VOL. XIV. No. 10. OCTOBER 1929

MECCANO MAGAZINE

ELECTRIC ARC WELDING

(see page 754)

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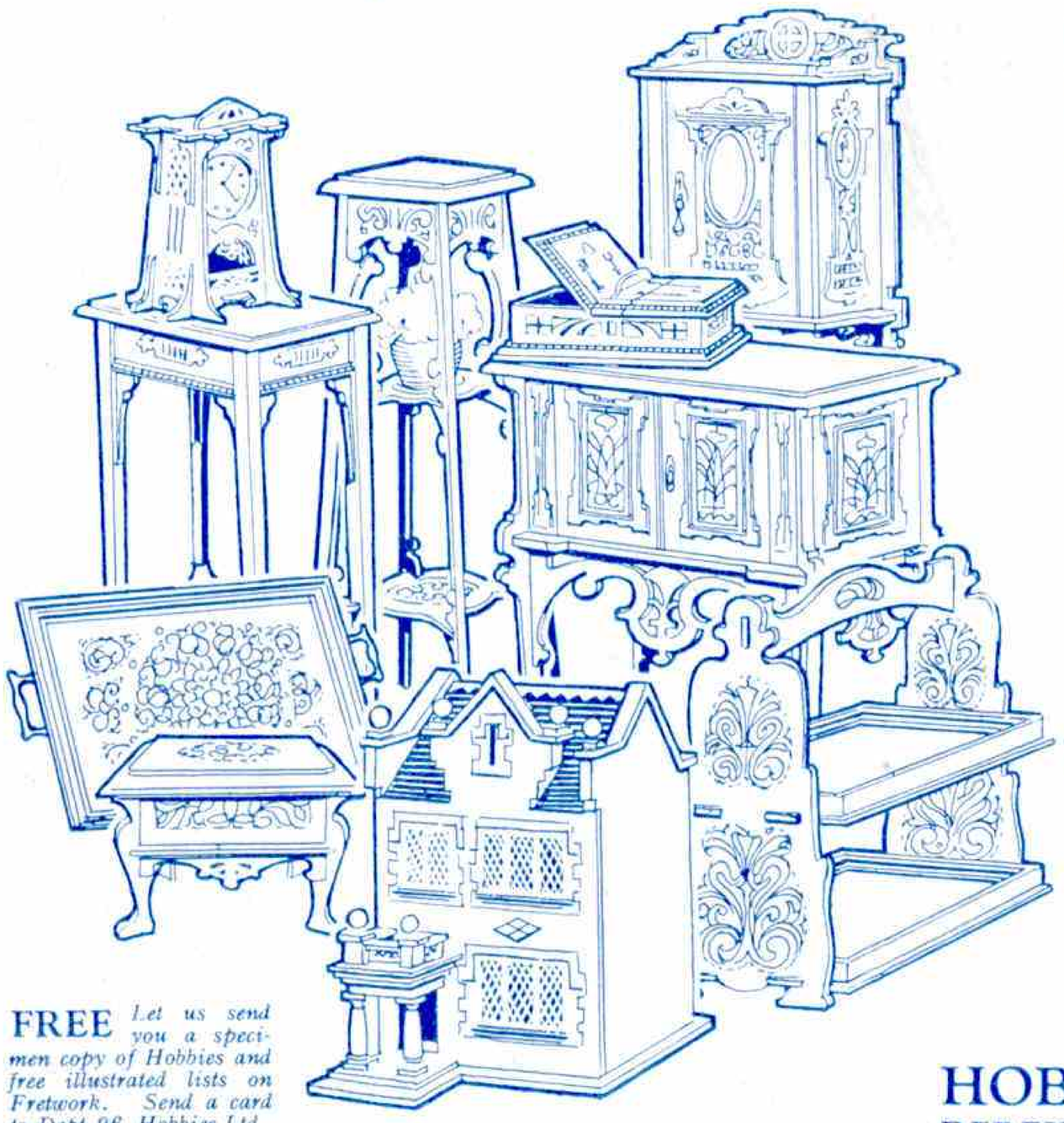

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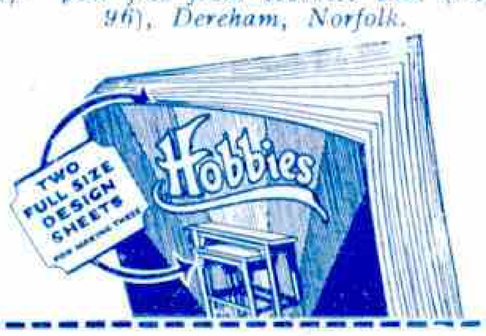

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With the Editor

What a Speck of Aluminium Revealed

On page 780 of this issue readers will find an account of the great race on 7th September last for the "*Schneider Trophy*" in which Great Britain retained her supremacy in the air. Few of the spectators who were thrilled by the wonderful speed and daring of the winner, Flying Officer Waghorn, had any suspicion that only a few hours earlier hope of the appearance of his machine in the race had been almost abandoned! Here is the story.

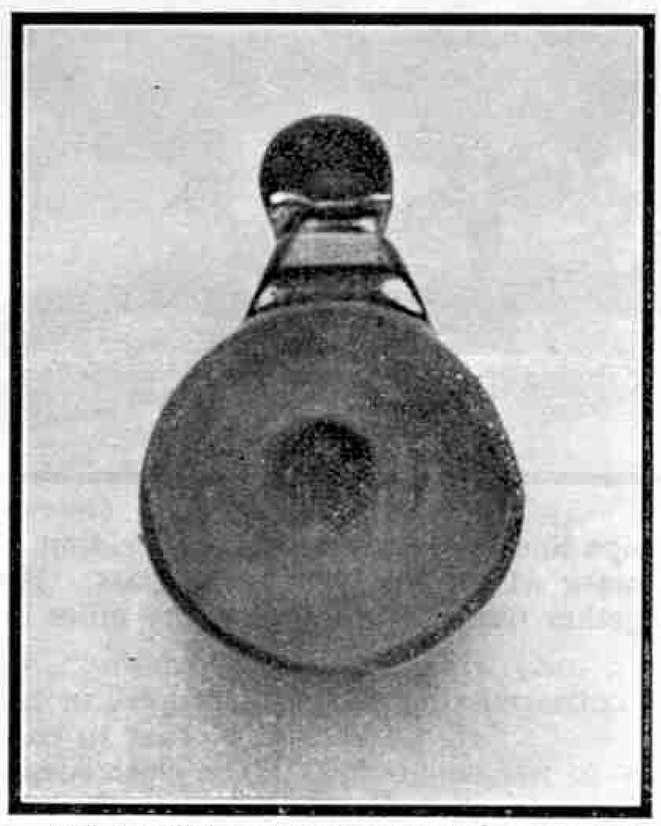
On the day before the actual race the Supermarine S.6 flown by this pilot made her qualifying flights and afterwards was moored for the seaworthiness test. On returning to the aerodrome, the pilot remarked that once during the flights the engine had "popped." Everybody is familiar with the "popping" of a petrol engine, for unfortunately too many motor cars are liable to this complaint! A certain proportion of misfiring may be allowable in an engine when running slowly, but in the case of a machine designed to travel at more than five miles a minute the mere mention of a misfire is sufficient to set a horde of mechanics to work to discover the cause and eliminate the trouble. The engine of a racing aeroplane must be perfect, for failure at such tremendous speeds may have disastrous consequences.

Except for the "popping" noted by the pilot, the Rolls-Royce engine installed in Flying Officer Waghorn's seaplane had acted perfectly up to that moment, but it was impossible to take any risk of its not continuing to behave in the same manner during the actual race. It was examined closely, therefore, and a curious discovery was made. This was the presence on one electrode of a sparking plug of a tiny speck of aluminium, and a little moisture!

The mechanic who made the discovery realised at once that the aluminium must have come from inside the engine, and that its presence, along with that of the moisture, probably meant that serious trouble was about to develop. The 1,900 h.p. Rolls-Royce engine has 12 cylinders cast in two blocks of six each. Removing a block of cylinders in order to discover and repair the defect is a formidable task, especially for the weary mechanics who had worked so hard to keep the British machines in racing trim. Normally the task would require 24 hours' hard work, but 24 hours were not available, for it was then late on Friday night!

Fortunately help came from an unexpected quarter. A large party of skilled mechanics from the Rolls-Royce works at Derby had made the journey to Southampton in order to see the great race, for naturally they were interested in the performance of the engines they had helped to make. An urgent message brought some of them to Calshot, and with their expert assistance the task of replacing the defective cylinder block was carried out in three hours. The wisdom of the step was seen during the process, for examination showed that the engine would have failed almost immediately after starting on the following morning.

No. 11. WHAT EVER IS IT?



The eleventh puzzle in this series of mystery photographs is seen above. To the first reader who identifies exactly this mysterious-looking object, or to the reader who gets nearest, I will send an autographed copy of my new book "Wonders of Engineering."

Solutions should be written on postcards only and addressed "Editorial Competition No. 11," Meccano Magazine, Old Swan, Liverpool. Closing date 31st October. For result of September "What ever is it" Competition see page 772.

The Importance of Little Things

The story of how Great Britain nearly lost the "*Schneider Trophy*"—for owing to the unfortunate disqualification of Flying Officer Atcherley this would have gone to the much slower Italian machines—shows the importance that often must be attached to little things. The interior of the engine was hidden from sight, and the only clue to any defect was the "popping" that Flying Officer Waghorn had noted. Even that would have been insufficient had it not been that a sharp-eyed mechanic detected the speck of aluminium. This was exceedingly small, and little blame could have been attached to him if he had overlooked it, or if he had failed to realise the message conveyed by its presence in the wrong place.

This incident affords a splendid illustration of the sensitiveness and strength of modern high-speed machinery. The early steam engines were crude in design and clumsy in construction, and their outstanding merit was their strength and robustness. They would keep pegging away, day after day, and would survive the most atrocious ill-treatment. These old engines were utterly inefficient and uneconomical as compared with the high-speed engines of to-day, but this advance has been made at the sacrifice of robustness. Modern machinery requires the most skilful handling and every adjustment must be made to perfection. The development of the machine has been accompanied by a corresponding development of the mechanic, who is to-day an expert in the best sense of the term. A mechanic of the old school would not have saved the *Schneider Trophy* for this country. It is most probable that he would never have seen the speck of aluminium, and even if he had done so he would not have received the necessary training that would have made him realise its significance.

"When I Leave School"

To-day it is almost impossible to make a success of any career without thorough training, and the need for forethought and careful preparation continually increases. It is for this reason that, as announced last month, I have arranged to publish a series of articles on careers. The first of these appears on page 757 of this number, and is a general survey of the whole field of engineering. In later articles I intend to deal in turn with each of the various branches of engineering—mechanical, civil, electrical, marine, etc.—and I hope to provide sufficient information about conditions in each to enable readers who are interested to make an intelligent choice of the career that they intend to follow.

Electric Arc Welding

Skyscrapers and Bridges Built Without Rivets

ONE of the most frequent tasks in engineering work is that of joining together plates or girders of steel or similar metal, for it is necessary to be able to do this rapidly and efficiently in boiler making; in the shipbuilding yard; in bridge construction; in the erection of modern steel buildings and in many other branches of the industry.

Until recently joints of this character could only be made by riveting. For instance millions of rivets were used in building the Forth Bridge, and the appearance of their rounded heads is familiar to every reader of the "*M.M.*" who has crossed this enormous structure. Similarly, riveting is one of the chief operations in the building of steel ships, and those who live or work in the neighbourhood of shipbuilding yards are familiar with the deafening rattle produced by the riveting gangs as they punch the rivets that hold the steel plates of such vessels together.

At best riveting is a clumsy operation. Not only is it noisy and laborious, but it is also a cause of loss of strength, the efficiency of a single row of rivets being only 70 per cent. of the strength of the material joined. In addition, many joints cannot be riveted without the aid of gusset plates, etc., which involve the addition of more metal without any corresponding increase in strength.

Courtesy [*International General Electric Co.*

Lowering a section of pipe line into position for arc welding. The operator wears insulated gloves and a mask with a window of blue glass. His task is to weld the sections together into a single pipe many miles in length

From every point of view it would be far better to use some means of uniting plates and girders, instead of merely fastening them together. Fortunately it is now easy to weld two pieces of metal in their final positions in almost any kind of structure by simply fusing their edges together. Formerly welding meant joining pieces of metal by hammering them together after they had been sufficiently heated to become plastic. An operation of this kind may be carried on in a workshop, but it would be practically impossible in work on the stocks in a shipbuilding yard, or on the cantilevers of a giant bridge. The change has been made possible by the introduction of what is known as electric arc welding.

The chief requisite in any welding operation is, of course, means for heating the work. In cases where an ordinary furnace cannot be used attempts have been made to supply this by the use of the oxy-acetylene flame, but the problem has been solved finally by the use of an electric arc struck at the point where the metal is to be heated.

To most people the electric arc is familiar as a means of lighting streets, while it is also largely used as a source of illumination in projecting lanterns. In both cases the arc passes, or "is struck," between two carbon rods connected to the poles of a battery, usually of from 30 to 70 volts. When the rods are brought into contact and then separated slightly the current continues to flow across the gap between the two in the form of a brilliant arc of light. The positive pole is worn away into the form of a crater, and it is in this crater that the heat produced by the arc is most intense, the temperature rising to about 4,500°C.

Several early unsuccessful efforts were made to adapt the arc for use in melting metals for welding purposes, for the heat is produced within a small space. In one interesting attempt an electro-magnet was used to divert the arc on to the work to be welded, but this did not prove satisfactory. To-day, the simple method is adopted of making the work itself the positive pole of the arc, this being chosen because it reaches the greater temperature.

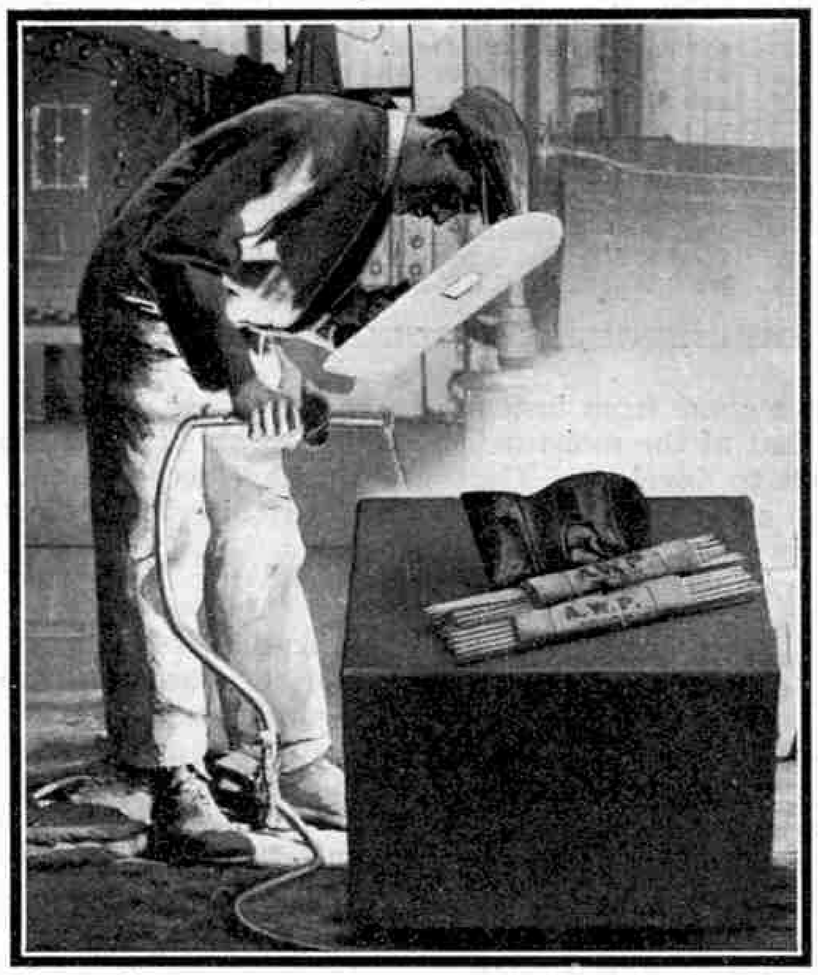
The negative pole is a rod of the same metal as that undergoing welding. This rod is usually referred to as the electrode. A normal electrode is about 18 in. in length, and its diameter varies from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. In order to prevent oxidation, which would result in a faulty weld, the electrode is wrapped in asbestos cotton, and a flux is incorporated with it in order to ensure a free flow of the molten metal.

The electrodes used in arc welding are of very great importance, for upon them depends the efficiency of the process. Owing to losses that occur in the electric arc, the metal deposited by the arc in a weld is very different from that of which the electrode itself is made. These losses may affect the quality of the work, and if really sound joints are to be made some means of replacement is necessary.

The electrodes manufactured by Alloy Welding Processes Ltd., are built round cores of steel rod that is first coated with nickel. Open spirals of asbestos yarn are then wound on and into them the flux is forced.

It is the flux that makes good the losses in material, for mixed with it are varying proportions of the rarer metals that enter into the composition of alloy steels. For instance, the flux used in a typical electrode for depositing high-speed steel may contain 24 per cent. of tungsten, eight per cent. of chromium, 0.25 per cent. of vanadium, and one per cent. of carbon. During a welding operation in which an electrode of this type is used, these materials alloy themselves with the mild steel of the core.

Of the 22 types of electrodes manufactured by Alloy Welding Processes Ltd.,



Courtesy *Alloy Welding Processes Ltd.*

Electric arc welding operator at work on a tank

the core is made of mild steel in no less than 18. The materials required to make any particular alloy are carried in the flux, for it has been found that more satisfactory results are obtained when the alloy of the weld is actually produced in the arc than if a rod of alloy steel were employed. It is only when the quantity of alloying material required is too large to be carried in the flux that the core is made of any other material.

In order to show how arc welding is carried out, let us suppose that two pieces of boiler plate are to be joined. The first step is to clean the surfaces of the metal, dirt, grease, rust, and any other foreign matter being removed by means of a wire brush or scraper. The operator next prepares the plates by filing or chiselling bevels on their edges, so that when they are placed together there is a V-shaped slot at the place where the join is to be made.

The positive pole of the current supply is now attached to the pieces of boiler plate and the other pole to the electrode, which is fixed in an insulated handle in order that it may easily be manipulated. The welder starts up the generator and lightly touches the plates with the end of the electrode. As he draws it away a dazzlingly brilliant arc leaps across the space that intervenes between the boiler plates and the electrode.

Courtesy] [*International General Electric Co.*

How electric arc welding is used in constructional work. Welding a girder to the main column of the steelwork of a large building at Philadelphia

Onlookers are quite unable to distinguish anything in the centre of the brilliant glare, but the eyes of the operator are protected by red or blue glasses, and he has no difficulty in maintaining his electrode at the correct distance from the plates to give a concentrated arc of high temperature. The intense heat quickly melts the metal of the electrode and the surface metal of the plates, with the result that the portions are fused together. Steadily moving the electrode backward and forward along the seam, the welder deposits sufficient metal to fill the V-shaped opening. This metal actually becomes part of the combined plate itself, the two portions of which are completely melted together into a single mass.

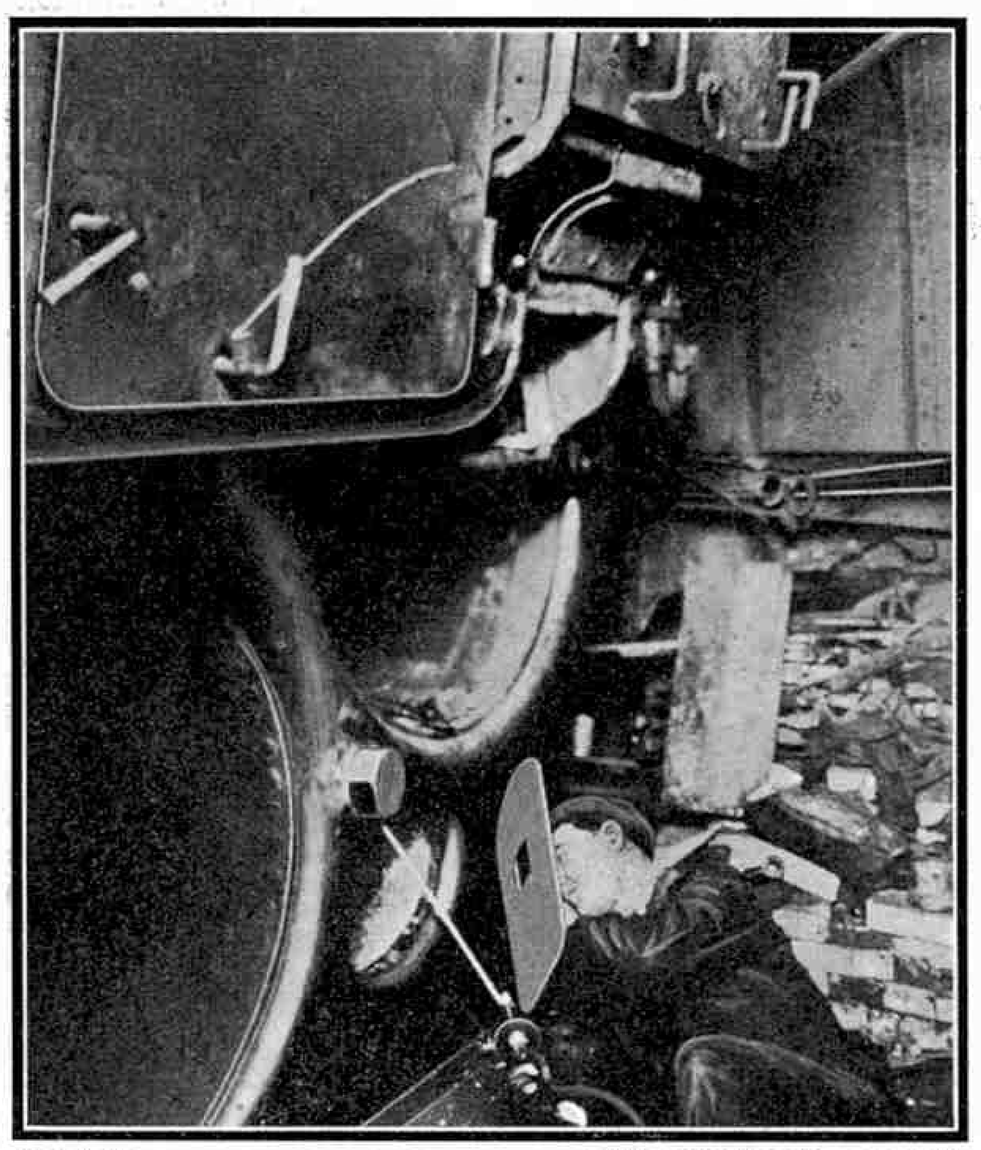
It is interesting to note that the advantages of arc welding have been extended to all classes of metallic alloys. The welding of aluminium proved difficult, but the special problems involved have now been almost completely solved, and to-day there is only one alloy that is somewhat unkind to the welder. This is nickel chromium steel, which can be welded, but in cooling persistently develops minute hair-cracks which, under strain, extend until a complete fracture occurs.

The amount of current used in work of this kind is considerable. A metal electrode $\frac{1}{8}$ in. in diameter requires about 90 amps., but this must be increased to 200 amps. when an electrode $\frac{1}{4}$ in. in diameter is used. The current employed may be either direct or alternating if protected electrodes are used, but for bare wire welding direct current is necessary. In each case satisfactory work can only be done if a very steady source of current is used. A steady arc can best be obtained when using direct current, and for this reason it has become customary to use a D.C. generator driven by a small A.C. motor.

When the material to be welded can be moved, the work is usually carried out in a special welding shop in which the plant is housed. The motor and generator are mounted on a concrete base and the control board is permanently fixed to the floor or the walls of the building. During the welding process dangerous metallic vapours are formed and it is necessary to make special ventilating arrangements in order to remove them.

A great extension of arc welding has been made possible by the introduction of portable plants. These are similar to those already described, but the generator and motor are directly coupled and are mounted on a movable trolley. In place of the electric motor that is usual in fixed plants, a petrol, steam or gas engine may be used to drive the generator.

On large plants several operators work simultaneously, the number being dependent on the output capacity of the generator. In this case each operator is provided with a resistance box in order that he may control his own current supply. Every part of his equipment is well insulated in order to protect him from severe burns or electric shocks, and in addition precautions have to be taken against the evil effects of exposure to the invisible ultra-violet rays produced by the arc. It is for this purpose that the welder wears heavy gauntlet gloves and closely woven overalls. Without the protection that these give he would be liable to a painful form of skin disease resembling that caused by exposure for long periods to X-rays.



Courtesy] [*Alloy Welding Processes Ltd.*

Arc welding under difficulties. The operator is effecting repairs to a Marine Boiler

The introduction of arc welding has brought about a revolution in engineering. The ease with which the new process may be carried out has made it invaluable in practically every industry in which iron or steel is employed. For instance, such parts of machinery as worn shafts and pinions, or gear wheels with broken teeth, may be repaired by the addition of new metal, and this can be done so readily that dismantling often is unnecessary. To-day defective machines, which formerly would have stood idle and unproductive until new parts could be obtained and fitted, may be repaired and restarted within a few hours of breaking down.

Arc welding has proved particularly useful in effecting repairs to motor car parts. For certain classes of work, such as cylinder repairs, the oxy-acetylene blow pipe is still used; but repairs to back axle casings, shafts, and crankshafts are most readily made by means of the electric arc. Its fierce yet easily controlled heat is produced in a very small space and

fusion of the metal parts to be joined takes place very readily.

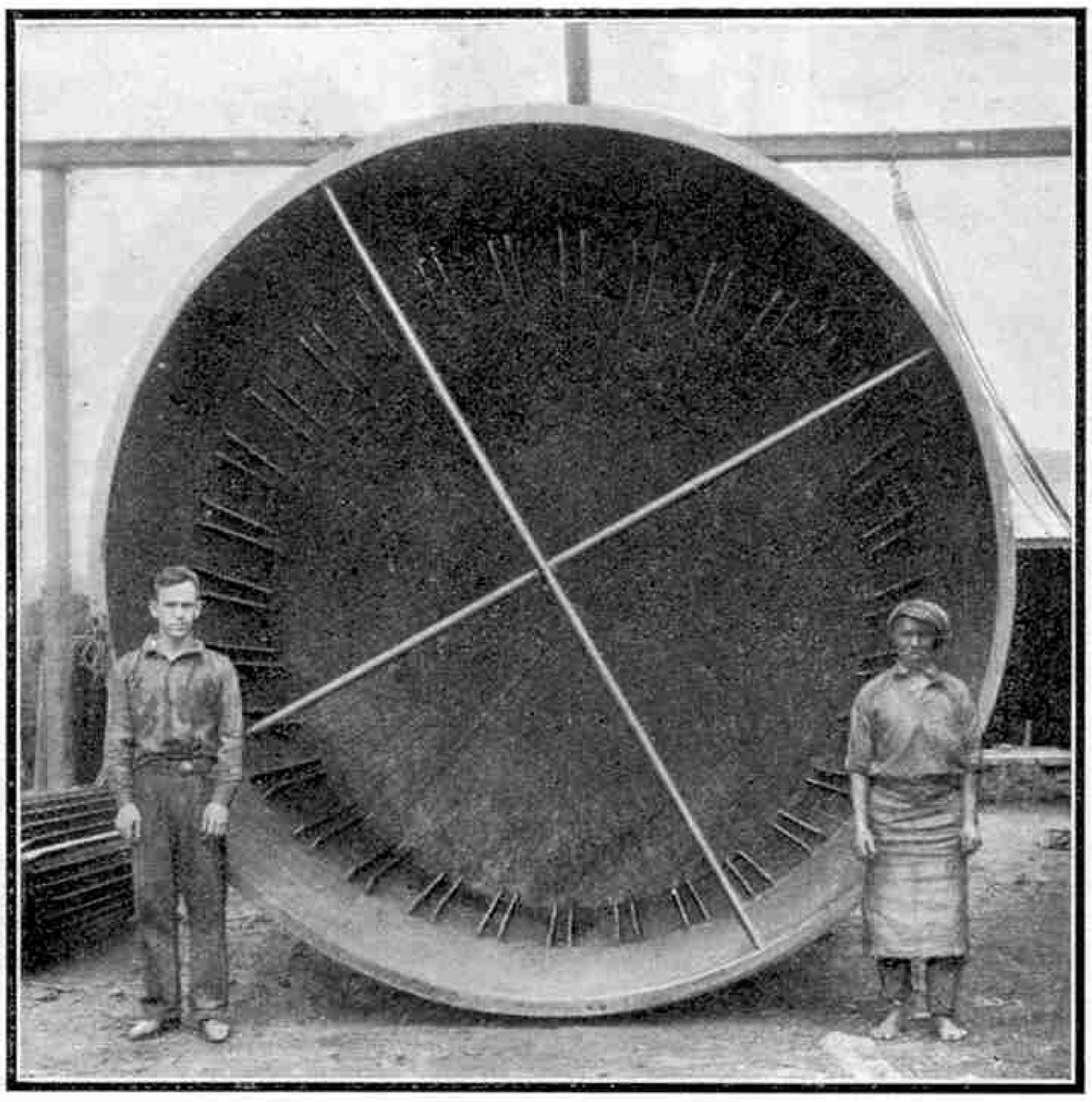
A very interesting case illustrating the value of arc welding is the manufacture of lathe tools, drills, and milling cutters. The working portions of these are made of special alloys, known technically as "high-speed" steels, which are very expensive. In making them a shank of ordinary steel is forged to shape, and a piece of high-speed steel to form the cutting edge is welded on, machined and ground. In this manner an efficient tool is obtained at a cost far less than would be the case if it were made throughout of the costly high-speed steel.

The work on which electric arc welding has been practised longest is the repairing of railway permanent way. When rails become worn or uneven, it is a very simple task to weld on additional metal, after which the new surface may be ground smooth and level by means of a carborundum wheel. In this manner rails that otherwise would have to be replaced—an expensive process—may be repaired without serious interruption to train services. A similar application of welding is made in repairing the steel tyres of locomotive wheels. When these show extensive wear new metal is welded on and the wheels are trued by machining.

Interesting as are the applications of arc welding in the workshop and the factory, they are of small importance in comparison with other developments of this process. In Poland a steel bridge has already been erected without the use of rivets, and the experiment has proved quite successful. The joints have been designed to have the same factor of safety as the steel sections themselves, and it is interesting to note that if the structure had been riveted 70 tons of metal would have been needed instead of the 55 that actually were used.

A similar experiment in shipbuilding has been equally successful. During the War a sea-going barge for cross-channel transport was constructed in which the plates were joined by means of arc welding instead of rivets. On one occasion the vessel ran ashore under conditions that would have severly tested one built by the usual methods, in which many rivets must inevitably have been forced out of position; but it sustained very little damage. Later a coastal steamer the "*Fullagar*" was built by Cammell Laird & Co. Ltd., Birkenhead, entirely by electric welding. No rivets were used in bulkheads, keel, rudder post, or hull plating. The time taken to construct the vessel in this manner was only a third of the time normally required for a riveted vessel of the same tonnage, and the cost was considerably lower. Since the "*Fullagar*" was built no other vessel has been constructed by means of arc welding, but it has been proposed to weld the hull plates of a new German cruiser of 10,000 tons. The successful construction of a warship no doubt will lead to a considerable development of the all-welded ship, and we may yet see giant ocean liners that have been built without the aid of a single rivet.

It is in the erection of steel buildings that arc welding has scored its greatest triumphs, however, and the progress that already has been made suggests that before many years have passed, the members of the steel framework of most reinforced concrete buildings will be welded together. At present this development is almost entirely restricted to America, where welded buildings have been found to possess all the advantages of those constructed by the older method, and in addition are cheaper to build, for less metal is used and they can be erected more quickly.

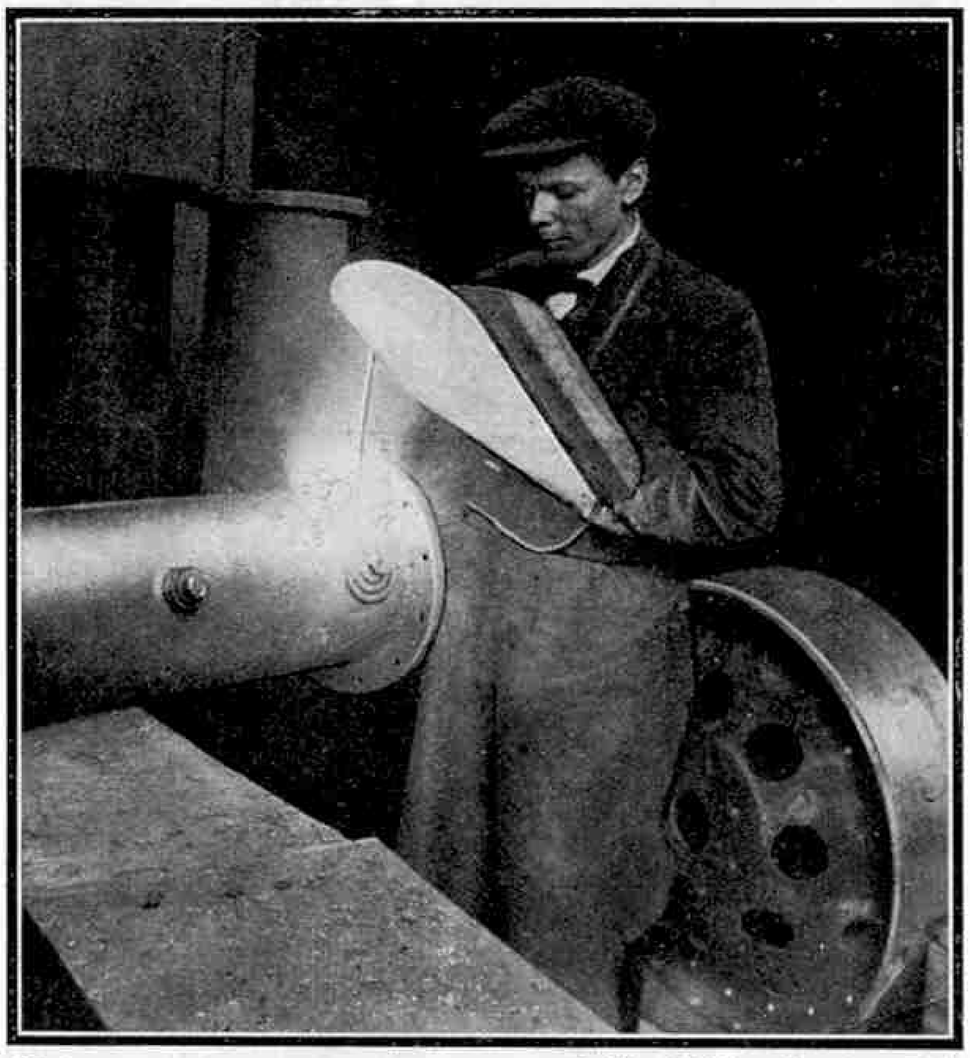


Tank used in gold-mining operations in Johannesburg. Every joint has been welded by means of the electric arc

Arc welding of steel buildings also has won approval on the score of silence. In the United States the noise made by riveting the steelwork of the sky-scrapers has become such an intolerable nuisance that in many cases necessary extensions to hotels, apartment houses, and hospitals have been postponed for fear of the din attendant upon building construction. In some centres this work has been restricted to the hours between 8 a.m. and 4 p.m., but even this has not been found satisfactory, for in the daytime the noise made by pneumatic hammers makes it difficult for professional men to concentrate upon their work. The suggestion to replace the use of rivets by welding has been well received, therefore, for the sputtering of the electric arc cannot be heard beyond a distance of a few feet.

The most impressive application of electric arc welding in building construction in recent months was the erection at Philadelphia of a thousand-ton factory building for the General Electric Co. of New York. This building is approximately 600 ft. in length, 140 ft. in width, and 50 ft. in height. The elements from which the framework of the building was constructed were welded in the shops, but the remainder of the work was done on the spot with the aid of two portable welding sets.

A particularly interesting application of arc welding occurred in the erection at Dallas, Texas, of a garage for 40 cars. This was constructed of steel, salvaged from an obsolete outdoor switch frame that otherwise would have been doomed to the scrap heap. The steel members utilised were of different lengths and sizes, and already contained numerous rivet holes that would have interfered with the punching of new holes to fit the garage designed. By means of a portable outfit they were welded together into a complete structure that cost only one-quarter of the lowest contract price for one in which riveting was employed.



Photos courtesy] [*Alloy Welding Processes Ltd.*

Welding flange on a steel pipe 12 in. in diameter. Our illustration shows that the heat of the electric arc is concentrated in a very small space

A very interesting application of electric arc welding is in the construction of pipe lines, either for water supply or for transport of oil. In an ordinary pipe line there is always risk of leakage through the joints, but this is completely eliminated when the sections of piping are fused together by means of the electric arc. Instead of a series of pipes joined together, a pipe line constructed by such a method is a continuous tube from end to end, and if the work is well done leakage is quite impossible except in the case of an actual breakage.

By the Editor

THIS month we commence our promised series of articles dealing with the choice of a career, and the best method of entering upon a career when it has been chosen. The majority of readers of the *"M.M."* are particularly interested in mechanical matters, and therefore we propose to deal first of all with the various branches of engineering.

No profession requires special aptitude to a greater extent than engineering. It is a big mistake to think that interest in mechanical contrivances and a certain amount of dexterity in handling them provides a sufficient guarantee for success in an engineering career. Manual dexterity is certainly needed, but by itself it is of comparatively little value. In order to ensure success, a boy must have the ability to grasp quickly how any piece of machinery works and to appreciate the principle involved and the reason why it is constructed to that particular design. This is, of course, a very different thing from mere ability to set to work with a spanner and a screw-driver and adjust a machine to work at its best.

Engineering Means Hard Work

A good all-round education is also very necessary, and year by year it becomes more so. The days when men like George Stephenson, Brindley and Telford could force their way to the front by sheer natural genius, added to indomitable perseverance, are gone. Engineering is now so highly specialised that unless a man is prepared to remain little more than a mechanic for the rest of his days he must be fully equipped to study and absorb the work of all those who have gone before him in his particular line. The boy who sets out on an engineering profession without the determination to study, and study hard, is almost certainly doomed to failure from the outset.

Even ability of the kind that we have described is not sufficient by itself. Sound, robust health is necessary, for many of the stages in engineering involve severe physical strain. Along with good health there must be ambition of sufficient strength to make difficulties, discomforts, and even dangers, things of small account, provided that they lie in the path towards success.

The ramifications of the engineering profession are immense, but they may be grouped roughly into certain broad divisions. Most familiar of all, perhaps, is mechanical engineering, which deals with the design, manufacture, and operation of machinery in general. One often hears it said that mechanical engineering is seriously overcrowded. This is true in regard to the lower ranks, but the same thing applies in almost every profession. We are all familiar with the old saying that "there is plenty of room at the top," but it is probable that those who are setting out upon a career of any kind do not realise sufficiently that it is *only* at the top that there is room.

Branches of Engineering with Prospects

The training through which a mechanical engineer must pass is severe, but the prospects are good for the right man. Mechanical engineering has, perhaps, a wider range than any other branch of the profession, and a well-trained and ambitious man will find it to his advantage to specialise as soon as possible in some particular type of machinery. Locomotive engineering may be regarded as a branch of mechanical engineering, and it affords good prospects, either with the railway companies or with firms that manufacture railway machinery.

The development of the internal combustion engine has given rise to two highly specialised branches of mechanical engineering dealing respectively with the motor car and the aeroplane. Vast as is the present development of the automobile, there is no doubt that it is very far from its limit; while aeronautical engineering obviously must have a tremendous future. Quite clearly, therefore, there is ample scope for the competent engineer in either of these branches.

Marine engineering deals with the design, construction and fitting of marine engines for ship propulsion, and it is a branch of mechanical engineering that appeals especially to boys who are keenly interested in ships and the sea. This branch of engineering is closely inter-connected with that of naval architecture, and the two are becoming more and more inseparable.

Electrical engineering demands equal and possibly greater intensity of training if the top is to be reached. It is in a sense more specialised than mechanical engineering, and a boy should not enter upon it unless he has a natural leaning towards electrical machinery and apparatus.

The Scope Offered by Civil Engineering

An entirely different branch of engineering is concerned with the discovery and production of the world's mineral resources. This is a particularly interesting branch of the profession. It offers good prospects, and the nature of the work is more varied and less confined than that of certain other engineering careers. Many of the best and most highly paid posts in mining engineering are concerned with work in the colonies and foreign countries, and a boy who enters upon this field of work must be prepared to go to any part of the world.

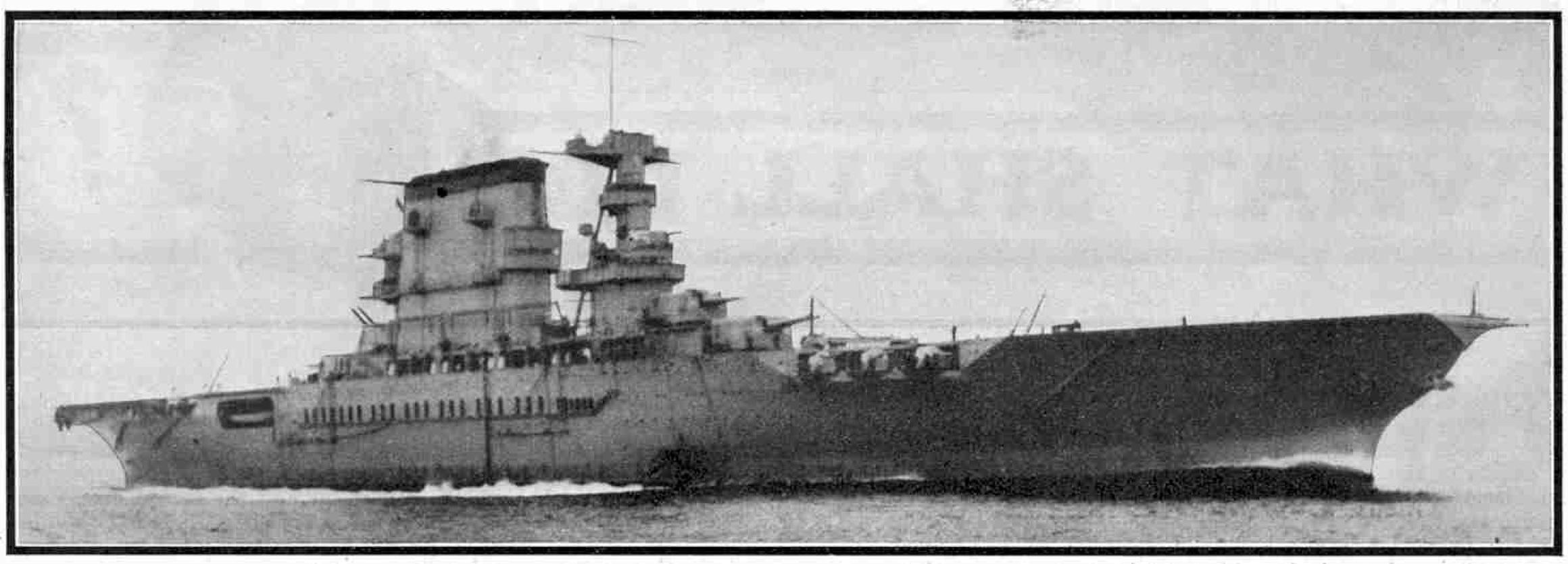
Finally we come to one of the biggest of all branches of the profession, namely, that known as civil engineering. This covers an enormous range of work, including docks, harbours, canals, bridges, roads, irrigation schemes, and municipal work of various kinds. The higher posts in this type of work, particularly in regard to public services, are very well paid and offer a splendid career to an ambitious boy. This branch of engineering resembles mining engineering in the fact that much of the best paid work is situated overseas.

There are many other subsidiary branches of engineering, but we have dealt with the main branches and given some idea of the enormous possibilities that are open to a boy leaving school. In subsequent articles we shall deal with each of these branches in detail and show exactly how a boy may enter upon his chosen career in the most practical manner, and thus start out on the road that leads to ultimate success.

In making preparations for this important series of articles valuable information was collected from all possible sources, including manufacturers, principals of technical colleges, secretaries of professional institutions, and others who were recognised as authorities in various branches of engineering. The sole purpose for which this information was collected and classified was to place it at the disposal of readers, and I hope that those who would like further information on any points that may arise will not hesitate to write to me immediately.

Giant American Aeroplane Ships

U.S.S. "*Lexington*" and "*Saratoga*"



Three-quarter view of the aircraft carrier, U.S.S. "*Lexington*." This vessel and its sister ship, the U.S.S. "*Saratoga*," are the largest carriers in the world, and are capable of a speed of 40 miles per hour. For the illustrations we are indebted to the International General Electric Co.

ONE of the most interesting developments of aerial activities during the late War was the introduction of ships devoted solely to housing large numbers of aeroplanes and so designed that the machines can depart from and return to the vessel at will.

In the "*M.M.*" of September, 1928, we described the British aircraft carrier "*Courageous*." This vessel was originally built as a light battle cruiser, but was later converted into an aircraft carrier, and it is interesting to note that the two huge aircraft carriers, the "*Lexington*" and the "*Saratoga*," that now form a part of the U.S. Navy, were originally planned to be battle cruisers. As a result of the Washington Treaty respecting limitations of armaments, however, the cruiser plans were laid aside and the partially built ships were completed as aircraft carriers.

As already indicated an aircraft carrier is literally a floating hangar, the roof—known as flight deck—of which is designed to serve as a taking-off platform and a landing ground for the aircraft that are carried on board. Thus the masts, funnels, gun turrets and other superstructures, common to warships, are wholly or partially dispensed with on an aircraft carrier, and such deck superstructures as cannot be abolished are placed where they will inconvenience operating aircraft as little as possible.

The United States aircraft carriers are the largest craft of their kind afloat, and it is distinctly unfortunate that they are doomed to destruction almost before they have had time in which to prove their worth. There are numerous reasons for the decision of the Naval Department of the United States. The limitation of armaments is to-day being carried further than was at first expected. In looking round for means of reducing the number and size of war vessels the aircraft carriers could scarcely escape notice, for an enormous sum of money is required to keep them in commission. This is approximately from £750,000 to £1,000,000 per year! An additional reason for their fall into disfavour is that they are so large that the locks of the Panama Canal are scarcely large enough for them. There is also some doubt in regard to their utility in time of war, for they would require a great deal of attention if attacks made on them by fighting vessels were to be frustrated.

Capt. Marshall, commander of U.S.S. "*Lexington*"

In many respects the "*Lexington*" and the "*Saratoga*" are the most interesting vessels that have ever been built. Their displacement is 33,000 tons, and their armament consists of eight 8-inch guns. They are equipped with wonderfully efficient turbo-electric machinery capable of developing no less than 180,000 s.h.p. Their maximum speed is 34 knots, and thus they can move about as quickly as an express train travelling at approximately 40 miles an hour. They are so large that if one of them was stood on end it would over-top the Woolworth Building, the tallest building in New York City, by no less than 96 ft.

The "*Lexington*" broke five world's records in its speed trials on a voyage from the Pacific Coast to Honolulu. On the first day out the carrier made 700 nautical miles, a new world's record for the distance steamed in 24 hours, and on the very next day exceeded this distance by 42 miles. Not content with this, the vessel covered the remaining distance to Honolulu, 786 miles, in 34 minutes over 24 hours, and thus on three successive days she broke the 24-hour steaming record. Until that time the 24-hour record was 675 miles, a distance covered by the famous passenger liner "*Mauretania*."

The "*Lexington*" made still another world's record by accomplishing the entire trip of 2,228 miles in 72 hours 34 minutes, as against the record of 75 hours 40 minutes that was set up in 1923 by the light cruiser U.S.S. "*Omaha*."

Although these wonderful vessels are now doomed to the scrap heap they present so many remarkable features that a complete description of their machinery and equipment is still of the greatest interest. As they are practically identical in construction, we will confine ourselves to the "*Lexington*."

This vessel was built at the Fore River yards of the Bethlehem Shipbuilding Corporation, Quincy, U.S.A., and has an overall length of 880 feet, a maximum width of 105 feet, and is of 33,000 tons displacement. As in the case of the British aircraft carriers

"Hermes" and *"Argus,"* the funnel and superstructure of the *"Lexington"* are arranged along the starboard side of the flight deck, in order to present a minimum of obstruction. Searchlight platforms and projecting footpaths along the sides of the huge funnel casing are connected by vertical ladders, while immediately astern are gun turrets and control platforms. At the same side of the ship and directly in front of the funnel casing is a lofty tower comprising two superimposed twin gun turrets, surmounted by the navigating bridge and conning towers. This arrangement has made possible the construction of an enormous flight deck that extends the full length of the ship.

The *"Lexington"* is well equipped for defensive and offensive operations during battle. Her hull is fitted with anti-torpedo bulges and a belt of armour at the water-line, while the lower decks have been made bombproof. The armament of the ship includes five 5-in. anti-aircraft guns for use against enemy aircraft, and eight 8-in. guns situated in pairs in the gun turrets. The crew totals approximately 2,000 about 600 being relegated for duty in connection with the aircraft carried on board. The problem of comfortably housing this large personnel was not an easy one, but has been accomplished in such a manner that the living quarters of the men are all above the water-line, thus providing as much natural light and ventilation as possible. The ship, however, is fitted throughout with mechanical ventilation, the intake and exhaust flow being regulated to the needs of each compartment. All state-rooms are fitted with steel furniture and there is a comfortable reading room and reception room provided for the members of the crew.

Beneath the flight deck is a huge hangar that can accommodate 72 aeroplanes, which are raised and lowered to and from the deck above by means of elevators.

The electrical machinery of the *"Lexington"* is the most powerful ever installed on board a ship and it was designed and built by the General Electric Company of America. The machinery includes four 35,000 k.w. turbine generator sets that supply electricity to eight 22,500 h.p. motors connected in pairs to four propeller shafts. The total power of these huge motors is sufficient to supply the needs of a city of 700,000 inhabitants.

The steam required for the turbo-generator sets is supplied by 16 "Yarrow" type water-tube oil-burning boilers, each installed in a separate watertight compartment. The boilers have a total heating surface of approximately four and a half acres. The air required for the burning of the fuel oil is supplied by steam driven draught blowers, two being assigned to each boiler compartment. Powerful oil pumps, having a pumping capacity of 208,200 gallons per hr., draw the fuel oil from the storage tanks in the base of the ship and feed it direct to the numerous boilers.

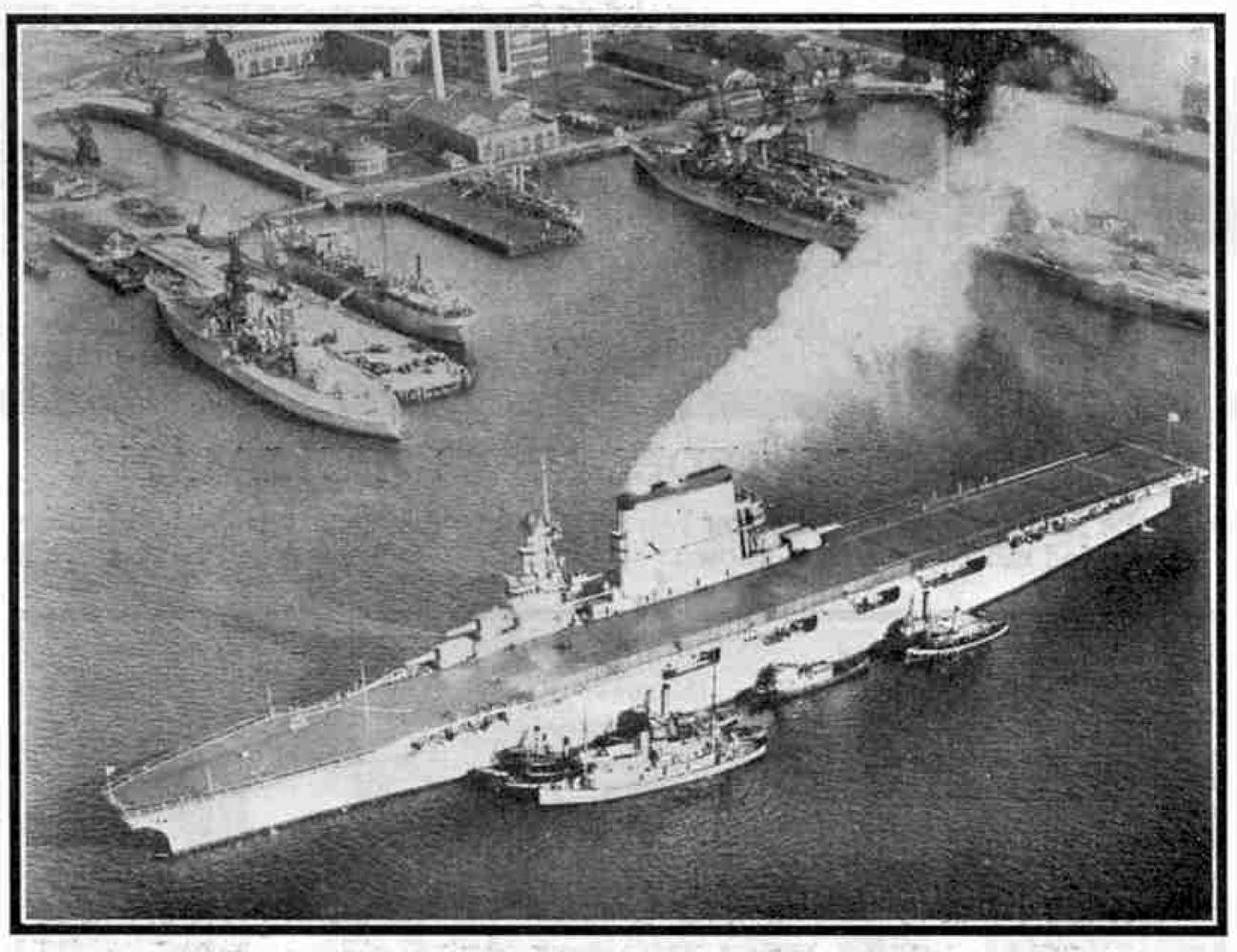
The necessary fresh water for the ship is supplied by a huge distilling plant capable of producing 104,000 gallons of fresh water daily. This plant is the largest of its kind that has been installed in a ship. The capacity of the fresh and salt water pumps amounts to 21,363,600 gallons per hour. These pumps are used for salt water, circulating, boiler feed, fresh water, fire main, sanitary systems and other miscellaneous services; their total capacity would be sufficient to serve the needs of a population of no less than four million people.

Electricity has been utilised to a considerable degree in the domestic equipment of the *"Lexington,"* and the galley of the ship contains 15 electric ranges, and seven electric ovens. Electrically-driven machines are used for meat grinding, potato peeling, dish washing and many other minor operations in the galley. In addition to the many purposes already enumerated, electricity is also utilised to operate the ship's steering gear, searchlights, repair shop's machinery, and the elevators by which the aeroplanes are conveyed to and from the flight deck and hangar.

A feature of the *"Lexington"* is the stowage of life boats and auxiliary craft in recesses in the side of the ship so that the top deck may be reserved entirely for the aircraft.

Although to all appearance the flying deck of the *"Lexington"* is almost unobstructed by masts and aerials, the ship is completely fitted out for transmitting and receiving wireless messages. The aerial is run to the deck from a single top mast that surmounts the superstructure forward to the funnel casing. This short but lofty mast has to be lowered when the ship passes beneath obstructions such as the Brooklyn Bridge.

A comprehensive telephone system has been installed in the ship and no less than 52 miles of wiring used in setting up the system. The interior communicating systems include the telephone and order transmitting, which required the use of wiring to the length of 52 miles. Ship service is provided for by 325 telephones in addition to a general loud-speaker announcing-telephone system consisting of 236 telephones. A call bell system that includes 500 annunciator drops, 710 push buttons and 248 bells is in operation. A feature of these interior systems is the provision made for sounding alarms, the fire alarm arrangements consisting of 230 stations, and a general alarm gong system that includes 216 gongs and howlers.



U.S.S. "*Saratoga*" from the air. Our photograph shows clearly how the deck superstructures are arranged in order to give a clear run for aeroplanes taking off or landing

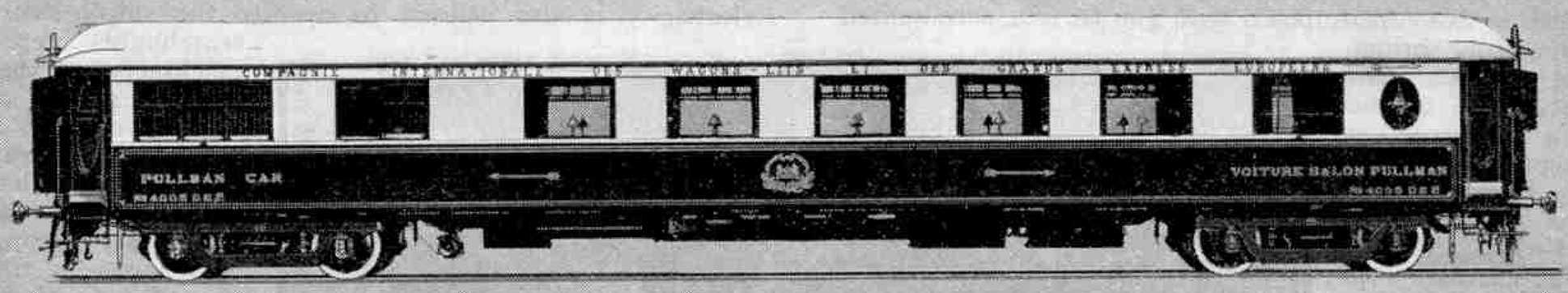
Capt. Yarnell, commander of U.S.S. "*Saratoga*"

During last year the U.S. airship *"Los Angeles"* effected a successful landing on the flying deck of the *"Saratoga"* while that vessel was steaming at a speed of 15 knots. The experiment took place about 30 miles south of Newport News with the aircraft carrier headed into the wind.

The great airship, after circling above the aircraft carrier at an altitude of about 400 ft., was by skilful manœuvring gently brought so low that its nose was close behind the funnels and masts of the *"Saratoga."* In spite of the gusty nature of the wind the descent was accomplished without mishap and the airship was brought to a standstill with its control cabin barely touching the deck.

The somewhat risky operation of bringing the huge airship into alignment with the aircraft carrier was successfully carried out, a rope being thrown from the airship's bow and two other lines cast from the side of the airship, all of which were caught and held by members of the crew of the *"Saratoga."* The *"Los Angeles"* is 656 ft. in length, and presented a striking spectacle as it rested on the 880 ft. flight deck of the aircraft carrier. Later the mooring ropes were cast off and the airship made an easy and unobstructed ascent from the deck of the aircraft carrier, and returned to her hangar at Lakehurst. The success of the experiment gave great satisfaction to the U.S. Naval authorities.

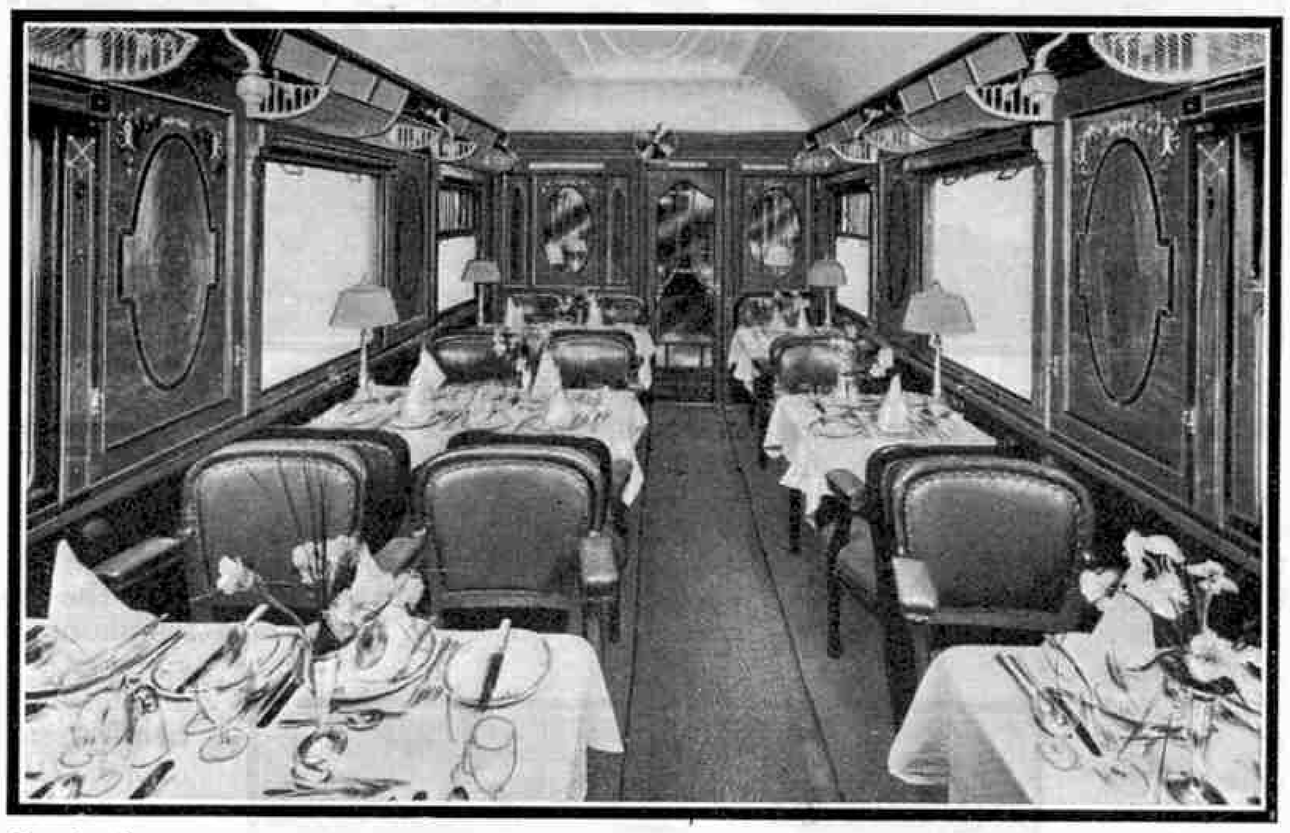
Famous Trains and the Routes over which they run



by CECIL. J. ALLEN. M.Inst. T. Etc.

XXXIII.—THE "EDELWEISS PULLMAN"

IT has been my good fortune during the past summer to "discover" a new gateway to the Alps. I had tried most of the best-known routes before and knew them by heart, so to speak; but the L.N.E.R. and the International Sleeping Car Company jointly introduced me to what turned out to be the most delightful journey I have ever yet made to and from Switzerland. It is no *new* route; neither is it the shortest, nor the most direct, nor the quickest. It was not, indeed, until the International Sleeping Car Company had added yet another strand to the web of their luxurious Pullman car expresses that now connects all parts of Western Europe that one would have thought seriously of this "way in" to Switzerland.



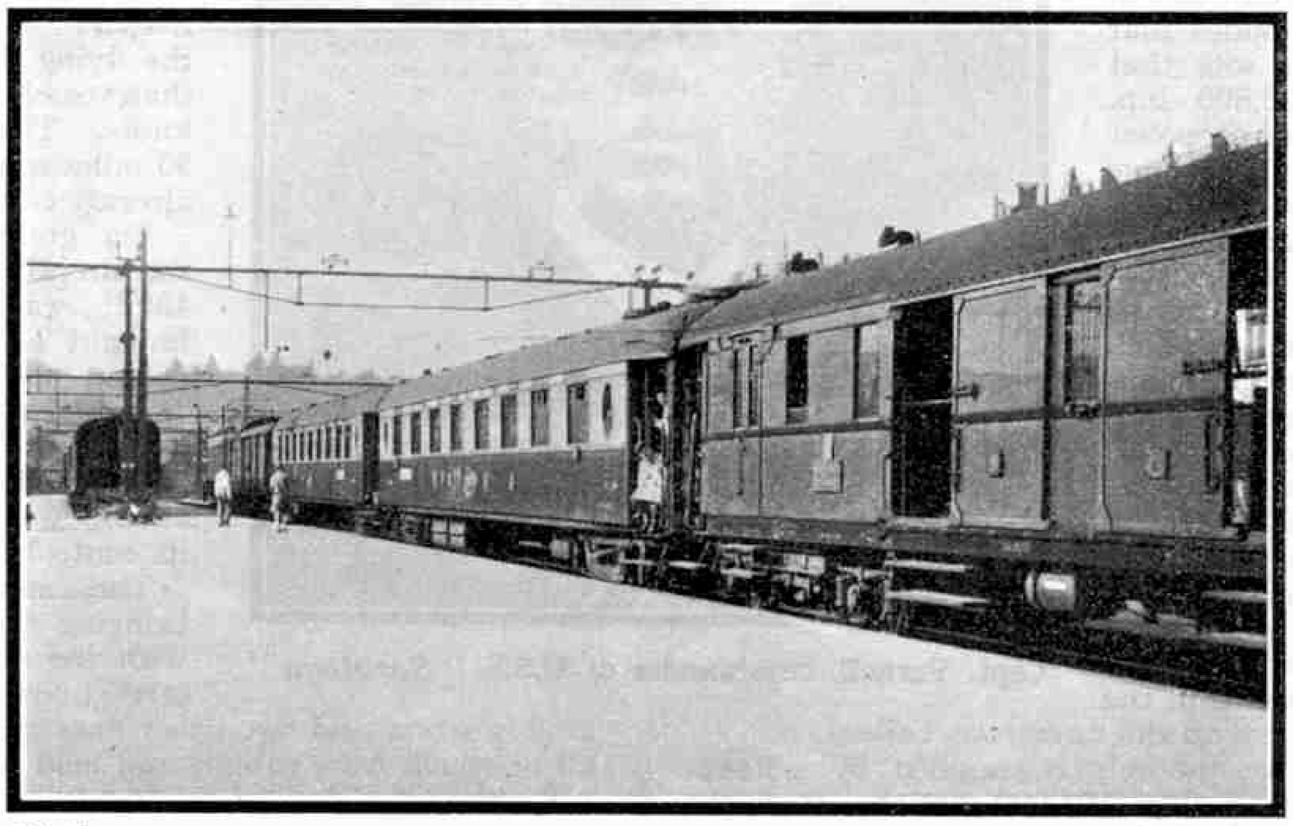
Courtesy] [*Birmingham Carriage Co.*

Interior of one of the cars on the "Edelweiss Pullman." The photograph gives an excellent idea of the spaciousness and beautiful decoration of these cars, which were built in England

The "*Edelweiss Pullman*" now makes possible an "all-Pullman" journey from London to the heart of the Alps and, what is more, the only such all-Pullman journey to and from Switzerland that can be made—a fact that the L.N.E.R. seem a little slow to advertise. There is, of course, the short break across the North Sea, but there a cosy berth in a comfortable cabin of one of the miniature liners with which the L.N.E.R. spans the Channel crossing is the best of all possible substitutes for a Pullman armchair.

Let me now be a little more explicit. My journey was made, first from Liverpool Street Station in London to Parkeston Quay, Harwich, and thence across to Antwerp in Belgium. The "*Edelweiss Pullman*" runs every day between Amsterdam in Holland and, during the height of the summer season, Lucerne and Zurich in Switzerland, the train being divided at Basel in order that one half may go to the former town and the other half to the latter. The route is right down through Belgium and the little Duchy of Luxembourg, and then on through Lorraine and Alsace—passing *en route* the historic cities of Metz and Strasbourg—to Basel. On arrival in the steamer at Antwerp you can either taxi across to the Berchem Station, where the "*Edelweiss Pullman*" stops on its way from Amsterdam, or you can take the boat train for the short journey direct from Antwerp Quay into Brussels, and join the "*Pullman*" at the great North Station in the Belgian capital.

There are some who prefer the rival attractions of the German "*Rheingold Express*" to those of the "*Edelweiss Pullman*," when entering Switzerland from this direction. But the "*Rheingold*" journey, with its fine scenic route up the Rhine from Cologne, means leaving Liverpool Street 15 minutes earlier, by the "*Hook Continental;*" crossing from Parkeston Quay to the Hook of Holland; starting to get dressed soon after five o'clock in the morning and, what is more, while the ship is still on the open sea—which you might not relish overmuch even if you are, like me, a very hardened traveller!



Photo] [*C. J. Allen*

The "Edelweiss Pullman" leaving Lucerne for Basel, Swiss Federal Railways. The overhead equipment is for alternating current at 15,000 volts. In the foreground is the brake-van of the "Rheingold Express" portion

As compared with this, the Antwerp boat allows you to sleep until you are cruising peacefully up the quiet waters of the River Scheldt. Then, at your leisure, you get up at about seven o'clock, take a turn round the deck in the morning sun, have your last good English breakfast down in the dining saloon, and are ready to make an unhurried landing, feeling in the "pink" of condition to enjoy a new day, at 8.30. If you intend to intercept the "*Edelweiss Pullman*" in Antwerp, indeed, you need not be up as early as this, as she is not due to leave Berchem Station till 10.9 a.m. If you are going into Brussels by the boat train, however, you must be in your place by 8.52 a.m., when the train leaves Antwerp Quay. Even this is a couple of hours later than the departure from the Hook of Holland of the

"*Rheingold Express*," of which we are to make the acquaintance, much later in the day, at Basel; for from Basel to Zurich, and also from Basel to Lucerne, the severed halves of the two famous expresses keep each other company. There is one other advantage of the "*Edelweiss*" route—it is the cheaper of the two!

So it was that on an evening early in July I found myself on No. 7 platform at Liverpool Street terminus, boarding the "*Antwerp Continental.*" The Pullman Car Company are well represented on this train, as in addition to the ordinary first-class "armchair" Pullman car, the ordinary restaurant car catering is now done in a handsome three-car Pullman "set." This is the first time that the Pullman people have introduced in England any Pullman restaurant cars of this type, without a supplementary charge for seats; although such cars have been run in Scotland for a long time past on the Caledonian Section of the L.M.S. The remainder of the train is made up of the fine bow-ended standard corridor stock of the L.N.E.R., with automatic couplings, the whole nine or ten vehicles making a particularly handsome turn-out.

I must not dwell at length on the journey to Parkeston Quay, however, as this was but the introduction to our real subject matter. Suffice it to say that on my trip the "*Hook Continental*" went out ahead of us at 8.15 p.m., with one of the new 3-cylinder 4–6–0 "Sandringham" class engines and an enormous train of 14 cars, which included three restaurant cars and two Pullmans, weighing all but 500 tons behind the tender. The extra five minutes now allowed to Parkeston by this express are well deserved with such loads as this.

We had a train of 315 tons only, with one of the familiar Great Eastern type 4–6–0 engines—No. 8580 of the last series, fitted with Lentz valves—and the driver early was determined to show that the 82-minute schedule over the 69 miles to Parkeston had no terrors for him! In fact we passed Shenfield in a time I have never previously equalled—27¼ minutes for the 20¼ miles, including the slow exit to Stratford and the formidable climb up Brentwood Bank. Then, after touching over 70 miles an hour and getting through Chelmsford in 36 min. 20 sec., we had positively to "ease" in order not to overtake the Hook train. Even so we ran the 39¼ miles from Shenfield to Manningtree in 41¾ minutes, and would have been at rest at Parkeston Quay in 81 minutes from Liverpool Street but for being pulled up at the home signals to allow the "*Hook Continental*" to clear the platform ahead of us.

Of the journey across the North Sea also little need be said. You may be mystified to notice that the bows of the boats—first the Hook boat, then the Antwerp boat, and then, in the height of summer, the Zeebrugge boat—are all pointing up the Stour estuary as they lie alongside the quay. They start in the same order, at intervals of a few minutes, and it is a fine sight to see the three brilliantly-lighted ships, first steaming in a semi-circle away from the quay, one after another, and then heading in a stately procession seaward, line ahead, through a mazy succession of lighted buoys.

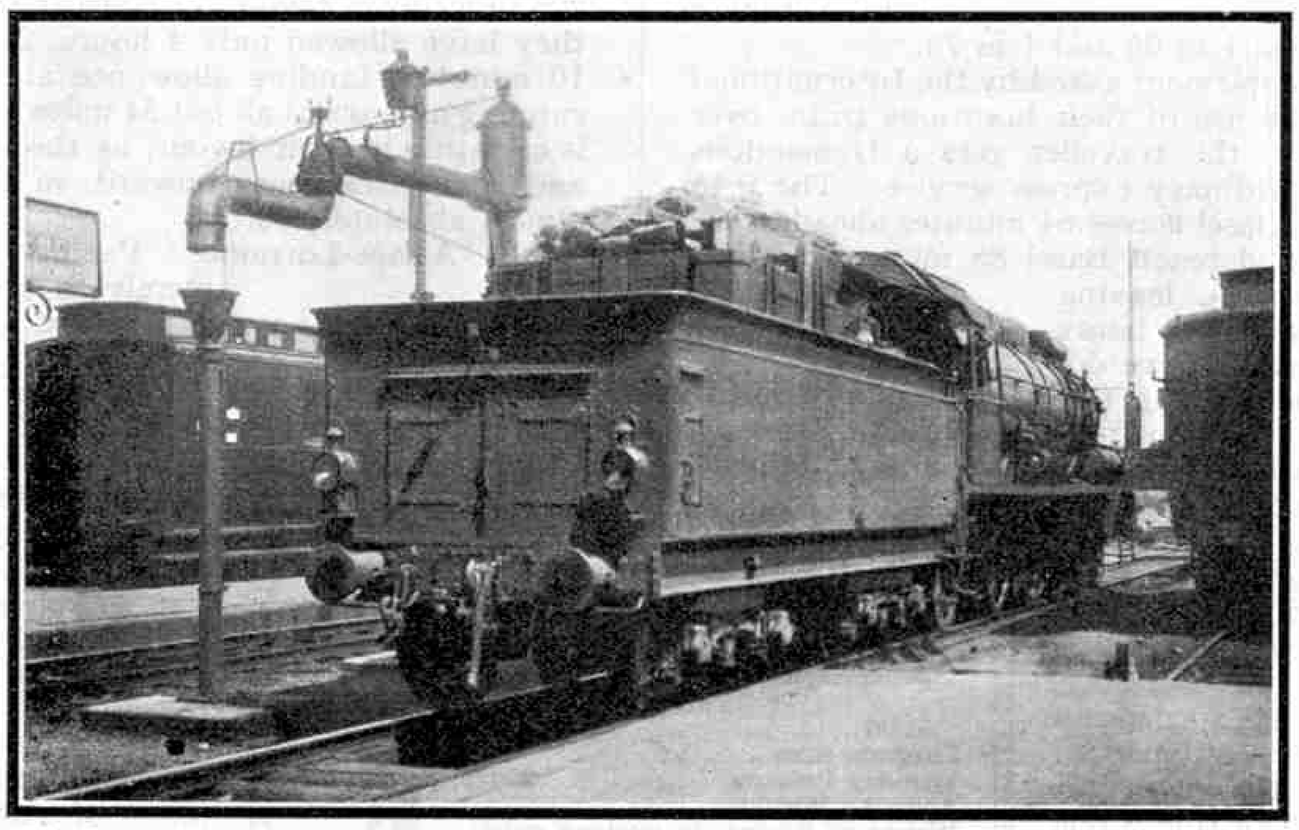
After that you go down below, as it is now well after 10 o'clock, and turn in for a comfortable sleep of eight hours or so. The motion of the boat is so perfectly steady that, unless it is very rough, you will know nothing of some six hours of open sea, but will wake up in the long reaches of another wide river—the Scheldt. It is nearly eight o'clock when the miles and miles of quayside come into view which, with the dignified background of the cathedral, proclaim the port of Antwerp. Soon after eight o'clock you have made a leisurely disembarkation.

The stock of the boat train provided by the Belgian National Railway Company from Antwerp Quay into Brussels, consisting mostly of rather primitive six-wheelers, is, it must be confessed, a poor exchange for the luxury of either the "*Antwerp Continental*" or the "*Edelweiss Pullman.*" The short journey, with its one intermediate stop at Malines, is soon over, however, and at 9.53 a.m. we find ourselves in the great Nord Station at Brussels. Further, we have always the option of getting the "*Edelweiss*" at Berchem, but the railway enthusiast prefers to take the opportunity of nearly an hour's inspection of Belgian locomotives and rolling stock at Brussels before the "*Edelweiss*" goes south at 10.49 a.m.

Courtesy] [*Swiss Federal Railways*

View of Lucerne. The handsome railway station is seen in the centre of the photograph, and in the distance tower the snow-clad Alps

There is much to be seen, too. The most intensive service of express trains in Belgium is that which works between the cities of Brussels and Antwerp. Known as the "Trains Blocs," because they are composed of special centre-corridor sets of coaches, with clerestory roofs, these expresses run at frequent intervals throughout the day, taking 36 minutes for the non-stop journey of 27¼ miles, or 42 minutes if a stop at Malines be included. For the most part they are worked by big ex-German 4–6–0 four-cylinder compound engines taken over from the Prussian State Railways after the war, many of which, together with "Atlantics" and 4–4–0's, are seen in and about the station. De Glehn compound Belgian 4–6–0's, of a neat type with brass-capped chimneys, are also seen in large numbers, together with inside-cylinder 4–4–0 engines modelled on the "Dunalastair" type of the late Caledonian Railway. The earliest of the Belgian engines last-mentioned were actually built in Scotland.



Photo] [*C. J. Allen*

Changing engines at Strasbourg. The Alsace-Lorraine "Pacific," with high-capacity 8-wheeled tender, is backing down for the run of 98½ miles non-stop to Metz. Over this stretch average speeds of more than 60 miles an hour are maintained continuously

At twenty minutes to eleven the blue and white cars of the "*Edelweiss Pullman*" are seen approaching from Schaerbeek. They have already been 3½ hours on the journey, having left Amsterdam at 7.25 a.m. (Dutch time, which is 20 minutes in advance of the ordinary Western Europe time), and called at The Hague and Rotterdam before reaching Rosendaal, where the Netherlands Railway authorities of Holland hand the train over to the Belgians and the first frontier is crossed. The length of journey in Holland is 89 miles in all, and with 54 miles through the north of Belgium, including the intermediate stop at Berchem, the "*Edelweiss Pullman*" is brought into Brussels (Nord) at 10.41 a.m. Immediately in front of it from Antwerp, but running round Brussels into the Midi Station and from there non-stop over the 192½ miles to Paris—the longest non-stop run on the mainland of Europe—is the "*Oiseau Bleu*," another all-Pullman express.

In all probability the "*Edelweiss Pullman*" has been brought from Rosendaal to Brussels by an ex-German 4–6–0, but at the Nord

Station, which is terminal, the train is reversed. Waiting to take it southward through Belgium to Luxembourg is one of the most singular-looking "Pacific" engines to be seen in any part of Europe. They are known as "Type 10" of the Belgian National Railways.

The strange feature of these "Pacifics," the earliest of which appeared as far back as 1910, is that a comparatively short boiler is used, with a sharply tapered barrel; and that the smokebox of the engine finished well clear of the cylinders and the bogie, which project like a great ram in front. Four high-pressure cylinders are used, so that the locomotives are simple and not compound; and the steam from each pair of cylinders is exhausted in the rebuilt engines into two separate chimneys, which are covered with one long casing, surmounted by a deep brass cap, and a high "capuchon" or smoke deflector on top of that.

The whole appearance is one of extraordinary power, but the Belgian "Pacifics" appear at times to have some difficulty in living up to the reputation that they might well earn by their massive outline. Their work has been greatly improved, however, since they have been rebuilt and modified in various respects, from 1922 onward. It must not be forgotten also, that the fuel used is of poor quality as compared with that to which we are accustomed in this country, and that the gradients over which we are to pass between Brussels and Luxembourg are extremely severe, including many miles inclined at between 1 in 60 and 1 in 70.

In exchange for the small supplement asked by the International Sleeping Car Company for the use of their luxurious train, over and above the ordinary fare, the traveller gets a tremendous advantage in time over the ordinary express service. The 9.45 a.m. express from Brussels to Basel leaves 64 minutes ahead of us, but we pass it on the way and reach Basel 85 minutes sooner. Even the best ordinary express, leaving Brussels at 12.40 p.m., takes two hours longer on its journey to Basel than we do. The Pullman train is not heavy, the formation consisting of one "fourgon," or luggage-van; one second-class car and one first-class car for Lucerne, and three similar vehicles for Zurich, making a total of six cars, or about 250 tons empty. With passengers and luggage 255 to 260 tons would represent the total weight behind the tender.

Out of Brussels our train has to make a wide circuit round the eastern suburbs of the city, passing on the way the important Quartier Leopold Station, which this is one of the few trains of the day to give the "go-by." Then follow heavily-rising grades and sharp ups-and-downs on the way to Namur, which is heralded by a very abrupt descent to the valley of the Meuse. For the stage of 38½ miles from Brussels to Namur the timetable allows 54 minutes, and over such a route the maintenance of an average speed of even 43 miles an hour is none too easy. At Namur we see a number of engines of distinctly French appearance. These are the property of the Nord-Belge Company, closely allied with the French Nord line, and are responsible for working the route from the French frontier through Namur and Liège to the German frontier, which is the main line from Paris to Berlin.

After Namur heavy climbing begins again, out of the Meuse Valley up to the high ground of the Belgian Ardennes, the worst ascent being for eight miles continuously at 1 in 62½. The run on which we are now engaged is the longest non-stop break made exclusively on Belgian territory, and is also the longest non-stop journey made by the *"Edelweiss Pullman,"* over the 102½ miles from Namur to Luxembourg. There is a liberal time allowance of 145 minutes, but this has to cover, in addition to the heavy grading, a number of severe slacks over curves intermediately.

In the heart of the Ardennes district we pass Jemelle—an important locomotive centre, where we shall see an extensive collection of engines, including the big 2–10–0 type, similar in general design to the "Pacifics," which is responsible for working freight over this heavy route—and Arlon, the southernmost important town in Belgium. At Kleinbettingen we cross the Belgian frontier, and at 2.12 in the afternoon we come to rest at Luxembourg, the capital of the little independent Duchy of that name. Although this is a "through" station, we have entered the city from the south side, and so for the second time must reverse our direction of running in leaving for Metz. The locomotive of the Alsace-Lorraine Railways, which is to take us over from the Belgian "Pacific," is therefore waiting outside the station as we enter.

Photo] [*C. J. Allen*

The "Edelweiss Pullman" at Luxembourg. It is headed by one of the monster 4-cylinder "Pacifics" of the Belgian National Railways, and about to begin the non-stop journey of 102½ miles through the Ardennes to Namur

Two hundred and eighty-four miles of the journey have now gone by, and have occupied just over seven hours; an overall average of almost exactly 40 miles an hour. The French are going to raise the figure considerably, however. For their 225 miles from Luxembourg to Basel, notwithstanding four stops, they have allowed only 4 hours, 21 minutes; and deducting the 10 minutes standing allowance at these four points, you have a running average of all but 54 miles an hour. The lie of the country is certainly in their favour, as the line is fairly level throughout; and from Strasbourg onward, in the wide valley of the Rhine, almost absolutely so.

The Alsace-Lorraine "Pacifics" do not confine themselves merely to keeping time, however. On the day of my journey our Belgian "Pacific" unfortunately failed at Brussels. It was half-an-hour before a substitute 4–6–0 was found, and what with this insufficient power over the heavy Belgian gradients, and an interminable succession of severe track relaying slacks, we were handed over to the French 70 minutes late at Luxembourg. Yet so splendid was the running, both in France and Switzerland, that, with the assistance of a considerable curtailment of the booked stopping time at Basel, we recovered 40 minutes of the loss and were only half-an-hour late at Zurich. The best piece of running on the Alsace-Lorraine line was from Metz to Strasbourg, this stretch of 98½ miles, allowed 107 minutes, being covered in 96 minutes, start-to-stop.

In the opposite direction, on my return journey, an Alsace-Lorraine 4–6–0 ran us from Mulhouse to Strasbourg, 67½ miles, in 69 min. 50 sec., and on from Strasbourg to Metz, uphill in the early stages, a "Pacific" covered the 98½ miles in 107 min. 50 sec., though the respective time allowances are 73 and 112 minutes. On the first stage we ran a stretch of 59 miles from Bolwiller to Grafenstaden in 56¾ min., and on the second, despite a bad service slack, the 84¼ miles from Vendenheim to Courcelles were reeled off in 88 min. 20 seconds. This is fine travelling, over a line whose speed exploits are not so much in the public eye as those, say, of the Chemin de Fer du Nord.

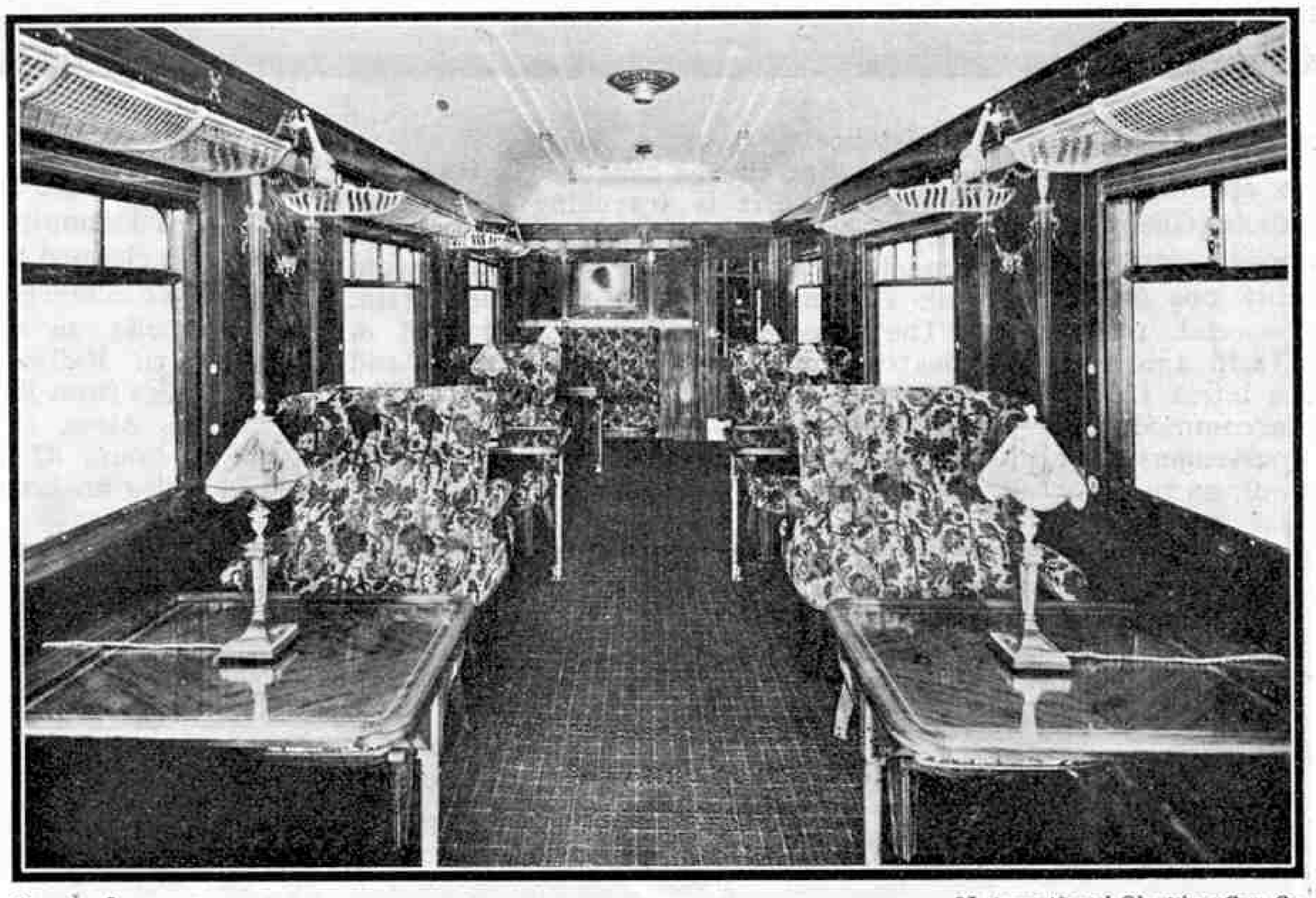
The Luxembourg frontier is crossed between Luxembourg

Leading Dimensions of "Type 10" 4-6-2 Express Locomotives, Belgian National Railways (as rebuilt subsequent to 1922)

Cylinders (4) Diameter	19⅝ in.
,, Stroke	26 ,,
Driving Wheels, Diameter	6 ft. 6 ,,
Heating Surface—	
Tubes	2,153 sq. ft.
Firebox	215 ,,
Superheater (40 elements)	893 ,,
Total	3,261 ,,
Firegrate Area	49.3 ,,
Working Pressure	200 lb. per sq. in.
Adhesion Weight	56.3 tons
Weight of Engine (in working order)	96.3 ,,
Tractive Effort (at 85% Wkg. Press.)	43,650 lb.
Water Capacity of Tender	5,286 gallons
Coal ,, ,,	7 tons

and Thionville and, to save any disturbance of passengers, French customs and passport officials make their visits inside the train. The succession of frontier crossings on this journey raises other complications also. As we enter every fresh country you will see the Pullman car attendants pass rapidly through the train, collecting all the cards showing the refreshment tariff and substituting fresh ones. So, at Thionville, we change over from prices in Belgian francs to those in French francs. Had I been a little more wideawake I should have realised that my afternoon tea would cost more on French soil than on Belgian, and acted accordingly! On this particular trip of mine the problem of exchange was really acute, and at one time I had seven different "currencies" in my pocket, of the six European countries I visited, in addition to British. But that is another story.

The 20¼ miles from Luxembourg to Thionville are allowed 26 minutes which, because of certain slacks *en route*, is a very tight time and may not be quite kept. After a halt of one minute at Thionville, where the customs and passport officials alight, we enter part of the iron and steel producing country that occupies the adjacent areas in the south of Luxembourg, the east of France and the west of Germany. Vast resources of iron ore in the neighbouring hills have established this great industry, and we pass row after row of blast-furnaces, all with the most modern equipment; as well as steel-plants and rolling mills, culminating in the extensive and well-known Hagondange works. Shortly afterward we are passing over elaborately fenced bridges into the fortified city of Metz, with the cathedral a prominent object on the right of the train.



Courtesy [*International Sleeping Car Co.*

Interior of a typical modern Continental Saloon Pullman Car

It is 18¼ miles from Thionville to Metz, and a brief 20 minutes for this again proves to be an extremely tight schedule. But we have the 98½-mile run to Strasbourg ahead now, and with a capacity for running for many miles indefinitely at over 60 miles an hour, our "Pacific" will easily regain any lost minutes.

We shall not fail to notice, by the way, that since we left Luxembourg we have changed over to the opposite track. That is to say, instead of passing trains travelling in the other direction on our right, they are now on our left-hand, as is the custom on the railways of Alsace-Lorraine and in certain other parts of Europe. We hurry on south-eastward through Benestroff, and then slow over a sharp curve at Rieding, where we join the main line from Paris to Strasbourg through Nancy, noticing here a nest of sidings filled with old locomotives awaiting the melancholy fate of "scrapping."

Next follows a tunnel of nearly a mile in length, ushering us into a deep valley through which the railway runs, amid very fine scenery, for the best part of 15 miles, passing through a number of short tunnels. We are here threading the northernmost spurs of the Vosges Mountains and are travelling due east. We emerge into open country again at Saverne, presently bearing round until we are heading full south; and some 25 miles later the outskirts of Strasbourg bear into view. We are due to spend five minutes at this historic city, from 4.54 to 4.59 p.m., and here engines are changed. We may have the services of another "Pacific," or possibly of a 4–6–0 locomotive. In either case it is certain to be a four-cylinder compound engine.

For the next 67½ miles to Mulhouse the allowance is only 71 minutes, but the almost perfectly flat grading of the track, as well as its splendidly straight lay-out, allows of the timing being maintained without difficulty. High hills may now be seen rising at a distance on both sides of the broad Rhine Valley, up which we are now hurrying. Far away to the east are the mountains of the Black Forest in Germany, on the other side of the river. To the west, prominently in view after Selestat, we see the Vosges, picturesquely crowned with a whole succession of castles in lofty positions, and culminating in the Grand Belchen, whose summit is 4,670 ft. above the sea. At Mulhouse we are joined on the east by the Belfort main line, direct from Calais and Paris, over which we travelled in the darkness when coming to Switzerland by the *"Engadine Express."*

The last short stage to the French frontier lies ahead. For the final 20½ miles to Basel, with a tortuous finish from St. Louis into the great "Hauptbahnhof," or Central Station, we are allowed 27 minutes; and at 6.38 p.m. we should be on Swiss territory.

The *"Edelweiss Express"* has now left 509 miles of journey behind her, over which 11 hours, 33 minutes have been spent; and a brief wait is now in prospect—of 19 minutes for the Lucerne portion and of 32 minutes for that to Zurich—during which customs and passport formalities will again be carried out. Meantime the *"Rheingold Express,"* which reached the Baden Railway Station in Germany on the other side of the river six minutes ago, appears at the opposite end of the Hauptbahnhof at 6.48 p.m., 10 minutes after us, in charge of a German 4–6–0 locomotive. All resplendent in violet and cream, with broad gold lining, the *"Rheingold"* cars of the German Mitropa Company present a striking contrast to the royal blue and white of our Pullmans.

The *"Rheingold Express"* is a bigger train than the *"Edelweiss Express,"* as it includes not only the through portions from the Hook of Holland to Zurich and Lucerne, but also a couple of through cars from Amsterdam to Lucerne, which left the Dutch city eight minutes after our express this morning, and were attached to the main *"Rheingold Express"* at Utrecht. A considerable amount of sorting of both the famous trains now takes place, with the result that a train of nine cars is made up for Lucerne—brake, three *"Rheingold"* cars from Hook of Holland and two from Amsterdam, and then our two *"Edelweiss"* cars and the *"Edelweiss"* brake, a heavy formation of roughly 400 tons. This leaves for Lucerne at 6.57 p.m., and the Zurich train, with two *"Edelweiss"* and two *"Rheingold"* cars, and also two brakes, at 7.10 p.m.

We have been over both the Swiss routes previously, and have made the acquaintance of the Swiss electric locomotives, as well as of their remarkable tractive powers. From Basel to Lucerne we travelled with the *"St. Gotthard Pullman,"* which, by the way, is due in Lucerne just an hour after our arrival.

On the way to Lucerne we thread the 5 miles of the Hauenstein Tunnel under the Jura Mountains, and reach Olten, 24½ miles, in 33 minutes; while the final 35¼ miles to the famous lakeside resort are scheduled to be covered in 49 minutes. This portion of the *"Edelweiss Pullman"* finishes its journey of 569 miles, and its transit of four countries and a duchy, 13 hours, 18 minutes after starting from Amsterdam. The Zurich portion has a non-stop run over the route that we traversed with the *"Engadine Express,"* reaching the great industrial centre of Switzerland seven minutes later, at 8.30 p.m.; 80 minutes being allowed for the distance of 55 miles.

"FAMOUS TRAINS"

Readers will be interested to know that we have published in book form a selection of Mr. Allen's "Famous Trains" articles.

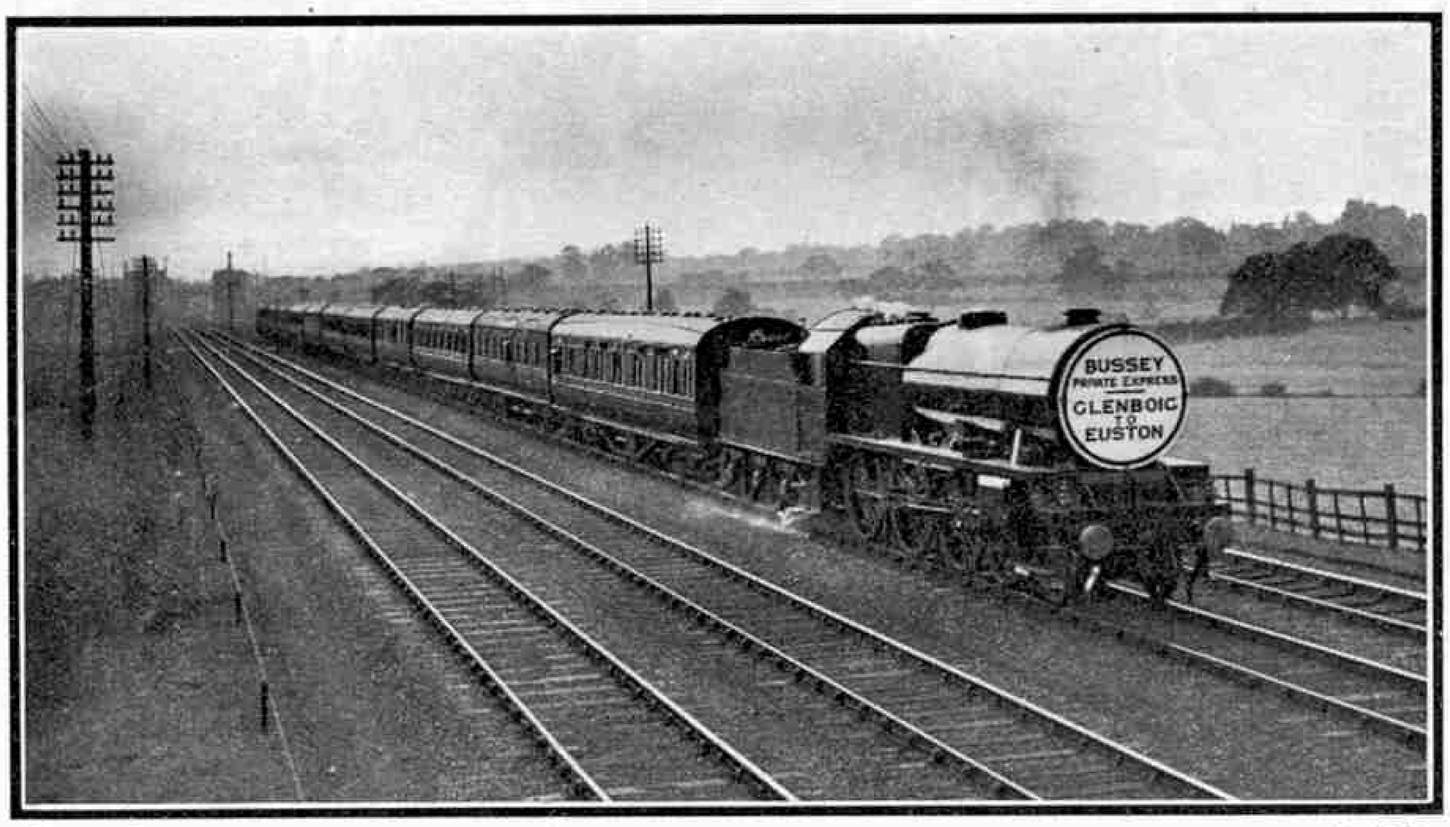
This book, "*Famous Trains*," which is illustrated with a large number of splendid photographs, may be obtained from any Meccano dealer or bookseller, price 2/6, or from Meccano Ltd., Binns Road, Old Swan, Liverpool, price 2/9, post free.

Banquet and Speeches on a Train

In connection with the opening of a new coal distillery at Glenboig (Glasgow), the L.M.S. Railway Company arranged to provide what is probably one of the world's most luxurious special trains. The train left Euston at 12.15 a.m. and was made up of 10 of the latest L.M.S. sleeping saloons giving accommodation for approximately 120 passengers. At Lanark (Race Course Station), on the way down to Glenboig, passengers were transferred to a luxurious day train in which breakfast was served, and this train was used also for the return journey from Glenboig to Euston. In addition to restaurant cars the train was equipped with two cinema cars, a lounge, and observation saloons.

The journey from Glenboig to London, a distance of 395½ miles, was made without a stop, thus constituting the longest non-stop run ever made from Scotland to London. During the journey a banquet was held on the train and speeches were made, which were broadcast by means of loud speakers throughout the length of the train.

Euston was reached at 7.30 p.m., six minutes before time; the journey having occupied eight hours altogether.



Courtesy [*L.M.S.*

The L.M.S. private special train, Glenboig to Euston, passing Tamworth. The return journey of 395½ miles was made non-stop

The Haunted Train: A True Story

Midnight!

The last train roars through the countryside, anxious, seemingly, to seek its well-earned rest before commencing another day of toil. The passengers are either nodding their heads in slumber or are immersed in theatre programmes. Station after station flits by; no lighted lamps announce their names and no scenes of activity enliven their platforms.

Beyond the train, all is quiet and still. Presently, something white appears at the window and is gone again in an instant. Then it looks in again; then vanishes once more. A newspaper thrown out of the window, perhaps. But no, there it is again, peering through the glass with a regular persistence.

No outline can be caught, nor its shape made out; it is travelling so swiftly, keeping pace with the train, through tunnel and station, over road and stream, mile after mile, now here, now gone again.

The passengers who are immersed in theatre programmes lay them aside and look with awe at the phenomenon. The slumbering ones awake and stare incredulously towards the window. Things are becoming decidedly uncomfortable. Why is it that the hour keeps recurring to the mind? Would any notice be taken of the incident if it were mid-day?

But this sort of thing doesn't happen at mid-day. There it is again, flit, flit, flit.

At last one passenger, braver than the rest, puts an end to the suspense that is becoming only too obvious. He rises, opens the window, and clutches the "ghost."

The offender is laid on the floor. The eerie traveller proves to be a damaged label from the destination board "TONBRIDGE."

This interesting paragraph is Reprinted by permission of the "*Southern Railway Magazine*."

DIFFICULTIES EXPLAINED

XIII—S.R. Engines exhausting steam in stations

Several readers have enquired as to what is the reason for the regular exhausting of steam from the chimneys of certain Southern Railway locomotives when standing still. This is not so loud and fierce as the exhaust when in motion, and is due to the Westinghouse air-brake pump being worked while the engine is in a station, in order to maintain air pressure in the reservoir.

Record Non-Stop Run

A Beardmore Diesel electric locomotive, built at Dalmuir, Glasgow, has performed what is claimed to be the longest non-stop run ever achieved on a railway. The run was made on the Buenos Aires Great Southern Railway, and the distance of 775 miles from Plaza Constitution Station, Buenos Aires, to Cipolletti was covered in 20 hours 37 minutes, thus averaging 37½ miles an hour. In the course of the journey, the train ran into a horse and it was feared that a stop would have to be made, but fortunately this was avoided and the desired record was achieved. The Diesel engine and electrical equipment worked admirably and no adjustments were necessary before starting on the return trip.

Most Powerful Locomotive Yet Built in Europe

The most powerful locomotive which has so far been built in Europe is a "Beyer-Garratt" articulated locomotive which has been designed to work on the South African Railways. It has four cylinders, 22 in. diameter by 26 in. stroke. The wheel arrangement is 4–8–2+2–8–4, and the driving wheels are 4 ft. in diameter. The total heating surface is 4,185 sq. ft., and the grate area 75.5 sq. ft. It has a water capacity of 7,000 gallons and a coal capacity of 12 tons.

The "*Flying Scotsman*"

The great popularity of the "*Flying Scotsman*" not only in England but all over the world, is shown by the demand for the various publications issued with regard to this famous service, requests for these being received from almost every corner of the earth.

The majority of the applications come from people of British origin residing abroad, but a surprisingly large number are received from people of other nations whose knowledge of English often can only be very limited. The number of publications sent abroad approaches 2,000, while 1,224 models of the "*Flying Scotsman*" have also been despatched.

L.M.S. Locomotive News

Over forty of the new 0–8–0 standard superheater freight engines have now been turned out at Crewe. Nos. 9520-4 have been allocated to the Central Division (L. & Y. section) and Nos. 9525-8 to the Midland Division. The later engines are still being broken in at Crewe. Some further 2–6–0 mixed traffic engines are being built. The first hundred of this class were numbered 13000 to 13099 inclusive, and seventy of them were built at Crewe and thirty at Horwich. Ten more of this type, Nos. 13100 to 13109 are Crewe-built, and a further twenty, Nos. 13110 to 13129 are to be built at Horwich this year. Eight of these, Nos. 13110 to 13117 are already in service. Derby continues to turn out engines of the 2–6–4 passenger tank class, the latest numbers being 2352-9.

The old North London Railway 4–4–0 outside-cylinder passenger tank engines have, with one exception, gone to the scrap-heap. There were seventy-eight of this class in service when the L.M.S. re-numbering was carried out and the numbers 6435 to 6512 were allotted. The sole survivor is 6445. A considerable number of the N.L. 0–6–0 outside-cylinder goods tank engines are still at work.

40-Ton Wagons for the L.M.S.

The L.M.S. recently placed an order with the Birmingham Railway Carriage & Wagon Co. Ltd., for thirty 40-ton side-discharging wagons. These are being built as an experiment in order to facilitate the conveyance of coal in bulk between certain collieries which are able to handle wagons of this size, and the L.M.S. electric power station at Stonebridge Park, Wembley, which supplies the current required for the Watford electrified lines. The new wagons will be 32 ft. long, 8 ft. 11 in. wide and 10 ft. 9 in. high. It will be possible to empty and clear a train of twelve of these wagons, which are to be self-discharging, in about thirty minutes.

L.N.E R. Locomotive News

One of Mr. H. N. Gresley's Pacifics, No. 2580 "*Shotover*," has been fitted with a feed-water heater. The reservoir has been placed on the front of the smoke-box and gives the engine an unusual appearance because when viewed from the front no chimney is visible.

A coned boiler is being fitted to one of Sir Vincent Raven's Pacifics, No. 2404, "*City of Ripon.*" Five engines of the J39, 0–6–0 goods class, have been recently turned out by the Darlington Works. They are numbered 2738 to 2742 and complete an order for fifty.

Doncaster Works are producing further engines of the K3, 2–6–0 class, and Nos. 1300, 1312, 1318, 1331 and 1364 have been allocated to the North Eastern Section.

G.W.R. Locomotive News

Additional engines of the "Hall" Class (4–6–0 passenger), have been built at Swindon, and their numbers and names are as follows:—No. 4935 "*Ketley Hall.*" No. 4936, "*Kinlet Hall.*" No. 4937, "*Lanelay Hall.*" No. 4938, "*Liddington Hall,*" No. 4939, "*Littleton Hall.*" No. 4940, "*Ludford Hall.*" No. 4941, "*Llangedwyn Hall.*" No. 4942, "*Maindy Hall.*" No. 4943, "*Marrington Hall.*" No. 4944, "*Middleton Hall.*" No. 4951, "*Pendeford Hall.*" No. 4952, "*Peplow Hall.*" No. 4953, "*Pitchford Hall.*" Further goods 0–6–0 tank engines have also been built, their numbers being 5761 to 5769.

The Directors have authorised the construction of a considerable number of new engines including ten more "Kings" and twenty more "Halls." It is realised that the 4–4–0 engines are no longer equal to the demands of much of the traffic of to-day, and they are therefore to be superseded by engines of the 4–6–0 types. In pursuance of this policy twenty engines of the "County" class have been marked for the scrap-heap. Formerly there were forty of these engines, which were numbered from 3800-3839 inclusive. A large number of tank engines of varying types are also to be built.

Photograph] [*Railway Photographs, Liverpool*

L.N.E.R. No. 4472 "*Flying Scotsman*," on the "Scotsman," with Corridor Tender

A Thame Mouse

The "*Great Western Railway Magazine*" gives the following interesting story:—

An unusual incident recently came to light at Thame station. It appears that a bottle of meal and water that had been used to feed some calves was thrown away in the goods yard, and lay on its side, while still containing some of the mixture.

If the story were told in dramatic form it would next be necessary to say "Enter a mouse, lean and hungry, through the neck of the bottle."

Nothing is known of the mouse's meal on the meal and water, but the evidence is that it was quite a good one, for by the following morning the rodent had been caught in a trap of its own contrivance, having grown too fat to get out of the bottle.

The Rush to the North

The traffic to Scotland is always especially heavy during the days and nights immediately preceding "the Twelfth" of August when grouse shooting begins on the moors. On the 7th, the "*Royal Highlander*" (7.20 p.m. from Euston) was run in duplicate; on the 8th it was run in three portions, whilst on the 9th no less than six trains were required. Of these one went to Inverness and the North; another to Aberdeen, another to Oban, another to Perth; and the fifth and sixth served Aviemore and Boat-of-Garten.

In all, one hundred and fifty trains left Euston for Scotland during the week ending August 10th. Six hundred sleeping berths were booked in the fourteen expresses which ran between 7 p.m. and midnight on August 9th alone. Five hundred tons of luggage accompanied the passengers who were travelling north; and within four days, eighty private motor-cars were conveyed by express passenger trains from London.

G.W.R. Winter Train Service

All railway enthusiasts will welcome the news that the 2.30 p.m. express from Cheltenham Spa to Paddington is being continued throughout the winter. This includes the run of 77¼ miles, from Swindon to Paddington, in 70 minutes, which is a world's record for the fastest start-to-stop Schedule.

The Pullman-car facilities which were first introduced on the G.W.R. in July last are also being retained, and slightly extended, during the winter.

The "*Torquay Pullman Limited,*" introduced in July last, will run on three days per week instead of two as at present.

Manchester Railway Electrification

The L.M.S. and L.N.E. Railways have now placed the contracts in connection with the scheme for the electrification of the Manchester, South Junction and Altrincham Railway. This small railway, of a length of a little over nine miles, is used by the Manchester (Central)—Chester trains of the C.L.C. via the junction at Old Trafford; while the L.M.S., Liverpool, Widnes, Warrington and Manchester (London Road) trains use this line via Timperley junction. Two new stations are to be provided, one at Dane Road, Ashton-on-Mersey, and the other at Navigation Crossing; while the present Old Trafford Cricket and Football Ground Station will become a permanent residential station.

The overhead conductor system is to be adopted, power at 1,500 volts d.c. being supplied from the Central distributing station and two sub-stations situated at Cornbrook and Timperley Crossing. It will take 18 months to complete this conversion of the line from steam to electric, and the cost will be £500,000.

III.—NOCTOVISION AND PHONOVISION

WE stated in the August "*M.M.*" that Mr. Baird's chief difficulty was the construction of an electric eye, or photo-electric cell, that was sufficiently sensitive. Naturally the working of any television outfit depends on how well this substitute for the human eye can see. In his earliest experiments Mr. Baird found it necessary to concentrate a blinding glare from powerful lamps on the object being televised in order that a sufficient proportion of light should be reflected from it to have the necessary effect on the photo-electric cell in use. This made things very uncomfortable indeed for those who were called upon to act as television subjects in these pioneer efforts, an honour that could only be endured for very short periods!

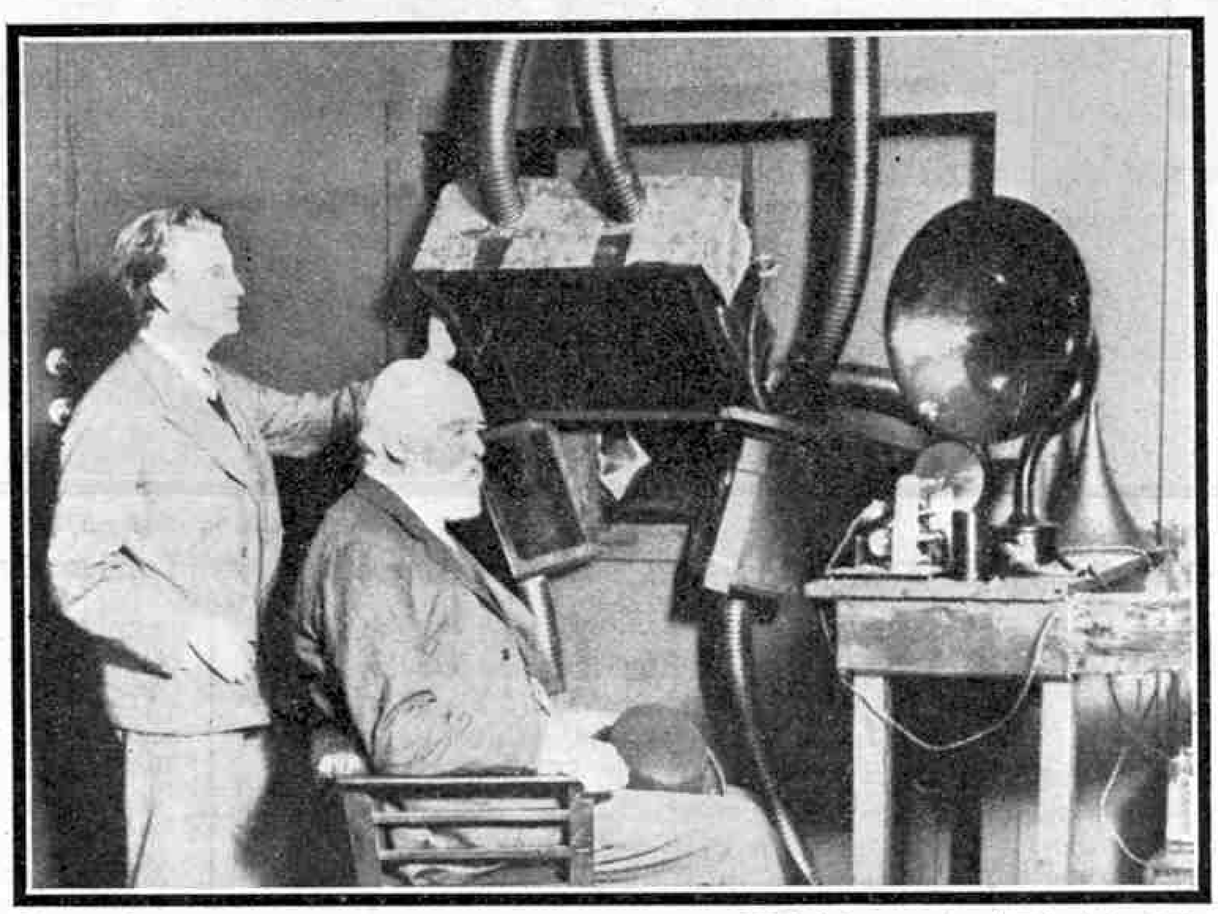
To-day photo-electric cells have been so much improved that it is quite unnecessary to use light of such power and, in fact, it is not even necessary to use visible light at all! There are many methods in use that make things more pleasant for those who sit in front of the electric eye, and yet give sufficient reflected light. One of these is the spotlight method, in which use is made of a scanning disc placed directly in front of a strong light. This is in such a position that the very narrow beam of light passing through the holes in the scanning disc falls on the object or scene to be televised. The scanning disc is, of course, rotated at very high speed, with the result that each portion of the scene or object is illuminated in turn. Thus, instead of lighting up the whole scene at once, only the portion of it that is required is illuminated at any one moment.

Traversing the face of a sitter with an exploring light spot of this kind is certainly much more reasonable than the use of blinding arc lamps, but photo-electric cells may now be made that respond equally well to daylight or to those rays of light, of wavelength greater than that of visible red light, to which the name of infra-red rays have been given. These are the rays that are turned through an angle a little less than that through which red light is bent, when a beam of sunlight is passed through a glass prism. They do not affect the eye, but their presence can be detected by their heating effect, or by their action on specially prepared photographic plates, as explained on page 126 of the "*M.M.*" for February last.

When a scene is being televised in this manner it is flooded with rays of invisible light from an arc lamp, ordinary light being cut off by interposing thin sheets of ebonite or some other substance through which the invisible rays can pass. Although the scene then appears to be in complete darkness, the electric eye sees quite plainly, and by means of the usual apparatus the electric currents produced in it may be translated into light flashes in a neon lamp at the receiver.

To television by means of invisible light Mr. Baird has given the name of "noctovision," and this invention opens up remarkable possibilities. By the use of a searchlight or beam of infra-red rays it will be possible to make visible a scene that to the eye appears to be shrouded in complete darkness, and this may be done in complete secrecy, for the beams of the searchlight themselves will be invisible.

The value of noctovision may be even greater than this, for infra-red rays penetrate a dusty and foggy atmosphere far more easily than does visible light. Very interesting trials proving this recently have been made by Mr. Baird at Box Hill, Surrey. On the Hill itself was placed the necessary apparatus for transforming the beams of light into the electric current that lights up the neon lamp in the receiver. Two-and-a-half miles away was a car with brilliant headlights.

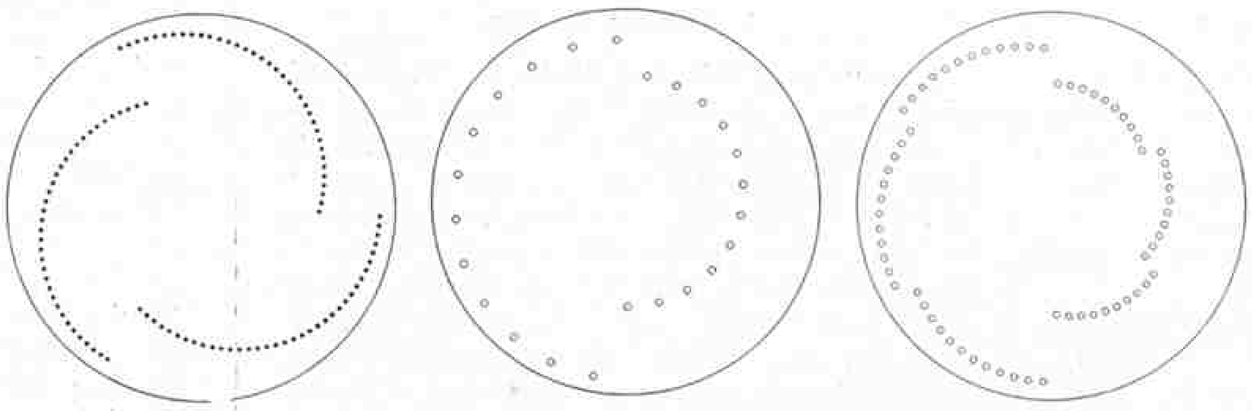


Courtesy] [*Baird International Television Ltd.*

Sir Oliver Lodge in front of the transmitter of the Baird Noctovisor. The inventor, Mr. J. L. Baird, is standing on the left

At an appointed signal a thin sheet of ebonite was placed in front of the headlights. The effect of this was exactly the same as that of thick fog, for the infra-red rays penetrate thin sheets of ebonite as easily as they find their way through fog, while rays of visible light are cut off. In spite of the presence of the sheet of ebonite, the lights of the car were clearly visible on the screen of Mr. Baird's apparatus on Box Hill.

It is quite clear from this and similar experiments made by Mr. Baird that noctovision may render navigation of crowded waters in fog very much safer. By the use of apparatus similar to that employed on Box Hill the navigation lights of approaching vessels may be made visible in any atmospheric conditions. It is not impossible that in time television apparatus may be so greatly improved that the approaching vessels themselves may be made visible, but the exact manner in which this will be done cannot be foreseen. Probably vessels will be equipped with a searchlight projecting a beam of infra-red rays, and a television transmitter the electric eye of which is so placed that it will receive the invisible light reflected from objects on which the beam falls. The electric currents thus generated in the photo-electric cell may then be made to



Television scanning discs. That on the left is used when transmitting colour in ordinary television. The middle disc is employed in stereoscopic television, and the third has two triple sets of spirals for stereoscopic television in colour

control the neon lamp in a television receiver, and thus the scene ahead that is hidden by fog will be made clearly visible on the screen of the receiver.

When noctovision is used for such a purpose as this, no wireless link is necessary. The tiny current across the photo-electric cell is amplified and taken direct to the neon lamp in the receiving portion of the outfit.

Another very interesting invention due to Mr. Baird is "phonovision," or the recording of sight by means of sound. Those who have been able to tune in their wireless receivers to the wavelengths on which television broadcasts have been sent out may have heard a peculiar groan, varying in pitch, that is quite distinct from the sounds usually heard. Sounds of this kind are produced in all television broadcasts. An inanimate object gives a steady sound, but the sound from an animate object varies slightly with even the smallest movement. The sounds thus made appear to be characteristic, and it is said that anyone sitting in front of the scanning disc may be recognised by the sound of his face! The sound produced when an electric eye takes a full face view is quite distinct from that heard when it is looking at the same face sideways.

Mr. Baird has turned these sounds to good use by impressing them upon a gramophone record. From this, not only may the sounds be reproduced, but the visible images that caused them may be reconstructed. When the record is played on the gramophone, using an electro-magnetic pick-up, electrical impulses associated with the sounds are also reproduced. These are amplified and allowed to act on the neon lamp in a television receiver. This combination of gramophone and televisor is called a "phonovisor," and it enables the sounds to be stored up for any length of time and to be looked at when desired.

Ordinary television resembles photography in that it gives a flat picture in one colour, but in order to give a faithful rendering other colours should be present, and in addition there should be a sense of distance and spacing.

The human eye automatically accounts for these important factors. Not only are the cells of the retina sensitive to visible light of all kinds, but in some mysterious manner we are able to distinguish clearly between the colours. The sense of distance and spacing is given by the use of our two eyes, which are set at a slight distance apart. The truth of this may be realised by examining any scene first with the right eye only and then with the left. Then when both eyes are used together it will be found that the combination of the two slightly different points of view enables a judgment to be made of distances along lines radiating from the eyes.

Courtesy] [*International General Electric Co.*

Interior of a television studio at the American Station, W.G.Y., arranged for broadcasting a play. The television "camera" is in the background, and is flanked by two powerful lamps. On the right is a receiver, on the screen of which the director follows the scene

Courtesy] [*Baird International Television Ltd.*

One of the studios at the Baird Television Laboratories. It is lined with copper in order to prevent electrical interference from outside

The familiar instrument known as the stereoscope makes use of this double-sight method. In a stereoscopic camera two lenses are used. The distance between them is 4½ in., which is equivalent to the separation between the eyes of the average human being; and when two pictures thus taken are combined, objects appear to stand out in relief exactly as they appeared to the eye in the original scene.

Mr. Baird has realised that colour and stereoscopic vision are necessary in television. He has now succeeded in introducing both, and as a result of this, in his latest production the objects shown on the screen of his receiver are amazingly life-like.

In order to make the electric eye see things in their natural colours Mr. Baird uses a scanning disc with three spiral lines of holes instead of one. These spirals follow each other round the circumference of the disc. The perforations in one spiral are covered with light filters that allow only red light to pass, while those in the remaining two are fitted respectively with green and blue filters. The reason for using these three colours is that they are the primary colours, from combinations of which all other colours may be obtained.

The scanning disc rotates in front of a lamp and the spot of light transmitted by it is directed on to the object to be televised. Thus the object is explored first by a small area of red light, next by one of green light, and finally by a spot of blue light. Light of these colours is reflected to the photo-electric cell, and impulses are transmitted in the usual manner to the receiver. There a similar disc reverses the process, and thus casts on the screen of the receiver spots of light corresponding exactly in colour, intensity and position to those reflected from the object being televised. These follow each other so quickly that the screen appears to be covered with coloured spots, and the general effect of a very large number of them is to give an image in colour of the original scene or object.

In the ordinary television set the spots of light constituting the image on the screen are produced by a neon lamp, and are thus of one colour, namely, red. Mr. Baird's chief difficulty was to find similar lamps that would give green and blue light. In the end he used a lamp containing helium and mercury vapour to supply the green and blue elements needed, while of course, the neon lamp continued to supply the red. By the use of commutators rotated by the motors driving the scanning discs at the two ends of the television apparatus the corresponding colours are brought into use at corresponding times. When the light reflected from an intensely green area of an object being televised is acting on the photo-electric eye in the transmitter, for instance, the helium and mercury lamp is brought into action. Similarly light from the neon lamp only reaches the screen when red light is being reflected to the photo-electric cell at the transmitter.

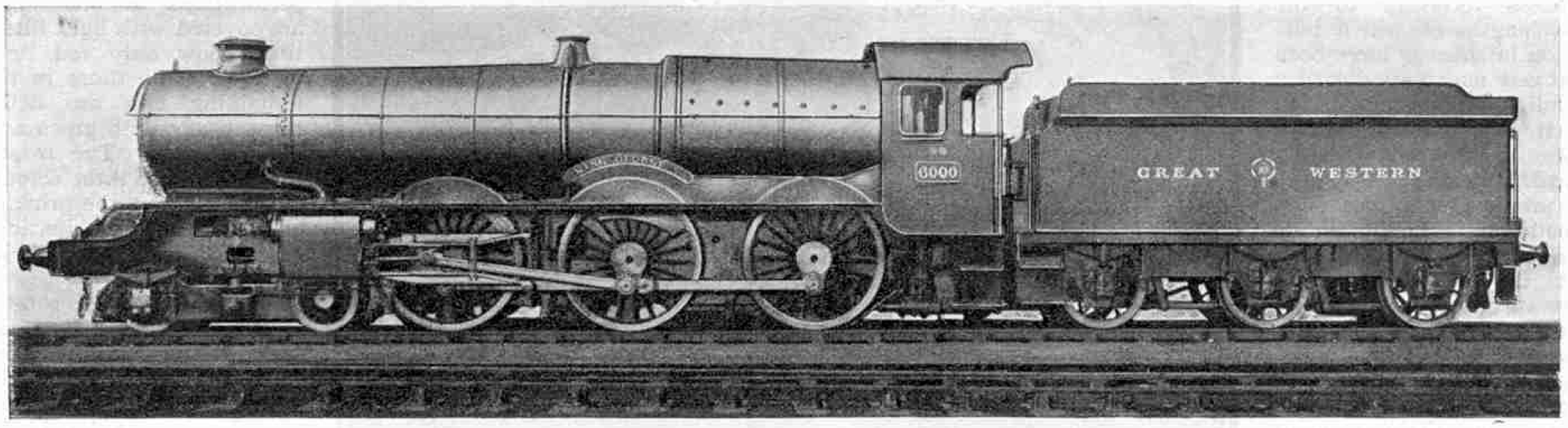
If we are to see on the screen of a television receiver objects exactly as they appear to human eyes, the electric eye must, of course, be double. Fortunately this may easily be done by providing a scanning disc in which are two spiral sets of holes, the distance between the two sets being about 4½ in. One set is arranged near the circumference of the disc and the other nearer the centre; and for each of these spirals

(*Continued on page 772*)

The "*Cornish Riviera Express*"

Twenty-Fifth Birthday of a Famous Train

By "Observer"

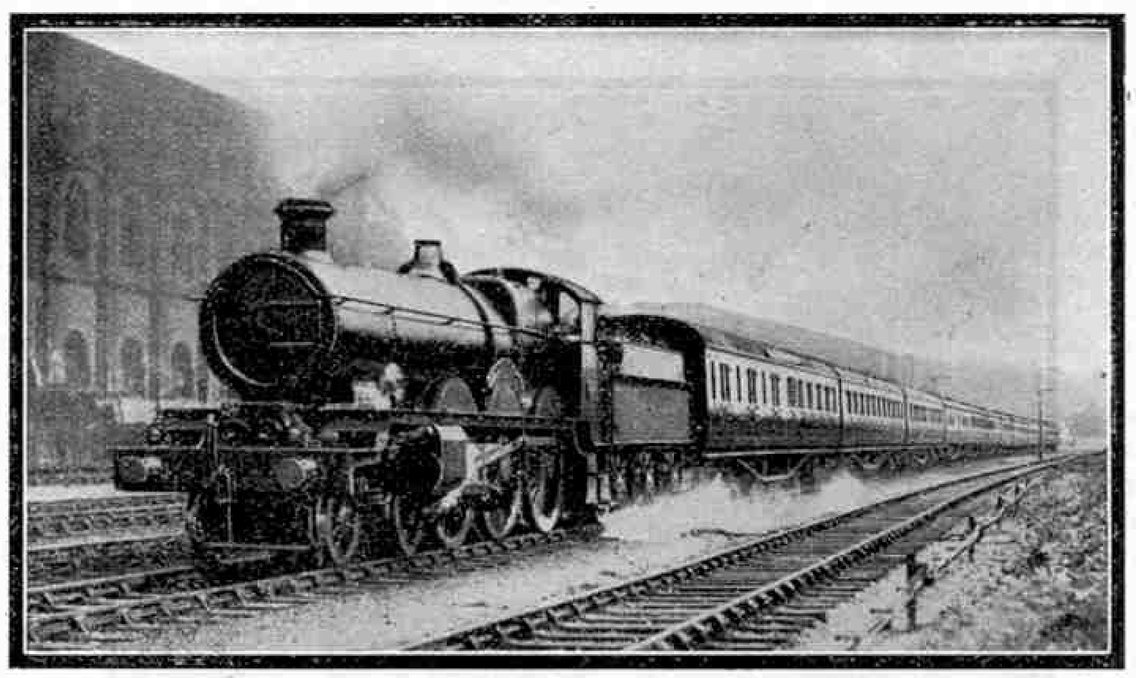


The famous locomotive "*King George V*," which aroused such widespread interest in America on the occasion of its visit to the Baltimore and Ohio Centenary Exhibition in 1927. For the illustrations to this article we are indebted to the Great Western Railway

ONE of the most notable events in the railway world this year has been the celebration of the twenty-fifth birthday of the popular "*Cornish Riviera Express*" of the Great Western Railway. In the September number of the "*M.M.*" particulars were given of the new rolling stock that has been specially built to mark this "silver anniversary." I now add some notes on the history of this famous train and on its present-day running.

It was on 1st July, 1904, that a new train from London to Cornwall was put on by the G.W.R., to which the name of the "*Cornish Riviera Express*" was given. The run of 246 miles between Paddington and Plymouth was made non-stop by both the down and the up trains. This was a feat greatly in advance of anything that had been attempted previously in a regular daily service, and it created quite a sensation.

The train originally left Paddington at 10.10 a.m. and was booked to arrive at Penzance at 5.10 p.m.; while the up train left Penzance at 10 a.m. and was due at Paddington at 5 p.m. On the down journey, from the 36th to the 117th mile-post the average speed was over 60 m.p.h., and the time allowed from Paddington to Plymouth was 4 hr. 25 min. On 1st July, 1906, the shortened route via Castle Cary, effecting a saving of 19 miles, came into use for passenger trains. This enabled the timing of the "*Cornish Riviera Express*" to be reduced to 4 hr. 10 min. for the 226 miles, Paddington to Plymouth; and to 6 hr. 40 min. from Paddington to Penzance. The departure time was then altered to 10.30 a.m.



The down "*Cornish Riviera*" passing Kensal Green, hauled by 4–6–0 locomotive "*Prince George*"

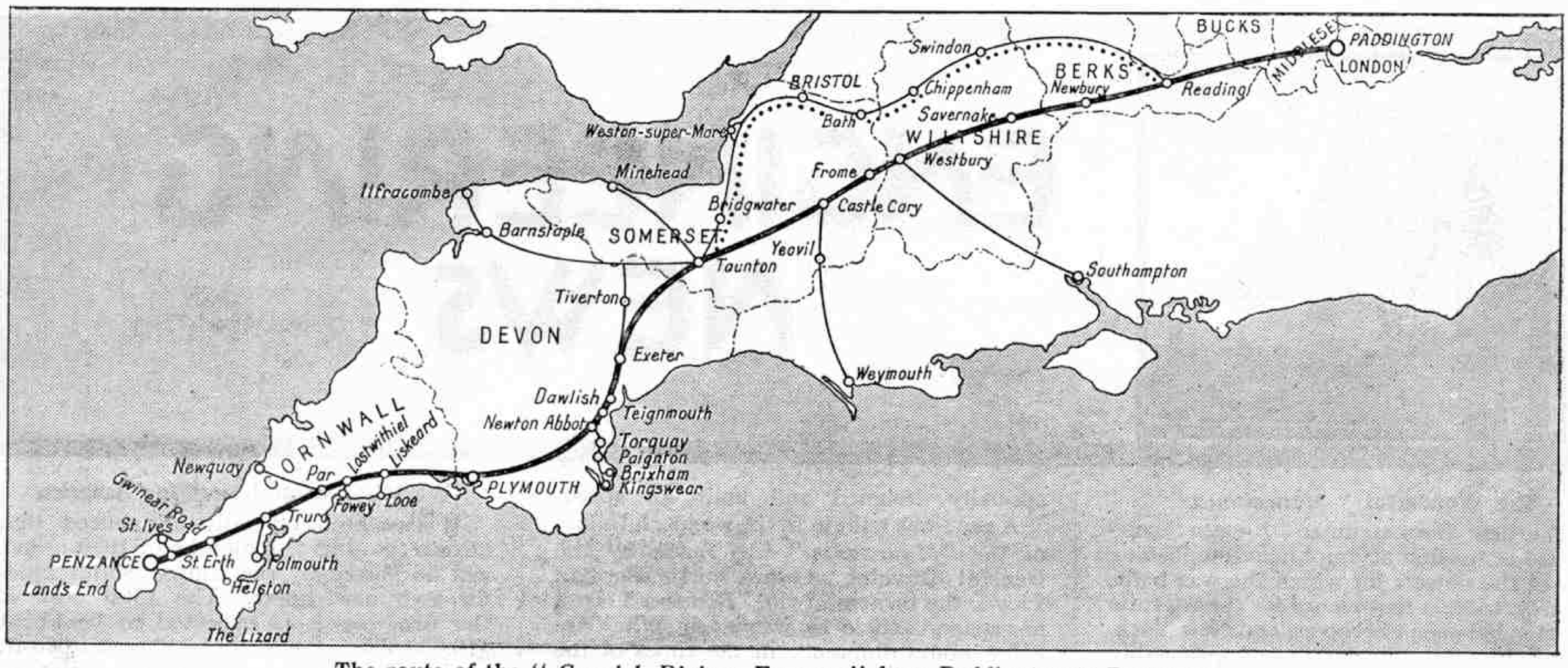
The regular non-stop run from London to Plymouth was a world's record when it was instituted in 1904, and was maintained for nearly a quarter of a century without challenge with the exception of some adjustments due to national requirements during the war period. Despite other longer non-stop journeys of a seasonal character, recently introduced, the average speed of the London to Plymouth run is still substantially higher than that of any other non-stop run of over 200 miles in the country.

For the first two years the "*Riviera*" ran during the summer months only, but its increasing popularity led to its being continued throughout the year. With the winter service a new feature was introduced in the shape of a slip portion for Taunton, which provided an improved service to Minehead, Barnstaple and Ilfracombe. This slip was in addition to the coaches regularly slipped at Westbury and Exeter respectively. Besides performing a non-stop run at record speed, the "*Riviera*" is unique in that for many years—except at the height of the summer season—it regularly slipped coaches at three places *en route* to Plymouth, thus giving fast services to a large number of places beyond the slipping points, in addition to those served by the main portion of the train.

From the first it has been the policy of the G.W.R. to run the most up-to-date stock on the "*Riviera*," and in the new trains that have now been built to signalise the twenty-fifth anniversary many novel features and refinements have been introduced that greatly add to the comfort and enjoyment of all who have the good fortune to travel by this express.

The first of these new trains was put into service on 8th July, and it was given an enthusiastic send-off. When the brand new coaches backed down on to No. 1 platform at Paddington there was a considerable crowd of interested spectators eagerly waiting to see them. The newly-appointed General Manager of the G.W.R., Mr. James Milne, was there, and also Mr. C. B. Collett, the Chief Mechanical Engineer. All who examined the coaches were unstinting in their praise. When in due course the engine came on at the head of the train it proved to be no other than the world-

First and third class corridor coach



The route of the "*Cornish Riviera Express*" from Paddington to Penzance

famed "*King George V*," and before the train started Mr. Collett—who of course is the designer of both the engine and the train—rang the brass bell that the engine bears as a trophy of its recent triumphal visit to America.

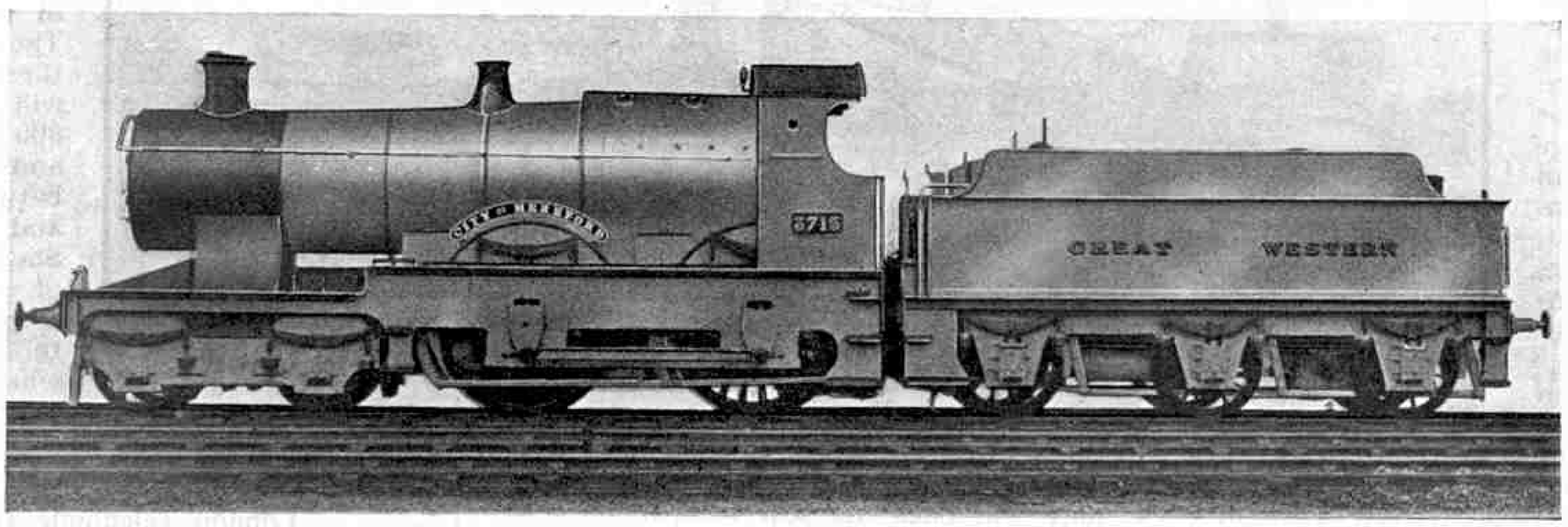
I was not able to travel on the new train on the first day on which it ran, but that pleasure was mine in the following week. It was a day on which traffic was so heavy as to demand the division of the train. The first portion, in which I travelled, consisted of 10 coaches, a lighter load than usual, but it included no slip-coaches. The weight was about 360 tons, including passengers and luggage, and we were fortunate in that "*King George V*" was again taking the train. Getting away promptly at 10.30, the great engine accelerated with such rapidity that the very tight timing of the working timetable to Southall — 11 minutes for the 9.1 miles — was precisely kept. Slough, 18.5 miles, was passed in 18 min. 45 sec.; and by Maidenhead we had bettered "even time" and done the 24.2 miles in 23 min. 20 sec. The 31 miles to Twyford were reeled off in exactly 29 minutes—a thrilling start indeed! Reading, 36 miles, was passed at reduced speed in 33 min. 15 sec.

Running easily, the 17.1 miles forward to Newbury occupied 17 min. 35 sec.; while on the rising grades from there to the summit at Savernake the mighty engine showed its power by covering the 17 miles in only 30 seconds over 17 minutes. Thus the 70 miles to Savernake were done in 68 min. 20 sec.

Down the favourable grades that followed, speed steadily rose until at Lavington we were doing over 80 m.p.h. At all speeds movement was of the smoothest, and the great train glided sweetly along. As we approached Westbury the brakes were applied and we slowed down to negotiate the curve and junction there; but in spite of this the 25.5 miles from Savernake to Westbury had been covered in 21 min. 45 sec., and the 95.6 miles from Paddington in 90 min. 5 sec.!

Time was now so well in hand that our driver took things more deliberately. Castle Cary, 115.3 miles, was passed in 112 min. 30 sec., and Taunton, 142.9 miles, in 140 min. 10 sec. The ascent to Whiteball was accomplished with masterly ease, and a very high speed had been attained on the subsequent descent when adverse signals at Cullompton gave us a severe check, and in consequence Exeter, 173.7 miles, was passed slightly behind time in 172 min. 10 sec. from Paddington.

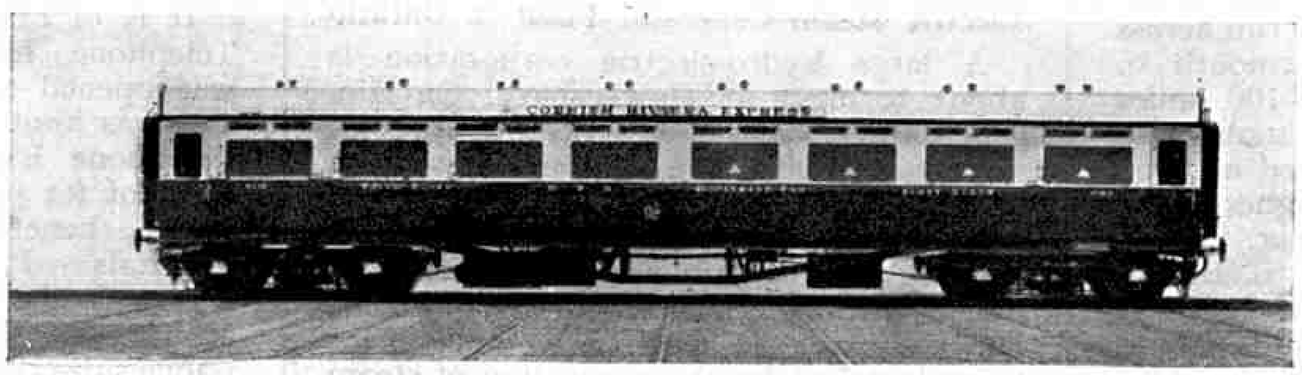
The 20.2 miles on to Newton Abbot occupied 20 min. 45 sec., but the stiff climb to Dainton brought down our speed to barely 25 m.p.h. At Totnes a dead-slow slack for bridge repairs handicapped our engine for its attack on the next heavy ascent, and the 2.7 miles to the Tigley box took 6 min. 30 sec. On the further climb to Rattery there was a steady increase of speed, and some time was gained on the down grades that followed, with the result that Plymouth, 225.7 miles, was reached in 236 min. 20 sec.—over 3½ minutes early. This was a most pleasing ending to a run worthy of this famous train.



The "*City of Hereford*," one of the 4–4–0 engines that at one time hauled the "*Riviera Express*"

At Plymouth our "*King*" came off and "*Highclere Castle*," 4096, came on to take the train forward to the West.

On the return journey, which I made some days later on the up "*Riviera*," the train from Plymouth to Paddington consisted of 12 coaches, weighing in all about 455 tons. The train engine was 6013, "*King Henry VIII*," and a 4–4–0 was taken to assist us as far as Newton Abbot. The up train is allowed a quarter-of-an-hour more than the down, and the running was good but not exceptional until the closing stages. Perhaps the driver had been taking things somewhat too easily; at any rate Reading was passed with only 35 min. 40 sec. for the 36 miles to Paddington, and so a late arrival seemed probable. A hurricane finish, however, in which the 25.3 miles from Twyford to Ealing were reeled off in 22 min. 25 sec., disposed of any such fear, and resulted in our arrival 30 sec. before time.



First and third class restaurant car

On several other occasions during the past summer I have personally observed

(*Continued on page 773*)

ENGINEERING NEWS

The Wonderful "*Mauretania*"

The new German liner "*Bremen*" succeeded at the first attempt in accomplishing one of the objects for which she was built, namely, to set a new record for the Atlantic crossing between Cherbourg and New York. Assisted by following winds and reasonably calm seas the "*Bremen*" made the crossing in 4 days 17 hrs. 42 mins., thus beating by 8 hrs. 52 mins. the fastest time previously recorded by the "*Mauretania.*"

The eastbound journey of the "*Bremen*" was even more remarkable, for the new vessel maintained the wonderfully high average speed of 27.9 knots, covering the distance of 3,084 miles from the Ambrose Lightship to Eddystone Lighthouse in 4 days 14 hrs. 30 mins. Thus the maiden voyage of the German vessel was a splendid achievement, and her engineers are to be congratulated on her success.

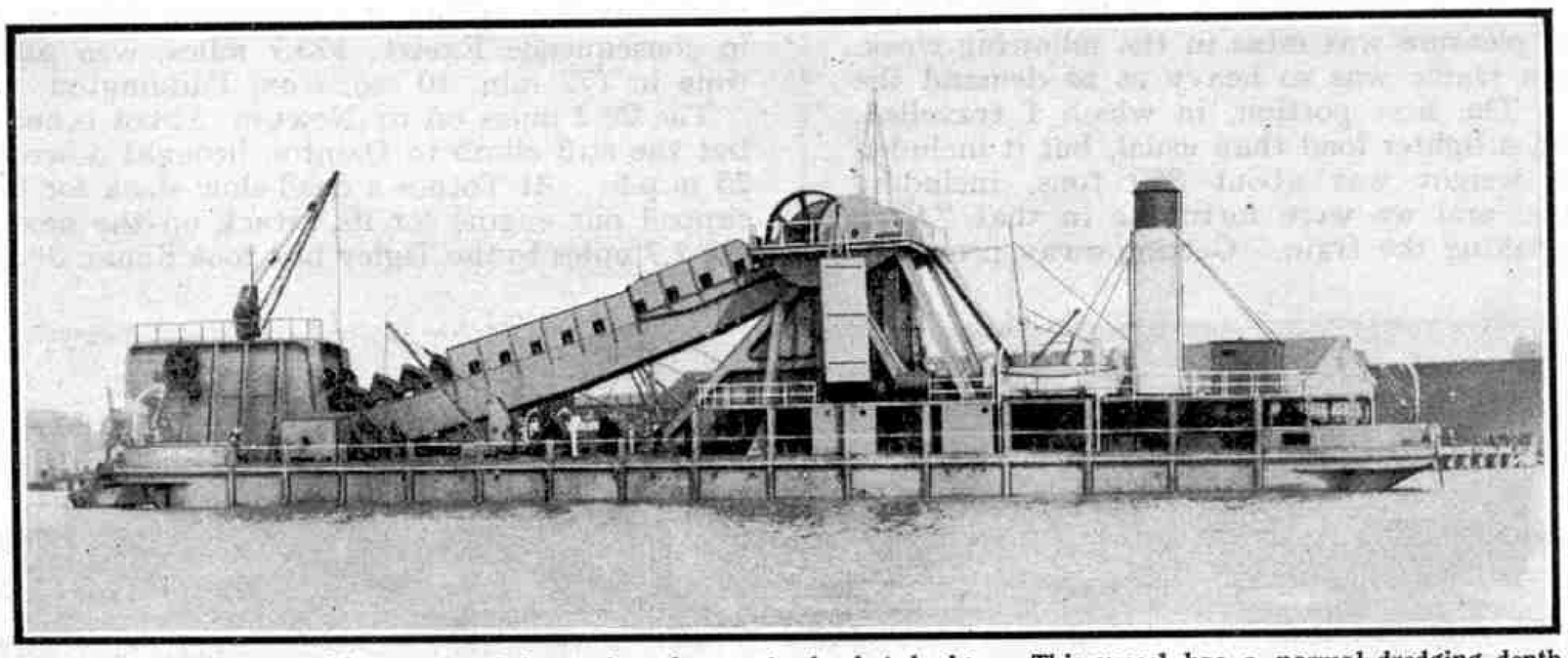
The veteran Cunard liner "*Mauretania*" immediately made an attempt to recover her lost records. Leaving Cherbourg on 3rd August she made the voyage to New York in 4 days 21 hrs. 44 mins. Although this was 4 hrs. 2 mins. behind the record established by the "*Bremen,*" the wonderful old vessel beat her previous best time by 4 hrs. 50 mins. in spite of having to face head winds and heavy seas almost throughout the whole of the voyage. Her gallant effort came nearer success on the return voyage, which she made at an average speed of 27.22 knots, her time being only 3 hrs. 19 mins. less than that of the "*Bremen's*" first eastward crossing.

Although the "*Mauretania*" failed in her sporting effort to regain for Great Britain the Blue Riband of the Atlantic, which she held for 22 years, she broke still another record on the short run across the English Channel from Plymouth to Cherbourg. She covered the 106 miles at an average speed of 29.7 knots, and during the short voyage attained a speed of 32 knots, which is the highest ever reached by any passenger liner.

It is a remarkable tribute to British shipbuilding that at the end of 22 years regular service the "*Mauretania*" should only be beaten by a margin of little more than four hours by a brand new liner specially designed and built for speed.

A generous tribute to the wonderful effort of the "*Mauretania*" was made by the General Director of the North German Lloyd, the owners of the "*Bremen.*" In a newspaper article he wrote :—" What are a few hours difference in the times of the voyage ? We shall be happy and proud if in twenty years we can maintain so small a margin of time against the latest competitor."

The "*Mauretania*" may make another attempt to cross the Atlantic in less time than the "*Bremen,*" and if she meets with really favourable weather conditions may win back her lost record.



"Foremost IV," a splendid example of the modern deep water bucket dredger. This vessel has a normal dredging depth of up to 60 ft., or with special extension up to 76 ft., and has a capacity of 1,500 tons per hour. The vessel was designed by the James Dredging, Towage and Transport Co. Ltd., to whom we are indebted for our photograph

Floating Dock for Falkland Islands

A small floating dock of 600 tons capacity has been built by Swan, Hunter and Wigham Richardson Ltd., of Newcastle-on-Tyne, the builders of the 50,000-ton floating dock at Singapore. The new dock is to be stationed at Port Stanley, East Falkland Island. It is to be transported in sections to Port Stanley and re-assembled there.

The dock is 180 ft. in length, 61 ft. 3 in. in breadth, and has walls approximately 8 ft. 6 in. in thickness. It is capable of lifting a vessel of 600 tons displacement, and of 9 ft. draught, in less than one hour.

Electric Steam Generator Plant in Ontario

A large hydro-electric corporation is about to erect at Hawkesbury, Ontario, a new transformer station costing approximately £50,000. The station will operate to a capacity exceeding 40,000 h.p. and will supply the necessary current for working the big pulp mills of a Canadian paper manufacturing company, also at Hawkesbury. At these mills boilers are being installed for the generation of steam by electricity.

World's Fastest Liners for America

It has been officially announced that during the first few months of 1930 orders will be placed by the United States Lines for two new liners. The total cost of the two vessels is expected to be about £10,000,000. Each will be almost 1,000 ft. in length, will have a displacement of about 56,000 tons, and will possess accommodation for 4,000 passengers. The proposed liners will be propelled either by turbo-electric or geared turbine machinery, and the company anticipate that they will be the fastest vessels afloat.

According to the "*Engineer,*" construction of two huge Italian ships is also to begin in a short time. The larger of these two liners will be well over 800 ft. in length and will displace between 42,000 and 45,000 tons. She will be capable of a maximum speed of from 27 to 28 knots, but when in actual passenger carrying service it is probable that her speed will not be in excess of 25 knots.

London Telephone Jubilee

The recent jubilee of the first London Telephone Exchange served as a reminder of the remarkable increase in the use of the telephone during the last 50 years. When the first London Telephone Exchange was opened in August 1879, it had only about six subscribers. By January 1880, the number of telephone subscribers in London had increased to about 200, while on 31st May this year there were close upon 650,000 subscribers.

Several private lines were in use in 1879, and it is said that the first was installed at a private house at Chislehurst and served between the residence and its stables.

It is of interest to note that the first Telephone Exchange in Great Britain was opened at Glasgow in March 1879, and was known as the " Glasgow Medical Telephone Exchange." This exchange was not for public use, but was provided for the benefit of chemists, doctors, and hospitals. It proved very successful and was speedily followed by other private exchanges. To-day the number of telephone subscribers in Great Britain numbers more than 1,750,000.

Southampton Docks Extension

The aerial photograph below shows the progress which is being made with the Southern Railway Company's Docks Extension on the Western Shore.

In the bottom right hand corner can be seen a part of the new quay wall, about 400 ft. long, which has been built between the Royal Pier and the Town Quay. The provision of the eastern rail connection, i.e., between the existing and the new docks, involved the construction of this new quay wall, the reclamation of land behind it, and the remodelling of the sidings which previously served the old quay and the warehouses opposite. It also permitted the widening of the very narrow road between the old quay wall and the warehouse.

This rail connection will also involve the demolition of the existing pier entrance building; this is to be replaced by a new and larger structure now in course of erection, and which can be seen in the photograph.

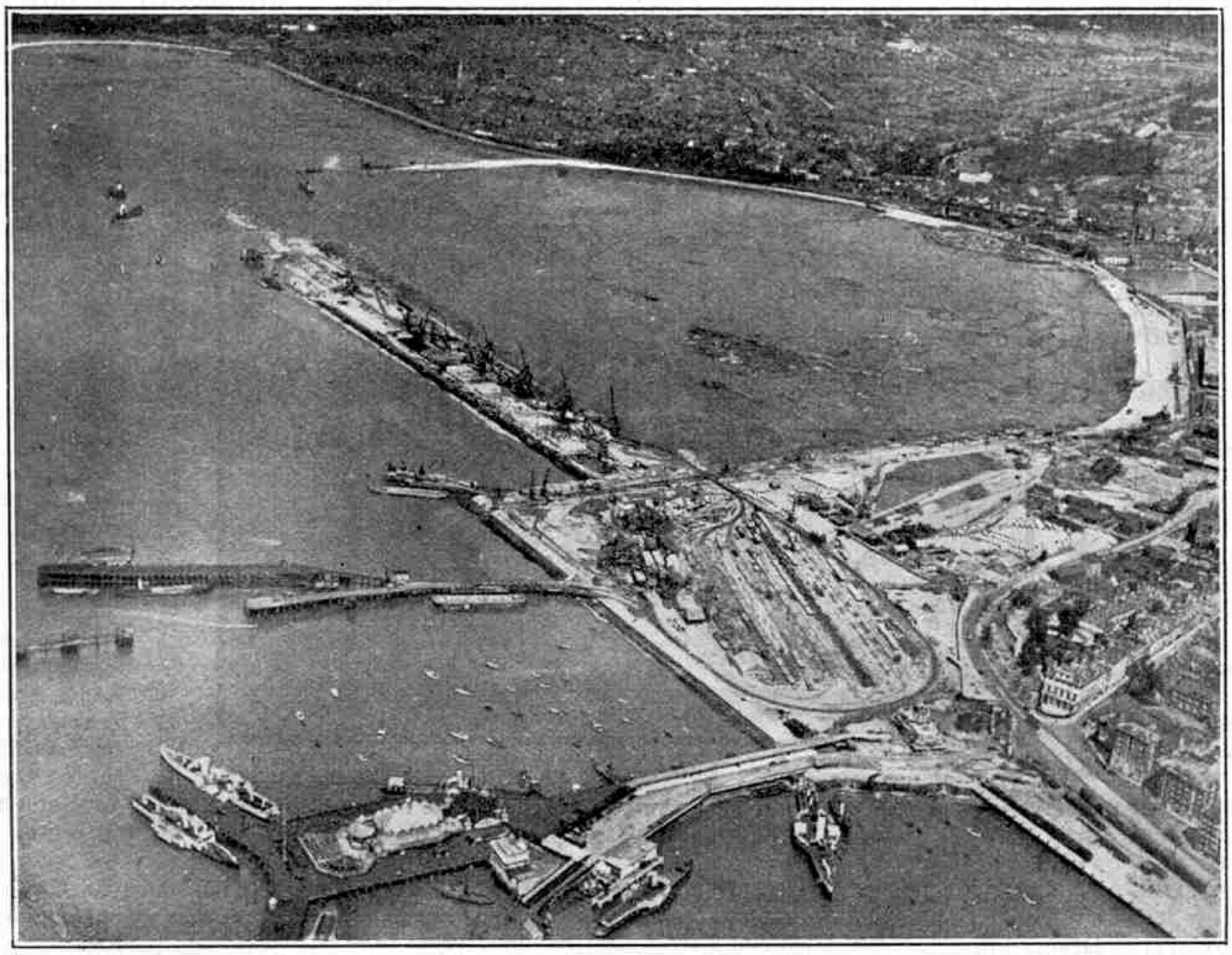
In the centre of the picture can be seen the area of land, roughly triangular in shape, which has already been reclaimed. The seaward portion of this land is being used for the time being by the contractors engaged upon the construction of the new monolith quay wall, and upon it they have laid out their blockyard where the concrete blocks, varying in weight from about 4 to 10 tons each, for the monoliths are being moulded; they have also erected their workshops, stores, concrete mixing station, etc., on this ground.

The remainder of the land already reclaimed is occupied by various contractors' offices, and as a storage ground for sundry materials, amongst the latter being a large number of 7 ft. diameter reinforced concrete pipes for use as linings to culverts. Three of the latter are being constructed in one large trench; one will convey seawards the storm water drainage which at present discharges on the mudlands of the bay, and of the other two, one will be a supply and the other a discharge for sea water to and from the Corporation Electricity Station for condensing purposes. These culverts will eventually supersede the existing Cooling Pond.

Projecting from the land already reclaimed, can be seen a wide bank in course of construction.. This is being built in order that the sinking of the large concrete monoliths which will form the quay wall, can be commenced from dry land, and also to form a retaining bank when the reclamation behind it is taken in hand. A large number of cranes employed in the sinking of the monoliths can be seen in the photograph.

A second bank can be seen in course of construction in the middle distance. This will eventually join up with the wide bank above referred to, and the area thus enclosed by these banks and the existing foreshore of the bay, about 170 acres in extent, will be reclaimed.

In the far distance can be seen another bank in course of construction. This bank will eventually join the wide bank, and upon it will be built the western rail connection to the new docks, from its junction with the Company's main line near Millbrook Station.—Reproduced by permission from "*Southern Railway Magazine.*"



Courtesy] [*Southern Railway Magazine*

Aerial view of Southampton Docks showing docks extensions on western shore

Famous Steelworks to Close

The decision, recently announced, to close the Sheffield works of Henry Bessemer & Co. Ltd., will terminate the career of one of the most famous firms in the steel industry. The company was founded by the late Sir Henry Bessemer, and it was at the works just referred to, that in 1856 he first demonstrated the commercial value of the open hearth melting furnace that he had invented. Less than five years later his invention was in use at many important steelworks in this country and abroad.

Decreasing British Tramways

An interesting sidelight on modern changes in municipal transport systems is revealed by the fact that a large Sheffield mill, that at one time produced many thousands of tons of rails for British tramways, has been closed down owing to lack of orders. This state of affairs has been brought about mainly by the increased adoption of trackless trams and 'buses in lieu of the electric tramcar.

Motor Vehicles in South Africa

During 1928 the number of motor vehicles registered in the Union of South Africa was 158,838, a total which represents an increase of 54.72 per cent. over the vehicles registered in 1927. Ordinary motor cars accounted for 113,002; of the rest 11,672 were omnibuses, vans and lorries, while 34,164 were motor cycles.

In Cape Town alone no fewer than 48,585 cars, 8,445 motor cycles and 6,235 other vehicles were registered, while Transvaal registered the next greatest number with 34,813 cars, 17,382 motorcycles, and 3,198 other vehicles. An interesting feature is that the number of cars registered in Johannesburg was 12,684 although there were only 13,836 residents who paid income-tax. In Cape Town on the other hand, the number of cars actually exceeded that of tax payers by 2,000!

World's Largest Carbonisation Plant

What is probably the largest low temperature carbonisation plant in the world was opened a short time ago at Glenboig, Scotland. In the 14 retorts of the plant a maximum of 700 tons of coal may be burnt in one day, and from this amount of coal 450 tons of smokeless fuel, 20,000 gallons of oil and 20,000 c. ft. of gas may be produced.

The retorts installed are automatically fed with coal by means of electrically-driven feeding gear, the current required by the motors being generated by alternators driven by oil engines. The Bussey Coal Distillation Co. Ltd., for whom the plant has been constructed, have stated that it is their intention to construct 20 similar installations in Great Britain.

Salvage Work at Scapa Flow

The salvage operations being carried out in connection with the sunken German battleships at Scapa Flow, by the well-known firm, Cox & Danks Ltd., continue to make good progress. At the present time attention is being devoted mainly to inverting the German light cruiser "*Bremse,*" preparatory to towing it to Lyness Pier. The cruiser is lying on her side at Swanbister Beach, on the north side of Scapa Flow, and two floating docks have been placed in position alongside the vessel to assist in turning her bottom upwards. She will then be filled with compressed air and towed to the pier.

The next vessel to be dealt with will be the 27,000-ton battleship "*Prinz Regent Luitpold,*" at present lying bottom upwards in deep water.

Diving for Sunken Treasure

At the present time sixteen vessels of a Spanish treasure fleet—or all that is left of their timbers—lie submerged in 80 ft. of water in Vigo Bay. How they came there is an interesting story. In 1702 the treasure fleet arrived off Cadiz, to find there a blockading British and Dutch Fleet, for Spain was then at war with these countries. The Spanish vessels fled northwards and took refuge in the harbour at Vigo, where a boom was constructed across the entrance in order to keep out the pursuing fleet. A vigorous combat ensued, nevertheless, the combined fleets of the Allies forcing the boom and sinking many vessels. They did not capture the whole of the treasure fleet, for after removing as much of their precious cargo as time allowed, the Spaniards fired the galleons in order to save them from falling into the hands of their enemies.

It is believed that more than £10,000,000 worth of gold and silver still remain in the vessels at the bottom of the sea, for of the £20,000,000 worth of treasure brought from America only half was carried ashore before the fight. From time to time efforts have been made to recover this wonderful treasure, but all diving operations so far have proved unavailing. Time has rendered the work of recovery very difficult indeed, for the decks and sides of the vessels have been crushed in and the galleys themselves choked with silt and sand. An Italian syndicate now has revived the project, however. Divers employed by them have succeeded in locating the galleons, and with the improved resources at their command greater success may attend their efforts than has been the case with previous treasure seekers at Vigo.

How to Use Meccano Parts—

(*Continued from page 797*)

3" Sprocket, which is free on the axle.

It will be evident that the axle and Sprocket Wheel can each move independently in one direction only. The driving power may be imparted primarily to either the axle or the Sprocket, to suit requirements. Exactly the same results would be obtained by using only one Pawl in engagement with the Ratchet Wheel, but the second Pawl is added in order to obtain exact balance.

A mechanism of this kind is also invaluable for converting reciprocating motion into intermittent rotary motion. For example, if the Sprocket Wheel shown in Fig. 2 is attached to a connecting Rod or other reciprocating part so that it moves through part of a revolution and then returns, the axle of the Ratchet Wheel will be given an intermittent rotary motion in one direction only.

The Pawls may be obtained complete with a Pivot Bolt and two nuts. This Bolt forms an ideal pivot for the Pawl; it should of course be clamped to a Meccano part by the two nuts so that the Pawl is allowed plenty of freedom.

The Circular Saw (part No. 159), although a toothed part, is included under Class P since it is for use as a saw only and has nothing to do with gearing.

A Happy Memory of the Holidays

One of our readers, G. K. Benn of Grantham, is so deeply interested in the contents of the "*M.M.*" that he has not noticed the photographer

British Air Triumph—

(*Continued from page 782*)

effort attained success with a speed of 332.49 m.p.h.—the fourth record breaking effort of the day! Actually this lap, in conjunction with the third, provided two new records—for the 50 and the 100 km. closed circuits. Atcherley must have been doing over 370 m.p.h. on the straight, and it was unfortunate that one mistake, his failure to round the Hayling Island pylon on his first lap, should involve disqualification. Fortunately the whole of his flight was officially observed, and his records stand.

The entry of the third Italian, Lieut. Monti, came at 3.45, and for a few minutes it seemed possible that Italy could still make a fight for the Trophy. The Macchi 67 screamed round the course to return an average of 301.47 m.p.h., but almost before the figures were announced it was seen that again bad luck had dogged the challengers. When close to the Hayling Island turn Monti's machine was seen to make a sudden flashing swoop on to the water and come to a standstill. Later it was learned that an oil pipe in the machine had burst, and Monti was compelled to act with lightning rapidity to get down safely. It is a tribute to the skill and pluck of the pilot that he accomplished this perilous landing successfully, although seriously scalded about the arms by the oil flowing into the cockpit.

Thus Great Britain retained its grip upon the Schneider Trophy. Every British subject may take pride in this great successful effort, for the machines were produced by a national effort and flown by a team of pilots of the Royal Air Force. It is the national character of the Schneider Trophy Contest that has endowed its magnetic lure for the "man in the street." It is the only international contest in which the contestants are truly nations and not individuals.

Home Billiards for Winter Evenings

The problem of providing healthy recreation during the long winter evenings is one that puzzles many parents. One excellent solution lies in the provision of home billiards. No indoor game combines excitement and interest to the same extent as billiards, and there is no limit to the pleasure introduced into a home where a good table is installed. A full-sized table is out of the question for any ordinary room, and for this reason tables of a suitable size have been specially designed by Rileys of Accrington, whose name is known wherever the game is played.

One of the most popular tables made by this firm is the 6 ft. table, which rests comfortably on an ordinary dining table. A splendid game may be played on this, and it affords excellent practice for subsequent play on a standard table. There are many other sizes, however, both larger and smaller, to suit any room, and details of these will be found in the advertisement on page 822.

Price lists of these tables may be had free on application to E. J. Riley Ltd., Deal Works, Accrington, or at Dept. U, 147, Aldersgate Street, London, E.C.1.

Television—

(*Continued from page 767*)

a separate photo-electric cell is provided. Thus two electric eyes are used and the impulses derived from them are transmitted alternately to the receiver.

The effect of using two photo-electric cells in this manner is exactly the same as if the object were viewed first with the left eye and then with the right. At the receiver a similar double scanning disc is necessary, of course, and the images produced from the two points of vision are flashed in turn on the screen. The alternation is made with such great rapidity that the impressions are retained by the eye and combined into an image that conveys a stereoscopic effect.

Naturally this means that for complete success a larger number of flashes must be transmitted than in ordinary television, but in practice there is very little difficulty in getting a sufficient number to give an excellent result. Seen with the aid of two electric eyes and double scanning discs a human figure stands out in wonderful relief from its surroundings, and it is quite easy to form reliable judgments of comparative sizes and distances.

Stereoscopic television may be combined quite easily with colour television. We have already noted that for the latter three spiral sets of holes are necessary—each set transmitting one of the three primary colours. In order to give a stereoscopic effect to the image on the screen of a televisor, therefore, two sets of perforations, each consisting of three spirals, are arranged on the discs.

The final step in the development of complete television must come when stereoscopic colour television is combined with the use of daylight or artificial light of the ordinary kind as the illuminant. When the practical difficulties have been overcome, and a sufficiently large image can be projected on the screen of a receiver, it will then be possible to see what is happening at a distance almost as well as if one were actually present.

Mystery Photograph No. 10

The solving of the Mystery Photograph No. 10 that appeared in the September "*M.M.*" apparently presented little difficulty, for most competitors decided, quite correctly, that the curio represented in last month's photograph was nothing more than a simple funnel laid on its side, so that the handle obscured all but the tip of the spout. Rather curiously, a big percentage of the incorrect entries declared that it was an oil can with the spout knocked off.

An old-fashioned lamp or candlestick was another popular choice. A motor headlamp, an inkwell, a kettle, a megaphone, a speaking tube, a milk strainer and a tobacco pipe were other suggestions, and for each of these I can see a reason. Freak ideas, in fact, were completely absent.

The first correct entry was from Eric Whalley, of 20, Beverley Street, Blackburn, to whom an autographed copy of my book "*Engineering for Boys*" has been sent.

Earlier in the year I promised special prizes to those boys who succeeded in giving 10 correct solutions in the first set of mystery photographs. Examination of the records shows that no one can now qualify for these, and instead I have decided to give several consolation prizes in each of the remaining contests in the series. I have also awarded 25 of these in the September contest. The list of names is too long to give here, but on request a copy will be forwarded to any boy who has a legitimate interest in the competition.

"My First Aeroplane"

Sir Alan Cobham's Amusing Reminiscence

I ALWAYS wanted to fly, even from my earliest years. At the age of ten I was taken by my father to the Crystal Palace to see an airship flight. It was just after a flight had been made from the Crystal Palace to St. Paul's and back—a tremendous feat at the time.

My enthusiasm was so great that one of the men connected with the airship proposed that I should be put in the fuselage on the next trip. My father, however, was having no such "nonsense," and told me that when I got older "I should learn a little more sense."

So that was that!

About 1910 a prize was offered in Paris for the best aviette, or flying machine that could fly without the aid of a motor; that is, on manpower alone.

I and a pal got together on the subject. Our machine consisted of a bicycle with wings on either side, and a propeller of huge dimensions, which only just missed the front wheel in its revolutions. Our chain was cranked on to the propeller and not to the rear wheel, so that we hoped to get our forward motion by the revolutions of our propeller.

We worked very hard, my friend making the bicycle portion of the machine and I the wings and the propeller. I don't know where I got the idea of "camber" from, but I certainly felt sure that there should be such a thing. The problem that confronted me was that of first of all finding some means of getting all the ribs of each plane to the same curve, and then making them all stay in position. The scheme I hit upon had at least the merit of simplicity.

Sir Alan Cobham replying to the address of welcome on the successful conclusion of his England-Australia flight in 1926

I made a contrivance with the garden fork by placing a block of wood on each side of the prongs and placing the ribs-to-be in between. I pulled the ribs down to the handle of the fork, getting the required curve, and then tied them. Baths of hot water were then procured and the whole lot immersed.

The next day I was very proud when I cut the string and all my spruce ribs remained at exactly the same angle. Indeed, our only trouble now seemed to be our poor dear parents; everyone feared for our safety when we should get "hundreds of feet in the air."

Now I always blame my pal for our non-success. He had a turn for mathematics and I never questioned him on such matters. So I took it for granted when he told me that by pedalling hard I ought to work up at least 3½ h.p., which would be sufficient to provide the lift.

Of course, we never flew. But it was my first "aeroplane"!

New Meccano Models—(*Continued from page 791*)

Brackets to a Flat Bracket, the other ends of these Strips being held together by two 3½" Axle Rods which represent the guns. These are passed through the Angle Brackets and secured to the turret frame by means of Collars. A 1" Triangular Plate is also secured to the turret by Angle Brackets and carries a ⅜" Bolt which forms the pivot about which the unit swivels.

Fig. 6 shows the aft gun turret. This consists of two 2½" × ½" Double Angle Strips, which form the sides, and two 2½" Strips, for the top, secured to a Flat Bracket at the rear of the turret. The remainder of its construction is similar to that of the forward turret.

The model comprises the following parts: 13 of No. 1; 8 of No. 2; 2 of No. 3; 35 of No. 5; 4 of No. 6; 5 of No. 6a; 2 of No. 8; 11 of No. 10; 1 of No. 11; 27 of No. 12; 3 of No. 14; 5 of No. 16; 1 of No. 18a; 1 of No. 20; 1 of No. 21; 3 of No. 22; 2 of No. 24; 3 of No. 35; 146 of No. 37; 4 of No. 38; 1 of No. 45; 2 of No. 48; 6 of No. 48a; 1 of No. 52; 1 of No. 53; 2 of No. 54; 9 of No. 59; 1 of No. 63; 2 of No. 111c; 1 of No. 139.

The "Cornish Riviera Express"—(*Cont. from page 769*)

the arrival of the "*Riviera*" at Paddington and Plymouth, and almost always it ran in before time. Only once was it late, and on that day 14 coaches had been brought through from Paddington to Plymouth. Very naturally, a stop had been made at Newton Abbot to take a 4–4–0 "hooker on," but even so the arrival at Plymouth was only 3 min. behind time. "*Powderham Castle*," 4080—her brilliant brass and shining steel reflecting great credit on the cleaners at Newton Abbot—took 13 coaches forward to Truro without assistance—a remarkable feat on the gradients that rule on that section. I may mention, too, that one day the up "*Riviera*" was stopped dead for 7 min. at Pewsey owing to a slight mishap to the preceding train, but nevertheless reached Paddington 1 min. early! "*King Henry VIII*," No. 6013, was the hero of this exploit.

The "*Cheltenham Flyer*" has also sustained a remarkable record for punctuality in spite of its extremely stiff schedule. On the first day of the new timing, "*Launceston Castle*" ran from Swindon to Paddington, 77.3 miles, in 68 minutes, thus arriving 2 min. early. On a subsequent occasion when I was present the same engine ran in 1 min. before time, as also did "*Caerphilly Castle*" on a later day.

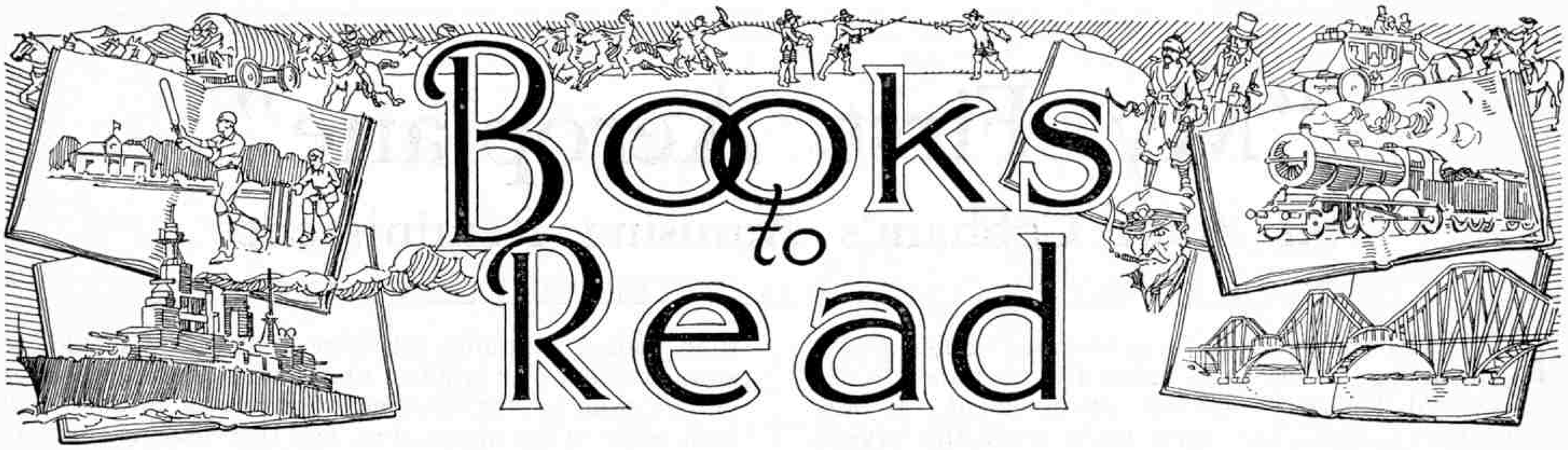
In this respect the G.W.R. is keeping up the reputation achieved under the former 75-min. schedule. This was inaugurated in 1923, and on the first day 2-cylinder 4–6–0 "*Saint Bartholomew*," hauling a load of about 300 tons, ran into Paddington three minutes early in spite of a severe delay near Wantage Road.

It may be added that over 40 of the new "Hall" class engines are now in service and doing highly efficient work on many parts of the G.W. line, and especially on the heavily graded sections between Newton Abbot and Penzance.

Altogether it may be safely said that during the past summer the G.W.R. have distinctly added to their already high reputation for express running.

Trains from the King

Master Gerald Lascelles, the younger son of Princess Mary, and his paternal grandfather, Lord Harewood, recently celebrated their birthdays—Master Gerald is five years of age, and the Earl of Harewood is eighty-three. The King and Queen sent their little grandson a clockwork train with lines. The Prince of Wales's gift was a collection of painting books, and Princess Elizabeth gave her cousin a toy imitation of her own dog.



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

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

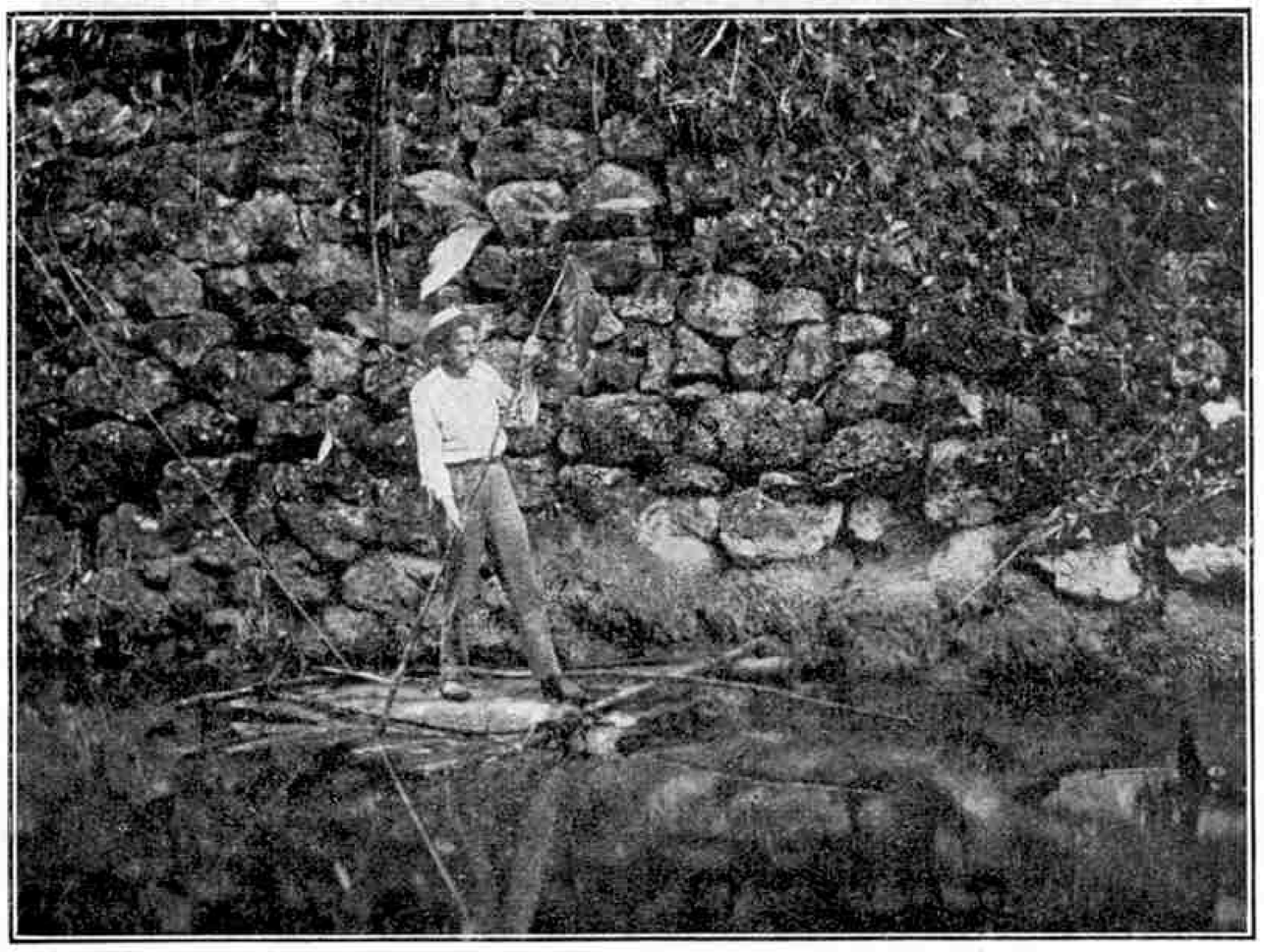
"Discoveries and Adventures in Central America"

By THOMAS GANN, F.R.G.S. etc.
(Duckworth. 21/- net)

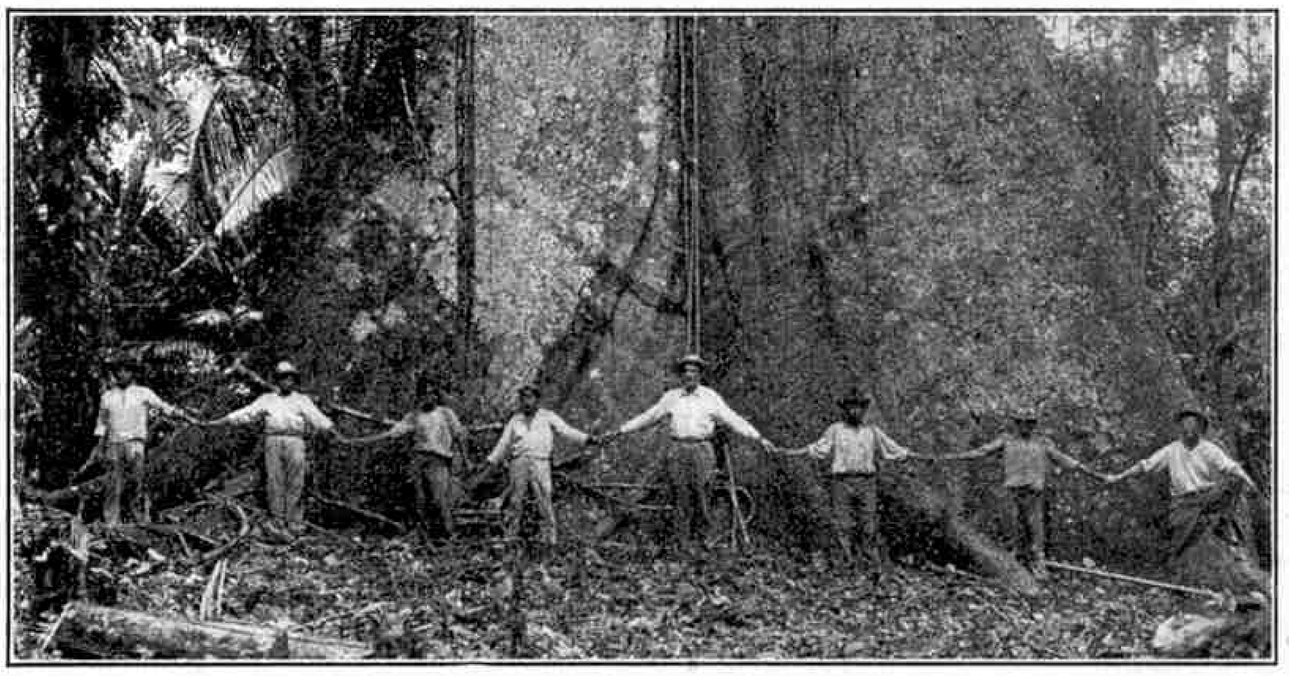
This book is the result of explorations made by an expedition sent out by the British Museum to Chumuchà in Honduras. Chumuchà is one of the oldest and most perfect of the ruined Maya cities, and the only one situated within the British Empire. Travel in the country where it is situated is by no means easy, and the expedition met with many adventures with the Kekchi Indians amid the forests and rivers of Central America.

The principal result of the excavations was the discovery of a remarkable series of inscribed stones, called "stelae," which has enabled at least twelve important dates in the history of Mayan civilisation to be fixed. The expedition also discovered many remarkable remains of pottery showing figures of men and animals, which seems to suggest that Chumuchà was the centre of manufacture for this type of painted ware.

A discovery that is of particular interest to readers of the "*M.M.*" was the finding of the ruins of a remarkable bridge across the Pusilha river (see illustration on this page). The ruins consist of two stone abutments with spillways to carry off flood water. The floor of the bridge was probably made of squared logs, laid side by side, but of this there is now no trace. The bridge is unique, for at no other Mayan city does such a structure exist. Its construction shows a considerable amount of skill on the part of the ancient Mayan engineers, not the least important fact being that the structure has withstood tremendous floods for 1,500 years.



Beside the ruins of the ancient Mayan bridge. One of the explorers seen on a raft, which is the first craft to navigate the river for fifteen centuries. (See below)



This illustration, which shows what is possibly the largest tree in the world, and the one above are from "Discoveries and Adventures in Central America," reviewed on this page

"Two Essays in Early Locomotive History"

By DENDY MARSHALL
(Locomotive Publishing Co. Ltd. 12/6)

Divided into two parts, this work respectively deals with the world's first hundred railway engines and with British locomotives in North America. The book will be of particular interest at the present time in view of the fact that this year marks the centenary of that most important milestone in the history of the railway—the Rainhill Trials of 1829.

Only a few years ago the late Mr. E. L. Ahrons gave us the fullest account that has ever been written of the steam locomotive. Mr. Ahrons began his story with the opening of the Stockton and Darlington Railway in 1825, and it was generally regretted that he had not found it possible to "begin at the beginning," and to include those locomotives that were constructed and running some years before "*Locomotion No. 1*" took the rails. With the present book Mr. Dendy Marshall has, however, filled the blank.

Commencing with the work of Richard Trevithick—who in 1801 built his first Cornish road engine, and three years later completed the famous "Pen-y-darren" engine, built for the Iron Works, near Merthyr Tydvil—he takes each of the famous locomotive engineers in turn and gives a brief summary of the historic facts concerning their engines.

Much of the existing information about these early engines is unreliable, having been supplied by people either lacking in technical knowledge or seeking to claim all the honours for one particular pioneer. Mr. Dendy Marshall has spared no pains to study all the contemporary engines that are known, and moreover he gives references for all his statements. In the course of his researches he has succeeded in bringing to light the records of several engines that hitherto had been unknown to historians, and illustrations are given of one or two that have not previously appeared in books on the subject.

The story is one of which British engineers have good reason to be proud, because out of the world's first hundred engines to be constructed—which number, by the way, was attained in the middle of 1831—it is shown that ninety were British, two German, one or two French and six or seven American. Moreover, only half of the ten foreign-made engines were of any practical use, and not one of them had any influence on the evolution of locomotive design.

The second part of the book deals with early British locomotives in North America,

and it is interesting to learn that up to 1836, about twenty engines were supplied by Britain to the United States, but after this date the demand ceased altogether and the Americans built their own engines.

The book is rendered more particularly useful by the addition of a table of the first hundred locomotives and by indexes of designers and constructors, and of engines and railways.

"Wild Creatures of Garden and Hedgerow"

By Frances Pitt
(Constable & Co., London. 7/6 net)

This fascinating account of some of our commoner birds and beasts has been written in the hope of interesting boys and girls—and possibly older people, too—in the common forms of wild life. The book deals with such everyday creatures as are met with in any garden, hedgerow, or meadow, and includes mice, birds, frogs, toads, hedgehogs, voles, and so on. The author has very successfully set out to tell us something of their lives, loves, fears, hates, and deaths, as well as the whys and wherefores of their doings. Such everyday creatures can be quite as interesting as the more uncommon animals. Indeed, from a natural history point of view there are probably as many valuable facts waiting to be discovered concerning them than there are concerning animals out in the wilds.

Of the blindworm, illustrated on this page, the author says: "it looks like a small snake, and is usually about 12 inches in length. Sometimes a very large one may reach 18 inches, but anything over that is a monster. It is often mistaken for a snake, but this need not happen if we remember that both our common snakes, the grass-snake and the adder, are both prettily patterned and marked. This mistake is the cause of scores of harmless blindworms being killed in the belief that they are vipers. Why this creature is named the blindworm does not seem to be known, for it has a pair of exceedingly sharp amber-coloured eyes, and it can see perfectly well. Its other name, slow-worm, is equally unsuitable, for it is far from slow and is most difficult to catch should it escape into the grass, for it glides smoothly and swiftly between the stems.

"At Home Among the Atoms"

By Prof. J. Kendall, M.A., D.Sc., F.R.S.
(G. Bell & Sons Ltd. 7/6 net)

Many Meccano boys who study chemistry are probably bored when their instructor quite properly insists on drilling into them some knowledge of the Atomic Theory. They will find, however, that the subject can be made one of absorbing interest if they read the clear—and often humorous—account given in this book of the particles, once supposed to be indivisible, that are the bricks of which all substances are built. In it Prof. Kendall traces the history of our ideas of the atoms, from the day when they were thought to be hard pellets to the discovery that they are really miniature solar systems, and he gives interesting pictures illustrating the present view that they are mostly empty space!

It is now believed that the atom consists of a small solid centre, or nucleus, around which whirl a number of even smaller particles called electrons. The change is amusingly driven home by the suggestion that the name "atom" should be discarded. This word is built up from two Greek words, *a* meaning not, and *tom* meaning divisible. By striking off the prefix we obtain the English sounding word "*Tom*," which means something that may be split up!

Most of the tiny universes that we continue to call by their old name are astonishingly complex—some of them, the radium atom, for instance, are actually explosive. Their make-up has been patiently unravelled in spite of the fact that they are so small that the point of a needle is sufficiently large to accommodate many millions of them. A great part of Prof. Kendall's book is devoted to the fascinating story of the manner in which this has been done, and he has succeeded in writing about this subject without hard words and technicalities. In the preface he says that he has done his best to keep the volume human, and it is certainly one that is easy to understand but is thoroughly accurate and reliable.

In the final chapter he deals with the latest theory of the atom. This is very startling for it is suggested that it has no real existence but is merely a wave in the ether! Thus we are now threatened with the loss of the nucleus and electrons, which promise to follow into oblivion the old idea of a hard atom. In their place we are to have what is described as an electrical hole in the centre of a vibrating halo.

The book is excellently illustrated and from beginning to end the story is told in such an interesting manner that readers cannot fail to become quite "at home among the atoms" before the book is finished.

A harmless Grass Snake about quarter-life size. (See below)

The innocent Blindworm about half-life size. (See below)

Bank Voles about half-life size. This illustration, and the two above, are from "Wild Creatures of Garden and Hedgerow" reviewed on this page

"Aerobatics"

By Major Oliver Stewart
(Sir I. Pitman & Sons Ltd. 5/–)

In this little book the author has given us a simple explanation of aerial evolutions, describing how to accomplish the various manœuvres that are generally known as "stunt flying." These evolutions are made use of not only to provide a spectacle at aerial displays but also in warfare, and they form part of a fighter squadron pilot's routine work. They are useful, too, in cases of emergency such as sudden engine failure, when it may be necessary to effect a swift landing in a confined space. The book is well illustrated, showing actual performance evolutions. The diagrams in the appendix, giving the particular control movements for each evolution have been specially prepared for the information of readers who may wish to try their hand at stunt flying.

Although we do not suppose that many readers of the "*M.M.*" will be actual performers in this connection, nevertheless for those who are particularly interested in the subject the book and the diagrams will be helpful in enabling them to understand how the various evolutions are carried out. When they are watching an exhibition of aerial showmanship they will be in a better position to understand exactly what the pilot has to do in order to obtain his interesting results.

Interesting New Books

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

"Constructive and Decorative Woodwork"
by A. C. Horth. (Sir Isaac Pitman & Sons Ltd. 2/6)

"Sent to Coventry"
by D. J. J. Dickie. (J. M. Dent & Sons. 6/–)

"Stove Pipe Man and Sandy"
by A. Chalmers. (J. M. Dent & Sons. 5/–)

"Short Stories in Science"
by Crowther. (G. Routledge & Sons Ltd. 5/–)

A New American Air Terminal

The Trans-Continental Air Transport Services of America, popularly known as the T.A.T., have made arrangements with the railways to facilitate a combined air and railway journey from New York to Los Angeles. Passengers leave New York City by train in the evening and arrive at Columbus next morning, where they change to aeroplane. At Waynocka in Northern Oklahoma they again board train and travel by Pullman during the night. Upon arrival next morning at Las Vegas, New Mexico, they are conveyed by aeroplane to Los Angeles, which is reached in the evening.

For this service the T.A.T. have constructed a large new air terminal at Port Columbus, on somewhat similar lines to the Air Port of London, Croydon. Passengers arriving by train from New York proceed under a covered passage way to the administration and waiting room building. This building is constructed of steel faced with brick. It is 110 ft. in length and 50 ft. in width, and is provided with a control tower for viewing the operation of aeroplanes on the ground. When an aeroplane is ready to depart it is brought to the building so that the passengers can enter under cover, and it then taxis to the end of the proper runway and takes off for its destination.

Similar conveniences and arrangements are provided at the other stops and terminals on this route, and sufficient aeroplanes are held in reserve to enable the service to be carried on without interruption throughout the year. For the present the machines used will seat 12 or 14 persons, but 30-seater machines are being built for next year, and even larger ones probably will follow later.

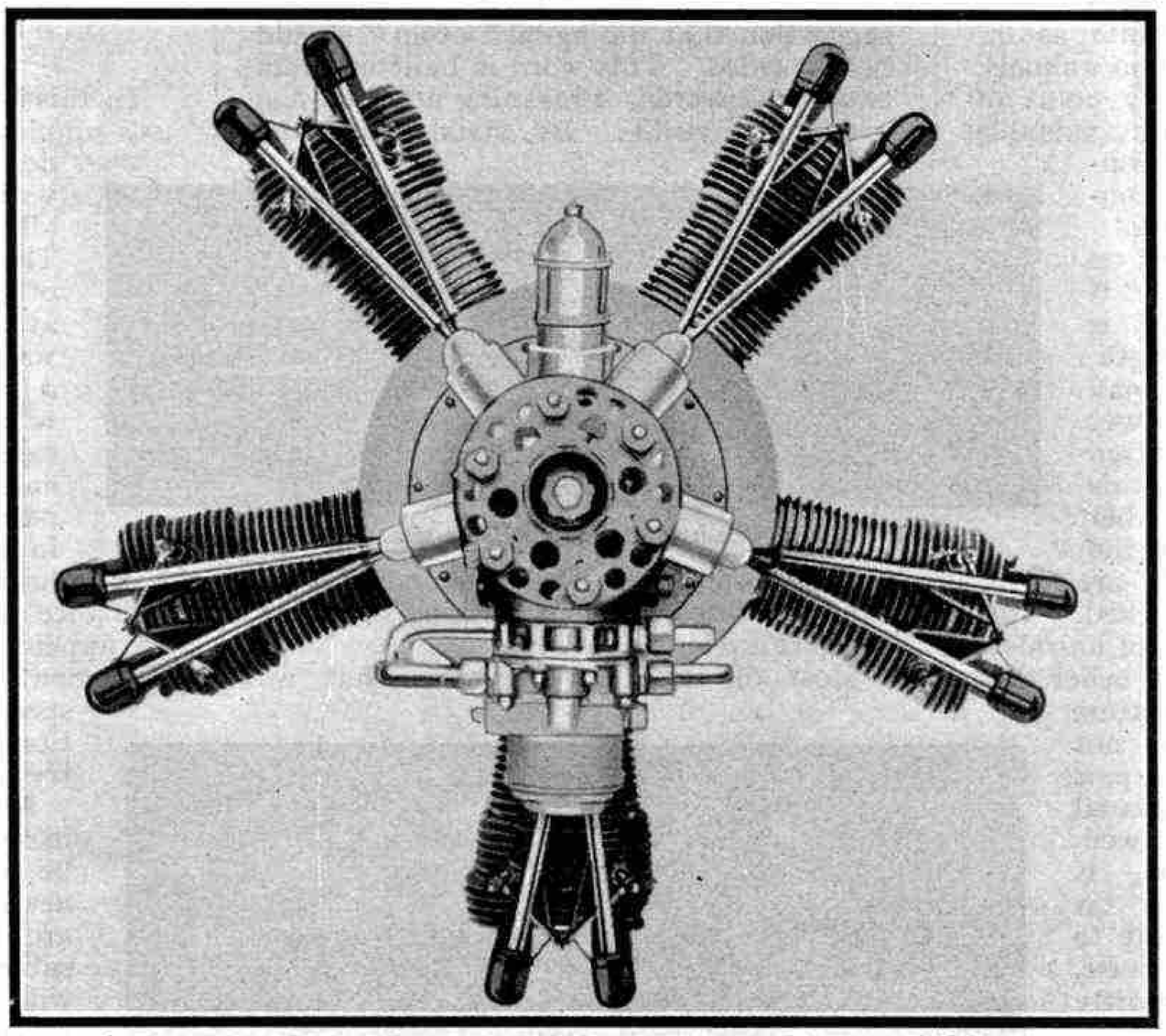
South African Air Mail Service

An air mail service was opened up a short time ago in South Africa, connecting Capetown, Port Elizabeth, Johannesburg and Durban. The line saves between one and two days' time on mails between the British Isles and these points.

Armstrong Siddeley "Genet Major"

A "Genet Major" is the latest addition to the range of Armstrong Siddeley air-cooled radial engines. It is rated at 100 h.p., and therefore it occupies a position midway between the 80 h.p. "Genet" and the 150 h.p. "Mongoose." It made its first appearance at the 1929 Aero Show at Olympia, where its clean design and sturdy appearance created a very favourable impression. It is particularly suitable for the more elaborate type of light aircraft, and also for triple-engined machines of the four-seater to six-seater type. It has been installed in the new triple-engined "Avro" four to five-seater machine.

The engine has five cylinders, the vertical cylinder being situated at the bottom, and the bore and stroke being 4.25 in. and 4.5 in. respectively. The normal propeller speed is 2,200 r.p.m. and the maximum speed 2,420 r.p.m. The complete weight is 250 lb., while the fuel and oil consumption are approximately 7 gallons and 2 pints per hour respectively.



Courtesy [*Armstrong Siddeley Motors Ltd.*

The "Genet Major" air-cooled radial aero engine recently added to the Armstrong Siddeley range

Experimental Air Mail Flight from Galway to London

An experimental air mail flight from Galway to London was carried out a short time ago. Mails that had been brought from America on the North German Lloyd "*Karlsruhe*" were landed at Galway and immediately despatched to the aerodrome by fast motor car. They were then placed on board a Vickers "Vivid" aeroplane, equipped with a Napier "Lion" X1A engine, specially lent for the occasion by the makers. The machine completed the 450-mile journey to Croydon in about 3½ hours, having made stops on the way at Baldonnell, Dublin, and Sealand to replenish the petrol supply.

The flight was made purely as an experiment, but it is very probable that in the near future a regular service between Galway and London will be inaugurated, as this will result in the saving of a day. If co-operation between Irish Airways Limited and Imperial Airways Limited were brought about, letters for the Continent could be flown from Galway to Paris, with a change of machine at Croydon.

There appears to be an increasing demand among business men for air mail services, not only for short distances such as from London to Galway, but also for letters going abroad. It has been suggested that a night service to the Continent should be inaugurated shortly. Other services that are receiving attention include an extension of the London-Karachi service to Bombay, Madras, and Colombo; and the R.A.F. are now engaged in collecting data for a line connecting Singapore, Rangoon and Calcutta.

Light Aeroplane's Fine Flight

By flying 1,062.5 miles in 12 hours 45 minutes at an average speed of 83.53 m.p.h., the German pilot Roeder, on an Armstrong Siddeley "Genet" engined Junkers "Junior" light aeroplane put up the star performance in the Circuit of France Competition for the Zenith Cup.

The Vickers "Vellore" Freight Carrier

One of the best known freight carriers now in use is the Vickers "Vellore." This is a single-engined land machine, and it has been designed with special regard to economy, both in operation and in the ground staff required, together with a good speed range and a low landing speed. With full load the landing speed is only 43 m.p.h., and the maximum speed is 107 m.p.h. The paying load of the machine is 3,828 lb., and with 85 galls. of petrol it has a range of 350 miles. The load per horse power is 7.9 lb., and it is stated that this load has not been attained on any other aircraft constructed for commercial purposes.

The cargo is carried in an all-metal electrically lighted hold of 225 cu. ft. capacity and equipped with a traversing system of pulley blocks and rollers for the handling of heavy cargoes. A large hatch is situated on the under side of the fuselage and immediately aft of the hold, in order to leave the total hold space unencumbered by doors. This hatch is 5 ft. 8 in. by 3 ft. 7 in., and its average height from the ground when the tail is down is 4 ft. 9 in., which is the minimum distance for hoisting goods when loading the machine. When it is required to house the carrier in a comparatively small space, the wings may be folded by the unscrewing of a single pin in each one, without disturbing the petrol system or any other piping. A special hand wheel is carried on the machine for folding the wings.

The engine is a geared "Bristol" Jupiter Mark IX. The petrol is contained in two tanks let into and forming part of the profile of the top wings, and therefore it is possible for the feed to be effected by gravity alone. The total capacity of the tanks is 162 galls., giving a possible cruising range of 670 miles; but in order to do this a certain amount of paying load has to be sacrificed.

The machine is constructed almost entirely of duralumin. It has a span of 76 ft. 6 in., the folded span being 20 ft. 9 in.; while the overall length and height are 51 ft. 6 in. and 16 ft. 3 in. respectively. The all-up weight of the machine is 9,500 lb. A useful feature is an engine starter that renders ground help for starting-up unnecessary, and space is provided in the cockpit for two pilots side by side.

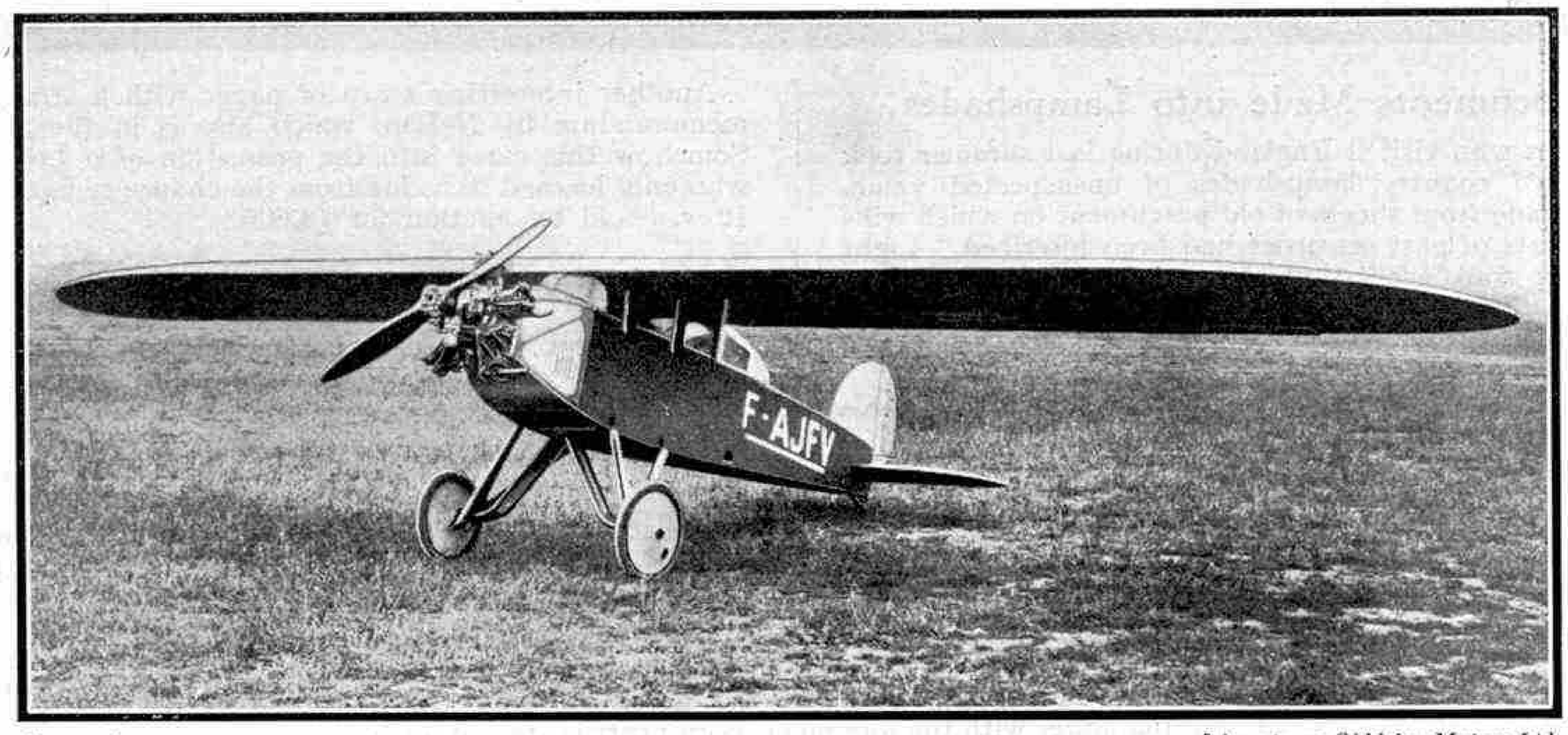
R.A.C.'s New President

The former Under-Secretary of State for Air, Sir Philip Sassoon, has replaced Brigadier-General Lord Thomson, the new Secretary of State for Air, as president of the Royal Aero Club.

New Italian Air Line

Some time ago the Italian Passenger Air Lines were extended from Venice to Brindisi, the new route connecting the Vienna-Venice-Rome line with the service from Brindisi to Constantinople via Athens. The aeroplanes chosen for the Venice-Brindisi flights were Junkers F.13 and G.24 types, and they can complete their aerial journey in 6½ hours, this time including a stay of one hour at Ancona.

The choice of machines was determined by the success of similar aeroplanes on the extremely difficult route from Vienna to Rome, which crosses the Apennines in addition to the mountainous country in Carinthia and the Tyrol. On this route the machines maintained the service throughout the whole of the trying winter period between December 1st, 1928, and the middle of March, 1929, without accidents, although temperatures of 45°C. below freezing point, heavy fogs, and violent storms were frequently met with. Altogether 79,320 miles were covered, while 526 passengers and 11 tons of mail and freight were transported during that period, the traffic being almost twice that of the same period in the previous year.



Courtesy] [*Armstrong Siddeley Motors Ltd.*

The "Genet"-engined "Albert" monoplane in which M. Albert recently set up a new altitude record for machines of this type in France

THIS MONTH'S AIR STORY

"Heard of the latest in poisons?"
"No, what is it?"
"Aeroplane poison. One drop is usually fatal!"

New Canadian Night-Flying Route

A night-flying route to carry air mail across the prairie provinces in western Canada will probably be inaugurated early this month. The new service will operate between Winnipeg and Regina, Regina and Edmonton, and Regina and Banff. A tentative schedule drawn up arranges for a mail-carrying machine to leave Winnipeg at 9 o'clock every night, arriving at Banff at 6.45 on the following morning, and making train connections there that will permit delivery of mail in Vancouver a day before the all-rail service. The east-bound mail will leave Banff at 11 p.m., catching the train at Winnipeg.

Imperial Airways News

A record shipment of bar gold was carried between London and Paris a short time ago by Imperial Airways. Forty tons of gold were carried in nine days, two tons being the usual load on each liner. The whole shipment was effected without the slightest delay or incident of any kind.

On the England-Egypt India Service recently the flying boat "*City of Athens*" had a somewhat unusual experience that provides another instance of aircraft assisting shipping. Flying south from Athens she passed, 10 miles south-west of St. Georgie, a sailing ship completely water-logged, the hull being below the water while the sails and masts remained standing. The flying boat flew low around the ship to make certain that no survivors remained and immediately wirelessed to Athens the position of the wreck. Within twenty minutes Athens broadcast a warning to all shipping in the vicinity of the danger reported.

The flying boats on the Mediterranean Division of the England-Egypt-India route have now flown over 125,000 miles on their weekly mail journeys, maintaining complete regularity of service throughout.

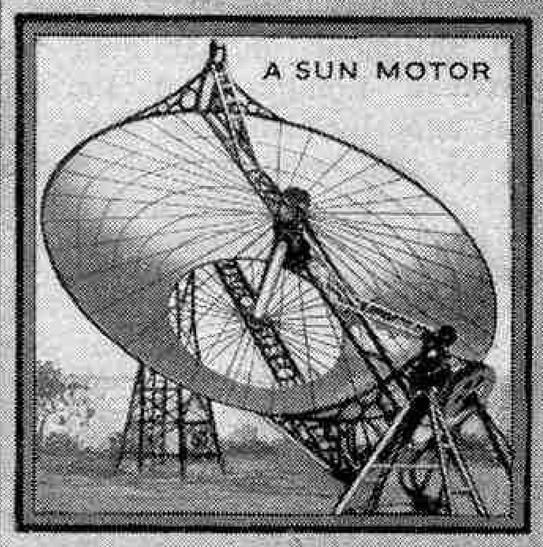
Certificates of Airworthiness

The Air Ministry have authorised the British Aviation Insurance Group to undertake the inspection of light aircraft for the purpose of granting or renewing certificates of airworthiness. At first the inspectors of the group will examine only private machines the owners of which reside in London and district, and Air Ministry officials will be present at the first few inspections. Eventually, however, the Insurance Group will take over the granting and renewal of all certificates issued for civil machines.

New Altitude Records

An "Albert" monoplane fitted with an Armstrong Siddeley "Genet" engine and piloted by M. Albert has made a successful attempt on the French altitude record for machines of this type. The height recorded was 21,255 ft., which was 3,276 ft. better than the previous French record, and only 624 ft. less than the world's record.

An altitude record has also been set up in America by an Armstrong Siddeley "Genet"-engined "Beazley" machine, which broke the world's record for aircraft weighing less than 880 lb. by climbing to 25,000 ft. The previous record was 22,250 ft. made in Germany.



Of General Interest

Historic Documents Made into Lampshades

Many Americans who visited England during last summer took back to their own country lampshades of unsuspected value. These had been made from sheets of old parchment on which wills and legal documents of past centuries had been inscribed. Light shines through the translucent skin with a soft radiance, and the decorative effect is greatly enhanced by the ink, which has turned brown with age and matches the creamy colour of the parchment.

It has now transpired that the parchment sheets from which they were made have had a very interesting history. They were originally kept in the Irish Record Office, which formed part of the famous building in Dublin called the Four Courts. During the rising in 1916 the rebels who took possession of the building sheltered themselves from bullets behind piles of historic books and records. Naturally many of these were burned or blown up before the building was captured, and the remnants disappeared in a similar manner in the still more destructive fighting in 1922. A surprisingly large number of documents survived the ordeal however, and many of them have since been returned to the authorities. Those that were turned into lampshades re-appeared on a stall in an open-air London market, where they were sold without suspicion of their value. Most of the sheets then purchased have gone beyond recall, but those remaining have been returned to Ireland.

Fortunately the loss of documents in this manner is now very rare, the only notable instance for many years being the burning of the Library of the University of Louvain during the Great War. No official English records have been lost since the Houses of Parliament were burned down in 1884, when many important papers were either destroyed or stolen. Curiously enough, many of these were also recovered from an open-air market in London, sack-loads of them being found beneath a fishmonger's stall, and restored to the authorities.

In the Middle Ages the contents of libraries and record offices were often scattered far and wide, in many cases after the castles and cities in which they were stored had been beseiged and sacked. Some of these priceless documents were afterwards discovered in the most romantic manner. This was the case with an original transcript of Magna Charta. Four hundred years after the famous charter was signed, this came into the possession of a London tailor, who was about to cut it up for patterns when one of his customers chanced to notice the seals attached. The customer was Sir Robert Cotton, a well-known antiquary, and he rescued the precious document, which is now one of the most treasured possessions of the British Museum.

Another interesting scrap of paper with a strange history is a memorandum by Nelson, which also is in the British Museum. Somehow this came into the possession of a London bus-driver, who only learned its value from the chance remark of a passenger. It was sold by auction for £3,600.

Pepper Traders Who Won an Empire

Many great events may be traced to remarkably unimportant and obscure causes, but it is very doubtful if there is any more striking instance of this than the foundation of British rule in India and Burma. Our great Eastern Empire owes its origin to the high price of pepper during the reign of Queen Elizabeth!

Pepper and other spices were then obtained, as they are to-day, from the East Indies. The trade was almost the monopoly of the Dutch, who were the great pioneers of the Spice Islands. Naturally merchants from Holland took advantage of this fact, and raised the price of pepper in England from 3s. to 8s. per pound. This caused great indignation in London, and the worthy citizens decided to fetch their own spices. A group of them formed a company for the purpose, and after some negotiations Queen Elizabeth granted a charter to this "Government and Company of Merchants trading in the East Indies," as it was called, to enable it to send its own merchant ships into the East.

The venture was very successful, and soon the East India men that rounded the Cape of Good Hope on the way to the Spice Islands made a great reputation for themselves. They were the finest sailing vessels of their time. Their crews were efficient in business and also in the piratical warfare then necessary in waters far removed from civilised centres. In those days it was often easier to obtain a valuable cargo than to defend it from marauders, but the stout seamen of the Company's merchant fleet more than held their own, and made their presence felt in Eastern waters. On one memorable occasion a fleet of 16 East India merchant vessels actually put to flight a squadron of heavily armed French warships.

Ten years after receiving its charter, the East India Company built its first factory on the mainland of India, and from this humble beginning it grew rapidly until at length it acquired control of almost the entire country. Its very success brought the Company to an end, however. It was scarcely to be expected that anything less than a national Government could maintain efficient rule over the millions of people in India, and the tragic events of the Great Mutiny closed the wonderful career of the enterprise that had its origin in a search for cheaper pepper.

Over a Hundred Years Ago!

A Questionable Advantage

"A provincial paper says that a gentleman in Devonshire has invented what he calls a snuff-pistol. It has two barrels, and being applied to the nose, and touching a spring under with the forefinger, both nostrils are instantly filled, and a sufficient quantity driven up the head to last the whole day!"—"THE TIMES," 20th April, 1827.

The Mersey Tunnel

"At the adjourned meeting held on Friday, at the King's Arms, after some conversation among the gentlemen present, it was resolved that application should be made to Mr. Brunel for an estimate of the expense of constructing a tunnel under the Mersey, before any further measure be adopted to form the Company."—"LIVERPOOL MERCURY," 11th May, 1827.

America's Gain

"On Saturday last about thirty persons left this town for Liverpool, for the purpose of embarking at that port for the United States of America. Some of them are very clever mechanics, who, when times went well, were accustomed to earn upwards of £2 a week, but lately have been unable to realise more than 20s. to 24s."—"PRESTON CHRONICLE," 11th May, 1827.

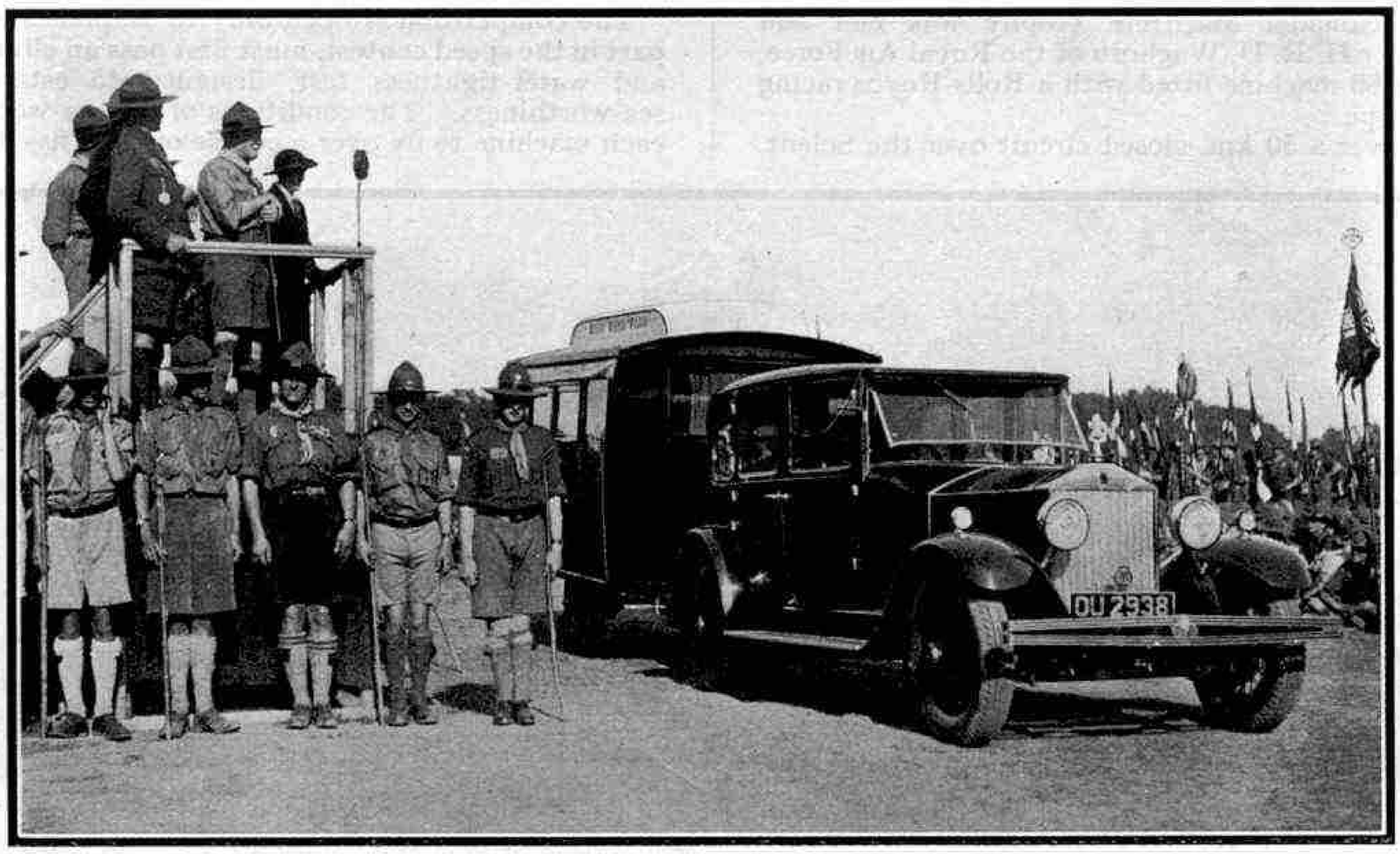
Cheap Travel

"A few days ago, such was the competition between rival steam vessels, that numbers of Irish labourers, on their return from our harvests, were conveyed from Liverpool to Newry (a distance of 200 miles) for threepence each."—"HANTS. ADVERTISER," 10th September, 1827.

Chief Scout Honoured at World Jamboree

The greatest event of the World Jamboree at Arrowe Park, Birkenhead, was undoubtedly the presentation of gifts from the Boy Scouts of the world to the Chief Scout, Lord Baden-Powell of Gilwell. The inspiration for the presentation came from the Scouts of Denmark, and more than 1,250,000 joined in the movement to honour the founder of the World Brotherhood of Scouts. The maximum subscription was only 1d., but so well was the idea supported that on Saturday, 10th August, Mr. Christian Holm, the President of the Danish Scouting Association, was able to present to Lord Baden-Powell the magnificent Rolls-Royce car and caravan trailer shown in our illustration. In addition, a cheque for £2,500 was presented to the Chief Scout to be applied by him to any purpose that he thought desirable.

In making these gifts to their leader, the Boy Scouts of the many nations assembled at Arrowe Park were doing honour to one of the most illustrious figures of to-day. Earlier in life "*B.P.*" earned a great reputation as a soldier, and it will be long before his magnificent defence of the open town of Mafeking against an overwhelming force of Boers is forgotten. In 1910, when his prospects of advancement in the British Army were exceedingly bright, he suddenly abandoned his military career in order to devote himself to the great movement that had begun with his first Scout camp at Brownsea Island three years earlier.



The Rolls-Royce car and caravan trailer presented to the Chief Scout during the World Jamboree at Arrowe Park, Birkenhead. The Chief Scout and Lady Baden-Powell may be seen on the dais

At the "Coming of Age" Jamboree "*B.P.*" stood on the dais to receive as Chief Scout the salutes of Scouts from practically every country in the world. Thus he has had the rare pleasure of seeing the movement become world-wide in the comparatively short period of 21 years.

Largest Tree in the World

It is believed that the largest timber tree in the world is a giant Californian redwood on the property of an American Logging Company. The height of this tree is 308 ft., and its circumference at a height of 20 ft. above the ground is nearly 16 ft. It contains enough marketable lumber to make a plank road, 12 in. in width, that would stretch from London to Southampton, a distance of 68 miles; or to build 22 wooden homes of average size.

The tree has been measured very carefully as a result of a statement appearing in an Australian newspaper that a certain eucalyptus gum tree in that country contains more commercial wood than any other known tree in the world. The exact size of the eucalyptus is unknown, and it will be interesting to learn how it compares with the Californian tree, and also with the Central American tree illustrated on page 774.

Deepest Hole Ever Made

The deepest hole yet bored in the earth is in West Texas, where an oil well now has been sunk to a depth of 8,255 ft. or more than 1½ miles. This is practically 200 ft. deeper than the well near Los Angeles referred to on page 396 of the "*M.M.*" for May 1928.

The well in Texas was drilled by means of a cable tool rig driven by two electric motors, and its owners intend to go still deeper, for they believe that the world's future supply of oil lies at depths beyond those of the wells at present being exploited.

In the neighbourhood of the same well are several others that also are more than 8,000 ft. in depth. The cost of drilling a hole of this astonishing depth is approximately £50,000.

Watch that Gave B.B.C.'s First Time Signal

A watch made well over 100 years ago is still serving as a time-keeper by which high-class clock and chronometer makers set their instruments. It has had a remarkable history since it was constructed by the famous clock maker John Arnold, for the Duke of Suffolk, one of the sons of George III. The Duke disliked it on account of its size and weight, and returned it to the maker with a message to the effect that he wanted a watch and not a warming pan! Later it was bought by a Mr. Belville, who changed its valuable gold case for one of silver.

In 1835 Mr. Belville conceived the idea of making use of the wonderful time-keeping qualities of his watch, and began to carry it round to clockmakers to enable them to check their clocks and watches. After his death in 1856 the business thus started was carried on by his widow, who was succeeded in 1892 by her daughter. Every week Miss Belville goes to Greenwich Observatory, where the watch is compared with the wonderfully accurate clocks used by the astronomers, from whom she receives a certificate that states exactly by how many tenths of a second the time it shows differs from the standard. Her weekly round consists of 50 calls, and her watch is used for checking the instruments, not only of watchmakers, but also those in several large works and in the houses of two millionaires.

Miss Belville usually refers to her watch as "*Arnold*," in memory of its maker, who was appointed chronometer and watchmaker to George III in recognition of several important inventions made by him. "*Arnold*" helped to win the War, for his services were called upon by several firms engaged on munition work that frequently necessitated working to seconds. But perhaps his most interesting feat was performed on the first day when the B.B.C. broadcast a wireless time signal. That day was chosen by the chronometer at Greenwich for a breakdown, a very rare thing indeed; but "*Arnold*" came to the rescue and thus was responsible for giving the first of the time signals with which listeners are now familiar.

Nearly 20 Million Telephones in U.S.A.

One of the largest and most imposing books in the world is in five volumes, and so great is the demand for it that it is issued twice yearly. It is nothing more exciting than a telephone directory, however, and contains the telephone numbers of the subscribers to the New York Telephone Exchange.

It is interesting to compare the present directory with the first, which was issued rather more than fifty years ago. At that time a large number of business firms refused to instal telephones, preferring to transact business by the methods they had always used, and the directory contained only 241 names. Of these 49 are still to be found in the current directory. One of them is a large store, and to-day there are more instruments in it than were to be found in the whole of New York when the first directory was issued, although even at that time the population of the city was 2,000,000!

The greatest increase in the size of the book has taken place since 1924, when a two-volumed directory was issued for the first time. This consisted of almost 2,000 pages, and the list of subscribers numbered more than 800,000.

The great popularity of the telephone in the United States is also illustrated by the number of calls made annually. In 1927 this amounted to the stupendous total of 31,614,172,621! The number of telephones on which the calls were made was 18,522,767, and these were connected by nearly 64 million miles of wire.

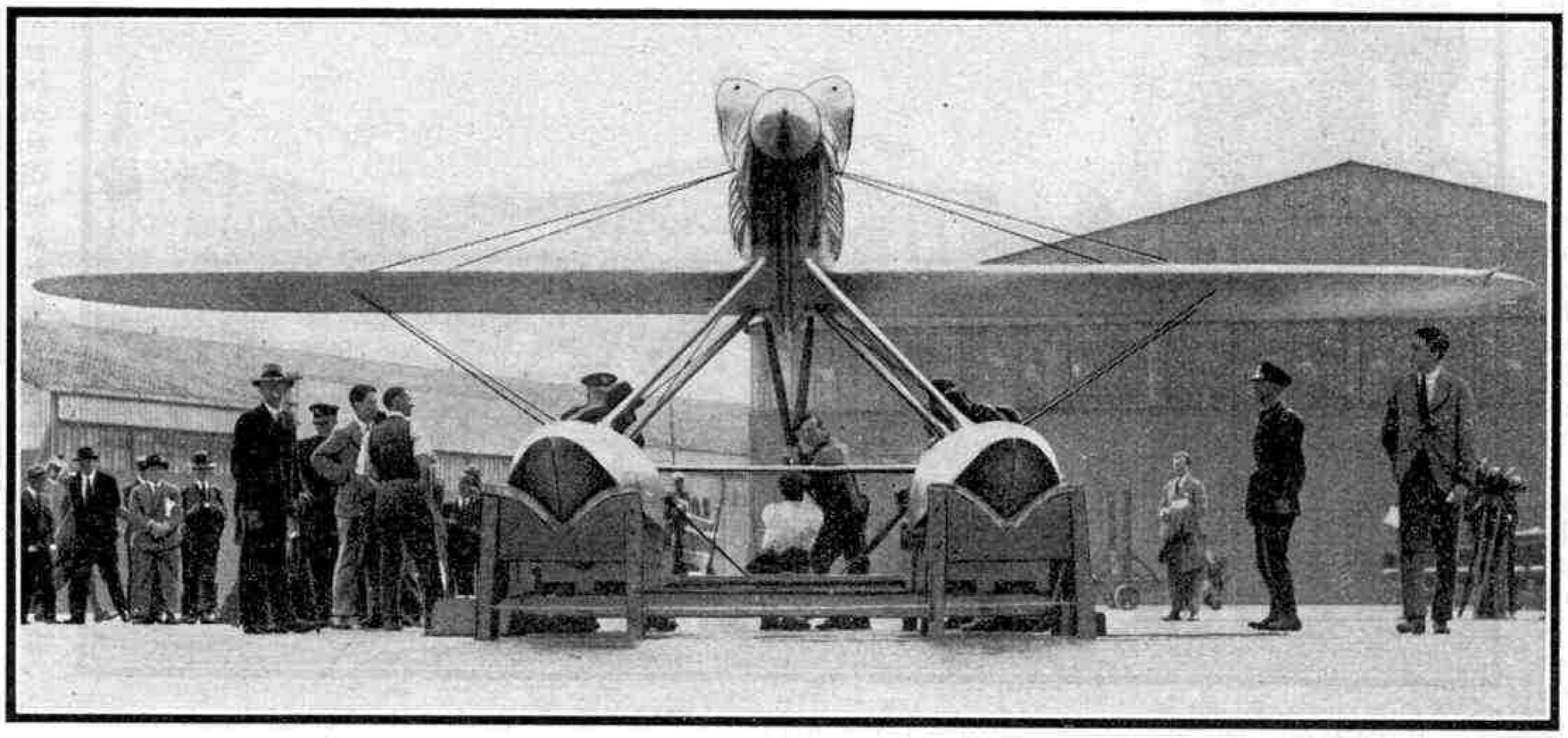
British Air Triumph

Schneider Trophy Contest Won at 328 Miles an Hour!

By Our Own Correspondent

THE supremacy of British aircraft construction was triumphantly upheld on 7th September, when Italy's challenge for the Schneider Maritime Trophy was met and beaten by Flying-Officer H. R. D. Waghorn of the Royal Air Force, flying a Supermarine S6 machine fitted with a Rolls-Royce racing engine of the "R" type.

The race was held over a 50 km. closed circuit over the Solent, each competitor being required to fly seven laps of the course, a total distance of 350 km. (217.7 land miles). Flying-Officer Waghorn's fastest lap speed was 331.46 m.p.h. on his third lap, the climax of a thrilling exhibition of speed flying, in which he actually smashed the existing world's aircraft speed record on his first lap, broke his own record on the second lap, and created a fresh record on the third!



A Supermarine Rolls-Royce S6 undergoing engine trials at the Calshot base. Although the machine is lashed to the ground the enormous vibration necessitates, also, the combined efforts of half-a-dozen mechanics to hold it down. For the photographs illustrating this article we are indebted to Rolls-Royce Ltd.

Waghorn's record existed for but one solitary hour, however. Flying-Officer R. L. R. Atcherley went all out to wrest the honour from his colleague, and succeeded. On his fourth lap his machine roared its way round the course in 5 min. 36-2/5 sec., at a speed of 332.49 m.p.h. This feat does not qualify for substantiation as the world's air speed record however, except over a 50 km. closed circuit course. The conditions for the major honour—over a straight 3 km. course—could not be complied with in the Schneider Trophy Race.

The Schneider Trophy, in pursuit of which nations spend hundreds of thousands of pounds and pilots risk their lives, is a beautiful piece of golden statuary, a triumph of the goldsmith's art valued at £1,000. It shows a winged figure, "*Speed*," kissing a zephyr recumbent upon a breaking wave, into which the head of Neptune is worked. It was presented by M. Jacques Schneider to the Aero Club of France in 1913, and is held in trust by the Federation Aeronautique Internationale, to be competed for by International challenge. The conditions of competition permit the holding club to be challenged by any other club, the actual contests to take place once every two years over a course not less than 150 nautical miles in length (a nautical mile is 1,852 metres), which may be in one straight line, a broken line, or a closed circuit, the last being the form of course that is most favoured to-day.

The competition is open only to seaplanes which, before taking part in the speed contest, must first pass an eliminating navigability and water-tightness test, designed to establish the machine's sea-worthiness. The conditions of the sea-worthiness tests require each machine to fly over a course of from five to ten nautical miles over the sea. The seaplane must first taxi over the starting line, then rise and continue the course, alighting twice to taxi over two distances of half a nautical mile at a minimum speed of 12 knots, and then fly over the remainder of the course prior to alighting and taxi-ing over the finishing line. Each machine is entitled to a second attempt at this test in the event of the first proving unsuccessful. After having taxied over the finishing line the seaplane must be moored immediately to a buoy and remain afloat unattended for six hours. After successful completion of this second test no modification to the machine is permissible, although such minor items as changing the air screw, cylinders, sparking plugs, magnetos or navigation instruments are allowed.

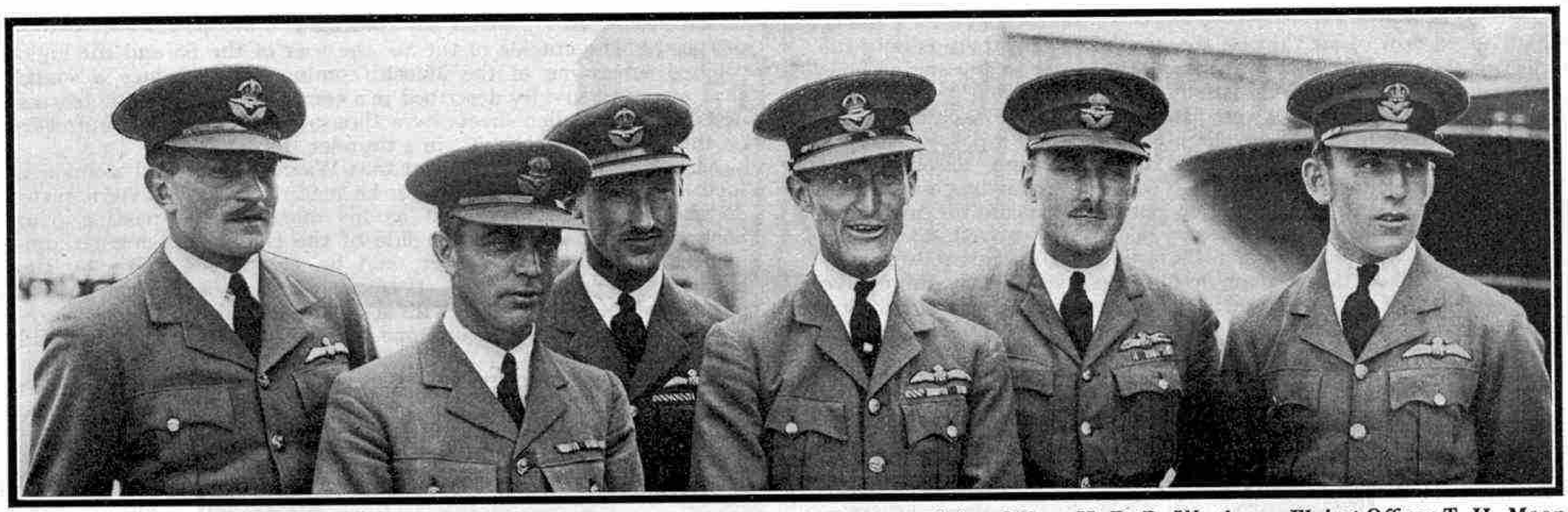
The object of these preliminary trials is to ensure that the machines taking part in the contest are not simply freak racers, but are reasonably sea-worthy craft capable of flying in normal weather conditions. The tests are sufficient to ensure a satisfactory standard of sea-worthiness, for the many take-offs, landings, and spells of taxi-ing would speedily wreck the floats if they were not sound. Leakage would result, and the machine would sink—if not during the actual navigability trials, certainly during the mooring period.

The British victory at the Lido in 1927 gave to us the honour of staging the next contest, and the actual course consisted of a quadilateral 50 km. circuit in the Solent, with the starting and finishing line off Ryde Pier and turning points as follows:—1, off Seaview, Isle of Wight; 2, off Hayling Island; 3, off Southsea; 4, off West Cowes. The course afforded a splendid test of the manœuvrability and general aerial qualities of the machines,

Schneider Trophy Race—Comparative Speeds

The reference to the speeds achieved at previous contests make the following figures of special interest. They show the actual winners and speeds since the inauguration of the race

	M.P.H.		M.P.H.
1913—M. Prevost (France)	45.75	1923—Lt. D. Rittenhouse (U.S.A.) ...	177.38
1914—C. H. Pixton (Gt. Britain) ...	86.8	1924—No contest	
1919—Contest annulled		1925—Lt. J. Doolittle (U.S.A.)	232.57
1920—Luigi Bologna (Italy)	107	1926—Maj. de Bernardi (Italy) ...	246.49
1921—G. de Briganti (Italy)	111	1927—S. N. Webster (Gt. Britain) ...	281.65
1922—H. C. Biard (Gt. Britain) ...	145.7	1929—H. R. D. Waghorn (Gt. Britain)	328.63



The British Schneider Trophy team. Reading from left to right the members are :—Flying Officer H. R. D. Waghorn, Flying Officer T. H. Moon (Technical Officer), Flight Lieut. D'Arcy Greig, Squadron Leader A. H. Orlebar (Commander), Flight Lieut. G. H. Stainforth, Flying Officer R. L. R. Atcherley

for the negotiation of such sharp turns as that off West Cowes calls for a remarkable degree of skill on the part of the pilot and a high standard of flexible control in the machine itself. Necessarily, such sharp turns must reduce the average speed of the machines over the course, and it is estimated that, at the remarkable speeds attained by modern racing craft, approximately one mile in distance is lost at each turn. Assuming an average speed return of 300 miles per hour over the circuit, the actual loss of one mile per corner in distance represents approximately a time loss of 48 sec. per circuit, equivalent to 45 m.p.h.

The actual contest having been fixed for Friday and Saturday, 6/7th September, the preliminary business of nominating the machines and pilots was carried through, and Britain decided to place its faith in the old Supermarine Napier S5, the sister craft to that in which Fl. Lieut. D. D'Arcy Greig broke Major de Bernardi's speed record; and two new Supermarine S6 machines fitted with Rolls-Royce engines. D'Arcy Greig, most famous of British high speed pilots, was allotted to the S5, while Flying Officers Waghorn and Atcherley were put up for the S6's. The Italian team consisted of Lieuts. Giovanni Monti and Remo Cadringher, and Warrant Officer Dal Molin, who were nominated for the two Macchi 67's and the Macchi 52 respectively.

Originally the entries for the contest included also three machines from France and one from America, but less than three weeks before the event took place the French team was withdrawn, owing to the fact that the French Government found it impossible to have the racing machines ready early enough to enable their pilots to become familiar with them before the race was due to be flown. The single American seaplane, entered by Lieut. Alfred Williams, was actually built, but it was badly damaged in preliminary trials and steadfastly refused to leave the water in subsequent tests. Eventually it was decided that the American entry also would have to be withdrawn.

These unfortunate events left only the British and Italian teams in the race, and indeed at one time it was possible that the race would degenerate into a "fly-over" for Great Britain, as the Italians experienced considerable misfortune during their training flights. Captain Guiseppe Motta, the greatest of the Italian high speed pilots, when testing a new machine over Lake Garda, near Desenzano, lost control when travelling at a speed estimated at well over 300 m.p.h. For a few seconds the machine plunged from side to side and finally dived at full speed into the lake below. Motor boats and launches rushed to the spot where the seaplane had hit the water, but no traces of Captain Motta could be found.

This disaster created considerable apprehension among the Italian pilots, but, with true sportsmanship, when it was announced that their semi-official appeal for a short respite could not be granted, training was resumed and the remaining pilots and machines left Italy for Calshot, the base of operations during the actual contest. Signor Balbo, the Italian Under Secretary of State for Air, is reported to have declared after the race that at no time had his team any faith in their ability to get their new machines into winning trim! In fairness to the British team, however, it must be pointed out that the weather over the Solent during the fortnight following the delivery of their racing machines precluded any possibility of real practice, and when the machines actually went to the post the balance of handicaps had been very evenly distributed.

For obvious reasons the information available concerning the intimate details of the competing machines and engines of both nations is sparse. As in past years, the British team consisted of Supermarine and Gloster racers, but while hitherto both types have been fitted with the famous Napier "*Lion*" engine, this year the task of providing the power unit was shared by Rolls-Royce Ltd., who previously have held aloof from racing.

The Supermarine S6 machines are a development of the S5 type that won the last Schneider Contest in 1927. They are somewhat bigger, however, to accommodate the larger Rolls-Royce engine. The long, slender fuselage is actually an elliptical shell of thin metal, strengthened by steel members internally at certain points. The wing spars and coverings and floats also are of metal. The Gloster machines also have metal fuselages and floats, but the wings follow the Gloster racing tradition, being built up of a number of spruce spars and covered with a special skin of spruce ply.

The floats of each type of machine are made to serve a useful purpose when in the air by acting as fuel tanks, the petrol being pumped up to the engines. It will come as a surprise to many to learn that the dead weight of the machines necessitates floats equal in size to two-thirds of the fuselage.

Mr. F. H. Royce, Chief Engineer to Rolls-Royce Ltd., photographed with Squadron-Leader Orlebar, during a visit to the Calshot base

The 12-cylinder supercharged Napier "*Lion*" engine is a development of the old 1927 "*Lion*," which gave nearly 900 h.p. It will be easy to guess therefore that the new unit gives something over 1,000 h.p. in a space less than 3 ft. × 3 ft. × 6 ft. The 12 cylinders are arranged in what is known as "broad arrow" formation; that is to say, there are three blocks of four cylinders on the crank case.

The Rolls-Royce engine is a special development of the famous "R" standard engine, and also has 12 cylinders. These are arranged in "V" formation in two rows of six on the crank case, and the total bulk of the engine is a shade greater than that of the "*Lion*." The standard unit is known to develop 830 h.p., and although nothing definite has been stated, it is rumoured that these engines actually develop 1,900 h.p.!

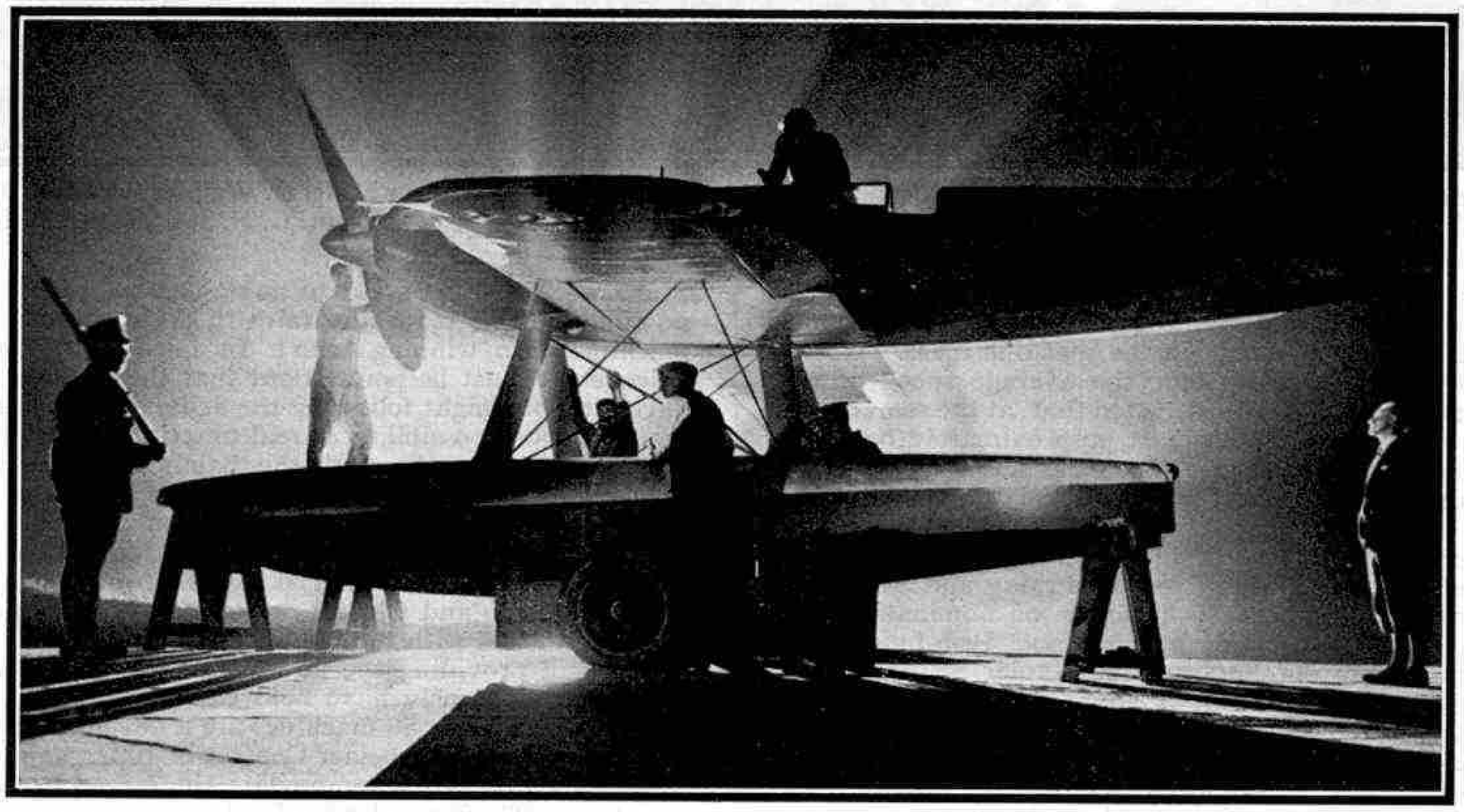
The engines are water-cooled, and the problem of radiation was exceedingly difficult, for ordinary radiators sticking out into the air were out of the question. Actually both designers arranged to circulate the cooling water under the outer skin of the wings, thus making the air perform the double duty of lifting the aeroplane and, in its rush past, extracting the heat from the water coming from the water jackets around the cylinders. So essential is a

high-speed flow of air that on the ground, where there is only the rush of the wind from the air screw, the water in the engine boils after one minute at full throttle !

The Italian Macchi 67's were fitted with Isotta-Fraschini engines reputed to be capable of developing up to 1,500 h.p.

The limitation of each team to three machines unfortunately precluded the inclusion of the two Gloster Napier machines, both of which gave excellent practice performances in the air; but it was wise, although unnecessary as events proved, to include an old tried aeroplane rather than to bank all upon three new machines. The Italian team had in reserve a very diminutive " mystery " Fiat machine and a tandem-engined Savoia Marchetta. Of these machines nothing is yet known, for they did not actually take the air in practice, and were packed for return to Italy immediately after the contest itself was over.

The successful passage of the preliminary tests paved the way for the speed contest and when Saturday, 7th September, produced ideal conditions, every single member of the million strong army of spectators that had scattered itself along the promenades and beaches of the Isle of Wight and Hampshire coasts, was agog with suppressed excitement, born of the belief that ere the day had passed man and machine would have travelled faster than ever before.



Night work on the second Supermarine Rolls-Royce machine. The mechanics responsible for the care of the racing seaplanes were the hardest worked individuals in Britain during the fortnight preceding the race. Here they are seen working under the glow of powerful searchlights, with an armed guard in attendance

The contest was timed to start at 2 p.m., and at 2.1 the dull boom of a starting gun at Calshot was heard. A few seconds later came the crackle of Waghorn's Supermarine S6. The crackle grew to a roar, and amid gasps of amazement from the crowd the machine swept over the starting point and the race had begun. Flying low at a terrific speed, Waghorn soon passed the Seaview turn and then, with an almost vertical turn, rounded the Hayling Island pylon and flashed across to Southsea. Now the immense speed of the machine became more obvious. Against a background of sea or sky, devoid of landmarks against which to " place " the machine, the true character of the performance had not been so vividly apparent. The organ-like note of the Rolls-Royce engine boomed from the Southsea coast, and one had to look two miles ahead of the noise to locate the machine ! A few seconds later the West Cowes turn had been negotiated and the flashing blue and white projectile was over Ryde and away again. Waghorn had completed his first lap, breaking all speed records in his flight with figures of 324 m.p.h. ! This was indeed a thrilling start to what promised to be a thrilling race.

Streaking through the sky like a shell from a gun, with the course to himself, Waghorn roared on, breaking his own record on the second lap and again on the third, with speeds of 329 and 331 m.p.h. !

A second booming of the gun heralded the approach of Dal Molin with his Macchi 52, the first of the Italians. With two machines in the air the excitement became more intense, but with Molin on the last leg of his first lap, and overhauled by Waghorn, the difference in the speed of the new Supermarine and the old Macchi was evident. Nevertheless one was hardly prepared to learn that Dal Molin's first lap had achieved nothing greater than 284 m.p.h. ! Before Waghorn had completed the course the second British machine, piloted by D'Arcy Greig crossed the starting line, and for a few seconds spectators had the spectacle of three high-speed seaplanes in the air at the same time.

The singular differences in the individual engine notes made a strange contrast; in fact for those few seconds it was the striking feature of the race, for already one had begun to lose the thrill of speed ! The crackle of the S6, the roar of the S5 and the high-pitched screaming of the Macchi combined to produce a sound that was most vividly described in a contemporary as " the tearing of a thousand calico sheets by a thousand demoniacal laundresses on the " *Flying Scotsman* " in a thunder storm ! "

At this stage it was apparent that Waghorn intended to make a further circuit of the course, for he made the three eastern turns on the eighth circuit. Just as his machine was passing over Stokes Bay on the northern side of the course, his engine commenced to splutter, however, and he was forced down by the failure of his petrol supply. It transpired that each of the British pilots had been provided with a board containing eight paper-covered holes, to be punched one by one at the starting post and at the completion of each lap. On his instrument Waghorn could not be certain that he had not punched two holes in one lap, and he determined to make assurance doubly sure. His average speed of 328.64 m.p.h. had set a heavy task for any would-be challenger. It was a brilliant piece of flying, for with the exception of the lap in which he overtook Dal Molin, Waghorn had actually followed an identical course in each lap throughout the race.

With the passage of Waghorn the sky was left to the two old stagers, and their duel, while less thrilling than the amazing speed of Waghorn, provided one of the most interesting phases of the race. Lap after lap was ticked off at an astonishingly consistent speed, and it soon became clear that the blood-red Macchi was holding its own. Dal Molin's actual time for the course was 45 minutes 52 2/5 seconds, an average speed of 282.2 m.p.h. His highest speed was on the second lap, which he covered in 6½ minutes at a speed of 287.78 m.p.h.

As D'Arcy Greig streaked for home on his fourth lap, interest became centred on the first of the new Italian machines, the Macchi 67, piloted by Lieut. Cadringher. Its speed was an unknown quantity, for the machine had not been in the air until the navigation trials of the preceding day. Flying very low and using a slightly wider course than the three previous competitors, Cadringher gave a wonderful exhibition of piloting. His vertical banks at the turns were perfect, and the blood-red machine gave one the impression of a bolt of flame as it skimmed the waters on the Hampshire side. Explain it as one will, the machine seemed even faster than Waghorn's Supermarine, and a cry of amazement went up from the crowd when it was learned that actually Cadringher had accomplished only 283.88 m.p.h. on his first lap !

A few seconds later there was another gasp, for away on the northern part of the course Cadringher's machine could be seen making for the water. It appears that the exhausts of the Macchi machines had been placed on the port side, on to which the machines banked in making their turns. Thus Cadringher was banking into his own exhaust as he turned, and betwixt the blackening of his windscreen and the filling of his cockpit with fumes that nearly overcame him, he was forced to abandon his effort.

Even as this tragic blow to Italy's hopes was being dealt, D'Arcy Greig completed the course, his return being 282.11 m.p.h.

Flying-Officer Atcherley's S6 now became the focus of attention. It was soon apparent that he was out to break his colleague's records, but his first lap held out no great hopes of further sensational accomplishments for it was returned at only 302.45 m.p.h. ! From this point his speed went up and up, until on the fourth lap, with interest once more growing tense, his

(*Continued on page 772*)

How We Spent the Holidays

The Romance of Great Railway Stations

By Hilda Trevelyan Thomson

THE problem that presented itself to me at the commencement of the recent holidays was how to amuse an active son of twelve who, for the first time in his life, had no country home and was doomed to spend August in London. I asked him what he would most like to see, and immediately he summed up his heart's desire in one word—"Stations!"

"Stations it shall be," I agreed, not without inward tremors, for I associated stations with discordant noises, which I take infinite pains to avoid. So each morning we spent some time in a large station, and I have learned by experience something that previously I had doubted, namely, that a genuine enthusiasm can in some marvellous manner change a companion's apathy to absorbed interest. I have succumbed to the fascination of a railway station and to the romance of the iron road.

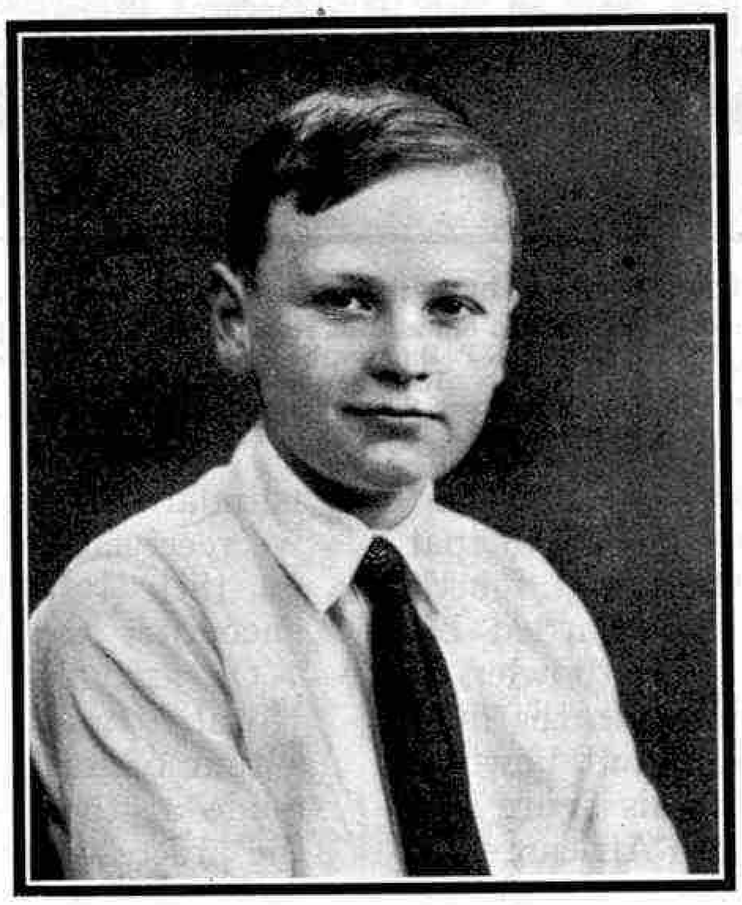
King's Cross Station showing the "*Queen of Scots*" ready to leave. Locomotive No. 6164, "*Earl Beatty*"

We spent one morning at King's Cross. The moment we entered the station my son's face lit up and he turned to me and whispered ecstatically: "The noise!" "the smell!" "the smoke!" I nodded in agreement.

We were lucky. A Gresley "Pacific" due to leave at 11.30 was standing at platform 6; and my son was soon in the cab in deep conversation with the engine driver. Their earnest faces were lit up by the glowing fire—the small boy in grey and the kindly blue-coated man both inspired by the same love and enthusiasm for the power and beauty of the steam engine. Then I turned my attention to the locomotive, and as I gazed at its sleek and shining sides I gradually began to realise the nobility and distinction that lay behind its perfect proportions.

The very names of many locomotives are full of romance. This one was "*Donovan*." Later my son and I met "*Blair Athol*," "*The White Knight*," "*Dick Turpin*" and "*Night Hawk*." How blind I had been in the past, caring only to find a seat in the train, and quite unconscious that I was being escorted majestically by "*The Tetrarch*," or being borne on the wings of the "*Scarborough Flyer!*"

On another occasion our luck was even better, for we encountered the "*Flying Scotsman*." The wonderful corridor tender is the stuff that engineers' dreams are made of. Through the little door come the second engine driver and fireman to take charge halfway through that magical flight of over 390 miles through the length of England and on to Edinburgh.



The railway enthusiast who "converted" the authoress of this article

Another day found us at Waterloo, and no Knight of the Holy Grail ever pursued his quest more earnestly than did we. We were rewarded; we met "*Queen Guinevere*" and "*Melisande*" standing beautiful, silent and dignified before their departure for far-off romantic Cornwall.

Over "*King James I*" we became wildly enthusiastic as the monarch's sleek sides and powerful form came into sight at Paddington Station. The little tank engine that always brings in the carriages and then waits, we call the "courier." After we have watched the "King" depart with fitting "pomp and circumstance," with his suite, we always salute the unassuming little tank as it slides quietly and unnoticed out of the station, its work done.

And so the holidays flew by, all too swiftly, on wings of interest and enthusiasm. I realised, more clearly than ever before, that to have an absorbing interest, whether it be profession or hobby, makes life an adventure—vivid, colourful, and ever-changing.

South African Cricket Team Visit Meccanoland

THE outstanding feature of the cricket season that has just closed has undoubtedly been the wonderful success of the South African touring team which, in addition to being the youngest side South Africa has ever sent over, has proved also by far the strongest. In previous tours the visitors have barely extended the English County sides, and England have not taken the test matches at all seriously. This year, however, South Africa has sent over a team of an entirely different class, and one that has given a hard battle to the best teams England could produce.

It is true that England won the test match rubber, but not until our selectors changed their policy. At first the England team consisted of the men who beat Australia, together with a sprinkling of younger players whose services may be expected to be necessary in the fight to retain the "Ashes" during Australia's visit to England next year. This policy did not succeed, and the selectors were compelled to pay the South Africans the compliment of calling back to service some of the old brigade, notably Woolley and Freeman. These Kent veterans were the principal factors in England's victory in the third and fourth tests. Even Freeman, however, who is regarded by many as the craftiest and most destructive bowler in English cricket to-day, came under the lash in the final test, when South Africa flogged the England bowling to the tune of 492 for eight, declared! This figure is a record test match score for a visiting South African side.

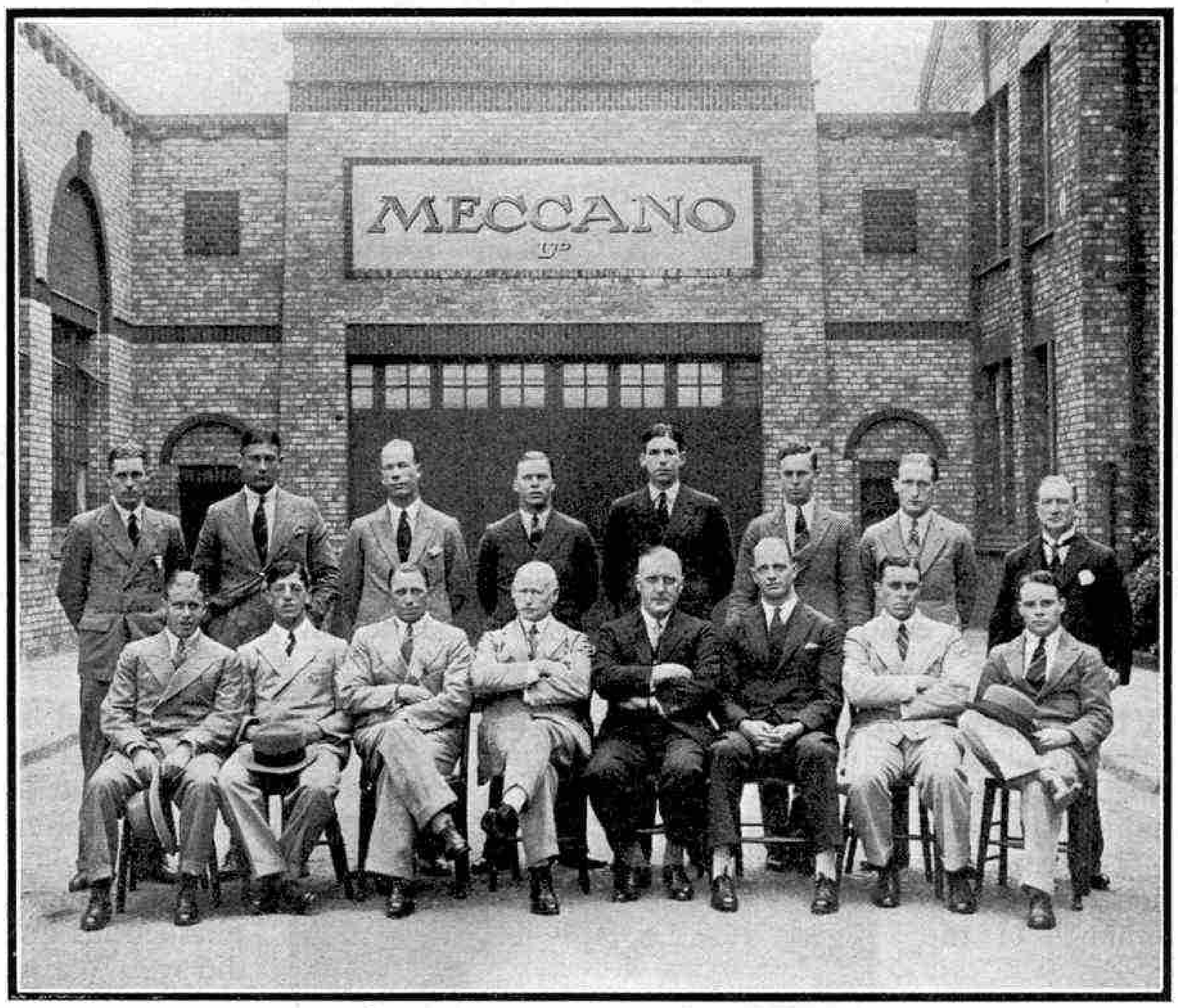
It is of interest to recall some of the outstanding performances of the tour. The most spectacular feat was certainly E. L. Dalton's centuries in three successive innings against County sides. The victims of this great performance were Kent—against whom Dalton scored a century in each innings—and Sussex.

Special mention must be made also of H. G. Owen-Smith's wonderful effort in the second innings of the Third Test Match at Leeds, when the tourists were fighting hard against impending defeat. Owen-Smith, who is only 20 years of age, and was included in the side for the test match only because more prominent personalities were injured and unable to play, defied the England attack for 2¼ hours in scoring his maiden century in first-class cricket.

His innings of 129 was not only a record test match score for a South African against England, but it also possessed all the qualities of the sensational. At the fall of the ninth wicket South Africa had succeeded only in wiping out their first innings arrears and setting England another 90 runs. Then, by skilful manœuvring of the bowling, Owen-Smith and A. J. Bell added a further 103 runs in 65 minutes! This partnership, which is a South African record tenth wicket stand is, in our opinion, the outstanding feat of the whole tour.

Cricket enthusiasts in all parts of the world have hailed with enthusiasm this great advance of the South Africans' playing standard, and therefore it was with great pleasure that we received the touring party at the Meccano Factory on 18th July last during their visit to Liverpool to encounter the Lancashire County Eleven.

On arrival the party were welcomed by Mr. Frank Hornby, and without further formality commenced a tour of inspection of the factory. The first call was made at the tool making shop, where were explained the processes involved in the preparation of the machine tools with which the Meccano and Hornby Train parts are cut and stamped. Our visitors were obviously surprised at the high degree of accuracy called for, the margin being never more than 1/1,000 in. and more frequently 1/2,000 in. They then passed on to the press shop where the first stages in the making of the parts are carried out. Here were seen the wonderful automatic machines that turn out from 40,000 to



The South African Cricket Tourists photographed during their visit to the Meccano Factory

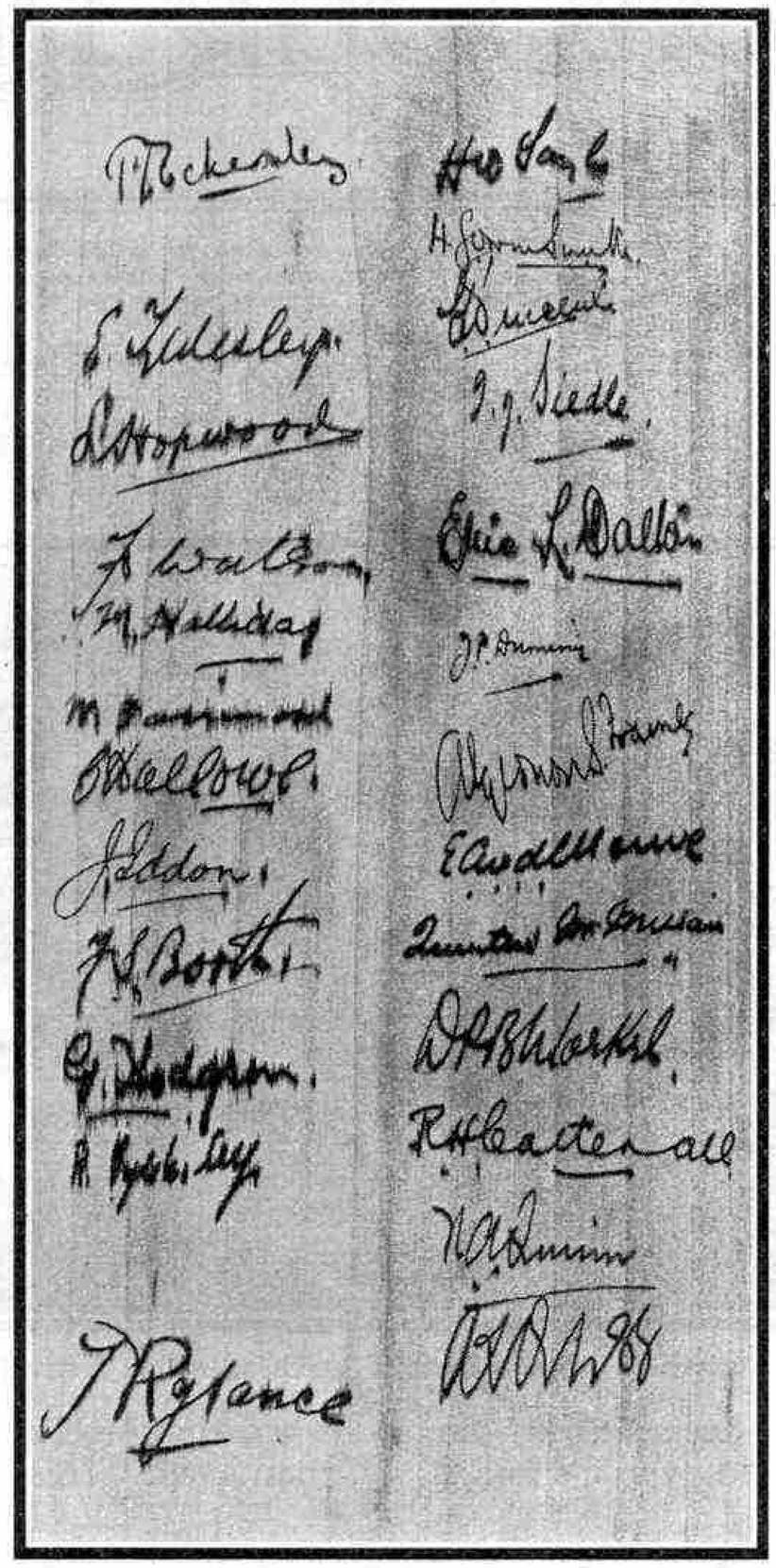
The names of the members of the team, reading from left to right, are :—
Back Row—C. L. Vincent, D. P. B. Morkel, J. P. Duminy, E. L. Dalton, N. A. Quinn, B. Mitchell, A. A. Frew, H. S. Martin
Front Row—(Three left) Q. McMillan, H. G. Owen-Smith, H. W. Taylor (Vice-Capt.), (Three right) A. S. Frames (Secretary), I. G. Siedle, E. A. Van Der Merwe

50,000 parts every day, steadily eating up long coils of steel with an appetite that never fails.

Our visitors showed special interest in the enamelling departments, and in particular admired the skill of the girls who carry through the hand finishing of the many items of Hornby rolling stock. From there the party passed through the plating shop; the foundry, where engine wheels, signal finials, buffers, chimneys, headlamps, etc., are cast; and so on to the machine shop. Here the special attraction proved to be the sprocket chain machine that converts steel wire into lengths of chain in which each link is a separate unit. Finally the visitors passed to the testing rooms, where every part that is made in the factory goes through an exhaustive examination, and then to the train assembly and packing departments.

We were particularly interested and pleased to notice that, as our visitors passed from one department to another, they were cordial in their praise of the obvious care that every employee showed in playing his or her part in the making of the world-famous toys.

At the request of the Editor of the "Meccano Magazine," each member of the party autographed a cricket bat specially procured for the occasion. This bat is to be awarded to the winner of a special competition, details of which will be announced in the December issue of the "*M.M.*" As the accompanying illustration shows, this bat bears not only the autographs of the South Africans, but also of those of the Lancashire Eleven against whom they played at Liverpool. The twelfth Lancashire signature is that of Mr. Rylance, the County's popular secretary. The bat was specially selected for the Editor by Mr. Jack Sharp, a former captain of the Lancashire County Eleven, who in 1912 scored 121 for Lancashire against the South African touring side of that year. Mr. Sharp is one of the select band of sportsmen who have played both cricket and football for England. The winner of this bat will possess a wonderful souvenir of the greatest touring side that has been sent by South Africa—a side that has made history and compelled the admiration of every cricket enthusiast.



Portion of the autographed bat that is to be the prize in a special competition, to be announced in the December "M.M." The signatures of the Lancashire team are on the left, and those of the South Africans on the right. From 1st to 12th October this bat will be on view at 75, Regent Street, London.

The striking feature of the South Africans' success has been the apparent reservation of their best efforts for the Test Matches. In County games their record has been good, but not such as to point to the brilliance of their play in Test games. It is obvious that they are a team built for big occasions, and their meetings with the Australians in the next series are already being anticipated with keen interest. If the form in the last series between Australia and England was true, the South Africans have a splendid chance of victory, a feat that has yet to be accomplished by South Africa in a Test Match series with Australia.

Australian cricketers will not hear of defeat by South Africa, we know, and claim that the English victory in the last rubber was not achieved entirely by merit. They point to injuries sustained in the early games by Ponsford, Gregory and Kelleway, factors that undoubtedly were a serious handicap. Against that must be placed the South Africans' plight this summer, when, through injuries, they were actually hard pushed to raise a Test Match side, and had to send to Switzerland for J. P. Duminy who was played without having had practice!

South African cricket long ago won its spurs; to-day its banner stands high among the Imperial cricketing countries.

Rambles on the Sea Floor

Of late years considerable attention has been directed to the problem of studying life at the bottom of the sea. Some time ago Dr. Beebe, a noted American scientist, built a diving bell of specially strong steel in order to enable it to resist the enormous pressures met with at great depths. This was equipped with glass windows by means of which Dr. Beebe intended to study the habits of fish in their native haunts, and even to take photographs and cinematograph films of their actions.

More recently simpler and less costly means of exploring submarine life in shallow waters have been found, and an interested scientist now may stroll about at the bottom of the sea, leisurely recording fish and plant activities! To enable him to do this a light helmet has been invented. This is made of rubber, and in front is a square of plate glass. The helmet fits tightly around the shoulders of the diver, and he is supplied with air by means of rubber hose connected with a small pump in a boat. A ladder from the boat gives access to the floor of the ocean, and the explorer of this new wonderland may then move about freely, the extent of his wanderings being limited only by the length of the rubber hose through which he obtains air.

Down at the bottom of the sea the silence is intense. The movements of the investigator are necessarily slow, and this prevents him from covering a very large area. Invariably the most narrow field of action is crowded with life, however, and he may see long spiked sea urchins, spiny lobsters protruding antennæ from under their coral shelters, and fishes in unending variety. One peculiarity of many of the fishes is that their colour is connected with their habits. For instance, fish that lie hidden by day and hunt for food only by night are almost always red, while those that swim near the surface in daylight usually are green.

A more comfortable means of studying life on the ocean bottom has been adopted by Charles E. Williamson, a photographer, who has made use of a contrivance for deep sea salvage invented many years ago by his father. This is a globe-shaped steel chamber that hangs from a ship by means of a long flexible steel tube containing a ladder to give access to it. The steel chamber is practically a camera studio, for it has a large plate glass window through which Mr. Williamson and his wife have taken many wonderful photographs of sea life.

Wonderful cinematograph pictures of fishes swimming in coral forests, and even of sharks prowling along the sea bottom looking for prey, have been taken with the aid of this remarkable invention.

FROM OUR READERS

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

Casting Out an Evil Spirit

The story in the June "*M.M.*" of the defeat of the evil spirit that haunted the natives of New Guinea reminds me of an incident that occurred in one of the islands of the neighbouring New Britain Archipelago. My informant is my uncle, who has lived many years in that part of the world.

During May in each year the natives of New Britain celebrate a feast at which one man is chosen as ruler of the ceremonies. His authority is absolute, and if any of his subjects proves disobedient he sends word to the miscreant that he will die at a stated time and from a given cause! The cause is often extremely absurd, according to our notions, but the ruler has so great a hold over the minds of his subjects that the death of the native invariably follows. This is probably a case of being "frightened to death," and the awestruck witnesses invariably believe that the cause is the one stated by the ruler.

Natives of New Britain celebrating a festival

On one occasion during this feast a native who had become a Christian told the medical missionary that the ruler had informed him that he was to die, the reason given being that he had swallowed a saucepan!

The missionary determined to put an end to this, and he instructed the native to return on the following day. In the meantime he obtained the use of a dark hut, from the roof of which he suspended a saucepan. On the arrival of the native a long and impressive ceremony was performed, at the end of which an accomplice cut the string supporting the saucepan, thus allowing it to fall at the native's feet. From the moment that he saw the object the native began to improve in health, for he was convinced that the saucepan that was killing him had been removed from him by the superior magic of the white man!

E. WILLIAMS (Wembley).

Weird festive costumes of natives of New Britain. Note the curious drums

Peat Fires in Scotland

In the countryside in the north of Scotland coal is very little used, and in its stead a black substance called peat is burned. This is formed by the decay of vegetation and is always found in boggy ground. When the peasants need a supply of fuel they go up into the hills and dig a ditch of sufficient depth to reach the peat. As a rule 12 to 18 inches of soil must be removed for this purpose, and the peat is cut out in oblong blocks until the pit is about 6 ft. in depth.

When taken from the ground peat is very wet. It must be kept for weeks to dry before it can be used, but when thoroughly dried it burns more easily and quickly than coal. This we should expect, as it is an intermediate stage in the formation of coal from wood.

Huge peat fires are kept burning in the kitchens of nearly all the country houses of the north, where coal is dear and gas and electricity are not available. Pans are never allowed to rest on the fuel because their weight would break it up and prevent it from burning properly. Instead they are hung by means of S-hooks from a bar fixed about 2 ft. above. There are usually about seven of these hooks in every kitchen, and they are of different lengths in order that both large and small pans may be hung a few inches above the fire.

W. GRANT (Edinburgh).

A Visit to a London Dock

During a visit that I paid to St. Katherine's Dock, which is near the Tower of London, I entered the ivory warehouse. The ivory was in the form of whole tusks, and it was easy to realise the difference between the solid portion, from which billiard balls are made, and the hollow part that is used in making

brushes, piano keys, the backs of mirrors, and various fancy articles. I was greatly surprised and interested to see an immense pair of tusks from a mammoth that died thousands of years ago. They had been dug out of the ground in Siberia.

My tour of the docks included also a visit to a warehouse in which was stored wool from Australia and New Zealand. This was enclosed in huge bales, which were slit open in order to enable buyers to judge its value. Next I went into a warehouse that contained barks and spices. This was a wonderfully fragrant place, for it contained cinnamon, nutmegs and cloves; while on one floor there were large quantities of cinchona bark, from which the valuable medicine quinine is extracted.

I was also shown round a wine vault, in which hogsheads are stored at a temperature of 60°F. in order to mature their contents; and a rubber warehouse, where I saw a large quantity of latex, the white milky fluid that is extracted from rubber trees by tapping. This is mixed with water and ammonia in order to prevent it from coagulating, and in this form is transported overseas. Solid rubber is obtained from it by allowing the ammonia to evaporate.

D. W. Young (Hastings).

Mrs. Hedgehog bolting for home! The trials experienced by our reader in attempts to photograph her family are described on this page

Photographing a Hedgehog

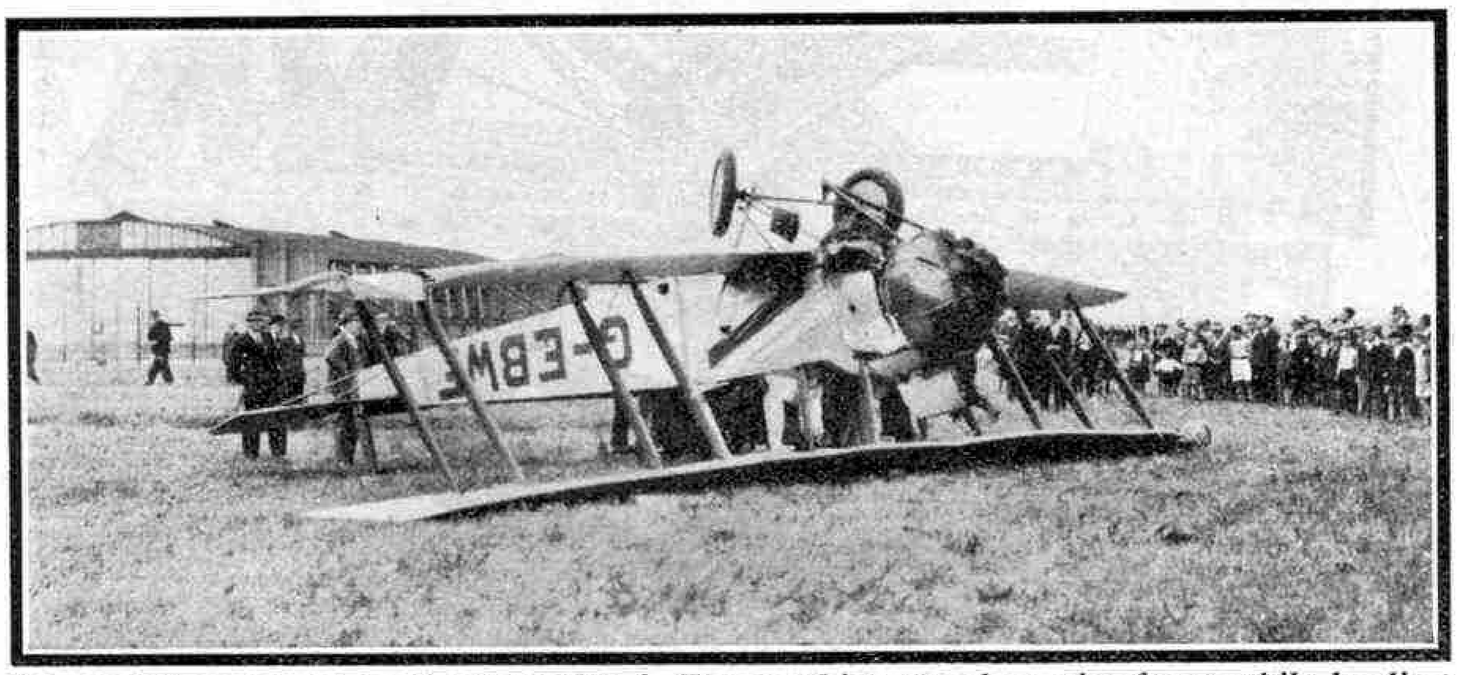
On learning that there was a hedgehog's nest in a garden near my home I set out with my camera in order to attempt to obtain a good photograph. After a long search I found the nest under a hedge. I was not surprised that for some time it had escaped my notice, for in appearance it resembled a heap of weeds, and it was only Mother Hedgehog's spiny armour that finally revealed its whereabouts. She was on guard, and no enemy could have reached the interior of the nest without pulling the whole structure to pieces, for she lay with her head towards the interior, and the entrance was completely blocked by a barrier of prickly spines.

I removed her and found that she had made a short tunnel underneath the sods, over which she had piled weeds as a precaution against rain. The tunnel led into a cosy chamber lined with soft grass and moss, in which were seven baby hedgehogs, all of which were as soft and as playful as kittens.

I carried Mrs. Hedgehog and her family in my cap to a bare patch of ground, and there I attempted to photograph them. Never have I seen any creatures more lively than those young hedgehogs. I simply could not get them to keep any pose or make them remain still. Their mother was even more intractable, for she rolled herself into a ball and absolutely refused to uncurl. Eventually I gave up in despair, collected the squeaking babies, and returned them to the nest.

Then I decided to make a last effort to photograph Mother Hedgehog. For fully five minutes I watched her as she lay motionless. Suddenly she uncurled and bolted, and I was too startled to make an exposure. She travelled at an astonishing pace, and when stopped promptly curled herself up once more. After remaining motionless for another five minutes she again tried to escape, but this time I was ready for her and secured the accompanying photograph. This was a satisfactory conclusion to my efforts, but I am sorry that I did not obtain a photograph of the infants.

A. B. Baxter (Peterborough).



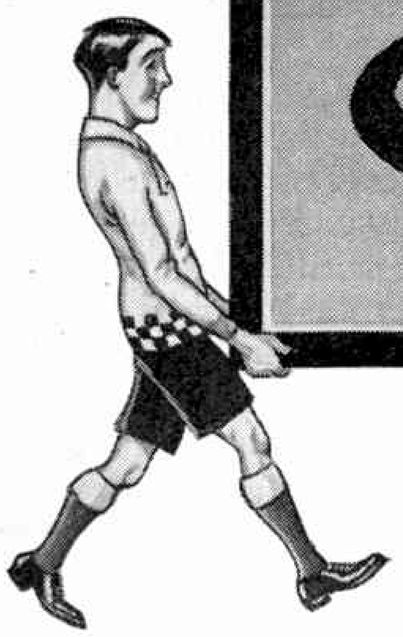
An aeroplane in an unusual position! The machine struck a wire fence while landing and toppled over into the position shown

An Aeroplane Accident

As I am interested in aviation I attended a flying meeting at Swaythling, near Southampton, where short trips were being made in a three-seater aeroplane of a well-known make. After a dozen successful flights had been completed the engine was restarted with difficulty. On its next flight a longer run than usual was required before taking off, and the machine failed to gain height. Very soon it was seen to turn round and approach the flying field once more.

By this time it was quite clear to the spectators that the engine was missing fire, for the pilot was unable to reach his starting point. He tried to land two fields away, but unluckily the ground had not been cleared and the undercarriage of the machine struck a wire fence. The aeroplane toppled over and the two passengers and the pilot rolled out of their seats. Fortunately only one of them was slightly injured.

A. Leighton (East Leigh).



Suggestions Section "Edited by Spanner"

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

(172)—Demonstration Model of Feathering Paddle-Wheel

IN the early days of steam navigation the paddle steamer reigned supreme and some very fine examples of this type of ship were on the high seas. To-day all is changed, for the screw steamship has ousted the paddle-wheel ship, except for a few that are engaged in coastal pleasure cruises and those which trade on tropical rivers.

The reasons for this are not difficult to find. First and foremost among the disadvantages of the paddle steamer is its vulnerability. It is quite an easy matter for her to become totally disabled by floating wreckage, or by heavy seas striking the paddle-wheels and seriously damaging the floats, feathering gear, or even the wheels themselves. A screw steamship, on the other hand, is practically immune from such mishaps by reason of the position of the propeller.

Another point showing the superiority of the propeller over the paddle-wheel, is that slow running engines of the paddle type are much more massive and clumsy and are relatively more thermally inefficient compared with the high-speed screw engines of the same power.

Paddle-wheel ships may be divided into two distinct classes, namely side wheel and stern wheel. The former, as their name denotes, possess a pair of wheels one on each side of the hull, but the stern wheeler has a single wheel working in a gap in the stern. In this position the wheel is to a large extent protected, and hence this type of vessel is to be found on shallow weed-infested rivers. The side wheel steamer is the type of vessel that will be the more familiar to most of our readers, however, since it is the one that is used to a large extent round the English coast.

A paddle-wheel consists essentially of two rims spaced a short distance apart and connected by spokes to bosses, which are secured rigidly on the paddle shaft. The latter forms a continuation of the engine crankshaft, and in the case of a side wheel steamship passes through watertight glands in the ship's sides. At equal distances round the circumference of the wheel are spaced flat wood boards or iron plates termed "floats." These form the driving members of the wheel.

Advantages of Feathering Gear

There are two methods of fixing the floats. In the first the floats are clamped immovably to the spokes, and in the second they are actuated by a mechanism in such a manner that they remain practically perpendicular throughout their period of immersion and thus drive the vessel in the most efficient manner. Such a wheel is known as a feathering paddle-wheel, and is a great advance on the fixed or radial float wheel.

In the case of the latter, since the floats are fixed radially with respect to the rim, only the most deeply immersed float is perpendicular to the water's surface and is therefore the most effective as a propelling agent. The others are at various angles from the perpendicular and hence their effort is not fully utilised.

The device shown in Fig. 172 is a demonstration model of a feathering paddle-wheel. Its unique movements are well worthy of study by anyone who is interested in the different methods of ship propulsion or in mechanical movements generally.

Each rim of the wheel in the model is composed of eight Channel Segments, and they are connected together by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, the retaining bolts of which serve to secure also the $5\frac{1}{2}''$ Strips forming the spokes. Each series of spokes is bolted to a Face Plate that is secured to an $11\frac{1}{2}''$ Rod 1 journalled in the back Girders of the demonstration frame. (Note that the Rod is not journalled in the front Angle Girder). In order to make the Rod more rigid a number of Couplings are mounted on it and secured thereon by their grub-screws.

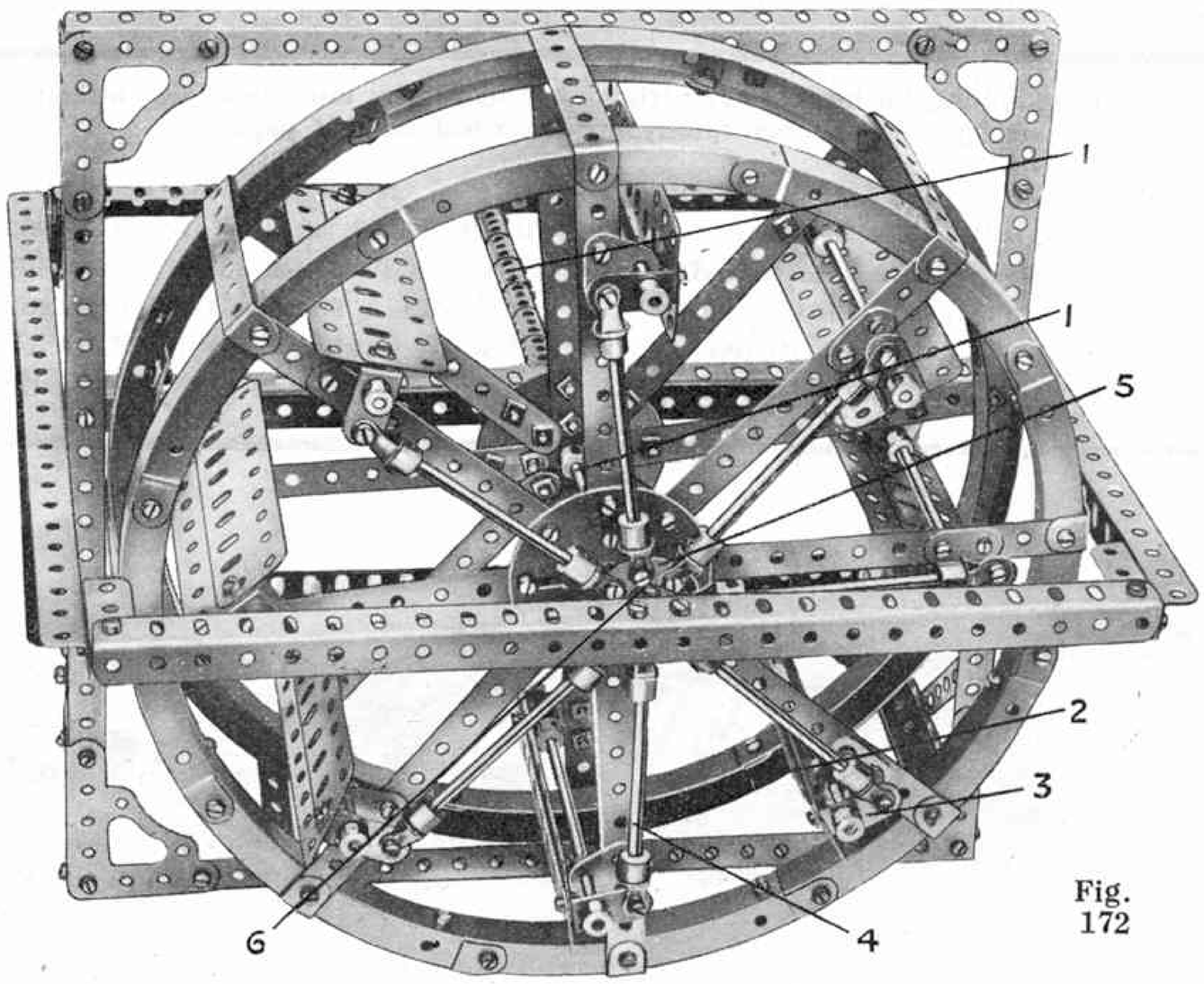


Fig. 172

The floats 2 each consist of two $4\frac{1}{2}''$ Flat Girders, with a $1'' \times 1''$ Angle Bracket 3 at one end and a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket at the other. They are mounted pivotally in the wheel by means of Rods, which pass through both Angle Brackets and through 1" Triangular Plates that are secured to the spokes.

A Bush Wheel 5 should next be mounted on a Pivot Bolt, that is inserted in the end traverse bore of a Threaded Coupling and secured in position by a lock-nut. The Threaded Coupling is attached to a 1" Triangular Plate 6 by a Bolt passing into its tapped longitudinal bore.

The floats are all linked to the Bush Wheel 5 by Rods 4 fitted with End Bearings, which are attached freely (with one exception) to the Bush Wheel and to the $1'' \times 1''$ Angle Brackets 3. One of the Rods 4, which forms the exception, is secured as rigidly as possible to the Bush Wheel in order that the latter may rotate with the paddle-wheel.

The axes of the Bush Wheel and paddle-wheel do not coincide, hence an eccentric movement is imparted to the system of links connected to the floats, thus giving to the three lowest floats in any position of the wheel a practically perpendicular position. In practice these floats would, of course, be immersed. The mechanism also ensures that the floats meet with minimum resistance at the moment of entering the water.

The framework shown in the illustration is for demonstration purposes only. If the wheel is incorporated in a Meccano model of a paddle steamer a semi-circular framework of strips should be placed over its upper part, to represent the "paddle box."

Meccano boys who wish to drive the model continuously will find the Meccano 6-volt Motor ideal for the purpose. It should be geared so that the paddle-wheel turns at about 50 r.p.m.

(173)—Demonstration of Ship's Steering Mechanism

(W. Johns, Winchester)

The methods of operating a ship's rudder vary greatly according to the size of the vessel. On small yachts a hand-operated tiller suffices and even on comparatively large sailing ships the steering gear is usually a simple screw mechanism. But when we come to steam-driven vessels, some form of power-operated steering gear becomes essential. A very ingenious form of steam steering gear is known as the Brown Steam Tiller and is suitable for ships of the largest tonnage. A model of this apparatus constructed entirely from Meccano parts and demonstrating faithfully the principle of the prototype, appeared in the October 1928 issue of the *"M.M."*

It will readily be conceded that greater effort is needed to move the rudder through large angles than small ones, and any means that can be devised to provide this extra effort is of great value. The device illustrated in Fig. 173 is intended automatically to increase the power applied to the tiller when it is nearing the maximum position, by altering the effective length of the tiller. The Meccano model is shown in a demonstration form, but it would, of course, have to be altered to suit different circumstances.

The tiller, which is secured to the rudder stock, is represented by a $4\frac{1}{2}''$ Strip attached pivotally to the frame. An Eye Piece, sliding freely on the end of the tiller, carries a Double Arm Crank which carries two $\frac{1}{2}''$ loose Pulleys. Two similar Pulleys are mounted on the side Girders.

One end of a length of cord is tied to a Pivot Bolt, projecting shank upward from the side Girders, passed round the $\frac{1}{2}''$ Pulley on the Double Arm Crank and over the fixed Pulley on the Girder. The cord is secured finally to a Rod that is journalled in $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. The process is repeated with the other system of pulleys, and the length of the cords adjusted so that by turning the Rod one cord is wound in and the other let out.

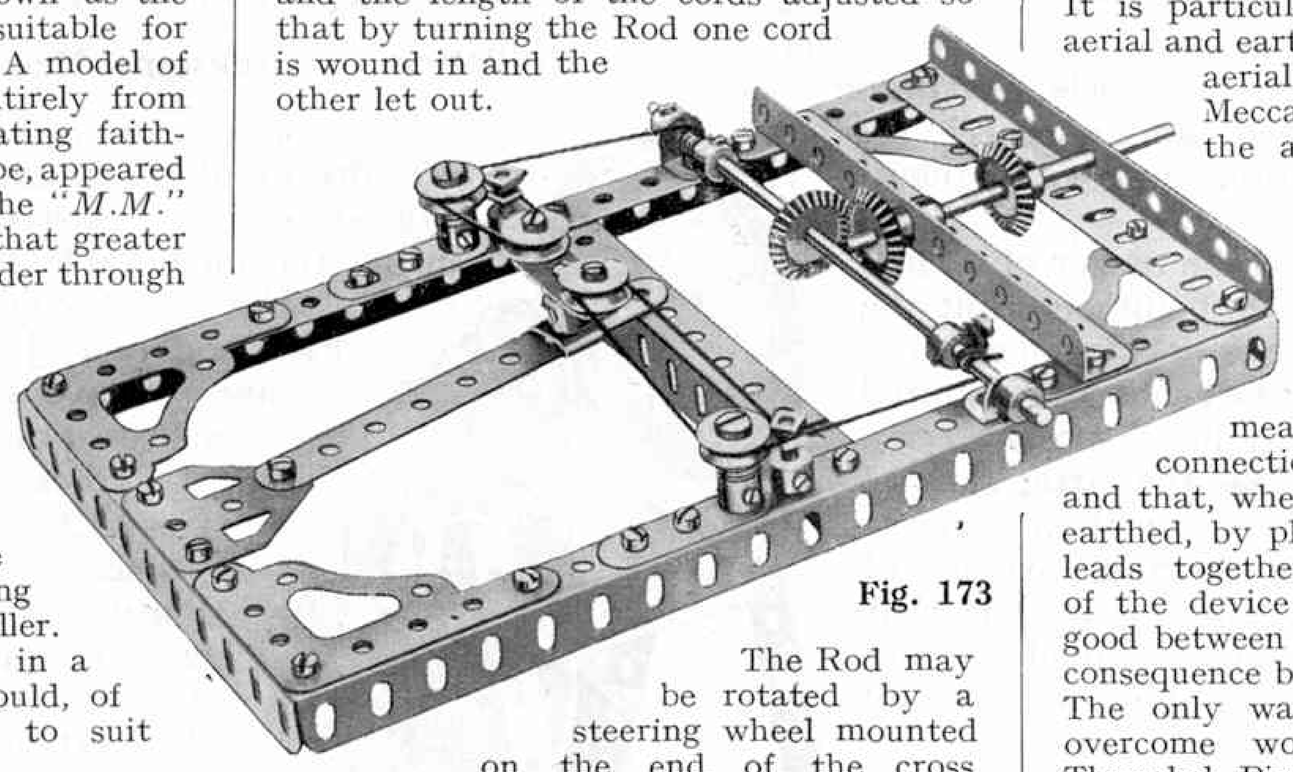


Fig. 173

The Rod may be rotated by a steering wheel mounted on the end of the cross shaft, or the latter may be actuated from a distance through rods and bevels. As the tiller moves over, the Double Arm Crank slides nearer the end of the tiller thus providing the necessary increased leverage.

(174)—Mine Cage Depth Indicator

(G. Pell, Chesterfield)

In all mines it is necessary that the time occupied in conveying men and material to and from the surface should be reduced to the shortest possible limit, for in the mining industry, as in all others, time means money. But as safety must not be sacrificed for speed, the most elaborate means are taken to reduce to the minimum the possibility of mishaps.

After the brakes, one of the most vital safety appliances of the winding gear at a mine is the depth indicator. This is attached to the winding engines to indicate to the man in charge the depth at which the cage is at any particular instant on its journey down the shaft, for lack of knowledge of its exact position might result in its being dashed to pieces at the bottom.

The depth indicator shown in Fig. 174 will considerably enhance the interest of any Meccano model pithead gear in which it is incorporated. It is made as a complete unit, and little alteration should be found necessary in order to render it suitable for any model.

The main portion of the device consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, which are connected together at each end by Angle Girders bolted to Flat Girders. The dial is part of a Protractor (part No. 135) and the divisions should be marked off to represent feet or inches.

Two $1'' \times 1''$ Angle Brackets are secured to one of the side Plates, a Washer on each retaining bolt serving to space the Brackets from the Plate. A 3" Strip is also secured to the Plate, Washers being used for spacing purposes as in the case of the Angle Brackets. Before fixing the Strip in place, however, an Eye Piece should be placed on it.

A 1" Rod is secured in the boss of the Eye Piece, a Coupling being fixed on the projecting end of the Rod and a $4\frac{1}{2}''$ Screwed Rod passed through its centre tapped bore. The Screwed Rod is journalled in the end holes of the $1'' \times 1''$ Angle Brackets, and a $\frac{3}{4}''$ Contrate Wheel is secured to it. A $\frac{1}{2}''$ Pinion on a Rod journalled in the Plates, meshes with the $\frac{3}{4}''$ Contrate, and a 1" Sprocket Wheel connects it by Sprocket Chain to the model. A length of Chain is secured to the Eye Piece, led over a guide Sprocket and over the Sprocket on the Pointer shaft, and then is attached to a weight.

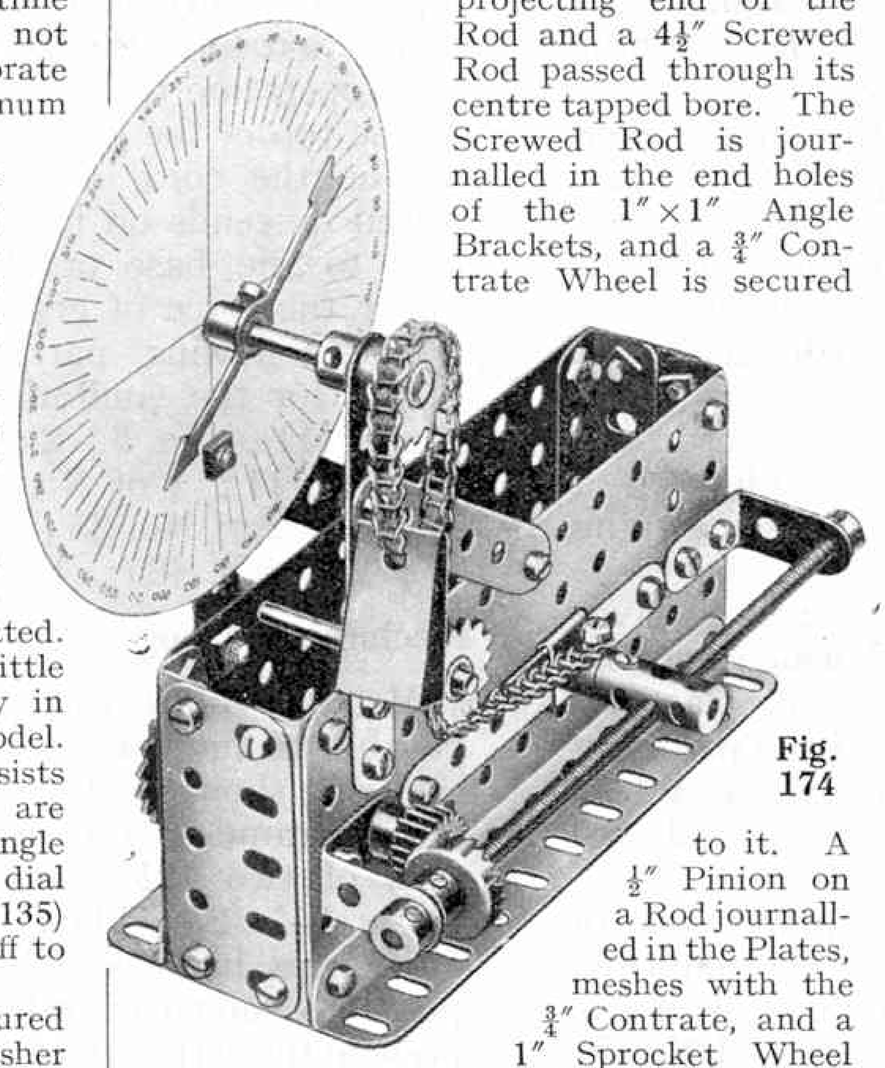


Fig. 174

Miscellaneous Suggestions

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

(M.67). Plug Connections for Wireless Set.—An interesting suggestion for using Meccano parts as "wander plug" connections in wireless work was received recently from F. Palin (Bletchley, Bucks.). It is particularly handy in making the aerial and earth connections to a set. The aerial terminal is replaced by a Meccano Coupling and the end of the aerial lead is fitted with a Threaded Pin, so that the latter may be plugged into the former. A Threaded Pin is substituted for the earth terminal and a Coupling is secured to the end of the earth lead. By this means it will be seen that the connections are non-interchangeable and that, when desired, the aerial may be earthed, by plugging the aerial and earth leads together. The only disadvantage of the device is that the contact is not good between the Pins and Couplings, the consequence being that crackling is set up. The only way in which this could be overcome would be by securing the Threaded Pins in the Couplings by the grubscrews of the latter.

(M.68). Magnetic Brake.—A magnetic brake proposed by M. Wrigley (London, W.1), makes use of a solenoid to draw a pawl into contact with a rotating Ratchet Wheel. There is no doubt that this would ensure the stopping of the machinery, but we fear that the braking effect would be altogether too sudden, for in practice, if not in Meccano models, the result would certainly be strained or broken parts. Some form of electrically operated band brake is much to be preferred.

(M.69). Novel Free Wheel Device.—The following free wheel by J. Redding (Bridport) is extremely neat and ingenious. A 57-teeth Gear Wheel is free on a Rod and it has two $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets attached pivotally to it at diametrically opposite points. A $\frac{3}{4}''$ Pinion is secured to the Rod so that the Angle Brackets are in engagement with its teeth. A short piece of Spring Cord attached to each Angle Bracket ensures constant engagement with the Pinion. Similar devices were submitted by J. Gerny (Rose Park, Australia) and K. Gardner (Northampton).

(M.70). Double Action Buzzer.—In the ordinary type of buzzer there is only one set of magnets on one side of the armature. In Neal Smith's (Richmond) instrument, however, use is made of a double set of magnets so that the armature is pulled alternately first to the left and then to the right. Although we have not tested the device for ourselves, Neal Smith vouches for the noise produced by his invention!

(M.71). A Simple Spring Gun.—A simple gun that actually shoots "shells" quite a respectable distance has been devised by R. Harrison (Bournemouth). It consists of a Rod to represent the "gun barrel" and a Spring, one of the loops at the end of which is slipped on to the barrel and the other end secured to the front portion of the base of the model so that the shell—a Meccano Collar—is pushed along the barrel against the tension of the Spring. When the Collar is released, the Spring will drive it about 25 ft.

New Meccano Models

Grinding Machine—Guillotine—Gong—Battle-Cruiser

EVERY Meccano boy, no matter how prolific a model-builder he may be, periodically finds that his stock of ideas for new models has become sadly depleted, if not exhausted, and a search for new subjects for model-building has consequently to be instituted.

This task, in the case of the owner of a large Outfit, is not generally a difficult one, but the model-builder who possesses only a small set is not always so fortunate as he is naturally limited by the number of parts at his disposal.

In searching for new ideas the latter class of model-builder cannot do better than make a careful inspection of the previous articles of this series, as the large range of models that have been illustrated and described therein will in many cases provide him with many new ideas for future constructional work.

This month we illustrate four new examples, three of these being simple working models that can be built with quite small Outfits, while the battle-cruiser illustrated on the opposite page employs a comparatively large number of parts in its construction.

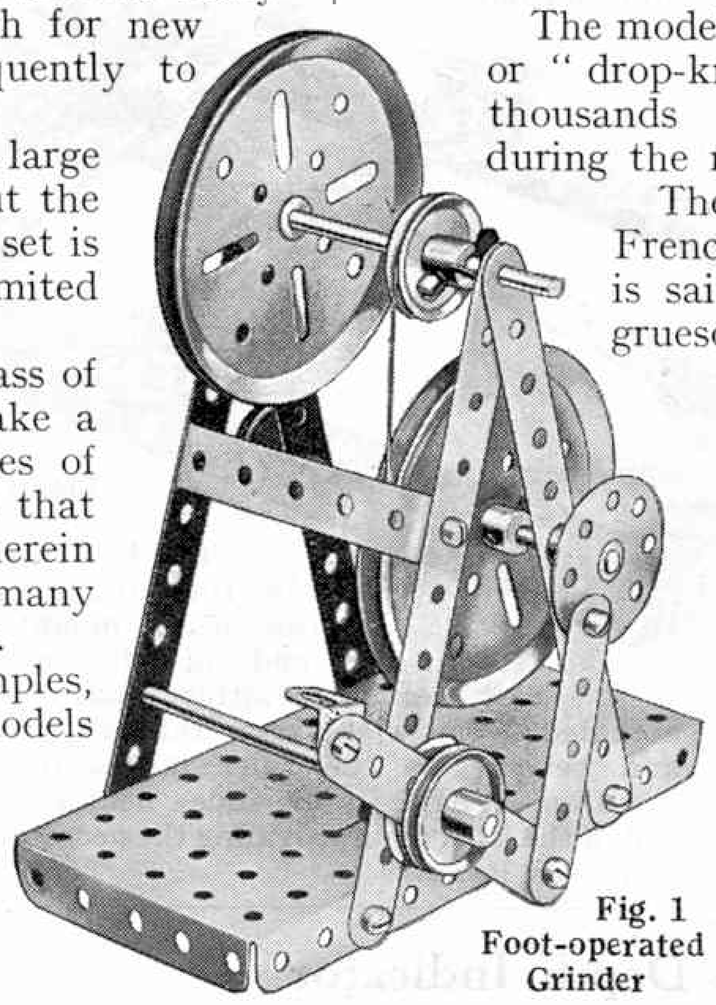


Fig. 1
Foot-operated Grinder

Treadle Grinding Machine

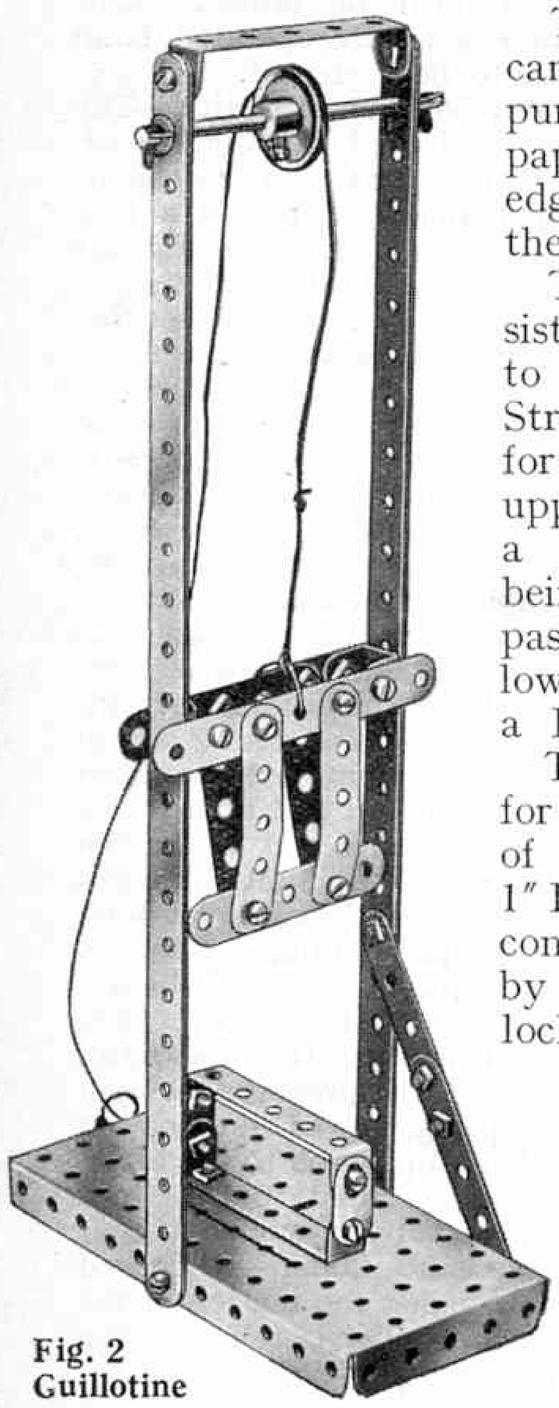


Fig. 2
Guillotine

This ingenious little model can be used for light grinding purposes if a strip of emery paper is secured around the edge of the 3″ Pulley forming the grinding wheel.

The base of the model consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate to each side of which two $5\frac{1}{2}''$ Strips are bolted forming journals for three $3\frac{1}{2}''$ Axle Rods. The uppermost Rod carries a 3″ and a 1″ Pulley Wheel, the latter being driven from a cord belt passed over a 3″ Pulley on a lower Rod, this Rod also carrying a Bush Wheel.

The third Rod forms a pivot for the foot pedal which consists of a $3\frac{1}{2}''$ Strip held in place by 1″ Pulleys. The Strip is pivotally connected to the Bush Wheel by a further $2\frac{1}{2}''$ Strip and two lock-nutted bolts.

In the construction of this model the following parts are needed: 4 of No. 2; 1 of No. 3; 1 of No. 5; 1 of No. 12; 3 of No. 16; 2 of No. 19b; 4 of No. 22; 1 of No. 24; 3 of No. 35; 9 of No. 37; 2 of No. 37a; 1 of No. 48a; 1 of No. 52; Strip of Emery Paper.

Guillotine: a Gruesome Meccano Model

The model shown in Fig. 2 represents a guillotine or "drop-knife," an instrument by which many thousands of "aristocrats" were decapitated during the memorable French Revolution.

The instrument received its name from a French doctor, Joseph Ignace Guillotin who is said to have been the originator of the gruesome weapon!

To construct the Meccano model, two $12\frac{1}{2}''$ Strips are bolted in a vertical position to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and connected at their upper ends by means of a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. Further support for the vertical members is provided by a stay composed of two $2\frac{1}{2}''$ Strips overlapped and bolted together, which is attached as shown in Fig. 2.

For the knife holder, two pairs of $2\frac{1}{2}''$ Strips are overlapped three holes and bolted on each side of two Double Brackets, the latter being placed so that they bear against the inner surfaces of the vertical members. The "knife" which consists of a $2\frac{1}{2}''$ Strip, is bolted to these Strips by two further pairs of $2\frac{1}{2}''$ Strips. A length of cord is secured to the knife carriage and passed over a 1″ Pulley on a Rod journalled in the $12\frac{1}{2}''$ Strips that form the uprights.

In operation the knife is raised to the top of the guides by hauling on the cord, and when released descends on its fatal mission to the base of the model under the force of gravity!

The following parts are required for the Guillotine:—2 of No. 1; 11 of No. 5; 2 of No. 10; 2 of No. 11; 1 of No. 16; 1 of No. 22; 2 of No. 35; 24 of No. 37; 2 of No. 48a; 1 of No. 52.

Mechanical Gong

Meccano boys will no doubt be able to find practical use for the gong shown in Fig. 3!

The frame of the model consists of two $12\frac{1}{2}''$ Strips bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, $5\frac{1}{2}''$ Strips being secured in the positions shown in order to prevent the vertical members from moving. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is bolted across the upper ends of the vertical Strips and to this a

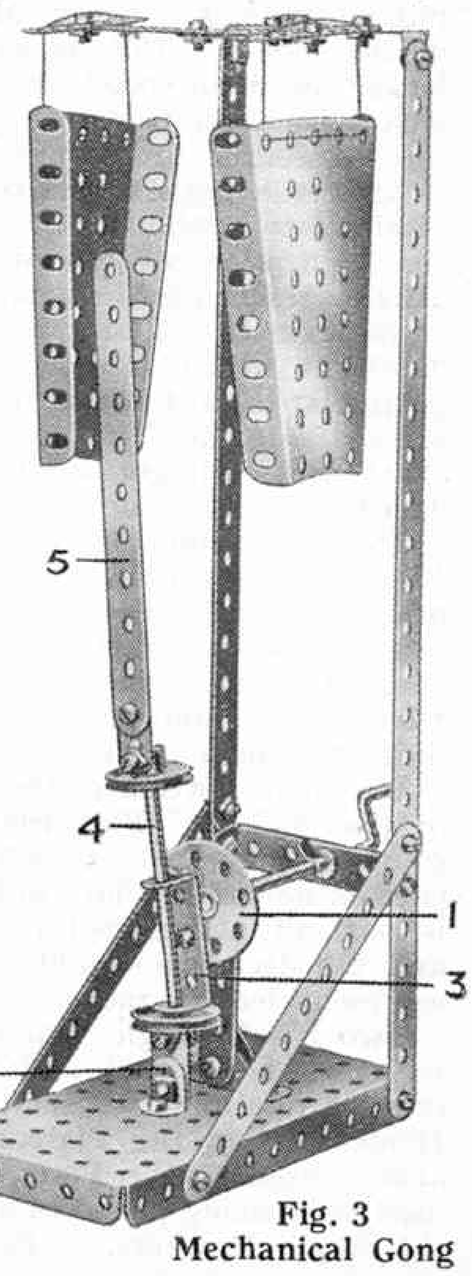


Fig. 3
Mechanical Gong

$2\frac{1}{2}$" Strip and a Flat Trunnion is bolted. The Strip carries at its other extremity a $3\frac{1}{2}$" Strip, to each end of which, a further $2\frac{1}{2}$" Strip is bolted at right angles. Sector Plates are suspended from these Strips by means of cord. The hammer mechanism is constructed as follows. The Angle Bracket 2 is bolted rigidly to the $5\frac{1}{2}$" × $2\frac{1}{2}$" Flanged Plate forming the base of the model, and carries a Flat Bracket which is pivotally connected to a 1" Pulley secured to the Rod 4, a bolt being passed through the round hole of the Bracket into the set-screw hole in the boss of the Pulley Wheel.

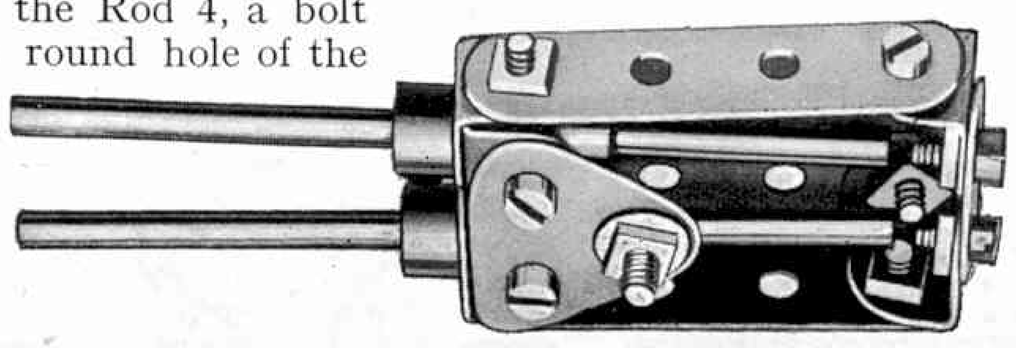


Fig. 4. Forward gun turret of battle-cruiser

A Pulley is also secured on the other end of the Rod 4 and a Flat Bracket is firmly secured to its boss by means of a bolt passed through the elongated hole, a nut being first placed between the head of the bolt and the Bracket. The Strip 5 is then bolted to the Bracket.

A Crank Handle carrying the Bush Wheel 1 is journalled in a Double Angle Strip and also in a $2\frac{1}{2}$" Strip mounted in a vertical position on the base plate by means of a Trunnion. The Double Angle Strip 3 on the Rod 4 is pivotally connected to the Bush Wheel by means of a bolt and lock nuts.

When it is required to operate the gong the Crank Handle is rotated causing the Strip 5 to oscillate backward and forward and strike each of the Sector Plates in turn.

Fig. 5. General view of battle-cruiser, showing gun turrets in position

The following parts are necessary to build the Gong: 2 of No. 1; 3 of No. 2; 1 of No. 3; 4 of No. 5; 2 of No. 10; 1 of No. 12; 1 of No. 16; 1 of No. 19s; 2 of No. 22; 1 of No. 24; 2 of No. 35; 27 of No. 37; 1 of No. 37a; 1 of No. 48; 2 of No. 48a; 1 of No. 52; 2 of No. 54; 1 of No. 126; 1 of No. 126a.

A Realistic Model Battle-Cruiser

The imposing model shown in Fig. 5 is sure to appeal to those constructors who are interested in naval matters. The model, although not intended to represent any one ship, bears striking resemblance in its external proportions and fittings to the type of heavily armoured cruiser completed, for the British Navy, in 1918.

An interesting feature of the vessel is the aeroplane launching platform, complete with miniature aeroplane, while the tripod mast, conning tower, gun turrets, etc., closely follow their counterparts in actual practice.

All the parts necessary in the construction of this model are contained in a No. 5 Outfit.

Commence the construction of the model by assembling the Strips that comprise the hull. The sides of the hull are each formed from three rows of $12\frac{1}{2}$" and $5\frac{1}{2}$" Strips, each row consisting of two $12\frac{1}{2}$" Strips overlapped three holes and bolted together, and further extended by a $5\frac{1}{2}$" Strip also overlapped three holes. The compound Strips thus formed are held together by diagonal $2\frac{1}{2}$" Strips and the completed sides are bolted to a $1\frac{1}{2}$" Strip at stem and stern.

The deck is built up from $5\frac{1}{2}$" × $2\frac{1}{2}$" Flanged Plates and Sector Plates, the space between the two former Plates being filled in by $5\frac{1}{2}$" Strips on either side of the Girders forming the superstructure.

The superstructure is composed of two $12\frac{1}{2}$" Angle Girders and one $12\frac{1}{2}$" Strip, the Girders being held to the deck by Angle Brackets. The conning tower and navigating bridge are built up from $2\frac{1}{2}$" Strips which are bolted vertically to the forward end of the superstructure. These are surmounted by Double Angle Strips which support further $2\frac{1}{2}$" Strips.

The tripod foremast is placed directly behind the conning tower. The mast proper, which consists of a $11\frac{1}{2}$" Axle Rod is secured to the deck by a $1\frac{1}{2}$" Pulley Wheel and carries a Flanged Wheel, representing the "fire-control station," and two 1" Pulleys near its upper end. Two further $11\frac{1}{2}$" Rods are passed through holes in the face of the Flanged Wheel and their lower ends secured in the superstructure, thus completing the "tripod."

For the funnel, ten $2\frac{1}{2}$" Strips are bolted to $5\frac{1}{2}$" Strips that are bent to form a "decagon" or figure with ten sides, the completed funnel being held in place by Angle Brackets. The aft mast consists of a $7\frac{1}{2}$" Axle Rod secured in a Coupling which in turn is attached by means of a 1" Rod to a Bush Wheel bolted to the deck superstructure of the vessel.

The main features of the model have now been completed, and it remains to attach the aeroplane landing platform, and gun turrets.

The diminutive aeroplane that can be seen resting on the platform will surely be acclaimed by model-builders as the "smallest" that has yet been constructed in Meccano!

The "fuselage" of the machine consists of a 2" Axle Rod. A bolt carrying Washers is passed through the central hole of a $1\frac{1}{2}$" Strip (the main wing!) and a Double Bracket, and its shank is screwed into the threaded bore of a Collar placed on the 2" Axle Rod. A Spring Clip forms the "tail plane." The landing platform on which the aeroplane is placed consists of three $2\frac{1}{2}$" Strips secured to a Bush Wheel.

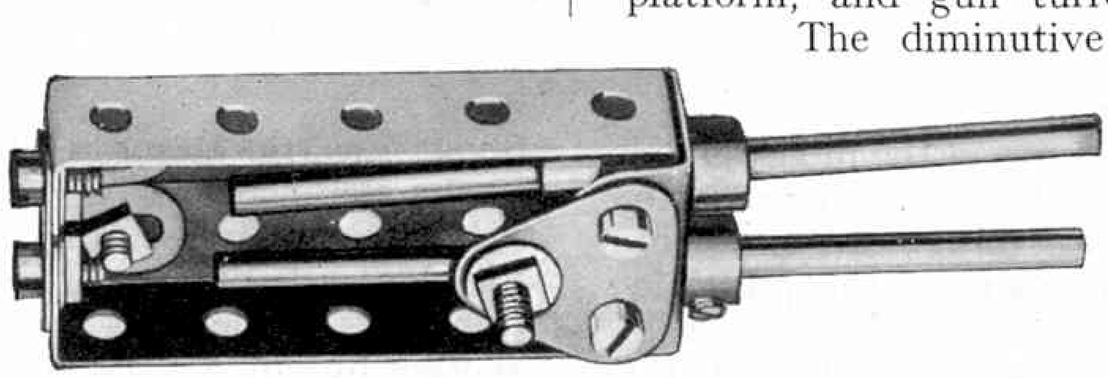


Fig. 6. Construction of aft gun turret

An underneath view of the forward gun turret appears in Fig. 4. The 2" Strips forming the top and sides of the turret are bolted by means of Angle

(Continued on page 773)

A 1″ Scale Reproduction of a T

Meccano Model Baltic T

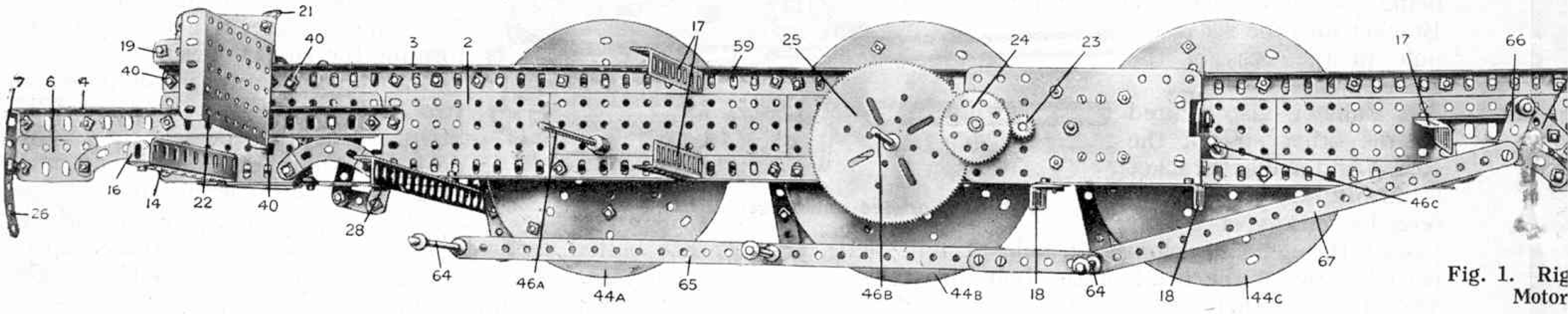


Fig. 1. Rig
Motor

THIS month we have pleasure in placing before our readers constructional details of one of the largest and most imposing Meccano models—a splendid tank locomotive.

The type of engine that our model represents is designed specially for express passenger work, and possesses a 4–6–4 or " Baltic " wheel formation. This type of engine has received in recent years well-merited attention from the locomotive designer, and it is to be found in increasing numbers working passenger trains non-stop over distances varying from 50 to 100 miles.

The tank engine, of course, possesses the advantage of being an absolutely self-contained power unit, as it carries both its fuel and water within its main frames, thus dispensing with the losses and inconvenience occasioned by the use of a tender. The fuel is carried in a special bunker at the rear of the cab, while water is contained in tanks placed on either side of the boiler and fire-box.

Although the Meccano model has not been designed to resemble any particular prototype, it reproduces the general design of the " Baltic " class of locomotive very closely. The model has been built to a scale of 1 in. to 1 ft., and actually measures 44 in. over-all. It is capable of moving under its own power, a Meccano 6-volt Electric Motor being fitted in the frame and coupled to the centre pair of driving wheels through reduction gearing, while a 6-volt Accumulator may be included in the cab for supplying current to the Motor.

One of the most interesting features of the model is the Walschaerts valve gear, which has been reproduced with remarkable accuracy. This gear forms an excellent model in itself, and clearly demonstrates the principle underlying this type of valve-motion. The gear will be fully described in the next instalment of this article.

In common with other Meccano models the tank locomotive is constructed entirely on the unit principle, which considerably simplifies the final assembly, besides following actual railway practice. This month the sections described and illustrated are the main frames, front footplate and buffer beams, and also the two bogie units. In a further instalment we shall continue the constructional details of the locomotive by describing the way in which the driving gear and valve mechanism, boiler, cab and other fittings are built. The method of assembling the main units will also be dealt with.

Construction of the Model : The Main Frames

The assembly of the main frames should be made the starting point of the construction. Fig. 3 shows the left main frame (looking toward the front of the model), while Fig. 1 gives a very clear idea of the appearance of the inside of the right-hand main frame, with the various connecting Girders and the Meccano

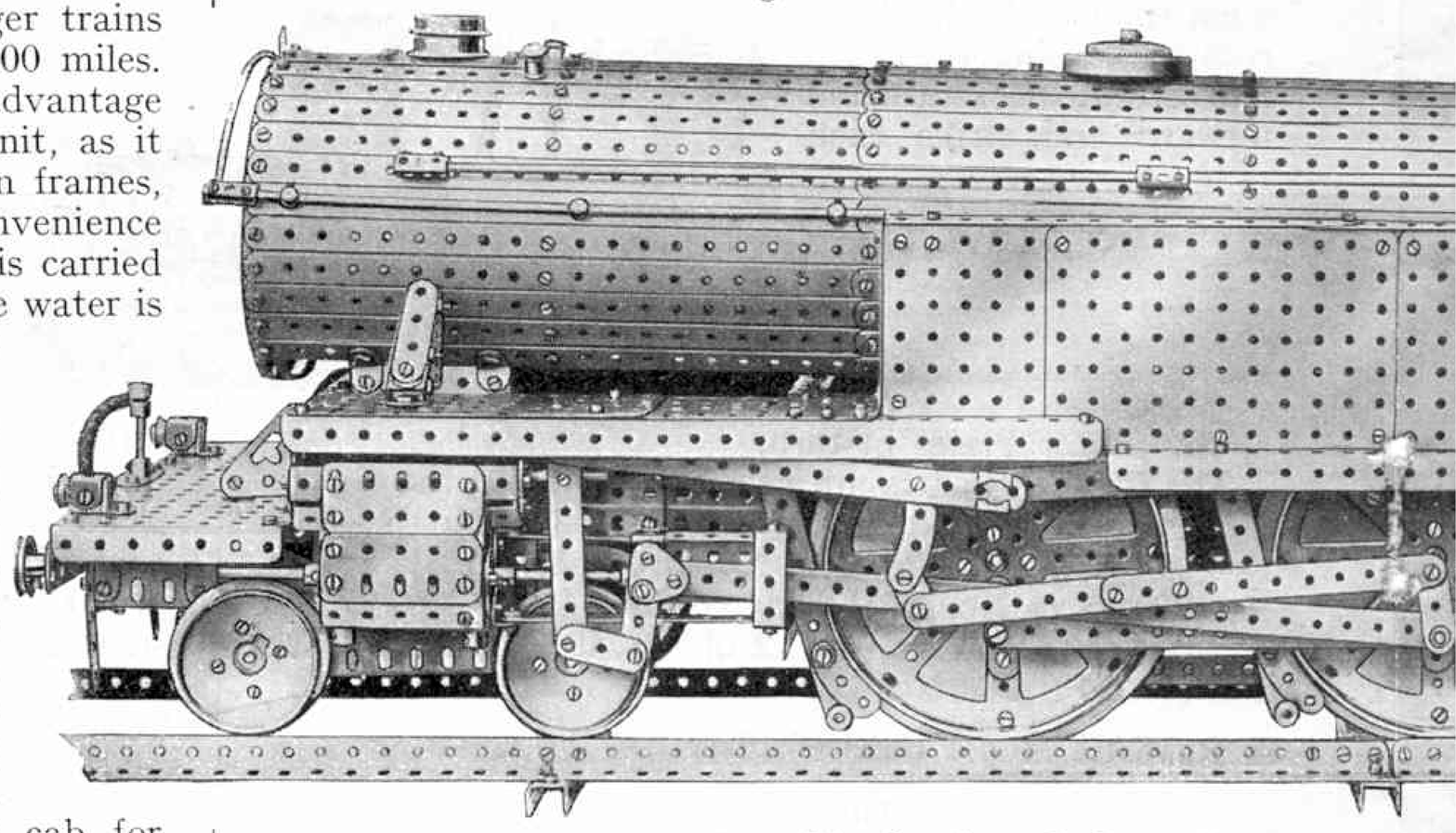
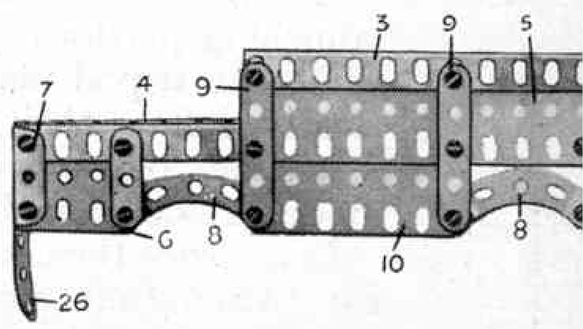


Fig. 2. General view of the Meccano m

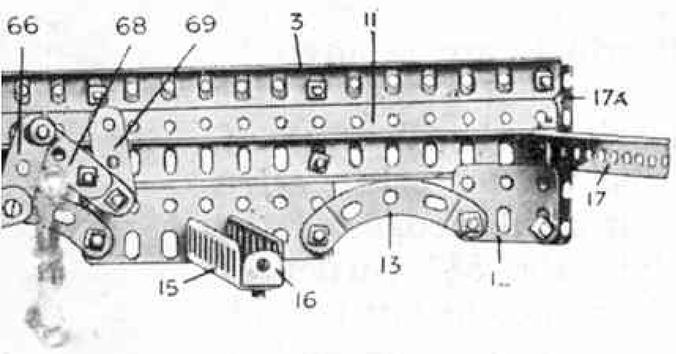
6-volt Electric Motor in the positions they will occupy in the complete unit.

Each main frame (Fig. 3) consists of three $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates 1 with one $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate 2 at each end. One $24\frac{1}{2}''$ and one $18\frac{1}{2}''$ Angle Girder 3—overlapping one another by nine holes—are bolted to the top edges of the Plates 1 and 2 and a further $24\frac{1}{2}''$ Angle Girder (Fig. 1) is attached to the lower edges of the Plates. A $9\frac{1}{2}''$ Angle Girder 4 (Fig. 3) is bolted to the end hole of the $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Plate 2 and to a $5\frac{1}{2}''$ Flat Girder 5. A 2″ Flat Girder 6 is attached to the $9\frac{1}{2}''$ Girder 4 by means of a $1\frac{1}{2}''$ Angle Girder 7 and also by a $1\frac{1}{2}''$ Strip which is secured to the other end of the 2″ Flat Girder and to the Girder 4. A $2\frac{1}{2}''$



Typical Passenger Express Engine

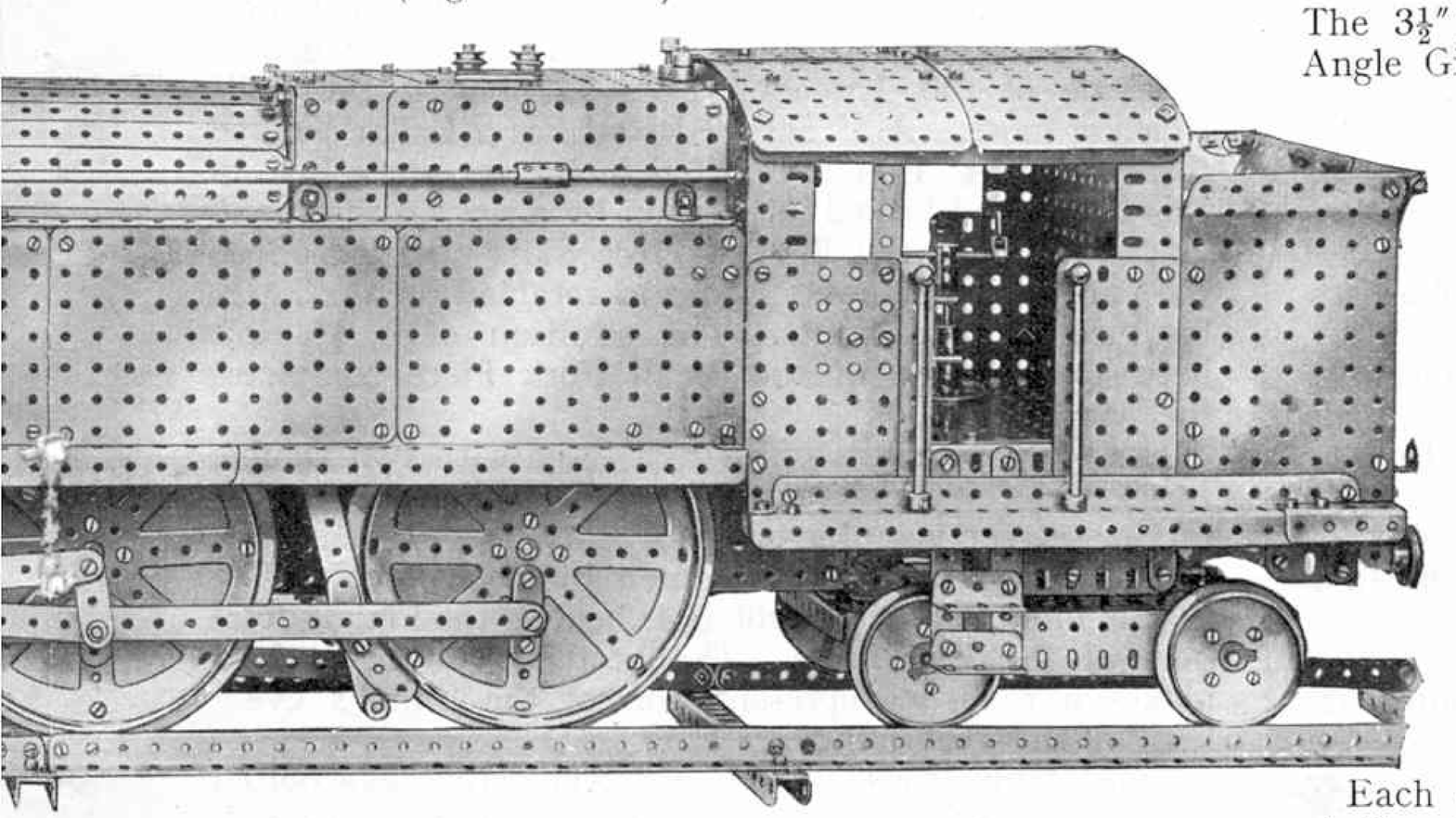
Type Tank Locomotive



1. Right-hand frame unit, showing Motor and reduction gearing

small radius Curved Strip 8 is attached to the 2″ Flat Girder 6 as indicated in both Figs. 1 and 3, its other end being secured by a bolt passing through the bottom hole of the $2\frac{1}{2}$″ Strip 9 and the $3\frac{1}{2}$″ Flat Girder 10 (Fig. 3). A corresponding $2\frac{1}{2}$″ Strip 9 and Curved Strip 8 are bolted to the other end of the Flat Girder 10, the other end of the Curved Strip being attached to a Flat Bracket bolted to the end hole of the $4\frac{1}{2}$″ × $2\frac{1}{2}$″ Flat Plate 2. The two $2\frac{1}{2}$″ Strips 9 serve as connecting pieces to hold the various parts firmly together. A $2\frac{1}{2}$″ Strip 26 attached to the $1\frac{1}{2}$″ Angle Girder 7 represents the "guard iron."

The rear end of the main frame is built up in a somewhat similar manner to the front portion. A $9\frac{1}{2}$″ Flat Girder 11 (Figs. 1 and 3) is bolted to the end of the



cano model Baltic type Passenger Locomotive

Plate 2, its other extremity being attached to a $2\frac{1}{2}$″ Angle Girder 17a to which is bolted a $1\frac{1}{2}$″ Flat Girder 12. A $2\frac{1}{2}$″ small radius Curved Strip 13 is attached to the Flat Girder 12. As will be gathered from the illustrations both the small radius Curved Strips 13 are secured to a $3\frac{1}{2}$″ Flat Girder which is attached to the rest of the frame in a similar manner to that employed in fixing the Flat Girder 10 at the front end. When both main frames have been completed, the various cross Girders 17 and 18 should be attached to one of the main frames as shown. The front and rear "bogie pin stretchers" 14 and 15 each consist of two $4\frac{1}{2}$″ Angle Girders bolted together so as to form a channel section girder, being attached to the main frame by means of $\frac{1}{2}$″ × $\frac{1}{2}$″ Angle Brackets 16.

The Motor supports consist of two $4\frac{1}{2}$″ Angle Girders 18 secured both to the Motor and to the $24\frac{1}{2}$″ Angle Girders that are bolted to the bottom of the main frame. A $7\frac{1}{2}$″ Angle Girder 28 is bolted to the lower Girder, a Washer being placed between them on the shank of the retaining bolts.

Each half of the smoke-box saddle consists of a 3″ Angle Girder 19 (Fig. 1) bolted to the Angle Girders 3. A $2\frac{1}{2}$″ Flat Girder is secured to the Girder 19, flush with the rear end of the latter, and a $\frac{1}{2}$″ × $\frac{1}{2}$″ Angle Bracket 9 is bolted in the front end hole of the Angle Girder. Two Flat Brackets 21 fixed to the $2\frac{1}{2}$″ Flat Girder will be used eventually to form a connection between the smoke-box and the smoke-box saddle. The $3\frac{1}{2}$″ × $2\frac{1}{2}$″ Flanged Plate 22 is secured to the 3″ Angle Girders 19, and also to the $9\frac{1}{2}$″ Angle Girder 4 by a $\frac{1}{2}$″ × $\frac{1}{2}$″ Angle Bracket.

Before bolting the two main frames together the Motor should have its gearing inserted. The gearing is arranged as follows: a $\frac{1}{2}$″ Pinion secured to the armature spindle of the Motor meshes with a 57-teeth Gear Wheel that is fixed to the other end of a $2\frac{1}{2}$″ Rod, to which the $\frac{1}{2}$″ Pinion 23 (Fig. 1) is attached. The Pinion 23 meshes with the Gear 24, which is secured on a 2″ Rod journalled in the Motor side plates. This Rod carries a $\frac{3}{4}$″ Pinion that engages with the $3\frac{1}{2}$″ Gear 25 on the driving wheel axle 46b.

The two halves of the main frames may now be bolted together.

The Construction of the Bogies

Each of the leading and trailing bogies is exactly similar in construction; therefore one description should suffice for both. The construction of the bogies is shown clearly in Fig. 4. The sides of the frame consist of $7\frac{1}{2}$″ Flat Girders that are bolted to $7\frac{1}{2}$″ Angle Girders 128. The latter are connected together by $4\frac{1}{2}$″ Angle Girders at each end and the corners strengthened by means of Corner Brackets. The "bogie pin" 129 consists of a 1″ Rod held in a Double Arm Crank that is bolted to two $4\frac{1}{2}$″ Angle Girders which are placed together to form a channel-section girder and bolted, in turn, to the $7\frac{1}{2}$″ Angle Girders forming the bogie sides.

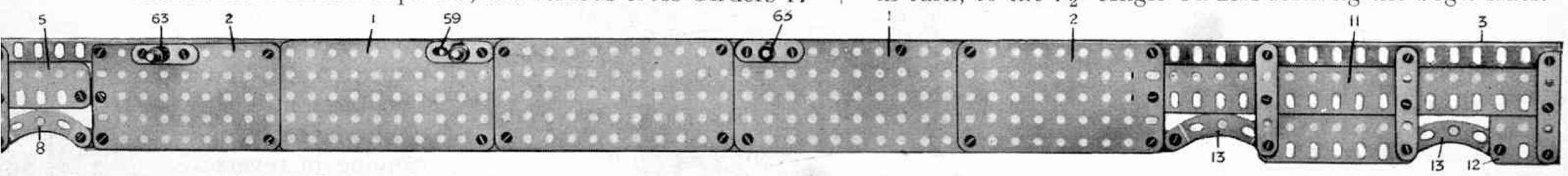


Fig. 3. Left-hand Frame unit, showing bearings for driving wheel brake arm pivots

Each of the bogie wheel axles consists of two 3″ Rods connected together by a Coupling. They are journalled in the slotted holes of the 7½″ Flat Girders, to allow the wheels to rise and fall independently when traversing uneven ground. The wheels themselves consist of Face Plates to which are bolted Wheel Flanges, and are secured rigidly to the ends of the 3″ Rods forming the axles.

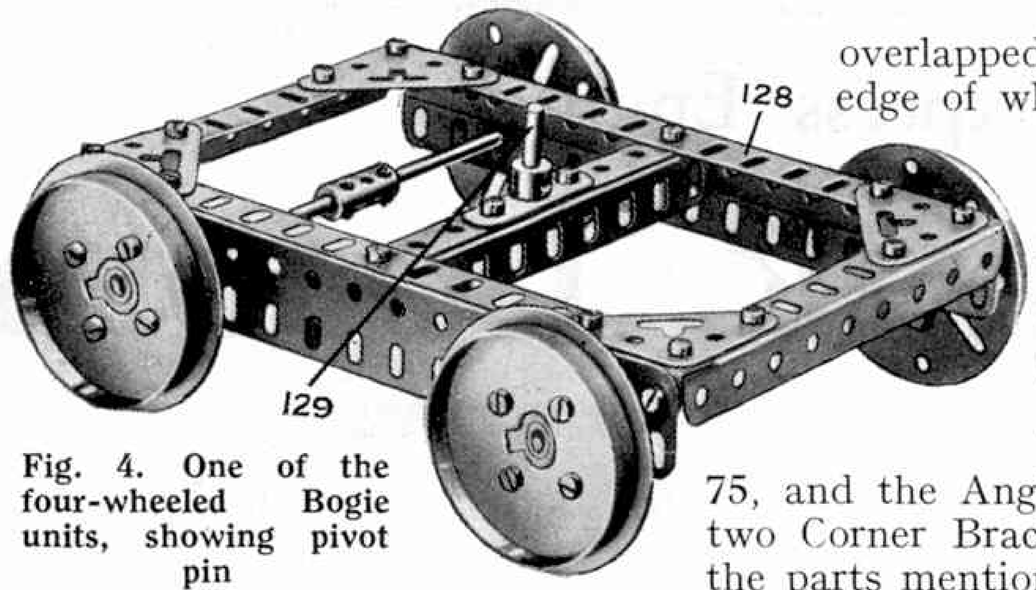


Fig. 4. One of the four-wheeled Bogie units, showing pivot pin

Front Footplating and Buffer Beam Unit

As will be seen from Fig. 5 the front portion of the footplate, together with the buffer beam, etc., forms a complete unit which, when erected, may be attached to the top of the main frames of the locomotive.

The longitudinal 12½″ Angle Girders 70 are connected together by Angle Girders 71 at the points shown in the Figure. The Angle Girders 71 each consist of two 5½″ Angle Girders overlapped five holes and bolted together rigidly. The rear Girder 71 has a 4½″ Angle Girder bolted midway along its bottom edge to give added stiffness to the whole and to form a convenient bracket by which to attach it to the top Girders of the main frames. Each half of the footplating, which consists of a 4½″×2½″ Flat Plate 72 and a 5½″×2½″ Plate 73, is bolted to the Girders 70 and 71 as shown. The Architrave 52, which is termed the "expansion link bracket" in practice, is attached to the underside of the Angle Girders 70 and 71 by the Bolts 52a, 52b. A similar bracket is mounted on the other side of the unit, of course. One Washer is placed on the shank of the Bolt 52b between the expansion link bracket and the Angle Girder 71 (this Bolt also secures the Angle Girder 70 to the Angle Girder 71). Two Washers are placed on the remaining Bolt 52a.

The outside steam pipes 74 each consist of a Double Bracket, bolted to the 5½″×2½″ Flat Plate 73, through which is passed a 1″ Screwed Rod. A second Double Bracket is also mounted on the Screwed Rod, on the ends of which are placed two Corner Brackets. A 2″ Strip secured to this latter Double Bracket finishes off this fitting effectively.

The front portion of the footplate unit carrying the buffer beam consists of two 5½″×3½″ Flat Plates 75 overlapped five holes, along the front edge of which are bolted two 5½″ Angle Girders. To the latter are secured the two 5½″ Flat Girders 76 that represent the buffer beam. A 5½″ Angle Girder 77 is bolted to the rear edge of the Plates 75 midway between the ends of the latter. To the 5½″×3½″ Flat Plates 75, and the Angle Girders 71, 77, are secured two Corner Brackets 78 which are secured to the parts mentioned by means of ½″×½″ Angle Brackets. These may be seen clearly in the illustration, where it may also be ascertained that the correct location for the Corner Brackets 78 is 2½″ from the edges of the Plates. A Flat Girder is bolted to the 5½″ Girder 77 to fill up the space between the latter and the Girders 71.

The brake pipe 79 consists of a Spring, one end of which is secured to the buffer beam 76, the other end being mounted on the end of a 1½″ Rod. The latter is mounted in a Double Arm Crank that is secured to the Plates 75. The "buffers" are 1″ fast Pulleys secured to Threaded Pins that are bolted to the buffer beam. A Collar is placed on each Threaded Pin to represent the buffer stock.

The "screw coupling" comprises a Threaded Boss 80 that is mounted between two ½″×½″ Angle Brackets bolted to the buffer beam. The bolts by which the Threaded Boss is attached to the Angle Brackets are inserted in the transverse tapped holes of the Threaded Boss, nuts on the shanks of the bolts being locked against the side of the Threaded Boss to prevent the bolts working loose. A 1″ Screwed Rod has a Collar secured to it, and a ⅜″ Bolt is inserted in the set-screw hole of this Collar and locked in position by a nut on the shank of the Bolt. A Small Fork Piece 81 is now placed on the end of the Screwed Rod and retained on the latter by means of lock-nuts. The addition of a ½″ Bolt between the jaws of the Small Fork Piece completes the coupling.

Each lamp consists of an Eye Piece with two Double Brackets secured to its boss by two bolts that are inserted in the set screw holes on each side of the boss. The front of the lamp is represented by a ½″ loose Pulley that is mounted on a Pivot Bolt held in the longitudinal bore of the Eye Piece. The head of the Pivot bolt makes a realistic representation of the "bull's eye" lens of the real lamp.

The "lamp irons" are ½″×½″ Angle Brackets bolted to the Plates 75 in the positions indicated, and the Eye Pieces of the lamps slide down on them. The lamps are thus readily detachable. A lamp iron should also be secured to the smoke-box in front of the chimney and three others—½″ Reversed Angle Brackets — should be attached to the rear of the coal bunker, one over each buffer and the other at the top centre of the Plate, so that the lamps may be used when the engine is running in reverse.

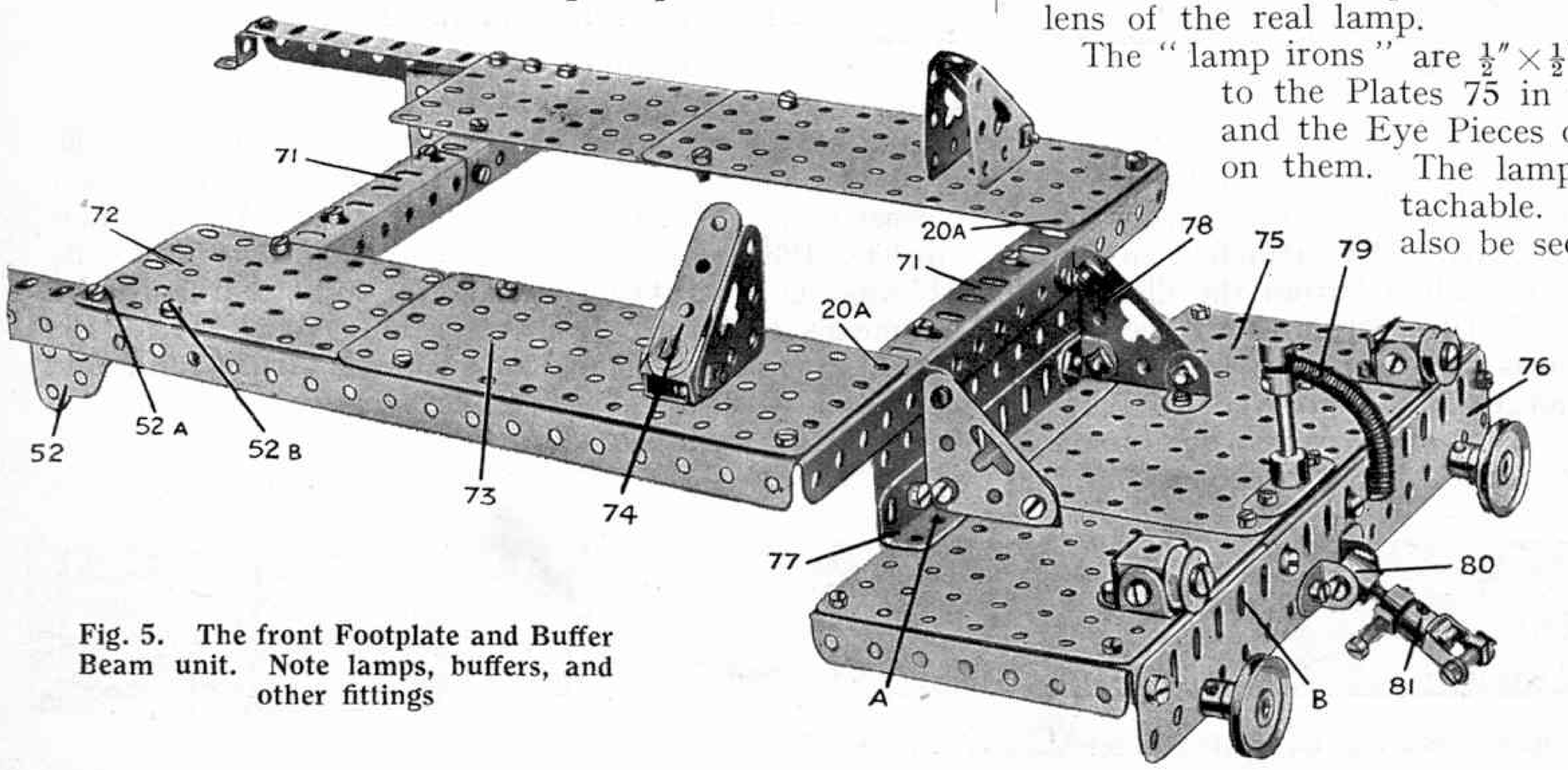
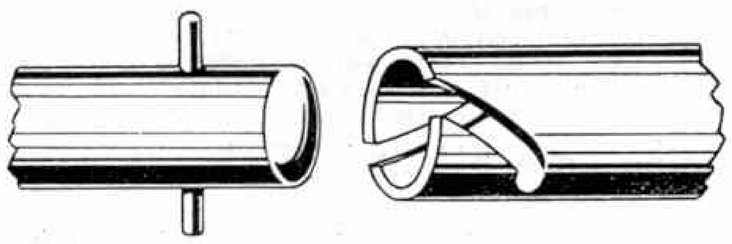


Fig. 5. The front Footplate and Buffer Beam unit. Note lamps, buffers, and other fittings

(*To be continued*)

READERS' SUGGESTIONS FOR MECCANO IMPROVEMENTS

NEW COUPLING.—Your proposal regarding an improved method of winding the spring of the Clock-



work Motor is interesting. From the sketch it will be seen that the existing square-section winding spindle would be replaced by a plain rod having a hole drilled near one end to enable a small metal pin to be introduced. The key would be formed from a length of metal tubing, two diagonal slots being cut in it in the manner shown. When it is required to rotate the winding shaft the tubular key is pushed on to the shaft so that each of the slots engages with one end of the pin. The tube is then rotated in a clockwise direction whence the key and winding shaft will revolve as one unit. When rotated in an anti-clockwise direction, however, the key will be forced away from the pin of the winding spindle and no motion will be transmitted. The idea possesses distinct possibilities especially where remote control of the motor is required. The main objection to this idea, however, is the high cost of production, as a large number of delicate operations would be necessary in manufacture. Your suggestion will, however, receive consideration. (*Reply to F. S. Elcock, Glasgow*).

MULTIPLE GROOVED PULLEY.—We note your idea that multiple grooved pulleys should be introduced, and agree that these articles would enable a multi cord drive, capable of transmitting quite a considerable torque, to be built up. In instances, however, where a powerful drive between two shafts is required, it is a far better plan to employ Meccano Sprocket Gearing and thus overcome the tendency to slip which is always present in cord transmission. (*Reply to E. Graves, Bradford*).

V-BELTING.—We are not in favour of your suggestion that rubber treated canvas belting of tapered section, should be added to the system. In order to enable the belt to fit into the grooves of the standard Pulley Wheels, they would have to be manufactured to very small dimensions, and the cost of production would consequently be great. It would also be necessary to introduce these belts in a great range of sizes, and this again would tend to increase their cost. We are unable therefore, to give any further attention to your idea. (*Reply to J. R. Kendall, Hove*).

4″ AND 5″ STRIP.—We have purposely refrained from introducing 4″ and 5″ Strips as we have found from experience that these are but rarely required. (*Reply to E. W. Pritchard, Bogawantalawa, Ceylon*).

NEW HOOK.—Although the system at present contains an extensive range of hooks, several uses could no doubt be found for your suggested new part. This would consist of a length of 5/32″ diam. rod bent to form a hook of substantial dimensions, while its straight portion or shank would be screwed with the standard Meccano thread so that Nuts, Threaded Bosses, etc., could be attached to it. When building certain types of pulley blocks, this article would come in very handy as it would enable the sheave and hook to be formed in one rigid unit, while numerous other uses will doubtless suggest themselves to readers. We intend giving this idea careful attention. (*Reply to J. R. Case, Nottingham*).

POINTED STRIP.—This part would be unnecessary as the Pointer (part No. 156) fulfils all its functions. (*Reply to C. Lockell, Grimsby*).

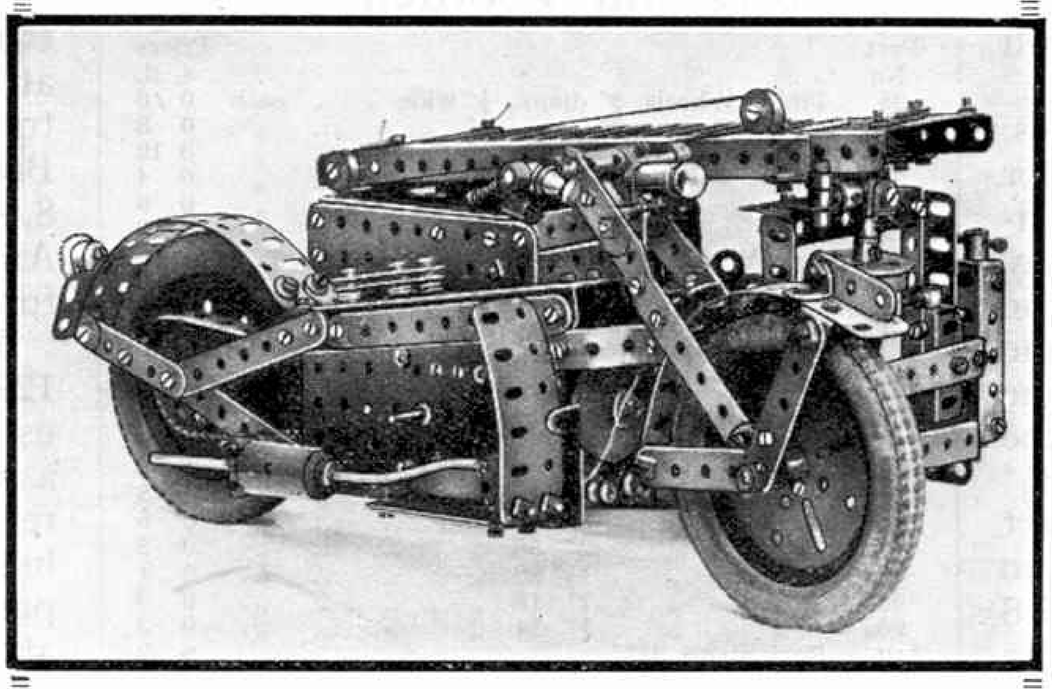
HEAVIER TYPE OF CHAIN.—Only in a few rare instances is a really heavy chain required in connection with Meccano model-building. The existing Meccano Sprocket Chain answers satisfactorily all demands normally met with and we do not think that the production of a stouter chain is justified at the present time. (*Reply to M. Appelbaum, Transvaal, S. Africa*).

BUILDING MATERIAL.—We have noted your idea that small pieces of wood, shaped to represent concrete blocks or building bricks should be introduced. We agree that these parts would look effective if employed for the foundations of model towers, bridges, and other structures, but we are of the opinion that it is a better plan for constructors to secure their models on a firm and solid foundation such as a heavy wooden board, etc. It would be a difficult matter to obtain rigidity when supports, built up in the manner you suggest, were employed. (*Reply to V. A. White, Jamestown, South Australia*).

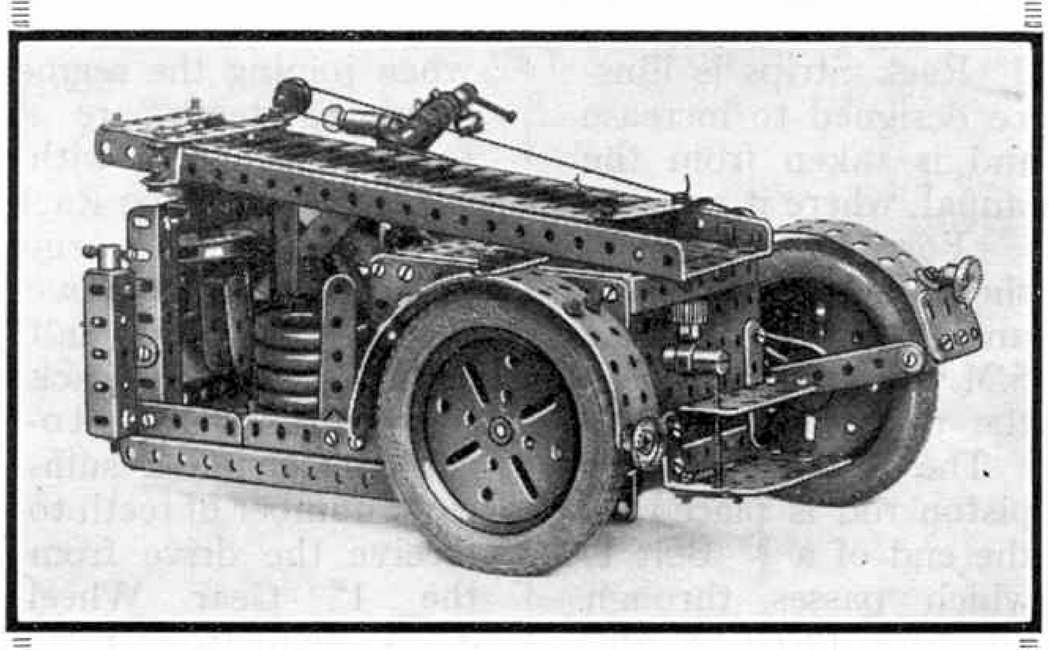
2″ TRIANGULAR PLATE.—There would be few uses for this, and we are not therefore considering its introduction. (*Reply to B. Madeley, Didsbury, Manchester*).

BRAKE BLOCKS.—Your suggestion that rubber or fibre brake blocks, suitable for use in Meccano brake and clutch gears, should be supplied, is quite interesting. We agree that some form of frictional substance is required if an entirely practical internal expanding brake is to be constructed from standard parts, although we have found the brakes fitted to the rear wheels of the Meccano Motor Chassis to function quite efficiently (these depend upon the friction created when Collars are pressed against the internal surfaces of Wheel Flanges). We shall be pleased, however, to consider readers' ideas for the most suitable shape for a frictional pad or block and will endeavour to go into the question more fully. (*Reply to F. T. Nash, Stoke-on-Trent*).

Fire Fighting by Motor Cycle!



Only a few years ago the smaller type of fire engine relied solely on manual labour as a means of propulsion and operation. Nowadays, however, a fire fighter is able to make use of a handy motor cycle outfit for conveying him and his equipment to the scene of an outbreak. The photographs reproduced herewith show a cleverly constructed model of one of these machines. This splendid example was built by R. W. Baker, of Twickenham, and carried off one of the principal awards in Section A of the October Model-building Contest

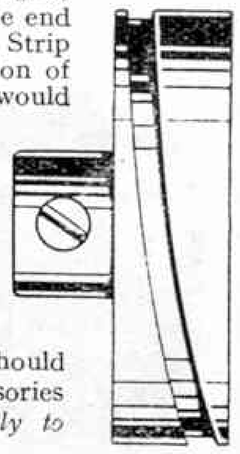


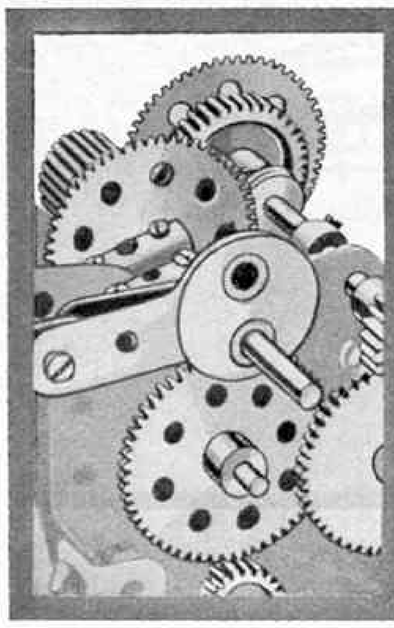
LARGER FORK PIECES.—A larger edition of the Fork Piece (part No. 116) having its horizontal lug extended to 1½″ would form an unnecessary addition to the system. It is quite a simple matter to reproduce your suggested article by bolting an Angle Bracket to each end of a Double Arm Crank (part No. 62b). (*Reply to A. J. Stewart, London, N.W.6*).

CHANNEL GIRDER.—We agree that channel and other patterns of girders, when built up from a number of standard Angle Girders, are not quite as compact as if these were supplied already manufactured. We feel sure, however, that the introduction of a special set of girders of various types, would meet with little appreciation from most model-builders, as the construction of T-, U-, and H-section members from standard parts provides the model-builder with interest that would be altogether lacking if these patterns were supplied already manufactured. (*Reply to E. W. Pritchard, Bogawantalawa, Ceylon*).

RATCHET SPROCKET.—Your suggestion that a series of sprocket wheels carrying teeth of ratchet formation should be introduced presents several interesting possibilities. Provided that the teeth were made similar in size to the teeth of the existing Sprocket Wheels, standard Sprocket Chain would be employed to couple these wheels together, and a "free wheel" effect could thus be produced, the chain merely slipping over the teeth of the wheels when these were driven in one direction. This movement can, however, be easily reproduced by employing Sprocket gearing in conjunction with a built-up free wheel similar to that illustrated and described in this month's "How to Use Meccano Parts" article (see page 796). It would also be a difficult matter to obtain smooth working with teeth of this kind but we shall keep your idea in mind. (*Reply to R. Slater, Portsmouth*).

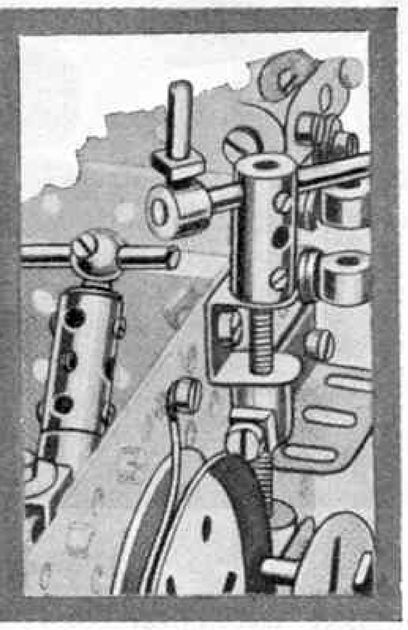
DRUM CAM.—We note your suggestion that a "drum cam" should be introduced. We would point out to you, however, that this mechanism although interesting, is only rarely employed in engineering and would have a very limited application to mechanisms constructed in Meccano. The cam as will be seen in the sketch, would comprise a disc of metal, having a groove cut in its periphery, the groove being placed obliquely to the plain of the drum, while the width of the groove would be of such a size to allow the end of a Meccano Rod or Strip to rest in it. On rotation of the cam the Rod, etc., would be given an oscillatory movement, the amount of "travel" imparted to the Rod being dependent on the shape of te groove cut in the cam's surface. Readers will readily appreciate the fact that a movement of this type is hardly ever required, and in cases where it is absolutely necessary it should be possible to employ existing accessories to achieve a similar result. (*Reply to H. Carter, Surbiton*).





HOW TO USE Meccano Parts

IX.—GEARS, etc. (CLASS O)



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

THE Meccano Pinions, Gear Wheels, and Sprocket Wheels, which are included under Class O, formed the subject of last month's article, and below we describe the principal functions of the remaining parts in this class. For the benefit of those readers who are unable to refer to the September issue, we are reproducing on this page the complete list of parts that are grouped under Class O.

The Rack Strips (parts Nos. 110 and 110a) are designed for converting rotary motion to rectiliniar motion, or vice versa. They are invaluable for obtaining the traversing movement of lathe saddles or other parts of machine tools. In model No. 6.17 in the 4–7 Instruction Manual two 3½″ Rack Strips are used to impart up and down motion to a Meccano jack, while in model No. 7.8 (Steam Shovel) Rack Strips are employed to thrust the shovel arm toward or away from the jib. The 6½″ Rack Strip is one of the latest additions to the Meccano system, but it has already found a very large number of uses.

A very ingenious movement produced with the aid of two 3½″ Rack Strips is illustrated in Fig. 3. This is a device designed to increase the length of a crank stroke, and is taken from the Standard Mechanisms Manual, where it appears under detail No. 278. For the benefit of those readers who are unable to refer to the S.M. Manual, we repeat the description:—

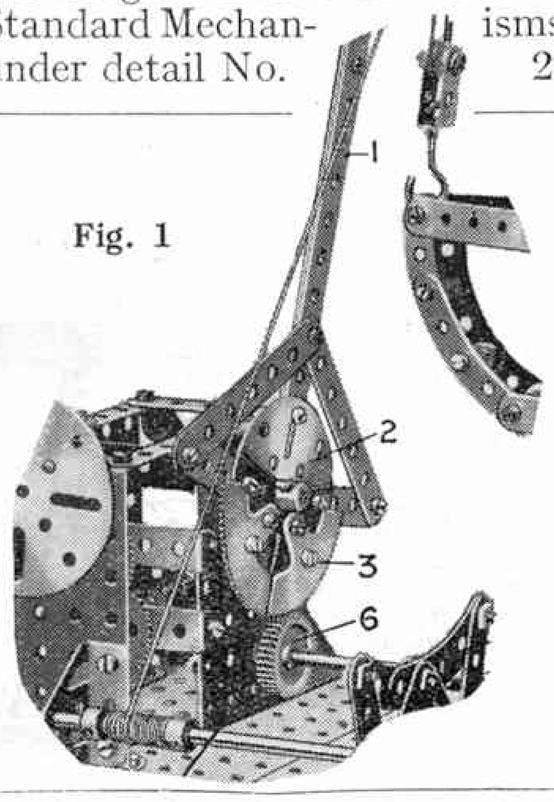


Fig. 1

The connecting or piston rod is placed on the end of a ¾″ Bolt 1, which passes through an Eye Piece 2 and carries on its shank a ½″ Pinion 3. The latter rolls on a 3½″ Rack Strip 4 secured by Angle Brackets to the base of the model. A second Rack Strip 5 bolted to two Eye Pieces 6 sliding on a 5½″ Strip 7 also engages with the Pinion 3.

At each stroke of the connecting rod the Pinion 3 is caused to rotate, owing to its engagement with the Rack 4, and thereby thrusts the upper Rack Strip in the same direction as that in which the connecting rod moves, but through a distance twice as great. Strip 7 is bolted at each end to 1½″ Strips secured to the base by means of 1″ Angle Brackets. A second guide Strip 8, secured at either end to a 1″×½″ Angle Bracket, forms a support for the Eye Piece 2.

The Rack Segment (part No. 129) is intended principally for use where it is required to rotate a mechanism through part of a revolution only. It should be bolted to a Face Plate or other part that is capable of turning about a centre and a 1″ Gear Wheel should be engaged with its teeth. The Segment has 28 teeth and a radius of 1½″, so if four Segments are placed together to form a circle, the latter will measure 3″ in diameter and will have 112 teeth. Great care should be taken when joining the segments together, because unless the adjoining teeth are spaced correctly they will fail to mesh properly with the Gear Wheel.

Fig. 1 shows two Rack Segments secured to the bottom of one of the davit arms of a boat launching gear. This arm is required to move through less than half a circle, hence two Rack Segments joined together provide a sufficient number of teeth to receive the drive from the 1″ Gear Wheel 6, a reduction ratio of approximately 3:1 being obtained. The Rack Segments (shown at 3 in the illustration) are bolted to the Face Plate 2, which forms part of the arm 1.

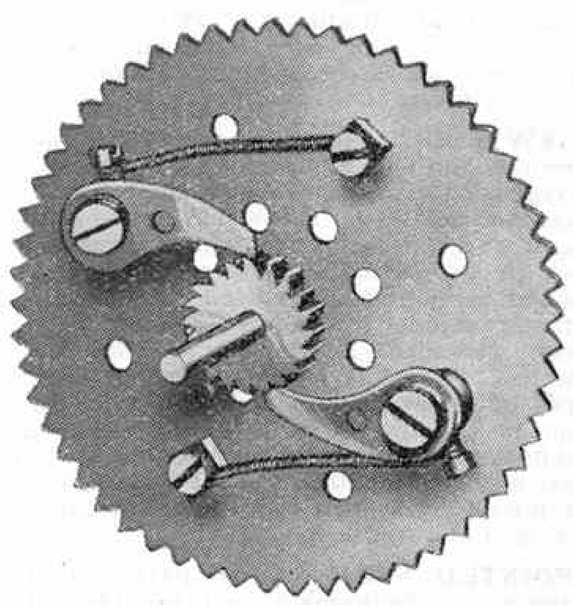


Fig. 2

Parts in Class O: Gears and Toothed Parts

Part No.		Prices s.	d.
25	Pinion Wheels, ¾″ diam., ¼″ wide ... each	0	6
25a	" " ¾″ " ½″ " ... "	0	8
25b	" " ¾″ " ¾″ " ... "	0	10
26	" " ½″ " ¼″ " ... "	0	4
26a	" " ½″ " ½″ " ... "	0	6
26b	" " ½″ " ¾″ " ... "	0	8
27b	Gear Wheels, 133-teeth (3½″ diam.) ... "	1	3
27a	" " 57 " (1½″ ") ... "	0	6
27	" " 50 " (1 5/16″ diam.) "	0	6
31	" " 38 " (1″ diam.) ... "	1	0
28	Contrate Wheels, 1½″ 50-teeth ... ... "	0	9
29	" " ¾″ 25 " ... ... "	0	6
30	Bevel Gears, ⅞″ 26-teeth ... ... "	0	9
30a	" " ½″ 16 " ... ... "	0	6
30c	" " 1½″ 48 " ... ... "	1	6
32	Worm, 12 threads per inch ... ... "	0	5
95b	Sprocket Wheels, 3″ 56-teeth ... ... "	0	6
95	" " 2″ 36 " ... ... "	0	5
95a	" " 1½″ 28 " ... ... "	0	4
96	" " 1″ 18 " ... ... "	0	3
96a	" " ¾″ 14 " ... ... "	0	3
110	Rack Strips, 3½″ ... ... "	0	2
110a	" " 6½″ ... ... "	0	3
129	Rack Segments, 3″ diam. ... ... "	0	5
144	Dog Clutches ... ... "	0	6
147	Pawls, with Pivot Bolts and Nuts ... "	0	3
147a	Pawls ... ... "	0	2
148	Ratchet Wheels ... ... "	0	6
167a	Roller Races, geared, 192 teeth } see class N.		
167c	Pinions for Roller Bearings, 16-teeth } see class N.		
168b	Ball Races, geared, for Sprocket drive } see class N.		

Functions of the Dog Clutch

The Meccano Dog Clutch (part No. 144) consists of one male and one female section. The object of this part is to enable two shafts to be engaged with each other or disengaged whenever desired. The shafts must be mounted end to end and one must be slidable in its bearings so that the clutch sections can be thrown in or out of engagement on operation of a suitable lever.

Alternatively, the Dog Clutch may be used, in conjunction with a Socket Coupling, to enable a Gear Wheel or Pinion, etc., to be mounted on a shaft so that it can either be carried round bodily with the shaft or allowed to remain stationary whilst the shaft carrying it turns in its boss. A typical example of the Dog Clutch used in this way has already been described (see Fig. 6 in last month's "*M.M.*").

Another typical Dog Clutch mechanism will be found in Fig. 4. In this case the driving Rod carries the Clutch member 1 and on movement of the lever 3 the secondary Rod 2 may be brought in or out of engagement. The lever is pivoted by a bolt and lock-nuts 5 to an Angle Bracket and also to a Single Bent Strip 4 that is held loosely between the Clutch sections 1 and a Collar with set-screw.

Fig. 6 shows the Dog Clutch employed in the construction of a reversing mechanism. In this mechanism either of the horizontal Rods may be used as a driving shaft. Each carries at its inner end one segment of a Dog Clutch 1, and one $\frac{3}{4}$" Pinion 2, 3. The left-hand horizontal Rod is slidable in its bearings and is controlled by a suitable hand lever, such as that shown in Fig. 4.

In the first position of the hand lever the $\frac{3}{4}$" Pinion 2 is caused to engage with a $1\frac{1}{2}$" Contrate Wheel 4 (as in the illustration) whilst in its second position the Pinion is thrown out of engagement and the clutch members are combined. The Pinion 3 remains in constant engagement with the Contrate 4, and in the second position of the lever the Contrate merely revolves idly. Incidentally, this diagram indicates another important use for the $1\frac{1}{2}$" Contrate Wheel.

Fig. 3

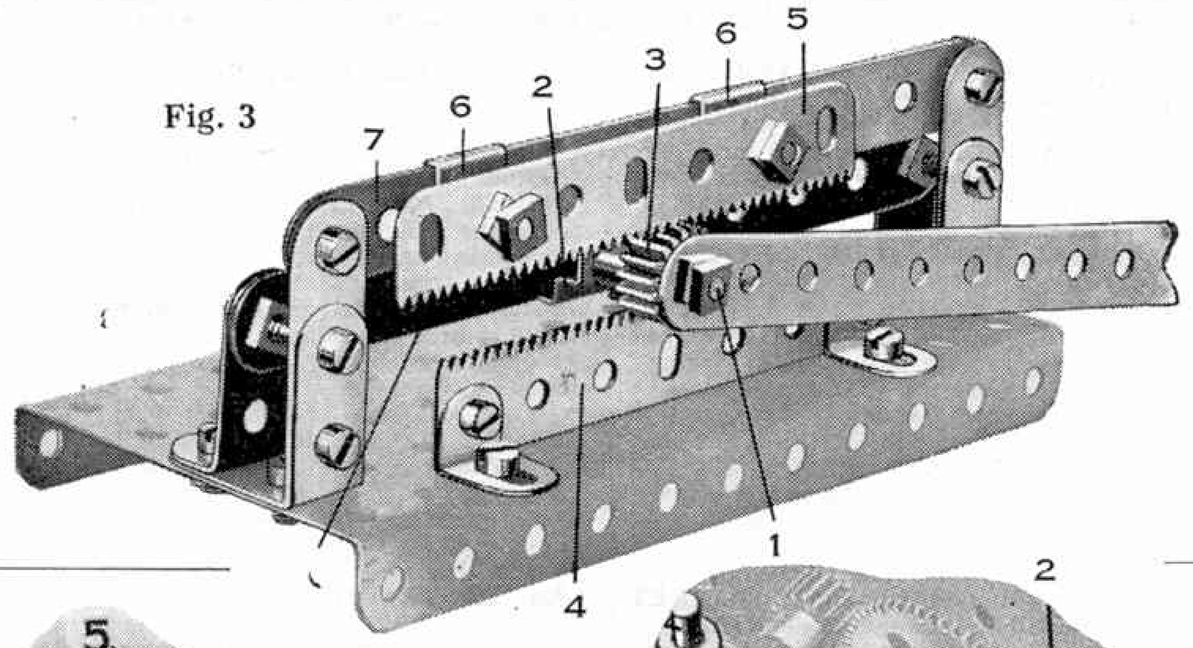


Fig. 4

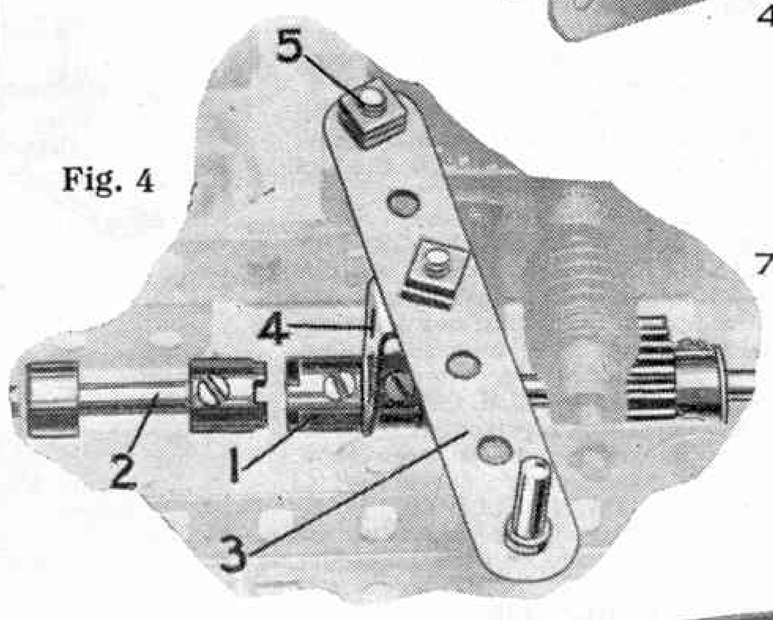
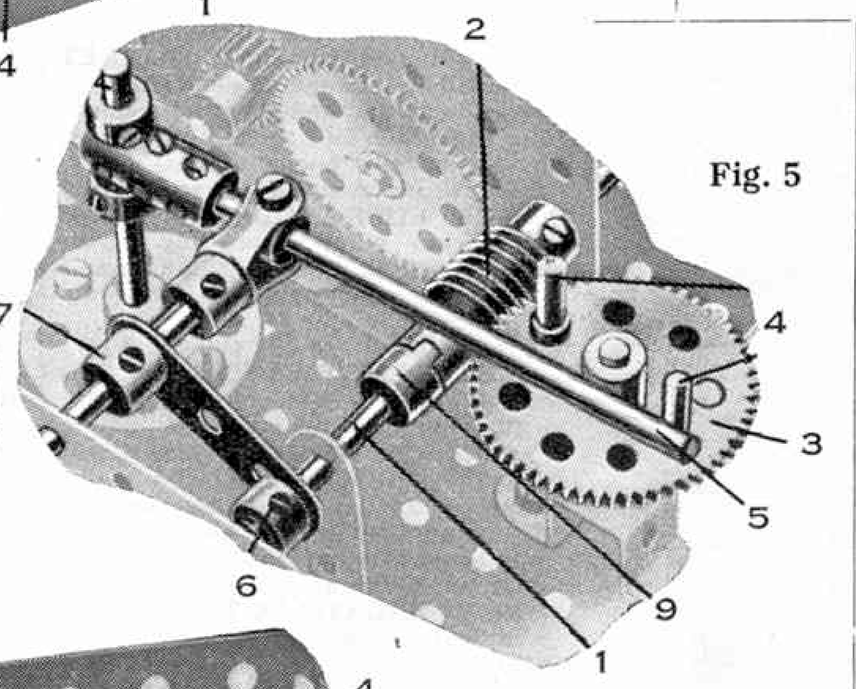


Fig. 5



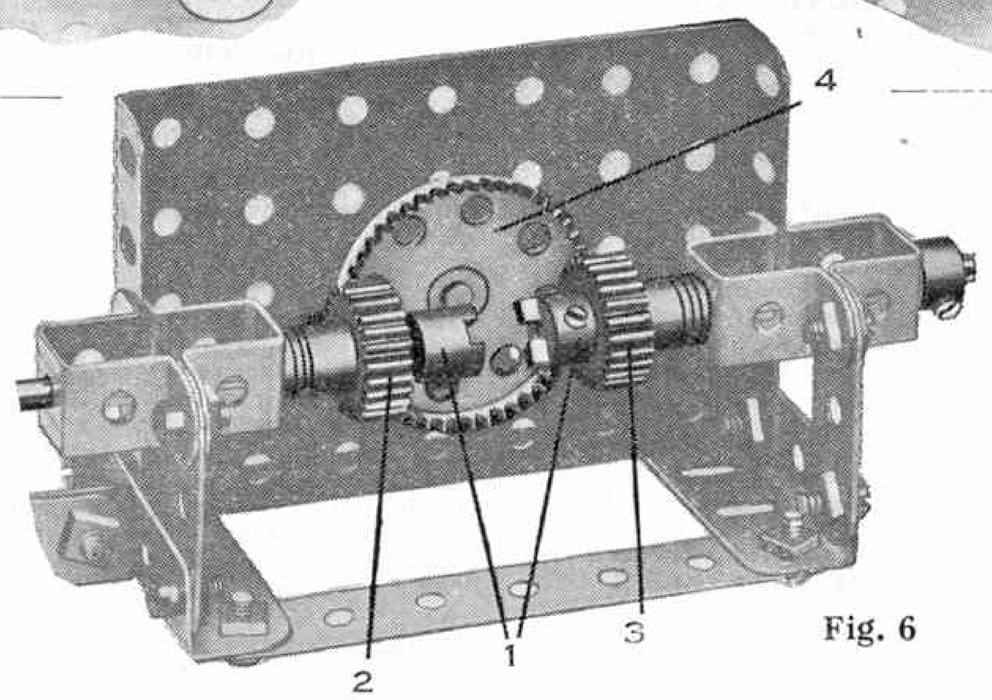


Fig. 6

In Fig. 5 the Dog Clutch is used to obtain intermittent rotary motion. One portion of the Dog Clutch is secured to the shaft of the Worm 2, which is driven constantly. The other portion 9 of the clutch is mounted on a secondary shaft 1, which is slidable in its bearings, and through the action of the Threaded Pins 4 secured to the revolving Gear Wheel 3, and the lever 5 with its connecting link 7, the Rod 1 is pushed outward at certain regular intervals and after a short period returned to its former position by means of a Compression Spring pressing against the Collar 6. In this way the clutch members are alternately engaged or disengaged, thus imparting intermittent rotary motion to the shaft 1.

Pawl and Ratchet Gear

The Meccano Pawl (part No. 147) and Ratchet Wheel (No. 148) may be said to be in partnership, for the one is never used without the other, except on those rare occasions when use can be found for the Pawl only, as in the safety device fitted to the Meccano Warehouse (special instruction leaflet No. 31) where it forms a small catch that engages with the lift guides in the event of accident to the hoisting mechanism. Used in conjunction with each other, the Pawl and Ratchet provide a mechanism that allows the shaft on which the Ratchet Wheel is secured to rotate in one direction only. The advantages of such an arrangement are obvious, especially when attached to model cranes and hoisting tackle, etc., where the Pawl and Ratchet gear prevents falling-back of the load as it is hoisted.

A slight pressure should always be applied to the Pawl—by means of a spring or weighted lever—to ensure that it is always in proper engagement with the teeth of the Ratchet Wheel.

Fig. 2 shows a typical Meccano free-wheel movement employing two Pawls and a Ratchet Wheel. In this mechanism the Pawls are mounted pivotally on the face of the Sprocket by means of Pivot Bolts and lock-nuts, and are held in engagement with the Ratchet Wheel by lengths of Spring Cord attached to set-screws in the Pawls and to the face of the

(*Continued on page 772*)

MECCANO

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Our expert designers have produced for us 35 super models that reach the highest pinnacle ever attained in Meccano construction. Each model in this series is a masterpiece and there is not a boy who will not be eager to build them all.

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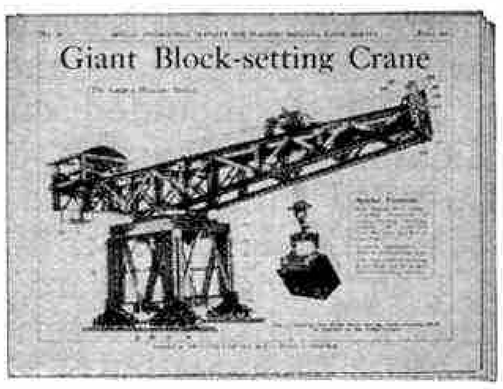
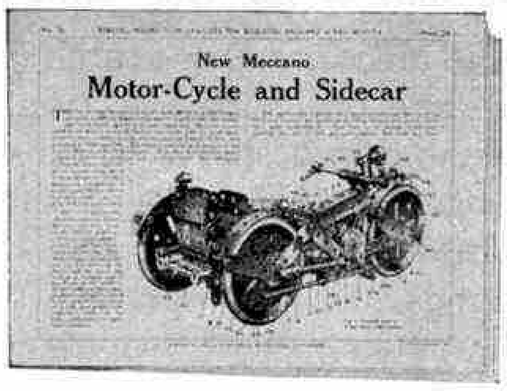
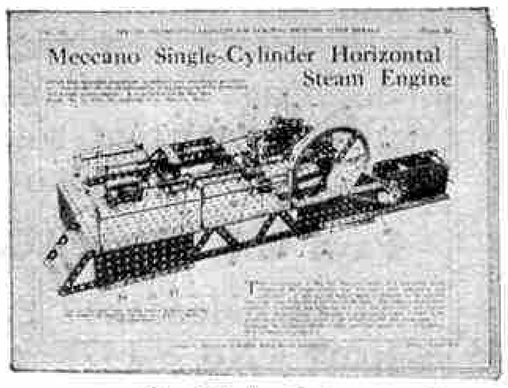
A brief description of each model in the series is given below and the number and price of the special Instruction Leaflet are indicated. Copies of the leaflets may be obtained from any Meccano dealer or direct from us, post free, at the prices shown.



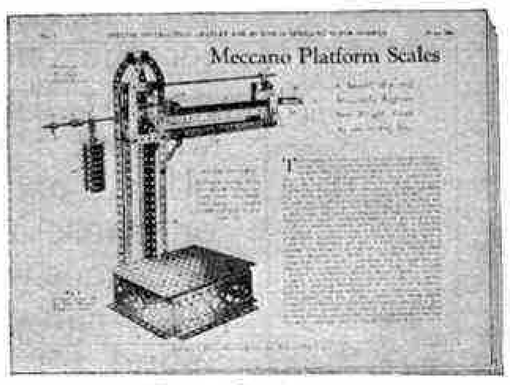
No. 4 Leaflet.



No. 3 Leaflet.



No. 11 Leaflet.



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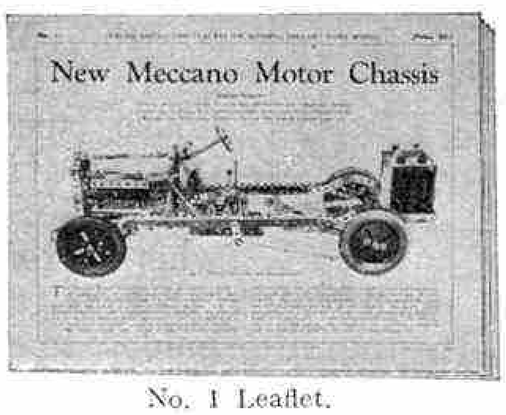

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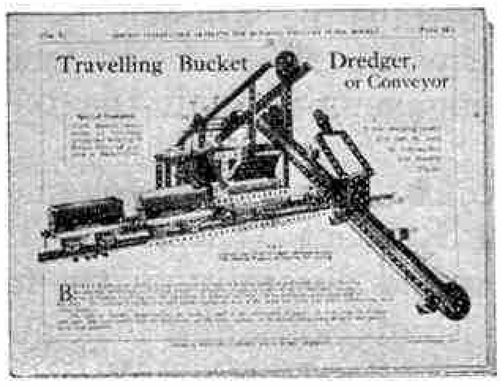


No. 5 Leaflet.

No. 1 MOTOR CHASSIS. This model runs perfectly under its own power. It has Ackermann Steering, Differential, Gear Box and Clutch, etc. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 2 SHIP COALER. All the movements of a real ship-coaler are reproduced in this model. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 3 MOTORCYCLE AND SIDECAR. The sidecar is of stream-line design and is mounted on springs. The motorcycle is complete with lamps, horn, exhaust pipes, etc. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 4 GIANT BLOCK-SETTING CRANE. This realistic model is fitted with an accurate reproduction of Fidler's block-setting gear. *Price 6d. (Overseas 8d., Canada 15 cts.)*

No. 5 TRAVELLING BUCKET DREDGER. In this model trucks and wagons can run underneath the chute through which falls the material raised by the dredger buckets. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 6 STIFF-LEG DERRICK. This model has many interesting movements, including hoisting, luffing and swivelling, which are controlled by suitable levers. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 7 PLATFORM SCALES. This model will weigh articles up to 4½ lbs. with remarkable accuracy. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 8 ROUNDABOUT. This model is most attractive when in motion. As the roundabout rotates the cars spin round and the horses rise and fall. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 9 BAGATELLE TABLE. This is an interesting model that will give hours of fun to the players. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 10 LOG SAW. In this model the saw is driven rapidly to and fro while the work table travels beneath it. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 11 SINGLE-CYLINDER HORIZONTAL STEAM ENGINE. Fitted with balanced crankshaft, crosshead, and centrifugal governor. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 12 STONE SAWING MACHINE. The model is equipped with adjustable work table and overhead trolley with self-sustaining chain hoist. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 13 MECCANOGRAPH. This wonderful model will draw hundreds of beautiful designs. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 14 GRANDFATHER CLOCK. A practical example of Meccano model-building. The model keeps accurate time. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 15 BALTIC TANK LOCOMOTIVE. The driving wheels are operated by an Electric Motor. An accurate reproduction of Walschaerts' Valve Gear is fitted. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 16 LOOM. This is perhaps the greatest Meccano success. The model weaves beautiful material. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 17 PLANING MACHINE. Fitted with quick-return motion. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 18 REVOLVING CRANE. This model is fitted with screw-operated luffing gear. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 19 STEAM SHOVEL. This model embodies travelling, rotating, racking and digging movements, and jib hoisting and lowering gear. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 20 MOBILE CRANE. This model has hoisting, luffing, travelling and slewing movements. It is fitted with an automatic brake on the hoisting shaft, an internal expanding brake on the front axle, and a limit switch to prevent over-winding of the jib in either direction. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 21 TRANSPORTER BRIDGE. The carriage automatically travels to and fro for as long as the motor is driven, pausing for a few seconds at each end of its travel. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 22 TRACTION ENGINE. A remarkably realistic model that will pull a boy of average weight. Fitted with two speeds. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 23 VERTICAL LOG SAW. While the saws are in motion, the logs are fed slowly to them. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 24 TRAVELLING GANTRY CRANE. The movements of this model comprise the traversing of the entire gantry, hoisting and lowering, and the traversing of the crane trolley. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 25 HYDRAULIC CRANE. The hydraulic ram is represented realistically by a powerful screw mechanism. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 26 TWIN ELLIPTIC HARMONOGRAPH. Some beautiful designs may be produced with this model. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 27 DRAGLINE. This imposing model of a giant excavator is fitted with travelling, luffing, slewing, and dragging movements. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 28 PONTOON CRANE. The movements of this model include the operation of the two hoisting blocks, slewing of the entire crane, and luffing. *Price 2d. (Overseas 3d., Canada 5 cts.)*

No. 29 HAMMERHEAD CRANE. This is a very realistic and powerful model, comprising traversing, hoisting and slewing motions. *Price 2d. (Overseas 3d., Canada 5 cts.)*

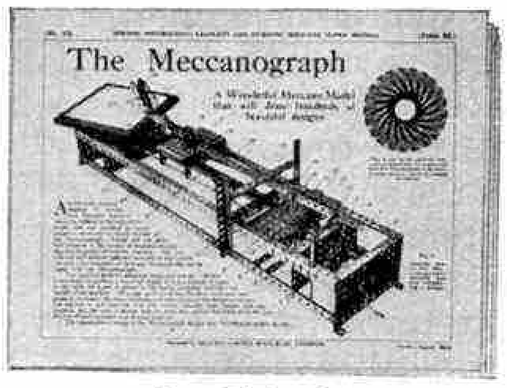
No. 30 BREAKDOWN CRANE. This model is equipped with travelling, slewing, luffing, and hoisting motions, and also is fitted with laminated springs, brakes, out-riggers, etc. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 31 WAREHOUSE WITH ELEVATORS. The two cages are driven automatically and work alternately, pausing at top and bottom positions. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 32 TWO-CYLINDER STEAM ENGINE AND BOILER. This is a realistic working model of a complete steam plant, equipped with valve gear, governor, balanced cranks, etc. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 33 SINGLE AND DOUBLE FLYBOATS. These two models represent popular pleasure-fair attractions. *Price 3d. (Overseas 4d., Canada 8 cts.)*

No. 34 THREE-ENGINE BIPLANE. This is a realistic model of an "Argosy" machine, and is fitted with ailerons, elevators and rudders. *Price 3d. (Overseas 4d., Canada 8 cts.)*



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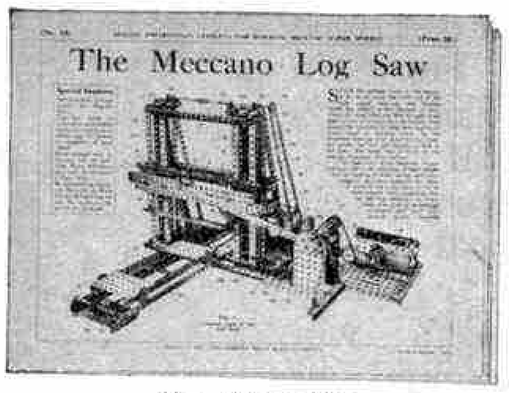

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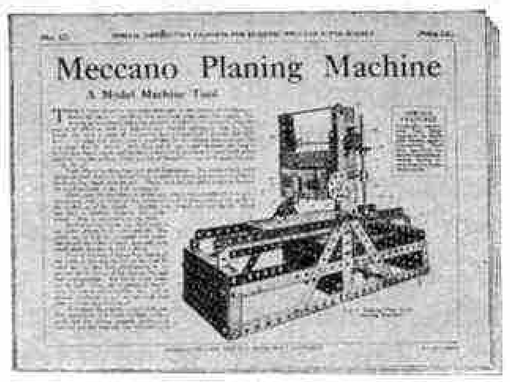

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No. 19 Leaflet.

Meccano Limited

OLD SWAN, LIVERPOOL

PONSLTBVEBOUTELINNSI = Bolt
PONSLTBVEUEINNSI = Bevel
PONSTUBBOSA = Plate = NSTUS

Grand Autumn Model-Building Competition

FULL particulars of the special "Autumn" Model-building Competition were published in the September issue of the "*M.M.*" All sections of the contest are still open and we are repeating the announcement this month so that any readers who did not see the previous one may have a chance of competing.

Entrance forms are not required and there are no fees to be paid. Any type of model may be entered and the competitor is not limited to any particular size of Outfit or number of parts. He may construct his model with just those parts that he finds necessary. This does not mean, however, that the most complicated or largest models will win the prizes. There is just as much scope for the owner of a small Outfit as for the lucky possessor of a No. 6 or No. 7 Outfit, and intending competitors should remember that mere size or complexity adds nothing to the value of a model unless it is combined with careful thought, good workmanship and sound constructional features.

Readers are again reminded that actual models must not be sent. It is only necessary to submit either clear photographs or, if this is not possible, good drawings of their models, together with a brief but concise explanation of any constructional or mechanical features that are not easily apparent from the photos or drawings. Neither photographs nor drawings need be the competitor's own handiwork but it is absolutely essential that the model itself is his own unaided work.

Entries will be divided into three sections: Section A, for readers residing in the British Isles and over 14 years of age; Section B, for readers residing in the British Isles and under 14 years of age, and Section C, for readers of all ages residing Overseas. Age will be taken into consideration.

The competitor's name, address, and age must be written clearly on the back of each photograph or drawing sent in, together with the section (A, B, or C) for which the entry is eligible. Envelopes containing entries should be addressed "Autumn" Model-building Competition, Meccano Ltd., Binns Road, Old Swan, Liverpool. All photographs of prize-winning models become the property of Meccano Ltd.

As will be seen from the accompanying list, many splendid prizes are offered for those entries that the judges decide after due consideration to be the most soundly constructed and original in principle. Competitors may, if they wish, submit more than one model but in this event all entries must be sent under the same cover. No single competitor will be awarded more than one prize and if more than one model is submitted they will be considered jointly.

Models displaying features of unusual interest, or such originality of construction as would be likely to appeal to Meccano boys generally, will be described and where possible illustrated, in future issues of the "*M.M.*" as well as in forthcoming Instruction Manuals and other Meccano publications.

We think it well to remind intending competitors that reproductions of models described in any of the Meccano publications are not eligible for entry in this contest, and any such models received will be disqualified.

October 31st, 1929, is the last day on which entries may be received in the Home Sections (A and B). Intending competitors in either of these Sections still have a month after the date of publication of this issue in which to construct and enter their models. No time must be lost, however, and Meccanoites are urged to go right ahead with their model-building. Overseas readers must forward their entries so that they reach Liverpool not later than 31st January, 1930. Entries received after the above dates will be disqualified.

It is our wish that the ample time allowed in the Overseas Section will result in a record number of entries of outstanding merit and we hope Meccano boys the world over will submit at least one model and so help to make this contest the most successful yet organised.

List of Prizes

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

First Prize: Cheque for three guineas.
Second Prize: Cheque for two guineas.
Third Prize: Cheque for one guinea.
Six Prizes, each consisting of Meccano products to the value of 10/6.
Twelve Prizes, each consisting of Meccano products to value 5/–.

The Prizes in Section B are as follows: —

First Prize, Meccano products to value two guineas.
Second Prize, Meccano products to value one guinea.
Third Prize, Meccano products to value 10/6.
Six Prizes, each consisting of Meccano products to value 5/–.

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

New Meccano Contest: "Jumbled Words"

Here is a simple yet intriguing competition called "Jumbled Words." There is no entrance fee and every reader of the "*M.M.*" is eligible to compete for one of the splendid prizes offered.

The twenty letters shown in the panel below represent the total letters contained in the names of four Meccano parts. Every letter in each of the four names is shown, and competitors are invited to discover which are the four Meccano parts named. For the guidance of competitors it may be mentioned that not more than six letters are contained in any one of the four names.

PONSLTBVEBOUTELINNSI

The entries will be divided into two sections; Section A for readers residing in the British Isles, and Section B for readers residing in countries outside the British Isles.

A prize consisting of Meccano or Hornby Train goods to the value of half a guinea will be awarded in each Section to the first correct solution examined, and twelve copies of the book "Famous Trains" by C. J. Allen will be awarded to the twelve correct solutions next examined. In the event of no competitor submitting a correct solution the prizes will go to the boys who submit the nearest and most complete solutions. None of the entries will be examined until after the closing date in each Section.

The judges' decision is final and no correspondence can be entered into in regard to the contest.

Competitors should write their solutions clearly in block capitals on a postcard, together with the letter "A" or "B" (indicating the Section in which it is desired to compete) and their name and address. Postcards should be addressed to "Jumbled Words" Competition, Meccano Ltd., Binns Road, Old Swan, Liverpool. Closing dates; Section A, 31st October, 1929; Section B, 31st January, 1930. Solutions received by the Competition Department after the above dates will of course be automatically disqualified, so entries should be posted early.

Contests of this type generally prove popular with Meccano enthusiasts and we are looking forward confidently to a record number of entries. Intending competitors are advised to start right now and endeavour to discover the hidden words. Provided that the number of entries received in this contest fulfils our expectations, further competitions of this type will be announced in forthcoming issues.

Bolt
Pivot or Bevel

NSLEBUEMNSI

Some Results of "Prowling Around"

My note on this page in the July "*M.M.*" in regard to "prowling around" has brought me many interesting letters, both from those who had already acquired this habit and those who adopted it after reading my remarks. One of these letters is so interesting as to deserve quotation.

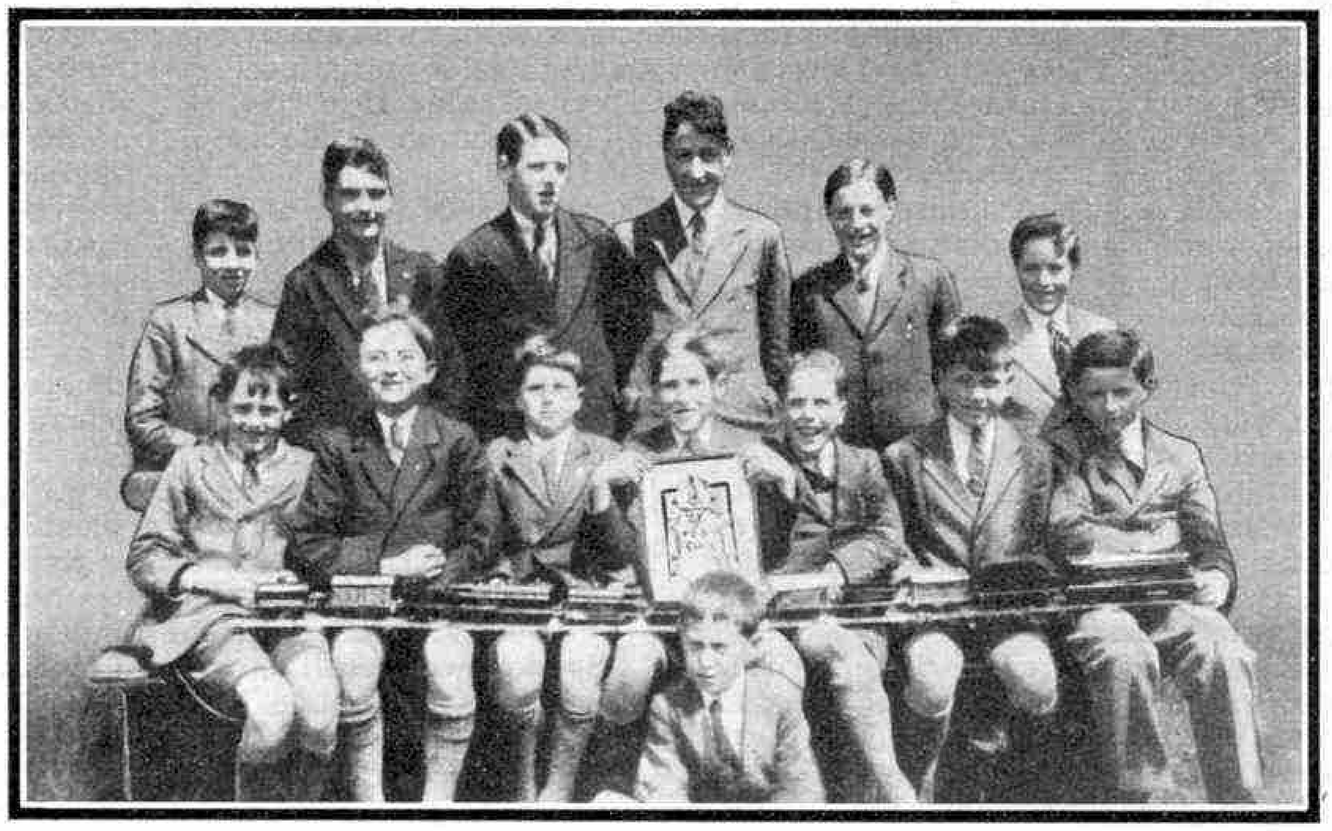
"One fine day," says the writer, "I was scouting around for a suitable position from which to snap passing trains, when I came upon a signal-box situated on the main line from London. Taking a chance, I approached the box and succeeded in obtaining quite a good photograph of a train that happened to come by soon afterward. The signalman noticed me and made a few cheery remarks, and we quickly became friends. The result was that I visited that box regularly, making friends also with the two signalmen who worked the other shifts. Eventually I became familiar with all the details of the working of the box, and in this way I learned more about the "inside," so to speak, of signalling than I could possibly have done in any other way."

This, I think, is a good illustration of how the hints given in the "*M.M.*" may be developed.

Another correspondent was equally successful in a different direction. He also was out to see what he could capture with his camera, and he happened to come across a goods engine waiting in a siding. This was a splendid opportunity and off he went to snap the engine.

"While focussing the camera," he says, "I noticed that the driver was down oiling the engine, and when he realised my intention he called his fireman, who promptly put in an appearance at the side of the cab. The exposure was made, and the men seemed pleased at having their photographs taken. We were soon in cheerful conversation, and the driver kindly explained to me all the mysteries of the cab. Since then I have sent him copies of the photographs I took, and received a friendly reply."

These experiences are only two out of many, but they are sufficient to make it clear that "prowling around" is well worth while.



Members of the Brookfield (Wigton) Branch, No. 28 ; Chairman, Mr. D. H. Reed, Secretary, J. M. Lister. This Branch has a splendid out-door track on which large-scale operations are successfully carried out

A Suggestion for Debates

During the progress of a meeting of a flourishing H.R.C. Branch there arose "a certain liveliness" as a result of a fierce argument between two members, concerning the respective merits of the G.W.R. and L.M.S.R. locomotives. Other members joined in, but before any serious developments could take place the Chairman intervened. "If you really want to argue this matter," he said, "we will arrange a proper debate." This idea met with general approval, and the debate was duly held at the next meeting, with great success.

I think this little episode gives an excellent hint for Branch secretaries who are arranging the winter's programme. Occasional debates on some railway topic are bound to be very interesting, and they provide a welcome change from model railway operations.

Branch Photographs

I am still anxious to obtain more photographs of H.R.C. Branches for publication on these pages, and I shall be very glad if Chairmen will endeavour to assist me in this matter. I require not only photographs of Branch groups, but also of Branch Chairmen and secretaries. It is probable that during the summer many H.R.C. members will have taken photographs of railway interest, and I shall be glad to see any of these, with a view to their publication if suitable.

Correspondence Club

It is advisable for entrants to name on their application forms alternative countries in which they would like to have correspondents. Occasionally it is necessary for a member to wait for a short time until his requirements can be fulfilled, and by adopting this suggestion the risk of delay is diminished. At the first opportunity a correspondent will be found in the country originally named.

Branch Notes

ST. CHADS (WITHINGTON) BRANCH.—Three very successful track nights were held at which timetable working was strictly adhered to. At one of the meetings a "train smash" was carefully staged and caused great excitement among the members. An express passenger train travelling to a station on the "down" line was hit "head on" by an express goods train diverging from the "up" on to the "down" line by means of a crossover, which had been wrongly set. A full breakdown set was rushed to the scene of the accident and it took the relief gang, working at top speed, a full hour to straighten things out!

BELFAST.—In spite of the fact that a permanent club room has not yet been secured, a very successful meeting was held in a yard placed at the disposal of the Branch. Mr. Hope, the father of one of the members, attended the meeting and kindly gave a short lecture, which was greatly appreciated.

NOTTINGHAM.—A club room has been erected for the use of members and they are making arrangements to take possession. A very interesting "lineside" ramble was organised to a local railway station. Members were particularly interested in a small tank engine that was busily shunting empty trucks into a siding. A large steam derrick conveying sand from wagons to the side of the track also attracted much attention. Members terminated a very pleasant day by having tea, which they had brought with them, by the side of the River Trent.

LENTON SANDS (NOTTINGHAM).—Cycle tours in the country have been very popular and one evening a week has been devoted to sports. The first copy of the Branch magazine has been produced and has proved quite a success. The magazine consists of eight pages and contains a report on the activities of the Branch; railway and engineering notes; two pages of articles; one page devoted to topical events, and a page of humorous stories. Efforts are now being made to find a suitable Branch room in which it is proposed to lay a permanent track.

FARNHAM GRAMMAR SCHOOL.—An interesting excursion was made to Eastleigh Railway Works. An early start was made and the journey in the train was rendered very interesting by a talk on railway matters in general given by the Chairman. The morning was spent in inspecting the carriage sheds, and considerable interest was shown in the suction saw-dust conveyors and an ingenious screwing machine. In the afternoon the party went to the locomotive running sheds, where one of the drivers very kindly showed them round and allowed them to examine thoroughly a number of engines. Photographs were taken, and subsequently the party inspected engines being coaled at the coaling stage.

GLOUCESTER.—Successful track meetings have been held regularly, and working to timetable is very popular. Preparations are now in hand for the winter indoor meetings, and if a permanent club room can be secured new members will be welcomed. Any reader who can suggest where such a room can be found is asked to communicate with the Secretary, George T. Clark, 66, Falkner Street, Gloucester.

NEWCASTLE-UPON-TYNE.—Meetings have been resumed, and it is proposed to hold an Exhibition early this month. It is intended to devote the proceeds to a fund that has been started to pay for the building of a club room. Intending members should communicate with Mr. B. Gilbey, 41, Portland Road, Shieldfield, Newcastle-upon-Tyne, who will be pleased to supply full particulars.

IPSWICH.—A Branch library has already been formed and is proving very popular. It is proposed to start a Branch Magazine and, if possible, to produce it monthly. It has been decided to fix a subscription of 2d. a week in order to provide additional stock for the use of the Branch. A signal-box has been erected from which the whole of the track can be signalled by one person. Members are learning a system of bell signals in order to add to the realism of the layout. A bank is being started in which money may be deposited to cover the cost of Branch outings and visits.

Happy days in the garden! Young Hornby Railway enthusiasts at Ilford testing their engines for length of run

Further Branches in Course of Formation

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

ALDERLEY EDGE—Alan Crossley, Laburnum Lodge, Heyes Lane, Alderley Edge, Cheshire.
BRADFORD—K. Harrison, 1, Thompson Avenue, Five Lane Ends, Bradford.
BRIGHOUSE—C. D. Sunderland, 1, Victoria Place, Rastrick, Brighouse, Yorks.
CAMBRIDGE—H. J. Daniels, 3, West View, Merton Street, Newnham, Cambridge.
COVENTRY—G. Bull, 131, Hearsall Lane, Coventry.
CROYDON—M. Nunn, 23, Warrington Road, Croydon, Surrey.
EDGBASTON—Eric A. Bates, 316, Dudley Road, Edgbaston, Birmingham.
GILLINGHAM—W. B. Hudson, 73, Second Avenue, Gillingham, Kent.
HINDHEAD—C. N. Craig, Tanera More, Hindhead, Surrey.
LEEDS—Mr. Wm. Rainforth, 3, Tower Grove, Armley, Leeds.
LIVERPOOL—William Tuer, 18, Montagu Road, Old Swan, Liverpool.
LONDON (PADDINGTON)—L. F. Harding, 52, Shireland Road, Warwick Avenue, London.
MANCHESTER—L. Manion, 71, Kensington Road, Chorlton-cum-Hardy, Manchester.
MIDDLESEX—E. Mills, "Langsford," Forty Lane, Middlesex.
PENDLETON—B. Gardner, 11, Prestwood Road, Pendleton, Salford.
RICHMOND—S. Redington, 4, Somerton Avenue, Clifford Avenue, Richmond, Surrey.
ROMFORD—L. Haylor, 86, Mildmay Road, Romford, Essex.
SHERINGHAM—A. C. Perry, The Manse, Holway Road, Sheringham.
SOUTH BANK—R. Bradburn, "Southville," Normanby Road, South Bank.
SOUTHEND-ON-SEA—Mr. H. Shaw, Windy Ridge, Gravil Road, Eastwood Rise, Southend-on-Sea.
TONBRIDGE—John W. C. Robertson, 77, Hadlow Road, Tonbridge, Kent.
TORQUAY—L. Drake, 7, First Avenue, Daison, Torquay, Devon.
WEST HARTLEPOOL—W. H. Smith, 48, Harworth Street, West Hartlepool.

OVERSEAS

AUSTRALIA—W. H. Jack, 31, York Street, Ballaret, East, Victoria.
AUSTRALIA—Mr. Alex. S. Cohn, 12, Banool Avenue, Kew, Victoria, Australia.
FEDERATED MALAY STATES—Yong Yoon Choi, 8, Java Lane, Seremban, F.M.S.
NEW ZEALAND—Albert Saunders, 17, Te Aroha Street, Hamilton, N.Z.
SOUTH AFRICA—W. Dunsdon, "Mabmardon," 39, Belvedere Avenue, Oranjezicht, Capetown, S.A.

Further H.R.C. Incorporated Branches

63. IPSWICH—Percy E. Puck, 10, Dial Lane, Ipswich, Suffolk.
64. LYTHAM CENTRAL—W. Towler, 8a, Park Street, Lytham, Lancs.
67. WHITGIFT GRAMMAR SCHOOL (CROYDON)—Reginald Furlong, 49, Kilmartin Ave., Norbury, S.W.16.

OVERSEAS

65. OBSERVATORY (CAPETOWN, S.A.)—Miss K. Murgatroyd, P.O. Box 1247, Capetown, S.A.
66. SEA POINT (CAPETOWN, S.A.)—Ronald Beevers, P.O. Box 1247, Capetown, S.A.

XII.—AN INTERESTING "THROUGH" STATION

THE designing of stations plays a very important part in model railway engineering. However large and elaborate a model railway may be, a great deal of railway-like effect is lost if the layout does not include a station that is capable of dealing adequately with the traffic.

Railway stations may be divided into two main classes, "through" and "terminal." Some stations are a combination of both types, but the majority may be placed in one or other of these categories. "Through" stations are undoubtedly favoured by model railway enthusiasts. "Terminal" stations require an amount of space that is usually out of proportion to the space occupied by the rest of the layout, and in addition they are much more difficult to operate successfully than "through" stations.

The design of a station, whether "through" or "terminal," should be such that it will allow of prompt arrival and departure of trains, without continual delays due to congestion. A particularly important point is that trains should not be delayed by minor shunting operations being carried out across the main line. Smooth working on realistic lines can only be obtained if the station plan is such that rolling stock can be moved quickly from the sidings to the platforms without upsetting any other traffic.

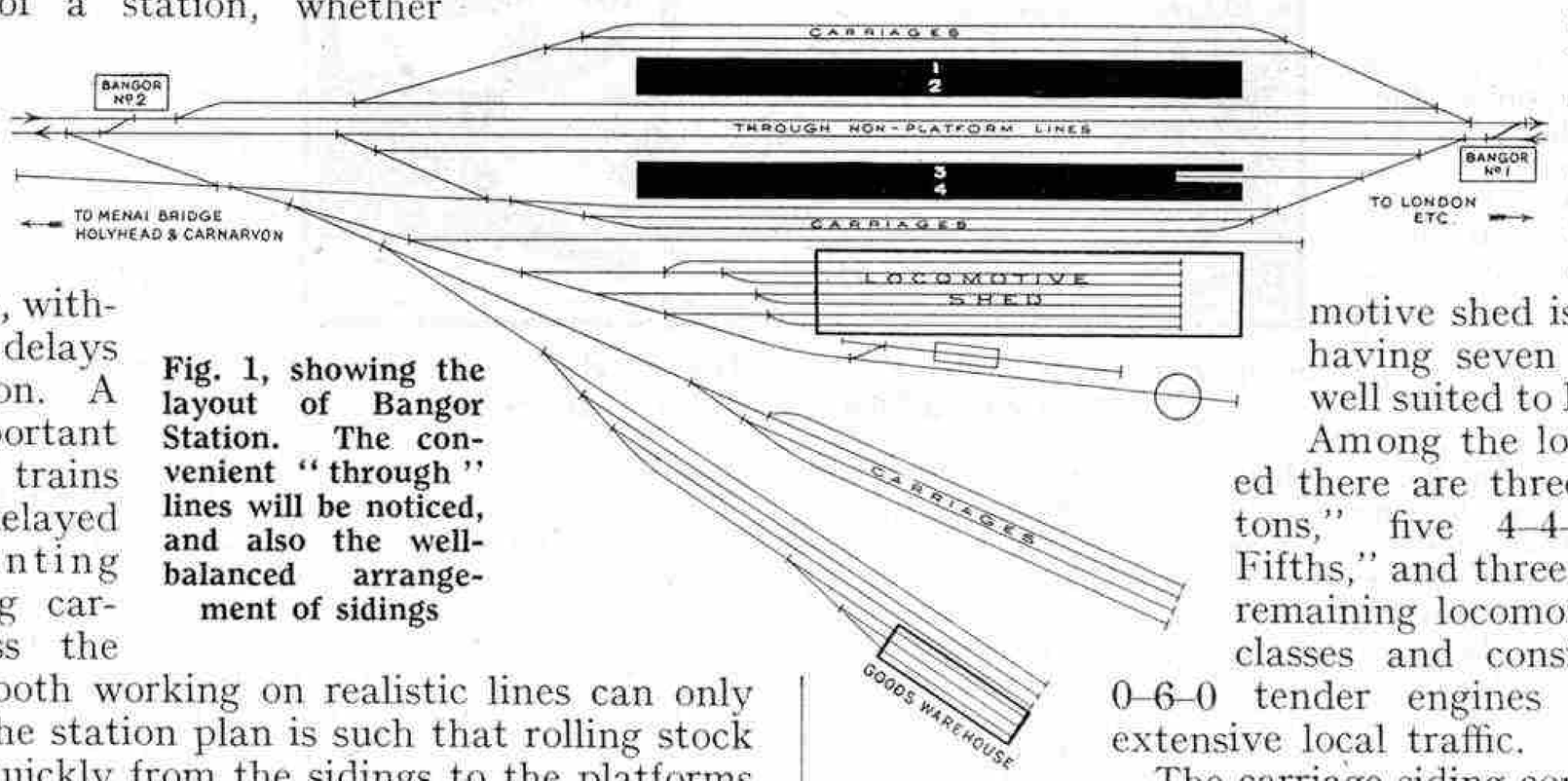


Fig. 1, showing the layout of Bangor Station. The convenient "through" lines will be noticed, and also the well-balanced arrangement of sidings

As an example of an exceedingly compact "through" station might be mentioned Bangor, which large numbers of "*M.M.*" readers will have passed through, and also seen mentioned in Mr. C. J. Allen's article on "*The Irish Mail*" that appeared in the September 1928 issue. The layout of this station is not at all difficult to reproduce in miniature when the main system is simplified.

A brief description of the main features of this station, taken in conjunction with Fig. 1, will make matters clear. From the west, the two main running lines approach the station and continue straight through without coming to any platform. Two lines branch off to the left and right respectively and run alongside platforms 2 and 3. Before these lines reach the platforms, however, another line branches off from each of them, running to platforms 1 and 4 respectively. These lines converge in the same sequence at the east end of the station, thus producing a symmetrical effect. There are trailing crossovers at each end of the station, and carriage sidings are situated on both sides of it, adjacent to platforms 1 and 4.

The station deals with a very large volume of both local and express traffic; and one of the great advantages it affords is that express trains may overtake and pass slow trains while the latter are standing at the platforms.

The following is the general allocation of traffic. Platform 1 is used by up terminating local traffic, and during busy periods by important stopping trains. Platform 2 is used by up fast stopping trains, and platform 3 by down fast stopping trains. Platform 4 is used by down local trains, and corresponds to platform 1.

The line at platform 4 continues some distance as a siding, from which branches diverge to the locomotive shed, the carriage shed and a goods depot. The locomotive shed is of moderate size, having seven roads; and it is well suited to local requirements. Among the locomotives stationed there are three 4–6–0 "Claughtons," five 4–4–0 "George the Fifths," and three 4–6–2 tanks. The remaining locomotives are of minor classes and consist of tanks and 0–6–0 tender engines for working the extensive local traffic.

The carriage siding consists of four roads to hold about 30 coaches. The goods warehouse is rather small, but by keeping very busy appears to do all that is required. The spacious cattle-dock that is provided is adequate for the needs of the district.

There is, in addition, a 60-ft. "well" type turntable and a small coal stage.

The signalling at Bangor is operated from two boxes, one at each end of the platform. Gantries guard incoming lines at each end, and the station lines are track-circuited throughout. From this it can easily be seen how compact this station is, and what a splendid model it affords for Hornby enthusiasts.

In modelling Bangor Station it has been necessary to simplify the general layout a good deal in order to make it really practicable for model railway purposes, and the result is shown in Fig. 2. The outstanding feature here, as in the actual station itself, is the non-

platform lines designed specially for "through" traffic. From these, loops branch off to platforms 1, 2, 3, and 4; while the crossovers, being a necessity, are retained. The allocation of traffic may be the same as in the actual station.

From the down line at the west end of the station a line branches off to the locomotive shed, turntable, carriage siding and goods depot, all of which are easily provided from Hornby material.

There are two roads for carriages and three roads for goods, which will provide ample shunting facilities. The Hornby Goods Platform and Movable Crane will be extremely useful here.

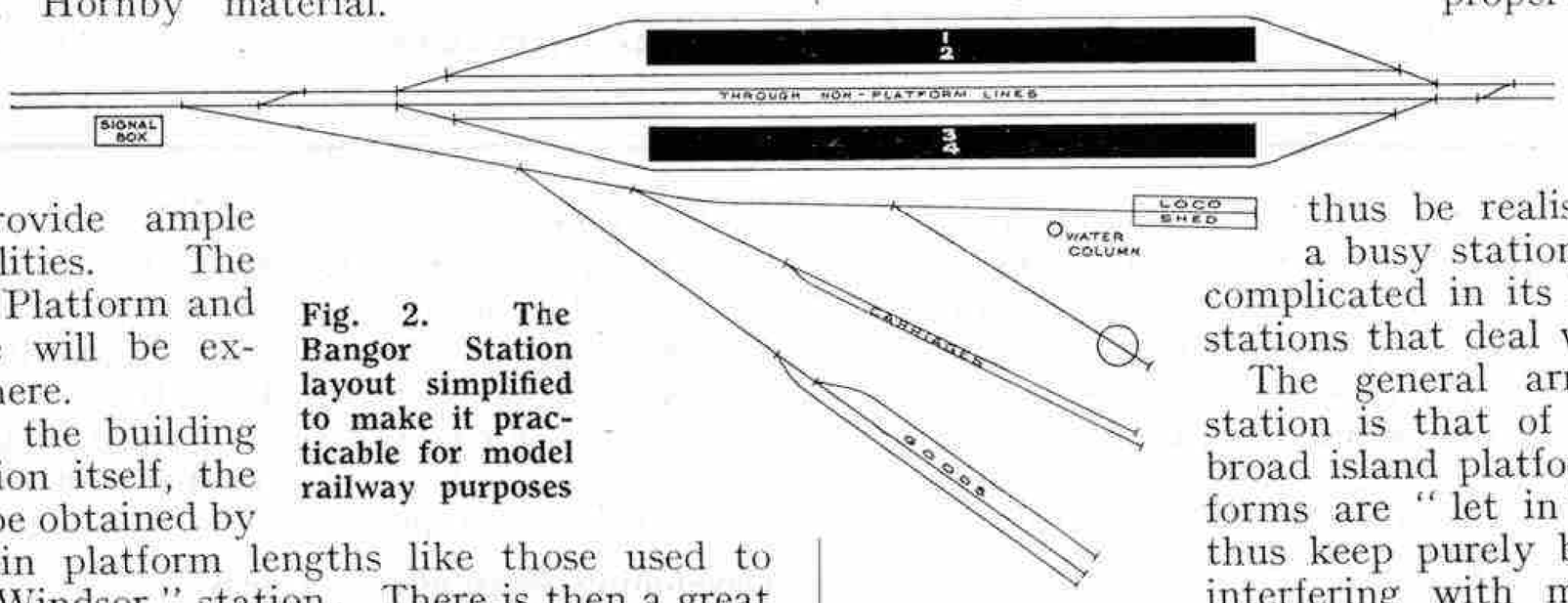
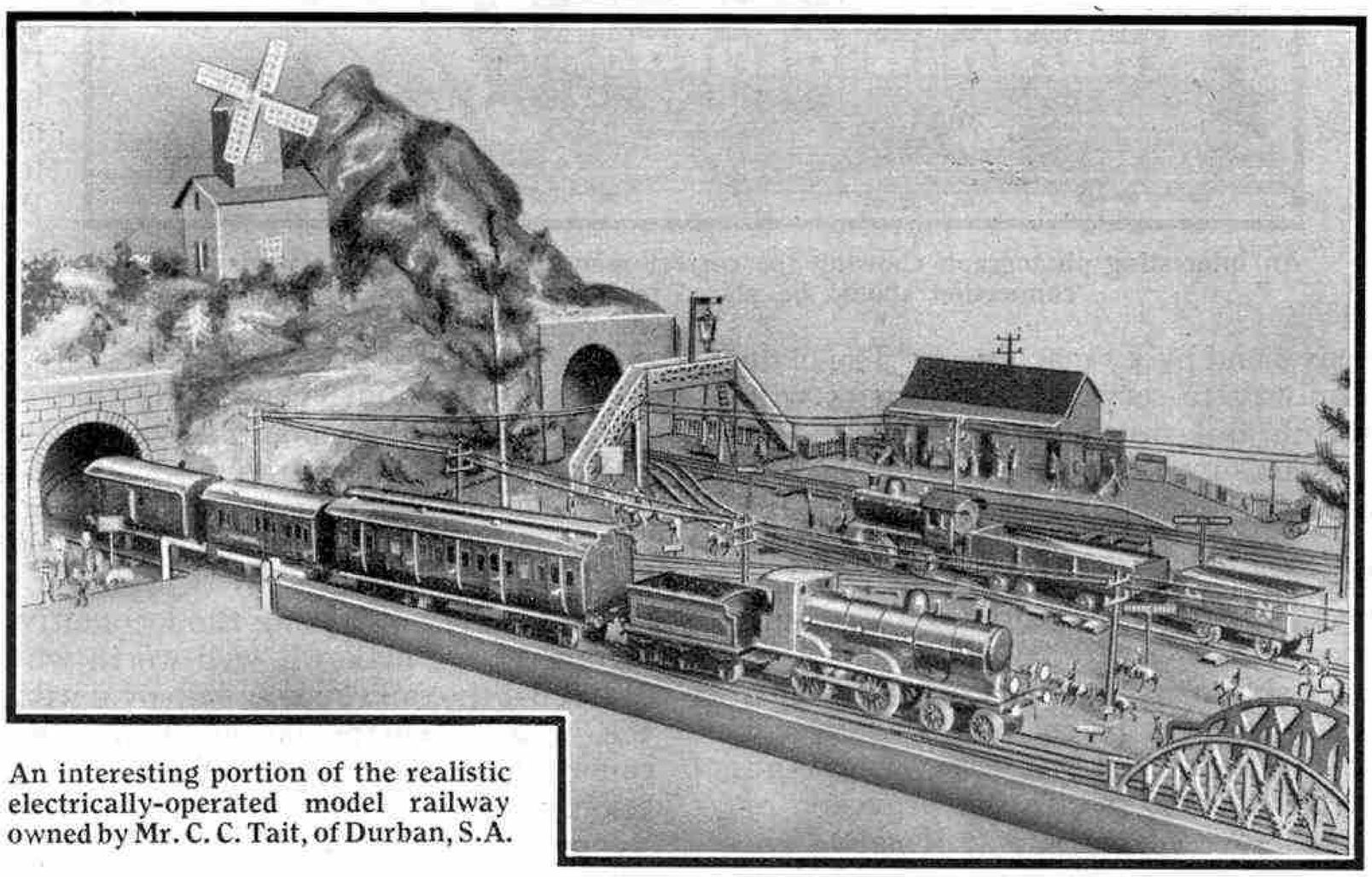


Fig. 2. The Bangor Station layout simplified to make it practicable for model railway purposes

In regard to the building up of the station itself, the best effect will be obtained by the use of plain platform lengths like those used to lengthen the "Windsor" station. There is then a great deal of scope for placing on the platforms, in suitable positions, the various Hornby miniature platform accessories.

One very interesting piece of shunting may be mentioned, as this will be of great assistance in manœuvring trains. Suppose that the station shunting engine is not available and that the main line locomotive has to go to shunt its own coaches. It leaves the shed, tender first, and proceeds out beyond the carriage siding. It is then reversed and run up the carriage siding, where it is hooked on at the rear of its train. It now proceeds down the carriage siding on to the main line and past the signal box. When the last coach has reached the signal box the points are set and the train pushed into, say, platform 2. The engine is then detached and, by one of the many lines, runs round the train and is then ready for its journey. This movement is quite easy to carry out without any undue shunting to and fro.



An interesting portion of the realistic electrically-operated model railway owned by Mr. C. C. Tait, of Durban, S.A.

This model station will be found to provide a great deal of interest, both in building and operation, and it is quite large enough to meet the requirements of all average-sized model railways.

Another station on the L.M.S. system that would lend itself to reproduction in miniature, on a reduced scale, is Rugby. This is, as all "*M.M.*" readers know, on the main line of the L.N.W. section of the L.M.S., at a distance of 82½ miles from Euston. All traffic for Birmingham and the Black Country, and Crewe and the North generally, passes through here.

The main line throws off two branches on its left going northward, one to Leamington and one to Birmingham. To its right we have connections with the Midland Section at Leicester and Market Harboro'; while south of the station we have the junction of the main line proper and the Northampton loop, which has diverged from the main line at Roade. It will thus be realised that Rugby is a busy station, but it is far less complicated in its layout than many stations that deal with less traffic.

The general arrangement of the station is that of a long and fairly broad island platform. "Bay" platforms are "let in" at the end and thus keep purely branch traffic from interfering with main line working. There are two running lines on each side of the island and these are connected at the centre of the platform by a double or "scissors" crossover. It will thus be realised that, since the platform is of great length, two trains can be dealt with at the same platform place at the same time, and either can arrive or depart without obstructing the path of the other. Trains that pass through keep to the outer lines, and so these can pass perhaps two more that are performing station duties at the same time. This can occur at each side of the platform, so it is possible for six trains to be in the station at once, while branch trains can be simultaneously dealt with in the bay platforms.

This type of station would be most convenient on a large layout such as might be owned by a Branch of the H.R.C. It would, of course, take up a good deal of space, but it would be ideal for an exhibition layout in connection with a bazaar or similar function. The ease with which trains can arrive and depart, and also pass through, each without disturbing the other, is a great feature, which would strongly recommend the adoption of this type of station for display purposes.

Next month we shall give further interesting details of Rugby Station, and a plan of the actual layout, together with suggestions for the reproduction of its main features on a miniature scale.

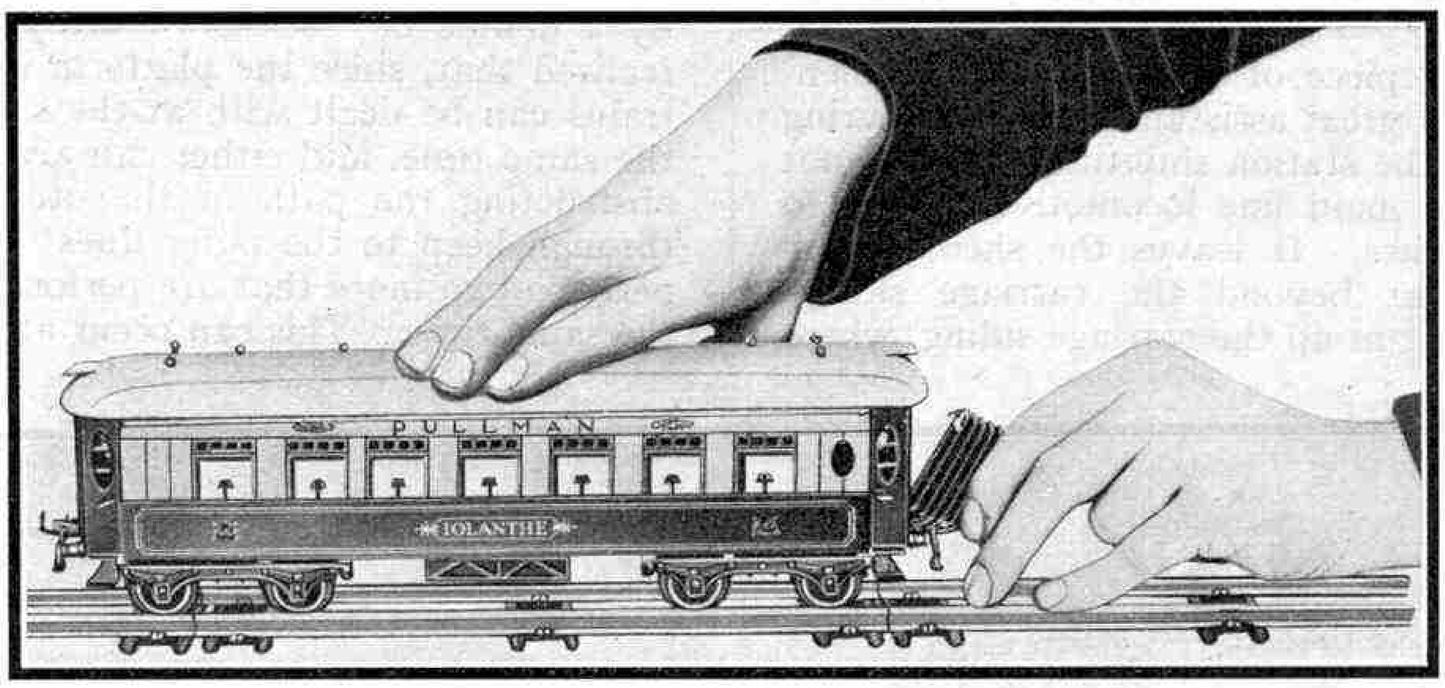
Hornby Railway Company

JUNIOR SECTION

X.—Layouts for Special Purposes

LAST month we dealt with the development of a small layout on real railway-like lines and with the smallest possible expenditure. Model railway development may also be approached from an entirely different standpoint, and that is according to the nature of the traffic that the line is mainly intended to carry.

In order to settle this point the best plan is to imagine the railway to be serving a district of a certain type, and to develop it according to the requirements such a district would actually have. For instance, an industrial area will have a heavy service of goods and mineral trains. If it is to be an iron and steel producing area collieries will be included, and this will necessitate a good service of coal trains and their corresponding returning "empties." If the district is near the sea, then probably shipyards will have to be considered, and particularly in connection with the carriage of heavy raw materials of all kinds, and also of heavy and bulky machinery. The main requirements of a railway to serve such a district will, therefore, be powerful, but not necessarily very fast locomotives, an ample supply of open wagons, and also trolley wagons of large capacity.



An interesting photograph showing the correct manner in which the Hornby corridor connection should be placed on the Pullman coaches

Variety of Wagons Required

If a seaport town is served then the import and export traffic will contribute largely to the train loads. There may be special shipments to be dealt with such as oil fuel in bulk, and for these petrol tank wagons will be required. Imported meat and grain and fruit and other perishable goods will necessitate the provision of refrigerator vans and covered vans, but if cattle are to be imported special cattle trucks must be provided.

On a model railway a train of perhaps six or eight white-painted refrigerator vans and a brake van, hauled by a 4–4–0 express locomotive, is very effective. Another train of this type may be a "milk special," consisting entirely of milk vans or, on the more up-to-date systems, milk tank wagons bringing the milk supply from the inland agricultural areas to the busy seaports. The returning empty wagons or vans of this class of traffic form an important and essential feature in the scheme of working. Of course special trains of vehicles for each of these classes of traffic will not always be possible on a model system; but one or two of the special vans may be attached to convenient passenger trains as is frequently done in actual railway practice.

In regard to the loads of the trains so far dealt with, small pieces of coal can easily be carried in open wagons, and iron and steel and miscellaneous engineering products may be represented by suitable Meccano parts.

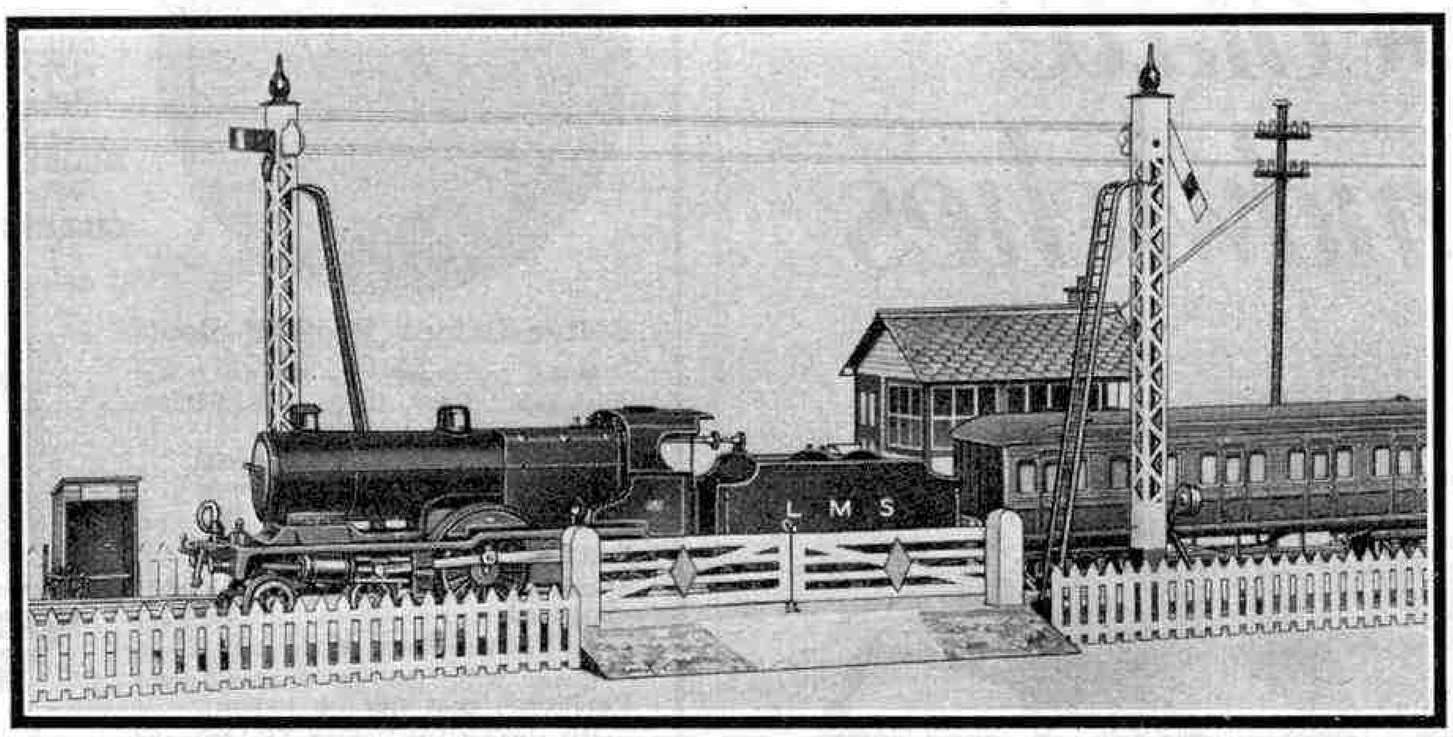
Developing Passenger Services

Passenger working allows many interesting and realistic operations and train movements to be carried out, and therefore the passenger services in our industrial and seaport area must not be forgotten. If there is considerable passenger traffic in and out of the port, then boat trains will figure in the scheme of operation, and for these the latest Pullman stock will be the most suitable. For local services with ordinary coaches small tank locomotives are the most handy. A feature of suburban working that should, if possible, be included in a model railway is the running of the engines round their trains on arrival at the terminus, thus placing themselves ready to work out again with the smallest possible delay. This involves two cross-overs or a loop line with two points, but the resulting advantage of not having the locomotive "trapped" in a terminal road makes it well worth while.

Even if the railway is a plain oval with only one station, the interest will be far greater if the engine can run round the train at its destination. It is indeed most fascinating to run the train in to a stop, uncouple the locomotive, and run it forward till clear of the point blades. The points are then set to allow the locomotive to pass along the loop and rejoin its former line; and subsequently are reset to allow it to back on to the train. Then when the engine is coupled up and rewound, all is ready for the train to go out again. If the train is not to go out again for some time then the coaches may be taken to the sidings and the locomotive freed for another turn of duty or, if its day's work is finished it may proceed to the sheds, where it is recoaled and watered, overhauled and cleaned in readiness for the next day's duties, unless due for its weekly shed-day.

Catering for an Agricultural District

Now by way of a change let us suppose that our line runs through an agricultural district. The chief goods traffic will consist of farm and dairy produce, livestock and a certain amount of general merchandise. The goods wagons usually seen in typical country districts are open wagons that carry general goods, and when covered over with tarpaulin sheets, serving also for carrying hay, etc., in bales; a few covered vans, milk vans and cattle trucks; and white-coloured vans or refrigerators for fruit traffic in the season. For traffic into this district the use of open wagons for the local coal supply and covered wagons for general merchandise will tend to balance the working of these wagons in the other direction, and thus reduce as much as possible "empty wagon mileage."

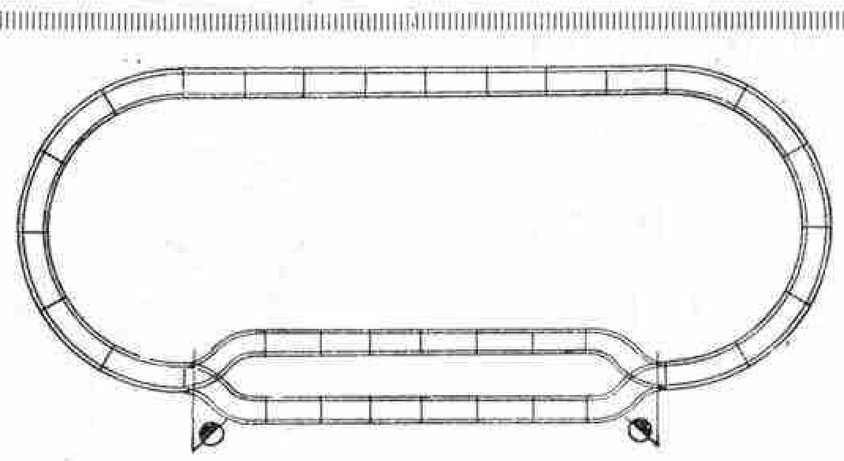


The 4-25 p.m. Hornby Express thundering over a level crossing! It will be noted that a very realistic effect may be obtained by the use of railings and telegraph wires

Fruit and milk vans arriving empty will be attached in ones and twos to passenger trains or, if the traffic is heavy, will form complete trains of their own. Agricultural machinery will, of course, be required, and suitable wagons for carrying this should be provided.

If we decide to devote our model railway mainly to passenger traffic the range of our operations is rather more limited. At the same time, however, plenty of variety may be obtained by the use of a little ingenuity. For instance in addition to our regular passenger services we may decide to run occasional "specials" which will be crowded with passengers and therefore very heavy. This gives us an opportunity for "double-heading." It is surprising how few model railway enthusiasts ever seem to think of trying double heading, but as a matter of fact it is an extremely interesting experiment and it adds valuable variety to the normal operations.

An alternative is to run the train in two parts. This is almost a necessity if the available platform accommodation is very short. It looks extremely unrailwaylike to have a very long train projecting far behind the platform limit and it is much more satisfactory to arrange matters so that the length of the train is proportionate to that of the platform. This, of course, is very frequently done on actual railways at times of holiday pressure.



Suggested Layouts (No. 4)

2′ Radius (as illustrated): 12 Curves, 20 Straights, Parallel Points (Right), Parallel Points (Left).

1′ Radius: 6 Curves, 8 Straights, Parallel Points (Right), Parallel Points (Left).

Deciding the General Plan of the System

With a permanent layout in a room set aside for the purpose there is, of course, practically no limit to the scope of operations. At the same time an enormous amount of interest and entertainment can be obtained from a "portable" railway if a suitable plan is chosen.

The type of service that it is desired to run will govern to some extent the general plan of the system. For an industrial area such as we have described the most suitable plan is probably one of the non-continuous "there and back" type. In such a layout trains that depart from the terminus become "arrivals" a few minutes later after a run around the main line, in the course of which they may serve one or two stations according to the space available. One goods and marshalling yard as large as possible should be provided and much interest is added if a dock or quay can be incorporated in the plan.

For the agricultural and residential area schemes the best plan is the continuous line with one or more country-type stations and goods yards. If space allows there is, of course, every advantage in adding a large town station such as the one described in the "*M.M.*" for December 1928.

One point that should always be borne in mind is that a much greater amount of fun may be obtained from a model railway with several operators than is possible for one or even two working alone. If the layout is at all extensive and elaborate three or four operators are necessary, otherwise the proceedings will become a wild scramble from place to place to pull over points and to attend to various other matters. Unless an orderly method of working is possible the whole point of the layout is lost and, of course, anything in the nature of timetable working is quite out of the question.

It is possible that some readers may think schemes such as we have outlined in this article are not worth the trouble they involve. This is a great mistake, however, for there is nothing more fascinating than deciding that our railway shall serve a district of a particular type, and then doing our utmost to make it fulfil the various tasks involved on railway-like lines. The best advice we can give to H.R.C. members who doubt this is—"Try it and see!"

If layouts on these lines are constructed by any members of the H.R.C. we shall be pleased to have a description of them, together with any photographs. If members have any difficulty with regard to the working of their systems, we will do our best to help them if they will let us know exactly where their trouble lies.

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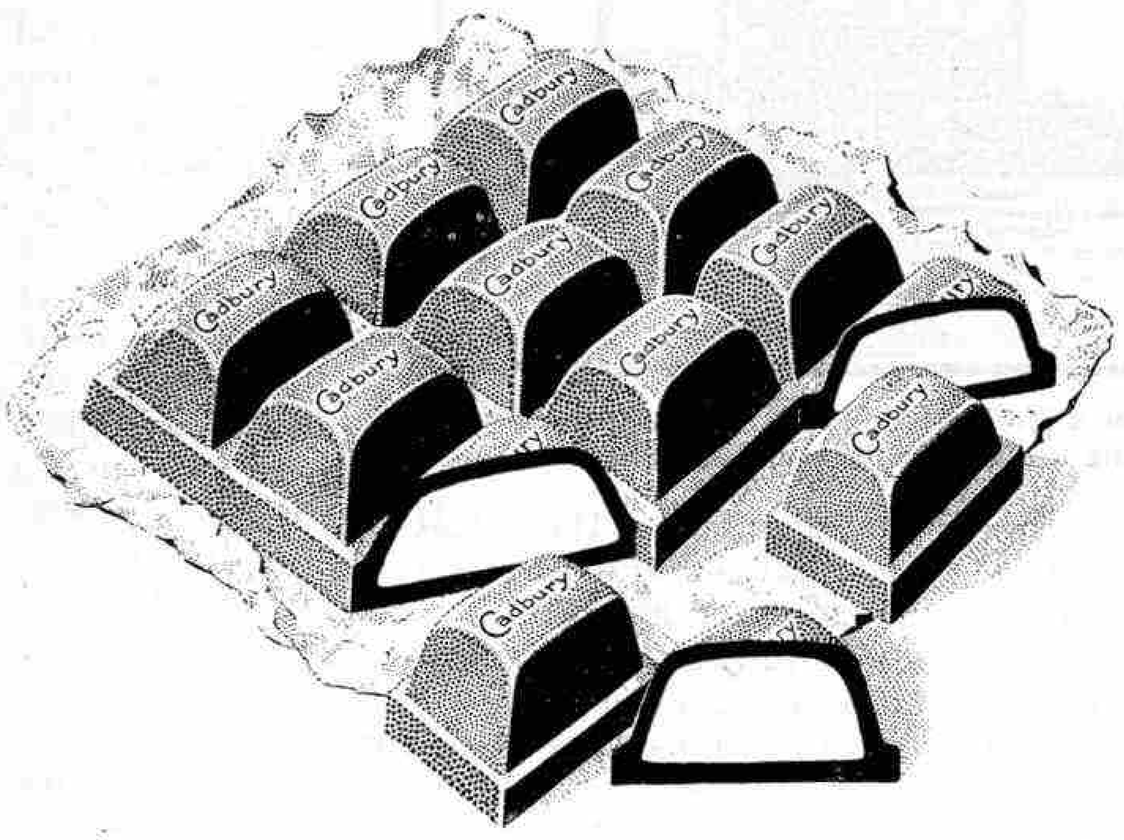

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H.R.C. COMPETITION PAGE

A Novel Route-Finding Contest

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

TO railway travellers the choice of the best route whereby they may reach any particular place is an important matter. In many cases, of course, there is only one possible way to go, but very often there is a choice of two routes, at any rate as far as some parts of the journey are concerned. This is the result of the splendid network of lines covering the country, resulting from the acute competition of former days. There are even instances in which there is a choice of two routes to the same place on the same railway system. Such cases as this are, of course, much more numerous since the grouping system came into operation, but even in pre-grouping days there were examples of alternative routes on the same company's line. This was due to the fact that the great railway systems were built up by the amalgamation of a large number of small railways which, in their original state of independence, were often engaged in the fiercest competition.

The choice between two different routes for a particular journey is based nowadays mainly on the question of time. Formerly differences in fare formed an important consideration, but now fares are generally uniform, based as a rule on the shortest mileage between any two places. This is rather hard on a system that may happen to own a much longer route than a rival line to a particular town. A notable instance of this occurs in regard to Reading, to which the shortest route from London, 36 miles, is that of the Great Western Railway. As against this we have the former London and South Western route of 43 miles, and the still longer one of $68\frac{3}{4}$ miles of the old South Eastern and Chatham line, via Redhill. Both these last-mentioned routes now belong of course to the Southern Railway under the grouping scheme.

Even when we are not proposing to make an actual journey it is extremely interesting to travel in imagination to various places, picking out the best or most convenient routes in each case. It is interesting to know that George Edmonson, brother of Thomas Edmonson, the inventor of railway tickets, introduced the study of "*Bradshaw*" into his famous school at Tulketh Hall. He used to set his pupils to work out problems in cross routes and connections as an alternative and, in his opinion, better mental exercise than Latin or Greek. In order to introduce H.R.C. members to this fascinating pastime we announce this month a Route-finding Competition.

Competitors are required to state the most convenient route to be taken by a passenger travelling from London to each of the stations given below, and also to mention the chief engineering features along each route.

Gilderso.ne	Abbey Town	Ilkley
Yoker	Upwey	Corpach
Chwilog	Southwell	Stratford-on-Avon
Braunton	How Mill	Irton Road

In the panel in the centre of this page appears a list of 12 stations situated in various parts of the country and on various railways. The problem is to find out the most suitable route for an intending passenger from London to each of the places named.

Each competitor is required to state in his entry the following items:—1. The most convenient route, mentioning the lines travelled over and the stations at which a change must be made. 2. The most notable railway features along the route selected. By railway features is meant tunnels, bridges, viaducts, cuttings, etc., which are actually on the line, features of interest visible from the carriage, but not actually on the line, being ignored.

Readers will find this an interesting competition needing some patience to answer correctly.

The competition will be divided into two sections—Home and Overseas. Prizes of Hornby Goods (or Meccano if preferred) to the value of £1 1s., 15/–, 10/6, and 5/– respectively will be awarded to the four competitors in each section who submit the most complete lists. In addition a number of consolation prizes will be awarded to entries which, although good, do not reach prize-winning standard.

Envelopes containing entries in this competition should be marked "Route-Finding Contest" in the top left-hand corner, and should be posted to reach Headquarters at Binns Road, Old Swan, Liverpool, on or before 31st October. The closing date for the Overseas Section is 31st January, 1930.

My Favourite Railway Station

During their holiday travels many "H.R.C." members will have become acquainted with railway stations previously unknown to them. For various reasons some particular "new" station may have attracted them more than any they were already acquainted with, and in the hope that members will take us into their confidence we have selected as the subject of the third "H.R.C." Essay Contest, "MY FAVOURITE RAILWAY STATION AND WHY I PREFER IT." Essays must not exceed 500 words in length.

The contest will be divided into two sections, A for those of 16 and over, and B for those under 16. Prizes of Hornby Railway material (or Meccano if preferred) to the value of 15/–, 10/6, 5/– and 2/6 respectively will be awarded for the four most helpful essays in order of merit in each of the two sections. It should be noted that there is no Overseas Section for this competition.

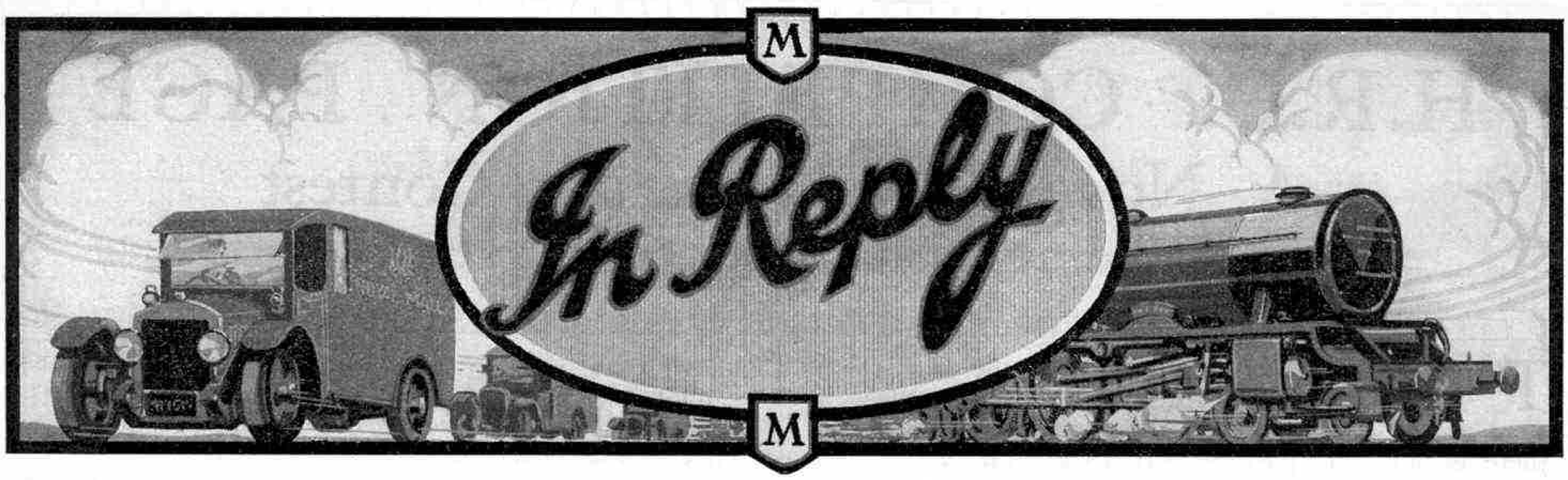
The competitor's name, address, age and H.R.C. number must be clearly written on the back of every sheet submitted, and envelopes should be marked "Third Railway Essay" in the top left-hand corner. Closing date 31st October.

H.R.C. Competition Results—Home

June "Locomotive Problem, Link Competition."—First: R. C. STORRAR (8625), Fife, Scotland. Second: B. H. BRAY (8259), Walton-on-Thames. Third: P. HARRAD (9069), Manchester. Fourth: J. B. FROST (3542), Newton-le-Willows. Consolation Prizes: A. H. STOODLEY (6872), Trowbridge; R. N. CROOKS (2399), Leicester; H. AITKEN (2602), Solihull, Warwickshire; R. GAUKROGER (4174), Cheltenham.

July "An Interesting Signalling Competition."—First: C. F. WELLS (9320), London, S.E.22. Second: R. LUCAS (9439), New Barnett, Herts. Third: G. C. L. ALEXANDER (1117), Neath. Fourth: J. T. CUTBUSH (9095), Belvedere, Kent. Consolation Prizes: J. E. JONES (2480), Portland; A. E. MURRAY (4524), Wigan; G. C. RICHMOND (136), Chester; W. H. WATTS (618), New Barnett, Herts.; R. W. MACKLEY (8762), Manchester.

August "Fourth Photographic Competition."—First: JOHN ROGERS (2259), Kent. Second: D. L. WILLIAMS (3886), London, N.W.3.



Suggested Hornby Train Improvements

SHUNTING HUMP.—We do not think the addition of a Hornby shunting hump would be practicable. A hump is easily made by banking up the track to a suitable height, as described on page 644 of the August "*M.M.*" (*Reply to D. L. Cole, Dover*).

RAILS WITH FIVE SLEEPERS.—The present Hornby rails appear to be giving very general satisfaction, and we do not think more sleepers are necessary. (*Reply to D. Ecclestone, Bungay, Sussex*).

YELLOW DISTANT SIGNALS.—So far we have had very few requests for yellow distant signals, but when these become general on British railways we shall probably introduce them. (*Reply to J. Gilchrist, Hemel Hempstead, Herts.*).

OPENING DOORS FOR SIGNAL CABINS.—Opening doors to Hornby Signal Cabins would not serve any useful purpose, but would be purely ornamental. At the same time they would increase the cost of this accessory, and for this reason we do not think your idea can be considered. (*Reply to C. Watson, Magazon, Bombay*).

A TENDER FITTED WITH MOTOR.—This is quite an interesting idea, but scarcely feasible. We do not think such an innovation would be popular. (*Reply to J. A. Gower, Edinburgh*).

ELECTRIC LIGHTS IN PULLMAN CARS.—The fitting of electric lights in Hornby Pullman Cars would add to the cost of production, and it is our aim to keep the price of these splendid models as low as possible. As a matter of fact we have had no demand for the introduction of such lights. (*Reply to C. Aldridge, Victoria, Australia*).

MINIATURE FOG SIGNALS.—We have had several requests for the introduction of a system of fog signals. We have given the matter careful consideration, however, and have decided that such a system is not practicable on an ordinary model railway. It would be costly and would serve no real purpose. (*Reply to T. D. Bleakley, Leigh, Lancs.*).

TWO-SPEED GEAR FOR LOCOMOTIVES.—The idea of a two-speed gear is very interesting, but we are afraid it is impracticable. The construction of a "0" gauge locomotive with such a gear would involve many complications and would make the locomotive very costly. (*Reply to P. Ericson, Durham*).

VIADUCT WITH LEVEL APPROACHES.—Your suggestion that a viaduct should be made with its approaches level instead of inclined is interesting and will be considered. We quite agree that such a viaduct would more closely resemble those used in actual railway practice. (*Reply to T. Shaw, Penrith*).

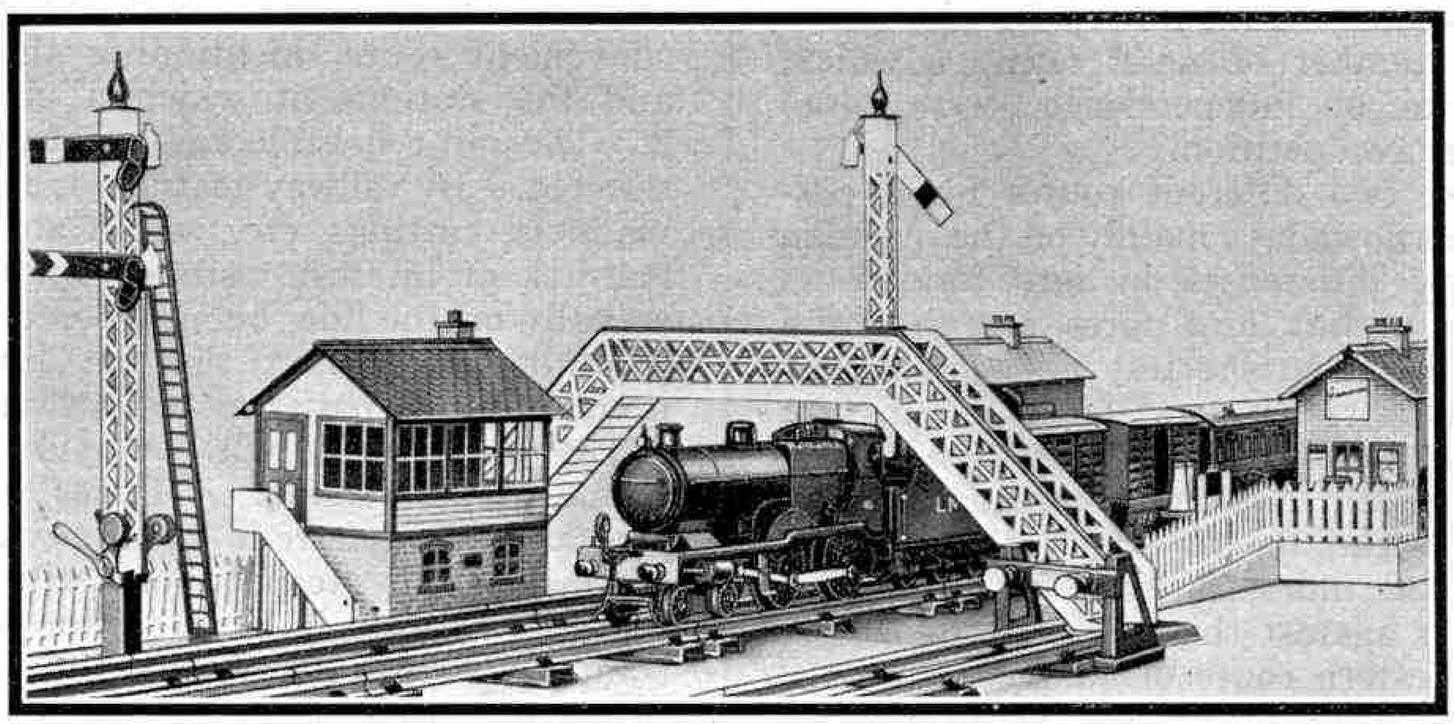
SPRING BUFFERS.—We have previously stated on this page that we do not think that spring buffers would serve any useful purpose. Not only so, but we believe that they would introduce undesirable complications. In any case the fitting of such buffers to our rolling stock would involve an appreciable increase in price. (*Reply to T. Cox, Middlesbrough*).

LONGER STRAIGHT RAILS.—Yours is the first suggestion we have had that our straight rails should be made 12 inches in length instead of the existing 10½ inches. We do not quite see what practical advantage such longer rails would have, but we will give the idea careful consideration. (*Reply to F. Charlesworth, Bexhill-on-Sea*).

OIL TANKS FITTED TO TENDERS.—We understand why you would like us to introduce tenders fitted with oil tanks, but we are afraid that your suggestion is impracticable. Locomotives fitted for burning oil were very useful during the last coal strike, but they are not in the least likely to come into common use. (*Reply to J. W. Taylor, Dover*).

VACUUM BRAKE PIPES.—You will be interested to learn that the latest models of Hornby locomotives will be fitted with vacuum brake pipes. (*Reply to J. E. Burton, Widnes*).

IRISH ROLLING STOCK.—There does not appear to be any demand for Hornby rolling stock enamelled in the colours of Irish railways, and therefore we cannot consider your suggestion at present. If such a demand should arise we should certainly give it careful consideration. (*Reply to C. W. Barnes, Manchester*).



The 7.30 Hornby "local" unloading milk at Binnswan Station

MILK TANK WAGON.—We now manufacture a milk tank wagon of the type you suggest, and it may be obtained from any Hornby Train dealer, price 5/6. We think you will agree that this splendid model adds considerable realism to any layout. (*Reply to J. Edwards, Chelsea*).

DOUBLE JUNCTION.—A double junction is certainly useful in the construction of elaborate layouts, and it is quite possible that we shall introduce such an accessory before very long. (*Reply to B. Beresford, Burton-on-Trent*).

SHEEP TRUCK.—Your suggestion for a sheep truck is quite novel, but we do not think we can consider it as such trucks are not in general use. (*Reply to J. B. Milson, Tasmania*).

RAIL INSULATED FOR TRACK CIRCUIT.—A rail ready insulated for track circuit and other electrical purposes would probably make an attractive addition to the Hornby System. We will give your suggestion careful consideration as soon as opportunity arises. (*Reply to R. Heaton, Stafford*).

OPERATING TWO ELECTRIC LOCOMOTIVES.—As you point out, it is very difficult to control, independently of each other, two electric locomotives running on the same layout. It is possible, of course, to obtain the desired result by dividing the track into two sections, each section being insulated from the other and provided with a separate resistance controller. An alternative method is the provision of a resistance on each locomotive, but here the old difficulty again arises, of the possibility of short circuits or an unequal supply of current to the locomotive. (*Reply to J. Hicks, Gosport*).

DOUBLE TRACK BUFFER STOP.—A double track buffer stop does not appear to be necessary as two buffer stops of the present type will serve exactly the same purpose and look equally effective. (*Reply to F. Davies, London*).

ELECTRICAL DOUBLE TRACK.—The introduction of electrical double track is now under consideration, and as soon as a decision is reached an announcement will be made in the "*M.M.*" (*Reply to T. Alcherley, Bury*).

THREE-QUARTER RAIL.—We do not see that a three-quarter rail would have any advantages over a combination of a half-rail and a quarter-rail. If you can suggest any such advantage we should be glad to know it. (*Reply to E. P. Starlow, Canada*).

CHIMNEYS FOR No. 2 LOCOMOTIVES.—We think the new series of No. 2 Special Passenger Locomotives will meet your requirements in regard to chimneys. (*Reply to F. E. Toner, London*).

BREAKDOWN CRANE WITH CLOCKWORK MECHANISM.—This is quite an interesting suggestion, but the great drawback to it is the extra cost. Such a crane fitted with its own propelling mechanism would inevitably be much more costly than the present type, and in spite of its undoubted interest would probably not be popular for that reason. (*Reply to T. Broughton, Bolton*).

ELECTRICAL LEVEL CROSSING.—A crossing of this type would certainly be a very useful accessory, and we shall consider its introduction when opportunity arises. (*Reply to F. Jones, Cardiff*).

CORRIDOR TENDER.—The corridor tender of the "*Flying Scotsman*" is one of many features that are of great interest on real railways, but are not suitable for reproduction on a small scale. A tender of this type would be much more costly to produce than one of the normal type, and would not be worth the extra cost. (*Reply to W. Green, New Zealand*).

SEATS ON PULLMAN CARS.—We do not think that the advantages to be obtained from the addition of seats and tables in the Pullman and restaurant cars would justify the increased cost. (*Reply to W. Abbott, Withernsea*).

No. 2 LUGGAGE VAN.—Your suggestion for an eight-wheeled combined luggage and guard's van for use with Hornby Pullman trains will be given careful consideration when we re-design our existing rolling stock. (*Reply to W. Davies, Birkenhead*).

THREE-LINK COUPLINGS.—Your suggestion for the introduction of three-link couplings is quite interesting, but the chief objection to their introduction is that they would tend to make wagons "buffer-lock" on sharp curves. Otherwise they would be a good addition and would certainly make wagons look more realistic. (*Reply to H. G. Ackland, Devon*).

CATTLE DOCK.—The introduction of a cattle dock into the Hornby System would no doubt be a popular addition and as a matter of fact the idea is now under consideration. We are afraid that nothing can be done in this direction for some time yet, however. (*Reply to S. Williams, Ireland*).

COAL OFFICE.—Your suggestion for a coal office is extremely interesting and will be borne in mind. We shall probably introduce several new accessories of this type at a later stage. (*Reply o W. Z. Cook, Devon*).

The 1929-30 Hornby Book of Trains

Order your copy now

Ready:
1st November

Biggest and Best Ever Issued

The 1929–30 Hornby Book of Trains will be the biggest and best ever issued. It will tell the wonderful story of our railways—how a locomotive is driven—how the driver and fireman carry out their duties—how the permanent way is kept in repair—how mail trains work by day and night—how four British expresses have achieved world wide fame.

It will also contain full details and many beautiful illustrations in full colour of the new "better-than-ever" Hornby Trains, together with descriptions and prices of all items included in the Hornby System.

How to Order the Book

The book may be ordered from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Old Swan, Liverpool, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written. There is no reduction if more than one copy is ordered.

Orders will not be acknowledged. They will be dealt with in strict rotation as soon as the book is published.

We hope to have the 1929-30 Hornby Book of Trains ready for delivery on the 1st November.

Orders from Overseas

There is a special edition of the Hornby Book of Trains for Overseas, and copies have already been despatched to our agents to fill orders received. The price Overseas is 6d. post free (Canada 10 cents or 12 cents post free). Readers in Australia, New Zealand, South Africa or Canada who require copies should address their orders to our agencies as detailed below.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Old Swan, Liverpool, sending a remittance for 6d. with their order.

AUSTRALIA.—E. G. Page & Co., 52, Clarence Street, Sydney. (P.O. Box 1832K).

NEW ZEALAND.—Models, Ltd., Kingston Street, Auckland. (P.O. Box 129).

SOUTH AFRICA.—Arthur E. Harris, 142, Market Street, Johannesburg. (P.O. Box 1199).

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

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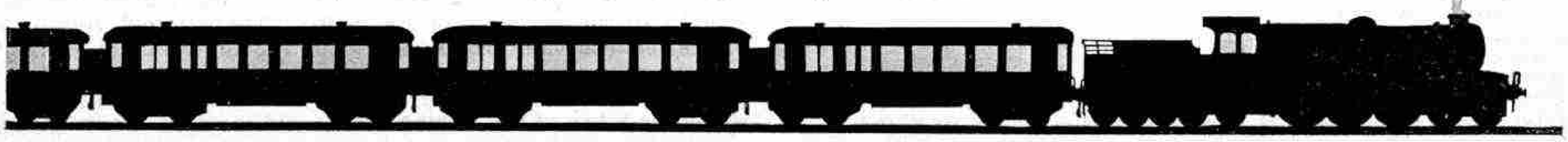


Results of Meccano Model-Building Contests

By Frank Hornby

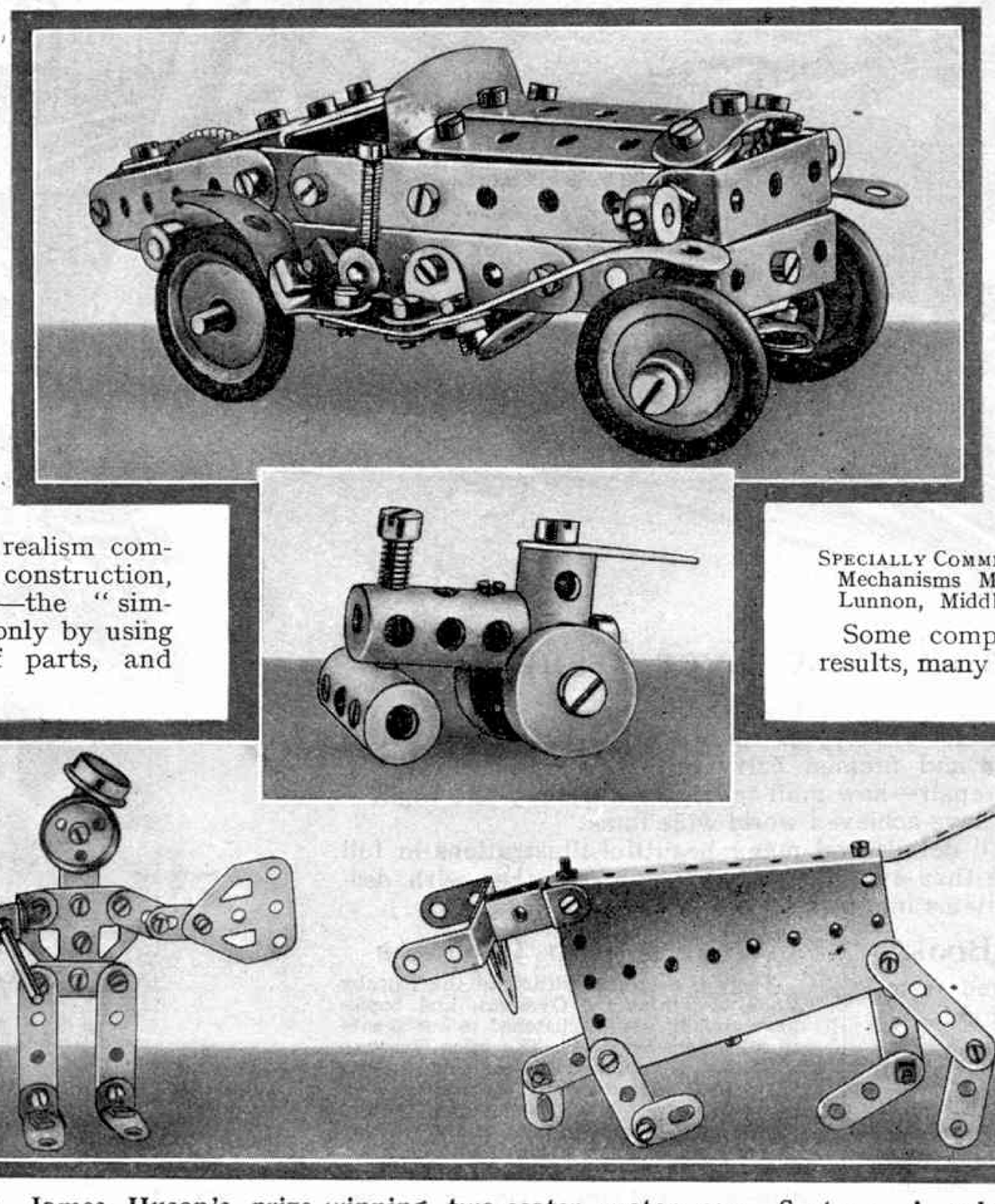
"Simplicity" Competition, Home Sections

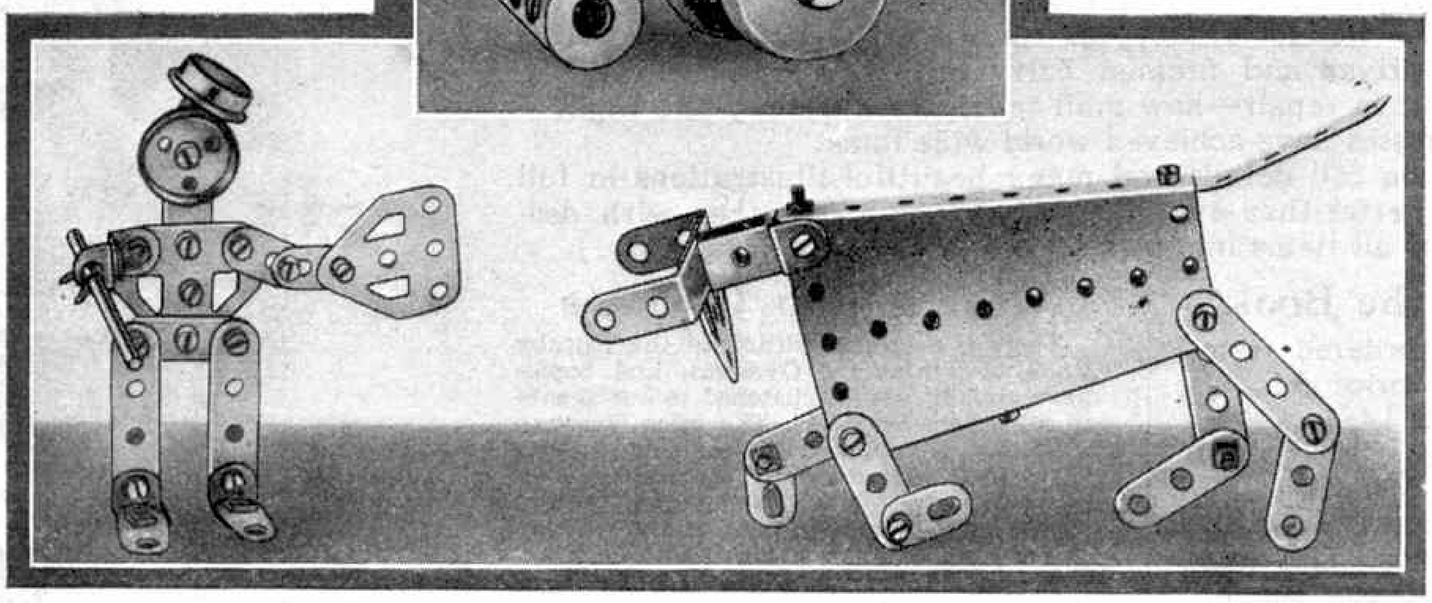
THE "Simplicity" Competition has proved to be one of the most popular contests yet announced in these pages. Although comparatively few of the models entered represented objects not previously reproduced in some form in Meccano, sufficient compensation for lack of originality of subject was afforded by the many novel and cleverly thought out uses to which the various Meccano parts were put.

It will be remembered that no stipulation was made in the competition announcement in regard to the type of models to be submitted, the condition of the contest being that the prizes would be allotted to those competitors who submitted the most realistic, ingenious, and soundly constructed models using as few parts as possible.

Such a task perhaps seems a very simple matter, but although it is really quite easy to bolt together a few Strips and a Pulley or two and call the finished contrivance an aeroplane or a ship or anything else, such a model could have but little chance of winning a prize! The main thing looked for when judging the entries was realism combined with practical methods of construction, and—most important of all—the "simplicity" that can be obtained only by using the least possible number of parts, and making the most of each piece used.

The task of the judges was one of extreme difficulty owing to the fact that many models appeared to be of equal merit. Indeed, it seemed almost impossible to distribute the prizes in such a manner as to treat all competitors fairly. It was decided at last, however, to waive the original plan of awarding First, Second and Third Prizes and instead to provide a number of Special Prizes of a slightly larger total value than those originally offered. By this means it was possible to award a larger number of prizes, which were finally allotted as follows:—





Top: James Huson's prize-winning two-seater motor car. Centre: A splendid "Simplicity" effort by C. Banthorpe. Bottom: The "Meccano Matador," an amusing entry by Peter Harris

Section A (for Competitors over 14 years of age)

SPECIAL PRIZE, consisting of Meccano products to value 30/-: Cyril Walker, Woodborough Road, Nottingham. TWO PRIZES, each consisting of Meccano products to value 21/-: Donald V. Learoyd, Crossgates, Leeds; D. Bell-Scott, Edgbaston, Birmingham. FOUR PRIZES, each consisting of Meccano products to value 15/-: James Huson, Upper Norwood, London, S.E.19; K. C. White, London, S.W.8; James E. Shapley, Withycombe, Exmouth; F. A. D. Sadler, Four Oaks, Warwickshire.

SIX PRIZES, each consisting of Meccano products to value 10/6: James Wilson, Aberdeen; D. P. Edkins, Accrington; C. E. Wrayford, Teigngrace, Near Newton Abbot; Leslie Hope, Weston-super-Mare; A. E. Wood, Rotherham; R. F. Newton, Clapton, London, E.5.

TWELVE PRIZES, each consisting of Meccano products to value 5/-: L. Dadson, Catford, S.E.6; W. J. Burke, Cork; Geoffrey Stapleton, Stamford Hill, N.16; R. C. Randall, St. Albans; H. E. Jones, Highams Park, E.4; Frank Mills, Kearsley, near Bolton; A. J. Stevens, Upper Hale, Farnham; R. Gilbert, London, N.8; Philip J. Wright, Cotham, Bristol; Dennis Sandiforth, Folkestone; D. Hirst, Wakefield; H. Rice, Westcott, near Dorking.

SPECIALLY COMMENDED (Certificate of Merit and Standard Mechanisms Manual): L. Lacey, St. Leonards-on-Sea; J. Brodie, London, E.7; A. Cole, Choppington; Miss Karen Harris, London, S.W.1.

Section B (for Competitors under 14 years of age)

SPECIAL PRIZE, consisting of Meccano products to value 30/-: C. Banthorpe, East Ham, E.6. TWO PRIZES, each of Meccano products to value 15/-: P. Harris, Felixstowe; D. F. Forbes, Leith. TWO PRIZES, each of Meccano products to value 7/6: E. Paul, Otley, Yorks.; R. I. Hood, Cromer, Norfolk.

SIX PRIZES, each consisting of Meccano products to value 5/-: K. F. Scotney, Andover; A. W. Marshall, Cromer, Norfolk; P. Mytton, Gromsport; A. Nash, Wallington; Ian R. Griffiths, London, E.12; B. G. Shearing, Southampton.

TWELVE PRIZES, each consisting of a Meccano Instructions Manual (2 vols.): E. H. Bradshaw, Sheffield; G. F. Gutteridge, Southampton; W. N. Carnaghan, Glasgow; C. Storr, Bath; D. H. Brooks, St. Andrews, Bristol; K. Bewick, Epsom; R. Pratt, Stony Stratford, Bucks.; R. C. Chamberlain, Tarporley; A. Dobson, Nottingham; B. Pickering, Brandon; G. Riley, Wallasey; S. Hewitt, Manchester.

SPECIALLY COMMENDED (Certificate of Merit and Standard Mechanisms Manual): E. Hall, Manchester; R. Lunnon, Middlesbrough; R. Iniff, Carnforth.

Some competitors secured really amazing results, many of the models surprising even our own experienced model builders. For instance, using only a few parts one bright boy (B. G. Shearing) constructed a most life-like representation of "Ben Hur" standing in his chariot and driving furiously his team of four horses. The effect obtained was excellent and carried one irresistibly back to the Coliseum and the days of Roman supremacy.

All branches of mechanical engineering were represented, and of course, such subjects as motor cars, cycles, aeroplanes, and locomotives were as usual warm favourites with competitors. Some boys, on the other hand, chose highly amusing subjects, an excellent example being the "Matador" shown herewith. The funny side is not perhaps so apparent to the matador himself, for he looks as though he would like to escape as quickly as possible from the charge of the furious Meccano Bull!

C. Walker, who carried off the largest prize in Section "A," submitted the two fine models shown. In addition to having designed both entries on very neat lines the builder has kept strictly to the principle of simplicity. The external appearance of the removal van certainly gives one the impression of reliability and the power to "get there," and close inspection of the photograph will show a wealth of realistic detail. In particular, notice should be taken of the locking handle and screw on the smoke-box

door of the boiler, the swivelling front axle, and the neat manner in which a representation of the engine has been carried out.

The appearance of the traction engine reflects great credit on the builder. It is indeed a fine example of miniature modelling, but I believe that, by one or two slight modifications, it may be improved even further. When it was re-constructed by the competition judges, the chimney was made shorter and moved a little further forward.

This was carried out by lengthening the canopy by means of a 1½" Strip bolted across the front end and connected to the side Strips of the canopy by Flat Brackets. This allowed the chimney to pass through a hole nearer the front end of the boiler. The boss of a Crank bolted to the upper surface of the centre Strip of the canopy served as a portion of the chimney and a 1" Rod passed through and secured in the boss, carried at its lower end (below the canopy) a Collar to which a second Collar representing a dynamo was bolted, in the same manner as shown in Walker's original. The chimney was completed by securing a further Collar on the upper end of the Rod.

Of the two models entered by Walker I prefer the removal van principally because it is devoid of scrappiness, a feature which is unfortunately often present in miniature models of this type.

Leaving for a moment the subject of heavy traffic vehicles we will turn to the model of a light weight two-seater sports car entered by James Huson.

Considering its minuteness it must be admitted that Huson has constructed a most pleasing model and has made excellent use of the few parts incorporated. This miniature car is a real working model, the motive power being derived from a length of elastic, arranged in a somewhat similar manner to the familiar method adopted in the case of toy aeroplanes. The elastic is wound up by turning the rear wheels, and when fully wound provides sufficient power to drive the car at good speed for three or four yards before it is necessary to re-wind the elastic!

Perhaps the most ingenious feature of Huson's model, however, is the excellent representation of Ackermann steering gear that he has endeavoured to reproduce, using only a very limited number of parts. The steering wheel consists of a ¾" Contrate Wheel secured on a 1½" Axle Rod that forms the steering column. The front wheels are mounted on Bolts journalled in Angle Brackets that are secured to Flat Brackets, the other ends of which are bolted pivotally to a transverse 1½" Strip. This Strip is connected loosely at its centre hole to the end of a Crank on the bottom of the steering column. A slight turning movement applied to the steering wheel results in the Crank applying a sideways sliding movement to the 1½" Strip, which in turn directs the front wheels either to the right or the left according to the direction in which the steering wheel is moved. It has not been possible, unfortunately, to show an underneath view of the car, otherwise readers would be able better to realise the remarkable ingenuity of Huson's model.

While on the subject of motor vehicles mention must be made of K. C. White's very amusing entry illustrated on this page. For sheer simplicity combined with a truly realistic effect, it would be hard to excel the miniature "dirt track" motor cycle and rider entered by this competitor. With the aid of a few Angle Brackets, White has given the rider a most genuine-looking posture, whilst the crash helmet represented by a Meccano Worm adds the final touch to an altogether praiseworthy effort. It is evident that White has a most intimate knowledge of the adaptations of Meccano parts and he is to be congratulated on securing such a life-like effect. The appearance of speed suggested is so real that one cannot help but think the crash helmet will be put to practical use before the intrepid motorist has travelled many more yards on his "super-speed" machine!

Another motor cycle model, that entered by I. R. Griffiths, is worthy of special notice. Although not so original in conception, perhaps, as the dirt-track model, its proportions are excellent.

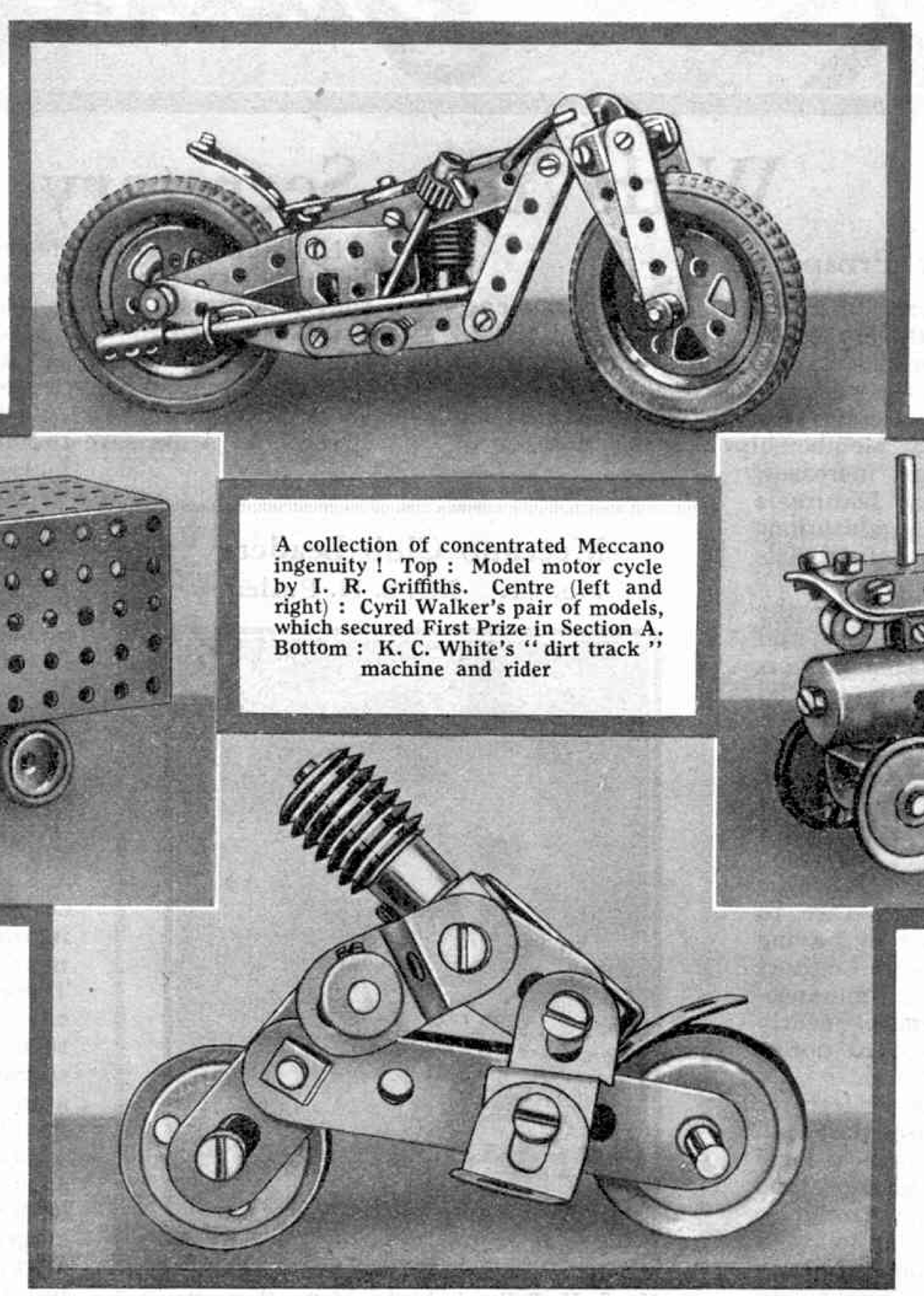
The steam roller included in one of the accompanying illustrations might well be described as the acme of simplicity. It was constructed by Cyril Banthorpe of London. I think all readers will agree that the effect of realism obtained with so few parts is literally amazing, and in such a contest as the "Simplicity" it is not surprising that this model secured a special prize.

Couplings are the main "theme" in Banthorpe's model and by clever arrangement he has made them serve the triple purpose of cab, boiler, and road roller. With the addition of a couple of ½" loose Pulleys, a Flat Bracket, and one or two nuts and bolts, he has completed a model that does him great credit.

The unique entry sent in by D. Edkins serves to show the extent to which a keen Meccano boy can go when he is all out to win! It is a model of a diver's suit!

The body of the suit is formed from five 1" Pulley Wheels, placed face to face on a short Rod. A Coupling secured to the lower end of the Rod by its central transverse hole carries in its end transverse holes Threaded Pins, to which further Couplings are secured to form the "legs" of the suit. The "shoulders" are a Coupling secured at its centre to the projecting centre Rod of the body. The "arms" each comprise a Coupling supported on a ¾" Bolt passed through its end transverse hole and screwed into one end of the Coupling forming the shoulders. Centre Forks held in the lower end of the "arms" provide a most realistic pair of "hands," while an inverted Contrate secured to the upper end of the central Rod forms the head.

A. E. Wood secured his prize in Section "A" with a miniature railway breakdown crane. The length of the wheel-base is 3½" and the over-all length 5½", the width being 1½" only. Yet in spite of its small size the model is fitted with a realistic boiler, formed from a Sleeve Piece, and will lift and deposit loads.



A collection of concentrated Meccano ingenuity! Top: Model motor cycle by I. R. Griffiths. Centre (left and right): Cyril Walker's pair of models, which secured First Prize in Section A. Bottom: K. C. White's "dirt track" machine and rider

OBJECTS of the GUILD

To make every boy's life brighter and happier.

To foster clean-mindedness, truthfulness, ambition and initiative in boys.

To encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.

The Meccano Guild

With the Secretary

Bright Prospects

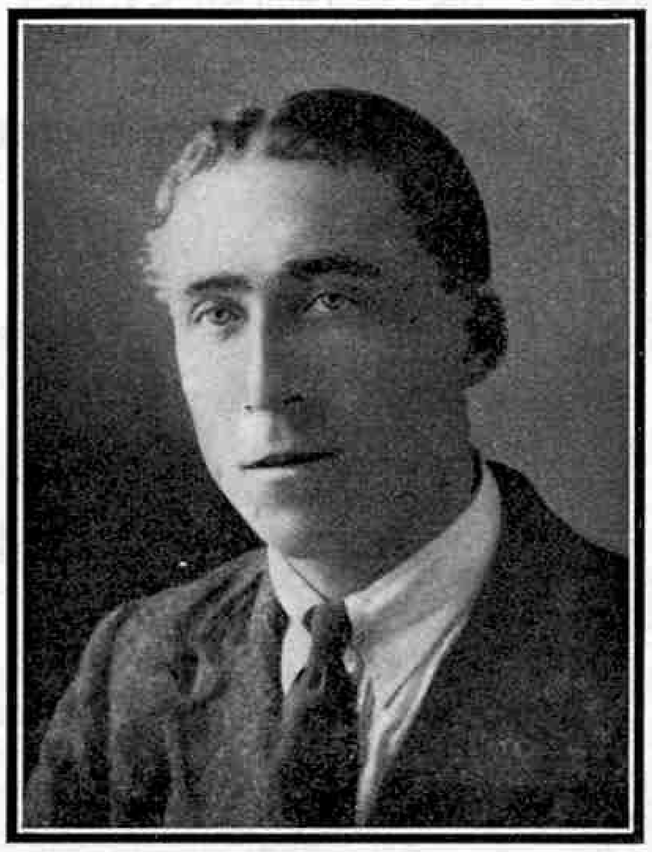
During this month the majority of Meccano Clubs will commence their first winter session. With very few exceptions every affiliated Meccano Club commences the new session with greatly improved prospects, and judging by the reports that I have already received, this promises to be the most successful session since the foundation of the Guild ten years ago. Membership and the number of affiliated clubs show gratifying increases, but an even more satisfactory feature is the greater strength of these organisations and the growing enthusiasm of officials and members.

In making their arrangements for the present session I hope that Leaders and secretaries have been successful in persuading local gentlemen with special qualifications to give talks or lectures on subjects in which they are specially interested. These always form a welcome variation in the programme, and often lead to valuable publicity, for a talk by a recognised expert may attract attention in circles outside those represented in the club. Secretaries should take care to advertise such an event, either by having a note inserted in the local press—editors are usually willing to include an announcement of this kind—or by sending neatly typed copies of a suitably worded notice to people who may be interested.

One great advantage of talks or lectures of this kind is that in many cases they lead to arrangements for paying visits to local works or factories. For instance, one club invited the local stationmaster to speak to them, and this gentleman followed up a very interesting talk on "*Railway Operations*" by inviting the members to visit the station of which he is in charge in order that he might give them a practical demonstration of the principles that formed the basis of his talk. In other clubs lectures on gas-making, the generation of electricity, or on important local industries have been followed by equally interesting visits, and the friendships thus formed have proved of great service to the clubs concerned.

Meccano Club Leaders

No. 41. Mr. S. H. Pullen



Mr. S. H. Pullen is Leader of the Herne Bay Meccano and Hobbies Club, which was affiliated in 1922. Previously he had been Leader of the Senior Section, which he had helped to establish, and under his energetic guidance the club is making splendid progress. Its programme is remarkable for the great variety of hobbies and sports in which members are interested.

Club Visit to Meccano Factory

During August a party of officials and members of St. Albans M.C. took part in an excursion of special interest. Leaving St. Albans at the early hour of 5.30 a.m. they travelled to Liverpool, arriving at their destination at 12.30 p.m. After a brief inspection of the wonderful Cathedral now in course of erection, they made their way to the Meccano factory at Binns Road, and spent the remainder of the afternoon in a tour of the extensive organisation that is responsible for the output of Meccano parts and Hornby Trains. During the afternoon the members of the party were entertained in the canteen attached to the factory, and a wonderful day's outing was brought to an end by a trip down the river to New Brighton.

Not until 6 o'clock on the morning of the following day did the members of the party reach their homes, and in the meantime they had travelled more than 400 miles! Naturally they were extremely tired, but all agreed that they would have been very sorry to have missed such an experience.

The example of St. Albans M.C. is one that I should like other clubs to follow, particularly those with headquarters nearer Liverpool. I am sure that the prospect of visiting the Meccano factory would be exceedingly attractive to the members of every club. In some cases distance and expense form serious obstacles, but in arranging excursions the possibility of visiting Meccanoland should not be overlooked. Notice of intention to visit the works should be given me well in advance in order that I may be able to make suitable arrangements, and I can promise a hearty welcome and the most interesting time of their lives to the members of any party that makes the trip.

Reports from Unaffiliated Clubs

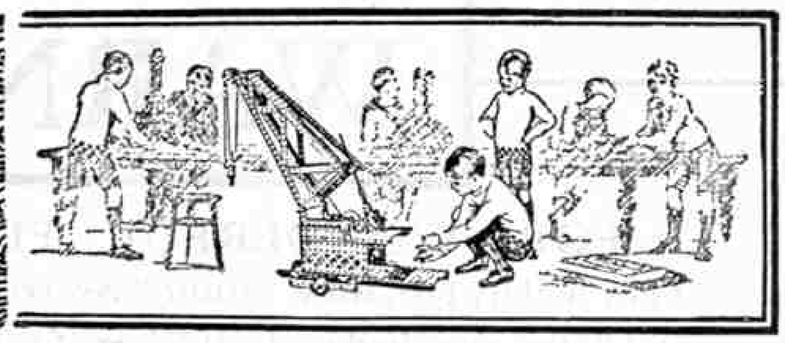
I should like secretaries of unaffiliated clubs to keep me informed of their progress in order that I may be able to publish more reports from such organisations. These are usually in need of recruits, and one of the best means of securing them is to use the "*Club Notes*" page in order to spread knowledge of the club's existence among Meccano boys who may become members. The chief difficulty that prevents a more regular appearance of reports from such clubs is that these are usually uninteresting. I know that in the early stages of the history of a club it is not always easy to write an attractive report, but I hope that secretaries of unaffiliated clubs will make special efforts to exhibit their activities in a favourable light.

Certain unaffiliated clubs are not new and, only remain unaffiliated because of the difficulty of finding a suitable adult Leader. The prospects of such clubs will be greatly improved by the regular appearance of good reports, and I would like their secretaries to realise that these are welcomed just as much as those of affiliated organisations, and that when possible these will appear on the "*Club Notes*" page.

* * * *

The Holy Trinity (Barnsbury) M.C. will hold their Annual Exhibition in the Holy Trinity Parish Hall on Friday and Saturday, 25th and 26th October. This will be the eleventh Annual Exhibition held by the club, which was the first to be affiliated with the Guild, and promises to be as extensive and interesting as previous displays of this club have been. A special feature this year will be the exhibit of Meccano models. These will include a set designed to exhibit mechanisms from the well-known Meccano Standard Mechanisms Manual. Meccano enthusiasts, and particularly members of other Meccano clubs, will be given a very hearty welcome.

CLUB NOTES



Great Baddow M.C.—Took part in Chelmsford Annual Carnival procession, members exhibiting models on a decorated lorry. An excursion was made to Clacton. This proved very enjoyable, a trip on the river being a special feature. The Cricket team concluded a very successful season and members are now taking up Football. A full fixture list has been arranged. Club roll: 39. *Secretary*: Miss D. K. French, High Street, Gt. Baddow.

Chelmsford M.C.—A new Leader has been secured in Mr. J. Cory, a Master in a Chelmsford school. An excellent programme has been arranged and new members will be welcomed. Club roll: 28. *Secretary*: Miss Flaxman, Saracen's Head Tap, Chelmsford.

Herne Bay M.C.—Cricket matches and two Sports Evenings have been held. At the latter competition was very keen, and proceedings greatly interested visitors and attracted recruits to the club. A visit was paid to Margate Waterworks, the Cycling section making the journey of 16 miles by road. From members of the Senior Section a Football Club known as the "*Blue Triangle Club*" has been formed, and membership of an important local League has been secured. Club roll: 47. *Secretary*: C. W. Russell, 4, Clifton Villas, Herne Bay.

Albert Village M.C.—The Cricket Teams concluded successful seasons, the Junior Eleven having won ten matches and lost ten out of a total of 23. For the second Annual Athletic Sports, an interesting programme of over 40 events was organised, and many exciting contests resulted. Club roll: 39. *Secretary*: L. C. Adey, 239, Occupation Road, Woodville, Burton-on-Trent.

Fulstow Junior M.C.—The Summer Session was concluded with a highly successful Garden Party. There were many attractive Sideshows, including Ping Pong and Darts, and models on view included a Tank Locomotive on loan from Headquarters, and the Eiffel Tower lent by a Grimsby Meccano dealer. In addition, every member of the club made at least one model for exhibition. Four Hornby Train Sets were continually at work. The proceeds amounted to £11, and are to be devoted to the purchase of a Hornby Train Set, books for the Club Library and necessary equipment. Club roll: 13. *Secretary*: L. W. Doe, The Stores, Fulstow, North Thoresby, S.O. Lincs.

Bedlington Secondary School M.C.—Members paid a visit to the North East Coast Exhibition at Newcastle, and thoroughly enjoyed the outing. It was noticed on several stands that good use was being made of Meccano parts and Hornby Trains. Ordinary meetings were devoted to building models and practising timetable working on the Hornby Train layout. This was on view at the Annual Exhibition, which was highly successful. Meccano models exhibited included a Meccanograph, and a mystery Kum Bak Tractor. Club roll: 17. *Secretary*: J. W. Dobson, 1, Portland Terrace, Ashington, Northumberland.

Tynecastle School M.C.—A display of Meccano models formed part of the attractions at the Annual School Exhibition. Models constructed by members were entered in a special Competition. The Workshop loaned from Headquarters attracted considerable attention, and many enquiries regarding the club were made by visitors. Club roll: 20. *Secretary*: Wm. Urquhart, West Mill Road, Colinton, Edinburgh.

Dudley M.C.—Members in fancy dress took part in the Charity Carnival, at which an excellent Exhibition of Meccano models was made on a decorated lorry. Another week-end has been spent in the Club Camp. Club roll: 15. *Secretary*: Mr. A. Darby, 93, Queens Cross, Dudley.

Middlesbrough M.C.—For the third Annual Outing members visited Saltburn. The day was spent in games on the sands, and rambles on the cliffs and in the woods. During the Summer, Cricket Matches have been played regularly, the most exciting being "Test Matches" between the two sections—the "Nuts" and the "Bolts." The series ended in a draw, each side winning the same number of matches. A Football Team has been formed and an excellent fixture list arranged. Club roll: 74. *Secretary*: A Bradley, 95, Deepdale Avenue, Marton Grove, Middlesbrough.

Harehills (Leeds) M.C.—Has commenced a recruiting campaign, and the Leader is visiting every Guild member in Harehills. Arrangements for joint Excursions and Exhibitions, and inter-club visits, are being made with Bramley M.C., and it is hoped to include other local clubs. R. K. Fourness, secretary of the club since its commencement, has resigned owing to pressure of school work for Matriculation, and the Leader is temporarily taking his place. Club roll: 24. Leader: Mr. W. C. Whitelow, 50, Baker Street, Burley Road, Leeds.

Morison Memorial M.C.—Members are rehearsing sketches for presentation at Exhibitions. The second joint Sports Meeting with the Victoria M.C. was held on the moors at Duntocher, a long programme of events for Junior and Senior Sections being carried through successfully. Club roll: 19. *Secretary*: F. Bannister, 7, Wallace Street, Clydebank.

St. Albans M.C.—A Visit to Liverpool proved the finest excursion the club has yet had. After visiting the Cathedral, the members were shown round the Meccano and Hornby Train Factory and entertained to tea. The outing was concluded by a sail down the Mersey to New Brighton. The party arrived at St. Albans 24 hours after having travelled 400 miles in the interval. Members were interested in Crewe Railway Works, and also in the Transporter Bridge at Widnes, both of which were passed on the journey. Club roll: 21. Leader: Miss C. Brooks, 56, Holywell Hill, St. Albans, Herts.

Exning (Newmarket) M.C.—At the Annual Sports, twenty events were contested, Meccano parts being awarded as prizes. In the Team Contest the "Nuts" beat the "Bolts" by 68 points to 46. Refreshments completed a successful day. A point of interest is that a boy has been given preference, when applying for work at the local iron works, because he is a member of the Meccano Club. Club roll: 13. *Secretary*: Miss S. Payne, Red House, Exning.

Halifax M.C.—Rambles on the moors and cricket matches have been the chief items on the programme during the fine weather. Members are now actively engaged in preparations for a display at a local Bazaar to be held in October, for which several large models are being constructed. Club roll: 10. *Secretary*: H. Ramsbottom, 155, Warley Road West End, Halifax, Yorks.

St. Peter & St. James (Exeter) M.C.—The Summer Session was brought to a close by a series of excursions including a visit to Exeter Cathedral. Members spent two hours in the Cathedral, where they ascended the towers and made a tour of the roof. A new Football League has been organised in which local Meccano clubs may take part. The Club Magazine "*The White Triangle*" is now well established. Notable features of this publication are cartoons drawn by a talented but anonymous member, and very interesting articles contributed by secretaries and Leaders of other clubs. Leader: Mr. M. C. Hodder, 60, Elmside, Exeter.

Holy Trinity (Barnsbury) M.C.

A group of members of the Holy Trinity (Barnsbury) Meccano Club. This club has the honour of being the first to be affiliated with the Guild, and under the able and enthusiastic direction of the Leader, Mr. Stuart H. Wilson, who is standing on the left of the group, it has developed steadily on the best possible lines. The programme followed by the club is remarkable for its variety, and the members' annual two-day exhibition is being held this month for the 11th year in succession

Australia

Hampton M.C.—It is the practice of members to read and discuss engineering articles with the aid of Meccano models constructed as illustrations. At one meeting an interesting set of Hydraulic Buffers was constructed for this purpose. Good use also is made of Meccano Lectures. Club roll: 30. *Secretary*: L. E. Jones, 34, The Avenue, Hampton S.1, Victoria.

India

Georgetown (Madras) M.C.—An interesting Lecture on "*Motor Mechanism*" was given by Mr. C. Rajamannar, who illustrated his talk by demonstrations with a Motor Car. At other meetings essays on various topics were read by members. The club made a special display at the "Madras Boys' and Girls' Exhibition" held in the Y.M.C.A. Buildings. Club roll: 13. *Secretary*: S. N. Thangaveloo, No. 42, Nambulier St., G.T. Madras, South India.

New Zealand

Dunedin M.C.—Members specialise in Contractors' Nights, the favourite task being bridge-building. Models built invariably are incorporated in a Hornby Train layout. Mock Trials are frequently held. The "accused" usually is a member who has caused an accident to a Hornby train. If found guilty of such a crime culprits are severely dealt with. Club roll: 10. *Secretary*: T. MacLachlan, Art Studio, 66, Albany Street, Dunedin, Otago.

Wisemans (Auckland) M.C.—A Visit was paid to the new railway workshops at Otahuhu. Mr. Norman Kerr, a well-known New Zealand athlete, gave an interesting talk on "*Physical Culture*," illustrating this with practical demonstrations of the use of the muscles. The club possesses a moving picture machine, and at many meetings excellent films are shown with its aid. *Secretary*: W. Shearer, 170-172, Queen St., Auckland.

South Africa

Malvern Wesleyan M.C.—Visits were paid to the Johannesburg Fire Station, a Bakery, and the studio of the Broadcasting Company. A Gramophone Evening was also held, the representative of a well-known firm of Gramophone dealers explaining the working of the instrument. At the Annual Social members were asked to represent in some manner the names of Transvaal Railway Stations, and some of the efforts showed great originality. At another meeting a series of papers on various subjects were read by members. Club roll: 52. *Hon. Secretary*: A. Clelland, P.O. Box 8, Cleveland.

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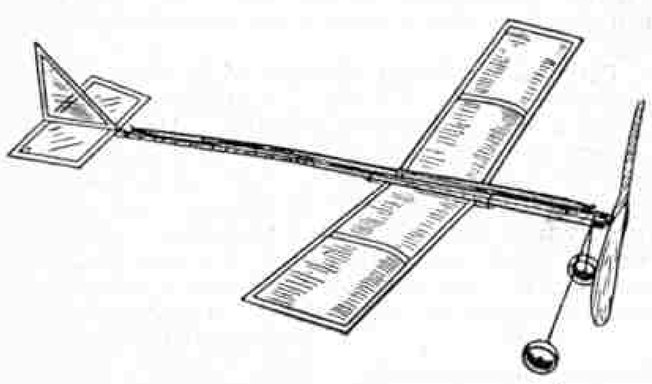

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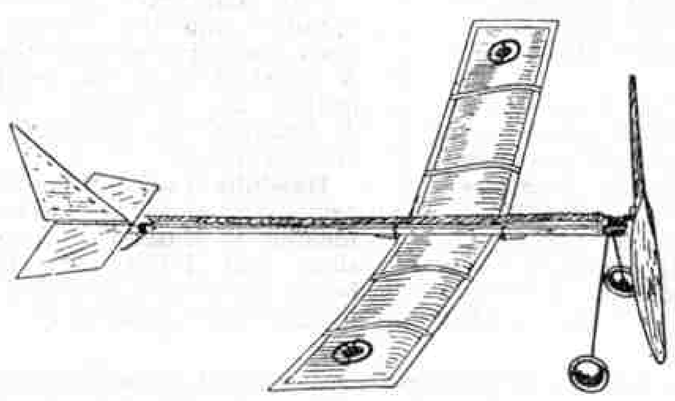

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FLIES YOUR KITE — AND

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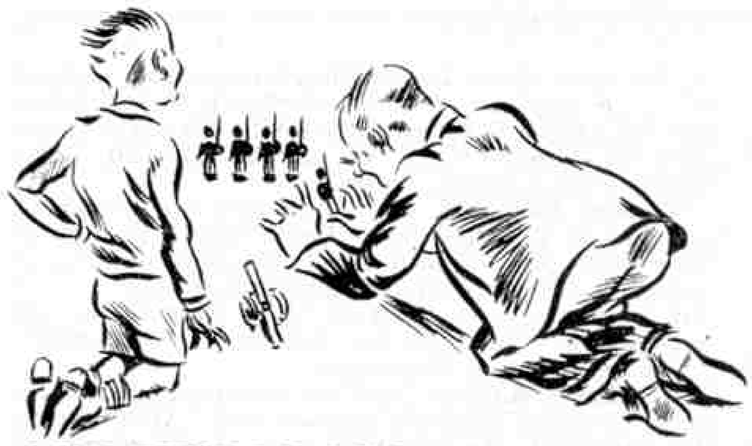
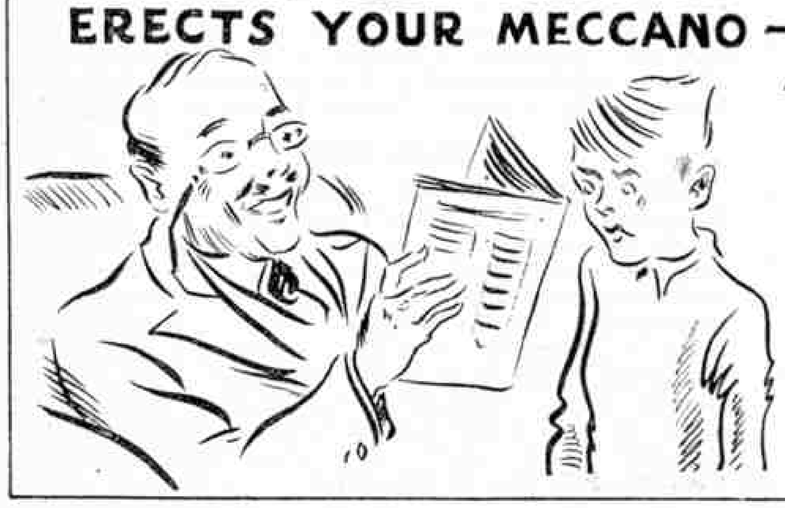


— AND READS ALL YOUR MAGAZINES



DON'T GRUDGE HIM A GOOD TIME ON GUY FAWKES DAY — JUST SEE HE GETS

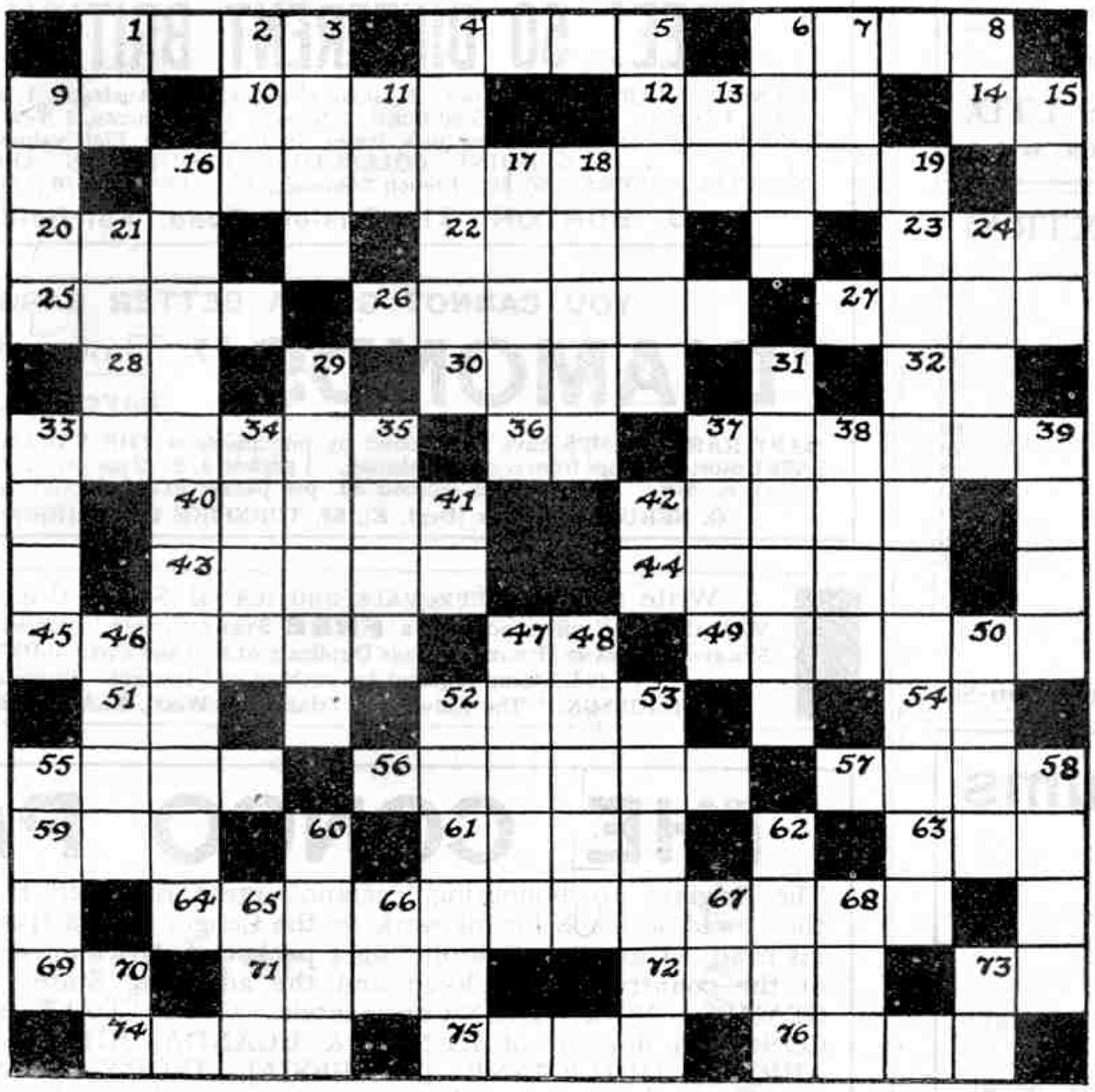
STANDARD FIREWORKS

AND YOU'LL BOTH HAVE A GOOD TIME

THERE'S A SHOP IN EVERY TOWN SELLING "STANDARD"

Competition Page

Another Crossword Puzzle



CLUES DOWN

1. Perform
2. Vehicle
3. Beam
4. Admitted
5. Ships' voices
6. Turn
7. By
8. About
9. Reptile
11. Newspaper Title (Abbrev.)
13. Thoroughfare (Abbrev.)
15. Imitate
16. Anniversary
17. A bear
18. Natural fat
19. Unselfishness
21. Breed
24. Open ditch
29. Improved
31. Stanzas
33. A Gipsy dance
34. Part of body
35. Peruse
37. Kill
38. Scheme
39. Rope
41. According to nature (Abbrev.)
42. Exist
46. Needy
47. Principal subject
48. French soldier
50. Separated
52. Ruined
53. Pursue
55. Metal
58. Sheep
60. Pipe
62. Glimpse
65. Money
66. Preposition
67. Not good (Abbrev.)
68. Water
70. Belonging to
73. Denoting presence

CLUES ACROSS

1. Tube
4. Holds fast
6. Mineral
9. As far as
10. Sunken court
12. Small island
14. Printer's measure
16. Type of bridge
20. Part of verb to be
22. Exclusive
23. Tree
25. Cheerless
26. Relax
27. Fruit
28. Public representative (Abbrev.)
30. Platform
32. Part of King's title (Abbrev.)
33. Policeman
36. Royal Navy (Abbrev.)
37. Steps over walls
40. Observes
42. Leaf
43. Giant
44. Edge of roof
45. Begun
47. People's representative (Abbrev.)
49. Frothy
51. Not off
52. Foot
54. Negative
55. Idle
56. Portion
57. Gun catch
59. Mistake
61. Slab of stone
63. Fasten
64. Immaturity
69. Act
71. Wind instrument
72. S-shaped line
73. Because
74. Another wind instrument
75. Lure
76. Gasp

Since the appearance of the last Crossword Puzzle in the June "*M.M.*" we have been bombarded with requests for information as to when the next will appear. Well, here it is.

The rules governing the solution of Crossword Puzzles require no explanation. We should like to make it clear, however, that it has been our endeavour as far as possible to avoid setting unfair traps, although of course the clues have to be "wrapped in mystery" to a certain degree. Every word will be found to be quite straightforward, and can be found in Chambers' 20th Century Dictionary or any other good dictionary.

Prizes of Meccano Parts or Hornby Train Accessories, to be chosen by the winners, to the value of £1/1/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the first four correct solutions in the order in which they are opened on the morning following the closing date. In addition there will be a number of consolation prizes, and in awarding these neatness and style may be taken into consideration.

Entries should be addressed to "October Crossword Puzzle, Meccano Magazine, Binns Road, Old Swan, Liverpool," and should reach this office not later than 31st October. Overseas closing date, 31st January, 1930.

Competitors who do not wish to disfigure their magazines may draw the Crossword design on plain paper and submit their entries in that form.

28th Drawing Contest

The most topical subject for a drawing contest this month is without doubt "*A Schneider Trophy Seaplane.*" Every newspaper and every magazine has devoted considerable space to this event, the greatest of the sporting year, and the appearance of the machines that took part is familiar to every reader.

There is little that need be added as an instruction to would-be competitors. All that is necessary is to select one of the machines and draw it, flying, taxi-ing, or at rest on the water, or in its cradle on land. Competitors may colour their drawings in crayon or paints if they wish.

Entries will be divided into the usual two sections, A for those aged 16 and over, B for those under 16; and cash prizes of 10/6 and 5/– are offered for the two best drawings in order of merit in each section. In addition, there will be a number of consolation prizes.

Entries should be addressed to "28th Drawing Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool," and should be sent to reach this office not later than 31st October. Overseas closing date, 31st January, 1930.

Competitors must state their name, age and address on the back of each drawing submitted.

COMPETITION RESULTS

Home

Holiday Contest :—Photographic Section.—First Prizes: Section A, F. G. Clements (Luton, Beds.); Section B, R. W. Haw (Darlington); Second Prizes: Section A, R. W. Norman (Chesham); Section B, E. V. Morgan (Warwick); Third Prizes: Section A, O. A. Kimmings (East Acton, W.3); Section B, W. Davies (Manchester). Consolation Prizes: R. P. Stevens (Leyton, E.10); R. E. Gates (Manchester); A. C. V. Kendall (Fovant, Salisbury); A. Lester (Chorley).

Sketches Section.—First Prizes: Section A, L. T. Levitt (Swansea); Section B, R. A. S. Musker (Hightown, Nr. Liverpool); Second Prizes: Section A, H. H. Castle (Ackworth, Yorks.); Section B, C. Booth (Doncaster); Third Prizes: Section A, Miss S. Clark (East Clevedon); Section B, H. Fecitt (Blackburn). Consolation Prizes: O. A. Kimmings (East Acton, W.3); J. Hunter (Coulsdon); E. V. Hare (Chatteris); A. Finbow (Stowmarket).

Essay Section.—First Prizes: Section A, A. Murray (Glasgow); Section B, Miss N. Loveley (Exeter); Second Prizes: Section A, W. Harbord (Normandy, Surrey); Section B, J. Maller (Eastbourne); Third Prizes: Section A, N. M. Loveley (Exeter); Section B, L. Lea (Kent). Consolation Prizes: J. Rogers (Broadstairs); R. Outram (Garston, Liverpool).

3rd Sketchograms Contest.—First Prizes: Section A, W. Adderley (Birmingham); Section B, R. Hamilton (Reading); Second Prizes: Section A, J. W. Percival (Birmingham); Section B, L. Annand (Hamilton). Consolation Prizes: G. W. Downer (London); J. C. Thompson (Berwick-on-Tweed); A. F. Lowsby (London); E. G. Dowdney (Ilford).

Overseas

Summer Holiday Plans Contest.—First Prizes: Section A, N. F. Keith (Victoria); Section B, A. R. A. Hashmi (Karachi); Second Prizes: Section A, E. F. Smith (Montreal); Section B, S. Stevens (Sydney).

39th Photographic Contest.—First Prizes: Section A, G. Walker (Victoria); Section B, H. Watson (Winnipeg); Second Prizes: Section A, C. Galdes (Malta); Section B, C. Anderson (Subiaco, W. Australia). Consolation Prizes: T. MacLachlan (Otago); E. Bonnici (Malta).

SG

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PIONEERS OF EXPLORATION

THE world of exploration is a most fruitful source of stamp interest, for many of the outstanding personalities and feats of early days of discovery can be recorded permanently in the pages of a stamp album.

Christopher Columbus, perhaps the greatest of all the early navigators, is commemorated on the stamps of practically every stamp-issuing country on the American continent. Single stamps and complete series have been issued to commemorate his great voyages, which resulted in the discovery of America. In the March, 1928, *"M.M.,"* we dealt with Columbus, using the famous Columbian Exhibition Commemorative set of stamps, issued by the United States in 1893, as our theme. This month we propose to concentrate on some of the equally able but less known personalities, Cabot, Cook, Balboa, and Prince Henry of Portugal.

There is, however, one Columbus stamp that possesses a claim to fame quite apart from its association with the explorer. This is the St. Kitts-Nevis general issue of 1903, on which Columbus is shown on the deck of his ship, the *" Santa Maria,"* sighting land through a telescope! This in 1492, some 100 years before the telescope was invented!

Contemporary with Columbus was Vasco da Gama, the greatest of the Portuguese navigators, who gained fame by his exploits in the Eastern Seas in the discovery of the ocean route from Europe to India. The story of Vasco da Gama's voyage was told in the June, 1927, *"M.M."*

Vasco da Gama, and, indeed, navigators of all time, owe an amazing amount to the inspired early work of another Portuguese sailor, Prince Henry, known as *"the Navigator."* It would probably be justifiable to assert that the maritime discovery of more than half the earth's surface within a single century from 1430 was due solely to the perseverance and enlightened foresight of this remarkable man. He is shown here on the 5 reis value of the Portuguese issue of March, 1894, commemorating the 500th anniversary of his birth. This issue consisted of 13 values ranging from five to 1,000 reis. Three designs of stamps were used, the one we illustrate, showing Prince Henry seated on the bow of his ship, being used for the 5r. to 20r. denominations. The 25r. to 100r. values show him standing on the deck of his vessel directing the operations of his fleet. The third design, used for the four high values from 150r. to 1,000r., is symbolical of Prince Henry's studies and shows him seated on a throne with his arms outflung resting on two globe atlases.

Almost before he had attained manhood Henry had distinguished himself as a man-of-arms, and had been offered by King Henry V of England the post of Commander-in-Chief of the English armies. He declined this honour, and in 1418 commenced to devote himself to the study of astronomy and mathematics and to the equipment and organisation of the expeditions he was planning to send to explore the coast of Africa to test his theory that the sea route to India lay beyond the southern extremity of Africa. He built the first Portuguese observatory on the promontory of Sagres in Algarve, and there for 12 years he persevered in his studies in the face of ridicule and extreme discouragement.

His early expeditions produced little result, but from the time Cape Branco was reached in 1441 discovery followed discovery, and the Prince's fame spread rapidly throughout the world. For his great services to the science of navigation King Henry VI of England created him a member of the British Order of the Garter.

Prince Henry died in 1460 and was buried on the West African coast at Lagos, but a year later his remains were brought home and deposited in a convent at Batalha.

Among the British discoveries of this period was Giovanni Cabot's location of Newfoundland and the Labrador Coast. Cabot, who is better known with the British "John" as his Christian name, was, like Columbus, a Genoese by birth, but some 10 years older than his more famous compatriot. Early in life he was fired by a desire to discover new lands across the sea, and after having failed to secure support for his enterprises from the Spanish and Portuguese Courts, he came to England at the age of 66 and offered his services to King Henry VII. In 1496 the King granted letters patent to Cabot and his sons to take possession on behalf of England of any unknown land they might discover.

The sailing of their little ship *"Matthew"* from Bristol in 1497 is shown on the 10c. value of Newfoundland's 1897 issue celebrating the 400th anniversary of Cabot's discovery of Newfoundland on 24th June, 1497. A portrait of Cabot appears on the 2c. value of the same series, while on the 3c. stamp there is a picture of Cape Bonavista, the first point sighted by Cabot. The 60c. stamp of this series, showing a portrait of Henry VII, is specially interesting in that it is the first appearance of a British monarch of pre-postal days on a British stamp. We illustrate both the 2c. and 10c. values.

Cabot did not live long to enjoy the fruits of his success. In 1498 he sailed again from Bristol in command of a further expedition consisting of five vessels, but nothing was ever heard of the fleet afterward, and it is presumed that the ships were sunk with all hands in a violent gale out in the Atlantic.

The exploits of Vasco Nunez de Balboa, one of the bravest and most successful of the Spanish explorers, are commemorated on the Panama issues of 1906, 1909, 1913 and 1915. Balboa was one of a party of adventurers from Spain who set out in 1501 to seek their fortunes in the islands of the Western seas. He appears to

(*Continued on page 819*)

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Stamp Collecting—(*Continued from page 817*)

have, settled in Hispaniola, now known as Hayti, but his farming activities proved a failure. He determined to escape his debts by stowing away on a new expedition that was being formed by Enciso, a lawyer of San Domingo, and concealing himself in a barrel that purported to contain provisions for the ships from his farm he managed to secrete himself on board. After many adventures, during which Enciso was thrown into prison and sent back to Spain, Balboa gained command of the expedition and ultimately reached the isthmus of Panama. Here he learned of the mighty ocean that lay on the Western side of the mountains, and of the great wealth of Peru.

His desire to discover these things for himself was spurred by the arrival of a peremptory recall to Spain from the King. Something sensational must be done to placate the sovereign, and the discovery and annexation of the great ocean over the mountains alone would suffice. On 26th September, 1513, from the ridge of the mountain range, he sighted the vast extent of the Pacific ocean and, three days later, with great ceremony he formally planted the Spanish flag on its shores. This incident is shown on the 2c. stamp of the 1915 issue from Panama illustrated here, while the actual sighting of the ocean from the mountains is represented, somewhat melodramatically, on a special 2½c. stamp issued in 1913 to commemorate the 400th anniversary of the discovery. A portrait of Balboa appears on the 1c. value of the 1906 and 1909 issues.

As has been the case with many another successful adventurer, jealousy proved the downfall of Balboa, and in 1517 he was executed on a false charge of treason laid by his colleague Pedrarias.

Passing to more modern times, we find portraits of Captain James Cook on various stamps of the Pacific Islands; for example, Rarotonga, of the Cook Islands federation, 1½d. value of 1920 issue. Cook is an outstanding example of a poor man who succeeded in spite of disadvantages. He was born in 1728, the son of a farm labourer. His early life at sea was spent on Baltic and North Sea traders, but in 1755 he entered the Navy and was employed on coastal survey work. After service on the coasts of Canada and Newfoundland, in 1768 he was given the charge of an expedition to the Pacific to observe the transit of Venus. Voyaging westward he made the first circumnavigation of New Zealand, and charted the coast.

Cook's landing on the shores of New Zealand and his meeting with the Maori Chiefs is shown in our illustration of the 3d. value of the 1906 series issued in connection with the New Zealand Exhibition held at Christchurch. Although New Zealand was actually discovered in 1642, it was not until 1840 that a treaty between the natives and Britain was completed, and a formal annexation of the Islands carried out by Captain Hobson. The actual ceremony of the raising of the British flag on annexation is shown on the 10d. stamp of the 1906 series.

Cook continued his voyage by way of the eastern coast of Australia and established that New Guinea was not part of the Continent by sailing through the dividing straits. Eventually he reached England again in 1771. In later expeditions he endeavoured to survey the Antarctic Continent and in the course of this voyage his vessel, the "*Resolution*," actually completed the first eastward circumnavigation of the globe.

On arrival home in 1775 Cook was promoted Captain, and the following year found him again at the head of an expedition to the Pacific, on this occasion to discover a north passage around the American continent. His effort was unsuccessful, but during the voyage he discovered the Sandwich Isles, where at Hawaii, on 14th February, 1779, he was murdered by natives when leaving the shore to rejoin his ship.

No reference to stamp exploration would be complete without mention of two very interesting stamps issued respectively by Portugal and Norway, both of which are illustrated here. The Portuguese stamp is taken from the 1923 series commemorative of the first trans-Atlantic flight from Portugal to South America via the Azores. The stamp shows Vasco da Gama's old flagship, the "*San Gabrielle*," and also the Rolls-Royce engined seaplane on which Sacurdura Cabral made his trans-Atlantic crossing in 1922. Above the ship and the seaplane appear the respective dates of their exploits, and between these are the portraits of the pilot of the seaplane and his companion. The stamp is symbolical of the amazing progress made in means of exploration in the last 500 years.

The Norwegian stamp is commemorative of Captain Amundsen's great Polar flight on the airship "*Norge*," and is taken from the Norwegian commemorative issue of 1925. This voyage is sufficiently recent still to be vivid in the minds of our readers, who will hardly require to be reminded that Amundsen took with him an aeroplane with which to make a final dash to the Pole. The stamp shows the figure of a Polar bear standing on an ice-floe gazing at Captain Amundsen's machine as it passes on its way across the Polar wastes.

Portugal is not alone in the commemoration of a trans-Atlantic flight. On the 15c. value of the current Newfoundland series is shown a picture of the Vickers Vimy machine on which Sir John Alcock and the late Sir Arthur Whitten-Brown made the first non-stop crossing of the North Atlantic, from Newfoundland to Ireland, 1,890 miles in 16 hrs. 12 mins., on 14th June, 1919.

We also illustrate the stamp issued by Egypt in 1925 in celebration of the meeting of the International Geographical Congress at Cairo. This stamp links up the field of exploration of Ancient Egypt with the work of the pioneer navigators, and is a fit inclusion in a special collection of stamps dealing with exploration work.

The list of stamps associated with the work of exploration is by no means exhausted with those to which we have referred in our article. Many others come to mind immediately. Captain John Smith, the founder of Jamestown in 1607, is commemorated by a special U.S. issue that appeared in 1907, while another U.S. issue, commemorating the opening of the Panama canal in 1913 gives an interesting portrait of Balboa. As we have already pointed out, statues of Columbus and incidents of his life abound among the issues of the Latin-American States and the West Indies. Trinidad, Guatemala, Nicaragua, Salvador, Peru, Porto Rico, are cases in point, while the St. Kitts-Nevis Tercentenary issue of 1923 shows Columbus' ship sailing into the Old Road Bay nestling beneath the shadow of Mount Misery.

The galleys of ancient days, an article on which appeared in our issue of February last, also come within the scope of the subject, and to the stamps illustrated then can be added the U.S.A. Norse Centennial issues of 1905.

The many aviation stamps commemorative of pioneer flights also can be included in the exploration section. Apart from the Portuguese and Newfoundland stamps already mentioned, there are the U.S. Lindbergh issue and the Spanish 1926 Red Cross issues commemorating the flying boat "*Plus Ultra's*" trans-Atlantic flight and the Madrid-Manila flight.

Unquestionably there is wonderful scope for stamp specialisation in the field of exploration. A collection comprised of stamps dealing with the lives and feats of the early pioneers would prove a fascinating pictorial history of the world.

We take this opportunity of making acknowledgment to Stanley Gibbons Ltd., for their courtesy in loaning the stamps from which the illustrations used with this article have been prepared.

An Advertising Offer

Those of our readers who are taking up stamp collecting for the first time this year will find a specially attractive offer contained in Messrs. Amber and Wright's advertisement on another page of this issue.

Those who already possess an album will doubtless find good use for another and, as the number offered gratis by our advertisers is strictly limited, those readers who are interested will be well advised to apply at once.

come on you chaps!

Look at this Fairycycle! With balloon pneumatic tyres; powerful brakes and glittering handlebars—what a bike! What a proud machine to ride! Fancy going out to tea on it! Fancy turning up at school on it! Fancy the other chaps crowding round! Yes, you must wangle a Fairycycle.

Every possible detail of equipment on her. Dunlop balloon tyres for solid comfort, tangent spoke wheels with glittering plated rims; bell, pump, tool bag with real tools; stand, so that she stays upright when not in use, and carrier for the mater's parcels. Moreover, any Fairycycle can be fitted with a flat plate between the saddle and the handlebars showing a realistically painted motor cycle engine! Yes, the No. 8 Fairycycle is a machine in a thousand and is so strongly built that when you are big enough to hand it on to a small brother or sister it will still be well worth handing on.

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Model A.—Well finished in black cycle enamel, ball-bearing pedals and plated handlebars. Dunlop saddle, 12″ tangent spoke wheels, $\frac{7}{8}$″ rubber cushion tyres - **29/6**

Model Ax.—Like Model A, but larger size, with 14″ wheels and $\frac{7}{8}$″ rubber cushion tyres - **33/–**

Model B. — Very suitable for young children being light and easy to ride. Has 12″ tangent spoke wheels with $\frac{7}{8}$″ rubber tyres. Complete with chain-guard, reflector, stand and carrier - - - **39/6**

Model Bx.—As model B but larger size with 14″ wheels and $\frac{7}{8}$″ rubber cushion tyres - **42/–**

Model C.—Raised pattern plated handlebars, has chain guard, stand, carrier, reflector and bell. Cycle pattern rim brake, 12″ tangent spoke wheels, adjustable ball-bearing hubs, 1″ imitation pneumatic tyres - **49/6**

Model Cx.—As model C but larger size with 14″ wheels - **52/6**

Model Px.—As model Cx but with 14″ × $1\frac{3}{8}$″ Dunlop "Kempshall" pneumatic tyres - **55/–**

Model D.—Cycle type brakes, raised pattern plated handlebars, 2-coil spring saddle, etc. $\frac{1}{2}$″ × $\frac{1}{8}$″ roller chain, adjustable ball bearings throughout. 12″ tangent spoke wheels with 1″ imitation pneumatic tyres, complete with chain-guard, stand and carrier, reflector and bell - **59/6**

Model 6.—Strongly built for children up to 9 or 10 years old. 16″ tangent spoke wheels fitted 1″ imitation pneumatic tyres, adjustable ball-bearings throughout, cycle pattern rim brake. Imitation pneumatic tyres, 3-coil spring saddle, tool bag, bell, etc. - - - **70/–**

Model 8.—The "Rolls-Royce" of Fairycycles, raised pattern plated handlebars, $2\frac{1}{4}$″ buttress tread Dunlop balloon tyres. Plated ball-bearing pedals, tool bag, carrier, stand, bell, reflector and pump, etc. - - **87/6**

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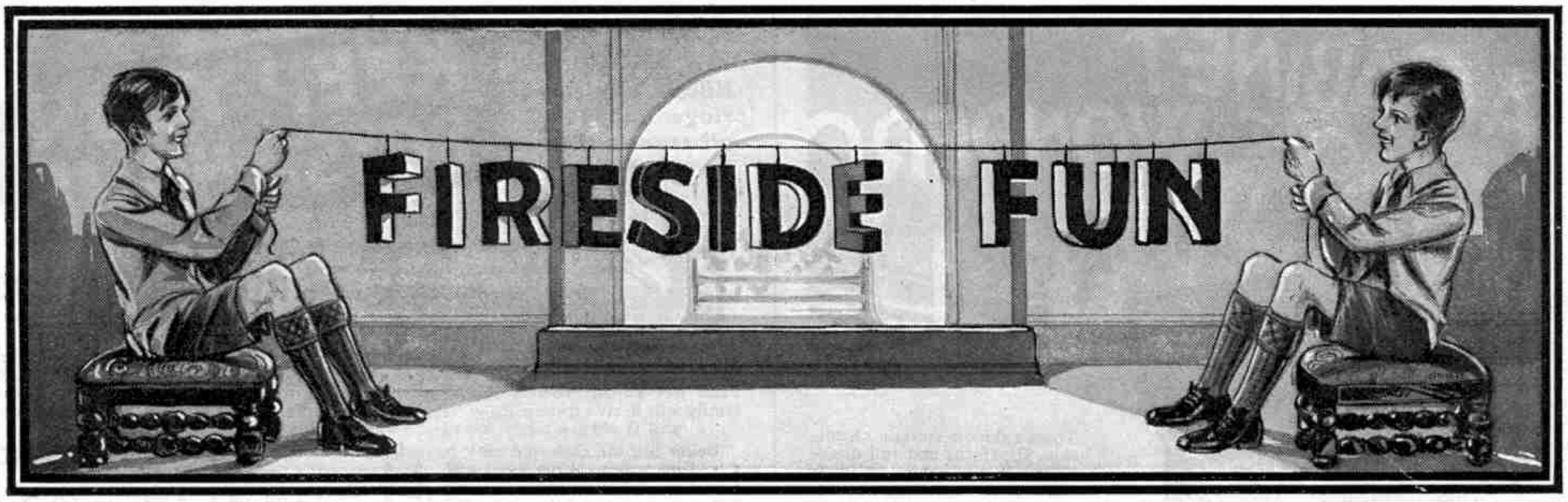


EXACTLY

Sergeant: "Men, ye are on the eve of battle. Will ye fight or will ye run?"

"We will," shout the men eagerly.

"Which will ye do?" says he.

"We will not," says they.

"Thank ye, men," says he. "I thought ye would."

"*Liverpool Echo.*"

* * * *

"And what is this particular bell for?" enquired a visitor who was being shown over a small country church.

"This bell is only rung when there is a fire or a flood, or a visit from the bishop or any such calamity," replied the sexton solemnly.

* * * *

A conscript, called up for medical examination, was trying to prove that his eyesight was so bad that he ought to be entirely rejected. Various tests were tried, but each time he swore he could see nothing. At last, the doctor took a round tin tray, two feet in diameter, and held it within six inches of the man's eyes.

"Can you see that?" he asked.

"Yes, sir," was the reply, "it's half-a-crown—or is it a two shilling piece?"

* * * *

Scoutmaster (to tenderfoot scout): "Are you a good cook?"

Tenderfoot: "Well, I can boil water."

* * * *

Farmer (to boy in apple tree): "Hey! What are you doing in that tree?"

Small Boy: "Believe it or not, mister, but I just fell out of an aeroplane." "*Everybody's Weekly.*"

* * * *

"I woke up last night with a start; I thought my watch was gone."

"Well, was it?"

"No, but it was going."

* * * *

Teacher: "A fool can ask questions that a wise person cannot answer."

Pupil: "No wonder we didn't pass our exam."

* * * *

"Sam, are you ever fired with enthusiasm?"

"Yessah, from every job I tackles!"

* * * *

OUT OF PLACE

Landlady: "And how do you feel now?"

Lodger: "Just terrible. I feel as if I was going to die."

Landlady: "Well, you can't die here; this is the living room."

* * * *

Lecturer: "Friends, if we were to turn round and look ourselves squarely in the face, what would we find we needed most?"

Tense silence. Then a small boy piped up: "A rubber neck, mister."

R.I.P.

Here lies till Gabriel's trumpet peal,
The bones of Shelby Sharp.
He dozed while holding a steering wheel,
And woke up holding a harp.

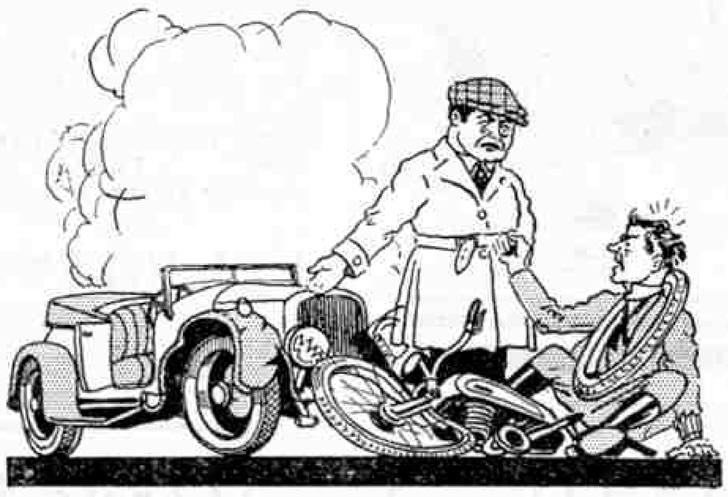
"*Boston Transcript.*"

* * * *

A bald-headed man who has just heard that the hairs of our heads are numbered wants to know if there is not some place where he can get back numbers.

* * * *

A FREE SUPPLEMENT



Motorist (after smash): "I ought to get a new wing out of you."

Enraged Motor Cyclist: "Yes! and if I had my way you'd get a harp as well."

"*Ford Times.*"

* * * *

Tommy: "Pass the cake, auntie."

Auntie: "If what, Tommy?"

Tommy: "If you can reach it!"

* * * *

Old Lady: "I always feel that I am much nearer the infinite when I'm on board ship, Captain."

Captain: "You certainly will be this trip, madam, the engineer says that the boilers are liable to blow up at any moment."

* * * *

"It says here," said Henry, "that a nautical mile is nearly one-seventh more than a land mile. How can that be, John?"

"Well," replied John, "you know how things swell in water."

* * * *

Driver of Small Car (relating facts of holiday trip): "And then hanged if I didn't run into a trap."

Bored Listener: "And was the cheese good?"

* * * *

O.C. (to recruit): "You must remember that we are a big family and that you must have confidence in the elders of the regiment. I am father of the regiment. Do you understand?"

Recruit: "Yes, Dad!"

"*The Passing Show.*"

* * * *

The young man had been to business for nearly six months and was fully conscious of his importance.

"The chief is beginning to take an interest in me," he said to a friend.

"Really?" said the friend, interested.

"Yes," was the reply. "Yesterday he saw me in the office and asked if I worked there."

* * * *

"And how is the patient to-day?" asked the doctor.

"Much better, doctor," replied the patient's wife. "But there's one thing that troubles me."

"What's that?"

"Well, he sleeps so heavily that it's as much as I can do to wake him up to give him his sleeping draught!".

IN OTHER WORDS

The class had been asked to re-tell in their own words the story of Oliver Twist's asking for more, and one little girl had written "In the kitchen stood a statue of a policeman."

"Where did you get that idea from?" the teacher inquired.

The child replied: "Isn't that what you said, miss?"

"No, no," said the teacher, "I said that in the kitchen there stood a stone copper."

* * * *

Old Gentleman (in the train about to start): "Here boy! here's twopence. Go to the refreshment room and get me a bun, and one for yourself."

Boy, after visit to refreshment room—running up to the train now moving—and eating a bun as he ran: "Here's your penny guv'nor—they only had one."

* * * *

A traveller knocked on the door of the village inn about two o'clock in the morning. The landlord put his head out of the window and inquired what he wanted.

"Can I stay here for the night?" shouted the stranger.

"Sure," replied the landlord. "I'll bring a cushion down in case you find the doorstep rather hard."

* * * *

The holidaymaker spent a successful day fishing, and presented his landlady with enough fish to supply the whole boarding-house.

At the end of the week his bill included the item, "Lard (for frying fish)—1s. 6d."

* * * *

The rural postman was describing his round to a visitor. "Yes, sir," he said, "being a postman on a round like this means a lot o' leggin' about, twelve and fourteen mile a day very often; but there, I mustn't complain, as my 'olidays be due next month, an that'll put me on my legs again."

"And where do you propose to spend your holidays when you have them?"

"Well, sir, it be like this: they generally sends out a young feller from the head office, and bein' as 'es a nice sort of chap as a rule, I goes around with 'im just for a talk an' a bit of company like."

* * * *

A YOUTHFUL COMPLAINT

Sympathetic old lady to small boy: "What is troubling you, my little man?"

Small Boy: "Boo Hoo! Dyspepsia and rheumatism."

Old Lady: "Surely not at your age?"

Small Boy: "Yes; teacher caned me 'cause I couldn't spell them."

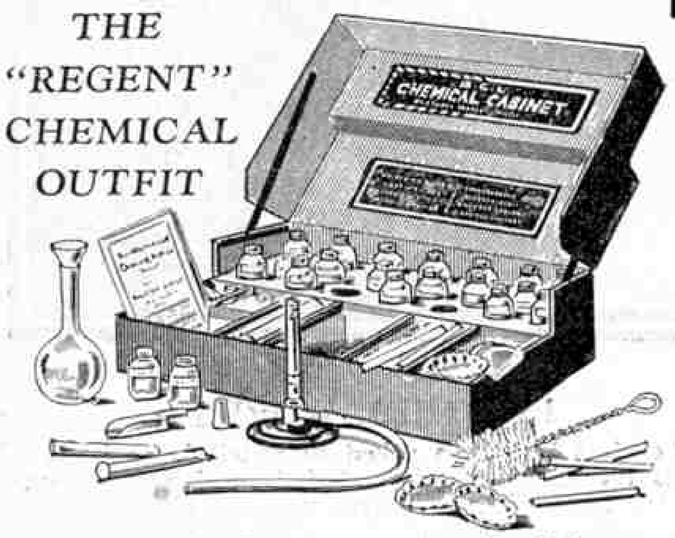
* * * *

"My dad's taller than yours," boasted Johnny. "When he stands up in a bus he has to take his hat off."

"That's nothing," retorted Jimmy. "Mine's so tall that he has to stand on a chair to reach his neck to put his collar on!"

A CABINET of WONDERS

THE "REGENT" CHEMICAL OUTFIT



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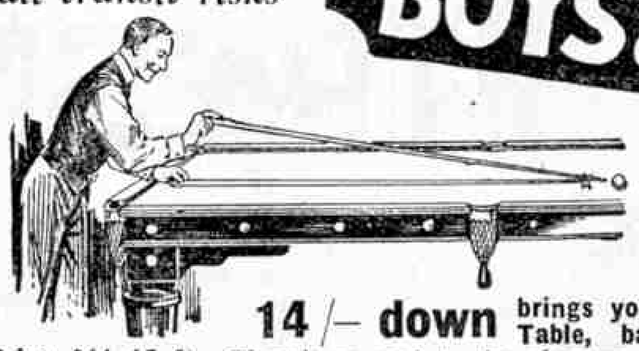

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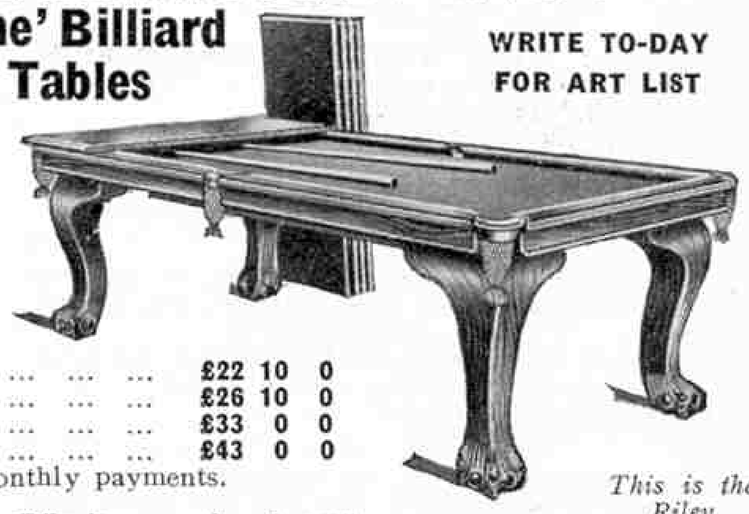

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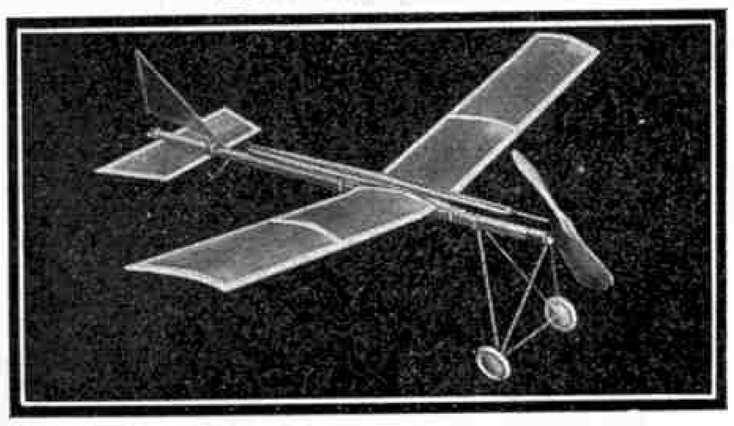

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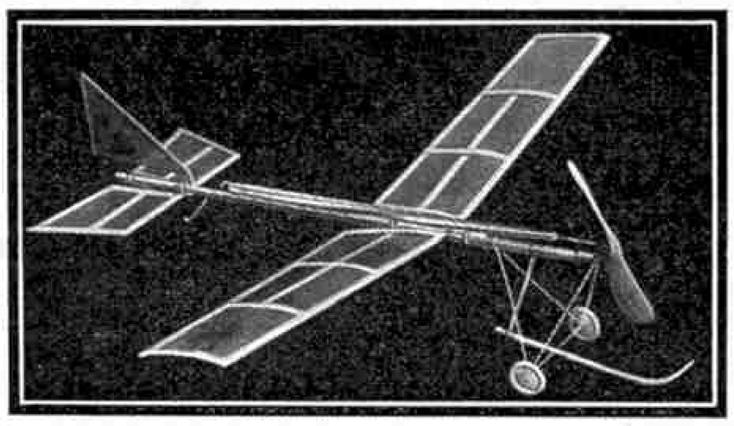

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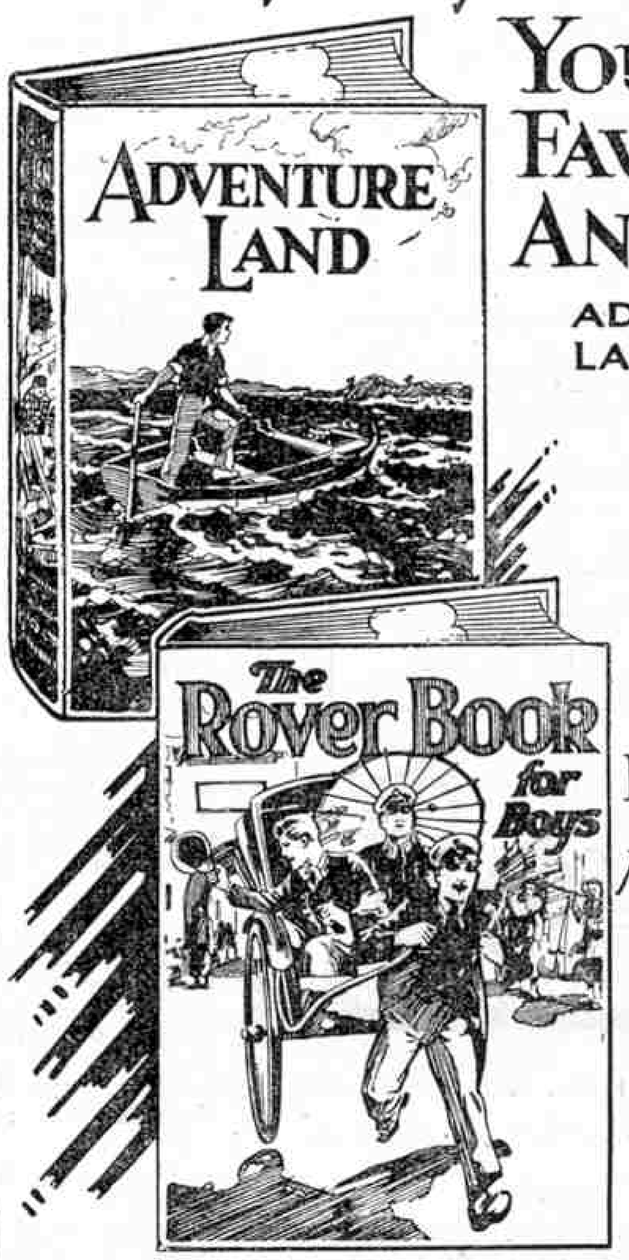

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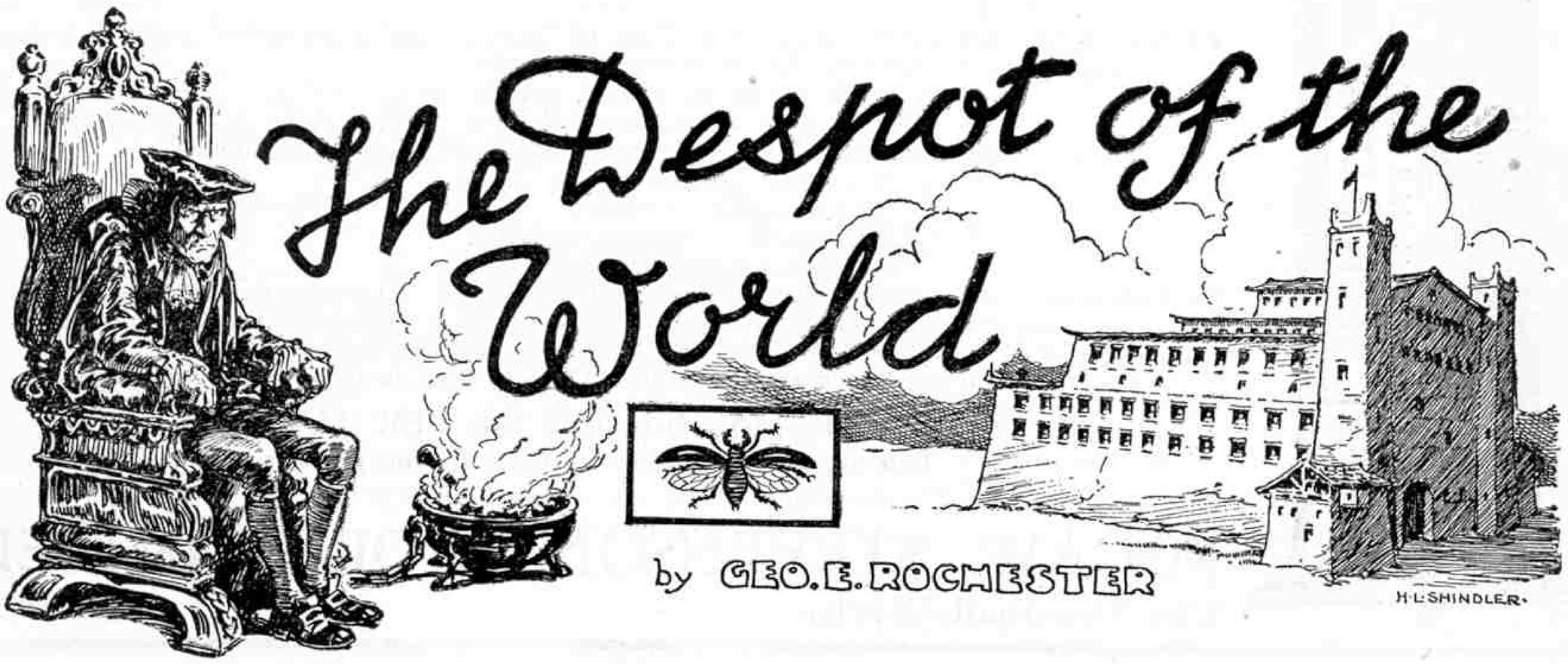

Prologue to the Story:

Day is all but done, and shades of the coming night are creeping in across the restless sea to swathe in grey shadow the silent dunes of sand. And as I sit here by my window I see again in the deepening dusk that strange fantastic company of Castle Grim.

They pass before me, a phantom host, but I can name them all: the cruel and merciless Zanderberg, warped of mind and body, yet brilliant of wit; the gentle Guillaume, scarred by the knout, crippled by the fetters, yet with the hint of gallant laughter still in his weary eyes; the brutal Borstorge.

Those three I see, and many others. But as I watch, they fade along the ghostly trail they tread, and in their stead comes one who was my own familiar friend. Visions, these, I know, bred by what I have in mind. But I seem to see him there—him whom the world knew as the Flying Beetle—and it brings a sudden dimming to my eyes.

A little while will I linger with thoughts of days now dead. Then drawing the curtains to shut out the night and lighting the lamp which stands upon my table, I will take up my pen to record the strange tale of Castle Grim; a tale which will tell of that quest of the Flying Beetle which was destined to prove the most perilous and the most tragic of them all.

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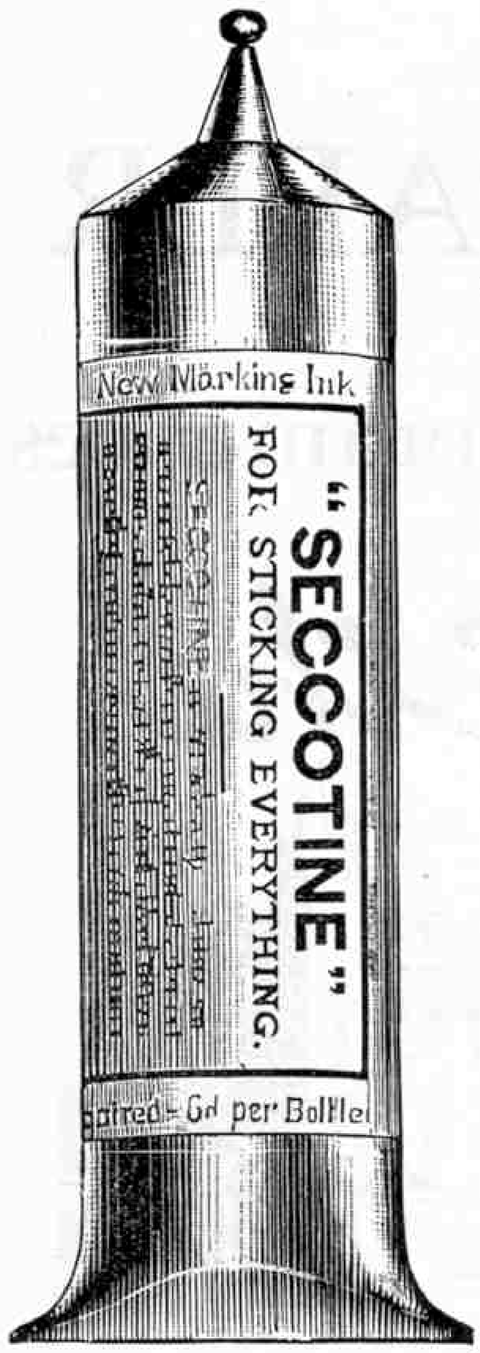

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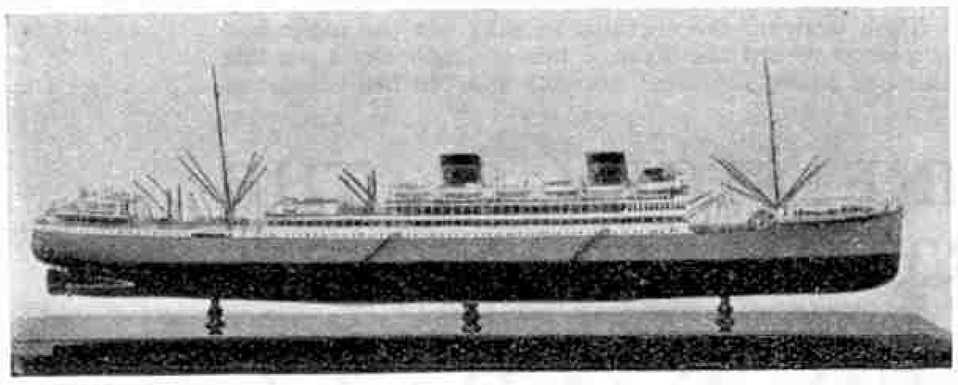

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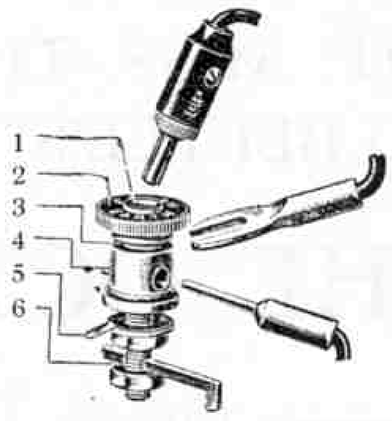

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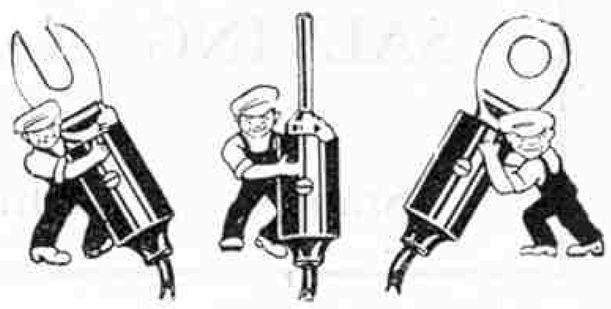

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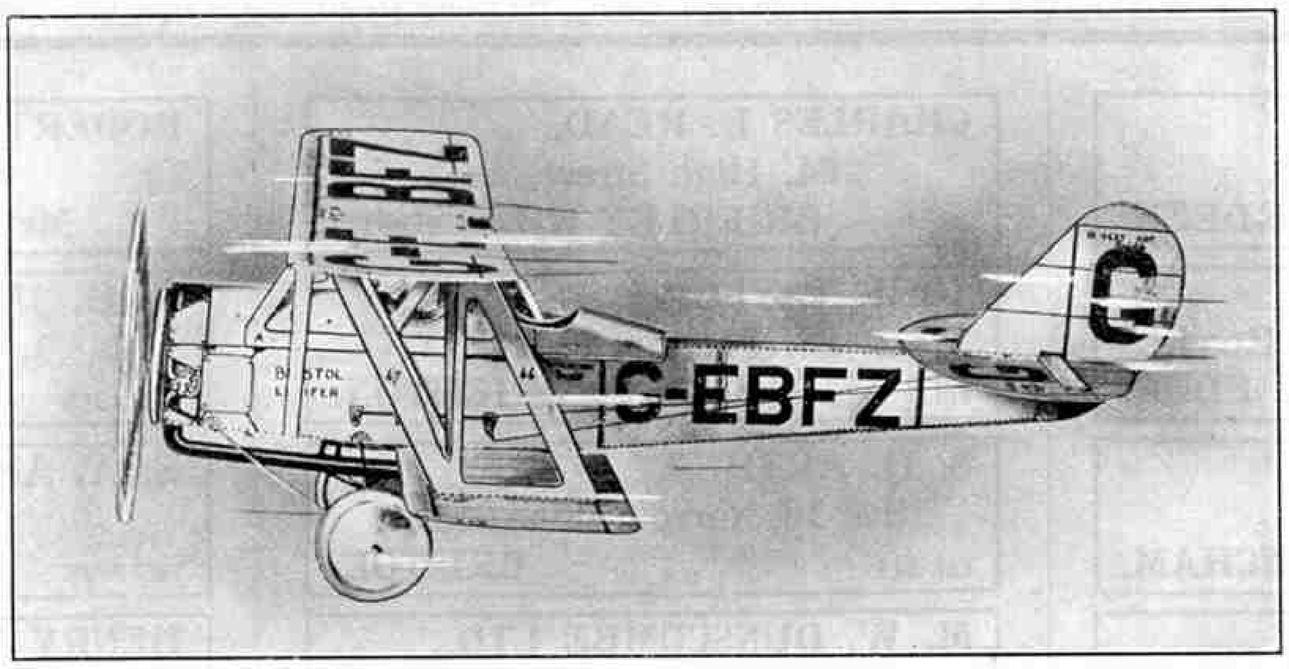

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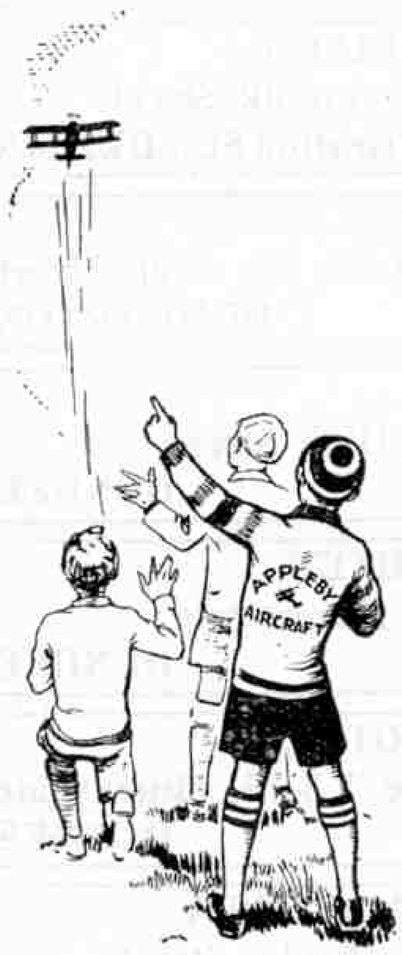

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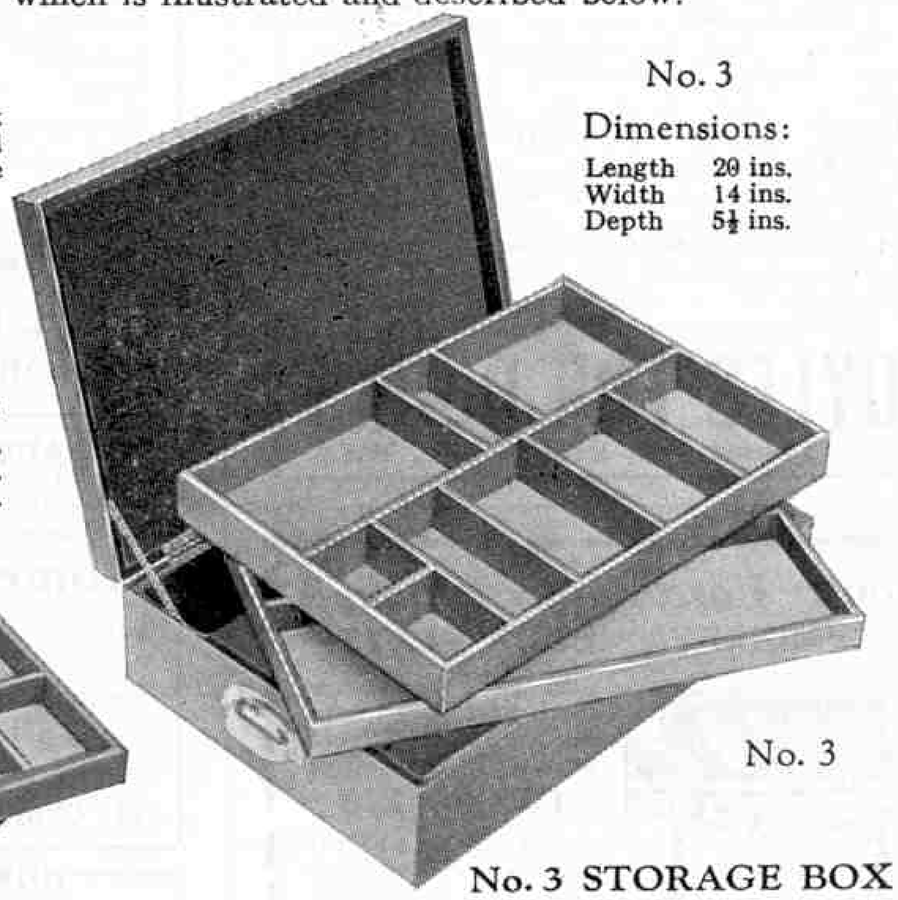

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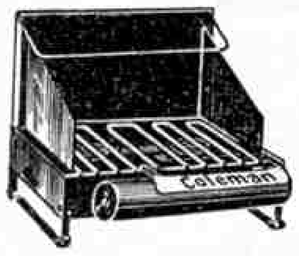

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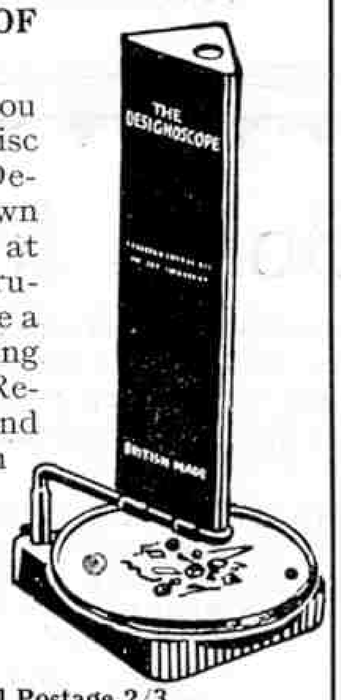

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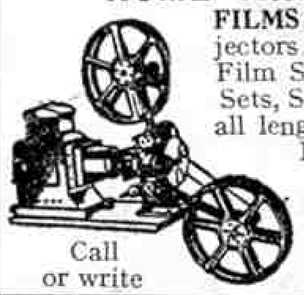

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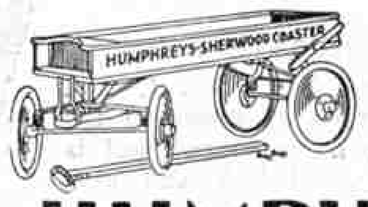

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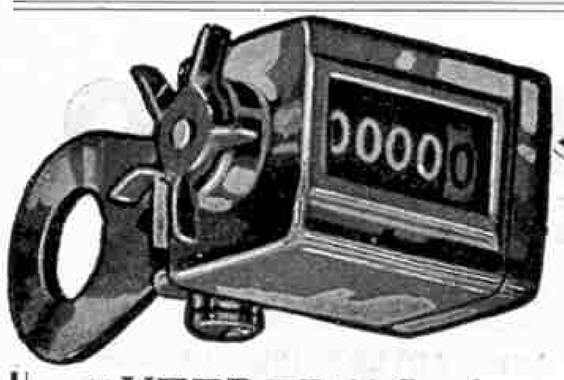

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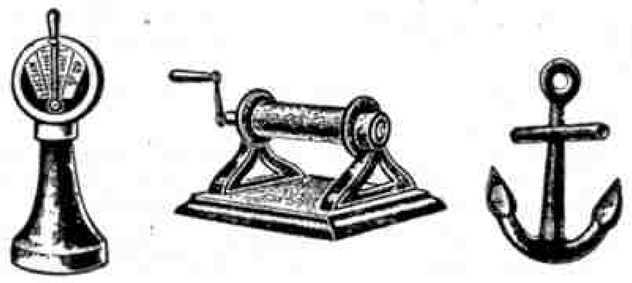

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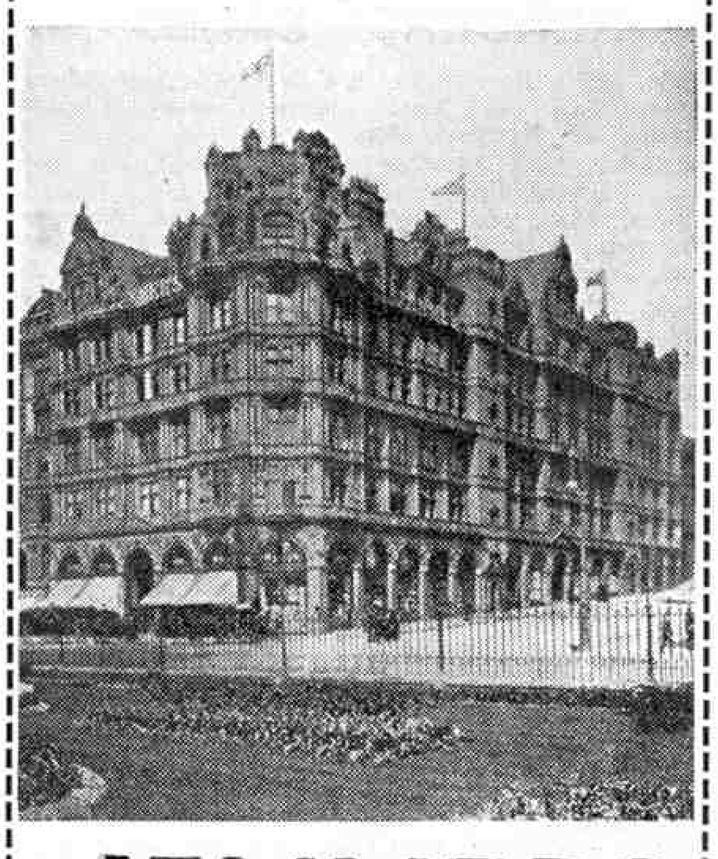

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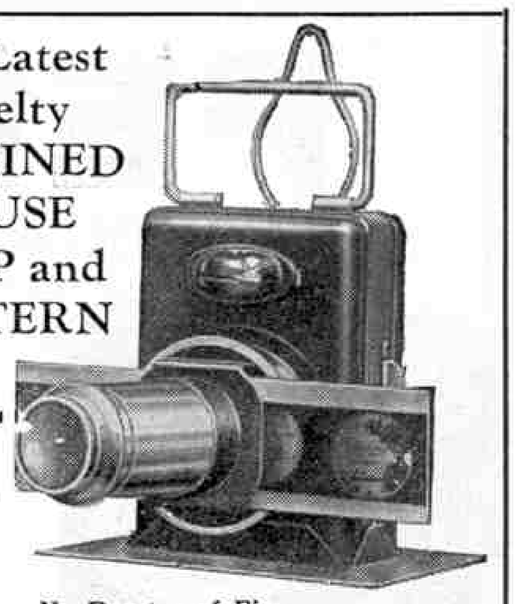

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48 "M.M.s" as new, 1925–1929. Offers.—Brierley, 69, Gordon Road, Nelson, Lancs.

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Simplex Typewriter, cost 30/–. Nearly new, 21/–.—C. Williams, Winkfield, Preston, Paignton.

MECCANO MAGAZINE

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

EDITORIAL AND ADVERTISING OFFICES:—

BINNS ROAD, LIVERPOOL, ENGLAND.

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 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

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

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

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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 8d. to their remittance and should order voucher copy at same time.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers, or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/– per copy (postage extra), and the subscription rates 7/– for six months and 14/– for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post free).

The U.S.A. price is 15c. per copy, and the subscription rates 90c. and $1.75 for 6 and 12 months respectively (post free).

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 concerned.

CANADA: Meccano Ltd., 45, Colborne Street, Toronto.
UNITED STATES: Meccano Co. Inc., Elizabeth Av., Elizabeth, N.J. Meccano Co. Inc., 200, Fifth Avenue, New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street. Bombay: Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

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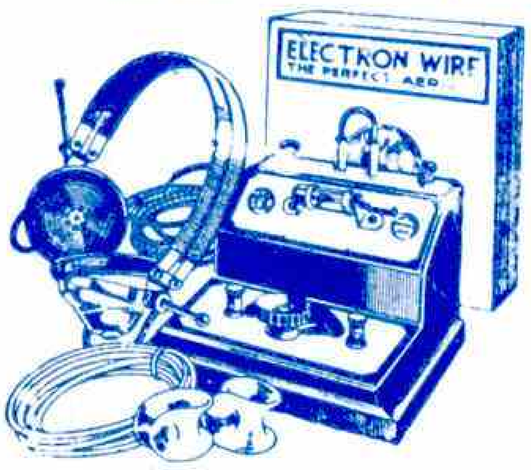

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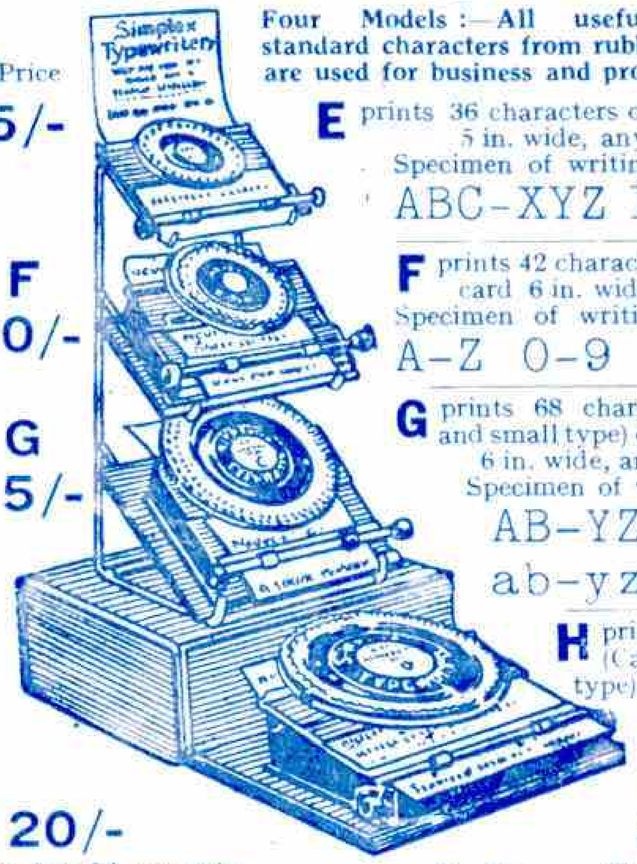

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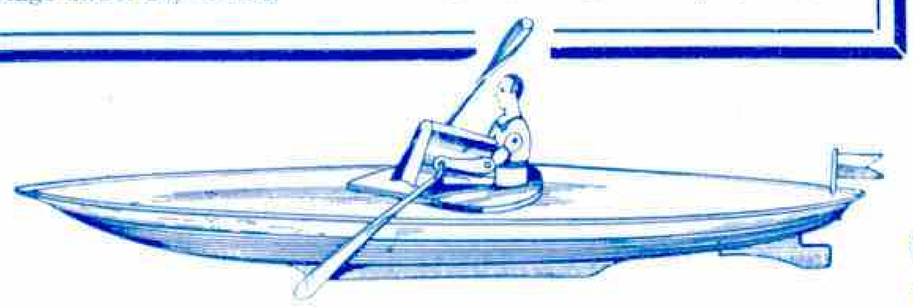

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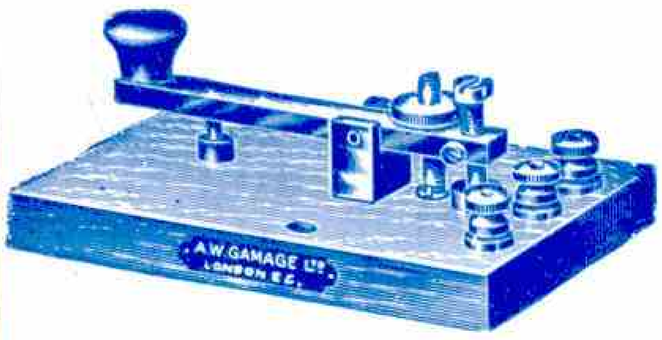

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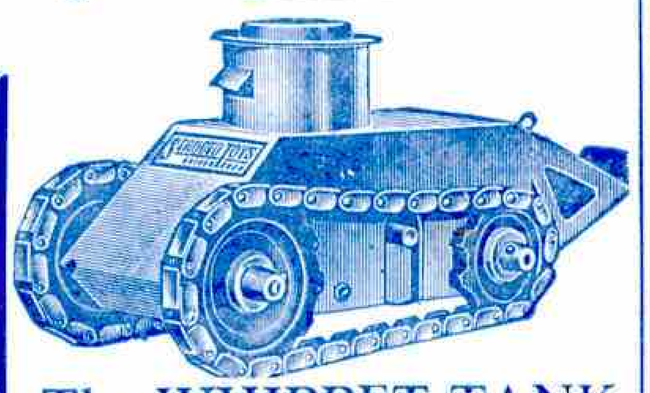

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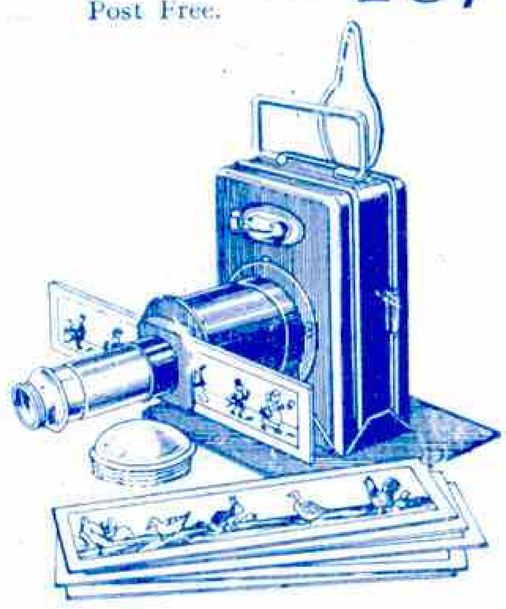

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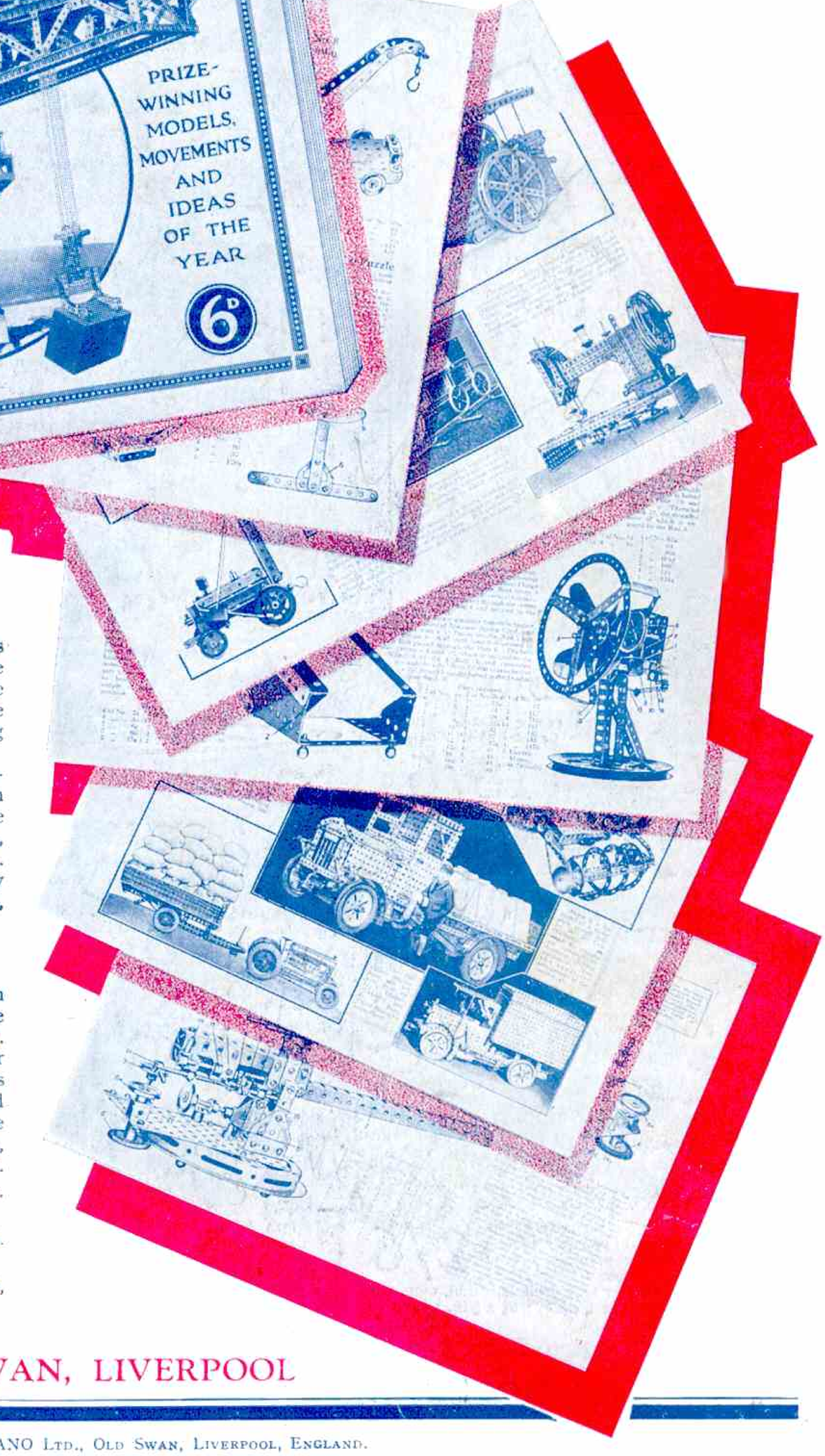

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How to Obtain the Book

There is a special edition for Overseas, price 9d. from dealers or 10d., post free, from the agents (in Canada, price 15 cents from dealers or 20 cents post free, from Toronto).

Readers in Australia, New Zealand, South Africa or Canada who require copies should apply to their dealers or should address their orders to our agencies as detailed below. Readers living in countries other than those mentioned should order from Meccano Ltd., Old Swan, Liverpool, sending a remittance of 10d. with their order.

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

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

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