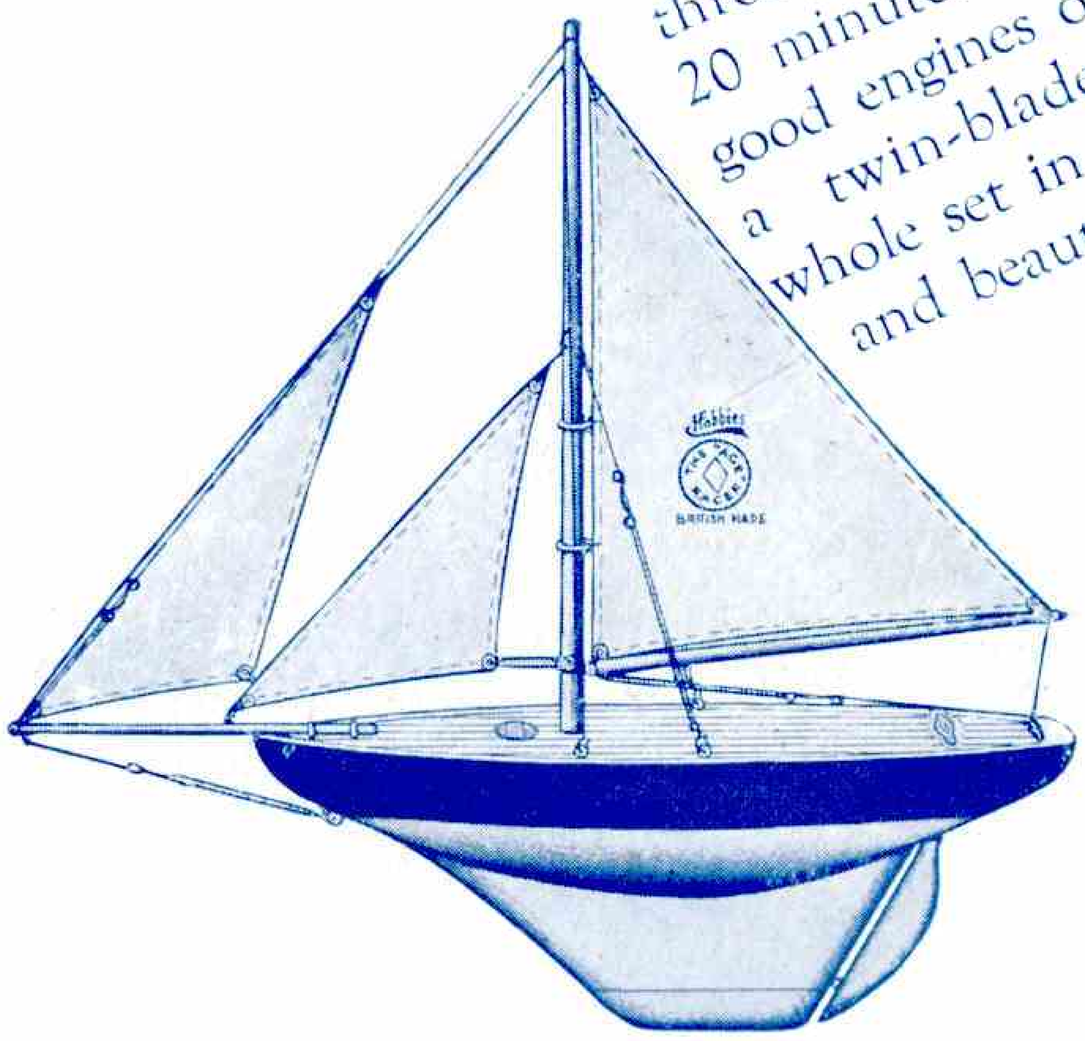
VOL. XIV. No. 7. JULY 1929.

MECCANO MAGAZINE

OFF FOR THE HOLIDAYS

Now who's with me?

Now, you fellows, what about some sport on the yacht pond? Here are some model boats if you like to manœuvre about with "reaching," "tacking," "running," and so on. Or what about one of those popular steam launches? Top-hole things they are—just 2ft. 6ins. long and driven steadily through any calm water for 20 minutes at one filling. Real good engines of brass, driving to a twin-bladed propeller—the whole set in a strong waterproof and beautifully finished hull.



SAILING BOATS

The Ace *A new range of solid-hull boats built Bermuda-rigged and guaranteed to sail. 11-in. deck* **2/6**, *12-in.* **3/6** *(postage 6d. extra). 16-in. deck* **5/6**, *and 18-in.* **6/6**. *Postage 9d.*

Whitewings *A real model yacht. Hollow hull, beautifully finished. With clean cut and securely lashed rigging, waterproof lines and running rudder. Deck 20¼-in. long. Price* **8/6**. *Postage 9d.*

Seagull *A larger model with hollow hull and 23-in. deck. White linen sails, waterproof cords and bowsies. With collapsible mast and rigging. Supplied in strong box. Price* **15/-**, *Postage 9d.*

STEAM LAUNCHES

Miss America *A sturdy model 26½-in. long with 4¼-in. beam. See the strong oscillating type engine drive her steadily for 20 minutes across the water. Price, with lamp and instructions,* **12/6**. *Post Free* **13/3**.

Peggy *With 26-in. deck, spraybood, strong brass engine, fitted with automatic lubricator and safety valve to the large capacity boiler. Lamp and instructions supplied.* **17/6**, *Postage 9d.*

Pioneer *The most up-to-date model for the modern boy. Built with super heated steam unit giving great driving power. The entire engine easily withdrawn and used for driving Meccano models. Price* **30/-** *or* **31/3** *post free.*

Ask for these boats at all leading Stores or Toyshops. See them at Hobbies Branches or write direct to Hobbies Ltd. (Dept. 96).

FREE AN INTERESTING ILLUSTRATED SET OF LEAFLETS WITH PICTURE AND FULL PARTICULARS OF ALL BOATS AND ENGINES IS SENT FREE ON REQUEST TO HOBBIES LTD. DEPT. 96, DEREHAM, NORFOLK.

ALWAYS ASK FOR **HOBBIES**

MODEL LAUNCHES & SAILING BOATS

NEXT MONTH: HOW MOUNTAINS ARE MADE. *READY: 1st AUGUST.*

MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool
England

Vol. XIV. No. 7
July, 1929

With the Editor

Long Words Again!

Since the appearance in these columns in the April "*M.M.*" of a paragraph on the longest word in the English language, I have been deluged with an amazing flood of many-lettered words. The longest of all was a Greek word, and consequently was not a serious competitor for the prize I offered to any boy who could send me a genuine English word of more than 34 letters. This is unfortunate, for the word has 169 letters, and in length far surpasses all other efforts that have been submitted to me.

When looking through the enormous number of entries I realised that there are more "*ologisms*" and "*isticisms*" in the world than I ever dreamed of! Some of the competitors confessed quite frankly that they had made words by adding prefixes and suffixes to an existing word, and in some cases this had been done without any regard to meaning, but with amusing results. One reader succeeded in building up in this manner a word of no fewer than 115 letters from the word vivisection—and in a postscript to his letter he remarks that he has not the least doubt that it is not a genuine English word! Another correspondent suggested the word "*controarcheoarchianthropomorphitismaciousness.*" This appears to be an invention, for the writer goes on to claim it as being a useful addition to the English language, on the ground that it "takes quite a lot of defining!" In this I agree with him, and in fact I have abandoned the attempt to extract the full meaning of the word!

Other readers sent in equally weird and wonderful words that are names of chemicals. I am afraid that some of these words represent compounds that have yet to be discovered, and many of them cannot possibly exist! Unfortunately such words cannot be regarded as simple, and in the original article on page 265 of the March "*M.M.*" it was pointed out that in strict fairness they should be ruled out of consideration. Similarly, several readers overlooked the fact that place names did not satisfy the conditions of the competition, and sent in the name of a notorious Welsh village; but I am surprised that none of them seem to be acquainted with Lake Chargoggagoggmanchaugagoggabunagunamogg in Massachusetts, in the United States of America. Although I believe this to be the longest place name of America, I cannot be certain on the point and perhaps some reader in the United States can enlighten me.

D. G. Roberts, Oakham, had the bright idea of placing the prefix semi- before the word given in the April "*M.M.*" Thus the word becomes semi-antidisestablishmentarianistically. Anybody who is so inclined must be a direct descendant of the famous Sir Roger de Coverley, who invariably concluded every argument by remarking wisely that there was much to be said on both sides! I do not know any instance of the use of this word, but I have decided to award Roberts the prize on the ground that his is the best effort to produce a word that may reasonably be described as a simple English word longer than the one quoted three months ago. An autographed copy of my book "*Romance and Reality of Radio*" has therefore been sent to him.

Sea-serpents and Rattle-snakes

It is announced that a scientific expedition is to explore the waters of the Pacific Ocean, especially in the neighbourhood of Galapagos Island, in the hope of catching specimens of a sea-bat that is alleged to have been seen. In appearance this new mystery of the ocean is said to resemble a gigantic pancake, and it is believed to weigh several tons! A sturdy whaleboat with harpoon equipment is to be taken in order that no opportunity may be lost of capturing any specimen that may be seen by the lookout man.

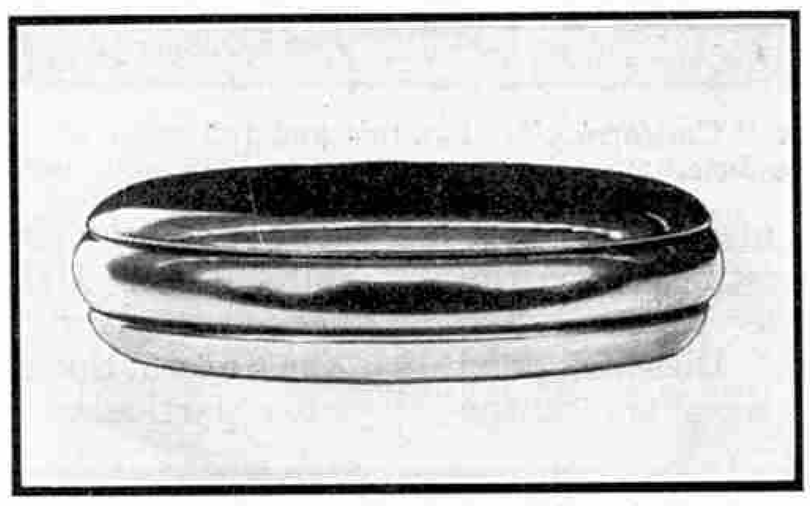
The members of the expedition are prepared to deal with any other strange denizens of the ocean they may meet, and a considerable amount of space below deck is given up to tanks in which the catches are to be brought home. I have been wondering if the tanks will be large enough to contain a sea-serpent for, as all my readers will know, now is the time of the year when these monsters may be expected to put in an appearance. It will be a great feather in the cap of the leaders of the expedition if they discover not only a sea-bat but a sea-serpent!

While we are awaiting the result of the search for the sea-bat it will be well to remember that on land there are wonders quite as remarkable as any to be met with in the sea. For instance, I have heard of a naturalist who has adopted as pets a family of rattlesnakes. There are ten of them altogether—father, mother, and eight youngsters. They are quite harmless, for their poison glands have been removed; and they are so friendly and intelligent that they have been given a very unusual amount of freedom, which they appreciate very greatly and use wisely.

Early one morning the naturalist was awakened by a series of tugs from mother rattlesnake. As soon as she had aroused him she made for the door in a manner that showed very plainly that he was expected to follow. Downstairs she led him, and there he was amazed to find father rattlesnake swaying ominously in front of a terrified burglar, who was crouching down by the side of the safe. This would have been more than sufficient to confirm the ancient belief that the serpent is the fount of wisdom, but when the naturalist looked at the open window by which the burglar had entered, he could scarcely realise that he was awake. On the sill were the eight little rattlesnakes, all rattling their tails for dear life in order to call a policeman!

After patting each little rattlesnake on the head the grateful naturalist returned to bed, feeling confident that his pets would explain everything to the police, and that they could be relied upon to close and fasten the window—after bringing their rattles inside, of course!

No. 8. WHAT EVER IS IT?



Here is the eighth little puzzle in the series that is proving so very popular, judging from the number of postcard "solutions" I receive.

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

Solutions should be written on postcards only and addressed "Editorial Competition No. 8, Meccano Limited, Old Swan, Liverpool." Closing date 30th July.

For result of June "What Ever Is It" Competition see page 543.

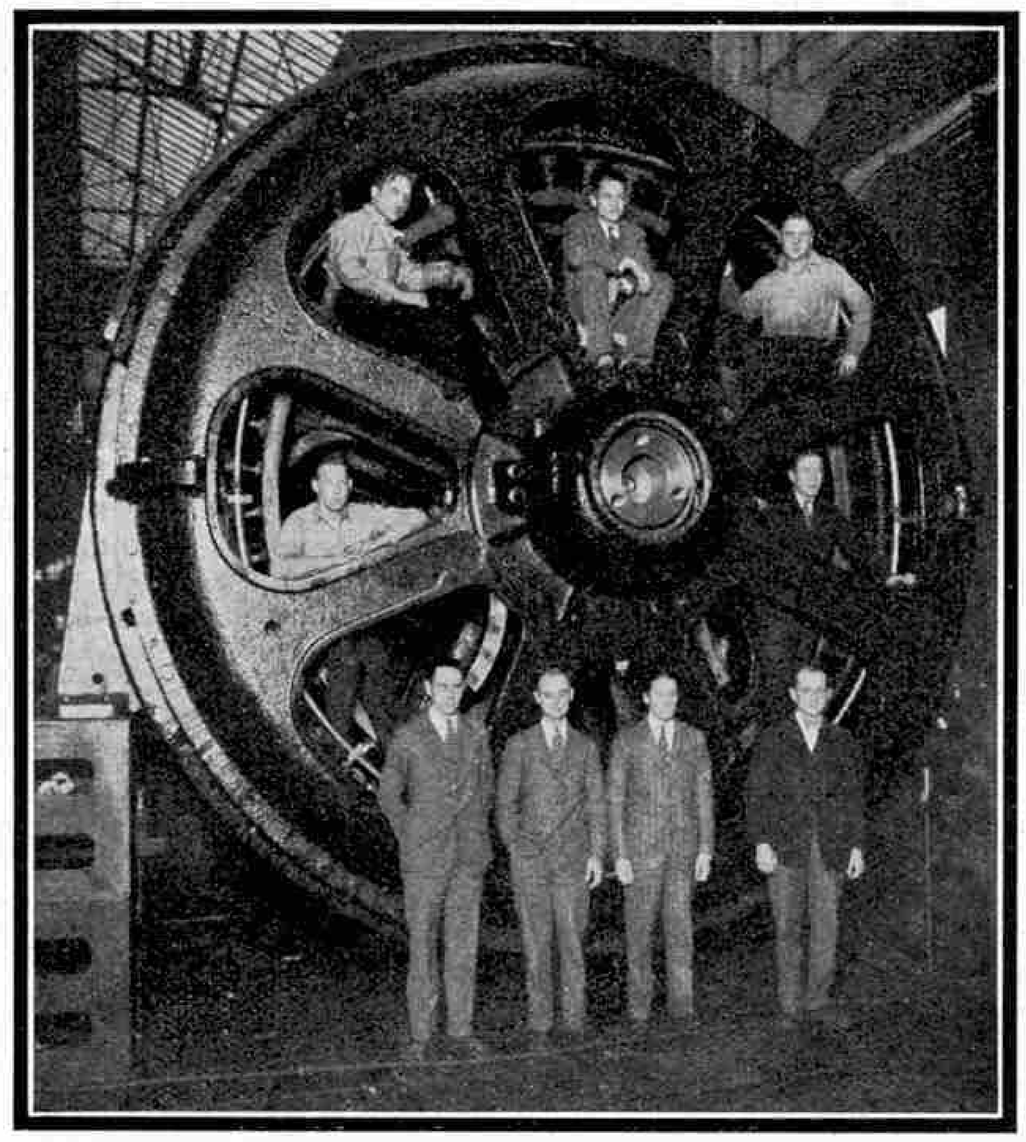
Electricity to Propel Giant Liners

New U.S. Ships: *"California"* and *"Virginia"*

The Electrically Propelled Panama Pacific Liner "*California.*" For this and the other photographs illustrating this article we are indebted to the International General Electric Company, Inc.

THE present position in regard to methods of ship propulsion is exceedingly interesting. In the foreground is the great struggle between the Diesel-engined ship and the steamship. Diesel-engined vessels have been launched in large numbers during the past few years, but the struggle is by no means over, and many authorities still consider that on balance the steam-propelled ship is the better of the two. This controversy is likely to be a prolonged one, and in the meantime another interesting development is taking place—that of the electrically-propelled vessel.

Although the earliest application of the principles of electric propulsion was made on the Clyde, where an experimental launch named the "*Electric Arc*" was built in 1911, subsequent developments in this direction have been very largely confined to the United States. In 1913, three 20,000-ton colliers for the navy were equipped with turbo-electric machinery. The trials and subsequent service performance of these ships proved very satisfactory; so much so indeed that it was decided to adopt electric propulsion for some of the larger battleships of the United States navy. This policy proved very successful and attracted world-wide attention. The International Mercantile Marine Co., of New York, gave particular consideration to the matter, and ultimately decided that electrical propulsion should be adopted for two new passenger and freight liners that were to be built for service under the flag of the Panama Pacific Line.



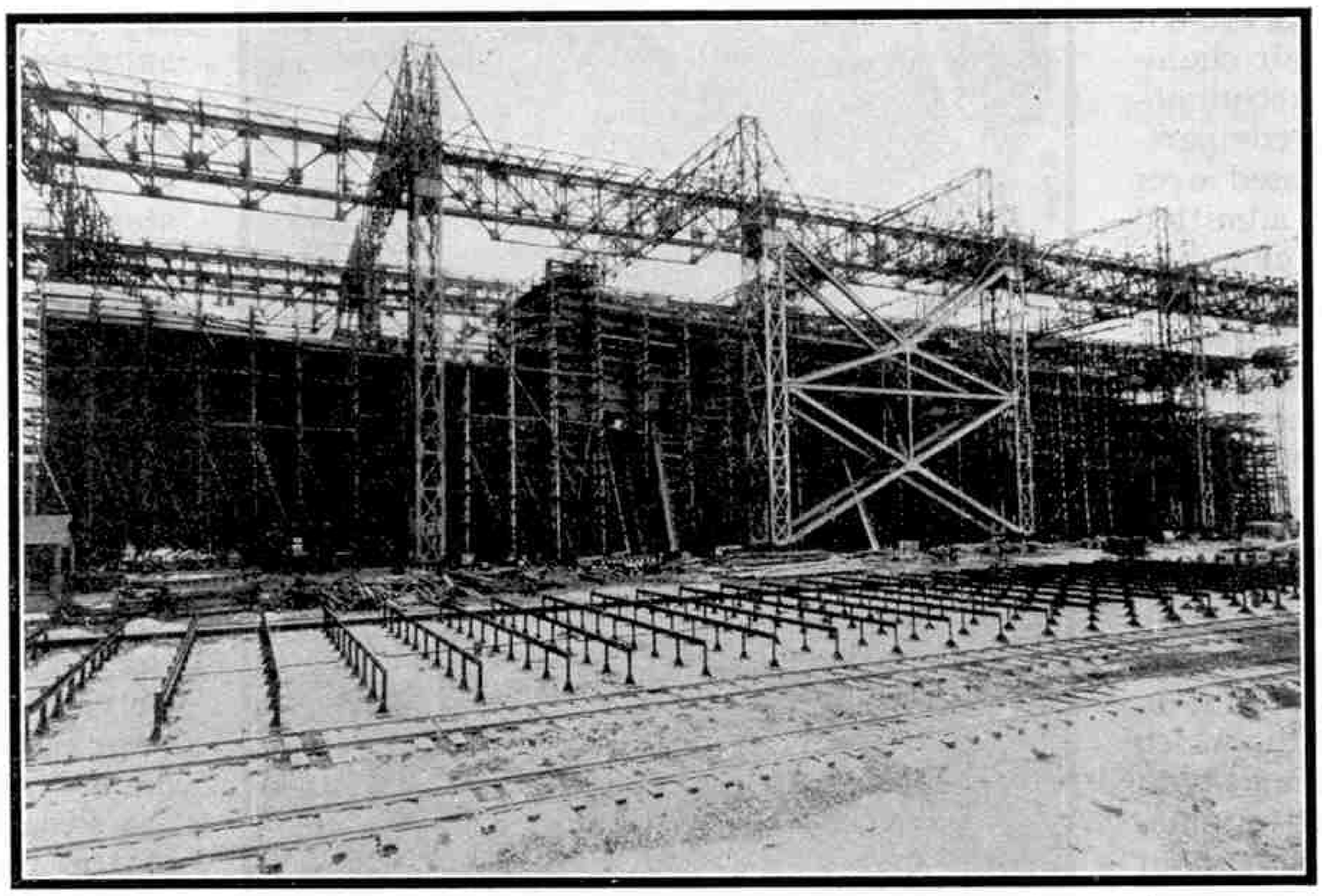
Photograph of one of the Propulsion Motors for the "*Virginia,*" taken in the shops with employees posed to afford a comparison of size

The "*California*" and the "*Virginia*" were constructed by the Newport News Shipbuilding and Dry Dock Company for the Panama Pacific intercoastal service between New York and San Francisco, via Havana and the Panama Canal. The ships have been built and fitted out to the same general design, but as the "*California*" was the first to be completed and placed in commission we will describe the principal features of this interesting vessel.

The "*California*" has an overall length of 601 ft. and is of 80 ft. beam. Her gross tonnage amounts to 30,230, of which 8,000 tons is in respect to cargo-carrying capacity. Comfortable and

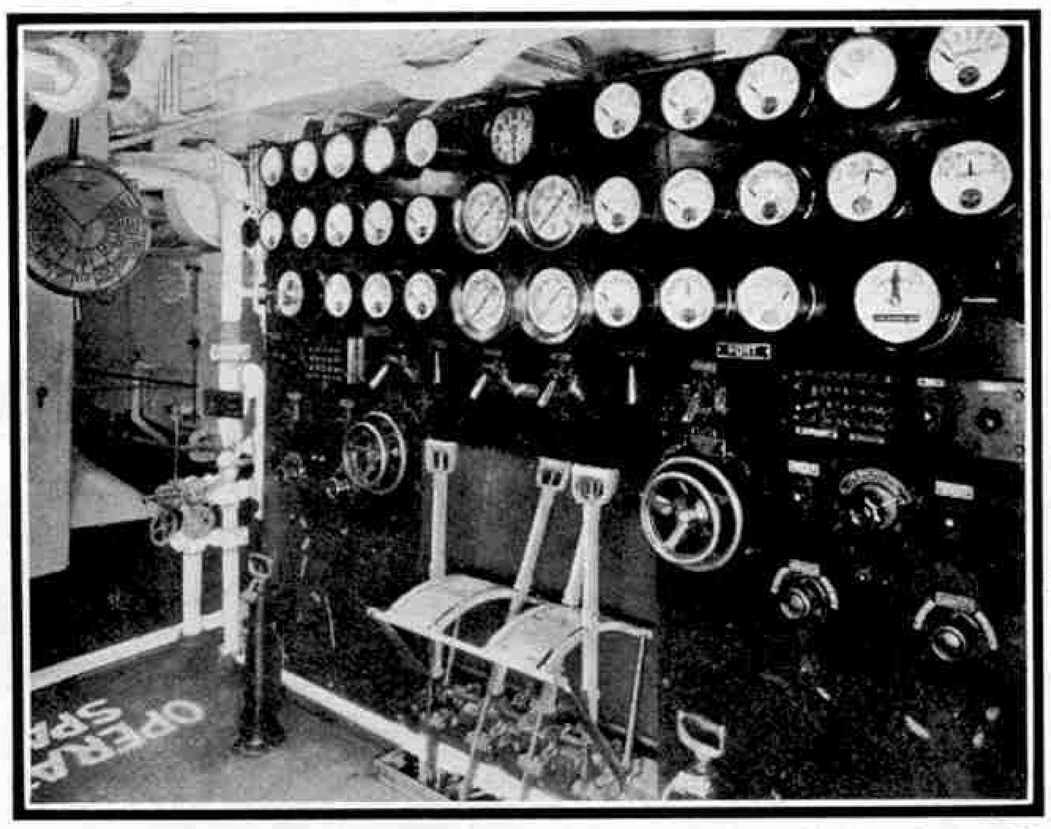
well-furnished accommodation is provided for 388 first-class and 363 tourist-class passengers. The passenger accommodation is well appointed and the numerous staterooms have been so arranged that each has a direct outlook. Another feature that emphasises the extent to which the comfort of passengers has been considered is that the staterooms are equipped with metal beds having springs and hair mattresses, instead of with the customary wooden berths. Sofa berths and folding Pullman upper berths are provided, however, so that additional passengers can be accommodated when necessary. Each stateroom is provided with hot and cold running water.

A novel feature on the "*California*" is the introduction of *de luxe* suites each having a private deck verandah, shaded by a projecting awning that can be adjusted as desired.



The "*Virginia*" nearing completion at the yard of the Newport News Shipbuilding Company. The enormous size of the structural framework is clearly shown

An impressive feature of the first-class dining saloon is a remarkable central dome containing a series of mirrors before each of which is a wrought iron rail, giving the appearance of a balcony. One effect of the mirrors is to create a feeling of space and distance. The port-holes of the saloon are concealed by casements of leaded glass suitably draped. Leading off from the dining saloon is a spacious foyer on one wall of which is a remarkable map, some 6 ft. in length, showing the old-time travel routes across the Isthmus of Panama. The map includes a series of panelled recesses with coloured illustrations that depict dramatic incidents in the great Californian gold rush of 1849, when men struggled desperately through the dense Isthmian jungle to seek, on the Pacific coast, any transportation that they could get to convey them to California and thence to the goldfield.



The Main Propulsion Control Board on the "*California*"

An equally interesting map adorns one wall of the first-class smoking room. This map depicts the routes that were followed by pirates in the Caribbean Sea. A brief record of their better known exploits is given, and the map is relieved by numerous small scenes in colour that illustrate the activities of these notorious buccaneers. The smoking room is panelled from floor to ceiling in American pine of beautiful quality.

The public rooms of the tourist accommodation are large, airy and pleasantly furnished, and include a lounge 48 ft. by 42 ft., panelled in old ivory and having windows of leaded glass. The tourist dining saloon extends the full width of the ship and is 73 ft. by 30 ft. The tourist cabin smokeroom is in the form of a deck-house and has ports on all four sides. It is 46 ft. by 29 ft. and is panelled in American old pine, while the electric fixtures are of antique brass.

The "*California*" has eight decks that have, including the floor of the lower hold, a total area of 72 acres. The loftiness of her superstructure is such that the bridge and pilot-house are 50 ft. above the water, and thus are well out of reach of any ordinary wave. The pilot-house contains the gyroscopic compass and various other up-to-date navigation devices.

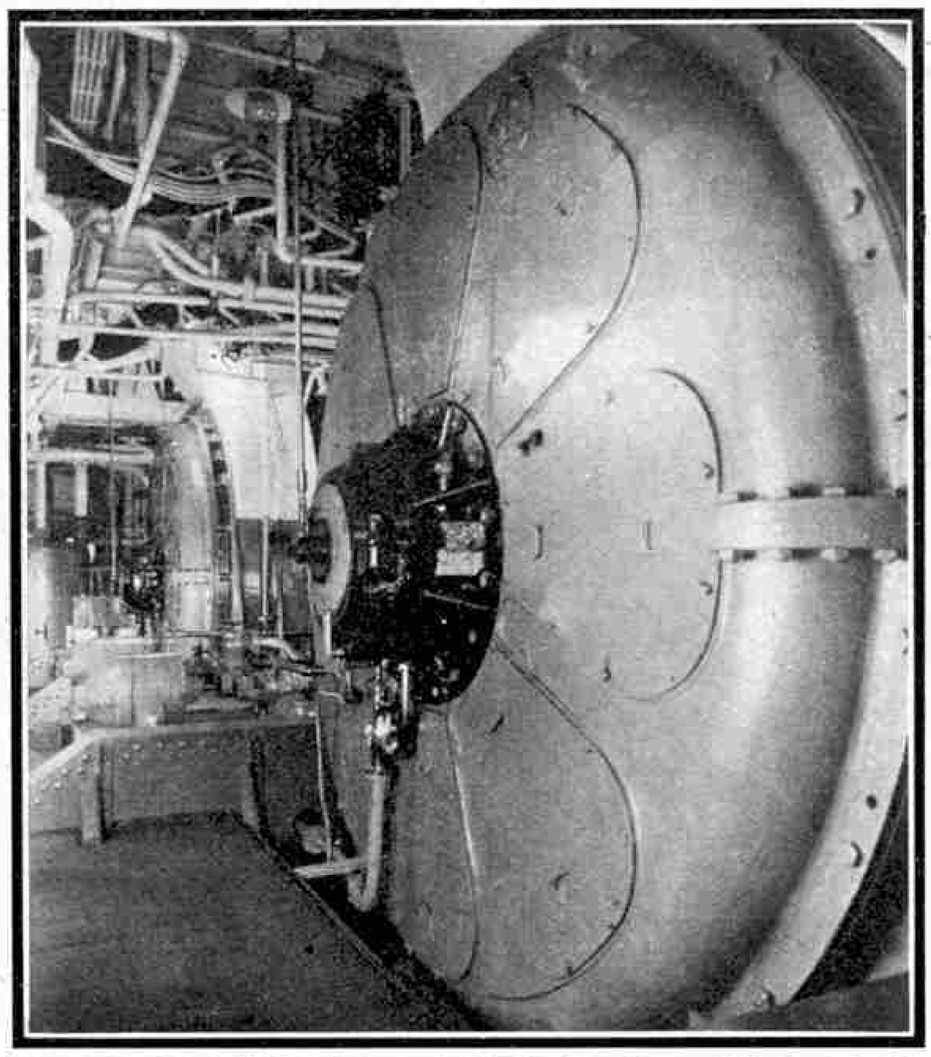
Electricity does almost everything on the "*California*," from propelling the ship to freezing ice cream. It is employed exclusively in the ship's extensive freight refrigerating department, while it also slices meat, bakes bread, grinds knives, washes dishes and runs the printer's presses. In addition it controls the numerous clocks, and is the means of lighting and heating the ship.

The "*California*" is designed to carry 8,000 tons of freight in addition to passengers and baggage. On the return journeys to New York the freight includes large quantities of Californian fruit, and it is very important that this should not be affected by changes of temperature as the ship passes from the cold northern waters near San Francisco to the canal zone, and later reaches the temperate zone again when nearing New York. On this account the fruit is stored in a special air-cooled chamber of 60,000 cu. ft. capacity. The chamber adjoins a 40,000 cu. ft. cargo space reserved for frozen goods.

The system of refrigeration employed is known as the "CO^2" compression brine circulating system, and the equipment for making the brine consists of four electric compressors each driven by a General Electric type 100 h.p. 230-volt d.c. motor. Three 16 h.p. centrifugal pumps circulate the brine mixture through long coils of

piping that extend from the ship's generating room to the refrigeration chambers. Each pump is capable of delivering 300 gall. of brine per minute against a head of 50 lb. per sq. in. In the chamber where intense refrigeration is carried out the temperature is kept below freezing point by brine pipes on which a thick coating of frost is maintained. Brine pipes are not present in the cooled air chamber, however, but are accommodated in an adjoining compartment. Cold air is passed over these pipes and is then admitted into the cooled air chamber, where it is circulated by means of electric fans. The vitiated air passes away through ventilators.

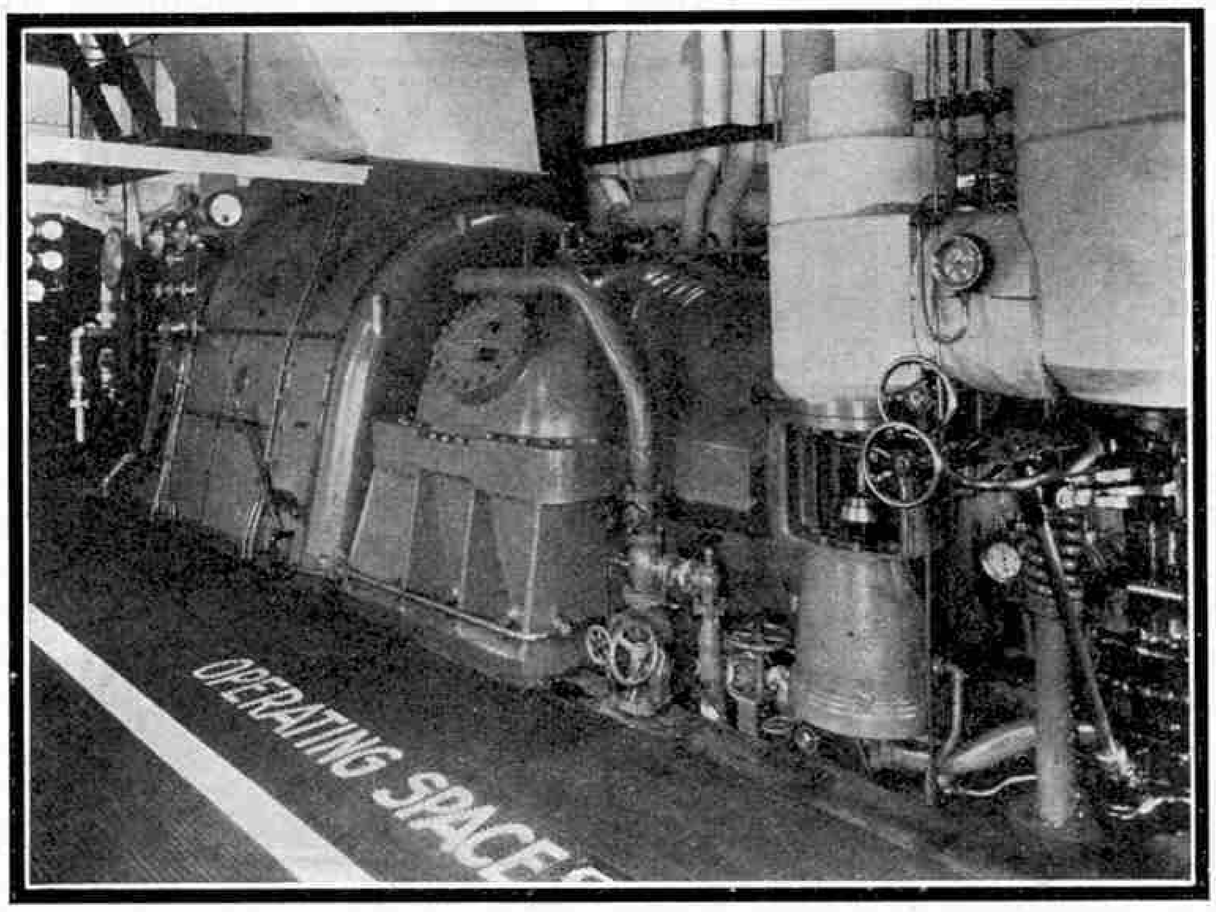
The freight handling equipment of the "*California*" has been designed to meet the special conditions existing in the Panama-Pacific intercoastal trade. In the side of the hull, below the main deck, are 18 cargo ports each 7 ft. 4 in. in height by 8 ft. in width, which are used for handling both package freight and automobiles. There are also four ports for the shipment of stores, while on D deck are two large ports for passenger use.



One of the "*California's*" Main Propulsion Motors, port side

The deck cargo-handling gear includes 31 reversible single drum, electric, spur-geared winches, arranged in groups. Each winch is capable of handling 3,000 lb. at 300 ft. per minute. The foremast carries one 10-ton and five 6-ton booms, and the main mast has six 6-ton booms. The deck gear of the ship is electrically operated throughout with the exception of the windlass and mooring winch, which are steam driven.

The life-boat equipment is on liberal lines and includes two 26 ft. boats and twelve 28 ft. boats of capacity varying from 35 to 60 persons each. All are metal built, and two of the 28 ft. boats are provided with masts and sails. The life-boats are slung from "Welin" type davits fitted on the boat deck, where are four non-reversible electrically-driven boat winches, each with two horizontal winch heads driven through worm gearing running in an oil bath. Each winch is capable of handling a life-boat loaded with 60 persons. In addition, there are two special motor-driven winches, each of which can lower or raise a motor life-boat loaded with 46 persons and fully equipped.



Port side Propulsion Turbine Generator of the "*Calitornia*"

The wide breadth of the "*California*" and her fullness aft, due to her cruiser stern, provide an unusual amount of space for the propelling machinery and auxiliaries, but so comprehensive is her engine plant that all this space has been utilised to advantage. The engine room arrangements differ from those of the average ship as the propulsion motors of the generating machinery are on different levels.

The entire propelling machinery of the "*California*" was supplied by the General Electric Co., U.S.A. The main plant of the "*California*" consists of two marine type G.E.C. steam turbines, rated at 6,750 S.H.P. at 2,640 revs. per minute—equivalent to a propeller speed of approximately 110 revs. per minute. The turbines are directly connected to 3-phase 3,700 volt alternating-current generators that are rated at 5,250 k.w. at 2,640 revs. per minute. This plant is situated on the upper level of the engine room, and power is conveyed by means of cables from the two generators to two main propulsion motors that are situated on the lower level of the room.

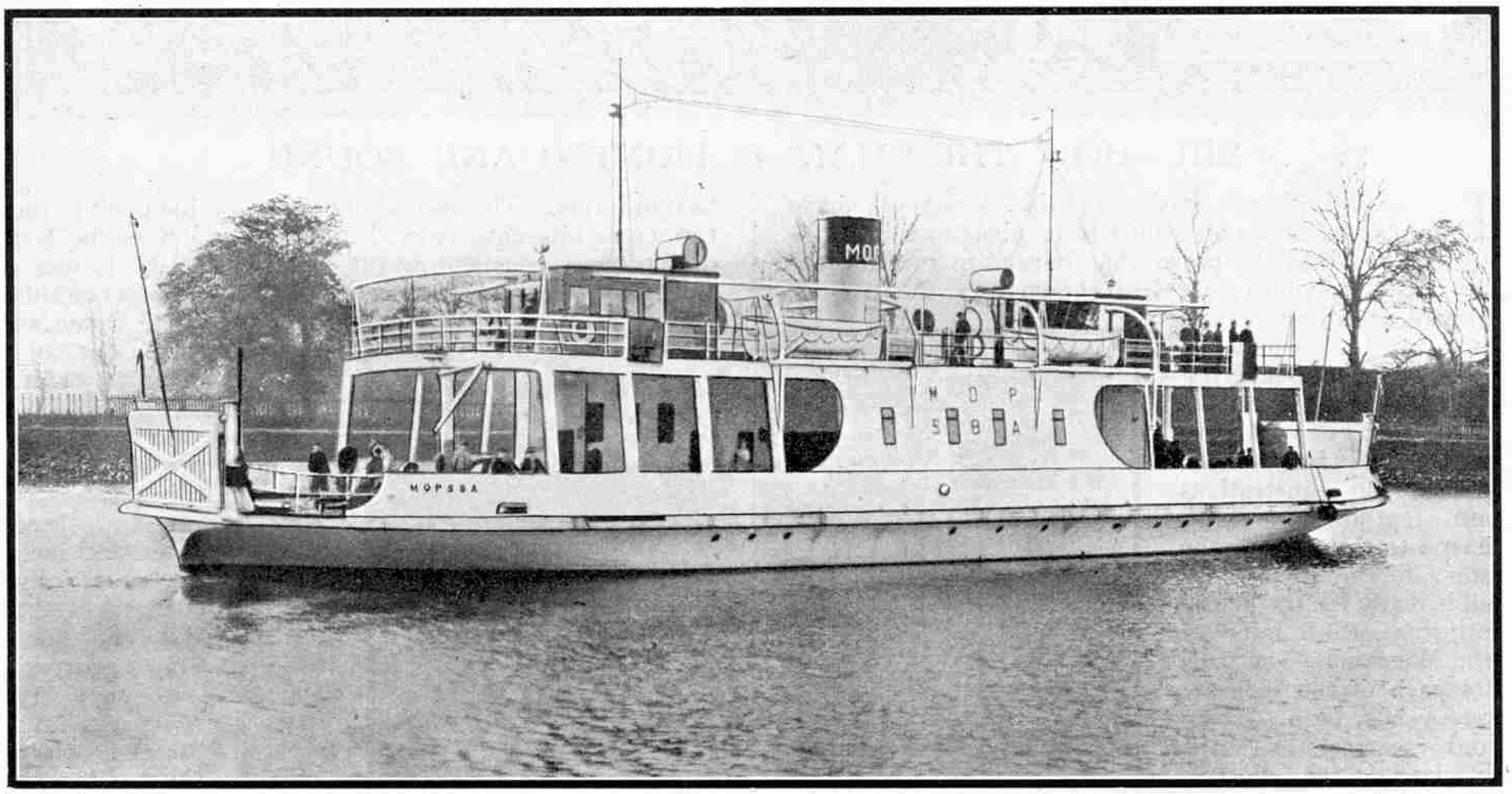
The propulsion motors are of the synchronous induction type, rated at 5,250 k.w. at 110 revs. per minute, and are directly connected one to each propeller shaft. It is claimed that this form of drive gives full backing power and eliminates the need of reversing turbines. The motors are of massive construction and each is nearly 16 ft. in height and is 82 tons in weight. They are almost silent in operation, and the only noise that they emit is a light but not unpleasant hum. Each motor is ventilated by two automatically controlled motor-driven exhaust fans, each capable of delivering 20,000 cu. ft. of air per minute.

Both motors can be operated with the current supplied by a single generator when producing only 75 per cent. of its rated output. This enables substantial economies to be effected when the ship is worked at a reduced speed, as when passing through the Panama Canal or when it is desired to avoid making port before a certain time. If, for any reason, it is found necessary to stop either of the turbines, the other one is capable of sufficient energy to enable the ship to be run at seventy per cent. of her normal speed.

Steam for driving the turbines is provided at 275 lb. pressure by 12 Babcock and Wilcox oil-fired water-tube boilers. The boilers have a (*Continued on page 543*)

A Boat Driven Like a Tram Car!

Unique Diesel-Electric Ferry for the Argentine



AN interesting vessel possessing several unusual features is a Diesel-electric ferry boat built to the order of the Argentine Government by Yarrow Ltd., with electrical equipment by the Metropolitan-Vickers Electrical Company. It is the first vessel of its type to be built in Great Britain.

The vessel is intended for service on the River Parana and its tributaries. It is designed to carry on its main deck 20 motor cars and on its upper deck 150 passengers. The over-all length of the vessel is 145 ft. and the width of deck 40 ft. The draft with full load is only 4 ft. 5 in. so that there is no difficulty in navigating quite shallow streams. The guaranteed speed is 17 kilometres, or approximately ten-and-a-half miles per hour.

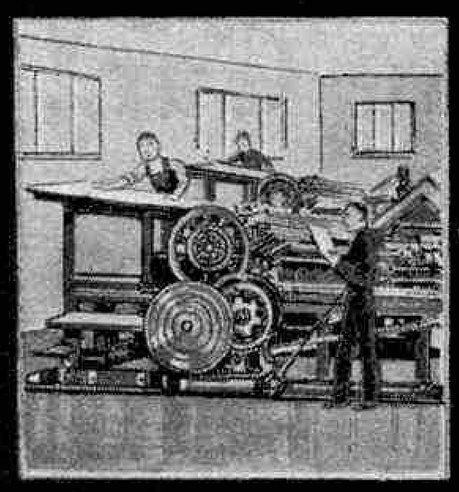
In order to permit of travelling in either direction the vessel is double ended and is propelled by one or other pair of twin screws that are provided at each end. Each of the four screws is driven by a separate 200 h.p. motor, the two motors of each pair being controlled jointly or independently as required.

Power is obtained from one or both of two generating sets, each consisting of a 6-cylinder 300 h.p. Diesel engine, driving the main generator for propulsion, and an auxiliary generator for supplying current to the pumps, winches and other gear, and also for lighting purposes. When only one of the generators is in operation the speed of the motors is automatically restricted sufficiently to prevent any possibility of the single generator becoming overloaded.

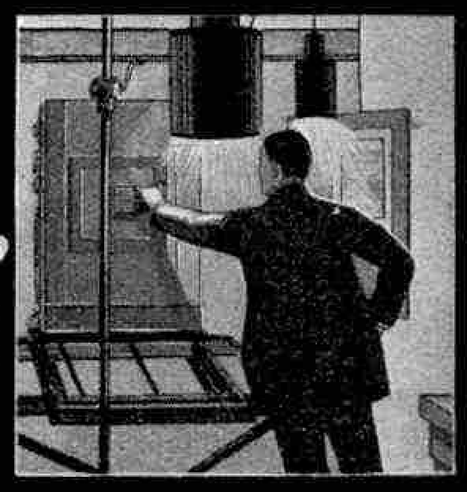
The vessel is unique in British construction in that it can be driven like a tram car from either end, according to its direction of travel. Full control may be effected also from the engine room, all provision being made to ensure that the three control points cannot possibly interfere with one another. The system which has been specially developed by the Metropolitan-Vickers Company is so simple that the navigating controls can be operated without any special training or detailed knowledge of the equipment. Owing to the flexibility of the electric drive, the vessel can be manœuvred in difficult or crowded waterways with far greater facility than could be obtained by any other method. This was clearly demonstrated when, during a series of exhaustive trials, the propellers were reversed from full speed ahead to full speed astern in three seconds which is a remarkably short time for this operation.

The semi-tropical climate of the districts in which the vessel is to operate has necessitated special ventilating arrangements for the propulsion machinery, and a fresh air supply is fed to each machine through trunking from a convenient space between decks. In order to keep the engine room as cool as possible, the whole of the heated air from the engines is drawn away and passed direct up the funnel.

The service for which the vessel is intended involves trips of about 95 miles. It is capable of very much longer voyages, however, even under severe conditions, as is shown by the fact that it is to undertake, under its own power and alone, the journey from the Clyde to Buenos Aires, a distance of over 6,000 miles.



Producing the "Meccano Magazine"



XIII.—HOW THE "M.M." IS PRINTED AND BOUND

IN the last three articles in this series we have explained how pulp made from pine trees is transformed into the paper that is used in printing the *"M.M."* Previously we had shown how the copy is prepared and set up in type on the wonderful Monotype, and had followed the work of the photo-engraver who prepares the blocks from which the illustrations are reproduced. We have thus carried the story to the stage when all is ready for the actual printing of an issue of the Magazine. The type for each of the separate pages has been set up and corrected; the blocks of the illustrations have been made and placed in position; and the paper, 20 to 30 tons of which are required for each issue, is at hand in sheets of convenient size.

Naturally it is impossible to print off an entire magazine in one operation, but at the same time a glance at any copy of the *"M.M."* will show that its pages are not printed separately. If the wires holding the sheets together are removed, it will be found that two pages appear to have been printed on each side of a sheet. Actually sheets large enough for 16 pages to be printed on each side have been used. The finished sheet usually contains 32 pages, and the entire Magazine is made by stitching the sections together after folding. The edges are then trimmed to open the folds.

As an example we may follow the make-up of the central sheet of the present number of the *"M.M."* This has been printed from two formes of 16 pages each. The first includes page 537, but the next two are in the second forme. The succeeding pages are included in the formes in alternate pairs, leaving page 568 as the last of the pages constituting the first of the two formes.

One side of a sheet of the "M.M." as it comes from the press. Folding along the lines AB, CD, and EF in turn brings each page into its correct position in preparation for binding the sections together. Afterwards the edges are trimmed and the copies are ready for despatch

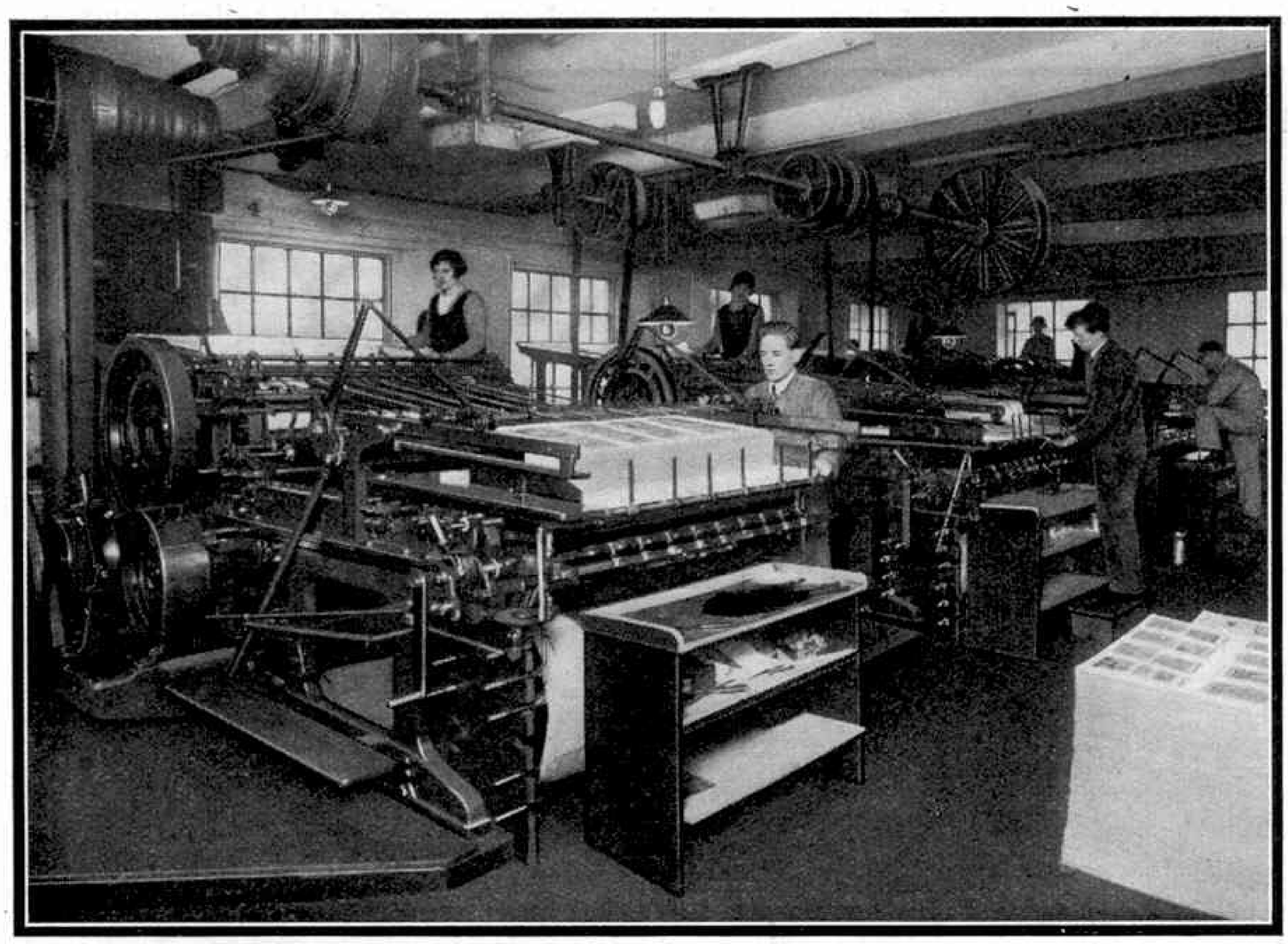
The 16 pages of type that are to be printed on one side of a sheet are taken to the imposing table and laid down in proper order. To a visitor's inexperienced eye there seems to be no order at all, for half of the pages are upside down and those that should succeed each other are separated by the entire length of the forme! But the confusion is only apparent, and later we shall see that every page falls into its proper place when the sheet is folded.

The complete forme is placed on the horizontal bed of one of the huge machines on which the actual printing is done. This is no light task, for the type and its steel frame make up a mass of metal that weighs more than 3 cwt. At this stage still another proof is taken. It is called a machine proof, and is examined no less carefully than were those of the separate pages. The printer studies it to make certain that his work is of good quality. Perhaps he finds that a block has not made a sufficiently good impression on the paper, and a little packing must be placed beneath it in order to give a better contact. On another page a few letters may have been forced slightly out of place while the type was being tightened up in the forme, and these must be returned to their original position.

The machine proof also gives the Editorial staff a final opportunity of searching for lurking errors. Misprints occasionally succeed in evading detection in a

most surprising manner. Usually they spring to the eye of the unlucky proof-reader immediately he opens his copy of the finished magazine, but unfortunately it is then too late to make any corrections.

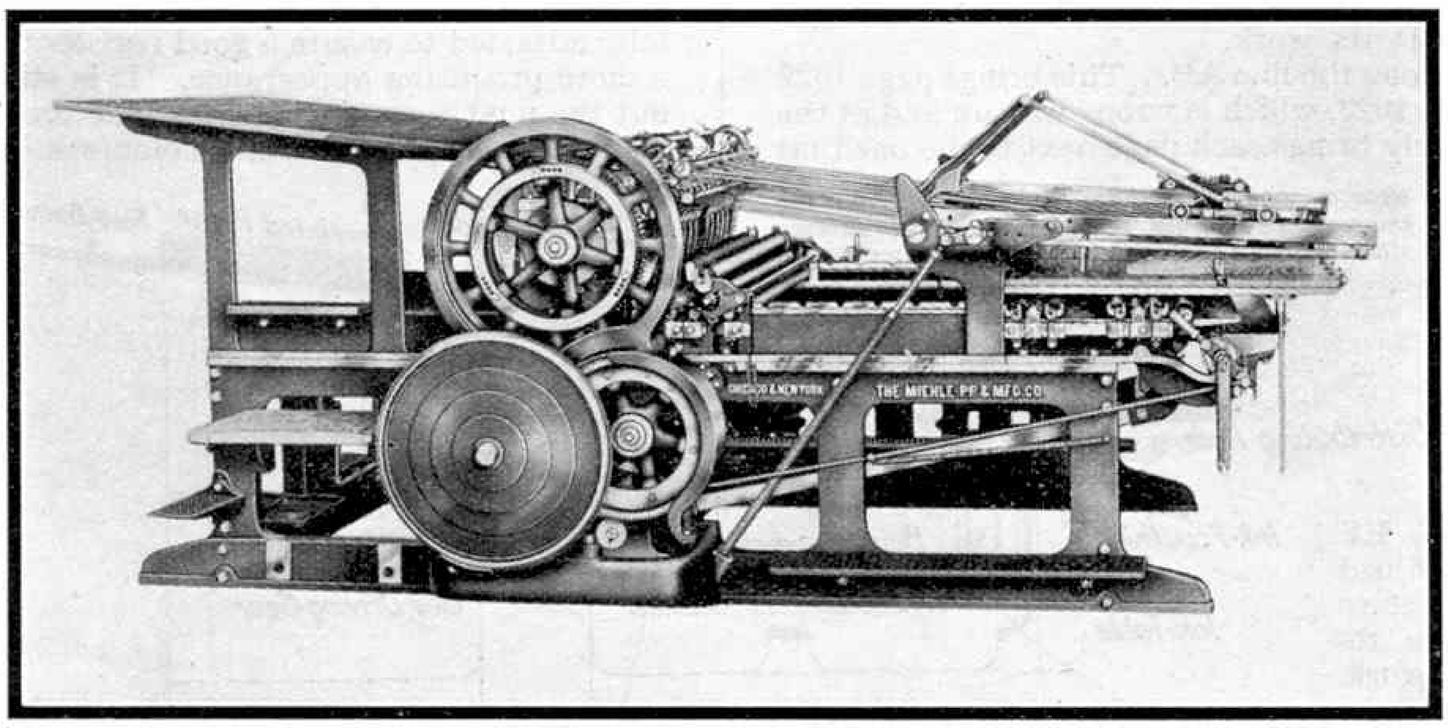
At last the word is given that all is in order. The machine-minder casts a final glance over his charge, and sets the great machines to work on their task of turning out printed sheets by the thousand.



A corner of the machine room at the printing works of Stembridge & Co. Ltd., Leeds. Each of the Miehle cylinder presses shown prints the 16-page sheets of the "M.M."

The heavy forme slides backward and forward below the rotating cylinder. As each sheet of paper is fed in by the attendant it is seized by grippers that wrap it round the cylinder, and the latter presses it on the sliding forme at exactly the right moment to receive the impression from the type. Metal fingers then peel off the paper, which is picked up by the hooks of a framework that swiftly carries it to a receiving board.

One of the accompanying photographs shows a row of presses at work printing the "*Meccano Magazine.*" In the nearest machine a printed sheet has just been added to the pile on the receiving board. The following sheet is on its way round the cylinder that brings it into contact with the sliding forme, and the next is being placed in position to be seized by the grippers on the cylinder.



Courtesy] [*Miehle Printing Press & Mfg. Co. Ltd.*

This illustration of the Miehle press gives an indication of the complicated nature of the machinery. On the right the ends of the inking rollers are clearly shown

The movement of the forme may best be seen on walking round the back of a machine. It comes into view from the far side of the cylinder every time a sheet is printed, and in spite of its great weight it slides on its rails as easily as if it only weighed a few pounds. During its return journey no impression must be made, and the cylinder is therefore raised slightly to keep it out of contact with the forme.

Every boy knows the fascination of watching a large printing press at work, particularly when the machine is one of the best of its kind. The machine used for printing the "*M.M.*" is renowned for the quality of the work it produces. It is called the "Miehle" press, and is a "two-revolution" machine, which means that the cylinder rotates twice during the printing of each sheet. This type of press was invented by Robert Miehle, an American printer, and has been developed to its present state of perfection by the efforts of the engineers of the company that he founded.

It is very interesting to find that the American inventor had been anticipated, for a similar machine was made as long ago as 1824 by an Englishman named David Napier. The "Naypeer" press, as its inventor called it, had practically every movement that distinguishes the two-revolution machines in use to-day, and to Napier must be given the credit of producing the earliest cylinder machine that was really practical. But he was ahead of his time, and it was not until this type of press had been invented independently by Miehle that it came into general use. To-day it is a standard type of printing press.

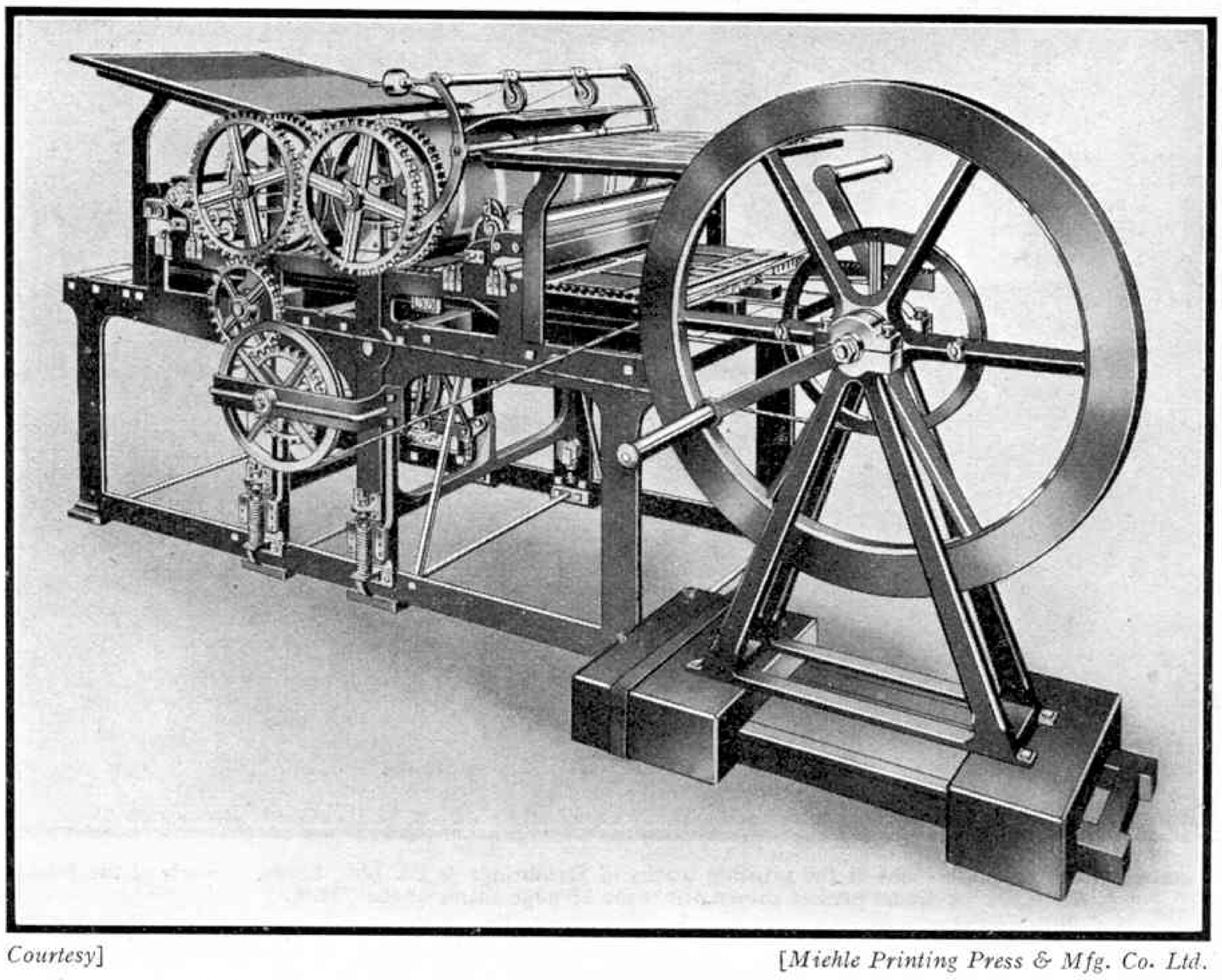
The most wonderful thing about the huge Miehle press is the manner in which different complicated operations are made to fit in with one another. The rotating cylinders bring each sheet of paper into the position required for printing at exactly the right moment, not once, but thousands of times in quick succession. The last sheet of the 96,000 copies printed from each forme of the December "*M.M.*," for instance, was brought into position with the same accuracy as the first, and the machine could have gone on printing with equal perfection until the type itself was worn out.

At the same time various intricate mechanisms do their work with unfailing precision. One of them raises the cylinder clear of the forme during its return and releases it again in preparation for making another impression; another carries the paper to the delivery board; a third runs the inking rollers over the forme, and so on, every movement being timed to a fraction of a second. Only the greatest engineering skill, working on the finest of materials, could produce a machine to run with such uncanny smoothness and accuracy.

Each sheet passes through the presses twice, in order to print on both sides, and is then ready for folding. The machine in which this is done is simple but ingenious, and it is very fascinating indeed to watch one of them in operation. The sheets disappear into the depths of the machine, and a few moments later they reappear in the form of 32-page booklets on a delivery board in front.

The action is so rapid that it is not easy to follow, but the sheets appear to be pushed to every corner of the machine in turn before they emerge completely folded. As each is fed into the machine it comes to a momentary stop on a row of one inch tapes. A knife edge pushes down on the line where the fold is to be made, between two steel rollers which carry the paper through, and make the fold by pressure. The two halves are thus brought on top of each other and at the same time the doubled sheet is taken to another part of the machine where this action may be repeated.

The double sheet is folded three times in succession in this manner before delivery. Guides are fixed throughout to make sure that the folds are in the correct positions, and all that the attendant has to do is to flick each sheet in turn into contact with the wheels that draw it into the machine, and to remove the pile of folded sheets from the collecting board.



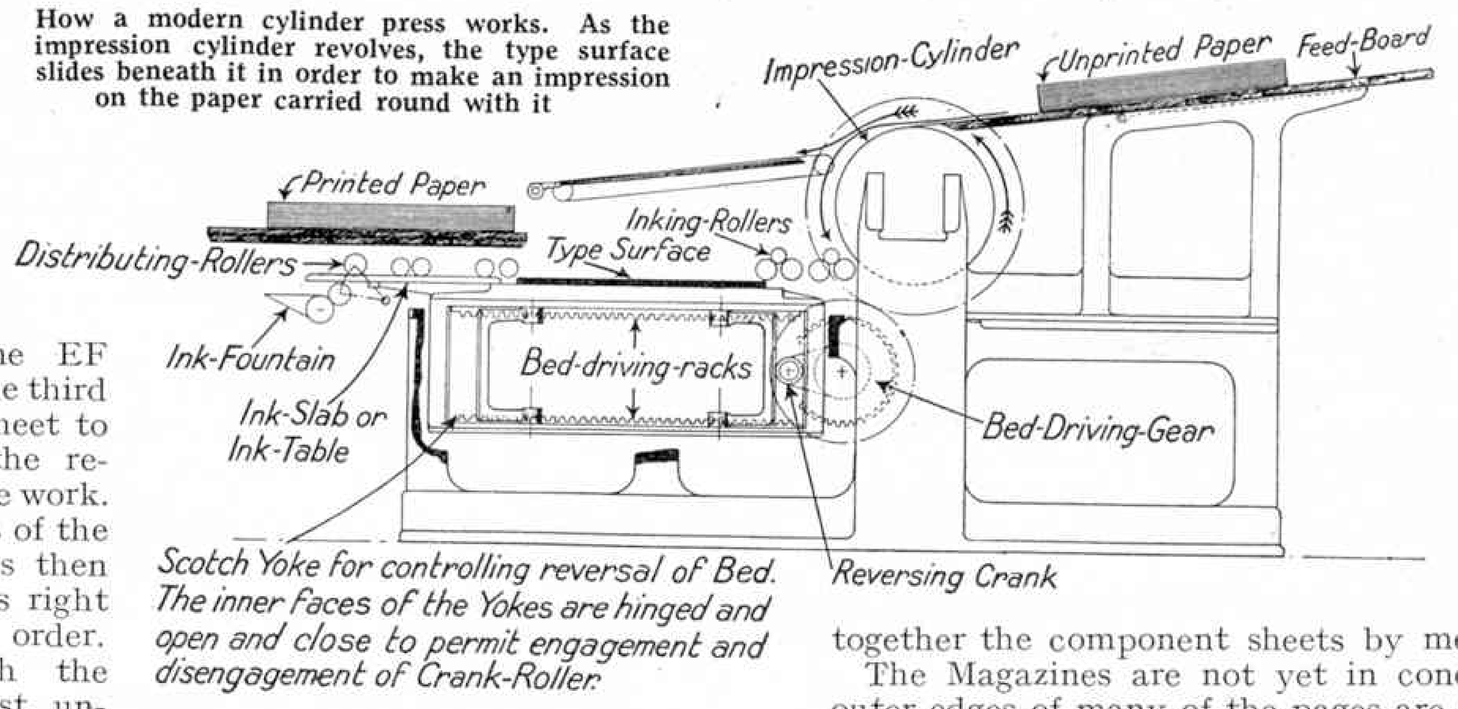
Courtesy] [*Miehle Printing Press & Mfg. Co. Ltd.*

Hand-operated cylinder printing press invented in 1824 by David Napier. Comparison with the lower illustration on page 519 shows how greatly it resembles the giant power presses now used for printing the "M.M."

It is the folding operation that reduces to order the apparently confused layout of the pages in the forme. On page 518 is a reproduction of one side of the middle sheet of the issue of the "*M.M.*" for December, 1928, and a glance at it will help the reader to understand how the folding machine carries out its work.

The sheet is first folded along the line AB. This brings page 1022 next to the succeeding page 1023, which is wrong way up and at the top of the sheet, and similarly brings each page next to the one that should follow it. Thus page 1027 falls on page 1026, and pages 1010 and 1011 also are brought together. The second fold is made along the broken line CD, and is followed by bending the upper half of the partly folded sheet over the lower portion, the dotted line EF marking the position of the third fold. This reduces the sheet to double-page size, and the remaining fold completes the work. At a later stage the edges of the booklet are cut and it is then found that every page is right way up and in correct order.

How a modern cylinder press works. As the impression cylinder revolves, the type surface slides beneath it in order to make an impression on the paper carried round with it



The speed at which the machine works is almost uncanny. The sheets pass through it at the rate of 40 per minute, and thus each is folded four times in little more than a second. Even at this speed a single machine could not cope with the work of folding the sheets of the "*M.M.*" The December number, for example, consisted of four sheets, one of which contained 16 pages only, and 96,000 copies were printed. This meant that no fewer than 384,000 sheets had to be folded! The performance of this gigantic task would have occupied 30 days of eight hours each if only one machine had been used.

As already explained, the first sheet will have printed on it the middle 32 pages of the Magazine. The next to be printed contains the 16 pages before and the 16 pages that come immediately after the middle section; and when the Magazine is being made up the central section will be slipped inside it. The remaining sheets are similarly divided between early and late pages, so that the last section will have on it the first and last pages of the Magazine itself, and will enclose the remaining sections.

Only the coloured covers then are needed in order to complete the Magazines, and these are printed while the pages of reading matter are being run off on the cylinder presses. The story of the making of the three-colour blocks used for this purpose has been told in previous articles.

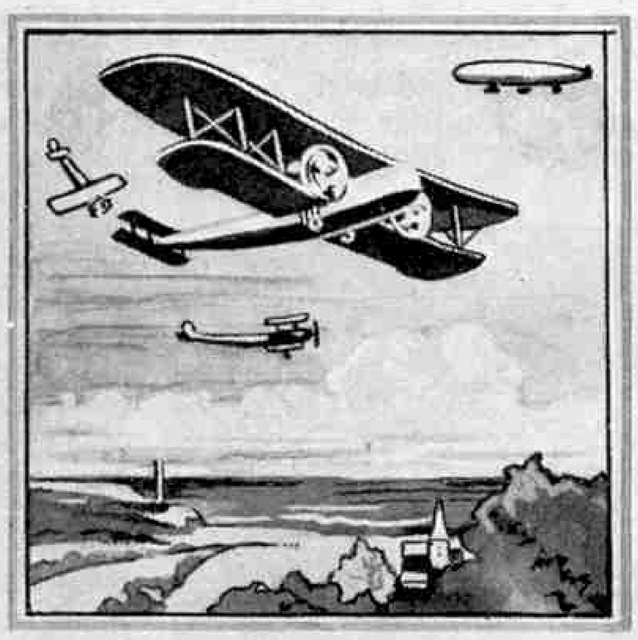
To watch the growth of a high-class coloured illustration is one of the most fascinating things to be seen in a printing works. The five coloured illustrations at the foot of the back page of the cover of the "*M.M.*" for March last, show successive stages in the printing of one of our covers. Yellow is the first colour to be printed. The necessary block is fitted vertically in a platen machine, which brings sheet after sheet of smooth and heavy paper into contact with it, rollers charged with yellow ink passing over the block between the impressions. The imprint thus made does not look impressive, and it is difficult to believe that it is the foundation of a magnificently coloured illustration of the kind to which "*M.M.*" readers are accustomed.

The next colour to be applied is red, which also combines with the yellow to give orange tones. Each of the sheets carrying the yellow impression is overprinted in this colour, the machinery being carefully adjusted to ensure a good register. The picture now takes on a more promising appearance. It is still somewhat uninteresting, but the final overprinting with blue brings it to life in a surprising manner. All three primary colours show up quite definitely, and the intermingling of the tiny coloured dots that form the picture produce almost at one stroke the whole range of the colours of the spectrum.

When both sides of the cover sheets have been printed, all is ready for the final assembly of the Magazine. A cover is placed over each of the sets of folded sheets and the entire Magazines thus formed are put in turn under a machine that fastens together the component sheets by means of wire staples.

The Magazines are not yet in condition for reading. The outer edges of many of the pages are still connected, and very few can be read without the aid of a knife. Formerly books were often issued with the pages uncut, but this is now very rarely the case. The reason is that a powerful machine is available for trimming the edges. It is called the "guillotine," and is modelled on the ill-omened invention of the famous Dr. Guillotin that became so notorious in the Reign of Terror during the French Revolution. To-day it finds more peaceful applications.

The knife in the revolutionary guillotine fell by its own weight, but in the modern machine it is pulled down by powerful gearing. When the copies of the "*M.M.*" have had their edges trimmed in this manner they are ready for despatch to their thousands of readers.



The Conquest of the Air

DEVELOPMENT OF THE AEROPLANE

DURING the Great War aeroplane design and construction in this country developed enormously, and aircraft adapted to military purposes were built in great numbers. One result of this intense production was to create a serious shortage of suitable timber, and many aircraft firms began to turn their attention to the use of metal as an alternative.

The metals favoured for use in aircraft construction are duralumin and high tensile steel. Duralumin is a non-rusting steel alloy that combines much of the lightness of aluminium with the strength and toughness of steel, and its use in the construction of heavier than air machines was originated some years ago by Dr. Rohrbach, a German expert. Metal hulls are particularly suitable for flying boats on account of the absence of water soakage. On one occasion an ordinary wood and fabric seaplane weighing 18,000 lb. was tested to determine how far its structure was waterproof. After a day or two, the machine was found to have gained no less than 600 lb. in weight, after all leaks had been accounted for and carefully drained out. Such an increase of weight is obviously a serious handicap to a machine and it is almost entirely eliminated by metal construction.

A D.H. 54, de Havilland "Highclere," fitted with a 650 h.p. Rolls-Royce "Condor" Engine. Some idea of the great size of this machine may be obtained by comparing it with the Rolls-Royce car under the engine

Duralumin was used in the construction of the first British all-metal flying boat, the "*Calcutta*," built by Short Bros. Ltd., at Rochester and launched last year. The entire structure of this interesting machine is of metal, with the exception of the surface coverings, duralumin being used in conjunction with fittings of stainless steel. The machine is fitted with three Bristol "Jupiter" engines, each developing 485 h.p. at 2,000 r.p.m. These engines are mounted in line between the planes and arranged as tractors. The petrol is carried in two tanks in the upper plane, the engines being fed entirely by gravity; and the system is so arranged that any engine can be fed from either tank.

The pilot's cockpit is very roomy, and is sufficiently far forward in the hull to give a particularly good view in all directions. It has two seats, the port side one being the pilot's, while the starboard side seat has removable controls in front of it. Normally the navigator is in his wireless cabin immediately aft of the pilot's cockpit, and shut off from it by a roller blind. This compartment has a seat and a table, a map shelf and all the wireless instruments. An emergency aerial is fitted on a telescopic mast attached to the upper plane for use when the boat is moored in harbour or has to make a forced landing for any reason.

The main passenger cabin is 17 ft. in length, 6 ft. 6 in. in width and 6 ft. 3 in. in height, and normally the passengers are arranged in rows of three with a gangway slightly off the centre. The comfortable upholstered seats are constructed of metal and are fitted with cushions designed to be used as lifebelts in an emergency. The sides of the cabin are provided with large plate glass windows that ensure an excellent view for every passenger. The passengers enter the cabin through a specially designed hatch at the forward end, arranged so that they can step direct from the flying boat to the quay to which it is moored. A separate hatch is provided aft for dealing with luggage while passengers are disembarking.

The overall length of the "*Calcutta*" is 64 ft. 9 in., and its overall height 22 ft. 3 in. The overall spans of the upper and lower main planes are respectively 93 ft. and 76 ft. 6 in. The weight of the boat when fully loaded is 20,200 lb., and its empty weight 12,600 lb., leaving 7,600 lb. available for load. The maximum speed at sea level is 126 m.p.h. At a cruising speed of 100 m.p.h., with a petrol supply of 320 gals., the range is 500 miles.

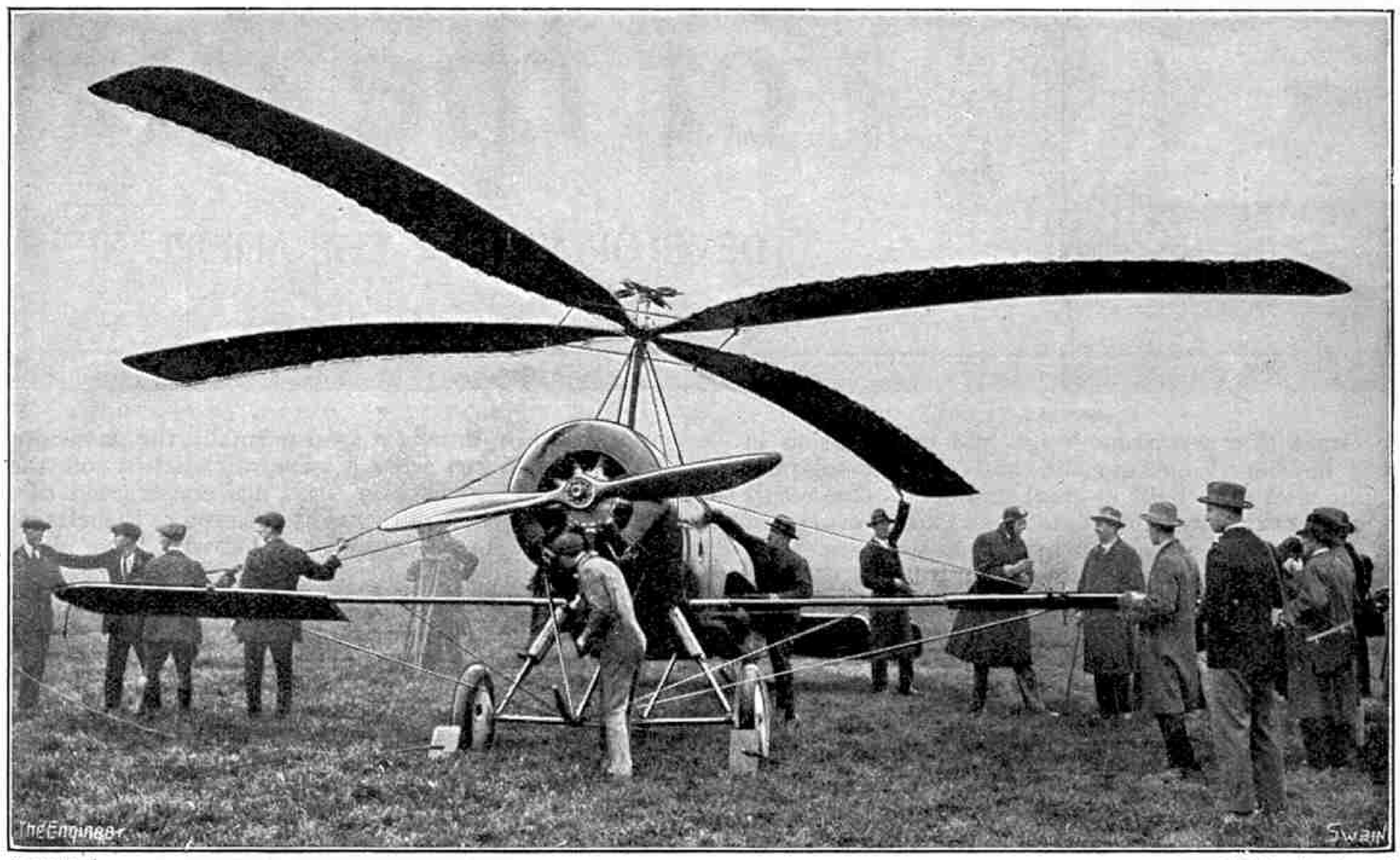
The most important advantage of steel construction is the saving in weight, for high tensile steel has a higher specific strength than any other constructional metal. An aeroplane can be built of steel to have only about 4/5ths of the weight of a corresponding machine built of wood. The weight thus saved may be used either to increase the useful load that can be carried, or to increase the speed and rate of climb with a given engine power. The steel aeroplane does not warp and lose adjustments in tropical climates as do timber machines, and it is much less liable to collapse from local damage. The steel used for the main members of a machine is an alloy steel obtainable in tensile strengths ranging up to approximately 80 tons per square inch.

It is of interest to note that the Air Ministry have decided that in future all machines constructed or purchased by them for the use of the Royal Air Force will be of the all-metal construction type.

From the time that the aeroplane became a really reliable means of transport, aviators have turned their attention to long-distance flights and in particular the crossing of the Atlantic. The first airmen to accomplish the Trans-Atlantic flight were Sir John Alcock and Sir Arthur Whitten Brown. Using a Vickers "Vimy" bombing machine they flew from Newfoundland to Ireland, a distance of 1,880 miles in 15 hours 57 minutes, averaging 118 m.p.h. Their achievement created a great sensation both in this country and in America, and it was eventually pre-

dicted by many aviation experts that flights across the Atlantic would soon become an everyday occurrence.

It was not until 1927 that the Atlantic was flown again, however. In May of that year Colonel Lindberg flew from Long Island, New York to Le Bourget, Paris, covering a distance of 3,610 miles in 34 hours. This flight was accomplished in a single-seater Ryan monoplane equipped with a 220 h.p. Wright "Whirlwind" engine, and was a really remarkable feat of endurance. On long flights of this nature where there is no such thing as an intermediate landing ground, the physical strain on the pilot is very great. The machine must be kept going at a steady pace; the airman cannot move from his seat, nor must he change the position of his feet on the rudder bar. Hour after hour is spent in a fixed position and in a state of continuous mental concentration; hence, physical fitness is essential.



Courtesy] ["The Engineer"

The "*Auto-Giro*" flying machine invented by Don Juan de la Cierva, a Spanish engineer. The above illustration shows the machine being started, with men hauling on the rope to rotate the "Windmill Sails"

Lindberg's flight aroused the ambition of many other airmen, and in the following month two Americans named Chamberlin and Levine set out to beat the record. Their attempt was successful, and they landed at Eisleben, about 100 miles south-west of Berlin, having flown a distance of 3,905 miles in 42¾ hours. The time spent in the air would have been shorter if the airmen had not lost their bearings on flying into a thick fog over Germany. Other successful west to east Atlantic flights were made in the same year by other airmen.

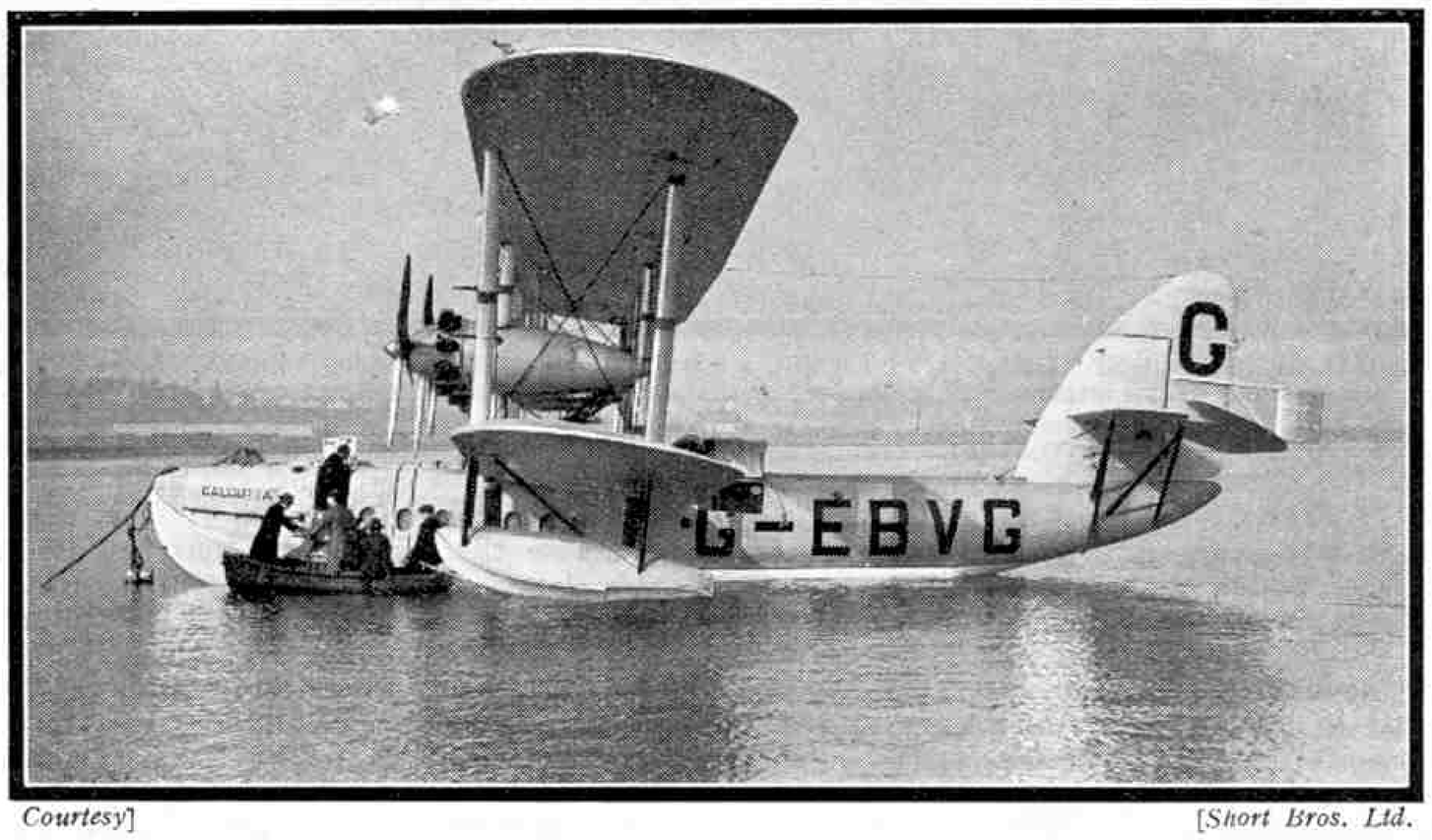
Several attempts were made also to cross the Atlantic from east to west, but these began tragically. It is still fresh in memory, for example, how the French airmen Nungesser and Coli, officers in the French air service, left Paris in May 1927, with the intention of flying to New York, but from the time they approached the Atlantic these unfortunate airmen were never seen or heard of again.

The first successful east to west flight was made by two German airmen, Captain H. Koehl and Baron von Huhnefeld, accompanied by Commander Fitzmaurice. Flying a Junkers all-metal machine they set off from Baldonnel, Ireland, and after being in the air for about 38 hours they descended on the lonely ice covered coast of Greenly Island, off Labrador, owing to shortage of fuel.

Several noteworthy long-distance flights have been accomplished by British airmen on other routes. Sir Alan Cobham's flights to Cape Town and back, Australia and back, and his recent survey flight round South Africa are familiar to everybody. Although these flights have not been of the "single hop" kind as are Atlantic ventures, they have been of the greatest importance in testing the ability of aircraft to withstand all kinds of weather. Another important function of these long flights has been the laying of the foundations of air transport services.

During the 16 months devoted to the Australian venture in 1925-6, Sir Alan Cobham covered a distance of 28,000 miles in approximately 13 days 8 hours actual flying time. It is of interest to note that the same De Havilland machine was employed as on his earlier flight to Cape Town and back.

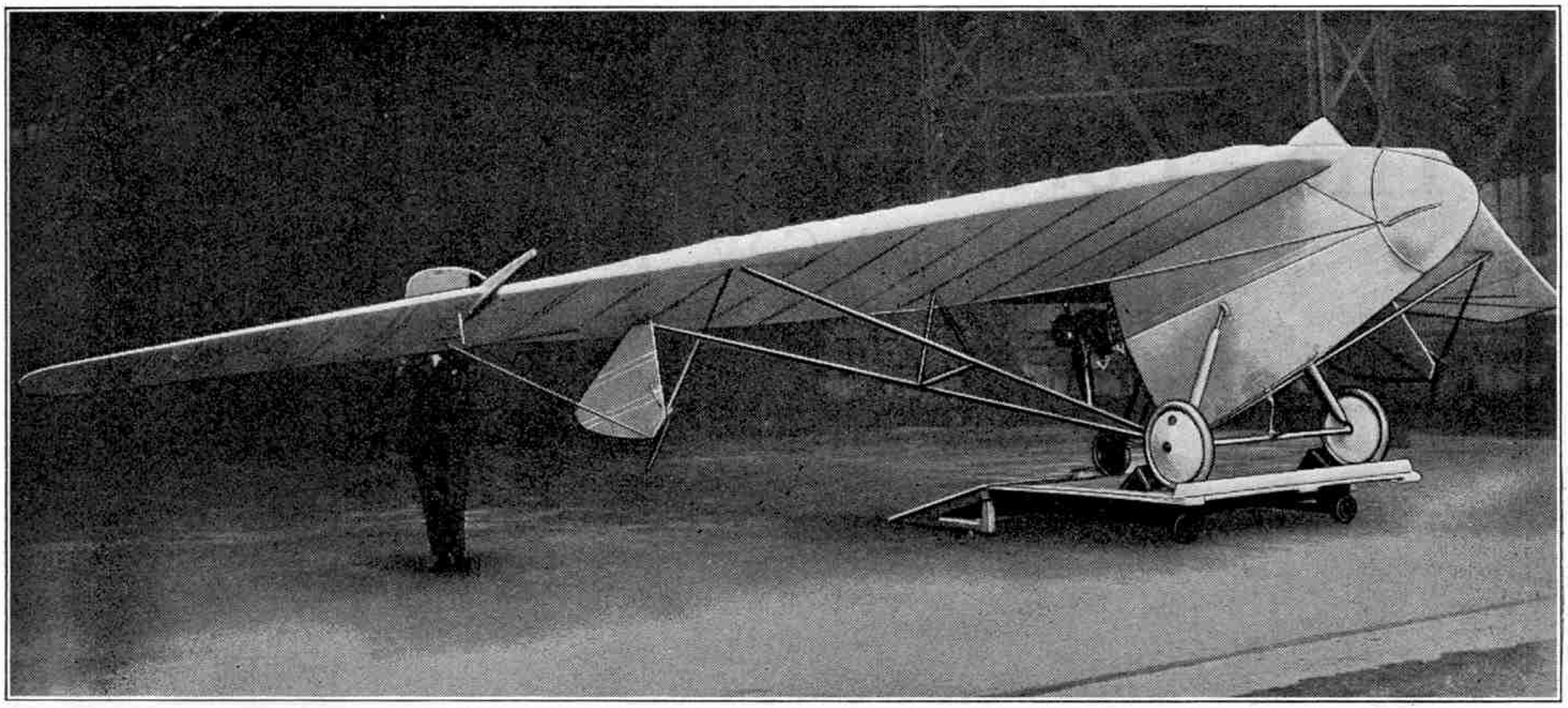
Less spectacular than these long distance flights, but equally or more important are the many regular air services now in operation. The growth of commercial transport by air is one of the most remarkable of all post-war developments, and some idea of the progress that has been made may be gained from the fact that during 1927 British aircraft carried 16,533 passengers on the cross-Channel service which was only inaugurated in 1919. In addition, 5,199 passengers were carried by French aircraft; 3,586 by Dutch aircraft, and 1,446 in Belgium machines. To these must be added 1,972 passengers who crossed the Channel in German aeroplanes, and a few people carried by machines belonging to other countries; making a total of 28,764 passengers transported by air across the Channel. In addition to passengers, a steadily increasing amount of merchandise of various kinds and also gold and silver is carried by air, and during 1927 this traffic had a total value of almost £10,500,000.



Courtesy] [Short Bros. Ltd.

A side view of the Short "Calcutta" Flying Boat at its moorings in the Medway. The photograph gives a good idea of the enormous size of the machine in proportion to the boat and the men

The British share of the cross-Channel air services is in the hands of Imperial Airways Limited. This company was formed in 1924, and since then more than 100,000 passengers have been carried to and from England and France without mishap, while



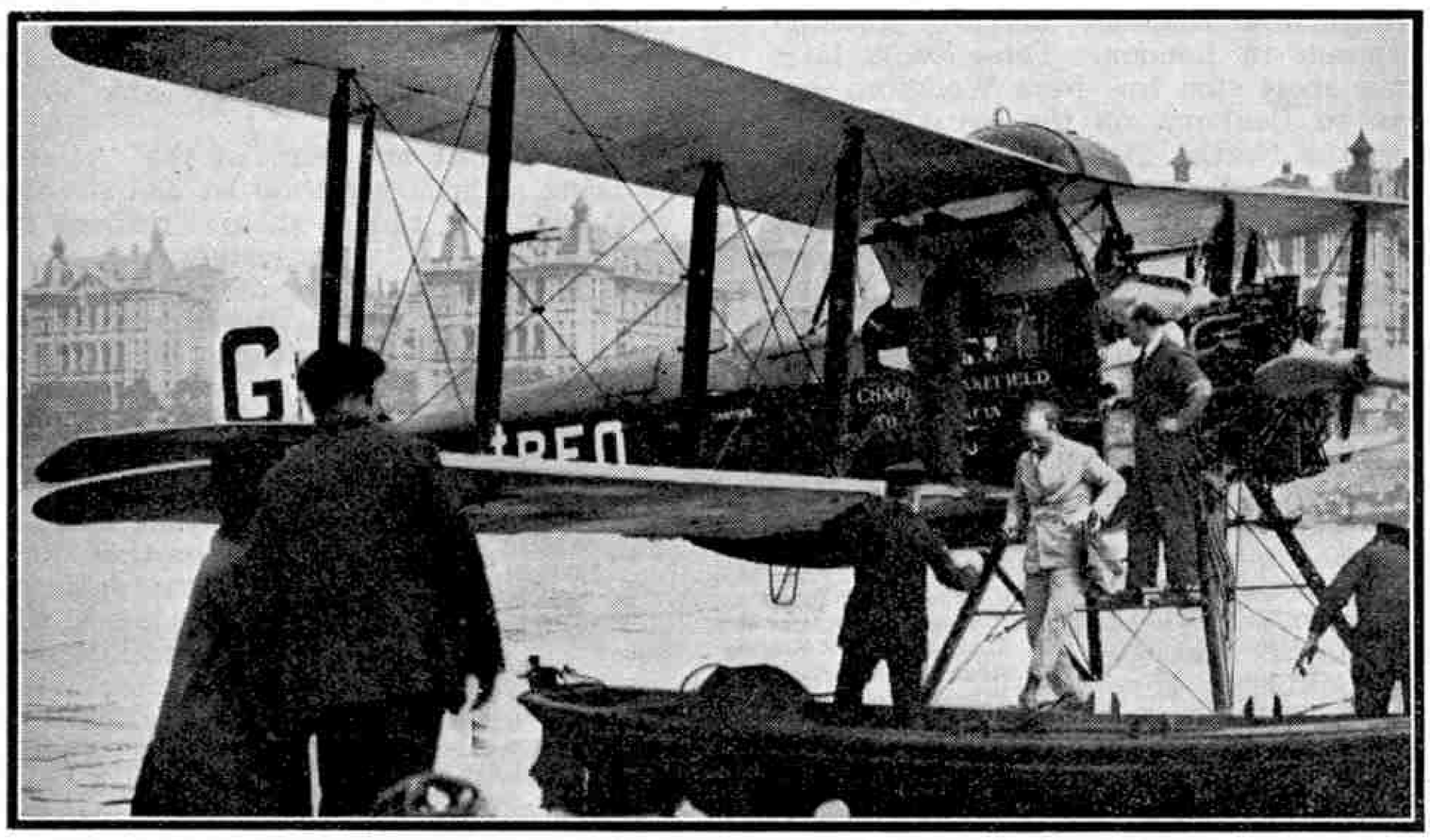
The Hill "*Pterodactyl*" Tail-less Monoplane that attracted much attention at Hendon in July 1926. The set-back and considerable span of the wings is clearly shown

freight totalling more than 2,200 tons has been safely handled.

This service is but one of a vast network that is in daily operation over Europe, and to-day it is possible to travel by air from London to places as far away as Riga in Latvia and Constantinople in Turkey. The latest addition to the operating air routes is the first Empire service inaugurated by Imperial Airways on 30th March last, by means of which India has been brought within six days 5¾ hours of London.

Although air travel is now quite as safe as travel by land or water aviation experts continue to seek means of making flying still safer. One of the most important advances in this direction was the invention of the Handley-Page automatic slot. It will be well-known to most readers that if an aeroplane loses flying speed it ceases to be under the control of the pilot and commences to fall to earth. The fall may take the form of a nose-dive or a spin, and unless the pilot is able to regain control immediately the probability is that a bad crash will follow. It is the function of the automatic slot to overcome trouble of this nature. The slot itself consists of a hinged flap placed on the leading edge of the plane, or the upper planes in the case of a biplane. When the machine is in ordinary flight the slots are closed, but as the speed decreases they are forced downward by the air suction on the top of the wing. The slot diverts a continuous flow of air over the outer portion of the wings when the unslotted inner portion is not receiving any air. The result of this state of affairs is to leave the machine in full lateral control by means of the ailerons.

It is the opinion of experts that 90 per cent. of the serious accidents that occur in flying could be proved to have been caused by loss of flying speed or "stalling," and that 70 per cent. of these accidents could be eliminated by the use of a slot. The British Air Ministry have ordered that all new military aircraft with the exception of single-seater fighters must be fitted with it.



Sir Alan Cobham alighting from the D.H. 50 on his arrival on the Thames, at the conclusion of his 26,000 mile Australian flight, 1926

Many attempts have been made to design a machine capable of rising into the air without making a preliminary run and of landing directly upon any desired spot. All kinds of weird machines have been produced including several with wings that flapped up and down in imitation of a bird in flight. Great things have been claimed for these inventions, but as yet none has actually achieved vertical flight, although some have shown great promise.

One of the most interesting of recent machines is the "*Auto-Giro*," the invention of Don Juan de la Cierva, a Spanish engineer. This machine has four wings arranged windmill fashion above the fuselage or body of the machine and rotated automatically. The wings have a span of 36 ft. and are hinged to a vertical shaft that rises from the fuselage, and is held in position by steel tubes in pyramid formation. The fuselage and the undercarriage are of the standard Avro type, and a 120 h.p. Le Rhone engine mounted in the ordinary manner drives a two-bladed tractor propeller.

Before commencing a flight it is necessary to start the wings rotating because if this were not done it would take too long for them to get up speed as the result of the aeroplane's forward motion along the ground. When the wings are rotating the engine throttle is opened and the machine moves forward, drawn by its propeller in the same manner as an ordinary aeroplane. The wings then move upward a little and their speed of rotation increases. When the wings are rotating at a speed of about 140 r.p.m., and the machine has attained a ground speed of some 30 m.p.h., it is able to rise from the ground, which it does by bounding upward 5 ft. or 6 ft. Subsequently it behaves in a similar manner to a machine of ordinary design. In flight the position of the four wings is at right-angles to the shaft, but the arrangement is such that they may be built up in a bunch when desired. It is important to remember that the rotating shaft and the "windmill sails" are not in any way connected with the engine.

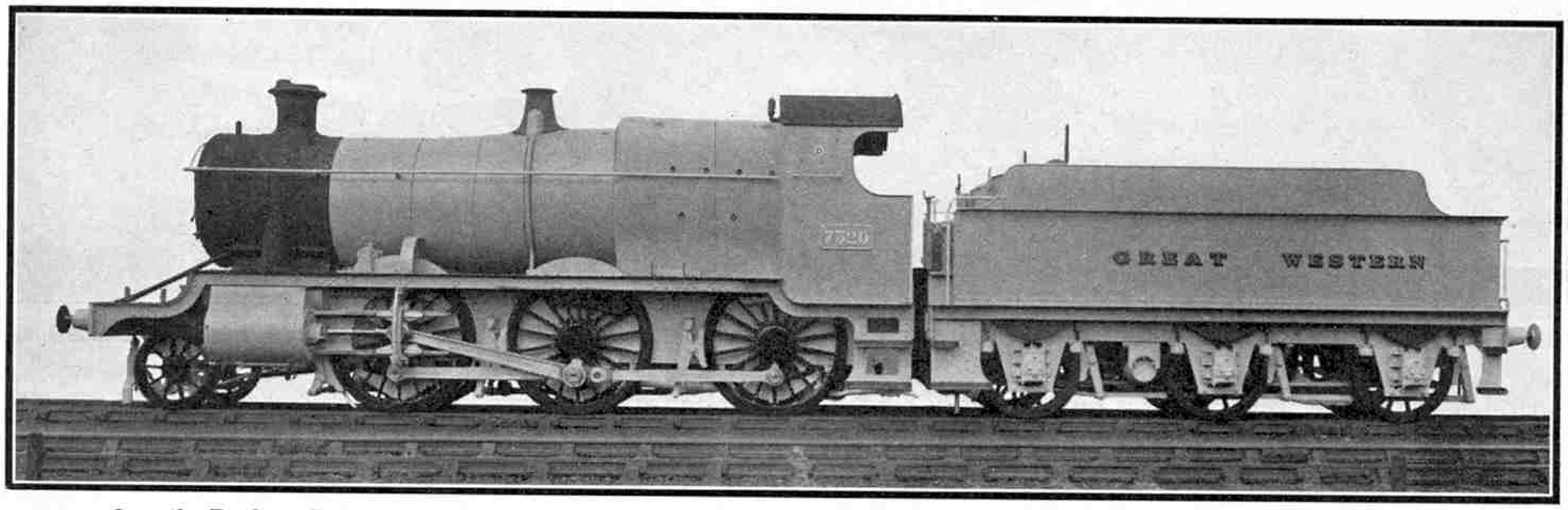
(*Continued on page 585*)

FAMOUS TRAINS: XXX.

The "*Ports-to-Ports*" Express

L.N.E. and G.W. Railways

By Cecil J. Allen, M.Inst.T., etc.



Over the Banbury-Barry portion of its run, the "*Ports-to-Ports*" Express is headed by one of the G.W.R. 2-6-0 "Moguls"

IT may fairly be claimed that the late Great Central Railway, now part of the London and North Eastern system, in pre-war days did more than any other British railway to popularise comfortable cross-country travel. It was in 1899 that the "London Extension" of the Old Manchester, Sheffield and Lincolnshire Company was opened through from Annesley, north of Nottingham, to Marylebone Terminus in London. Three years later followed the opening of the short spur line from Woodford and Hinton, on this extension, to Banbury, on the Great Western main line from London to the North. Although the length of this spur, between Culworth Junction and Banbury Junction, is only 8¼ miles, it has had a far-reaching effect on the development of British cross-country communications.

Attention was first directed to Bournemouth, and a through service was established in 1902 between the popular South Coast resort and Newcastle-on-Tyne, the North Eastern and London and South Western Railways being associated in the venture with the Great Central and Great Western. The route from the south was over the South Western line to Basingstoke; then the Great Western to Reading and by the West Curve there on to the Bristol main line, whence the route lay through Didcot to Oxford and Banbury. Here the Great Central took over and ran the train through Leicester, Nottingham and Sheffield to York, where the North Eastern took charge for the remainder of the journey.

Since that date many other similar services have been established over this valuable Woodford-Banbury connecting link. One of them follows much the same route between Southampton (where important steamer connections are made) and Newcastle, with through coaches running on beyond Newcastle to Edinburgh and Glasgow. In the summer the main restaurant car part of this train is diverted from York to Scarborough instead of Newcastle, and it becomes a popular "de luxe" service between the Midland cities of Leicester, Nottingham and Sheffield to that famous resort.

But the most spectacular of these through runs is that of the Aberdeen-Penzance train, established after the grouping to show what railway amalgamation really could do in this direction. There is rather a "catch" here, however, as this is not, like the others, a through train; it is only a single through coach. It comes down from Aberdeen to Edinburgh on the ordinary 9.50 a.m. express, there to be attached to the 1.50 p.m. London express as far as York. At York a train is made up with this coach, another from Glasgow to Swindon, various vans and a restaurant car, for the journey to Swindon, over the same route as before through Woodford and Banbury to Oxford, and then round Didcot West Curve on to the Bristol main line. At Swindon the Penzance coach is attached to the night "sleeper" from Paddington to Penzance, and passengers who desire are able to transfer into the Great Western sleeping cars.

So you must not think of the "*Aberdeen-Penzance Express*" as being a through restaurant and sleeping car express over the whole distance, though the one through coach does have sleeping or restaurant cars in its immediate company for the complete journey in both directions, in the ingenious manner that I have described. Nor must you imagine that such a service as this is established for the sole benefit of through passengers from Aberdeen to Penzance, or vice versa. I often wonder, indeed, if such a ticket as this is ever issued at all, except, possibly, to the seeker after sensation.

No; the value of such a through train as this, as indeed with the others I mention, is in the facilities they afford to the intermediate places on the route. The Aberdeen-Penzance coach is generally well filled with people from Aberdeen, Dundee or Edinburgh to Sheffield, Nottingham and Leicester; and at these Midland towns there join the passengers wanting to travel to Plymouth, Penzance and other places in the West Country. Enormous quantities of parcels, too, benefit by the express service that these through trains afford in obtaining quicker overnight transit, and to this express in particular a whole string of through parcel vans is always attached.

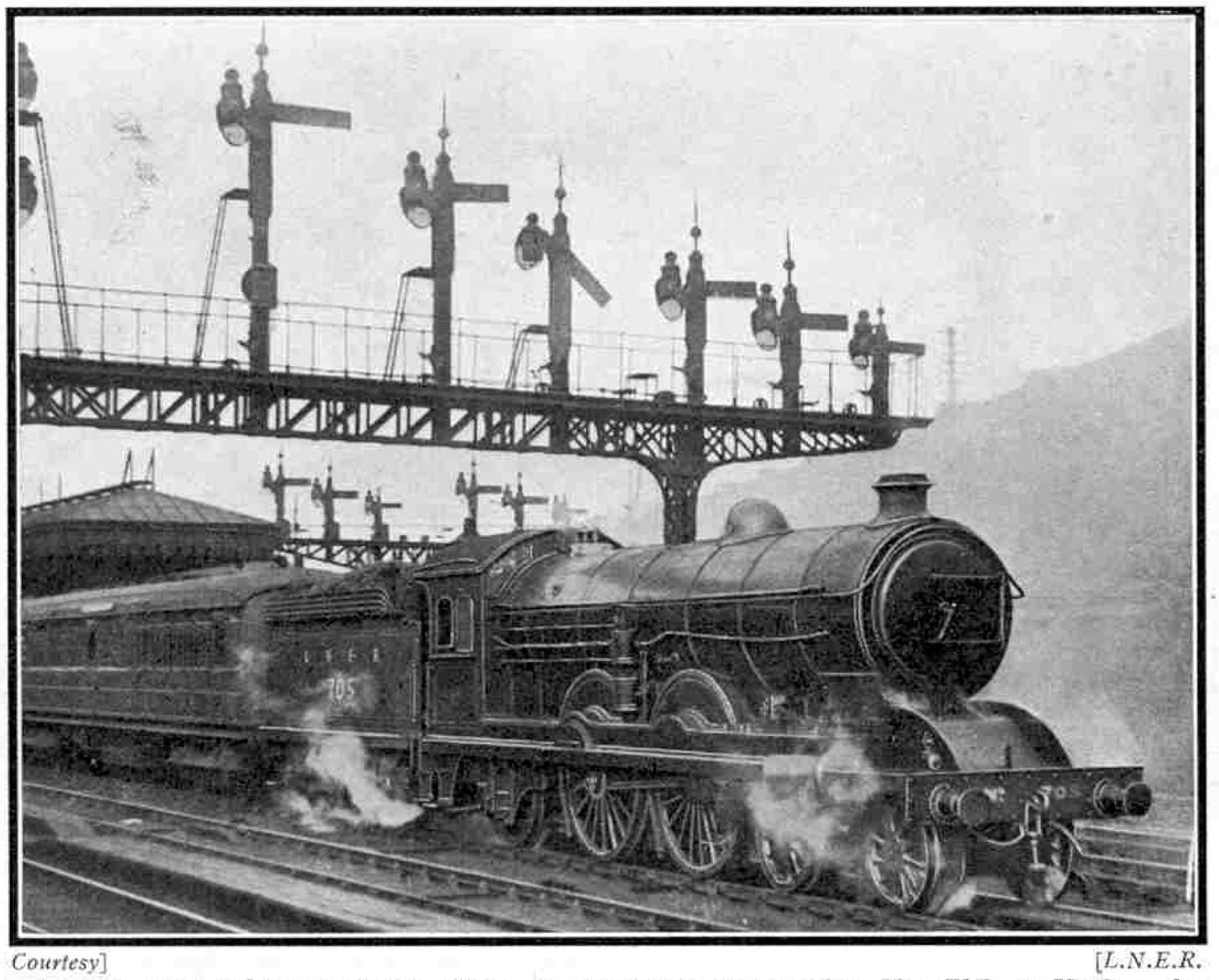
This has been a lengthy preamble to my subject matter proper; but I wanted to begin by explaining both the origin and the purpose of these cross-country trains, which to-day form so valuable a part of our express train services. The "*Ports-to-Ports*" express was another early institution of the Great Central Railway, over the Woodford-Banbury spur, in conjunction with the North Eastern and Great Western Companies. It began to run in 1906, and was designed to connect the ports of the North-East Coast of England with those in South Wales, entailing a diagonal course across the country from north-east to south-west. The main portion of the train normally runs between Newcastle-on-Tyne

Leading Dimensions of the 2-6-0 G.W.R. "Moguls"

Cylinders, Diameter	18½ in.
,, Stroke	30 in.
Boiler Pressure	200 lb.
Heating Surface—	
Firebox	128.72 sq. ft.
Fire Tubes	1,349.64 ,,
Superheater Tubes	191.79 ,,
Total Evaporative H.S.	1,670.15 ,,
Total Weight of Engine	62 tons
Area of Fire Grate	20.56 sq. ft.
Wheels, Pony	3 ft. 2 in.
,, Coupled	5 ft. 8 in.
Water Capacity of Tender	3,500 gallons
Tractive Effort	25,670 lbs.
Total Weight of Tender	40 tons

and Barry, just outside Cardiff. Sunderland passengers make their connection at Newcastle, and those from West Hartlepool, Stockton and Middlesbrough—the Tees-side ports—at Northallerton. At Sheffield is attached a coach that has come from Hull, so that Tyne, Wear, Tees and Humber are all served at this end of the journey.

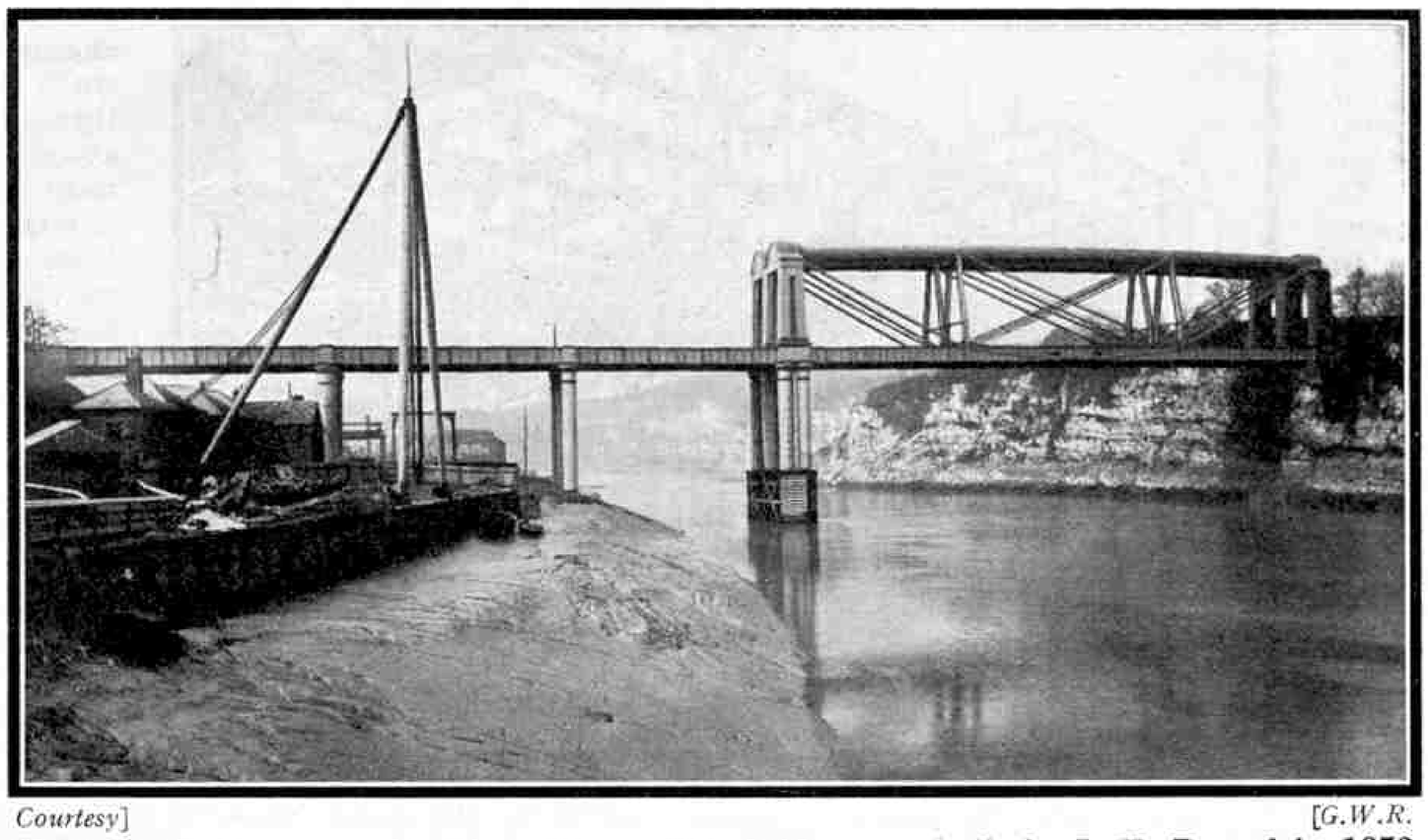
At the other end the train stops at Newport and Cardiff, from which, as just mentioned, it runs into Barry. During the summer months, however, other South Wales ports are linked up, for the express runs on from Barry through the Vale of Glamorgan to join the South Wales main line again at Bridgend, whence it calls at Port Talbot and Neath, and terminates at Swansea. Over the route followed between Cardiff and Bridgend this is the only express train ever seen, but still more singular is the link that is used between Banbury and the Severn Valley. This is a sleepy single-line branch running across from King's Sutton, just south of Banbury, through Chipping Norton, Stow-on-the-Wold and Bourton-on-the-Water—the very names give away the character of the country traversed!—to Cheltenham. Here again, of course, the "*Ports-to-Ports*" expresses in each direction provide a striking variation of the two- or three-coach trains or rail-motors, or occasional freight trains, that are the only other types ever seen on the branch.



Courtesy] [*L.N.E.R.*

L.N.E.R. Two-Cylinder "V" Class "Atlantic" locomotive No. 705 at York. An engine of this Class, or the similar 3-cylinder Class "Z," is frequently used to haul the "*Ports-to-Ports*" Express over the Newcastle to York section of its journey

And now the time has come to make the trip. You can have your choice of rolling stock, as the London and North Eastern Railway provide the train one day and the Great Western the next. The L.N.E.R. train travels south on Mondays, Wednesdays and Fridays, returning on the alternate days; while the opposite workings are carried out by the Great Western train. You can easily remember the order, as each train is in its own home territory over the week-end. The G.W.R. usually make up the train with a composite restaurant car in the centre, flanked by composite coaches on both sides and third-class brakes outside them, together with a composite brake for Hull, all of the latest 60 ft. steel-panelled stock.



Courtesy] [*G.W.R.*

Chepstow Bridge over the River Wye. This bridge was built by I. K. Brunel in 1852 and is an interesting early example of the employment of continuous girders

The L.N.E.R. use a third-class brake, a third corridor, an open third-class coach for diners, a combined kitchen and dining car and a first-class brake, with an additional composite brake to and from Hull, all of the newest East Coast stock. The complete Great Western train scales 184 tons empty, but the L.N.E.R. stock is heavier, the weight in this case being 202 tons. These are minimum formations, and for a considerable part of the year additional third-class coaches are added as required. In both directions north of York, too, extra coaches are attached for the local passengers between York, Darlington and Newcastle.

As we are to be in charge of the London and North Eastern Railway for the major part of the journey, we may as well start at the Newcastle end. We will assume, however, that this is a day on which the train is being worked in the south-bound direction with Great Western stock, as on these days three railways are represented in the formation of the train at the start. Next the engine are two L.M.S. corridor coaches for Bristol, concerning which I shall have something of particular interest to say presently. Then follows our Barry portion of five or six Great Western coaches. The tail of the train is brought up by four non-corridor North Eastern Area coaches of the L.N.E.R., for the use of local passengers as far as York. It only needs some Southern stock to complete the representation of the "Big Four," and you might have seen even that 90 minutes earlier, on the 8.0 a.m. London express, which went out with L.M.S., Southern and L.N.E. coaches in its make-up!

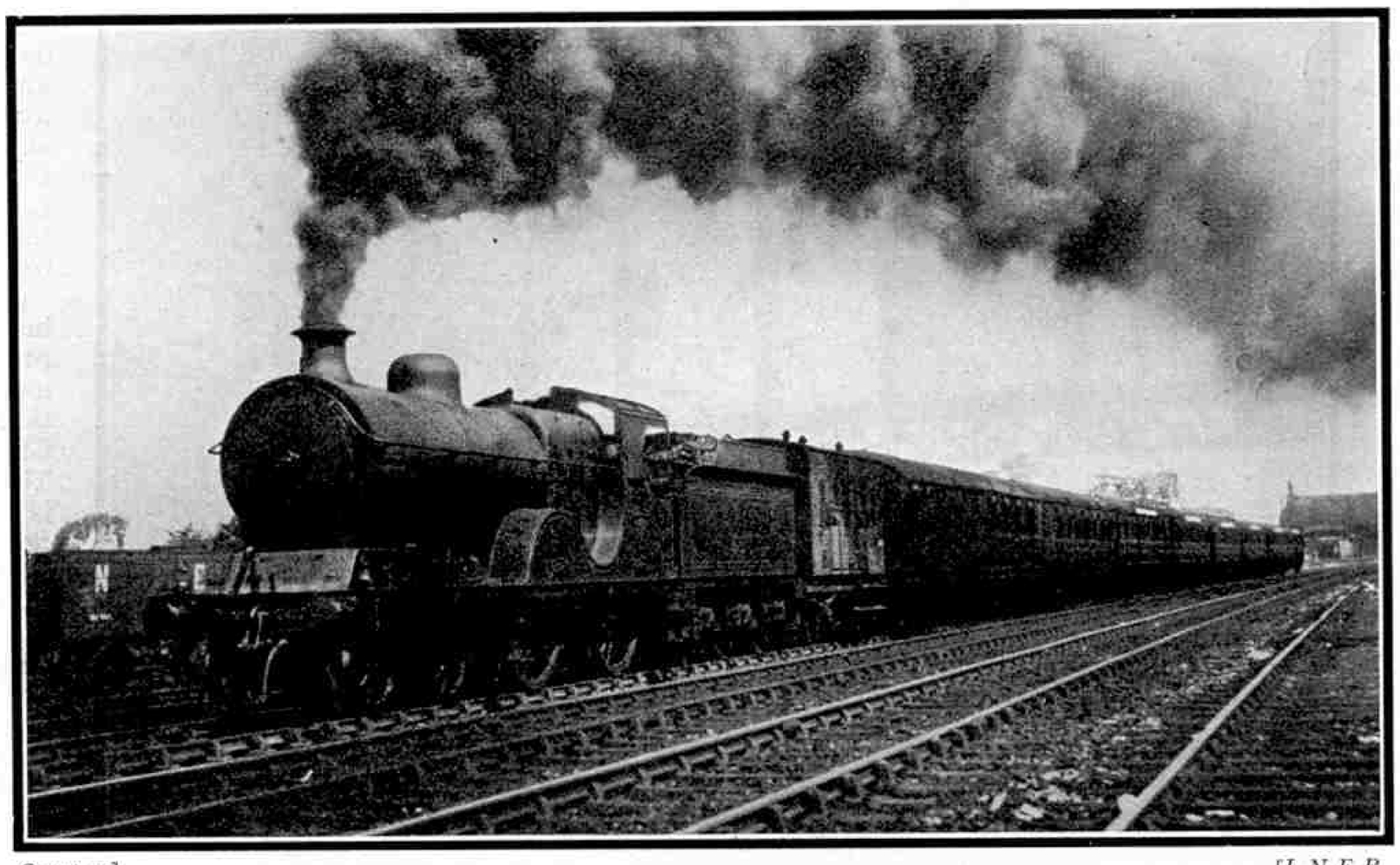
The engine out of Newcastle may be one of the 50 three-cylinder "Z" class "Atlantics" of the late North Eastern Railway (or possibly one of the very similar 20 "V" class engines, with two cylinders); or, more usually now, a Gresley "Pacific" will undertake the haulage as far as York. Such a train as this is a playtime task for a "Pacific," as it only weighs about 350 tons all told, and the intermediate timings are very easy. Leaving Newcastle at 9.30 a.m., we are allowed 24 minutes for the 14¼ miles to Durham, with some steep gradients on the way. Then for the 22 miles to Darlington the schedule is 31 minutes; for the 14 miles on to Northallerton 18 minutes, and for the 30 miles thence to York 39 minutes.

Thus five minutes over two hours for the 80 miles from Newcastle to York, stops included, is very moderate going; but it is customary with these cross-country trains to allow ample margins of time, as seriously late running may put train services out of gear all over the country. Liberal running times allow a good chance of recovering lost time, as I once proved on this very train, when a "Z" class "Atlantic" ran the 30 miles from Northallerton to York in 30 min. 50 sec., thereby gaining over eight minutes on this short stretch alone. On this occasion we touched 75 miles an hour on a dead level track at Alne.

At York, where we run to No. 14 platform, outside the wall

of the station, a fresh engine is waiting to take us to Sheffield. A variety of locomotives is employed between York and Sheffield, and we may have a North Eastern "Z" or "V" class "Atlantic"; a 4-4-0 of class "R" or "R.1," or a three-cylinder 4-4-0 "Shire"; or, as seen here, a rebuilt Great Central 4-4-0 of the type next in size below the "Directors." The allowance of 65 minutes for this next length of 46¾ miles is none too easy, as there are some steep gradients, and it is infested with bad slacks for curves, and on account of colliery subsidences.

To Ferrybridge, near Pontefract, the lines are those of the old North Eastern; then, to near Mexborough, we run over the track of the Swinton and Knottingley Joint Railway, first built jointly by the North Eastern and Midland Railways, and now joint L.N.E. and L.M.S. property. This forms a link of equal importance with that from Woodford to Banbury in maintaining these through train services between the North-East and the South and West of the British Isles.

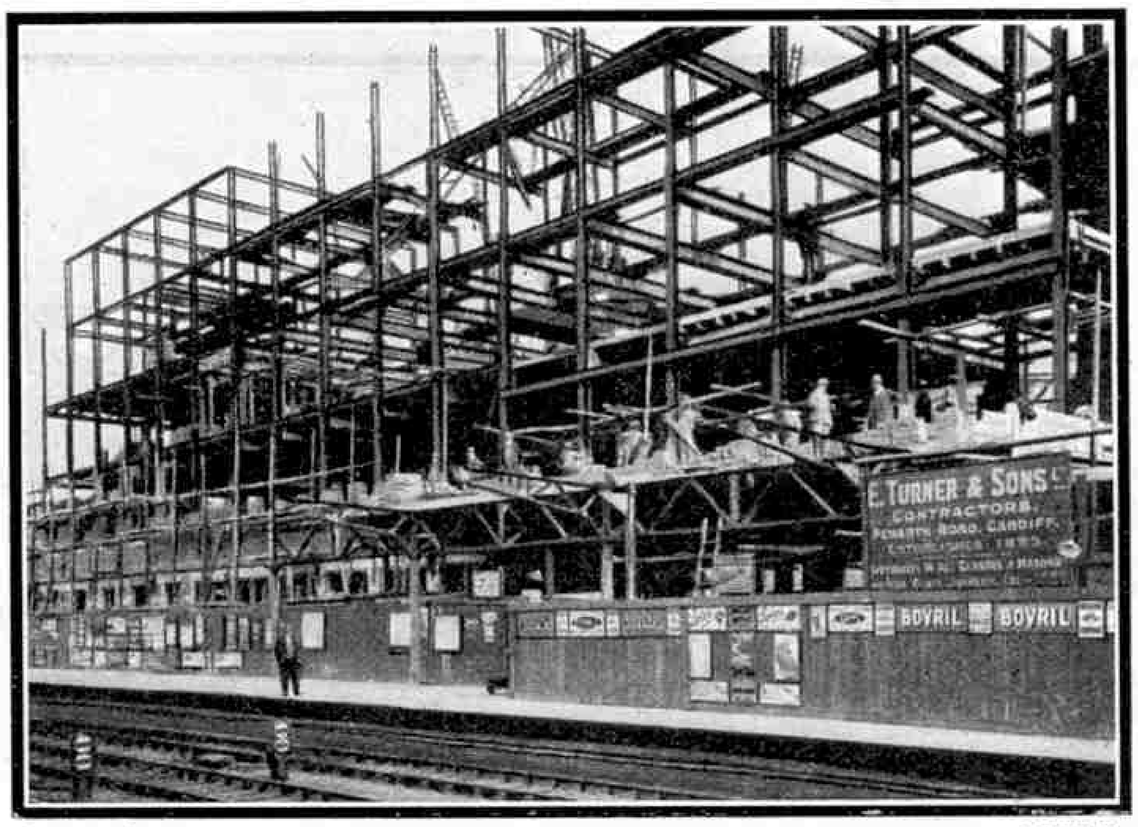


Courtesy] [L.N.E.R.

The South-bound "*Ports-to-Ports*" express leaving York for Sheffield, L.N.E.R.

We leave York at 11.45 a.m. for the longest non-stop run of the whole journey. The going is level past Church Fenton and Milford Junction—in early days one of the most important railway junctions in the North of England, but now no longer a passenger station—to Ferrybridge and Pontefract, but we may have to slow severely in order to cross from one set of tracks to the other at Church Fenton. At Burton Salmon we slow again to diverge to the left from the old York and North Midland line (which proceeds to Normanton), pass through a short tunnel, and then over a fine girder bridge spanning the River Aire. To the left of the embankment running from here down to Ferrybridge we get a splendid view of one of the vast new power-stations that have been erected in connection with the great scheme by which the country is now being supplied with electricity.

From Ferrybridge past Pontefract—famous for liquorice—we mount for 2¾ miles at 1 in 153, drop sharply to Ackworth and mount again for two miles at 1 in 151; then, after some further steep undulations, we drop at 1 in 149-159 for 3¼ miles from Frickley past Moorthorpe, very likely reaching the 70-miles-an-hour mark, if the driver be so minded. The numberless railways that cross us or join us between Church Fenton and Sheffield are in themselves an interesting geographical study, but we have not time to pursue it. Among others, the L.N.E.R. main line from Leeds to London is spanned near Moorthorpe, and if we are lucky we shall catch a glimpse as we pass of the "*West Riding Pullman,*" flying Londonward at 75 miles an hour or more, as it is now just due.



Courtesy] [G.W.R.

Newport Station in course of reconstruction by the Great Western Railway Company

Presently we see the Midland main line of the L.M.S. nearing us on the right, as we cross the Dearne Valley. We are now slackened severely at Dearne Junction, and we run down to join the Great Central line coming from the Barnsley direction and Wath marshalling yard towards Doncaster. Even worse is to come, as less than a mile later we leave this line to travel round what must be one of the very sharpest curves on any main line in Great Britain.

This is known as Mexborough West Curve, and it turns our train through considerably more than a right-angle in a quarter-of-a mile of distance. For this we have to come down to a walking pace. From here to Sheffield, too, there is a constant succession of curves, many of them requiring special speed restrictions; and a general speed limit of 30 miles an hour is enforced for the whole distance. A point of interest just beyond Rotherham is that we run for some distance right alongside the great steelworks of the firm appropriately named Steel, Peech and Tozer.

Sheffield is reached at 12.50 p.m., and if we are to time we shall just see the disappearing tail of the "*North Country Continental,*" by which we travelled so recently, on its way to Liverpool. It is always rather a mystery to me why these two trains cannot be made to connect, as they would give an excellent "all-L.N.E." service from Newcastle and York to Manchester and Liverpool; and it is tantalising to see that such a connection is possible and yet be unable to take advantage of it.

We are to reverse in the Victoria Station at Sheffield, and as we run in we see our engine waiting for the next stage of the journey, with our through coach from Hull already attached. The engine will almost certainly be one of the handsome Great Central "Atlantics," which did such excellent service on the London trains—and on some of them, indeed, still do it—and will take us as far as Leicester.

We have already travelled between Sheffield and Woodford, only in the reverse direction, when we had our run on the "*3.20 Down Manchester,*" so that not much need be said about this section of the journey. Between Sheffield and Nottingham we shall probably take our lunch, and at the same time remark the singular fact that lunch on this express costs a different amount on different days. If it is the Great Western train, you may have the excellent two-course lunch served by that company for a modest half-crown; but if it is the London and North Eastern train the usual five-course meal will be served at 3s. 6d.

Leaving Sheffield at 1 p.m. precisely, we set out over the 38¼ miles to Nottingham. Rising at 1 in 144-155 past Darnall to the summit—once in tunnel, but now opened out to a four-track cutting—we drop sharply to Woodhouse, and reduce speed over the junction. At Eckington we pass over the second set of track water-troughs that we shall see on this journey. From Eckington

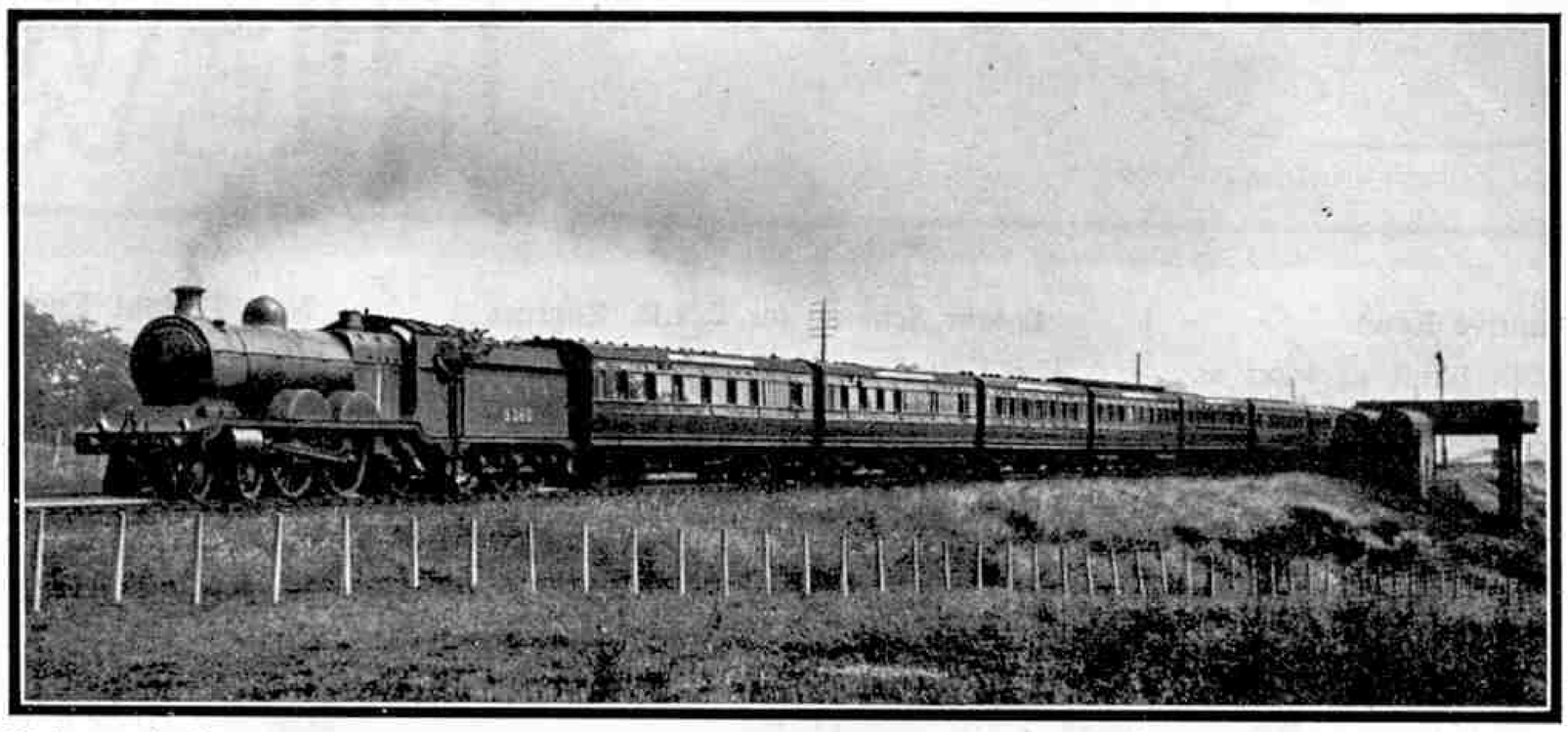
there is a severe rise of 9½ miles past Heath to Pilsley, the first four miles from Staveley being at 1 in 100. After this we encounter sharp undulations to Kirkby South Junction, and then a long and practically unbroken downhill at 1 in 132, where again we shall probably touch 70 an hour or more, to Nottingham. It is interesting, just after Annesley Sidings, to see on the right the old Great Northern and Midland lines running exactly parallel with ours, a brief width of fields separating all three, until below Linby we curve to the right and cross the other two. The approach to Nottingham Victoria Station is made slowly through two tunnels, and we are due there at 1.51 p.m.

From Nottingham to Leicester is the fastest booking of the journey, 27 minutes being allowed for the 23½ miles, which requires an average of 52.2 miles per hour. In earlier days the northbound "*Ports-to-Ports*" was only allowed 24 minutes for the same distance, but the time is now eased out to 26 minutes. About seven minutes after leaving Leicester, by the way, we should pass the latter express, in full cry northward. We are due away from Nottingham at 1.55 p.m. Touching 60 miles an hour at Ruddington, we fall to between 50 and 55 at Barnston Summit; dash down to Loughborough at over 70; climb to Rothley, and finish smartly into Leicester at 2.22 p.m. The interest of this last station lies in the fact that it is one of the biggest in the country built on the "island platform" principle. The one main platform, with the up line on one side and the down on the other, is 1,245 ft. in length.

There is probably a change of engines here, and for the next stretch to Banbury we get either a fresh "Atlantic," or possibly one of the big four-cylinder 4–6–0 engines with driving wheels of reduced diameter for mixed traffic work. We are away from Leicester at 2.28 p.m. on the short run of 20 miles to Rugby. Although we have over seven up miles at 1 in 176 past Whetstone and Ashby to negotiate, the timing of 26 minutes is easily kept.

Then follows the final L.N.E.R. stage of 25½ miles to Banbury, allowed 35 minutes—again an easy piece of work. We climb the seven miles of 1 in 176 from Braunston to Charwelton, threading the two miles of Catesby Tunnel on the way, and then taking water from the third and last set of L.N.E.R. track-troughs. After passing Woodford Junction we slow over Culworth Junction, diverging to the right from the London main line; achieve some more fast running on the four-mile descent towards Banbury; clear Banbury Junction, and draw up in the Great Western Station there at 2.55 p.m.

Here we may be surprised at the type of engine that is awaiting us. It is none other than one of those handy and very numerous Great Western "Moguls"—a "maid-of-all-work" class, if ever there were one. Over the next section of our journey there are various bridges that can carry only certain maximum weights, and the "Moguls" are in consequence the most powerful type that is permitted to run between Banbury and Cheltenham. The engine now backing on to the train will run it over the remainder of the journey to Barry, having already brought to-day's northbound "*Ports-to-Ports*" express from Barry to Banbury. And we shall find that our new steed is well up to its task and will have no difficulty in making speed or maintaining time.



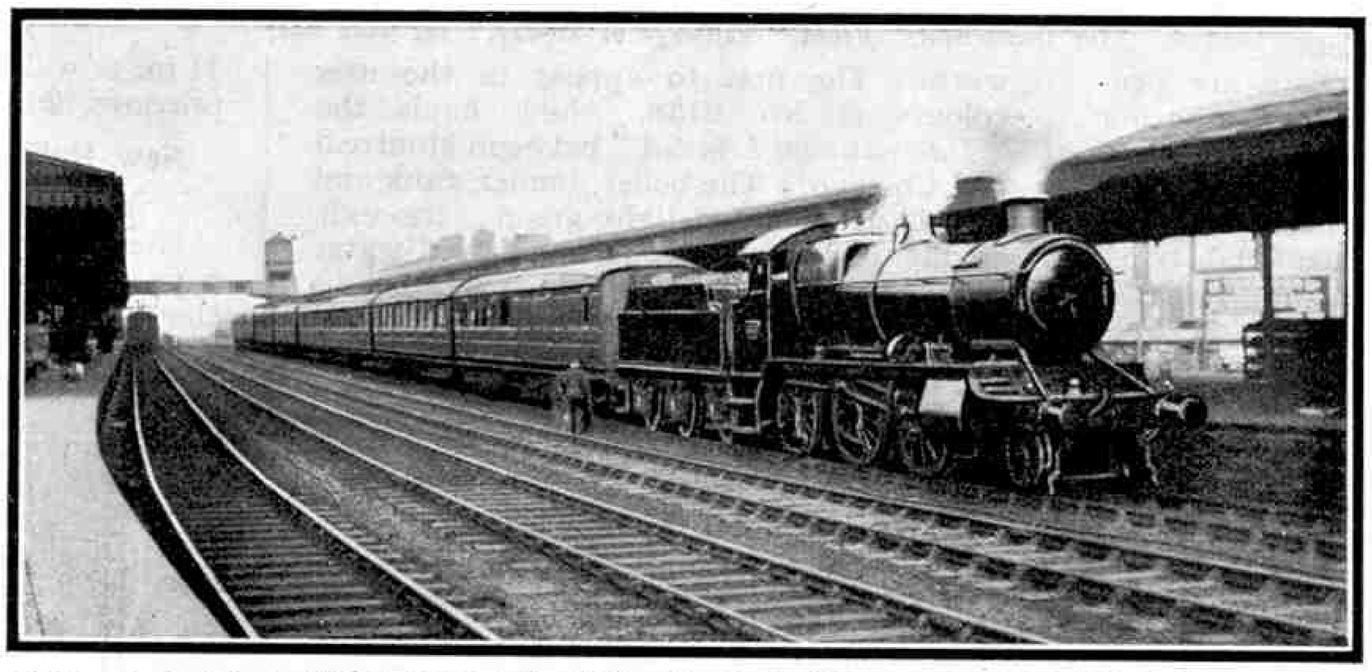
Photos courtesy] [*L.N.E.R.*

The "*Ports-to-Ports*" Express passing over Charwelton Water Troughs near Woodford, hauled by Great Central "Atlantic" No. 5360

We leave Banbury at 3.37 p.m., and run 3½ miles along the Great Western North main line to our divergence to the right at King's Sutton. For 1¾ miles the branch is double line, but after that we take to single-line working for 34½ miles to Andoversford. There are therefore frequent severe slowings for exchanging the single line tokens. As there are also long and severe grades, such as 7½ miles up at 1 in 100 from Bloxham to Rollright, a similar distance down as steep in parts as 1 in 80 to Kingham, and ups-and-downs steepening finally to 1 in 60, this is not exactly an "express" route. For the 44¾ miles from Banbury to Cheltenham South, including three "conditional" stops, the time allowed is 80 minutes, and it is fully needed. By contrast, the eight miles from Cheltenham to Gloucester are smartly run in 11 minutes, and we reach there at 5.10 p.m.

Now for the interesting note I was going to give you about those Midland coaches that accompanied us from Newcastle to York. They followed us out of York at 12.8 p.m., as far as Dearne Junction. There they passed on to the Midland main line and ran into the Midland Station at Sheffield, which they reached at 1.21 p.m., 21 minutes after we left Victoria Station. Since then they have travelled down through Derby and Birmingham, and now, if you please, between the Midland stations of Cheltenham and Gloucester, they run for six miles from Lansdown Junction over exactly the same metals as ourselves, and just five minutes behind us! This really is a rather remarkable fact.

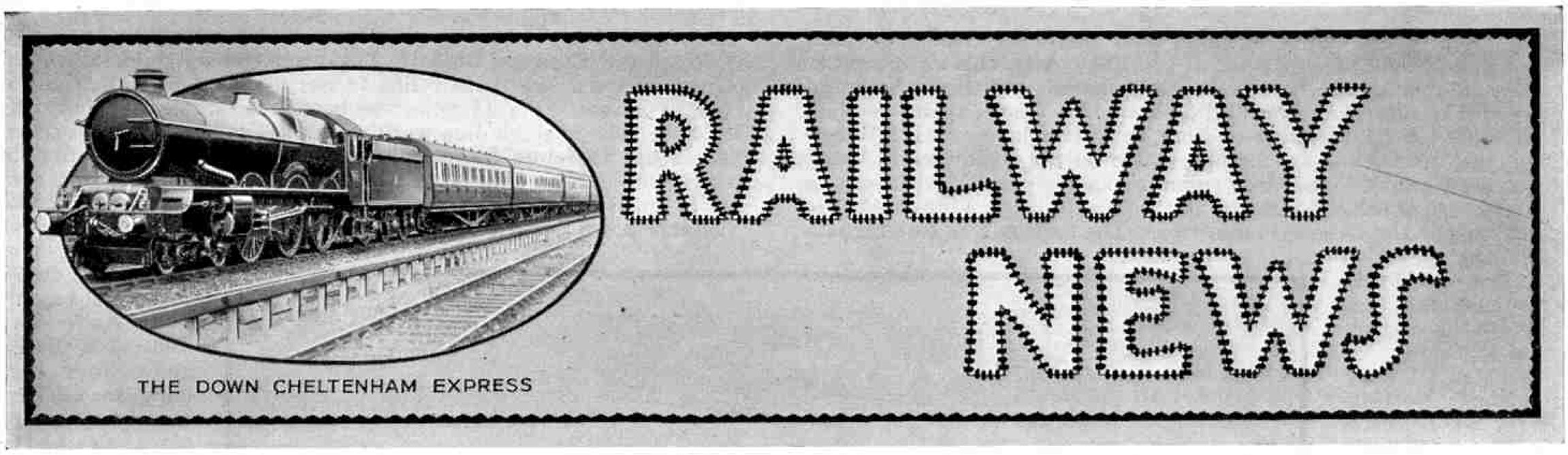
From Gloucester onward we have to travel over the original main line to South Wales that the Great Western used from London before the Severn Tunnel had been bored. It is practically level and there is some good going, the time allowed between leaving Gloucester at 5.18 p.m. and reaching Newport at 6.24 p.m. being 66 minutes for the 44½ miles, including the stop at Chepstow. In the opposite direction the "*Ports-to-Ports*" express has only 59 minutes for the same run, the smartest time being 32 minutes for the 27½ miles from Chepstow to Gloucester.



"*Ports-to-Ports*" Express at Cardiff, with L.N.E.R. stock and G.W.R. locomotive

There is much of interest to be seen along this stretch, as from Newnham onward we have the wide estuary of the Severn on our left for nearly 25 miles. Approaching Lydney we see the striking bridge that has been thrown across the Severn between there and Sharpness, carrying a single line that is the joint property of the G.W. and L.M.S. Railways. The only occasion when express trains are passed over this structure, which can carry but limited locomotive weights, is when the Severn Tunnel is closed at times on Sundays for repairs. Another interesting bridge, designed by Brunel, and of considerable size, carries us across the mouth of the River Wye, at Chepstow.

Hurrying on, we run over the Severn Tunnel—which is unseen, of course, but betrayed by the ventilating shafts coming up to the surface—and immediately afterward notice the deep cutting bringing the main line up on our right to join us at Severn Tunnel Junction. A little less than 10 miles farther on, heralded by extensive suburbs and the many (*Continued on page 585*)



THE DOWN CHELTENHAM EXPRESS

S.R. Locomotive News

Work will be put in hand as soon as possible to recondition Hastings Station at a cost of £202,000.

Nos. E.859, "*Lord Hood*," and E.860, "*Lord Hawke*" are now in service. "Urie" 4–6–0's Nos. E.736–742, 744 and 746 now have 21 in. by 28 in. cylinders. Nos. E.542 and B.200 have been scrapped.

New large six-wheeled tenders have been allotted to "King Arthur" class locomotives Nos. 763, 764, 765, 766, 768, 770 and 772.

The following 4–4–0 type engines have recently been fitted with C.3 class boilers with flat domes and whistle fitted on the safety valve mounting, instead of the more usual position in the cab roof :— B.171, 322 and 323.

Concerts while you Travel

A concert coach is the latest addition to the rolling stock of the Great Southern Railway of Ireland. Six of the seats have been removed from a 60 ft. coach and a collapsible stage constructed. The artists are provided with dressing rooms in another portion of the train and give variety performances to two or three "houses" during long-distance excursions to the West of Ireland. On three trial trips, the Dublin Glee Singers and Railway Entertainers had an audience of over 1,000 people.

German Locomotive Standardisation

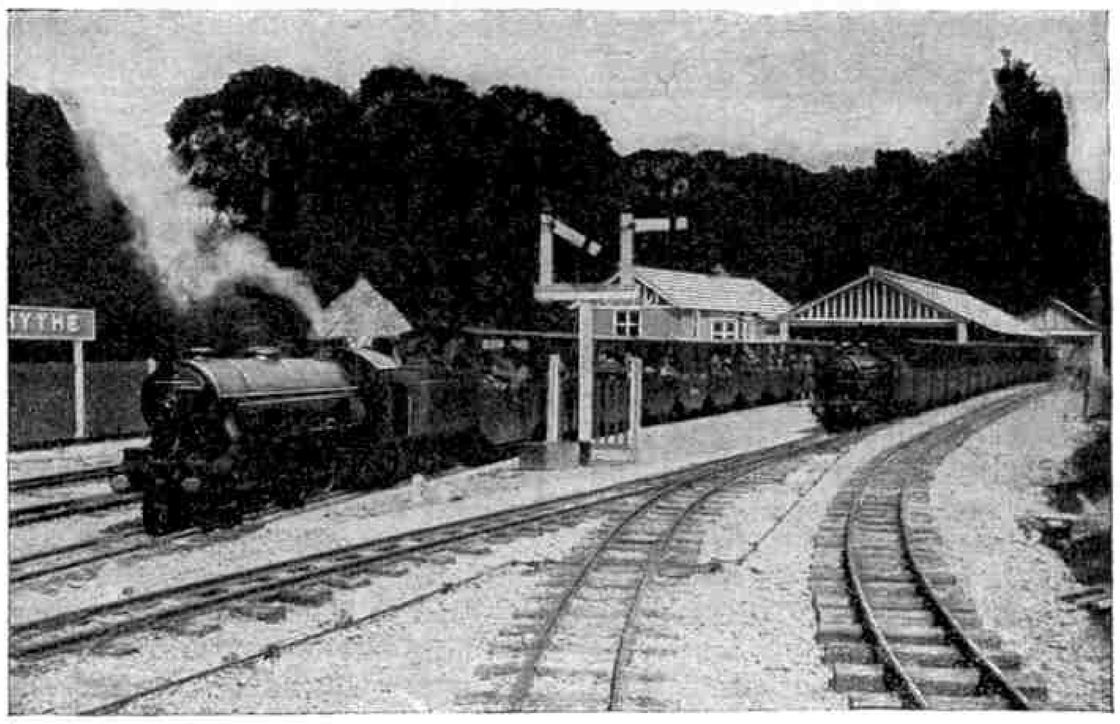
Much has been done during recent years to further the principle of standardisation of locomotives on the German railways. The scheme covers all types of engines and it is intended to reduce considerably the number of classes, of which there are more than 100 at present in freight service alone. A standard "Unity" type locomotive with 2–10–0 wheel arrangement is being built for the heaviest freight duties and it is believed that some are already in service. With improved repair shop facilities and a reduction in the number of classes, the cost of overhauls should be reduced.

L.N.E.R. "Pacifics"

New "Pacifics" working on the G.N. section are Nos. 2743-47 and 2750. No. 2745 "*Captain Cuttle*" appears to have been transferred elsewhere.

Colour Scheme for C.N.R. Engines

The Canadian National Railways have recently adopted a colour scheme of bright green, vermilion and black for their famous "6100" class locomotives. These engines are among the largest and most powerful passenger locomotives in the world. The first to appear in the new colours is No. 6138, which hauls the "*International Limited*" between Montreal and Chicago. The boiler, tender, tank and wheels are painted light green; the cab, smoke box, coal hopper and feed-water heater are black; while the buffer beams at each end, together with the wheel spokes and the fluting of the driving rods, are bright red. This marks a new departure in Canadian railway practice.



A view on the 15 in. gauge Romney, Hythe and Dymchurch Railway. Leaving Hythe for Dungeness. (From "Railways of To-day," see page 531)

DIFFICULTIES EXPLAINED

XI.—White Locomotive Headlamps on L.N.E.R.

Locomotive headlamps painted white have lately appeared on the L.N.E.R. The object of these is to enable signalmen and others concerned to distinguish various classes of trains while they are in motion.

The contrast of the white lamps against the black smokebox shows the position of the lamps clearly and makes a fleeting glance sufficient to determine the type of train.

Training School for Railwaymen

Work commenced recently on a new training school at Lambeth North Station. When completed, the building will be used as a school for drivers, guards, signalmen, and other grades concerned in the operation of the Underground Railways, London. The school will contain electrical and mechanical equipment, together with models of signals and other apparatus used on the Underground Railway.

New Freight Engines for B.A. & P.R.

Eight heavy "Mikado" 2–8–2 freight engines for the Buenos Aires and Pacific Railway have recently been turned out of the works of Beyer, Peacock and Co. Ltd., Gorton Foundry, Manchester. These engines are fitted with two large outside cylinders and Walschaerts valve gearing.

The new locomotives are to be used for hauling very heavy freight trains on the 5 ft. 6 in. gauge main lines. These engines are believed to be the heaviest non-articulated 2–8–2 type so far constructed by any British firm. Each engine weighs 205 tons complete with tender and in working order.

The boiler is fitted with a "top feed" device, a dynamo for electric lighting, and four Ross "pop" safety valves. Owing to the height of the boiler, the steam whistle has been placed in a horizontal position. The following are some of the leading dimensions: Cylinders, dia. 24½ in.; stroke, 30 in.; coupled wheels, 5 ft. 7 in.; length of boiler, 21 ft. 11 in.; width 6 ft. 8-13/16 in.; working pressure, 200 lb. per sq. in.

New Rolling Stock for the Piccadilly Railway

Nine new trains of the most modern type were recently placed in service on the Piccadilly Railway. All the original rolling stock of this line is being replaced, and 27 new trains of six cars each have now been supplied for this purpose. The old cars have been in service since the line opened in December, 1906, and are now to be sold as scrap. The new rolling stock is identical with the new cars already in service on the Hampstead line.

New Station at Bombay

The new main line station Victoria, Bombay, on the Great Indian Peninsular Railway, has been opened for service. The opening ceremony was performed by Sir Frederick Sykes, the Governor of Bombay. This new station consists of 13 platforms for passenger traffic, while two platforms are to be added that will be used for luggage only.

Additions to the L.N.E.R.

The L.N.E.R. have placed an order with the Sentinel Waggon Works Ltd., for 18 "Sentinel" shunting locomotives.

New 4-8-0 Locomotives for B.A.C.R.

Six new "Mastodon" 4–8–0 type locomotives have been built by Kerr, Stuart & Co. Ltd., for the Buenos Aires Central Railway. The diameter of the driving wheels is 4ft. 9 in., and the diameter of the bogie wheels is 3 ft. The cylinders of the new engines are of 20 in. diameter and the piston stroke is 24 in. Ample room is provided in the tender for 3,000 gallons of water and five tons of coal.

Cascade Tunnel Completed

The eight-mile Cascade Tunnel on the Great Northern Railway, in the United States of America, has now been completed. This is the longest tunnel on the American Continent, and it has taken only three years to build, compared with the five years required to construct the Moffat Tunnel, which is two miles shorter.

Express Engine Fails

An express train travelling from London and Manchester to the North was rushing down Shap Summit in Westmoreland recently when, without warning, the engine failed. The train came to a standstill, and was eventually hauled into Carlisle Station by another locomotive running tender first. The mishap caused serious delay to the "Royal Scot."

The "Royal Scot" express from London to Glasgow recently established a new record in hill climbing, four minutes being gained in the ascent of Shap Summit, which is nearly 900 ft. above sea level.

L.M.S. Fast Run

From a standing start, the new Sheffield and Leeds to Glasgow express via Carlisle made an excellent run from Appleby to Carlisle, covering a distance of 30½ miles in 32 minutes. We have no details of the locomotive concerned.

New "Pacifics" for Indian Railway

A contract for the construction of eleven 4–6–2 "Pacific" type locomotives complete with tenders, for the Eastern Bengal Railway, has been placed by the Indian Government with Sir W. G. Armstrong Whitworth & Co. Ltd., Scotswood-on-Tyne.

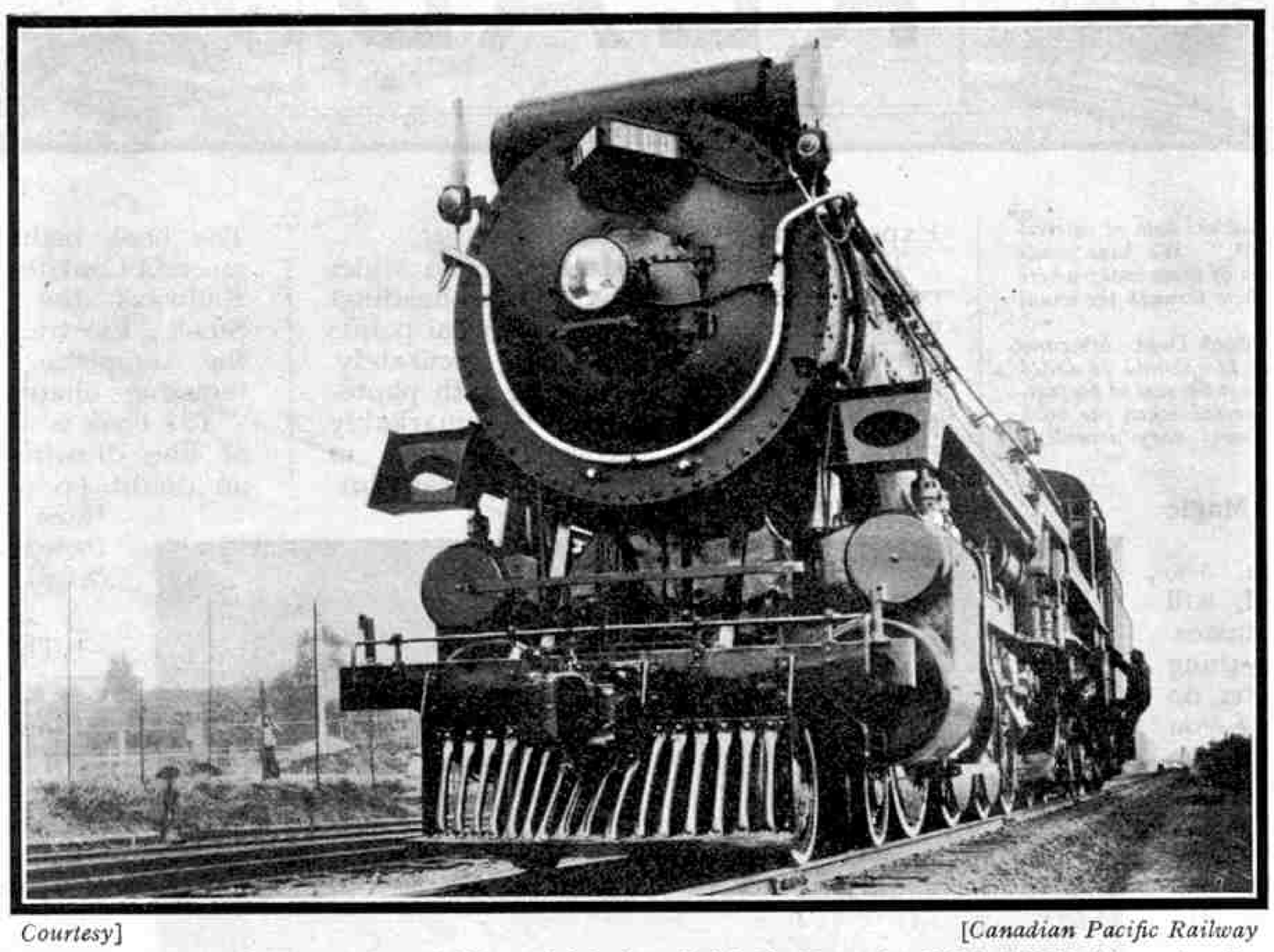
322 Railway Halts on the G.W.R.

With the opening recently of Chalvey Halt, between Slough and Windsor, the number of halts opened by the Great Western Railway now totals 322.

Luxurious G.W.R. Motor Travel

New motor-coaches recently have been put into service by the Great Western Railway Company between Oxford and Cheltenham, to link up with trains from London and Reading. The new coaches are claimed to be the finest of their type, and each seat is a separate leather upholstered armchair. A special hot water heating apparatus is installed in each coach; and the apparatus may be adjusted to give various degrees of temperature. Cigarette, match, and chocolate machines; travelling rugs; ash-trays; loose cushions; mirrors; and a clock all help to make a journey in one of these coaches a real pleasure. The chassis is designed for 32 passengers, but to ensure the greatest comfort only 22 seats are fitted.

The Largest Passenger Locomotive in the Empire



Courtesy] [*Canadian Pacific Railway*

This monster 4-8-4 locomotive, which was briefly described in the December, 1928, "M.M.," has a tractive effort of 60,800 lb., equal to 3,685 h.p. The boiler pressure is 275 lb. and the cylinders are 25½ in. by 30 in. The driving wheels are 75 in. in diameter, and the total length of engine and tender is 97 ft. 5 in. The coal capacity is 18½ tons, and 12,000 gallons of water are carried. A mechanical stoker of the latest design is fitted to cope with the locomotive's enormous appetite.

Details of the New 4-6-0 L.N.E.R. Locomotives

The following are the leading dimensions of the new 4–6–0 "Sandringham" class express passenger locomotives, which have been designed for service on the Great Eastern section of the L.N.E.R.

Boiler working pressure	200lb. per sq. in.
Heating surface :—	
Firebox	168 sq. ft.
Small tubes, 143, 2 in. diam.	1,048 ,,
Flues, 24, 5¼ in. diameter	460 ,,
Total evaporative :—	1,676 ,,
Superheater :—	
No. of elements—24	
Heating surface	344 ,,
Total heating surface	2,020 ,,
Tractive effort at 85 per cent. boiler pressure...	25,380 lb.
Weight of engine in W.O.	76 tons 13 cwt.
Total weight of engine and tender in W.O.	116 tons 1 cwt.

Each driving axle carries a total weight of 18 tons and the trailing coupled axle 17 tons 15 cwts. The boiler has a maximum diameter of 5 ft. 6 in. Ross "pop" safety valves are mounted over the firebox.

L.M.S. Locomotive News

Claughtons Nos. 5912, "*Lord Faber*"; 5915, "*Rupert Guinness*"; 5917, "*Charles J. Cropper*"; 5979, "*Frobisher*"; 5933 and 5976 (unnamed) have been seen recently working north of Carlisle.

The Manchester-Llandudno Club Train is generally worked by "Claughton" class engines Nos. 5994 and 5995.

Three of the new "G.3" class 0–8–0 superheater fitted freight engines Nos. 9500-2 ex Crewe are now working from the Crewe South Shed.

"Royal Scot" No. 6148, "*Velocipede*," was seen recently hauling a "*Merseyside*" thirteen-coach train into Liverpool.

It has been reported that rebuilt "Claughton" class locomotives fitted with Caprotti valve gear will shortly take over the "Irish Mail" trains. At the present time these trains are worked by rebuilt Claughton locomotives fitted with Walschaerts valve gear, and six of these engines are stationed at Holyhead.

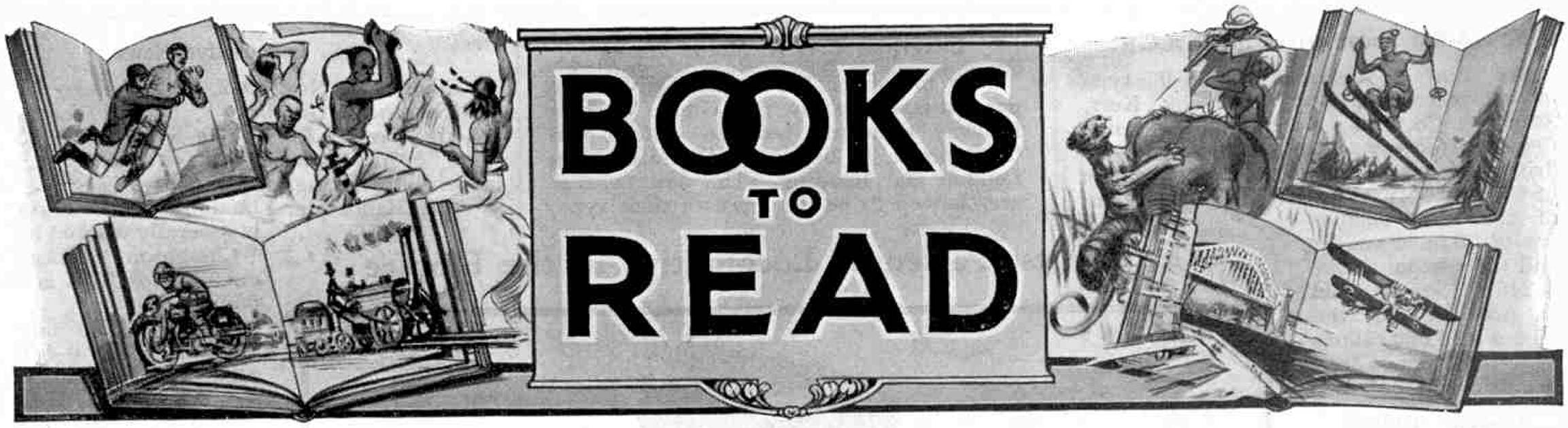
A very unusual sight was witnessed a short time ago near Mossley Hill, Liverpool, when a "Royal Scot" class locomotive No. 6144, "*Ostrich*," was seen working a four-coach local train on the slow line into Lime Street, Liverpool. It is probable that the engine was working back into Liverpool to be in readiness for an outward fast train. This locomotive bore an engraving of an earlier locomotive of the same name built in 1842 at the works of the Liverpool and Manchester Railway.

G.W.R. Locomotive News

Several 4–4–0 "*Bulldog*" class locomotives recently left Swindon Sheds fitted with painted safety valve covers. These include Nos. 3329, "*Mars*"; 3391, "*Dominion of Canada*"; 3325, "*Kenilworth*" and 3326, "*Laira*."

It is interesting to note that a considerable number of 4–6–0 "Castle" class locomotives have recently been fitted with "King" class high capacity tenders. These include Nos. 4073, 4074, 4076, 4079, 4081, 4083, 4084, 4088, 4091, 4096, 5001, 5002, 5003, 5005 and 5010. Many of these large tenders are to be seen outside Swindon Locomotive Sheds, ready to be allotted to "Castles" when they arrive for repair.

The North British Locomotive Co. Ltd., Glasgow, have delivered the following 0–6–0T Goods engines:—5708-17, 5730-35 and 5737. Locomotive No. 2195 "*Cwm Mawr*" has been seen recently working in the vicinity of Swindon.



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.

"Wireless: The Modern Magic Carpet"

By Ralph Stranger. (Partridge. 3/6)

This book, it is claimed, will appeal to all classes and tastes. If you do not know anything about Wireless—even if you do not possess a receiving set—you will find this book invaluable, assuming you are at all interested in the subject. It will show you how to make life more interesting, and how you may provide yourself with an absorbing hobby.

If you are a listener and your receiving set is not your servant but your master, and a difficult master to understand, you will find the book indispensable. Not only will it help you to understand your set, but it will also save you considerable expense, worry and trouble.

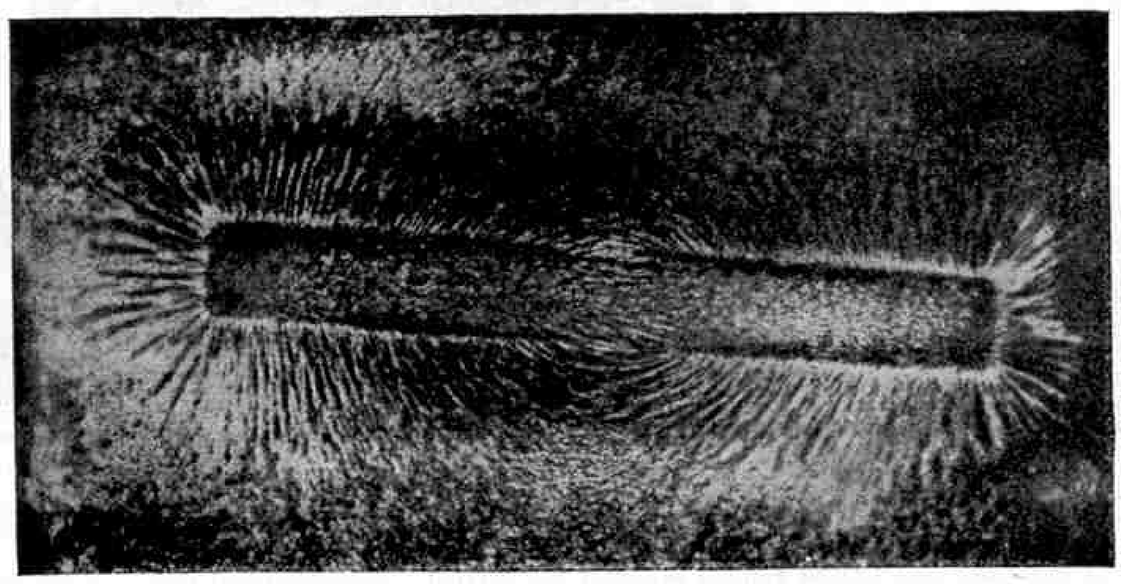
If you are an experimenter without sound theoretical knowledge; if your fame as a wireless expert is such that you cannot possibly ask your friends technical questions; if you find the usual text books rather dry and difficult to follow, this volume will solve your difficulties. Not only so, but it will provide you with valuable experimental data, and show you the way to quick study.

If you are an expert and have to lecture from time to time on wireless subjects, the book will be of interest if only as an attempt to explain in everyday language a highly-scientific and complicated subject.

The book is divided into four parts. The first, entitled "Where Does the Magic Carpet Take Us?" deals with the stations that can be heard on modern sets. This is followed by "The Why and the Wherefore of the Magic Carpet," which tells us about matter and energy, magnetism and electro-magnetism. Then comes "The Weaving of the Magic Carpet," covering such subjects as the Riddle of the Ether; Wave Lengths; The Microphone; the Aerial; the Valve, and so on. Part four, "The Magic Carpet Flyers," mainly deals with the Legal Aspect of Listening; Protection of Inventions; How to Experiment in the Right Way, etc.

The ground covered is of even wider range than the various section headings would indicate. All really essential points are dealt with simply but accurately.

The book is well illustrated with photographs and diagrams and is remarkably good value, and anyone interested in wireless will find it a good investment.

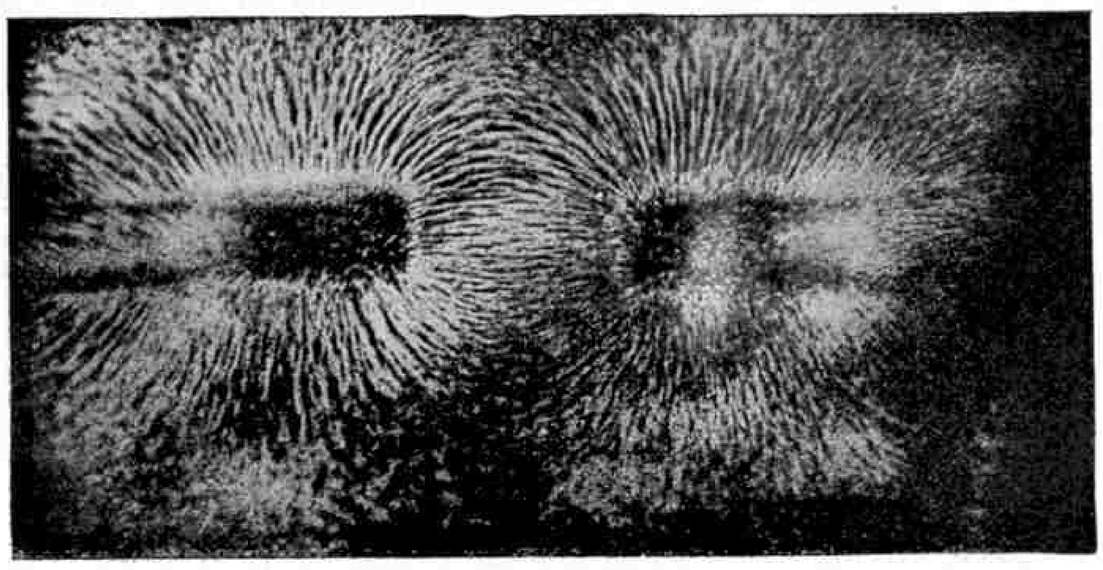


The magnetic field around a bar magnet (see below)

"More Machines"

By O. M. Baker
(Wells Gardner, Darton & Co. Ltd. 7/6)

The purpose of this book, which is a sequel to "The World of Machines" already reviewed in these pages, is to make clear the working of some of the machines by which we are surrounded. In it, all who have little or no acquaintance with technical matters but who take an interest in machinery, will find much that will help them to understand and appreciate the works of the engineer. The author does not write about things that have been common knowledge for years, wonderful though they are, but deals with fundamental principles in every case, and this makes the essential details all the clearer.



The magnetic field between two dissimilar poles. (From "Wireless, the Modern Magic Carpet" reviewed on this page)

The book includes chapters on the Engineer's Contribution to Modern Progress; Railways—the Road and the Rolling Stock; Electric Railways; the Motor Car; the Aeroplane; and finally, a very interesting chapter on Power and Fuel.

The book is well illustrated by a number of line drawings in the text, and will no doubt be of considerable interest to those of our readers who wish to learn more about mechanical details.

A Mystery of the Sea
"The Great '*Mary Celeste*' Hoax"

By Lawrence J. Keating
(Heath Cranton. 10/6 net)

Of all the mysteries of the sea, none has roused anything like the same interest as that of the "*Mary Celeste.*" The mystery presented a set of such baffling conditions that not a single one of the scores and scores of suggestions that were brought forward seemed in the slightest degree satisfactory. Most of us, indeed, had long given it up as hopeless. Now Mr. Keating comes along, tears the veil of mystery to shreds, and gives us what is most certainly the first really adequate explanation.

The facts of the case are quite simple. The "*Mary Celeste*" was a brigantine of some 230 tons, and in November 1872, she sailed from New York for Genoa with a cargo that included a quantity of spirits. Nothing more was heard of her for several weeks, after which she was found deserted in mid-ocean by the British vessel "*Dei Gratia.*" She was sailing along normally and all on board was in order, yet captain and crew had absolutely vanished. Her boats were still on board, and there was not the slightest clue to show what had happened. The "*Mary Celeste*" was brought into Gibraltar Harbour by the "*Dei Gratia,*" and after due inquiries the story of the captain of the latter ship was accepted, and he was awarded salvage.

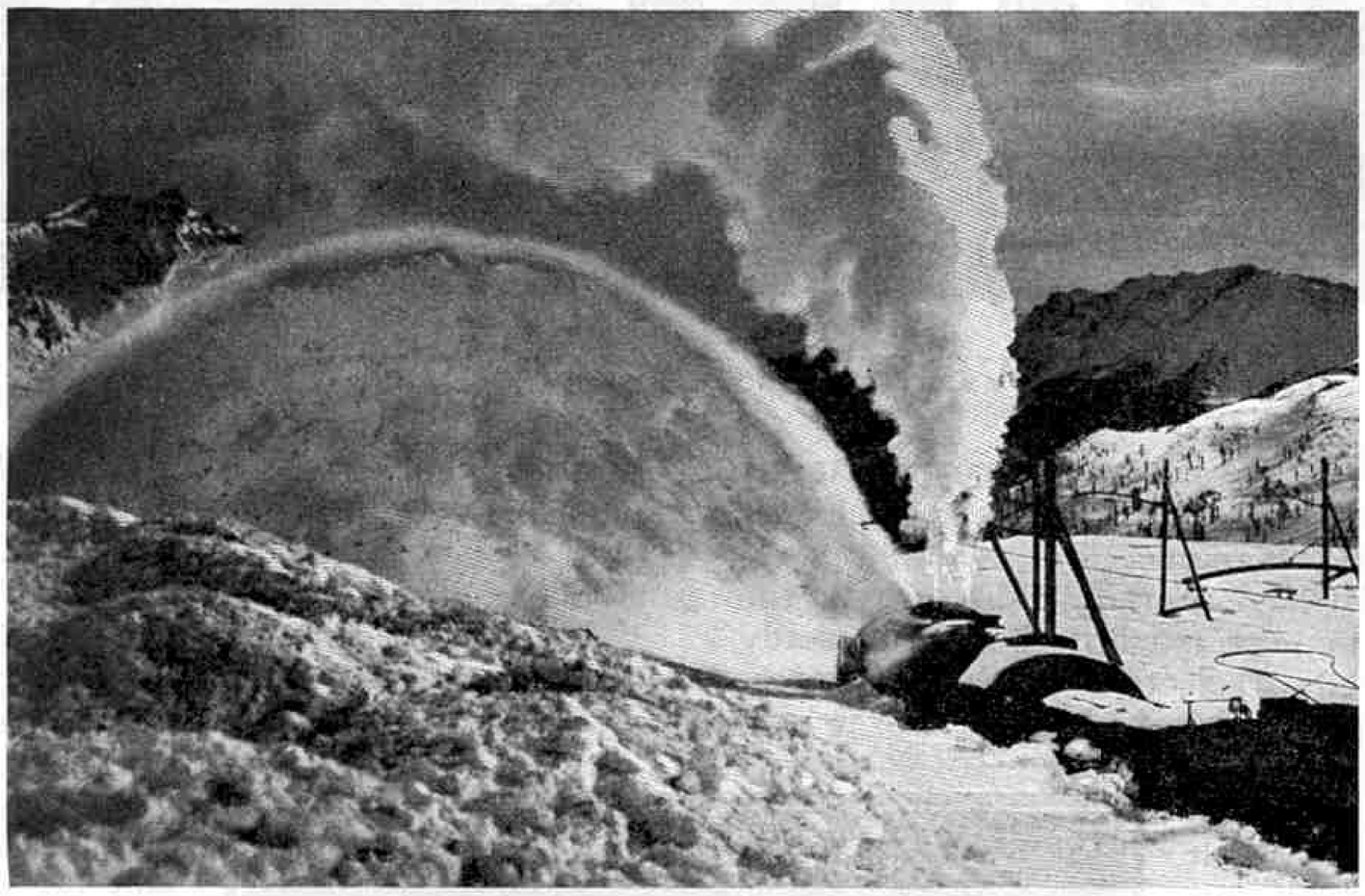
Mr. Keating traces the career of the "*Mary Celeste*" from her first voyage, and finally we see her in dock loading up for the trip that was to arouse world-wide excitement. We follow her out to sea, and one by one the unsolved problems are shown by the results of quite ordinary circumstances. To explain the mystery would be to destroy the interest of the book, and nothing would persuade us to do this, for the story is really of unique interest.

The explanation given is remarkably detailed, and it appears to cover the facts

of the case. At the same time one or two features of the book are not quite satisfactory. In the first place the explantation, or at least a great deal of it, is based upon the recollections of a Liverpool man, John Pemberton, who was cook and steward on the "*Mary Celeste.*" Without casting any doubt on Pemberton's honesty, one cannot help feeling that in order to become aware of all the matters that he describes so minutely he must have had the capacity of being in two places at once! Granting that the conditions on board the "*Mary Celeste*" were decidedly unusual, it is difficult to know how Pemberton could have had personal knowledge of certain of the things he describes. In short, one has the feeling that, although his story is no doubt correct in its outlines, it has had many gaps filled in by the use of either deduction or imagination, or perhaps both.

Another point that is not by any means satisfactory is why Pemberton failed to bring his explanation into the light of day for such a long period. Mr. Keating tells us why this was so, but his explanation is not altogether conclusive.

It was quite time that this famous mystery of the sea should be cleared up, and Mr. Keating has done this for us in masterly fashion. It is in many respects a grim and sordid story, in which the principal actors seem to be driven helplessly along by a malignant fate. One feels a tinge of regret that the long-delayed solution has not turned out to be a more romantic one.



Clearing snow with a rotary plough on the Bernina Railway, Switzerland. At this point the railway is 7,400 ft. above sea-level, but is kept open for traffic throughout the winter by means of these rotary snow ploughs (see below)

"Railways of To-day"

By Cecil J. Allen
(Fredk. Warne & Co. Ltd. 12/6)

Mr. Allen is already well known to "*M.M.*" readers and requires no introduction. Not only is he a regular contributor to the "*M.M.*" and to various railway magazines and journals, but he is well known as a broadcaster on railway subjects.

In his new book he deals, with the aid of photographs, diagrams and appendices, with every detail of railway equipment and operation. He goes very thoroughly into steam locomotive design and into the various questions connected with railway electrification. He does not restrict himself to railways of Great Britain, but includes information and illustrations of the leading railways throughout the world. The appendices are particularly valuable, and we have no doubt will be used to settle many an argument! Among other things, they give lists of notable engineering features, including highest altitudes of British railways and of railways of the world; locomotive types, classes and dimensions; fastest and longest train journeys; longest railway tunnels; largest signal boxes in Great Britain, etc.

In his preface Mr. Allen draws attention to the fact that a special feature has been made of the colour reproductions, which are on a scale not previously attempted in any railway book. The colours of present day locomotives, rolling stock and equipment in many countries have been recorded by skilled artists. There are 200 other half-tone illustrations specially selected with a view to helping the reader to understand the text, and a large folding plate showing a section of a modern express locomotive, with every part numbered and tabulated.

A view on the 15 in.-gauge Ravenglass and Eskdale Railway showing Irton Road Station, Cumberland. (This illustration and the one above are taken from "Railways of To-day" reviewed on this page)

The sections dealing with railway operation are especially valuable. To-day interest in model railways is increasing rapidly, and information on all branches of railway working is eagerly sought for by enthusiastic owners of miniature layouts.

The book will be of the greatest use to the railway enthusiast and to the keen railway student. Our only regret is that the price of 12/6 is somewhat high, and we feel that on this account alone it will have a more limited number of readers than it deserves on its merits.

"Books for the Handy Man"

(Frederick Warne & Co. Ltd. 6d.)

Continuing their policy of producing practical and well-written handbooks on various topics at the low price of 6d., Frederick Warne & Co. Ltd. now issue a series of six "Useful Books" dealing with the building and repairing of houses; the making and repairing of simple furniture, and the carrying out of ordinary household repairs. It is probable that few "*M.M.*" readers will be likely to undertake house-building, but there is ample scope for ingenuity and nimble fingers in tackling the small repair jobs that crop up from time to time in every household.

The books in this series dealing respectively with "*Simple Furniture Repairs*" and "*House Repairs*" cover a great variety of subjects, and show just exactly how different jobs should be dealt with to secure the best results in the simplest way. In most small household repairs there is no particular skill required, but there is a right way and a wrong way of doing every job, and these books make matters perfectly clear. Their object is to show how to do the little jobs which, done now, save a builder's bill later, and in this they are certainly successful.

The book on "*Simple Furniture Making*" will be found invaluable for those who have the ambition to make things, and the one on "*House Decoration*" gives simple and practical hints on painting, papering and distempering and other matters worth knowing.

Of the remaining books in the series, one entitled "*Your House*" contains useful advice to those who intend to buy, build, or rent a house, and a little study of its pages will help to prevent the unwary from making errors that may prove costly.

The planning and actual construction of simple forms of bungalows is dealt with in the last of the six, "*Bungalows, Pavilions and Cottages.*" It contains one section that will be particularly interesting to many readers of the "*M.M.*"; this is a very useful guide to the building of sports pavilions that are reasonable in price, and at the same time durable and thoroughly suitable for their purpose.

Interesting New Books

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

"East South East"
by Morley. (Longmans, Green & Co. Ltd. 7/6)

"Learning to Fly"
by F. A. Swoffer. (Sir Isaac Pitman & Sons Ltd. 7/6)

"On Leaving School"
by Sir Charles Wakefield.
(Hodder & Stoughton Ltd. 3/6)

I.—THE INVENTION OF AN ELECTRIC EYE

IT is now little more than a century since the Italian scientist Count Volta introduced the famous electric battery that bears his name, and only 98 years have elapsed since Michael Faraday discovered the principle of the dynamo, the machine now universally used for the generation of electricity. In this comparatively short interval electricity has become a part of our daily life. We use it as a means of light and power, and almost every year brings with it some new marvel of an electrical character.

In very early days it was seen that electricity could be used for sending signals over long distances, and this was the beginning of telegraphy, a word that is derived from the Greek word "*tele*," which means "at a distance," and "*grapho*," a Latin word meaning "I write." At first the "writing" consisted merely in making long and short signals, the length of these being controlled by means of a tapping key that closed the circuit and allowed the current to flow through the connecting wires for the necessary length of time. In order to represent letters and numbers, combinations of these two kinds of signals were arranged, thus giving a code by means of which messages could be spelled out. The code in use to-day is practically that introduced nearly 100 years ago by the American pioneer in telegraphy, S. F. B. Morse.

Mr. J. L. Baird, the inventor who, in April 1925, gave the first successful demonstration of true television. Three years later Mr. Baird spanned the Atlantic by the same means

Telegraphy has been developed into real writing at a distance, for the operation of tapping out a message on instruments at the transmitting end may be made to print it in ordinary type on a ribbon at the receiving end. An even more wonderful achievement is wireless telegraphy, by means of which messages may be transmitted through the ether instead of through costly and cumbersome connecting wires.

After signs came sounds. The wonderful discovery that sounds could be electrically reproduced at the end of a wire of almost any length was made in 1876 by Alexander Graham Bell. On 10th March in that year Bell spoke into the first telephone ever constructed, and his words were easily distinguished by Watson, his assistant. These historic words were: "Mr. Watson, please come here, I want you."

It is interesting to note that 39 years later the inventor and his assistant played an important part in opening the United States trans-continental telephone line. On the occasion of their first telephone conversation the inventor was on the ground floor, and his assistant in the attic, of the same building; this time Bell was in New York and Watson in San Francisco, 3,390 miles away. The former spoke in exact reproduction of the original occasion: "Mr. Watson, please come here, I want you," and his assistant's reply was "It would take me a week now!"

The work of Graham Bell thus gave to the world an electric ear. To-day a network of telephone wires covers every civilised country, and by means of electro-magnetic waves the electric ear also enables us to communicate easily and almost instantaneously with almost every part of the world.

The world had thus been given the telegraph and the telephone, but there still remained the task of giving it an electric eye and making television or "far-seeing" possible. If, during the first public demonstration of the telephone, it had been suggested that seeing at a distance would some day be added to hearing at a distance, there would have been loud outcries of derision. Even 10 years ago most people would have scoffed at the suggestion that one day we should be able to see across the Atlantic Ocean, yet the miracle has been accomplished by a British inventor, and real television, or "far-seeing," has been successfully demonstrated not only in Great Britain, but also in America.

In this field the greatest success has been achieved by Mr. J. L. Baird, to whom belongs the distinction of having been the first to demonstrate true television. Like Graham Bell, the inventor of the telephone, Mr.

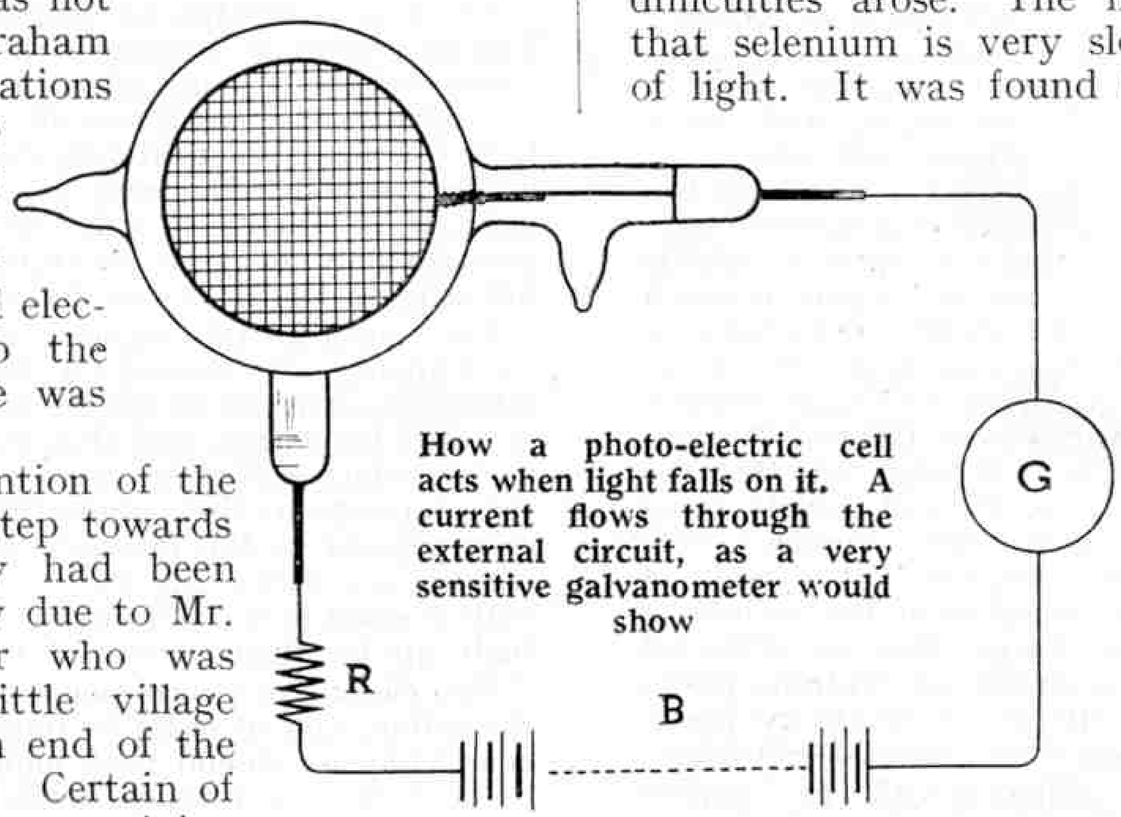
Baird is a Scotsman. About five years ago he was compelled by ill-health to abandon an active business career. Scientific work had always been his hobby, and he decided to continue certain experiments in television that he had commenced some years earlier. After several months' hard work with weird apparatus—including old bicycle sprockets and cardboard discs held together by sealing wax and string—he had the satisfaction of seeing on his receiving screen the reproduction of a human face, not in outline, but as a real image with shape and detail. This was the first successful demonstration of real television.

Mr. Baird has continued his pioneer work with great success and is now able to transmit scenes containing as many as 12 people, and to show them on screens measuring 6 ft. by 3 ft. Absolute perfection has not yet been reached, but this is not surprising. Many years of hard work were necessary to perfect Bell's telephone, and that was a much simpler task than perfecting the details of a scheme of television. Progress in the last few years has been extraordinarily rapid, however, and there is little doubt that before long television will become a practical proposition. Electricity will then enable us both to see and hear what is happening in far distant parts of the earth.

Courtesy [*Baird International Television Ltd.*

How Television may be received in the home. The "Televisor" shown above simultaneously receives vision and music or speech. The screen on which distant scenes are reproduced is in the circle on the right

Although it is only within the last few years that television has become practicable, its foundations were laid many years ago. At the time of Bell's invention of the telephone there appeared to be no connection between light and electricity that promised to be as useful as that between sound and electricity. It was not difficult to understand how Graham Bell made use of the vibrations of a thin steel diaphragm to send currents of varying strength through the transmitting wires, but a similar connection between light and electricity that might lead to the invention of an electric eye was undreamed of.



How a photo-electric cell acts when light falls on it. A current flows through the external circuit, as a very sensitive galvanometer would show

But even before the invention of the telephone the first definite step towards making television a reality had been made. This was a discovery due to Mr. May, a telegraph operator who was stationed at Valentia, a little village in Ireland where the eastern end of the Atlantic cable comes ashore. Certain of the resistances used in the receiving apparatus were constructed of selenium, an element that is chemically related to sulphur. A peculiarity of selenium is that it exists in three forms, one of which is a grey crystalline variety obtained by allowing the melted element to cool slowly. Crystalline selenium offers great resistance to the passage of electricity, and it was this form that was used in the telegraphic receiving instruments installed at Valentia.

One sunny day Mr. May observed that on several occasions the needle of his indicator moved without any apparent cause. After considering the matter for some time he came to the conclusion that the sunlight falling upon his apparatus was responsible for this, and by covering up various parts in turn he eventually traced the trouble to the selenium resistances. When the sunlight fell upon them they allowed a larger current to pass, and this caused the needle of the telegraph instrument to move.

This accidental discovery aroused great interest. Until that time it had always been thought that the electrical resistance of a metal or other substance was fixed, and it was a great surprise to find that a substance existed that sometimes was practically a non-conductor, and at other times allowed large currents to pass through it. Further experiments were eagerly made, and it was soon found that in the dark the resistance of a strip of selenium is from two to five times as great as when it is illuminated by a strong beam of light.

Many attempts have been made to make use of the discovery. Nearly fifty years ago one scientist included a strip of selenium in a circuit containing an electric bell. In the dark, the resistance of the strip was too great to allow the passage of sufficient current to ring the bell, but this could be brought about by flashing an intense beam of light on the selenium.

Other efforts to put this remarkable property of selenium to practical use were made, but unfortunately difficulties arose. The most important of these was that selenium is very slow in responding to impulses of light. It was found that its action could only be speeded up by using very thin films, and great ingenuity has been exercised in devising sensitive forms of selenium resistances, or selenium cells, as they came to be called. In one form now largely used two platinum wires are wrapped in a double coil round a block of steatite in such a manner that they do not touch each other, but remain a fraction of a millimetre apart. The space between them is then filled with selenium, and this is changed to the grey crystalline form by annealing at 200°C.

Another type of selenium cell is made by burning a deposit of platinum into a glass plate and dividing it into two portions by scratching a zig-zag line across it. The selenium is then deposited on the plate and occupies the space across which an electric current between the two platinum surfaces must flow.

Cells of this kind will transmit fairly large currents, and in conjunction with relays have found many interesting uses. In certain parts of London selenium cells are used for turning on gas lamps. When the intensity of the daylight falls below a certain standard, the change in the resistance of a selenium cell is made to operate an electro-magnet that turns on the gas, which of course is ignited by a pilot light.

Among other applications of the selenium cell may be mentioned its use in the provision of a burglar alarm, or a device for detecting smoke in the holds of ships before any ordinary temperature indicator would give notice of an outbreak of fire. In these cases a beam of light is continually directed upon a selenium cell and the interruption of this, in the one case by the passage of an unwanted intruder, and in the other by the growing density of smoke, brings an electrical device into action to give warning. More recent uses are in automatically stopping trains when signals are against them, in telegraphing pictures, and in television. It is with its use for the last-named purpose that we are chiefly concerned.

A selenium cell is not a very great success as an electric eye owing to its slowness of action, but fortunately a more satisfactory connection between light and electricity has been discovered. This is based upon the fact that electrons, or negative particles of electricity, are expelled from the surface of a metal when a beam of light falls on it. Practically every metal behaves in this manner, but the effect is most pronounced in the cases of potassium and sodium, the soft metals obtained by electrolysis of caustic potash and caustic soda.

The rate at which the electrons are driven off depends on the intensity of the light used, and also upon its colour. For instance, red light has practically no effect on potassium, but a beam of violet light falling upon it causes it to throw off a stream of electrons, and the number of these expelled in a given time is increased when the beam of light is made stronger. It is interesting to note that invisible ultra-violet light is even more effective.

A stream of electrons of this kind is nothing more or less than an electric current, and in order to make use of the effect some means of controlling the current is required. For this purpose bulbs known as "photo-electric cells" are constructed. In making one of these a portion of the inner surface of a glass bulb is silvered over and on to this a thin layer of potassium is distilled. Air must be excluded during the operation, for the oxygen in it would act on the potassium. The cell is not absolutely empty however, for a proportion of an inert gas is introduced, argon being the one most commonly used. During their passage across the cell the electrons shot out from the potassium dislodge secondary electrons from the molecules of argon, and these reinforce the main stream and make the cell more effective.

As a current of electricity is to flow across a photo-electric cell, two electrodes are necessary. The layer of potassium acts as the cathode, or negative electrode, and the anode usually is a circular wire grid of nickel. During use the anode is given a high potential by connecting it to the positive terminal of a battery. The flow of electrons is increased by applying a large voltage, but if this is made too great a glow discharge appears in the tube, and the practical limit varies from 120 to 300 volts.

An area of glass is left clear, and it is through this that the light is allowed to act on the potassium, the cell usually being enclosed in a light-tight box through which the "window" only is visible. The passage through the "window" of a beam of light causes the electrons to be discharged from the surface of the potassium. As they are negative charges they are attracted to the positive electrode, and thus a stream of electrons passes across the cell—in other words, a current of electricity passes through it and along an outside wire connecting the two electrodes.

The action will be made clear if we compare it with what happens inside an ordinary wireless valve. In this the lighted filament is throwing off electrons, and these are immediately attracted to the anode, which is connected to the positive of a high tension battery. Thus a current flows through the valve in one direction only, and it is because of this that the valve may be used for rectifying and amplifying purposes.

Before we try to understand how the photo-electric cell is used in television, let us see how by means of it a single beam of light may be reproduced at a point many miles distant. Suppose we allow the beam to fall upon a photo-electric cell in London. Through the cell a current will then flow, and this may be amplified by means of wireless valves and transmitted by cable, or by wireless, to New York or almost any other point on the face of the earth. In receivers at these points small currents will then flow that vary in sympathy with those passing through the photo-electric cell in London. They will change as the intensity of the beam of light changes—being strong when an intense beam of light falls on the cell, and becoming proportionally weaker as the intensity of the beam fades.

It only remains to change this varying current back into light, which may easily be done by means of a special electric lamp containing neon under very low pressure. This glows with a brilliant red light when a current of electricity is forced through it under high voltage. Tubes of this kind have become familiar through their use in illuminated advertising signs.

A modern form of photo-electric cell. The nickel wire grid forming the anode is clearly visible, and the coating of potassium is on the inner wall of the base of the bulb which contains argon

Photograph reproduced by courtesy of the General Electric Co. Ltd.

The currents in the receivers of our light transmitting apparatus are impulses that occur at frequencies of many thousands per second. An ordinary lamp would be useless for recording their passage, but the neon glow lamp can be lighted and extinguished at the rate of more than one million times per second, and responds practically instantaneously. Thus changes in the intensity of a light illuminating a photo-electric cell in London may be faithfully reproduced at distant points by a neon lamp.

As an electric eye a photo-electric cell of this kind is more promising than a selenium cell because it responds to a beam of light almost instantaneously. The electrons shoot out from the metal at speeds that are very little short of that of light itself, and thus no time is wasted.

Unfortunately the new cell has the serious drawback that the current which passes through it is very small, that produced by an electric lamp placed a few inches from the cell being only a few hundred-thousandths of a milliampere. In this respect the selenium cell is much better, and it is claimed that one has been constructed that allows a current of an ampere to pass through the circuit containing it.

Summing up, we see that there are two electric eyes that may be used for television, and that one of them is very slow while the other gives feeble results. The slowness of the selenium cell prevents its use for this purpose, and practically all experimenters now make use of a photo-electric cell, along with apparatus for magnifying the current that it gives. This may easily be accomplished by means of the ordinary wireless valve, and the impulses passed to a wireless transmitter.

Unfortunately this is not all that is required in television, and there are many practical difficulties to be overcome. One of these is that, although the electric eye can handle a single beam of light, it is unable to take in the whole of a scene at once and can only be used for transmitting the general or average intensity of the light directed on it.

The reason for this becomes apparent when we compare it with the human eye. Behind the iris diaphragm and the lens of the latter is a screen on which the image of a scene is projected. This is called the retina, and it is composed of millions of tiny cells, each of which is directly connected to the brain by means of one of the filaments in the bundle constituting the optic nerve. The cells respond to the influence of the light focussed on them by sending impulses along the nerve filaments, but each deals only with a small portion of any scene, and the whole of a picture is built up by their combined effect.

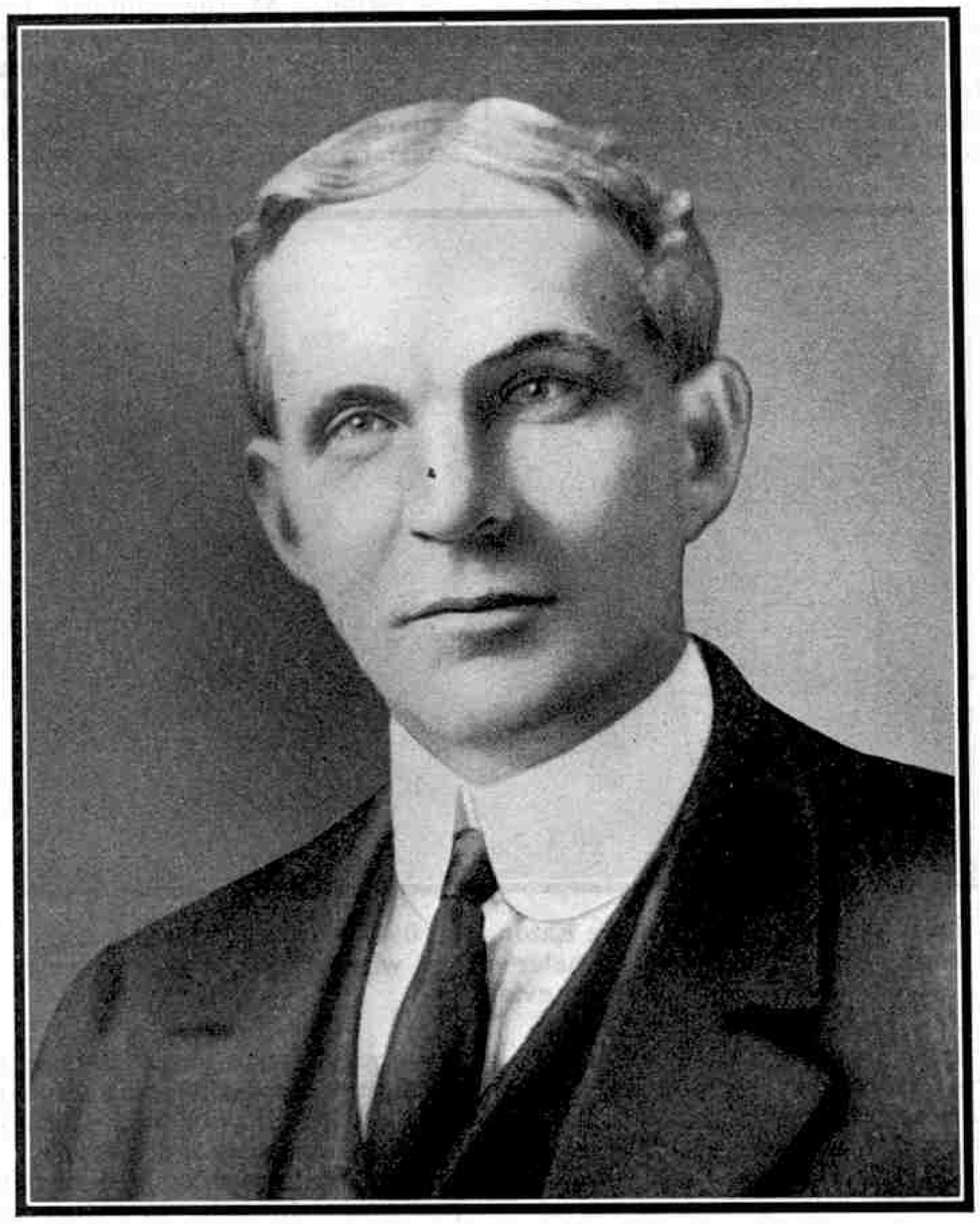
The electric eye corresponds to one of the microscopic cells of the retina, and in order to imitate the action of the human eye completely we should need millions of photo-electric cells! For each of these a wire, or wave-length, would be necessary over which the electrical impulse could be transmitted, and at the receiver a corresponding number of amplifiers and neon lamps would be required. Such apparatus no doubt could be constructed, but the cost and labour of building it would be absolutely prohibitive, for it has been calculated that, in order to produce on a receiving screen a picture that is not too coarse, no fewer than 90,000 cells would be required!

Next month we shall show how the indomitable perseverance and courage of Mr. Baird and other pioneers, have enabled them to overcome this and many other almost equally serious difficulties.

The Genius of Mr. Henry Ford

Industries Within An Industry

IT is probable that a very large number of people look upon Mr. Henry Ford merely as the designer and producer of the best-known motor-car in the world. This idea is accurate as far as it goes but it does not go anything like far enough. The fact that Mr. Ford is a motor-car designer and manufacturer might almost be regarded as an accident. He is an industrial genius, and there is not the slightest doubt that, no matter what industry he had entered upon, he would have brought about as great changes as he has done in the motor-car world.



The ramifications of the Ford business are bewildering in their variety and vastness, and wherever we turn we find evidence of the master mind. About seven years ago Mr. Ford found that a certain railway was interfering with improvements in the River Rouge plant, and therefore he bought it. This railway was "something more than a streak of rust and something less than a railway." It had been organised 21 years previously and re-organised every few years afterwards, but had never paid anybody but the bankers! To-day that railway is a paying proposition. In a few years, by applying the same principles to it as govern other Ford enterprises, a deficit has been turned into a surplus. The trains run to schedule; a minimum wage of about 24/- a day is paid; many miles of new rails have been laid down and nearly the whole track has been re-ballasted. A journey that formerly took eight or nine hours now takes 3½ hours. Mr. Ford has not poured great amounts of money into the railway; everything is being done out of earnings.

We have shown what happened when Mr. Ford went into the railway world. Something similar has happened whenever he has turned to the production of anything needed for the building of cars or tractors. The Ford Motor Company never make a thing themselves if they can buy as good an article at a lower price; but it constantly happens that the only way to get what they want is to produce it themselves.

As a result scores of "industries within an industry" have grown up around the Ford. In order to utilise waste slag from the blast furnaces, facilities for making cement were installed in 1924. During 1927 nearly 700,000 barrels of Ford Portland cement were made and much of it sold outside the Ford plant. In 1922 the company had on hand an enormous quantity of waste wood and rags. This led them into the paper industry, for this waste is made into waterproof binder board to the extent of nearly 4,000,000 lb. annually.

About half the coal from Ford mines is sold direct to the public; the other is coked, resulting in an amazing variety of by-products. In 1927, for instance, the by-products totalled 8,000,000 gallons of coal tar; 23,000,000 lb. of ammonium sulphate sold as a fertilizer; nearly 8,000,000 gallons of benzole purchased by motorists; and over 10,000,000,000 cubic feet of gas, some of which was utilised at the Fordson plant and the remainder sold to a local gas company.

Even this is only a small part of the story. The wood waste from the Ford body factories is converted into charcoal briquettes—more than 25,000,000 lb. of which were produced during 1927. During a single year the company's iron mining properties yield over 100,000 tons of ore; more than 1,000 tons of ingots are produced each day and nearly 350,000 tons of pig-iron each year. The company's vessels travel nearly 425,000 miles in a year and handle approximately 2,265,534 tons of motor and tractor parts, coal, cotton and lumber. The all-metal aeroplanes in the company's fleet, carrying Ford freight and United States mail, completed during 1927 without accident 93.5 per cent. of their scheduled trips.

From this brief summary it will be seen that Mr. Ford is associated with most of the greatest industries of the world and in all of them the record is of constantly growing success. When Mr. Ford took over his railway he did not set out to show how railways should be run, but records show that from that time income started to exceed outgo—a thing that had never happened before.

What is the explanation of this unparalleled success? It probably lies in the fact that every Ford undertaking is run on the same principle. "We have always found," says Mr. Ford, that if our principles were right the area over which they were applied did not matter." By applying the rule of the maximum service at the minimum cost the Ford undertakings go on from success to success.

The workers in the Ford plant are never satisfied with the way that things are being done; they always contend that each thing *could* be done better, and that one day it *will* be done better.

The underlying spirit of the Ford enterprise is well illustrated by an incident told by Mr. Ford in his book, "*My Life and Work.*" A machine manufacturer was called into conference on the building of a special machine. The specifications called for an output of two hundred per hour. "This is a mistake," said the manufacturer, "you mean two hundred a day—no machine can be forced to two hundred an hour." The company officer sent for the man who had designed the machine and called his attention to the specification. He said, "Yes, what about it?" "It can't be done," said the manufacturer positively, "no machine built will do that—it is out of the question."

"Out of the question!" exclaimed the engineer, "if you will come down to the main floor you will see one doing it; we built one to see if it could be done and now we want more like it." There were no more protests from the manufacturer!

Mr. Ford has now turned his attention to air travel. His all-metal aeroplanes convey the United States mails between Detroit and Chicago, and machines from his factories have already carried more than a million passengers. He believes that a light Diesel engine is the best type for aircraft, as it does not take fire so easily as the petrol engine now used, and he is now making experiments in order to find a suitable design. If successful he will be able to make a cheap and efficient aeroplane on mass production lines.

The Eaton Hall Railway

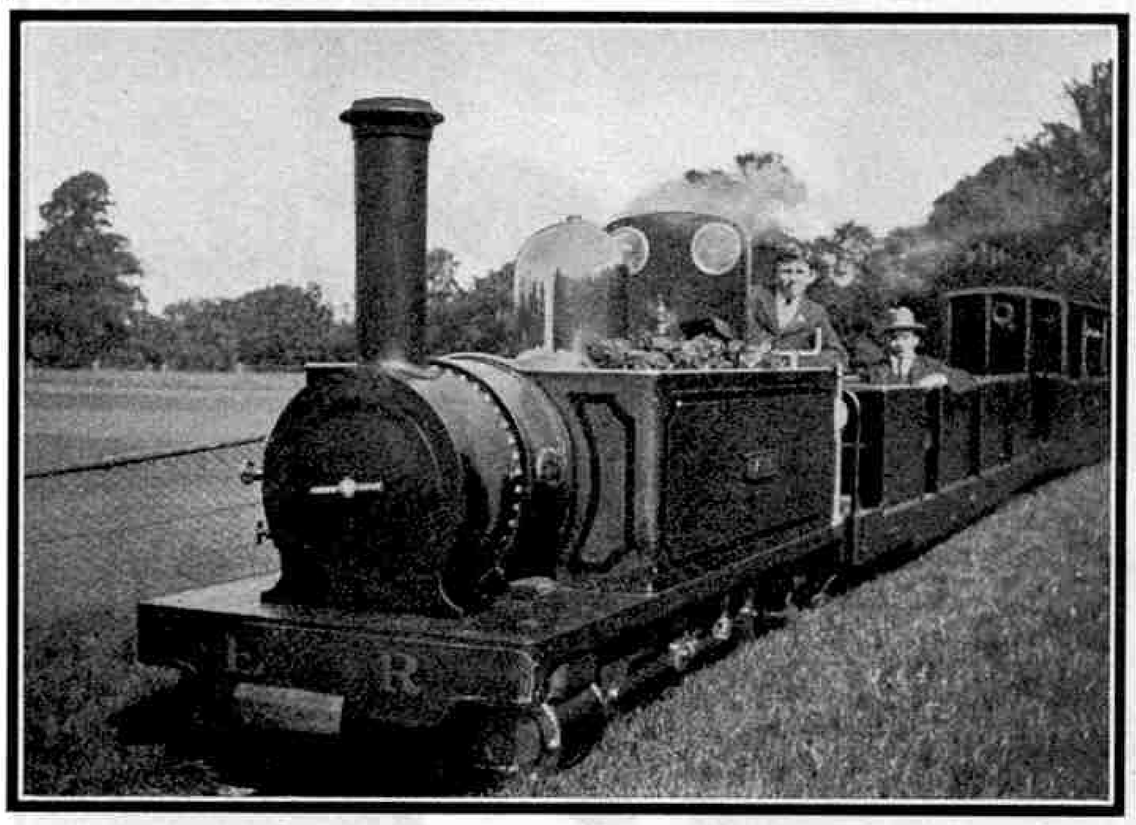
A Miniature Line That Can Earn Its Own Living

THERE is something peculiarly interesting about a miniature railway that is not a mere ornament, but is actually capable of doing hard work and earning its own living. Among such small railways is that of the Duke of Westminster at Eaton Hall, near Chester, which not only handles its fair share of traffic but does it quietly and efficiently.

The gauge of the Eaton Hall railway is 15 in., and it is interesting to note that this railway was actually the second 15 in. gauge system to be laid down in this country. The whole system, including track, rolling stock and two locomotives—only one of which is now in service—was entirely designed by Sir Arthur P. Heywood, Bart., M.A., who made a special study of railways of this gauge, having introduced the first one on his own estate at Duffield Bank, near Derby, as a hobby.

The Duffield Bank railway was a great credit to Sir Arthur Heywood's railway knowledge and skill, and it provided a satisfactory answer to his own query: "What is the smallest and cheapest railway capable of being worked practicably and advantageously from a business point of view?"

This railway was far from being a scale model system, the locomotives in particular being designed by Sir Arthur entirely with a view to making them as efficient and, at the same time, as economical as possible. Sir Arthur's opinion was that a scale model locomotive, although handsome in appearance, would be far too costly to construct and, when finished, would not fulfil the same duties as an engine of his own design with anything like the same success or economy. The track also differed from that used on actual railways in that it had a totally different kind of sleeper. It was proved by experiment that wooden sleepers at the best lasted only six years when exposed to ordinary climatic conditions at Duffield Bank, and therefore Sir Arthur devised a very interesting and useful cast-iron sleeper and chair combined.



Front view of "*Katie*," the Eaton Hall 0–6–0 two-cylinder side tank locomotive. The small diameter of the wheels, 1 ft. 4 in., is very evident

Various experiments were tried with the rolling stock in order to make it as perfect as possible, and perhaps the most noticeable innovation of all was the special automatic coupler-buffer designed by Sir Arthur. With this combination of buffer and coupler it is a simple matter for an engine to enter a siding and for the coaches to continue their straight course on the main line, or vice versa, without either engine or train stopping. In order to effect this it is only necessary for the shunter to pull over the points immediately after the engine has passed over them.

It was while exhibiting the Duffield Bank railway in 1894 that Sir Arthur had occasion to meet the agent of the Duke of Westminster. At that time the Duke was contemplating the installation of a light railway in his grounds at Eaton Park to connect Eaton Hall with the G.W.R. station at Balderton, three miles away. The Duffield Bank system impressed the Duke's agent as being a really sound economic proposition and in every respect the ideal type of railway required for Eaton Park. Sir Arthur was invited to estimate the cost of laying out in the Duke's grounds a system similar to his own and, although at first he hesitated as to whether it would be possible for him to devote sufficient time to the project, he eventually decided to undertake everything at a cost exclusive of buildings of about £6,000.

The three important requirements were that the line should be unobtrusive in appearance; should be of a thoroughly permanent character, and should be capable of handling an annual traffic of from 5,000 to 6,000 tons. The laying of the line was begun in August, 1895, and after various preliminary difficulties had been overcome the railway soon began to take a tangible form. Towards the end of December of that year Eaton Hall was reached, and such good progress was made that by May, 1896, practically all the work on the line was completed.

The method adopted in constructing this line was very interesting. At the railhead four 15 ft. lengths of light timber framing 9 in. in depth were laid down in order to hold the ballast in position. A train then backed up, consisting of eight wagon loads of ballast on top of which were four lengths of rail already keyed to the sleepers. The rails were lifted off and carried forward near to where they were to be laid, and the sides of the wagons were removed and the ballast shovelled off on each side. The wagon sides were then replaced, and the train drew away to refill. The length of framing next the railhead was then lifted forward to the end of the furthermost framing, and so in succession with the other three, thus leaving between the railhead and the freshly laid framing a space of 60 ft. with loose ballast. Four men with shovels and four with rammers then put the ballast in shape and rammed it straight and true to the level given by the engineer in charge. The next set of rails and sleepers were then lifted into place and the fish-plates fixed. The sleepers next to the joints were temporarily packed, and by that time a fresh train had arrived, and the whole process was repeated from the beginning.

In this manner, with a staff of 10 men at the railhead, a driver and a boy on the engine, six men laying ballast, three men straightening and bending rails and three fixing them in sleepers—60 ft. of track were laid in about 40 minutes, including delays for field crossings and bridges.

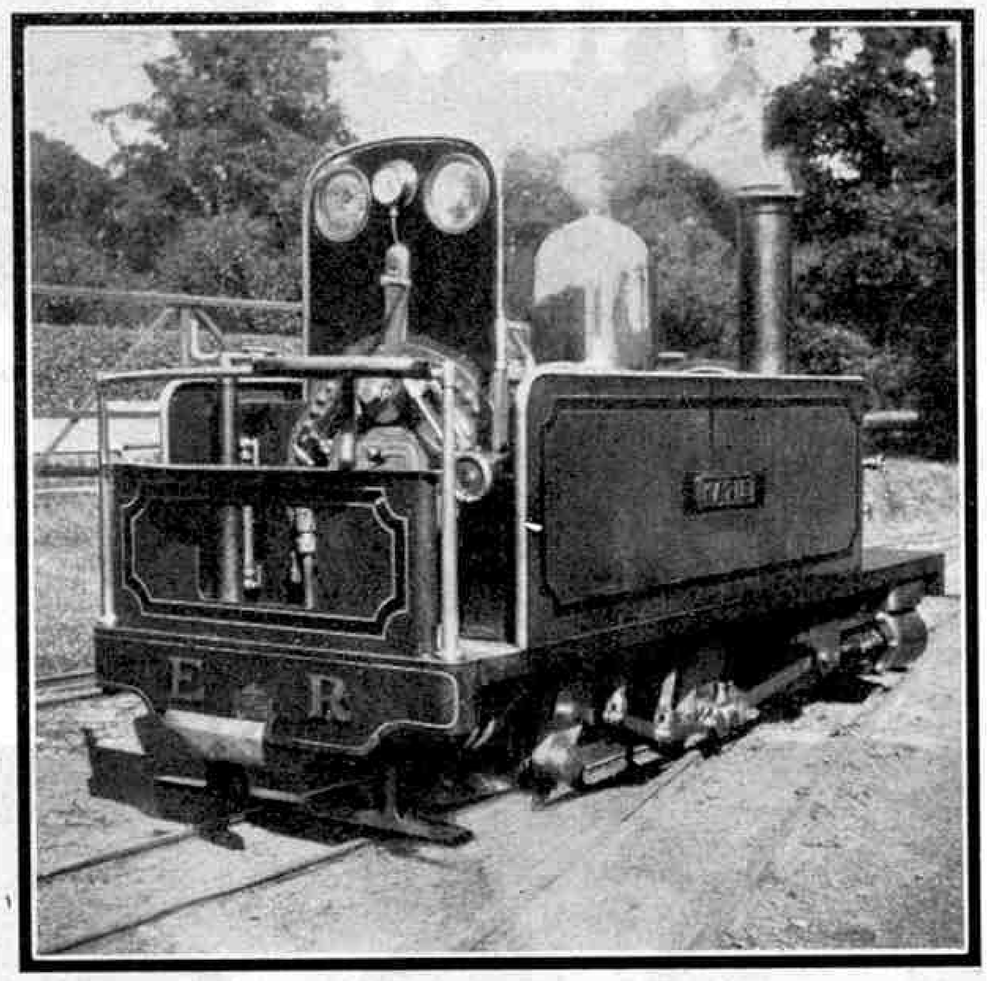
The line is laid with steel flat-bottomed rails weighing 16½ lb. per yard. In order to reduce repairs to the minimum these are carried throughout on cast-iron sleepers 3 ft. in length, 6½ in. in width, weighing 28 lb., and coated with anti-corrosive. Steel spring-keys secure the rails in jaws cast on the sleepers, which are spaced at 2 ft. 3 in. centres, and at the joints of the rails at 1 ft. 4 in. Steel girders resting on cast-iron foundation plates are used for all the bridge work, and thus no timber whatever is employed on the permanent way. The result is that depreciation is almost entirely limited to wear of the rails.

The rails for the points are riveted on to flat-topped cast-iron sleepers, and special cast-iron sleepers are employed on the girder bridges. These are of bar form, having below a cross piece that is tightened up to the sleeper by two bolts, and grips the inner flange of each girder. For crossing roads a very strong sleeper only 2 ft. in length is employed, with jaws fitted to take a second rail on each side to act as a guard rail to the running rail. These sleepers have a concrete foundation and are packed to the required level with tarred macadam. The ballast is red furnace cinders 5 in. to 6 in. in depth below the sleepers. The surface width is 4 ft. and through the park the top of the ballast is level with the turf, the appearance thus being that of a narrow garden walk. For the remainder of the route, which is entirely over grassland with a stiff clay subsoil, the ballast is above ground.

The railway is unfenced throughout and passes from field to field, on short open girders with a dyke excavated below, thus

preventing the passage of cattle. Two high roads, in addition to three drives, are crossed on the level, and several brooks are crossed by girder bridges, the longest span being 28 ft. The maximum gradient against the load is 1 in 70. The highest point of the line is 63 ft. above the lowest, and the Eaton terminus is 51 ft. above the junction with the G.W.R. The curves on the main line do not run below 300 ft. in radius, but curves of 60 ft. radius and, at certain difficult points, of even less, occur at some of the termini and on the branches.

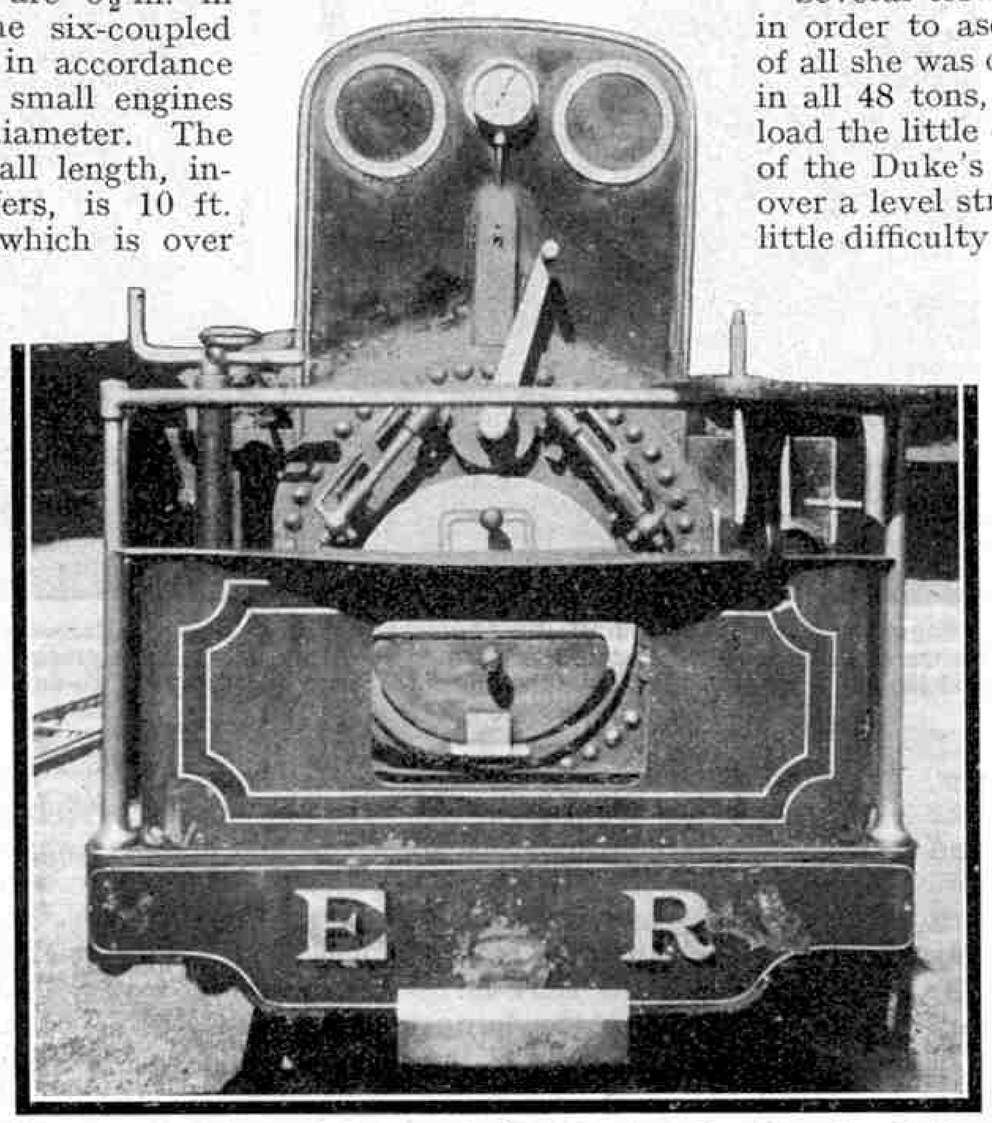
The rolling stock, which is all capable of traversing a minimum curve of 25 ft. radius, is fitted throughout with self-acting coupler-buffers of the type that proved so successful on the Duffield Bank system. Thirty wagons 6 ft. in length, 3 ft. in width, and 1 ft. 3 in. in depth, and each weighing 7½ cwt. are now in service. These wagons are each capable of holding from 16 to 17 cwt. of coal, or 20 to 22 cwt. of bricks and road metal. The sides are of box form and are removable so that the floors can be used as flat wagons for the conveyance of large stones, castings and similar material. In addition, fittings for carrying long timber are attachable to each wagon. There is also one bogie passenger coach 20 ft. in length, 3 ft. 6 in. in width and weighing 23 cwt. This coach is capable of seating 16 persons comfortably.



Rear view of "*Katie*." The absence of a cover-over cab is a noteworthy feature, and the unusual arrangement of the driving wheels may be seen

There are now in service one steam engine and one petrol engine. The petrol engine comes in very useful for jobs that require immediate attention, as it can be made ready very quickly and run straight on to the job. As regards interest, however, the steam engine takes first place. This is a two-cylinder side tank engine of the 0–6–0 type, named "*Katie*." Both cylinders are carried outside the frame, and are 5½ in. in diameter with a stroke of 8 in. The six-coupled wheels are made as small as possible in accordance with Sir Arthur Heywood's ideas for small engines of this kind, and are 1 ft. 4 in. in diameter. The wheelbase is 5 ft., and the total overall length, including the automatic coupling buffers, is 10 ft. The engine is 3 ft. 10 in. in width, which is over three times the width of the rails upon which it runs; and yet steadiness is one of the most notable qualities of this engine even at comparatively high speeds.

The boiler is pressed to 160 lb. per sq. in., and the weight of the engine in working order is 4 tons 5 cwt. The tractive effort is 2,195 lb., taking the main cylinder pressure to be 145 lb. per sq. in. "*Katie*" resembles the engines of the Duffield Bank Railway, in not being fitted with a cover-over cab. To quote Sir Arthur Heywood's words on the subject: "Cabs on such small engines are to be avoided as unbearably hot in summer, dangerous in case of emergency, and inconvenient at all times on account of their contracted dimensions. A stout mackintosh is cheaper and far better for the driver."



A close-up view of "*Katie's*" cab showing the simplicity of the control mechanism

Although she is a six-coupled locomotive, "*Katie*" has what are technically known as radiating wheels, which enable her to traverse curves that would be absolutely out of the question for a locomotive of her size with a rigid wheelbase. The arrangement of the driving wheels is very ingenious. The axles have outside bearing and cranks, and the cranks, being connected together by a coupling rod, are given no play whatever. The wheels, which are of cast steel, are not fixed upon the axles, but each pair is keyed upon a cast-iron sleeve through which the axle passes. The sleeve upon the middle axle is capable of sliding 1 in. in each direction laterally, but it cannot revolve upon its axle. Thus, when the engine negotiates a curve, the centre driving wheels are free to move laterally and apply themselves to the curvature of the line.

The leading and trailing pairs are likewise mounted on sleeves, but here the connection of the sleeve with the axle is by means of a ball joint at the centre, so constructed as to leave the sleeve free to radiate in any direction, but obliging it to revolve with the axle. The middle sleeve is connected with the leading and trailing sleeves, so that when the former makes a lateral diversion the two latter are radiated precisely to the required curve, provided, of course, that this is within the limit of travel of the middle sleeve.

This arrangement of radiating driving wheels aroused considerable interest among railway enthusiasts, but the opinion was expressed that it would not stand up to hard work. A few years later, however, some officers of the Royal Engineers were trying a similar engine to Sir Arthur Heywood's with a view to adopting the scheme on a military railway at Chatham. They subjected it to very severe tests, loading it up steep inclines to its utmost capacity, and stopping it with a steam brake when travelling at various speeds and over the most awkward places. Subsequently they gave it a 50-mile run with all the load that could be got together at an average speed of 7½ m.p.h., stops being made for water, etc., for 12 minutes in each hour. This test was followed by a continuous run with a similar load for 1 hour 35 minutes—the extreme limit to which the water in the tanks would last out. During the whole of these trials there was no over-heating of any part, nor failure of any kind.

Several tests have been carried out with "*Katie*" in order to ascertain exactly her capabilities. First of all she was coupled to a tremendous train weighing in all 48 tons, including her own weight. With this load the little engine, under the capable management of the Duke's driver, gave an excellent performance over a level stretch of track, starting apparently with little difficulty and gaining speed quite rapidly. Later, with a load of only 17 tons less, she actually succeeded in breasting a gradient of 1 in 100—a truly remarkable feat when one considers that "*Katie*," weighing 4¼ tons, was hauling well over ten times her own weight! Subsequently "*Katie*" was driven to the bottom of an incline of 1 in 50 and 18 tons were then loaded up behind her; but even this load and incline did not seem to worry her any more than the others had done. In other tests, trains of 11 tons and 4.4 tons were hauled up slopes of 1 in 25 and 1 in 12 with equal success.

The results of these searching tests show beyond doubt that "*Katie*" is fully capable of "pulling her weight" in very adverse circumstances. Her success in hauling these big loads up such formidable inclines is due to the fact that she is fitted with such small driving wheels.

It may surprise many railway enthusiasts to learn that, on good level stretches, it is nothing new for "*Katie*" to do 20 m.p.h., with ease, after a little tuning up. She does her 15 m.p.h. regularly, and her riding qualities at this speed are as smooth as those of any monster "Pacific," "Scot," or "King."

For the information in this article we are indebted to the courtesy of Major Basil Kerr, Estate Agent to the Duke of Westminster.

Up-turned Cruiser's Long Voyage

The salvage of the ex-German warships at Scapa Flow is proceeding steadily. The battle-cruiser *"Seydlitz"* arrived recently at Rosyth after an interesting voyage of some 250 miles from the Orkneys. When raised from the bottom of the sea the cruiser floated upside down, and was only prevented from sinking by the compressed air that had been pumped in. Four tugs took the ship in charge, and the passage from the Pentland Firth and round Duncansby Head was made without any mishap beyond the breaking of a tow rope.

Towing the hulk up the Firth of Forth called for a considerable amount of skill, and an Admiralty tug joined in to assist with the steering. With this additional aid the *"Seydlitz"* made the passage through the north span of the Forth Bridge at a good speed. When Rosyth was reached the air pressure inside the hull was increased in order to raise the vessel sufficiently high in the water to allow her to pass over the sill of the dry dock in which she will be broken up.

The next vessel to be moved from Scapa Flow will be the battleship *"Kaiser."* This was floated some months ago, and is now being prepared for the voyage to Rosyth. In the meantime work is being carried on in preparation for the final lifting of the battle-cruiser *"Hindenburg."*

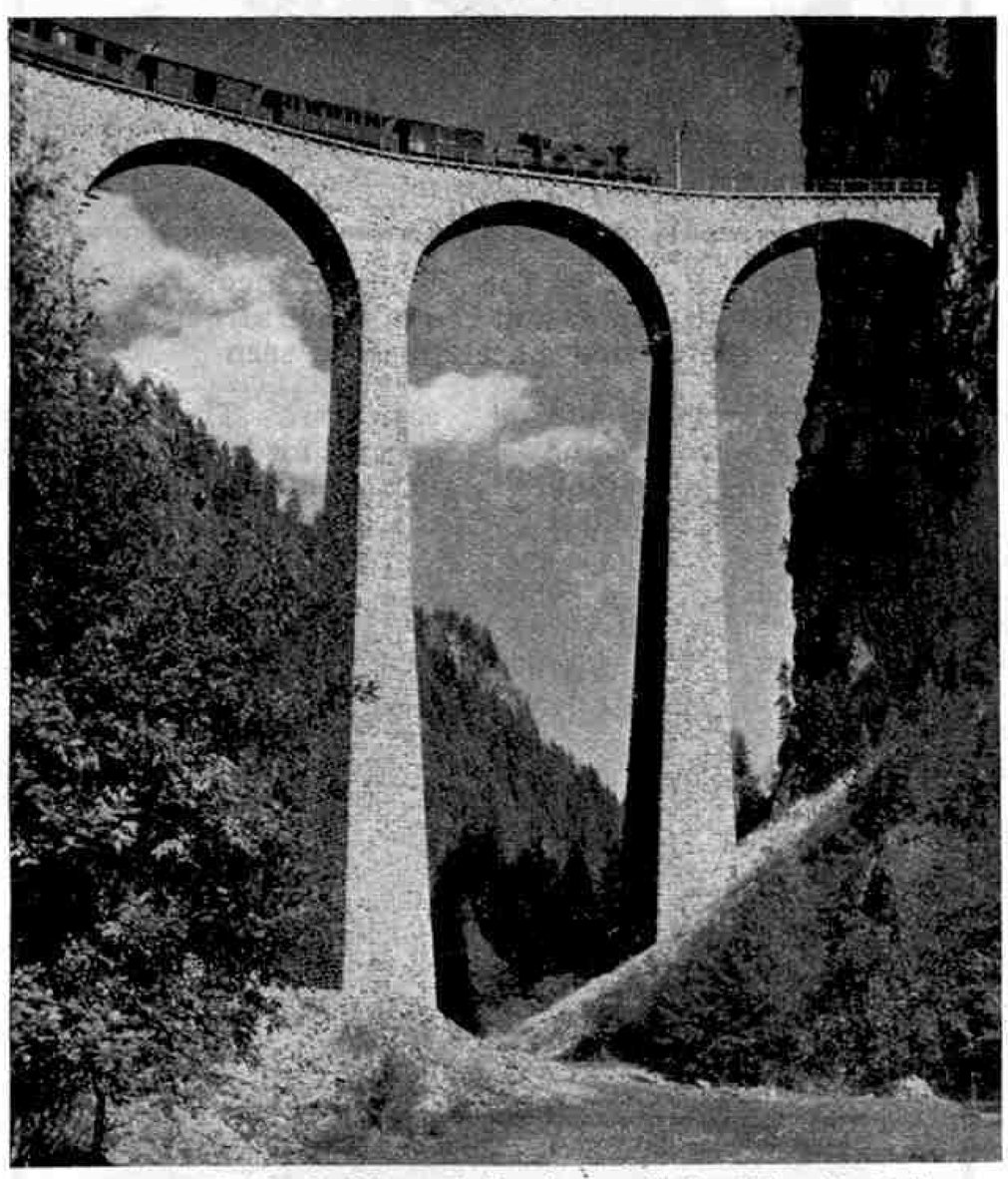
Record Tunnelling Speed

The boring of the eight-mile tunnel under the Cascade Range in the United States has been a remarkably speedy engineering achievement. The contract for the work was awarded on 25th November, 1925. Operations were commenced as early as 1st December in the same year, and the celerity with which the contractors began was paralleled by the speed with which they carried on their enormous task. Although two tunnels had to be driven for most of the eight miles, and a shaft also sunk to a depth of 622 ft. through the heart of the range, they completed the work early in January of this year, the undertaking thus occupying practically three years.

This constitutes a record time for tunnelling operations of such magnitude, and was only made possible by the liberal use of labour-saving devices, including powerful modern air-driven drills and efficient explosives, together with cordial and willing co-operation on the part of the crews.

Removing Black Deposit from Electric Lamps

One of the greatest problems encountered in the use of electric lamps is how to remove the black deposit that forms on the interior surface of the bulbs when they have been in use for some time. The deposit is most noticeable in the case of gas-filled lamps, for the upward current of hot gas readily carries with it minute particles of tungsten from the filament, and these particles are deposited on the glass. A remarkably simple method of dealing with the trouble has now been discovered, all that is necessary being to include within the lamp a small quantity of coarsely-powdered tungsten. When a lamp becomes blackened with use, it is removed from its socket and inverted, when the coarse powder sweeps off the particles that cause the blackening. It is claimed that the tungsten filament in a lamp protected from blackening in this manner may be heated to a much higher temperature than usual without injury, and thus a much more intense illumination may be secured.



A fine example of bridge-building—the Landwasser Viaduct, Rhaetian Railways, Switzerland. The right-hand arch is sprung from the face of a sheer precipice and the rail level is 213 ft. above the valley. (From "Railways of To-day." **See page 531)**

Unsuitable Cables Delay Bridge Opening

It had been hoped that the present month would witness the opening of the *"Ambassador"* Bridge over the Detroit River between Detroit, U.S.A., and Windsor, in Canada. Unfortunately it has been necessary to postpone the opening until early next year.

The reason for the delay is that the suspension cables have proved unsuitable, and are being replaced by new ones. The original specifications called for the use of cold-drawn steel wire of the type that has almost always been used for suspension bridges. Later the specifications were changed in order to allow the use of special heat-treated wire that had given excellent results under severe conditions in other places. Doubts arose as to the suitability of this wire, however, when defects were noticed in the cables of a suspension bridge in Rhode Island in which it was used. As a result of the discovery of these defects the use of the new cables on the *"Ambassador"* Bridge was discontinued, and the cables already in position are now being replaced by cold-drawn wire cable as originally intended. Fortunately the contractors are almost 13 months ahead of their construction schedule, so that the delay is not very serious.

For a time this bridge will have the longest single span in the world. It will lose this distinction when the Hudson River Bridge at New York is finished, for the latter bridge will have a span of 3,500 ft.—nearly twice that of the *"Ambassador"* Bridge.

Interesting Wireless Extensions

The manner in which the advantages of wireless communication are being extended to remote parts of the earth is well illustrated by the news that a radio-telephone service between Germany and Siam was commenced on 26th April last. This is carried out on a wavelength of 16.9 metres, this being very suitable for communication over the distance of about 5,300 miles between Siam and Nauen.

Even Abyssinia is taking steps towards the construction of wireless stations. The Government of that country have asked for tenders for the erection of a transmitting station with a power of 20 to 25 k.W., to work on wavelengths between 10 and 50 metres, and to be capable of maintaining permanent communication with Europe. In addition, it is intended to construct five stations of smaller power.

Electricity in Canaan

The ancient and historic land of Canaan is about to become electrified, the plant that is to supply its inhabitants with current deriving its power from the waters of the Sea of Galilee and the River Jordan. About five miles below the Sea, or the Lake of Tiberias, as it is more usually called, the Jordan receives from the east a tributary called the Yarmuk, which is a turbulent stream that falls 800 ft. in a distance of a few miles. This it does in a series of waterfalls, the last of which is 27 ft. in height; and it is this fall that is the source of the power required for the scheme to electrify Palestine.

A dam 28 ft. in height is being constructed across the Yarmuk in order to form a large lake that will have a surface area of 255 acres. A similar dam is being constructed across the Jordan itself, and a canal is being constructed to connect the stream above it with the new lake on the Yarmuk. Thus the turbines in the powerhouse now being erected below the Yarmuk dam will make use of the whole of the water in the two rivers, and the Sea of Galilee a few miles further up the Jordan River will act as a reservoir to supply water during the dry season. A reserve of this kind is very important, for in Galilee no rain falls in the summer.

Between 500 and 600 men are employed in the work, which was started in July last year and is expected to be completed early in 1930. In the meantime the inhabitants of the country are being introduced to the advantages of electric light and power through the medium of temporary stations at Haifa, Jaffa and Tiberias, the last-named being a small town on the shores of the Sea of Galilee. At these points Diesel engine plants have been installed to generate current at 6,000 volts, except at Tiberias, where the voltage is only 400. Overhead lines are used for distribution, and in Tiberias these are a very striking and unexpected feature of the oriental landscape.

When the station on the Yarmuk has been completed it will generate current at 6,000 volts. This will be stepped up to 66,000 volts at an outdoor sub-station before being distributed to all parts of Palestine, with the exception of Jerusalem. No difficulty will arise if the demand for power exceeds the capacity of the station at present under construction, for a second station can be built to utilize differences in level further up the two rivers.

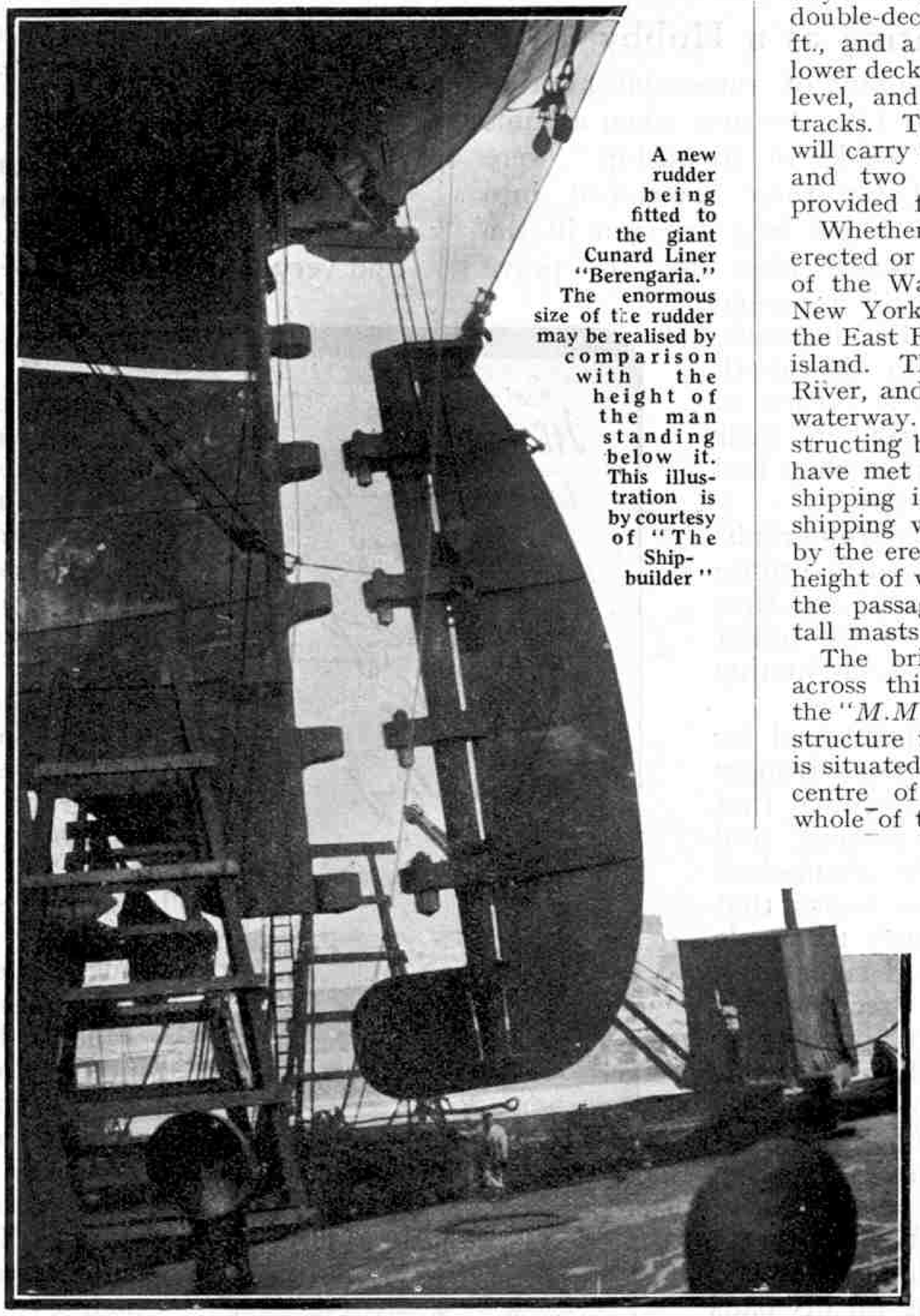
Icelandic Cables

It will probably come as a surprise to many readers to learn that 1,892 miles of overhead telegraph and telephone cables were in operation in Iceland at the end of 1927, in addition to 80 miles of underground and submarine cable.

Road Through Unclimbed Mountain

One of the most spectacular engineering feats of recent years is now being carried out in the mountainous country in the south of Utah, U.S.A. This is the construction of a new motor road 24 miles in length to connect several of the splendid National Parks that are such prominent features of the western portion of the United States. The cost of the undertaking is expected to be close upon £500,000. The most interesting portion of this road is an electrically illuminated tunnel driven through a mountain that had never been climbed. At carefully selected points along this tunnel, which is more than a mile in length, galleries have been cut in the precipitous face of the mountain in order that motorists may look out on the wonderful scenery of the surrounding Zion National Park.

The construction of this tunnel presented many fresh engineering problems, particularly during the preliminary survey. The proposed entrances were high up on the cliff-like sides of the mountain, and were entirely inaccessible. It was impossible to survey the road by climbing the mountain, and eventually it was mapped out by observations made from a distance, surveyors planning the road without going near its intended position.



A new rudder being fitted to the giant Cunard Liner "Berengaria." The enormous size of the rudder may be realised by comparison with the height of the man standing below it. This illustration is by courtesy of "The Shipbuilder"

Another Hudson River Bridge Proposed

New York has been described as a city of great bridges on account of the succession of wonderful structures that have been erected in order to give access to the mainland from Manhattan Island, on which the city is built. It will deserve this name still more if the Baltimore and Ohio Railroad are allowed to construct the bridge that they propose to build across the Hudson River at a point very little removed from the business centre of the city. The suggested bridge is to be a double-decker with a total length of 7,210 ft., and a central span of 3,240 ft. The lower deck will be 175 ft. above high water level, and will accommodate 12 railway tracks. The roadways on the upper deck will carry 20 lines of vehicles of all kinds, and two moving platforms are to be provided for the use of suburban traffic.

Whether this gigantic bridge will be erected or not depends upon the engineers of the War Department. Until recently New York bridges have been confined to the East River on the opposite side of the island. This is narrower than the Hudson River, and is not of such importance as a waterway. All suggestions for constructing bridges across the Hudson River have met with strenuous opposition from shipping interests, as it was feared that shipping would be interfered with, either by the erection of piers, or by bridges the height of which was not sufficient to allow the passage of ocean liners with their tall masts.

The bridge at present being erected across this river was fully described in the "*M.M.*" for May 1928. It is a gigantic structure with a span of 3,500 ft., but it is situated too far away from the business centre of New York, practically the whole of the course of the Hudson River past the city being left unbridged. The projected bridge of the Baltimore and Ohio Railroad will be built much farther down the river, and the decision of the War Department is awaited with great interest.

The proposed bridge is estimated to cost the enormous sum of £36,000,000, but the additional facilities it will provide for both rail and road transport between New York and the west are expected to compensate for the outlay. The chief object of the Baltimore and Ohio Railroad is to secure direct access for their trains to New York City, and thus to avoid the troublesome motor and ferryboat journey to their terminus in Jersey City. At present only the Pennsylvania Railroad enters New York from the west, and further use of its tunnels has been denied to the rival company.

Road Making in U.S.A.

The official publications of the United States Department of Mines state that American quarries produced 95 million short tons (2,000 lb.) of crushed rock during 1927. With this tremendous quantity of material a road 20 ft. in width and 1 ft. in thickness could be made from the most northerly point of North America down to the South Pole, a distance of nearly 12,000 miles. Two years' output would almost suffice to build a similar highway round the Earth!

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.

Autograph Hunting as a Hobby

The beginning of the hobby of autograph hunting may be traced back to the 14th century, when albums that were described as "books of friendship" were common in Germany. Later these developed into visitors' books, several of which may be seen in the British Museum. These books were used to prove that a visit had been paid to some well-known personage. For instance, those who visited Queen Elizabeth would be expected on their return to show her autograph written in their books in order to prove that they had actually conversed with her.

The collection of detached autographs is believed to have originated in France as early as the 16th century, and thus autograph hunting is one of the oldest as well as one of the most fascinating of hobbies.

Beginners will be well advised to obtain a book that is very strongly bound, for they must remember that it is intended to be permanent, and they should also provide themselves with two or three cheaper books that are suitable for sending away to people of note who have promised signatures.

Most "victims" are secured by personal effort, and when approaching them it is advisable to have ready a fountain pen with a good nib and to present them with the book open at the place where the signature is required. Judgment also must be exercised in deciding when to make the approach. For instance, a cricketer should be asked to sign when he is putting on his pads or is waiting to proceed to the wickets. It would be fatal to try to stop him when he is obviously in a hurry—or when he is returning to the pavilion after scoring a duck!

The signatures of the Australian Touring Team of 1927. A page from the autograph album of a reader, G. C. L. Alexander, Neath

I obtained the signatures of the members of the Australian Touring Team of 1926 by the very simple device of sending a spare book to Mr. H. L. Collins, the former captain of the team, who accompanied them during their tour in England. I despatched the book to his London address, and he not only signed it himself, but also obtained the signatures of all the members of the team with the exception of Mr. C. V. Grimmett. It is not often that a chance shot secures such a wonderful bag of victims as that illustrated on this page!

In order to succeed in obtaining a representative collection of signatures, the autograph hunter must have a good knowledge of the celebrities in various walks of life and must keep a sharp eye on stations, hotels, sports clubs, theatres, golf links and other places where they may be seen. He must also display great pertinacity and unfailing tact, and his reward will be a splendid variety of autographs. At times rebuffs are to be expected, but my own personal experience is that people usually show themslves to be extremely kind and very patient. G. C. L. ALEXANDER (Neath).

Hippopotamus Visits Durban

Hubert is a hippopotamus who suddenly decided to leave home in order to make a tour of the country around Durban, Natal. He made himself quite at ease among the sugar canes, and developed a wonderful liking for them. Presently, continuing his tour, he proceeded inland to a village called Pinetown. He does not seem to have been at all happy there. He was seriously disturbed by the well-meant but over-persistent efforts of various people to photograph him, and he developed a condition of nervous irritability that made him liable to charge human beings at sight. It was evident that he did not like cameras; perhaps he thought they were unpleasant weapons of some kind.

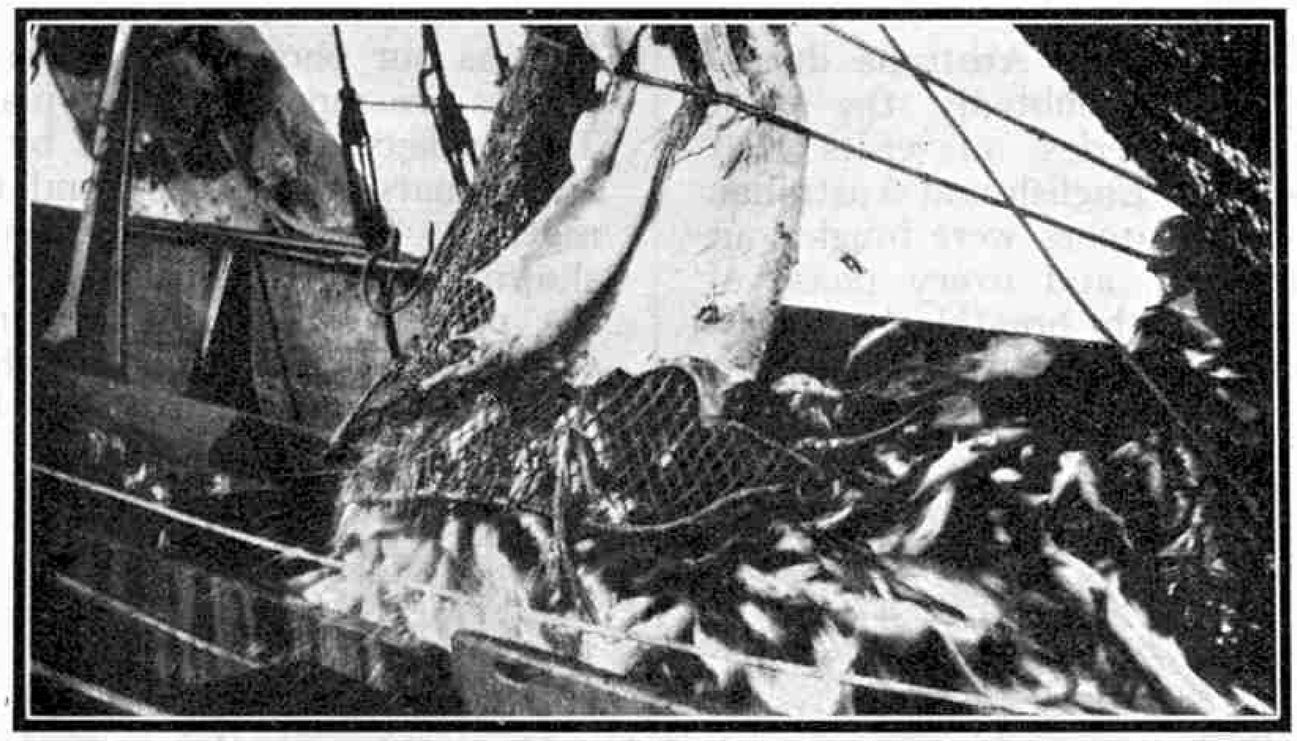
Finally Hubert turned his back on Pinetown and settled down in a river about a mile from my home in the outskirts of Durban. Every evening at dusk he was to be seen at one particular place, and once I had the great pleasure of catching him in the act of indulging in three enormous yawns, which gave me a very impressive view of his formidable teeth!

Hubert visited Durban itself on one occasion, but with great judgment he chose a very quiet time. It was two o'clock in the morning when he was seen in Durban's busiest street. The shops and bright lights possessed no attractions for him, however, and he did not stay long in town. As he retraced his steps to his river home he passed within a few hundred yards of the place where I live.

Now we are all wondering what will happen to him. Suggestions have been made that he should be shot, but most people are strongly opposed to this. In the meantime he is conducting himself in a peaceful and thoroughly gentlemanly manner in the residence he has chosen for himself a few miles out of town. He seems to become annoyed only when he is thoughtlessly disturbed. G. W. STEWART (Durban).

To Iceland on a Trawler

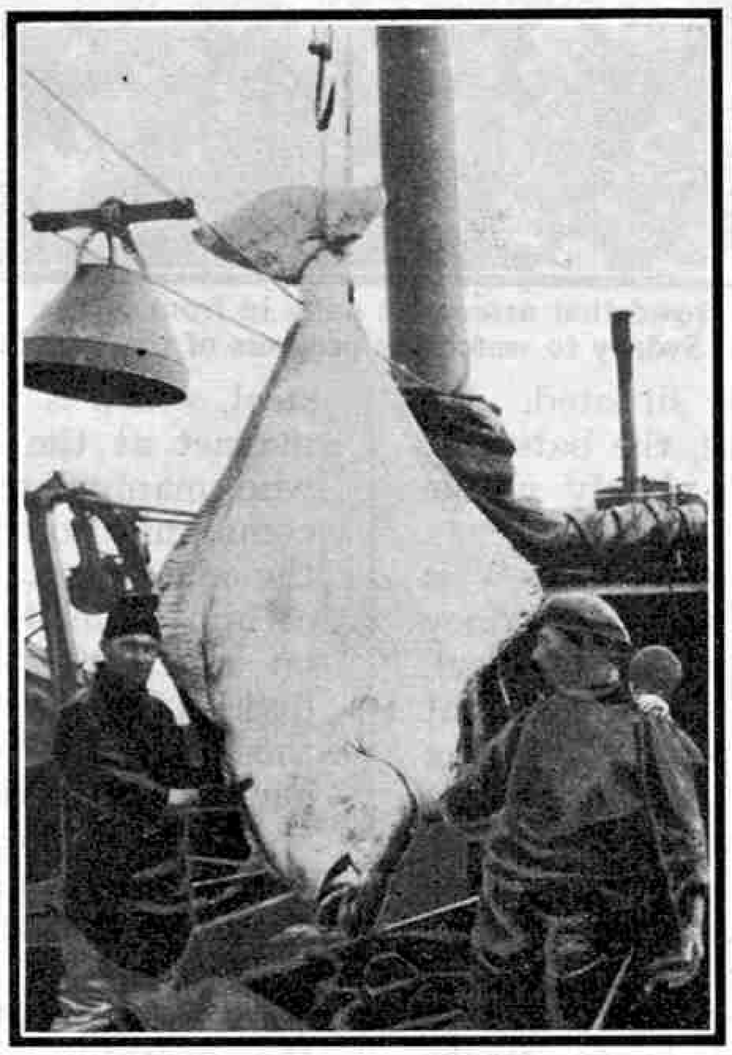
When I was given the opportunity of making a trip to Iceland on a steam trawler I seized the chance without hesitation, for often I had watched other fishing vessels leaving Hull, and had longed to be on board. The vessel on which I sailed was the steam trawler *"Lord Gainford,"* and we left Hull in the morning of a beautiful day in July. On reaching mid-stream the ship's compass was tested and its deviations from truth were marked for the skipper's future guidance, after which we steamed away down the Humber. Soon Spurn Point was passed, and we turned north, losing sight of land until next day, when the sea wall of Peterhead came into view. This little town in Aberdeenshire is the site of a prison and the wall was built by the convicts.



Releasing the catch! The end of a trawl net is secured by a knot that is loosened by pulling a rope

From Peterhead our route took us through the bleak Orkneys and in a direct line for the rocky Faroe Islands. Shortly before reaching the latter we caught sight of a small Norwegian whaler that was in pursuit of a whale. The vessel was being directed by the look-out man in the crow's-nest and the gunner was ready at the harpoon-gun, but to our regret we left the whaler far astern before it had approached near enough to its quarry to fire a shot.

At length we reached the spot where the skipper thought he should commence fishing operations. When the lead showed a depth of 100 fathoms, everybody on board became very busy. The trawl net was hoisted up with the aid of a steam winch and put out over the starboard side of the vessel. Very soon the long line of bobbins marking the end of the net was rolling over the bed of the sea, and fish of all kinds were being gathered into the wide open mouth. These were swept by the movement of the trawler into the narrow end, or the cod-end, as the fishermen call it, of the net, in which is a trap-door to prevent the fish from finding their way out.



A monster from Iceland waters

Three hours later the trawl was hoisted on board, the cod-end containing the catch being the last to come into view. When it was opened a wonderful collection of sea-life shot out on to the deck of the trawler. This included cod and halibut, in addition to dog-fish, cat-fish and other strange creatures that are unfamiliar to landsmen such as myself. I was particularly interested in the cat-fish, which is remarkable for its powerful teeth that enable it to crack shell fish, and also in specimens of the fat giant gold-fish that fishermen nick-name *"soldiers."* Their real name is *"bergylt"* and one part of the west coast of Iceland is known as the *"Hindenburg Line"* because of the abundance of these quaintly-named fish in the surrounding waters.

After four days' fishing it came on to blow very hard, and the trawler put into the North Fiord of Iceland for shelter. There the water was perfectly calm and it was interesting to watch the people in a tiny village at the foot of the mountains surrounding the fiord. The women were busy spreading cod-fish to dry while the men who had caught it were overhauling their gear. When the storm abated we went out in order to resume fishing until at last the skipper was satisfied with the quantity of fish he had caught. The decks were then cleaned and put in order, and the nose of the vessel was pointed southward for the long run of about 1,000 miles to the Humber. H. L. YEOMAN (Hull).

Seven Years in Canada

During a stay of seven years in Canada my home was in London, Ontario. This city is not as large as the capital of England but resembles it in being built on the banks of a river called the Thames, the Indian name of which means *"River of the Forked Antler."*

It was on the Canadian Thames that I learned to paddle a canoe, in which I made many trips up the creeks that flow into the river. On one occasion I and a friend had an exciting adventure on a raft. We launched our rude vessel on the river itself, but before we could get it under control it was carried away by the swift current into the rapids lower down the stream. In shooting these our raft capsized, leaving us to make our way ashore as best we could.

There are still a number of Indians left in this part of Ontario, although they are now civilised. At Brantford on the Grand River is a large reservation, on which live no fewer than 5,000 Iroquois, remnants of a great tribe that once ruled the country between the Atlantic Ocean and the Mississippi River. When they retreated before the advance of the white men they were led into Canada by a great war chief called Joseph Brant. Their descendants still keep up many of the ancient customs, and visitors to the reserve may have the good fortune to see them performing their war dances, or holding a "pow-wow." H. INGRAM (Manchester).

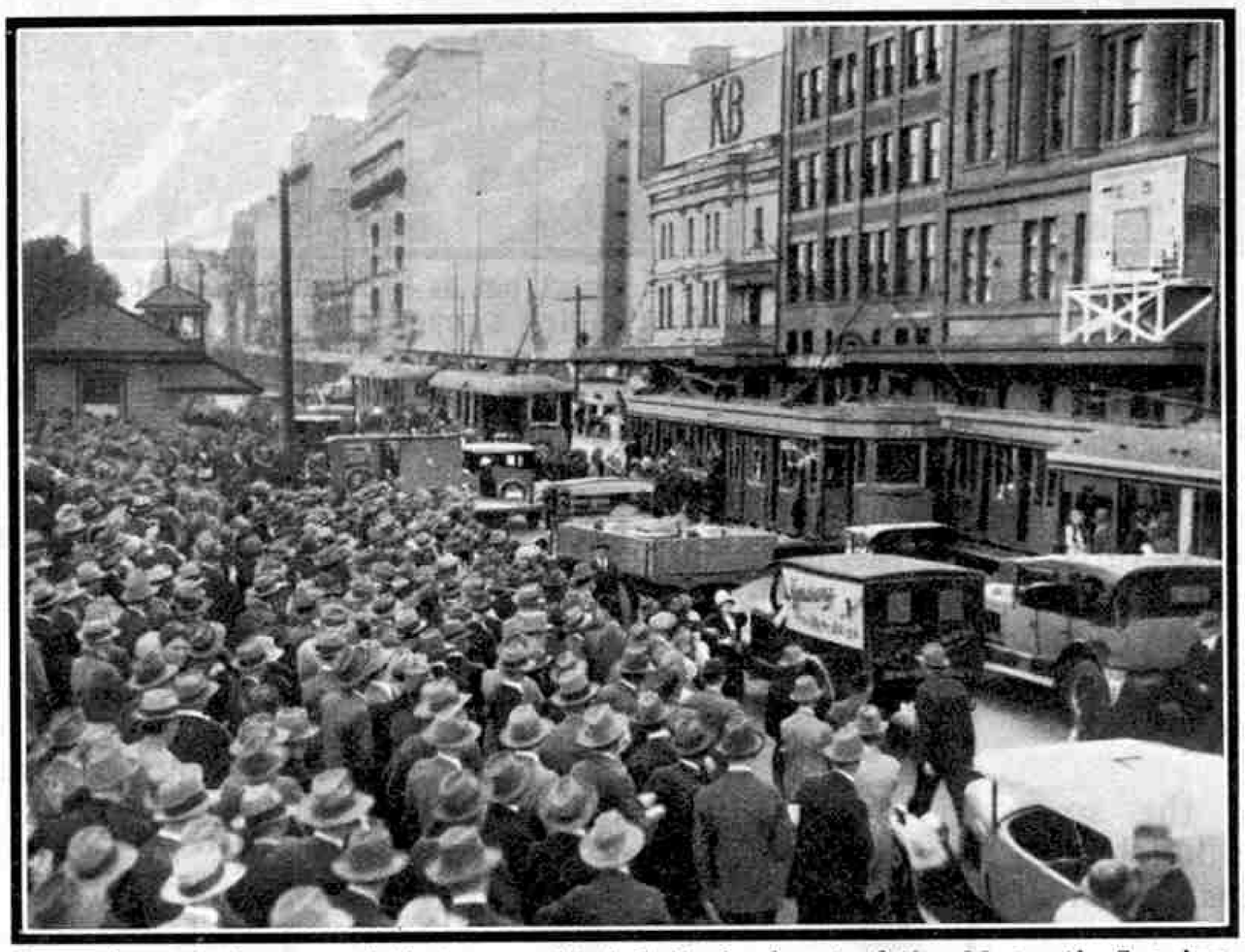
Watching a Cricket Match 1,000 Miles Away

A Wonderful Magnetic Scoring Board

By Roy W. Stanhope

THE tour of the M.C.C. team in Australia during the past winter was undoubtedly the most remarkable of the long series of visits that have been interchanged between English and Australian cricket teams. The five Test Matches were fought out with the utmost determination, and every phase of these contests was followed with breathless interest by cricket enthusiasts throughout the world.

The Test Matches were played on four different grounds, hundreds of miles apart, and the great majority of Australians could follow them only by means of newspapers and telegraphic reports. The people of Sydney were more fortunate, however, for they were able to follow the progress of the games by watching a reproduction of the actual movements of the ball and the principal players on a wonderful magnetic scoring board. This was designed by a member of the staff of "*The Evening News*," a well-known Sydney newspaper, and it was fixed in front of the upper storeys of the building in which the office of this newspaper is situated. On it were shown the movements of the ball, the batsmen, and the bowlers, and every detail was plainly visible at a distance of 150 yards.



A portion of the crowd that assembled daily in front of the Magnetic Scoring Board in Sydney to watch the progress of the Test Matches

Although the office of "*The Evening News*" is situated in Elizabeth Street, one of the busiest of Sydney thoroughfares, the position of the board was ideal, for opposite is Hyde Park, a splendid open space that easily can accommodate thousands of people. During the Test Matches the Park became a popular lunch-time resort, and both then and between the hours of 5.0 and 6.0 p.m. the onlookers usually numbered about 20,000. The largest crowd assembled when Woodfull and Hendry were making their famous stand during the second Test Match, and on that occasion nearly 40,000 people keenly followed every stroke made by the two batsmen.

The photograph of the scoring board reproduced on the next page shows that it gives the total score, the scores of the individual batsmen, and also the records of the bowlers. In this respect it does not differ from any ordinary scoring board, but in the centre is a green-painted sheet of zinc that was used to show to onlookers exactly how play proceeded in the actual Test Matches. This sheet is 6 ft. square and, as our photograph shows, the boundary and the creases are represented by plainly-marked white lines. The wickets are indicated by uprights of the size of an ordinary lead pencil, and they are surmounted by movable bails. The positions of the batsmen are shown by two discs about 3 in. in diameter. These are painted white and red respectively in order to enable onlookers to distinguish between the men they represent, and the running between the wickets is indicated by moving them in slots.

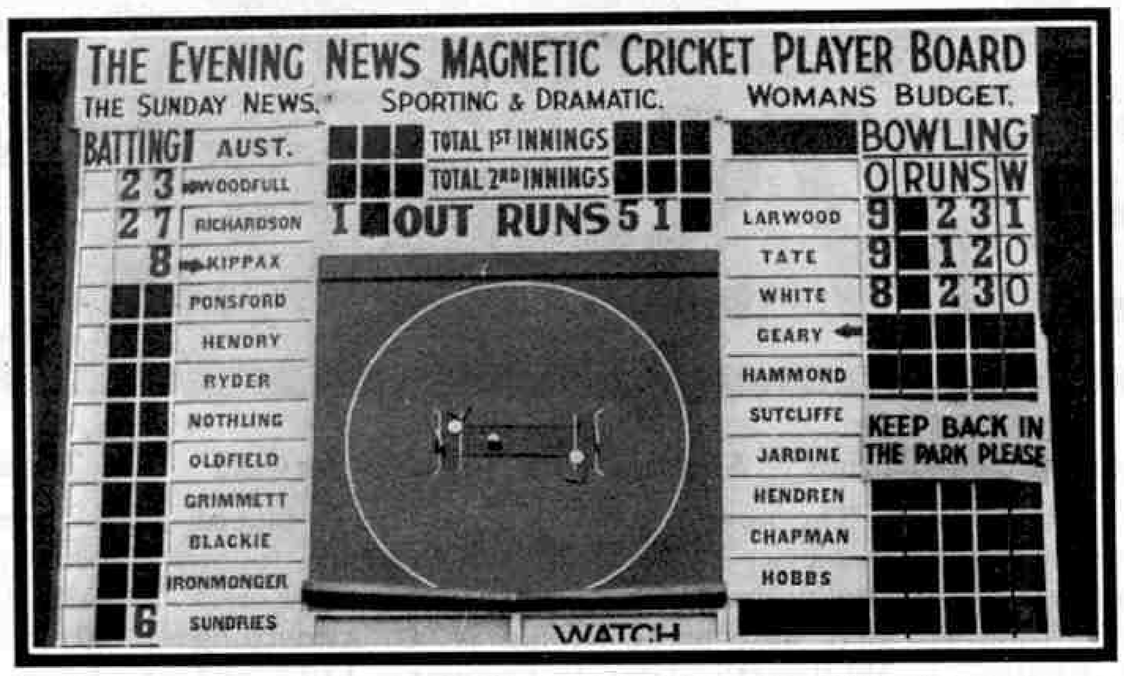
At the moment when our photograph of the board was taken the batsmen were Woodfull and Kippax, and this is shown by the arrow heads opposite their names in the list of the Australian eleven that appears on the left side of the board. One arrow is painted red and the other white to correspond with the discs on the central portion of the board.

The chief interest of the board lies in the method adopted to reproduce the movements of the cricket ball. This is represented by a hollow sphere of chrome steel, which is kept in position by means of an electro-magnet at the back of the zinc sheet. The operator who manipulates the magnet is in direct telephonic communication with an observer at the ground where the match is taking place. The observer has in front of him a small-scale reproduction of the scoring board on which the area representing the field of play is divided into twelve numbered sectors; and he describes the motion of the ball by reference to these. The back of the scoring board at Sydney is similarly marked, and thus the operator is able to move his electro-magnet, and with it the steel ball, in accordance with the movements of the actual cricket ball used.

This will be made clear if we follow an imaginary conversation between the observer at the match and the operator standing behind the board. As play commences the observer informs the operator at which ends the batsmen are, and also tells him who is to commence the bowling. An arrow opposite his name indicates that Geary was bowling when our photograph of the board was taken, and the directions of the observer would run somewhat as follows: "Geary bowling to Kippax. Walking back a short distance. Turning. Taking his run. Ball delivered. Kippax drives down centre of No. 8. One!—two!—a boundary!"

The operator moves his electro-magnet in accordance with these directions, and thus causes the steel ball in front of the zinc plate to reproduce the movements on the field of play of the real cricket ball. At the same time assistants move the discs representing the batsmen backward and forward in the slots as the runs made are called over the telephone.

Although the "batsmen" on the board were not human figures, and the swerve or break of the ball could not be represented, the faithfulness with which the play was reproduced was almost uncanny. Every stroke could be followed by the crowd in front of the board, who watched the progress of the iron disc across the zinc circle almost at the very moment that its prototype travelled over the field on which the match was being played, even when this was in Brisbane, Melbourne, or Adelaide, hundreds of miles away.



A close up view of the Magnetic Scoring Board. This shows clearly how the details of play on grounds hundreds of miles away were reproduced almost simultaneously in Sydney

When a wicket was broken the operator removed the bail by the touch of a lever, and even the rebound of the ball from the picket fence when a boundary was scored was made plainly visible! When a batsman made a good stroke, or a bowler secured a long-wanted wicket, the applause of the people in the Park was almost simultaneous with that of the crowd at the cricket field.

There is no doubt that the magnetic scoring board provides a splendid means of following the fortunes of rival teams in matches played at a distance, and its performance will only be bettered when television reaches the stage when the transmission of open-air scenes has become a practical reality.

Mystery Photograph No. 7

Those readers who are fond of searching for outlandish ideas had a royal time over the seventh of the puzzle pictures, the subject of which was the milling on the edge of a half-crown, as seen under a low power microscope.

Waterfalls and sluice gates poured into the Editorial sanctum; the tongues of bumble bees tried to lick the covering from the secret, while sparks of electricity flashed across insulators in a desperate attempt to discover the truth. "Zip" fasteners, corroded firebars, fuse boxes, combs, caterpillar tracks, nail brushes, motor tyre treads, stripped cells of high tension batteries, pieces of corrugated paper, louvres on motor car bonnets, a row of organ pipes, and a stack of cigarettes were other ideas. For these, of course, there was some justification, only a slight stretch of imagination being necessary to see the competitors' viewpoint.

Hundreds of Meccano boys were convinced that the picture represented the teeth of a Meccano gear wheel, but only slightly more than 50 succeeded in giving the correct answer. The first of these was Frank Heslop, 84, Wentworth Road, Doncaster, to whom an autographed copy of my book "*Engineering for Boys*" has been sent.

How to Use Meccano Parts—

(*Continued from page 549*)

intended primarily for connecting Meccano Rods at various angles to each other. Typical uses of the part are shown in Figs. 4 and 6. The use of the Coupling in Fig. 11 has already been described.

There are several special types of couplings designed for specific purposes. The Strip Coupling is intended for coupling a Strip to a Rod as shown in Fig. 7. The Threaded Coupling has the longitudinal bore tapped for half its distance, so that a Screwed Rod may be inserted in one end and an ordinary Rod in the other. The object of the flat surfaces in the Octagonal Coupling is to receive Strips when it is required to bolt them to the side of the Coupling. The part will also form a kind of ratchet when it is desired to turn a Rod step by step, a spring strip being caused to press upon the flats.

The Train Coupling (part No. 121) provides means of connection between Meccano models of railway subjects and Hornby rolling stock. The Universal Coupling is intended to couple two shafts together end to end, so that they may rotate through almost any angle to each other. In all motor cars a universal joint or coupling is used to connect the main driving shaft with the propeller shaft, to enable the latter to follow the vertical vibrations of the back axle. The Meccano Chassis embodies a Universal Coupling.

The Socket Coupling is designed to couple two wheels or gears together rigidly so that they can turn as a unit upon a shaft, or alternatively remain stationary while the shaft carrying them turns in the Coupling. Fig. 1 shows a Socket Coupling used to connect a section of a Dog Clutch to a 57-teeth Gear Wheel. The slots 1 of the Coupling (Fig. 2) enable wheel bosses to be inserted without removing the set-screws, while the grub-screws 2 secure the bosses in position. The groove 3 is provided to facilitate the sliding movement of the Coupling.

The Swivel Bearing (part No. 165) is intended for coupling rods together when they are used as levers, etc. Two Swivel Bearings are illustrated in Fig. 4, which shows a linkage for converting a pull on one lever to a thrust on another.

The End Bearing (part No. 166) has functions similar to those of the Strip Coupling. In Fig. 10 it is used as the crosshead between the piston rod and connecting rod of a small reciprocating engine.

Electricity to Propel Giant Liners—

(*Continued from page 516*)

total heating surface of 55,176 sq. ft. and a total superheating surface of about 16,000 sq. ft. They are arranged three abreast in two boiler rooms and operated under forced draught with double-front furnaces equipped with Peabody burners.

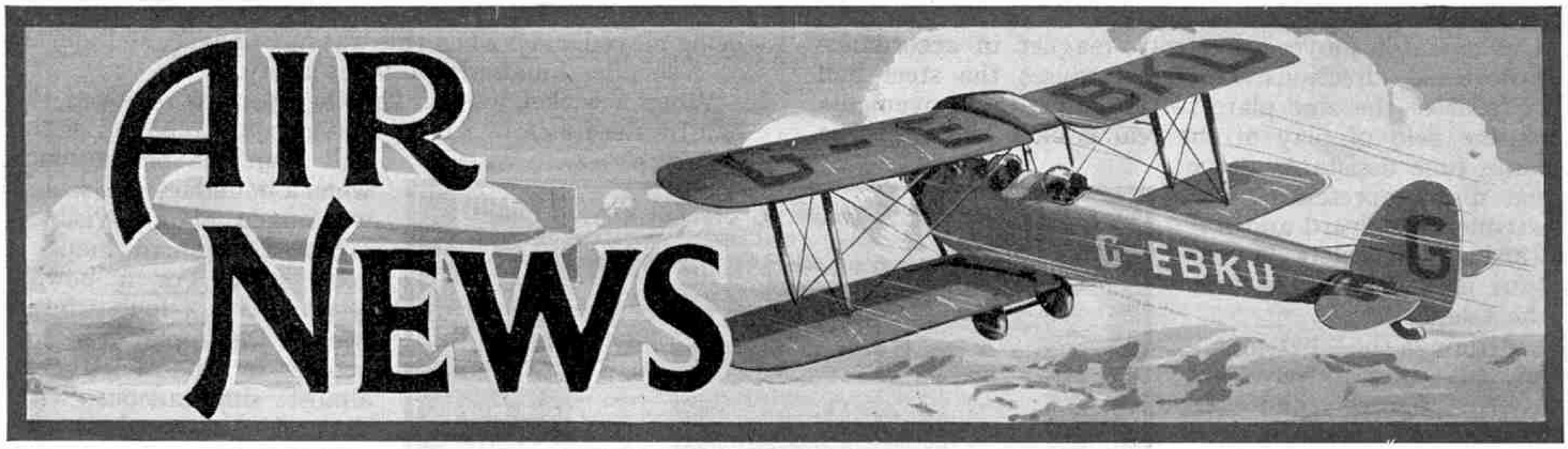
The condenser set in the "*California*" is the largest ever installed in an American-built liner, and consists of two 1,600 gall. main and two 400 gall. auxiliary condensers. Each of the main condensers contains 5,300 $\frac{3}{4}$ in. diameter brass tubes and has 11,000 sq. ft. of cooling surface, while each auxiliary condenser contains 1,644 copper tubes and has a cooling surface of 2,800 sq. ft. The four condensers have a total of $27\frac{1}{2}$ miles of tubing.

The "*California*" is a twin-screw ship and each of her huge three-bladed propellers is 18 ft. in diameter and nearly $17\frac{1}{2}$ tons in weight. They are constructed of manganese-bronze and have detachable blades; and they are carried on shafts that revolve in bearings of lignum vitae, set in heavy built-in skeleton frames. The rudder is of the balanced type and, complete with stock, weighs 45 tons. It has a larger area than is usual, to provide an extra margin of safety when the ship is passing at low speed through the Panama Canal. The rudder is controlled by hydro-electric steering gear.

The "*California's*" official trials took place off Virginia Capes, U.S.A., on 7th January last year, and during a 32-mile run the ship was tested thoroughly under various engine conditions. With both turbo-generators working she maintained easily her contract speed of 18 knots, while with one turbo-generator only, and both motors in operation, a speed of 15 knots was attained. The propeller speeds were 120 r.p.m. and 77 r.p.m. respectively.

The sister ship "*Virginia*" was launched on 18th August, 1928, and her efficient performance during her trial run in November last showed her to be equally as fine a ship as the "*California.*" Both these ships have a maximum speed of $19\frac{1}{3}$ knots and can accomplish the voyage of 5,600 miles from New York to California or vice versa in 13 days.

A third ship, to be named the "*Pennsylvania,*" is now being built on the slipway from which the "*Virginia*" was launched, and it is expected will be ready for service in November this year.



World's Speed and Height Records

During May two height records were made and submitted to the International Aeronautical Federation for examination and confirmation. Prior to that time the record was held by Lieut. C. C. Champion, U.S.N., who, on 27th July, 1927, reached a height of 38,418 ft. on a Wright "Apache" single-seater biplane. Using the same machine, Lieut. Soucek established a new height record of 39,140 ft. The aeroplane in which these feats were performed also has the distinction of having been concerned in establishing the seaplane height record of 37,995 ft., for Lieut. Champion, the holder of this record, fitted it with floats in order to make the attempt on which this height was reached.

On the 26th of the same month Lieut. Soucek's record was beaten by no less than 1,485 ft. by a German airman, Herr Neunhofer, who reached a height of 40,625 ft. in a Junkers W.33 monoplane. The engine that carried the aeroplane to this amazing height was a "Bristol" Jupiter.

The speed record for a distance of 5,000 k.m. has been raised to 117 m.p.h. This speed was achieved by Commandants Weiss and Girier, two military French airmen, who covered the distance in a Breguet XIX biplane in 26 hrs. 34 mins.

The previous speed record for a distance of 5,000 k.m. was held by Captain Ferrarin and Major del Prete, who on 1st June last year covered the distance at an average speed of 82.5 m.p.h. It will be remembered that the same airmen set up the world's long distance record of 4,453.9 miles in a flight from Rome to Natal in South America. This record is still unsurpassed.

Bull as Air Passenger

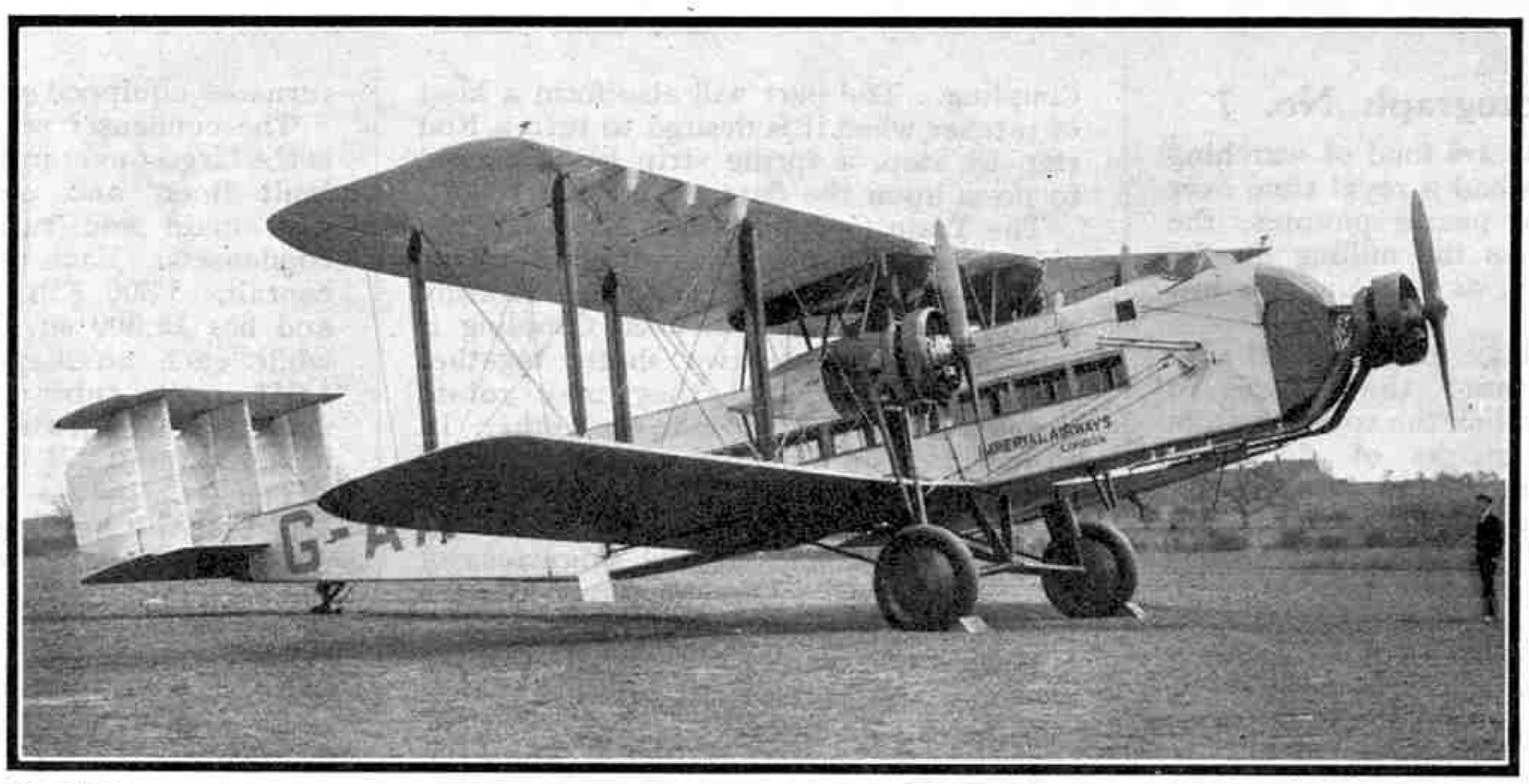
A triple-engined aeroplane has been put to a novel use in America, where a pedigree Holstein bull has been shipped from Chicago to Shulenberg in Texas. The total distance over which the animal was transported is 1,200 miles, and the plane only made four stops for feeding and watering purposes.

New "Argosies" for Imperial Airways

The new "Argosies" now being placed in service by Imperial Airways Ltd., follow the design of the "Argosy" Air Liners that were made by Sir W. G. Armstrong Whitworth Aircraft Company Ltd., and have done such splendid work on the London-Paris Airway during the past three years.

The new "Argosies" are fitted with three air-cooled geared Armstrong Siddeley "Jaguar" engines. The gearing not only increases the cruising speed, but also enables the machine to carry a greater paying load. The cabin has seats for 20 passengers and when carrying fuel for 3½ hours, wireless and full passenger equipment, the machine has a useful load of 5,000 lb.

The cruising speed of the "Argosy" is 95 m.p.h., at which speed the petrol consumption is 65 gallons an hour. The tanks have a capacity of 360 gallons, which gives an endurance of 5½ hours. The aeroplane can take off with full load in 200 yds., and will fly easily on any two engines at a height of 2,000 ft. The controls are particularly light and effective and the aeroplane has a very short run on landing. As mentioned in the note published in these pages in our March issue, the three new "Argosies" are being fitted with servo lateral control apparatus which, together with automatic slots, will make them extraordinarily safe. The three "Jaguar" engines on each machine are being equipped with Townend rings in order to diminish the wind resistance.



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

A general view of one of the Armstrong Whitworth "Argosy" air liners, showing Townend rings fitted round the "Jaguar" engines to enhance the streamlining effect

Dangerous Cargo Transported by Air

Some time ago an airship flew from Shelby in the United States to Calgary, Alberta, Canada, with a cargo of nitroglycerine. The explosive was required by a Canadian oil company, and as its carriage by rail is prohibited and the roads were blocked with snow, air transport offered the only available means of obtaining it without considerable delay. The pilot was Captain F. R. McCall, and he made two trips, carrying 100 quarts of nitroglycerine on each.

This dangerous explosive is usually transported on motor lorries that are fitted with special springs and cradles in which the containers are carried in order to avoid unnecessary shocks. Such lorries are familiarly known as "death waggons," and the life of a driver of one of them is adventurous, for instances have been known in which a lorry has disappeared completely! It also is somewhat lonely, for other users of the road take care to keep as far away as possible. It is reported that no difficulty was experienced in controlling the crowds that came to see Captain McCall's departure from Shelby and his landing at Calgary, for everybody remained at a very respectful distance!

Increasing Popularity of the Light Aeroplane

The wonderful growth of the Light Aeroplane Clubs of Great Britain is illustrated by the great increase in membership, which has risen from 780 at the end of 1925 to 3,288 for the corresponding period in 1928. Altogether there are now 13 subsidised clubs, and between them they have 420 trained pilots, a number that may be expected to show an increase very shortly.

Five similar clubs are in active operation, although they have not received any Government subsidy. Great interest in light aeroplanes is also being shown in the Dominions, the number of clubs in Canada being 25, in Australia six, and in South Africa five, while there are also six in India.

World's Longest Air Mail Route

A contract awarded to a United States firm for operating an airway down the west coast of South America completes the longest airway in the world. The contract in question is for the carriage of mails from Cristobal in Panama to Santiago in Chile. This connects up with the recently opened route between Miami in Florida and Panama, giving an air mail line with a total length of no less than 4,300 miles, to which must be added the length of the routes between Miami and Canada. With the inauguration of the new service the time required to send a letter from New York to Chile will be reduced from three weeks to seven days.

The establishment of this air line draws attention to the remarkable aviation developments now proceeding in South America. This country is yet only partially developed, and aeroplanes and seaplanes are being found invaluable in covering vast distances across wild and inaccessible regions, and along the east coast. Air lines already established on the east coast connect Natal and Pernambuco, the points nearest Africa to which a proposed Trans-Atlantic service will run, with Rio de Janeiro and Buenos Aires, and a route across the Andes to extend this service to the west coast has already been surveyed.

Some idea of the value of aeroplanes in South America may be gained by a comparison of the air and ground routes from Cochabamba to Santa Cruz, two places of importance in Bolivia. The distance between them is only 300 miles, but the trip by mule, the most convenient mode of ground travelling, occupies three weeks, whereas an aeroplane will transport passengers in the short space of three hours!

An even more interesting case is that of the journey from Lima, the well-known seaport in Peru, to Iquitos, a city in the jungle near the source of the Amazon River. Until recently the most expeditious way of sending mail from Lima to Iquitos was by way of Rio de Janeiro and up the Amazon River, a journey of many thousand miles that required six weeks; while travellers from the sea coast made a perilous journey on the streams that flow into the Amazon in its upper stages. To-day mail and passengers are transported in comfort between the two places in the short space of 36 hours, the journey being made partly by aeroplane and partly by seaplane that operate along the lines of the broad rivers of the country around Iquitos.

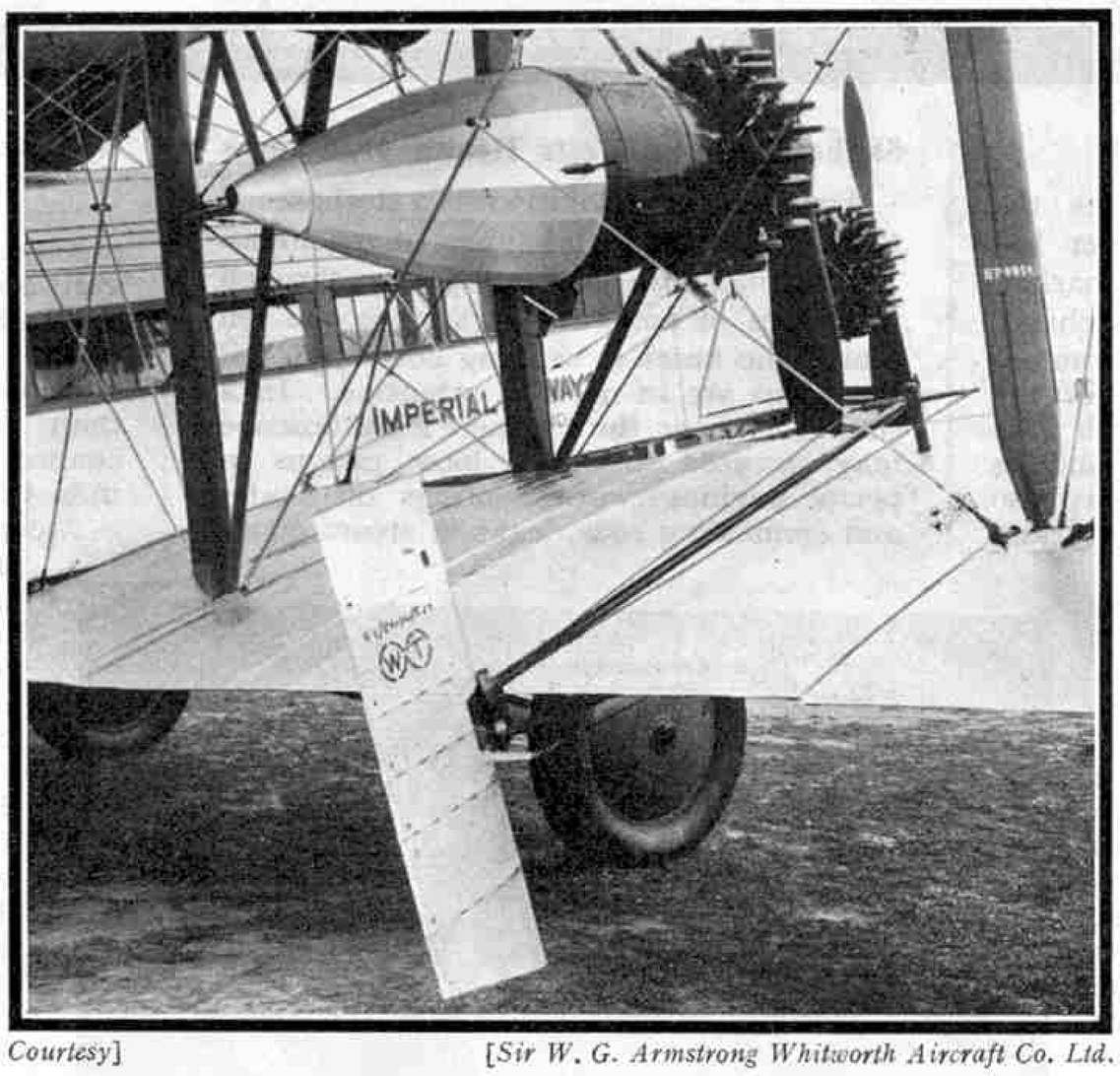
An Interesting "Avro" Monoplane

An interesting exhibit at the forthcoming Aero Show at Olympia will be a triple-engined four-seater "Avro" monoplane. The new machine, which was announced last year in single-engine form, complies with the firm's three-engine policy and follows the lines of the triple-engined "Avro 10." There will also be a number of other interesting "Avro" exhibits.

Mexican Airman's Remarkable Exploit

It is interesting to learn that aeroplanes supplied to the Mexican Air Force by the Bristol Aeroplane Co. Ltd., have given such splendid service that General Calles, Minister of War and former President of Mexico, has sent a message of congratulation to the Mexican representative of this firm.

One of the most remarkable early feats of the recent Civil War in Mexico was performed by Colonel Sidar, who flew a "Bristol" Boarhound. He created a great sensation by twice bombing a force consisting of more than 2,000 rebels with such effect that they responded to his invitation to surrender. He then had the pleasure of conducting his captives to the headquarters of his own force—prisoners on the ground and escort in the air!



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

A view of an Armstrong Whitworth "Argosy" showing the right-hand engine nacelle before the Townend ring has been fitted. The rudder-like contrivance at the rear of the wing is one of the new servo controls for operating the ailerons

THIS MONTH'S AIR STORY

"Were you seriously injured in that aeroplane accident?"
"Well, I didn't think so, until I read the newspaper accounts of it!"

Aviation Events for the Month

There is a great number of interesting aviation events due to take place this month. The first event of importance is the King's Cup air race, which is to be flown on the 5th and 6th. On Saturday the 13th, the Royal Air Force display is to be given at Hendon Aerodrome, while on the following Tuesday the International Aero Show opens at Olympia. The 20th anniversary of the first cross-Channel flight, which was made by Louis Blériot in 1909 from Calais to Dover in 37 minutes, will be celebrated on the 25th at Calais, and also in London, where a conversazione is to be held at the Science Museum, South Kensington, by the Royal Aeronautical Society. The final event is an International Flying Meeting which is to be held in Sweden on the 28th.

Interesting Airship Developments

This year appears likely to be one of outstanding interest from the airship point of view. It is true that the German airship "Graf-Zepplin" is out of action for the time being, but the giant British vessels *"R.100"* and *"R.101"* are now almost ready to take the air, and in America huge airships are being built for the Navy. Now comes the news that "baby" airships are being constructed at Cramlington, near Newcastle, by the Airship Development Company, and that in America an all-metal dirigible has been constructed.

The tiny aircraft being made in Great Britain are to have a capacity of 60,000 cu. ft., compared with the 5,000,000 cu. ft. of the *"R.100,"* and will be fitted with 75 h.p. A.B.C. "Hornet" engines driving a tractor airscrew. Two vessels are at present planned, the construction of one of which is already well advanced. This is to be known as *"A.D.1"* and it is designed to act as a flying hoarding! Fabric banners 76 ft. in length and 24 ft. in height are to be laced on each side of the envelope, and on them advertisements are to be painted. Wide publicity will be assured for any announcement carried by the airships, for they have a range of 500 miles at cruising speed. They may also be used for night advertising flights, and a system of illuminated advertisements suitable for use on them has been patented.

The second airship will be known as the *"A.D.2"* and is to be used for training and passenger flights. It is interesting to recall that no other airships have been privately built in this country since 1913.

The American all-metal airship has been constructed at Glendale, California, and was briefly mentioned in our February issue. It has a capacity of 330,000 cu. ft., and is expected to undergo its trial flights at a very early date. The material used in the construction of this craft is duralumin, and it is built on the "egg-shell" or "double-arch" principle, a method that ensures great strength with a minimum of internal bracing.

The power plant that is being installed is as novel as the airship itself, for the customary petrol or oil engine is replaced by a 400-500 h.p. steam turbine that is expected to give a speed of 100 m.p.h. The boiler is of the flash water-tube type and from it the steam at a pressure of 600 lbs. is transmitted by means of a flexible tube to the driving turbine which is directly behind the tractor screw in the nose of the airship. The fuel used in the boilers is ordinary oil mixed with hydrogen.

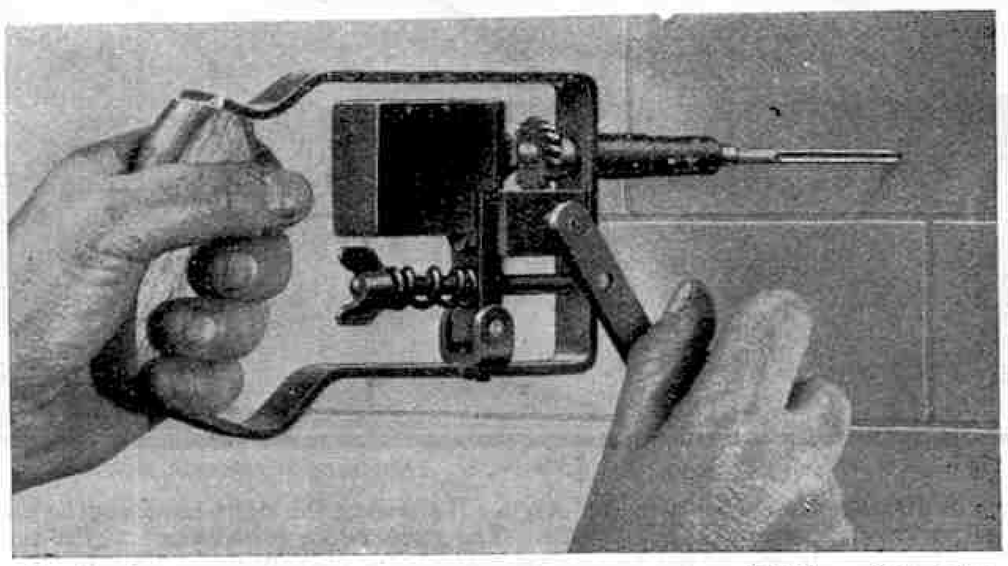
The cost of this novel airship has been about £24,000, but it is estimated that the cost of similar ships would be reduced to only £15,000 if an output of one per month were produced, for in that case the Company would be able to introduce mass-production machinery.

OUR BUSY INVENTORS

Combined Hammer and Drill

An ingenious tool that combines the functions of a drill and a hammer has been invented and is now on the market. It is called the "Rapper," and is chiefly designed for making holes for the accommodation of wall plugs. By means of the invention holes may be drilled with ease through brick, stone and cement, and its action is so clean and true that it may also be used for drilling through tiles and materials of similar nature.

As the accompanying illustration shows, the tool is sufficiently light to be handled easily, and is operated by turning a handle. This rotates the drill at a uniform speed, and at the same time actuates a worm that raises and releases the hammer head. The actual blows given to the drill are dealt by means of a very stubborn spring that moves through a short distance. The power thus imparted to the hammer head is enormous and has been calculated to be equivalent to blows of an ordinary hand hammer delivered at the rate of 600 to 800 per minute. By turning a wing nut the weight of the blow can be varied in order to suit the material that is being drilled.



Courtesy] [*William Geipel Ltd.*

Turning the handle of the ingenious tool shown above causes the drill to rotate, and also drives it into the wall

Car Driven from a Standing Position

A motor car that may be driven while the driver is in a standing position has been introduced in America. The idea is that van-men making a number of calls at places only very short distances apart inevitably waste a good deal of time with the ordinary type of vehicle. It is claimed that the saving of time brought about by the use of the new type of van is as much as a quarter of the time at present occupied in delivering goods with ordinary vehicles.

The floor of the van is placed as low as possible, and it only just clears the axles. An ordinary driving seat is provided and is mounted on a raised platform in front of the usual controls. For long runs the driver makes use of the seat in the ordinary way, but when he wishes to drive only very short distances he pulls up the seat and makes use of a special pedal conveniently placed for his left foot. When this pedal is pressed halfway down it releases the clutch, thus enabling gear changes to be made; when pressed right home it applies the brake.

When in the standing position, the driver experiences no difficulty in using either the hand brake or the gear lever. Steering also is not affected, for the height of the platform, and the rake of the steering wheel are arranged so that the latter is in a comfortable position for handling, whether the driver is seated or standing.

Stethoscope that Tests Health of Engines

Among recent inventions is a stethoscope to test the heart and lungs of machines. The murmurs heard by a physician through the tubes of an ordinary stethoscope tell him if the heart is working correctly or if the lungs are in need of attention. In a similar manner the engineer's stethoscope may be used to detect loose pistons in petrol engines, worn bearings on shafts and connecting rods, leaks of steam or air from pipe lines, and plate-rubbing in steam turbines.

The noises are picked up by a steel disc that is connected by a short rod of the same metal to a small box that resembles a telephone receiver. This contains a diaphragm in which vibrations are set up by the sound waves transmitted from the receiving disc. The noise is thus amplified, and finally is conveyed to the ear through tubes of stout rubber. The instrument is called the "Transmit-O-phone" and there is no doubt that it will prove very useful in tracing defects in enclosed engines and machinery of every kind.

Busy Inventors in Britain and America

Last year British inventors thoroughly earned the right to be considered busy, for the number of applications filed at the Patent Office was almost 2,000 greater than the previous record, the actual number being 38,500. Prior to 1928 the busiest year was 1920, when there was a rush of applications from inventors who had been prevented by the war from carrying on their work.

A remarkable feature of last year's inventions is the wonderful advance that has been made in what may be described as the scientific type of invention. The greatest activity prevailed in regard to improvements to the various kinds of electrical apparatus. Wireless and talking film inventions were very numerous, but a very large proportion of the applications filed related to the replacement of cumbrous and dirty power units for the workshop and the home by neat, clean electrical devices. It is estimated that of the £35,000,000 spent in developing inventions during 1928, more than £5,000,000 have been invested in connection with entirely new electrical industries.

A comparison of the activities of British inventors with those of their rivals in the United States is of great interest. Last year the applications for patents in the latter country numbered 88,482, an increase of 3,971 on the previous year. It is remarkable to find that although 1928 was a record year for applications, the number of patents issued was less than in any year since 1924. The number of patents granted has been falling steadily since 1926, in spite of the fact that the number of applications has continuously increased.

The explanation of this state of affairs is difficult to find. The American market for inventions of merit is greater than ever, and there is no doubt that the number of people who are trying to invent something is steadily increasing. A clue to a possible explanation is given by the fact that most inventions that are patented relate to improvements, and not to actual discoveries. This suggests that invention is overtaking science. If this is the case, then a great revival will only come when some great scientific discovery is made.

Machine to Grade Eggs

A recently-invented machine for grading eggs greatly resembles a model railway layout in appearance. The eggs to be tested are made to roll down a series of sloping tracks. These are made in sections, each of which is hinged in the middle. As each egg reaches a certain point on the track, the section carrying it tips up and allows it to run slowly on to other tracks beneath. In every case the egg automatically finds its way on to a delivery track that carries it to a storage bin in which it meets other eggs of equal size and quality.

The secret of the machine is that each hinged section is carefully balanced, in order to cause one end to tip up only when an egg of above a certain weight rolls on it. Both the size and the freshness of an egg may be judged from its weight, and by means of the invention the eggs in a consignment may be graded with great speed and accuracy into three or four divisions of different qualities.

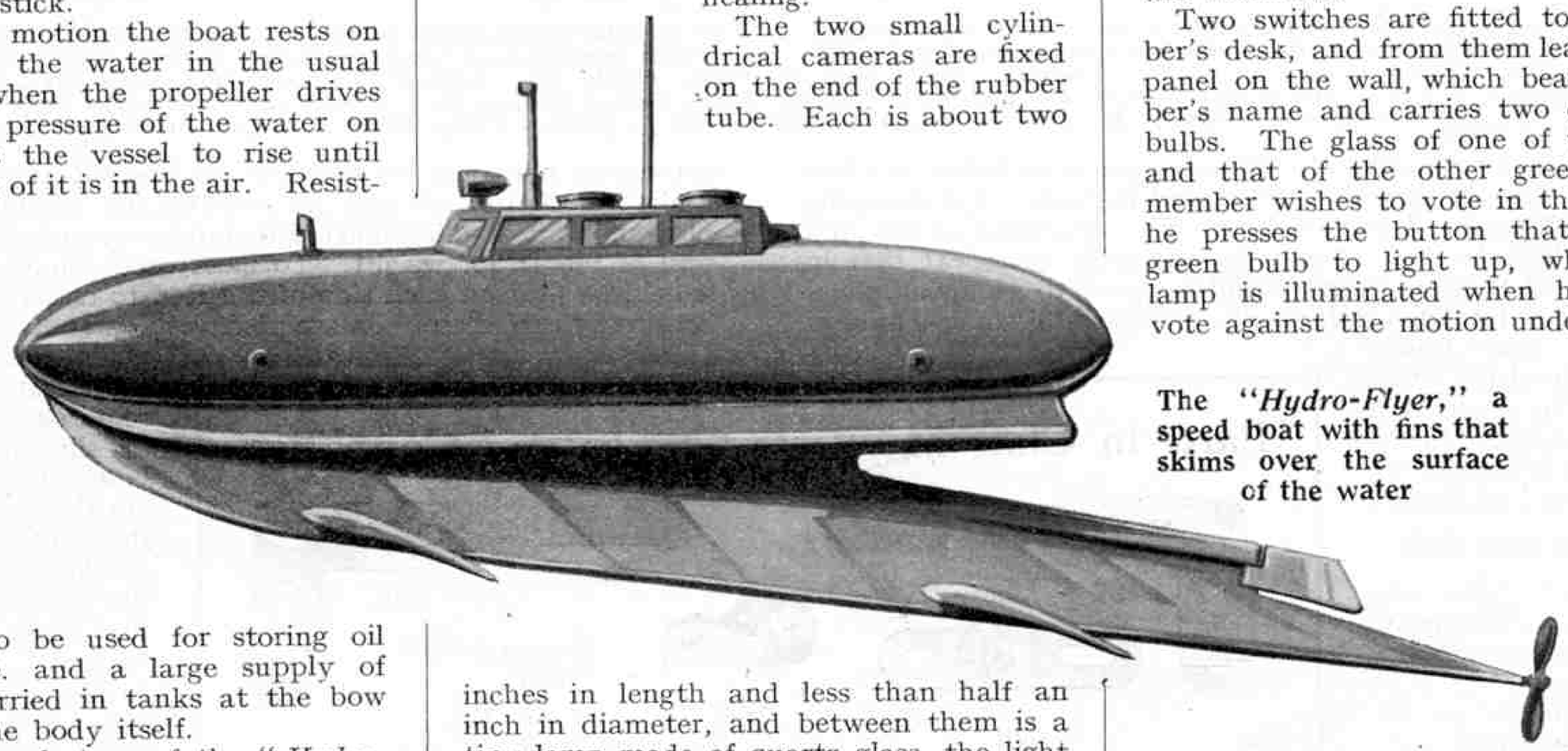
A New Type of Speed Boat

An American inventor has designed an interesting speed boat that he calls a "*Hydro-Flyer.*" The boat itself is of normal type and can be completely enclosed, but its keel is deeper and longer than usual. It projects backward almost as far again as the length of the boat, and along its sides are submerged fins that are shaped like the wings of an aeroplane. The pilot guides the vessel by means of a control system similar to that used on aeroplanes. He steers it with the aid of a rudder bar operated by his feet, and regulates the movements of the underwater fins by a lever resembling a joy-stick.

When not in motion the boat rests on the surface of the water in the usual manner, but when the propeller drives it forward the pressure of the water on the fins causes the vessel to rise until the greater part of it is in the air. Resistance to its movement is thus considerably reduced, and a high speed may be attained.

The inventor is now building a full-sized craft that will be driven by a petrol engine. The long keel is to be used for storing oil for the engine. and a large supply of fuel will be carried in tanks at the bow and stern of the body itself.

An interesting feature of the "*Hydro-Flyer*" is that it may be propelled on the rocket principle, since very little of the vessel is submerged when it is in movement.



The "*Hydro-Flyer,*" a speed boat with fins that skims over the surface of the water

Testing 6,000 Wireless Valves Per Hour

A wonderful machine that tests 6,000 wireless valves an hour is now at work in a factory near New York. It not only detects faulty valves, but also shows the operator exactly what is wrong with them. Before the machine was introduced the important final tests of valves were performed by girls, who inspected about 200 an hour. The new machine thus takes the place of from 25 to 30 girls, and at the same time performs the work with more accuracy than the most skilful inspector using the old method.

Valves are picked up by the machine from a carrier belt and automatically placed in position, and each is then rapidly tested in several electrical circuits. The flash of signal lights shows if a valve works efficiently, and any failure ends in its ejection from the machine, the point at which it is thrown out indicating what is wrong. The machine does not merely reject all valves with broken filaments or short circuits, but also those with incorrect operating characteristics.

Sir Alliott V. Roe, the famous aeroplane pioneer, has recently devised a very comfortable form of motor cycle, in which the 3 h.p. motor drives the rear wheel by means of a shaft instead of the usual chain. The most novel feature of the cycle is that it has a body of the type used on motor cars. The driver sits on an upholstered seat, and a large shield protects him from wind and dust.

Photographs taken in a Man's Stomach

A convict in Sing Sing prison, New York, recently swallowed a length of thin rubber tubing, two small cameras, and an electric lamp. This was not an original method of committing suicide, but a contribution to the advance of science on the part of the convict, who was serving a life sentence. The apparatus that constituted his strange meal had been invented for the purpose of taking photographs of the interior of the stomach. This particular convict was chosen for the first trial because he had recently been operated upon for a stomach complaint, and the prison doctor wished to find out how the wound was healing.

The two small cylindrical cameras are fixed on the end of the rubber tube. Each is about two inches in length and less than half an inch in diameter, and between them is a tiny lamp made of quartz glass, the light from which passes through perforations in its rubber casing. This lamp supplies the required illumination. When the cameras are in position in the stomach, pressure on a plunger passing through the rubber tube switches on the light and makes the exposures. Each camera takes eight pictures, and the size of the full set of 16 pictures is less than that of a postage stamp! Before they can serve any really practical purpose, therefore, the photographs must be very considerably enlarged.

This idea is a very ingenious one, and undoubtedly has possibilities. At the same time there are many obvious difficulties to be overcome before regular and practical use can be made of the tiny cameras. It will be necessary to await the result of further trials before passing an opinion as to the practical value of the scheme.

Wonderful Automatic Stamp Machine

From Australia comes news of the invention of an automatic stamp-selling machine that not only delivers stamps but gives correct change. A 1½d. stamp may be obtained by putting in the machine either three half-pennies, or a penny and a half-penny. The machine also works when two pennies are inserted and in that case it automatically gives a half-penny change along with the stamp.

This does not exhaust the ingenious features of the machine. When all the half-pennies have been given in change a warning sign "No Change" is displayed. It is not necessary to refill with half-pennies, however, for any that are placed in the slot automatically fall into the change box.

Electric Lights Record Votes

In the British Houses of Parliament the members tramp through lobbies in order to record their votes, while in many other assemblies they vote by calling out "yes" or "no," or by raising hands. The members of the House of Delegates at Richmond in Virginia have adopted a device that enables them to register their intentions by merely pressing a button switch. This method is quicker and more convenient than any other yet invented. Its use has added dignity to the proceedings of the Virginian assembly, and in all probability other representative bodies will adopt the invention.

Two switches are fitted to each member's desk, and from them leads run to a panel on the wall, which bears the member's name and carries two electric light bulbs. The glass of one of these is red, and that of the other green. When a member wishes to vote in the affirmative he presses the button that causes the green bulb to light up, while the red lamp is illuminated when he desires to vote against the motion under discussion.

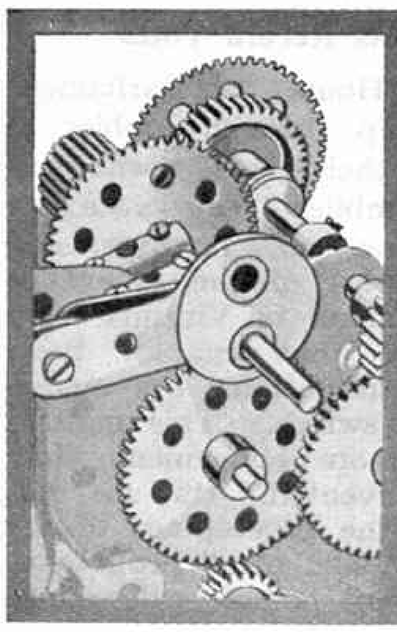
When the time comes for voting on any measure, the members merely press the buttons that light up these lamps, and counting the green and red lights is a very easy matter. In addition, the manner in which each member votes is so clearly shown that it is easy to take a record.

War on Maggots that Spoil Fruit

The deadly work of the maggots and moulds that develop on fruit during long railway or steamship journeys will in future be stopped completely by a device that has been perfected in California, a great fruit-growing state. Poisonous gas is to be used to destroy them, and at the same time to sterilize the refrigerator wagons which are employed in the transporting of the fruit.

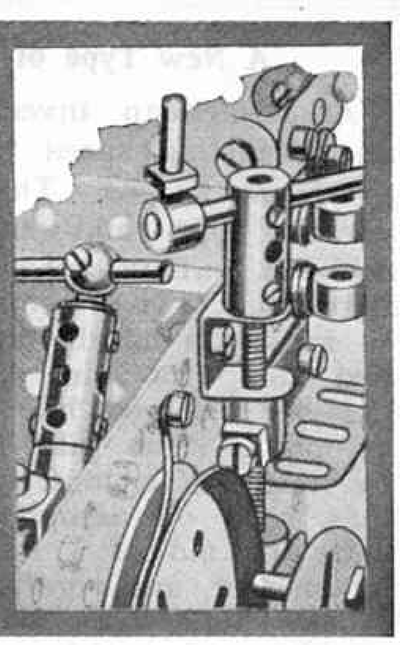
The gas used is sulphur dioxide. Steel cylinders containing it are plunged in water heated to 140°F. This increases the pressure of the gas and causes it to escape rapidly when a valve in the neck of the container is opened. In a closed wagon it immediately spreads to all corners and completely exterminates grubs. The chief difficulty in making use of the method was to find a reliable method of heating the water. The invention of a suitable electrical immersion heater solved this problem, and a large scale gas attack is now to be made upon the maggots that in the past have caused loss while the fruit has been in transit.

An ingenious flashlamp that requires no battery has been invented by an American. The electric bulb obtains the necessary current from a tiny dynamo that is rotated by means of a spring in the handle. No oiling or adjustment is required. The lamp has been found very reliable, and it should prove useful where batteries for refills are difficult to obtain.



HOW TO USE Meccano Parts

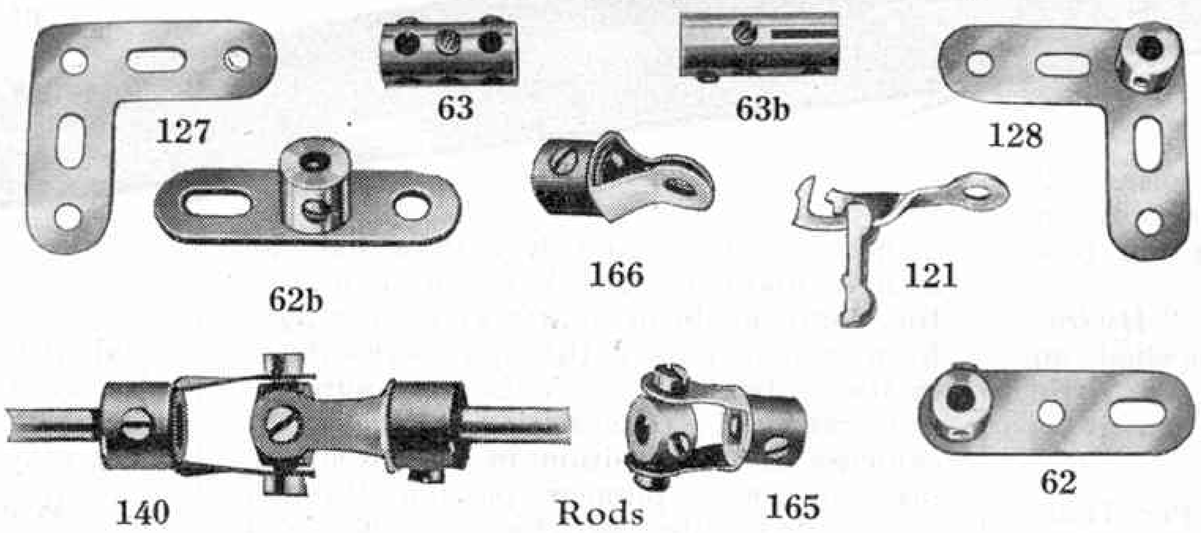
VI.—RODS, CRANKS, etc. (CLASS M)



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.

THIS month we describe the Meccano parts included in Class M, the first class in the Mechanical Section. The grouping of the Meccano Accessories was fully described in the first article of this series, but it may be advisable to repeat that in the Mechanical Section we have endeavoured to group all those parts that are intended principally for assembly in mechanical movements (gear boxes, driving mechanisms, etc.), as opposed to parts that are used principally in the construction of the frames and bases, etc., of models.

Parts in Class M: Rods, Cranks and Couplings



Rods

Part No.		Price s.	d.	Part No.		Price s.	d.
13	Axle Rod, 11½″ long ... each	0	2	19	Crank Handles, Large each	0	2
13a	„ 8″ „ ... „	0	2	19s	„ „ Small „	0	2
14	„ 6½″ „ ... „	0	1	134	Crankshafts, 1″ stroke „	0	2
15	„ 5″ „ ... „	0	1	78	Screwed Rods, 11½″ ... „	0	6
15a	„ 4½″ „ ... 2 for	0	1	79	„ 8″ ... „	0	5
16	„ 3½″ „ ... „	0	1	79a	„ 6″ ... „	0	4
16b	„ 3″ „ ... „	0	1	80	„ 5″ ... „	0	3
16a	„ 2½″ „ ... „	0	1	80b	„ 4½″ ... „	0	3
17	„ 2″ „ ... 3 for	0	1	80a	„ 3½″ ... „	0	3
18a	„ 1½″ „ ... „	0	1	81	„ 2″ ... „	0	2
18b	„ 1″ „ ... „	0	1	82	„ 1″ ... „	0	1

Cranks

62	Cranks ... ... each	0	3	127	Simple Bell Cranks ... each	0	1
62a	Threaded Cranks ... „	0	4				
62b	Double Arm Cranks ... „	0	3	128	Boss Bell Cranks ... „	0	3

Couplings

63	Couplings ... ... each	0	6	140	Universal Couplings ... each	0	10
63b	Strip Couplings ... ... „	0	8	171	Socket Couplings ... „	0	9
63c	Threaded Couplings ... „	0	6	165	Swivel Bearings ... „	0	6
63a	Octagonal Couplings „	0	8	166	End Bearing ... ... „	0	3
121	Train Couplings ... „	0	2				

The Meccano Axle Rods

The Meccano Axle Rods are made to a diameter of .160 inches and are supplied in lengths from 1″ to 11½″. If greater lengths are required two Axle Rods may be joined end to end by means of a Coupling. In addition to their obvious uses as shafting or spindles for rotating machinery, the Rods are often employed as levers, guides for sliding mechanisms such as the work-table of a lathe or planing machine, tie rods or struts in structural work, etc.

In assembling rotating machinery the bearings should receive very careful attention, especially if the shafts are to rotate at great speed or are to withstand excessive strain. In either case it is a good plan, instead of journalling the Rod in a hole in a single Plate or Strip, to reinforce the bearing by bolting a Wheel or Crank to the Plate so that the Rod may turn freely in the boss. If the Wheel is bolted so that the set-screw hole is uppermost, an excellent oil receptacle will be provided. Alternatively, several short Strips can be bolted to the Plate so that the width of the bearing surface is increased. Unless these precautions are adopted the rotating shaft will gradually increase the diameter of the hole in which it is journalled.

Fig. 1

For all ordinary purposes the set-screws provided with the various Meccano Wheels and Cranks should be sufficient to hold the parts rigidly in position on the Axle Rods. In the latest Meccano parts, however, the set-screw hole has been extended right through the boss so that two set-screws can be inserted if desired, one on each side. In certain cases, even two set-screws may not be sufficient to prevent the wheels slipping upon the shafts. A case in point is the winding drum of the Meccano Clock, which must withstand over many hours the direct pull of the 18 lb. weight. To meet such conditions a small flat should be filed on each side of the Rod to receive the ends of the set-screws. If these flats are filed very carefully a wheel may be made quite immovable on the shaft, and yet when required it may easily be slipped off merely by loosening the set-screws. On the other hand, unless the flats are cut very carefully the set-screw will slip partially round the Rod and become firmly wedged.

The Crank Handles, which are obtainable with either 3½″ or 5″ shafts are in reality ordinary Axle Rods with their ends bent to form convenient handles. In addition to their obvious uses, they may be employed where a bent handrail is required, or as a crankshaft when the crank is required at one end only and not in the centre as in part No. 134. The stroke of the crank so provided is roughly 1¼″.

Part No. 134 may be used in numerous cases where it is required to convert rotary motion to reciprocating motion, or vice versa. It gives a stroke or total rectiliniar movement of 1″. An ordinary Meccano Strip is intended to be used as the connecting rod. It should be slipped into place in the centre of the crank portion and held in position by two Spring Clips. If desired a more elaborate connecting rod may be built-up as shown in Fig. 11. As will be seen, it consists of an Axle Rod 2, the big-end bearing being formed from two 1½″ Strips mounted on the crank and bolted to a Coupling 1. The Strips are held in place by a ½″ Bolt 3 passing completely through the end of the Coupling, and by a pair of set-screws 4, which serve also to grip the connecting rod in the Coupling. The position of the connecting rod in the centre of the crank is maintained by a Spring Clip 5 mounted between two Washers.

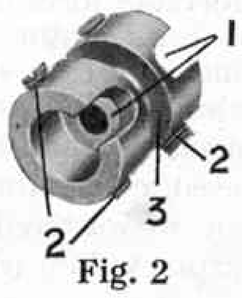


Fig. 2

Screwed Rods and Their Uses

The Meccano Screwed Rods are cut throughout their lengths with the Meccano standard thread

(32 threads to the inch). They form extremely valuable parts, their principal function being the conversion of rotary motion to longitudinal motion, as in screw elevating machinery, etc. Also, in cases where a longer bolt is required than part No. 111, which is the longest in the system, one of the shorter Screwed Rods may be used with advantage.

Several Meccano parts are specially designed for use in connection with the Screwed Rods, such as the Threaded Boss, Threaded Crank and Threaded Coupling. If one of these parts is secured to a portion of a model and a Screwed Rod threaded through it, then the latter may be caused to move longitudinally as it rotates, or this movement may be prevented and instead that portion of the model carrying the threaded part caused to move up and down the Rod. If it is required to fix a Threaded Boss or Threaded Coupling on a Screwed Rod, a nut should be placed on the Rod and screwed tightly against the part. It should never be secured by a set-screw, as this will inevitably damage the thread of the Rod. Any other Meccano Wheel, Pinion, etc., may be attached rigidly to a Screwed Rod by gripping it tightly between two nuts threaded on the Rod.

When it is required to journal a Screwed Rod between bearings so that it may rotate like an ordinary Axle Rod, it should be connected by Couplings to Axle Rods so that the latter may be journalled in the bearings instead of the Threaded Rod. If this is not possible the Rod should be journalled in the boss of a Crank or Wheel, etc., in order that the bearing surfaces shall be as large as possible.

It should be remembered that the Screwed Rod proves invaluable as a means of increasing the available power, although at a considerable loss of speed. It should be used wherever it is necessary to cope with specially heavy loads, such as in raising the jib of a large model crane or in elevating a lift bridge, etc.

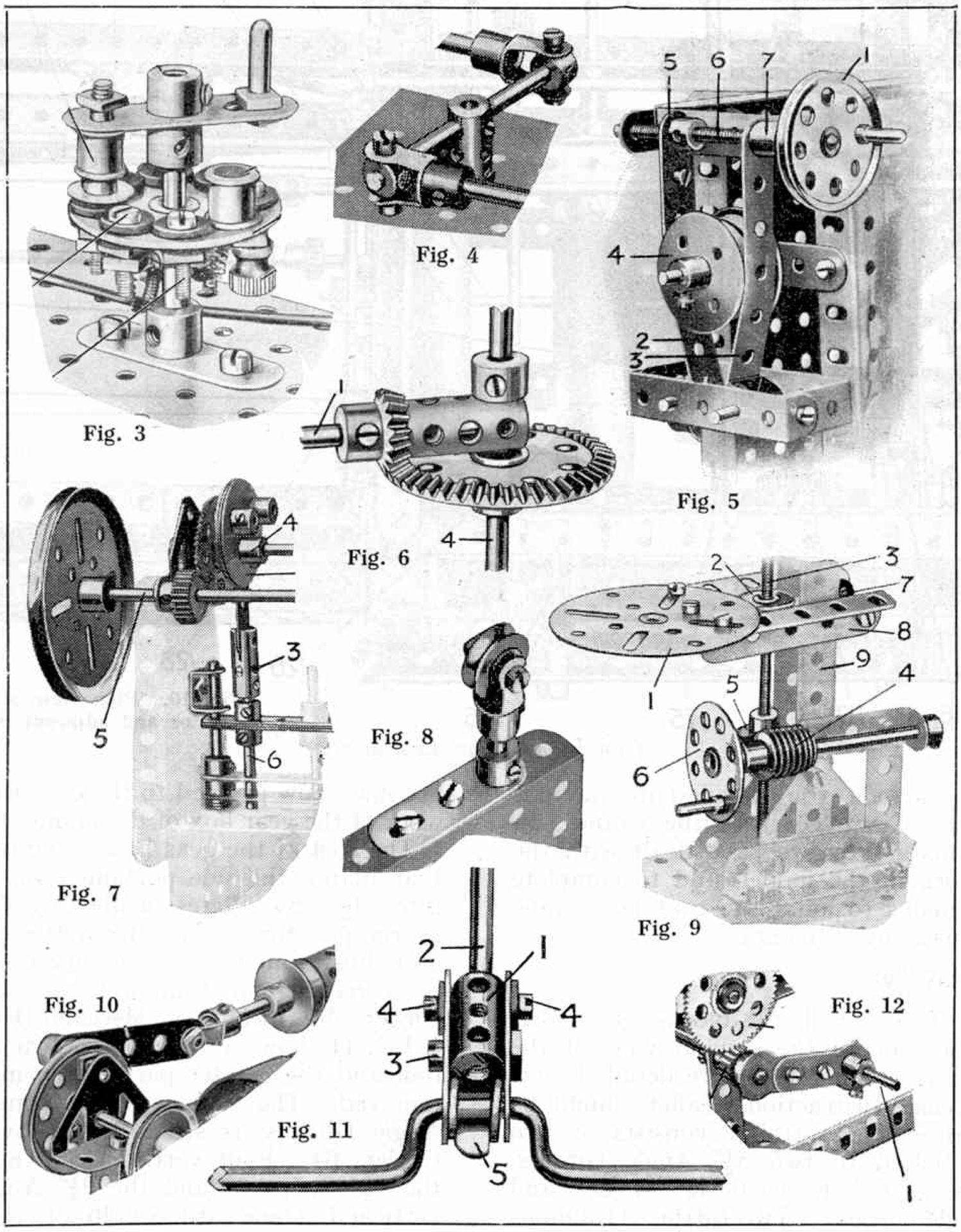


Fig. 5 shows a Screwed Rod employed to expand or contract the bands of a brake. The Strip 2 is bolted to Threaded Crank 5 engaging the Screwed Rod 6 and the Strip 3 presses against a Threaded Boss 7. The Threaded Boss revolves with the Rod 6, to which it is locked by means of a nut also mounted on the Rod and screwed tight against the outer end of the Boss. The position of the Boss 7 on the Rod does not change, but the Threaded Crank 5 travels forward or backward according to the direction of rotation of the hand wheel 1, thus applying or releasing the brake. The Rod 6 should be allowed sufficient play to move longitudinally in its bearings as the brake bands contract or open, so that the pressure on each band is equal.

In Fig. 9 a Screwed Rod is employed as a simple means of elevating or lowering the worktable in a model drilling machine. The table 1 is bolted to the Threaded Crank 2, the boss of which engages the vertical Screwed Rod 3. The latter may be rotated from the hand wheel 6, and since the Crank 2 cannot turn with the Screwed Rod, it must either rise or fall, according to the direction of rotation.

There are numerous other important uses for the Screwed Rod, such as in jib-raising mechanisms and elevating and adjusting gear for all kinds of machine tools, etc., and for further particulars of these we would refer Meccano boys to Section IX of the Standard Mechanisms Manual.

The Meccano Cranks

The Meccano Cranks are in reality short Strips fitted with bosses so that they may be attached easily to Axle Rods. Part No. 62 is 1½″ in overall length and has a boss secured to one end. In addition to its obvious uses as a crank, it may be employed to secure an Axle Rod to any other Meccano part as in Fig. 8, where a Crank is used to fix a 1″ Rod rigidly to a Flanged Plate, or to form handles as in Fig. 12. In the latter illustration two Cranks are bolted together, the boss of one being secured to the driving spindle whilst the boss of the other holds a short Rod 1 which serves as the handle proper.

The Threaded Crank is similar to the ordinary Crank except that the longitudinal bore of the boss is tapped, or threaded. The functions of this part have already been indicated in connection with the Screwed Rods and it is illustrated in Fig. 9.

The Double Arm Crank has similar functions to part No. 62, but when a crank stroke of only 1″ is required it proves far more adaptable. It is ideal for securing Rods to Strips or Plates, as will be seen from Fig. 3. This illustration shows a Meccano electric controller and it will be seen that another Double Arm Crank is used as the controller handle. The Crank is free to turn about the fixed vertical Rod, being held in position by a Collar placed on the extreme upper end of the Rod, and one arm is used to carry the spring contact whilst the other is fitted with the Threaded Pin that forms the handle proper.

The only difference between parts Nos. 127 and 128 is that the Simple Bell Crank has no boss. The Meccano Bell Crank is a lever of the first order and is employed as a means of changing the direction of a force through a right angle. For example, supposing the Bell Crank is mounted on a horizontal Rod, a downward pull on one arm may be converted to a transverse pull or push on the other. Another important use of the Bell Crank that does not often occur to the Meccano boy is found in strengthening the corners of a square or rectangular framework of Strips, where it forms a very neat connecting piece.

The Meccano Coupling (part No. 63) is (Continued on page 543)

Block-setting Crane

Super Model No. 4

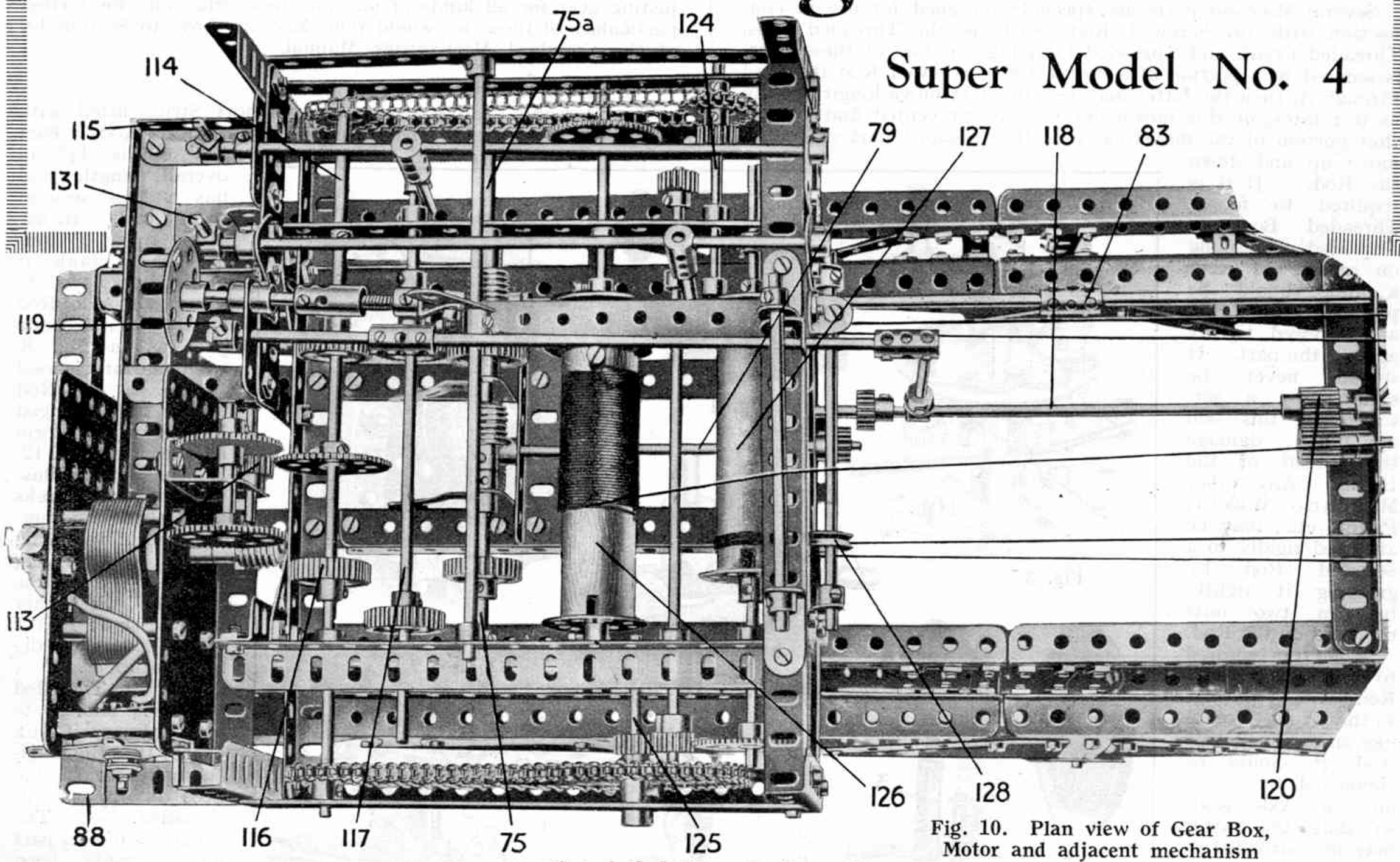


Fig. 10. Plan view of Gear Box, Motor and adjacent mechanism

(Concluded from last month)

THIS month we conclude the detailed instructions for building the Giant Block-setting Crane. In the two previous articles we have dealt with the purely structural work in the model, and to complete the crane it now remains to build the gear box, crane trolley, and accompanying fitments.

Crane Trolley or Traveller

The crane trolley, from which the block-setting gear is suspended, can be seen in the general view of the crane (see May "*M.M.*"), but for a more detailed view of this unit the Special Instruction Leaflet should be consulted. The frame of the trolley consists of two $4\frac{1}{2}''$ Angle Girders bolted to two $5\frac{1}{2}''$ Angle Girders. Two Trunnions are bolted to each $4\frac{1}{2}''$ Girder and support two $5\frac{1}{2}''$ Angle Girders. Two further Trunnions are secured to each of these Girders, and form bearings for two $6\frac{1}{2}''$ Axle Rods carrying four $\frac{3}{4}''$ Flanged Wheels. These Wheels run on rails 51 (see Fig. 2 May "*M.M.*"). A third $6\frac{1}{2}''$ Axle Rod is journalled in the $4\frac{1}{2}''$ Girders, and carries five 1″ Pulleys spaced apart by six 2″ Strips, the Wheels and Strips being kept in a central position on the Rod by means of Collars. A 5″ Axle Rod placed directly above the $6\frac{1}{2}''$ Rod is supported at each end by a $1'' \times \frac{1}{2}''$ Angle Bracket bolted to the $4\frac{1}{2}''$ Angle Girder forming the sides of the trolley framework. At each end of the trolley two $1'' \times \frac{1}{2}''$ Angle Brackets are secured and are joined by $5\frac{1}{2}''$ Strips, while two Handrail Supports are secured in each of these Strips enabling the trolley to be drawn along by means of cords.

We may now proceed to the construction of the framework of the gear box of the crane.

The roof of the gear box is composed of a number of Flat Plates, the side portions each being built up from three $3\frac{1}{2}'' \times 5\frac{1}{2}''$ Plates, while two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, overlapped three holes, form the centre portion. The roof thus formed should be curved slightly and attached to a rectangular framework consisting of $9\frac{1}{2}''$ Angle Girders by means of Meccano Hinges.

Fig. 11 shows a view of the gear box, from which the roof and the greater part of the mechanism have been removed. The square base, composed of four $9\frac{1}{2}''$ Angle Girders, is strengthened by two similar Angle Girders 64. Four vertical $4\frac{1}{2}''$ Angle Girders 65 carry the $7\frac{1}{2}''$ Strips 66 and the $9\frac{1}{2}''$ Angle Girder 67. Two vertical 3″ Angle Girders bolted to the Girder 67, together with two $2\frac{1}{2}''$ Angle Girders 69 (which are braced by Corner Brackets), form supports for a $7\frac{1}{2}''$ Angle Girder 70 and two $7\frac{1}{2}''$ Strips 71. A $4\frac{1}{2}''$ Flat Girder 72, carrying two $1\frac{1}{2}''$ Flat Girders 73, is bolted to a vertical $2\frac{1}{2}''$ Strip 74 and the upright Girders 69, 65. These Strips and Girders, etc., form the necessary bearings for the shafts of the gear box. Care should be taken to see that they are placed exactly in their correct positions and secured very rigidly.

Two $3\frac{1}{2}''$ Axle Rods 75, 75a are journalled in a pair of Flanged Brackets and $7\frac{1}{2}''$ Strips 71, and meet inside the Worm Wheel 77 which is secured to the Rod 75. Two 1″ Gear Wheels are secured to the Rods 75, 75a and a second Worm Wheel is mounted on the Rod 75a.

The Worms are spaced on their respective Rods by means of Collars and set screws. The 5″ Rod 79, bearing a ½″ Pinion Wheel and a 50-teeth Gear Wheel that meshes with the Worm Wheel 77, is journalled in bearings consisting of a 1½″ Angle Girder and a 3½″ Angle Girder 82: an 8″ Rod, parallel with the Rod 79, carries a second 50-teeth Gear Wheel engaging with the Worm 77a: this Rod bears on its outer end a Coupling 83. Washers are placed between the Girder 82 and the Girders 64 in order to bring the 50-teeth Gear Wheels into mesh with the Worms 77, 77a.

A 5½″ Strip 86 is attached by means of a Meccano Hinge to the Girder 67, one end of the Strip being left free inside the gear box. The manner of attaching the remaining parts of this unit, viz., a 1½″ Flat Girder 84, two 1″×1″ and one ½″×½″ Angle Bracket 85, 85a, a 1″ Triangular Plate 87, and the 3½″ and 2″ Angle Girders 88, 88a, may be seen from the illustration (Fig. 11).

The framework of the gear box, built as shown in Fig. 11, should be attached to the rear end of the boom by means of nuts and bolts, and the remainder of its mechanism may then be added. The Electric Motor is bolted to the Angle Girders 64, 88, 88a (Figs. 10, 11). A Worm Wheel secured to the armature spindle turns a 57-teeth Gear Wheel on a 2″ Rod journalled in a Channel Bearing on the side of the motor frame, and a 50-teeth Gear Wheel on the same Rod engages the teeth of a ¾″ Pinion Wheel 113 that meshes with a 57-teeth Gear Wheel on the Rod 114 (Fig. 10). This Rod, which is thus in constant rotation, may be caused to transmit the power from the Electric Motor to the Rods 75, 75a (which as already stated, meet inside the Worm Wheel 77) by operating the Threaded Pin 115. By this means a 1″ Gear Wheel on the Rod 117 can be made to engage simultaneously the 1″ Gear Wheel 116 and the 1″ Gear Wheel on the Rod 75. The drive is then led through the gears shown in Fig. 12 to the ½″ Pinion Wheel on the outer end of the Rod 79. A ½″ Pinion on the Rod 118 can be brought into gear with this ½″ Pinion by pulling the handle 119, which thus causes the double width face ½″ Pinion Wheel 120 to turn a similar Pinion on the Rod 121. Reference to Fig. 7 (see June "*M.M.*") will show that this Rod actuates the traversing mechanism of the crane by means of the Bevel Gears 122 and the gears already described in the section dealing with the gantry.

The handle 115, which causes the crane to travel on its wheels as described when turned in a clockwise direction, is also used to swivel the crane. For this purpose it is turned in an anti-clockwise direction (i.e., to the left) thus interposing a 1″ Gear Wheel between similar Gear Wheels on the Rods 114, 75a. The latter Rod, which is thus caused to revolve, rotates the Coupling 83 by means of the Worm and 50-teeth Gear Wheel shown in Fig. 12, and a Rod secured in the Coupling turns a vertical Rod 123 by means of two ⅞″ Bevel Gears. The small toothed wheel of the roller bearing unit, which is secured to the lower end of the Rod 123, rolls around the teeth of the upper Geared Disc and causes the boom to be driven bodily about the centre of the roller bearing.

The Rod 114 carries on its ends two 1″ Sprocket Wheels which are connected to a 1″ Sprocket Wheel and a 3″ Sprocket Wheel secured respectively to the Rods 124, 125. The Rods 124, 125 are thus constantly revolving, and operation of the handle 131 interposes ½″ Pinion Wheels secured to a 6½″ Rod between ½″ Pinions on the Rods 124, 125 and 57-teeth Gear Wheels on the spindles of the Wood Rollers 126, 127, causing the latter to rotate. (Only one of the Rollers, of course, can be operated at a time). The Roller 127 carries two cords, which are each given a few turns round its circumference. One end of each cord is led under one of the ½″ loose Pulley Wheels 128, and is tied to a Handrail support on the end of the crane trolley. The other ends of the cords are stretched to the forward end of the boom, passed round the 1″ Pulley Wheels 107 (see Figs. 1, 4) and tied to the remaining Handrail Supports on the trolley.

The Wood Roller 126 carries only one cord, which passes in turn round the five 1″ loose Pulley Wheels of the trolley and the four similar wheels that form the

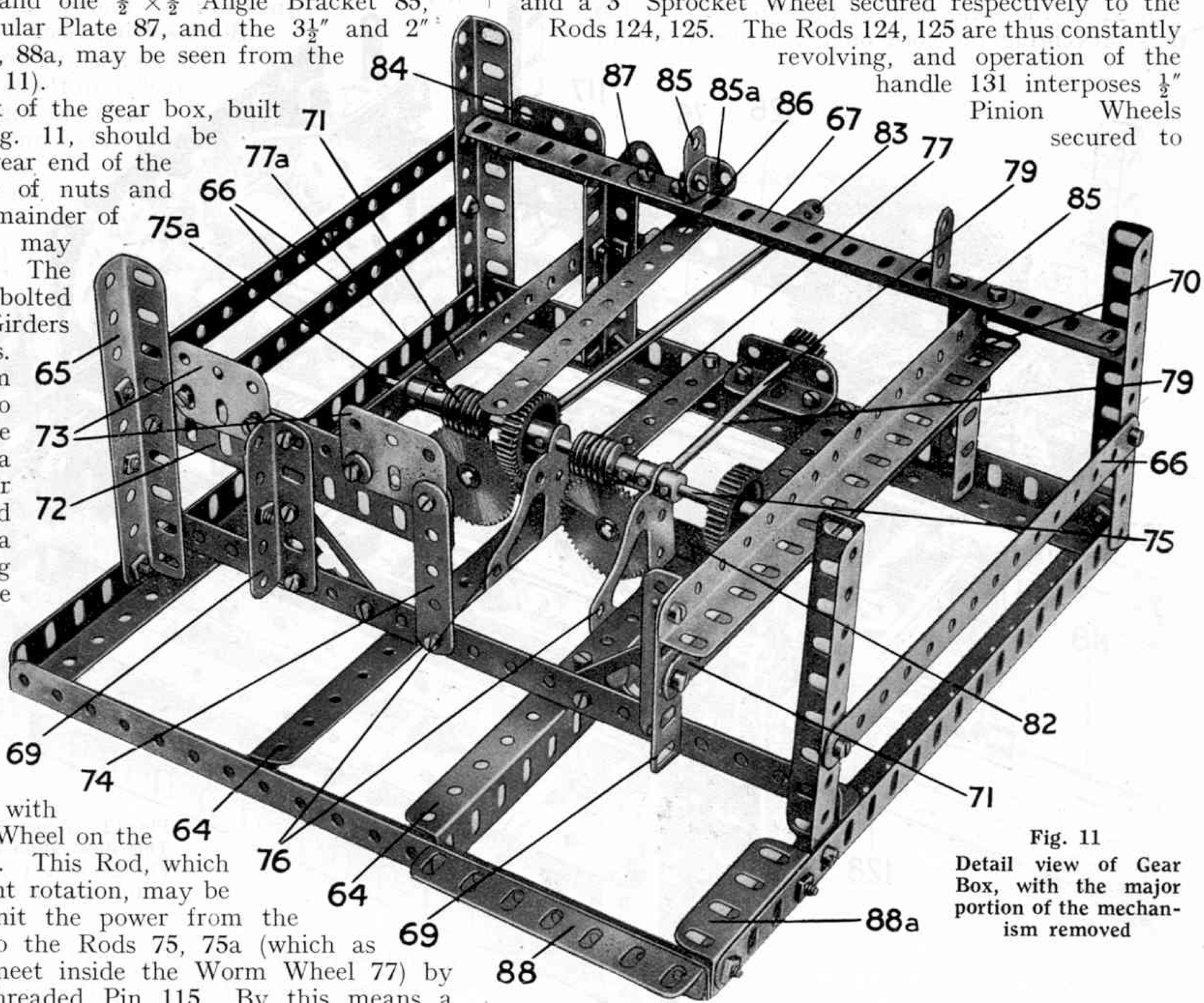


Fig. 11
Detail view of Gear Box, with the major portion of the mechanism removed

sheaves of the pulley block from which the block-setting gear is suspended. The end of the cord is then carried to the front end of the boom and is tied to a Washer on the opposite side of the Girder 105.

The block-setting gear is prevented from falling back by means of a brake operated by the handwheel shown in the back of the gear box between the handles 119, 131. A 2½″ Rod secured in the boss of the Bush Wheel is gripped in the smooth bore of a Threaded Coupling, into the threaded bore of which is screwed a 1″ Screwed Rod. An End Bearing on the opposite end of the Screwed Rod actuates a Crank that is secured to a 6½″ Rod by means of a ⅜″ Bolt, so that when the handwheel is turned to the right, the ⅜″ Bolt causes the Strip 86 to press on the flanges of two Flanged Wheels secured to the same Rod as the Wood Roller 126, thus preventing the cord on the Roller from unwinding. The Strip 86 should be bent slightly to ensure effective contact with the Flanged Wheels.

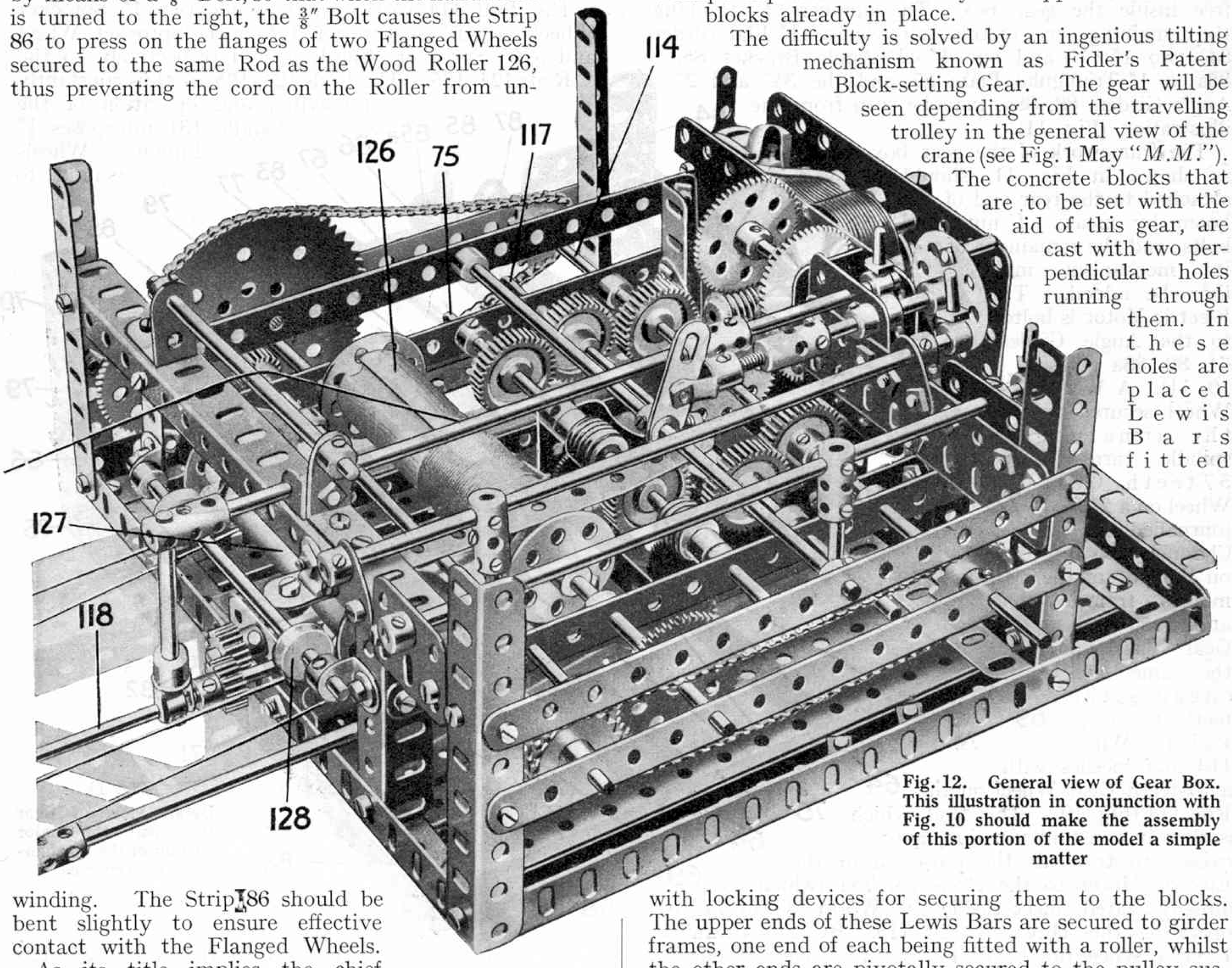


Fig. 12. General view of Gear Box. This illustration in conjunction with Fig. 10 should make the assembly of this portion of the model a simple matter

As its title implies the chief purpose of the prototype of the model is the setting of concrete and stone blocks that comprise breakwaters, or the foundations of piers, etc. In many cases the blocks that comprise these breakwaters are laid horizontally, and are lowered into position by means of a self-releasing grab. Strong though the resulting structure may be when the blocks are set in this manner, in certain cases even greater rigidity is essential in order to counteract the enormous power of the waves.

A more complicated form of setting the blocks has consequently to be resorted to, and they are therefore set on what is termed the "inclined bond." The foundation is first formed so that the blocks on being placed in position will rest with their faces out of the vertical. This method effectively locks the blocks to each other enabling the complete structure to withstand great pressure.

The slinging of the blocks into position is by no means a simple task, a fact that will be more readily appreciated by anyone who has constructed a model crane and afterwards attempted to sling a small block of wood or stone in an inclined position when using a simple type of grab. In actual practice the difficulties are, of course, considerably increased. The blocks are often extremely heavy and considerable force is required to deflect them from the vertical, so that they may fit into the V-shape depression formed by the upper faces of the blocks already in place.

The difficulty is solved by an ingenious tilting mechanism known as Fidler's Patent Block-setting Gear. The gear will be seen depending from the travelling trolley in the general view of the crane (see Fig. 1 May "*M.M.*"). The concrete blocks that are to be set with the aid of this gear, are cast with two perpendicular holes running through them. In these holes are placed Lewis Bars fitted with locking devices for securing them to the blocks. The upper ends of these Lewis Bars are secured to girder frames, one end of each being fitted with a roller, whilst the other ends are pivotally secured to the pulley suspension framework. This ingenious arrangement causes a block, on being lifted by means of the crane, to cant over so that its face is at an angle with the vertical. The block can thus be lowered into the exact position, and on releasing the Lewis Bars the gear may be drawn free of the block.

Those readers desirous of building it should note that constructional details of the Meccano model of the gear are contained in the special Instruction Leaflet on the Crane itself. This Leaflet in addition deals at greater length with several portions of the crane than has been possible in the Magazine articles. It may be obtained from any dealer price 6d., or direct from Meccano Ltd., Old Swan, Liverpool, price 6d. post free.

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

IMPROVED FLANGED WHEEL.—Your suggestion that standard teeth should be cut in the rims of the ¾″ and 1⅛″ Flanged Wheels is quite interesting. Apparently your idea is to fasten two of these Wheels flange to flange and to pass a belt over the pulley so formed, at the same time employing the toothed rims to transmit power to other portions of a mechanism by means of standard Meccano Gear Wheels. The main objection to this idea is that the function of the Flanged Wheel as a simple road wheel in the smaller models would be destroyed, as a toothed rim is obviously unsuitable for rolling on a smooth surface. We are, however, keeping your idea in mind for further consideration. (*Reply to T. Clayton, Brentford.*

SPECIAL LUBRICANT.—We do not consider that it would be advisable to introduce special semi-solid grease for lubricating the working portions of the Meccano models. This form of lubricant is only suitable for large and heavy machinery where great power is transmitted and any but a very viscous substance would be squeezed out from the bearing surfaces. All machinery that may be built up with Meccano parts, is on the other hand of a very delicate nature and only thin oil of fine quality is suitable for lubricating purposes. Special Meccano oil of the correct constituency for this purpose is now supplied, price 6d. per bottle. (*Reply to F. Rockwood, Clapham, London, S.W.4*).

LONG BOLTS.—There is no necessity to introduce long threaded bolts as Threaded Rods can be used quite effectively. Two nuts screwed on to one end of the Rod and locked together will form a "head" which can be turned by means of a Spanner. (*Reply to W. A. Jackson, Langley, Birmingham*).

IMPROVED GEAR WHEEL.—We do not consider that there is any necessity to decrease the toothed face of the 1″ Gear Wheels. Rather than being clumsy, the extra width often proves a decided advantage in the construction of models, and at the same time greatly minimises the wear on the teeth. (*Reply to L. Redshaw Bourne*).

"CHEVRON" TEETH GEAR.—

While we agree that there are several advantages to be obtained from the "chevron" type of gear wheel, we are unable to consider its manufacture on account of the excessive cost. The design of this type of wheel will be seen clearly in the sketch, and it will be noticed that actually it comprises two "skew" gears butted together, this form of construction enabling an extremely smooth and silent drive to be obtained. It will be obvious, however, that a wheel of this type cannot be produced without the aid of complicated machinery, and its resulting cost would consequently be very high. (*Reply to J. S. Fernley, Leeds*).

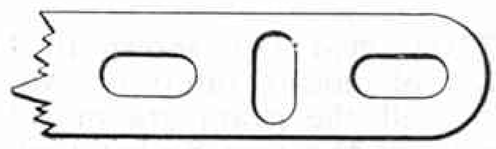
NEW BOLT.—A 7/32″ bolt having its shank tapped for only half of its length would be quite useful in forming a neat pivot mechanism. Such bolts could not, however, be employed in ordinary constructional work, and their use would therefore be very limited. Where two parts have to be pivoted by means of a bolt, it is quite a simple matter to apply the lock-nut mechanism described in the Instruction Manuals. (*Reply to D. Patterson, Woolton*).

IMPROVED LOOSE PULLEY.—We were interested in your idea that the holes at present stamped in the 1″ loose Pulley should be enlarged. This suggestion has been put forward previously, but we do not think that the alteration would materially increase this part's usefulness. We have yet to find an instance where bolts etc., have to be fastened to the loose Pulleys. Perhaps readers will offer their suggestions? (*Reply to J. Foley, King Williams Town*).

WHEEL DISCS.—We were interested in your plan of a suggested type of wheel disc. This would be fitted with two slotted lugs so that it could be attached to Pulley Wheels, etc. You mention that if a small sized disc were introduced it would give a neat finish to the front portion or 'nose' of a model aeroplane. Although this is an interesting adaption of the suggested part, it would necessitate introducing a special sized disc in addition to the larger variety for fitting to motor car wheels, etc. Your idea has possibilities, however, and we will keep it in mind. (*Reply to R. C. Storrar, Ladybank, Fife*).

RIGHT-ANGLE FORK PIECE.—An accessory somewhat resembling a large Fork Piece and with the forks turned at right-angles would be quite a useful addition. This part could be used as a "castor" in certain models, but we see no reason why you should not use the existing Fork Piece with two Flat Brackets bolted to it to form your suggested part. (*Reply to E. A. Fountain, Brandon, Canada*).

NEW TYPE STRIP.—Strips perforated with a number of slots in place of the standard circular holes (see sketch) would be quite unsuitable for inclusion in the system. The only advantage that these articles would have over the existing strips would be that the slots would enable adjustments to be carried out with greater ease. On the other hand, structures held together by means of bolts placed in slotted holes could hardly be said to conform with engineering practice, as the bolts would tend to slide in the slots, and the rigidity of the structure would suffer. It should be remembered that while the "keyword" of the Meccano system is "adaptability," strength of construction has never been sacrificed to achieve this end. (*Reply to O. S. Westburn, Slough*).



NEW DOG CLUTCH.—We were interested in your idea that a new form of dog clutch should be introduced. Your suggested part would consist of a brass collar with either the male or female portions of the standard Dog Clutch cut in each end. This part would doubtless prove useful in gear boxes, etc., but we would point out to you that it is possible to devise this article from existing parts. This can be done by securing two Dog Clutch members in the sockets of one of the new Socket Couplings. (*Reply to L. Redshaw, Bourne*).

2½″ GEAR WHEEL.—The introduction of a gear wheel of this size is under consideration. When used in conjunction with a ½″ Pinion it would of course enable the extremely useful ratio of 5 : 1 to be obtained. A further announcement regarding this part will shortly appear. (*Reply to L. Redshaw, Bourne*).

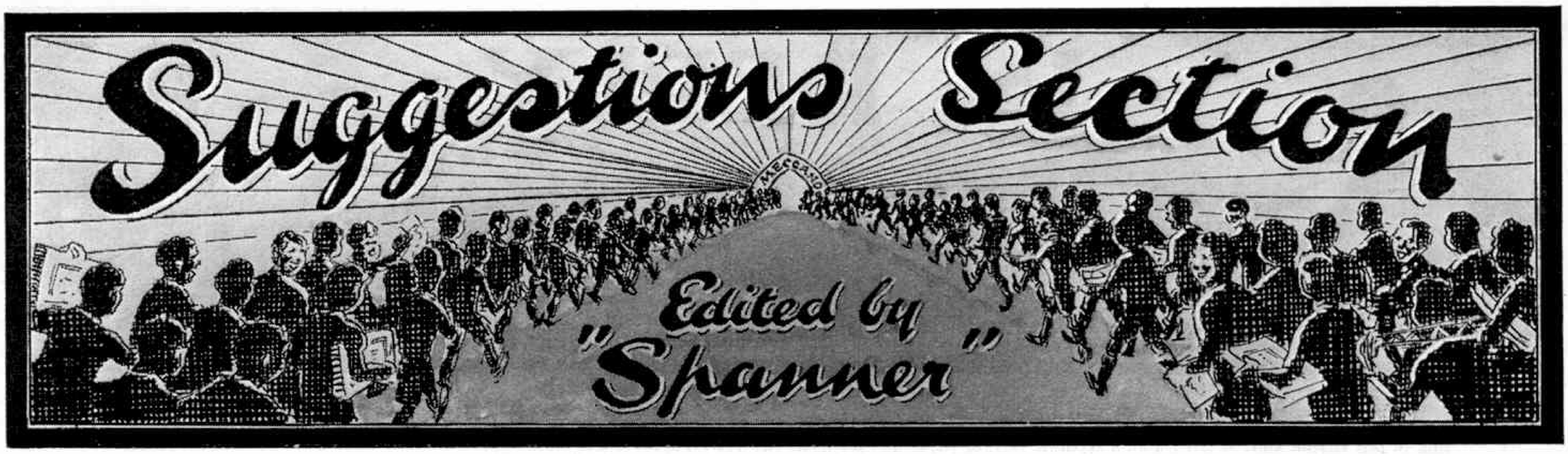
IMPROVED PULLEY.—Your suggestion that special belt pulleys should be introduced is quite good. These pulleys would resemble the existing ones with the exception that the bottom of the groove would be flattened to enable the belt to grip. We would point out to you however, that it is quite a simple matter to build up belt pulleys from existing parts. For example, two Flanged Wheels butted together form an efficient pulley of this type, while if a larger pulley is required, two Wheel Flanges secured to Face Plates and butted together can be employed. (*Reply to W. E. Avory, London, W.11*).

SPRING COUPLING.—As previously stated, we are not considering introducing a Spring Universal Coupling into the system. We were interested to hear that you have devised a Coupling of this type from a length of "spring curtain rod" held in the bores of two standard Couplings. Although the universal coupling thus formed will not be so positive in action as the Meccano Universal Coupling (part No. 140), we recommend readers to try it out, as it is certainly very ingenious. (*Reply to P. Morris, Chiswick, W.4*).

CIRCULAR RACK STRIPS.—A circular rack strip serrated on both edges would be a most useful addition to the Meccano system. The part could be used as an internally toothed gear in the construction of an epicyclic gear box. We are giving careful attention to this idea. (*Reply to J. R. Sheldon, Chester, and others*).

Fun with the Funicular!

Here we have an excellent camera-study of a young Meccano enthusiast happily engaged in watching his model funicular railway in operation. Most readers will agree that the model is indeed an excellent example of constructional skill and ingenuity and they will understand the pleased expression on its constructor's face as he watches the cars hauled up and down the inclined tracks



(162)—Sliding Dog Constant Mesh Gear Box

(J. M. and A. M. Johnston, Dunstable)

THE gear box shown in Fig. 162 possesses several features of unusual interest. An efficient "gate" change is included, all the gears are in constant mesh, and extensive use is made of the new Socket Coupling. The fact that the gears are in constant mesh eliminates wear to a large extent and facilitates gear-changing, while the employment of the "gate" ensures that a particular gear cannot be engaged unless all the others are in neutral. The model very closely follows the design used in nearly all motor cars.

The gear box is composed of $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates with $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates connecting their ends. The shaft 1, which is driven by the engine, is a short Rod journalled in one of the end Plates and also halfway through the top transverse bore of the Coupling 14. The latter is secured to a Threaded Pin that, in turn, is secured to a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip bolted to the side Plates of the gear box. The Rod has a 1" Gear 12 secured to it, which meshes with both the similar Gears 11 and 13 on the Rods 3 and 4 respectively.

The Rod 3 carries two sliding clutch units 9 and 10. The unit 9 comprises a portion of a Dog Clutch and a $\frac{1}{2}''$ Pinion ($\frac{1}{2}''$ face), connected together rigidly by means of a Socket Coupling; the other member of the Dog Clutch is secured on the Rod.

The unit 10 is similar but a 1" Gear is employed instead of the Pinion. The two clutch units on the Rod 4 are identical, each consisting of a $\frac{1}{2}''$ Pinion ($\frac{1}{2}''$ face) and one portion of a Dog Clutch held together by a Socket Coupling. Either of these engage at will with the appropriate fixed portions of the Dog Clutches on the Rod.

The "gate" in which the gear change lever moves and which prevents a false change being made, is composed of two $1\frac{1}{2}''$ Strips, two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, and two Double Bent Strips, the entire assembly being attached to $2\frac{1}{2}''$ Strips secured to the end Plate of the gear box. The gear lever is held in the boss of a Swivel Bearing that is mounted freely on a Pivot Bolt. The lever, when moved sideways through the gate, engages between the pair of $\frac{1}{2}''$ fast Pulleys on either of the gear selector rods 5 and 6; the latter may then be moved backwards or forwards to change gear. The selector rods have short Rods secured to them by Couplings and engaging with opposite sides of the grooves of the Socket Couplings.

The device for locking each selector rod after movement of the lever is shown clearly in the illustration. It consists of a $\frac{1}{2}''$ Bolt mounted on the end of a $1'' \times \frac{1}{2}''$ Angle Bracket. The head of the bolt rests in the hole of a Collar secured to the rod to lock the gears in the neutral position, and on either side of the Collar to prevent the gears riding out of mesh after engagement.

The travel of each selector rod should be just sufficient to permit of the bolt heads springing over the edges of the Collars when a gear comes into engagement. This result may be attained by adjusting the positions of the Clutches on the Rods 3 and 4, the Gears on the Rod 2, and the distance between the Couplings on the selector rods. Matters must be so arranged, of course, that when both selector rods are in the neutral position, they are retained therein by the heads of the bolts of the locking devices falling into the holes of the Collars. If the construction of the model has been carefully carried out, it should be impossible to move the gear lever across the gate, without first restoring it to the neutral position.

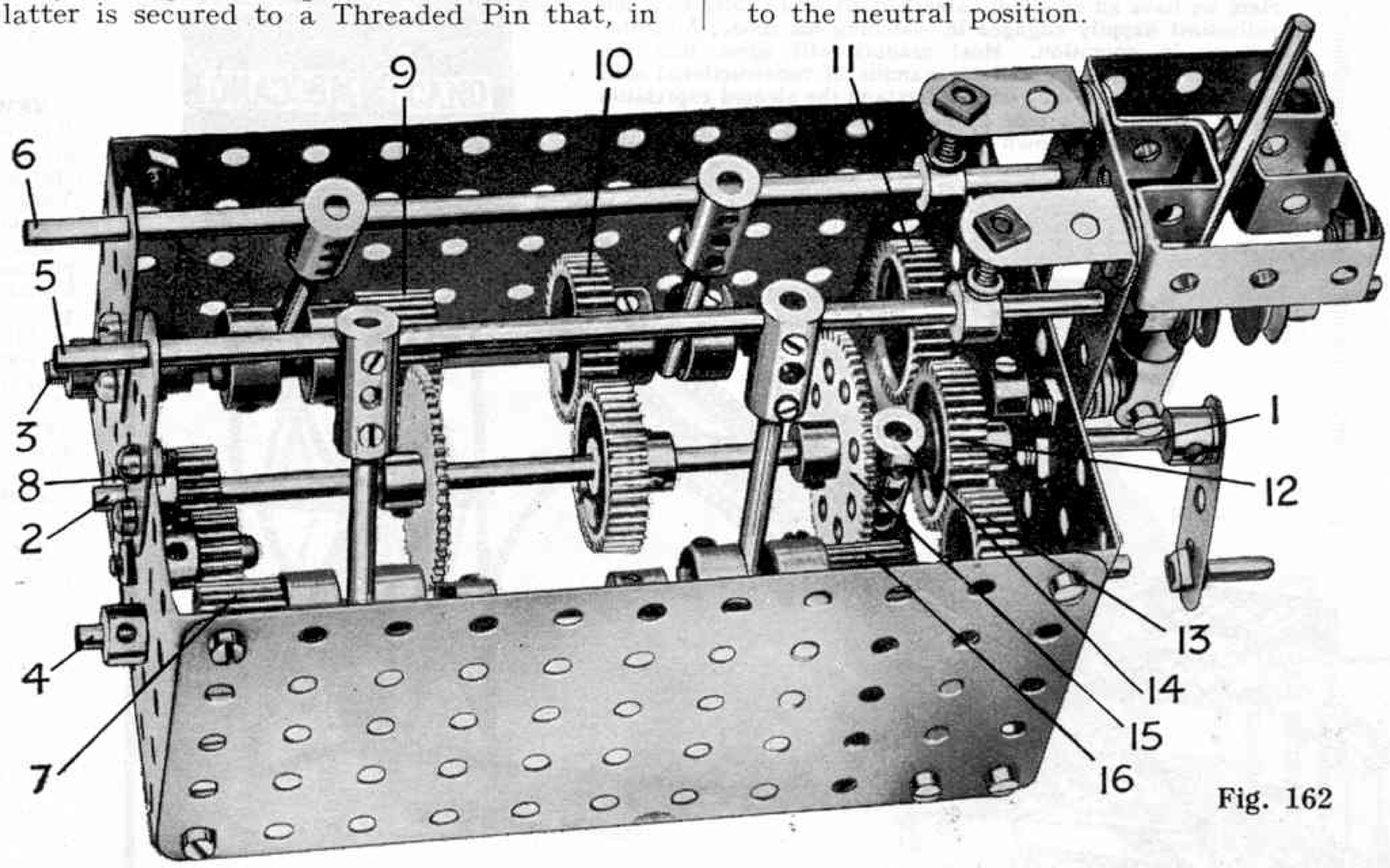


Fig. 162

When the gear lever is on the near side of the gate and moved forward, the unit 16 will slide along the Rod and come into engagement with the fixed portion of its clutch. Thus the Rod 2 is driven through the gears 12, 13, 16 and 15, giving first forward speed. By moving the lever in the opposite direction, reverse gear will be obtained. By first restoring the gear lever to neutral, moving it through the gate, and then forward, the unit 9 will drive the Rod 2 through the medium of the 50-teeth Gear secured to it. This is second forward gear. Then, by shifting the gear lever back, the top gear ratio will be obtained.

Although the general design of the gear box is excellent, there are one or two points that require criticism. A departure from actual practice exists in the fact that the reverse gear ratio is the same as that of the top forward gear. This is a fault that could only be overcome by making radical alterations in the layout of the model.

The following readers have also sent in excellent designs of gear boxes: S. Herbert, London, S.E.15; H. Hankey, Limpsfield; M. Jackson, Berkhamstead; F. Case, East Grinstead; G. Redfern, Matlock; L. Stone, Plumstead, S.E.18; L. Hogarth, Cardiff, and many others. These gear boxes do not make any considerable advance on those already published, however.

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."

THE MAGIC CLOCK: A NEW COMPETITION

"Time" that Waits for Any Man!

In view of the enormous success of the three "mystery" competitions that have appeared previously in the "Suggestions Section," we have been on the look out for some time past for a suitable subject for another competition of the same type, and now the opportunity is afforded by a suggestion received from Eric Brammer (Armley, Leeds). The model shown in Fig. 163 is based on his suggestion, and as will be seen it resembles a clock face with a single hand.

The hand is mounted upon a pivot so that it may be spun round and round, its longer arm being balanced by a Worm on the shorter arm. The peculiarity of the model lies in the fact that the hand will stop at any pre-arranged hour! Brammer used his model to mystify his friends at a party, and we believe many Meccano boys will decide to employ it for a similar purpose. The demonstrator asks any one of his audience to name the particular hour at which the hand is to stop. He then moves the hand to the hour stated, and sets it spinning rapidly. No matter how many revolutions the hand makes, it will always stop at the pre-arranged point. The process may be repeated indefinitely, the demonstrator merely pointing the hand to each new hour called for and then spinning it round.

The problem of how this result is brought about is just the kind that appeals to keen Meccano boys. We are withholding further details of the model, therefore, so that readers may think out the solution for themselves and send in their efforts for participation in the "Magic Clock" Competition. For their guidance we may say that the model is constructed throughout with standard Meccano parts, excepting the clock face, which may easily be contrived from a sheet of cardboard.

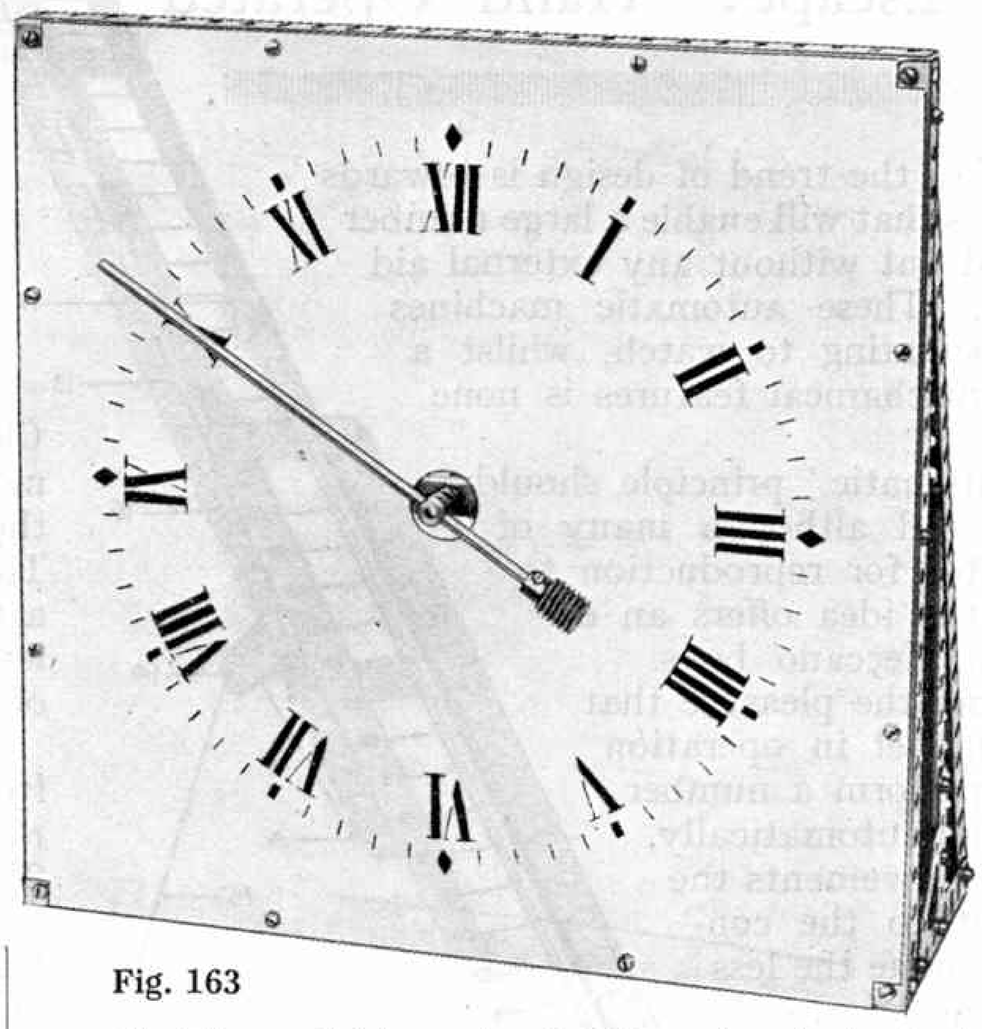


Fig. 163

Entries in the Competition will be divided into Section A, for readers residing in the British Isles, and Section B, for readers residing overseas. A prize consisting of a selection of Meccano or Hornby goods, to be chosen by the winner, to the value of ONE GUINEA will be presented for the best entry in each section, and other readers whose entries are considered to be particularly good will receive special Meccano Certificates of Merit and complimentary copies of the "Book of Famous Trains," by C. J. Allen, or of the Meccano Standard Mechanisms Manual.

If no competitor succeeds in reproducing the operating mechanism exactly as fitted to the original model the principal prize in each section will be awarded to the competitor whose entry approaches nearest to the correct solution or shows how the required results may be obtained in the simplest manner.

Competitors should send in clear photographs or drawings of their solutions together with any explanations that may be necessary, although the latter should be as brief as possible. Actual models should not be sent. The name, address, and age of the competitor and name of the competition ("Magic Clock") must appear on the back of each photograph or sheet of paper used, and envelopes marked "Magic Clock."

Closing date for Section A, 31st August. Section B, 30th November, 1929.

(164)—Gradient Indicator

(H. Moorcroft, Lincoln)

The device illustrated in Fig. 164 consists essentially of a pendulum that is mounted so as to register changes in the gradients encountered whilst cycling or motoring, etc. It may also be used in models.

The pendulum 1 consists of a short Rod that is secured by means of a Coupling to a Rod carrying a $1\frac{1}{2}''$ Contrate Wheel. The pendulum may be made longer than in the illustration in order to render it more sensitive to slight changes in the gradient. The dial 2 consists of a Bush Wheel, on which is stuck a circular disc of cardboard, suitably graduated. In the illustration the Pointer 3 (part No. 156) is shown partly cut away in order to expose to view the top end of the pendulum.

The spindle on which the dial is mounted is journalled near its top end in a $1\frac{1}{2}''$ Double Angle Strip and at its bottom end in the longitudinal bore of a Coupling that is mounted on the Rod carrying the $1\frac{1}{2}''$ Contrate. A $\frac{1}{2}''$ Pinion is secured on the dial spindle and meshes with the Contrate.

When complete, the device may be clamped to the top bar of the cycle by the 2" Screwed Rod 4. Matters should be so arranged that the zero mark on the scale is opposite the Pointer 3 with the machine standing on a perfectly level surface.

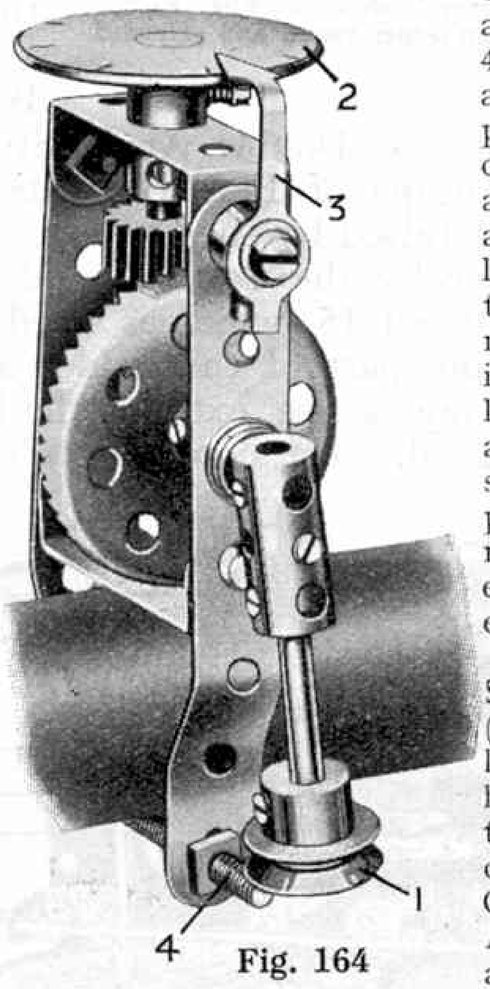


Fig. 164

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.54). "Cum Bak" Car.—A novel suggestion has been sent in by C. Jalin (Dunston-on-Tyne) in the shape of a model car that when pushed forward a few feet returns again to its starting point. This result is achieved by attaching a Spring (part No. 43) to the road wheel axle by a short length of cord. In pushing the car forward the cord is wound round the axle and the Spring is extended, and when the model is released the Spring, in recoiling, turns the road wheels in the reverse direction. Jalin's idea should appeal particularly to one's younger brothers and sisters with whom the simple type of model is more popular than the complicated mechanisms that arouse the enthusiasm of the Meccano expert.

(M.55). Coin-in-the-slot Success.—V. K. Rangaswami (Mylapore, Madras) is evidently full of excellent ideas, for he organised recently an extremely interesting exhibition of Meccano models at his College Physics Exhibition. Amongst the models that attracted most attention were the Meccano Chassis—shown working alongside a diagram of an actual chassis for comparison—and a model of the Big Wheel, with which was incorporated the coin-in-the-slot mechanism described in the "Suggestions Section" of the November, 1928, "*M.M.*" The latter model proved undoubtedly the greatest draw, for over 250 visitors put coins in it!

(M.56). Roller Blotter Pad.—A blotter designed by A. Wood (Rotherham) consists essentially of a $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate that is curved slightly so that blotting paper may be placed on its convex side. The Plate is retained in the curved position by means of crossed $4\frac{1}{2}''$ Strips that are attached to the four corners. A suitable handle for holding the blotter when in use is composed of $2\frac{1}{2}''$ Double Angle Strips, secured by a bolt to the point of intersection of the $4\frac{1}{2}''$ Strips.

(M.57). Ratchet for Brake Lever.—Readers must often have experienced difficulty in locking a hand brake lever in the "on" position. F. Griffiths (Blackburn) has overcome the difficulty by securing a ratchet wheel near the pivot of the brake lever and arranging a Pawl on the lever itself to engage with it. The Pawl is pulled out of engagement with the Ratchet Wheel by means of a short length of wire, which is secured to the Pawl and to a small lever on the end of the brake lever proper. The lever actuating the Pawl consists of Threaded Pin mounted on a Collar, the wire mentioned previously being attached to the Threaded Pin. The Threaded Pin and Collar look rather cumbrous when mounted on the end of the brake lever, and the wire attachment between the pawl and threaded pin is also open to criticism.

New Meccano Models

Automatic Fire Escape: Hand Operated Gantry Crane

IN engineering practice to-day the trend of design is towards the production of machines that will enable a large number of processes to be carried out without any external aid other than a prime mover. These automatic machines are of course extremely fascinating to watch, whilst a detailed inspection of their mechanical features is none the less interesting.

It is natural that the 'automatic' principle should interest the model-builder, and although many of the mechanisms are unsuitable for reproduction to a small scale, undoubtedly the idea offers an excellent field for enthusiastic Meccano boys.

Readers can well understand the pleasure that will result from setting a model in operation and afterwards watching it perform a number of different functions entirely automatically, the more varied the series of movements the greater being the enjoyment to the constructor. Quite a simple but none the less interesting example of this class of model appears on this page.

Automatic Fire Escape

Fig. 1 shows a very ingenious model of a fire escape, the ladder of which is raised and extended automatically when the vehicle runs up against a wall, while Fig. 2 is an underneath view of it.

Commence the construction of the model by building the chassis, which consists of two $12\frac{1}{2}''$ Angle Girders 20 spaced apart by means of $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Plates. Flat Trunnions are bolted to the Girders to act as journals for two $4\frac{1}{2}''$ Axle Rods carrying four 3″ Pulley Wheels forming the road wheels of the model. The motive power is supplied by a Clockwork Motor which is carried underneath the chassis so that the side plates form part of the model. A Worm 2 (see Fig. 2) is secured to the driving spindle and engages with a $\frac{1}{2}''$ Pinion on a Rod that is journalled in a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. This Rod carries a Bevel Wheel 3 meshing with a further Bevel 4 that is carried on the axle of the front road wheels.

It is important to note that in order to bring the shaft of the Bevel 3 into line with the back axle it is necessary to raise the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and the $4\frac{1}{2}''$ Strip by means of Collars placed between the Strips and Motor casing. This also applies to the $3\frac{1}{2}''$ Strip to which the Double Angle Strip is bolted. The model may be reversed by pushing over the reversing lever 7 of the Clockwork Motor, while the Collar 5 mounted upon a 3″ Axle Rod controls the stopping and starting of the Motor. The inner end of the 3″ Rod is held in a Collar pivotally secured to the brake lever of the Clockwork Motor by means of a bolt.

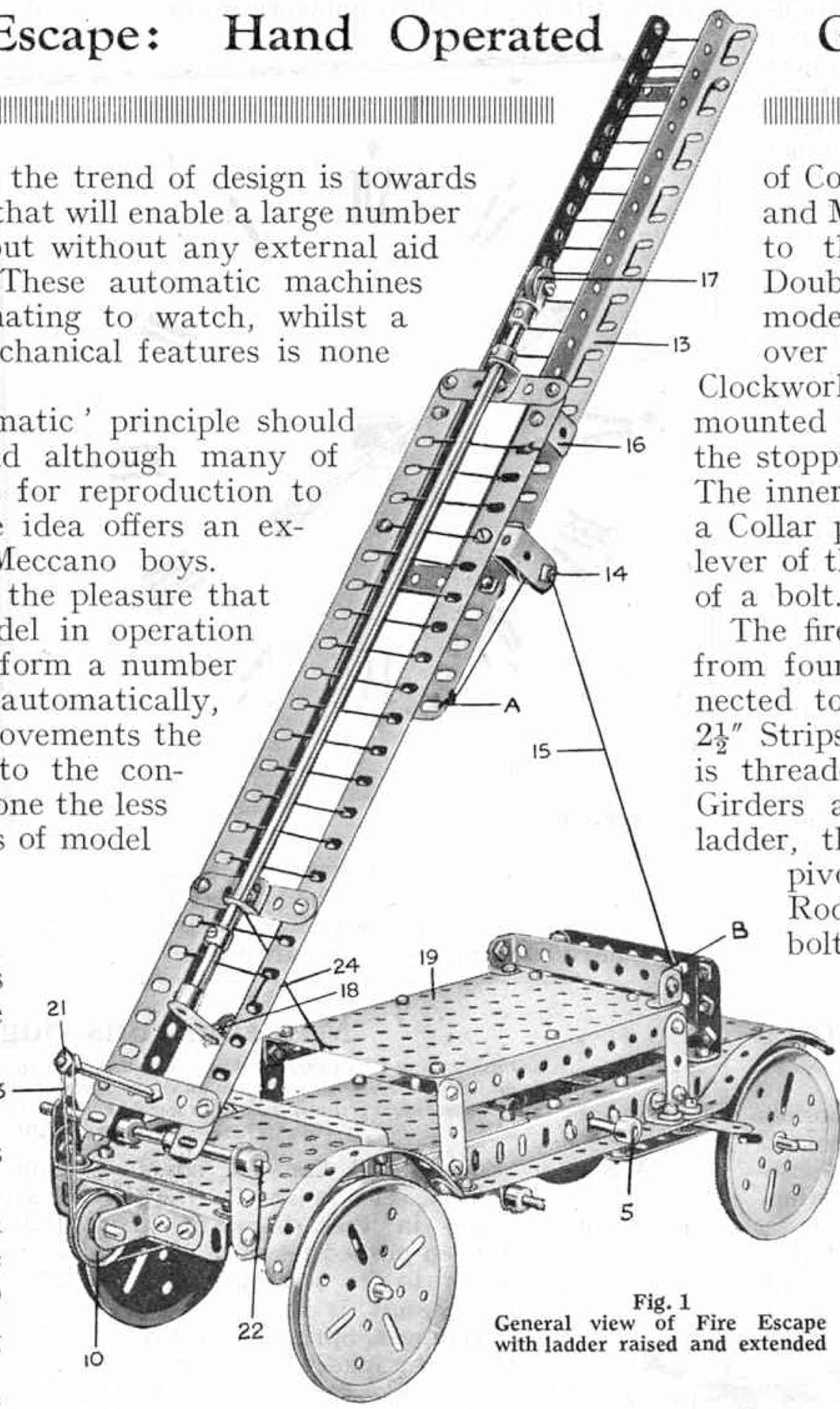


Fig. 1
General view of Fire Escape with ladder raised and extended

The fire escape proper is constructed from four $12\frac{1}{2}''$ Angle Girders 13 connected together in pairs by means of $2\frac{1}{2}''$ Strips. A length of Meccano cord is threaded through the holes in the Girders and forms the rungs of the ladder, the lower section of which is pivoted on a $4\frac{1}{2}''$ Rod 22. This Rod is held in two $1\frac{1}{2}''$ Strips bolted to the side frames of the model and is secured by means of Collars. The upper pair of Girders 13 slide in four Double Brackets 16 that are bolted to the lower portion of the escape.

When the model is run up to a wall the $\frac{1}{2}''$ Pulley 17 (Fig. 1), is forced back, releasing by its movement the catch 18 (consisting of a Crank with an Angle Bracket attached to it), from a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip secured to the chassis by means of Flat Brackets. This causes the ladder to be raised by the Springs, which are connected to the ladder by the Cord 23 and the 2″ Threaded Rod 21. The Cord 15, which is fixed at the point "A" on the moving part of the ladder and "B" on the body of the fire escape, extends the ladder as the lower section is raised. The cord passes over the $\frac{1}{2}''$ Pulley 14 that is carried in a Single Bent Strip and attached to the bottom of the ladder by an Angle Bracket. The $\frac{1}{2}''$ fast Pulley 6 (see Fig. 2) is secured to a $6\frac{1}{2}''$ Rod journalled in $1'' \times 1''$ Angle Brackets. It takes no active part in the action of the mechanism but prevents the vehicle touching the wall and thus

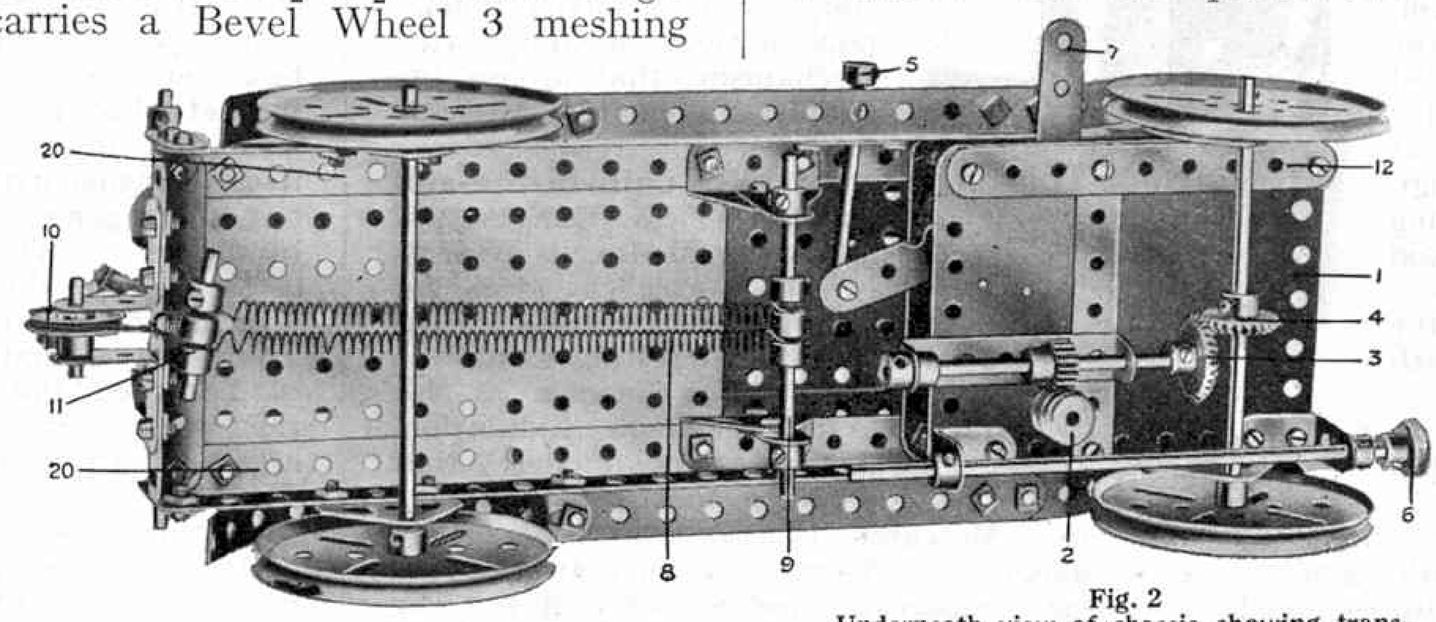


Fig. 2
Underneath view of chassis, showing transmission gear and Springs operating ladder

fouling the extended portion of the escape.

Before setting the model in motion apply a little oil to the gears and shafts so that everything will run smoothly. Then wind the Motor and place the model so that it will run to the wall of the room, where, as soon as the Pulley 17 touches the wall, the catch 18 will be released allowing the ladder to be raised and extended.

The following parts are required in the construction of the model: 2 of No. 2; 4 of No. 2a; 4 of No. 3; 7 of No. 5; 10 of No. 6a; 6 of No. 8; 2 of No. 9; 2 of No. 9b; 2 of No. 10; 4 of No. 11; 10 of No. 12; 4 of No. 12a; 1 of No. 13; 1 of No. 14; 3 of No. 15; 2 of No. 16; 2 of No. 16a; 1 of No. 18a; 1 of No. 18b; 4 of No. 19a; 1 of No. 22; 2 of No. 23; 1 of No. 23a; 1 of No. 26; 2 of No. 30; 1 of No. 32; 86 of No. 37; 8 of No. 37a; 2 of No. 38; 1 of No. 40; 2 of No. 43; 1 of No. 48a; 2 of No. 48b; 2 of No. 52a; 20 of No. 59; 1 of No. 62; 1 of No. 81; 1 of No. 102; 5 of No. 111c; 1 of No. 116; 2 of No. 126; 4 of No. 126a; 1 Clockwork Motor. These parts are in Outfit No. 7.

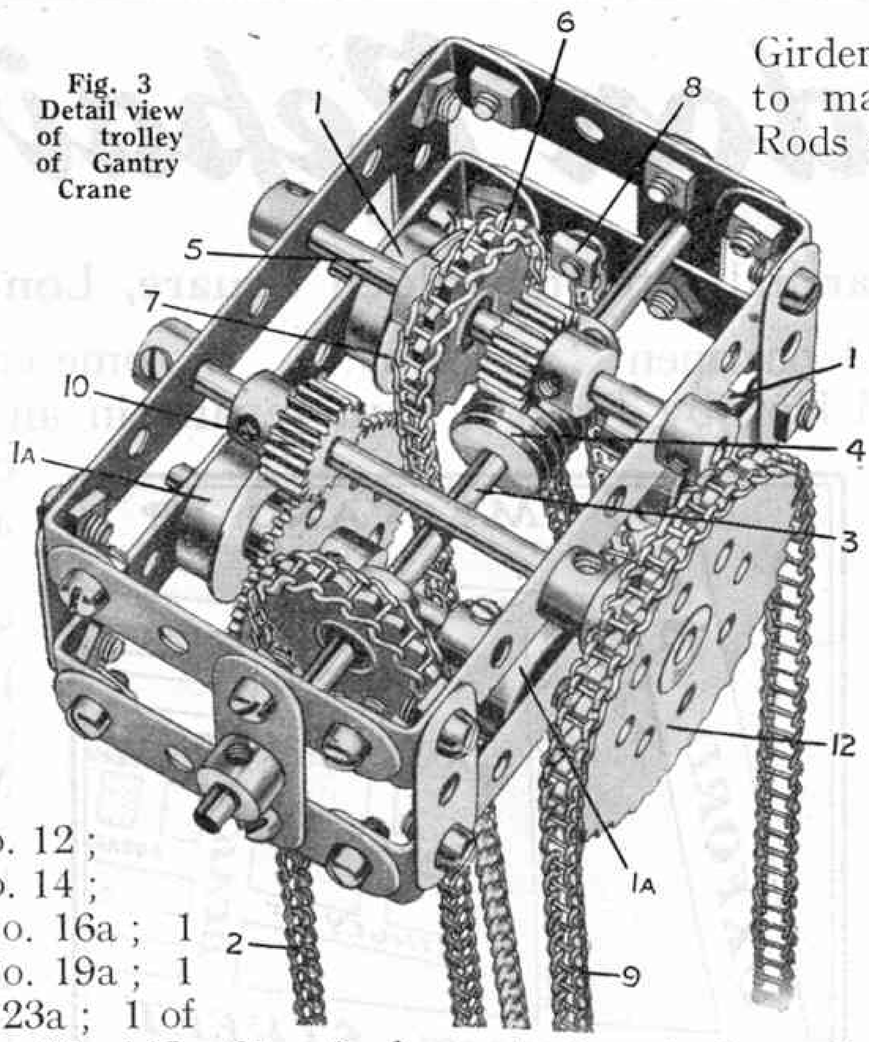


Fig. 3 Detail view of trolley of Gantry Crane

Hand Operated Gantry Crane

On mention of a gantry crane many readers will at once visualise a large and massive structure employed in the casting shops of a locomotive works, etc., where large and heavy masses of metal have to be handled.

The gantry crane has, however, many other uses besides that mentioned above, the prototype of the model shown in Fig. 4 being employed in warehouses, etc., where crates and boxes are unloaded from lorries and wagons. As exceptional lifting power is not required, hand operated hoisting and travelling gear is included in place of the powerful electric motor used to drive the larger types of cranes previously mentioned.

The horizontal frame of the gantry consists of two $12\frac{1}{2}''$ Angle Girders extended at each end by means of $5\frac{1}{2}''$ Girders. Braced Girders 13 support further $12\frac{1}{2}''$ Angle Girders that form the track along which travels the crane trolley.

The end towers are each built up from $12\frac{1}{2}''$ Angle Girders 14, Strips being bolted to them to make the structure rigid. $1\frac{1}{2}''$ Axle Rods are journalled in the lower ends of the Girders, and carry $\frac{3}{4}''$ Flanged Wheels that form the travelling wheels.

The construction of the trolley or traveller is shown clearly in Fig. 3. Two pairs of $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are spaced apart by means of 2" Strips and $1\frac{1}{2}''$ Strips are bolted between each pair. Two $2\frac{1}{2}''$ Rods are journalled in the Double Angle Strips and carry the $\frac{3}{4}''$ Flanged Wheels 1 and 1a. The Rod of the wheels 1a also carries a 57-teeth Gear which meshes with the $\frac{1}{2}''$ Pinion 10.

By hauling on the Chain 9, which is passed over the Sprocket Wheel 12, the $\frac{1}{2}''$ Pinion 10 and the 57-teeth Gear Wheel is made to rotate, thus driving the Flanged Wheels 1a and causing the trolley to travel along the gantry.

The hoisting mechanism is operated by the chain 2 which passes over a 1" Sprocket on a $4\frac{1}{2}''$ Rod 3. A Worm 4 on the same Rod engages the teeth of a $\frac{1}{2}''$ Pinion on the Rod 5 carrying a 1" Sprocket Wheel 6. A length of Sprocket Chain 7 is placed over this Wheel, one end of it being secured between two Flat Trunnions 15, while the other end is secured to the frame of the trolley by means of a nut and bolt 8. By operating the Chain 2 the load hook 16 is raised or lowered.

Track on which the four $\frac{3}{4}''$ Flanged Wheels of the Gantry may travel can be built up from Angle Girders, or a double length of Hornby track would be equally effective.

The parts required for the model are: 12 of No. 2; 4 of No. 3; 6 of No. 4; 4 of No. 5; 4 of No. 6; 6 of No. 6a; 12 of No. 8; 4 of No. 9; 1 of No. 15a; 3 of No. 16a; 1 of No. 16b; 4 of No. 18a; 8 of No. 20b; 2 of No. 26; 1 of No. 27a; 1 of No. 32; 87 of No. 37; 8 of No. 37a; 2 of No. 38; 4 of No. 48b; 1 of No. 57; 6 of No. 59; 4 of No. 90a; 60" of No. 94; 1 of No. 95; 2 of No. 96; 2 of No. 99; 4 of No. 111c; 2 of No. 126a.

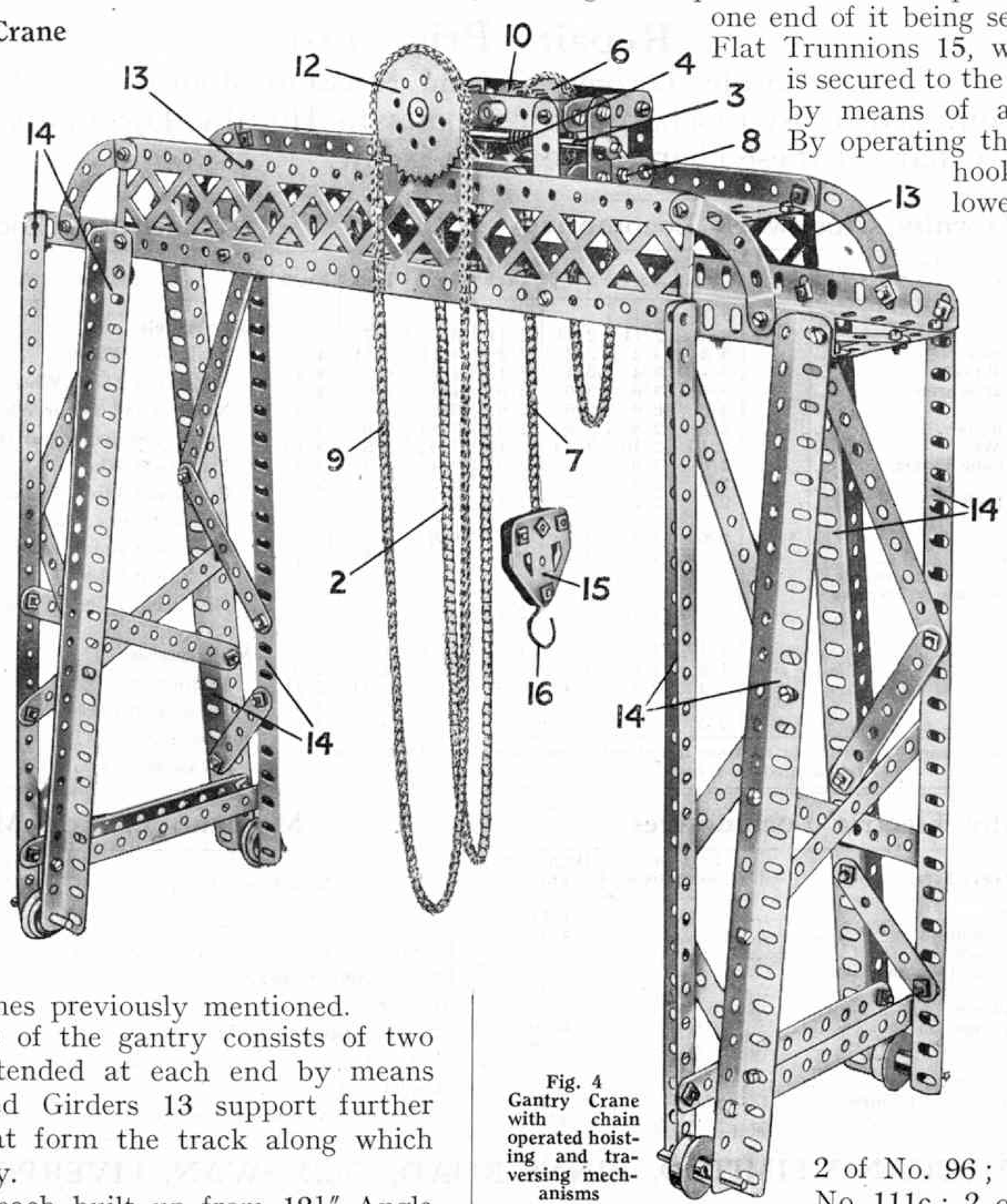
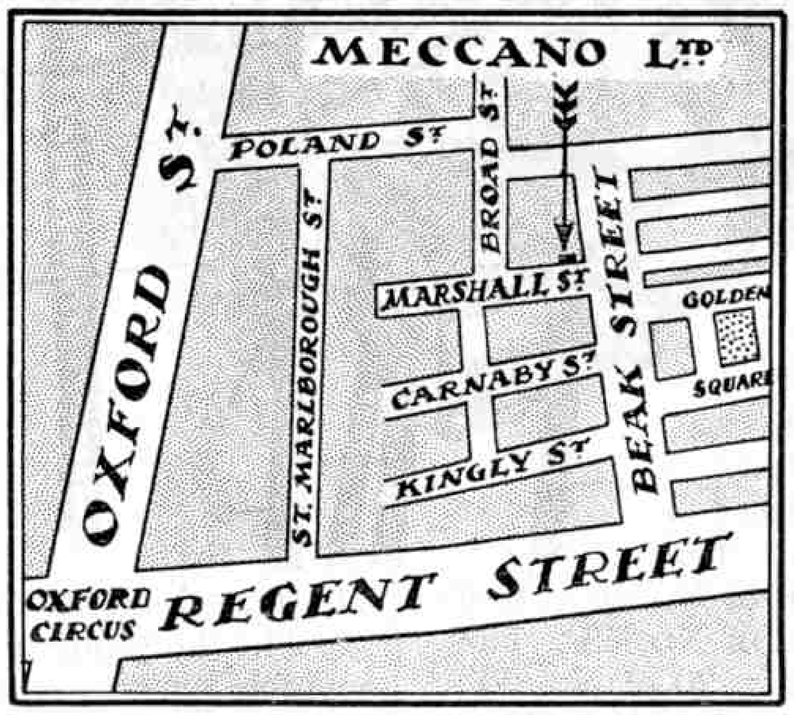


Fig. 4 Gantry Crane with chain operated hoisting and traversing mechanisms

Our London Repair Depot

is at 5-6, Marshall Street, Golden Square, London, W.1

Hitherto our Service Department at Liverpool has carried out all Hornby Train and Meccano Motor repairs for the whole of the United Kingdom. Now, for the convenience of boys living in London and the Home Counties, we have established a new London Service and Repair depot, fully equipped to deal expeditiously with all Hornby and Meccano repairs. The accompanying map shows how to find the depot, the address of which is 5-6, Marshall Street, Golden Square, W.1. In some cases it is possible to carry out repairs in an hour or two, but this is dependent entirely on the amount of work necessary.



Plan showing Position of our London Repair Depot

When Locomotives are sent to the depot by parcel post they should be packed carefully and addressed to Meccano Ltd., 5-6, Marshall Street, Golden Square, London, W.1. A note should be enclosed in the parcel giving the name and address of the sender, together with full instructions regarding the repairs to be carried out.

Repairs Price List

Hornby Locomotives and Meccano Motors

We have compiled a list of charges for repairs to Hornby Locomotives and Meccano Motors. Particulars of these charges are given below.

Hornby Clockwork Locomotives

New Parts Fitted, and Renovations	M1/2	M3	No. 0	No. 1	No. 1 Tank	No. 2	No. 2 Tank	No. 3
Gear Wheels								
No. 1 Gear Wheel	—	2/11	2/11	2/11	2/11	3/7	3/7	3/7
Nos. 1 and 2 Gear Wheels	—	3/2	3/2	3/2	3/2	3/11	3/11	4/–
Nos. 1, 2 and 3 Gear Wheels	—	3/4	3/4	3/4	3/4	4/3	4/3	4/4
Nos. 1, 2, 3 and 4 Gear Wheels	—	3/6	3/6	3/6	3/6	4/6	4/6	4/7
No. 2 Gear Wheel	—	2/6	2/6	2/6	2/6	3/2	3/2	3/3
Nos. 2 and 3 Gear Wheels	—	2/8	2/8	2/8	2/8	3/6	3/6	3/7
Nos. 2, 3 and 4 Gear Wheels	—	2/10	2/10	2/10	2/10	3/9	3/9	3/10
No. 2 Gear and Reversing Pinion... ...	—	2/8	2/8	2/8	2/8	3/4	3/4	3/5
No. 3 Gear Wheel	—	2/5	2/5	2/5	2/5	3/2	3/2	3/2
Nos. 3 and 4 Gear Wheels	—	2/7	2/7	2/7	2/7	3/5	3/5	3/5
Housings								
*New Housings	1/9	2/6	3/6	4/–	4/–	6/6	7/–	11/–
Enamelling Housings	—	—	3/1	3/4	3/4	5/–	5/8	7/4
Additional charges for enamelling Housings in cases where repairs are also effected	—	—	1/10	2/1	2/1	3/8	4/4	6/–
Miscellaneous								
Mainspring	–/11	1/7	1/7	1/7	1/7	1/10	1/10	2/–
Set of Motor Wheels	—	1/8	1/8	1/8	1/8	2/3	2/3	2/3
Winding Shaft	—	2/4	2/4	2/4	2/4	2/11	2/11	2/11
4 Bogie Wheels	—	—	—	—	—	1/5	1/5	1/5
Governor	—	2/5	2/5	2/5	2/5	3/2	3/2	3/2

*In cases where new housings are fitted in addition to extensive mechanical repairs they will be charged at a reduced rate.

Meccano Clockwork Motor

New Parts Fitted	Clockwork Motor
Gear Wheels	
No. 1 Gear Wheel	1/10
Nos. 1 and 2 Gear Wheels	2/–
Nos. 1, 2 and 3 Gear Wheels	2/2
Nos. 1, 2, 3 and 4 Gear Wheels	2/4
No. 2 Gear Wheel	1/3
Nos. 2 and 3 Gear Wheels	1/5
Nos. 2, 3 and 4 Gear Wheels	1/7
No. 2 Gear and Reversing Pinion ...	1/4
No. 3 Gear Wheel	1/3
Nos. 3 and 4 Gear Wheels	1/5
Miscellaneous	
Mainspring	1/7
Winding Shaft	1/2
Governor	1/5
Re-assembling only	1/–

Hornby Electric Locomotives

New Parts Fitted	Low-volt Locomotives	High-volt Locomotives
Brushes (2), Springs (2)	2/–	1/11
Brushes, Springs and Commutator	4/1	4/5
Brushes, Springs and Shoes...	3/11	3/10
Brushes, Springs, Shoes and Commutator ...	4/3	4/7
Armature	5/8	6/1
Armature, Brushes, Springs	6/4	6/8
Armature, Brushes, Springs, Shoes	6/6	6/10
Field Coil	4/6	4/10
Sideplates (2)	5/7	4/5
Sideplates, Brushes and Springs	6/3	5/–
Sideplates, Brushes, Springs and Shoes	6/5	5/2
Collector Shoe Complete	3/10	3/10

Meccano Electric Motors

New Parts Fitted	Low-volt Motor No. 1	High-volt Electric Motor No. 2
Brushes (2), Springs (2)	1/9	1/9
Brushes, Springs and Commutator	3/3	3/7
Armature	3/7	6/11
Armature, Brushes, Springs	4/2	7/6
Field Coil	3/5	3/9
Sideplates (2)	2/8	2/8
Sideplates, Brushes and Springs	3/3	3/3

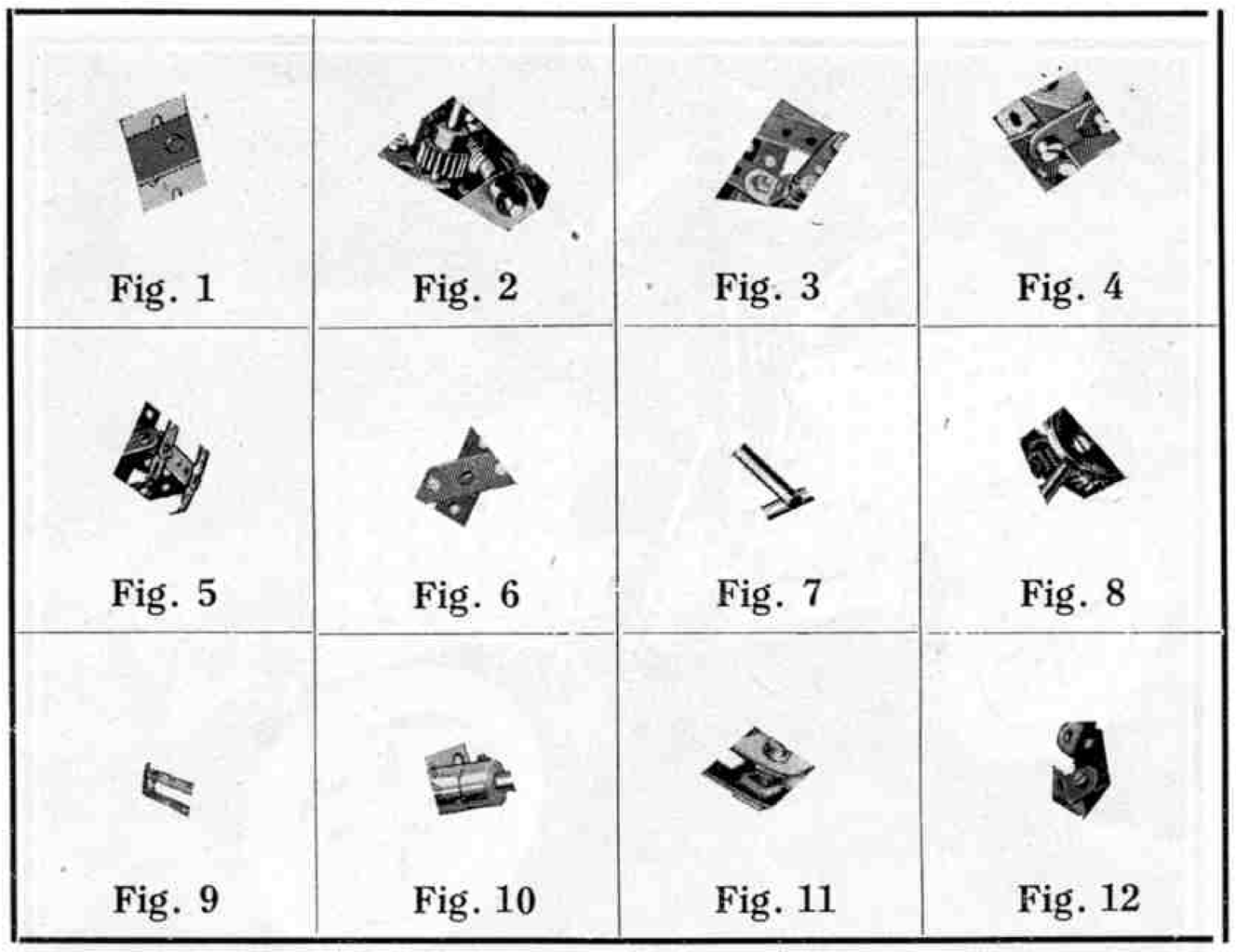
MECCANO LIMITED, BINNS ROAD, OLD SWAN, LIVERPOOL

Fourth "Lynx-Eye" Competition

A SPLENDID TEST FOR YOUR POWERS OF OBSERVATION

THE FOURTH AND FINAL CONTEST OF A NOVEL SERIES

The twelve fragmentary pictures that we illustrate herewith mark the last of the special series of "Lynx-Eye" Contests that have appeared in the "*M.M.*" recently. Solving these puzzle pictures is a remarkably fascinating task, and if you have not attempted the previous tests, hurry up and enter this contest right away. Readers who have competed in the three previous competitions should make a special effort to enter this one, for in addition to the usual prizes for this individual contest, we are offering three special prizes, consisting of Meccano products to the value of £3-3s., £2-2s., and £1-1s., for competitors who solve the largest number of pictures in all four of the series.



The twelve pictures shown herewith have all been cut from either the 00-3 or 4-7 Manuals, and all you have to do is to find out from which model each of the twelve pictures has been taken.

The contest will be divided into two Sections—Section A for readers residing in the British Isles, and Section B for readers residing Overseas. Prizes will be awarded in each section as follows:

First Prize: Meccano products to the value of £1-1s.; Second Prize: Meccano products to value 15/–; Third Prize: Meccano products to value 10/6. Twelve copies of "Famous Trains," by C. J. Allen.

In the event of more than one competitor solving all twelve puzzles correctly the prizes will be awarded to the first examined.

As you solve each picture write down carefully on a post card, first the number of the picture and then the number of the model from which it is taken. The post card must in addition contain your name, age and full address together with the Section in which you are entering. Address post cards "Fourth Lynx-Eye" Competition, Meccano Ltd., Old Swan, Liverpool. Entries for Section A must reach this office not later than 31st July, 1929. Competitors in Section B must post their entries so that they arrive not later than 30th September, 1929.

RESULT OF FIRST "LYNX-EYE" CONTEST (HOME SECTION)

The "Home" Section of the First Lynx-Eye Contest attracted an exceptionally large number of entries, and judging by the quantity of correct or almost correct solutions submitted, Meccano boys must have been "sharpening" their ocular members to a state of "razor keenness"!

Below we give the solution to the first set of pictures showing the Manual numbers of the models from which the fragments were removed.

Fig. 1, Model No. 4.51 (Fig. 4.51a); Fig. 2, Model No. 4.38; Fig. 3, Model No. 0.25; Fig. 4, Model No. 1.161; Fig. 5, Model No. 6.34 (Fig. 6.34a); Fig. 6, Model No. 4.53; Fig. 7, Model No. 4.33; Fig. 8, Model No. 3.12; Fig. 9, Model No. 00.4; Fig. 10, Model No. 1.43; Fig. 11, Model No. 3.51; Fig. 12, Model No. 7.21.

It was mentioned in the competition announcement that in the event of more than one correct entry being submitted, the prizes would be awarded to those first examined. This plan had to be adopted and the prizes were arranged accordingly. Prize winners are as follows:

First Prize (Meccano Products to value of £1-1s.): W. Parks, Burnham, Bucks. Second Prize (Meccano Products to value of 15/–): George Charlton, Eltham. Third Prize (Meccano Products to value of 10/6): Kenneth A. Bak, Leicester.

Twelve copies of "Famous Trains" by C. J. Allen (Meccano Library No. 1) have been awarded to the following competitors: E. H. Bradshaw, Sheffield; B. H. Moloney, Cheltenham; David Farnen, Liverpool; F. W. Crook, Sheffield; Cyril E. Wrayford, Teigngrace, Newton Abbot; George S. Marsh, Thornton, Blackpool; W. Wright, Chryston, Nr. Glasgow; Francis O'Connell, Liverpool; A. Lonnon, Kensington, W.8; Harry P. Thornton, London, N.W.10; John Young, Grimsby; R. Bowden, Richmond.

Results of the Overseas Sections of the Grand £100 Model-Building Contest

By Frank Hornby

How the Prizes have been Awarded to Competitors Abroad

IN the April issue of the "*M.M.*" a complete list of the prize-winners in the "Home" Sections of the Grand £100 Contest was published. The Overseas entries have now been judged and I am pleased to be able to include herewith the entire list of prize-winners.

I have always found that the Overseas Sections of model-building contests can be relied upon to produce something really novel and interesting, and I naturally held great expectations for the quality of the models submitted in these sections of the £100 Competition. I can certainly say that I was in no way disappointed!

Section D (for competitors over 16 years of age)

FIRST PRIZE, Tie; each competitor will receive a cheque for £2-10s.: Jean Woillez, 28, Rue de Rouen, Beauvais, Oise, France; Jack Bratt, 12, Newdegate Street, North Hobart, Tasmania.

SECOND PRIZE, Tie; each competitor will receive a cheque for £1-10s.: Cesare Sardi, Via Burlamacchi N.19, Lucca, Toscana, Italy; R. Wallace, 29, Bell Grove, Durban, Natal, South Africa.

THIRD PRIZE, Tie; each competitor will receive cheque for £1: Marcus D'Lima, 17, Sleater Road, Grant Road, Bombay, India; Giovanni Papo, 42, via Roma, Torino, Italy.

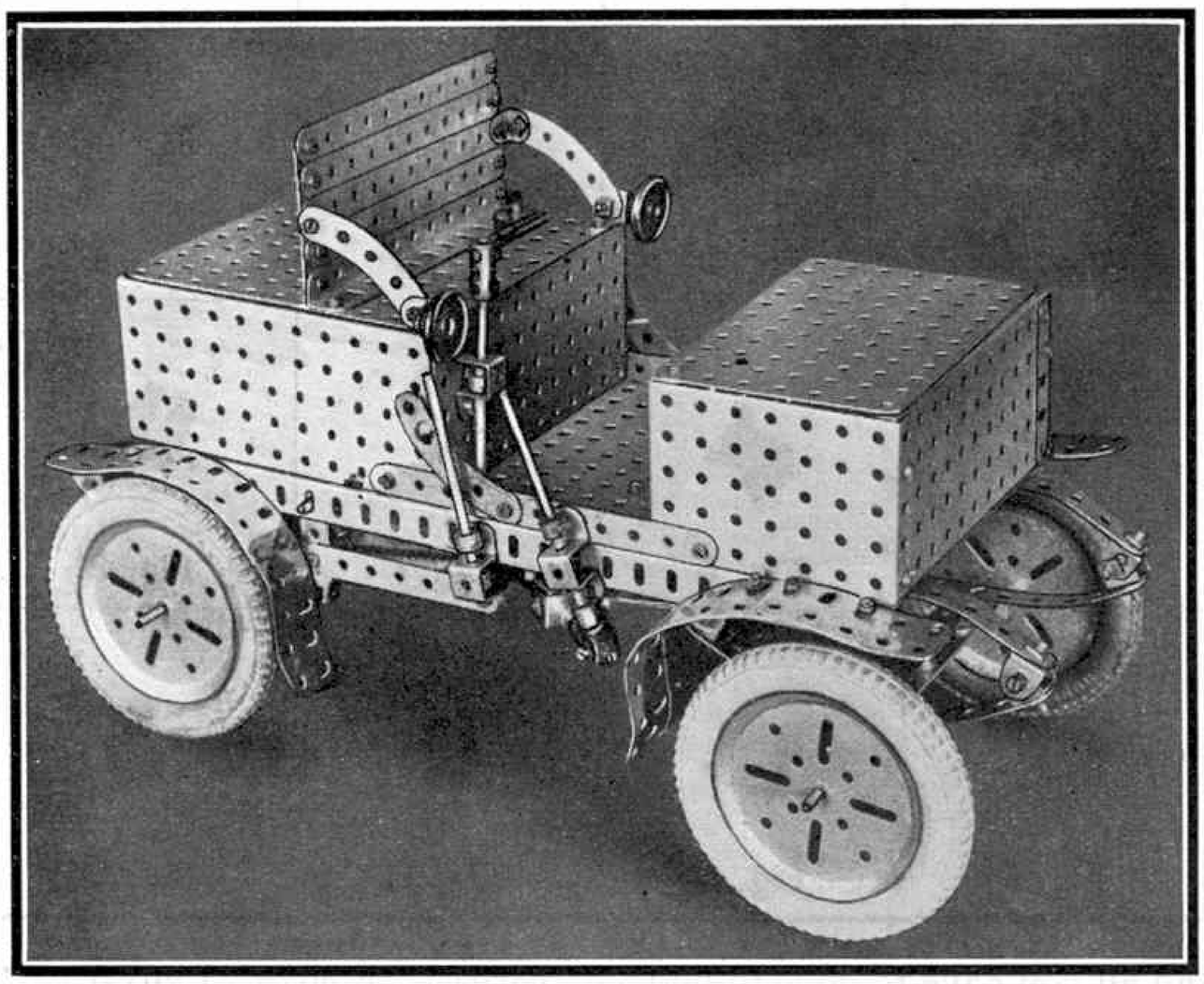
SPECIAL PRIZES have also been awarded as follows:—

PRIZE consisting of an Inventor's Outfit: George P. Henwood, 56, Lake Road, Takapuna, Auckland, New Zealand.

PRIZE consisting of a No. 2 Outfit: Edward A. Fountain, 213, 14th Street, Brandon, Manitoba, Canada.

PRIZE consisting of 6-volt Motor: Donald Robert Ross, Parkhouse Road, Cape Town, South Africa.

PRIZE consisting of Clockwork Motor: Thomas Aberdein, Belvedere Road, Claremont, South Africa.



J. Richardson's version of "Auckland's First Motor Car" (Second Prize, tie, Section E)

TWO PRIZES, each consisting of Meccano No. 2 Oil Can ("K" type): J. C. Rishworth, Balaghat Gold Mines, Coromandel P.O., Kolar Gold Fields, India; R. W. Earp, Edgecliff, Sydney, Australia.

TEN PRIZES, each consisting of a copy of "Famous Trains" by C. J. Allen (Meccano Library No. 1): J. W. Swift, Westmount, Quebec, Canada; R. C. Cumming, Vancouver, B.C., Canada; S. Hyett, Woollahra, Sydney, Australia; H. Stauffer, Zurich, Switzerland; John Frazer Dennison, Otago, New Zealand; R. O. Jukes, Christchurch, New Zealand; L. A. Day, Durban, Natal, South Africa; J. Neijts, 's Hertogenbosch, Holland; Jack Sharpley, Hastings, New Zealand; J. A. Galloway, Dannevirke, North Island, New Zealand.

TEN PRIZES, each consisting of a "Standard Mechanisms" Manual: Maxwell Gage, Mt. Eden, Auckland, New Zealand; E. F. Smith, Montreal, Canada; E. Worthington, Vancouver, B.C., Canada; A. Huszar and C. Ruata, Cairo, Egypt; Donald D. Smith, Flemington, New Jersey, U.S.A.; Hans Zimmerlin, Aaran, Switzerland; F. E. Bulkley, Pretoria, S. Africa; Leslie Potter, Mosman, Sydney, Australia; Roger F. Weagly, Maryland, U.S.A.; Georges Saltat, Besançon, France.

Section E (for competitors under 16 years of age)

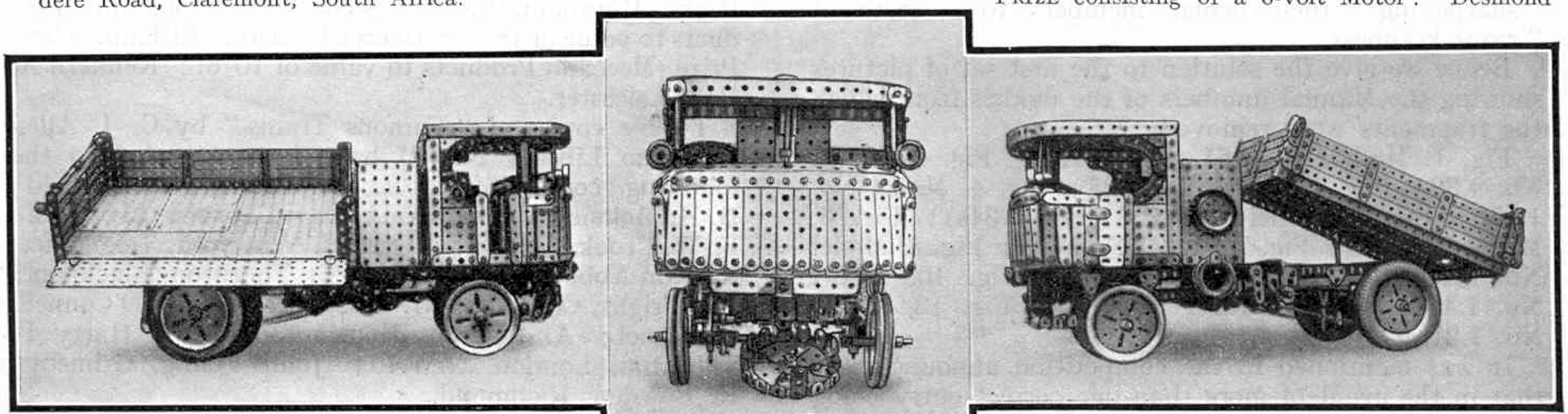
FIRST PRIZE, Tie; each competitor will receive a cheque for £1-10s.: J. A. Bakker, Lage Naarderweg 37a, Hilversum, Holland; Jack W. Tanner, 318 Young Street, Annandale, Sydney, Australia.

SECOND PRIZE, Tie: each competitor will receive a cheque for £1; Jack Richardson, 45, Empire Road, Epsom, Auckland, New Zealand; Stephen P. Morelock, Westminster, Maryland, U.S.A.

THIRD PRIZE, Tie; each competitor will receive a cheque for 10/-: John S. Elder, High School, De Aar, South Africa; D. W. Riddler, 30, Raymond Street, Timaru, S. Canterbury, New Zealand.

SPECIAL PRIZES have also been awarded as follows:—

PRIZE consisting of a 6-volt Motor: Desmond



An excellent model of a Steam Wagon built by R. Wallace (Second Prize, tie, Section D)

Freeman, 118 Main Street, Rosettenville, Johannesburg, South Africa.

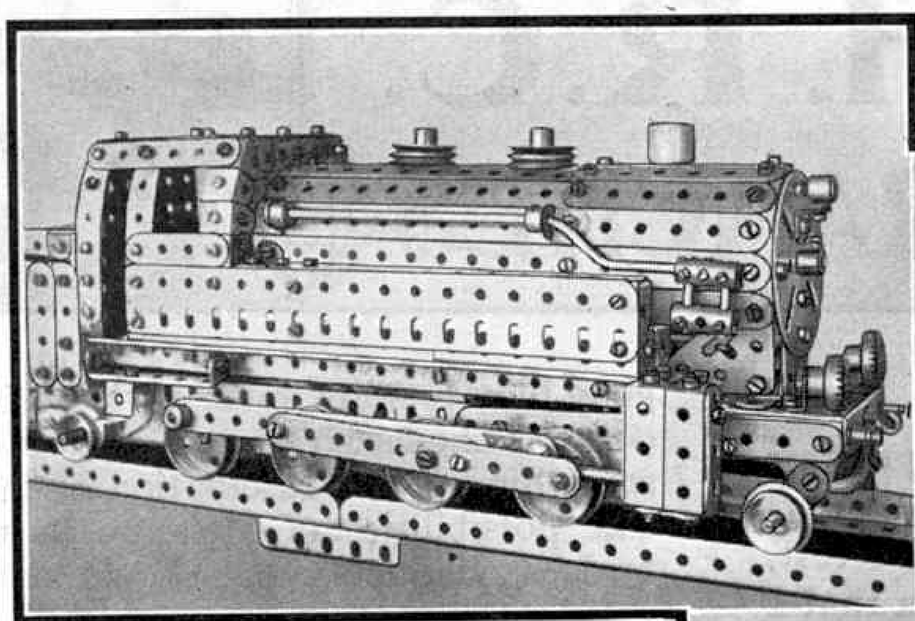
PRIZE consisting of a No. 1 Outfit: F. and C. Begemann, Merbaboeweg 4, Semarang, Java, D.E.I.

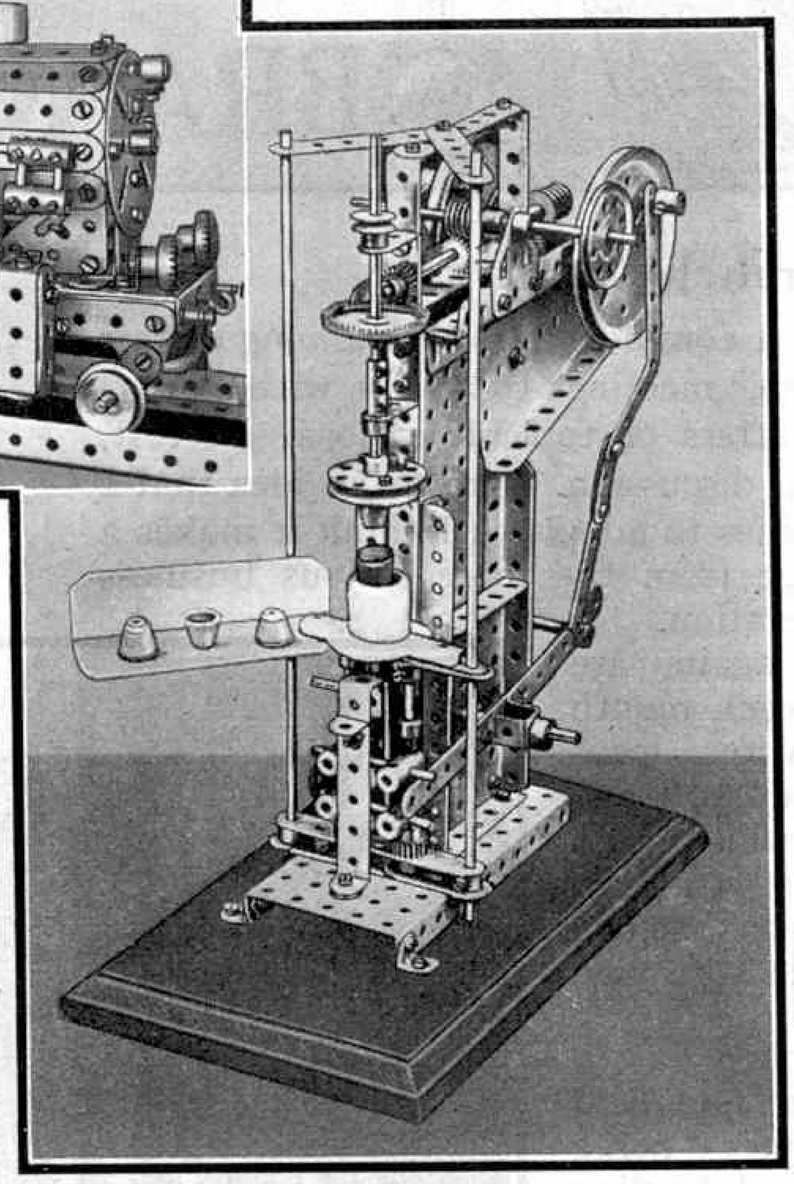
PRIZE consisting of a Clockwork Motor: Maurice Penrose, 136 Quartz Street, Hillbrow, Johannesburg, S. Africa.

FOUR PRIZES, each consisting of Meccano No. 2 Oil Can ("K" type): Tony MacLachlan, Dunedin, New Zealand; W. Toohey, Montreal, Canada; Brian Warner, Grahamstown, S. Africa; H. N. Eustis, Jamieson Street, Alberton, South Australia.

TEN PRIZES, each consisting of "Famous Trains" by C. J. Allen (Meccano Library No. 1): F. L. Webb, Christchurch, New Zealand; Peter D. Potts, Cleniris S.E.6, Victoria, Australia; G. R. Nisbet, Mont Albert E.10, Melbourne, Australia; Alex S. Dunn, Sydney, N.S.W., Australia; Burton Carnson, Kenilworth, Cape Town, S. Africa; Ross McAdam, Croydon, Victoria, Australia; F. J. Blundy, Burwood E.13, Melbourne, Victoria, Australia; Arthur R. Luecker, Plymouth, Wisconsin, U.S.A.; Eric L. Munks, Johannesburg, S. Africa; A. F. A. Osborn, Sydney, N.S.W., Australia.

TEN PRIZES, each consisting of a "Standard Mechanisms" Manual: Jack Seivl, Murrurundi, N.S.W., Australia; Clive W. Monk, Sydney, N.S.W., Australia; Charles Pattenson, Edmonton, Canada; James Foley, King Williams Town, S. Africa; Norman Clatworthy, Johannesburg, S. Africa; Ian Taylor, Hawera, New Zealand; S. Reuben, Bangalore City, India; A. R. Lyell, Hawthorn E.2., Victoria, Australia; S. Falkof, Johannesburg, S. Africa; James Brown, Fairfield, Melbourne, Australia.





(Above). This 2-8-2 Tank Loco was built by J. A. Bakker (First Prize, tie, Section E). (Right). An ingenious model of a Flower Pot Making Machine by J. Woillez (First Prize, tie, Section D)

One of the most novel entries submitted was the flower pot moulding machine built by a French competitor, Jean Woillez (First Prize, tie, Section D). This model is shown herewith, and the illustration includes a number of miniature flower pots that have been produced with its aid. The die and mould, into which the soft clay is introduced obviously could not be improvised from Meccano parts, but all other portions of the mechanism are composed of standard accessories. The action of the machine is remarkably ingenious.

The moulder is driven from an external motor coupled to it by means of cord passed over a 1½" Pulley Wheel situated near the top of the framework. On the shaft carrying the 1½" Pulley a Worm Wheel is secured, and meshes with a ½" Pinion on a shaft placed at right angles to it, this shaft also carrying a Worm Wheel at one end and a ½" Pinion at the other. The last mentioned Pinion engages with a 1½" Contrate Wheel secured to a vertical shaft to the lower end of which is secured the flower pot die. The gearing thus enables the die to be rotated whilst the soft clay is pressed against it, and the possibility of sticking is eliminated.

The 3" Pulley Wheel journalled at the back of the framework is driven through double worm reduction gearing from the 1½" Pulley Wheel previously mentioned. A connecting rod built up from Strips is pivoted to the side of this 3" Pulley and its lower end is attached loosely to an arm pivoted centrally. The other end of the arm is held between two short Rods attached to the framework holding the flower pot mould, the framework itself sliding in two vertical guides composed of Axle Rods. The sliding framework is fitted with a central Axle Rod which normally is held beneath the lower portion of the mould by means of Compression Springs, but as the mould is lowered by the action of the pivoted lever, the Axle rises and thus ejects the flower pot from the mould. Meccano boys who decide to build this model are sure to find the flower pots in great demand by their younger sisters for use in dolls' houses, etc.!

Illustrated with the flower pot moulder is a model locomotive of—to English eyes—somewhat unorthodox appearance, constructed by J. A. Bakker (First Prize, tie, Section E). It is a very accurate reproduction of one of the new 2-8-2 tank locomotives that have just been built for the Halberstadt-Blankenburg Railway in Germany. Readers will remember that an interesting article describing one of the engines was published in the February issue of the "*M.M.*", together with a photograph of the actual engine.

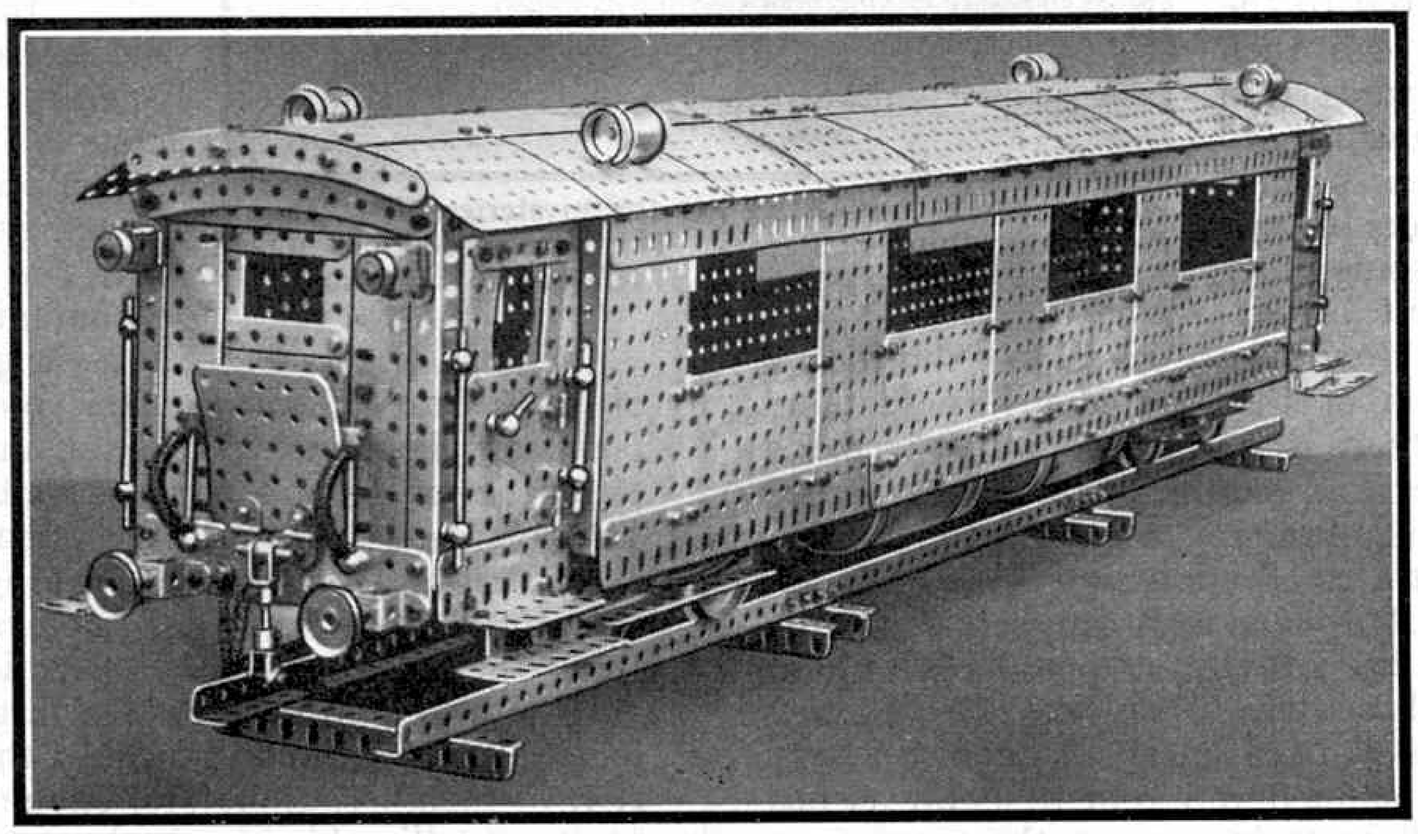
When it is remembered that the actual locomotive is intended to travel over gradients that have previously necessitated the use of rack engines, the reason for the large number of small diameter coupled wheels will be understood. Note the representation on the front portion of the boiler, of the air brake compressor, consisting of two Couplings connected by two 1" Axle Rods.

While Meccano is more often employed in constructing models of the latest developments in the engineering world it will, of course, be found equally useful in preparing examples of early engineering achievements. There are few of us, for instance, who have not at some time or other attempted the construction of a model of the "Rocket" or an old-time ship!

Illustrated on the opposite page is an excellent example of an early motor car built by J. Richardson of Auckland, New Zealand (Second Prize, tie, Section E). While its prototype cannot be said to be the "first" automobile (indeed it would be difficult to name the machine that actually was) it has the distinction of being the first petrol-driven vehicle to run in the town of Auckland, New Zealand. This clever model conveys some idea of the enormous progress that has been made in the design of the automobile during the last quarter of a century!

As will be seen, no steering wheel is fitted, the upright rod with its horizontal projection or "tiller" representing all that was provided in the actual vehicle for steering purposes! I venture to think that such an arrangement would hardly satisfy the demands of the motorist of the present day, when cars actually equipped with power-operated steering gear are to be obtained! The other two levers fitted, operate the brake and reverse gear respectively of a Clockwork Motor that is fitted beneath the

(*Continued on page 580*)



A well proportioned Pullman Car constructed by C. Sardi (Second Prize, tie, Section D)

Branch Nights

There seems to be a common tendency among certain Branches to bring their meetings to a close with a short informal talk on matters of topical or local interest, followed by a general discussion. This is an idea that I should like all Branches to adopt, as I think it makes a very pleasant change from the more serious business of model railway operation.

Other Branches, again, are allotting one night each month to carrying out various locomotive tests, in order to ascertain the work for which each type is best suited—that is, whether they should be assigned to express passenger or fast or slow goods trains.

The trials are carried out in a very thorough and practical manner, the engines being strictly tested for speed, hauling power, gradient climbing ability, and length of run on one winding. This is an excellent scheme, and I shall be glad to receive detailed results from Branches that have carried out such tests, with a view to publishing some of them for the benefit of other Branches and "lone" members.

Branch Finances

Last month I referred to the troublesome question of Branch subscriptions. There are certain Branches which, owing to peculiar circumstances, cannot pay their way by means of subscriptions alone, and some other source of income must be discovered. As far as my experience goes, an exhibition is the very best solution of this problem. There is no doubt whatever that there is a growing interest in model railways and as a rule, if an exhibition is well organised, there is no difficulty in obtaining a good attendance of parents and friends at a small admission fee.

At the same time it is extremely important to give value for money. As big a layout as possible should be carefully planned with a view to railway-like accuracy combined with attractive appearance. A definite scheme of working should be planned and kept to as far as possible, so that one or more trains are on the move practically all the time. If the railway is electric it is often a good plan to allow some of the visitors to manipulate the controls themselves for a minute or two, and to realise something of the fascination of model railway working. The possibilities of Meccano in the way of providing bridges, viaducts, etc., should not be overlooked.

H.R.C. members investigating the mysteries of a van at Beckenham Junction Station. This is an excellent example of the "Prowling Around" referred to last month

Growth of the H.R.C.

During the past few months the increase in membership of the Hornby Railway Company has been a source of great interest to everyone at Headquarters, and it can be due only to enthusiastic recruiting work. I am particularly pleased to note recruiting activity on the part of Branches, because most of them until recently have been so busily engaged in arranging their own domestic affairs that they have had little time to spare for the building-up and extending of the H.R.C. generally. Now that they have become more or less settled down and can devote time to the enlistment of new members it should not be long before larger Branch rooms are required to accommodate all concerned.

One of the most satisfactory instances of Branch recruiting is provided by the Plymouth (St. Bartholomew) Branch, which has increased its membership during the past month from 8 to 45! Of course it is not possible for all Branches to achieve results of this kind, but the example is a very encouraging one.

Increase of membership adds greatly to the strength of any Branch. Each new member brings a fresh point of view on some topic, and his suggestions are often the means of setting on foot entirely new schemes. There is also the fact that as most members are able to contribute locomotives, rolling stock or accessories the Branch equipment becomes enlarged, with the result that more extensive operations can be carried out.

In almost every respect a large Branch has greater possibilities for fun and interest than a small one. Every H.R.C. member, therefore, should never lose an opportunity of telling his friends about his Branch and pointing out to them the many advantages of membership.

Branch Notes

WINDSOR (COUNTY BOYS' SCHOOL).—This Branch is fortunate in having the use of an excellent Chemical Laboratory at the school. With the aid of Meccano Strips and Girders, etc., four benches have been bridged together, and form a splendid support for the track. The various Branch activities are now firmly established and in the near future it is proposed to hold a series of tests with various types of layouts, with the object of finding the purpose for which each is best suited.

WHITGIFT (MIDDLE SCHOOL).—It has been proposed by the Chairman that members should hold a Branch Race Night—open to all locomotives—and the track to consist of two long parallel straight lines. Such an event, no doubt, would be very interesting, and is a suggestion that other Branches might adopt to their advantage. Members hope to pay a visit to the London General Omnibus Company's Garages at Chiswick in the near future.

1ST CROYDON (ADDISCOMBE) WOLF CUBS.—Members continue to show keen interest in all spheres of the Branch activities. Two Layout Nights proved very popular, members being assisted by an H.R.C. friend from Catesham, who personally controlled Meccano signals by means of a Meccano Signal Frame. An interesting lecture was given by the father of one of the members, on the "*Signalling System in use on the Southern Railway.*"

NEATH.—Alterations have been carried out in the track, and the position of the stations on the branch line has been definitely decided upon. Plans are now in preparation for the installation of extensive sidings to accommodate the increased rolling stock available. Two members paid a visit to a signal box and gained much valuable knowledge regarding the control of actual traffic.

LENTON SANDS.—Timetable working is now in full swing and is meeting with considerable success. Latest activities include the formation of a Junior Section for members under 12 years of age, while arrangements are under discussion regarding the production of a Branch magazine.

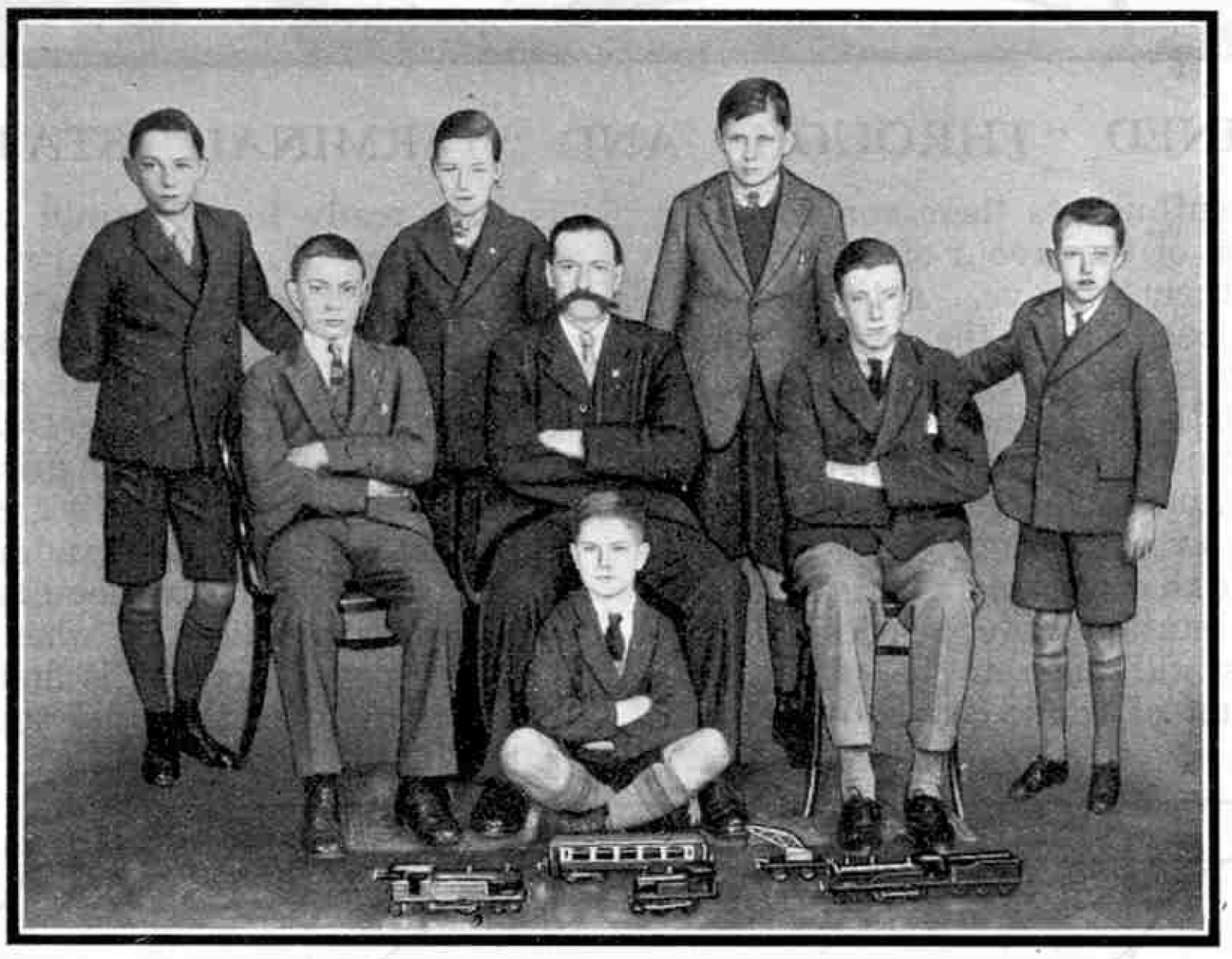
SOUTHCHURCH (ESSEX).—It is proposed to hold an exhibition this month. One of the main events during the month was an attempt to break the scale mileage speed record, and it is interesting to note that a distance of 39 ft. was covered in eight seconds.

STROUD GREEN.—Members paid an excursion visit to the Swindon works of the G.W.R. On this occasion the train was hauled by No. 6000 "*King George V.*" Great interest was taken in the machining operations carried out in the different shops visited, and the controls in the cab of a modern locomotive provided much of interest. Future arrangements include a visit to the Sheds at King's Cross.

GLOUCESTER.—A visit to the Great Western Railway Pump House provided members with an enjoyable time, the boilers and pumping machinery being particularly interesting.

HENDON.—Some very enjoyable evenings have been spent recently running a number of trains simultaneously over a fully signalled track. At one meeting a very large layout was arranged and some sound advice given by the Chairman.

MONTPELIER.—The library has been enlarged by the addition of numerous books relating to Model Railways. A special feature is being made of visiting stations in the vicinity, to study the appliances in use on actual railways. A cricket team is now in course of formation.



Members of the Gloucester Branch, No. 26; Chairman, Mr. T. W. Clark, Secretary, G. T. Clark. This Branch is in the unusually fortunate position of having a Great Western Railway official as Chairman

ELLESMERE (DULWICH).—Colour light signalling has been installed on the Branch track, and has proved a great success. At a recent visit to the Camden Locomotive sheds members were able to inspect the footplate of a Royal Scot (No. 6100). During the summer this Branch intends to hold its meetings in the open.

NEWCASTLE-ON-TYNE.—Efforts have been made to procure a permanent Branch room but so far the members have been unsuccessful. A special Parents' and Visitors' night has been held recently and the funds benefited considerably. This Branch is desirous of enrolling further members and those who wish to join should write to the Secretary, K. Mark, at 445, Chillingham Road, Heaton, Newcastle-on-Tyne.

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 are given in the next column. All owners of Hornby trains or accessories are eligible for membershp and the various secretaries will be pleased to extend a warm welcome to all who send in their applications.

ABERDEEN—N. Meldrum, 26, Carden Place, Aberdeen.

BECKENHAM—J. K. Stubbs, 159, Mackenzie Road, Beckenham, Kent.

CHESTERFIELD—S. Wheatcroft, 50, Walton Road, Chesterfield.

CROYDON—A. M. E. Nunn, 23, Warrington Road, Croydon.

EVESHAM—B. Sheppard, 70, Albert Road, Evesham, Worcester.

FARNWORTH—R. B. Taylor, 119, Peel Street, Farnworth.

GLASGOW—G. Watson, 188, King's Park Avenue, Glasgow.

HUDDERSFIELD—F. Douglas, 56, Lowerhouses, Huddersfield.

LIVERPOOL—L. J. Blundell, 31, Bedford Place, Seaforth, Nr. Liverpool.

LONDON—M. G. Turner, 1, Kensington Court, London, W.8.

MANCHESTER—F. G. Marshall, 42, Oldham Road, Failsworth, Manchester.

MIRFIELD—J. Hazzlewood, 86, Knowl Road, Mirfield, Yorks.

OLDBURY—Mr. Fred Webster, 24, Albion Street, Brades Village, Oldbury, Birmingham.

PERSHORE—D. Cross, Knight's Villa, Church Street, Pershore.

READING—S. G. Burley, 12, Gloucester Road, Reading.

WATFORD — J. W. Moss, "Meldreth," Wood Waye, Oxhey, Watford.

WINCHESTER—E. Chalkley, 78, Hatherley Road, Winchester, Hants.

OVERSEAS

AMERICA—Mr. W. R. Giles, Junr., P.O. Box 124, White Haven, Pa. U.S.A.

AUSTRALIA—H. Walsh, "Bringa," 220, Princes Highway, Koganah, N.S.W.

INDIA—B. N. Ghosh, 56, Luxa, Benares City, India.

NEW ZEALAND—T. MacLachlan, Art Studio, 66, Albany Street, Dunedin, Otago.

SOUTH AFRICA—Walter Gordon, 124, Louis Botha Avenue, Yeoville, Johannesburg.

SOUTH AFRICA—John Gilchrist, 280, Celliers Street, New Muckleneuk, Pretoria.

Further H.R.C. Incorporated Branches

39. SOUTH SHORE (BLACKPOOL)—R. V. Bentley, 9, Bamton Avenue, Watsons Road, Blackpool.
40. FIRST WALLASEY—Harry Collard, 7, Birkenhead Road, Wallasey, Cheshire.
41. STROUD GREEN—J. Summers, 214, Stapleton Hall Road, Stroud Green, London, N.4.
42. BOWDON—P. E. Arnold, "Lynton," Wood Lane, Timperley, Cheshire.
43. SECOND FRIEND'S SCHOOL (WIGTON)—R. A. Hunter, Friend's School, Wigton, Cumberland.
44. THORNBAY—Mr. W. A. Winstone, Thorpe Hall School, Thorpe Bay, Essex.

IX.—A COMBINED "THROUGH" AND "TERMINAL" STATION LAYOUT

TO all model railway enthusiasts there comes sooner or later the question of the layout of the stations, and how many of them to have. A lot depends, of course, upon the personal taste of the owner. Some prefer to concentrate all their efforts on one large central station that combines both the "terminal" and "through" types; whereas others enjoy working through a chain of small stations. For timetable working, of course, the latter scheme is by far the better.

Then again it is possible that work on a main terminus and one small through station may be desired. In such cases the terminus will have to be planned so that the maximum amount of traffic can be dealt with easily, while the "through" station should embody trailing goods yards and sidings. The reason for arranging trailing goods yards in a "through" station is that it is important never to trap an engine in a goods siding. Engines of "pick-up" and "set-down" goods trains will avoid being held up by backing into the sidings in order to perform any necessary operations. They will then be able to proceed on their journeys.

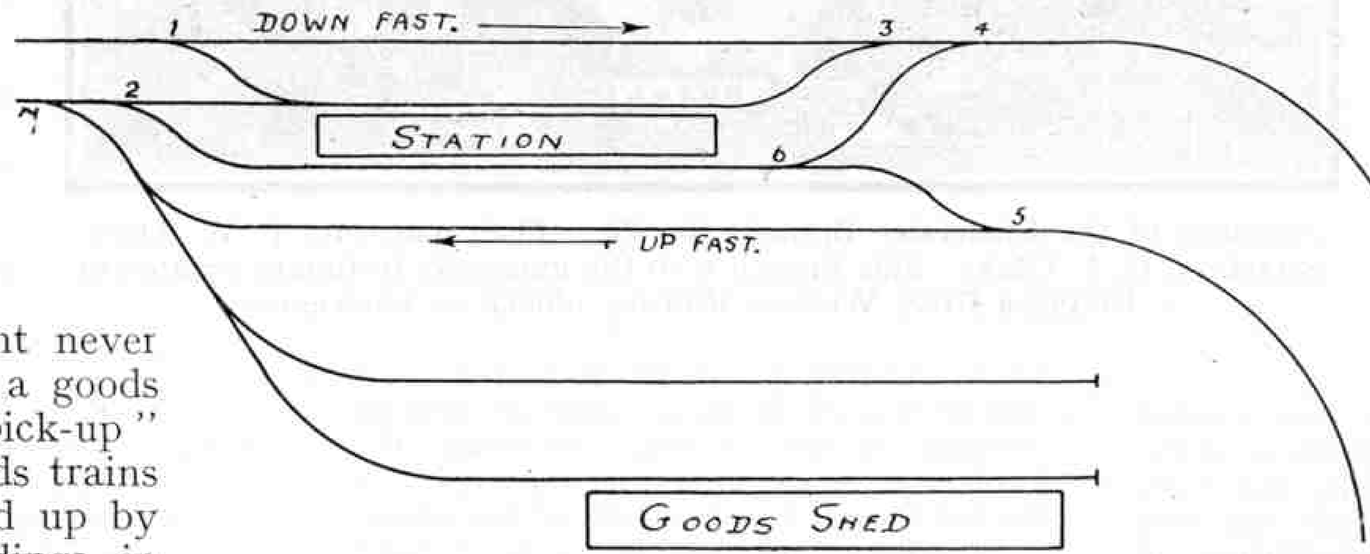


Fig. 1. A good example of a combined "through" and "terminal" station layout

Readers then who desire to obtain the advantages of a terminal station and yet retain all the facilities offered by a "through" station will find the following suggestion of value. In this a plan has been devised whereby all the essential features of the two types of layout are retained and arranged in a simple straightforward manner. The track should be laid out on the system indicated in Fig. 1, from which it will be seen that the whole idea is very simple. The method of operation is as follows.

Express non-stopping trains use the outer "down" and "up" fast lines, while stopping through trains on "down" lines enter the station at the facing crossover 1. On leaving the station the train will converge on to the "main" down line at 3.

Stopping trains travelling on the "up" line enter the station over the points 5 and 6 and continue their journey over points 2. On the other hand, "down" trains scheduled to terminate their journey at this station arrive over the metals at 1, and the engine is uncoupled and run round to the other end of the train by way of the points 3, 4, 6 and 2. Everything is then ready for the train to leave by the points 2.

An "up" terminal train may enter the station over the points 5 and 6 and the engine is run round by points 2, 3, 4 and 6. The locomotive may now be coupled up and the train is free to depart by points 6 and 4.

When two terminating trains are at the platforms at the same time, the engines will be prevented from running round to the other end of the trains, and in this case both of the standing trains can be reversed by changing over their engines. The following example will give some idea of what is meant.

The "down" engine is first run off and then coupled on to the rear of the train standing at the "up" platform. The engine of this latter is then run off and backed on to the train standing alongside the "down" platform. Both trains are then ready to start away again. It is not always permissible, however, to exchange engines. For instance, one engine may not be strong enough to haul the train brought in by another engine. In such circumstances an engine could be allowed to run round its own train by using the "down" or "up" fast lines as a running-round loop.

From the foregoing brief examples it can be seen that this layout is one that will give any Hornby railway enthusiast plenty to do, as an excellent service of express, stopping and terminal trains can always be maintained.

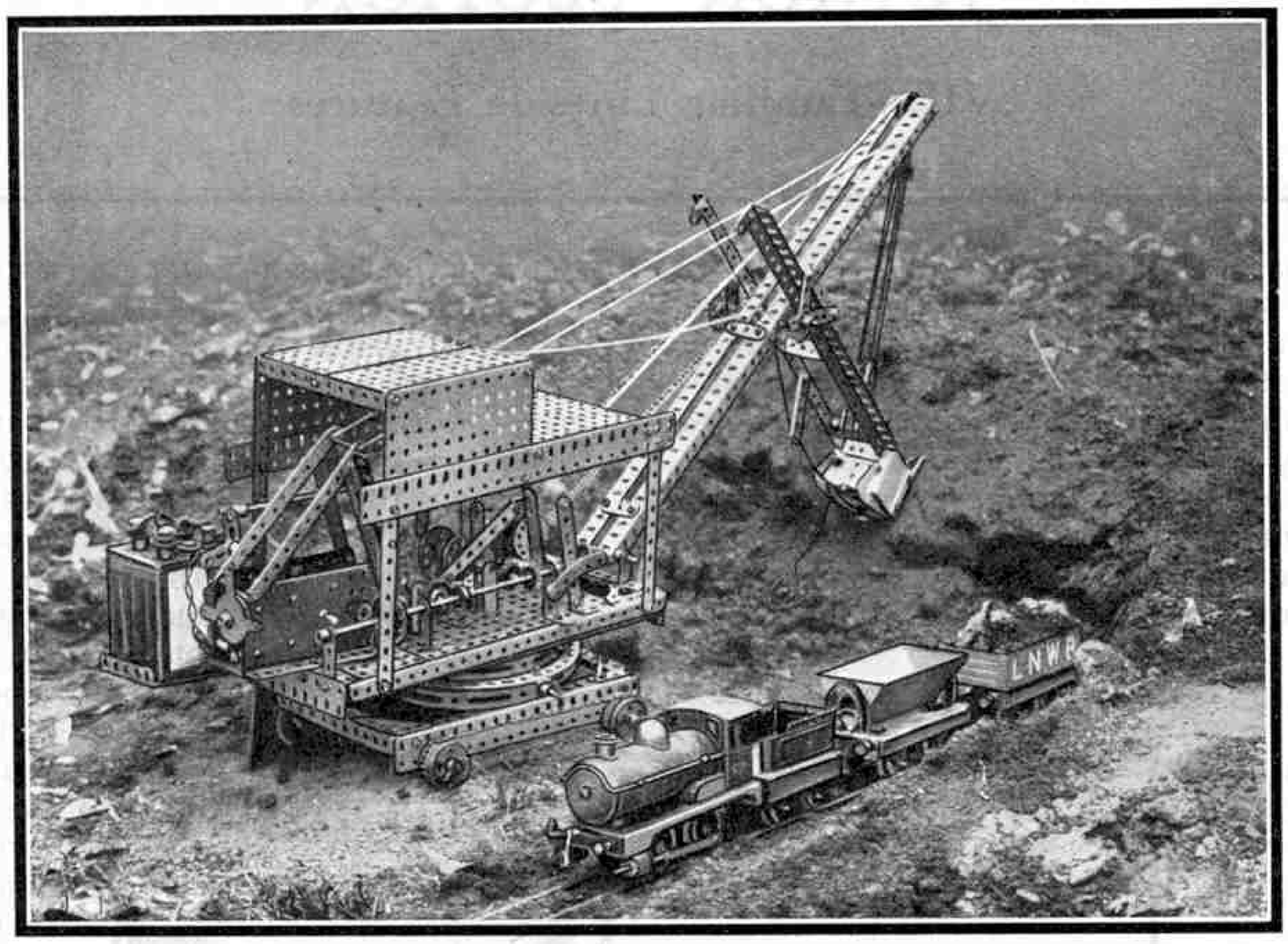
A layout of this type could be operated by several boys simultaneously and each would find plenty to occupy his time. Just picture for a moment, a local "down" train entering the station, and immediately afterwards the arrival of an "up" train at the opposite side of the platform. Now a "down" express roars past on the "through" fast line, while a modest goods train noisily clanks its way over the metals of the "up" fast line. Shortly afterwards the trains standing in the station are given the signal to continue their journeys and then the tracks are clear for a terminal train to arrive. Supposing this latter has now drawn up alongside the platform, its engine is run round on to the other end of the train as soon as possible, ready for departure. After this the tracks are again "all clear."

All the above fascinating train-working arrangements

are easily possible on a layout of this description, and many other workings may be carried out in an interesting manner.

An interesting station layout for single line working

Many Hornby Train users who, through lack of space or other reason, confine their activities to single line operation, seem to experience some little difficulty in planning a suitable station layout that will allow the necessary shunting operations, etc., to be carried out easily and quickly without having recourse to the very unrailway-like practice of lifting engines from the rails in order to carry out various manœuvres.



This photograph shows the realistic possibilities in the use of Meccano in conjunction with a model railway, especially if used out-of-doors as in this instance

When this difficulty was brought to our notice therefore, we promptly set about the task of devising a layout that would be simple in operation and yet thoroughly efficient. After much experimental work, during which innumerable layouts were tried out in order to find one that could be described as really good, our experts eventually decided on a plan such as that shown in Fig. 2. It can safely be said that this layout will afford scope for endless highly interesting operations, including express or slow passenger and goods train running; while in addition ample space is provided for shunting and other goods yard operations.

The principal feature in the design of the station is the number of loop lines leading to the original single line, which thus permits of closer running of trains on the latter. A further advantage lies in the great lengths of the loops. While passing the station, trains may follow ordinary double track running without the necessity of waiting a considerable time in order to allow another train to pass.

Referring to Fig. 2, it will be noticed that loop lines are provided for fast traffic, and the local passenger or slow goods traffic is suitably accommodated also. The platform is placed far away from the "up" through line so as not to interfere with express trains, for which, of course, the platform is not needed. Owing to the length of the complete section of the layout we have unavoidably had to show it in two sections, the point where it has been separated being indicated by the figures 1, 2 and 3.

As a means of easy reference to the various routes, all the points in the diagram have been clearly lettered. In the station itself the loop "AB" is provided for through trains on the "down" fast line. Fast "up" trains traverse the crossover at "A" and have a clear run along the station platforms and emerge past the station, leaving the loop line at point "B." On the other hand, fast trains on the "down" line do not use any points but proceed until they come to the original single line shown to the right of crossover "A."

Local trains, that is, stopping passenger, or slow goods trains, take the points at "A" and proceed until they come to points "C," which guides them over a diamond crossing and so into the station. When ready for the start again, the train leaves over the metals at the point "D." Similarly, local trains in the opposite direction traverse the point "B" and arrive on the "down" line in the station, returning to the single line either by the crossover at "E" and straight along to the points "A," or by proceeding until they come to the crossover at "G," and then on to point "A," as indicated.

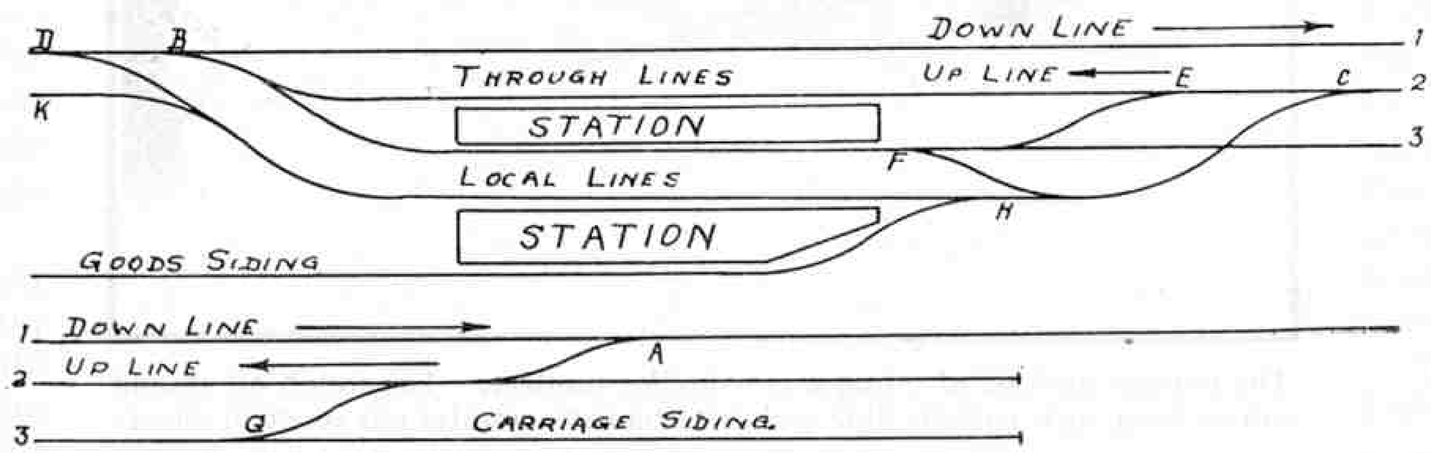


Fig. 2. An interesting station layout for single line working

In cases of emergency, the crossover at "F" could be brought into operation, which would take the train over the diamond crossing and so on to the crossover at "A" again. Strictly speaking, however, this crossover at "F" is to enable engines to run round their trains if the trains are reversing, and it is also very useful in facilitating shunting from the main lines into the goods siding at the back of the station. The goods siding is easily accessible by means of the point "H."

In planning this layout, no attempt has been made to produce either an elaborate or an extensive goods yard. The four sidings provided, however, will be found quite sufficient to cope with the amount of traffic usually possible on a single line railway. At the point "G" a carriage siding branches off, and this should be of a convenient length to accommodate (Continued on page 585

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

Hornby Railway Company

JUNIOR SECTION

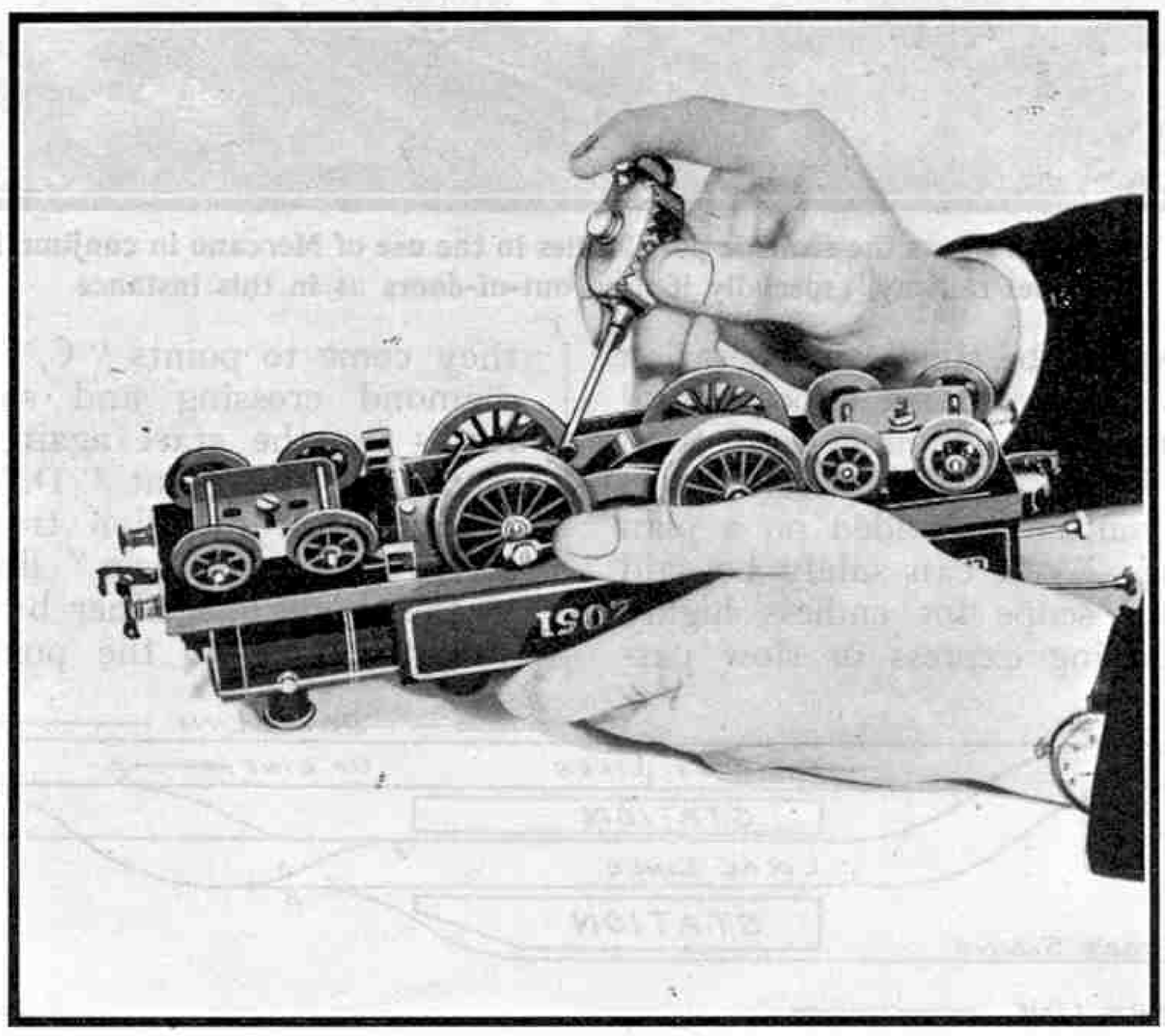
VII.—Familiar Lineside Features

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

THERE are so many small details connected with a model railway as to render it impossible to put them under a definite heading. It is certain, however, that these final touches, although so minute, really make all the difference in the general appearance and give the railway just the realistic atmosphere that is so essential. In view of this, therefore, it is proposed to take this opportunity to mention one or two small details which, if carried out, will effect considerable improvements to any layout, no matter how simple or how elaborate it may be.

Miniature Gradients

A track layout that includes gradients for the locomotive to climb will prove more interesting than one where all the track is on the level. These gradients must not be made too steep. The slightest amount of oil on the track will cause the locomotive driving wheels to slip, and the train will " stall " if the grade is too heavy. Real railways very rarely use a grade steeper than one in 40, which means that the train climbs up one foot for each 40 feet of track. Any well-built model locomotive will climb such a gradient easily and pull the usual number of coaches without undue wheel slip.



The correct method of oiling a Hornby locomotive. Too much oil should not be used, as it collects dust and grit and thus counteracts its good effects

One of the simplest methods of installing a gradient is to take a single board the length of the gradient and cut some short pieces, beginning with a 1 in. piece, then a 2 in. piece, a 3 in. piece, and so on. These are then placed at uniform intervals under the long board and the spacing between them will determine the grade. If the board on which the track is fastened is 5 or 6 in. in width and $\frac{7}{8}$ in. in thickness, the supports may be as much as 30 in. apart ; but if a thinner board is used it will be well to double the number of supports by cutting them in $\frac{1}{2}$ in. steps.

Portable grades may be made just in the same manner as permanent ones except that plywood is used instead of thick board, and these must be attached to the track by means of cheap hinges to allow them to be folded easily against the track board when it is wished to support it or when the gradients are not in use.

Having arranged one or two gradients it now remains to instal the gradient indications posts. The Hornby series includes some splendid examples of these accessories, marked to indicate various gradients. The posts should not be scattered about casually, but as far as possible should only be placed where they fulfil some useful purpose. If, for instance, the railway has a scenic background this should be taken into consideration. If a viaduct is included among the accessories it suggests that the railway either drops down to its level or else climbs up from low-lying country. In the case of the Hornby Viaduct the railway is the lower and has to climb to cross the viaduct. Gradient posts should therefore be placed on each side to show that the line rises.

When a tunnel is included in the layout a gradient post should be placed at a reasonably long distance away from its mouth to indicate that the ground falls to allow the line to pass under without undue excavation. On the other side of the tunnel another post should be placed to show that the line rises again. There are, of course, many other points at which gradient posts may be fixed and these examples are only given to suggest the method of installing them in order to obtain the utmost realism.

The Hornby miniature mile posts form another interesting lineside feature. As explained in a previous article, scale miles cannot be reproduced on a model railway owing to the comparatively short length of the track. The best effect is obtained therefore by placing mile posts at intervals of about 2 or 3 ft., the exact distance being determined by the extent of the layout.

Familiar Lineside Sign Posts

The Hornby No. 6 Set of railway accessories includes a variety of signs such as " Caution," " Shut Off Steam," " Whistle," " Catch-Points," etc. The object of most of these signs is obvious, but a few words regarding catch-points will be of interest. Catch-points are

points provided for the purpose of throwing off the line any vehicles that may happen to be travelling over them in the wrong direction. On rising gradients of more than one in 260 these points are placed at a distance of rather more than a full train's length to the rear of the "home" signal. These are known as "runaway" catch-points, and their function is to derail any vehicles that may accidentally become detached from a train and run backward down the incline. A vehicle running away in this manner would be derailed before it could proceed far enough to collide with an oncoming train. The "Caution" and "Repairs" signs are used to safeguard men working on the permanent way. These signs are placed at a sufficient distance in advance of the gang to enable the drivers of approaching trains to slacken speed in time to avoid any possibility of accident.

This splendid miniature locomotive is so soundly designed and constructed that it will haul three persons with the greatest of ease. The passengers appear to be thoroughly enjoying the trip

Miniature Telegraph Poles

Another familiar and important feature of railways to which model railway owners seem to pay very little attention is telegraph poles and wires. This neglect is very strange when one considers the realism that these accessories add to a layout, and the fact that they may be installed so easily and cheaply.

The course of telegraph wires on actual railways is often a puzzle to model railway enthusiasts. Actually the wires start from the terminus or goods yard offices and are laid underground until the open country is reached. The wires are then brought above ground and carried by the familiar telegraph poles.

Many expedients have to be adopted in order to carry the wires successfully over long distances through tunnels, cuttings and bridges. For instance, where a tunnel has to be negotiated the wires are bound with a canvas and rubber covering to insulate them one from another, and are then brought together in a single strong cable, which is laid in a wooden casing and carried along below the arch of the tunnel. The same procedure is adopted also with very high road bridges, but in cases where the bridges are very low it is usual for the telegraph poles to mount the banks (if there are any) on either side of the railway so that the wires are carried above the bridge. Where the ground is flat, poles of extra length are used, and these enable the wires to be raised high enough to be carried over the bridge.

The Hornby Telegraph Poles are fitted with eight insulating cups so that eight miniature telegraph wires can be supported. The poles look best if placed about 2 ft. or a little more apart, and to obtain the maximum effect thin white cotton should be used to represent the wires. It is quite easy to secure the cotton in position by twisting it round the cup and then pulling it tight and carrying it to the next pole where the process is repeated.

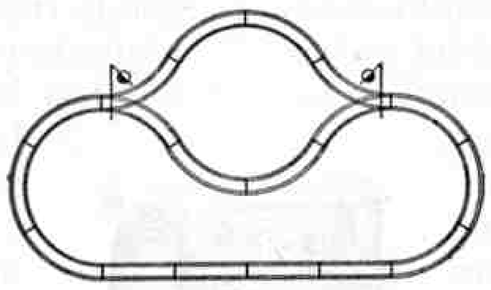
A Suggestion for Tenders

Any one who has watched a long-distance express starting out on its run must have been struck with the huge stack of coal carried in the tender. This great supply of fuel indeed gives one the impression that the engine could travel to the other side of the world! It is possible to produce a similar effect on a model railway by filling the tender with small pieces of coal, but if this is done the increase in weight is rather serious. A better plan is to fit a piece of cardboard into the tender so that it forms a shelf about a quarter of an inch from the top of the tender. The cardboard may be supported on "legs" of matchstalks glued beneath it, or more simply still by leaving sufficient cardboard to turn down all round and reach the bottom of the tender. The upper surface of the cardboard should then be painted black, and small pieces of carefully washed coal attached to it with seccotine. The coal should not form a level layer, but should be heaped up towards the centre.

This little dodge produces just the same effect as if the tender were completely filled with coal, and the increase in weight is very slight. The only unrealistic feature is that the quantity of coal is the same at the end of a journey as at the beginning!

Next month we propose to deal with a number of other accessories that should find a place in every model railway. These include engine sheds, water tanks, loading gauges and turntable, and we shall show where these should be situated and how they can be employed to the best advantage to increase the interest and railway-like efficiency of the layout.

No. 1. Suggested Layouts



1 ft. Radius (as illustrated): 10 Curves, 4 Straights, Double Symmetrical Points (Right), Double Symmetrical Points (Left).

2 ft. Radius: 24 Curves, 8 Straights, Double Symmetrical Points (Right), Double Symmetrical Points (Left).

Rolling Stock of the Hornby Series

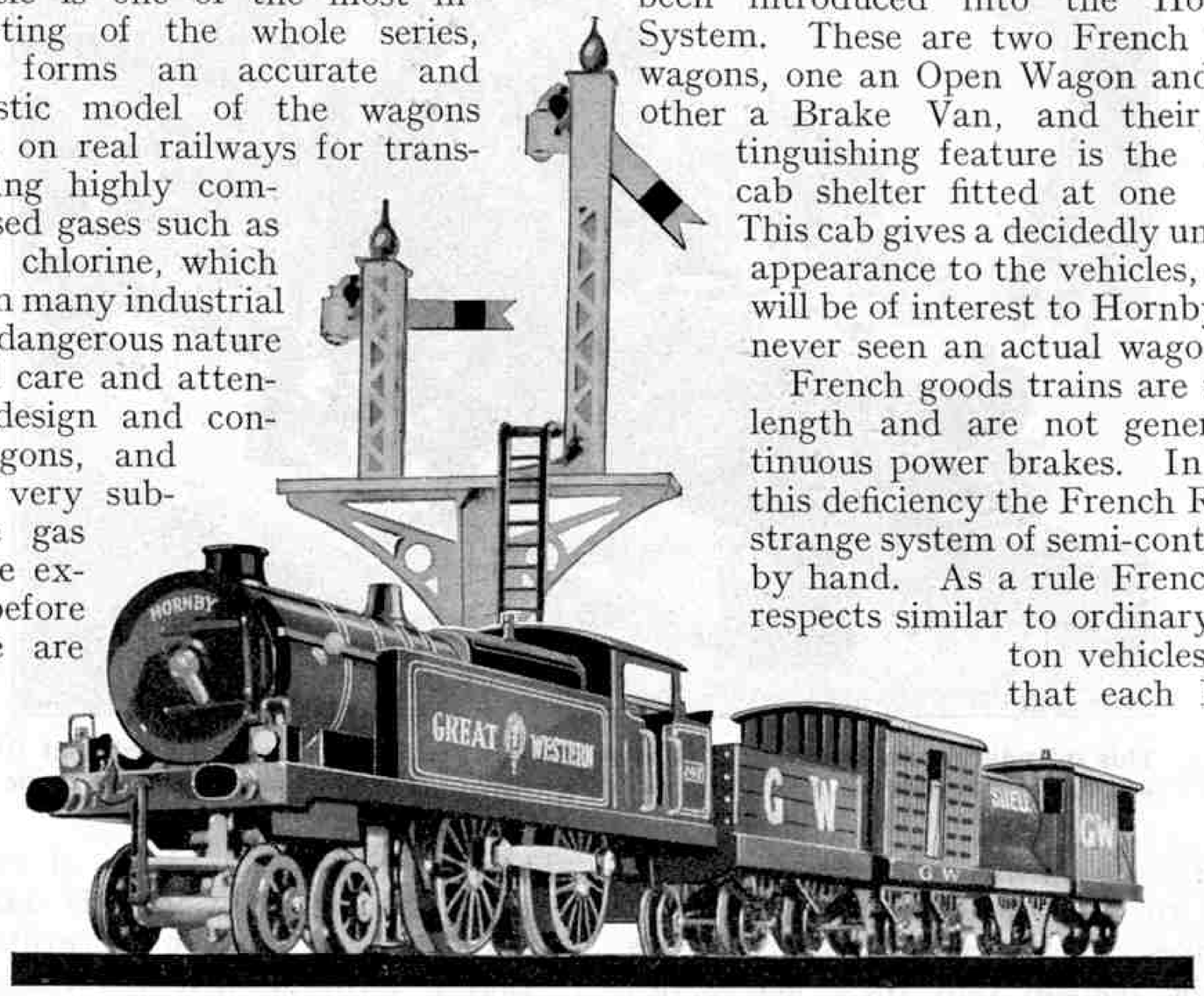
By 'Tommy Dodd'

THIS month I conclude my survey of the rolling stock of the Hornby Series with a description of a few interesting vehicles that so far have not been dealt with in these articles.

First of all there is the Gas Cylinder Wagon. This vehicle is one of the most interesting of the whole series, and forms an accurate and realistic model of the wagons used on real railways for transporting highly compressed gases such as oxygen, hydrogen and chlorine, which play an important part in many industrial processes. Owing to the dangerous nature of their freights, special care and attention is devoted to the design and construction of these wagons, and they are built with a very substantial chassis. The gas cylinders themselves are exceedingly strong, and before being placed in service are thoroughly tested to a pressure considerably greater than that they will normally have to withstand.

GAS CYLINDER WAGON

The Hornby model resembles its prototype in consisting of three separate cylinders bound together by strong iron bands, the latter serving also to hold the containers securely in position on the chassis. A special feature of a wagon of this type is the valve through which the gas is injected into the containers. This feature does not appear in the Hornby model owing to the difficulty in reproducing it sufficiently small to be in keeping with the general scale. In all other respects, however, the model is a splendid reproduction of the real vehicle. Following actual practice it is coloured red, which denotes danger and thus constitutes a warning to all concerned in the handling of the train that extra special care must be exercised.



HORNBY No. 2 MIXED GOODS SET

I come now to a vehicle of mechanical type; the Hornby Rotary Snow Plough. Actual mechanical appliances of this type are very largely used for clearing away heavy drifts that cause severe obstruction and often impassable barriers after a heavy snowstorm. The model consists essentially of a housing of the closed van type. At the front of the vehicle is a large propeller mounted in an open shield and rotated by a chain from the front wheel axle. The blades of the propeller are not flat, but are "pitched," that is, twisted, so that as the plough proceeds along the track the rotating blades act as spades and lift the snow upward, thrusting it through an opening at the top of the shield and on to the side of the track. A head lamp and side doors give a final touch of realism to the model.

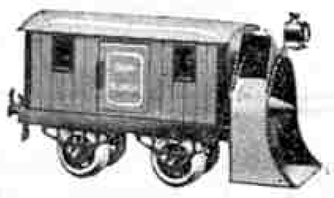
CRAWFORD'S BISCUIT VAN

Two wagons of more than usual interest have recently been introduced into the Hornby System. These are two French type wagons, one an Open Wagon and the other a Brake Van, and their distinguishing feature is the high cab shelter fitted at one end. This cab gives a decidedly unique appearance to the vehicles, and a brief description will be of interest to Hornby enthusiasts who have never seen an actual wagon of this type

FRENCH BRAKE VAN

French goods trains are usually of considerable length and are not generally fitted with continuous power brakes. In order to make up for this deficiency the French Railways adopt rather a strange system of semi-continuous brakes operated by hand. As a rule French wagons are in many respects similar to ordinary English 10-ton or 12-ton vehicles; the difference being that each French wagon is provided with a raised shelter or hut, which houses a brakesman to operate the hand brakes and thus assist in controlling the trains.

In a train of any considerable length several of these wagons are included with the result that as each brakesman can operate his own brakes the train is practically the same as a British continuous semi-brake goods train. By placing the brakesman's compartment high above the level of the rails the man is enabled to see all that is happening on either side of the train, and to keep a close look-out for derailments or trucks that may become detached.



SNOW PLOUGH

At the rear of the train there is generally a brake van that has a similar controlling effect to the open wagon just described, the difference being that instead of carrying part of the general freight the brake van carries tools, flag, lamps, etc., which might be required in the event of an accident of any kind taking place.

On English railways there are many types of privately-owned wagons. The most interesting of these are the closed type that are used principally for the conveyance of light traffic. The Hornby Biscuit Van is an excellent example of this type. It is available lettered to represent the three famous biscuit-making firms of Jacobs, Carrs, and Crawfords respectively. These vans are finished in the correct colours for each firm, and they form a particularly effective addition to any goods train especially if two or three are coupled together.

FRENCH WAGON

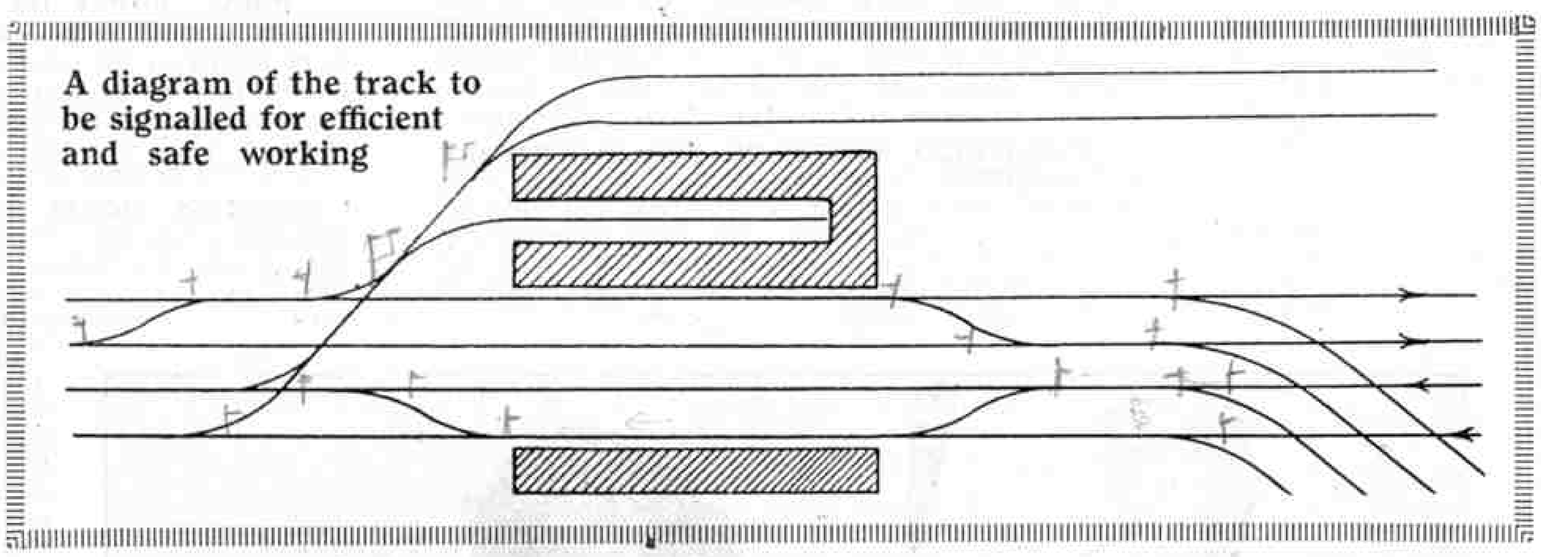
H.R.C. COMPETITION PAGE

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.

AN INTERESTING SIGNALLING COMPETITION

The signalling of railways, whether actual ones or models, is a subject that at first appears too complicated to be interesting, but subsequently becomes a most fascinating study. Although the mechanical and electrical mechanisms in use on real railways are very complicated in their construction, the operations that they carry out are quite simple, and are based on the same principles that govern the operations of an ordinary manual signal cabin.

With the exception of certain cases where special methods are necessary, all railway signalling is based upon definite principles; and once these principles are mastered it becomes quite easy to understand the working of existing installations, and to plan out installations for one's own model railway. These principles were described clearly in the H.R.C. pages of the "*M.M.*" for May last, and subsequent correspondence shows that keen interest has been aroused among members, especially those who had not previously given serious attention to signalling. Many requests have been made for a regular series of signalling problems to be included on this page, and although we cannot definitely promise to arrange this, we publish one this month that should prove of interest.



A diagram of the track to be signalled for efficient and safe working

The illustration in the centre of this page shows a portion of a railway track with a station and goods yard. The problem is to indicate the signals that would be required to enable all the operations possible with this layout to be carried on efficiently and safely.

Competitors should not tear the page out of their magazine, but should make a copy of the layout on a sheet of paper. It will be found easier to work out the necessary signalling scheme if the copy is made a good deal larger than the original, and it would simplify matters in judging the entries if the signals were marked in red or some other distinctive colour. If a competitor considers it advisable to add a few words of explanation in order to make matters perfectly clear, he may do so. Any explanation should be kept as brief as possible, however, and really should not be necessary at all if the signal indications are clearly marked on the layout.

The contest 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 and correct signalling scheme. In addition a number of consolation prizes will be awarded to entries that are very near to prize-winning standard. In the event of two entries being equal in regard to completeness and correctness, the prizes will be awarded to the one that is the more neatly prepared and legible.

Envelopes containing entries should bear the words "Signalling Problem" in the top left-hand corner, and on each entry should be clearly written the name, address and membership number of the competitor.

Closing dates. Home, 31st July. Overseas, 30th September.

We wish to remind competitors that the omission of the H.R.C. membership number from any entry will cause it to be disqualified immediately.

Holiday Essay Contest

The word "essay" seems to fit in better with school days than holidays, but the essay we have in mind is one that should appeal to all Hornby Railway enthusiasts.

During holiday times most of us do more or less travelling by rail and visit new places and scenes. We want all H.R.C. members to keep a keen look-out for anything of railway interest that is novel to them, and to send us a brief but clear description of it. The idea is not to send in an elaborate description of something that is already familiar, but a short account of "THE MOST NOVEL RAILWAY FEATURE I SAW DURING MY HOLIDAYS." Descriptions should 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 interesting 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 "Railway Essay" in the top left-hand corner. Closing date, 31st August.

Third H.R.C. Photographic Contest

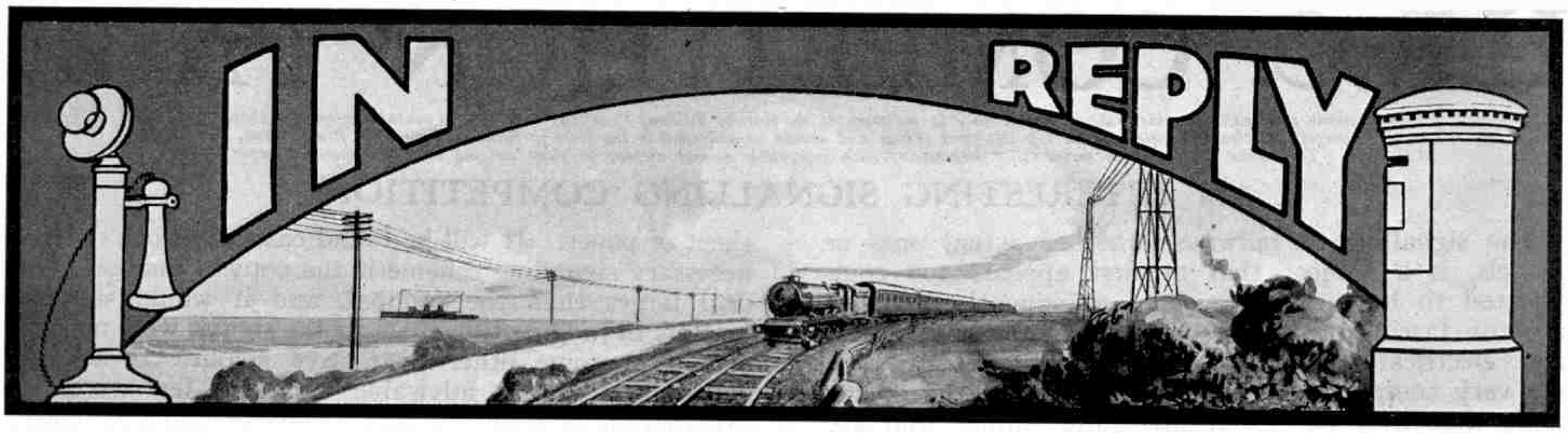
Our second photographic contest produced very much better results than the first, and this has encouraged us to hold still another contest on similar lines. Any photograph connected with model railways may be submitted, and the subject may be a complete layout or only a small section of it.

We draw the attention of competitors to the possibilities of outdoor layouts during the holidays on fine, dry, sunny days. There are great opportunities in the way of devising miniature landscapes through which the railway runs, and we shall look forward to receiving some interesting photographs. As a rule, it is not practicable to photograph an extensive outdoor layout as a complete unit, and sectional views are usually more effective.

Prizes of Hornby Railway material or Meccano to the value of 15/–, 10/6, 5/– and 2/6 respectively, will be awarded to the four most interesting model railway photographs in each of the two sections, Home and Overseas.

Envelopes should bear the words "Third H.R.C. Photos" in the top left-hand corner. Competitors can submit as many photographs as they wish, but each one must bear on the back the competitor's name, address, and H.R.C. number.

Closing date, Home, 31st July. Overseas, 30th September.



Suggested Hornby Train Improvements

CAST IRON WHEELS.—Cast iron wheels would no doubt be an improvement, but their use would add considerably to the cost of rolling stock. If heavier wheels are needed, the Hornby spoked wheels may be obtained separately, and are particularly suitable for goods vehicles. The heavy Mansell wheels are most suitable for passenger vehicles. (*Reply to T. Webster, Glasgow*).

ARMOURED TRAIN SETS.—We do not think that armoured trains would be anything like so popular as you imagine. The suggestion is quite an interesting one, however, and will be kept in mind. (*Reply to P. C. Wicks, Cirencester*).

AMERICAN LETTERING ON HORNBY TRAINS.—The Hornby rolling stock available in America is lettered and coloured in accordance with American railway practice. (*Reply to F. T. Willey, Cincinatti, U.S.A.*).

ENGINE CAB LEVERS.—The fitting of a scale model regulator and a brake handle in place of the existing levers would no doubt improve the general appearance of Hornby locomotives. The change would involve many difficulties, however. Your suggestion for shortening the control rods is much more feasible, and we shall give this consideration. (*Reply to R. Brown, Liverpool*).

HIGH SIDED WAGONS.—High sided wagons would no doubt form a popular addition to the Hornby rolling stock as they are very familiar vehicles in goods trains and goods yards. Your suggestion will be considered when opportunity occurs. (*Reply to G. Edwards, Blackburn*).

LOCOMOTIVE COAL WAGON.—We have already stated in these pages that the introduction of vehicles of this type is under consideration. (*Reply to E. Johnstone, Canada*).

"LET-DOWN" SIDES TO OPEN WAGONS.—An open wagon with "let-down" sides would certainly make an interesting model, and we are filing your idea for consideration. (*Reply to E. Barnett, Burnley*).

REVISED GOODS SHED.—A covered-in goods shed with rails for the shunting of trucks would be an extremely interesting model, and we are making a note of your suggestion. (*Reply to J. M. Hunter, Kirkcaldy*).

PLATELAYER'S HUT.—A platelayer's hut will probably be introduced into the Hornby System before long. No doubt you have seen our realistic little Watchman's Hut complete with brazier, shovel and poker. (*Reply to P. E. Buck, Ipswich*).

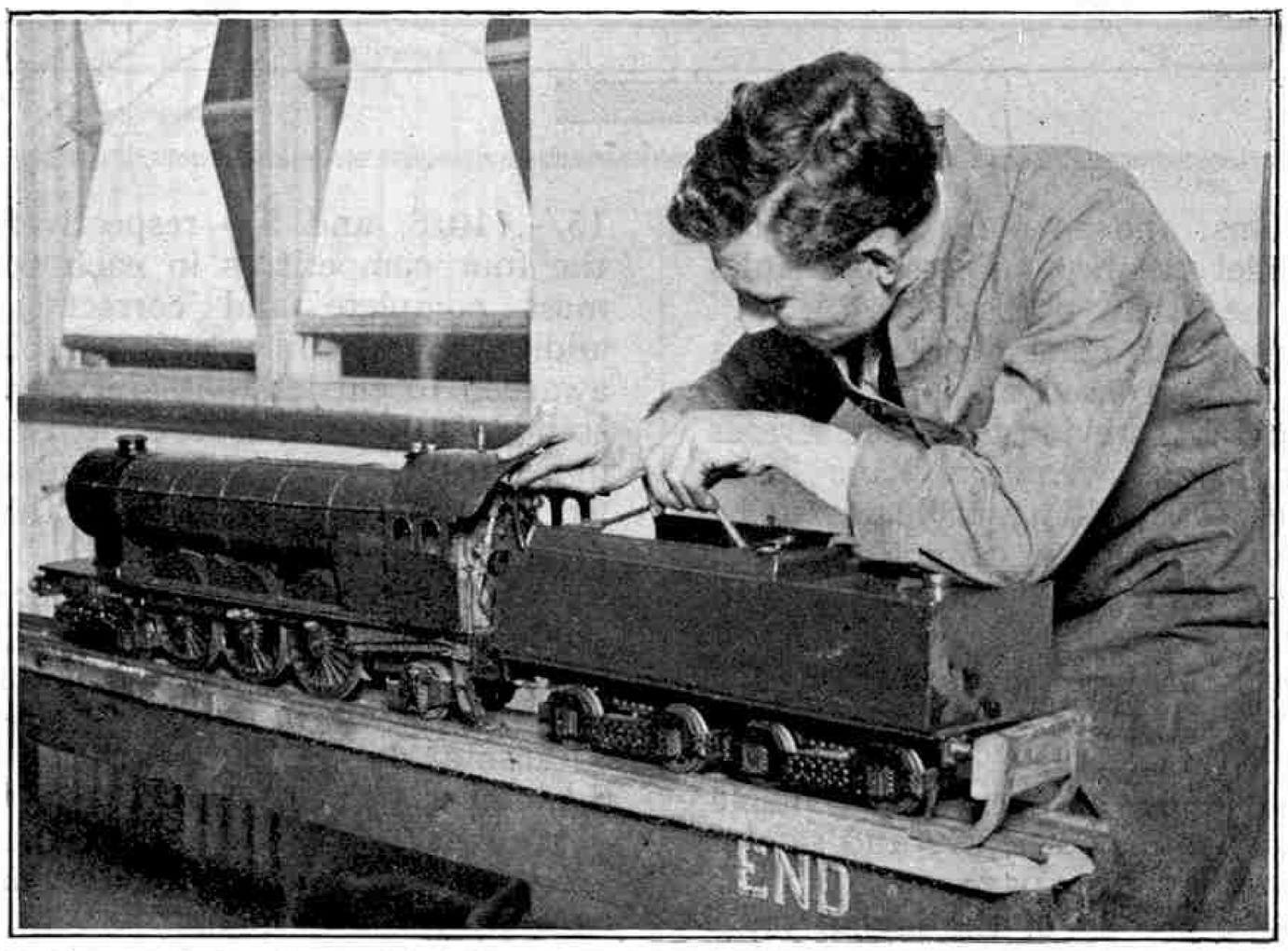
CATTLE PENS.—We agree that a cattle pen would be a very popular feature, and it is probable that it will find a place in the Hornby series before long. (*Reply to H. Elliot, Manchester*).

MODEL OF "KING GEORGE V."—Our present No. 2 Locomotive is quite a good model of the "George V" Class engines on the L.M.S. If it is the Great Western Railway "King George V" that you have in mind, we are afraid we cannot adopt your idea at present, as it entails the use of a six-coupled mechanism. (*Reply to A. Smith, Waterloo*).

4-4-2 TANK LOCOMOTIVE.—We think that a 4-4-2 Tank locomotive would be popular, and it is very probable that we shall introduce a locomotive of this type in the near future. (*Reply to G. Jarrett, Clevedon, and others*).

8-COUPLED TANK ENGINE.—An engine of this type would have such a long wheelbase that it would be almost impossible for it to negotiate the existing curves. Apart from this we have had no demand for such an engine. (*Reply to J. Watson, Aberdare*).

CENTRIFUGAL GOVERNOR FOR CLOCKWORK MECHANISMS.—Your idea for an improved type of governor for Hornby locomotives and Meccano motors is very interesting. We have experimented with the centrifugal form of governor, but have not yet made any definite decision. (*Reply to R. P. Printer, Bombay, India*).



Getting ready for the road ! A fine example of a "Pacific" type locomotive with an eight-wheeled bogie tender, built by a French model railway enthusiast

FISH VAN.—A van of this type has been suggested many times, and its introduction will be considered when we are revising our rolling stock. (*Reply to J. Davison, Darwen, Lancs.*).

DETACHABLE COUPLINGS.—We do not see that any advantage would be gained from the introduction of couplings such as you suggest. The present short length couplings are proving quite satisfactory. (*Reply to A. Lloyd, Ashford*).

SPRINGS FOR HORNBY ROLLING STOCK.—The smooth running of Hornby rolling stock seems to make springs unnecessary. In addition their introduction would involve considerable complications. (*Reply to R. Kelly, Bournemouth*).

REVERSIBLE MECHANISM FOR M3 LOCOMOTIVES.—Reversible mechanism would undoubtedly be an improvement to these locomotives, but on the other hand its extra cost would necessitate an increase in the price, which would not be desirable. (*Reply to M. J. Skinner, Bilston, Staffs.*).

ELECTRICAL DOUBLE TRACK AND CROSSOVER.—We propose to introduce electrical double track and crossovers in the near future. (*Reply to G. Burgess, London, N.12*).

RAILWAY FIRE ENGINE.—We do not know of the existence of railway vehicles such as you describe, and we do not propose to introduce them. (*Reply to S. G. Ellis, London, N.4*).

"H.R.C." BADGE ON COACHES.—Your suggestion for a small badge bearing the letters "H.R.C." to be placed on the sides of Pullman coaches is quite interesting. At present, however, we do not think the idea is practicable as we only manufacture models of rolling stock of actual railway companies. (*Reply to T. E. Gibbs, Great Malvern*).

SHUNTING SIGNAL.—Shunting signals are not sufficiently familiar objects to warrant their introduction into the Hornby System, although we agree that they would look very well in a large layout. (*Reply to L. B. Stewart, Dundee*).

CHEAPER TRAIN SETS.—The prices of Hornby Train Sets are kept as low as possible, and the only way in which still cheaper sets could be manufactured would be by using inferior materials. This would result in an unreliable and unsatisfactory article, and this would be entirely against the principles of Meccano Ltd. (*Reply to H. Abbott, Bournemouth*).

RESTAURANT CAR.—The introduction of restaurant cars and 8-wheeled passenger coaches has been under consideration for some time, but so far no definite decision has been reached. (*Reply to J. Ridley, Southport*).

LIGHTER LOCOMOTIVES.—We fail to see that a reduction in the weight of a Hornby locomotive could have any advantages in any way. As a matter of fact we are now increasing the weight of our locomotives very considerably in order to obtain the highest possible efficiency from their motors. (*Reply to E. Thomas, Paignton*).

ROSS "POP" SAFETY VALVES.—You will no doubt be pleased to hear that our new designs of locomotives will include these and other interesting features. (*Reply to E. J. Milton, Toronto*).

SINGLE BOLSTER LUMBER WAGONS.—Your suggestion for single bolsters on our No. 1 Lumber Wagons is interesting and certainly quite practicable. As this arrangement is often seen on actual railways we shall give it careful consideration when opportunity occurs. (*Reply to L. R. Taylor, Dunston-on-Tyne*).

MODEL WEIGH-BRIDGE.—It would be very difficult to include a model weigh-bridge in the average model railway layout. A further objection is that such an accessory would necessarily be very costly to manufacture, and the resulting price would be too high to be popular. (*Reply to N. Baker, Newcastle*).

TWO-SPEED GEAR.—We have received many suggestions regarding the introduction of a two-speed gear to our locomotives. We agree that such a gear has many advantages, and the idea will be considered. The first difficulty, of course, is that such an innovation would involve the entire reconstruction of the existing mechanisms, which would be a very serious matter. (*Reply to V. Potter, Mansfield*).

CORRIDOR TENDERS.—At present this suggestion is extremely popular, but a tender of this kind would be very costly to produce and would really serve no more useful purpose on a Hornby layout than the ordinary type. In any case the number of locomotives fitted with corridor tenders running on the actual railways is very small. (*Reply to W. Mack, Hastings*).

"TUBE" RAILWAY.—Your suggestion regarding the introduction of a model "Tube" railway is interesting, but we are afraid quite impracticable. It would be impossible to reproduce the correct surroundings in miniature, and we think you will agree that there would be very little fun in operating trains that would be out of sight most of the time! (*Reply to G. Williams, Dover*).

POINTS WITH LEVERS ON INSIDE OF CURVE.—Points of this kind can be obtained by placing a special order with your Hornby Train dealer. If you have any difficulty in obtaining them let us know. (*Reply to D. J. W. Brough, Cheam*).

GUNPOWDER KEGS.—Accessories of this kind can be made quite easily out of wood, and we do not think it would be worth our while to produce them. (*Reply to E. Walbank, Dublin*).

MEAT VANS.—There is no doubt a well-designed meat van would be popular, but, as we have informed correspondents on many occasions, there is a distinct limit to the number of vans that can be included in the system. (*Reply to A. R. Molyneux, Wallasey*).

CATTLE PEN.—A cattle pen will probably be among the first new accessories to be introduced when the time comes for a revision of the list. (*Reply to S. Williams, Tullamore, Ireland*).

SIGNAL BOX FITTED WITH ELECTRIC BELL.—This is decidedly a good suggestion and there is no doubt that such an arrangement would add considerably to the interest of a layout. We think, however, that this is a mechanism that the majority of Hornby railway enthusiasts would prefer to make for themselves. We shall probably deal with this matter before long in the H.R.C. pages. (*Reply to L. Bradshaw, Tyldesley*).

DOUBLE TRACK VIADUCT.—A double track viaduct seems to be required to complete matters, and we are filing your suggestion for consideration. The main objection to such an accessory is, of course, the cost. (*Reply to P. P. Fleming, Wanstead, E.11*).

GOODS SHED.—Your design for a goods shed is interesting and it appears to be quite practicable. We cannot promise any immediate developments in this direction but we have made careful note of your proposal. (*Reply to J. H. Forth, Catford, S.E.6*).

3 ft. RADIUS CURVES.—We do not propose to introduce curves of 3 ft. radius. A larger curve undoubtedly gives better running, but the larger amount of space taken up is a serious drawback. We draw your attention to the Double Track recently introduced to the Hornby series. In this track the outer curve is of approximately 2 ft. 6 in. radius. (*Reply to Max Engels, Toronto*).

REMOVAL VAN TRUCKS.—Trucks of this type are not often to be seen on actual railways, but we agree that they are attractive in appearance. Your suggestion will be given consideration later. (*Reply to J. Williams, Newcastle*).

AUTOMATIC TURNTABLES.—The possibility of producing an electrically-driven turntable has been carefully considered. For the present we do not propose to introduce such a turntable, but it is quite possible that we may do so later. The cost of such an accessory is, of course, a serious feature. (*Reply to A. Moss, Southampton*).

MODEL CRANES.—We do not favour the idea of introducing model cranes other than those already fitted to the Hornby goods platform. It is very easy to construct suitable cranes from Meccano parts. (*Reply to E. B. Parker, Wallasey, and J. Poolesfoot, Swansea*).

NAMES ON STATION LAMPS.—You are right in stating that most station lamps bear the station name on them. At present it would be rather difficult to apply this idea to our models, for various reasons, including the shape of the lamps, but when the time arrives for re-designing our lamps the idea will receive full consideration. (*Reply to P. Harding, Huddersfield*).

CATCH POINTS.—We note your suggestion, but we do not think there would be a very great demand for an accessory of this kind. (*Reply to N. Fearnley, Birkenhead*).

"FAIRLIE" LOCOMOTIVE.—We do not think that a "Fairlie" locomotive would prove sufficiently popular to warrant its introduction. It is not in use to an extent to justify a model of it. (*Reply to E. Hoey, Birmingham*).

BRAKES ON ROLLING STOCK.—Brakes on rolling stock would not serve any useful purpose. They would be purely ornamental, and as such would not justify the extra cost of the vehicles concerned. (*Reply to D. Morton, Glasgow*).

MINIATURE FOG SIGNALS.—Your idea is quite interesting, and no doubt would produce some excitement. We doubt very much, however, whether such signals are really practicable on so small a scale. (*Reply to E. Bentley, Fleetwood*).

TOOLS FOR BREAKDOWN VAN.—Accessories of this kind, if made to scale, are so exceedingly small as to be of little utility. Unless a manufactured article of this kind serves some really useful purpose, its cost of production is altogether out of proportion to its value. (*Reply to K. E. Jackson, Sunderland*).

ELECTRIC COLLECTING SHOE DEVICE.—Your suggestion that Hornby Electric Locomotives should be fitted with a device by means of which the collecting shoe may be raised clear of the line rail is interesting. We agree that this would be of value when it is desired to run two engines from the same circuit, for it would allow one to remain stationary while the other is in motion. Further experiments will be made at some future date. (*Reply to H. Wilkins, Blackpool*).

GAUGE 3 MODELS.—For the present at any rate we do not propose to manufacture locomotives or railway material of any kind in any other than gauge "0," which we have adopted as our standard. (*Reply to L. Lewis, Bootle*).

RAIL CONNECTING PLATES.—The new Hornby rails are manufactured with specially shaped sleepers and locking plates (or Connecting Plates) similar to the one you suggest. These plates hold the rails securely together and result in a very rigid layout. (*Reply to M. Bray, Bradford*).

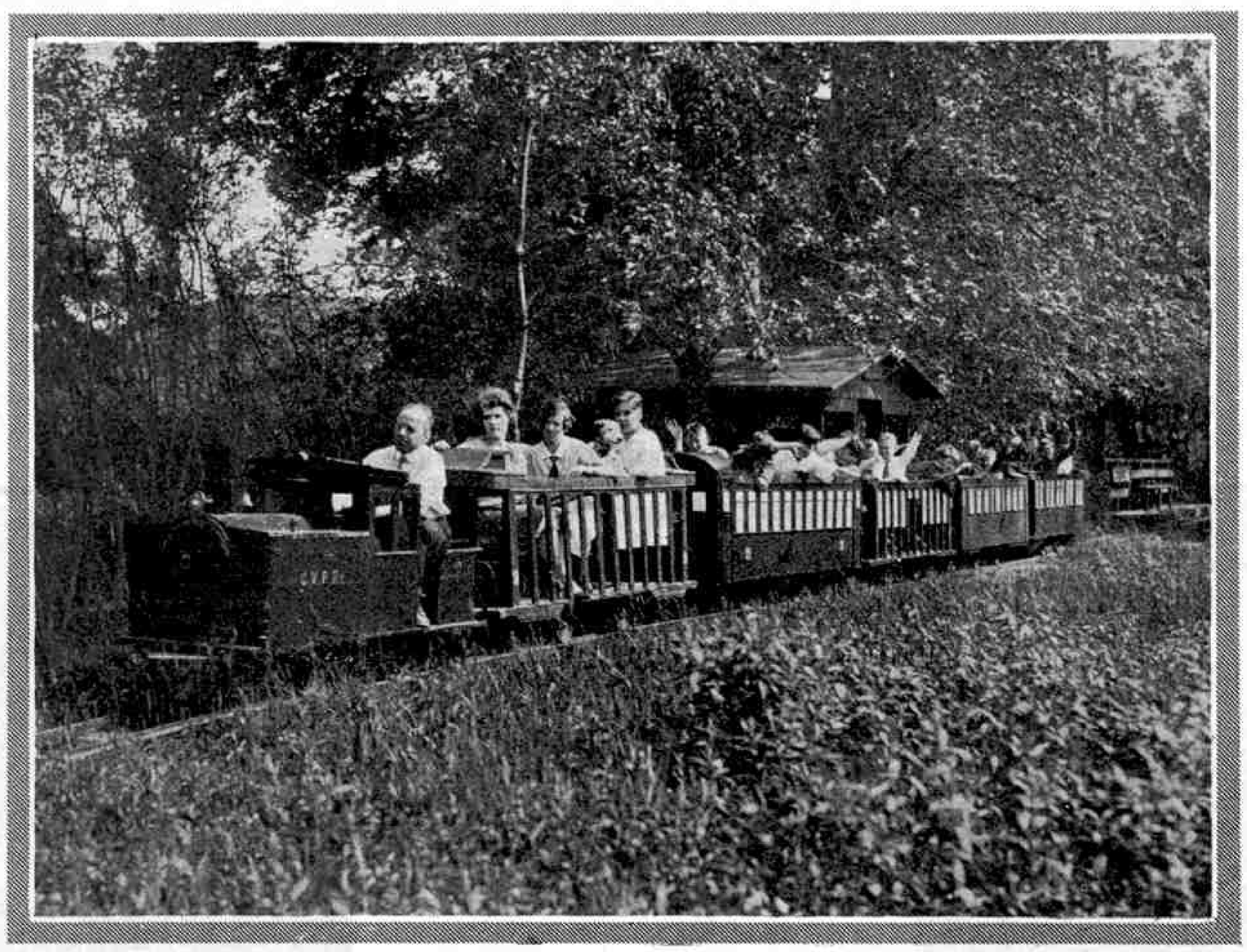
UNLETTERED WAGON.—We do not think that very many Hornby Railway enthusiasts would be inclined to attempt to letter their own wagons. Lettering of this kind is by no means easy if a really good result is to be obtained. We therefore think that your suggestion for Hornby wagons with unlettered sides is not practicable. (*Reply to R. W. Baxon, Oldham*).

FIRE BUCKETS.—We hope to introduce fire buckets into the Hornby System before very long, but we cannot say exactly when this will be. (*Reply to J. K. Autey and L. G. Morrey, Burslem, Staffs.*).

SCENERY VANS.—This type of van is comparatively unknown to the average railway enthusiast and for this reason we do not think it would be a popular feature to introduce. (*Reply to F. Smith, Chatham*).

STEAM LOCOMOTIVE.—We cannot consider the introduction of steam locomotives of any kind at present. We propose to concentrate our attention as before on clockwork and electric locomotives. (*Reply to W. E. Gaunt, Bowden, Cheshire*).

TWO-SPEED GEAR MECHANISM. — A two-speed gear mechanism would undoubtedly add to the interest of a clockwork locomotive, but there are many practical difficulties in the way. For one thing it would be very difficult to make a really satisfactory mechanism of a sufficiently small size to fit into the standard Hornby housing. In addition, the cost of locomotives so fitted would have to be increased considerably. At the same time the idea is worth careful consideration. (*Reply to J. Jones, Stone-house, Glos.*).



A miniature railway in operation near New York. It is extremely popular, and its small size has earned for it the nickname of the "Vest-pocket Railroad"!

SPRING-CONTROLLED POINTS.—The introduction of spring-controlled points to allow of operation from a distance has been suggested by many readers. Possibly you are not aware that the Hornby Control System enables the operator to manipulate either points or signals from a distance. We advise you to obtain particulars of this system. (*Reply to D. Spencer, Burnley*).

IMITATION COAL.—Imitation coal undoubtedly adds to the realistic appearance of tenders. We have considered the introduction of suitable material, but so far the demand has not been sufficiently large to justify our proceeding with the idea. (*Reply to T. Ridley, Manchester*).

STEEL RAILS AND WOODEN SLEEPERS.—A track constructed on the lines that you suggest would certainly give very smooth running, but its cost would be very much higher than that of our present tinplate track. We do not think that there would be much demand for a track of this nature. (*Reply to J. T. Morris, Bedford*).

WHITE LINES ON GOODS WAGONS.—Detailed markings of this nature serve a useful purpose on actual railways, but on model railways they are purely ornamental, and therefore we do not propose to introduce them. If they are really wanted, they can easily be painted on by any Hornby Railway owner. (*Reply to E. Murray, Galway*).

LUMINOUS PAINT ON HEAD LAMPS.—We do not think that painting the Hornby locomotive headlamps with luminous paint would increase their popularity. We are of opinion that the number of Hornby enthusiasts who run their trains in the dark is comparatively small, and so the advantage of this rather expensive alteration would be entirely lost on most Hornby layouts. (*Reply to K. Milldoon, Birmingham*).

MODEL GRAIN ELEVATOR.—Your suggestion is interesting, but structures of this kind are best dealt with in Meccano. (*Reply to E. Evans, Australia*).

SIX-WHEELED BRAKE VAN.—We are interested in your proposal regarding the introduction of a six-wheeled brake van for goods trains, but we do not consider that such a van would constitute any important improvement over the existing brake vans. Moreover, in your proposed wheel arrangement the centre axle would have to be loosely mounted so that the vehicle could negotiate the small radius curves. (*Reply to J. Fulton, Ilkley, Yorks.*).

NEW STATION.—We note your suggestion regarding the addition of another station to the Hornby system, but we think your proposal is covered already by the Wayside Station, now available. This is similar to the existing "Windsor" station but is without ramps or fencing, etc. (*Reply to A. McCormick, Nottingham*).

L.N.W.R. BRAKE VAN.—We do not propose to introduce any locomotives or rolling stock with lettering that has been obsolete since the grouping of the railway companies. We very rarely receive a request of this kind. (*Reply to E. D. Bedford, South Africa*).

PLATELAYER'S TROLLEY.—This accessory would no doubt be interesting, but we do not think there would be much demand for it. At any rate yours is the first suggestion of this nature. (*Reply to P. J. Elkes, Tottenham*).

SHUNTING LOCOMOTIVE.—The introduction of a special shunting locomotive does not seem necessary in view of the fact that any of the 0-4-0 locomotives of the Hornby series will serve the purpose admirably. (*Reply to T. Edwards, Canada*).

Results of Meccano Model-Building Contests

By Frank Hornby

"October" Competition, Home Sections

THE Home Sections of the October Contest produced a great diversity of original and well built models. The entries submitted provide excellent proof of the continued progress that is being made by model-builders both young and old in constructional methods and design. The prizes have been allotted as follows :—

Section A

THE FIRST, SECOND, and THIRD PRIZES have been combined and the following four competitors will each receive cheques for £1-11s.-6d.: L. W. Grey, East Ham, London, E.6; V. Smith, Dublin; R. W. Blake, St. Margarets-on-Thames, Twickenham; T. Sergeant, Triangle, Yorks.

SIX PRIZES, each consisting of Meccano products to value of 10/6: H. G. Clements, Luton; C. E. Wrayford, Teigngrace, near Newton Abbot; J. Hamilton, Litherland, Liverpool; A. E. Thurgood, London, S.E.10; Charles R. Sawyers, London, S.E.1; Jack Senior, Cleckheaton, Yorkshire.

TWELVE PRIZES, each consisting of Meccano products to value of 5/-: Leslie Hollyoak, Coventry; W. T. Chambers, Pleasley, near Mansfield; L. M. Lea, Chesham Bois; W. Hardwell, Bristol; Alan J. Stewart, London, N.W.6; R. W. Nash, Harrogate; C. C. Cullen, Surbiton; R. B. G. Fletcher, Walthamstow, E.17; G. Nicoll, Farnham; A. G. Newton, Castor, Near Peterborough; N. Ward, London, S.E.24; W. C. Higgs, Clapham, S.W.4.

SPECIALLY COMMENDED (Certificate of Merit and copy of Standard Mechanisms): W. H. Trenholm, Eaglescliffe, S.O.; Cecil Kinipple, Uckfield; B. Mall, Nottingham; P. Banks, Dunstable; M. E. Edwards, Oxford; G. W. Downer, London, S.W.17; G. Hunter, Edinburgh; F. A. N. Hitch, Gosport; J. Knight, Milwick Hall, near Stafford; R. White, Wolverton, Bucks.

Section B

The FIRST, SECOND, and THIRD PRIZES have been combined and divided equally among the following four competitors who will each receive goods to the value of 18/6: Sidney G. Ellis, Norwich; W. Davidson, London, S.E.24; H. Mason, Southfield, Leicester; J. W. Elliot, Rotherham.

SIX PRIZES, each consisting of Meccano products to value 5/-: D. B. Hewitt, Didsbury, Manchester; G. W. Ling, London, N.11; D. Cheshire, Hastings; Harold Corbett, Alvaston, Derby; N. E. G. Theakstone, Murton, York; R. Ballard, Friadsbury, near Rochester.

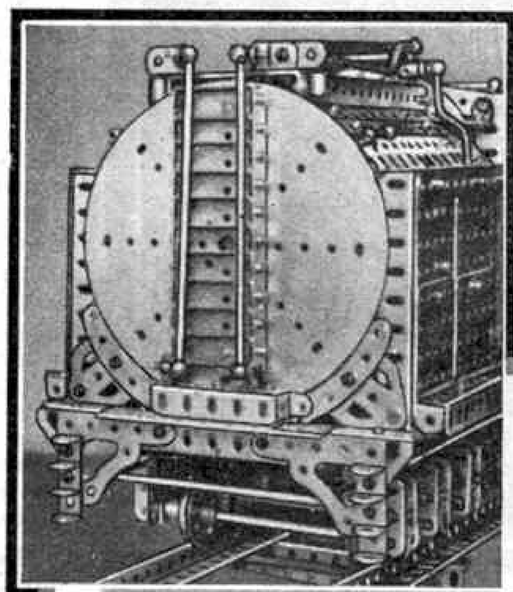
TWELVE PRIZES, each consisting of a complete Instruction Manual: Bracewell Hartley, Earby, near Colne; R. Burton, Hoylake; W. M. Field, Yeovil; Peter Ray, Bournemouth; Eric Beale, Redhill, Surrey; Gordon Griffiths, Liverpool; M. A. F. Hirst, Solihull; James G. Clegg, Shawforth, near Rochdale; George King, Margate; C. F. Sheppard, Chippenham; George Blackburn, Thornton Heath, Surrey; Oscar Herington, Birmingham.

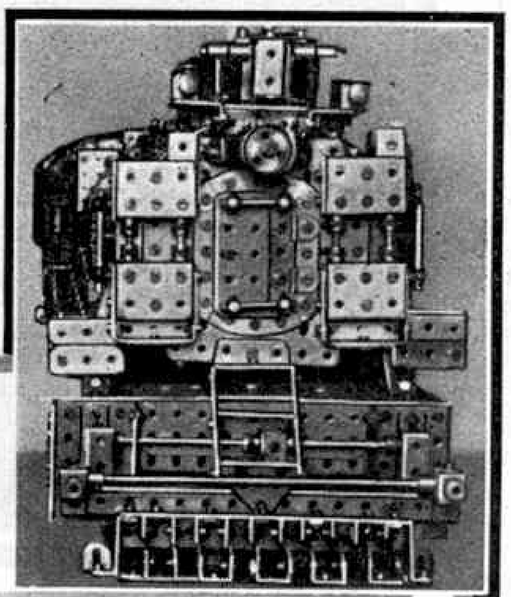
SPECIALLY COMMENDED (Certificate of Merit and copy of Standard Mechanisms): G. E. Farrington, Walsall; J. V. Hudson, London, S.W.16; W. H. Kent, Brighton; Peter R. Lincoln, Potters Bar; P. Burn, Salisbury; Billy Hunt, Hockley Heath, near Birmingham; Peter Troup, London, W.1; J. Gladwin, Scunthorpe.

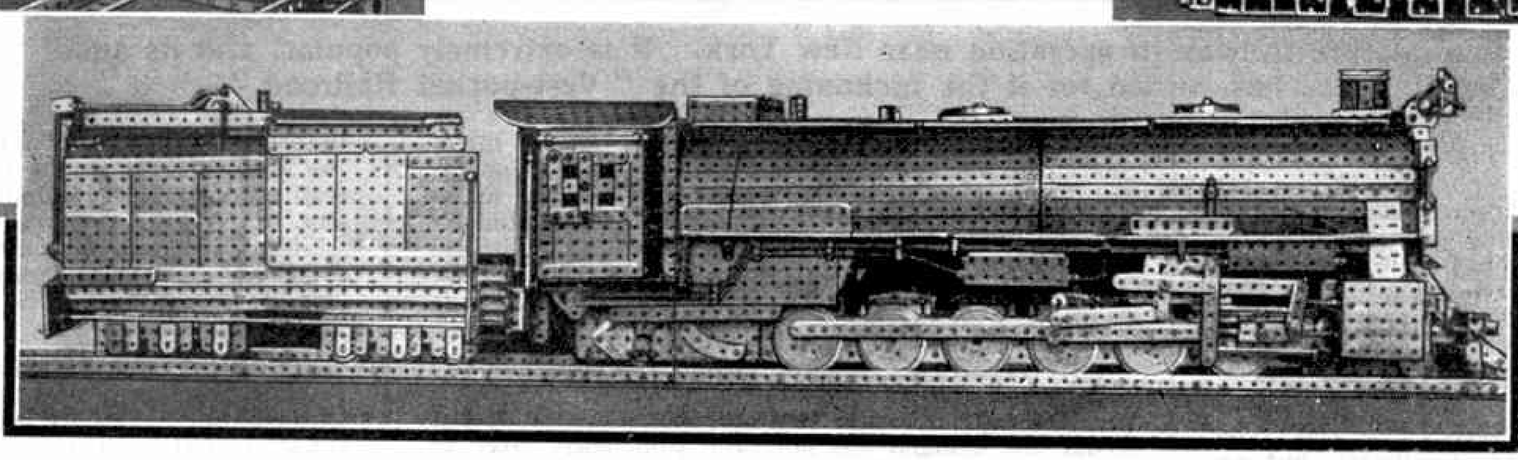
In Section A the outstanding entries were all so uniformly good that it was found impossible to award the First, Second, and Third Prizes to any individual competitors. The prizes were therefore divided equally amongst four entrants.

Mr. Grey's model, which is illustrated on this page is an accurate reproduction of a 4–12–2 three-cylinder engine built by the American locomotive Company for freight service on the Union Pacific Railway, and presents a fine aspect of American locomotive practice.

The prototype of the model is designed for hauling very heavy freight trains at fast speeds over the steep gradients with which the Union Pacific Railway abounds; hence a large number of coupled driving wheels and a particularly large boiler are distinctive features of the design. No doubt some readers will be surprised at the appearance of the front of the engine (see right-hand sectional view) for it must be admitted that the appearance of the engine from this angle bears little resemblance to the corresponding portion of the English type of locomotive. This part of the model has been modelled quite faithfully, however, and includes a representation of each of the fittings to be found on the smokebox of the actual engine.







Three views of Mr. L. W. Grey's 4-12-2 Union Pacific Freight Engine. A wonderful example of model locomotive construction

On either side of the smokebox door will be seen an air brake compressor, which in practice is connected to the vacuum brakes of the freight vans. Directly above the smokebox door a pulley wheel is secured, representing the powerful electric headlamp which is a standard feature of all American locomotives. Just above the Pulley Wheel a series of short Rods and Angle Strips form the warning bell, while to the right and left of this Angle Brackets fitted with Buffers represent two further electric headlights. The cowcatcher secured to the lower portion of the frame of the engine can also be seen clearly in this view.

The enlarged view of the rear of the tender is also of particular interest. The tender, it will be noticed, is of particularly massive dimensions in order that there will be ample accommodation for both fuel and water. A very neat ladder can be seen fastened to the water tank (the end of which is formed by a 6″ Circular Plate) and the other portions of the tender that can be seen in this illustration are built equally neatly and solidly. The model certainly proclaims Mr. Grey to rank amongst the cleverest of Meccano model locomotive constructors.

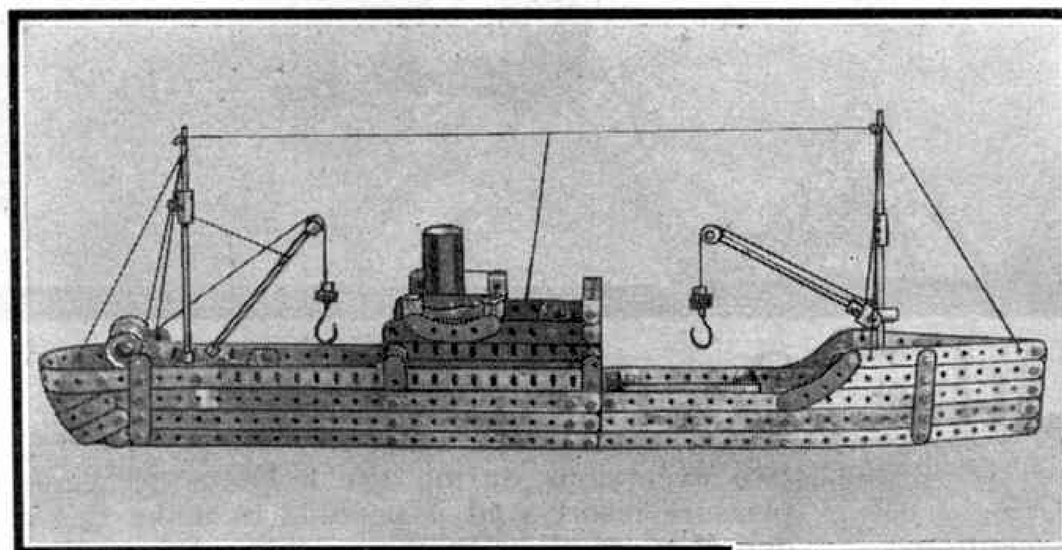
Perhaps the most novel entry submitted in Section A of the Contest is the "caterpillar" barrow by T. Sergeant. In a previous article I commented on the way the caterpillar system of propulsion, first introduced in the army tank, has been adapted to farm tractors, motor cars, excavators, cranes, and many other types of machine. The principle is now employed in one of the most commonplace of vehicles, the wheelbarrow!

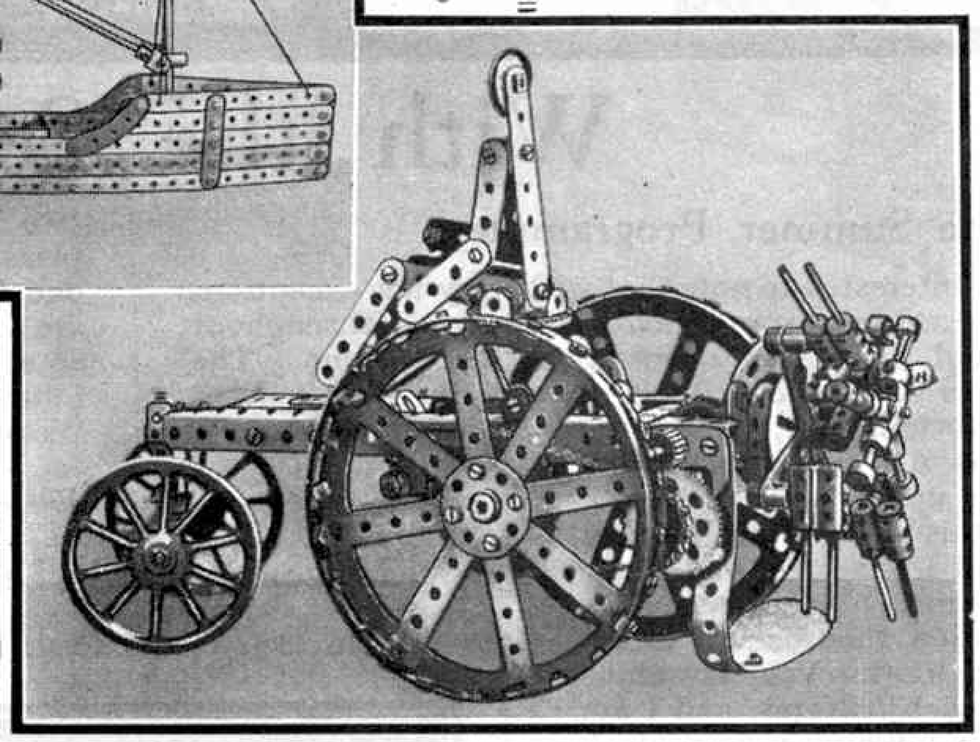
At first it might appear that there is little advantage to be gained by fitting a barrow in this way, but as a caterpillar unit will travel over either very rough or swampy ground without jamming or sinking, it obviously enables increased speed and efficiency to be obtained, at the same time decreasing the effort required on the part of the operator. Sergeant's model demonstrates the working of the device remarkably well.

The Meccano model is of quite orthodox construction, the chief point of interest, of course, lying in the way the caterpillar track has been constructed. The track proper consists of an endless length of

Sprocket Chain which is passed over two ¾″ Sprocket Wheels mounted on 2″ Rods that are journalled in the end holes of two 2″ Strips. To the centre of each of these Strips a 1″ Triangular Plate is attached and a third 2″ Axle is passed through the top holes of these Plates and also through the end holes of two 3½″ Strips that are bolted to the sides of the barrow.

The framework carrying the track can thus pivot independently about the end of the barrow while the track itself may roll round the Sprocket Wheel. Consequently the complete unit will adjust itself to the contour of the ground over which it is travelling. I hope to be able to include an illustration of this ingenious model shortly.





(Above) A small but cleverly built model of a cargo steamer, by W. Davidson. (Right) Potato reaper built by V. Smith. The mechanical features of this model have been very ingeniously devised. Note the Meccano "operator"!

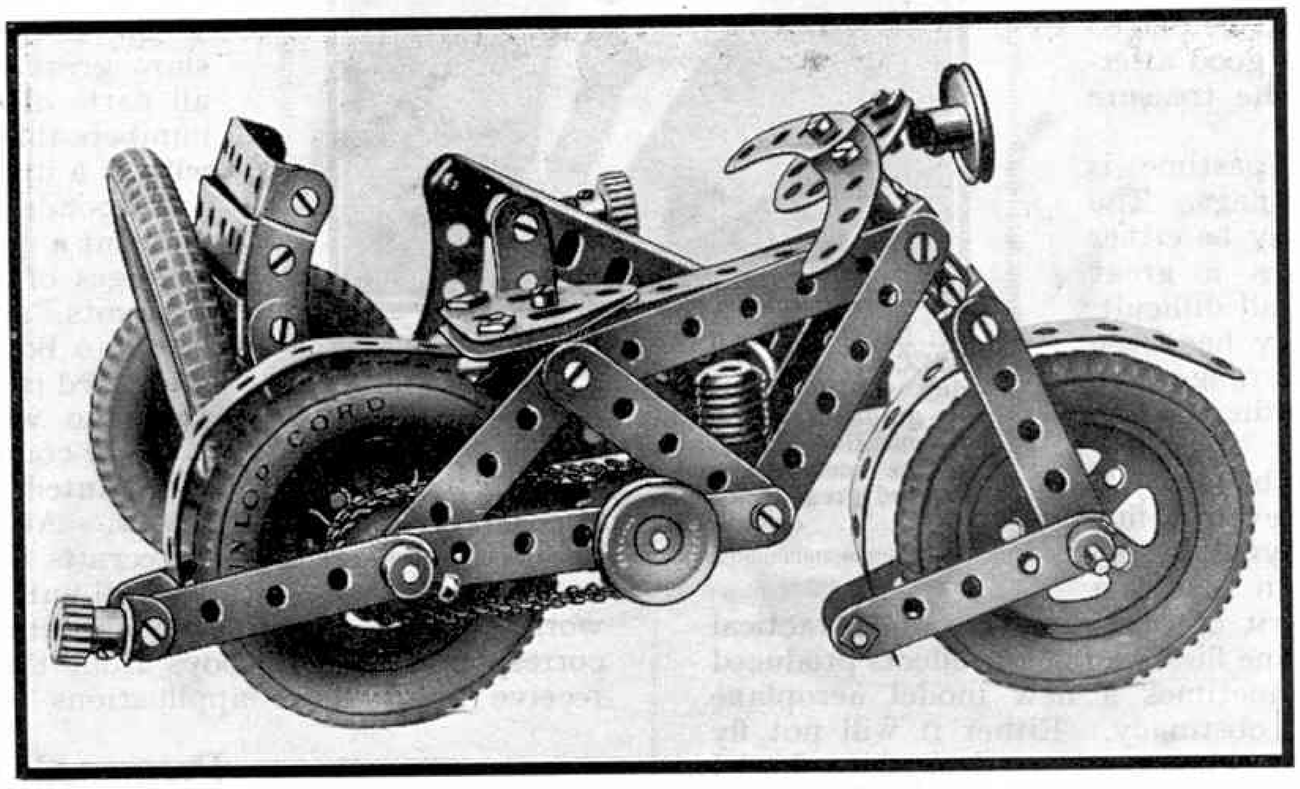
The cargo steamer constructed by W. Davidson and illustrated on this page presents several original features. The model, as will be seen, is fitted with two neatly constructed cargo derricks, which give the vessel a most workmanlike appearance. The boom of the fore derrick is hinged to the base of the mast by means of a large Fork Piece held to a Coupling that in turn is secured to the mast by means of a 1″ Axle Rod. The ½″ Pulley at the tip of the boom rotates on a ½″ Bolt secured in the threaded hole of a Collar. A different method is employed for hingeing the rear derrick boom to the base of the mast. A Collar is placed on the lower end of the Rod forming the boom and one lug of a Meccano Hinge rigidly secured to it by means of a bolt. The other lug of the hinge is firmly bolted to a Bush Wheel forming the base of the rear mast. These derricks look remarkably neat, while they have of course the additional attraction of actually working.

Illustrated with the cargo ship just mentioned is a model of a potato reaper built by V. Smith. The model includes a number of interesting features, not least of which is the Meccano "operator" sedately perched upon a seat in the centre of the machine!

In actual practice the reaper is drawn over the potato field so that the share (represented in the model by a Propeller Blade) cuts into the furrow in which the potatoes are planted, while four pairs of revolving forks placed directly behind the share separate them from the soil, and throw them to either side of the furrow. The frame carrying these forks is driven by means of Sprocket and Contrate and Pinion gearing from the two large road wheels, each of the forks being pivoted in an ingenious manner so that it is given an oscillating motion while being driven round. This motion is achieved by coupling the upper ends of the forks to a short stationary crank, by means of linkage built up from Rods, Collars, and Fork Pieces. As the frame rotates, the linkage is pulled backwards and forwards, and the forks themselves are rocked to and fro.

This mechanism causes each of the forks to travel across the furrow with a greatly decreased angular movement, so that they may be said to make a practically parallel cut.

Readers will be interested in the model motorcycle and sidecar built by H. Mason and illustrated on this page. The model has been constructed to quite a small scale, 2″ Pulleys and Dunlop Tyres being employed for the road wheels. The general appearance of the complete outfit is, however, strikingly realistic. The tail and sidecar lamps consist of ½″ Pinions, while a 1″ fast Pulley represents the headlamp!



Motor Cycle and Sidecar. The work of H. Mason

A point that could perhaps be improved upon is the position of the flywheel in the frame of the machine. This, it will be seen, is some distance away from the cylinder (which consists of a Worm Wheel). In order to conform with actual practice, the flywheel should, of course, be placed directly beneath the cylinder, as otherwise the piston and connecting rod could not possibly function. By moving the axle carrying the 1″ Pulley slightly forward, this point could be rectified.

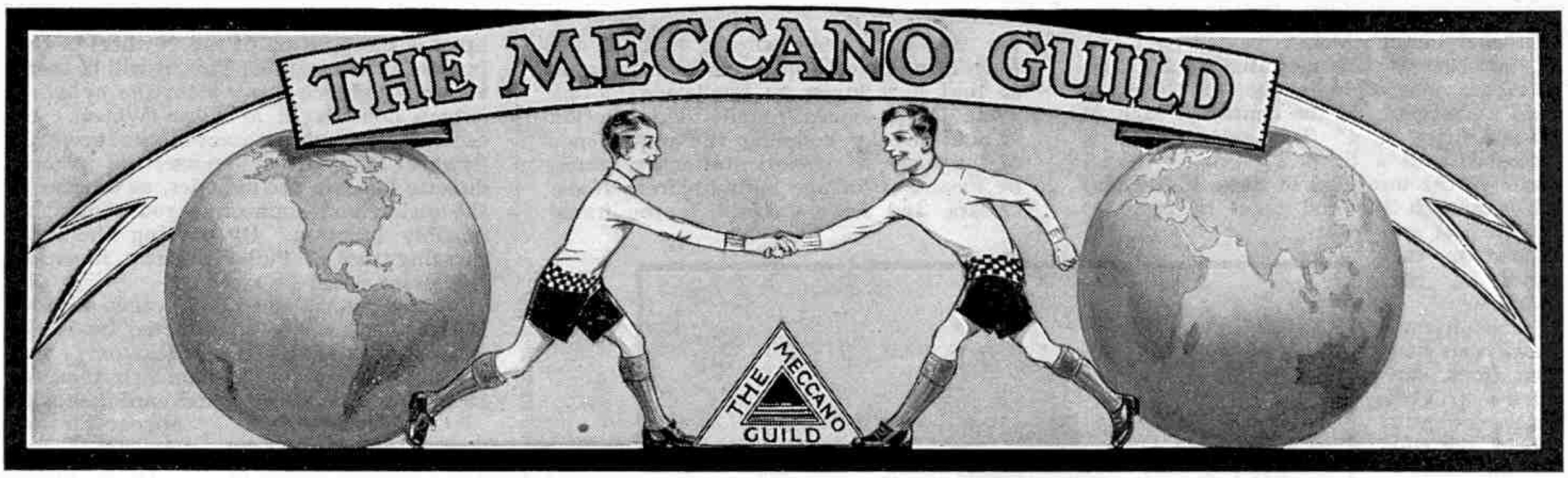
Another model worthy of note in section B was the seaplane constructed by S. G. Ellis. This model comprises only the "skeleton" of the machine, but when covered in with fabric or stiff card it should appear most realistic.

It is fitted with a representation of a "six-in-line" type of aeroplane engine in place of the more usual "radial" motor. The engine consists of six Meccano Couplings, each placed directly behind the preceding one in the fore part of the machine, while short Axle Rods secured in the upper lateral holes of the Couplings represent the exhaust "manifold." The construction of the undercarriage and floats of the machine have also been carried out with great care, Strips being used throughout to form these portions. The complete result is a very fine example of aircraft construction in Meccano.

A particularly original model was submitted by H. G. Clements in Section A. This comprised an hydraulic press for shaping straw hats. The model consists essentially of a platform built up from Angle Girders in the centre of which is placed a Hub Disc. This represents an aluminium pan around which steam is circulated, the aluminium pan being shaped in the form of the hat that is to be modelled.

The upper portion of the actual machine consists of a large chamber inside which a rubber bag is placed. This chamber has been represented in the model by means of a number of 2″ Strips secured around the circumference of a Hub Disc. The chamber can be raised or lowered by means of a length of Sprocket Chain, passed over a 2″ Sprocket Wheel mounted on a standard at the top of the model.

The action of the press is as follows:—The felt or other material from which the hat is to be formed, is placed in the aluminium pan, and the upper part of the press lowered. Water is then pumped into the rubber bag under pressure, and the felt is consequently forced into the shape of the pan. In this way the hat is formed.



With the Secretary

The Summer Programme

I have been very interested to note that with very few exceptions Meccano Clubs are making arrangements to carry on throughout the summer instead of closing down until the autumn. The few clubs that have closed down have done so for certain local reasons which, unfortunately, made this course quite inevitable.

The larger clubs find no difficulty in keeping themselves in full activity during the summer, but this is not quite so easy for small clubs, and I have received many requests for suggestions.

The first suggestion that occurs to me is that of a treasure hunt. Very few clubs appear to arrange such features, and I am sure that they are missing a good deal. I do not know of a better means of cramming every possible ounce of fun and excitement into a long summer afternoon than a well-organised treasure hunt. The value of the treasure itself is, of course, a minor point; the real interest is in the finding of it. Careful organisation beforehand is necessary for success. The treasure should be carefully hidden by the organiser of the hunt, who is usually the Leader of the club, and its whereabouts should be revealed through a series of hidden clues, each one leading on to the next. A great deal of ingenuity may be displayed in preparing these clues, and I have seen some that were really brain-teasers, and at the same time very humorous. The hiding places of the clues should be placed sufficiently far apart to ensure a good afternoon in the fresh air before the treasure is finally discovered.

Another splendid open-air pastime is that of signalling by means of flags. The learning of the code, which may be either Morse or semaphore, provides a great deal of interest, and is not at all difficult. When the necessary proficiency has been attained it is great fun to arrange two parties to signal to one another across a stream or a narrow valley.

One or two very small clubs enjoyed themselves immensely on several fine afternoons last summer in flying model aeroplanes. This is quite an exciting sport, and it also has the merit of providing a sound practical knowledge of how a real aeroplane flies, and of the effects produced by different adjustments. Sometimes a new model aeroplane shows a surprising amount of obstinacy. Either it will not fly at all or it will do just exactly what it is not desired to do. I do not know of anything more interesting than to patiently subdue its bad habits by little alterations here and there until it turns out to be a really good flyer.

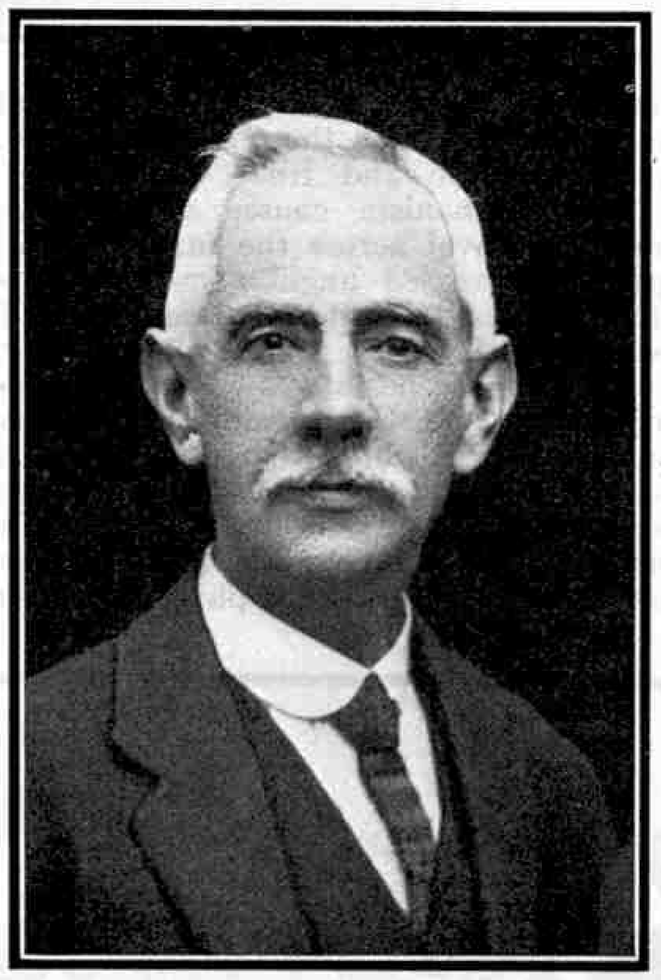
Joint Excursions

I hope that every Meccano Club that is not already following a regular summer programme will endeavour to arrange one or two excursions during the holidays to some inland or seaside pleasure resort, and if possible to make this a joint outing with one or more clubs in the neighbourhood. Even when two clubs are a considerable distance apart it is possible to arrange a meeting at some place of interest halfway between the two. As I write I have in front of me a description of a visit of the Falmouth Wesley M.C. to Plymouth, on which occasion the St. Bartholomew (Plymouth) M.C. acted as hosts and guides. The result was a thoroughly enjoyable and interesting day, and I am looking forward to hearing of the Falmouth Club returning the compliment by extending an invitation to the Plymouth Club. I am quite sure that if Leaders and secretaries would take this matter a little more seriously a very much greater number of interesting inter-club meetings could be arranged.

I find that some clubs are not taking full advantage of the extensive facilities offered by the railway companies in the way of cheap bookings. When a visit to a particular place has been decided upon, the secretary of the club should make full inquiries at the local station in order to obtain the best terms. All the companies are prepared to make really valuable concessions to organised parties, but it is necessary to make arrangements in advance.

Meccano Club Leaders

No. 38. Mr. C. J. Berry



Mr. Berry has been the Leader of the Exmouth Y.M.C.A. Meccano Club since its foundation. The club was affiliated in February 1929, and under his guidance has quickly become a very sound organisation. Model-building is the chief pursuit of the members, and their recent Exhibition aroused great local interest and very favourable comments in the press

Correspondents Wanted

The Correspondence Club continues to show great activity and Meccano boys in all parts of the world are joining in such numbers that the rush of applicants brings with it a little difficulty in finding suitable correspondents quickly. At the present moment a number of French boys between the ages of 12 to 18 are awaiting correspondents, and I shall be glad to enrol Meccano boys in other countries who are interested in stamps, wireless and aviation, and who wish to write in French.

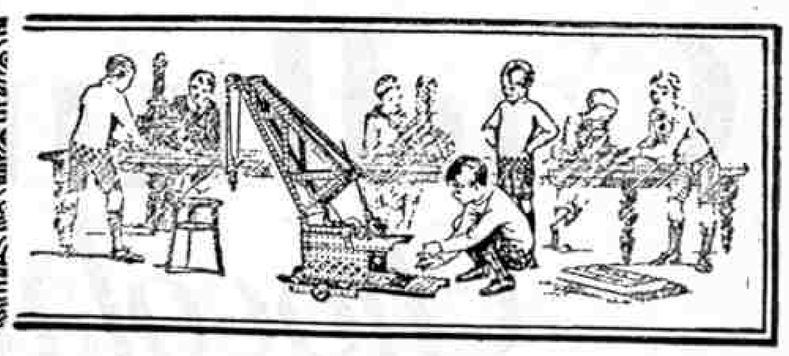
Other countries in which correspondents are wanted are Canada and the United States. At present there is a steady flow of recruits from North America, but there are still numbers of boys in all parts of the world who are awaiting an opportunity of entering into regular correspondence with boys from these countries, and I hope to receive many more applications from them.

Proposed Clubs

Attempts are being made to form Meccano clubs in the following places and boys interested should communicate with the promoters, whose names and addresses are given below:—

BEDFORD—Eric Lee, 126, Bower Street.
BRISTOL—A. K. Chivers, 1, Glentworth Road, Clifton.
BURY ST. EDMUNDS—R. Mousley, The Bungalow, Rushbrooke.
HODDESDEN—A. Mansfield, The Cottage, Stanstead Road.

CLUB NOTES



Great Baddow M.C.—A Bridge-building Competition produced many excellent models, and a working model of a Bacon Cutting Machine constructed by one of the older members aroused great interest. Lectures by the Leader, and Games, completed the programme, a Dart Competition being keenly contested. An excellent programme was arranged for Visitors' Night, at which Mrs. Phillips, wife of the President of the Club, kindly distributed the prizes earned during the session. Club roll: 39. *Secretary*: Miss D. K. French, High Street, Gt. Baddow.

Herne Bay Meccano and Hobbies M.C.—Indoor games tournaments have been completed, and the prizes presented by Mr. J. R. Huxtable, the new President. In the Air-Gun Shooting Contest, the "*Stevens*" Championship Shield and Silver Medal were won by S. H. Williams. The Amateur Magazine Competition was won by S. Ubsdell, V. Redmond being second. The Annual Picnic was held at Bishopstone Glen, members spending an interesting day in Cliff Climbing, Rambling, Bathing, and playing Cricket, Rounders and other games. Club roll: 46. *Secretary*: C. W. Russell, 4, Clifton Villas, Herne Bay.

Victoria (Glasgow) M.C.—A Debate on "*Buses v. Trams*" ended in a novel manner, for it was decided by vote that trams were best in cities and buses preferable in the country! An interesting evening was spent in building Clockwork Motor Cars, which afterwards took part in several races. At a joint meeting with Morison Memorial M.C. a Lantern Lecture on the "*Progress of Ships from Noah's Ark to the Present Day*" was given. In return members visited the Annual Display of the Morison Memorial M.C. Visits also were paid to a Lemonade Factory and the Corporation Gas Works. Club roll: 56. *Secretary*: R. Hannah, 26, Kennedy Drive, Partick West, Glasgow.

Morison Memorial M.C.—The second Annual Display was an outstanding success. The chief attraction was a Model Colliery, in which models of Rock Drills and Coal Cutters were at work, in addition to the usual Pit Head Gear and Engineer's Workshop. A Model Railway was run in connection with the Mine. Other models included a Fairground and a faithful reproduction of a Corporation Tramcar. A Concert also was given at which the Gymnastic Squad gave a display. Instructive talks entitled "*A Tour through London*" and "*Black and White Sketching*" have been given and a performance of the Meccano play "*Nonsense Nana*" was greatly enjoyed. Club roll: 54. *Secretary*: Geo. Gerrard, "Yarrow," Montrose Street, Clydebank.

St. Bartholomew's (Plymouth) M.C.—Membership has increased steadily since the formation of a branch of the Hornby Railway Company in association with the club. The first copy of the Club Magazine, "*The Gearbox*," has been produced. A visit to Plymouth by the members of the Falmouth Wesley M.C. led to a very interesting and enjoyable afternoon and evening. The club has paid a visit to the Laira Engine Shops, and members were greatly interested in the locomotives on view. Club roll: 45. *Secretary*: K. A. W. Wills, 8, Beechwood Avenue, Mutley, Plymouth.

South Shields Y.M.C.A. M.C.—Is now affiliated and is attracting many new members. Model-building, Lectures and Visits have formed the programme, talks on "*Electro-magnets and Motors*," "*Model Aeroplanes*," and "*Coal Mining*" being particularly enjoyable. Another interesting evening was provided by a demonstration of "*X-Rays*." Summer sports and outings arranged include a Club Camp. Club roll: 12. *Secretary*: G. H. Blanche, 241, S. Palmerston Street, South Shields.

Wealdstone Locket Road M.C.—The greatest interest of last session was Model-building, and the Competitions were keenly contested. New members are urgently required, and those wishing to join should apply to the secretary. Club roll: 10. *Secretary*: J. E. Skoyles, 28, Aberdeen Road, Wealdstone, Middlesex.

Pershore M.C.—First prize in the Model-building Competition was awarded to an excellent Tractor and Trailer. The Contest was exceedingly close, and only the superiority of the springs of the winning model gained it the prize. A Club Library has been started, members paying 1d. or 2d. for the loan of each book. A Table Tennis match against Evesham H.R.C. has been played. Club roll: 10. *Secretary*: D. Cross, Church Street, Pershore.

Halifax M.C. was affiliated in November 1927, and has made excellent progress under the energetic Leadership of Mr. H. Ramsbottom, who is standing in the back row of our photograph. Model-building is the most popular pursuit, and a special feature is made of large models built by the joint efforts of members

Albert Village M.C.—An interesting talk on the district around Burton-on-Trent was given by the Assistant Leader. The Concert and Exhibition was very successful, chief prizes in the Model-building Competition being awarded for models of Meccanograph, Beam Engine, Vertical and Horizontal Steam Engines, and Revolving Crane. Other models displayed included Pit Head Gear, Dutch Windmill, Motor Cycles and the Model Workshop on loan from Headquarters. Cricket is the chief summer occupation, and a programme of 22 matches has been arranged. Club roll: 19. *Secretary*: L. C. Adey, 239, Occupation Road, Woodville, Burton-on-Trent.

St. Peter Mancroft (Norwich) M.C.—In a Model-building Competition that aroused great interest the number of parts allotted to each competitor was 35, together with 25 nuts and bolts. Surprisingly excellent models resulted. A Hat Night and a Debate on "*The Value of Atlantic Flying*" were also exceedingly interesting. A talk by Miss A. E. Steward, Vice-President, was greatly enjoyed. At the same meeting a Gramophone demonstration was given, and Merit Medallions presented. Club roll: 14. *Secretary*: J. Vyse, 51, Cardiff Road, Norwich.

Weymouth Central School M.C.—An interesting programme has included visits to a Printing Office, a Newspaper Plant, the Poole Gas Works, and a Ship Coaling Wharf, where members inspected the engine room of a Coaling Steamer. Members also had Cycle Rides and a Paper Chase. A Camping ground has been arranged where members may spend week ends and occasional nights. Club roll: 30. *Secretary*: R. P. Mogg, 26, Chelmsford Street, Weymouth.

Wallisdown M.C.—A Cycle Run, a Paper Chase, and Cricket Matches have occupied attention. Other items included a talk on "*Electrical Machinery*" by a local electrical engineer, and a Business Meeting to discuss co-operation with neighbouring clubs. Club roll: 13. *Secretary*: G. Hoddinott, Bryant's Cross, Wallisdown.

St. Paul's (Lozells) M.C.—A large Hornby Train Layout is operated on realistic lines, shunting particularly being well carried out. Members are now expert in changing points quickly. A talk on "*Armour*" by one of the members was of great interest. Other Lectures included one on "*British Railways*," and a visit has been paid to the Great Western Railway Engine Shops at Tyseley. Club roll: 24. *Secretary*: E. Cunningham, 93, William Street, Lozells, Birmingham.

Wallingford County Grammar School M.C.—A Lecture on "*Photography*" was kindly given by Mr. Heslop, Assistant Master of the School. Later meetings were devoted to Model-building in preparation for the Exhibition. This was a great success, the room being so full of visitors that there was scarcely room to move about! A Meccano Outfit and extra parts have been purchased for club use. Club roll: 13. *Secretary*: L. M. Allen, Rosemead, The Moors, Pangbourne, Berks.

Carlingford College M.C.—Members paid an interesting visit to the Model Railway Exhibition. Almost every member went for a ride on the model steam railway, after which the free cinema was visited. Advantage was taken of the opportunity to visit St. Paul's Cathedral, where the whispering gallery aroused great interest. Club roll: 30. *Secretary*: E. Martin, 122, White Hart Lane, Tottenham, London, N.17.

Cecil Road (Gravesend) M.C.—Recent meetings included a Colliery Night, when a Meccano Pit-head Gear was placed above a floor ventilator that made an excellent pit. Hornby Trains carried the coal away from an adjacent siding. On Shipping Night the plan of a dock was drawn on the floor, and members built Ships and Cranes, while a goods line was constructed from the wharfside. Another interesting evening was devoted to Aeroplanes, excellent models of R.A.F. Fighting Machines and Junkers All-metal Monoplanes being built. A Pageant concluded the evening. Club roll: 20. *Secretary*: G. N. Cottle, 53, Cecil Road, Gravesend, Kent.

Spilsby Church School M.C.—Lectures are alternated with Model-building Evenings, and every member in turn gives a short account of some interesting topic. Those given have included talks on "*Stars*," "*Locomotive Repairing*" and "*Aeroplanes*." In fine weather Cricket Matches are played on Club Nights. Club roll: 12. *Secretary*: D. P. Dennis, Church Street, Spilsby, Lincolnshire.

Harwich M.C.—The Exhibition was very successful, the sum of £8/10/- being raised. Among the working models were a Ship Coaler on loan from Headquarters, on which regular demonstrations were given, a Roundabout and a Bucket Excavator. During the evening members were busy casting toy soldiers, which were sold to visitors. *Secretary*: A. E. Ward, Osborne House, Pepys Street, Harwich.

Fulstow Junior M.C.—Members are entering into Model-building Competitions with great keenness, a contest for the construction of bridges attracting a very large entry of excellent models. The bridges built were used afterwards in an extensive Hornby Train Layout. Recent events have included a visit to a Wild Flower Show, a Treasure Hunt and several Cricket Matches. Club roll: 10. *Secretary*: L. Doe, The Stores, Fulstow, North Thoresby, S.O., Lincs.

Cadbury's *Chocolate Sandwiches*

6d EACH

5 KINDS

Truffle, Creme, Scotch
Caramel, Nougat,
Almond Toffee.

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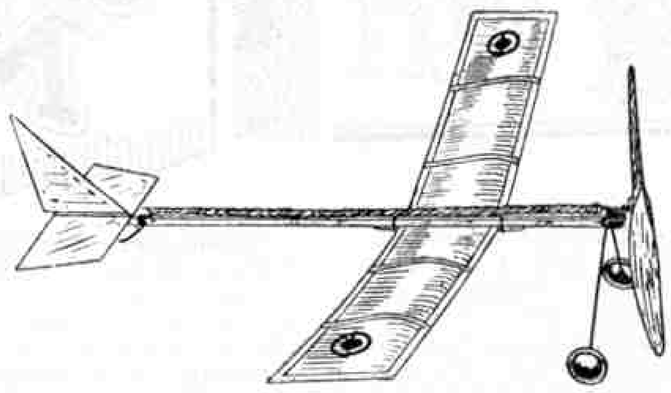
BRITISH MADE AND GUARANTEED



The "DEMON" Patent No. 296946

Fitted with the ingenious Warneford Rocking Bracket Chassis, a 10" Hand Carved and Balanced Propeller, and Covered Yellow Proofed Silk. Simple to control, it can be adjusted for many variations of flight.

Price 7/6

Larger Model
The "SWIFT"
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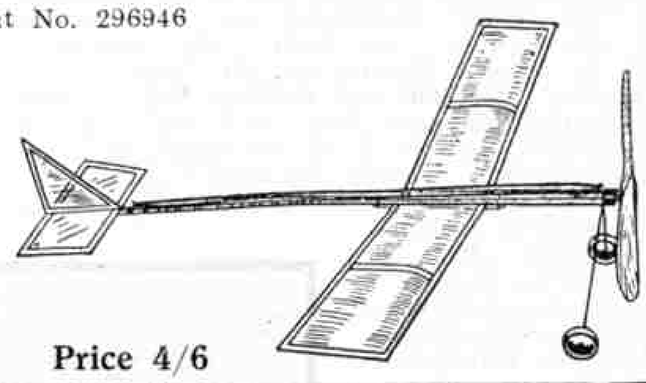
The "MOTH" Patent No. 296946

Fitted as above with 8" hand carved and balanced Propeller. The weight and wind resistance has been reduced to a minimum and you will be delighted with the wonderful flying you can obtain with this model. The best design, the finest workmanship, and the greatest value obtainable anywhere.



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A 15" Model that weighs only ¾ oz. Made from the Lightest Wood in the world. Price 1/6.

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The greatest Aeroplane Novelty ever invented. Has Feather Wings, Tail and Rudder. Price 3/6.

See our exhibit at the International Aero Exhibition, Olympia, July 16-17. Stand No. 185.

WARNEFORD MODELS are scientifically designed by a practical aviator. The flying of these models, besides being a pleasureable pastime, will enable you to obtain a sound basic knowledge of aviation.

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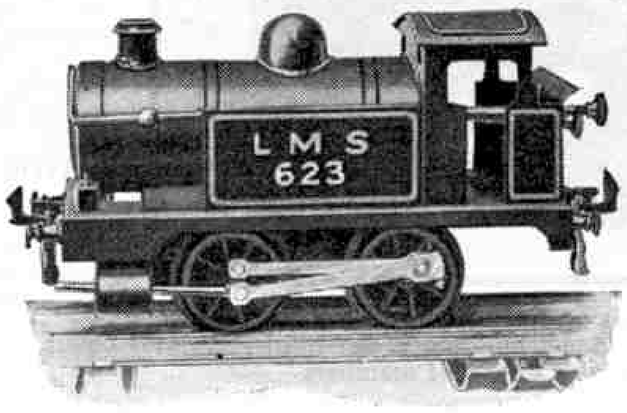
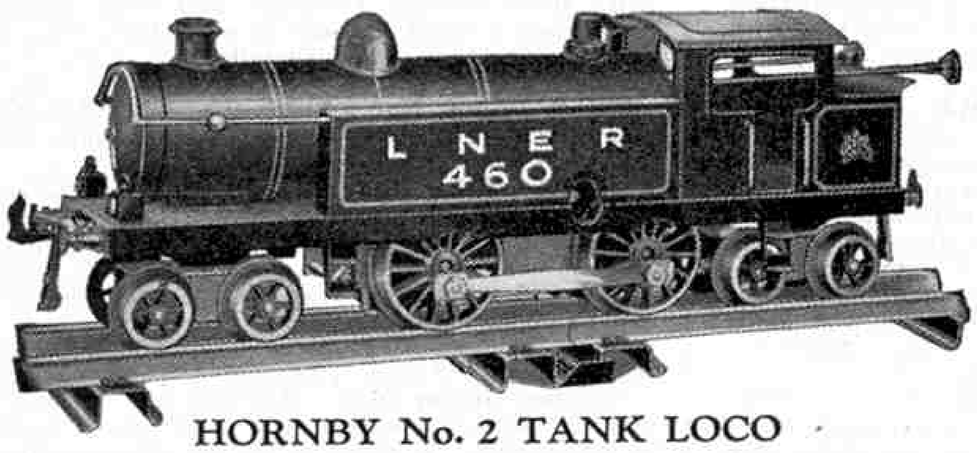
HORNBY TANK LOCOS



HORNBY No. 1 TANK LOCO

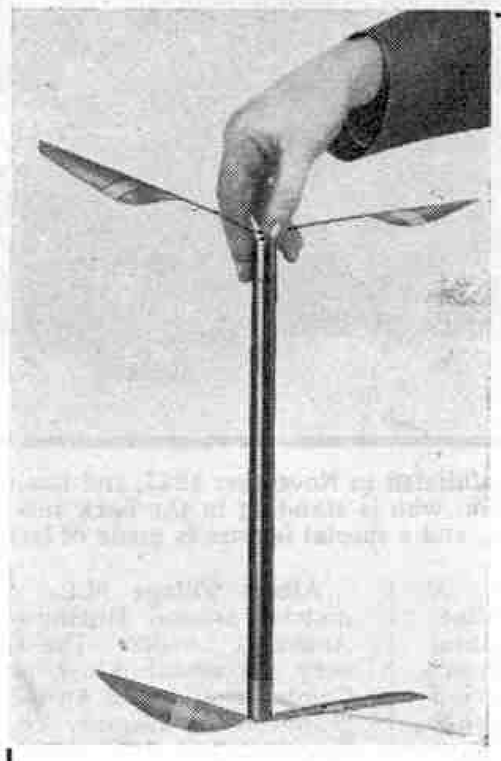
Strong and durable loco capable of any amount of hard work; richly enamelled and highly finished: fitted with reversing gear, brake and governor.
Gauge 0, in colours to represent L.M.S., L.N.E., G.W. or Southern Railway Companies' Locos ... ... Price **12/6**



HORNBY No. 2 TANK LOCO

Powerful model embodying all the splendid Hornby characteristics. It is 10½" in length and is fitted at both ends with a four-wheeled bogey. Beautifully finished in colours to represent L.M.S., L.N.E., G.W. or Southern Railway Companies' Locos. Fitted with reversing gear, brake and governor. Suitable for 2-ft. radius rails only ... ... Price **22/6**

MECCANO LTD., OLD SWAN, LIVERPOOL



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A Fascinating Sport

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The HELIOFLYER

Only needs to be wound up; and dropped perpendicularly. It rises 40 to 70 feet, or, carefully adjusted, even more.

HAVE ONE FOR THE HOLIDAYS

Hamleys
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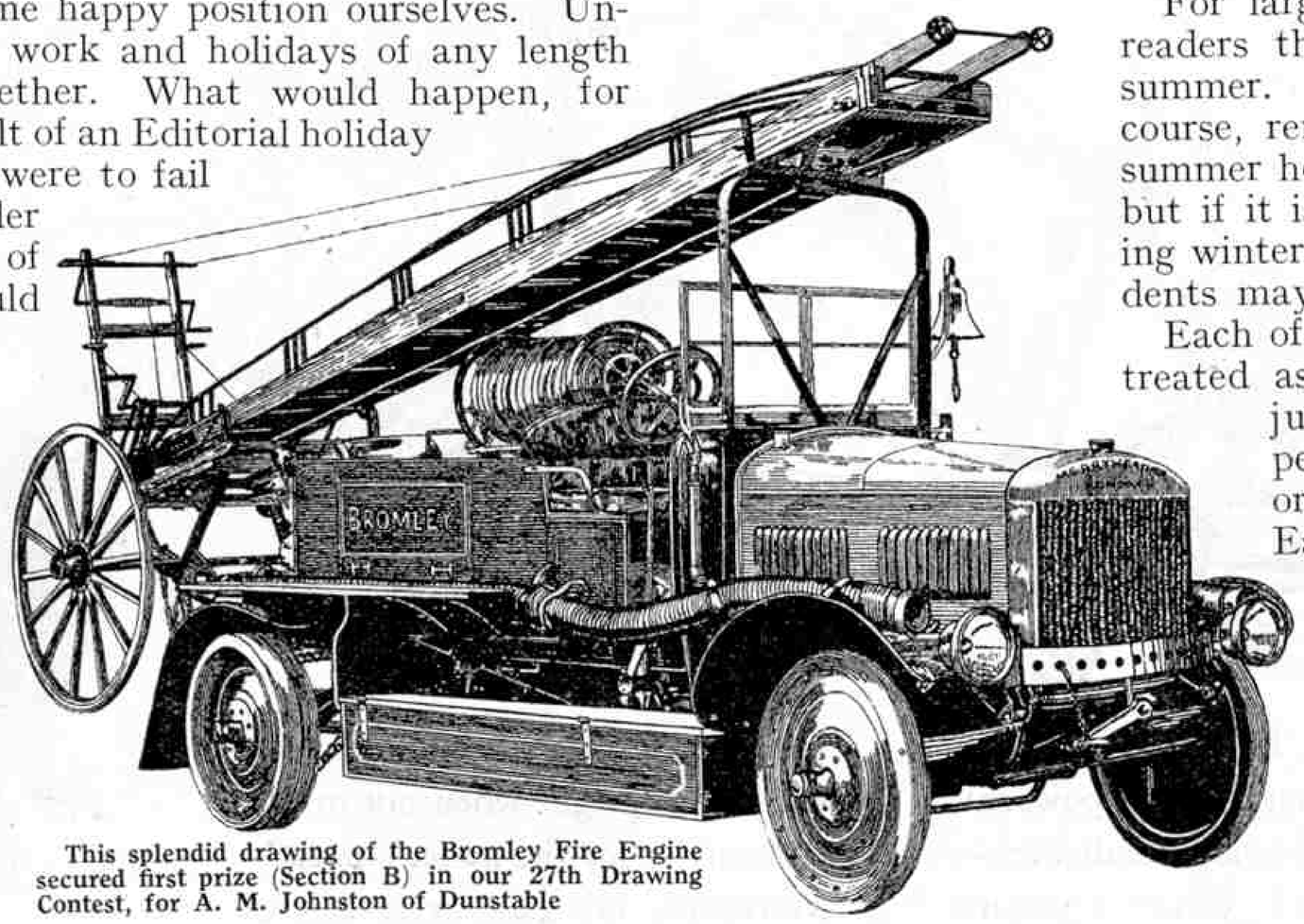
Competition Page

GRAND SUMMER HOLIDAY CONTEST

At present there is only one subject worth serious discussion and that is holidays—planning where we are going and what we are going to do when we get there. By the end of this month a very large proportion of "*M.M.*" readers will have commenced holiday-making in earnest, and we should like nothing better than to be in the same happy position ourselves. Unfortunately Editorial work and holidays of any length do not fit well together. What would happen, for instance, if as the result of an Editorial holiday the August "*M.M.*" were to fail to appear? We shudder to think of the storm of indignation that would burst forth!

The next best thing to having a holiday one's self is to hear about the good things others are having. In previous years we have organised summer holiday contests for essays, photographs, or sketches, and this year we are going to combine all three in one big contest.



This splendid drawing of the Bromley Fire Engine secured first prize (Section B) in our 27th Drawing Contest, for A. M. Johnston of Dunstable

The competition falls into three groups, *Stories*, *Photographs*, and *Sketches*, and the requirements for each group are indicated by the titles.

In the *Stories* group entries are limited to 500 words. What is required is not a serious essay, but a brief and interesting description of some incident or episode that occurred to the competitor during his holidays.

In the *Photographic* group any and every holiday photograph is eligible. We hope to have a particularly big entry in this group because nowadays almost every one of our readers carries a camera of some kind. The aim of competitors should be to produce a photograph depicting a really typical holiday scene or incident.

In the *Sketches* group subjects may be treated in black and white or in colour as desired. Entries in this group, like those in the photographic group, should have as much of the holiday spirit about them as possible.

It should be clearly understood that literary, technical or artistic quality will not be the deciding factors in awarding prizes in this contest. The entries that are most likely to win are those that bring with them into this office the strongest suggestion of a really happy and healthy holiday, no matter how it was spent.

For large numbers of Overseas readers this is winter instead of summer. Such readers have, of course, reminiscences of their past summer holiday to fall back upon, but if it is desired, entries depicting winter holiday scenes and incidents may be submitted.

Each of the three groups will be treated as a separate contest for judging purposes, and competitors may enter for all or any as they feel inclined. Each group will be divided into two sections—A, for those of 16 and over, and B, for those under 16. Prizes of £1/1/–, 15/– and 10/6 respectively will be awarded to the senders of the first, second and third best entries in order of merit in each section. There will be also a number of consolation prizes, and some of these are specially earmarked for boys under the age of 12.

Competitors are reminded that they must put their name, address, and age on the back of each sheet of paper, photograph, or drawing submitted. An entry for one group should not be fastened to an entry for another group, but all may be enclosed in one envelope, which should be addressed: "Holiday Contest, 'Meccano Magazine,' Binns Road, Old Swan, Liverpool." Entries can only be returned if a stamped addressed wrapper of suitable size is sent for the purpose. Prize-winning entries cannot be returned in the normal course; they remain the property of the "Meccano Magazine."

Closing date: Home Section, 31st August. Overseas: 30th November.

COMPETITION RESULTS

Home

Limerick Skeletons Contest.—1. Miss Barbara Gibson (Muswell Hill, London, N.10); 2. A. S. Wiles (Birmingham); 3. E. H. Hare (Chatteris); 4. M. Long (Poole). Consolation Prizes: R. Jackson (Surfleet, Lincs.); B. Lloyd (Belfast); J. R. Quine (Hull); F. Palmer (Kettering).

Summer Holiday Plans.—First Prizes, Section A, C. E. Keath (Manchester); Section B, R. P. Phillips (Chingford, E.4); Second Prizes: Section A, T. R. Johnson (Leeds); Section B: R. J. Gething (Griffithstown, Mon.). Consolation Prizes: P. Booth (Ashton-u-Lyne); R. C. Randall (St. Albans); B. E. Bellamy (S. Norwood, S.E.25).

39th Photographic Contest.—First Prizes: Section A, F. W. Jones (Birmingham); Section B, H. Lambert (Harrogate); Second Prizes: Section A, J. da Costa (West Drayton); Section B, G. M. Lane (Wakefield). Consolation Prizes: A. Bullard (Oldham); R. Kippen (Leytonstone); M. Brander (Woore, Salop).

Overseas

38th Photographic Contest.—Group 1. First Prizes: Section A, N. Johnson (Sydney, N.S.W.); Section B, R. Collins (Paris). Second Prizes: Section A, E. Worthington (Vancouver, B.C.); Section B, E. Saunders (Toronto). Group 2. First Prizes: Section A, C. Stone (Auckland, N.Z.); Section B, K. R. Prince (Melbourne); Second Prizes: Section A, C. W. Beese (Hamilton, Ont.); Section B, C. Galdes (Valletta, Malta).

Vocation Vote Competition.—1. E. P. Hincks (Ontario); 2. B. Warner (Grahamstown, S.A.); 3. Y. M. Bhave (Panvel, Bombay); 4. F. Bradley (St. Louis, U.S.A.). Consolation Prizes: S. S. Reuben (Bangalore City); F. Bulkley (Pretoria, S.A.); J. P. Brunet (Paris).

Christmas Card Design Competition.—First Prizes: Section A, L. G. Mauger (Cranbrook, W. Australia); Section B, MacL. Morgan (Cremonre, N.S.W.). Second Prizes: Section A, B. C. King (Ontario); Section B, D. Adams (Sydney, Australia).

Christmas Jokes Contest.—1. J. Credie (Cape Town, S.A.); 2. E. P. Hincks (Ontario); 3. D. Johnston (Wellington, N.Z.); 4. E. M. Boldero (Auckland, N.Z.). Consolation Prizes: B. G. Watson (Victoria, Australia); D. R. Edwards (Cape Town, S.A.).

Animal Stories Competition.—1. J. Hyde (Matakohe, N.Z.); 2. A. Thomas (Bloemfontein, S.A.); 3. T. MacLachlan (Otago, N.Z.); 4. E. Smith (Montreal, Canada).

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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FAIRYCYCLE

FAIRYCYCLE ASSOCIATION
Membership free to owners of genuine Fairycycles and badge attached to every machine. Simply fill up the form when you buy your Fairycycle, post it to Lines and you will then become a member. This is the badge of the Fairycycle Association.

Fairycycles are made in the following sizes at he prices stated:

Model A.—Well finished in black cycle enamel, ball-bearing pedals and plated handlebars. Dunlop saddle, 12" tangent spoke wheels ⅞" rubber cushion tyres 29/6

Model Ax.—Like Model A, but larger size, with 14" wheels and ⅞" rubber cushion tyres 33/-

Model B. — Very suitable for young children being light and easy to ride. Has 12" tangent spoke wheels with ⅞" rubber tyres. Complete with chain-guard, reflector, stand and carrier - - - - 39/6

Model Bx.—As model B but larger size with 14" wheels and ⅞" 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" x 1⅜" Dunlop "Kempshall" pneumatic tyres - 55/-

Model D.—Cycle type brakes, raised pattern plated handlebars, 2-coil spring saddle, etc. ½" by ⅛". 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, 2¼" buttress tread Dunlop balloon tyres. Plated ball-bearing pedals, tool bag, carrier, stand, bell, reflector and pump, etc. - - 87/6

All these models with the exception of models A and AX are finished in black or blue, with gold lines. Fairycycles can be obtained at all good toy shops, or write for illustrated leaflet.

LINES BROS. LTD., MORDEN ROAD, MERTON, LONDON, S.W.19

MASS PRODUCTION !

Artist (despondently): "I haven't sold half-a-dozen pictures this month."

Wife: "Well, George, that's your own fault. I'm sure if you would only charge half as much as you do now, you'd sell twice as many pictures."

* * * *

The Judge asked the habitual offender her age.

"Thirty," said she.

"You've given that age in this court for the last three years," exclaimed the Judge.

"Yes," came the reply. "I'm not one of those who say one thing to-day and another to-morrow."

* * * *

Lady (to car salesman): "What is the price of that car?"

Salesman: "That is a fairly expensive model, madam, the price is £750, ex works."

Lady: "But how much would it be with the works?"

* * * *

Sergeant, at company parade: "All those fond of music step two paces forward."

With visions of a soft job in the regimental band, half a dozen men stepped forward.

"Now then," cried the sergeant, "you six chaps get busy and carry that grand piano in the basement up to the officers' new quarters on the seventh floor."

* * * *

"Well, that's the absolute limit!" said a teacher of psychology. "Here have I been giving lessons to a pupil of mine for over six months on the cultivation of the memory, and now he's gone away and forgotten to pay me, and I'm hanged if I can think of his name or address."

* * * *

"Johnnie," said his mother on his birthday, "I know some little children who have no father, no mother, no uncles and no aunts. Wouldn't you like to send them a present?"

"Oh, yes, mummy. I'm sure we could spare them Auntie Jane!"

* * * *

NOT WHAT HE THOUGHT

Sergeant: "Hey! You can't go in there—that's the Colonel's tent."

Recruit: "Then what have they got 'Private' over the entrance for?"

* * * *

The man who bought a second-hand motor car had brought it back.

"What's the matter with it?" asked the seller.

"Well, you see," said the disgusted owner, "every part of it makes a noise, except the horn."

* * * *

Householder (from above, disturbed by voices downstairs): "Who's there?"

Burglar (with great presence of mind): "6LV now closing down. Goodnight everybody."

IMPOSSIBLE

"Have you any grouse to-day?" a sportsman asked a village store-keeper.

"No sir," was the reply "but we've some excellent pork pies."

"Don't be a fool, man," said the sportsman. "How do you think a fellow could go home and say he'd shot a couple of pork pies."

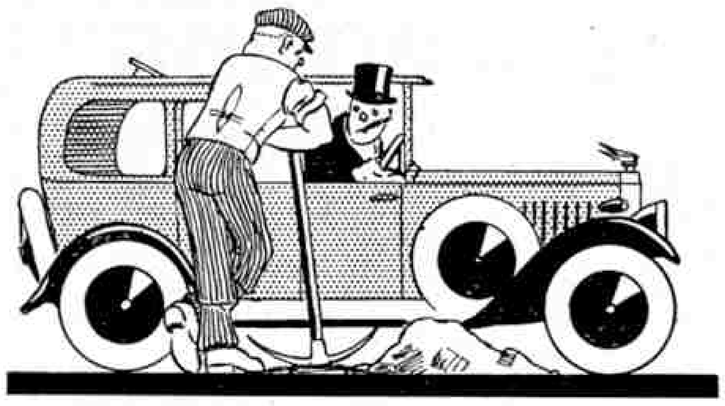
* * * *

"My doctor has ordered me to take fish for the brain, sir," said a student to a professor. "Will you tell me what kind of fish you would advise?"

"Well," said the professor, "if I had a brain like yours, I think I should start with a couple of whales."

* * * *

A GUESSING GAME



Motorist (hailing road mender): "Say, George, which is the way to Liverpool?"

Roadmender: "How did you know my name was George?"

Motorist: "Oh, I guessed."

Roadmender: "Well, guess the way to Liverpool."

* * * *

Mike and Ike were separating after an evening together, when Mike said: "Au revoir."

"Begorra, what's that?" asked Ike.

"That's 'good-bye' in French."

"Well," said Ike, "Carbolic Acid."

"And what's that?" asked Mike.

"That's 'good-bye' in any language."

* * * *

"Now, Paul, tell me why we put a hyphen in bird-cage."

"It's for the bird to perch on."

* * * *

From the bedroom of the twin boys came the mingled sounds of loud weeping and hearty laughter, so father went up to investigate.

"What's the matter up here?" he inquired.

The joyous twin indicated his weeping brother. "Nothing," he chuckled, "only nurse has given Alexander two baths and hasn't given me any!"

* * * *

A MATTER OF ARRANGEMENT!

Young Oswald was an over-officious young man, and like most self-opinionated people was heartily disliked by everyone who worked with him.

There were two partners in the firm, and, one of them happening to die, the young man approached the surviving partner, with whom he was also unpopular.

"I am sorry, sir, to hear of Mr. John's demise, and I have come to ask if you would like me to take his place," he said suavely.

"Yes, I should very much," was the reply. "If you could get the undertaker to arrange it."

* * * *

The young scientist was showing a country relation round his laboratory.

"We are now trying to find a universal solvent," he said; "that is, a liquid that will dissolve anything."

"Is that so?" queried the countryman. "But what are you going to keep it in?"

* * * *

The Chief was very well satisfied with the work that Pat was doing. "I'm going to raise your wages, Pat," he said.

Pat at first appeared delighted; then a cloud came over his face.

"Don't do that, sorr," he said. "Just think how much more I shall lose when I take a day off."

SAFETY FIRST

An old lady looked out of the car window as the train drew into the station, and, hailing a little boy, said:

"Little boy, are you good?"

"Yes'm."

"Parents living?"

"Yes'm."

"Go to Sunday school?"

"Yes'm."

"Then I think I can trust you; run with this penny and get me a bun, and remember God sees you!"

* * * *

Caller: "Look here, I want to see you about this paragraph announcing my resignation from the Chamber of Commerce."

Editor: "But it's quite true, isn't it?"

Caller: "Quite. But I should like you to explain why you've printed it in the 'Public Improvements' Column."

* * * *

Smith: "I got that crate of chickens you sent the wife all right, but next time I wish you'd fasten them up more carefully. Coming up from the station the beastly things got out. I spent hours scouring the neighbourhood, and only found ten of them in the end!"

Jones: "Hush, old man; I only sent six!"

* * * *

"Here is a cheque for your charity fund."

"But it isn't signed!"

"No: I prefer to remain anonymous."

* * * *

A mother took her little son into a London tea-shop. "Now Freddie, say your grace," she said, as they were about to begin their meal.

"But, mother," objected Freddie, "We're paying for this, aren't we?"

* * * *

The Professor was very absent minded. He had been ailing for some time, and his wife sent for the Doctor.

"The Doctor is here, sir," announced the maid one morning.

"I can't see him," replied the Professor. "Tell him I'm ill."

* * * *

The Lawyer: "But, look here, after all, he is your brother."

The Client: "Without doubt, sir, but only very distantly; we are a family of eleven, and I am the first and he is the eleventh."

* * * *

QUITE USELESS

Irritable Traveller: "What is the use of your time-tables if your trains are always late?"

Station Master: "Well, sir, what would be the use of our waiting rooms if our trains were always early?"

* * * *

Green: "Why didn't you tell me that the horse was lame before you sold it to me?"

Dealer: "Well, guv'nor, the man who sold him to me said nuffin' abaht it, so I thought it was a secret."

* * * *

Billie had heard that Yarmouth was noted for curing herrings. "Oh, daddy," he exclaimed, "how funny it must be to see all the little herrings sitting round getting better!"

SG

Don't Stop Collecting in Summer

The keen collector now carries on his hobby all the year round. He realises that, if he "shuts down" for the summer, he will be six months behind his friends when winter comes again.

Ask for FREE lists of Albums, Packets and Sets, and "carry on" with Gibbons Approvals during the summer.

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40 ,,	...	6d.	45 ,,		8d.
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60 ,,	...	1/-	55 ,,		10d.
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80	...	3/6	65 ,,		1/-
20 French Cols.	...	2d.	70 ,,		1/1
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Free! 100 Good Cleaned Stamps. Send for ½d. approvals.—Very best value.—Markwell, 31, Oakfield Rd., Newport, Mon.

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This Space is set to ½ inch s.c. and costs 8/- per month. The sum is the 50th of £20, the price of a whole page advertisement. Over 69,600 copies of the last issue were sold in various parts of the world. Your advertisement therefore reaches this exclusive public for approximately 1½d. per 1,000.

£100 Model-building Contest—

(*Continued from page 561*)

centre of the chassis.

It would indeed be difficult to find fault with the steam wagon built by R. Wallace of Durban (Second Prize, tie, Section D).

Amongst the mechanisms fitted, a complete Ackermann steering gear with worm and pinion drive is particularly noteworthy, while a special type differential and two-speed gear box enable the Electric Motor included to transmit a varied tractive effort to the road wheels.

The final entry to be illustrated this month is the Pullman Car built by C. Sardi (Second Prize, tie, Section D). A very good idea of the external appearance of one of these railroad luxury conveyances will be obtained by inspecting the illustration of this model. The car is fitted with spring bogies, roof, ventilators, spring buffers, vacuum brake connections, etc., while gas cylinders, consisting of Meccano Boilers, can be seen attached beneath the frame.

Luminous Star Watches, **1/4.** Full-size Luminous Skull Masks, **1/-.** Electromagnets, **1/-.** Combined Two-Magnet Moving Card Compass and Sun Dial, **1/4.**

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Sole Concessionaires for the World.

Now see pages 590 and 592.

Stamp Gossip

A Novel Birthday Gift

King Fuad, the Egyptian Monarch, is an ardent stamp collector, as is well known to most of our readers, and this hobby has led him to choose a distinct novelty as a birthday gift for his young son, the little Prince Farouk. It consists of a special commemorative stamp issue that appeared on 11th February, the ninth anniversary of the Prince's birthday. Four values, each bearing a three-quarter length portrait of the Prince, were issued—5m. black and brown; 10m. black and carmine; 15m. black and deep ultramarine; 20m. black and dull blue. The perforation in each case is 13½ all round. The stamps comprise a set well worthy of ranking with the several other beautiful Egyptian commemorative sets issued in recent days.

This is not the first Egyptian royal birthday stamp, for in 1926 King Fuad celebrated his own birthday with a special commemorative stamp of the value of 50 piastres, bearing a three-quarter length portrait of himself. The design in this instance was not a success, for the very heavy frame used tended to make the King's figure somewhat insignificant-looking.

Probably the best known of previous issues commemorative of a royal birthday is the Austrian 1910 issue celebrating the 80th birthday of the Emperor Franz Joseph. This appeared on 18th August of that year, and consisted of a complete set of 17 issues, ranging in value from one heller to 10 kr. The designs of the 1908 issues, commemorating the Emperor's Diamond Jubilee, were borrowed, and new tablets bearing the dates 1830-1920 inserted. As most of the 1908 stamps bore portraits of the Emperor at various stages of life, or in the uniforms of various Austrian organisations, the adaption of the first set for a second purpose was a complete success.

The Postal Union Commemorative

As promised in our notes last month, we illustrate here the three low value types of Britain's new issue commemorating the Postal Union Congress now sitting in London. The use of the King's head design had a happy association in the almost simultaneous issue of the stamps and of the final bulletin announcing the King's restoration to health. At the same time, bearing in mind the richness of Britain's postal history, the issue is extremely disappointing. The designs are not at all striking, and the policy of permitting the issue of the speculative £1 denomination is retrograde. The high regard paid to British issues by stamp collectors is due to the steadfastness of a postal policy that has prohibited philatelic freaks. The re-issue of the postally useless £1 stamp is a step in the wrong direction.

We would have preferred a premium charity issue for a hospital thanksgiving fund in celebration of the King's recovery. In such circumstances that £1 stamp would have been forgivable.

An Anti-Thief Device

In countries as big as the United States the disposal of stolen property is not a very difficult matter if the right channels are employed. In order to limit the area in which stamps stolen from post offices can be marketed, the stamps now being issued from offices in Kansas and Nebraska are being overprinted with the abbreviated name of the state, Kans. or Neb., as the case may be. Stamps over-printed in this manner can only be sold in the particular State for which they are overprinted, although they are available for use in any part of the United States.

Mr. B. T. Cadbury, of Moorestown, N.J., in telling us of this interesting overprint, says that at the time of writing only these two States, and 11 values, 1c. to 10c., including the 1½c., were concerned. The actual issues involved are the rotary press printed stamps perforated 11 × 10½.

The future task of the specialist in American stamps will present appalling difficulties if this scheme is adopted generally, for he will be required to collect 11 values from each of 48 States. We can appreciate Mr. Cadbury's comment: "Some of us hope that the experiment will not be carried further than the first two States!"

Jamaica's King's Head Issue

At last the outsize "War Contingent" 1½d. issue of Jamaica has been banished, and in January last the new King's head design reproduced on this page was introduced. The new stamp is one of the most attractive portrait stamps of His Majesty King George that has yet been issued, and at the time of penning this note is available in the denominations of 1d. carmine, 1½d. chocolate and 9d. maroon. The watermark is Multiple Script C.A.; perforation 14.

The World's Rarest Stamp

The gem of the British exhibit at the International Philatelic Exhibition at Le Havre in May last was Mr. Arthur Hind's 1c. British-Guiana stamp, issued in 1856, the only known copy of the issue to be in existence. Anyone other than a philatelist might be excused for regarding this great rarity as a simple scrap of dirty paper. It is approximately twice the size of an ordinary postage stamp and is roughly octagonal in shape. It is a dirty purple-red in colour and has some almost indecipherable heavy black marks on it.

Before the War it was the property of an Austrian stamp collector who lived in Paris and had what was probably the finest collection in the world. At the declaration of war in 1914 he hastily collected together his belongings and fled to Germany. But in his haste he overlooked a part of his collection, including the precious Guiana stamp! When, at the end of the War, the confiscated property of enemy nationals was sold on account of reparation payments, the stamp realised between £7,000 and £8,000.

It is now valued at £10,000 and, in company with other stamps to the total value of £250,000, it was guarded carefully by detectives throughout its journey from Britain to France. The British exhibit was conveyed in several packing cases, but only one man, the Secretary in charge, knew the case that housed the 1c. Guiana Stamp.

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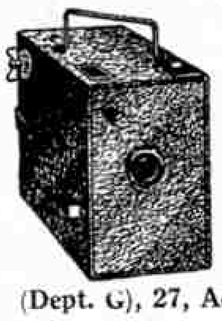

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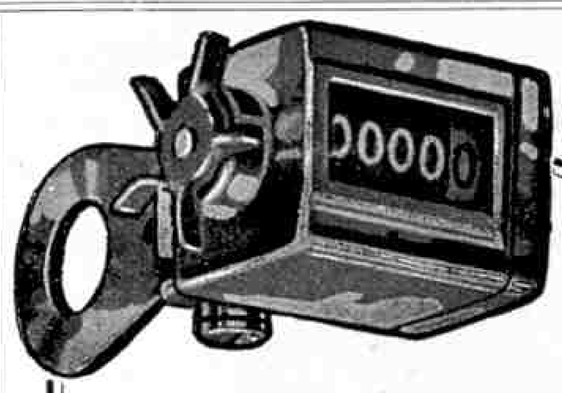

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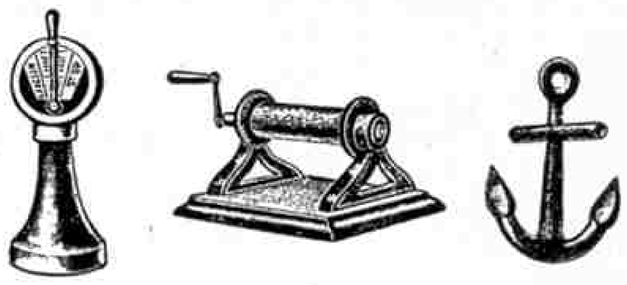

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This bright and attractive Pennant, size 8" × 4", in correct MECCANO Red and Green, with Rustless Mast and Fixing Nuts to fit your Cycle or Model. Think of the finish it will give a MECCANO Tower, etc. ! ! Send a P.O. 9d. (not stamps) and it will arrive nicely packed, post paid, by return. Handle Bar Clips 2d. extra.

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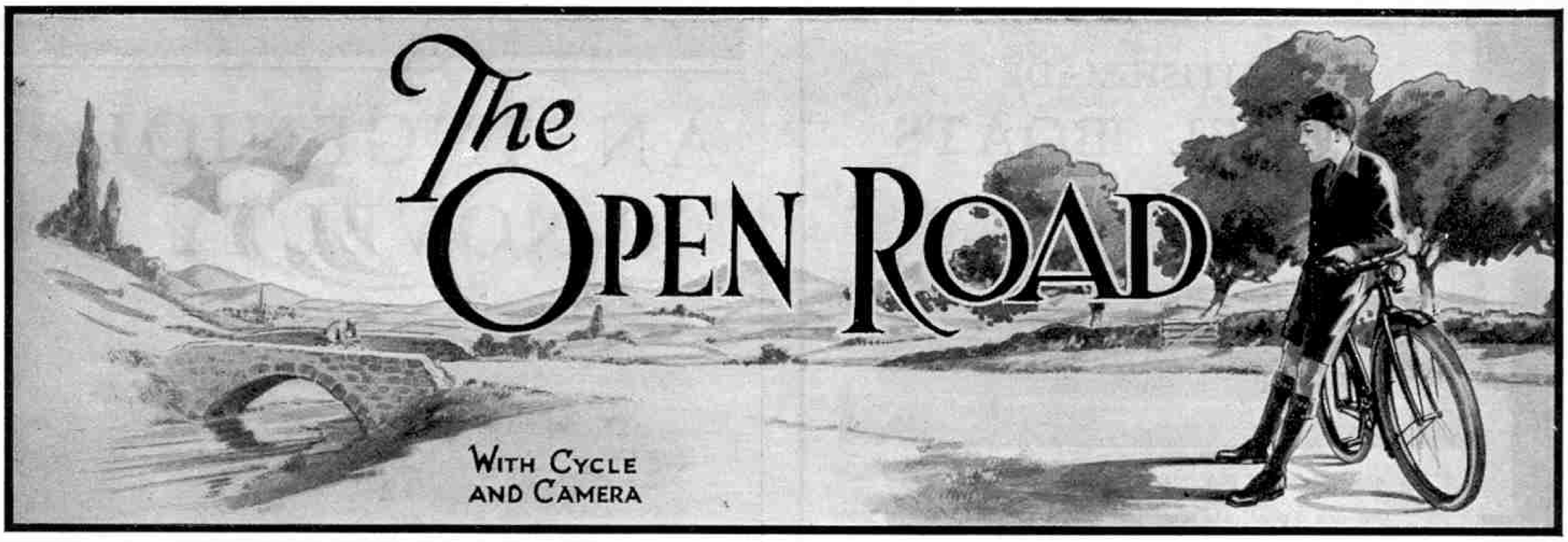
A CORRECTION

By an unfortunate confusion of names, we connected the name of Messrs. R. Crook & Sons with the Meccano Engineer's Flag in a recent Editorial note on this attractive accessory. Readers are asked to note that this pennant is made and marketed by the "Q" Accessories Company, of 1 and 2, The Arches, Kew Bridge, Chiswick, London, W.4.



Photography

IN CAMP WITH A CAMERA

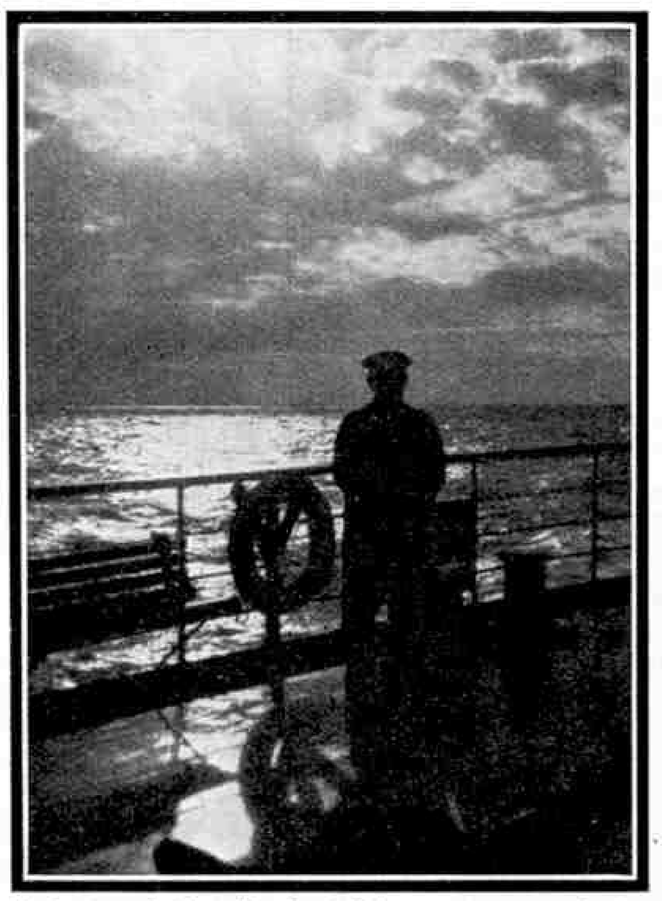
The photographer in camp has a wonderful opportunity of securing a splendid collection of photographs. The most ordinary scenes of camp life make excellent pictures, and, apart from the interest they will recall in later days, there is always the opportunity of selling prints to assist in defraying the expenses of the holiday. For this kind of photography a small pocket camera is really the best, as it can always be carried ready for immediate use when a good opportunity arises.

The most successful photographs are those taken when the subject is quite unaware of the fact that he is being immortalised! There is always a touch of life in snapshots taken unawares that is absent from a carefully posed picture. This is particularly the case with little groups busily engaged on some task such as preparing the mid-day meal. One thing should always be borne in mind, however, and that is no one should ever be photographed in circumstances that would cause him annoyance.

There is one carefully posed photograph that should be taken, and that is a group of members of the camp. Such a photograph provides a splendid memento, and is of interest to everybody concerned. There is no particular difficulty about taking a group of this kind, except that with a very small camera care should be taken to stand far enough back to bring every member of the group well within the boundaries of the picture. The photograph should be taken in as good a light as possible, but preferably not in direct sunshine.

In most snapshots of this nature there is no rapid movement and an exposure of 1/50 sec. or even 1/25 sec. is sufficient. If the camp is out in the open, and particularly if it is by the seaside, the question of exposure is greatly simplified on account of the photographic strength of the light. There is indeed a surprising variation between the average strength of the light in an inland town and at the seaside, and this is due to light reflected from the sea, sands and promenade, combined with the clear, smokeless atmosphere. The range of subjects to be obtained by the sea-shore is almost endless, and most of them come well within the capacity of even the cheapest camera. In particular the wonderful possibilities of sea and sky effects and of sunsets should not be overlooked.

Woodland scenes are very tempting, particularly if streams and waterfalls are present. In photographing such scenes, however, it is extremely important to realise to what a large extent the trees cut off the light. As a rule snapshots are out of the question, but fortunately this difficulty can be got over by resting the camera firmly on a rock or other support and giving a time exposure.



"Contemplation." A striking camera study by G. S. Marsh, Blackpool, from the 39th Photo Contest

Cycling

CARE OF THE MACHINE

The ability to look after his machine, and particularly to put right defects that arise on the road, is the first essential of the really good cyclist. Bicycles, like all machinery, call for constant attention if smooth, steady running is to be achieved. Neglect can only result in a breakdown at some very early stage in the machine's life.

The brakes are undoubtedly the most important feature, for the life of the rider may depend upon their efficiency at some critical moment. It is not enough to give them only an occasional glance and a grand overhaul once a year; they should be examined at the commencement of each run and any necessary slight adjustment of rods and levers made at once. When in the "off" position the blocks should be as close to the wheel rim as possible without being in actual contact.

The chain is the next most important feature. It must always be kept well oiled, and at intervals it should be removed from the machine and given a 24-hour bath in paraffin oil to remove the dust and mud that it has accumulated. A chain is liable to stretch after a good period of use, and at intervals it must be tightened up. This is done by loosening the rear wheel, and pulling it back very slightly until the chain is at the right tension, and then tightening it up once more. A chain that is too slack not only makes riding very unpleasant but is a source of serious danger. Quite recently I saw a cyclist fall headlong from his machine in a busy street and escape serious injury through the presence of mind and good brakes of a lorry driver. The cyclist's chain had suddenly jumped the driving wheel, and he was left helpless.

The smooth running qualities of a machine depend very largely upon the condition of the wheels. The wheel hubs should be kept well oiled and free from dirt and rust, and the wheel spokes should be tightened up when they become loose, by adjusting the small nut that is on each one just where it meets the wheel rim.

The lubrication of the machine is the final important point. Ball races on cycles are not dust proof, and oil is essential to protect them and to enable the bearings to work freely. The hubs, brackets, chain and coaster-hub brakes require the most frequent attention, and an occasional touch of oil should be given to the pedals and head bearings, and to the brake rod joints.

Most boys, fortunately, pay a considerable amount of attention to keeping the plating and the enamel of their machines spick and span. Oil is a splendid cleanser and will polish up the enamel wonderfully, if it has become dull through an accumulation of dust and mud. In wet weather the plating should be covered with vaseline. It is an excellent preservative against rust and can be removed quickly to show the original brilliancy of the metal.

Although modern pneumatic tyres have reached a very high pitch of excellence they are still the most vulnerable part of the machine, and next month we shall give a few hints on the care of tyres.

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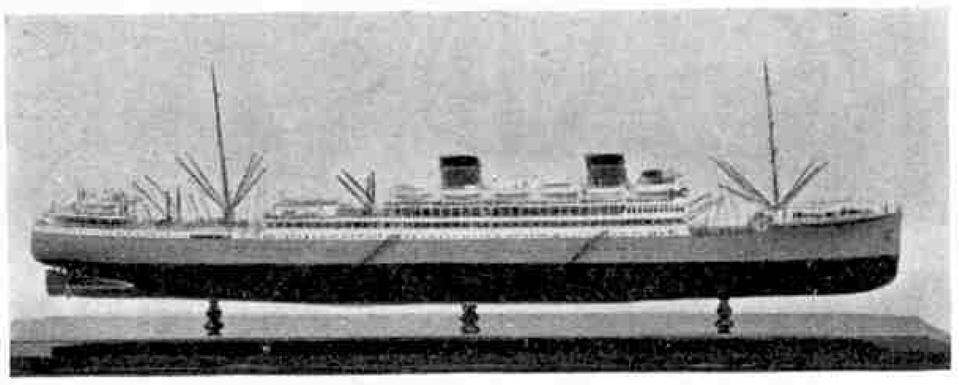

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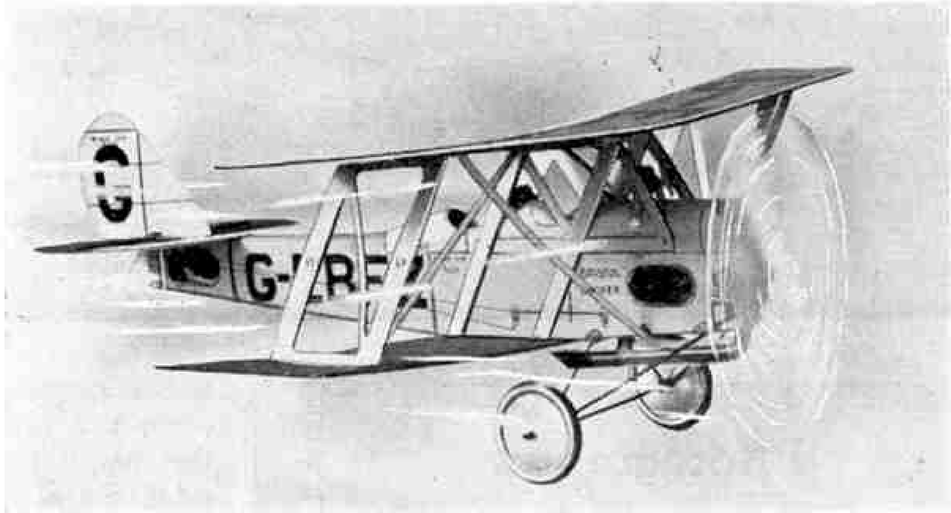

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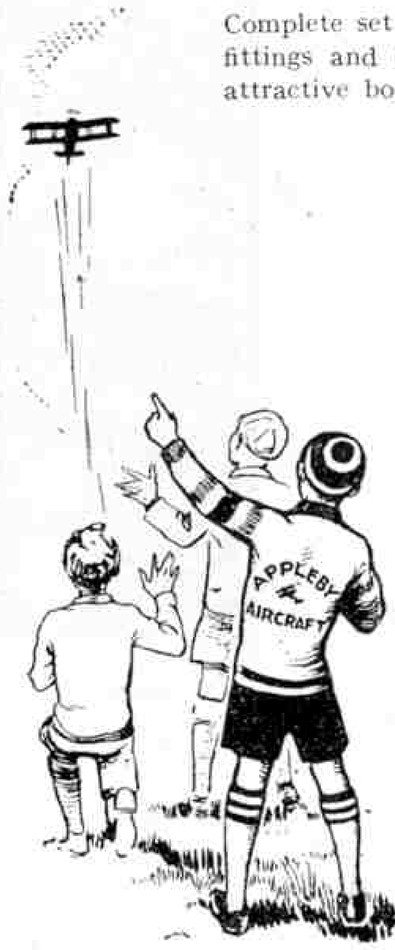

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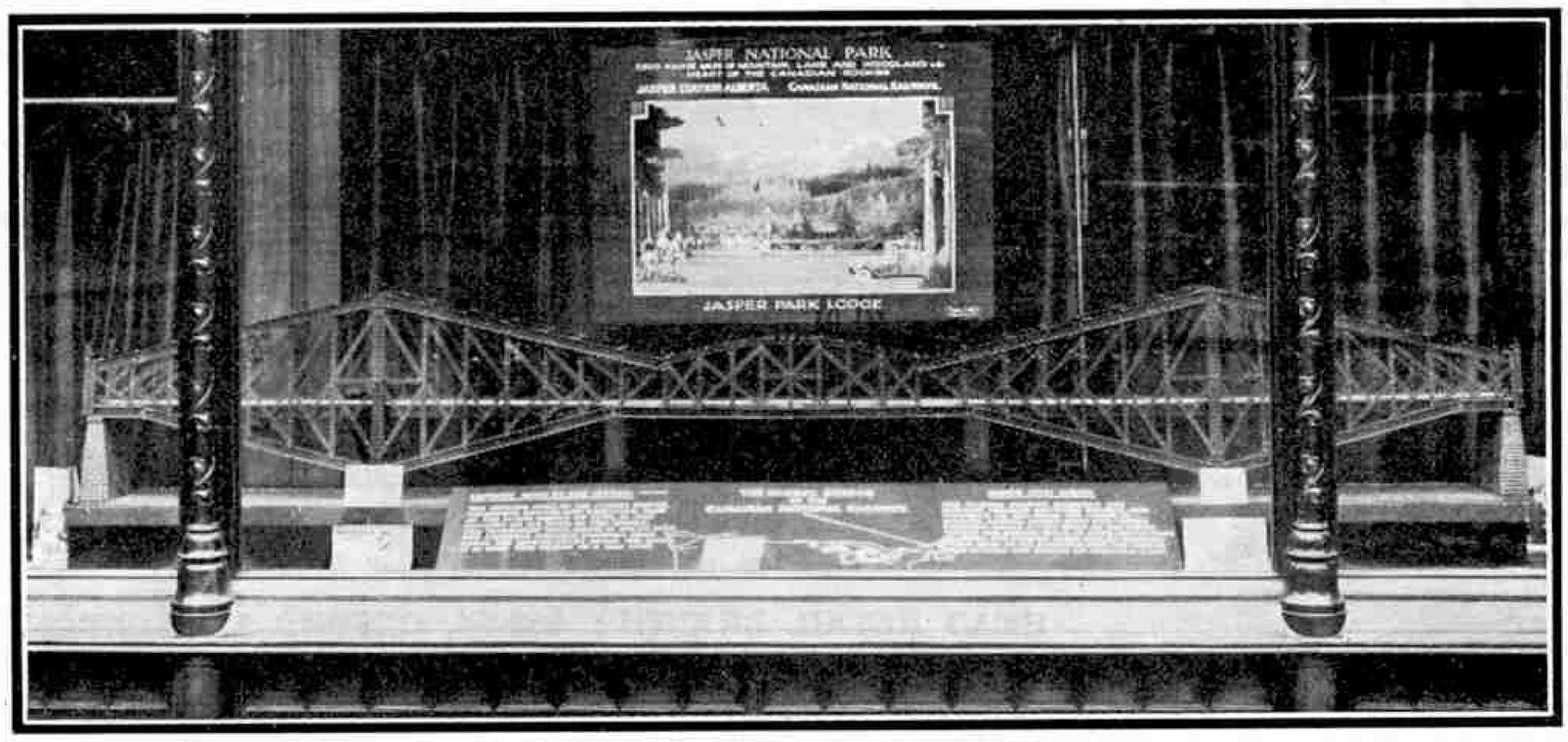
Quebec Bridge in Meccano

During the past month keen public interest has been displayed in a Meccano Model of the Quebec Bridge displayed in the window of the Canadian National Railways, 17, Cockspur Street, London. The photograph on this page gives an excellent idea of the realistic appearance of the bridge. Every day large numbers of people have crowded round the window to admire the model, showing the keenest interest in its design and construction.

The Quebec Bridge, which is over two-thirds of a mile in length, carries the Canadian National Railways over the St. Lawrence River, and reduces the railway mileage between Halifax and Winnipeg by 200 miles. At the point where the bridge spans it, the river is 2,000 ft. across, 200 ft. in depth and flows between banks 200ft. in height. Over 66,000 tons of steel and 106,000 cu. yds. of masonry were used in its construction.

The model is a particularly fine example of Meccano construction. It is over 15 ft. in length, carries a double track of Hornby rails, and contains altogether the enormous total of 2,372 nuts and bolts.



This splendid model of the Quebec Bridge has been exhibited for some weeks at the London office of the Canadian National Railways, to whom we are indebted for our photograph

Famous Trains—*(Continued from page 527)*

chimneys that speak of industrial activity, we run into the city of Newport. A prominent object to the left of the line, before and after Newport, is the high transporter bridge over the mouth of the River Usk, which river we cross immediately before running into Newport Station.

The Great Western Railway have recently spent a great deal of money in modernising Newport Station, and the work is not yet complete. One of the alterations has been a considerable addition to the length of the main platforms, and the down platform, at which we are now stopping, is no less than 1,500 ft. in length. From here to Cardiff is but a short run of 11¾ miles, and takes 17 minutes. We see near both towns many hundreds of coal wagons, bearing witness to the busy neighbouring industry of the Welsh Valleys, which pour their product down to Newport and Cardiff for shipment at their extensive docks. The docks at Newport, Cardiff, Penarth, Barry, Port Talbot, Swansea and elsewhere in South Wales, together make the Great Western Railway the largest dock-owning company in the world.

Cardiff is reached at 6.47 p.m., and the only section now remaining is the short run of 9¼ miles to Barry. Leaving the big General Station at Cardiff at 6.55 p.m., and stopping only at Barry Docks, we come to rest in Barry at 7.20 p.m.

Since 9.30 this morning we have travelled 352 miles, and our average speed of nearly 36 miles an hour over this difficult cross-country route has, we shall agree, been quite a creditable performance. So now we must leave the *"Ports-to-Ports"* express to rest for the night, ready to begin its journey back to the North-East Coast ports at 9.5 to-morrow morning.

Conquest of the Air—*(Continued from page 523)*

The chief advantages of the *"Auto-Giro"* are that in addition to being able to fly at a comparatively high speed, climbing and gliding in the usual manner, it is also able to fly at very low speeds, and to descend almost vertically, while still remaining under complete control.

One of the most interesting flying machines of recent times is the *"Pterodactyl,"* a tail-less monoplane invented by Capt. C. P. R. Hill. The peculiar name chosen by the inventor gives a clue to the machine's appearance, for *"Pterodactyl"* is the name of a type of flying lizard that lived in prehistoric times. The wing of the monoplane is of fairly normal construction, but instead of being spread at right-angles to the fuselage it is swept back so that the front edge tapers from the fuselage at an angle of 59 degrees. The trailing or rear edge is set at an angle of 76 degrees, so that the width of the plane narrows as it recedes from the fuselage, which is short. A 30 h.p. Bristol *"Cherub"* engine is fitted in the back of the fuselage and drives a "pusher" propeller.

The undercarriage legs lead through the sides of the fuselage, in the body of which the shock absorbers are placed; while at the back end of the fuselage a small wheel, mounted very similarly to the front fork of a bicycle wheel, is fitted to complete the landing gear. The rudders present a specially novel feature. They are mounted below the wing, one on each side, and in their normal position they trail freely in the wind. When it is desired to turn, however, say to the right, the right rudder is deflected across the line of flight and turns the machine to the right. The left rudder remains trailing and offers no resistance. In a similar manner, when turning to the left the left rudder is deflected and the right swings free.

The body of the *"Pterodactyl"* is of light balsa plywood and the overall span is 45 ft. The area of the main plane is 223 sq. ft., of the controllers 55 sq. ft., and of the rudders 13 sq. ft. The unloaded weight varies from 444 lb. to 458 lb. according to the size of the undercarriage wheels. The weight of petrol and oil when fully loaded is 30 lb., and the total loaded weight without the pilot 488 lb. The speed range is from 30 to 70 m.p.h.

The *"Pterodactyl"* made its first public flight at the R.A.F. display at Hendon aerodrome in July, 1926. Piloted by Flight-Lieutenant Chick, it took part in the aerial parade before the King, and although the parade consisted of sixteen machines, representative of the then newest aeronautical practice, the *"Pterodactyl's"* only rival in popular attention was the Cierva *"Auto-Giro"* just described.

How to Get More Fun—

(Cont. from page 565)

a fairly long train of local coaches. This siding is easily accessible from the station and the points enable coaches to be run on to either the "up" or the "down" slow line.

The siding running parallel with the carriage siding will be found useful for both passenger and goods vehicles, and will be of value also in carrying out shunting operations, as it has direct access with the main line. Suppose, for instance, a light goods engine travelling in the down direction is required to take up some trucks from the siding "H" in the station. The engine proceeds over points "B" along the local line through the station, over the metals at the crossover "F," and then reverses on to the train. As an alternative, if the station is occupied by a passenger train, the engine may proceed straight down to points "A" and then shunt back again over the crossover, along the "up" line (tender first) and back on to the train over the diamond crossing.

In addition to the foregoing examples, many further uses of the sidings could be given, and there is hardly one shunting operation normally required that cannot be carried out easily and quickly. The working of this layout offers great scope for ingenuity and it is indeed an exciting task arranging trains to fit in with each other, especially when they all converge on to one line and travel in both directions! It is most important to pay attention to both the arrival and the departure of trains. For example, when an express is roaring down the straight and a goods train has only a few moments to clear the main line and get safely on to the loop, the operator must be very alert and accurate in his timings, or a collision is bound to occur. On the other hand, if a goods train is clanging along on the "down" line while a passenger train is awaiting departure in the station, care will have to be taken to stop the goods train some distance up the line, so as to let the passenger train leave the station and proceed ahead along the single line. The necessity for keeping always on the alert adds greatly to the interest of the operations.

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The 1929 Jaeger Meccano Jerseys

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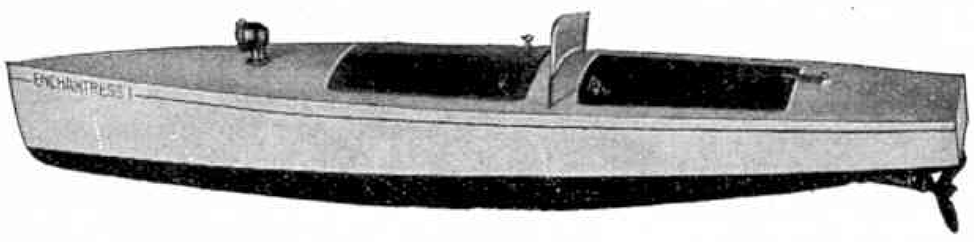

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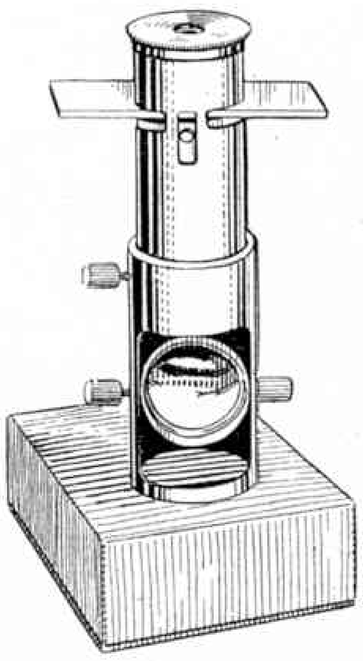

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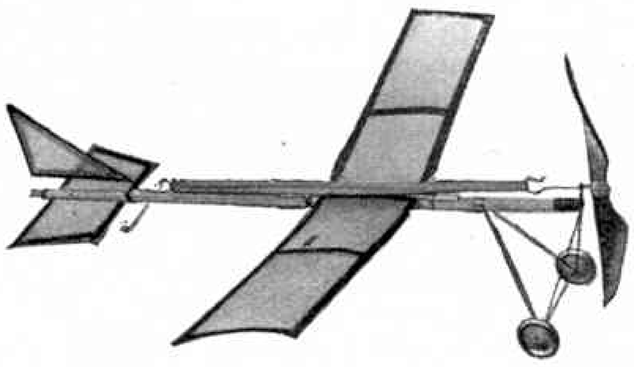

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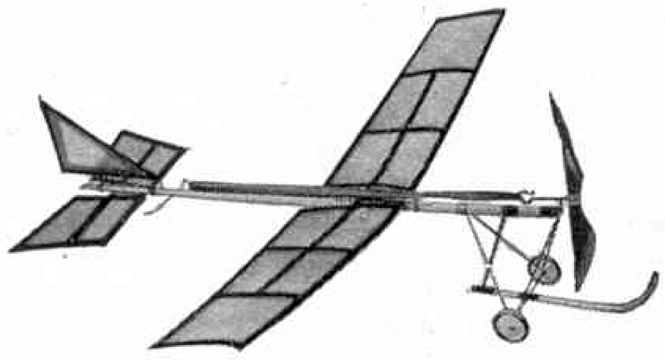

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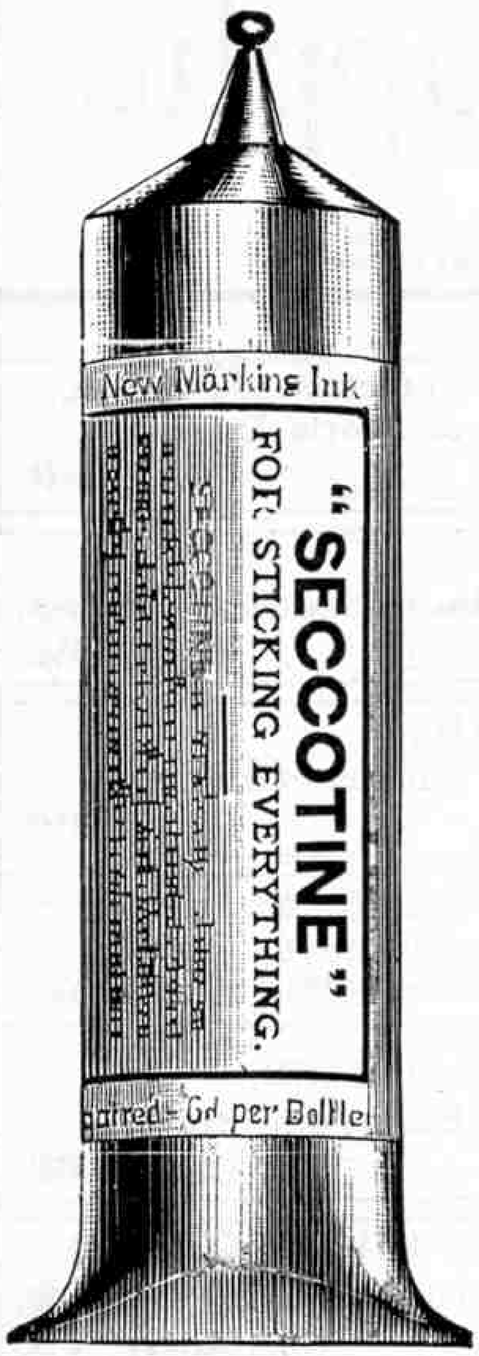

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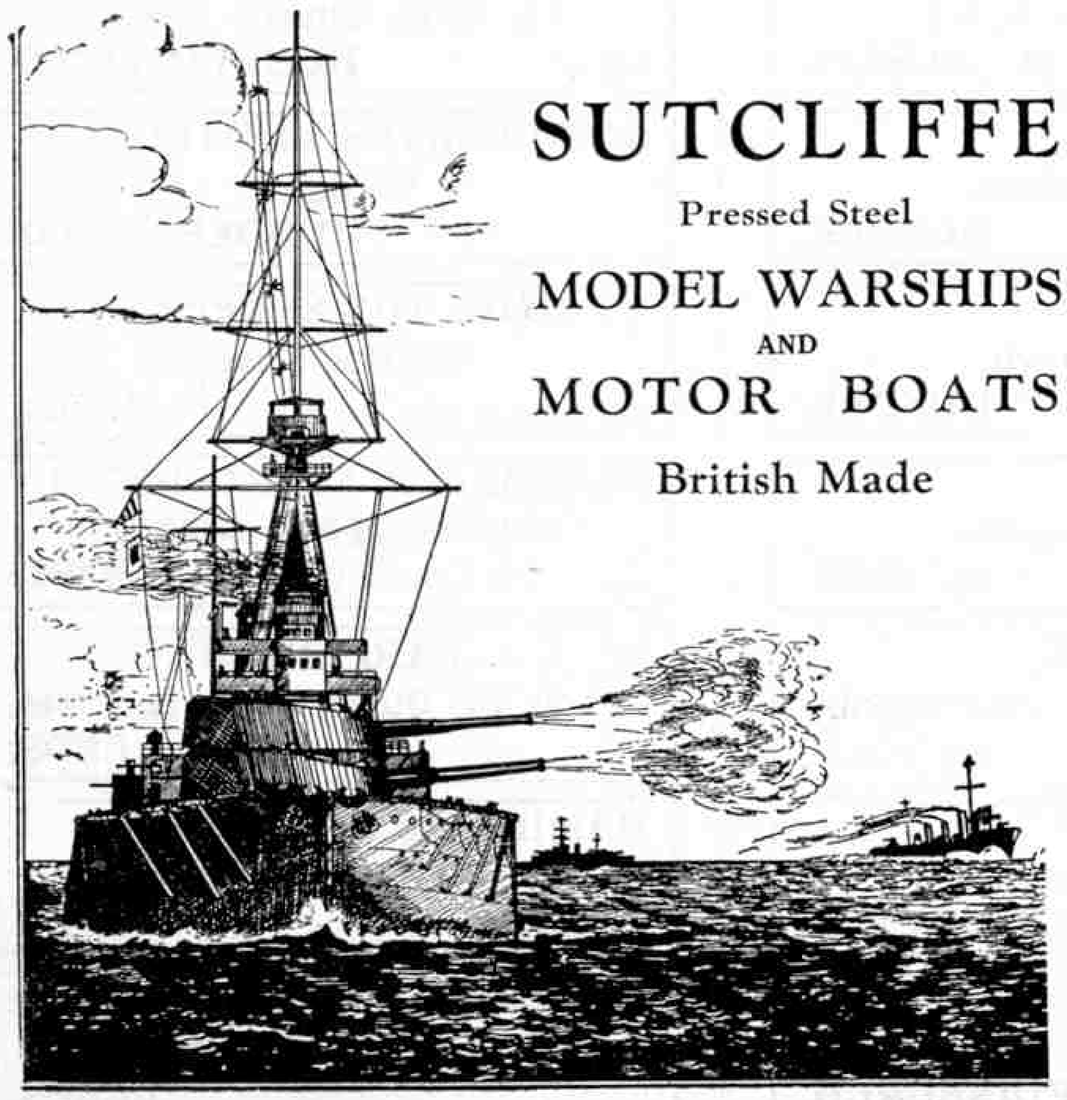

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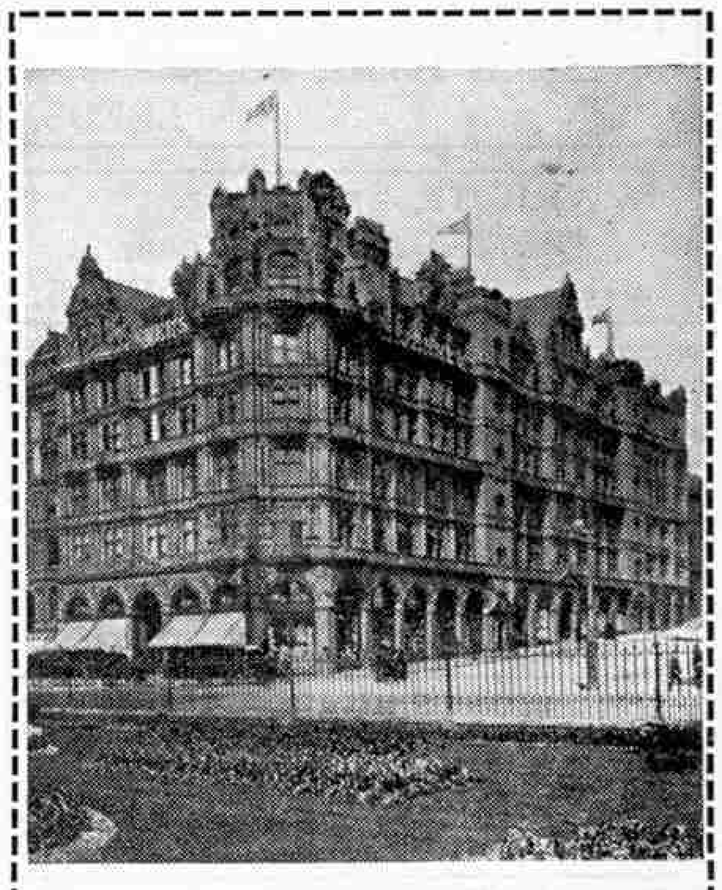

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There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

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Now turn to our adverts. on pages 580 and 592.

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ALSO "TOC-TOC" NINE
3/11
(Post free 4/5)

A Handy Tool Cabinet

Meccano boys invariably are "handy-men," and when there is a job about the house to be tackled they usually can see it through. Ingenuity often has to be exercised in improvising tools, however, and many of our readers—and their parents, too—will welcome the reasonably priced but comprehensive cabinet of tools recently placed on the market by Messrs. Hollingsworth, of Rookery Road, Handsworth, Birmingham.

This contains a complete set of 22 tools, all of first quality British material. We have been able to inspect one of these cabinets and we find that—as our advertisers claimed in their February announcement—the kit is not a toy set but consists of tools that no carpenter would scorn to use. Further details are given in an illustrated booklet, No. M1, a copy of which can be obtained from the advertisers by any interested reader who cares to apply and mentions the "*M.M.*"

Model Battleships with Mysterious Mechanism

Among the many British toys that have come to the front in recent years, the model battleships manufactured by J. W. Sutcliffe, of Horsforth, Leeds, take a very high place.

The great feature of Sutcliffe models is their mysterious method of propulsion. The power is produced merely by heating a piece of copper tube, which is coiled and bent in a special manner so that when the tube becomes hot the water that has run into it is ejected in the form of steam. This is replaced by more water, which in turn is instantly turned into steam; and the action goes on so rapidly and continuously that the boat is propelled forward, the action being similar to that of a motor boat.

To quote the words of a well-known expert in toys who spent a considerable time watching the Sutcliffe models at this year's British Industries Fair:—"It is really a most mysterious and ingenious arrangement, and one can watch one of these Sutcliffe models for hours without getting tired of it. Subconsciously one is always asking the eternal question, 'Just why does the water go in and out like that?'"

Full details of the Sutcliffe battleships are given in a booklet that the manufacturers, Messrs. J. W. Sutcliffe, Atlas Works, Horsforth, Nr. Leeds, will be pleased to send, post free, to any reader who writes mentioning the "*M.M.*"

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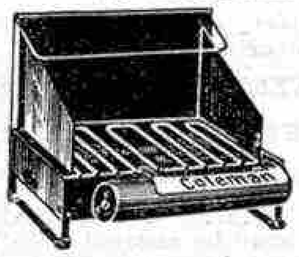

This Camp Stove is not a toy but a miniature kitchen range. Uses petrol fuel under safety control, and is absolutely safe and foolproof. Cooking space 16½″ by 9″. Folds up like a suitcase to 17″ by 4″ by 9″. Weight 11½ lbs., 2 burners which can be used separately or together.

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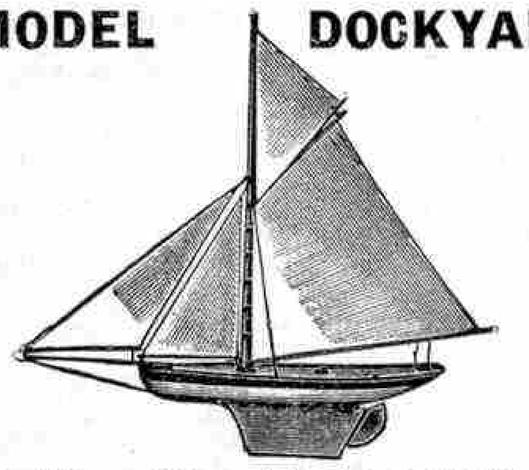

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With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two"; difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea?

The Chairman,

SCHOOL FOR THE BLIND

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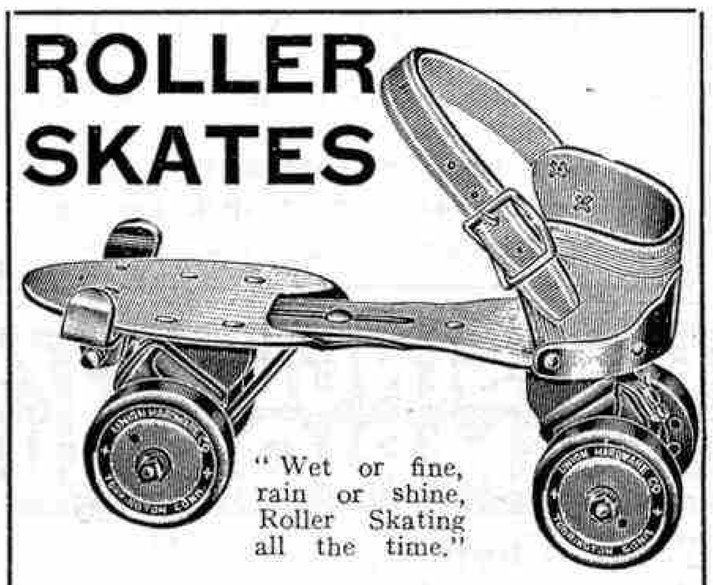

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The pads are supplied in two sizes, each consisting of 50 printed sheets of tinted bank paper with cover. Prices—Large, 1/- each (post free); Small, 6d. each (post free), from Meccano Ltd., Old Swan, Liverpool.

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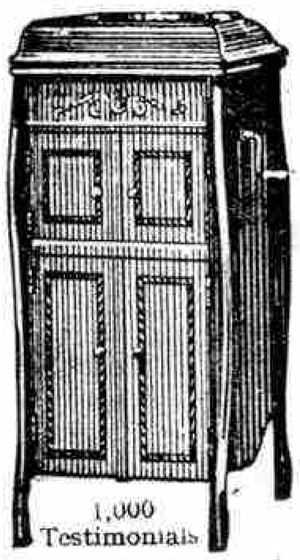

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EDITORIAL AND ADVERTISING OFFICES :—

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Telegrams : "Meccano, Liverpool."

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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.

Advertisements

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

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Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

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

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

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

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

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

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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.

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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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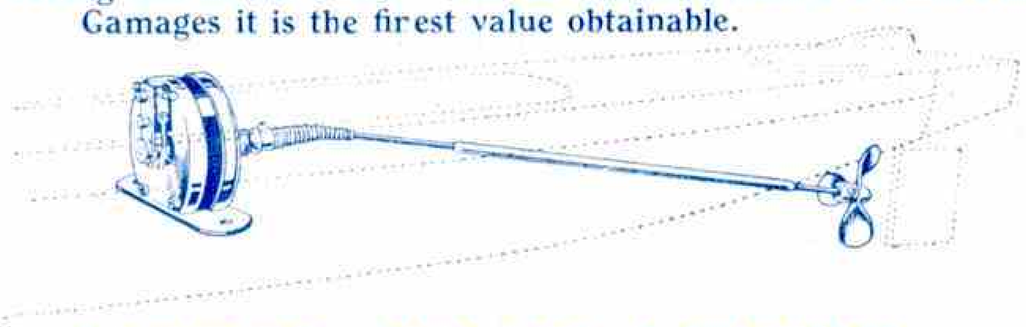

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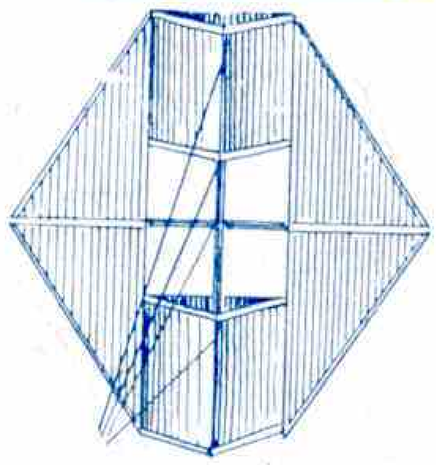

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Price	2/6	3/6	4/6
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Height	40	46	52 in.
Price	4/11	6/6	8/6

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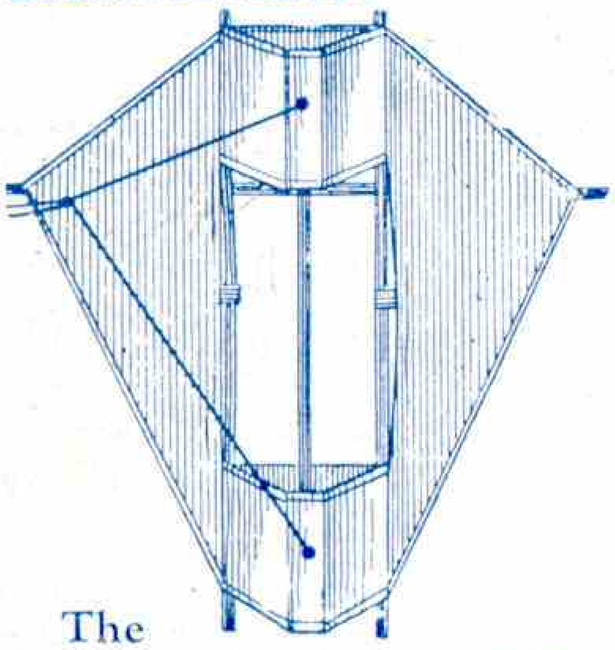

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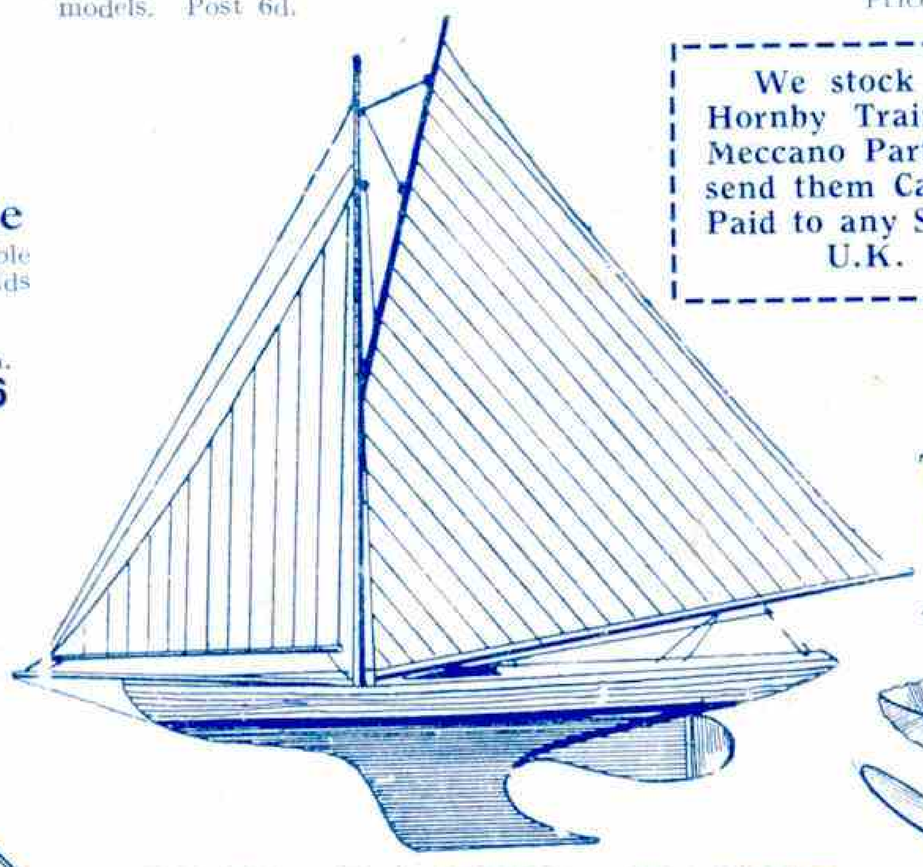

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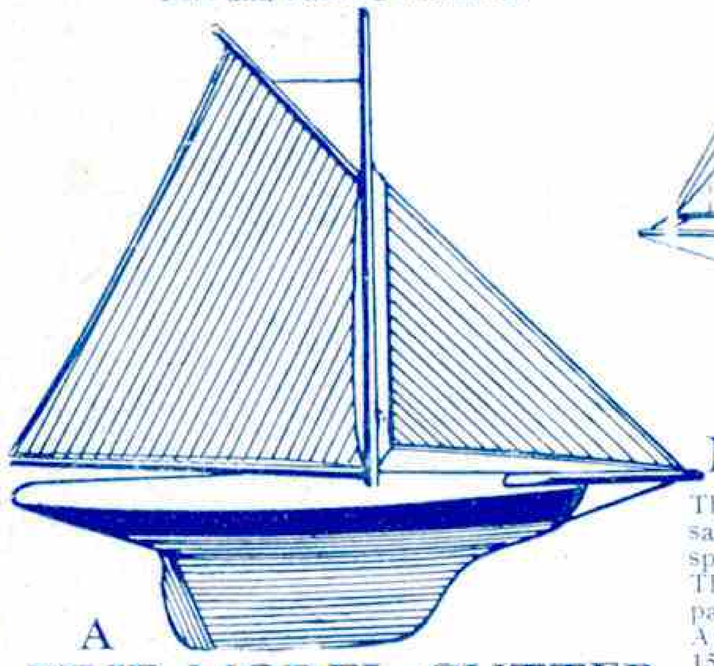

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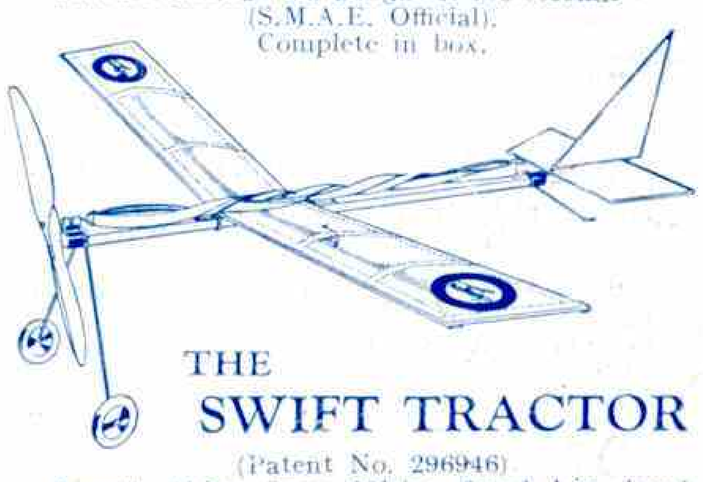

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(Patent No. 296946)

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200 pages
58 illustrations

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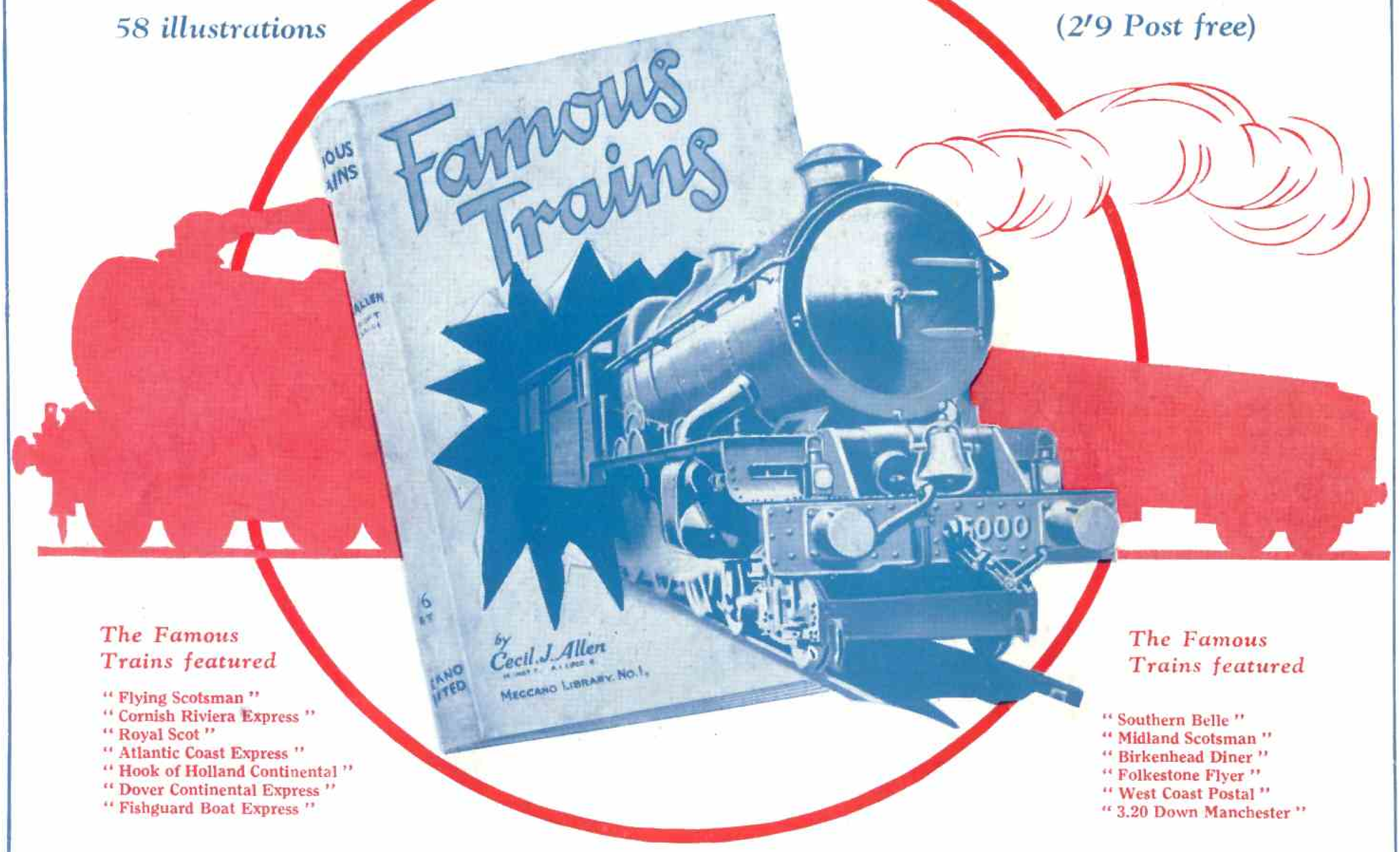

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- "Atlantic Coast Express"
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The Famous Trains featured

- "Southern Belle"
- "Midland Scotsman"
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