the beginning of last year, the author broadcast fortnightly talks from London on "Popular Fallacies." In these talks he asked his listeners to send him posers, which they did, in their hundreds! The book is a collection of the best of these posers, with the addition of some collected by the author many years ago, and everyone interested in this type of literature will find the book useful.

The book is more or less on the scientific side, but includes many problems that are purely and simply mathematical puzzles. One of these, which our calculating readers may like to worry out, is contributed by Professor C. V. Boys (who, incidentally, uses Meccano in his experimental work and has paid a high tribute to its value in this connection). This poser runs thus:—"Little Tommy was exactly half my age. Some time later he died. If he had lived twice as long as he did he would have been a year older than I was when he died, and that would have been as many years ago as I was older than Tommy. Now I am eight years older than I was when he was half my age. *Poor* little Tommy! How old was he when he died?" asks Professor Boys.

Another interesting problem, which comes up for solution periodically, was invented by Lewis Carroll, the author of "Alice in Wonderland," and is the first one given in the book. This reads as follows:—

"*A rope is hung over a pulley and its two ends hang down and end at the same level. A monkey holds on to one end and its weight is balanced by an equal weight tied to the other end. The monkey starts to climb up the rope. What happens?*

Mr. Ackerman solves this problem thus:—"Suppose the weight of the monkey is 5 lbs., then the weight at the other end of the rope is also 5 lbs. The tension or pull throughout the whole length of the rope is therefore also 5 lbs. Now in order to climb up the rope, the monkey must cause his body to move up, and it cannot do this without applying an additional upward force to it—additional because the rope is already pulling upwards to the extent of 5 lbs. on the monkey.

"The moment this additional force is produced by the monkey's effort to climb, it increases the tension in the rope supporting the monkey; this increase of tension is transmitted over the pulley and passes down to the weight on the other end of the rope. This weight is thus also caused to move up, but in doing so, more than half the rope gets on to the monkey's side of the pulley, and that side thus becomes the heavier, overcomes the other, and the weight arrives at the top first. If the rope were weightless, or if being not weightless it were endless (i.e., a large ring of rope), then the monkey and weight would arrive at the pulley at the same time.

Battles by Sea

By E. Keeble Chatterton

(Sidgwick & Jackson Ltd. 7/6).

Mr. Keeble Chatterton's name needs no introduction to our readers, many of whom must be familiar with his "*Sailing Ships and their Story*," "*Ships and Ways of Other Days*" and several other volumes all telling of the life of the sailor and those who "go down to the sea in ships." In "*Battles by Sea*," the author deals with 12 of the world's most famous naval engagements, from the defeat of Xerxes at Salamis to the Battle of the Falkland Islands. He describes these sea fights in a graphic manner and his object is to present a connected view of the development of naval warfare from the earliest times to the present day.

The book is divided into three parts, the Galley, the Sailing Ship, and the Steam-Ship periods, and the author has endeavoured to present his narrative in such a manner that the characters and the difficulties of the commanders, as well as the ships engaged may easily be imagined by his readers. It is a book full of daring deeds well calculated to stir the imagination of any reader, and we feel sure that many of our readers will find delight and profit from reading it.

The London & North Eastern Railway

By G. E. Mitton

(A. & C. Black. Price 2/6 net).

As mentioned in the introduction to this book, it is no light task to deal with such an important Railway group as the L. & N.E.R. in one small volume of 92 pages, yet the author has certainly performed the task in a very efficient and interesting manner.

First of all the history of this Railway group is dealt with from the time when the longest railway was the London and Birmingham. This is followed by the main outlines of the development of the railway from 1840 to the present time, which make very interesting reading. Several chapters are devoted to a description of the various counties through which this railway passes, with comments on their past history, illustrations and descriptions of some of England's most beautiful cathedrals and some account of the famous county families.

The technical side of the railway is not mentioned to any great extent in this book, which deals more with interesting towns and villages and the countryside through which it passes. The book contains one or two sketches in line, a map of the whole of the L. & N.E.R. system, and eight beautiful coloured plates showing the country through which the L. & N.E. Railway runs. Incidentally, the book should give readers many inspirations for their holidays.

Other Books Received

We have received copies of the undermentioned books during the past month, and these will be reviewed in a future issue.

"RAILWAY MARVELS" *by* C. J. Allen (J. F. Shaw & Co.), 2/6

"THE EMPIRE CRUISE" *by* V. C. Scott O'Connor (Griddle, Smith & Duffus), 16/-

"THE FUTURE" *by* A. M. Low (Routledge), 5/-

"BRITISH BUTTERFLIES AND MOTHS" *by* Furneaux (Longmans, Green & Co.), 6/6 net

"COPPER" *by* N. E. Crump (Rider & Co. Ltd.), 10/6

"GREAT PEOPLES OF THE ANCIENT WORLD" *by* D. M. Vaughan (Longmans, Green & Co.), 3/6

"STRATEGY AND TACTICS OF AIR FIGHTING" *by* Major O. Stewart (Longmans, Green & Co.), 6/-

Testing Rails for Length

Great Accuracy Necessary to Ensure Safe Travelling

THOSE who have occasion to make long train journeys by night seldom realise the influence of the permanent way in promoting that drowsy feeling that finally results in a sound sleep. Amid the rumbling and swaying of the carriage, the singing of the wind in the ventilators and the steady "click—click—click" of the wheels on the rails, it is surprising that anyone is able to sleep at all. When we are at home we know that little disturbances—such as the whistling of the milk-boy—the slamming of a door, or the passing of a tramcar—are quite sufficient to disturb our slumber, yet the characteristic noises and incessant din of a railway train very often act in quite an opposite manner and promote sleep.

The reason for this seeming paradox is the uniformity of the noises experienced on the railway and the rhythmic sound of many of them. Thus, although it is possible to fall into a deep sleep when the train is in motion, it very often happens that one wakens when the train stops.

The most uniform of the noises of a railway train is that due to the joints between each successive length of rail. The "click—click—click" is produced as each wheel passes over the joint, the periodicity of the clicks depending upon the speed of the train and the length of the rails. Every reader of the "*M.M.*" must have noticed how the length of the rail influences the clicking sound when making a journey over certain railways where different lengths of rails are used.

Long Rails are Economical

The standard rail length is generally 45 ft. but rails of 60 ft. length are also in use. The primary effect of the longer lengths is economic, since if a mile of permanent way comprising 45 ft. lengths is replaced by 60 ft. lengths, the number of joints required for the 60 ft. rails is only 75% of that required for the 45 ft. rails. That means a saving of 33⅓% in fishplates and bolts, together with the saving in time corresponding to the fewer number of joints that have to be made.

The economic effect of longer rails is easily understood from this point of view, and, in so far as the manufacturer is concerned, no difficulty would be experienced in producing rails very much longer were it not for the transport difficulties. Other factors, however, such as expansion and contraction due to change of temperature require consideration. As these factors are bound up intimately with railway operation it is difficult for the layman to realise the effect of long rails in this connection.

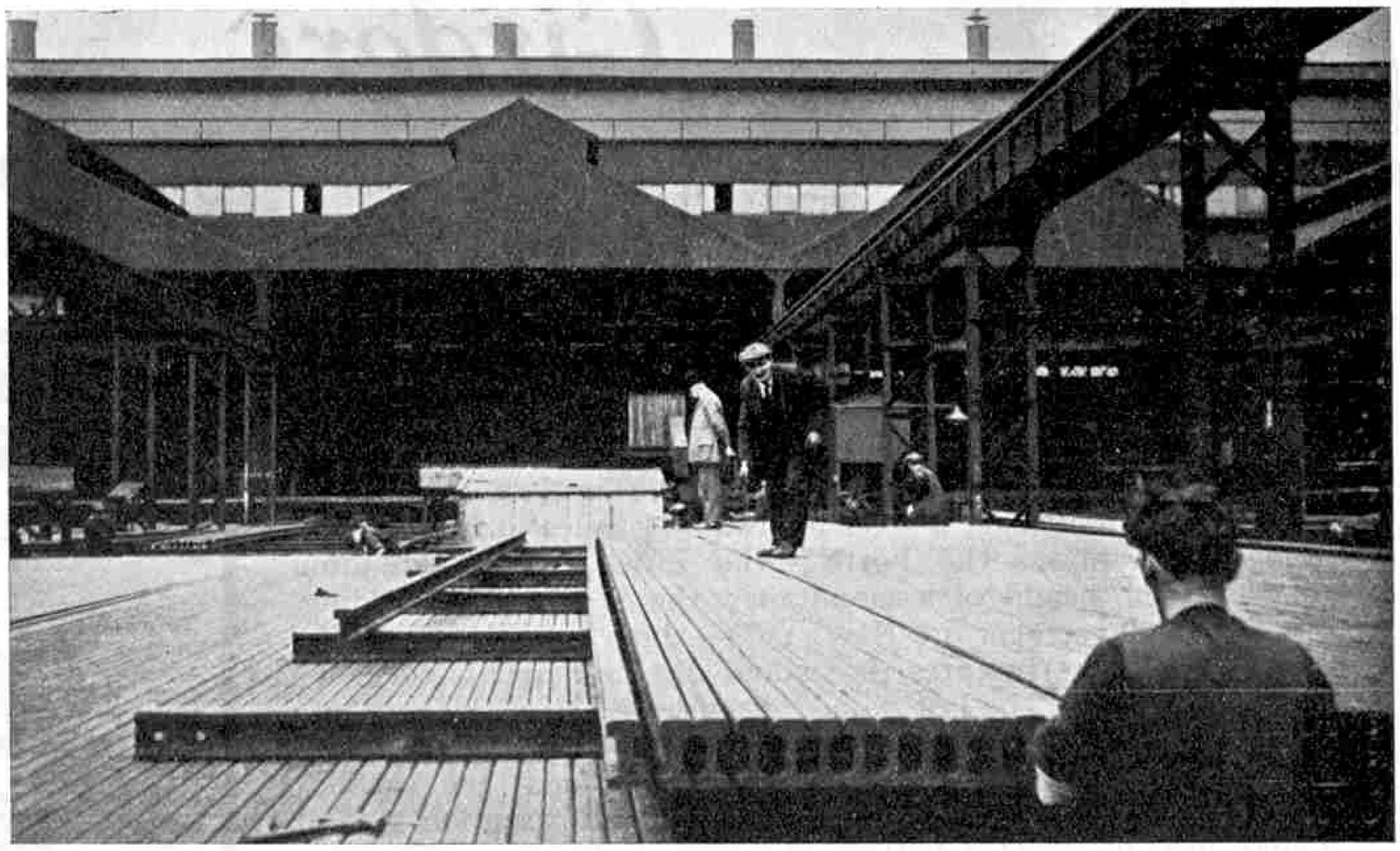


Photo courtesy] [*Messrs. Wm. Beardmore & Co. Ltd.*

Testing Rails for length at the Beardmore Works

A Long Walk

One of our illustrations shows part of a recent order placed with Messrs. Sir Wm. Beardmore & Co. Ltd., Mossend, by a British railway — a batch of 60 ft. rails weighing 90 lb. per yard. The illustration shows part of the inspection process, which is subsequent to the machining processes. Here we see the rails being inspected for length by means of a measuring rod, one end of which is folded over at right angles, so as to register against the end of the rail. This measuring rod, which is longer than the rail to be measured, has an arrow head cut on the face at exactly 60 ft. from the registering stop. Hence, the inspector is quickly able to check a large batch of rails, since the arrow head should coincide with the rail end for exact length.

Few people realise how minutely an inspection is carried out, or how often the rail inspector requires to walk backwards and forwards to complete a mile of single rail. Thus, one mile of single rail of 60 ft. lengths consists of 88 rails. Each of the sides, together with the top and the bottom of the rail, must be carefully examined one at a time, so that each length of rail is traversed four times. This means that the inspector walks four miles per single mile of rail, and in so doing traverses backwards and forwards 352 times for 60 ft. rails. Not only does he carry out this minute surface inspection, but he also examines the profile very carefully to ensure that each rail conforms to template.

MECCANO ACCESSORY PARTS

Girders

Their Importance in Engineering

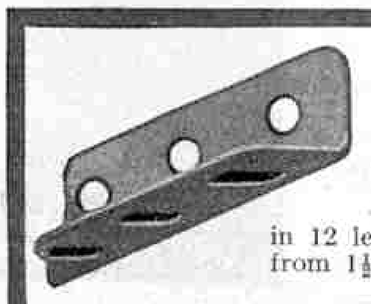
The greatest works of engineering depend for their strength and durability upon the massive girders of steel which, though sometimes hidden by an outer casing of masonry, bind them together and hold them rigid. A single rolled steel girder, if properly constructed, proves as strong as a wall of masonry.

The Forth Bridge, a steel highway 1½ miles in length, suspended high above the Forth; the Eiffel Tower, extending almost to the height of a mountain; the Woolworth Building, the tallest skyscraper in New York—these are three of the world's greatest structures that stand like monuments to man's constructive skill. The last named disguises its steel skeleton in a cloak of masonry, but the others tower into the sky like huge Meccano models. It is plain to see how even the smallest strut or tie is carefully planned and placed into position so that it may bear its allotted portion of strain or thrust.

Meccano Girders fulfil the same important duty in Meccano engineering. They are fitted into models and braced by Strips or Rods until the finished structure would support a man's weight, without the slightest disruption. Meccano Girders are made of the finest steel. The edges and corners are rounded and smoothed off, while the perfect accuracy of their manufacture makes them invaluable in the construction of even the most intricate mechanisms.

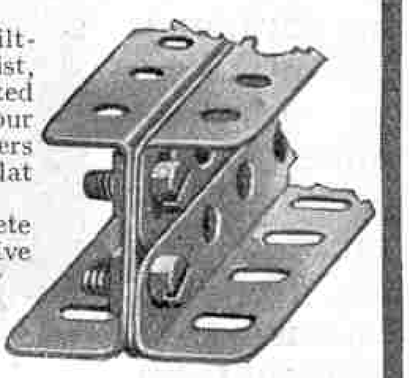
No.			s.	d.
1.	Perforated Strips,	12½" long ... ½ doz.	1	0
1a.	" "	9½" " ... "	0	9
1b.	" "	7½" " ... "	0	8
2.	" "	5½" " ... "	0	6
2a.	" "	4½" " ... "	0	5
3.	" "	3½" " ... "	0	4
4.	" "	3" " ... "	0	3
5.	" "	2½" " ... "	0	3
6.	" "	2" " ... "	0	3
6a.	" "	1½" " ... "	0	3
7.	Angle Girders,	24½" long ... each	0	8
7a.	" "	18½" " ... "	0	6
8.	" "	12½" " ... ½ doz.	1	9
8a.	" "	9½" " ... "	1	3
8b.	" "	7½" " ... "	1	2
9.	" "	5½" " ... "	1	0
9a.	" "	4½" " ... "	0	10
9b.	" "	3½" " ... "	0	8
9c.	" "	3" " ... "	0	8
9d.	" "	2½" " ... "	0	7
9e.	" "	2" " ... "	0	6
9f.	" "	1½" " ... "	0	6

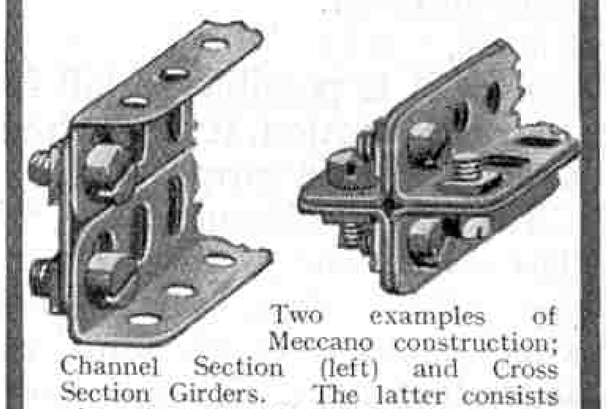
No.			s.	d.
97.	Braced Girders,	3½" long ... ½ doz.	0	9
98.	" "	2½" " ... "	0	6
99.	" "	12½" " ... "	1	9
99a.	" "	9½" " ... "	1	6
100.	" "	5½" " ... "	1	0
103.	Flat Girders,	5½" long ... "	1	0
103a.	" "	9½" " ... "	1	6
103b.	" "	12½" " ... "	2	0
103c.	" "	4½" " ... "	0	9
103d.	" "	3½" " ... "	0	7
103e.	" "	3" " ... "	0	6
103f.	" "	2½" " ... "	0	5
103g.	" "	2" " ... "	0	4
103h.	" "	1½" " ... "	0	3
103k.	" "	7½" " ... "	1	3
113.	Girder Frames (triangulated truss type) ...	... ... each	0	2
143.	Circular Girders, 5½" diam. "L" section ...	... ... "	1	0



Angle Girders ("L" section, ½" × ⅝") in 12 lengths, ranging from 1½" to 24½".

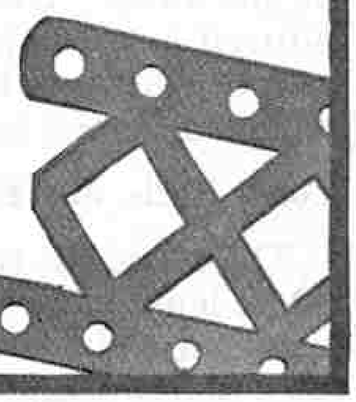
Meccano built-up Steel Joist, constructed from four Angle Girders and one Flat Girder. The complete unit is massive and of very great strength.





Two examples of Meccano construction; Channel Section (left) and Cross Section Girders. The latter consists of a pair of "I" girders butted together.

Braced Girders. Stout lattice-work throughout. Width 2". In 5 lengths, 2½" to 12½". Very ornamental and of great utility.



YOUR DEALER WILL BE PLEASED TO SHOW YOU ALL THE MECCANO PARTS. ASK HIM FOR A COMPLETE PRICE LIST.

MECCANO LTD., BINNS ROAD, LIVERPOOL

Further Adventures in Meccanoland

A Sequel to "*Discoveries in Meccanoland*"

By R. C. Manning

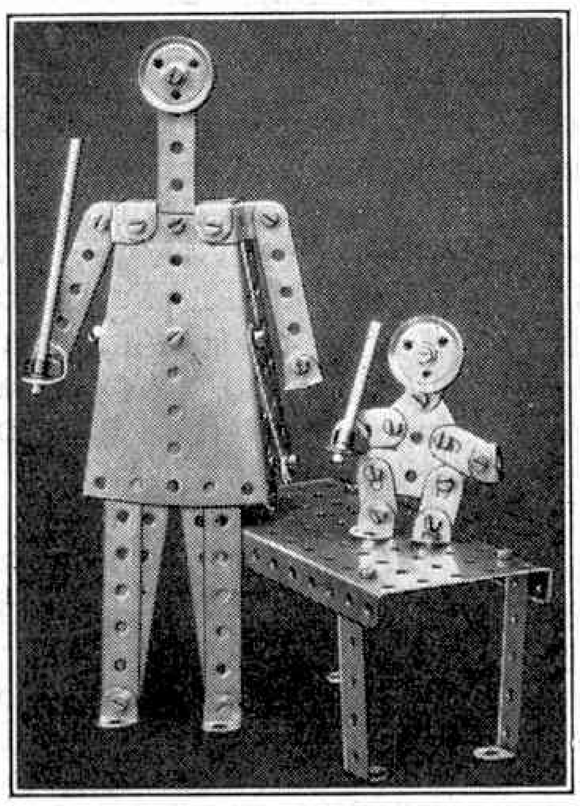
In this article, the first instalment of which was published in last month's "M.M.," our contributor describes the more humorous aspects of Meccano model-building. "Discoveries in Meccanoland" appeared in the "M.M." for Xmas 1924 and January 1925. The quaint models with which the article is illustrated may all be made with a No. 1 Outfit, and should provide hours of fun both during construction and after completion. We believe they will appeal to a large number of readers.—EDITOR.

(Concluded from last month)

ON leaving the farm, we walked quickly, and very soon were entering a splendid recreation ground, where a 'soccer' match was in progress. A penalty kick was being taken just as we appeared on the scene and I cheered as loudly as anyone when the ball struck the net at a fearful pace.

(THE PENALTY KICK.—The goal-posts are constructed from 5½" Strips spaced by Double Brackets at top and ½" Reversed Angle Brackets at the bottom. The cross-bar consists of three 12½" Strips. A ping-pong ball may be used for the football. To take a penalty kick, place the forefingers on the elastic bands, draw back figure with the thumbs, and release like a catapult. Many fascinating games could be played with a miniature football set constructed on similar lines to this model).

"We next paid a short visit to other parts of the ground where cricket and tennis were in full swing, and crossing over the golf links, which were also well

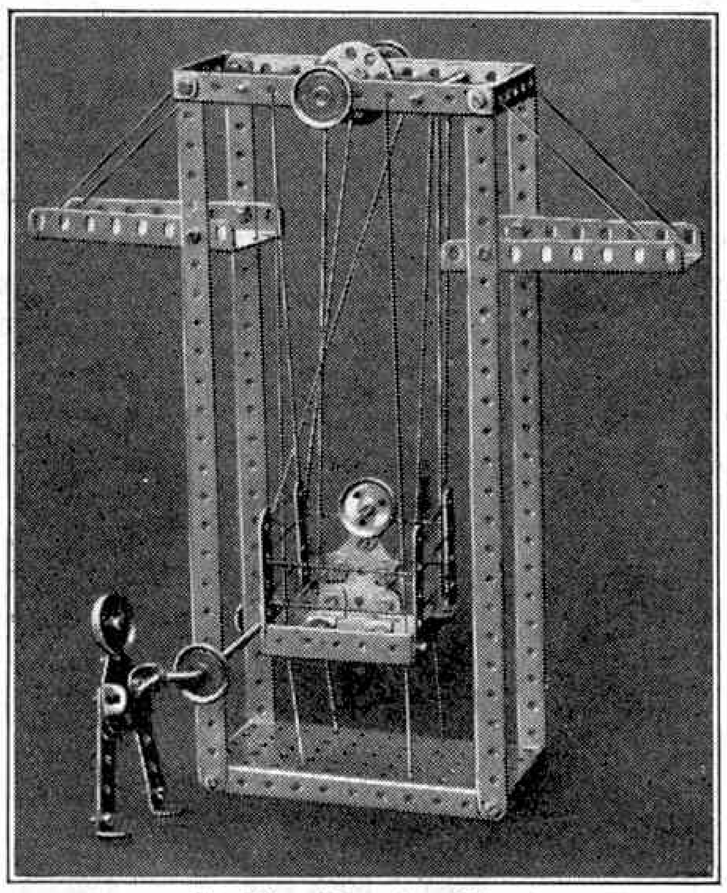


Dignity and Impudence

patronised, we approached a tall structure I had noticed some way back. My guide informed me that this was an airship mooring-mast.

"'You see we are quite up-to-date. Almost a little beyond it too, if I may venture to say so,' he said with a smile.

(AIRSHIP MOORING-MAST.—The lift-cage is guided by four lengths of cord tied to top and bottom of the tower and passing through the cage floor. Two lifting ropes, secured on either side of the cage, pass over guide Rods in the top of the tower, and are secured to the Bush Wheel on the winding shaft, each first being given a few turns in opposite directions round the shaft. The latter is driven from the Crank Handle by means of a belt passing round 1" Pulleys on the far side of the model. The floor of the cage consists of cardboard, and a 3½" Strip represents the seat).



Airship Mooring-Mast

"At last the time came for us to make our way back. On our return His Majesty introduced me to the tallest man in the Empire—an awe-inspiring specimen attired in military dress. His name, I learned, was Major McCahno. I was afterwards presented with a signed photograph of him together with the smallest man, as a souvenir of my visit to Meccanoland. I at once named them "Dignity and Impudence," much to the King's secret amusement.

(DIGNITY AND IMPUDENCE.—The construction of these queer figures is clearly shown in the illustration. Major McCahno wears a military cloak, composed of two Sector Plates joined by 2½" Strips, with Double Brackets as epaulets!)

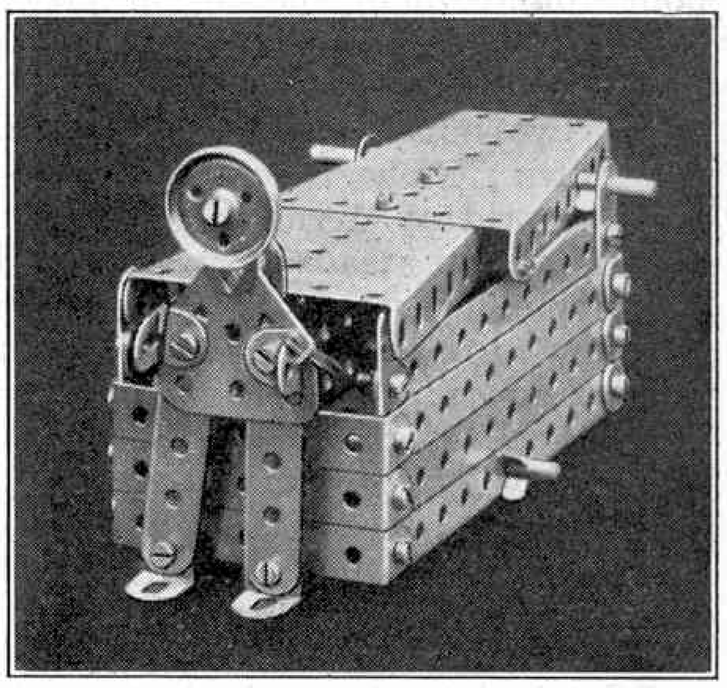
"On returning to the town I was taken to see an excellent performance on the tight-rope. It was an extremely clever turn and the performer held us spellbound by the most reckless stunts, without once giving us the impression that he would fall off, however. (See illustration on page 198.)

"It was getting late and I was feeling a little sad now that my excursion was nearly over. We drew near to our starting point which—you will remember—was the magic box. I was trying to find some suitable words in which to thank His Majesty for his kindness, when he suddenly stopped by the box and said he would show me one more trick before saying *au revoir*.

"'Just slip around to the other end and touch the lid,' he said.

"I did so, and was startled by a loud noise. Running back, I was alarmed to find the King had disappeared!

(THE DISAPPEARING MECCANITIAN.—The construction of the box in this model is similar to that described in "the Appearance." The lid, which is pivotly mounted on an Axle Rod, consists of two Sector Plates bolted together. Elastic bands are tied to the sides of these plates, and connected to a Rod passed through the bottom of the box. The Meccanitian also is connected to this Rod by pieces of elastic. On pressing the

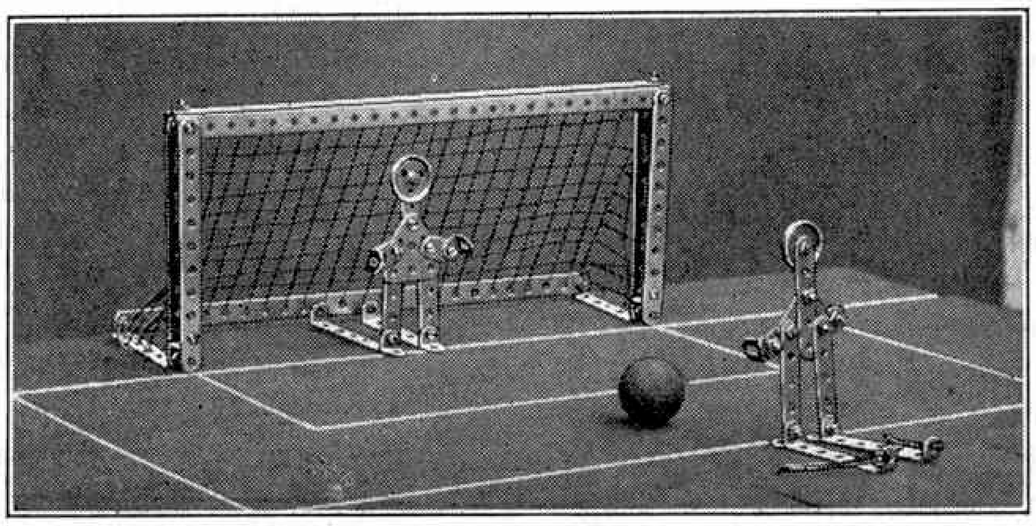


The Disappearing Meccanitian

end of the rear Sector Plate, the lid opens sufficiently to allow the figure to be drawn inside, and then snaps back into place. A Cranked Bent Strip is bolted at the back of the figure and rests against the edge of the Sector Plate).

"Once more I found myself gazing at my unfinished model, and returned to normal surroundings," concluded Jack. "For a moment I looked round the room half expecting to find my recent strange companions still with me. Then I realised that I had had my wish and must have dropped asleep whilst puzzling my head over a difficulty, which happily our mutual friend King Meccano has solved for me. How's that for best now, old man?"

THE END.



The Penalty Kick

A HERO OF THE MINE

By Edward W. Parker

BENTLEY, the engine driver, left his steel platform high among the dials and the reel drums and came slowly across the wide floor. "It's three, two and one," he said in his quiet voice.

"Oh, I've got the firing signals by heart forwards and backwards," replied Dick Dent, the head shaftman. But it's all right for you to mention it. You can't rehearse this little play too many times for safety."

Dick extended his coal-oil torch and lighted its wick from the torch, that his partner, Holmes, was holding.

"When you give the three-two-one," continued Bentley in his characteristically stern and deliberate manner, "I'll know you are ready to fire. Then I'll dip the cage. When you're ready to come up ring three and then one. I'll jerk you up that three-quarter mile stretch in a jiffy."

"Right you are!" cried the head shaftsman.

Dent and Holmes stepped abroad the lower deck of the cage, and Bentley went back to his station. In another minute the two men were sinking swiftly into the hole, and almost instantly the shaft water began to pour round them, falling in greater volume as they descended.

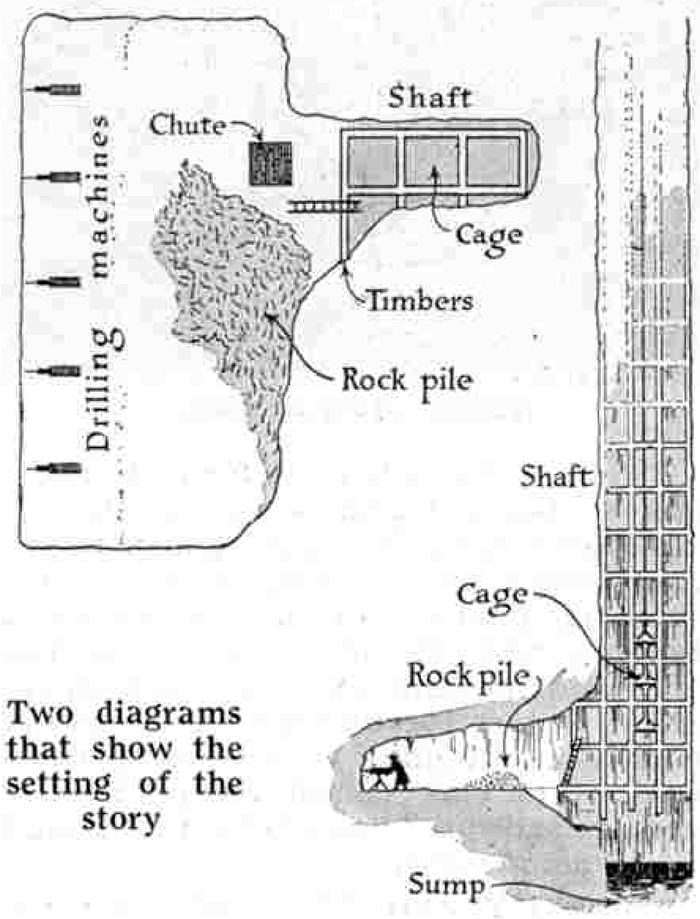
On top a short time before they had heard two noisy roosters crowing for the dawn; now they were sinking into a world of eternal night.

"It takes a steady nerve to handle an engine like that," observed Dent as they dropped past the winking shaft timbers. "The engineman will have the lives of every one of us in the hollow of his hand to-day. I'm glad that Bentley happens to be on shift. He's the best of them all. He uses his head every second. But they don't last long, those fellows; they can't stand the strain! . . . . Ah! here we are."

Dent had to shout the last words, for suddenly they had come into the midst of a terrific, detonating roar—the thunder of five huge drilling machines at work cutting out the new pumping station at the four-thousand level. The cage had descended almost as far as the timbers reached. Twenty-five feet below was the sump, the water-filled bottom of the shaft.

The pump station was brilliantly lighted with many candles. Five machine men and five chuck tenders, all working with furious energy and ranged along the wall like a battery of artillery men, were directing their rapid-fire guns at the solid rock.

Immediately below the cage Louis, the Indian "mucker," sat on a pile of loose rock near the mouth of an open chute. In front of him was the black sump water—a stagnant, Stygian pool. To his left his candle light gleamed fitfully on the grey rock of the shaft hanging wall. Behind him were the men at the machine drills.



Two diagrams that show the setting of the story

In the midst of the tumult Louis was indifferent and calm. His shift was over. For eight hours he had been shovelling the shattered greenstone into the shaft chute, from which it had been drawn regularly at half-hour periods by the skip tender, who came down like a man in a balloon, riding in the bulky square steel bucket. So engrossed was Louis in the idle industry of picking hardened grease from the thimble of his dagger-like candlestick, that he had not observed the arrival of the cage.

"He's a queer chap," shouted Dent, pointing down at Louis. "He wouldn't turn his hand to dig a man out of a hole."

"Do you know what he's sore about?" Holmes yelled in Dent's ear. "He wants to run a machine. He's plumb crazy to be a machine man. The boss won't let him. Told him only white men can run machines. It isn't so much the pay as it's the idea."

Louis suddenly rose to his feet, took up his shovel and stuck it down the chute to measure the height of the rock.

"I'll bet he's dreaming about running a machine this minute," Holmes continued. "Remember when Jim Smith was running a machine in the fourteen hundred north stope? Well, Jim let Louis take hold of the crank one day, and after that Louis used to play with the machine every chance he got. Since then he has been Smith's friend."

"I don't believe the Indian's got another friend in the mine then," replied Dent. "He never says anything to anybody."

A lull came in the roar, and Dick took advantage of it to shout down, "Get a move on, you fellows; it's late."

"Last hole all around," sang out Smith as he made a violent attack with his long wrench on the clamp while his chuck tender unscrewed the air hose. "You'll see some quick work here in a minute if you watch, Dickie."

The other machine crews followed suit, and soon the machines were torn down and stacked in a corner of the chamber. Dent and Holmes could count sixty drill holes in the north wall.

"Come over here and lend a hand, will you?" Burns, a machine man called to Louis. Burns and his chuck tender were struggling with a heavy plank, trying to move it out of the line of fire.

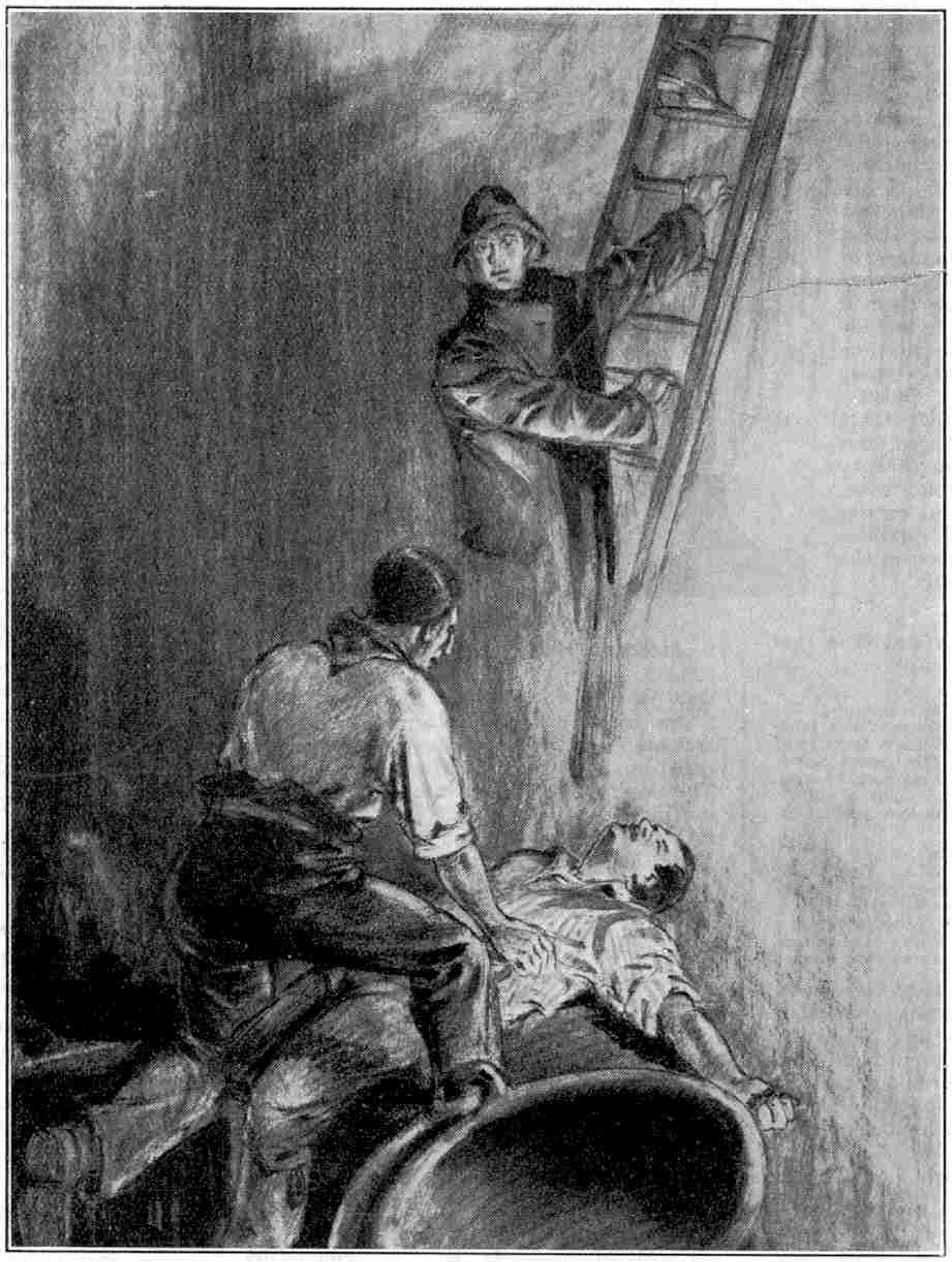
"What for?" asked Louis, laughing insolently. "Me get pay for shovel. Me not machine man."

Burns made an angry retort, but Louis only laughed coolly as he donned his rubber coat and sou'wester hat and went toward the cage. He followed the path the

others would have to take after lighting the sixty fuses. It was along the side of the open chute, over a waist-high pile of splintered blocks, up a fifteen-foot ladder to the shaft timbers and thence across a wet and slippery plank to the cage. Louis climbed into the cage and squatted comfortably in a corner.

Spurred by the briefness of the time left to load and fire, the five machine crews worked with unusual speed. The chuck tenders ripped open the rolls of fuse and handed them to the machine men, each of whom measured off and cut twelve ten-foot lengths. Then the chuck tenders pried off the covers of boxes of dynamite while with the points of their candlesticks their partners crimped the detonating caps on the fuse, laced each length of fuse through a stick of the giant powder and laid them aside to be used for primers.

Now the machine men began to slide the yellow sticks down the holes, tamping each firmly with long wooden poles. In went the primers carrying their long tails of fuse, then another stick of powder, and last of all the gouge, or plug of mud. In a twinkling the fuses were coiled. Whipping out their pocket knives, the machine men slit the fuses at the proper distances from the end so that the holes should explode in such a sequence as to "break down" the rock. The chuck tenders set on the floor short pieces of lighted candle for emergency use.



. . . . the unconscious inert form of Smith . . . .

"All ready," cried Smith.

"All set here," echoed Burns.

"Everybody's all set," yelled the machineman Murphy."

The crews donned their rubber coats and hats.

"Wait a minute," called Burns and, coming over to the ladder, shook it by way of testing it. Then he examined the path round the chute and kicked aside a few small bits of rock that had been lying on the timber.

"Let her go," he said.

"I'll give the three-two-one," called Dent.

The combined strength of Dent and Holmes easily brought down the bell wire, although they had to reach out into the shaft for it. Dent counted each pull aloud, and a moment later the cage dipped for a yard and came to a rest.

"Fire!" roared Dent.

Flame and brown smoke spurted from the fuses as the machine men applied the tips of their candle flames to the black cores. Soon the fuses were hissing and sputtering along the entire face, and the machine men were groping for those that remained unlighted.

Burns on the extreme left fired his round first and yelling "Fire" ran for the cage. His chuck tender followed him. They came racing up the ladder and across the narrow bridge. Dent and Holmes stood ready to seize them and pull them safely inside. It was no time now for a slip of the foot or the hand.

"Fire!" yelled Shaw, then Murphy, then Carton. With their chuck tenders they came darting for the cage in groups of two.

"Get a move on, Smith," yelled Burns with nervous harshness from the cage.

Smith was having trouble with his fuse and through a cloud of smoke was groping with reckless obstinacy for a top hole.

"Leave it as it is and come!" bellowed Dent.

The man in the cage heard Smith give a quick order to his chuck tender, who turned reluctantly and then fled toward the cage.

"You come or we leave you!" roared Dent.

"Fire!" cried Smith and added banteringly as he ran. "There's plenty of time, Dickie, old man."

Just then he stepped on a small stone, slipped, lost his balance and fell headlong into the chute.

"He's gone! Give that bell!" cried Burns hoarsely, elbowing his way through the crowded cage toward the wire.

Instantly Louis, with eyes flashing dangerously,

(*Continued on page* 196)

No. 1 Outfit Competition Results

Following the success of the No. 0 Outfit competition, the No. 1 Outfit contest confirms the popularity of this new method of testing our readers' skill in Meccano model-building. The construction of new and mechanically-efficient models with the smaller Outfits calls for an equal amount of ingenuity, in my opinion, as that required in the design of far more complicated structures when no definite limit is placed on the number of parts that may be used.

The majority of the entries continue to show considerable merit. I am illustrating on this page the first prize-winners in Sections A and B and append below some particulars of their construction in order that every Meccano boy may reproduce them if he so desires. I hope also to include in the "*M.M.*" from time to time details of further prize-winning models in this and other "Outfit" competitions, for I feel that there must be many hundreds of our readers who will find them of very great interest. It is possible, moreover, that certain successful entries showing particularly good qualities will eventually be reproduced in the Meccano Instruction Manuals.

Results

The results of Sections A and B in this competition are as follows :—

Section A (boys under 12) :
1st Prize (Meccano Products to value of £2-2s.) Emlyn Owen, High Street, Metford, Wales (Submarine). 2nd Prize (Meccano Products to value of £1-1s.) : Arthur Rosenbey, 5, Plantagenet Street, Riverside, Cardiff (Motor Breakdown Lorry). 3rd Prize (Meccano Products to value of 10/6) : Ronald J. Salmond, 17, Rosedene Avenue, London, S.W. 16 (Electric Toaster).

Section B (boys over 12 and under 16) :
Prizes similar to those in Section A. First Prize : Lyn Jones, West Leake Rectory, Near Loughborough (Sewing Machine). Second Prize : C. A. Hankey, Highstead, Pain's Hill, Limpsfield (Automatic Railway Signal). Third Prize : H. Hancock, Blythwood, Pinner (Railway Breakdown Crane).

In addition to the prizes originally announced, we are presenting a number of complimentary copies of "Meccano Standard Mechanisms" to other competitors whose efforts show outstanding merit. Of these, the following have been specially commended by the judges :

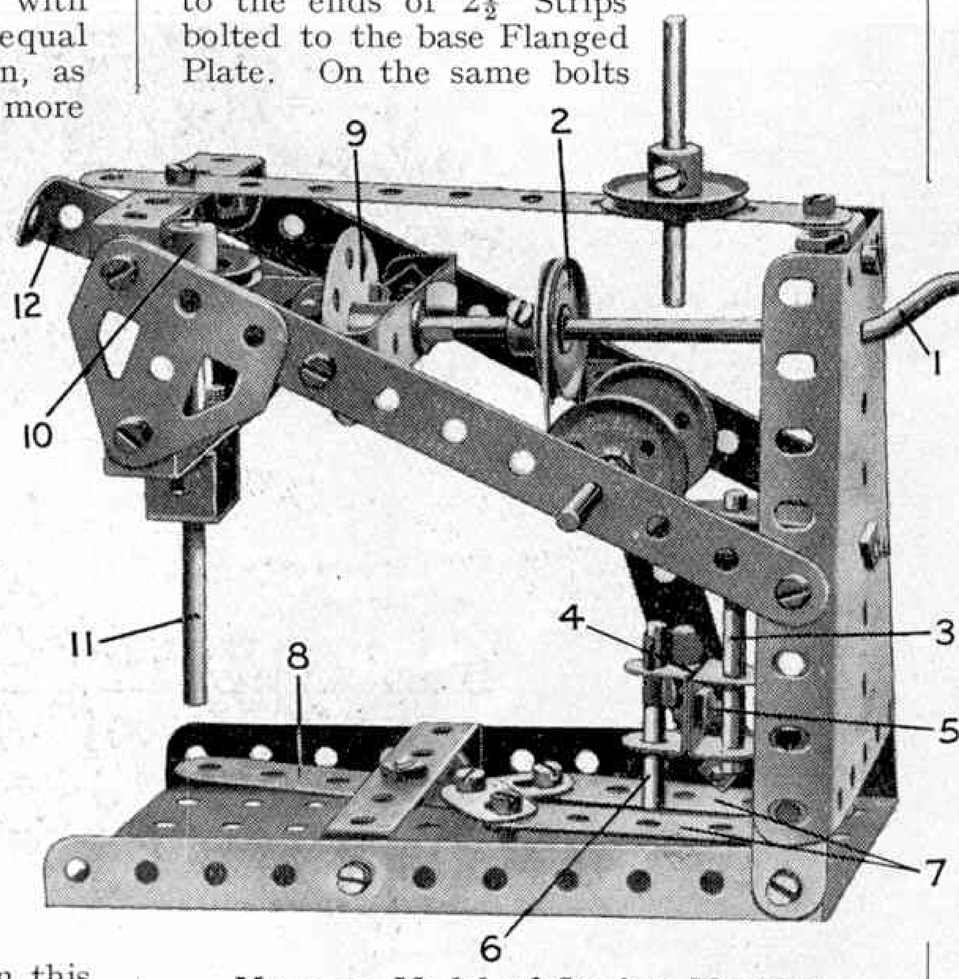
Section B :
Philip S. Levermore, Barnet, Herts. ; James Aitken, Glasgow ; Edmund Driver, Pudsey, Nr. Leeds ; Diana Meek, Bisley ; George Longe, Tamworth ; F. L. Paige, Southend-on-Sea ; Walter Hulton, Bellingham, North Tyne ; Percy Higgon, Hallen Henbury, Nr. Bristol ; Angus Higgins, Haverfordwest, Pen. ; Donald Sutherland, Brynmawr, Brecon ; Charles Margach, Lossiemouth ; and C. G. Fisher, South Croydon.

Section A :
James McNeill, Omagh, Co. Tyrone ; Norman Sandham, Liverpool ; Leslie Atkinson, Stockton-on-Tees ; Ronnie Viney, Manchester ; W. Lomas, Bolton ; and R. Richards, Winchester.

Model Sewing Machine

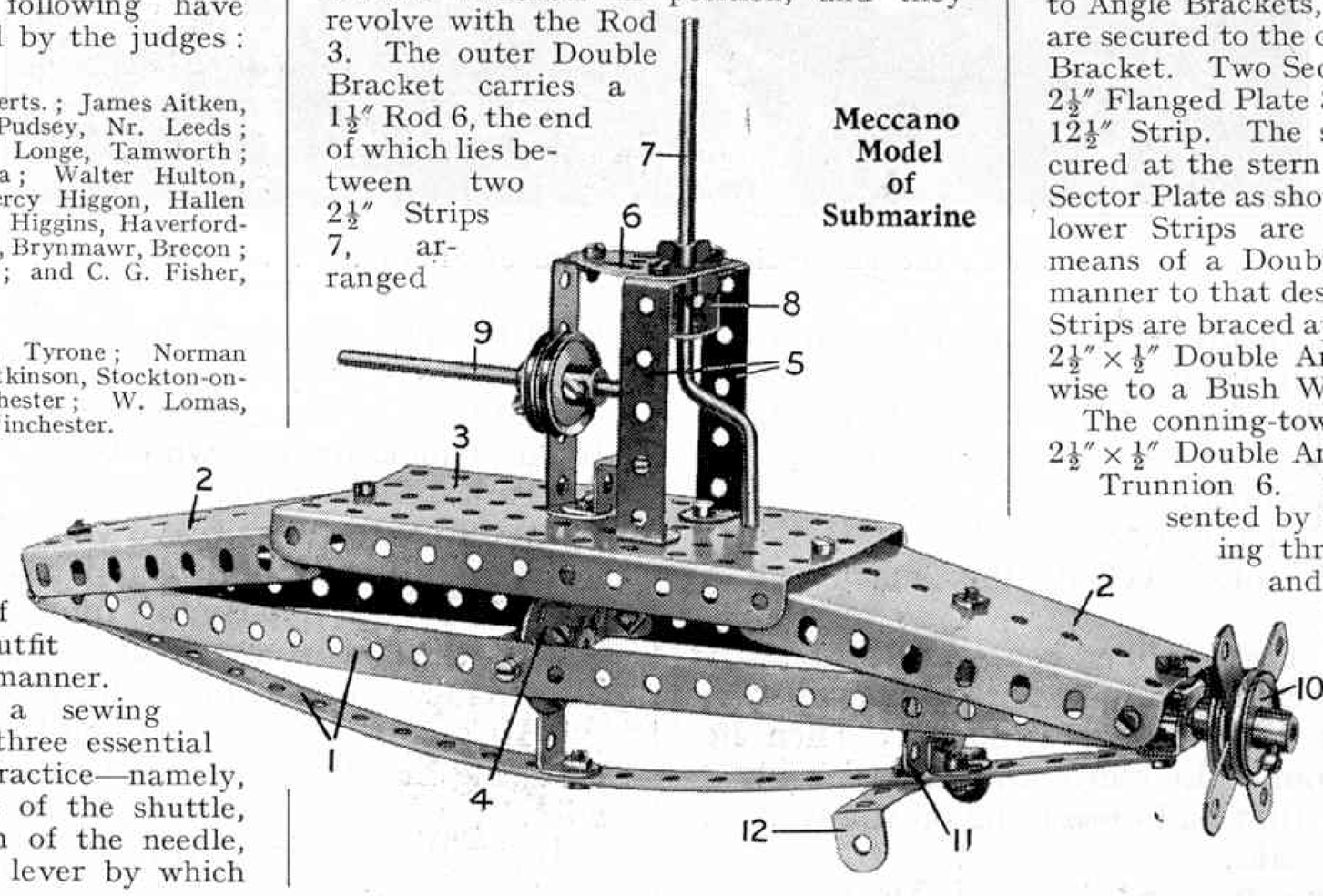
The construction of the winning model in Section B is very ingenious, and makes use of the contents of a No. 1 Outfit in an excellent and novel manner. The model represents a sewing machine, and comprises three essential movements as in actual practice—namely, the to-and-fro movement of the shuttle, the up and down motion of the needle, and the vibration of the lever by which the cotton is supplied from the reel to the needle.

The construction of the framework is fairly clear in the illustration, but I may mention that the Sector Plate is secured to the ends of $2\frac{1}{2}''$ Strips bolted to the base Flanged Plate. On the same bolts that secure the Sector Plate two $5\frac{1}{2}''$ Strips are mounted at an angle, as shown, and are connected together at their outer ends by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The sloping $5\frac{1}{2}''$ Strip on the far side of the machine is supported by a $3\frac{1}{2}''$ Strip bolted in its fifth hole (counting from the Sector Plate) and to the third hole from the end in the side of the base plate.



Meccano Model of Sewing Machine

The operating handle 1 carries a $1''$ Pulley 2, which drives, by means of a cord, a similar Pulley secured to a $2''$ Axle Rod 3. The latter is journalled in a Cranked Bent Strip bolted to the Sector Plate. Two Double Brackets 4 are secured together by a bolt 5, the shank of which presses very tightly on the Rod 3. This locks the Double Brackets in position, and they revolve with the Rod 3. The outer Double Bracket carries a $1\frac{1}{2}''$ Rod 6, the end of which lies between two $2\frac{1}{2}''$ Strips 7, arranged at a short distance apart from each other and bolted to two Flat Brackets secured to a further $2\frac{1}{2}''$ Strip 8.



Meccano Model of Submarine

The latter is attached by means of bolt and lock-nuts (Meccano Standard Mechanism No. 262) to a transverse $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip in the base of the model. As the shaft 3 rotates, the Rod 6, in describing a circle, slides between the Strips 7 and so rocks the Strip 8 from side to side. This represents the movement of the shuttle.

Operation of the "Needle"

The Bush Wheel 9 on the end of the Crank Handle carries in one of its holes two Angle Brackets placed together in the form of a Double Bracket, with their elongated holes overlapping, and in such a position that an imaginary line, drawn through their opposite round holes, would intercept the centre of the Bush Wheel. A Flat Bracket is bolted to the inner Angle Bracket in a line with the Crank Handle and forms a lever which engages a $1''$ Pulley 10 mounted on a vertical sliding Rod 11. This Rod is journalled in a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip bolted between the lower holes of the two Flat Trunnions, and is further supported by two $\frac{1}{2}''$ Reversed Angle Brackets secured to the Angle Strip. As the Bush Wheel rotates, the Flat Bracket imparts to the Rod 11 a movement corresponding to the action of the needle.

The outer Angle Bracket on the Bush Wheel strikes once in every revolution the end of a Double Angle Strip 12. This is pivotly attached, by means of bolt and lock-nuts passed through its second hole from the Bush Wheel end, to the centre hole of the Flat Trunnion on that side of the model. The resulting movement of the Strip 12 represents the apparatus by which the cotton is paid out from the reel to the needle.

A Neat Submarine

A neat model of a submarine secures the first prize in Section A. The main framework of this model consists of four $12\frac{1}{2}''$ Strips 1 converging towards the bows, the top and bottom Strips being secured to a Double Bracket while the two side Strips are bolted to Angle Brackets, the other holes of which are secured to the centre hole of the Double Bracket. Two Sector Plates 2 and a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 3 are bolted to the upper $12\frac{1}{2}''$ Strip. The side $12\frac{1}{2}''$ Strips are secured at the stern to the end holes of the Sector Plate as shown, whilst the upper and lower Strips are connected together by means of a Double Bracket in a similar manner to that described in the bows. The Strips are braced apart at the centre by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips bolted crosswise to a Bush Wheel 4.

The conning-tower is composed of three $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 5 and a Flat Trunnion 6. The periscope is represented by a Crank Handle 7, passing through the Flat Trunnion and a $\frac{1}{2}''$ Reversed Angle Bracket 8, which serves as an additional support. The end of the Crank Handle is inserted in the plate 3, and Spring Clips retain it in its position.

(*Continued on page* 198)

"Ship" Competition

In this competition, as first announced in the February "*M.M.*," we are offering splendid awards for new Meccano models of a Ship. The competition closes on the 31st of this month for readers in the British Isles, and entries from overseas competitors must be received by 30th June. Meccano boys should send along their efforts as soon as they are completed.

You may construct your model on the lines of any kind of ship or boat—from a rowing-boat to a liner, and you may use any Outfit or number of parts.

Entries will be divided into the following sections: SECTION A, for competitors residing in the British Isles; SECTION B, for competitors residing outside the British Isles. Competitors' ages will be taken into consideration when judging the entries. Prizes will be awarded for the best entries FROM EACH SECTION as follows: FIRST PRIZE, £3-3s.; SECOND PRIZE, £2-2s.; THIRD PRIZE, £1-1s.; SIX additional prizes of 10/6 each.

When you have built your model, you should send in a photograph or a good drawing, together with any explanations you may think necessary, although the latter should be made as brief as possible. Photographs or drawings will be returned if a stamped and addressed envelope of the necessary size is enclosed with the entry. Write your name and address on the back of each sheet used, and state your age, name of the competition, and section in which your model is entered. Mark envelopes "Ship Competition."

"No. 3 Outfit" Competition

As announced last month, we are offering prizes for the best models made entirely from a No. 3 Meccano Outfit. Models comprising parts that do not appear in this Outfit will be disqualified. It is not necessary to use all the parts contained in the Outfit. Those boys who possess larger sets may compete, providing they use only those parts that are in a No. 3 Outfit.

Models should not be sent. A clear photograph or good drawing is all that is necessary: this will be returned if desired, providing a stamped addressed envelope of the necessary size is enclosed with the entry.

Entries will be divided into the following sections:—SECTION A, for boys under 12. SECTION B, for boys over 12 and under 16. SECTION C, for boys residing overseas, and not exceeding 16 years of age. Prizes will be awarded for the three best entries FROM EACH SECTION as follows:—FIRST PRIZE: Meccano Goods to the value of £2-2s. SECOND PRIZE: Meccano Goods to the value of £1-1s. THIRD PRIZE: Meccano Goods to the value of 10/6. SIX CONSOLATION PRIZES, consisting of complimentary copies of "Meccano Standard Mechanisms."

Closing dates for Sections A and B: 31st March. Overseas Section, 30th June.

You should send in a photograph or a good drawing of your model, together with any explanations you may think necessary, although the latter should be made as brief as possible. Write your name and address on the back of each sheet used, and state your age, name of the competition, and section in which your model is entered. Mark envelopes "No. 3."

New Zealand (1926) Model-Building Competition

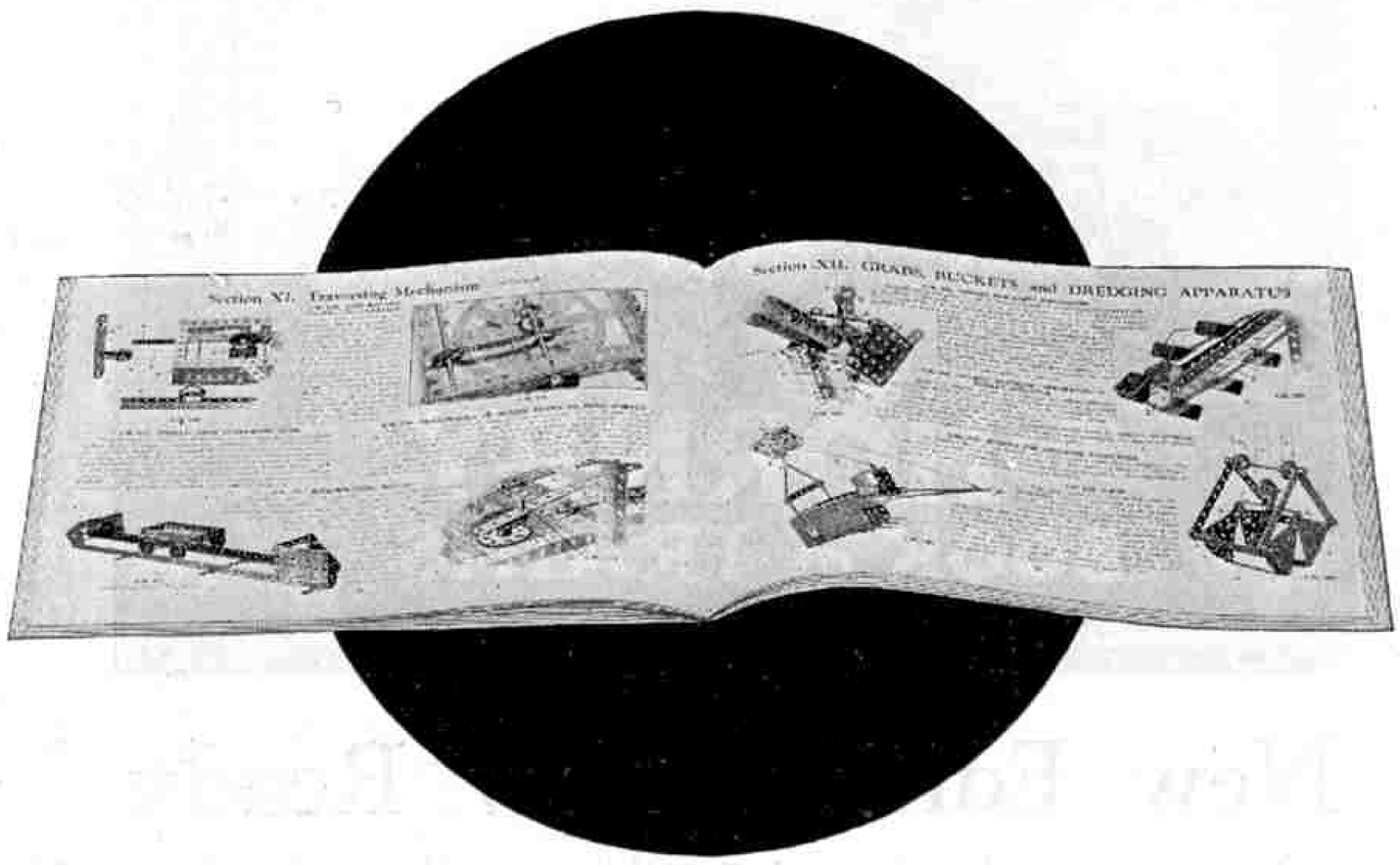
We wish to remind all readers who reside in New Zealand that the splendid Model-building Competition arranged for that country by Messrs. Browning, Ifwersen Ltd., the Meccano Agents, closes on the 31st May next. Entries in this competition will be divided into three sections, according to competitor's ages, and over three hundred prizes are offered. The first prize in Section 1 consists of Meccano Products to the value of £7-10s. Competitors may obtain their entry forms, together with all necessary particulars, from their Meccano dealers, or direct from Messrs. Browning, Ifwersen Ltd., P.O. Box, 129, Auckland.

Competition in Sunderland

Some interesting entries were received in a Model-building Contest recently organised by Mr. T. Williamson, whose establishment at The Arcade, Sunderland, is well known to local Meccano boys. It was hoped that the contest would prove an interesting test as to the ingenuity of the boys residing in that city. The first prize was secured by John D. M. Carr, 26, Sydenham Terrace, who submitted a Miniature Workshop, complete with various tools and appliances.

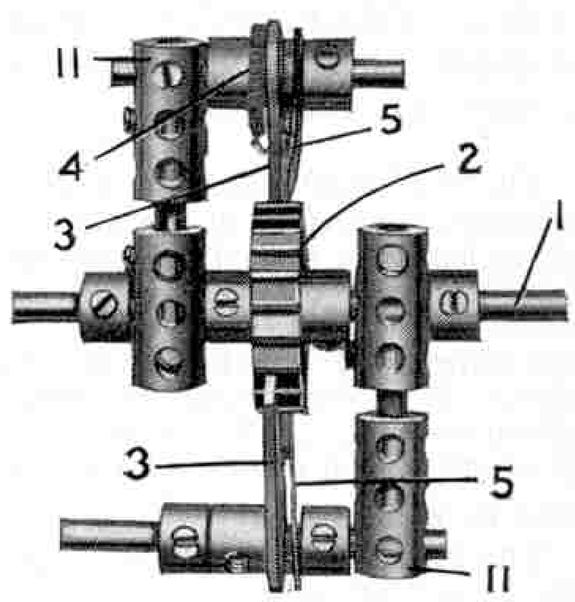
"Meccano Standard Mechanisms"

A New Manual for Model-Builders



There are a number of Meccano movements that have to a certain extent become standardised; that is to say, they may be applied to more than one model—in most cases without any alteration, but in some few instances with only slight alterations to the original movement. These have been collected and classified, and a selection has been published in each issue of the "*M.M.*" for the last few months as "Meccano Standard Mechanisms."

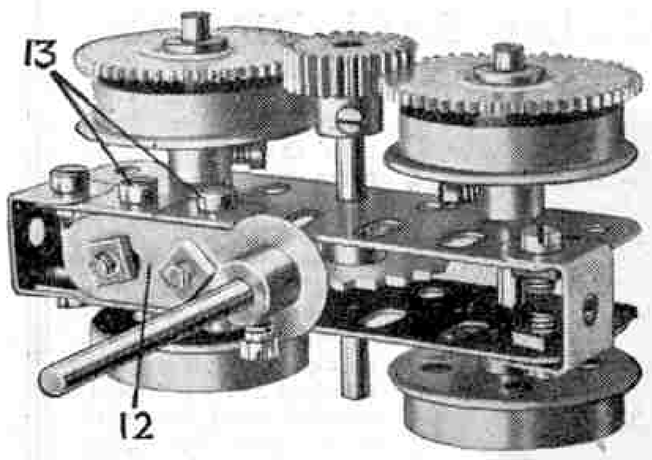
The entire collection, including the movements already published in these pages and many others in addition, may now be obtained in the form of a new Manual entitled "Meccano Standard Mechanisms." This publication consists of 48 pages, $9\frac{3}{4}'' \times 6\frac{1}{2}''$, and contains over 140 illustrations in half-tone. The various devices have been arranged so that immediate reference may be made to any particular motion that it is desired to incorporate in a model, and the book should be of special value in assisting inventive boys to embody correct engineering principles in their new structures. The clear and detailed manner in which the various mechanisms are illustrated and explained will be appreciated from the two specimens reproduced on this page. No keen Meccano boy will consider his equipment complete without a copy of "Meccano Standard Mechanisms."



S.M. 254a, Pawl and Ratchet Mechanism (Portion of "Variable Speed Gear")

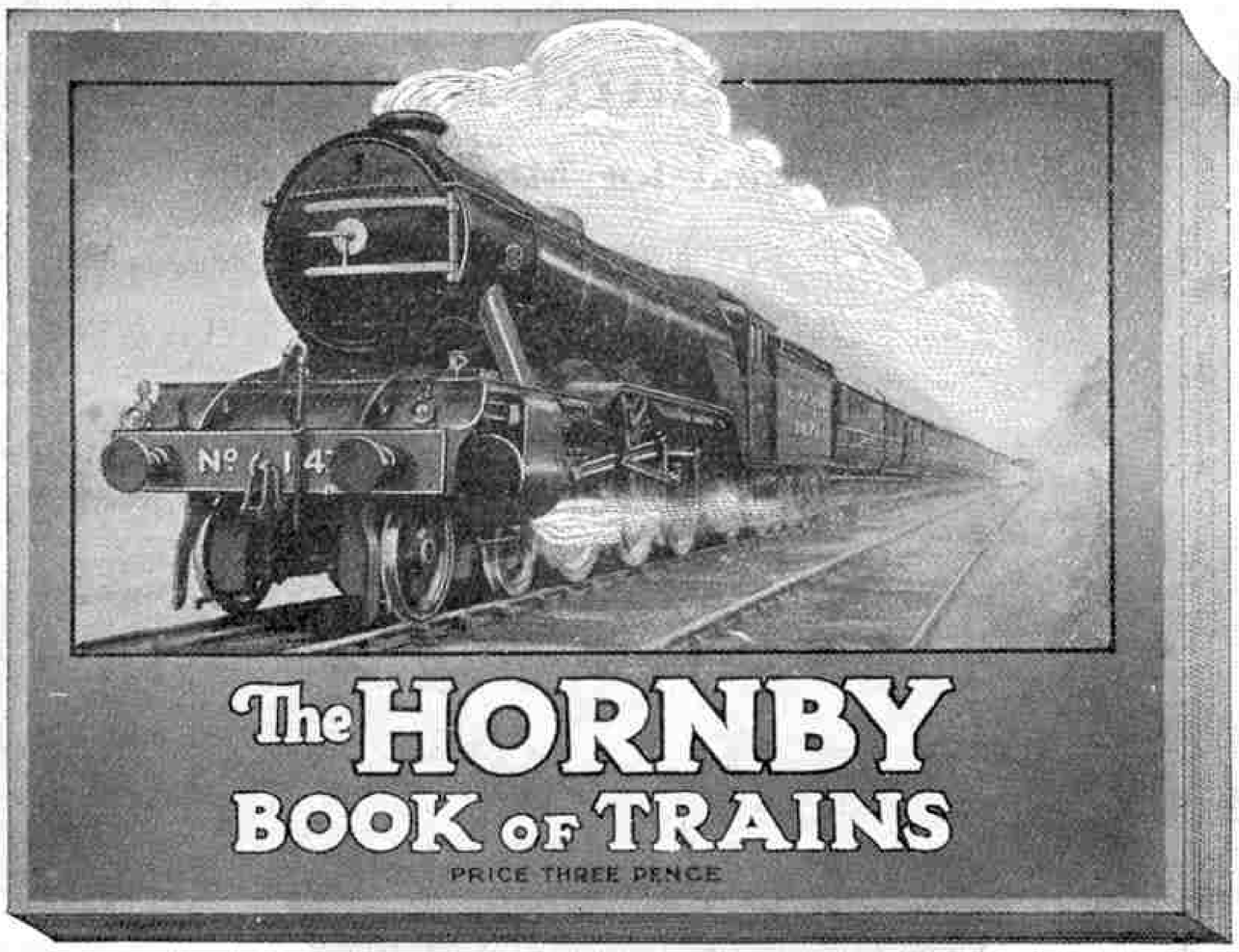
The book is divided into thirteen principle sections, as follows:—

I. Gear Ratios: Methods of Speed Reduction and Acceleration.
II. Belt and Rope Mechanism.
III. Pulleys and Pulley Blocks.
IV. Levers.
V. Clutches, Reversing and Drive-Changing Mechanism.
VI. Brakes and Retarding Appliances.
VII. Roller and Ball Bearings, etc.
VIII. Steering Gear.
IX. Screw Mechanism.
X. Overhead Trolleys and Trucks for Gantries, etc.
XI. Traversing Mechanism.
XII. Grabs, Buckets and Dredging Apparatus.
XIII. Miscellaneous Appliances.



S.M. 165a, Power-driven Bogie (Traversing Mechanism)

The price of "Meccano Standard Mechanisms" is 1/1½ post free. Overseas, price 1/7½ post free. It may be obtained from any Meccano dealer, from our Overseas agents (addresses on page 216), or direct from Meccano Ltd., Binns Road, Liverpool.



New Edition Now Ready

So great has been the demand for this splendid publication *"The Hornby Book of Trains"* that several editions have had to be printed and already over 130,000 copies have been sold.

In response to requests from many new readers of the *"M.M.,"* who did not see the original announcements and who therefore were not able to order a copy of *"The Hornby Book of Trains,"* we have printed a final edition, which is now ready. Any reader who has not already had a copy of this fine book should order without delay, as no further copies of this edition will be printed.

The *"Hornby Book of Trains"* is a splendid production in every way, and no effort has been spared to make the publication worthy of the name it bears. It consists of 44 pages (11" × 8¼") of special art paper and on the cover, illustrated above, is a magnificent reproduction in colour of the L.N.E.R. *"Flying Scotsman"* at speed, which is well worth framing.

What the Book Contains

The first half of the book is devoted to the story of the locomotive from its earliest days, dating to before the time of the opening of the first passenger line.

The following are the chief sections :—

The Development of Iron Rails
The Stockton and Darlington Railway
The First Railway Companies
The Classification of Locos
Early Steam Locomotives
The Liverpool and Manchester Railway
Development of the Passenger Carriage
Famous Trains

The second half of the book includes a beautifully illustrated description of all the Hornby Trains and the latest Hornby Series Rolling Stock and Accessories. These illustrations are printed in four colours and the reproduction of the Hornby Trains is most realistic.

Address your orders to "Hornby Book," Meccano Limited, Binns Road, Liverpool, and please write your name and address clearly. The book will be posted to you by return of post.

The price of the book is 3d. (post free) which may be sent in stamps. There is no reduction if more than one copy is ordered.

Orders from Overseas

There is a special edition of *"The Hornby Book of Trains"* for Overseas readers. Readers overseas should address their orders to our Overseas agencies as below.

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 Street, Johannesburg.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool, England, and send a postal order for 6d. with their order.

The price for all orders from outside the United Kingdom is 6d. per copy, post free.

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There is no better way of keeping your Magazines clean and tidy than by binding them in the special binder we supply for this purpose.

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"A Hero of the Mine"—

(*Continued from page* 193)

wound the fingers of his left hand in Burns's collar and pulled him back.

"Take your hand off me," snarled Burns.

Then he pulled his candlestick from his pocket and raised it high above his head to strike. But before he had time Dent thrust himself in front of the Indian.

"Here, stop that!" he shouted, and as he spoke Louis ran across the bridge, slipped down the ladder and lowered himself into the chute.

"That chute's almost full of rick!" gasped Shaw, who seemed to be breathing only from the tops of his lungs.

"Yes, and there'll be 'leven men blown to bits in just one minute!" cried Burns, again forcing his way toward the bell wire.

Dent raised his arm, and the miners saw that there was a short drill in his hand.

Holmes waited no longer to see how Dent should dispose of Burns but dashed after Louis across the slippery timber, followed by Murphy and Carton. As they went they heard Dent shout: "Stand back, Burns, or I'll brain you as I would a cow!"

Then they scrambled down the ladder, and just as they reached the chute out came the unconscious, inert form of Smith like an upheaved plank. Louis followed, breathing hard. He, Carton, Murphy and Holmes laid hold of Smith and bore him up the ladder. No men except miners could have done the job so quickly. As they descended to the plank they heard the venomous hissing of the fuses and knew that only a matter of seconds now lay between life and annihilation.

They heard loud mutinous voices, saw Dent's arm descend and saw Burns with blood streaming from his forehead fall back into the arms of Turner, Smith's chuck tender. They shoved Smith into the cage, and instantly twenty hands grasped the bell wire.

"Three, one!" Every man spoke the numbers aloud.

"Now altogether," cried Dent. "Three! Not too hard."

"Is Bentley asleep?" cried a chuck tender.

None of the miners had the hardihood to gaze down at that hideous pyrotechnical display along the wall. Every head was upraised; every eye was trying to pierce the floor of the upper deck of the cage.

After what seemed an age the cage jerked upward and rose with jumps of accelerating speed. As they shot past the twenty-one hundred mark there came a vast puff of air that took off every rubber hat, then another, and then a volley. But now they were flying beyond the twelve-hundred mark with the speed of a projectile, and soon they shot out into the fresh morning air.

* * *

"Man hurt?" asked Superintendent Farrell, who was awaiting them.

"Two," replied Dent.

Burns was the first to open his eyes.

"How do you feel, boy?" asked Dent kindly.

Burns sat up, blinked and replied, "Never better."

Smith went to the hospital, and Louis helped to carry him there on a stretcher.

* * *

"Say," observed Dent, "that boy is white clear through, and I'm going to make the foreman believe it with twelve witnesses. He'll be working a machine before the week's out, or my name's not Jimmy Dent!"

Eighty Miles on the Buffers

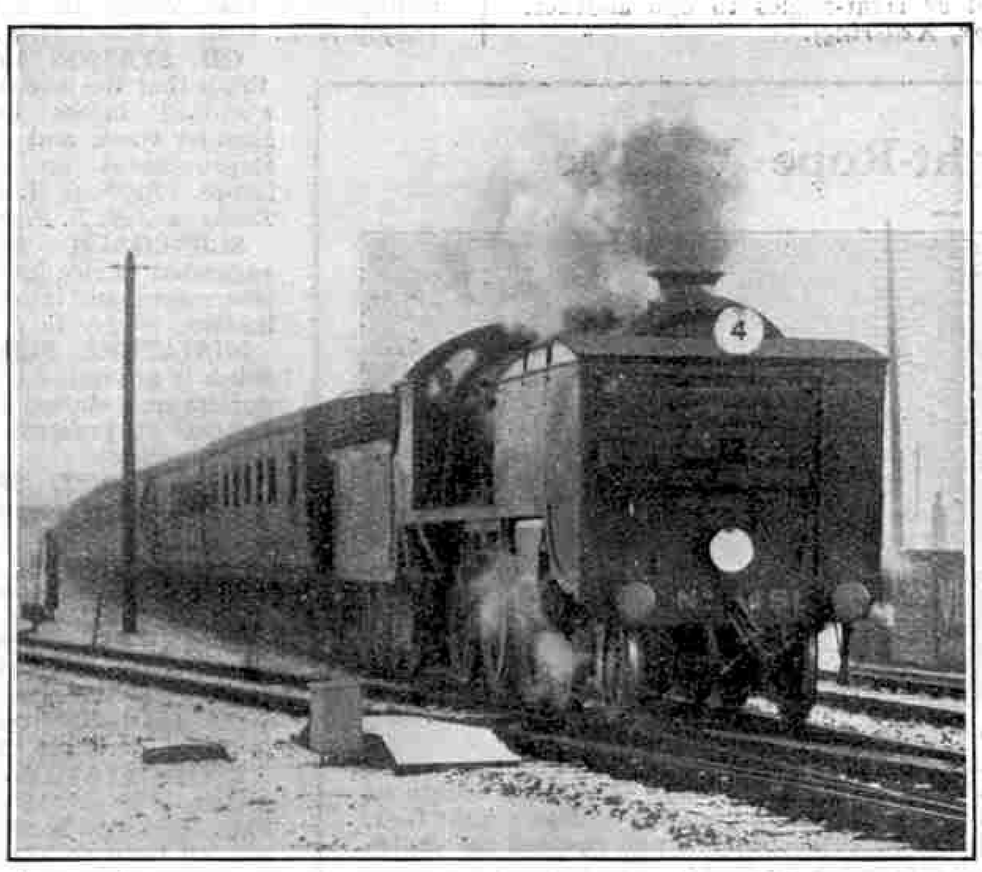
The following account of an unique train journey, reprinted from the "Daily Express," will, I feel sure, interest all readers of the "M.M."—Editor.

I HAVE just arrived at Salisbury, having been pushed for 83 miles from Waterloo in front of the West of England express train.

No ordinary engine did this, but one of the famous "King Arthur" breed, by name "*Sir Lamorak*."

I was on a testing expedition. Ordinary passengers prefer to ride in the comfortable coaches behind the engine. My journey was made in a wooden and iron box bolted to the engine's nose, with an eight-inch square peep-hole to see ahead.

"All aboard!" called the guard. A whistle blew and I had started on the most exhilarating journey of my life. I have flown in all kinds of airplanes. That is travelling by Pullman compared with an eighty miles spin on the rails with a 1,400 horse-power engine pushing you all the way!



Courtesy [*Southern Railway*

"Sir Lamorak" fitted with indicating shelter in front of smoke-stack

I sat on the edge of a steel plate jutting out from the front of the boiler, the engineer chief of the testing staff and his two assistants maintaining a perilous footing beside me. Fortunately we were boarded in, or we should have been scattered to the four winds before a third of the journey was done.

Rushed Along at 60 m.p.h.

We were off. Thud-thud-thud-thud went the engine. Then the thuds grew quicker—thud-thud-thud-thud. Then they merged into one—thudthudthudthud.

A violent jerk to the right, followed by a lurch into the waistcoat of the man on my left, with a full head butt at the boards in front, told me we were swerving through Clapham Junction.

At Wimbledon "*Sir Lamorak*" was pushing me along at 60 miles an hour. The din was deafening. My back grew hotter and hotter as the boiler warmed up. Now and again we would cross a network of points, and for ten seconds I could not have told you whether I intended landing among a clump of pines on my right or in the floods on my left.

A terrifying spine-shivering screech, and a few yards ahead the bottomless pit itself opened to receive me. I shot into dense blackness.

Suddenly, in that slope of Hades, fierce flames guarded the way. There was no escape. What fiends were waiting for me there right ahead? They were stoking up in grim anticipation. Weird shrieks as of a thousand souls in agony rose to greet me in those underground regions, and my knees knocked again and again!

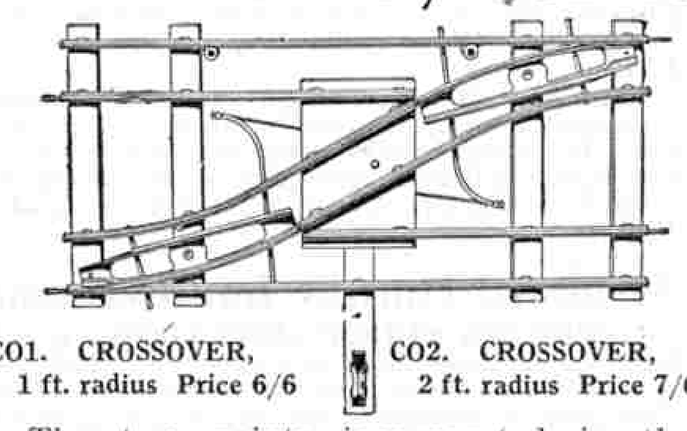
Then—— Thank heaven we had missed it! We had passed another engine and train in mid-tunnel.

* * *

As we slowed into Salisbury the engineer and his assistants tried to explain to me how, with various gauges and gadgets, they had felt the pulse of the great monster behind. My back was ready to believe that we had registered from 500 to 600 degrees Fahr. in steam heat alone! Then I remembered reading of a tramp who journeyed across Canada swinging on a chain between an express train.

I lifted my hat to that tramp!

New Hornby Points



CO1. CROSSOVER, 1 ft. radius Price 6/6

CO2. CROSSOVER, 2 ft. radius Price 7/6

The two points incorporated in the Hornby Crossover are operated simultaneously from the lever shown, and are set into parallel lengths of rails. The 2 ft. radius Crossover is over 18 ins. in length.

The Meccano Jerseys

The introduction of the Meccano Jersey, which has been placed on the market by the Jaeger Company at our instigation, has been a great success wherever Meccano goods are known. We are glad to inform our readers that The Jaeger Company are now marketing a Jersey in a larger range of colours and with a two-colour dice effect in collar, cuffs and round base. This is a great improvement and will certainly further popularise this neat and good wearing Jersey.

The lower prices at which the Meccano Jerseys are now offered will also help in the same direction. (Full details on page 209).

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.

David Cozens (Alberine, B.C.)—"My Dad has been out hunting. He has shot a fine buck with single spike horns. He will get more before the season closes. He shot two Brent Geese the other day, but there is not much on one of these. At present he is some miles down the Alberine Canal loading up fish on to a large vessel." A feeling of envy steals over us when we read of the glorious conditions under which some of you Canadian boys live. We are glad you are doing well at school, David.

O. Lee (Nottingham).—(1) The "*Mayflower*," the ship that took the Pilgrim Fathers to America, is shown on a stamp, issued by the United States, to commemorate the landing of the Pilgrim Fathers at Southampton, Mass., on the 21st December, 1620. (2) We are sorry we are not able to give you a list of war stamps, as this would run into several pages.

R. W. S. Moore (Burton-on-Trent).—It was a fine cover, as you say, R.W.S., but it got us into a lot of trouble! You see we had to reverse the design in order to get a properly balanced effect and not interfere too much with the title. Lots of our lynx-eyed readers spotted it at once and we have been explaining matters ever since!

M. Hodge (Bristol).—Little is known about the ether except that it is everywhere. Messages may be picked up even at the bottom of a coal-mine, hundreds of feet below the ground.

T. Hall (Weymouth).—"My friend Eric got his father to buy him a No. 2 Outfit and first of all he made a small model. Then his Grandfather made a model, then his Grandmother, and his father, his uncle, his aunt and his cousin." This is the worst case of infection we have heard of for a long time, Gordon. We'd just like to wager something though—that they are a perfectly happy family. Your poetry quotation is excellent and we wish we could find room for it.

V. Staker (Pinnaroo, S.A.)—"I am just taking my Eiffel Tower to pieces. It seems a pity but it must be done. I obtained two first prizes with it. One at an exhibition held locally and the other at the show." Good work, Victor!

H. Simpson (Wavertree).—"My Hornby engine has already done some track miles. I hope soon to have a model railway of some pretentions. Great oaks from little acorns grow." We can help you a great deal Herbert. We are preparing a scheme for showing all Hornby boys what to add to their miniature railway systems, and how to get the very best fun out of them. We shall eventually make the Hornby system just as perfect and complete as Meccano itself.

G. Winward (Burnley).—We certainly do wish that there had been Hornby Trains when we were young. But we are not too stately even now to play with them, George. If we want to sit inside the circle to operate the train, however, we have to use the 4 ft. diameter circle more, because we don't fit into the smaller circle so snugly as we used to do!

K. Yoshidi (Kitamachi).—"I never spent an autumn more associated with hateful lessons than this autumn. It's just learning from day to night all the time. It's simply awful." Sounds to us as though you are not at the head of your class K.Y. Better settle down to it steadily. In a little while you'll badly need all the learning that seems such a nuisance to you now.

A. H. Fletcher (Penarth).—"Each year I make a large Meccano model such as a tower or windmill and making it pretty with electric lights and tinsel, place it in the centre of the Christmas dinner table." This is quite a good idea. We should like to hear if any other Meccano boys have done the same thing.

R. Adair (Cork).—"I have just had a bicycle given me for my birthday and should like to know the correct parts to oil." The essential parts to oil are the hubs, cranks, chain and ball races. Use a good cycle oil.

M. Gage (Auckland, N.Z.)—It was thoughtful of you, Maxwell, to send us a copy of the Auckland Weekly News. We enjoyed looking at the pictures of your New Zealand scenery, which we know to be amongst the finest in the world. The sporting pictures were also very fine. We send our greetings to you and to all the members of Wiseman's Meccano Club.

G. Sheriff (Edinburgh).—How is the strained muscle getting along now, Geoffrey! No more rugger this season, of course! You are lucky to have a father to buy you a No. 7 Outfit and a Hornby Electric Train to while away the long days that you have to spend in bed.

In Reply

In these columns we reply to suggestions regarding improvements or additions to the Meccano and Hornby Train systems. We receive many hundreds of such suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Every idea, however, whether acknowledged in these columns or not, is carefully examined and considered. Practical suggestions that prove to be in popular demand are marked down for adoption at the first available opportunity. It would be of great assistance if readers, when submitting suggestions for consideration, would write them on separate sheets of paper and include their name and address on each sheet used.

Suggested Meccano Improvements

CLOCKWORK MOTOR.—The question of altering the design of the Clockwork Motor, as well as the position of the levers, will be entered into. Hitherto, however, we have found its present form most suitable for the majority of Meccano structures. (*Reply to Carl W. Beese, Hamilton, Ont., Canada*).

SPECIAL OIL.—We do not think it necessary to introduce special lubricating oil for use with Meccano models. Any good machine oil, such as that used for sewing machines, etc., is suitable, and can easily be obtained. (*Reply to Chas. Hare, Southport*).

GUILD BADGES ON MODELS.—Your suggestion re supplying of Guild badges suitable for attachment to Meccano models, such as on the radiators of motor-cars, etc., is very novel. We should like to receive further opinions upon this. (*Reply to W. L. King, Hyde*).

LIFE STORY OF MECCANO.—We published some years ago a series of articles describing the history of Meccano and the various processes in its manufacture, and we are considering the question of bringing this up to date and reprinting it in the "*M.M.*" (*Reply to W. L. King, Hyde*).

MOTOR BOATS.—We regret that the introduction of model motor boats would be outside our usual practice, at least for the present. (*Reply to Leonard Ruston, Amersham*).

Suggested New Meccano Parts

BRAKE SHOES.—The introduction of shoes and bushes for internal expanding brakes offers many difficulties. We are experimenting with various types of brakes for Meccano models, and hope to publish particulars of same in some future number of the "*M.M.*" (*Reply to W. L. King, Hyde, Nr. Manchester*).

24½" PERFORATED STRIP.—A strip of this length does not appear to be in particular demand. Various lengths of strips may readily be formed by joining the existing parts, and they can be connected together more easily than Angle Girders. With regard to the suggested longer Axle Rods, see our reply under "Bevel Wheels and Rods" in the January "*M.M.*" (*Reply to B. Hilliar, Karachi, India*).

SMALL FLANGED WHEELS.—We shall consider the advisability of introducing small Flanged Wheels, of about half the size of the present wheel. We agree that these would be useful for use as bogie wheels in model locos. (*Reply to E. G. Pike, Hayes End*).

BENT SHAFTING.—We are unable to discover many advantages to be derived from Axle Rods bent at right angles. Have you any special use for them in mind? (*Reply to P. Penny, Smethwick*).

IMPROVED SECTOR PLATE.—We shall look into the possibility of introducing more holes in the surface of the Sector Plate. (*Reply to A. G. Reid, Auckland, N.Z.*)

TRIANGULAR BRACED GIRDER.—This part would be difficult to standardise with the present system. It should be an easy matter to build it up from existing parts on the few occasions when a girder of this description is required. (*Reply to K. Offord, Ipswich*).

IMPROVED SPRING CLIPS.—We note that you consider the old style Spring Clips with tapered wings more satisfactory than the present style. The advantages of both types will be carefully examined, and we will let you know what we decide. (*Reply to N.S.W. and J. Wheatley, Claygate*).

T-PIECE AND DOUBLE CRANK.—Two simple Bell Cranks bolted together would provide a T-piece very similar to your sketch, while the ordinary Cranks secured to a spindle should fulfil the functions of your suggested double-armed crank piece. We always endeavour to avoid the addition of new parts the functions of which are already provided for with existing elements. (*Reply to Maurice Lee, Good Easter, Nr. Chelmsford*).

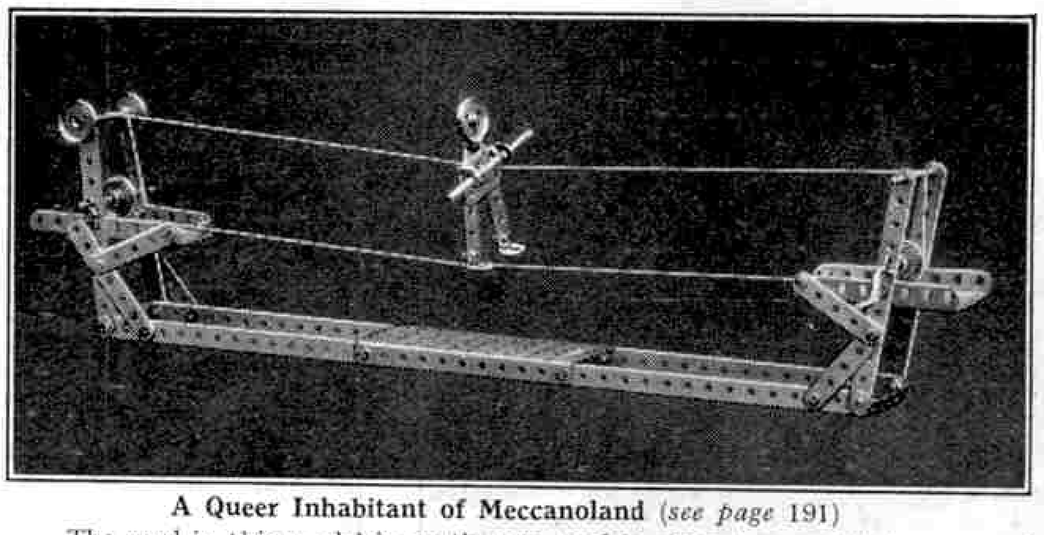
POINTER.—We are giving further consideration to your suggestions for a Meccano pointer for use in dial indicators, etc. (*Reply to C. H. Wilkins, Stonehouse, Glos., and S. Hutchinson, Auckland, N.Z.*)

LARGE FLANGED WHEELS.—The manufacture of a Flanged Wheel having a diameter of 5½" or 6" would be very costly. Moreover, a Hub Disc bolted to a Circular Plate (6" diameter) forms an excellent substitute for the part you suggest (see the Meccano Tank Loco, described in the "*M.M.*" for September 1925). (*Reply to G. C. V. Hyde, Dorchester and Albert Howarth, Rochdale*).

SPRING CORD AND 4½" PULLEYS.—(1) Short lengths of Spring Cord would not serve any specially useful purpose, for the existing Part No. 58 may be cut into any desired length and secured by twisting the ends round a bolt. (2) We have experienced little demand for a Pulley Wheel 4½" in diameter, but we shall keep the idea in view. (*Reply to Cecil T. Bishop, Bristol*).

RIGHT-ANGLE COUPLING.—Your proposal for a new coupling to be made in right-angle form does not appear to hold any special advantages over the present Coupling, which allows for the connection of two Rods placed at right-angles to one another. (*Reply to W. H. Cox, Kettering*).

The Tight-Rope Walker



A Queer Inhabitant of Meccanoland (*see page* 191)

The cord in this model is continuous, and is given a complete turn round the 1" Pulleys and Axle Rods at each end of the model. The lower length of cord passes through the Angle Bracket forming the Meccanitian's right foot, whilst the upper length is led under the balancing-pole and through the centre hole of the Flat Trunnion, which represents his body. The acrobat advances when the Crank Handle is rotated.

A curious feature of this model is the insistence of the acrobat to move along the rope in one direction only, no matter in what way the Crank Handle is turned. This fact has puzzled a number of Meccano boys who have seen the model. We therefore propose to award five shillings to the sender of the best explanation of the reason why the Meccanitian will only move forward. Solutions of the mystery must reach this office before 31st March.

MILLED KNOB.—We think a Meccano Pinion would form an excellent substitute for your suggested milled, or knurled, knob. (*Reply to S. Hutchinson, Auckland, N.Z.*)

GROOVED COLLAR.—The functions of your proposed grooved collar to fit over and engage the teeth of the Worm Wheel are already provided for, since the resulting movement can be obtained by using a Threaded Rod in conjunction with a Threaded Boss or Coupling. (*Reply to E. Pye, Walthamstow, and K. Hunt, Oxford*).

HELICAL GEARS.—Helical gears constructed on so small a scale would not be satisfactory in operation. In actual practice they are used to reduce "backlash," but their advantages in Meccano models would be negligible. (*Reply to K. Renault, London, N.W.1*).

Suggested Hornby Improvements

CLOCKWORK METROPOLITAN LOCOS.—Hornby Metropolitan Locos fitted with clockwork mechanism in place of the electric motor will shortly be available. They will be announced as soon as ready in this Magazine. (*Reply to S. Sanford, Colchester, B. S. Silva, Bexley, and others*).

SIGNAL GANTRIES.—Signal gantries are seldom called for with Hornby Trains, for the Junction Signal or Footbridge with Signals are sufficient for the majority of layouts. If the demand grows further, however, we shall endeavour to introduce them in the near future. (*Reply to B. K. Causley-Smith, West Clandon, Surrey, C. A. Beck, Belfast, J. Paton, Glasgow, J. C. Dewing, London, N. 12, L. Lyon, Pinner, and others*).

BOGIE PASSENGER COACH.—We shall consider the introduction of ordinary bogie passenger coaches. Meanwhile, the Metropolitan Passenger Coach might serve the purpose that you suggest. (*Reply to J. C. Dewing, London, N. 12, E. W. White, London, N. 1, L. Hamnett, Birmingham, and others*).

NEW COAL WAGON.—Your suggestion for a coal wagon with removable body, which may be lifted clear of the undercarriage by cranes when unloading, is very interesting, and will be borne in mind. (*Reply to E. L. Chapman and W. N. Shellshear, Toronto, N.S.W.*)

RAIL MOTOR TRAIN.—Your suggestion that a motor-train be formed by joining a Pullman Car and No. 1 Tank Loco together as a single unit would not be suitable for small radius rails. The question of lettering both types of Brake Vans L.M.S. and L.N.E.R. will be considered. (*Reply to G. F. Mellor, Dewsbury*).

"ISLAND" PLATFORMS.—We intend to introduce as soon as possible an "island" platform, which allows trains to draw up on either side, for passenger stations. Watch these pages for further announcements. (*Reply to Sidney Hunt, Grimsby, E. W. White, London, N.1, and R. Coverdale, Hornsea*).

SIGNALS FOR ELECTRIC TRAINS.—The suggestion of introducing special signals for the Hornby Electric Train will be considered later. (*Reply to E. R. Elliott, Burton-on-Trent*).

CATCH POINTS.—We do not like to think that the need of catch points in the Hornby system ever arises, Louis, for they are used, as you know, for derailing runaway trains, and there is always the risk that they might result in damage to Hornby rolling-stock that would be a little too realistic! (*Reply to L. Cisp, Wylde Green*).

OIL STATION LAMPS.—We do not think that the introduction of oil-burning standard lamps for illuminating the Hornby track and stations would be an improvement on our present electric lamps. (*Reply to A. F. Soar, Ticknall, Nr. Derby, and N. E. Pick, Strensall, Nr. York*).

SLIP-COACH ATTACHMENT.—Your suggested device for slip-coach working is interesting, and is receiving careful examination. (*Reply to J. Glennie, Minehead*).

MINIATURE PORTERS.—We do not think it advisable to introduce miniature porters and station hands to the Hornby system at present. (*Reply to G. Negus, Walthamstow*).

NEW LEVEL CROSSING.—We note your proposal for a level crossing for use with single track. We have had this suggested before, and we will look into its possibilities. (*Reply to C. Deacon, Norwich*).

BRAKE ON TURNTABLE.—Your suggestion that a brake should be fitted to the rail in the Turntable has been noted for further consideration. (*Reply to N. F. J. Ward, Berkhamsted*).

GOODS STATION.—We note your suggestion for a Hornby goods station. This accessory is already in preparation, and we hope to announce its availability in these columns in the near future. (*Reply to L. Anderson, Glasgow*).

ARTICULATED ROLLING-STOCK.—We do not consider there is sufficient demand for articulated rolling-stock. Its manufacture would present some difficulty and moreover, carriages built on these lines would not look well on small radius curves. (*Reply to K. Renault, Regents Park, N.*)

No. 1 Outfit Competition Results—

(*Continued from page* 194)

A 3½" Rod 9 and two 1" Pulleys represent a gun. A propeller is formed from two 2½" Strips clamped between 1" Pulley Wheels 10 secured to a 3½" Rod. The latter passes through the Double Bracket at the stern of the submarine, while its other end is journalled in the centre hole of a Flat Trunnion 11. This is secured in position by means of Angle Brackets bolted at top and bottom to the hull. The Double Angle Strip 12 is used merely as a rest on which to stand the model.

Overseas Competition Results—

(*Continued from page* 202)

9th Drawing Contest

First Prizes—Section A, E. HOLDER (Trinidad); Section B, F. J. KOOT (Rotterdam). Second Prizes—Section A, V. R. HEERAMANECK (Bombay); Section B, T. MACLACHLAN (Dunedin).

September Essay

First Prizes—Section A, L. MORRISBY (Tasmania); Section B, E. BOXILL (Port of Spain). Second Prizes—Section A, J. CLASSEN (Harrismith, O.F.S.); Section B, L. FISHER (Johannesburg).

19th Photographic Contest

First Prizes—Section A, J. GILLIES (Vancouver, B.C.); Section B, M. FALKOF (Johannesburg). Second Prizes—Section A, LEE EE NGEE (Singapore); Section B, F. G. HARPER (Christchurch, N.Z.)

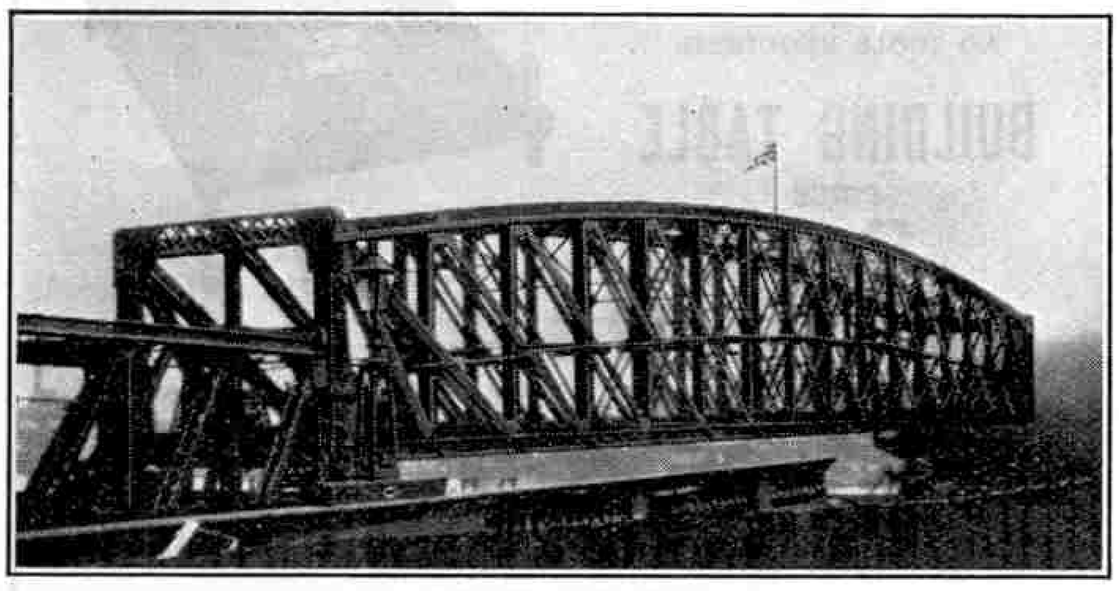
FIFTH SERIES:

Meccano Model-Building Contests

HOW TO QUALIFY FOR FURTHER SPLENDID PRIZES

The competitions announced below are the fifth pair of a series appearing in these pages each month. Every contest is complete in itself and separate prizes are offered for the best entries received in each. Subsequent competitions appearing in the Magazine will be arranged on similar lines, but the size of the Outfit involved in the "Outfit" contests, and the type of model required in the "Model" contests, will continually change. In this way we hope to extend the opportunity of competing to all our readers, whether they possess a No. 0 or a No. 7 Outfit. The results of the competitions will be announced in the "*Meccano Magazine*" two or three months from the date of the issue in which they appear.

In the February issue of the "*M.M.*" we announced the fourth pair of competitions of the series, in which some valuable prizes are offered. These two competitions do not close until the end of the present month, and form the subject of an announcement on page 195.



The centre span of the temporary Waterloo Bridge about to be lowered into position

"BRIDGE" COMPETITION
18 Cash Prizes

Entries in this competition will be divided into the following sections :

SECTION A, for competitors residing in the British Isles ;

SECTION B, for competitors residing outside the British Isles.

Competitors' ages will be taken into consideration when judging the entries.

Prizes will be awarded for the best entries FROM EACH SECTION as follows :—

FIRST PRIZE, £3-3s. ; SECOND PRIZE, £2-2s. ; THIRD PRIZE, £1-1s. ; SIX prizes of 10/6 each. Other competitors whose entries show outstanding merit will be presented with complimentary copies of "Meccano Standard Mechanisms," while in addition, a few special Certificates of Merit will be awarded at the judges' discretion.

Closing date for Section A, 31st May, 1926. Overseas Section, 31st August, 1926.

HOW TO ENTER. The subject chosen for this month's competition—Bridges—provides an interesting test of our reader's artistic ability. Amongst modern bridges are found some of the finest and most beautiful structures designed by man, and their principles of construction can be reproduced in Meccano with remarkable accuracy.

You may fashion your model from any type of bridge that you prefer, or with which you are most familiar. Cantilever, arch, girder or suspension bridges will be accepted under this heading, also transporter bridges, rolling, swing, draw- and lift-bridges, etc.

When completed, send in a photograph or good drawing of your model, together with any explanations that you think necessary, although the latter should be made as brief as possible.

You may use any Outfit or number of parts. The first prize in each section will be awarded to the competitor who builds the bridge that the judges decide to be the best model entered in that section, and the second and third prizes will be awarded to the second and third best models, and so on. It is wise to remember that very often the simplest and most straight-forward models are better than the most complicated structures.

IMPORTANT. The following instructions should be followed closely. Write your name and address on the back of each photograph or sheet of paper used, and state your age, name of the competition, and section in which your model is entered. Address the envelope : "Bridge Competition," Meccano Ltd., Binns Road, Liverpool.

Do not send models. A clear photograph or good drawing is all that is necessary. Photographs or drawings will be returned if desired, providing a stamped-addressed envelope of the necessary size is enclosed with the entry.

"NO. 4 OUTFIT" COMPETITION

This month we are offering prizes for the best models made entirely from a No. 4 Meccano Outfit. Models comprising parts that do not appear in this outfit will be disqualified. It is not necessary to use all the parts contained in the outfit.

Those boys who possess larger sets need not abstain from competing, for their entries are eligible providing only those parts which may be found in the No. 4 Outfit are used.

An interesting feature of the contest is the fact that all competitors will be using a similar number and variety of parts.

Entries will be divided into the following sections :—

SECTION A, for boys under 12.

SECTION B, for boys over 12 and under 16.

SECTION C, for boys residing overseas, and not exceeding 16 years of age.

Prizes will be awarded for the best entries FROM EACH SECTION as follows :

FIRST PRIZE : Meccano Goods to the value of £2-2s.

SECOND PRIZE : Meccano Goods to the value of £1-1s.

THIRD PRIZE : Meccano Goods to the value of 10/6.

Other competitors whose entries show outstanding merit will be presented with complimentary copies of "Meccano Standard Mechanisms," while, in addition, a few special Certificates of Merit will be awarded at the judges' discretion.

Closing dates for Sections A and B : 30th April, 1926. Overseas Section, 31st July, 1926.

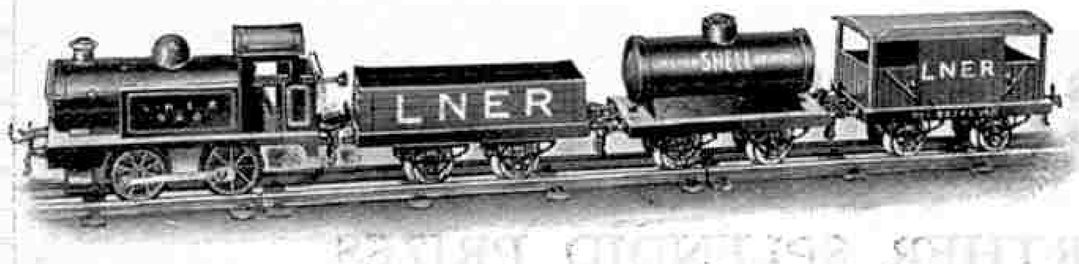
IMPORTANT. These instructions should be followed closely. Write your name and address on the back of each photograph or sheet of paper used, and state your age, name of the competition, and section in which your model is entered.

Address envelopes : "No. 4 Outfit Competition," Meccano Ltd., Binns Road, Liverpool.

Models should not be sent. A clear photograph or good drawing is all that is necessary. Photographs or drawings will be returned if desired, providing a stamped addressed envelope of the necessary size is enclosed with the entry.

Contents of No. 4 Outfit

12	of No.	1	4	of No.	18A	1	of No.	43	4	of No.	90
21	"	" 2	2	"	" 19	1	"	" 44	3	"	" 94
2	"	" 2A	1	"	" 19B	3	"	" 45	1	"	" 95
6	"	" 3	8	"	" 20	2	"	" 46	2	"	" 96
6	"	" 4	1	"	" 21	2	"	" 48	1	"	" 98
18	"	" 5	4	"	" 22	10	"	" 48A	4	"	" 99
2	"	" 6A	3	"	" 22A	6	"	" 48B	6	"	" 100
8	"	" 8	3	"	" 23	2	"	" 48D	2	"	" 103F
4	"	" 9	2	"	" 24	2	"	" 52	2	"	" 108
8	"	" 10	2	"	" 26	5	"	" 53	1	"	" 109
5	"	" 11	1	"	" 27A	3	"	" 54	3	"	" 111
22	"	" 12	1	"	" 28	1	"	" 56	2	"	" 115
4	"	" 12A	2	"	" 29	1	"	" 57	1	"	" 116
2	"	" 13	1	"	" 32	10	"	" 59	4	"	" 125
1	"	" 13A	2	"	" 34	4	"	" 61	4	"	" 126A
3	"	" 14	18	"	" 35	2	"	" 62	2	"	" 130
4	"	" 15	1	"	" 36	6	"	" 63	1	"	" 134
5	"	" 15A	130	"	" 37	1	"	" 65	1	"	" 147
5	"	" 16	24	"	" 38	2	"	" 77	1	"	" 148
5	"	" 17	4	"	" 40	1	"	" 80A			



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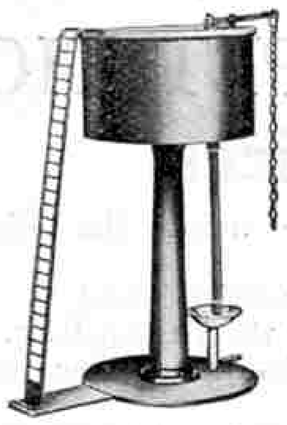

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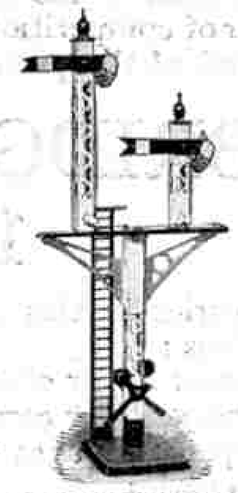

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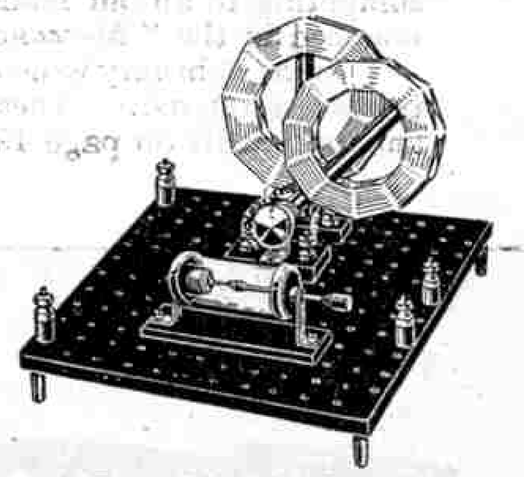

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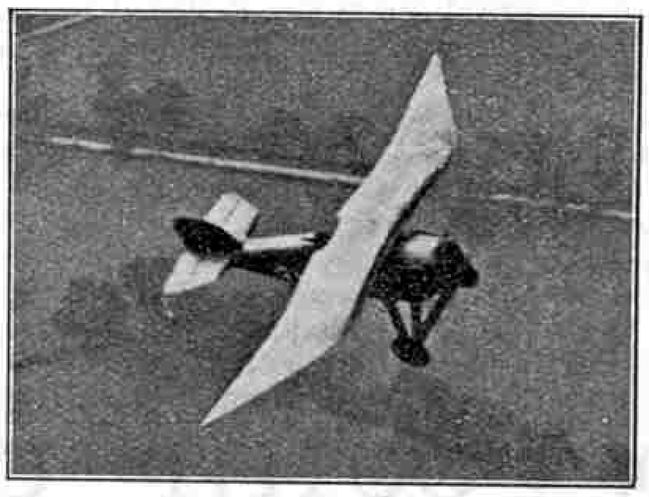

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March Puzzle Competition

DURING the past few weeks several competitors have written asking how a decision is made between two puzzle competition entries that have an equal number of correct results. It is certainly an interesting point and one to which I devoted considerable thought before coming to a decision. During the past few months the necessity for such discrimination has arisen on one occasion only.

The problem resolves itself into a question of which of the entries observes the rules of the competition more closely. That point settled, the prize is awarded to the entry that complies the more fully with the rules. For example, if two entries give the same number of correct solutions and both are written on one side of the paper, preference is given to that written the more neatly. Neatness indicates that care has been taken in preparing the entry and justifies the preference.

The question of neatness is one to which all competitors would be well advised to pay special attention. Even competition judges are human and a neatly prepared entry makes the checking of the answer, or the reading of the essay, a much more simple task. Fortunately the majority of our readers do pay a certain amount of attention to the matter—one or two boys I am certain, spend long hours in making up their puzzle entries—but still more can be done. Let us put it this way. There are no untidy entries but some are neater than others!

While we are dealing with this point, I would like to raise another, not solely connected with this page but relating to competitions generally. A boy wrote to me in a state of great indignation, demanding how it was that his name was not in the prize list. I had announced that no completely accurate solution had been received, but he asserted that his was correct. I was so struck by the boy's self-assurance that I looked up the whole of the entries for that competition and, among a number of entries rejected by my assistants for non-compliance with the rules, I found that there was one completely accurate answer. But the name and address of the competitor was not on the back of the entry. That boy lost a guinea simply by neglect, for the rules distinctly stated that the competitor's name and address must appear on the back of each sheet of paper used.

There are no special features about this month's set of puzzles and so I will leave you to them with the reminder that the usual four prizes of £1-1s., 15/–, 10/6 and 5/– will be awarded to the four best sets of solutions received. The closing date will be March 31st, and there will not be an Overseas Section.

For the benefit of new readers we repeat the puzzle competition rules:—(1) Entries must be written on one side of the paper only and (2) the entrant's name and address must appear on each sheet of paper used.

In previous years I have carried on the Puzzles Page throughout the year, but this year I intend to discontinue the page after this month until the autumn. The reason for this is that various special summer features are to be introduced and something has to be sacrificed to make room for them. This page appeared to be the one that could be spared most easily, and therefore it will temporarily disappear.

Puzzle No. 183

The names of well known books are to be filled into the spaces indicated by dots in the following paragraph; each dot indicates a letter.

"····· had ····· ····· of introducing ····· ····· in England, because he said, "··'· ····· ····· ·· ····," and because he knew that ····· was even possible in the ···· ·· ····· ····. Once, while on tour in ···· ····· he met ···· ···· who said to him "··· ····· ? ··· ····· ··· ···· ·· ··· ····· ····· is near." Cæsar answered, "I am to go ····· ··· ··· to ····· ··· ····· and I will ····· ···· ····· in ··· ·····, after which I will have a ···· ····· ·····. Again I'll pick the ···· ·· ···· whence I departed ··· ····· ···." "Well" answered ··· "but first visit ··· ····· ·· ·····, ··· ····· ····· and if you need anything call at the ··· ····· ····. There nobody will make ···· ··· ····· ····· and you will have all ·· ··· ···· ··." "Thank's," muttered Cæsar, "···'· ···· ···· ····."

* * * *

Puzzle No. 184.

There is a well-known proverb hidden in the following passage, every word of the proverb being hidden consecutively.

"When at last it chased one of the boys into a nearby hut, I merely tried to save some of the others who, even in eluding the angry bull, attempted to help their comrade."

* * * *

Puzzle No. 185.

A man had three sons and one day, while on his way home from business, he purchased for them 21 small packages. Seven were full of Hornby rails, seven half full and seven empty. He said that his sons could have these excellent rails provided that they were able to divide them between themselves so that each had the same number of rails and the same number of boxes. How did the boys get the rails without transferring any from one box to another?

* * * *

Puzzle No. 186.

In a garden was a greenhouse, in the greenhouse was a brownhouse, and in the brownhouse was a whitehouse, and in the whitehouse was a heart. What was it?

* * * *

Puzzle No. 187.

What Meccano parts are indicated by the following definitions.

(a) To educate, and that which connects.
(b) A domestic quadruped, and to seize.
(c) A coarse file, and a circle.
(d) An insect, and an old instrument of torture.
(e) A musical pipe, and to ensnare.
(f) The front, and wrought gold or silver.
(g) Thin or broken clouds, and to expose.
(h) To twist, and one who drives.
(i) To observe narrowly, and literary or artistic composition.
(j) A source, to cut off.
(k) A slant, and tackle.
(l) To telegraph, and an extended stroke.

Answers to Last Month's Puzzles

No. 177. The following are the solutions of the five problems in this puzzle:—(1) Train 22 in. long. (2) 39 seconds. (3) 24 strips. (4) 20 strips. (5) 8 trucks and 5 vans.

* * * *

No. 178. To rearrange the coins, place a finger on each of the second and fourth coins of the bottom row (heads) and with one movement draw them from the bottom row and move round to a position immediately above the second and fourth coins in the top row (tails). Then without stopping but by firm pressure, the second and fourth rows are pushed down to allow the two heads to take up their position in the top row. The effect of this is to push the second and fourth coins in each row into the row below.

* * * *

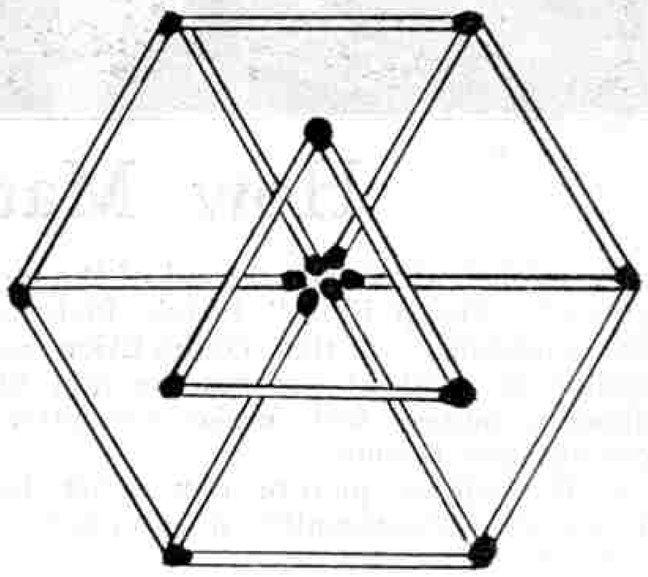
No. 179. "I don't like it," said the man in the black tie. "The rite we have just witnessed is interesting, but if we inter a man we retain a certain power of investigation, and there will be a reaction against cremation when the importance of this is realised."

* * * *

No. 180. The sentence is as follows: "To be tenacious in the midst of trifles is the mark of a mean understanding."

* * * *

No. 181. The matches are arranged as follows:—



No. 182. A blacksmith.

January Answers

No. 169. Cap, nap, gap, sap, lap.

* * * *

No. 170. 30 cases, each containing 532 oranges.

* * * *

No. 171. Shooting Star (G.W.R.); Highland Chief (L.N.E.R.); Flying Scotsman (L.N.E.R.); Clan Campbell (L.M.S.); Saint Bartholomew (G.W.R.); Pendennis Castle (G.W.R.); King Arthur (S.R.); Precursor (L.M.S.); Gooch (G.W.R.); Knight of the Golden Fleece (G.W.R.)

* * * *

No. 172. The number of the engine was 88. 8+8=16 (trucks). 8×8=64 (wheels).

* * * *

No. 173. There were 22 birds and 14 beasts.

* * * *

No. 174. Madeley, Taunton, Camelford, Choppington, Brighton, Dover and Whatstandwell.

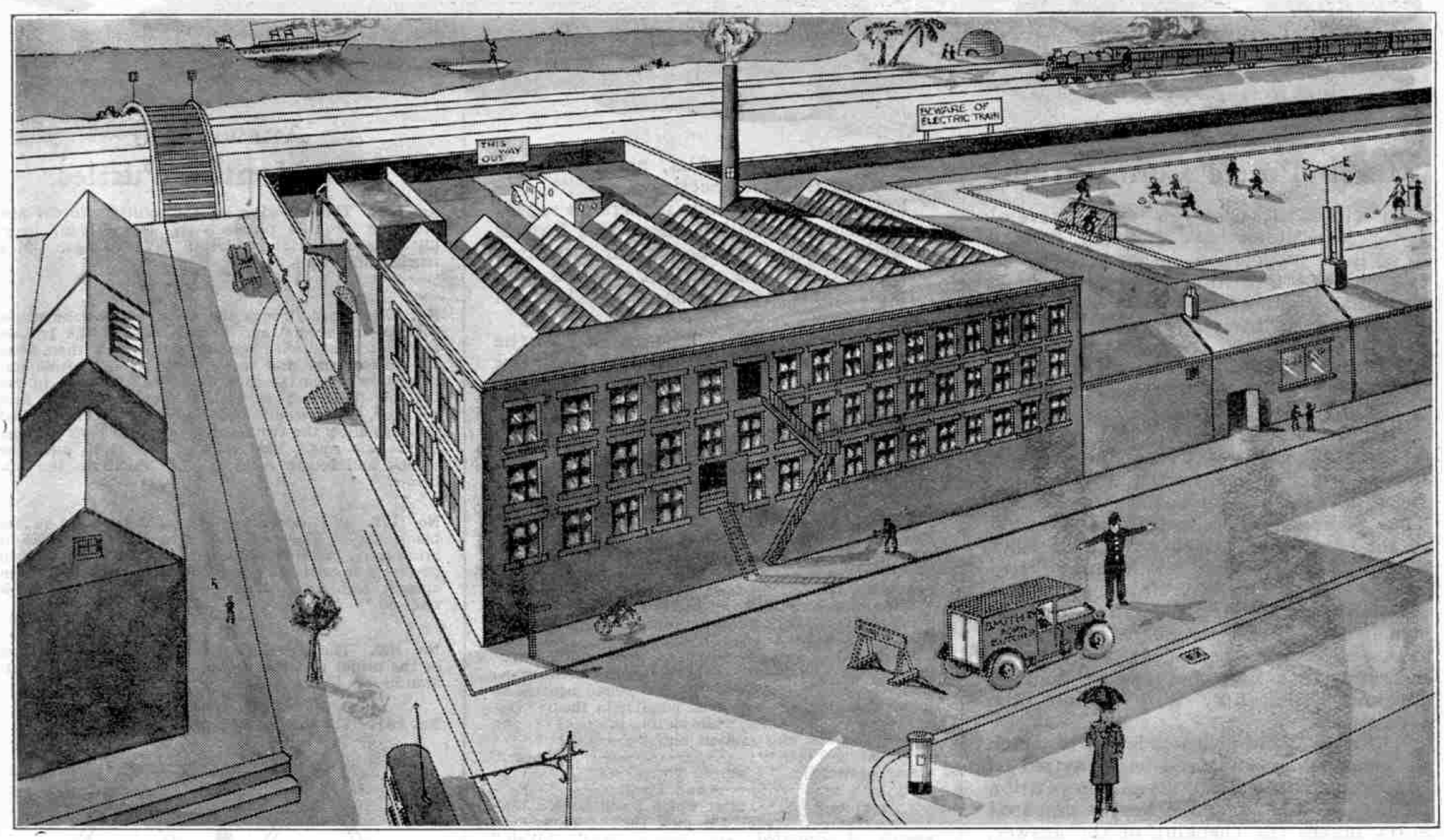
* * * *

No. 175. The ages were respectively 27 and 14.

* * * *

No. 176. The gifts cost £9 19s. 0d. The gentleman originally had £19 18s. 0d.

Competition Page



How Many Errors Has Our Artist Made?

We publish above the second of the new series of "Sharp Eyes" Puzzle Pictures. The conditions of this competition are familiar to most of our readers and the following notes will make everything clear to new readers.

In the above picture our artist has introduced intentionally a number of errors, and the task of competitors consists in finding and making a list of these mistakes. Competitors' lists should be written on one side of the paper only and at the foot of the list the total number of errors found should be noted. The description of the mistakes should be kept as short as possible.

Four prizes of Meccano or Hornby Train goods (to be selected by the winner) to the value of £1-1s., 15/–, 10/6 and 5/– respectively will be awarded in order of merit to the four competitors who send in the longest lists of genuine errors.

Closing date, 31st March. Overseas, 31st July.

24th Photographic Contest

This month our subject will be "AN INDOOR PHOTOGRAPH TAKEN BY ARTIFICIAL LIGHT." The photograph may be taken by any kind of artificial light and the subject may be a portrait, or "still-life" of any description.

There will be the usual two sections, A and B, for those over and under 16 respectively, and prizes of Photographic materials or Meccano or Hornby Train goods to be chosen by the winners to the value of 15/– and 7/6 respectively will be awarded to the best and second best entries in each section.

Closing date 31st March. Overseas, 31st July.

March Essay Competition

Every Meccano boy at some time or other has spent half an hour on a Railway Station Platform waiting perhaps for the arrival of a friend. Such a half-hour is crammed full of delightful incident for those who love railways and have eyes to see. If the station is of any size there is something of interest happening all the time and occasionally as a crowning joy one comes across a friendly driver who is proud of his loco and delighted to explain all its workings.

In this competition all that is necessary is to write a brief account of such a half-hour and the prizes will be awarded to the essays that are of greatest railway interest rather than to less interesting ones that may be perhaps more skilfully written.

Essays should not exceed 500 words, and must be written on one side of the paper only. The competitor's name and address must appear on each sheet of paper. There will be two sections, A and B, the former for those over 16, the latter for those under, and the first and second prizes in each section will consist of Meccano or Hornby Train goods to the value of £1/1s. and 10/6 respectively.

Closing date, 31st March. Overseas, 31st July.

Results

22nd Photographic Contest

This competition on Table Top Photography proved of great interest. Many of the competitors displayed ingenuity and imagination and evidently had spent considerable time in preparing their layouts. One of the best photographs submitted depicted a cross-Channel steamer foundering off the Kentish coast, the line of which is marked by bold cliffs. The representation of a raging sea was extremely good.

Awards :—First Prizes—Section A, N. W. HARRISON (Burton-on-Trent); Section B, G. S. ABLEWHITE (Ilford). Second Prizes—Section A, A. FAYRE (Birmingham); Section B, L. TOWNLEY (Swansea).

January Puzzles

1, K. KING (Derby); 2, I. G. WATKINS (Cardiff); 3, I. HOGG (Kendal); 4, P. SIMONS (London, S.E.3).

12th Drawing Contest:

The Guild Secretary is usually a genial sort of fellow, but we fear that quite a large number of our artist readers would do well to give him a wide berth until he has had time to forget this competition! During the past few weeks we have studied him from many angles, but really we cannot discover just why nearly half the entries depicted him as a particularly disreputable old gentleman, much given to throwing ink blobs around his sanctum! A good proportion of the drawings were really humorous and a few—very few!—were flattering. Time is a great healer, however, and we hope the "G.S." will smile again!

Awards :—First Prizes—Section A, A. G. GLENN (Ipswich); Section B, P. WALBOURN (Bishops Stortford). Second Prizes—Section A, N. EDGAR (Blaydon-on-Tyne); Section B, H. DAVIS (Bristol).

"Limericks"

The entry for this competition was extremely large. Many of the Limericks submitted were "old favourites" and were sent in by several competitors, but a considerable proportion were undoubtedly original and clever. Many boys struggled to include the word Meccano at the end of a line but practically all were in difficulties with their rhymes.

Awards :—First Prize, G. S. MARSH (Blackpool); Second, J. C. THORNE (Maidstone); Third, H. W. DYER (Exeter); Fourth, J. A. BLYTH (York).

(*Continued on page* 198)

The Secretary's Notes

In January I published a list of Special Merit Medallions awarded during 1925. This list is far too short, comparatively few clubs being represented. I should like all club Leaders to encourage their members to compete for the Special Merit Medallions, for these are well worth winning, and the effort to win them invariably has a marked effect in increasing enthusiasm throughout the club. Two of these Medallions are allotted to each club every session—one for the member who reads the best paper during the session, and the other to the member who performs the best all-round work for the club during the session. These Medallions are awarded on the recommendation of club Leaders, and they provide Leaders with a suitable means of rewarding and encouraging good service among members. During the present year I shall hope to have the pleasure of awarding a greatly increased number of these handsome Medallions. It should not be forgotten that Special Merit Medallions may be awarded to members of the Guild who are not members of a club, but who carry out some kind of work of value towards increasing the strength and influence of the Guild.

Special Merit Medallions

During the past few months the Guild Correspondence Club membership has increased by leaps and bounds and the club is now in a highly flourishing condition. A few of the more recently joined members have expressed some impatience at not being placed immediately in communication with correspondents in the countries they desired. I wish to point out that in many cases the delay is due entirely to the exacting nature of the requirements of these members. Some demand correspondents in such parts of the world as Siam, Tibet, Alaska and the Fiji Islands, and it is quite obvious that these parts of the world are not exactly crowded with members of the Meccano Guild ! Other members select more reasonable regions but insist that their correspondents must be interested in certain uncommon hobbies. In all such cases delay is inevitable. The situation would be made very much easier for the headquarters' staff, and much more satisfactory to members of the Correspondence Club, if each member, when filling up his application form with the name of the country where he most desires a correspondent, would also name one or two other countries as alternatives, at the same time giving alternative hobbies in which he is interested. Whenever this is done there is comparatively little difficulty in providing a member with a correspondent within a very short time. His special requirements are not lost sight of, however, and at the first opportunity he is placed in communication with a boy in the country he most desires.

Correspondence Club

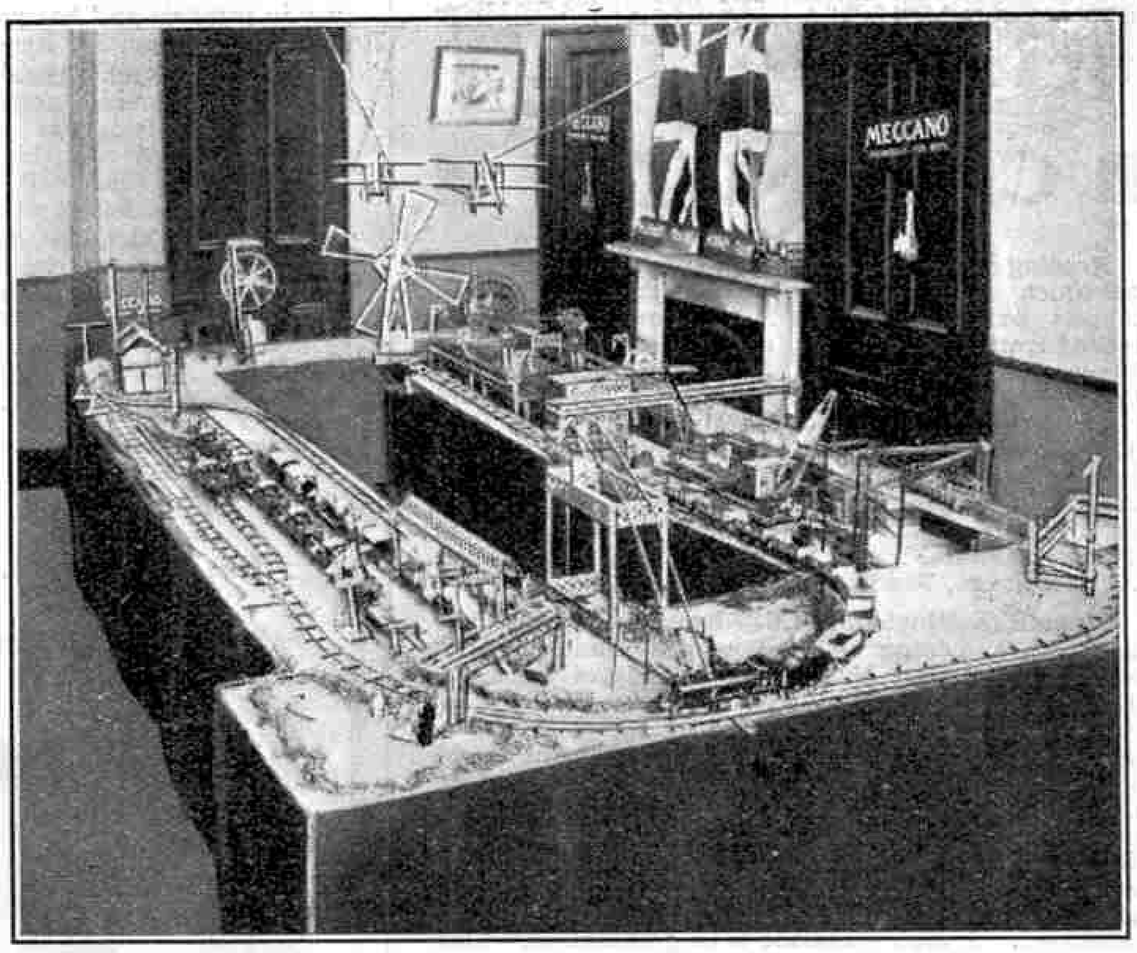
Before leaving the subject of the Correspondence Club I want to remind Overseas members of the Guild that I have on my lists the names of large numbers of English boys who are very anxious to be placed in communication with Overseas boys, particularly those living in Canada, South Africa, Australia and New Zealand. I feel sure that if the possibilities of the Correspondence Club were more fully realised by Overseas members I should have little difficulty in fixing up all these English boys with congenial correspondents. At present I am unable to do this, and therefore I hope that the Leaders and secretaries of all Overseas clubs will do their utmost to encourage all their Guild members to become members also of the Correspondence Club, which is undoubtedly the most splendid organisation of its kind in the world.

To Overseas Members

When the Meccano Guild was first instituted its membership was entirely confined to boys, and at that time I did not think it likely that such an organisation would appeal to girls. Presently various keen Meccano girls began to feel that they had as much right as their brothers to be members of the Guild and they wrote to ask me if they were eligible for membership. In each case I replied that girls were not only eligible but extremely welcome, and up to the end of 1924 the numbers of girl members increased slowly but steadily. Early last year, however, rapid developments commenced. The rate of enrolment of girl members began to increase surprisingly and that increase lasted throughout 1925 and still continues. Up to the present girl members have been supplied with the ordinary type of badge, but in response to widespread requests I have now had a new badge made in the form of a gilt safety pin to which the little triangular badge is securely fixed. This new brooch badge is attractive in appearance and is strong and durable. In future every girl recruit to the Guild will be supplied with this badge, the price of which will be the same as for the old badge, namely, 7d. for home members and 1/– for overseas members, post free, in each case.

The Brooch Badge

A Splendid Layout

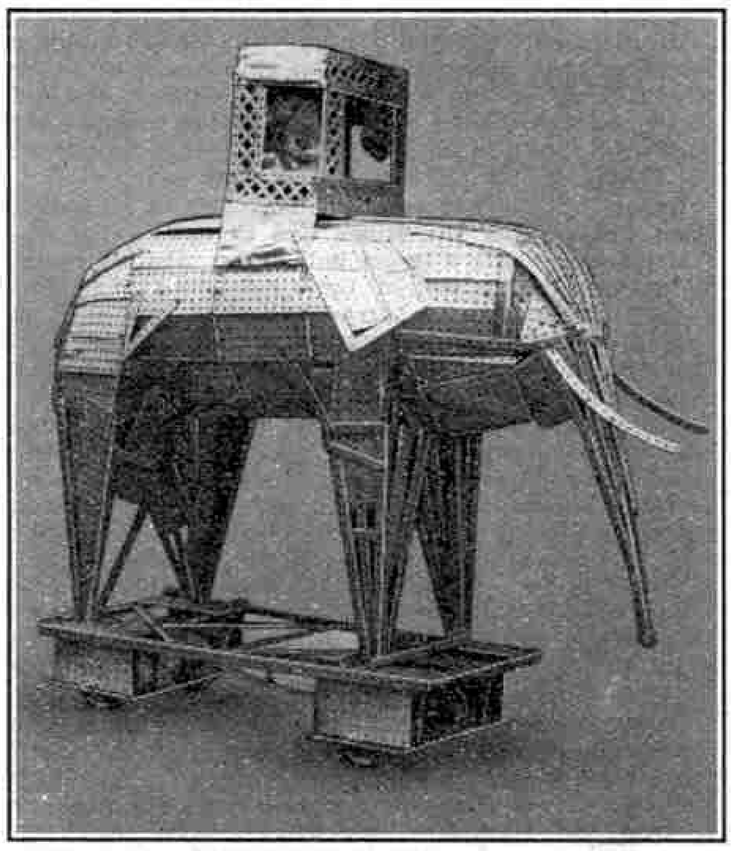


Our photograph shows a section of the Hornby Train layout at a recent Exhibition organised by the Ilfracombe Meccano Club.

On this occasion visitors were requested to inspect the models and then to write on a slip of paper the name of the one they considered to be the best. The slips were collected and prizes awarded in accordance with the general order of voting. Over 400 patrons were present, and a stall of goods was contributed by the townspeople. This helped greatly to swell the proceeds, which realised the sum of £6 13s. 9d.

The great success of this exhibition reflects the utmost credit upon the Leader, Mr. J. Knill, and the secretary, W. Webber, and the members are to be congratulated upon an excellent example of the organisation and enthusiastic "team-work" without which no exhibition can succeed.

A Meccano Elephant!



This interesting and realistic model of an elephant was built by the members of the enterprising Exeter Meccano Club and it has aroused great local interest.

CLUB NOTES

Reading M.C.—Has held a very successful Exhibition at which about 100 people were present. The 50 Models exhibited included a Transporter Bridge loaned from Headquarters, and a Motor Chassis, Big Wheel, High-Speed Drill, Speed Indicator, Gantry Crane, Search-Light and Battleship. A Hornby Train layout provided an additional attraction. The Rev. J. T. Munford, M.A., who takes a keen and practical interest in the club, presided and delivered a splendid address. The proceeds of the Exhibition will be used to provide equipment for the newly-formed Football Team. Club roll: 43. *Secretary*: F. G. M. Wheeler, 72, Pell Street, Reading.

Pinxton (Nottingham) M.C.—Recent activities have included a Lecture on "London's Underground" and an address on Magnetism, a study of the Eiffel Tower model, a Musical Evening and a Mock Trial. At a successful "Meccano Fair" recently held a special room was devoted to the Steam Engine model loaned from Headquarters and this aroused keen interest. A Lantern Lecture on "Beautiful Manx-land" was subsequently given. The success of this Exhibition was so pronounced that the club has been asked to give Exhibitions and Concerts at local churches, and the play "Nonsense Nana" is being rehearsed. A club Magazine is in preparation. Club roll: 40. *Secretary*: Harold Elliott, 150, Wharf Road, Pinxton, Nottingham.

South Park (Ilford) M.C.—The syllabus includes Meccano Model-building, Wireless Construction, Fret-work and the study of Electrical Apparatus. Recent Lectures have dealt with "Lives of Engineers" and "Lives of Inventors." Two Lantern Lectures on "The Secrets of Fleet Street" and "Legend-Land on the Great Western" proved particularly interesting. Club roll: 30. *Secretary*: S. R. Steele, 20, Ripley Road, Seven Kings, Ilford.

Pudsey and District M.C.—Has just been affiliated and members are full of enthusiasm. Recent events included a discourse on the works of Charles Dickens, a visit to the local Gas Works and a small Model-building Contest. Enjoyable Musical Evenings also have been held. Club roll: 18. *Secretary*: F. Young, "The Nursery," Hough Side, Pudsey.

Royal Grammar School (High Wycombe) M.C.—An interesting lecture was given by the Head Prefect on "The History of the Postage Stamp." The lecturer exhibited various specimens from his fine collection including one stamp valued at £80. The Leader, Mr. G. A. Grant, gave a very instructive address on the "Making of Lantern Slides." Club roll: 57. *Secretary*: H. R. Foden, "Taviuni," Copthall Lane, Chalfont St. Peter, Bucks.

Christ Church (Stratford, E.15) M.C.—The great feature of the recent successful Exhibition was a railway layout on a raised platform. Several trains were kept running at the same time and as each passed through a tunnel and temporarily disappeared from view, the loco was wound up and sent off again by the members in charge of the layout, who were screened off by a curtain. Several fine engine models were on view and also an Aerial Rope Railway complete with lights and a station at each end. The Leader, the Rev. R. J. Kelsey, B.A., has generously presented five Fretwork Saw Frames, a Zulu Tank Loco and a Model Dynamo. Club roll: 40. *Secretary*: R. H. Bentley, 81, Abbey Lane, Stratford, London, E.15.

Rosyth M.C.—In view of the excellent progress already made it is very unfortunate that this club is likely to be disbanded. The Royal Dockyard is closing down and in consequence many families will be transferred to southern dockyards. Members are continuing meetings to the last, however, and all are ambitious to form new clubs in the various towns to which they will be moved. *Secretary*: E. J. Hunter, 79, Admiralty Road, Rosyth, Fife.

Newcastle-on-Tyne M.C.—Model-building Competitions, Games and short Lectures by members are features of meetings. The club Library has grown and is a popular feature. Fretwork and Model Railway sections report good progress and a fine Meccano model of the new Tyne Bridge constructed by members has been shown at the Exhibition of the Newcastle Society of Experimental and Model Engineers, of which the Leader of the club, Mr. Gilbey, is Founder and Secretary. Club roll: 50. *Secretary*: Harry Levin, 3, Windsor Street, Walsend-on-Tyne.

Edinburgh Castle (London, E.3) M.C.—Has made good progress since affiliation. The syllabus includes Model Building, Competitions of various kinds, Lectures, Socials, Games and Physical Exercises. A large workshop model was loaned from Headquarters to provide an additional attraction for an Exhibition. Club roll: 27. *Secretary*: Ernest Weedon, 173, Turners Road, Burdett Road, London, E.

Beverley Road (Bolton) M.C.—Has held a successful Exhibition of Models in conjunction with the Young Peoples' Guild at the local church. The Exhibition attracted a great deal of attention and won great praise for the members. A Recruiting Campaign is now in progress and has proved successful. *Secretary*: Hubert Henshaw, 35, Kendal Road, Bolton, Lancs.

Chalmers Ch rch (Alloa) M.C.—Model-building and Games are the chief activities on club nights. The Leader, Mr. Mein, has presented the club with a Bagatelle Board and this gift is highly appreciated by members. Club roll: 66. *Secretary*: William Henderson, 13, Paton Street, Alloa.

Combe St. Nicholas (Somerset) M.C.—The main feature of meetings continues to be Model-building and on a recent evening models were operated by a vertical steam engine. Games also are regularly enjoyed. The membership has increased. Club roll: 13. *Secretary*: John Canever, Combe Head, Combe St. Nicholas, Chard, Somerset.

Meccano Club Leaders

No. 25. Mr. J. D. Carey, B.A.

Mr. J. D. Carey, B.A., is Leader of the Stationers' School (London) Meccano Club, one of the most flourishing and efficient of our many School Clubs. Commencing with a small membership, the club was affiliated with the Guild towards the close of 1920, and since that time under Mr. Carey's enthusiastic and capable guidance it has made consistent progress.

The club makes a special feature of visits to the places of interest with which London abounds, and it possesses a library that promises to be very useful to members.

Recognition must be made of the splendid encouragement given to the club by its President, Major J. Huck, M.A., O.B.E., Headmaster of the Stationers' School.

Ilfracombe M.C.—Many interesting Model-building Evenings have been held. An Exhibition held in the school room of the Congregational Church realised £6 13s. 9d. A stall of goods given by the townspeople helped to swell the funds. Club roll: 41. *Secretary*: H. Thorp, 6, The Strand, Ilfracombe.

Bures M.C.—The new Leader, Mr. A. Bunker, Chief Engineer of the Bures Gas Company, has obtained for the club a larger and better meeting room. Members recently visited the Chelmsford M.C. and a joint excursion was arranged which included a tour of inspection of Messrs. Cromptons Electrical Works. *Secretary*: J. Deaves, Radio House, The Croft, Bures, Suffolk.

Haslingden Secondary School M.C.—The school laboratory is used for club headquarters and the membership grows steadily. Lectures have been delivered by Mr. G. D. Arnold on the "Reciprocating Steam Engine," by Mr. J. E. Shepherd on "Electricity and its Applications," and by Mr. F. Addlesee, B.Sc., on "Wireless Telegraphy." Model-building and Games are also included in the syllabus and a recent Draughts Competition was keenly contested. Club roll: 24. *Secretary*: Kenneth Tupling, 16, Alexandria Terrace, Haslingden, Manchester.

Collegiate Schools M.C.—A recent excursion to the Cosmos Lamp Works proved very interesting and was thoroughly enjoyed by members. The club's Exhibition was successful and was well attended by parents and friends of members. As a result an increase in membership is anticipated. Club roll: 32. *Secretary*: W. Wright, 14, Derwent Road, Palmers Green, London, N.13.

Wyggeston Boys' M.C.—In addition to having Wyggeston Grammar School Museum as headquarters, members have access to the Gymnasium, where games are enjoyed after meetings. The Headmaster of the school has entered enthusiastically into the scheme and has consented to become President of the club. Club roll: 41. *Leader*: Mr. G. F. Reynolds, Wyggeston Grammar School for Boys, Victoria Road, Leicester.

Richmond (Surrey) M.C.—Has been deprived of the use of the club room for several weeks and meetings have necessarily been suspended. Satisfactory accommodation has been obtained, however, for the club's Concert and Exhibition, a report of which will be published later. Club roll: 36. *Secretary*: A. R. White, 15, Albert Road, Richmond, Surrey.

Castle Douglas M.C.—The Leader, Mr. Thomson, recently gave a demonstration of how lead soldiers are made, and this was greatly enjoyed by the members. Mrs. Murray entertained the club to dinner, and they spent the evening in playing games. Everyone had a thoroughly good time. Club roll: 20. *Secretary*: R. Haugh, 26a, King Street, Castle Douglas.

Holy Trinity (Blackburn) M.C.—A Model Fairground has been held, and working models constructed by the members were exhibited. Mr. Hulme, the Leader, delivered an interesting lecture on "Model Steam Engines." The Football Team has done well but R. Smalley recently sustained a serious injury. He has the sympathy of his colleagues and of all at Headquarters. *Secretary*: T. Donald, 6, Camden Street, Blackburn.

Victoria (Glasgow) M.C.—A club Library is the latest addition and is proving very popular, every member contributing books. A "Dutch Parliament" was held recently with great success. This is conducted in a similar manner to the popular "Hat Night" featured by many clubs. Preparations for an Exhibition include the introduction of a Jazz Band. Club roll: 48. *Secretary*: Robert White, 22, George Street, Scotstoun, Glasgow.

Maryfield (Dundee) M.C.—An interesting lecture on Bridges has been delivered by the President, Mr. Dickson, and the Meccano Suspension Bridge model, loaned from Headquarters, was used for purposes of demonstration. A good Lecture on the "Working of a Steam Engine" was delivered by Mr. Pryde. A Social for members only was organised at the opening of the new session. Club roll: 25. *Secretary*: Stanley Smith, 14, Maryfield Terrace, Dundee.

Ruthin School M.C.—Excellent progress is being made and a play is being rehearsed by members to be given at the term end. Weekly meetings are well attended. *Secretary*: J. Butcher, Ruthin School, Ruthin, N. Wales.

Louth M.C.—An interesting Lecture on Electricity was recently given by D. Ingleton, with experiments. Model-building and Games have been features of club night, but most of the attention has been devoted to preparation for a great "Model Fairground," to which every member contributed a model. Club roll: 15. *Secretary*: H. Bell, 10, Dyas Terrace, Charles Street, Louth.

Redruth M.C.—A temporary cessation of activities has been necessary owing to a slight difference of opinion that deprived the members of a club-room. Enthusiasm has in no way abated, however, and the Leader, Mr. Williams, is hopeful of recommencing activities very shortly. *Secretary*: L. Trenberth, Tunnel Stores, Redruth, Cornwall.

Sandwich M.C.—Is making excellent progress and meetings are well attended. Non-members have been present at several meetings and a further increase in the membership is anticipated. Club roll: 17. *Secretary*: W. Barlow, 9, Paradise Row, Sandwich, Kent.

Blackpool M.C.—Mr. Slingsby recently delivered an interesting talk on "The Manufacture of Large Gear Wheels." An interesting debate on "Are Meccano Clubs for Education or Sport" was held last month, also a Mock Court, and a Lecture on "Model Railways." The secretary gave a lecture on "The Largest Gold-field in the World." The club roll has been increased by nine members during the past month. Club roll: 33. *Secretary*: Maurice Naylor, "Dalesford," St. Annes Road, Blackpool.

St. Mary Bourne M.C.—The membership is steadily increasing owing to continued and strenuous recruiting. A Social was held to which each member brought a friend and the Stoke Dance Band was in attendance. Outdoor activities for the summer months include a visit to Reading, a Camp, and Club Sports. Club roll: 21. *Secretary*: Douglas L. White, "Rosedale," Stoke, nr. Andover, Hants.

Clubs not yet Affiliated

Cardiff M.C.—Is making excellent progress, and it is hoped to obtain an adult Leader shortly. A visit was paid to the "*South Wales News and Echo*" works and was thoroughly enjoyed. Mr. Duncan, a director of the company, generously entertained the boys to tea afterwards. The Power Station has since been visited and other excursions are being arranged. *Secretary*: Geoffrey E. F. Hall, 28, Newfoundland Road, Gabalfa, Cardiff.

Paisley M.C.—A recruiting campaign is in progress by means of which it is hoped to effect a substantial increase in the membership. Mr. W. Sharp has been appointed correspondence clerk and general assistant to the Leader. *Secretary*: William Robertson, 1, Kerr Street, Paisley.

Rhos-on-Sea M.C.—Commenced the session with an "Indoor Sports" meeting, held at the house of one of the members. Small prizes were awarded. The members have formed two sections called respectively "Nuts" and "Bolts." A Club Magazine has been introduced and is a very promising little journal. It is hoped shortly to enlist the services of an adult Leader, and an Exhibition of Models will then be organised. *Secretary*: George E. Mellor, Bradda, Allanson Road, Rhos-on-Sea, Colwyn Bay.

Eastham M.C.—Meetings are held every Wednesday evening. The membership is small but it is hoped that there will be a substantial increase during the next few months. Meccano boys in the locality are invited to communicate with Fred Taylor, School Lane, Eastham.

Bristol M.C.—Model-building and Games are in full swing and it is hoped to introduce Philately. An adult Leader has not yet been obtained, but persevering efforts are being made. Club roll: 11. *Secretary*: G. Davis, 45, Arlington Road, St. Annes Park, Bristol.

Perran-ar-Worthal and District M.C.—Every effort is being made to obtain a Leader, and to secure affiliation. Intending members should write to the *Secretary*: F. R. Evans, "Penhenver," Perranwell Station, S.O., Cornwall.

Caulfield (Australia) M.C.—Meetings are well attended. A "Night Paper Chase" held recently proved thoroughly exciting, and outings have been arranged to the Museum, the Zoo and to the Bush. A No. 4 Outfit has been purchased for use in the club room. Club roll: 20. *Secretary*: Neil Brown, 89, Eskdale Road, Caulfield, Australia.

Hege (Denmark) M.C.—A new Meccano Club in Denmark should interest Meccano boys living reasonably near to Vagan Jansen, of Museumsgaarden, Hege, Denmark. Meetings are held every Monday and Thursday, and new members are assured of a hearty welcome.

Takapuna (Auckland, N.Z.) M.C.—Is progressing excellently. Model-building Competitions are being enthusiastically contested. It is hoped that affiliation will soon be possible. *Secretary*: George Henwood, "Fernbank," Takapuna, Auckland, N.Z.

Dunedin Central (New Zealand) M.C.—Model-building forms the main feature of a very good syllabus. Walks and Excursions are arranged for the summer months and an experimental "Contractors' Night" is arranged. A Debate has been held and when the last report was sent to Headquarters members were busily engaged in a general Recruiting Campaign. Club roll: 10. *Secretary*: Norman Davis, 276, High Street, Dunedin, N.Z.

Embee (Preston) M.C.—Is now divided into two sections, and meetings are held on Tuesdays and Fridays. At the commencement of the present session two No. 2 Meccano Outfits were purchased out of the funds for club use. As club Presidents, Messrs. Merigold Brothers take a keen interest in the club, and lend the club-room. The Leader, Mr. Bibby, is expected to apply for affiliation shortly. *Secretary*: Jack R. Drysdale, "Ellerslie," Talbott Road, Penwortham, Preston.

Teignmouth M.C.—As a result of the enterprise of an ex-member of the Exeter Meccano club, and the kind assistance and support of Mr. Hodder, Leader of Exeter M.C., a very promising little club has been formed at Teignmouth. Mr. Hodder and some of his boys were entertained recently at the new club-room, and until an adult Leader is obtained the affairs of the club will be governed from Exeter. Club roll: 9. *Secretary*: A. L. Radford, 17, Bank Street, Teignmouth, Devon.

Seestu (Paisley) M.C.—Excellent progress is being made, and a general Recruiting Campaign is in progress, by means of which it is hoped that a further increase in membership will be effected. *Secretary*: W. Robertson, 1, Kerr Street, Paisley.

Trinidad M.C.—Is now flourishing under an adult Leader, Mr. Henry Molineaux. The club motto is "Nothing Without Labour." To increase the finances of the club a "Progress Fund" has been inaugurated. Under this scheme members make voluntary donations at intervals to improve the financial condition of the club. A very interesting syllabus includes Lectures, Debates, Excursions, Special Model-building and Puzzles evenings.

Greenock Academy M.C.—A progressive club has been established, membership being confined to the younger boys of the school, who hold meetings every Wednesday. Models are brought to the Club-room and divided into three classes. Each member is then awarded so many marks, and prizes are awarded at the end of each session. Regular attendance is taken into consideration in the awarding of prizes, and every model of outstanding merit is subjected to general discussion by the whole club.

Harrogate and District M.C.—Mr. C. Crausaz, of 30, Lowther Arcade, Harrogate, has formed a very good club in the district, and boys interested will receive a hearty welcome. There is a Treasurer and a Committee of three, and a very satisfactory club-room has been obtained. Club roll: 6. *Secretary*: J. Spellman, 36, Victoria Avenue, Harrogate.

East Hove M.C.—Is slowly growing, but additional members are required, and any boys interested in the project should write to the *Secretary*, G. R. Webb, 7, Glendale Road, Hove, Sussex.

Southport M.C.—The two sections are each presided over by a sub-Leader, appointed by the *Leader*, Mr. Bowker. Application for affiliation is shortly to be made. Fretwork continues to be a popular feature. Club roll: 15. *Secretary*: E. Williamson, 10, Delamere Road, Ainsdale.

A Brotherhood of Boys

Why You Should Join the Meccano Guild

The really happy boys throughout the world to-day are those who have a hobby in which they take an enthusiastic and lasting interest, and the happiest of all are Meccano boys, for theirs is the greatest of all hobbies. When a boy takes up a hobby, whatever it may be, he feels a great desire to meet other boys having interests similar to his own, and to compare notes and talk things over with them. This is particularly the case with Meccano. No Meccano boy is content to "play a lone hand" for long. He very soon wants to meet other Meccano boys, to see their models and to show them his own, and to discuss plans and schemes for other and bigger models.

How the Guild Began

It is more than 20 years since Meccano began to take its place as the greatest of all hobbies, and even in those early days Meccano boys were forming themselves into little clubs and societies. These organisations steadily increased in strength and numbers but by degrees they began to realise that they were suffering from a very serious defect—they were isolated, each doing good work in its own little sphere, but knowing nothing of what other similar organisations were doing.

Presently we at Meccano Headquarters began to receive letters asking us to set up some form of central organisation to which all the individual clubs and societies might look for guidance and which would weld them all into one great body. Day by day these letters increased in number, and we realised that the desire for a central organisation was genuine and widespread. We were only too willing to do all that we could in the matter but, realising the immense responsibility and the enormous amount of work involved in taking such a step, we delayed action until we felt that we had the means and facilities for carrying out the task successfully. By 1919 we felt that we were in a position to tackle the job and in that year the Meccano Guild came into existence.

It is important to remember that the idea of a Guild did not originate at Meccano Headquarters. The Meccano Guild was organised solely as the result of urgent representations from boys all over the world. They, as Meccano boys, felt the need of attaining unity by means of such an organisation and we at Headquarters felt it our duty to do everything we could to satisfy the demand.

An Unique Brotherhood

So the Meccano Guild, the most remarkable brotherhood of boys in the world, came into being in the year 1919, with Mr. Frank Hornby, the inventor of Meccano, as its president. The announcement of its birth was received with the utmost enthusiasm throughout the great army of Meccano boys of all nations, and applications for membership began to come in immediately in large numbers. Since that time the membership of the Guild has grown enormously, and a special feature of its growth has been its steadiness, year in and year out.

Objects of the Guild

The three objects of the Guild, set forth in the form of application for membership, are as follows:—

(1) To make every boy's life brighter and happier.

(2) To foster clean-mindedness, truthfulness, ambition and initiative in boys.

(3) To encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.

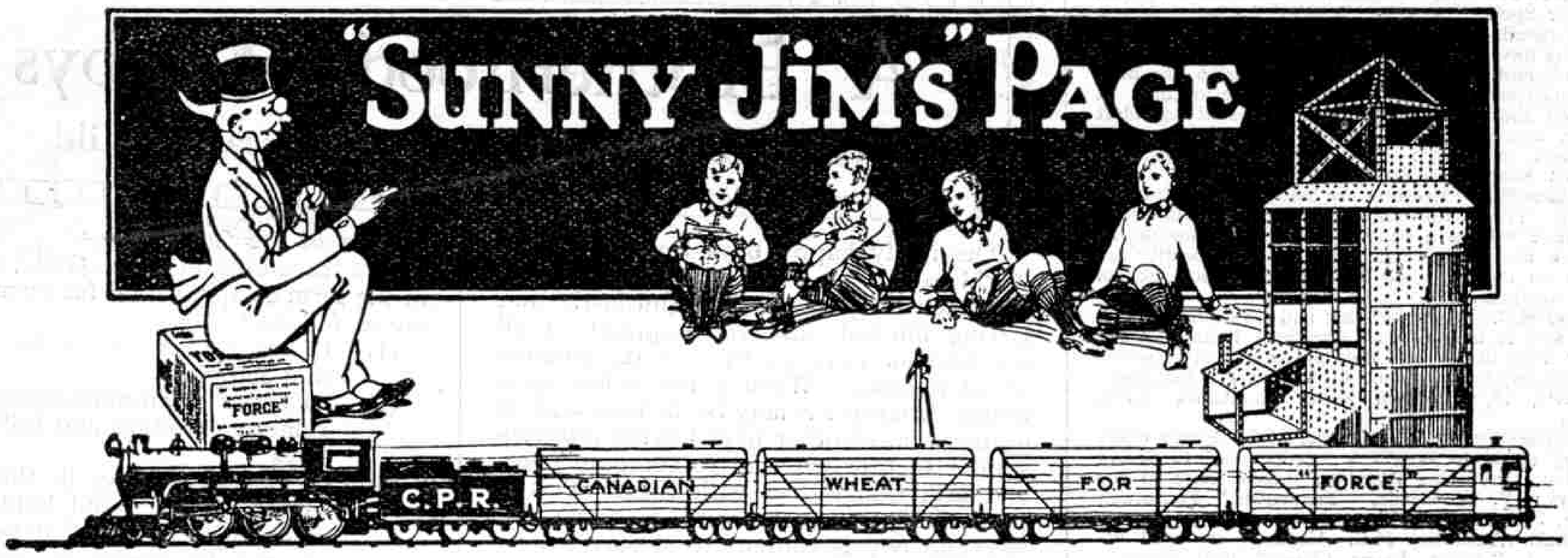
In order to join the Meccano Guild it is necessary for the form of application to be filled up, signed and witnessed. This form is then sent to the Secretary with a remittance to pay for a badge. The applicant is then duly enrolled as a member of the Guild and his badge and membership certificate are sent to him. The neat little triangular badge—its three corners representing the three objects of the Guild—and the handsome certificate are always received with enthusiasm. Most members have their certificates framed and hung in their own rooms, where they can always see them. The price of the Guild badge is 7d., or 1/– if sent overseas.

The Correspondence Club

Although the Guild was originated for the benefit of Meccano Clubs it includes to-day a very large number of "lone" members. In many cases these members live far away from a Meccano Club and sometimes far away from any other Meccano boy. It is a great joy to such members to have someone to write to who is really interested in the Meccano hobby, and it was the realisation of this fact that led to the inauguration of a Guild Correspondence Club. Through the medium of the Correspondence Club boys living in the remotest parts of the world are placed in touch with other boys of their own age and of similar interests. In most cases correspondence is carried on regularly, and results in the formation of firm friendships, although the boys may be living hundreds or even thousands of miles apart. Boys who have become acquainted through the Correspondence Club have even visited one another, each spending a happy holiday as a welcome guest in the home of the other.

The "*Meccano Magazine*" is the official organ of the Guild, and each month two or three pages are devoted to Guild matters. The progress of the various clubs all over the world is reported briefly and photographs are published of Leaders, and secretaries and club groups. Thus, by means of the "*Meccano Magazine*," each club is kept acquainted with the progress of all other clubs.

Every Meccano boy should be a member of the Guild. As soon as he receives his badge and certificate of membership he has the right of entry into the innermost circles of Meccanoland. His pleasure in his hobby is increased enormously and he has the keen satisfaction of knowing that, instead of being an isolated unit, he belongs to a great brotherhood of boys with members in every country in the world.



SUNNY JIM'S FORCEDRAUGHTS

How would you like to have a novelty Draughtboard ?

The board shown in the picture is quite easy to obtain, yet with it you will be able to enjoy many an exciting game with your friends.

"Have a game of Draughts ?" you will say.

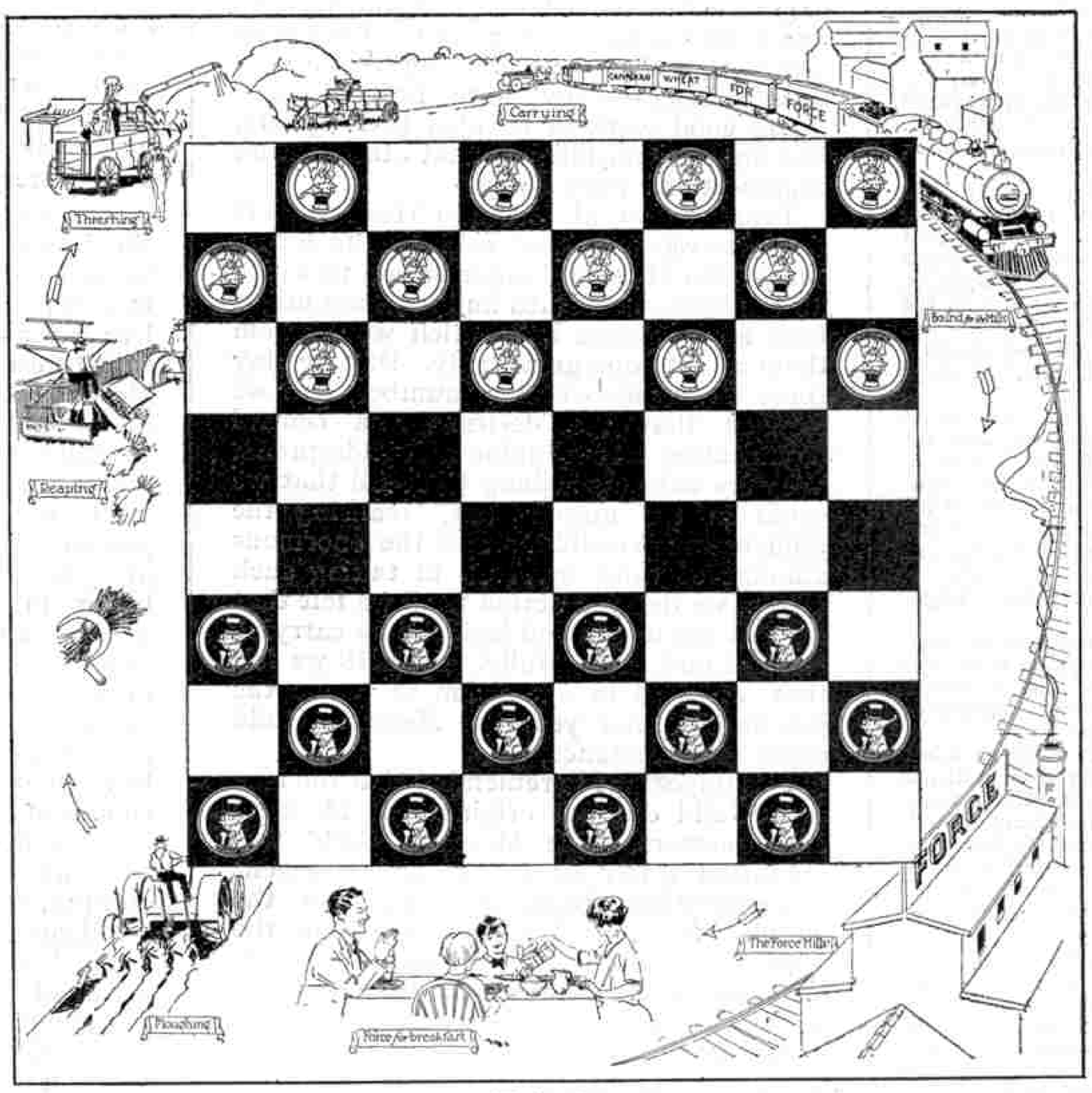
"Right oh," replies your friend.

You then produce your new Sunny Jim Draughtboard.

Watch your friend's expression of amazement when he sees that each of the draughtsmen bears in colours the familiar smiling face of yours truly "Sunny Jim."

On one side the "men" have a blue background. On the other side they have a white background. Blue plays white. Let us set them out.

While your friend helps you to do this you will notice that his looks plainly indicate that he envies you your new set. The board is not an ordinary board. The squares on it are brown and yellow, while round the outside are scenes from the Canadian Wheat Harvest.



15 inches

There is the plough tearing its way through the rich soil, the reaper and binder rattling through acres of standing wheat. Further on we see the threshing machine at work extracting the golden grain and shooting out chaff and straw on to a heap, the size of which shows the prodigious amount of work these giant machines perform during the course of a day.

Round the top of the draughtboard is a picture of the sacked wheat being carried to the elevators where it is stored preparatory to being loaded on to the train which we see steaming round the right hand side of the board, bound for the "FORCE" mills in Ayr, Ontario, Canada.

Finally we have the scene at the breakfast table where the family is enjoying the delicious toasted flakes of crisp malted "FORCE" whole wheat.

The board is 15 inches square. The reduced illustration here is to show you what it looks like. When you receive your set, the "men" will be ready stamped out and printed in colours, but the draughtboard has purposely been left for you to colour in any way you wish. Remember to get the idea of the golden wheat. Elevators are usually red. The "FORCE" factory is grey.

Of course you won't forget to tell your friend how you obtained the board, so that he can get a board too if he likes. If your friend has never tried "FORCE" tell him how nice it is with fruit and how good with milk. Hot milk for cold mornings, cold milk when the weather gets warmer.

Have you sampled Holforce Biscuits yet ? The special offer in last month's "Meccano Magazine" is still open, so if you have not yet taken advantage of it, *do so now.*

Sunny Jim

HOW TO GET THE SUNNY JIM DRAUGHTS SET

Buy six penny stamps from the post office, attach them to the top from a "Force" packet, post to—

Sunny Jim,
197, Gt. Portland St.,
London, W.1,

together with your own name and address and the complete set of "Forcedraughts" will be sent you post free by return.

Fireside Fun

A DIZZY DISCOURSE!

A maid from the country obtained employment at the house of a wealthy man. She was greatly puzzled by a big "D" that was painted on the side of the dustbin, and finally she screwed up courage to ask the footman about it.

"Damsel," replied the footman in a haughty tone, "the 'D' on the dustbin denotes that the despairing domestics of this detached domicile desire that the dutiful dustmen, during their daily diversions, will dislodge, deftly and deliberately, the dust and dirt deposited in that dreadful dustbin."

* * *

Small girl; "Please can you tell me the time?"

Small boy: "I can't tell you exactly, but I know it is not four o'clock yet."

Small girl: "Are you quite sure?"

Small boy: "Quite, I have to be home by four o'clock, and I'm not home yet."

* * *

At a certain works there was a man who continually arrived late. One morning, to the utter astonishment of the foreman, he arrived before anybody else.

"Well," said the foreman, "you were all behind before but now you are first at last!"

* * * *

OBVIOUSLY!

Old Gentleman: "Have you lived here all your life?"

Jackie: "Not yet!"

* * * *

Visitor (to hospital attendant): "Can I see Mr. Murphy?"

Hospital Attendant: "Yes, he is convalescing now."

Visitor: "Well, if that won't take more than a quarter of an hour I'll wait."

* * * *

Q. What crosses the street with the least sound?

A. A shadow.

This Month's Short Story

There was a young girl in the choir
Whose voice rose higher and higher,
Till one Sunday night
It went quite out of sight
And they found it next day on the spire!

* * * *

Professor: "What is the quickest way to produce sawdust?"

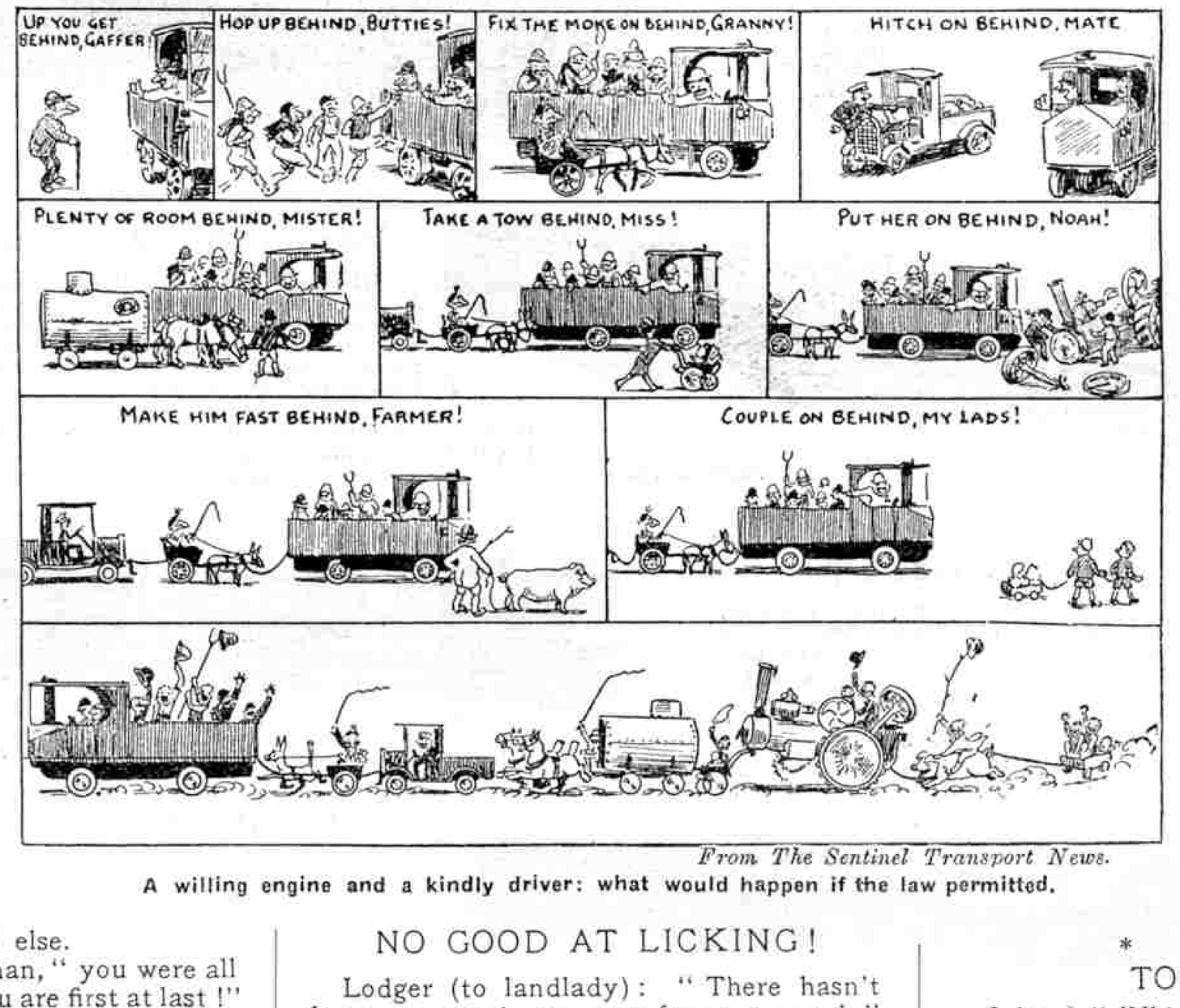
Nervous Student: "Why—er—er—"

Professor: "Come, my lad, use your head!"

* * * *

Employer: "Now, Pat, I'm giving you this pig for a Christmas present."

Pat (joyfully): "Faith, it's just like ye sorr!"



From The Sentinel Transport News.

A willing engine and a kindly driver: what would happen if the law permitted.

NO GOOD AT LICKING!

Lodger (to landlady): "There hasn't been any soap in my room for over a week."

Landlady: "Well, you've a tongue in your head, sir."

Lodger: "Yes, but I'm not a cat!"

* * * *

Growing boy: "Father, my bed is too short for me."

Father: "It would be alright if you didn't sleep so long."

* * * *

Nervous Old Lady (to tramp): "If I give you a piece of pudding, you won't come back, will you?"

Tramp: "Well, lady, you should know your own pudding!"

SOME LOOK!

An Englishman was showing an American round his estate. Coming to a giant tree he said proudly: "Well, Sam, that tree will take some beating, even in America."

"Rubbish," replied Sam. "In America the trees are so tall that it takes two men to see the top of them. One looks upward till he gets tired and then the second one commences where the first left off!" * * * *

Q. What has a tongue but cannot speak?

A. A boot.

* * * *

Teacher: "Can any boy give me a sentence containing the words defence, defeat and detail?"

Smart Boy: "When a dog jumps over de fence, de feet go over before de tail!"

* * *

She: "You remind me of an aeroplane."

He: "Because I fly so high?"

She: "No, because you are no use on earth!"

* * *

Joe: "Have you ever noticed that an ignorant person is often a very loud talker?"

Jim: "Yes. Don't shout at me."

* * *

Farmer (in outfitter's shop): "How much are these collars?"

Assistant: "Two for half-a-crown."

Farmer: "How much will one cost?"

Assistant: "Eighteenpence."

Farmer: "Then I'll take the other one."

* * * *

TOO TRUE!

John: "Which kind of candle burns longer, a wax one or a tallow one?"

James: "A wax candle I should think."

John: "You're wrong, both kinds of candles burn shorter!"

* * * *

Q. What relation is the door-mat to the scraper?

A. A step-father.

* * * *

Actor: "I'm going to have my name stamped on 10,000 tooth picks."

Friend: "What on earth for"

Actor: "So that my name shall be in everybody's mouth!"

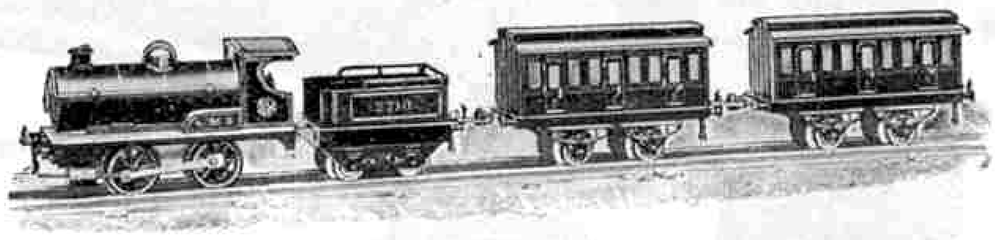
HORNBY CLOCKWORK TRAINS

BRITISH AND GUARANTEED

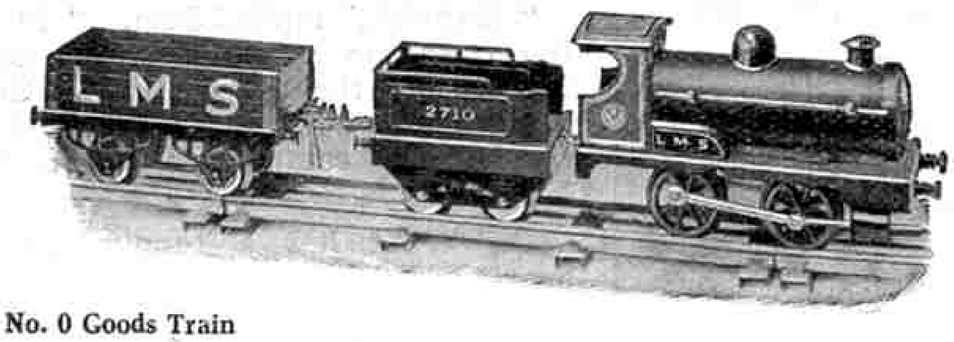
Hornby No. 1 Passenger Set

The set comprises Loco, Tender, two Passenger Coaches, and Rails to form a circle 2 ft. in diameter (including one Brake Rail, by means of which the train may be stopped from the track) and two Straight Rails. The Loco is equipped with reversing gear, brake and governor; the doors of the coaches open. In colours to represent L.M.S., G.W. or L.N.E.R. rolling stock. Gauge 0. Price, complete in strong box, **27/6.**

HORNBY No. 1 GOODS SET. This set is similar to the No. 1 Passenger Train but contains one Wagon in place of Passenger Coaches. Price, complete in strong box, **21/–.**



No. 1 Passenger Train



No. 0 Goods Train

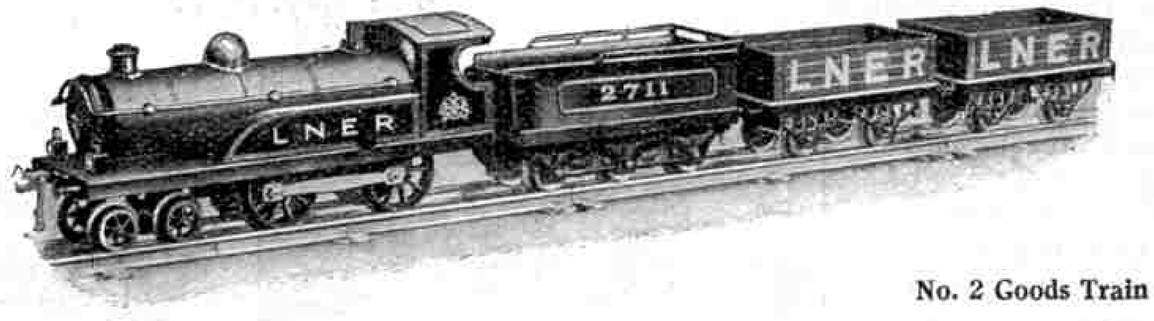
Hornby No. 0 Goods Set

Each set contains Loco, Tender, and one Wagon, with Curved Rails to form a circle 2 ft. in diameter and two Straight Rails. One of the Curved Rails carries a brake, by means of which the train may be stopped from the track. The Loco is fitted with brake and governor; non-reversing. Gauge 0, in colours to represent L.M.S., G.W. or L.N.E.R. rolling stock. Price, complete in strong box, **17/6.**

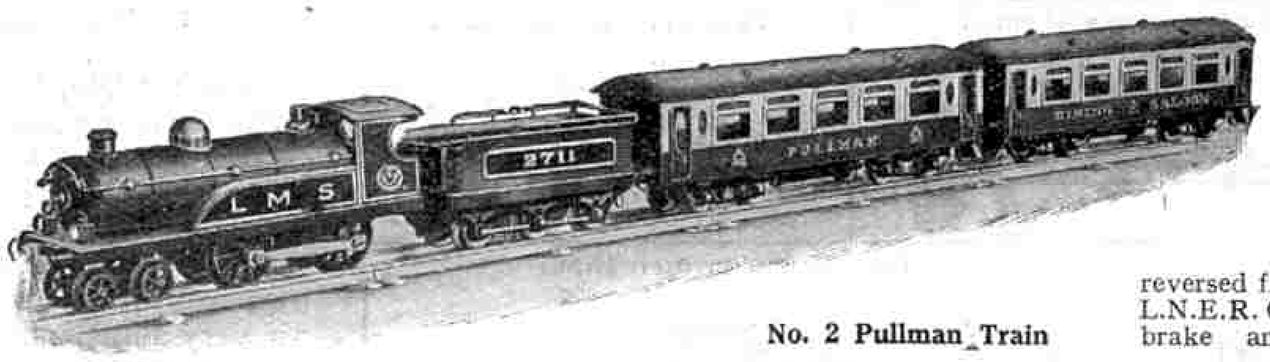
HORNBY No. 0 PASSENGER SET. This set is similar to the No. 0 Goods Train but contains two Passenger Coaches in place of the Wagon. Price, complete in strong box, **24/–.**

Hornby No. 2 Goods Set

The Loco, Tender and Rails of this set are similar to those in the No. 2 Pullman, but two Wagons take the place of the Coaches. As in all other No. 2 Hornby Trains, the Loco may be both braked or reversed from the track. The Loco and Tender are enamelled in black only, and lettered L.M.S., G.W. or L.N.E.R. Gauge 0. Price, complete in strong box, **37/6.**



No. 2 Goods Train



No. 2 Pullman Train

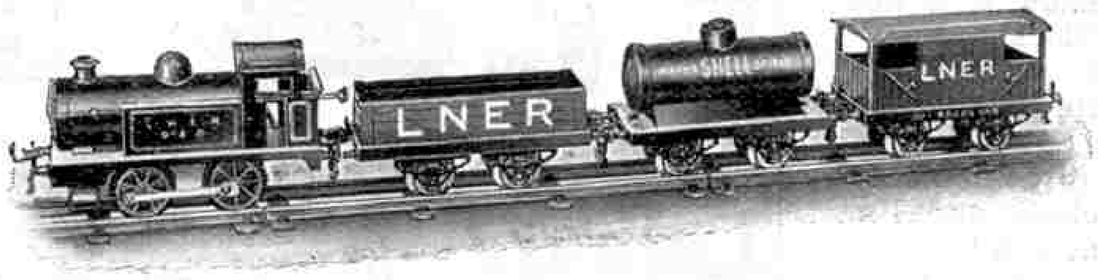
Hornby No. 2 Pullman Set

The Loco with Tender in this set measures 17 in. in length. A superior mechanism has been adopted, making it the most attractive and satisfactory clockwork train yet produced. The Coaches are beautiful both in colour and finish. Each Set includes Loco, Tender, and two Pullman Coaches, with Set of Rails to form a circle 4 ft. in diameter. The rails include one Brake Rail by means of which the train may be both braked and reversed from the track. In colours to represent the L.M.S., G.W. or L.N.E.R. Companies' rolling stock. The Loco is fitted with reversing gear, brake and governor. Gauge 0. Price, complete in strong box, **60/–.**

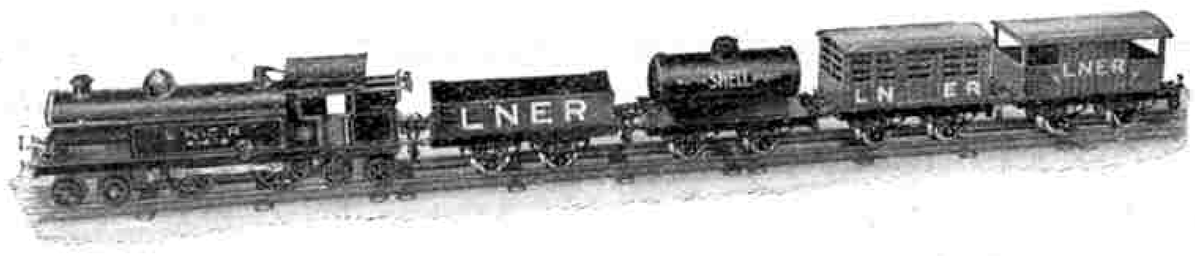
Hornby No. 1 Tank Goods Set

This set contains a No. 1 Hornby Tank Loco, Hornby Wagon, Petrol Tank Wagon, Brake Van and set of Rails to form a circle 2 ft. in diameter, and two Straight Rails. The Loco is fitted with brake, which may be operated by a lever in the cab or from the track, reversing gear and governor. Gauge 0.

In colours to represent the L.M.S., G.W. or L.N.E. Railway rolling stock. Price, complete in strong box, **25/–.**



No. 1 Tank Goods Train



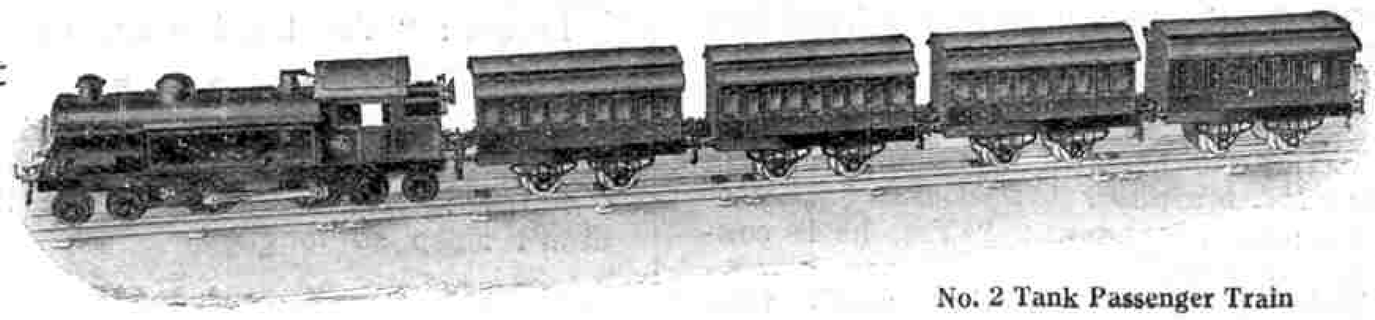
No. 2 Tank Goods Train

Hornby No. 2 Tank Goods Set

The rolling stock of this realistic goods train consists of a No. 2 Tank Loco, Hornby Wagon, Petrol Tank Wagon, No. 1 Cattle Truck, and Brake Van. The Loco may be braked and reversed from the track—which forms a circle 4 ft. in diameter—or from levers in the cab. The No. 2 Hornby Tank Loco is 11½ in. in length and is fitted with leading and trailing four-wheeled bogies. Gauge 0, in colours to represent the L.M.S., G.W. or L.N.E. Railway Companies' rolling stock. Price, complete in strong box, **45/–.**

Hornby No. 2 Tank Passenger Set

This set contains a No. 2 Hornby Tank Loco, three Passenger Coaches, Guard's Van, and set of Rails to form a circle 4 ft. in diameter. One of the Rails is fitted with levers by means of which the Loco may be both braked and reversed from the track. Gauge 0, in colours to represent the L.M.S., G.W. or L.N.E. Railway Companies' rolling stock. Price, complete in strong box, **45/–.**



No. 2 Tank Passenger Train

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JAEGER
Pure Wool

The New "Meccano" Jersey

This Jaeger "Meccano" Jersey is made in the special "Meccano" pattern. It wears splendidly and prevents 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, happiness and appearance of children.

22″	24″	26″	28″	30″ Chest
7/–	7/9	8/6	9/3	10/–

Colours :—Navy body with Light and Dark Saxe dice effect.
Mid Grey body with Black and White ,,
Fawn body with Brown and Saxe ,,
Brown body with Fawn and Red ,,
Saxe body with Navy and Dark Saxe ,,
French Grey body with Lt. and Dk. Saxe ,,

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*).

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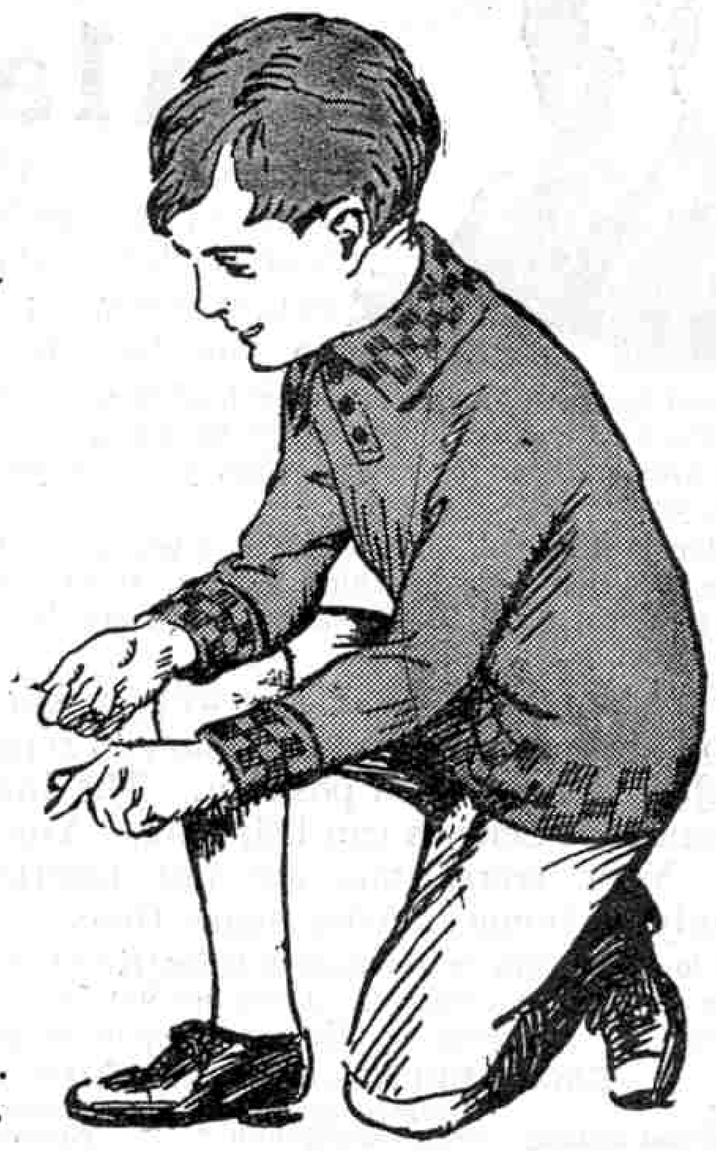
BRANCHES : AUSTRALIA—Melbourne, 325, Flinders Lane. Sydney, 38/44, York Street.
CANADA—Montreal, 1187, Bleury Street.



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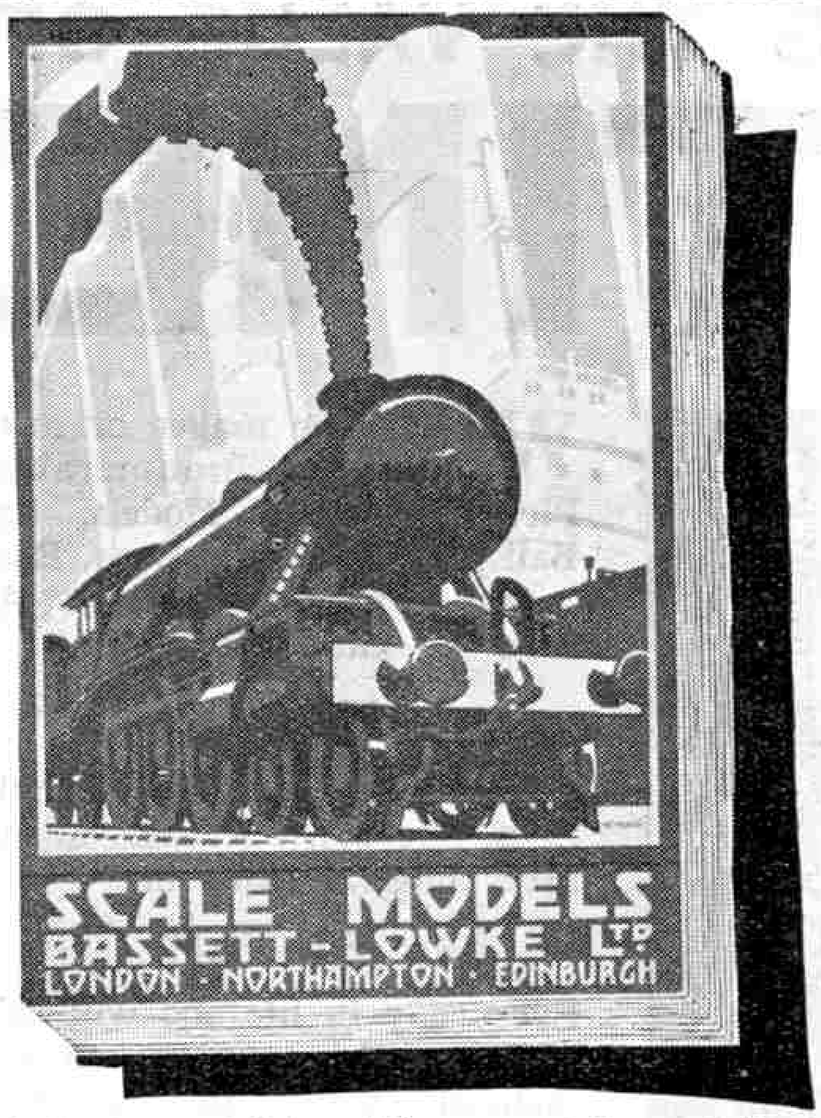

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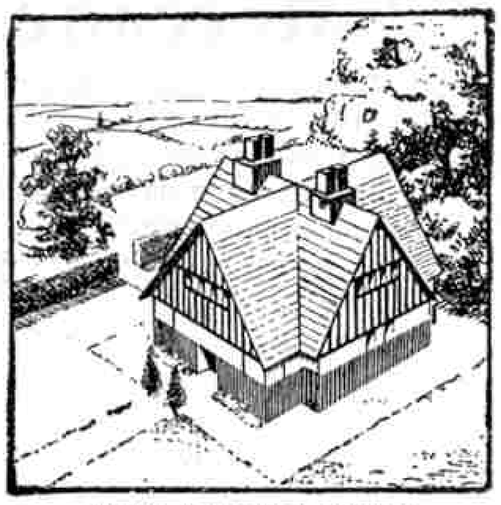

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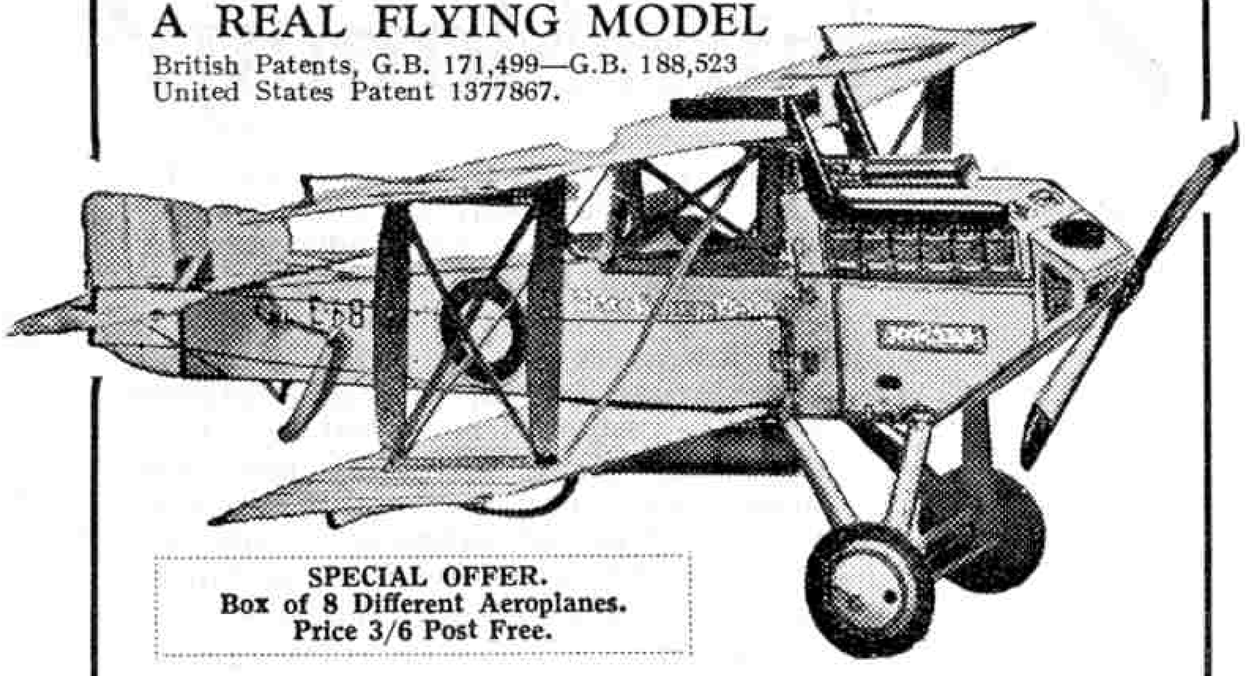

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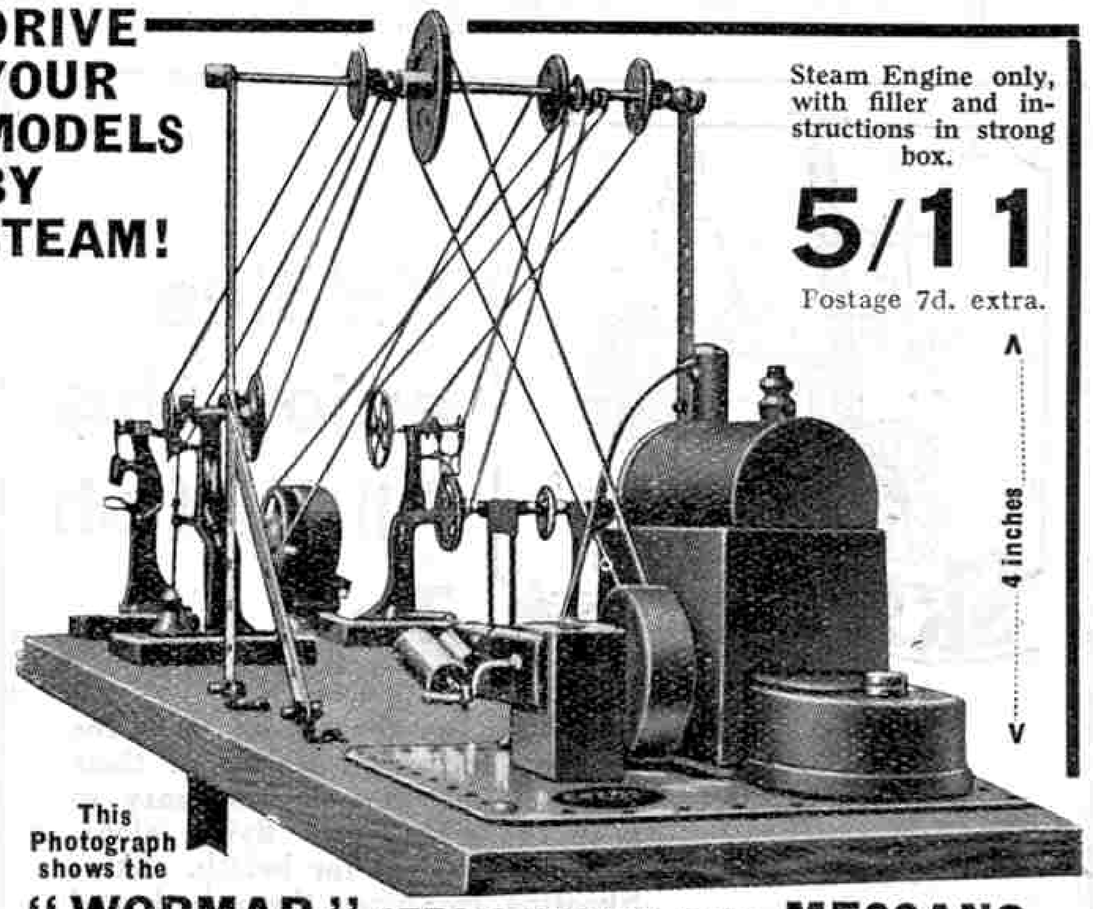

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By removing 4 screws it can be transferred to your Meccano Crane, Dredger, or other model, and being drilled with standard Meccano holes (by kind permission of Messrs. Meccano Ltd.), can be built in as an actual part of the model.

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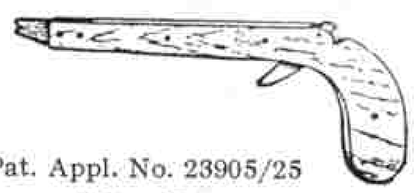

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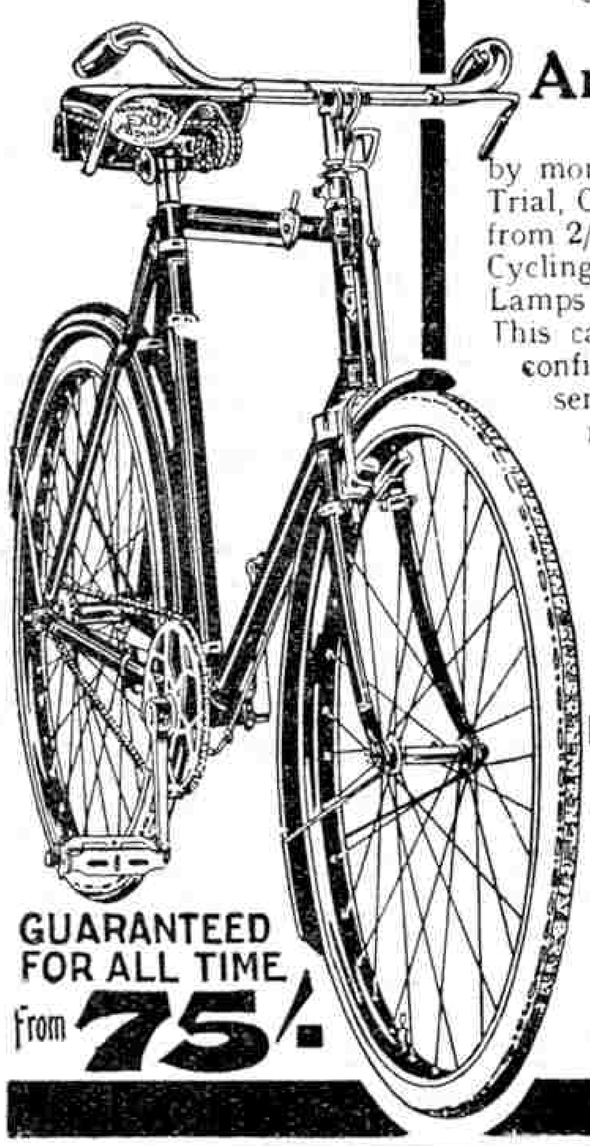

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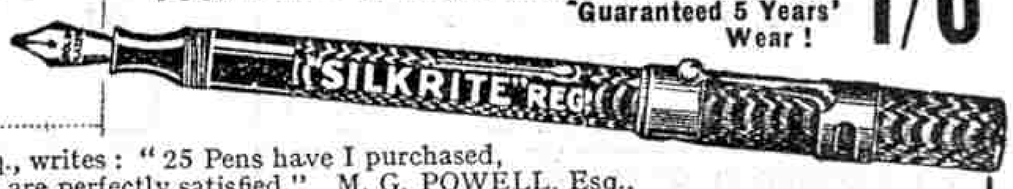

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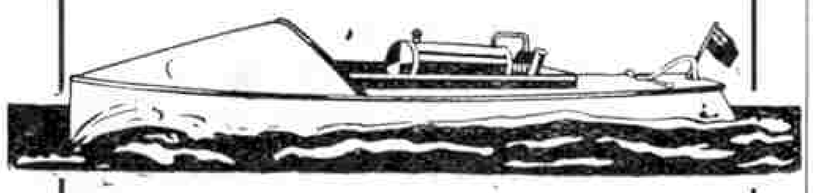

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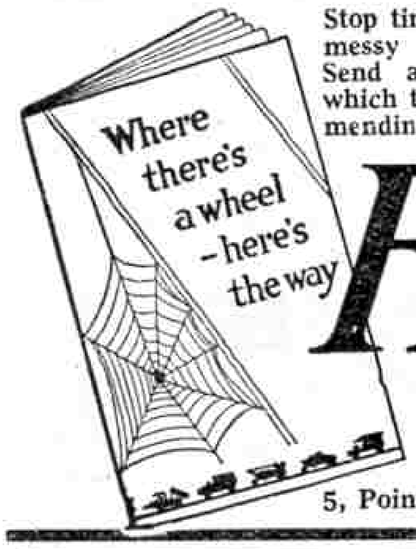

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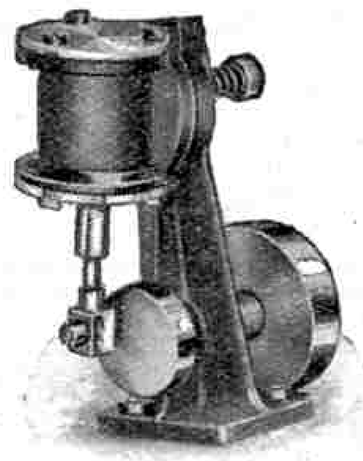

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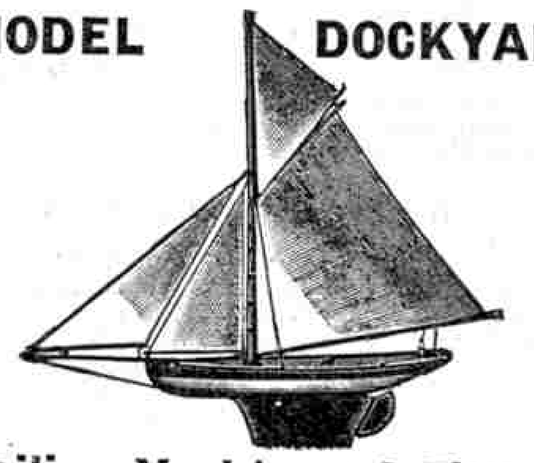

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Post Free 7½d. **THE NEW GAME "GALE BILLIARDS"** Post Free 7½d.
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Readers' Sales and Wants

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.

READERS' SALES

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

Stamps, Cigarette Cards, Albums for both, worth 25/-. Set (1925) Meccano Magazines. Books buy cheaply ! ! !—For particulars write J. E. N. Bingham, High Street, Hungerford.

Cinematograph for sale. Take 20/-. 2,500 Cigarette Cards on sale. Stamp particulars both.—3, Denmark Road, Southport, Lancs.

Horizontal Steam Engine, excellent working order, 10/- or nearest offer.—Butterfant, 11, Burlington Road, Withington, Manchester.

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Sale. Two volumes of the "Scout," August 1923—July 1925, 5/- each volume.—Combe, 49, Lawrence Street, Glasgow.

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2 Brownie, new, 8/-. 8 Mining Educators, 5/-, cost double. Exchange 75 "Scouts" for Metal Tripod—bigger the better !—Richards, Redgate Street, Pinxton, Nottingham.

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500 Cigarette Cards, 9d. per 100, large size, 2d. per doz.—O. Simpson, Heworth Nurseries, York.

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Miss America Launch, sell 7/6.—H. G. Pockson, 36, Fernbank Road, Redland, Bristol.

Album containing 125 Cigarette Cards, 3/6. Sets 25, 5d.—Bond, Yorkhill, Hereford.

900 Mixed Cigarette Cards, 10d. per hundred, 160 for 10d., slightly dirty. 6 sets at 8d., 4 at 4d. Album 3d.—J. Ward, 78, Short Street, Heaton Norris, Stockport, Lancashire.

Launch, Miss America, used 3 times, 7/6.—MacLeod, 13, Cumberland Road, Wallasey.

Stamps. Collector's Duplicates made into 1/- packets, postage 1½d.—Plummer, 1, St. Margaret's Road, Coventry.

For Sale. Cigarette Cards, 850 in sets, 500 miscellaneous. "Pals," numbers 1-36, "Rover," 1-48; "Boys' Realm," 162-231; "Young Britain," 12-210; "All Sports," 1-137. What offers ?—Norman Douglas, 22, Kingsmills Road, Inverness.

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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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(*Rate 1/- per line*).

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Take your own Films and project them on our special machine. Also takes standard films, which we supply. Machine 52/6 only. Send for Kine, Photo and Radio Lists.—King's, Manufacturers, 76, Shakespeare Road, N.16.

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New model 17-shot Pea Repeater, black finish, post free **1/3.**
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You can Build a £40 Sideboard Gramophone, or a £20 Four-Valve Set with our Drawings & Fittings for 40/-
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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.

Advertisements

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.

Small Advertisements. 1/- per line (average seven words to the line), or 10/- per inch (average 12 lines to the inch). Cash with order.

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 Meccano* 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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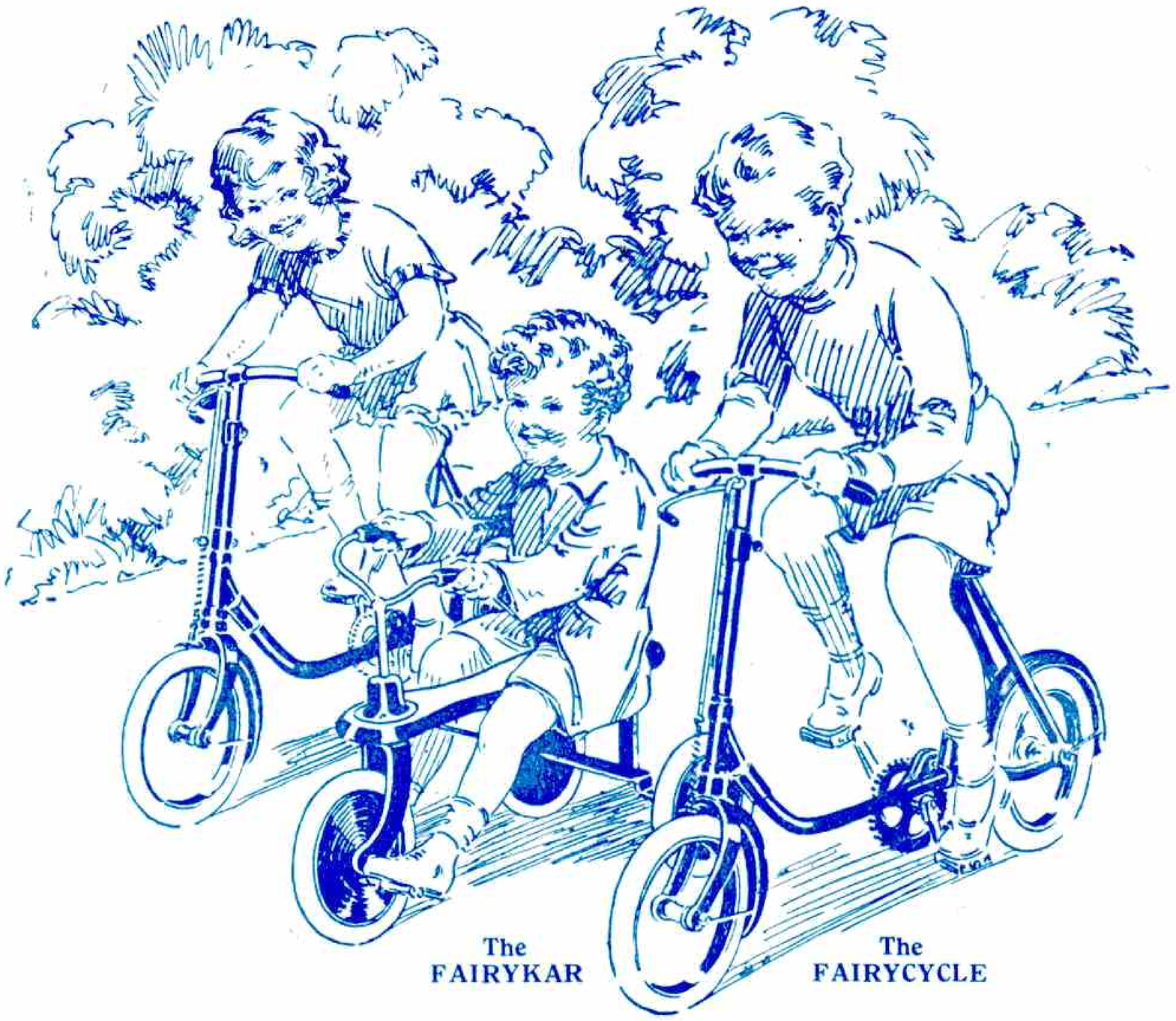
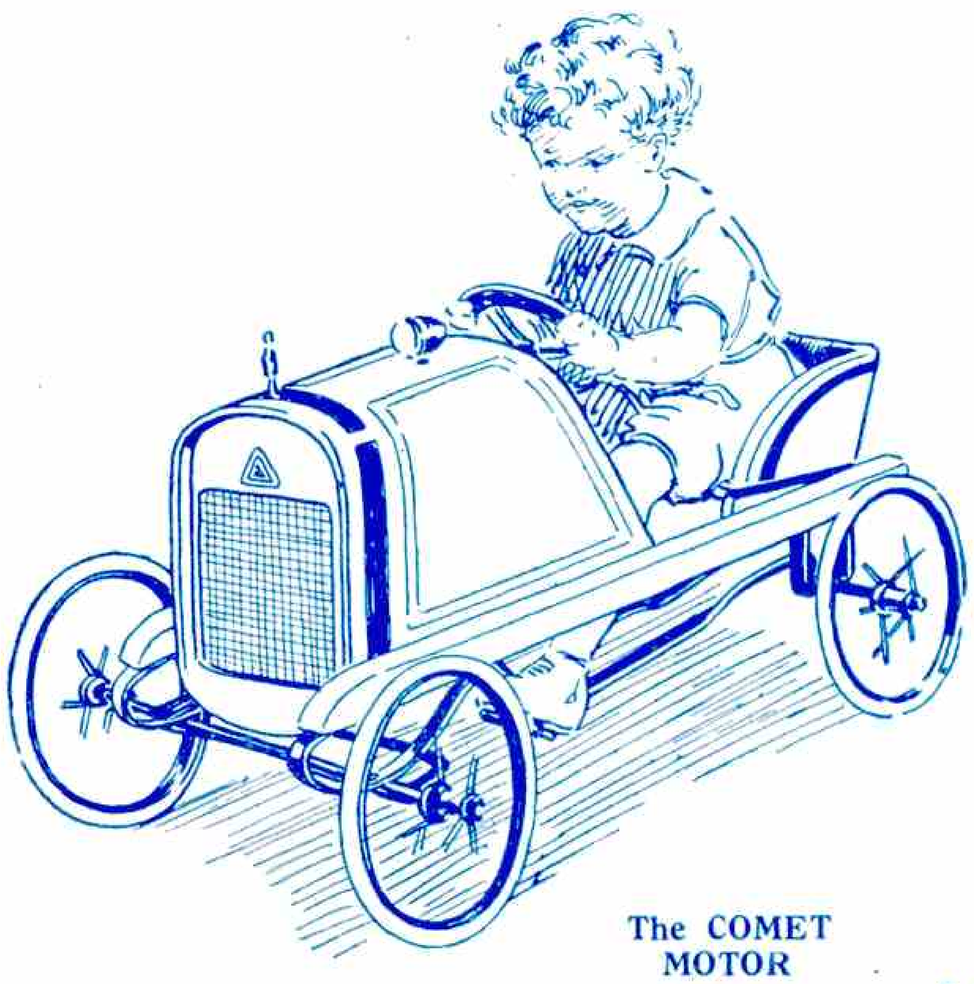
These fine toys have just been reduced in price. So popular have they become, that we have to make them in larger quantities than ever before. That has enabled us to effect many savings in the cost of production, and so we have been able to bring down the prices very considerably. Just show this to Dad and tell him what you want most of all. Then take him round to the local Toy Shop to see what splendid toys they really are.

Look for the Triangle Trade Mark on all these toys



The FAIRYKAR

The FAIRYCYCLE



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The Comet Motor

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REDUCED PRICE **21/-**

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know what "Meccano" Boys want!

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5/6

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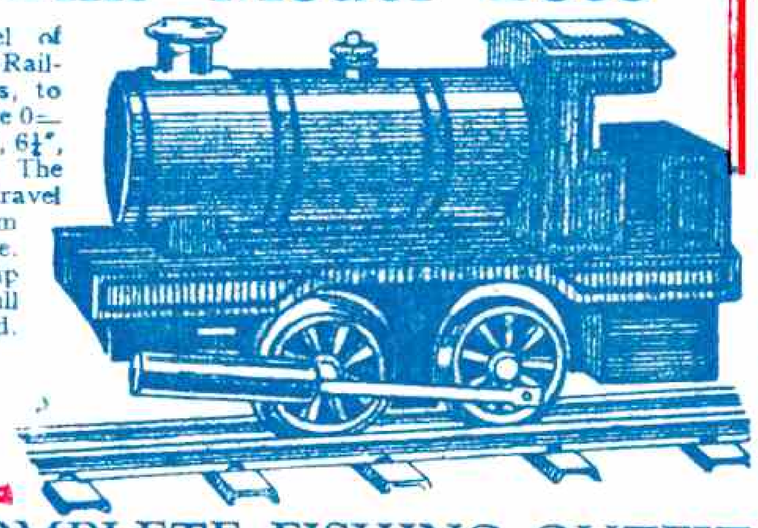
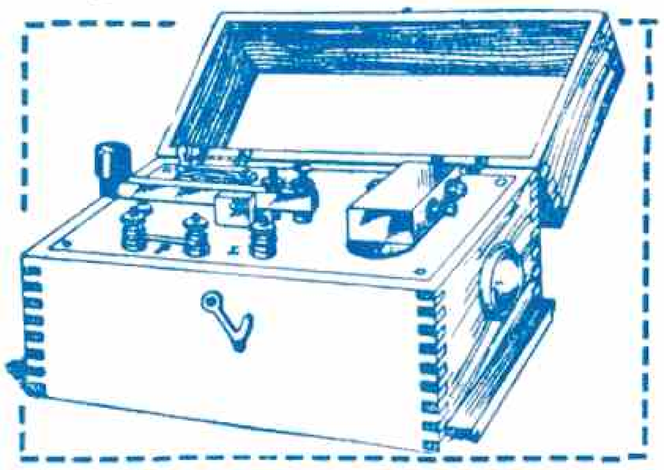
English made model of L.M.S. and L.N.E.R. Railway Pilot Locomotives, to fit Gauge 0 rails (Gauge 0—1¼"). Length over all, 6¼", diameter of boiler 1⅝". The engine is designed to travel under its own steam for a quarter of a mile. Complete with lamp measure, filler and full directions. Post 6d.

12/6





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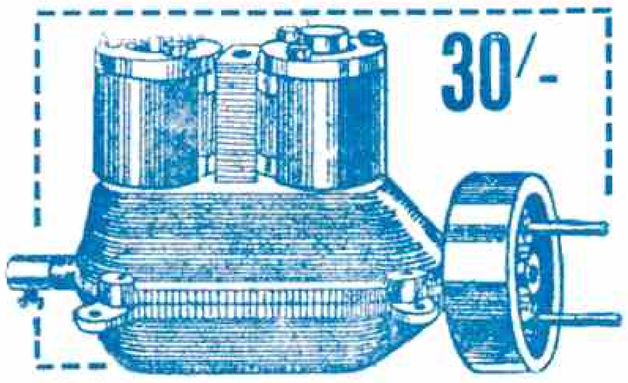

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MODEL LAUNCH ENGINE

2 Cylinder, each cylinder ½" × ½". Engine 4" long, 2¾" high, 1¼" wide. Weight 10½ ozs. It is made of Brass throughout. The two cylinders are mounted on the top of the crank case and are controlled by one piston slide valve. The crank shaft and pistons can be removed in one unit by taking the bottom half of the crank case off. Post 9d. Price

30/-

Are you interested in Model Engines? If so, write for one of our Amateur Engineer Catalogues, post free to Meccano Boys.

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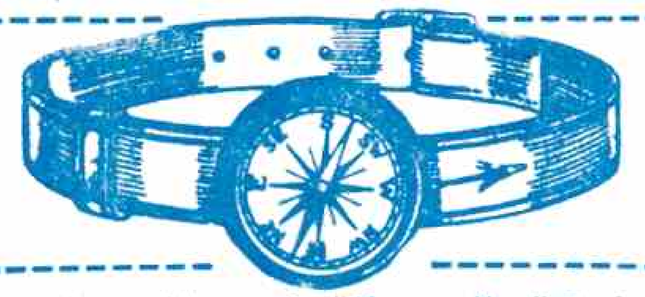
3/9

WRIST WATCH COMPASS



Here's something new for "Meccano Mag." Readers. A compass giving accurate direction, complete on strap so that you can wear it like a wrist watch. The compass is nicely finished and very neat. Strong strap. Post 3d. Price

1/6

KITE FLYING

Here's a game that's no child's play. To fly a Kite well calls for skill and strong arms. Among Gamages huge stock of Kites is one that will just suit *you*. We illustrate a very popular model.

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The finest of all Kites for attaining great heights. It is well and strongly made and stands 29" high. Post 6d. Price

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32" high. Post 6d. ... ... Price **4/6**
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£6:9:6 Down Secures a Splendid Motor Bike

Don't miss this splendid opportunity of getting a motor-bike at little more than the price of an ordinary Bike. Think of all the glorious country spins and seaside runs. Book your model now, so that you may not miss a single hour of the bright sunshine and long evenings that are coming.

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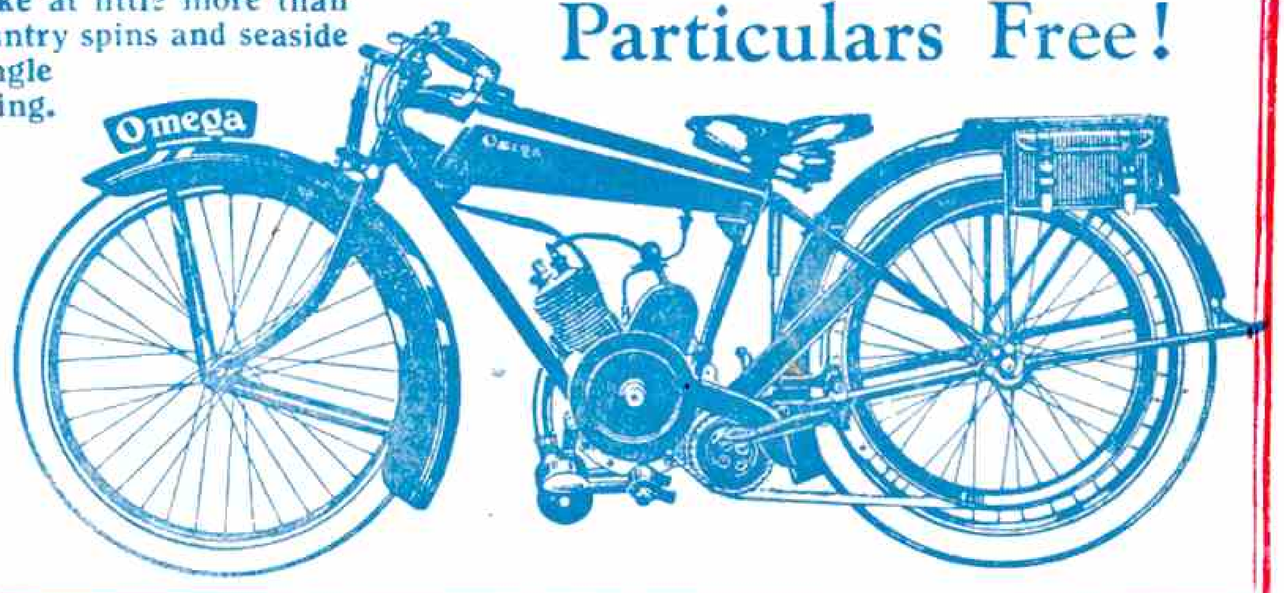

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PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL.
Printed by Stembridge & Co. Ltd., Albion Street, Leeds.