JUNE 1925

MECCANO MAGAZINE

PRICE 3D
VOL. X
No. 6

SWISS MOUNTAIN RAILWAYS
(See Page 266)

"Miss America"

The World's best value in Steam Model Launches

A BOY'S DELIGHT

Here's a tophole little launch which just buzzes through the water under her own steam. Thousands of boys are already having hours of delight with them on yacht pond or calm river. It is a three-guinea model for 12/6—beautifully finished, strong and well made.

GOES 20 MINUTES AT ONE FILLING

There is a real little engine and the new safety lamp raises a head of steam in very few minutes. A safety valve is fitted to the boiler and the oscillating cylinder turns the little twin bladed propeller to drive the boat 20 minutes at one filling.

NOTHING LIKE IT FOR PRICE ANYWHERE

"Miss America" is 2 ft. 6 ins. long, and has a 3½ ins. beam. She is finished off in three brilliant colours of enamel, and made to ride the water gracefully and easily. A tiller is provided so the boat can be steered, and a filler, lamp, and full instructions are supplied with each boat.

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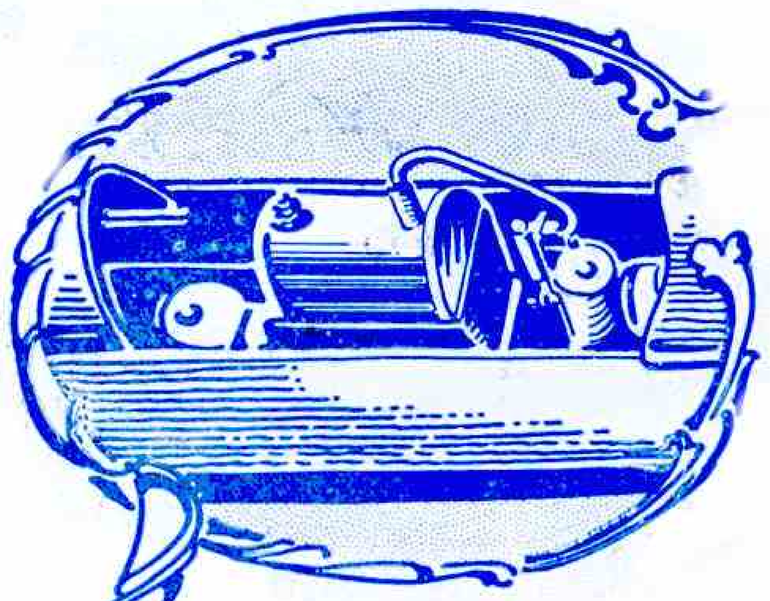
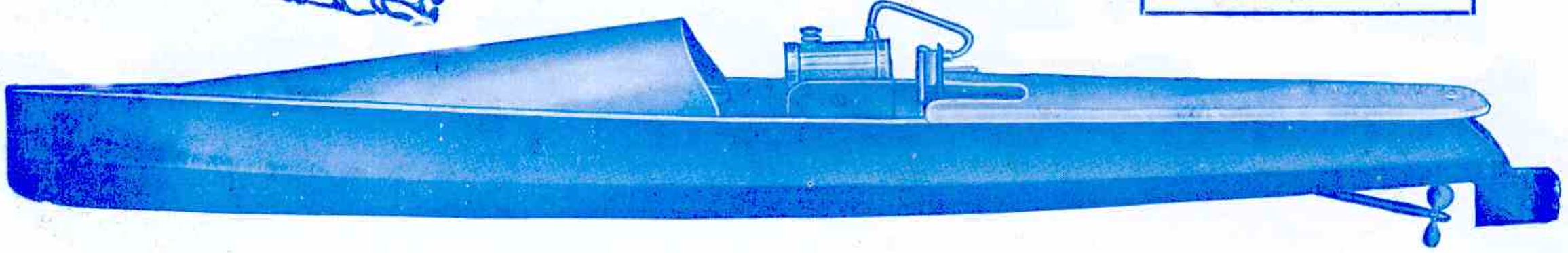


Free to Meccano Readers

A short pamphlet giving full details of the launch will be sent to any reader who sends a post-card for one to Department 960.



WHERE YOU CAN BUY THEM

Hobbies Ltd. (Miss America Department,) Dereham, Norfolk

Or from Hobbies Branches at London, Glasgow, Manchester, Birmingham, Leeds, Southampton, Brighton or Sheffield. From most good stores and sports houses and the usual Hobbies Agencies. Also at 45, Colborne St., Toronto, Canada.

NEXT MONTH: FRENCH, SWISS AND ENGLISH RAILWAYS COMPARED.

EDITORIAL OFFICE
Binns Road,
LIVERPOOL

Vol. X, No. 6

MECCANO MAGAZINE

PUBLISHED IN THE INTERESTS OF BOYS

June 1925

With the Editor

Our Cover

Our cover this month shows a view on the Rigi Railway, one of the famous mountain railways of Switzerland. The electric coach is seen climbing a narrow track that runs along the edge of a precipice, as it winds its way up the mountain. Swiss Mountain Railways are described in a special article in this month's issue by Mr. H. J. Shepstone, F.R.G.S., the well-known author and traveller, whom we welcome as a new contributor to our pages. Mr. Shepstone has promised us several other interesting articles in the near future, including an account of the building of the Sennar Dam across the Nile. The construction of this gigantic work is a particular triumph for engineers because not only was the work carried out in the face of great difficulties, but the engineers literally had to race with Nature so as to get the dam completed before the annual floods of the Nile set in.

Next Month

The July issue will include the first instalment of an article comparing Swiss, French, and English railways. This article has been specially written for us by Mr. H. E. Underwood, who lives in Geneva, Mr. Underwood, who has been a member of the Meccano Guild for many years, has contributed interesting news items to the "*M.M.*" for some time past, and he is now acting as our special correspondent at Geneva. He is particularly interested in railways and has promised to send us some splendid articles dealing with Swiss Railways and engineering works. I feel sure that my readers will look forward to these features, which will be published as opportunity permits.

For Our Cycling Readers

Our contributor "Rover," next month commences a special serial article describing a tour in Somerset and Devon. Although it may not be possible for a large number of our readers to go over the same ground, I feel sure that all cyclists will be interested in reading the new series. They are written in a somewhat different style from that which "Rover" has hitherto adopted and they contain a good deal of helpful instructions to cyclists generally, as well as some reading in lighter vein.

Cycling tours are very similar no matter in what part of the country they are made, the only differences being the scenery, the nature of the road, and the incidents on route. "Rover" is a confirmed cyclist and has averaged 5,000 miles every year for many years. He thinks there is nothing like cycling to keep one fit! I hope that his enthusiasm for cycling will be infectious and that a large number of my readers will be persuaded to get out into the country on tour during the holidays this summer.

A "Fishy" Subject

This month I am commencing a special series of articles on Aquariums and, as a result, many readers will no doubt be tempted to set up a tank or a bell-jar and to stock it with interesting specimens. I feel sure that these articles will be appreciated. No doubt many who already have aquariums—or even who keep the humble stickleback or tadpole in a jam-jar!—will learn with surprise that there is such a thing as cruelty to fishes, and that it is as easy to be kind to creatures that live in water as to those that live on land. No doubt a good deal of pain is inflicted unknowingly upon the inhabitants of an aquarium, but after reading what our contributor has to say on the subject there should be no excuse for any form of "cruelty to fishes."

The Railway Centenary

As most of my readers know, this year is the Centenary of the steam locomotive, and special celebrations are being held in the north of England to commemorate this anniversary. Although the first train on the Stockton and Darlington Railway ran on 27th September 1825, the centenary celebrations are being held in July next at the particular request of the international Railway Congress, which represents the railways of the world. The Congress meets in different countries every year, and for 1925 the meeting was to have been held in Madrid. Owing to the reports of the centenary of British Railways, however, the Congress Committee suggested that if the centenary celebrations could be held in July they would hold their session in London. For this reason it has been decided to celebrate the birth of the railway systems of the world on the site of the original Stockton and Darlington Railway on the 2nd and 3rd July next, instead of holding the celebrations on the actual anniversary of the opening of the railway.

A special Railway Centenary number of the "*M.M.*" will be published in September, and in addition to splendid articles on the history of the locomotive, modern locomotives, and other railway features, it will contain a full description of the Centenary Celebrations. A special representative is being sent to Darlington so that the events may be fully described and illustrated. Further particulars will be published later.

A Famous Author's Centenary

Speaking of centenaries, I read that the centenary of R. M. Ballantyne, the famous author of boys' stories, has recently been celebrated in Edinburgh. Robert M. Ballantyne was born on the 24th April, 1825, and when sixteen years of age received an appointment with the Hudson Bay Fur Co. Although his salary was only £20 a year, we imagine that a good number of our readers would have envied him, for his work lay among the traders and Red Indians in North America. The life was too severe, however, and so affected his health that he had to return to Scotland after six years of adventure.

In 1855, William Nelson, the famous Edinburgh publisher, suggested he should write a book for boys dealing with his experiences and adventures. Next year "*The Young Fur Traders*" was published and meeting with great success, was followed by two other books, which dealt with adventures in different parts of the world. The scenes were laid in countries that Ballantyne had never seen, with the result that in his third book "*Coral Island*" he made at least one great blunder. On this mistake being pointed out to him he determined never to write another book without first "obtaining information from the fountain head." With this maxim in mind he went to stay at Ramsgate and made friends with Jarman, the local coxswain, before writing "*The Life-boat.*" He visited the Bell Rock before writing "*The Lighthouse*" and for his splendid book "*Fighting the Flames,*" he served with the London Salvage Corps as an amateur fireman.

I hope that any of my readers who have not read Ballantyne's books will do so without delay, for they include some of the finest boys' stories that have ever been written. In this connection I wonder if any reader will be able to point out the blunder that appears in "*Coral Island.*" I shall award a cheque for a guinea to the sender of the first correct solution received before 31st August. Mark your envelopes "Coral Island" and do not forget to include your name and address.

Swiss Mountain Railways

Track-laying in Cloudland

By H. J. Shepstone, F.R.G.S.

THE Alps have been the scene of many battles-royal between skilled engineers and the towering peaks with their everlasting snows.

One of these battles is now in progress on the Aiguille du Midi, the companion peak of Mont Blanc. The engineers are endeavouring to throw a cableway to the summit of this famous peak. Operations were commenced as far back as 1909, and by the time the Great War broke out and put a stop to the operations a height of 4,099 ft. had been gained. A strenuous attempt is now being made to carry through the original scheme, that is to construct an aerial line capable of carrying passengers to the summit of the Aiguille du Midi—12,608 ft. above sea level. The cables on which the cars will run, swinging in the air as it were, are being carried up the mountain side on steel towers varying in height from 38 ft. to 108 ft. Each of these cars will be designed to carry twenty passengers and the motive power will be electricity.

The Avalanche Danger

The engineers have undertaken to reach an altitude of 9,080 ft. next year, but after that progress will prove exceptionally difficult. The work is extremely risky in many respects, but above all there is the danger of avalanches which are very frequent on the higher reaches of this peak. Geologists who have studied this mountain tell us that these avalanches frequently contain as much as 150,000 cubic yards of snow, stone and earth!

The Kohlerer Mountain Aerial Railway

This is by no means the first attempt to construct a passenger cableway up the steep sides of a great mountain. The Kohlerer Mountain Railway in the Austrian Tyrol, for instance, has been in constant operation for some years. In this case, however, the mountain is only 4,000 ft. high and has only two stations, one at the base and the other at the summit. Shortly before the war an aerial line was built to the edge of the Wetterhorn, its object being to raise passengers some 2,000 ft. to the Upper Glacier. Owing to the war this project failed to pay its way and to-day its cables and machinery are disused and covered in rust.

Snowdon Rack Railway

Whether these aerial lines will supersede the rack railways for scaling dizzy heights is doubtful. Rack railways are now in successful operation in almost all parts of the world where there are mountain ranges. We have an example of this system at Snowdon, where a little rack railway climbs about 2,000 ft. in just over four miles. There was a disastrous accident on this line shortly after it was opened and for a time tourists were very shy of it. To-day, however, the accident is forgotten and the line is in great demand as a saver of time and bodily fatigue by those who are anxious to reach the highest point in England and Wales.

As regards difficulty of construction and altitude obtained, the Snowdon line is a mere toy compared to the wonderful rack railways that carry passengers up Pilatus, Rigi, Zermatt, Jungfrau and many other mountains in the Swiss Alps.

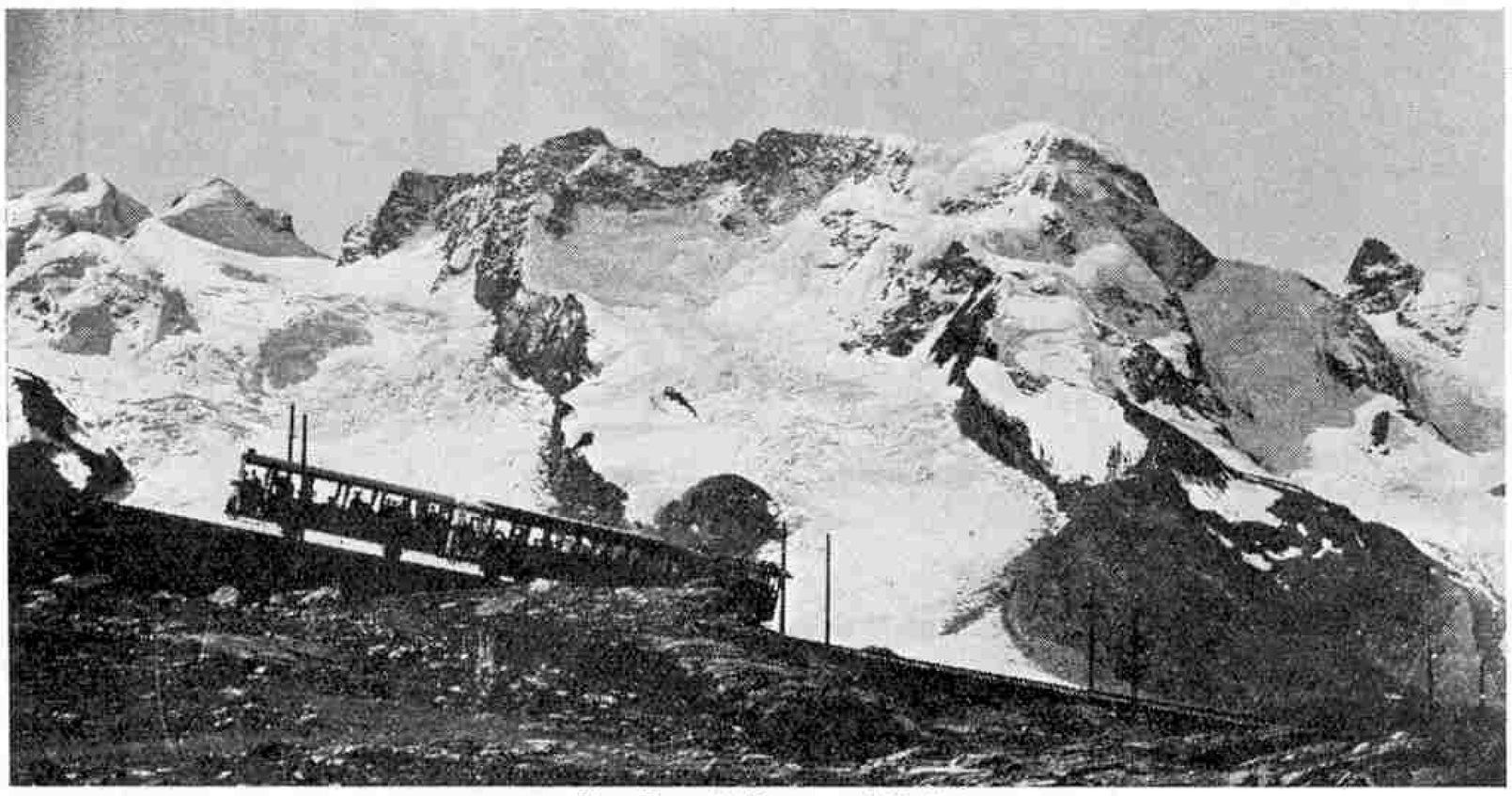
Conquest of Pilatus

Take, for instance, the Pilatus Railway, which, although it only attains an altitude of just under 7,000 ft., is nevertheless one of the most remarkable of the whole group. This rugged, serrated mountain, called Pilatus from the legend that the spirit of Pontius Pilate is condemned to roam its heights for ever in solitary contemplation of his sins, looks down upon the beautiful shores of Lake Lucerne. It is not by any means the loftiest of the Alpine peaks, but its great sides and naked rocks, its terrible precipices and its cliffs which rise so grandly into the air made the scaling of it a daring feat on the part of the engineer.

Pilatus is ascended to-day by the iron horse by means of a series of short tunnels and steep outside tracks. The gradient in some places is as much as one foot in every two. The Italian workmen who built the road frequently had to work while suspended at the end of ropes 100 ft. long. Sections of the track had to be hauled up by ropes and then fastened to convenient

rocks until they could be spiked into position. The work in fact was both dangerous and exhausting.

The wildest part of the road is reached at the point where it enters the rugged escarpment of the Esel. Here it passes round the fantastic blocks of the Mattalp under the very edge of the enormous mass of the Esel, whence a panoramic view is had of the Matterhorn. From there, describing a sharp curve, the line boldly mounts the ridge that connects the two summits. At this point the line lies at an altitude of 6,230 ft. above sea level, and it seems to cling to the very edge of the wind-swept, grim, grey peak of the Esel as it mounts slowly upward. Below, the Bernese Alps, lakes, towns and villages can be seen in every direction. Men working on this part of the line had to labour in a most unfriendly climate while toiling against engineering difficulties that were almost insuperable.

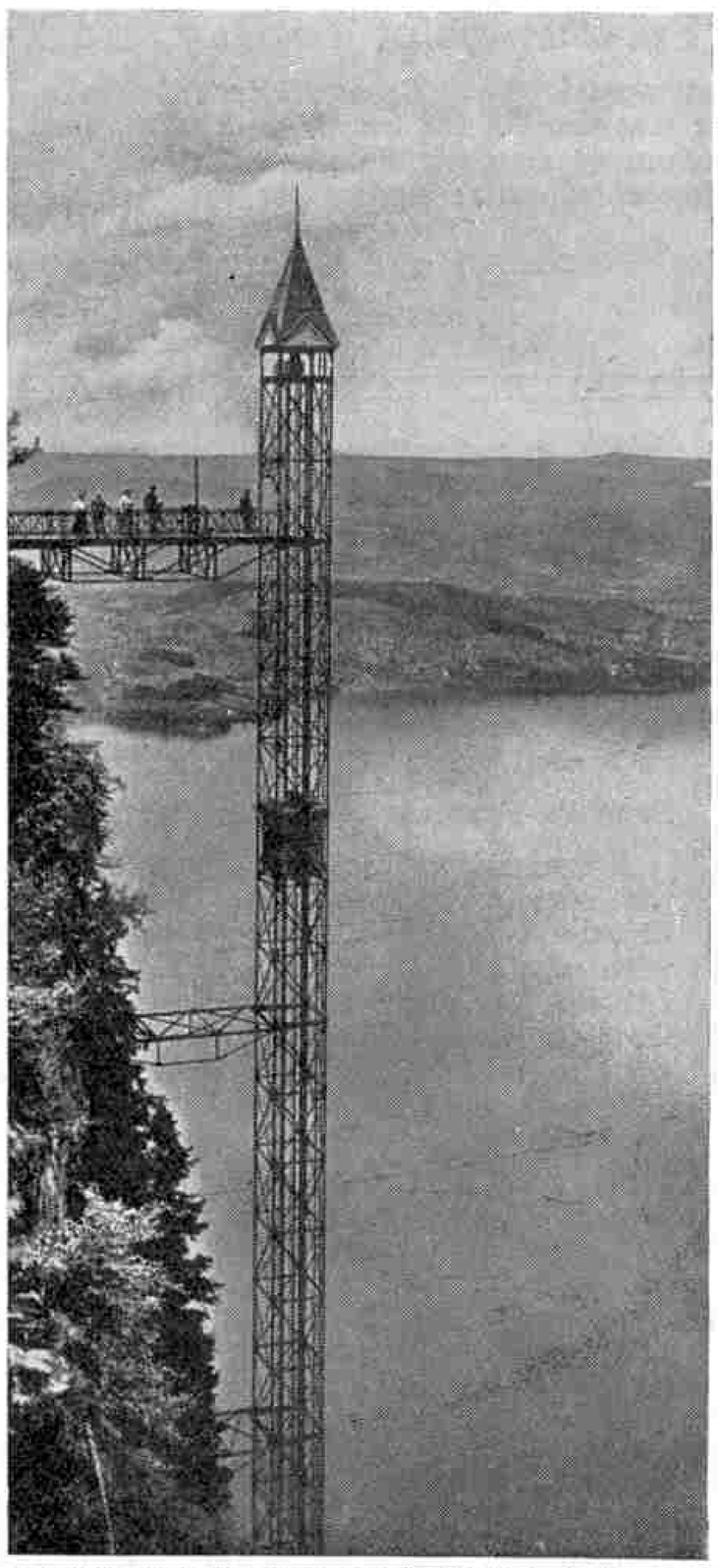


The Zermatt-Gornergrat Railway

A Narrow Escape from Death

An incident that occurred during the building of the railway up the Rigi provides a good example of the dangers of this kind of work. During the operations some workmen loosened from the mountain side a gigantic block of stone weighing over 20 tons, and this went crashing down the narrow road, threatening death and destruction to anything in its path. Five workmen saw the huge stone falling and dashed away into shelter. They were not a second too soon, for just as they reached safety the great block thundered past them! During the construction of the railway to Zermatt one hundred tons of snow from the mountain fell upon the toilers, burying them so deeply that it took a gang of experienced men many hours to dig them out.

Gales spring up very suddenly on these mountains, and as may be imagined the force of the wind on an exposed slope is terrific. For this reason men who are employed at work close to the edge of steep precipices are always roped, and this precaution has been the means of saving many lives. When a great wind has sprung up men have been blown over the face of the cliffs, there to dangle in mid-air until their comrades pulled them up, safe but bruised and bleeding from cuts received from the jagged points of the rocks. Without ropes these men would have been hurled to a terrible death.



This Elevator, on the Burgenstack Mountain Railway, has a perpendicular rise of 500 ft. up the face of the mountain

A Wonderful Lift

As I write, the engineers are busy erecting a wonderful lift up the last section of the Jungfrau. Until fairly recently it took two or three days' climbing, including some glacier work, to gain the summit of this peak which towers 13,670 ft. into the air. By means of the railway, however, one can ascend in comfort to a height of 11,340 ft., that is about 2,330 ft. below the summit. From this point it is quite probable that a lift will be constructed to carry passengers up the remaining portion of the mountain.

The Jungfrau Railway is a daring piece of work. It starts at the Little Scheidegg, 6,770 ft. above sea level, and climbs up in the open to Eiger Glacier station, 7,620 ft. high. Here one can step out and explore the glacier and even in midsummer indulge in tobogganning, as the writer did during the heat wave in July last year. From this point the railway plunges into a succession of tunnels between which the traveller gets glimpses of splendid prospects, round the southern face of the Eiger and then across a rocky neck to Eismeer and along the ledges to the Jungfraujoch station—cut in the solid rock—to a point 11,340 ft. above sea level—the highest railway station in Europe.

The construction of this remarkable mountain railway presented enormous difficulties. Five years were spent in surveying the route owing to the extreme difficulty of finding stations for the instruments. As the railway progressed upward only the hardiest and strongest men could endure the fatiguing work. Oxygen is scarce at such a height and the workmen soon became exhausted. After two hours' toil long periods of rest had to be taken before the men could start work again.

The rarified state of the atmosphere at high altitudes is a serious hindrance to mountaineers, especially in such undertakings as the climbing of Mount Everest.

Lives of Famous Engineers

XVII
Isambard K. Brunel *and the* "GREAT EASTERN"

LAST month we gave an account of the work of I. K. Brunel as a railway engineer, and this month we must turn to his equally great achievements in steam navigation.

The use of steam in the direct voyage across the Atlantic made by the American ship "*Savannah*," in 1819, drew general attention to the possibilities of the steam engine for purposes of navigation. Little advance in this direction was made, however, until 1835. In that year at a meeting of the Board of the Great Western Railway Company, one of the directors spoke of what he considered to be the "enormous length" of the proposed railway from London to Bristol. Brunel immediately exclaimed, "Why not make it longer and have a steamboat to go from Bristol to New York and call it the "*Great Western?*"

The suggestion was treated as a joke, but afterwards some of the directors discussed the matter with Brunel and ultimately became quite enthusiastic about his scheme. It was not long before a company was formed in Bristol, called The Great Western Steamship Company, and the construction of a ship, the "*Great Western*," was commenced, mainly under the direction of Brunel.

A Trans-Atlantic Controversy

About this time a serious controversy arose in regard to the possibility of successful trans-Atlantic navigation by steam. At a meeting of the British Association in Bristol in 1836 a Doctor Lardner gave an address on "Trans-Atlantic Steam Navigation," in which he made the following remarkable statement:—"Let them take a vessel of 1,600 tons provided with 400 horse power engines. They must take 2½ tons for each horse power, the vessel must have 1,348 tons of coal, and to that add 400 tons, and the vessel must carry a burden of 1,748 tons. He thought that it would be a waste of time, under all the circumstances, to say much more to convince them of the inexpediency of attempting a direct voyage to New York, for in this case 2,080 miles was the longest run a steamer could encounter; at the end of that distance she would require a relay of coals."

Launch of "Great Western"

This statement was widely circulated and made a deep impression, but in spite of all adverse criticism the construction of the "*Great Western*" was proceeded with and she was launched on 19th July 1837. While she was anchored in the Thames she was crowded with visitors who were astonished at her size.

Her engines having been installed, great efforts were made to get the ship to Bristol to commence her voyage across the Atlantic before the departure of the "*Sirius*," a vessel bought by the St. Georges Steam Packet Company in order to anticipate the "*Great Western*." The latter vessel started for Bristol on 31st March 1838, but in about a couple of hours a serious fire broke out in her engine room and the vessel was immediately run ashore on a mud bank.

Brunel's Remarkable Escape

A remarkable incident occurred during the extinguishing of this fire. Captain Claxton was at work in the engine room with a fire hose when something heavy fell on him from above. On recovering from the blow he looked to see what had hit him, and found a man lying insensible on the floor with his head covered to the ears with water. Captain Claxton called for a rope, the almost lifeless body was hauled on deck, and it was then seen that the man who had fallen was Brunel himself! He had a very narrow escape from death, but after two or three days he had largely recovered from his injuries.

The fire having been subdued, the ship resumed her voyage to Bristol, arriving there on 2nd April. She started on her first voyage to New York on 8th April with seven passengers on board and arrived at New York on 23rd April, having consumed three-fourths of the coal she had taken on board. She found that the "*Sirius*" had arrived before her, but the latter vessel had left Cork eight hours before the "*Great Western*" left Bristol, and had only arrived at New York a few hours before her. Another point of importance was that while the "*Great Western*" had nearly 200 tons of coal left, the "*Sirius*" had not only consumed all her coal but also almost every article on board that would burn, including—according to rumour—a child's doll!

The "*Great Western*" commenced her return voyage with 68 passengers and made the trip in 14 days. From that time she ran regularly between Bristol and New York until the end of 1846. In the following year she was sold to the West India Mail Steam Packet Company. She was broken up in 1857 and Brunel was among those who went to take farewell of her before she finally disappeared.

The principal dimensions of the "*Great Western*" were as follows:—Extreme length 263 ft.; breadth (including paddle boxes) 59 ft. 8in.; engines 450 h.p.; diameter of paddle wheels 28 ft. 9 in.; total tonnage 1,321 tons.

"Great Britain" Laid Down

The directors of the Great Western Steamship Company, encouraged by the success of the "*Great Western*," decided to lay down a second ship, and further, they determined that the new vessel should be the largest afloat and should be constructed according to the very latest theories. At first it was intended that the new ship should be built of wood, but afterwards the company decided that she should be built of iron. This decision met with almost general condemnation by the public, but the directors of the company persevered. Brunel's second vessel, the "*Great Britain*," was therefore laid down.

By this time the superiority of the screw to paddles was gradually being demonstrated and already several small vessels had been fitted with screws and had proved very successful. So far, however, no attempt had been made to build a screw steamer large enough for ocean voyages. The Great Western Company had intended that the "*Great Britain*" should be a paddle steamer, but they soon became convinced of the superiority of the screw

Giant Steamships of To-Day and Yesterday

Brunel's last vessel, the "*Great Eastern*," was a failure largely because she was too big for her day. The advance that has been made in steamship construction since that time is well shown by the following comparative figures for the "*Great Eastern*" and the "*Majestic*":—

	"Great Western"	"Great Eastern"	"Majestic"
Length	263 ft.	693 ft.	956 ft.
Breadth	59 ft. 8 ins.	83 ft.	100 ft.
Gross Tonnage	1,321	18,915	56,551

and without hesitation they ordered the design of the vessel to be altered so that a screw could be fitted.

Building Difficulties

The building of this vessel was attended with great difficulties. Her total length was 322 ft. and her beam 51 ft. Her total depth from the underside of the upper deck to the keel was 31 ft. 4 in., and her tonnage was 3,500 tons. At that time no shipbuilder had any experience upon which to draw for the construction of such a vessel, and shipbuilders generally were not at all keen on commencing the construction of iron ships. In addition there was a very general belief that a vessel of the size of the "*Great Britain*" could not be built of iron. The directors were unable to find a contractor for the vessel and were therefore obliged to instal their own plant for building the ship and her engines also. She was constructed under the supervision of Paterson of Bristol, as was also the "*Great Western.*"

The "*Great Britain*" was launched in 1843 after various more or less serious difficulties in regard to getting her afloat. She sailed for London in January 1845 and although she experienced bad weather she made an average speed of 12½ knots. Her arrival at Blackwall caused intense excitement and thousands of people flocked to see her. She remained five months at Blackwall, during which time she was visited by Queen Victoria, and she then left for Liverpool with about 80 passengers on board.

On 26th July, 1845 she left the Mersey on her first trans-Atlantic voyage and arrived at New York on 10th August having made the passage in 14 days 21 hours. On a subsequent voyage she broke one of the blades of her propeller and got home under canvas after 18 days of very rough weather. She was fitted with a new screw and various improvements were made to increase the supply of steam from her boilers, and early in 1846 she again commenced her Atlantic crossings. In the following September she ran aground in Dundrum Bay on the coast of Ireland and was not refloated until 11 months later. She was so strongly constructed, however, that she was little the worse for this long ordeal. Ultimately she was brought to Liverpool and subsequently placed in the Australian trade.

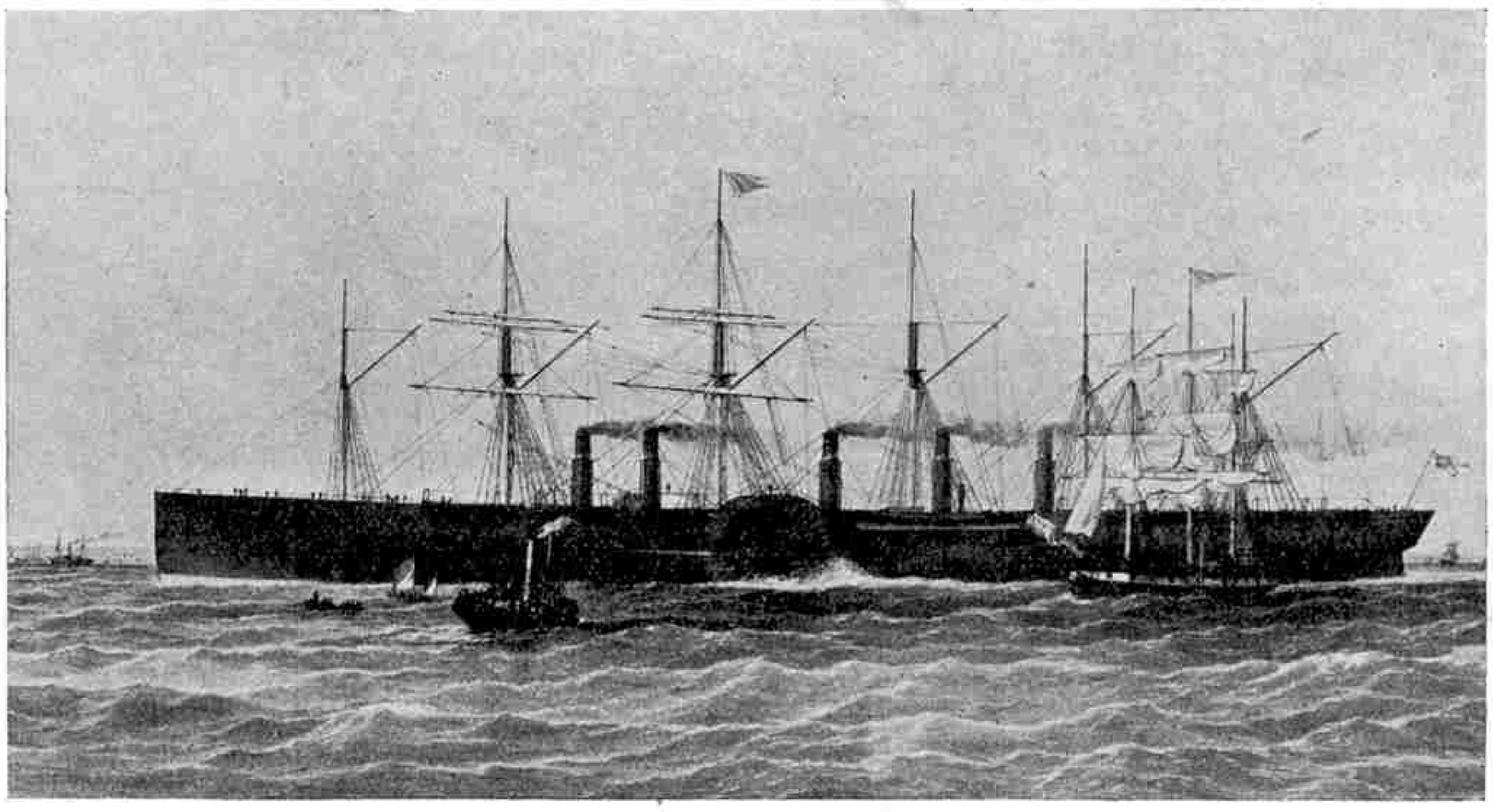
Brunel and the Screw Propeller

Soon after Brunel had taken the bold step of recommending the adoption of the screw propeller in the "*Great Britain*" he was invited by the Admiralty to take charge of certain experiments regarding the screw that were about to be made. These experiments were carried out on a fairly extensive scale and were so successful that the Admiralty ordered a number of vessels to be fitted with the screw, and from that time the paddle wheel was gradually abandoned. Brunel thus had the satisfaction of knowing that he had been mainly instrumental in introducing the screw propeller into the Mercantile Marine, and also in securing its adoption in the Navy.

"Great Eastern" Planned

In 1851 Brunel again became connected with the construction of steamships, in the capacity of engineer to the Australian Mail Company. He advised the directors, in order to carry out their contract for the conveyance of mails to Australia, to build ships of from 5,000 to 6,000 tons, in order that they need only touch for coal at the Cape. Two ships were built under Brunel's direction by Mr. J. Scott Russell. These vessels, the "*Victoria*" and the "*Adelaide,*" were a financial failure, largely on account of the fact that they could not carry enough fuel. This failure led Brunel to attempt to design a vessel large enough to carry her own coal for the voyage. In 1851 the Eastern Navigation Company was formed and decided to build a giant steamer in accordance with Brunel's views. This steamer was the famous and ill-fated "*Great Eastern.*" The lines of the vessel were designed by Scott Russell, who also built the hull, and the general details of construction were settled by Brunel and Russell.

The proposal to build such an enormous ship was received by the public with the greatest enthusiasm and excitement, and all kinds of wild and absurd rumours were floating about in regard to the actual dimensions and estimated speed of the ships.



Courtesy of] [*T. H. Parker*

The "Great Eastern"

The Vessel's Dimensions

The "*Great Eastern*" was provided with both paddle wheels and a screw propeller. She was built of iron with an inner skin from the keel to the water line and was thus a double-hulled vessel. Her chief dimensions were as follows:—Extreme length 693 ft.; breadth 83 ft.; depth 58 ft.; gross tonnage 18,915 tons. Her paddle engines were of 1,000 nominal horse power and weighed 836 tons. The four cylinders were 74 in. in diameter with a stroke of 14 ft. Each paddle wheel was operated by a complete double-cylinder engine and could be revolved without the other wheel if necessary. Steam was supplied at 24 lb. pressure from four double-ended tubular boilers each 17½ ft. long, 17 ft. 9 in. wide and 13 ft. 9 in. high. Each boiler weighed 50 tons and contained about 40 tons of water. The engines for the screw propeller were of 1,800 nominal horse power and weighed 500 tons. They were supplied with steam at 25 lb. pressure from six double-ended tubular boilers. The propeller was a four-bladed cast iron screw of 24 ft. diameter and 44 ft. pitch, weighing 36 tons. The vessel's speed under paddle wheels alone was about seven knots and under screw alone about nine knots. Using both screw and paddles her calculated speed was 15 knots.

Launching Troubles

The launching of the "*Great Eastern*" was fixed for 3rd November, 1857 but on that occasion the great ship moved only a few feet and then stuck fast, and it was not until 31st January, 1858 that she actually took the water. Her launch was attended with enormous difficulties and dangers, very largely due to the fact that she was launched broadside on to the river. In this matter Brunel certainly made a great mistake, and one which added £120,000 to the cost of the vessel and practically ruined the company.

"Great Eastern's" Career

The "*Great Eastern's*" bad luck began with her first trial in September 1859, for an explosion occurred which resulted in the death of six men and injuries to several others. Her first voyage was across the Atlantic. She left Southampton on 17th June, 1860 with 36 passengers and arrived at New York on 28th June. Her appearance at New York caused intense excitement and we are told that practically the whole city turned out to see her. On this trip the ship's best day's run was 333 miles and her maximum speed about 14½ knots. On the return trip she carried 212 passengers and a considerable amount of cargo, and made the trip in 9 days 11 hours.

In 1861 she successfully carried over 2,000 troops to Quebec and returned to Liverpool with about 500 passengers. On her next voyage, however, she encountered a great gale in which her steering gear was put out of action, and she was for a time in serious danger of being lost. In 1865 she was employed on laying the Atlantic cables and she continued on this work at intervals until 1886. This cable laying was the most successful work accomplished by the "*Great Eastern*" and next month her share in this gigantic undertaking will be described in our article on "The Atlantic Cable."

In 1886 the vessel was bought by a firm

(*Continued on page* 286)

Famous Locos under Test

G.W.R "Castle" Locos and L.N.E.R. "Pacifics"

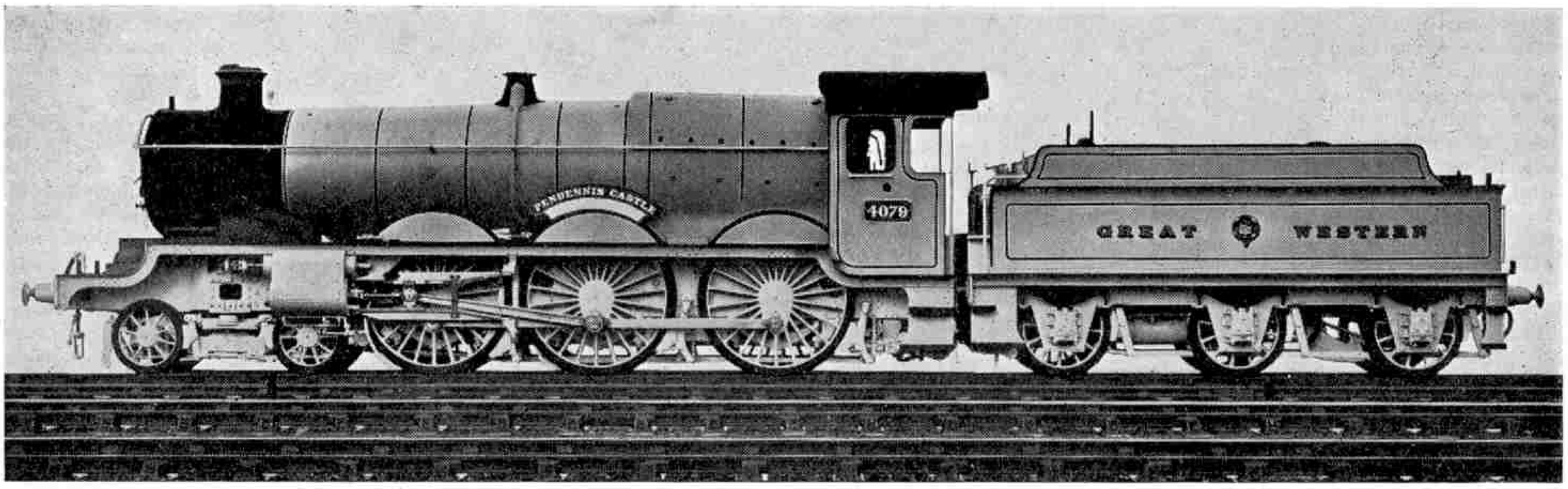


Photo courtesy] [*G.W.R.*

"The Pendennis Castle"

ONE of the most interesting recent events in the railway world is the exchange of locomotives between the G.W.R. and L.N.E.R., by which locomotives of the respective companies carried out a series of trials on the other company's line. The trials were arranged in order to enable the engineers of the two companies to obtain technical information that will be of considerable value and which, no doubt, will not be without some influence in future design.

The 1909 and 1910 Trials

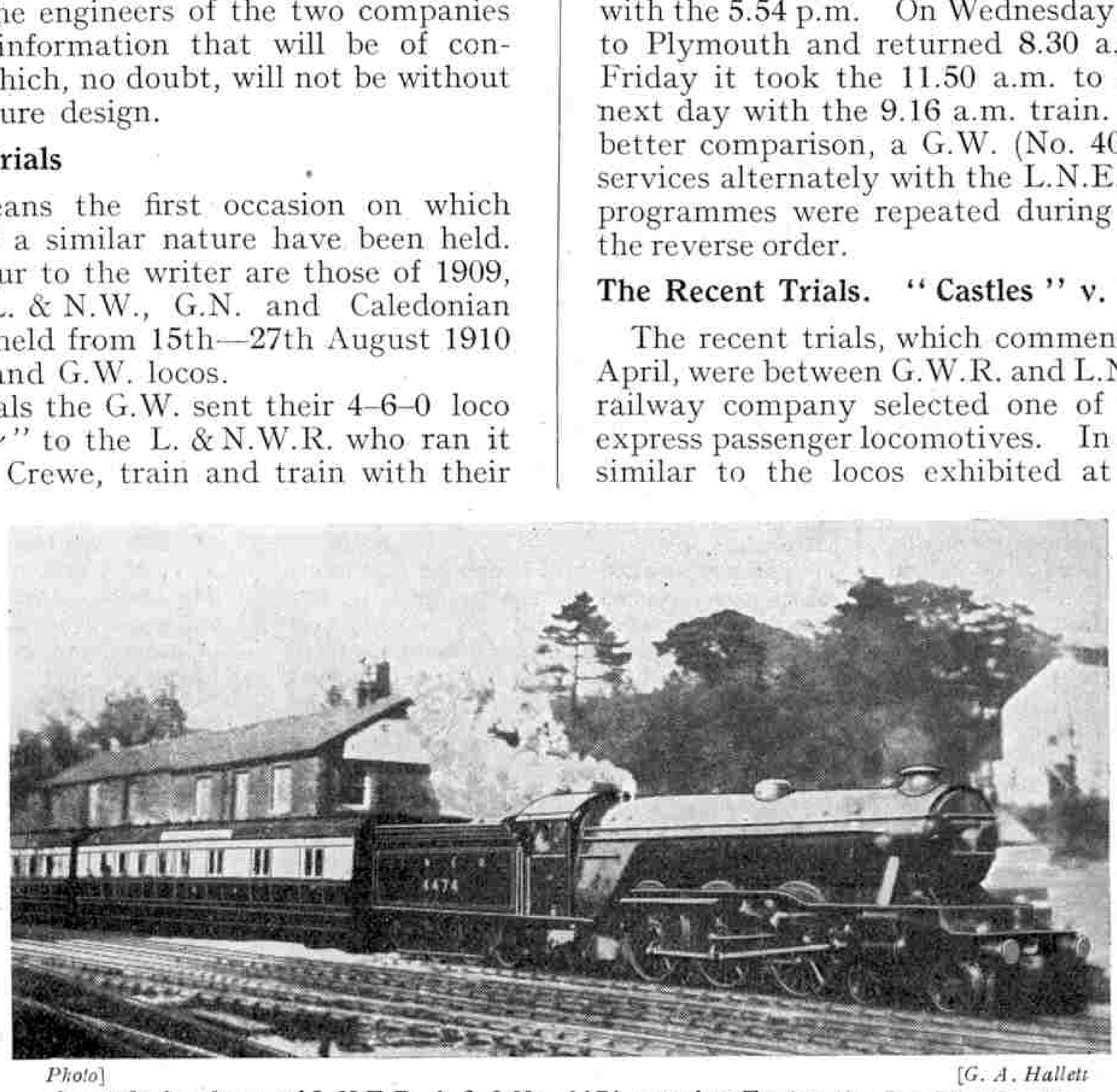
This is by no means the first occasion on which comparative trials of a similar nature have been held. Two that readily occur to the writer are those of 1909, arranged by the L. & N.W., G.N. and Caledonian Railways, and those held from 15th—27th August 1910 between L. & N.W. and G.W. locos.

For these latter trials the G.W. sent their 4–6–0 loco No. 4005, "*Polar Star*" to the L. & N.W.R. who ran it between Euston and Crewe, train and train with their 4–6–0 loco No. 1455 "*Herefordshire.*" During the week each loco hauled the 12.10 p.m. from Euston, with an average of 17½ coaches, three times, and the 10 a.m. train twice. The procedure was reversed, in the second week of the trials, the 10 a.m. being hauled three times and the 12.10 p.m. twice.

The L. & N.W. sent their loco No. 1471 "*Worcestershire*" to the G.W. who worked it with No. 4003 "*Lode Star*" as a comparison. On the Monday of the trials No. 1471 worked the 9 a.m. from Paddington to Bristol and returned with the 5.5 p.m. On Tuesday it hauled the 11 a.m. via Bath and returned with the 5.54 p.m. On Wednesday it took the 10.30 a.m. to Plymouth and returned 8.30 a.m. Tuesday, and on Friday it took the 11.50 a.m. to Plymouth, returning next day with the 9.16 a.m. train. In order to make a better comparison, a G.W. (No. 4003) ran on the same services alternately with the L.N.E.R. No. 1471, and the programmes were repeated during the second week, in the reverse order.

The Recent Trials. "Castles" v. "Pacifics"

The recent trials, which commenced on Monday, 27th April, were between G.W.R. and L.N.E.R. locos and each railway company selected one of their most powerful express passenger locomotives. In both cases these were similar to the locos exhibited at the British Empire Exhibition at Wembley last year, where, no doubt, many of our readers will remember seeing the G.W.R. "*Caerphilly Castle*" and the L.N.E.R. "*Flying Scotsman.*" Although these famous locos were not used in the trials, the locos actually used were of the same type and similar in every respect.



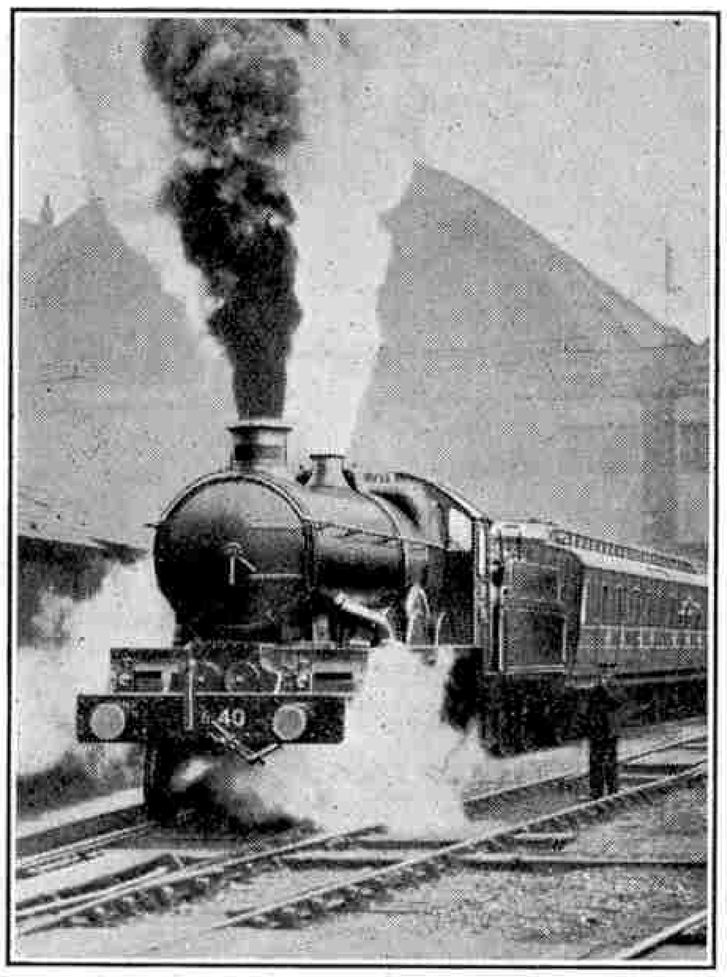
Photo] [*G. A. Hallett*

A reader's photo of L.N.E.R. 4–6–0 No. 4474 entering Exeter (St. David's) Station the week before the Trials, during a preliminary run

The L.N.E.R. selected for the trial one of their Doncaster-built "Pacific" type locos, No. 4474, which the G.W.R. set to haul the Cornish Riviera Express between Paddington and Plymouth. The loco was worked down to Plymouth on Monday, Wednesday, and Friday, and returned to Paddington with the "up" Limited express on Tuesday, Thursday, and Saturday.

The G.W.R. worked one of their latest locos of the "Castle" class No. 4074, "*Caldicot Castle*," in conjunction with the L.N.E.R. loco on the Limited Express—that is to say, No. 4074 worked the "down" train when the L.N.E.R. was working the "up," and vice versa.

For the tests on the L.N.E.R. line the G.W.R. selected No. 4079 "*Pendennis Castle*," which on Monday, Wednesday, and Friday worked the 10.10 a.m. Leeds Express between King's Cross and Grantham. It returned to London the same day hauling the 12.30 p.m. express from Harrogate, leaving Grantham at 2.7 p.m. On Tuesday, Thursday, and Saturday, the "*Pendennis Castle*" worked the 1.30 p.m. Leeds Express from King's Cross to Doncaster, returning to London on the same day with the 4.45 p.m. from Harrogate and leaving Doncaster at 6.21 p.m.

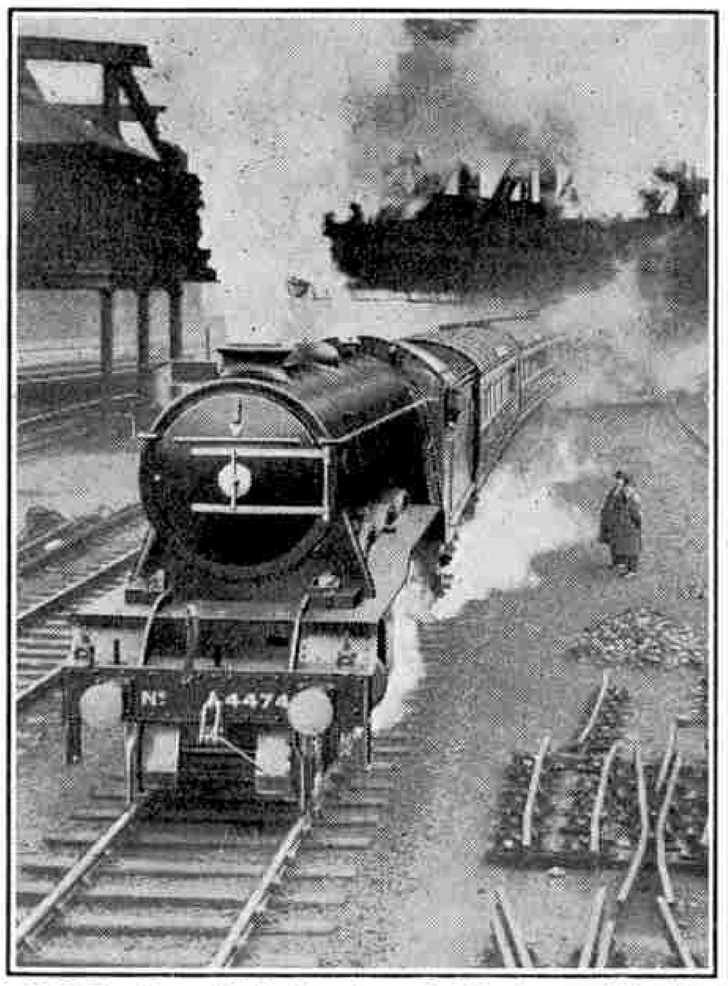


G.W.R. "Pendennis Castle" leaving King's Cross, with the 10-10 a.m. Leeds express

Competing Locos Use Standard Coal

One of the points on which comparative information was required was details of the amount of coal and water consumed by the two locos under identical running conditions. To make the comparison as fair as possible, each loco burnt the coal used as the standard for express work on the other company's line. That is to say, the L.N.E.R. loco. ran through the trials on Welsh coal, and the G.W.R. "*Pendennis Castle*" used South Yorkshire coal.

In order to give the competing locos every chance of working up to their normal capabilities, they were manned by the owning companies' crews, and the actual trials were preceded by a week's preliminary running, so that the respective drivers might get accustomed to the "foreign road."



L.N.E.R. No. 4474 leaving Paddington with the Cornish-Riviera express

Our Keen Readers

The trials have excited considerable public interest and day by day reports of the varying performances were published in the press. In passing it is interesting to note the keen interest of readers of the "*M.M.*" in the trials, for during the weeks in which the trials and the preliminary runs were held, we received numerous letters from enthusiasts who had seen either the G.W.R. "*Pendennis Castle*" or the L.N.E.R. No. 4474 at some part of their route. Several photographs were also sent to us. The one reproduced on the previous page—showing the L.N.E.R. loco hauling the G.W. train into Exeter station on the 20th April—was in our hands as quickly as two days later, a very creditable performance, especially when we remember that the "snap" was taken by an amateur with a small hand camera.

"Castles" and "Pacifics" Compared

In view of the excellent performances put up by both locos under trial, the further particulars and dimensions which we append should provide interesting comparisons between the rival types.

In size, the L.N.E.R. "*Flying Scotsman*" class exceeds the G.W.R. "Castle" locos, since the latter rely on a small boiler with a high steam pressure, as opposed to the large boiler with a lower pressure of the L.N.E.R. Engines. Loco No. 4474 used in the trials weighs 30 tons more than its rival, while its tender carries, in addition to 8 tons of coal, a water supply exceeding that of the "*Pendennis Castle*" by 1,500 gallons. Consequently the former is probably capable of a greater sustained effort, but as regards actual speed and power there seems little to choose between the two.

"No. 4474" belongs to the famous L.N.E.R. fleet of "Pacifics" (4–6–2). The loco is fitted with a superheater having a heating surface of 525 sq. ft., which, with the 168 boiler tubes and firebox, brings the total heating surface to 3,455 sq. ft. The size of its boiler may be imagined from the fact that during its run to Plymouth it consumed thirty gallons of water for every mile covered, and another 2,500 gallons were scooped into its tender whilst running, from the troughs between the rails.

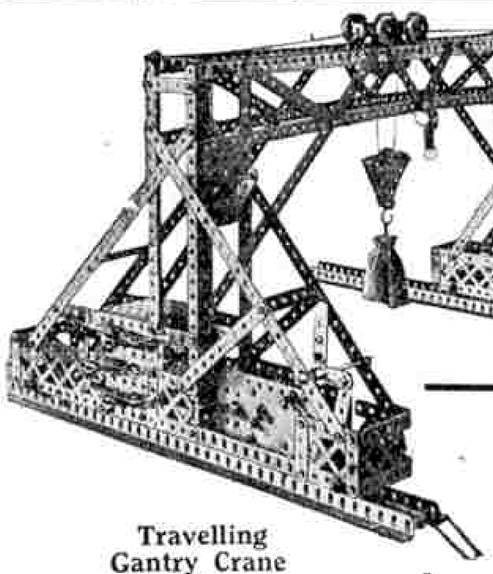
The steam working pressure is 180 lbs. per square inch, and there are three cylinders, each 20″ × 26″, all driving the centre pair of coupled wheels. The diameter of the wheels of the leading bogie is 38″, of the coupled drivers 80″ and of the trailing wheels 44″.

The boiler is 19′ in length and has a maximum diameter of 6′ 5″, and the smokebox is 5′ 11″ in length by 6′ in width. In working order the engine with tender weighs 148 tons 15 cwt., 60 tons of which represents the adhesive weight, since that is the load supported by the six driving wheels. At 85% of the boiler pressure the tractive effort equals 29,835 lbs., and therefore the ratio is said to be 4.5. This means that every 4½ lbs. of the adhesive weight represents 1 lb. tractive effort.

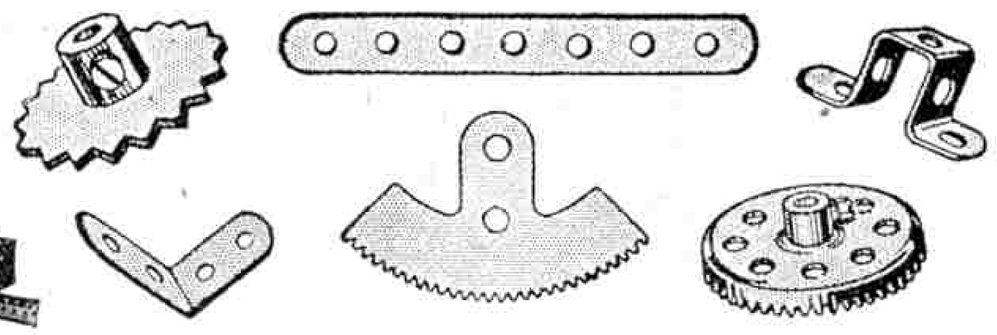
Details of "Castle" Locos

The G.W. "Castle" class numbers amongst its members one of the best-known locos in the world—the "*Caerphilly Castle.*" The fame of this loco rests

(*Continued on page 287*)

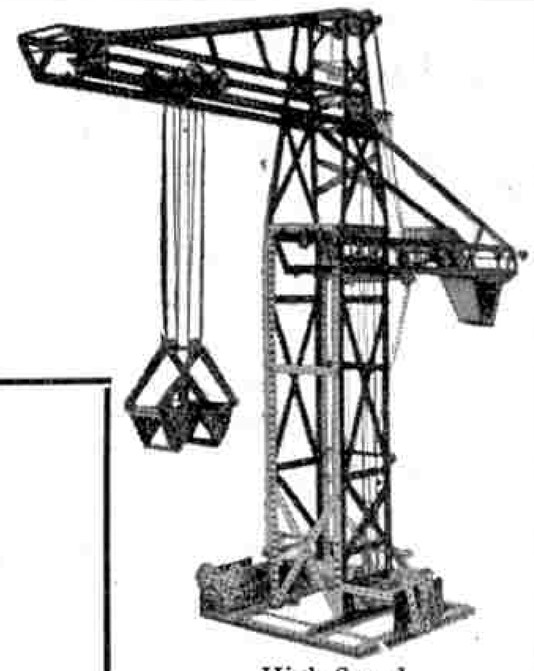


Travelling Gantry Crane



MECCANO

ENGINEERING FOR BOYS



High-Speed Ship-Coaler

Meccano this year is heaps more fun than it has ever been before. Many new parts have been added recently, and this, of course, means new and better models.

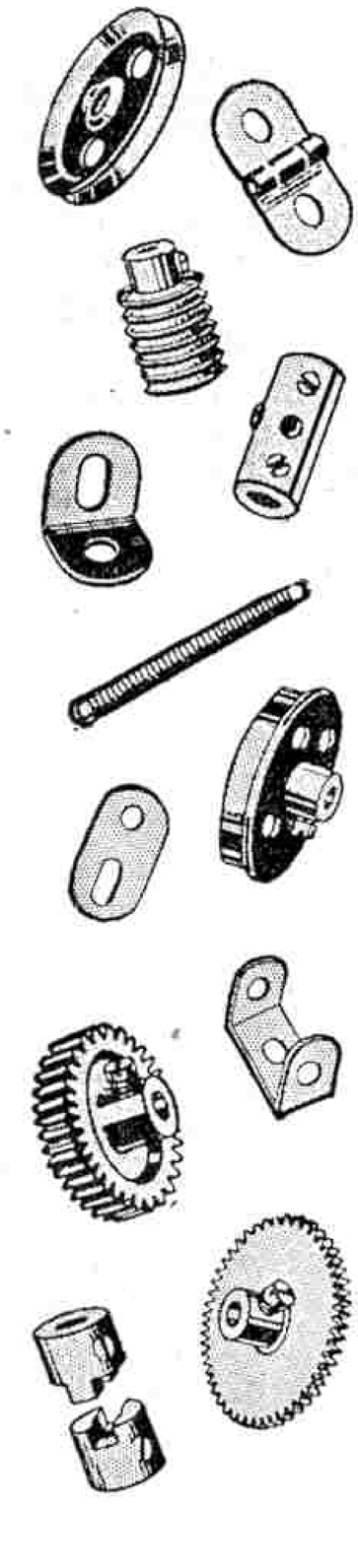
There is no limit to the number of models any boy can build with a Meccano Outfit. The hundreds shown in the Instruction Manuals are just suggestions and no boy ever stops when he has built them—he goes on building new models that he invents himself.

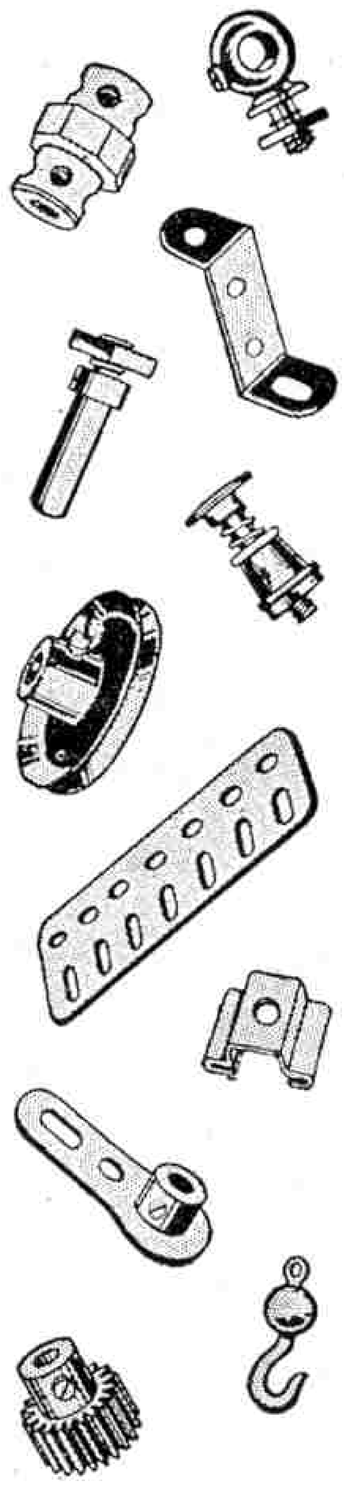
That's why Meccano is such splendid fun. The Crane you build to-day is a Tower to-morrow, a Motor Chassis the next day and so on. You can build a new model every day for years, if you wish! They will be **real** models, too, all sturdy and strong because they are built of steel. Meccano parts are exactly similar to the parts used by real engineers, only smaller. That's why Meccano Cranes lift and swing heavy loads, Meccano clocks keep perfect time, Meccano motor-cars run, and Meccano Looms weave real fabrics.

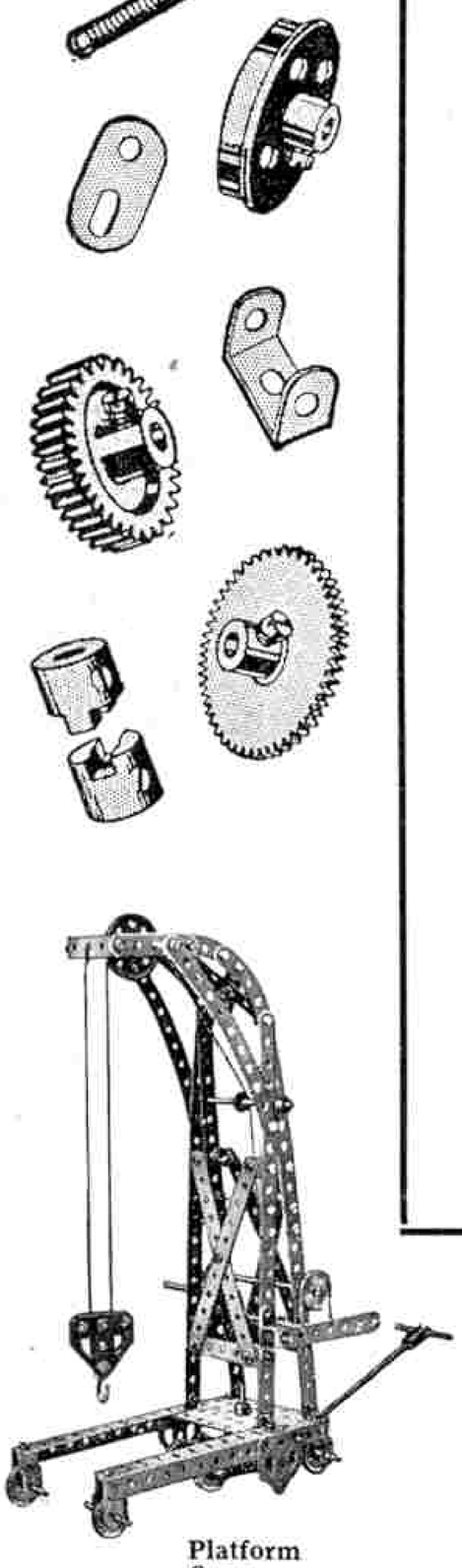
Meccano models are easy to build—you only require a spanner and screw-driver and these are provided in every Outfit.

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

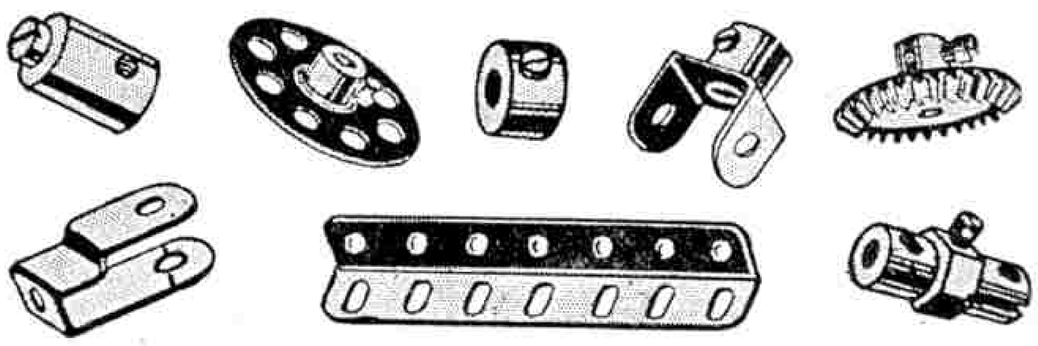
ACCESSORY OUTFITS	
No. 00a	1/6
No. 0a	4/–
No. 1a	7/6
No. 2a	8/6
No. 3a	18/6
No. 4a	15/–
No. 5a (in well-made carton)	50/–
No. 5a (in superior oak cabinet with lock and key)	80/–
No. 6a (in superior oak cabinet with lock and key)	210/–
Electrical Outfit	42/–

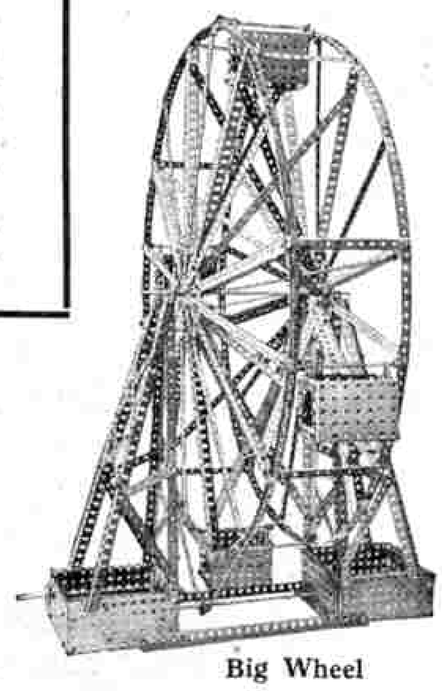






Platform Crane





Big Wheel

A NEW MECCANO MODEL

Model No. 709. Stiff-Leg Derrick

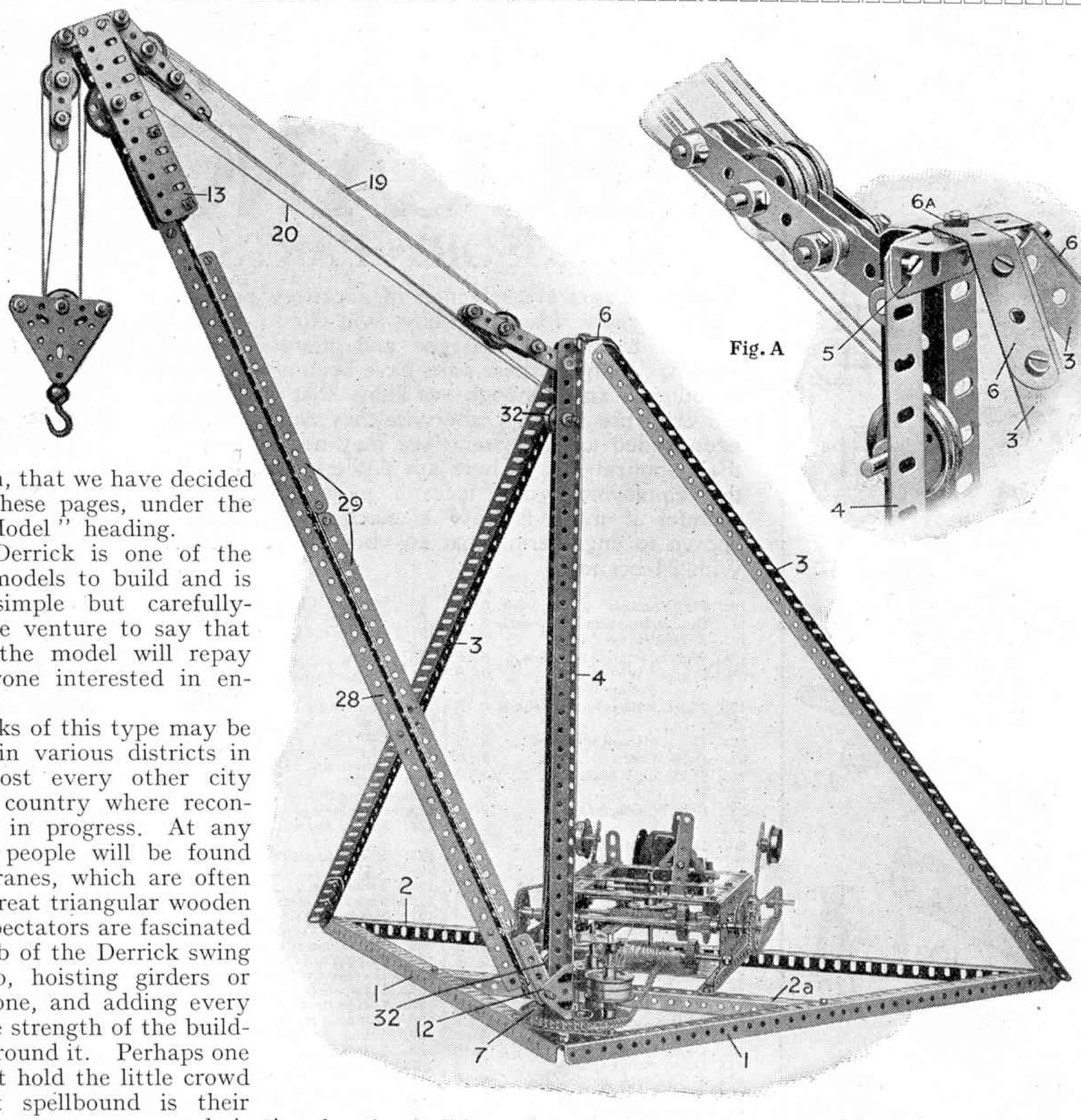


Fig. A

MOST of our readers will probably recognise an old friend in the Meccano Stiff-Leg Derrick, but this model has been recently revised to such an extent, and consequently greatly improved in both appearance and operation, that we have decided to include it in these pages, under the "New Meccano Model" heading.

The Stiff-Leg Derrick is one of the most interesting models to build and is constructed on simple but carefully-planned lines. We venture to say that when completed the model will repay the study of anyone interested in engineering.

Scores of Derricks of this type may be seen every week in various districts in London and almost every other city and town in the country where reconstruction work is in progress. At any hour of the day people will be found gazing at these cranes, which are often perched aloft on great triangular wooden structures. The spectators are fascinated in watching the jib of the Derrick swing busily to and fro, hoisting girders or huge blocks of stone, and adding every few minutes to the strength of the building that is rising around it. Perhaps one of the causes that hold the little crowd on the pavement spellbound is their admiration for the builders who nonchalantly proceed with their tasks around the crane, as though quite unaware that at times nothing but a plank of wood is between them and the ground, hundreds of feet below.

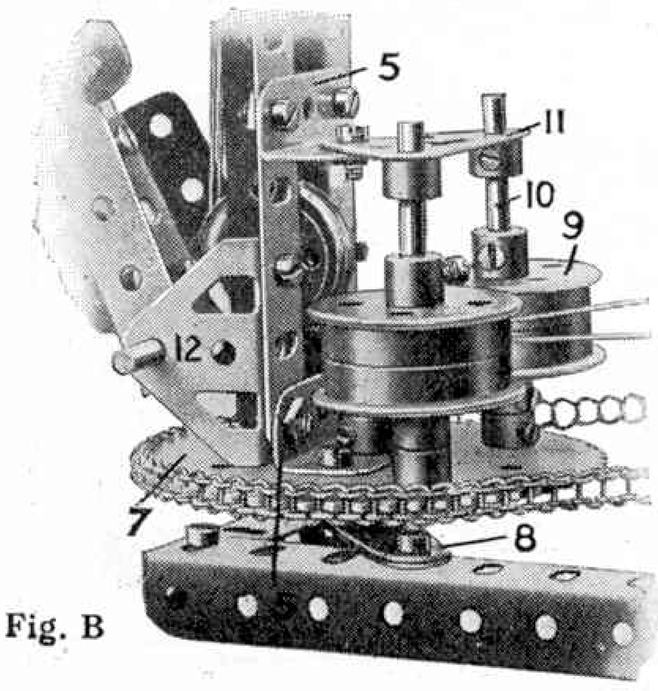
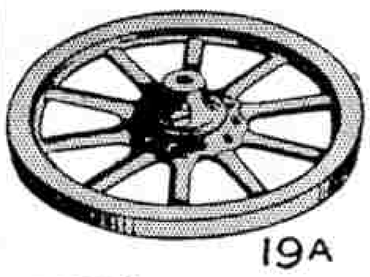


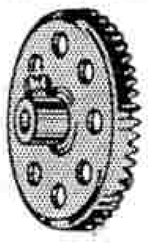
Fig. B

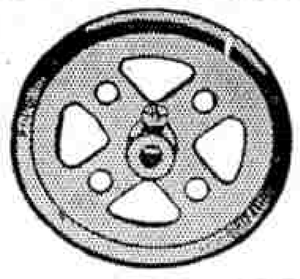
A close inspection of a Stiff-Leg Derrick shows that the strongest parts of the supporting structure are at the base of the jib—where it must withstand the compressive force exerted by the weight, or thrust, of the jib—and at the outer ends of the tie-members supporting the upper pivot of the rotating jib frame. In the latter case the force to be overcome is that of tension, exerted by the pull of the jib and its load.

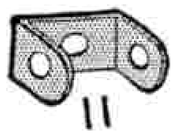
Construction of the Model

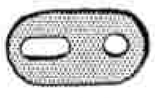
The base of the Meccano Model is formed of 18½" Angle Girders (1) bolted to a 24½" Girder (2) and held rigid by a 12½" Girder (2A). The side members (3) are constructed from 24½" Angle Girders extended at their lower ends by 2½" Girders overlapped three holes. 2½" Strips (6, Fig. A) bolted to the tops of the Girders (3)

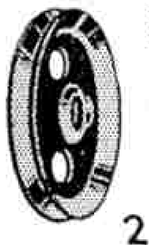


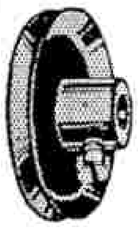


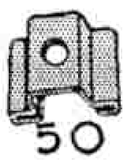


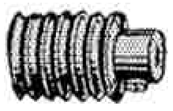


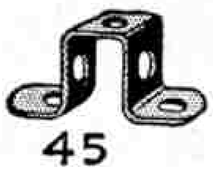


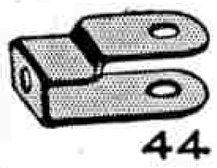


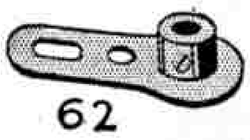


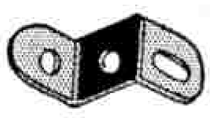


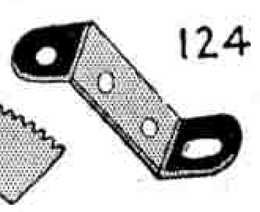


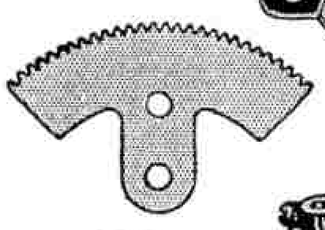


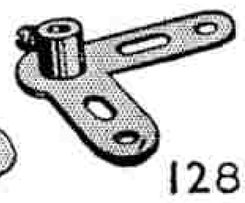


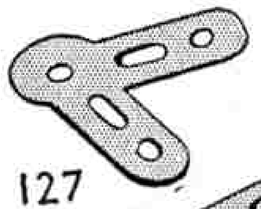


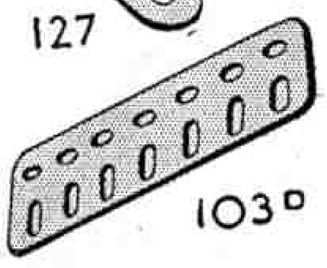


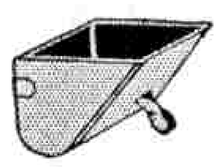


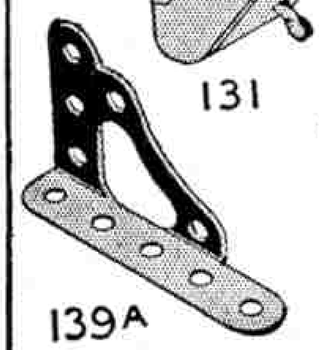












MECCANO

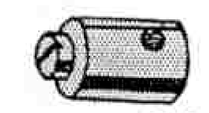
ACCESSORY PARTS

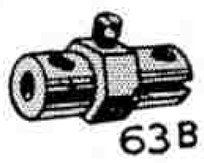
WE illustrate a selection of accessory parts that every Meccano boy will find useful in building the larger and more interesting models. Many of these parts have been only recently introduced, and although we know that they have a universal use (were it otherwise they would not have been added to the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

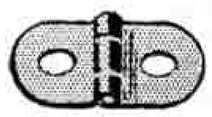
		s.	d.
10.	Flat Brackets ... ...½ doz.	0	2
11.	Double Brackets ... each	0	1
12a.	Angle Brackets, 1″×1″ „	0	1
19A.	Wheels, 3″, with set screw „	0	8
20.	Flanged Wheels ... „	0	6
	Pulley Wheels:		
19B.	3″ dia., with set screw each	0	8
22.	1″ „ „ „ „	0	4
22A.	1″ „ without set screw „	0	2
24.	Bush Wheels ...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

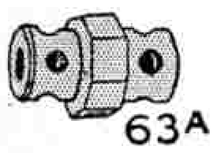
		s.	d.
94.	Sprocket Chain per length	0	6
96.	Sprocket Wheels, 1″ each	0	3
101.	Healds, for Looms ... doz.	0	9
108.	Architraves ... ... each	0	2
109.	Face Plates, 2½″ diam. „	0	4
113.	Girder Frames ... ... „	0	2
114.	Hinges ... ... per pair	0	4
115.	Threaded Pins ... ... each	0	2
116.	Fork Pieces ... ...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

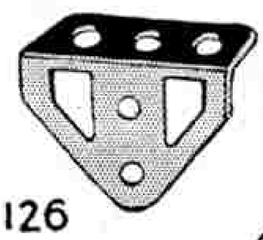
You may obtain Meccano Parts from your Dealer

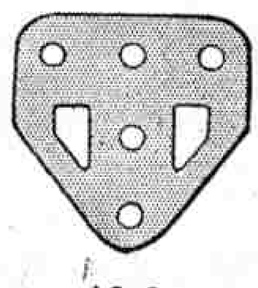


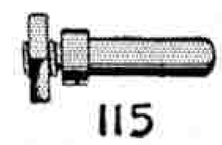


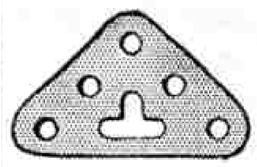


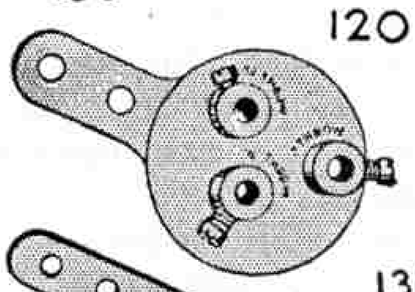


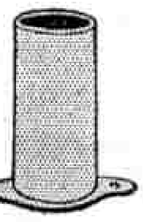


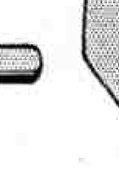


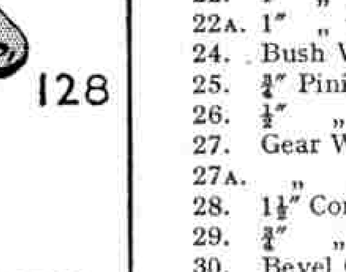


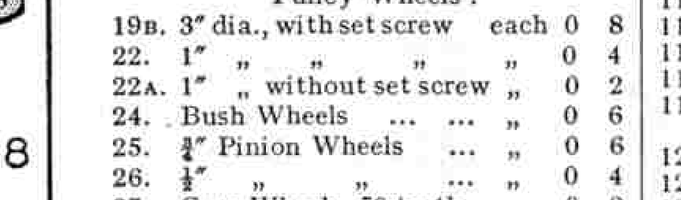


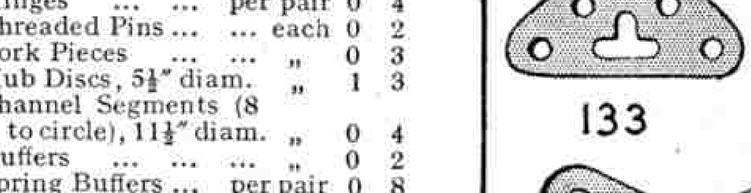


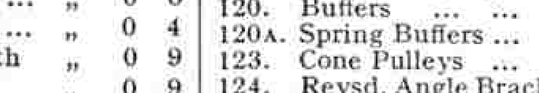


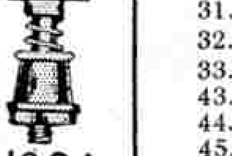


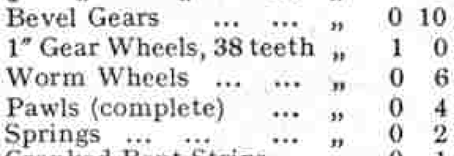


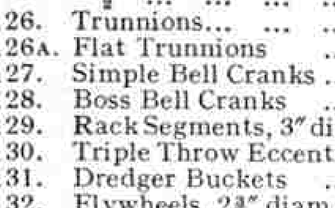


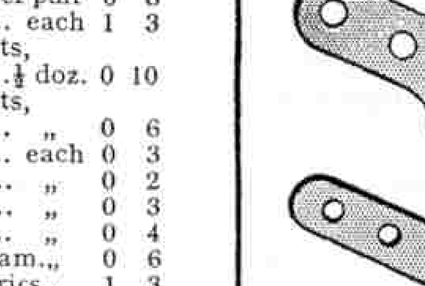












are slightly bent, as shown, and meeting together form a bearing for the bolt (6A), about which the upright member (4) pivots. The latter consists of 18½" Angle Girders, bolted together at each extremity by 1½" Girders (5), while a third 1½" Girder is bolted in the fifth holes from their lower ends (Fig. B). The lowest of these 1½" Girders is secured to a 3" Sprocket Wheel (7), which forms the swivelling base of the jib. The pivot is a 1½" Rod passed through the centre hole of the 1½" Girder and through the boss of the Sprocket Wheel and carried in a bearing (8) built up from two 2½" Strips bolted across the base Girders (1). Two Collars should be placed on this Rod, one above the Sprocket (7) and one below the Strips (8).

Two Flanged Wheels butted together forming guide pulleys (9) are carried on 2½" Rods (10), the upper ends of which are journalled in a Corner Bracket (11), secured to the 1½" Girder (5), while their lower ends engage holes in the Sprocket (7).

The jib is built up from two 24½" Angle Girders (28) bolted together in the form of a T and strengthened by pairs of 12½" and 7½" Angle Girders (29) similarly bolted together and secured along the upper sides of the Girders (28). A 2½" Rod, about which the jib pivots, is journalled through Trunnions (12, Fig. B) and through the end holes of 2" Girders bolted in the first and third holes from the end of the 24½" Girders (28). The head of the jib (Fig. D) is formed by two 5½" Flat Girders (13) secured to 2½" Angle Girders, bolted in the first and fourth holes of the Girders (28).

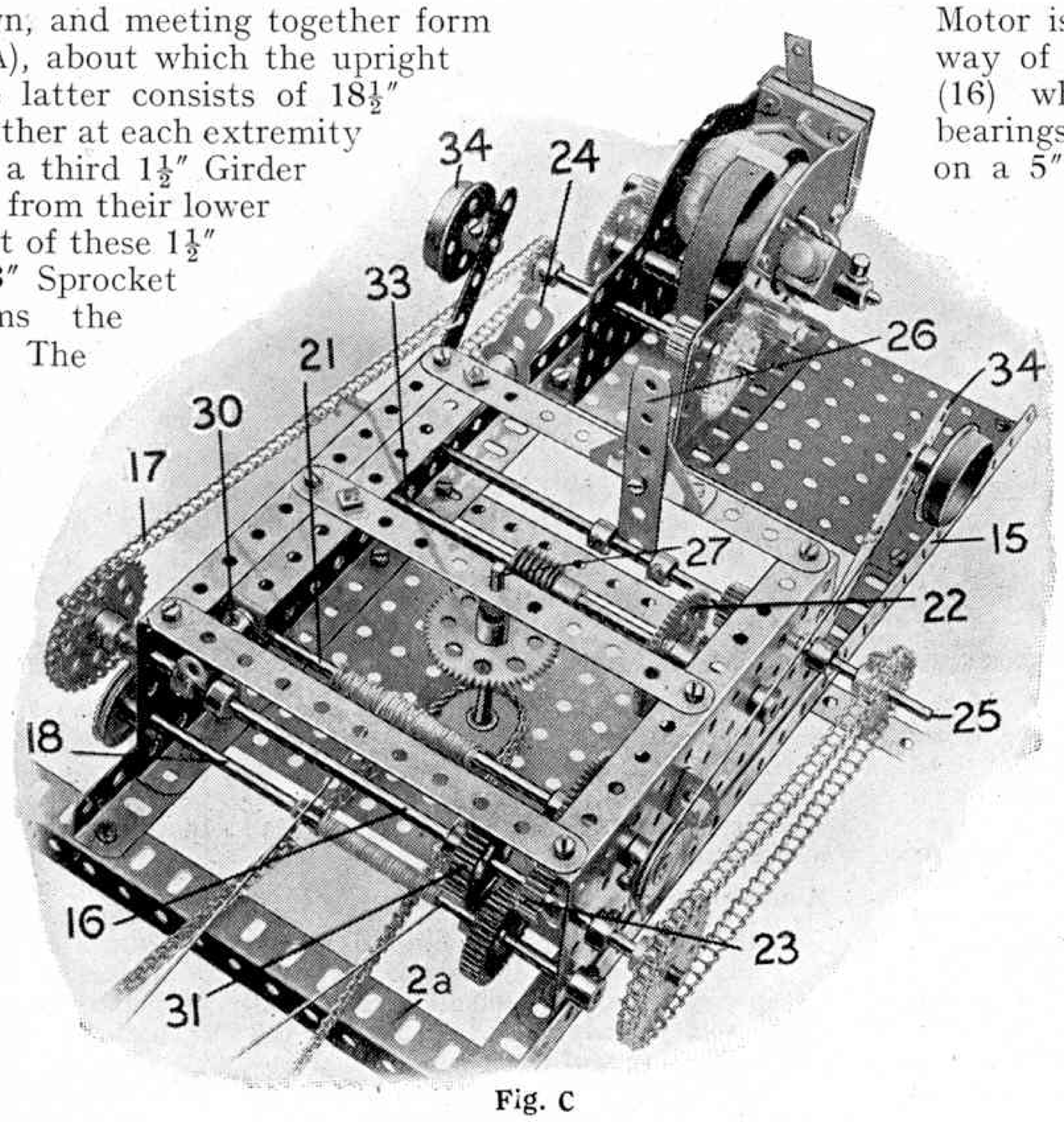


Fig. C

The Three Motions

The construction of the various pulley-blocks (Figs. A & D) may be followed from the illustrations, but care should be taken in spacing the strips with Washers in order to allow for free-running of the pulleys, or "sheaves."

The Motor and Gear-box are carried on 12½" Angle Girders (15, Fig. C) secured to the base Girder (2) and the cross stay Girder (2A); a 5½" × 3½" Flat Plate forms a base for the Motor and large Flanged Plates form the sides of the Gear-box.

There are three motions in the Crane, namely, swinging and luffing the jib, and hoisting—all of which are driven from the motor and controlled by suitable levers.

The jib is raised or lowered by means of the cord (19) winding on the Rod (18, Fig. C). The drive from the Motor is led to this Rod (18) by way of chain gear (17) and Rod (16) which is slideable in its bearings. A Crank (24) is mounted on a 5" Rod journalled in a 4½" Double Angle Strip and carrying a Coupling (30); a 1" Rod secured to the latter engages between two Collars on the Rod (16). On pulling the Crank (24) over to the right, the Rod (16) slides in its bearings, so bringing the 1" Gear Wheel (31) into engagement with a similar Gear secured to the shaft (18). This operates the cord (19), which, after passing round 1" guide pulleys (32) in the vertical member (4), is led round one of the sheaves of the pulley block pivoted at the rear of the jib-head, thence back again round one of the three pulleys situated at the head of the upright (4, Fig. A), and so on round all the six pulleys; finally its end is secured to the "tail" of the pulley block at the jib-head.

Rotating and Hoisting

The hoisting-block is operated by the cord (20) winding on a rod (21, Fig. C) which also carries a 57-toothed Gear Wheel. On moving the lever (24) over to the right, a ½" Pinion (23) is brought into mesh with this Gear Wheel, so connecting the hoisting mechanism with the drive from the Motor. The cord (20) is led over the pulleys in the vertical member in a similar manner to the cord (19) before passing over a 1½" Pulley in the jib-head; it next engages alternately the sheaves of the hoisting-block and of the second fixed block in the jib-head, being finally secured to the latter.

When the lever (24) is in a central position both the gears (31 and 23) are out of engagement; the Motor therefore is allowed to run freely.

The rotation of the jib is effected as follows: a Rod (25) driven by Sprocket Chain from the Rod (16) may be moved to and fro in its bearings on operation of a lever (26), and this movement is employed to engage or disengage a ½" Pinion with a 57-toothed Gear Wheel (22) on a secondary shaft (33). The latter carries a Worm Wheel gearing with another 57-toothed Gear Wheel on a vertical Rod (27) and a 1" Sprocket Wheel on this Rod rotates by means of a Sprocket Chain the 3" Sprocket

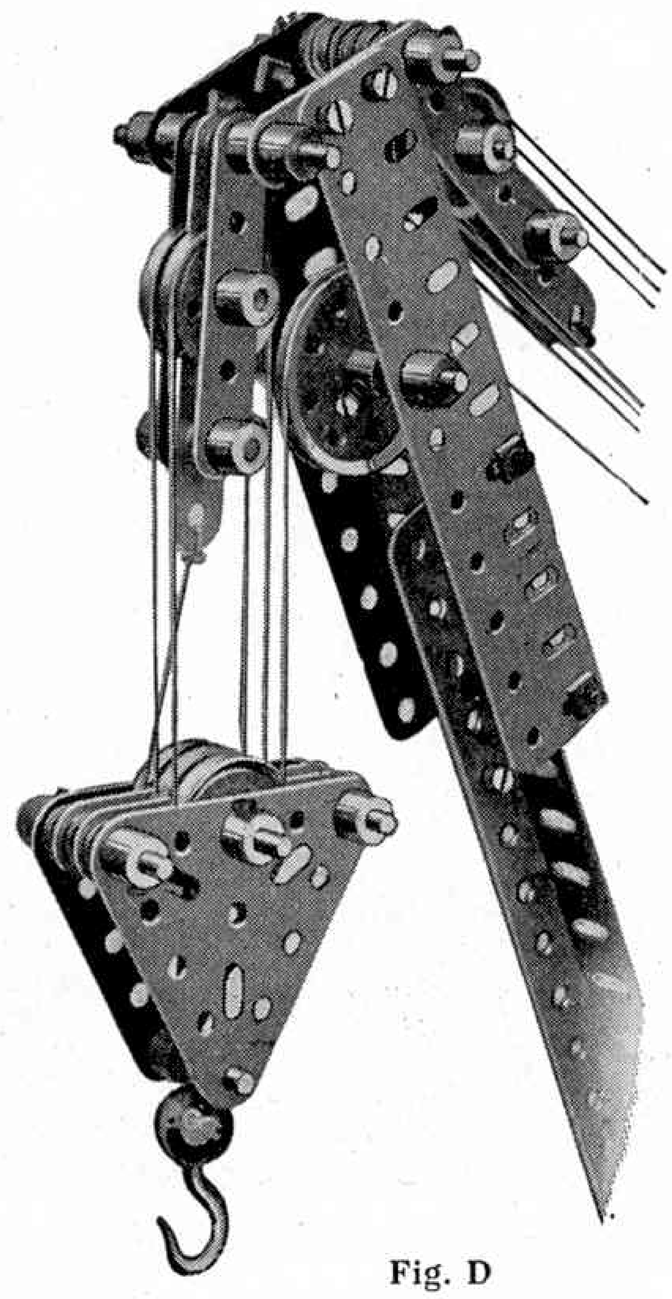


Fig. D

(Continued on page 320)

The Story of Metals

1. LEAD.

AS in the case of most of the other metals, the early history of lead is wrapped in mystery. The metal has certainly been in use from a very remote period, but it is probable that its discovery occurred some time after that of copper. There is evidence that the Assyrians, Egyptians, and other ancient peoples used the metal, and it is referred to in the Bible by Moses :—" Only the gold and the silver, the brass, the iron, the tin and the lead—everything that may abide the fire ye shall make it go through the fire and it shall be clean."

Lead was mined in large quantities by the Greeks and Romans. The mines of Laurium in Attica, which were reopened by a French company in 1863, were flourishing in the fifth century B.C. Large amounts of ore were taken by the Romans from mines in the south-east of Spain which were opened in the third century B.C. by Hannibal. We know also that the Romans carried on extensive mining operations along the Rhine and in various parts of England.

The old alchemists were keenly interested in lead. They regarded it as the oldest of all metals and named it after Saturn, the father of the Gods. They used lead very largely as the basis of their efforts to bring about the transmutation of metals, hoping to discover the " Philosopher's Stone " which, by a touch, should transform the base metal into gold. Unfortunately for their hopes the " Philosopher's Stone " was never discovered, although modern chemical investigations show that these ancient experimenters were nearer success than they realised.

Lead Ores

Lead is found in various parts of the world. The United States produce about a third of the total output, and next in importance come Spain, Germany, Mexico, and Australia. A considerable amount of the metal is produced also in Burmah.

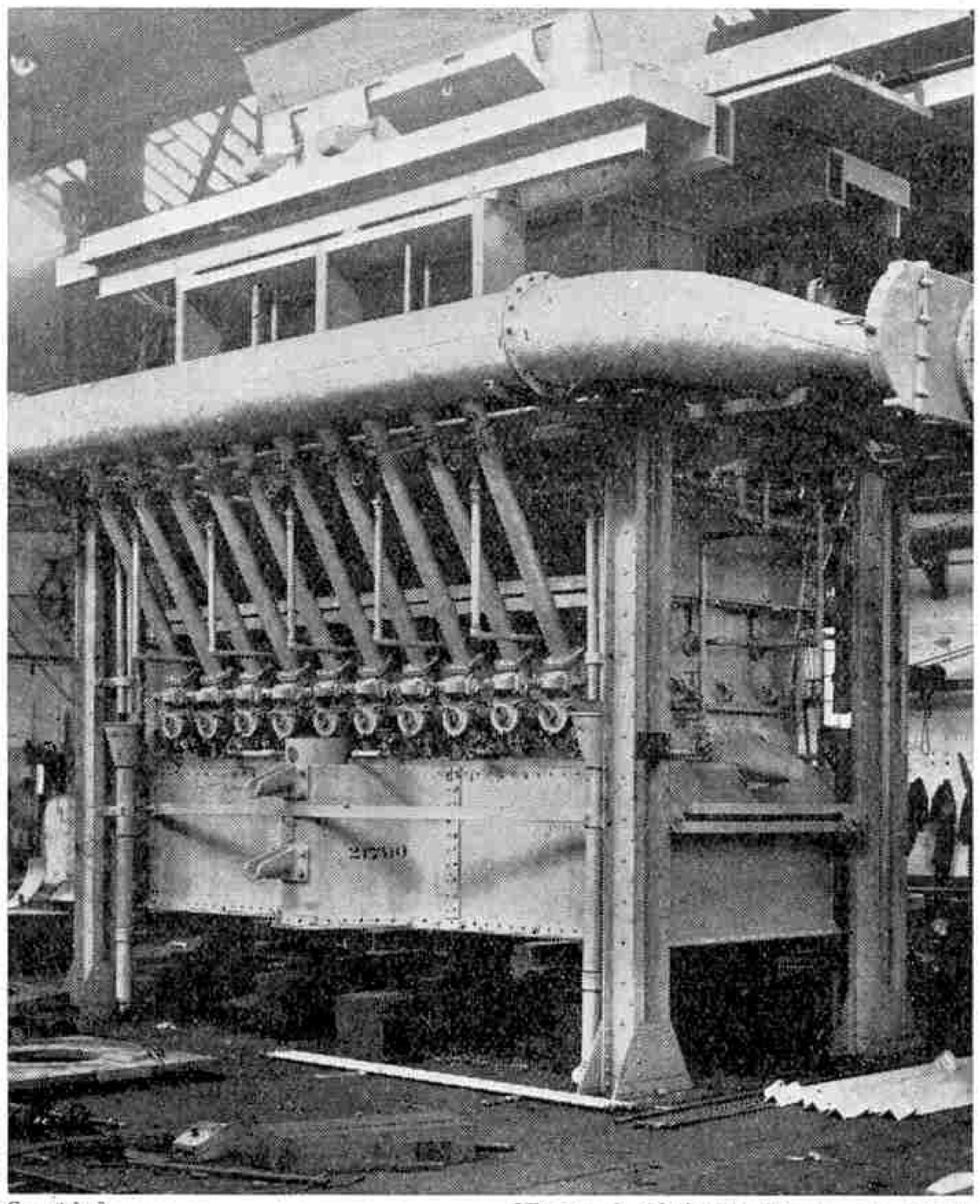
The most important lead ore is " Galena," crystals of which are very familiar to-day as used in detectors for wireless sets. Galena is a combination of lead and sulphur. The only other ore of real commercial importance is " Cerussite " or natural lead carbonate.

Mining, Crushing and Concentrating

In the United States the largest amount of lead is mined in Missouri. The ore was discovered about 1700 and first worked some twenty years later. In present-day operations a vein of the metal is sought for by boring into the earth and bringing up samples of the rock. When the vein is struck, shafts are sunk from which tunnels are driven in various directions, following the course of the vein.

The ore-bearing rock is brought to the surface in big lumps, which are passed through a series of revolving crushers, emerging as fine as sand.

The crushed material is then spread out on a sort of table that moves backward and forward with a quick jerking motion, causing the material to be impelled forward. The table has a slight tilt downward and is fitted lengthways with a series of low ledges or " riffles." The material is fed along the table with water, and on reaching the riffles the lighter particles, which contain practically no lead, are pushed over and so pass off the table at the side. The heavier lead-bearing particles are not able to surmount the riffles and so they work gradually down the table to the end. This process, which is called " concentrating," removes the greater part of the worthless material, and the material that remains contains a very high percentage of metal.



Courtesy] [*Fraser & Chalmers' Engineering Works*

Lead Smelting Furnace

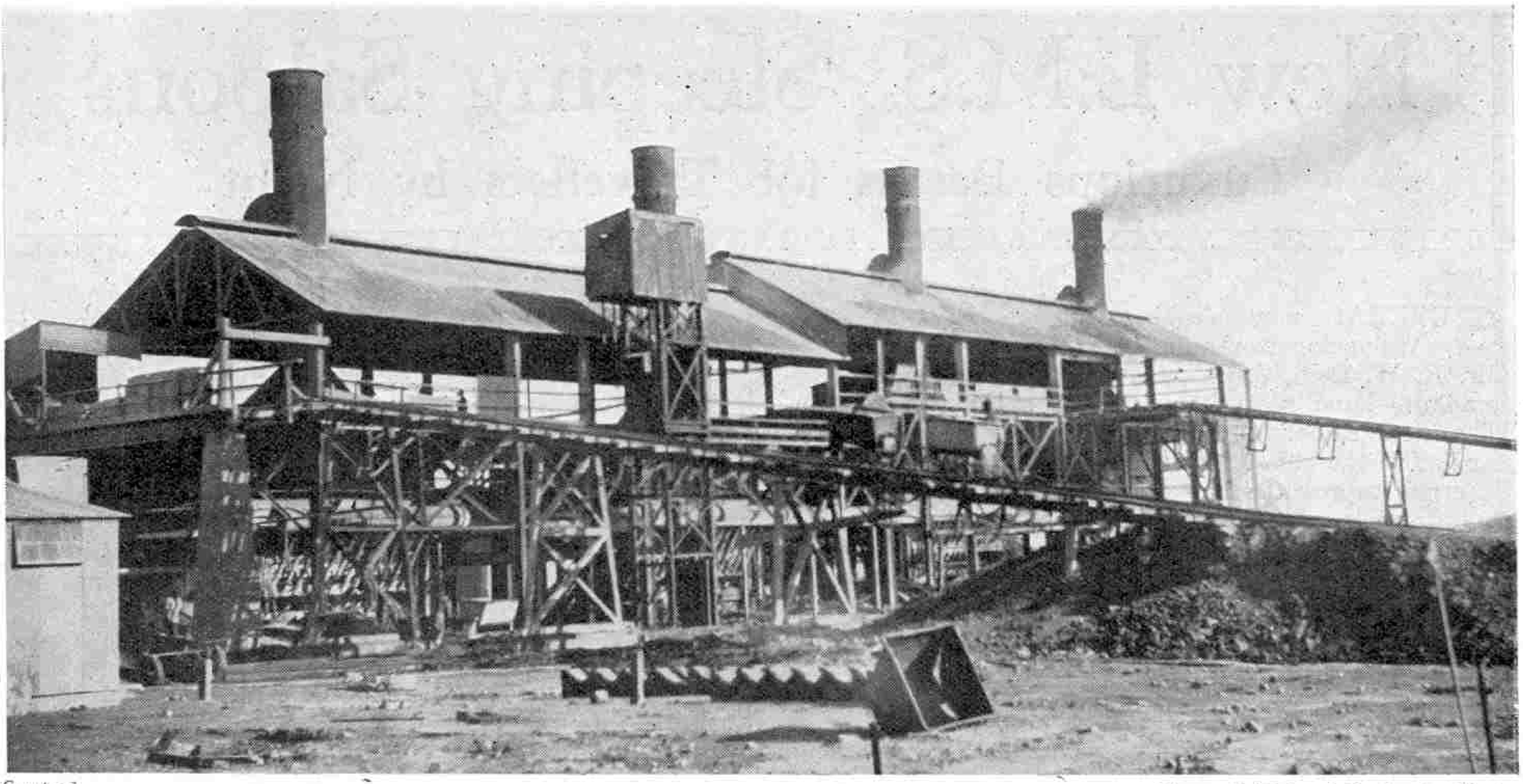
Smelting in the Blast Furnace

The concentrated ore is now ready for the smelter. In some cases the sulphur in galena can be separated from the lead by causing it to combine with oxygen. This is effected by treating the ore in an ore-hearth, which consists essentially of a small low fire-place surrounded by three walls, and having a tuyere at the back.

Frequently, however, the ore contains other impurities that cannot be eliminated in this manner, and smelting in a blast furnace is necessary. The ore is first roasted to remove the greater part of the sulphur and is then fed in at the top of the blast furnace along with the fuel, generally coke, and the " fluxing " materials, which are usually sand, iron ore and limestone. An intense heat is obtained by an air blast in exactly the same manner as in the smelting of iron. When the proper moment arrives the lead is drawn off at the bottom of the furnace.

Refining

The lead produced in the blast furnace contains small quantities of silver, copper, antimony and other metals,



Courtesy [*Fraser & Chalmers' Engineering Works*

South African Smelting Plant

and these must be removed by some process of refining.

The most important impurity in lead is silver, and most lead ores contain sufficient silver to make its recovery profitable. The removal of the silver is known as "desilverization," and it is most often effected by what is known as the "Parkes" process.

The first step is to remove the copper by a process called "liquation." This process depends upon the fact that copper solidifies at a higher temperature than lead. The molten lead is gradually reduced in temperature until the point is reached at which the copper compounds solidify, and these are then skimmed out. The lead, still molten, is now drawn off into a reverberatory furnace to undergo the process known as "softening." It still contains a certain amount of copper, but what is more important it contains also arsenic and antimony, which are very harmful even in small quantities. In the reverberatory furnace the lead is raised to a very high temperature and is thoroughly stirred. The arsenic and antimony present thus come in contact with the current of air in the furnace and are oxidised and skimmed off as dross.

Recovery of Silver and Gold

At this stage the lead still contains its silver and also certain quantities of gold and copper, and in order to separate the metal from these impurities it is run off into cast iron vessels known as "kettles." Small quantities of zinc are now thoroughly stirred into the molten lead, the exact amount of zinc added being determined by the amount of silver and gold in the lead. The zinc unites with the silver and gold to form an alloy which, being lighter than the lead, comes to the surface. The temperature of the molten mass is then lowered and as the alloy solidifies before the lead it is easily removed. This alloy contains practically all the silver, gold and copper and some of the zinc, and the lead is now pure except for a small quantity of zinc which is removed by further treatment in a reverberatory furnace. The refined lead is then cast into "pigs" weighing from 70 lb. to 100 lb. each.

Another method of desilverization, formerly in extensive use, is the "Pattinson" process. This process is based upon the fact that if lead is melted and then slowly cooled, the crystals that separate out are much poorer in silver than the original lead, while the liquid remainder is correspondingly richer in silver.

An Interesting Process

In its original form the Pattinson process is carried out in a set of from eight to fifteen cast iron spherical "kettles," each holding from six to fifteen tons of lead. The kettles are built close together in a row and each has a separate fire-place. The lead to be treated is placed in the central kettle and melted down, and then the fire below is withdrawn and transferred to a neighbouring kettle, the molten mass being continuously stirred while it slowly cools. Crystals separate out and are removed by means of a long-handled skimmer and transferred to the next kettle on the *right*. This process is continued until two-thirds of the whole contents of the central kettle have been removed in the form of crystals. The liquid remainder is then ladled into the next kettle on the *left*.

The kettle on the right is now two-thirds full of crystals, and to it is added one-third of lead containing the same proportion of silver. The kettle on the left is one-third full of molten lead, and to it is added two-thirds of lead containing a corresponding amount of silver. These two kettles are now heated, and then cooling, crystallizing and ladling out are carried on just as in the case of the original kettle. The latter thus receives crystals from the kettle on the left and liquid lead from the kettle on the right. The process is continued, with the final result that the amount of silver decreases in the kettles to the right up to the last one, while it increases correspondingly in the kettles to the left. In this manner a large amount of lead low in silver is produced, together with a small amount of lead very rich in silver.

There is also a variation of the Pattinson process in which only two melting pots and a crystallizer are used. The stirring is done by means of a jet of steam, and instead of ladling out the crystals the liquid lead is drawn off.

In some cases an electrolytic method of desilverizing is employed. The anodes consist of the lead to be refined, while the cathodes are made of pure lead. A special lead solution is used as the electrolyte, and as the current passes pure lead is taken from the anodes and deposited upon the already pure cathodes.

"Cupellation"

The amount of gold and silver in lead may be determined by an interesting process known as "cupellation." The sample of lead to be tested is placed in a small cup or "cupel" made of bone-ash, which is a very porous substance. The cup is then heated to a very high temperature, which has the effect of oxidizing the lead, but not the silver and gold. The oxidized lead either sinks into the pores of the cup or passes away as fumes, while the silver and gold remain in the form of a tiny button. This button is weighed, and its two metals are then separated by treating it with nitric acid so as to change the metallic silver into silver nitrate. The gold remaining is then weighed, and the difference between its weight and that of the whole button gives the weight of the silver.

Lead Pipes Laid 1,800 Years Ago

Lead is bluish-grey in colour, and a freshly cut surface shows a bright lustre which quickly tarnishes on exposure to air. It is so soft that it can be easily scratched with the finger nail and it readily marks paper with a grey streak.

(*Continued on page* 287)

New L.M.S. Sleeping Saloons

Luxurious Berths for Travellers by Night

SEVERAL new sleeping saloons—built at the Wolverton works of the L.M.S. to the design of Mr. R. W. Reid, C.B.E., Carriage and Wagon Superintendant—have recently been placed in commission. The new saloons are in general arrangement very similar to the old standard L.N.W.R. type, but various internal improvements have been made, adding many luxurious touches, which will, no doubt, be highly appreciated by passengers travelling at night.

The principal dimensions of the saloons are :— Length of Vehicle over Buffers, 71 ft. 8 in. Length of Vehicle over Body, 68 ft. 1 in. Width of Waist, 9 ft. 0 in.

Reducing Vibration

Special attention has been given to the springing, to ensure smooth riding. Each saloon is mounted on two six-wheeled bogies, and is supported on an all-steel underframe with fixed truss.

To reduce vibration and noise to a minimum, india-rubber body blocks are fixed between the body and the underframe, and hair felt is inserted between the double floors.

The coaches are equipped with vacuum brakes, electric lighting and steam heating. There is also electric communication between each berth and the attendant, the control switches for lighting being placed in the latter's compartment.

Each coach contains twelve single berths and an attendant's compartment and lavatory, with a vestibule entrance at each end. Communicating doors are placed between six of the single berths so that, if necessary, two single berths may be converted to a double berth.

Interior Decorations

The structural framing of the saloon bodies is of oak and teak, panelled with canvassed and blocked Honduras mahogany. The interior finishing of the berths and corridor consists of mahogany framing and finely veneered mahogany panelling. The ceilings and all above the cornice moulding throughout the saloon are finished with three-ply birch, painted and enamelled white.

White-corded net racks, supported on brass brackets finished oxidised silver, are fixed above the beds. These racks have been designed to give the maximum storage for light articles.

In each berth a self-contained mahogany lavatory cabinet is arranged, and in the upper part of the cabinet are fixed a folding table and a folding wash basin, with hot and cold water. The whole of the fittings are silver plated.

Above the cabinet a mirror, a brush and comb rack, a water-bottle, a glass holder and an electric lamp are fixed. The metal fittings are neatly designed and finished in oxidised silver

Rolling Shutter Excludes Draughts

A folding mahogany table is fitted on one side of the cabinet in the berths, and accommodates a tea tray.

A drop light, with perforated sheet copper in the top, is arranged on the coach side of the berth. A noteworthy feature is a rolling shutter arranged over these drop lights. In the "up" position this shutter is hidden behind a hood, but when the shutter is down absolute privacy and a general appearance of warmth and cosiness are obtained. This shutter does away with blinds and curtains and excludes all draughts.

Vertical Westinghouse five-column radiators are fixed in front of the side windows, and arranged so that the passenger can control the warmth of the berth either at the radiator or when in bed.

The berths are ventilated with hemispherical vents in the roof, drop light grilles fixed in the corridor partition above the cornice, and by small electrically-driven fans.

Passengers Control Lamps

Each berth is illuminated by a lamp over the mirror and one over the head of the bed. The latter is fitted with a satin-finished globe,

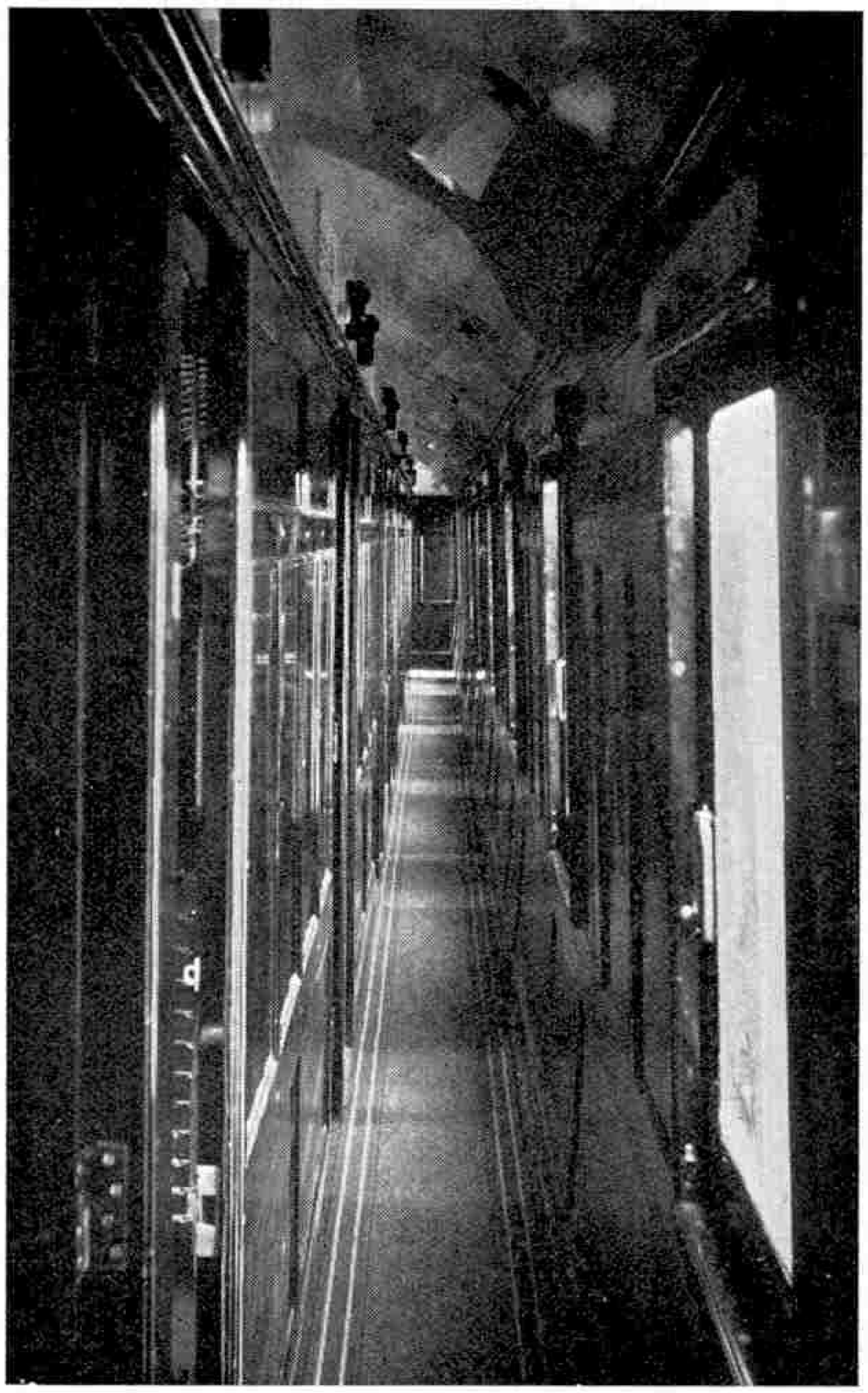


Photo courtesy] [*L.M.S.*

Corridor of New L.M.S. Sleeping Saloon

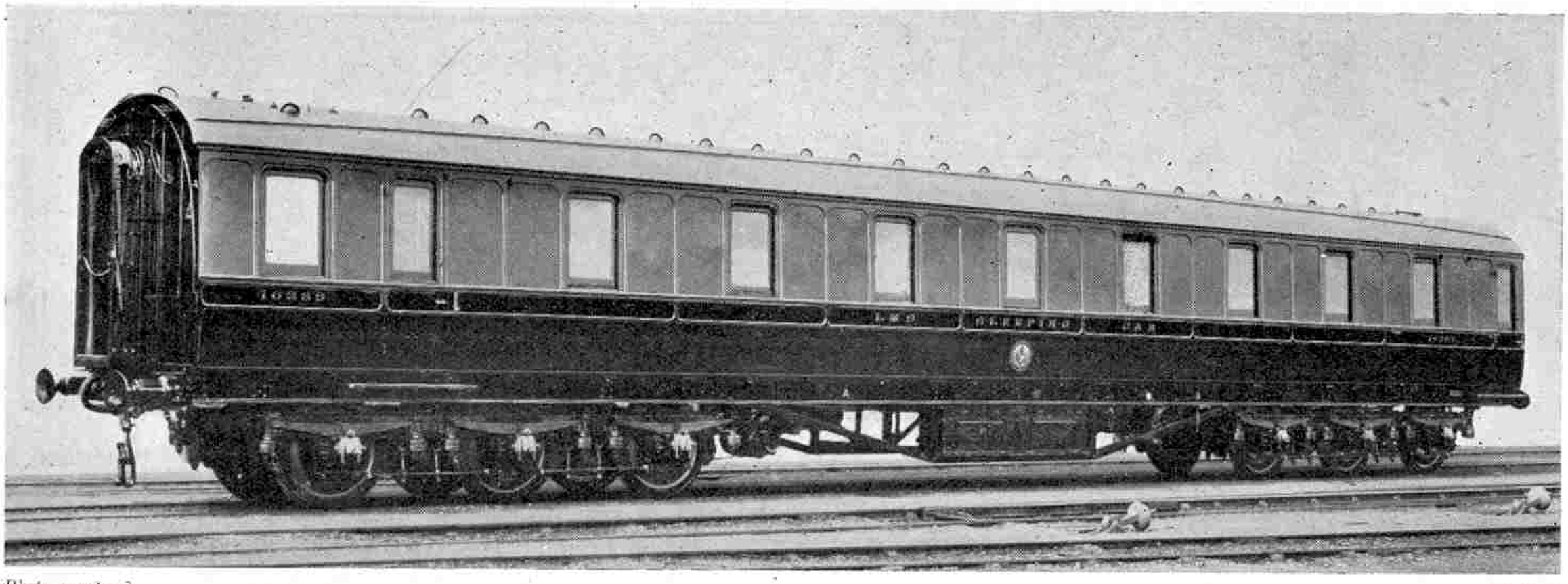


Photo courtesy] [*L.M.S.*

One of the L.M.S. First Class Sleeping Saloons, built for the London-Scotland Service

for use as an ordinary lamp, and a small blue glass globe enclosing a night lamp. The switches controlling the lamps are fixed near the head of the bed so that each passenger may regulate the amount of light to suit his own convenience.

The floors of the berths are covered with inlaid linoleum with loose rugs on the top. The windows in the corridors are all of the drop type and a postal box and a fire extinguisher are placed in convenient positions.

Sleeping saloons are attached to all the night express trains of the London Midland and Scottish Railway working between London and Stranraer, Edinburgh, Glasgow, Perth, Dundee, Aberdeen, Oban and Inverness, and there is little doubt that the new vehicles will be greatly appreciated by passengers making the night journey to Scotland by way of the West Coast and Midland routes. Ten of these luxurious saloons have been put into service and we understand that it is not intended to build any more at present.

Locomotive Exchanges

Some Interesting Results of Railway Grouping

By Gerald W. Spink

ONE of the most interesting sequels to the concentration of British railways in four great groups is the series of locomotive exchanges thereby brought about. Even before the railways were grouped interchange of engines was by no means unknown, but since the grouping the number of exchanges has increased tremendously.

Let us start from the South, working northwards, and consider some of the new developments. The "Harrogate Pullman Express" runs non-stop as far as Leeds, on the metals of the late Great Northern Railway, but the engine used is generally one belonging to the late Great Central Railway, and among such locomotives noted on this train have been "Lloyd George," "Earl Haig," and "Lord Faringdon," all veritable giants. Then the "Sheffield Pullman," which is really a Great Central train, though it starts from King's Cross instead of Marylebone by special arrangement, is frequently hauled by a G.N. "Atlantic" engine. Again, between London and Birmingham, on the late L.N.W.R., Midland engines are working frequently. The appearance of a Midland engine at Euston must have seemed very strange at first!

Further north the L.N.W. engines have been running in competition with Midland locomotives on the difficult section between Leeds and Carlisle, and it is to the credit of both companies that each type of engine showed great merit. Between Crewe and Carlisle, on the L.N.W.R., Lancashire and Yorkshire engines have been working some of the heavy England-Scotland trains with very successful results.

On the East Coast Route, North Eastern engines frequently make their appearance as far south as London itself, and until recently a North Eastern locomotive was responsible for performing a non-stop run of over 100 miles between Grantham (G.N.R.) and Darlington (N.E.R.), two towns which, for the first time in railway history, have received uninterrupted rail communication. Formerly G.N. locomotives were never permitted north of York (with the exception of one which occasionally went as far as Thirsk by special permission), but now fifteen of the new "Pacifics" of G.N. design —like the one exhibited at Wembley—are actually stationed at Newcastle, for hauling heavy trains to and from Edinburgh. Again, North British "Atlantics" have been working as far south as Newcastle on the main line, a thing unknown before 1921.

To balance this, North Eastern engines have taken their turns on the N.B. line between Edinburgh and Glasgow. Some new engines built to the designs of the former Great Central Railway are now doing the bulk of the heavy fast traffic between the two great Scottish towns, and a few of the same class are also running to Perth. It is indeed a far cry from Marylebone to Perth, yet in the year 1925 it is possible to see a G.C. engine at Perth. The very thought of such an occurrence would have been considered ridiculous ten years ago!

(*Continued on page* 281)

Dick's visit to MECCANOLAND

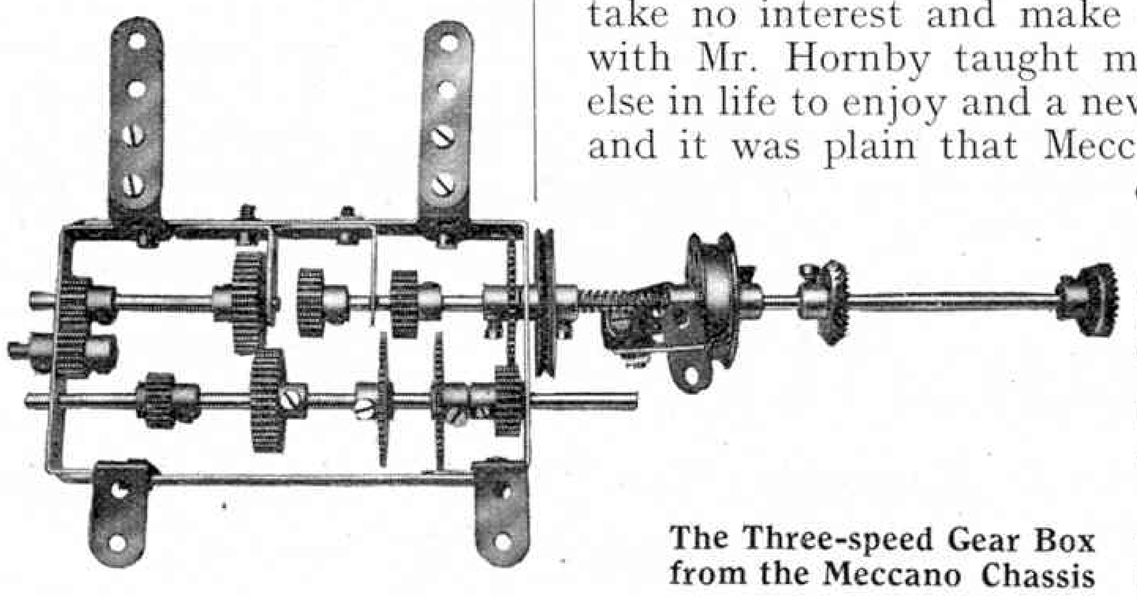
Where dwell the Happy Boys

(Continued)

"NOW," said Mr. Hornby, "you are beginning to see why boys become so enthusiastic over Meccano, and why, after all these years, there is no waning in my own enthusiasm. It is always teaching me something new, educating me and making me a better man and a better citizen.

What Meccano Taught Mr. Hornby

"It has taught me, and is going to teach you, the principles of weaving. Through the Meccanograph it has taught me the fascinations of design-making. It has taught me how a motor car gear box operates and how that intricate piece of mechanism, the differential, plays its important part in every motor car on the road to-day.



The Three-speed Gear Box from the Meccano Chassis

"Through Meccano I have learned the secret of how clocks keep time; how coal and ore are raised from the mines; how rope and twine are manufactured; how a marine engine works, and a host of other things—in fact it teaches me something new every day.

The Worth of a Meccano Boy

"I believe a keen Meccano boy has twice as much useful knowledge as any other boy. He is more likely to get a good job, and is more likely to succeed in any work he undertakes. He is a thinker, accustomed to take the initiative, always trying new schemes and inventions; and because he is nimble and dexterous with his fingers, he will often get through a job before another boy has started to think about it.

"A Meccano boy knows what accuracy and thoroughness mean, through handling accurate parts that have to be put together accurately. He learns to take great care of all the parts, and to keep them in an orderly manner; and, mind you, all these habits of orderliness, accuracy, and thoroughness that he acquires in his play-hours become fixed habits with him all through his life, and vitally affect his career.

"One of the best-known men in this country once told me that he bought Meccano Outfits for his boys because he believed Meccano would be worth £10,000 to them when they became men."

While Mr. Hornby was talking, my thoughts turned to Dick's future. I could see many years of Meccano happiness and fun before him, and I could clearly see something even better than that. I could see him growing up into an alert, thinking man, not afraid to experiment and break new ground; with thoughts and ideas well ordered, skilled with his hands, and with a knowledge of machines and mechanical movements such as few but Meccano boys acquire.

Dick had worried me for some time past to get him a Meccano Outfit, but I had been foolish enough to take no interest and make no investigation. My talk with Mr. Hornby taught me that here was something else in life to enjoy and a new duty to perform, however, and it was plain that Meccano was going to be "one of the family" in future.

"If you can wrench Dick away from the Loom," said Mr. Hornby, laughingly, "I'll tell you one or two things about the business side of Meccano."

Dick, however, was unwrenchable! He seemed to have forgotten that Meccano made other models as well as Looms, or that there was anything else in life except weaving fancy-coloured materials; so we had to leave him to it.

Running a World-Wide Business

"Running a world-wide business is not easy," said Mr. Hornby, "but it is extremely interesting! Every month I receive letters from boys in nearly every town in every civilised country in the world, and if I myself could reply to each one in his own language I should be a linguistic wonder. But we do reply to them in their own language—our foreign correspondents take charge of that. We see that every letter is replied to and that all the little difficulties are straightened out.

"You might say that Meccano is an international toy. It talks boy-language in any country, and is at home anywhere. All our instruction books, catalogues and leaflets describing Meccano are printed in 16 different languages, even including Chinese! The translation of this Manual into Chinese was about the most difficult linguistic problem we have had to tackle, but we were fortunate enough to secure the services of an educated Chinese who is not only a perfect Chinese and English scholar but also a skilled engineer.

The Meccano Manual in Chinese

"Here is a copy of the Chinese Manual," continued Mr. Hornby, handing one over to me. "I don't think you will find any mistakes in it," he said, with a twinkle in his eye, "but if you do I hope you will point them out." I gave him my word of honour that I would!

"Some day I should like to take you and Dick over our factory and show you all the various Meccano parts being made."

At this Dick was all ears, and left the Loom immediately to join in the conversation.

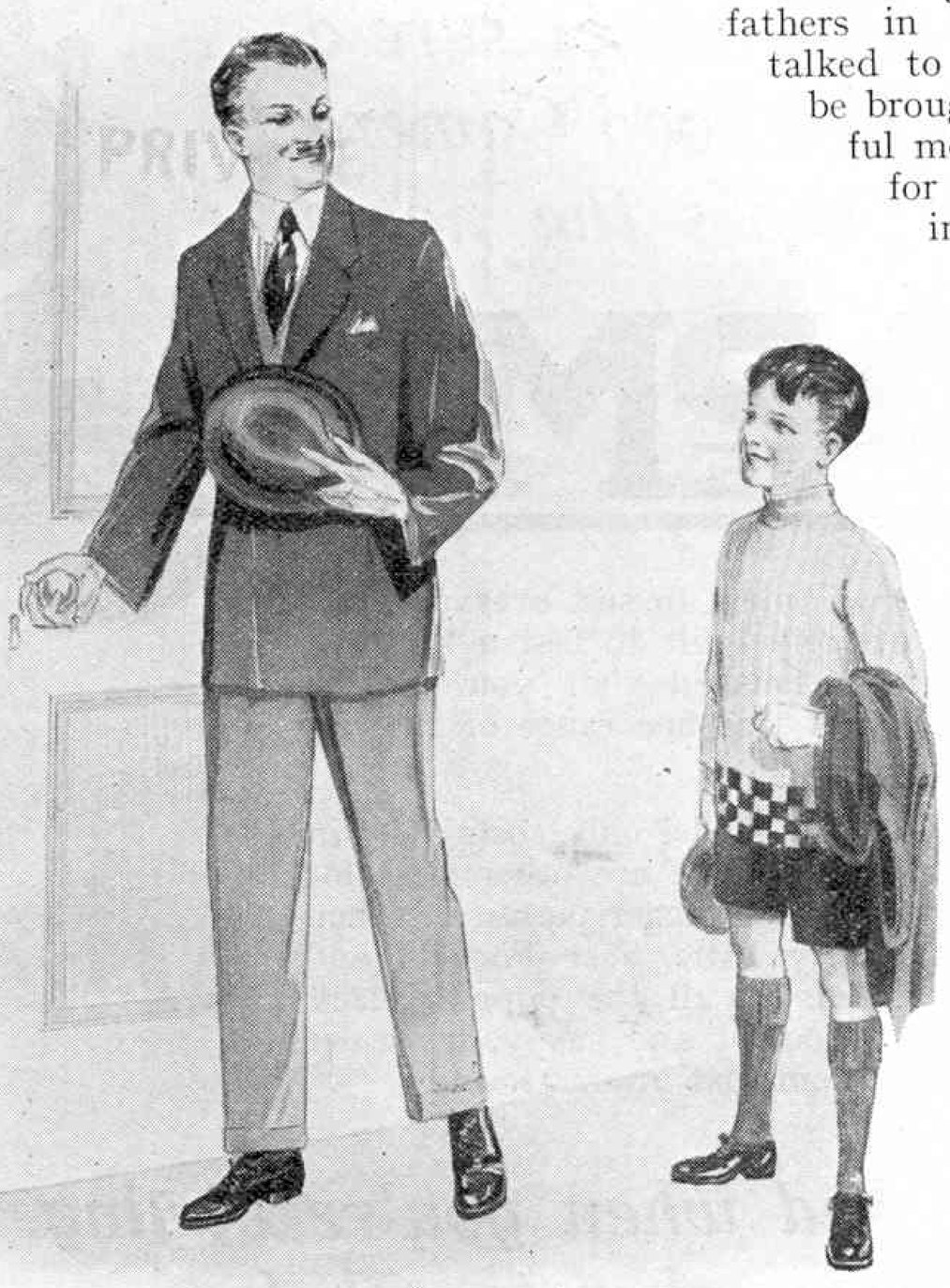
"How about going over now; couldn't we start at once?"

Mr. Hornby laughed at the boy's eagerness. "No, Dick," he said, "I don't think we could fix it up on such short notice. You will require to spend at least a whole day if you are to see all the different processes. Better leave it for your father and me to arrange.

"We take as great an interest in our employees as we do in Meccano boys, and we see that they work under first-rate conditions. Take, for instance, the Packing Department, where all the Meccano parts are packed into the Outfits. This room covers an area of over 26,350 square feet. There is not a finer or healthier workroom anywhere, and all the other departments are just as good.

"Our people appreciate the thought and care we devote to their welfare, and there is no more skilful or more efficient staff of men and girls in any factory in the world. We use high-grade machines only—the best the world produces. They are all operated at high speed and afford us the utmost limit of rapid production.

"When I tell you that in a year we manufacture over 40 millions each of the little nuts and bolts that every Meccano boy uses and knows so well, and that every nut and bolt must be separately tested and put together by hand in order to ensure accuracy in accordance with our general guarantee, you will realise that there is no time to be lost if Meccano boys are not to be kept waiting!"



Dick and I left Mr. Hornby's Office reluctantly . . . .

The Big Meccano Factory

"The Meccano factory is the biggest factory in the world for the production of a single toy, and we are extending our business so rapidly that in a very short time it will be double its present size. We make also the Hornby Clockwork Trains, and this side of the business, which is growing very rapidly, has a story of its own that some day I may tell you."

Dick and I left Mr. Hornby's office reluctantly. We lingered again in the model-room as we passed through it, and said to each other what a delight it would be if we could take home an armful of the models that gleamed like silver in the sunshine that flooded the room. As we walked along the street we talked of Meccano reverently, as of a new and wonderful friend who had come into our lives, never to leave us, to be our companion and source of joy for many a long evening to come.

Friend Hornby! If you could talk to all fathers in this great country as you talked to me; if only parents could be brought to realise what a wonderful medium they have in your toy for developing and strengthening the minds of their children—for bringing out initiative and inventiveness; for filling their brains with keen, ambitious and wholesome thoughts—what a nation of supermen our future rulers and workers would be.

THE END.

Exchange of Locos—

(*Continued from page 279*)

Caledonian Locos come South

Caledonian engines are now often to be seen on the metals of the G. & S.W.R., all the more so because certain Euston–Scotland trains are diverted from the Caledonian route between Carlisle and the north, and run into Glasgow via Dumfries and Kilmarnock, quite an interesting innovation! This may have happened very occasionally in pre-group days when some accident on the one line made diversion of traffic necessary if delay to passengers was to be avoided. Some Midland engines are to be sent for work in Scotland, and during the competition between L.N.W. & Midland locomotives (between Leeds and Carlisle) to which reference has been made, a Caledonian engine also took part. Leeds people must have been surprised to see a blue Caledonian engine so far south, though it is quite possible that the engine used had been repainted in the new L.M.S. colour—chocolate red as in the old Midland line.

Exchange of Coaches

Railway coaches have also been exchanged. Passengers from Edinburgh to the South (via Newcastle) may find themselves in Great Eastern Coaches, while in the London district of the late Great Central Railway carriages from the North British line have been seen. Several coaches from the Caledonian Company are being used in England, and these have been marked with a cross to prevent their use on certain sections where their dimensions would render them unsafe. Many similar interchanges of loco and carriage stock might be mentioned, but the above are perhaps the most important.

Boys!—You can be sure a Camera is a good Camera when it bears the name

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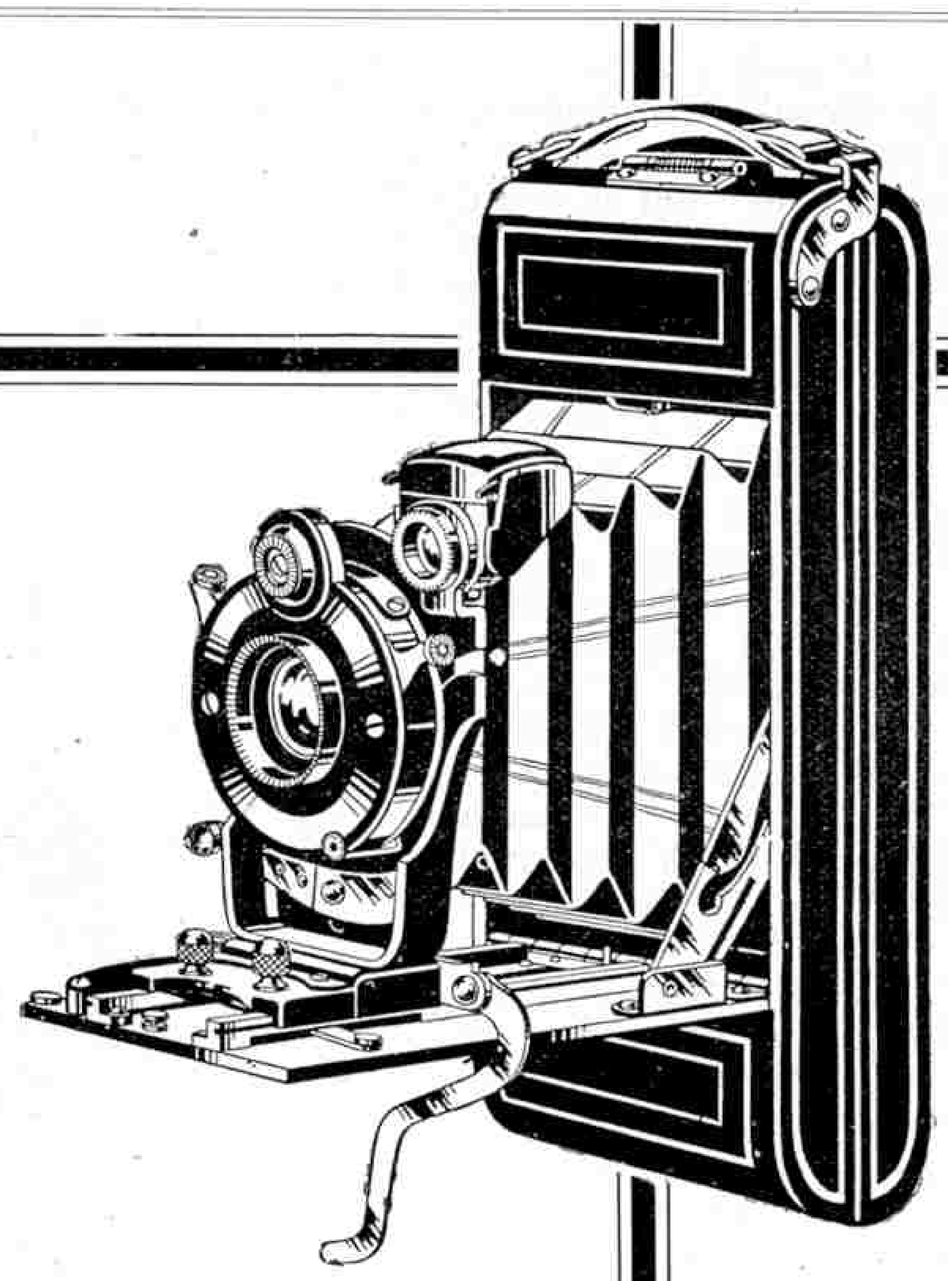

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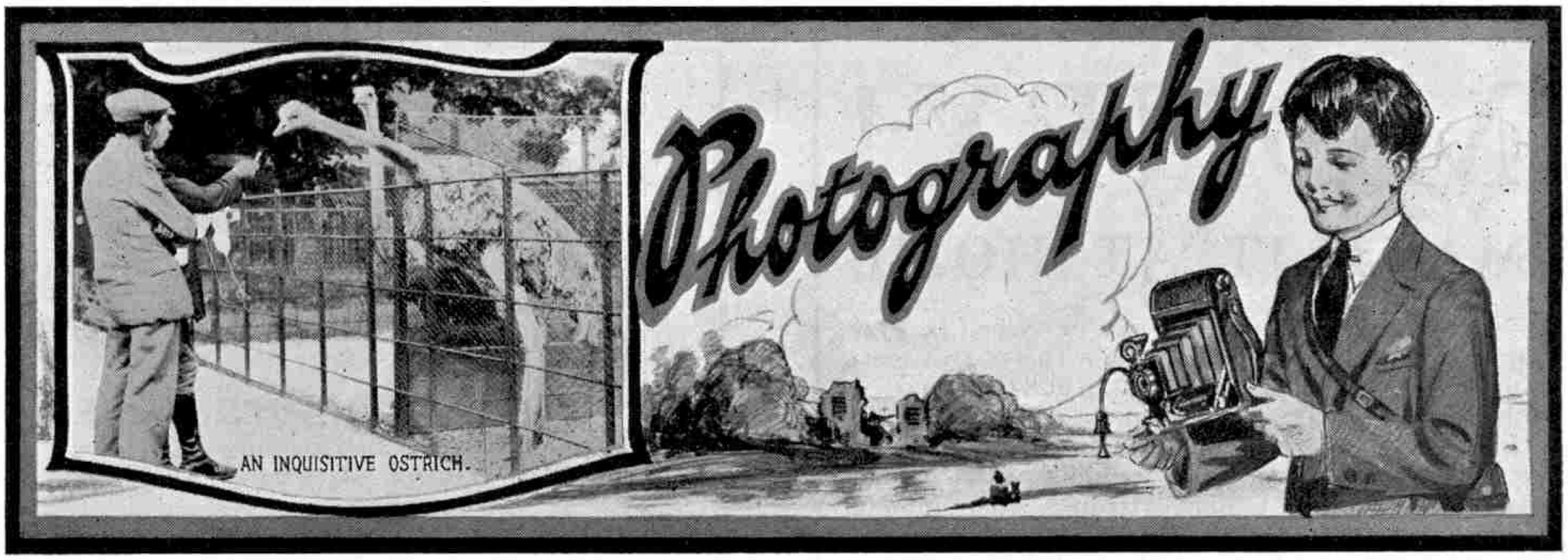

III. SHUTTERS AND THE EXPOSURE PROBLEM

LAST month we described the various types of photographic lenses, and we come now to a closely allied question, that of the shutter by means of which the lens is opened or closed as required in order to make the exposure. Exposures may be made by means of a cap fitting on the hood of the lens, and this method works quite well for fairly long exposures with a camera used on a stand. For use with a hand camera some kind of mechanical shutter is essential.

The simplest form of shutter works at one fixed speed and consists of a metal plate revolved on a pivot by a spring, and containing an aperture which passes in front of the lens, so making the exposure. Before and after the exposure the lens is covered by the metal plate. The speed of a shutter of this type may be anything up to 1/25 of a second. Sometimes an arrangement is fitted by means of which the aperture may be made to stop in front of the lens as long as required in order to give "time" exposures.

Bulb, Time and Instantaneous

This type of shutter is not only comparatively slow in working, but it has also many other disadvantages, and it is replaced on good class cameras by a shutter having two metal or vulcanite plates which open and close to make the exposure. The speed of these shutters is controlled by a pneumatic valve operated by turning a dial.

Most shutters of this type are marked with the letters "B," "T," and "I," which represent respectively "Bulb," "Time" and "Instantaneous."

If the shutter is set for "Bulb," the small trigger operating the shutter is pressed down and the shutter remains open until the trigger is released.

The term "Bulb" is derived from an earlier form of shutter which was operated by a ball and tube, such an exposure as we have just described being given by squeezing the ball and not releasing it until it was desired that the shutter should close.

When the shutter is set at "T," it opens when the trigger is pressed. The trigger is then released and the shutter remains open until a second pressure is made, when the shutter instantly closes. "Instantaneous" exposures are made by one pressure of the trigger, and the varying speeds at which the shutter will work are usually indicated on a dial which is revolved to set the required speed.

The roller-blind shutter, which works on a similar principle to the familiar domestic spring blind, has an opening that makes the exposure by passing in front of the lens. The blind is wound by pulling a cord, and released by pressure on a small trigger. This form of shutter is excellent for stand camera work, but is not at all satisfactory for small hand cameras.

In Shakespeare's Country

Photo by [*B. Bentley*

A corner of Warwick Castle

A reader's snap in a delightful district for photographers

All the foregoing types of shutter are always fixed close to the lens.

The Focal Plane Shutter

We now come to a shutter fitted at the back of the camera, so that it works immediately in front of the plate. This is the "Focal Plane" shutter, which is in many ways the most valuable and the most interesting of all shutters.

In many respects the focal plane shutter is similar to the roller-blind type, and as in the case of the latter its blind has to be wound up and released. It has two outstanding advantages—first, an exceedingly high speed, and second, great light efficiency—that is to say it allows more light to reach the plate during a given exposure than almost any other type of shutter.

A focal plane shutter is capable of giving exposures of one-thousandth of a second or even less, and for this reason it is used for the photography of rapidly-moving objects such as trains or motor cars, or for obtaining snapshots of cricket, football and other games.

Having now dealt briefly with the various types of cameras, lenses and shutters, we must now pass on to the first steps in taking an actual photograph.

The Perfect Negative

In taking a photograph, the aim of every photographer is, or should be, to produce a "perfect negative"—that is one that reproduces faithfully all the varying gradations of tone in the subject. Such a negative can only be obtained by allowing the light reflected from the subject to affect the sensitive emulsion on the plate or film for exactly the correct length of time. In other words, the plate or film must be given the correct exposure.

At one time it was generally believed that, although correct exposure was highly desirable, yet if by any chance the exposure was wrong it could be compensated for in the subsequent process of development. This idea is now known to be erroneous. It is quite true that incorrect exposure may be remedied very slightly during development, but the improvement thus effected is barely noticeable and is very difficult to obtain.

Factors Governing Exposure

We have said that a perfect negative demands correct exposure, and this brings us to the question of how to decide what is the correct exposure for a particular subject.

There are five factors governing exposure (1) The strength of the light; (2) The aperture of the lens. (3) The speed of the plate or film. (4) The nature of the subject to be photographed and (5) the movement (if any) of the subject.

The strength of the light depends mainly upon the height of the sun above the horizon and the clearness or otherwise of the atmosphere. For many years photographers used to guess the strength of the light, the success of such guesses, of course, depending largely upon the length of the

(*Continued on page* 285)

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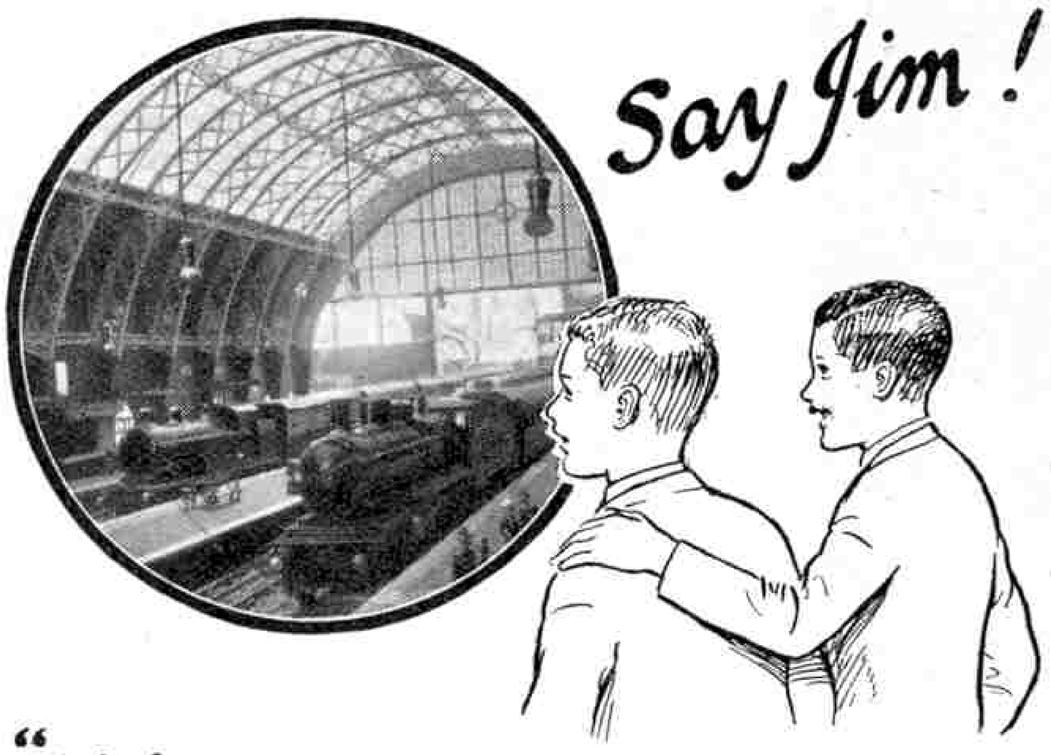

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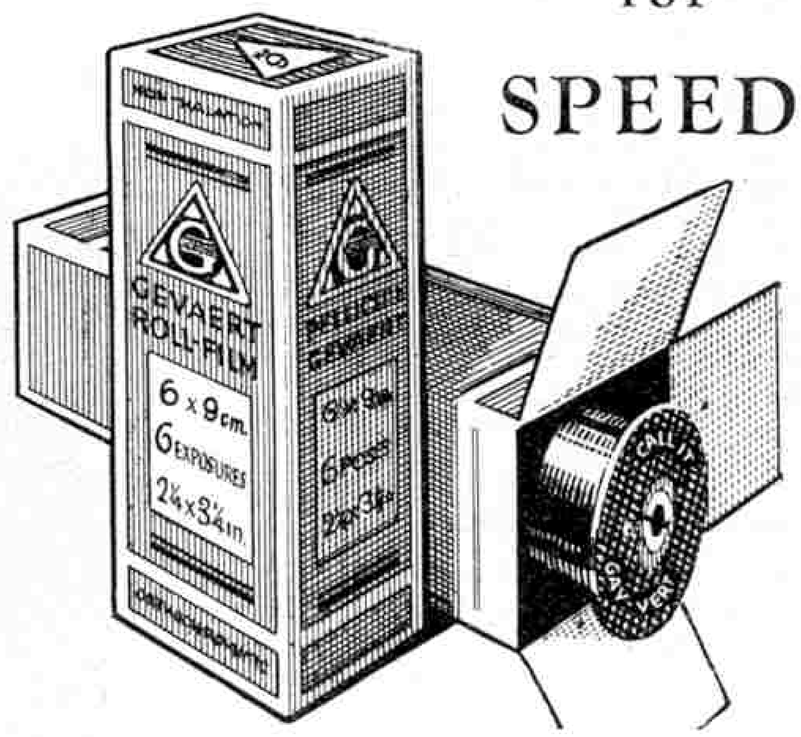

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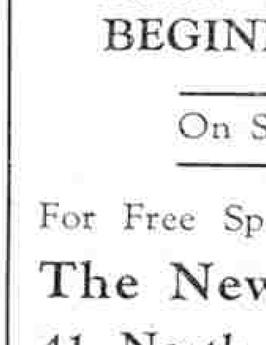
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Photography (*continued from page 283*)

photographer's experience. In addition to the errors introduced by this guesswork there was also the difficulty that the speeds of the various plates used were not known with anything like accuracy.

This state of affairs has now been changed entirely, largely through the efforts of Dr. Hurter, a chemist, and Mr. V. C. Driffield, an engineer, who, working together, carried out what is probably the most important research work in photography.

"H. and D." Numbers

First of all Messrs. Hurter and Driffield dealt with the question of light values, and presently they were able to tabulate the changing powers of daylight and to express these in the form of regular curves. Next these investigators turned their attention to the matter of plate speeds, and they worked out a system of plate testing by means of which the speed of a plate could be definitely expressed as a number. The numbers obtained by this method are always preceded by the initials "H. and D."

If we pick up a packet of plates marked "H. and D. 200" and another packet marked "H. and D. 100," we understand that the plates in the first packet require half the exposure of those in the second, or in other words that they are twice as fast. As a matter of fact, although the letters "H. and D." are still in general use, different plate makers have modified their methods of testing so that a plate of one maker marked, say, "H. and D. 250," is not necessarily of exactly the same speed as another plate similarly marked but produced by another firm.

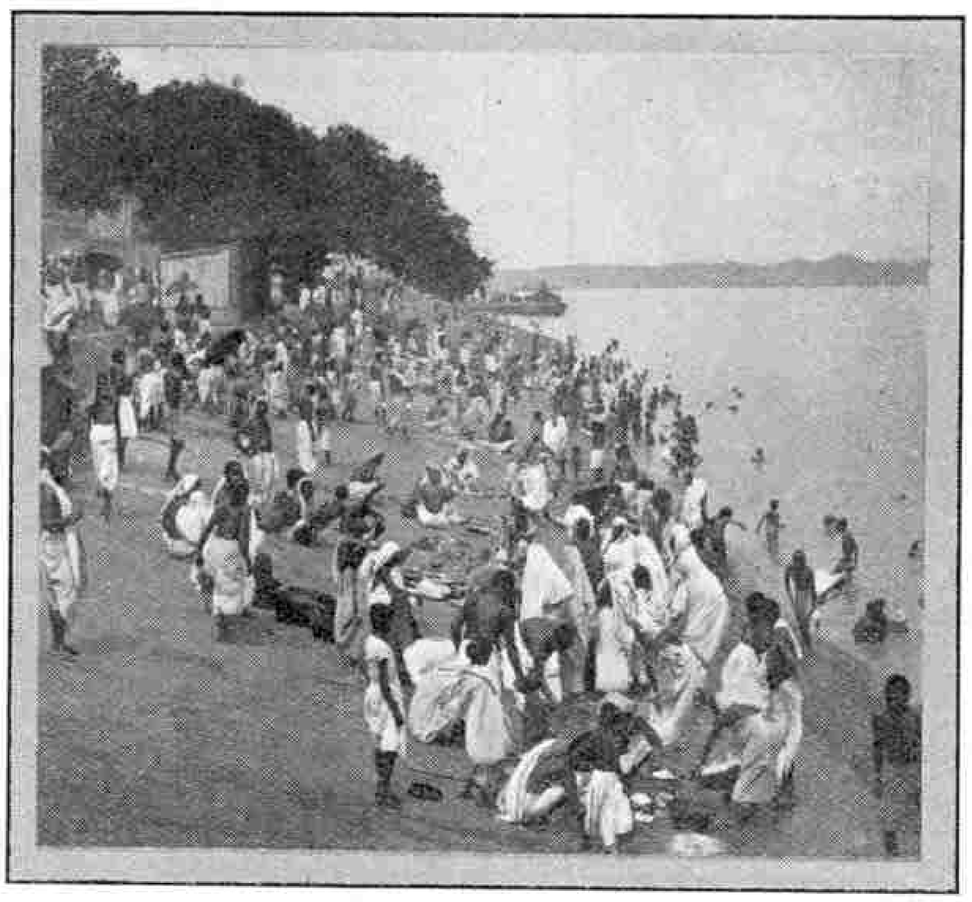
Measuring the Light

To-day the exposure problem is rendered comparatively simple by means of exposure meters or exposure calculators.

In order to estimate exposures accurately by either of these means it is obviously necessary that the speeds of the various brands of plates or films should be known, and therefore the makers of the best exposure meters and calculators issue lists of plates giving definite and accurate speed numbers, which are obtained by actual tests without reference to the numbers given to the plates by their manufacturers.

An exposure meter consists essentially of some kind of a case containing a strip of sensitized paper which darkens when exposed to light in accordance with the photographic strength of that light.

From "India's Coral Strand"



This photograph, sent by Birendra N. Roy, of Calcutta, was awarded First Prize (Section A) in our Tenth Photo Contest (Overseas Section). It shows a bathing scene on the banks of the sacred River Ganges

A tiny piece of this paper is exposed to the light falling upon the subject to be photographed, and a note is made of the time taken by this paper to darken to the same shade as that of a sample tint alongside it. Having found this time, the correct exposure is quickly calculated for the particular plate or film in use, according to the instructions issued with the meter.

Exposure Calculators

In the case of an exposure calculator, the light is not actually measured, but its value is ascertained by means of a scheme carefully worked out with reference to the month of the year, the time of day, cloud conditions, etc. One of the best-known of these calculators is that incorporated in the Burroughs Wellcome Photographic Handbook. This handbook gives speed factors for practically every brand of plate and film, together with light tables for every month and for every hour of the day during which photography is reasonably possible.

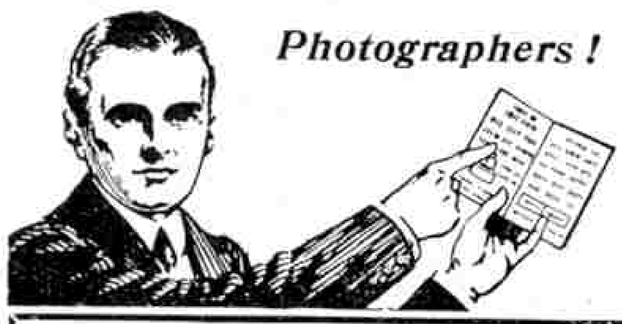
Having found the factor for the plate or film in use, the light table for the month is consulted and the factor found for the hour of the day and the weather conditions prevailing. The calculator is then referred to, and from these two factors the correct exposure is instantly and automatically found.

Nature of the Subject

The fourth factor governing exposure, the nature of the subject to be photographed, requires the use of judgment on the part of the photographer. Fortunately this is not a very difficult matter. If we are using an exposure meter we measure the light and from this ascertain the correct exposure for a normal or standard subject when using a certain speed of plate. This normal subject may be described as an average landscape with no dark trees or buildings in the immediate foreground, and it includes the great majority of outdoor views taken by the average amateur.

If the subject is not of this normal type certain modifications in the exposure must be made, and the nature of these is indicated clearly in the instructions for the various makes of meters. If we are using a Wellcome calculator the problem is made still easier, for the various types of subject are illustrated so clearly by a series of small photographs that it is almost impossible to go wrong.

(*To be continued*)



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Messrs. Taylor Bros., Art Printers and Publishers, Leeds, are always glad to have submitted to them Photos of attractive subjects suitable for publication, and invite correspondence.

Sixteenth Photo Contest

Although the seasons appear to have altered to some extent, June is still in many respects the most beautiful month of the year. Certainly at no other period is an English landscape so full of freshness.

For this reason we are selecting as the subject of our Sixteenth Photo Contest—"A June Landscape." We make no restrictions as to what is to be included in the landscape, and all that is necessary is for the competitor to take a photograph of some interesting open-air view. In judging this competition we shall be influenced mainly by two things—the interest and beauty of the scene chosen and the accuracy with which the scene is photographically depicted.

Of course, a good deal of what we have just said does not apply to large numbers of our overseas readers whose seasonal conditions are quite different from ours, and naturally we shall not expect the same kind of landscape from an Australian boy as from an English boy. Overseas entries, therefore, will be judged entirely on their own merits, without any comparison with the nature of the home entries.

Prints may be of any size and made by any process, and the work may be done by the competitor himself or by a photographic dealer. We are very anxious to encourage our readers to complete the whole photographic process, from making the exposure up to the finished print, entirely unaided, for the full fascination of photography cannot be realised if one merely clicks the shutter and then leaves everything else to a dealer. For this reason, in the event of a tie for a prize, preference will be given to prints that have been made by the competitor himself, and therefore every entrant must state on the back of his print by whom it has been made. In addition, each print must bear the name, address and age of the competitor clearly written.

The competition will be divided into two sections—(A) for competitors of 16 and over, and (B) for those under 16. Four prizes are offered—photographic goods to the value of £1/1/- and 10/6, to be chosen by the winners, as first and second prizes respectively in each section.

Closing date 30th June (Overseas, 31st October).

We wish to draw the special attention of our home readers to the additional prizes generously offered by Messrs. Gevaert Ltd., the well-known manufacturers of photographic products. Messrs. Gevaert offer an additional prize of photographic goods to the value of 5/- to each of the four prize winners in the home section of this contest, on condition either that *the negatives have been made on Gevaert roll films or Gevaert plates* or that *the prints have been made on one of the Gevaert papers.* Competitors who wish to try for these additional prizes must send in, along with their entry, the label from the packet of Gevaert films, plates or papers used by them, and also the name and address of the dealer from whom the material was obtained.

Gevaert Photo Materials

We have received from Messrs. Gevaert Ltd. (Walmer Road, London, W.10) some interesting particulars about the various photographic materials manufactured by them and also some samples of their papers.

The most interesting of this firm's products is the Gevaert Roll Film, which possesses the high speed and excellent quality that go to make a first-class film. In addition it has a feature of particular interest to the amateur who develops his own films in the usual form of tank, for other makes of film have first to be stuck down at the end of the film, which is a somewhat tricky operation. In the Gavaert spools the end of the film is already attached under a freely moving slot, however, and the exposed film is accordingly ready to be put straight into the tank.

Interesting literature regarding these films and also the other Gevaert products—plates, gaslight and self-toning paper—will be sent on application to any reader mentioning the "*M.M.*" Incidentally we would draw our readers' attention to the additional prizes offered by Messrs. Gevaert for our Sixteenth Photo Competition announced on this page.

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RESULT OF Thirteenth Photo Contest

There was a large number of entries for this Competition (photograph of a train standing in or starting from a station). Many of the snapshots indicated that the takers were aware of the absolute need of securing a really good vantage-point from which to direct their cameras. Especially where large stations are concerned, it is often impossible while standing on the platform to snap an incoming or outgoing train without getting a blurred effect owing to steam. Some of the best efforts submitted were apparently taken from an overbridge of some kind.

In one or two cases it was impossible to tell whether the train was in motion or standing, owing to the absence of steam and smoke emanating from the locomotive. As we intend to hold a similar competition in the near future it may be well to point out that a really arresting and effectual snapshot can be got only by waiting for a good smoke and steam effect, such as occurs when a heavy train is starting on a greasy rail, or when a locomotive is blowing off steam strongly as the pressure gauge ticks round to the maximum.

Selecting the winning photographs proved to be no easy task, but after full consideration we made our awards as follows:—CLASS A. First Prize (Photographic goods value 10/6), F. G. Simpkins (Treharris, Glam.) Second Prize (Photographic goods value 5/-), J. Duckworth (Accrington). CLASS B. First Prize (Photographic goods value 10/6), R. S. Hardy (Parkstone, Dorset). Second Prize (Photographic goods value 5/-), F. H. Jackson (Burton-on-Trent).

Lives of Famous Engineers—

(*Continued from page* 269)

of drapery and tea merchants and subjected to the indignity of being used as a kind of show place for advertising purposes. Four years later she was sold to be broken up, and thus ended her career.

An Unlucky Ship

The "*Great Eastern*" was dogged by misfortune, and almost everybody who was connected with her suffered financially. Regarded from a commercial point of view she was a failure, but this was due almost entirely to the fact that she was too far in advance of the times, and thus never really had a fair chance. If the "*Great Eastern*" could have been fitted with thoroughly efficient engines her story would probably have been very different. Although this great ship did not accomplish the wonderful things expected of her, nevertheless she marked an epoch in the history of steamship construction, and she paved the way towards the building of the giant liners of to-day.

Brunel's Ability as Ship Designer

We cannot do better than close this brief account of Brunel's work as a ship designer by quoting the following passage from Sir William White's address to the Institution of Civil Engineers in 1903:—

"Having recently gone again most carefully through Brunel's notes and reports, my admiration for the remarkable grasp and foresight therein displayed has been greatly increased. In regard to the provision of ample structural strength with a minimum of weight; the increase of safety by water-tight subdivision and cellular double bottom; the design of propelling machinery and boilers, with a view to economy of coal and great endurance for long-distance steaming; the selection of forms and dimensions likely to minimise resistance and favour good behaviour at sea; and to other features of the design which need not be specified, Brunel displayed a knowledge of principles such as no other ship-designer of that time seems to have possessed, and in most of these features his intentions were realised."

NEXT MONTH:—

BRUNEL'S CLOSING YEARS

OUR MAIL BAG

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

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

H. S. Downey (New Malden).—"Not for one moment did I dream that I should receive an answer from you and I take this opportunity of thanking you from the bottom of my humble heart." We are glad to note that you are revising your opinion of Editors and that you realise now that "most of them are good sports." We receive hundreds of letters every week from boys all over the world and we invariably answer each one individually. It makes no difference to us whether the writer is a very small boy or a very big one, or whether he lives in London or Timbuctoo; we read every letter with interest, and in replying try to imagine what the writer is like and to convey to him our spirit of friendliness. We are glad that our letters have "bucked you up" and we hope you will write to us very often and let us know what you are doing.

W. Wilson (Edinburgh).—"I think the '*M.M.*' improves with every issue and as long as it improves I do not mind if the price goes up to 2/6." We are afraid that there would most decidedly be a riot among our readers if the price went up as high as that, William, but we quite understand what you mean. You feel, as thousands of other boys feel, that the "*M.M.*" is the Meccano boys' own Magazine and that no other magazine can ever take its place. You have been a little unfortunate in sending in puzzles that have previously been submitted by other boys, but we hope you will try again, and next time with success.

E. P. Naish (Leeds).—We are interested to hear that you have had a year's "*M.M's*" bound for such a small cost as 5/-. Your suggestion with regard to an index is one that has been put forward by many readers, and you will be interested to know that we are now taking steps to have an index prepared for this year's issues. It will be published in December and we agree with you that such an index will greatly enhance the value of bound sets.

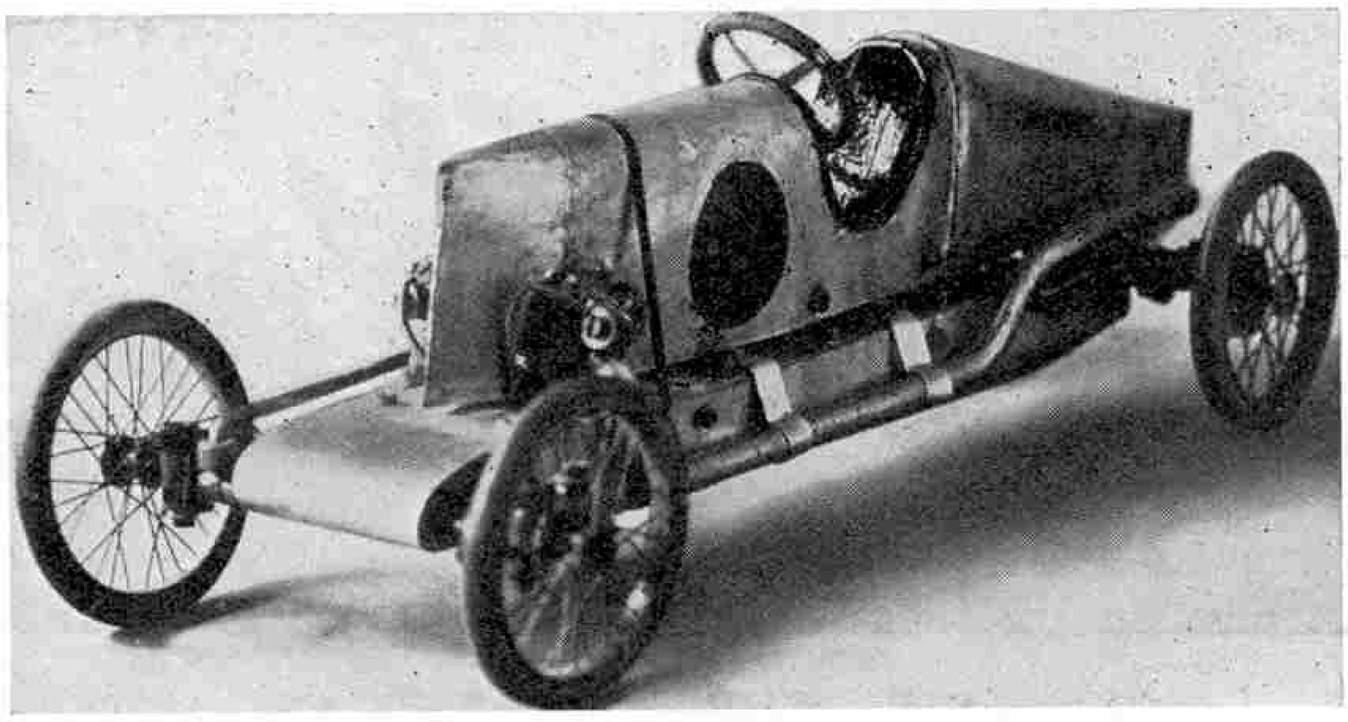
J. R. Campbell (Bloemfontein).—"I received the ever-interesting '*M.M.*' last month with its fascinating cover." We feel greatly encouraged by hundreds of such appreciations, J. R., for it makes us feel well repaid for the time and labour spent in producing the Magazine. We are glad to hear that you were so amused by "*Discoveries in Meccanoland.*" The inhabitants are certainly very remarkable people judging by their photographs. We cannot say what the motor cyclist takes to keep his nerves in good condition! Our own special tonic is to read such cheery and encouraging letters as yours. Send the next one along quickly!

W. Harvey (London, N.1).—"Although not a 'boy,' I find a set of Meccano has given me more enjoyment in my leisure hours than anything contained in my workshop." Your experience affords another proof of the truth of our slogan, "The correct age to start Meccano is anywhere between 5 and 70." We read somewhere the other day that "a man is but a boy thinly disguised." We agree with this and we are convinced that nothing penetrates that disguise so effectively as a Meccano set.

J. D. Richardson (Auckland, N.Z.)—We were very interested to read that your boy is allowed to monopolise the dining room table and floor during his holidays. Fathers and mothers very often try to pretend that they are not interested in Meccano or Hornby Trains, but we have a shrewd idea of what happens in thousands of homes when Dick and his brothers have been sent off to bed! Your confession—"After bedtime his mother and father have a go at it, and Oh! it's great stuff"—was indeed refreshing to read.

C. L. Pereira (Ceylon).—As in the case of many readers, you appear to be keenly interested in anything connected with nature study and we think you will appreciate our new feature 'How to Start an Aquarium.' These articles are written by an expert, a man who has made the creatures of pond and stream a life study and who is anxious to pass on some of his own enthusiasm. No doubt some of the plants and creatures referred to in these articles will not be quite the same as those to be found in your part of the world, but none the less we feel sure you will read the articles with keen enjoyment. Perhaps you might be able to write a short contribution for our "Readers' Page," dealing with some of the water creatures peculiar to Ceylon.

A Famous Racing Motor Car



The above is a clever model of the famous racing car Kim II. The framework of the model is entirely constructed with Meccano, being afterwards covered with sheet tin and painted.

The racing car of which this is a model is fitted with a two-cylinder air-cooled engine, the drive being transmitted by a shaft to bevel box, thence by cross-shaft and dog-clutch change-speed mechanism to chains driving the rear axle. This car was successfully raced for several years by Captain A. G. Fraser-Nash, who succeeded in making some of the fastest ascents that have ever been accomplished on hill trials in several speed events.

Fittings for Model Ships

The casting moulds of A. Rodway (102, Long St., Birmingham) are already well known and our readers will be interested in a new development by this enterprising firm in the shape of fittings for all kinds of model sailing boats, steamers, warships, etc. These fittings are well made and can be recommended for giving the finishing touches to any model ship. In addition the firm supply drawings, instructions and materials for building a wooden passenger liner, 2 ft. in length. The materials are sold in two separate parcels, one containing all the essential parts and the other the additional fittings required to complete the model. A scale drawing of this liner, together with an interesting list of fittings, will be sent to any of our readers for 6d., post free.

Famous Locos under Test—

(*Continued from page* 271)

principally upon its splendid work in connection with the "Cornish Riviera" Express—a train noted for its speed and precision in timing throughout its regular journeys from London to Plymouth—a distance of 226 miles, representing the longest daily non-stop run in the world.

As in all other "Castle" Locos, the boiler of the "*Pendennis Castle*" has a maximum diameter of 69″, and a minimum of 62″ (at the front end) and is 14′ 10″ in length. It is fitted with 201 2″ and 14 5″ tubes, and has a total heating surface of 2,312 sq. ft.

Four cylinders, each of 16″ bore and 26″ stroke, are fitted, two being mounted between the engine frames and two outside. The inner pair are connected to the forward driving axle, while those outside transmit power to the central pair of coupled wheels, which are 6′ 8½″ in diameter. Steam is supplied at the exceptionally high boiler pressure of 225 lbs., and the tractive effort equals 31,625 lbs. The engine with tender scales nearly 120 tons in full working trim, of which 59 tons are available for adhesion.

As soon as a detailed report of the recent te ts is available we shall print further particulars of the performance of each loco.

Tuition by Correspondence

Tuition by correspondence appears to be steadily gaining ground in popular favour, especially among those who wish to pass some particular examination but can only study in spare time. The tutorial Service College (183, Fulham Palace Road, Hammersmith, London, W.6) has been engaged for many years in teaching by correspondence and by means of its system instruction by expert tutors is brought to each student in his own home.

The Meccano Jersey

The popularity of the Meccano Jersey, made specially by the Jaeger Co. Ltd., increases steadily as the excellent qualities of the jersey become better known. Recently the jersey has been further improved by giving the collar a wider turnover in front and by tacking it down at the back, which will prevent the curling at front or back that has occurred occasionally in the past. The jersey is now obtainable from any Jaeger agent in five colours.—Navy/Saxe, Mixed Grey/White, French Grey/Mole, Camel shade/Brown, Brown/Camel shade.

The Jaeger underwear for boys fully maintains its excellent quality, and as it is made of pure wool it is the best possible safeguard against chills after strenuous exercise of any kind.

The Story of Metals—(*cont. from page* 277)

It is the heaviest of all the common metals. It is very malleable, being easily rolled into thin foil, but on the other hand it cannot be drawn out into fine wire in the same way as copper.

Lead is the most durable of all the common metals. If it is exposed to the action of the atmosphere a coating of rust forms upon it just as rust forms upon iron, but there the similarity between the two metals ends. Whereas rust gradually penetrates deeper and deeper into iron, lead is protected by the first coating of rust formed, and provided this coating is not scraped away no further corrosion occurs. So perfectly is the metal protected by this coating that lead pipes laid down in Rome, Herculaneum, and Pompeii some 1,800 years ago have lasted to the present day. For the same reason the lead roofs of many buildings erected hundreds of years ago are still in a state of excellent preservation.

Electricity

XVI. THE WHEATSTONE AUTOMATIC SYSTEM

EARLY in the history of the land telegraph it was found that the telegraph lines, especially those suspended in the air on poles, were capable of transmitting the dots and dashes of the Morse code at a much greater rate than it was possible for any operator to send them by hand. It was also found that the Morse inker at the receiving station was capable of operating at a much greater speed than that at which it worked when the signals were hand transmitted.

The maximum speed of a skilled Morse operator is about 30 words per minute. Duplex circuits (already described in this series) will thus take 60 words per minute per circuit and quadruplex circuits 120 words. This is still less than the line is capable of taking, and consequently it was not long before telegraph engineers began to search for a method of transmitting Morse automatically.

Sir Charles Wheatstone

The Wheatstone automatic system of telegraphy was invented by Sir Charles Wheatstone, and it was the crowning achievement of a life devoted to scientific research.

Wheatstone was born in February 1802 at Gloucester, his father being a music seller in that city. Four years later the family removed to London and the boy received his education at various local private schools. He does not appear to have shown any outstanding ability, and his most noticeable characteristic was an almost painful shyness and sensitiveness that made it almost impossible for him to make friends. At the age of 14 he was sent to his uncle, a musical instrument maker in the Strand, to learn the trade, but he never really settled down to this business and he spent more time in reading than at work. On the death of his uncle in 1823 Wheatstone and his brother took up the business, but Charles practically retired after about six years and devoted himself to experimental research.

Wheatstone's first work was chiefly concerned with sound. Among the various ingenious contrivances that he invented was one known as the "Acoucryptophone," which consisted of a box shaped something like an ancient lyre and suspended by means of a wire from a piano in the room above. When the piano was played the vibrations were transmitted silently along the wire to the lyre and there became audible, the instrument thus appearing to play of itself! Wheatstone's shyness was a great drawback to him in his scientific life as it prevented him from becoming a successful lecturer. As a matter of fact many of his investigations were first publicly described by Faraday in his discourses at the Royal Institution.

Sir Charles Wheatstone

Original Experimental Work

Wheatstone's originality and ability were fully recognised by 1824 and in that year he was appointed Professor of Experimental Philosophy at King's College, London. He became a Fellow of the Royal Society in 1837, and in 1868, after the completion of the automatic telegraph, he was knighted. The remainder of his life was uneventful except for the progress he made in scientific research. In 1875 he was in Paris working upon a receiving instrument for submarine cables and while there he caught a cold and died on 19th October.

The experimental work carried out by Wheatstone covered a very wide field. In addition to his telegraphic inventions he devised a cryptographic machine for printing cipher messages which were utterly unintelligible until translated by a duplicate instrument. He also invented various musical instruments, the best known of which was the concertina. It should be noted that the Wheatstone bridge, which we described last month, was not invented by Wheatstone. The actual inventor was a man named Christie, and Wheatstone was only instrumental in giving the apparatus publicity.

The Wheatstone System

Since its invention in 1867 the Wheatstone automatic system has undergone only small modification and it is still in practical use throughout the world for all types of telegraph work. A system that has withstood so successfully all the competition it has had to face from the great advances in telegraph science during the past 58 years must be extremely efficient and it is therefore interesting to study its operation. It can be worked at speeds ranging from 25 to 400 words per minute and even at 600 words per minute for short periods. In practice it has been found that a speed of 250 or 300 words per minute is quite sufficient for all normal purposes.

The Wheatstone system possesses an advantage over the Baudot and other similar systems in that no moving parts at the two stations need to be in synchronisation with each other. As we explained in last month's "M.M.," in the Baudot system the two distributing

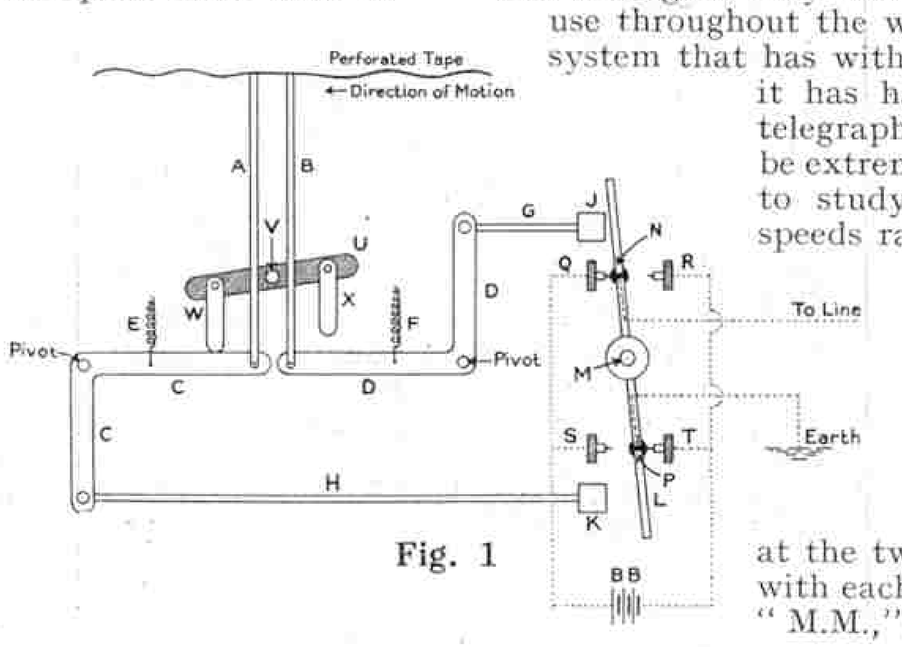
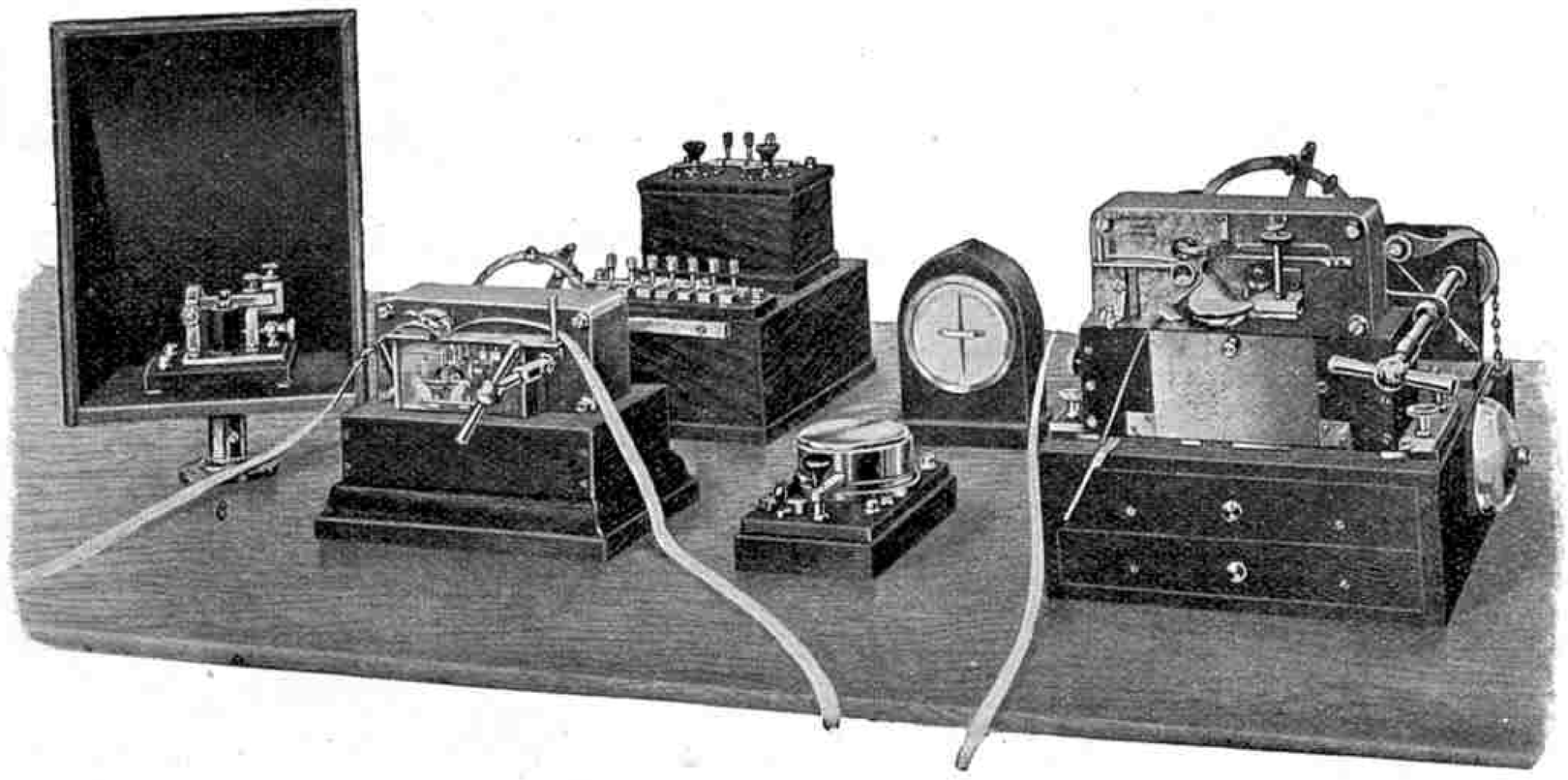


Fig. 1



Courtesy [*Messrs. Siemens Bros. & Co. Ltd.*

Fig. 2. Wheatstone Station Set

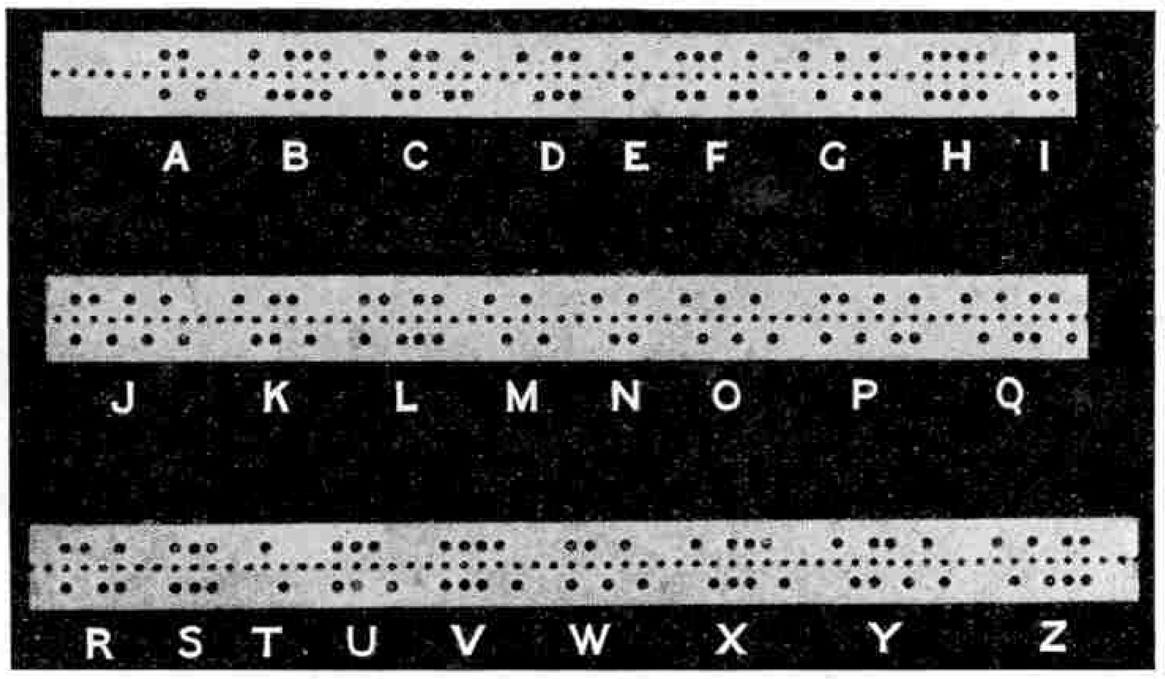
arms, one at each station, must both revolve at exactly the same speed. This means that the stations must always send and receive at the same speed, whereas in the Wheatstone system the transmitter works independently of the receiver, and the speed of the transmitter may be regulated without reference to the receiver.

The Wheatstone is a double current system, that is to say a current is flowing through the line the whole time but its direction is reversed to indicate a dot or a dash of the Morse code. Thus a reversal of short duration represents a dot and a reversal of long duration represents a dash.

The Wheatstone Perforator

The Wheatstone apparatus consists of three units. First there is the perforator by means of which holes are punched in a strip of paper tape. Then there is the transmitter which controls the reversals of current in the line in accordance with the perforations of the tape and finally there is the receiver which is a type of polarised inker and which receives the signals in the Morse code and marks them on a paper tape in the usual manner.

The hand perforator, shown in Fig. 4, consists of three keys operating three sets of punches. When the left-hand key is pressed two holes opposite to one another are punched, representing a dot. When the right-hand key is pressed two diagonal holes are punched representing a dash. The manner in which the holes are punched for dots and dashes respectively is shown in Fig. 3 which represents the Morse alphabet as it appears in the perforated tape. For example, the letter A consists of a dot followed by a dash, and to indicate this letter the operator would first press the left-hand key thus punching two holes in line, and then the right-hand key punching two diagonal holes. The letter B would require one depression of the right-hand key followed by three consecutive depressions of the left-hand key, and so on for each letter of the alphabet.



Courtesy [*Messrs. Siemens Bros. & Co. Ltd.*

Fig. 3. Alphabet in Perforated Tape

In Fig. 3 it will be noticed that there is a third line of holes, between the outside holes representing the dots and dashes. The purpose of this centre line of holes is to guide the paper tape steadily and regularly through the transmitter, the holes being used in the manner of a rack. There are 121 centre perforations for every 12 inches of tape.

When one message is required to be sent to several destinations, such as newspaper offices, several thicknesses of tape are punched at once by feeding the requisite number into the machine one over the other. In certain cases the punches are then operated by compressed air. There are also perforators with a lettered keyboard operated in a similar manner to that of a typewriter.

The Transmitter

The essential working parts of the Wheatstone transmitter are shown in Fig. 1.

Two light rods A B, pivoted to the cranks C D, are maintained pressing against the underside of the perforated tape by means of two springs E F. The distance between the two rods A B is the same as the distance between two of the centre holes in the paper tape. The rod A is in a line with the lower row of holes (Fig. 3) and rod B is in a line with the upper holes. The other ends of the cranks C D carry rods G H, on the ends of which are collars, J K. The rods G H are supported in bearings (not shown).

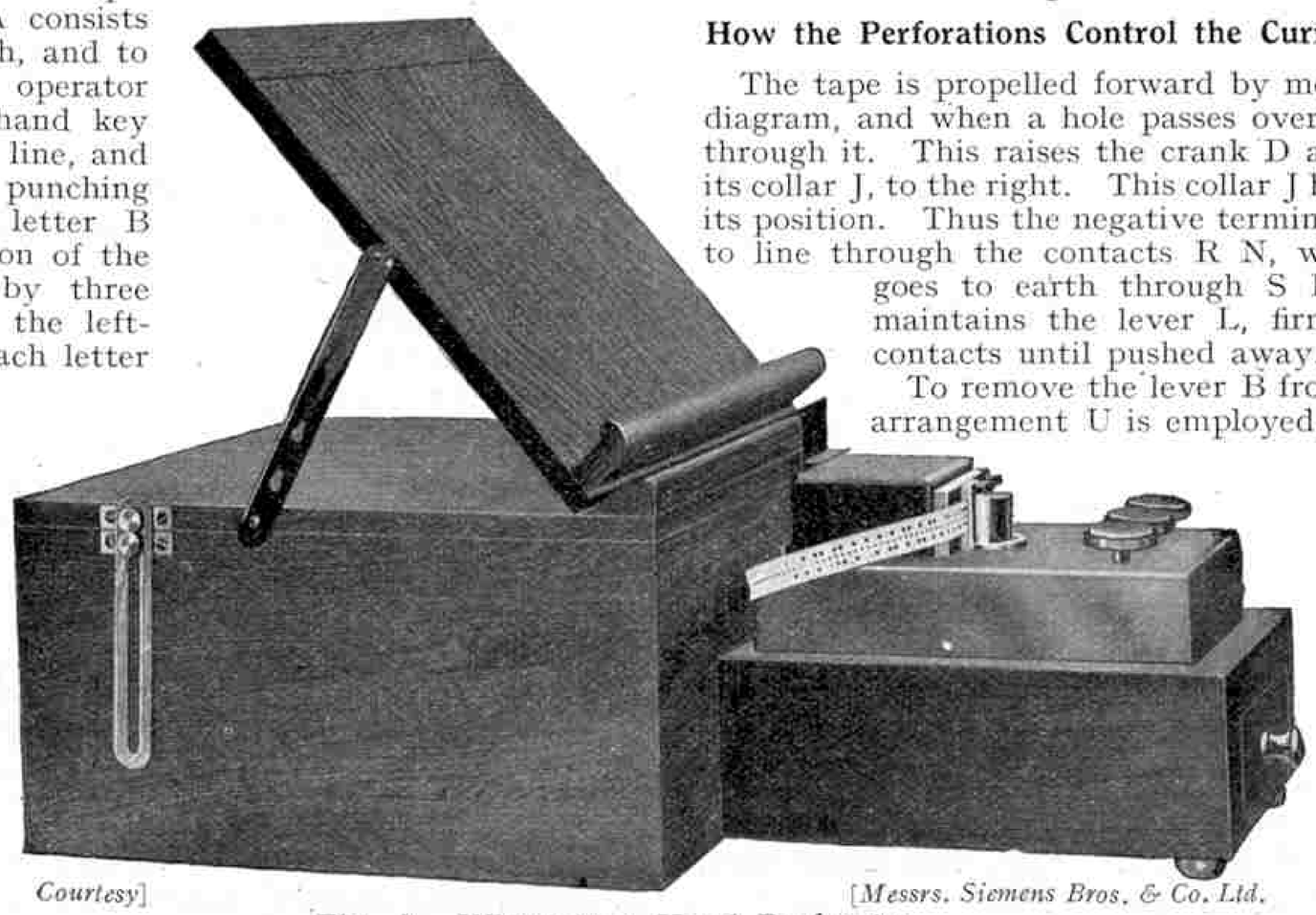
L is a lever, pivoted at M, carrying two pairs of contacts N P. One pair, N, is electrically connected to line and the other pair, P, to earth. The lever L with its contacts is associated with four contact screws Q, R, S and T, which are connected to the battery BB as shown by the dotted lines. Thus it will be seen that lever L is really a reversing switch for the battery BB, and it is by movements of this lever that the current reversals are put on the line. The object of the whole mechanism is to operate this lever in the correct manner in accordance with the perforations in the tape.

How the Perforations Control the Current

The tape is propelled forward by mechanism not shown in the diagram, and when a hole passes over the rod B, this rod rises through it. This raises the crank D and moves the rod G, with its collar J, to the right. This collar J hits the lever L and reverses its position. Thus the negative terminal of the battery BB is put to line through the contacts R N, while the positive terminal goes to earth through S P. A spring (not shown) maintains the lever L, firmly against either pair of contacts until pushed away.

To remove the lever B from the hole in the tape the arrangement U is employed. U is a beam pivoted at V and carrying the two rods W X. This beam is rocked very quickly the whole time the machine is in action. When rod A enters a hole in the tape and thus allows the crank C to rise, it is almost immediately removed by the rod W striking C and pressing it downward. The same applies to rod B.

Suppose the tape is moved from right to left



Courtesy [*Messrs. Siemens Bros. & Co. Ltd.*

Fig. 4. Wheatstone Hand Perforator

(*Continued on page* 300)

The Conquest of the Air

IV. Argentine Airman's Attempt to Circle the Earth

Photo courtesy [*Messrs. D. Napier & Son, Ltd.*

Major Zanni and his Fokker Aeroplane

OUR illustration shows Major Zanni of the Argentine Air Force, who is endeavouring to fly around the world on Fokker aeroplanes, fitted with 450 h.p. Napier "Lion" engines.

Major Zanni commenced his flight at Amsterdam on 26th July of last year. He reached Hanoi (7,500 miles) in 17 flying days and Tokio (10,000 miles) in 22 flying days, after many adventures.

Owing to his late start from Amsterdam heavy rains had set in by the time he had reached Hanoi and the aerodrome there was in an appalling condition. The result was that in landing the carriage sank into the soft mud causing the machine to fall forward on to its nose, breaking the propeller and damaging the machine in such a manner that it was impossible to get it repaired. Another machine therefore had to be sent to him from Tokio.

At Tokio he has been delayed by the advent of winter and adverse weather conditions, but a recent cablegram announced that he hoped to recommence his flight on 9th May last. He will proceed via Paramushir, Petropavlovsk, the Aleutian Islands, and Alaska to Vancouver, from thence to Chicago, New York, Halifax, St. Johns, Ireland, London and Amsterdam, making the journey across the Atlantic in one direct flight.

Major Zanni will use a Fokker seaplane in this part of his flight, and again a Napier "Lion" engine will be fitted. This engine, it is interesting to note, is very popular with the Royal Air Force and has been used with success by Imperial Airways Ltd.

Major Zanni has sent some interesting particulars about the behaviour of his engine during his flight from Amsterdam in a letter written from Tokio. He writes :—

"My first engine, the one that brought me along from Amsterdam to Hanoi, was really a fine specimen of trustworthiness and reliability. When I had to part with it—simply because my other machine sent to me from Japan had already a Napier engine mounted—it felt like parting with one's best friend. My mechanic was delighted with it, and was very sorry that it could not accompany us on to Japan, as he was sure it would have lasted all the way, and more if necessary.

"After the accident at Hanoi, with the aid of personnel of the French Aviation Corps stationed there, we dismounted the engine and found that it was still in perfect condition and without any apparent change from the day it was delivered, despite having flown for 105 hours through sand-storms, the most appalling rain imaginable (which came down just like a curtain), and most of the time through a heat that was too awful for words. These were unfortunately the conditions in which I had to fly.

"The French aviators at Hanoi found it difficult to believe that my engine had flown 105 hours. If I had not started too late, owing to the illness of my navigator who eventually had to stay behind, I think the accident at Hanoi would not have happened, as the conditions would have been good instead of finding

myself flying over lakes, caused by torrential rains.

Held-up by Winter Conditions

"Some days ago the Japanese Imperial Aeronautical Association asked me to give a lecture relating my experiences during the flight, the organisation of it, and any interesting features of same as they intend to make a Round-the-World flight also.

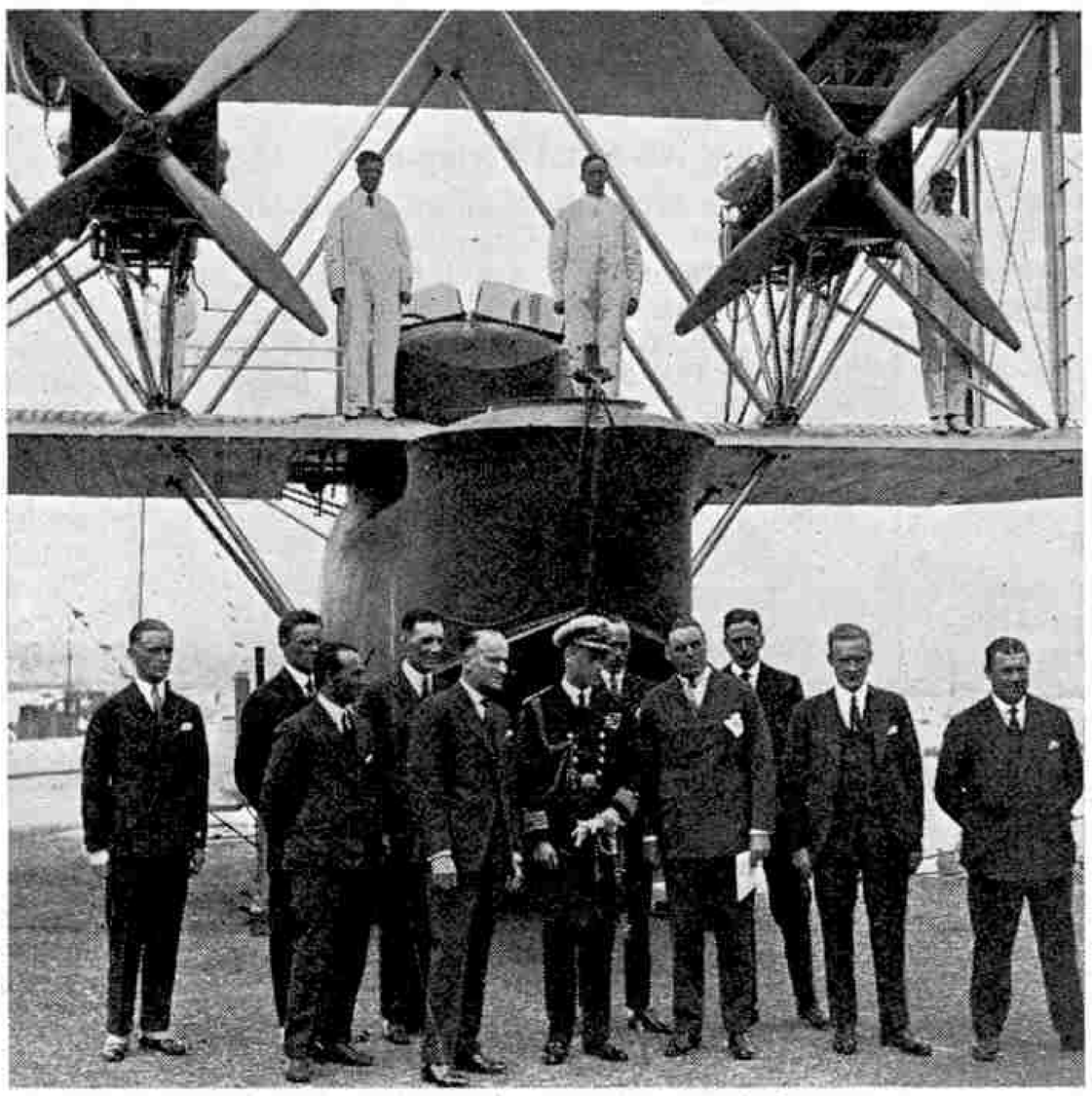
"During the flight we had very little time to give to the engine, as it was a case of arriving at a place in the afternoon, and off next day early, and then very seldom had we any hangar accommodation to protect the machine.

"Unfortunately I got to Japan so late in the year that I could not get ships to lay the provisions and fuel along the course. The owners would not venture their steamers beyond a certain latitude in the winter, because they were convinced that most of the ports and places that I had to touch were frozen. I endeavoured by all means to get the ships but had, eventually, to give it up and resign myself to interrupt the flight until next spring."

In addition to his mechanic Beltrame, who has been with him since he left Amsterdam, Major Zanni will carry with him for his journey across the Pacific Lieut. E. Velo, as navigator. He hopes to be able to finish the flight with the same Napier engines as he used in the first part of his epoch-making flight.

We feel sure that all our readers will join us in wishing Major Zanni "Good Luck!" on the resumption of his flight and we hope soon to be able to announce that he has not only safely reached Vancouver, but crossed the Atlantic and that he is once more in Europe.

The Prince's Interest in Aircraft



H.R.H. The Prince of Wales visiting the Supermarine Aviation Works at Southampton

NEXT MONTH:—

THE PARNALL "PIXIE"

£50,000 Going Begging!

The Air Ministry offered a series of prizes in May 1923 amounting to £50,000 for a helicopter, or flying machine that is capable of ascending and descending without running along the ground, as is necessary with all present forms of aeroplanes. The conditions governing the competition were so strict that, although several machines have been built with a view to competing, none has actually been brought to test, and the £50,000 has therefore not been awarded. Competing machines were required to hover for half-an-hour at a height of 2,000 ft. in a wind blowing 20 miles an hour, to complete a 20-mile closed circuit at a speed of 60 miles an hour, and to alight, with the engine shut off at 500 ft., within 100 ft. of a mark on the ground. The entries for the contest closed at the end of April last year, and the 15 entrants were allowed twelve months in which to complete their tests. This period expired last month, but none of the entrants has even submitted a machine, much less demonstrated its capabilities.

A Cinema in the Air

Recently a passenger aeroplane left Croydon Aerodrome and while it flew over Kent and Surrey, a cinema film was shown to the passengers for nearly an hour.

The machine used for the flight was a twin-engined Handley-Page. The screen was situated on the bulkhead that divided the passenger cabin from the pilot's cockpit, with the operator's cabin in the baggage compartment at the rear. "Cold" light, and a specially non-inflammable film, were used to ensure safety from fire.

The film was exceedingly good, and apart from three short breaks, caused by the machine dropping into air pockets, the showing was quite uniform.

The experience was, of course, a great novelty, but it is doubtful whether cinema entertainments will ever become popular with the flying public. For one thing, they necessitate darkening the cabin windows, and anyone who has flown knows that one of the greatest attractions of flying is to study the scenery over which the machine is passing.

* * * *

Wireless from Aeroplanes

Many boys cannot understand how it is possible to communicate by Radio from an aeroplane without connecting the apparatus to earth. The aerial proper is formed by a wire that hangs from the aeroplane, and forms an "open" aerial. With such an aerial an "earth" is required only to serve as a capacity that will balance the aerial circuit. This is obtained by using the fuselage of the aeroplane, which is, of course, insulated from the trailing aerial. This arrangement acts as a condenser between the "plates" of which the oscillations take place. The system is thus similar to the "counterpoise" aerial sometimes used in land stations.

* * * *

A Secret Aeroplane

An aeroplane intended to ascend to greater heights and to attain higher speeds than have hitherto been possible, is now being constructed in France.

Not only are the engine and the propeller designed to function efficiently when the machine is moving in thin air at immense heights, but pilot, navigator, and engineer will have a special cabin, to which oxygen will be fed automatically.

The machine's first long-distance test will be an attempt to fly, non-stop, the distance of about 3,300 miles from Paris to New York.

* * * *

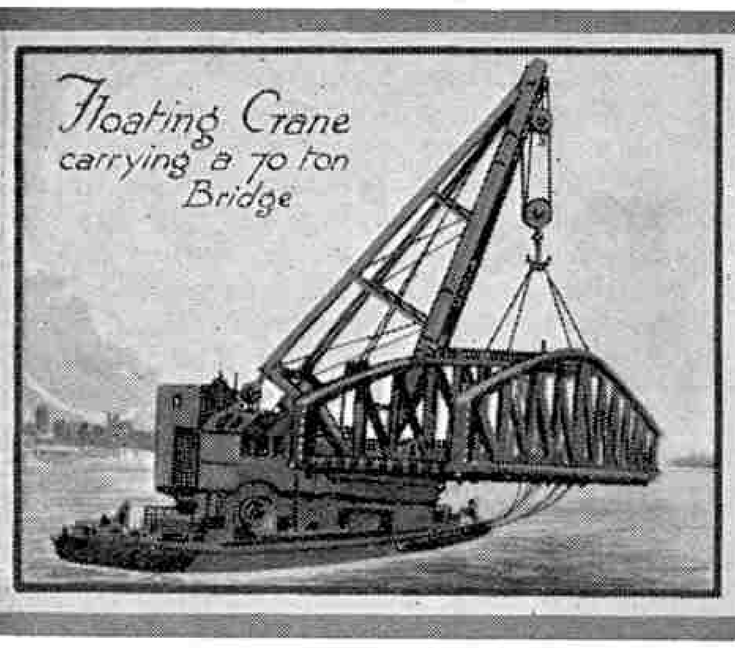
Money from the Air!

Those of our readers who remember reading of the special interview we had with Mr. G. Constantinesco, the inventor of the Torque Converter that bears his name, will be interested to hear that the famous inventor has recently been awarded £85,000. This sum has been paid to him and his collaborator, Mr. W. Haddon, by the Royal Commission of Awards to Inventors for their special timing apparatus for machine-guns. The invention enabled machine-guns to fire between the propeller-blades of an aeroplane at the rate of 2,000 rounds a minute. Over 40,000 of these synchronising gears were made for the British Air Force, and about 10,000 for the American Service, the U.S. Government contributing £15,000 of the award.

Other aerial inventions for which awards have recently been made include £50,000 for the Bristol Fighter aeroplane; £40,000 for the Sopwith machine; £40,000 for the Avro; £159,000 for the Gnome and Le Rhone engines, in addition to £200,000 already been received; £15,000 to the inventors of dual control for aeroplanes; £35,000 for the De Havilland aeroplane; and £6,500 to the inventors of the Parnall-Panther aeroplane.

Claims paid by the U.S.A. included £9,000 for the "0" type Handley Page biplane; £65,000 for the D.H. machine; £2,500 to Lieut.-Colonel J. T. C. Moore-Brabazon for his aerial cameras; £400 to the inventor of aircraft cameras; and £1,500 to Mrs. Minnie Porte for inventions in connection with flying boats.

These awards are for inventions that proved of value to the British and United States Governments during the war. Further awards are yet to be made.



Engineering News of the Month

The Russian Navy

The Russian Navy in the Baltic now consists of two dreadnoughts, one armoured cruiser, one light cruiser, eight destroyers, four submarines and four mine-layers. These ships are all seaworthy and other vessels, including two battleships and three light cruisers are being made ready for commission.

* * * *

New Dredger for Aberdeen

Tenders have been invited for a new suction hopper dredger for work in Aberdeen Harbour. A dredger costs anything up to £100,000 and it is interesting to note that a German firm have offered an excellent dredger for less than half this price. Representatives of the Aberdeen Harbour Board have visited Germany and have seen the dredger working on its speed trials in the River Elbe. The question of purchasing the German dredger has now to be discussed by the Board.

* * * *

Dry Dock for Durban

A large dry dock has recently been constructed at Durban, South Africa. It is 1,150 ft. in length, the width at the entrance is 110 ft., and the depth at high water 41 ft. The dock is divided into two lengths of 660 ft. and 440 ft. respectively, so that the dock may be used for one large vessel or two smaller vessels, which may be docked simultaneously. The dock is equipped with six 15-ton electric capstans along the dock walls for drawing vessels into the dock.

To construct the dock it was necessary to excavate 530,000 cubic yards of earth and 80,000 cubic yards of rock. The excavated material was used in reclaiming 100 acres of ground.

* * * *

New High Speed Cruisers

A new scout cruiser, the "*Marblehead*," has recently been launched for the United States Navy. She belongs to the Omaha class, which consists of ten vessels of uniform design. They are 555½ ft. in length, 55 ft. in breadth and have a displacement of 7,500 tons. The engines develop 90,000 shaft h.p. giving a speed of 33.7 knots.

On her trial run over a measured mile, the "*Marblehead*" developed just over 35 knots or 95,950 shaft horse power. The average speed during a four-hour full-power trial was 34.24 knots. The "*Marblehead*" is the fastest cruiser at present afloat under any flag with the possible exception of her sister ship the "*Detroit*."

All-Metal Flying-boat

A new type of all-metal flying-boat is announced from Copenhagen. In this boat duralumin is used throughout, no fabric being employed. The span of the wings is 96 ft. 9 in. and the length of the boat 54 ft. Its weight, fully laden is 8,140 lbs. and it is designed for a speed of 124 m.p.h. We hope to give further particulars of this flying boat in a future issue.

* * * *

Repairs to a Dry Dock

The dry dock of the Navy Yard at Philadelphia recently developed extensive leakages, which have now been repaired. The dock is one of the largest of its kind, being 1,025 ft. in length and 142 ft. in width. It has never been actually watertight, and four years ago the leakages became so considerable that action had to be taken. Wooden wedges were driven into the cracks but as soon as one leak was stopped the water broke through in another place. Grouting with liquid cement was resorted to and this was quite satisfactory. Three grouting machines were mounted on a heavy timber platform which could easily be moved by the cranes with which the dry-dock is equipped.

* * * *

Large Destroyers for Japanese Navy

It is reported that several very large destroyers are about to be built in Japan for the Japanese Navy. They will probably mount four or five 4.5 guns and have a speed of 35 knots, and their displacement of 3,000 tons will make them larger than any similar class of boats in existence.

As in the case of submarines, the dimensions of destroyers have steadily increased during the past ten years until some modern destroyers closely approach light cruisers in their displacement and armament. For instance, destroyers of 2,300 tons were built by the Germans during the war and those in the "Jaguar" class of the French Navy are of 2,359 tons displacement. The largest destroyers in the British Navy are the seven boats of the "Admiralty" Class, the displacement of which is 1,800 tons.

The new Japanese destroyers are considerably larger than any existing vessels of their type—they are, indeed, of only 500 tons less displacement than the famous light cruisers of the "Arethusa" class. Japan's famous cruiser "Yubari," completed in August 1923, is of 1,300 tons displacement, steams at 33 knots, mounts six 5.5 guns, one 12 pounder anti-aircraft gun and four torpedo tubes.

New Niagara Bridge

The new bridge built by the American Bridge Company for the Michigan Central Railway at Niagara Falls was opened on 16th February last. The bridge, which is a combination of the steel arch and cantilever types, was commenced as a cantilever bridge until the lower chord was connected at the centre, when it was made into a two-hinged arch. The arch measures 640 ft. in length, and the total weight of the structure is 6,130 tons. There are two railway tracks, and two footways, and the total cost was $2,225,000—over £550,000. The bridge is so constructed as to allow trains carrying the heaviest loads to cross without diminishing speed.

* * * *

World's Water Power

The United States Geological Survey has recently issued a review in which they estimate the possible water power of the world at 453,000,000 h.p. As far as they can ascertain the development of water power has increased by some 26% in three years, bringing the actual total water power developed to about 29,000,000 h.p. at the end of 1923. Although the development of water power is now being given increasing attention in the United States, they are still behind Europe, which has increased its water power by a much larger percentage during the same period.

* * * *

Preventing Metal Corrosion

Approximately 300 million dollars' worth of metal structures fall every year in the United States owing to corrosion, and with a view to preventing this a Corrosion Institute is to be formed. It is estimated that Great Britain could not produce enough metal to replace the world's structures that are wrecked every year by corrosion.

* * * *

New High Power Wireless Station

Wireless enthusiasts, and particularly owners of crystal sets, will regret to learn that in all probability the B.B.C.'s new high power station at present being erected at Daventry, Northamptonshire, will not be completed before August. The original intention was to open the station this month, but the work has proved greater than was at first anticipated and the opening has had to be postponed. The new station will use the same power and work on the same wave-length (1,600 metres) as Chelmsford, which was only built as an experimental station and will be closed as soon as Daventry is completed.

America's Latest Submarine

Further to our recent paragraph regarding large submarines we now learn that the latest United States submarine is twice as large as the biggest undersea vessel ever before built in America. It is the submarine cruiser V-1, launched at the Portsmouth Navy Yard last summer, commissioned a few weeks ago, and now is in service with the U.S. Navy.

The V-1 is 341 ft. in length, 27 ft. maximum breadth, and of 2,164 tons displacement. She is propelled by four Diesel engines developing 6,500 h.p. and has a surface speed of 21 knots and a submerged speed of nine knots. Her armament consists of six 21-inch and one five-inch torpedo tubes, a 51 calibre rifle, and two machine-guns.

V-1 is the first of three submarine cruisers, and is designed primarily to accompany the fleet at sea in any weather and to maintain any speed of which the fleet itself is capable.

* * * *

Cathode-Ray Oscillograph

The Liverpool University has acquired a cathode-ray oscillograph, one of four in use in this country. With the instruments at the University it is now possible to measure such small amounts of power as a ten-billionth of a horse-power!

* * * *

Hydro-Electric Works in Italy

The continued development of hydro-electric works in Italy is shown by a report from Rome. This states that no fewer than 67 new works of a total of 300,000 h.p. have been brought into operation in the past two years, and that in the same period a beginning was made with 51 more works with 27 reservoirs, which are to yield 364,000 h.p. Further hydro-electric works are projected, particularly in the province of Trient and in four years Italy will have hydro-electric works of at least 3,000,000 h.p., or twice the power available in 1914.

* * * *

A New Motor Ship

An interesting single-screw motor ship, the *Raby Castle*, has recently been built by the Caledon Shipbuilding and Engineering Co., Dundee. The vessel is of about 4,900 tons gross, with an overall length of 412 ft. 9 in., a breadth of 52 ft. 3 in. and a depth of 37 ft. She is engined with an eight-cylinder North Eastern Werkspoor motor, the largest of its type yet installed in a single-screw ship.

The main motor is designed for a normal output of 2,200 brake horse-power, at a speed of 92 revolutions per minute. The eight cylinders each have a bore of 28¾ in. and a stroke of 4 ft. 3 $\frac{3}{16}$ in. All auxiliaries are electrically driven, with the exception of a small steam boiler to be used only for emergency starting. The ship has undergone successful trials and has taken up her work, which lies between New York and the Far East.

* * * *

N.S.W. Hydro-Electric Station

The Premier of New South Wales recently opened at Nymboida, 27 miles from Grafton, N.S.W., another Hydro-electric station, with a capacity of 2,000 horse power. It will supply the needs of Grafton, South Grafton, and Ulmarra, whilst connection is also being made with the municipality of Maclean, some 56 miles away so that power will be available to farmers along the river.

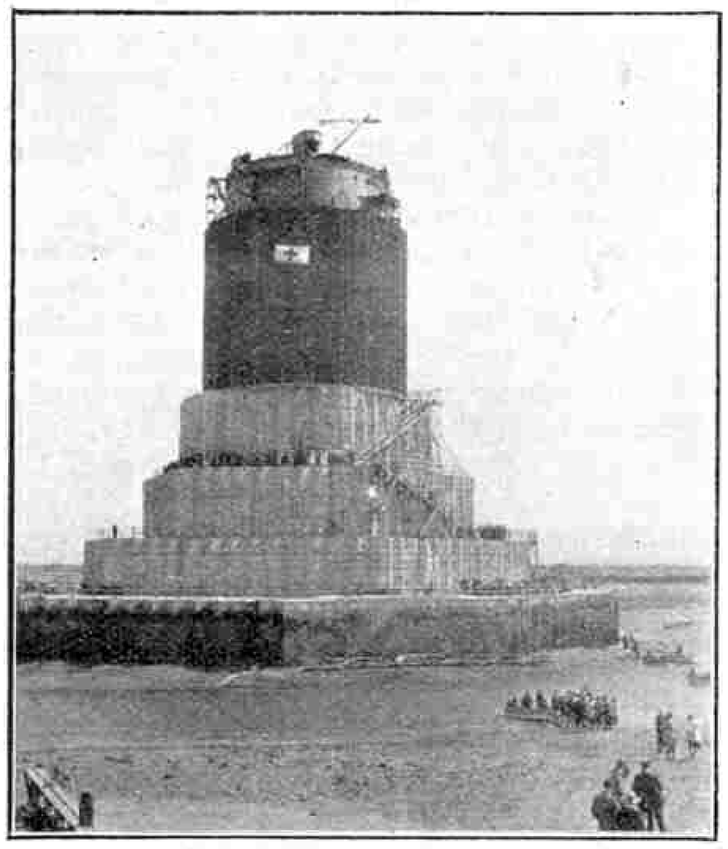
Remarkable Towers

Photo] [*F. Cordingley*

We illustrate two remarkable structures both of which are engineering achievements of considerable merit, although differing widely in almost every particular.

The photograph above shows the Blackpool Tower, which, graceful and elegant, rises to a height of 500 ft. Built of steel girders, it was constructed entirely for pleasure.

Below we illustrate one of the "Mystery Towers" of the war, broad and massive



and as different in appearance from the Blackpool Tower as it is possible to imagine. These towers were constructed for—nobody knows what, hence their name! Some say they were to be used for generating devastating death rays to protect our coasts against submarines. Others assure us that they were to carry more powerful searchlights than have been imagined, and with big guns working in unison, would "win the war" for the Allies. Whatever was to be their use, they were not completed when the Armistice was signed. The one in our illustration (at Shoreham, by the way) was thrown open for inspection by the public, who are to be seen on one of the galleries, the proceeds being given to local hospitals, hence the Red Cross flag on the tower.

Can any of our readers tell us for what the "Mystery Towers" were really built?

Joint Power Plant

Two 33,000-volt cables are to link up the Corporation power plants of Halifax and Huddersfield, so that when the load is light one station can be shut down altogether.

Canadian Hydro-Electric Development

The latest report issued by the Dominion brings the figures of hydro-electric development in Canada up to 1st June 1924. At that date the total water power in actual use was 3,569,275 h.p. and of this 2,696,997 h.p. was being developed by central stations, 503,039 h.p. by pulp and paper mills, and 369,239 h.p. by other industries.

The total installed generator capacity in the Dominion was 2,046,104 kVA at 1st June 1924.

The latest figures of the water power available show 18,255,316 h.p. at ordinary minimum flow, or 32,075,998 h.p. at ordinary six months' flow.

* * * *

Marine Oil Engine for R.M.S.P. Liners

Messrs. Harland & Wolff Ltd., have recently had under test an eight-cylinder four-cycle Burmeister & Wain type double-acting marine oil engine, the largest built in Great Britain. The engine is designed for an output of 10,000 b.h.p. at 110–120 r.p.m. Two of these engines will be installed in a new liner of 22,000 tons, at present being built for the Royal Mail Steam Packet Company.

* * * *

Completed at Last

H.M.S. "Effingham," the new cruiser that is to take over the duties of flag ship and replace the "Chatham" at the East Indies Station, has now carried out her sea trials. Built at Portsmouth Dockyard, she was laid down on 2nd April 1917, but was not launched until June 1921, construction having been held up until the Navy Estimate provided the money required to complete her. Her displacement is over 9,750 tons, length overall 605 ft., breadth 65 ft., and mean draught 17¼ ft. The turbine machinery develops 65,000 shaft horse power, and the ship is designed for a speed of about 30½ knots.

Owing to the long time the cruiser has been under construction she was once referred to in the House of Commons as H.M.S. "Methuselah!"

* * * *

Motor Ship Era

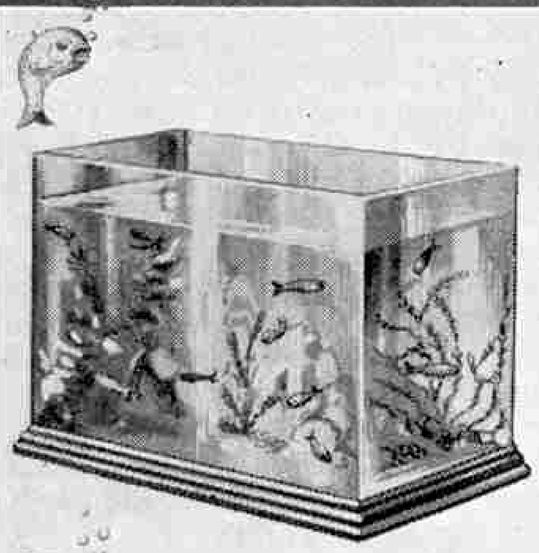
The most interesting and noteworthy feature of the annual report of Messrs. Harland & Wolff Ltd., the famous ship-builders and engineers, is a prediction regarding the future of the motor-ship. Speaking of these vessels the report says:—"Although their first cost is at present retarding somewhat their more general adoption, it seems probable that within a comparatively few years (unless some way should be found of greatly increasing the efficiency of steamships) the motor ship will supersede the steamship in much the same way as in the course of last century the steamship superseded the sailing ship."

It is interesting to note that Messrs. Harland & Wolff at present have 21 vessels under construction. Of these vessels 13 are motor-ships, three of which are mail and passenger liners of over 20,000 tons gross register each.

* * * *

Fire in Coal Mine

A cutting 1,600 ft. in length, from 45 ft. to 65 ft. in depth, and 70 ft. in width has been made in Pennsylvania for the purpose of stopping a coal mine fire. The cutting, which took a year to make, was made in the overburden between the fire and the unburnt coal, and the remainder of a 9 ft. seam of coal was saved as a result of this cut.



How to Start an Aquarium.

by

W. COLES-FINCH

(Resident Engineer, Chatham etc. Water Co.)

I. GENERAL HINTS

PROVIDED the necessary few minutes each day are devoted to the keeping of a fresh water aquarium, no hobby affords so much interest with so little trouble. Unfortunately there is a general impression that, given a tank or a bell glass and a few fishes, a satisfactory aquarium is an accomplished fact. Alas for the poor fishes! Under such conditions they are condemned to a lingering death. If a student of pond and river creatures were to raise a protest against "cruelty to fishes" most people would certainly think he had "a bee in his bonnet." Nevertheless it is a fact that much cruelty is unwittingly inflicted on these delicate creatures.

Cruelty to Fishes

We frequently see live fishes offered for sale in our shops. They are generally accommodated in an inverted bell glass which is placed in as prominent a position as possible in the shop window. The result is that in summer the sun's rays beat down upon the fishes during a considerable part of the day and the unfortunate creatures, having no shelter from the glare, get no seclusion or rest. We shall probably notice also that small pieces of biscuit and other food lie at the bottom of the tank, polluting the water, and as a general rule there is an entire absence of plant life without which the fishes cannot thrive.

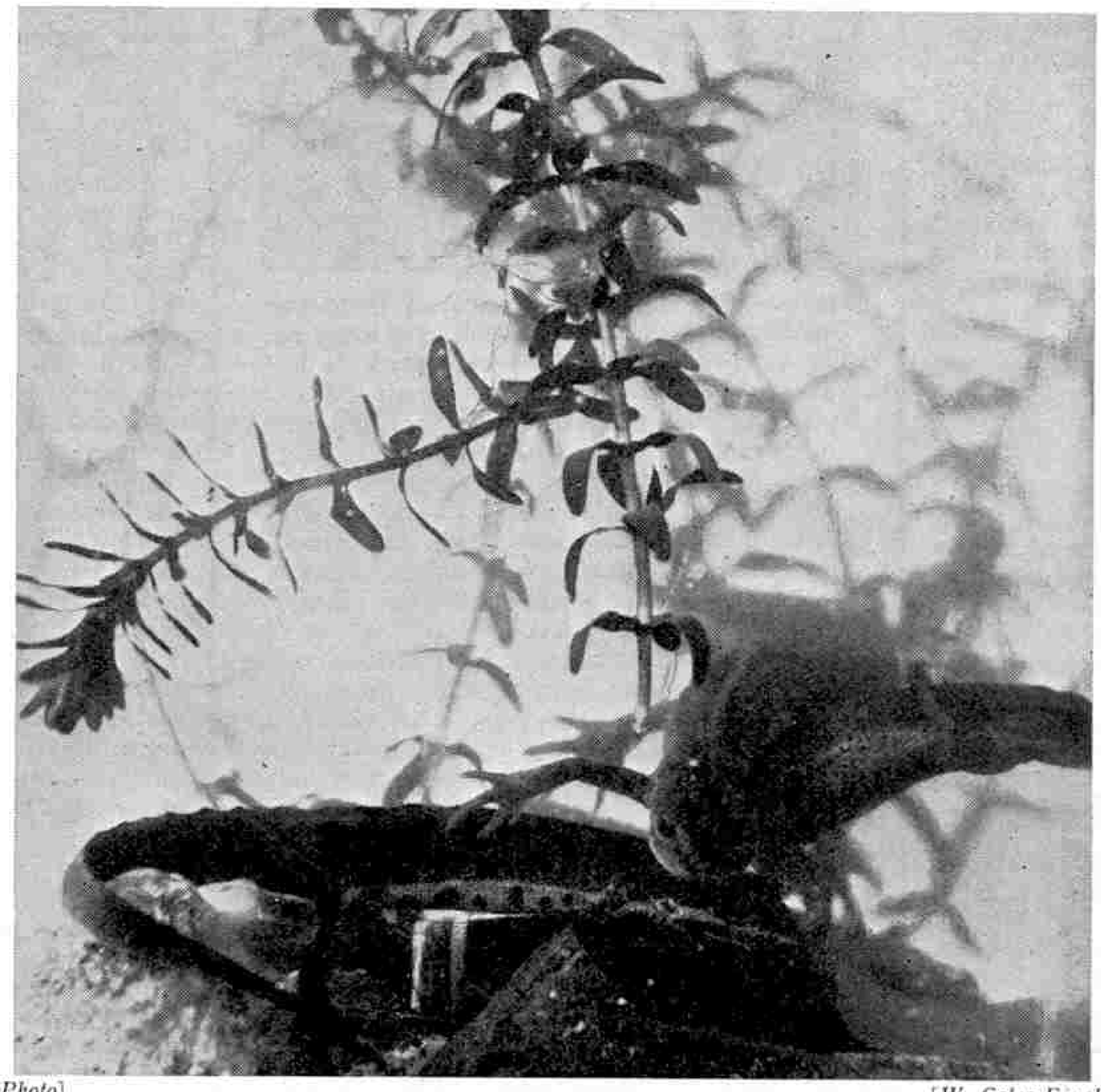
In this tank of exhausted water the fishes swim round and round with painful weariness, their mouths skimming the under surface of the water. Day by day they linger through their miserable lives until a purchaser buys them when we can only hope that a better fate awaits them, which assuredly will be the case if they fall into the hands of one who knows how to tend and care for his new pets. Even with the best care, however, it is possible that many of the fishes will not survive long on account of the injuries already inflicted upon them by the neglect to which they have been exposed.

The reader will probably ask what is meant by "exhausted" water, why the fishes need protection from the direct rays of the sun, and why they skim the surface of the water. The answers to these questions are interesting and of great importance if the correct method of maintaining an aquarium is to be understood.

How Fishes Breathe

Everybody who has watched fishes swimming about in an aquarium has noticed that they ceaselessly open and close their mouths. It is quite natural to think that in doing this the fishes are drinking water, but as a matter of fact they are breathing. The water is received by the mouth of the fish, driven to the gills by an action similar to that of swallowing, and expelled through the gill openings. During this process the delicate membrane of the gills takes up from the water the oxygen necessary to the life of the fish. It is important to understand that the oxygen consumed by fishes is not the oxygen that forms one of the chemical constituents of water, but is contained in the air that is dissolved in the water.

Having made use of the oxygen breathed in, fishes exhale or breathe out carbon di-oxide (carbonic acid gas) just as we ourselves do. This carbon di-oxide is the main food of growing plants which, by the aid of sunlight, break it up and utilise the carbon, along with water and a small quantity of mineral constituents, to build up their structure, afterwards giving out the oxygen that remains. Thus fishes breathe in oxygen and breathe out carbon di-oxide, while the aquatic plants absorb the carbon di-oxide and return oxygen to the water. In other words the fishes and plants in an aquarium supply one another's needs and in order that life in the aquarium may proceed on sound lines a balance must be effected between the plant and the animal life.



Photo] [W. Coles-Finch

Canadian Water-weed
Notice the beads of oxygen on the leaves of the plant

"Exhausted" Water

This brings us to the

question of "exhausted" water, that is water exhausted of the life-giving oxygen. This exhaustion is caused by having too many or too large fishes in the aquarium, with the result that they use up the oxygen faster than it can be replaced by the water plants and faster than the water surface in contact with the air can replace the supply. When this condition arises the fishes are driven to the surface of the water for air, and the fact that the little creatures are doing this is an infallible sign that the water is incapable of supporting its inhabitants and that they are suffering.

In such a tank the conditions are very similar to those that would exist if we were forced to breathe the same air over and over again. The terrible consequences of such a state of affairs may be realised by recalling the awful tragedy of "The Black Hole of Calcutta." In 1756 Suraj-ud-Daula, the Nawab of Bengal, captured Calcutta and at the point of the sword drove 146 Europeans into the guardroom, a chamber barely 20 ft. square and having only two small windows. The result of crowding so many people into such a small room was that the air quickly became exhausted of its oxygen and unfit to support life, and next morning when the room was opened only 23 of the prisoners were found alive!

Renewing the Supply of Oxygen

When the fishes in an aquarium show by coming to the surface of the water that there is a shortage of oxygen, prompt steps must be taken to remedy the evil. First the number of the occupants of the aquarium must be reduced. Then a portion of the water should be drawn off and replaced by fresh water or the water should be aerated by injecting air, as will be described in a later article. The tank should then be watched carefully for some time to make certain that good conditions have been restored before the fishes that have been removed are replaced.

Fishes that have been negligently treated should not on any account be bought for an aquarium. The unnatural breathing of atmospheric air instead of air dissolved in the water is liable to set up inflammation in the delicate gills of the fishes and the little creatures will not recover from this malady. Fishes should be bought only from those who understand and care for them and who may be relied upon to supply only healthy specimens.

Shade for the Fishes

Fishes cannot thrive if they are always exposed to the glare of sunlight. They need shade and seclusion, which, in their natural surroundings, is provided by various plants overhanging the pond or stream in which they live. Further, out in the open the sun's rays strike downward only, whereas in a glass bowl the illumination comes from all points and this is very trying to the fish. It is necessary therefore to provide some means of shading the aquarium from too much sunlight.

Another source of trouble in an aquarium arises from leaving unconsumed food in the tank, where it turns sour and quickly poisons the water.

Starting an Aquarium

When you have finally decided to start an aquarium the first thing to do is to obtain a tank or bell glass. Do not be persuaded to purchase one of the fashionable fish globes, for everything placed in these globes is distorted in appearance, so that the inhabitants are never seen as they really are. If your tank has putty or paint likely to come in contact with the water it should be given a coating of shellec and spirits of wine, obtainable from a chemist. This coating is impervious to water and will securely seal up any impurity.

Next procure from the nearest builder's yard a small quantity of pea-gravel or coarse sand, scald it, wash it, and rinse it with clean water and then place it in the aquarium. If the tank is small a rockery is not advisable because it displaces too much of the more necessary water. If desired, however, a few pieces of rough vitrified brick may be cemented together and used for this purpose.

The next step is to visit a local stream or pond and collect some suitable water plants, which should be washed clear of mud. If your selection includes the Canadian Water-weed, starwort, mare's tail, or other trailing varieties, gather the plant up into small bunches, attach each to a piece of broken flower-pot and bury this in the sand to act as an anchor for the plant.

Filling the Tank

Stand the tank near or in front of a window where, without inconvenience to the household, it can receive light and yet at times be shaded by a blind or otherwise until the plants have grown sufficiently to afford the necessary shade and seclusion.

The tank should then be filled with clear spring, stream or rain water, or failing these, water from the domestic tap. The water should be poured very gently into the tank so as not to disturb the sandy bottom or the plants. However carefully this is done, however, the water will no doubt be cloudy at first, but it will soon clear. By means of a thin rod or pencil the plants should be assisted to spread themselves gracefully and naturally in the water. This is the first step in the stocking of an aquarium.

Need for Patience

The time is not yet ripe for the purchase of the fishes, and it is necessary to be patient for a while if success is to be assured. The plants must be carefully watched and their progress noted. When, by indications of natural growth and form, they show signs of thriving, or when streams of silvery beads of oxygen rise from their leaves to the surface of the water, we may be sure that all is well. Another visit may now be made to the pond or stream for the purpose of collecting a number of water snails which should be placed in the tank. These snails will act as the scavengers in our aquarium, their occupation being to eat the confervoid growth that forms on the glass of the tank, as well as decaying portions of the water plants.

Introducing the Fishes

The object of first establishing plant life is to ensure that when the fish are placed in the tank they will be in a healthy environment. Just as the trees and plants of our land live and thrive on carbon di-oxide and give back to the atmosphere the life-giving oxygen, so in our miniature water world the plants prepare the water for its occupants.

In our next article we shall give instructions how to make a glass tank and later articles will deal with suggestions in regard to the best and hardiest fishes with which to stock the aquarium, together with methods of aeration, feeding, and other necessary matters to help the lover of aquatic creatures to attain success in the management of his aquarium.

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Matched Headphones

As everyone knows headphones are the most important part of a Receiving Set, and because of the extremely minute currents with which they are expected to operate, they must be of great sensitivity. Too little attention is paid to getting both receivers of a double headphone exactly matched in tone. This is a very important point for with unmatched receivers a signal sounds differently in one of the receivers than in the other. In the case of faint signals it would really be better if one of the receivers did not operate, as the user unconsciously concentrates his attention on the receiver giving the louder signal, and thus loses the value of the second 'phone.

To those readers who wish to get the very best out of their sets, the "Matched Tone" Headphones (made by Messrs. Brandes Limited, 296, Regent Street, London, W.1), should particularly appeal. The 'phones are matched with an ingenious apparatus that secures the same tone in strength and sensitivity to within five degrees. Signals in each therefore sound exactly alike, and in this way even the faintest signals are clearly heard and free from 'mush.' Brandes' Matched Tone Headphones are so well made that they are not easily thrown out of adjustment, and there are no moving parts to wear out.

We recommend all our Radio readers to send to the makers for a booklet giving full particulars of these 'Phones. On request the firm will also send particulars of their Table Talker, an instrument which, both in quality and price, should appeal to owners of valve sets.

Competition Results

(*See page* 307)

Sharp Eyes

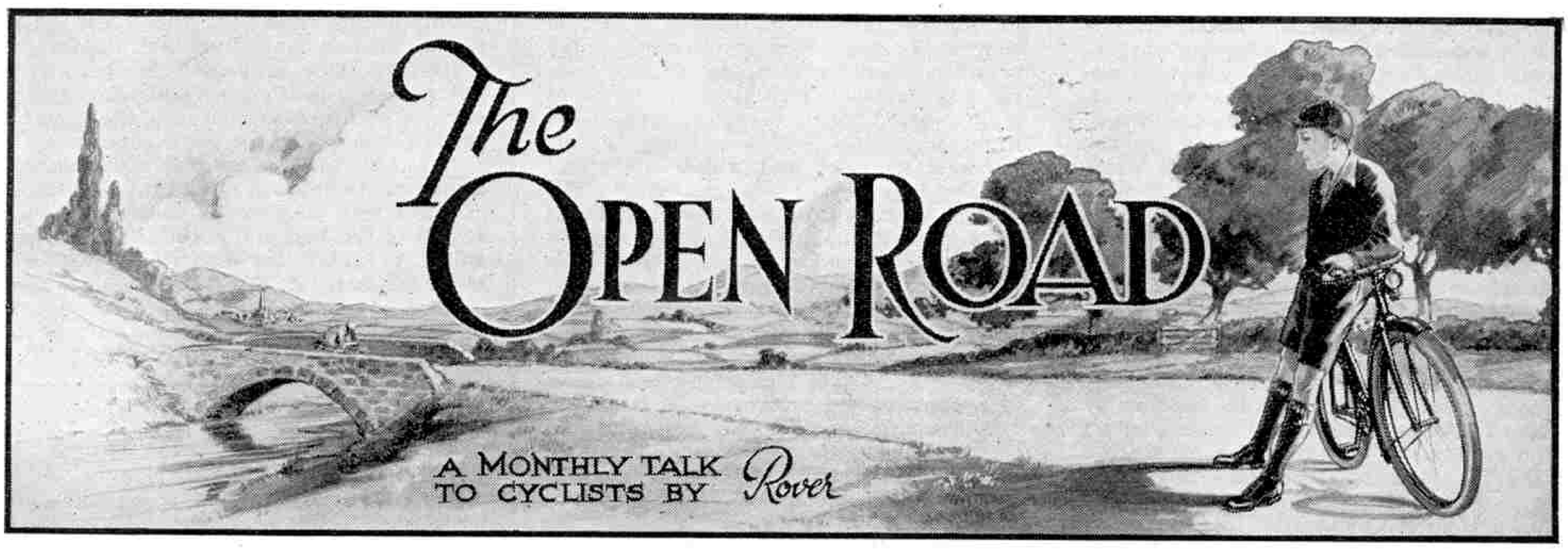
The drawing of the motor-car, horse and trap, and steam-roller in their somewhat bizarre surroundings brought in a vast shoal of lists of mistakes. In common with many competitors in the Home Section of this contest, a large number of entrants pointed out the absence of fittings on the vehicles that could not possibly have been visible to anyone on the side-walk where our erratic artist installed himself. Other competitors could have saved us trouble by checking their own lists and deleting items entered more than once. Another difficulty in judging was caused by the use of foreign or colonial terms for items on the drawings, particularly in regard to the motor car.

Long and patient scrutiny and correction have resulted in the final award of the three prizes offered as follows:—First Prize (Hornby No. 2 Goods Set), Harold Turner (Hastings, New Zealand). Second Prize (Hornby No. 1 Goods Set), Bertie Graveur (Sydney, New South Wales). Third Prize (Meccano No. 1 Radio Receiver or Double Headphones), R. V. Shutte (New Brighton, Christchurch, New Zealand).

"Bargain Hunt"

It was interesting to find the Overseas entrants for this contest arriving at a different verdict from that of our home readers. To decide from the voting the first in order of popularity of our advertisers was not difficult, but two firms tied for second place and very little behind them came the third. Votes were carefully counted with the following results:—(1) Nelson T. Hillier (Horsmorden); (2) Messrs. Witherick (Coventry) and Messrs. Watkins (Barnet) a tie; (3) Messrs. Lisburn & Townsend (Liverpool). One competitor, Jack Weatherway, Brantford, Ontario, sent in a correct entry and to him is awarded the first prize of stamps to the value of £1/1/- to be chosen from the list of any firm advertising in the "Meccano Magazine." Prizes of a free advertisement in the "Meccano Magazine" to advertise their own wants or sales are awarded to C. W. Watkins (Sydney, N.S.W.); Arthur Wilson (Hamilton, Ont.) and H. V. Reynolds (Georgetown, British Guiana).

The two consolation prizes awarded by Nelson T. Hillier for the two best runners-up under and over 12 years of age have been won by V. Sammie (Trichinopoli, S. India), collection of 1,000 different stamps, and Stan. Hutchinson (Ebendale, New Zealand), Standard Catalogue of postage stamps (1925 edition).



LAST month I gave some hints about touring, and I see from my mail bag that already several readers have completed enjoyable tours and they write to say they intend planning many more tours during the summer holidays. Good luck to them and to all who take to the Open Road! There is no more enjoyable holiday than one spent awheel, among the hills or on the moors, where the pure bracing air gives new life and makes us feel that it is good to be alive.

Don't Ask the Way!

All Meccano boys—cyclists and non-cyclists alike—should be able to read a map. Maps are as fascinating as good books, and to those who hold the key to their secrets they yield endless information. To every cyclist on tour a good map is essential, and assuming that you have arranged the main lines of the tour the next thing is to buy a good map of the district. But it is no use buying a map unless you can read it—you will be like an uneducated savage with a good book!

Although there is nowadays such a large number of road users—both motorists and cyclists—it is surprising how very few know how to read a road map correctly. No doubt this is largely due to the excellent system of sign-posting that obtains in most parts of this country. Sometimes, however, as in the west of Scotland, if you cannot read a map you will probably be lost, for sign posts do not exist and you may ride for hours without meeting anyone of whom you can ask direction.

A good map will save you a great amount of time and trouble and it should be your endeavour to complete your tour without once having to stop and ask the way. There should be no difficulty about this to anyone who can read a map.

Road maps are made in such large variety that it is impossible to describe here exactly how each one is to be read. Certain general hints, however, will be found of use in every case.

Scale, Surface and Signs

In map-reading there are three main things to study—the scale on which the map is drawn, the means employed to indicate the nature of the surface of the country mapped, and the conventional signs used in the map.

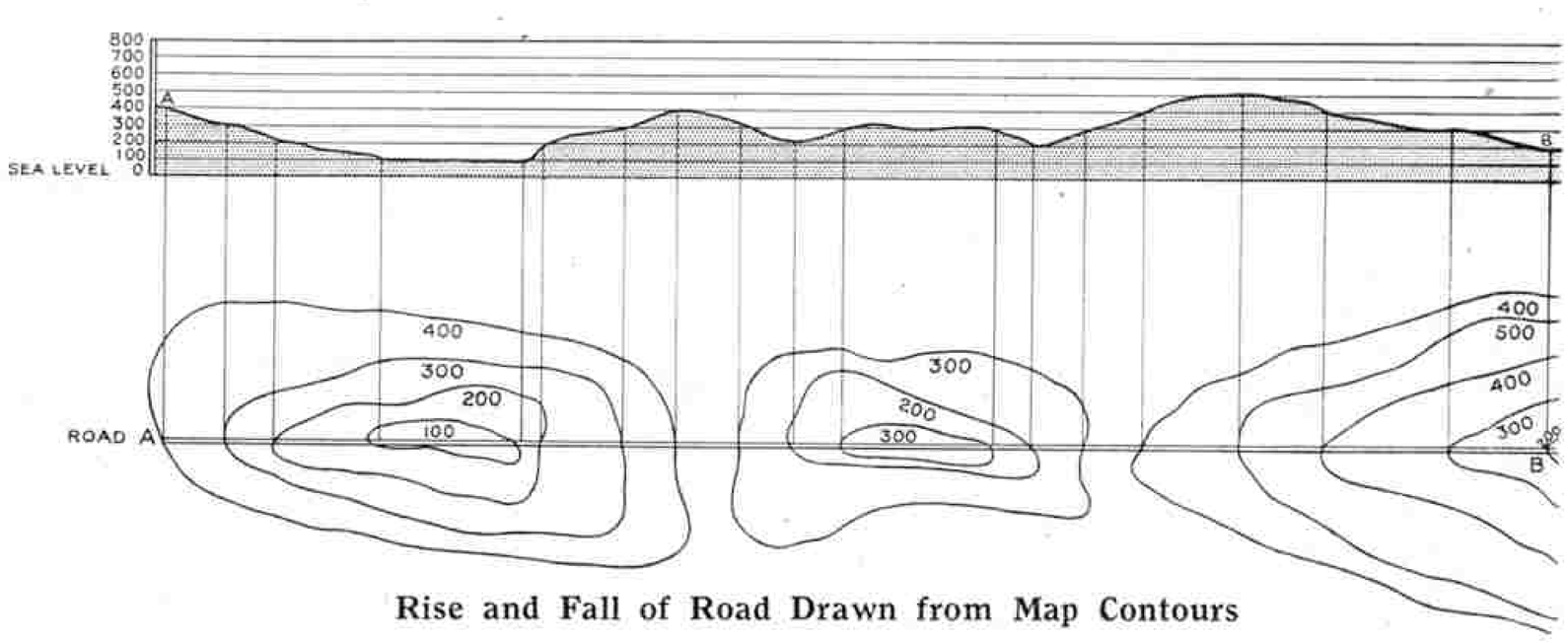
The scale on which the map is drawn will probably be given in one of three ways. It may be shown by a statement in the margin, such as "1 inch equals 4 miles," or "2 miles to the inch." Such a statement as the former means, of course, that one inch on the map equals four miles of country, or in the latter case—that two miles of country are represented by the space of one inch on the map.

The second method of showing the distance is by means of what is called a "representative fraction," such as 1/63,360, which means that one unit on the map equals 63,360 units on the road. If the unit given is one inch, therefore, it is obvious that one inch on the map is equal to 63,360 inches—or one mile—on the road.

The third method is by means of a line marked off in equal divisions, each of which represents a given distance of country. This method is known as a "plain scale."

The Meaning of Contour

The next thing to consider is the "contour" showing the nature of the country with which the map deals, and this will interest intending tourists for the nature of the country naturally determines the type of roads that run through it—they will be hilly or otherwise.



Rise and Fall of Road Drawn from Map Contours

Contours are lines drawn on a map at different points showing the height above sea level at the particular point marked. Look at a good map and you will see that there are numerous lines drawn over it in the form of irregular circles or ovals. Each line has a number at its side, which number indicates in feet the height above sea level of the ground enclosed by that line. In some maps the different heights are shown by means of different colours or shadings—green for the lower areas, light brown for higher regions and dark brown for the highest points.

On most maps contour lines are marked off at intervals of from about 25 to 50 ft. according to the nature of the country they represent and the scale on which the map is drawn. Sometimes, if the country is very hilly, the differences between the contours may be shown at 150 ft. intervals, but if there is very little rise or fall only 25 ft. intervals may be used.

Before you can make use of the contour lines of your map you must find out this difference in level between them. If, for instance, they are plotted at 50 ft. intervals, then the ground shown between two adjacent contours rises or falls 50 ft. By referring to the scale the distance between the lines can be ascertained and the average gradient worked out.

Drawing a Contour

It is very interesting to draw out the contour of the roads over which your tour will take you, for by so doing it is possible to follow accurately the rise and fall of the road and see exactly what hills you will encounter. Such a drawing may be easily prepared in the following manner.

On a sheet of paper draw a number of horizontal lines, say, not more than one eighth of an inch apart, and mark them at the left-hand side with the figures given on your map for the different contours between the two points denoting the beginning and end of your ride. The lowest line of all represents sea level and is marked "O" and the other numbers

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for the different contours are allotted in ascending order to the various lines. Now place the lower edge of the paper—which of course is parallel to the lines you have drawn—on the map, so that the edge connects up the two chosen points, and draw vertical lines from where the edge of the paper crosses the contours to the horizontal lines above indicating respectively the same heights. Then by joining up the ends of these lines, a curve will be produced that will show exactly the rise and fall of the road. This description may appear rather complicated, but a few minutes' study of the accompanying diagram will make matters quite clear. A and B represent the starting and finishing points of the ride. The lower part of the diagram represents the contours shown on the map, and the upper part shows how the curve representing the rise and fall of the road is obtained from the contours.

Special contour books of most of the roads in the United Kingdom may be obtained and these are very useful to the tourist in showing him what hills he has to face.

Before commencing a tour it is best to make a careful study of your map so as to be as certain as possible of the general route before starting out. Every now and then a halt may be called and the map consulted for the next few miles, when the chief features should be memorised and important turnings noted.

Where to Buy Maps

In buying a map it should be borne in mind also that, while large scale maps are most interesting and useful, they are very bulky to carry, and it is often wiser to buy a map which, although drawn on a smaller scale, can be carried conveniently in your pocket. There are many good maps to be bought but the tourist cannot do better than purchase either Ordnance Survey maps or those issued by Messrs. Bartholomew & Son Ltd. (Duncan Street, Edinburgh). If there is a choice as to whether the map shall be of paper or mounted on linen, choose the latter kind every time—they last longer, do not tear when opened in the wind, and are altogether to be preferred.

The signs used on all Ordnance maps are standardised and are known as "conventional signs." By studying these signs the nature of the country to be covered may be ascertained. Fenced roads, for instance, are shown by means of straight lines, and unfenced roads by dotted lines. Two thick parallel lines indicate a first-class fenced road, one thick and one thin line a second-class road, two thin lines a third-class road, and so on. Other signs indicate the position of churches, castles, abbeys and other objects of interest.

If a guide to places of local interest is required, Messrs. E. J. Burrows & Co. (of Cheltenham) publish a large selection covering practically every point of interest in the British Isles. Another good and complete guide is that issued by the Michelin Tyre Co. (81, Fulham Road, S.W.3). This contains much information useful to the tourist, concerning maps, routes, hotels and their charges, places of interest, etc., and it can be conveniently carried in the pocket. Another useful but more expensive guide is the "Dunlop Book," published by the Dunlop Rubber Co. (55-56, Pall Mall, London, S.W.1), but this is really intended for motorists, and while cyclists will find anything they require in it, it is too bulky to be taken on a tour.

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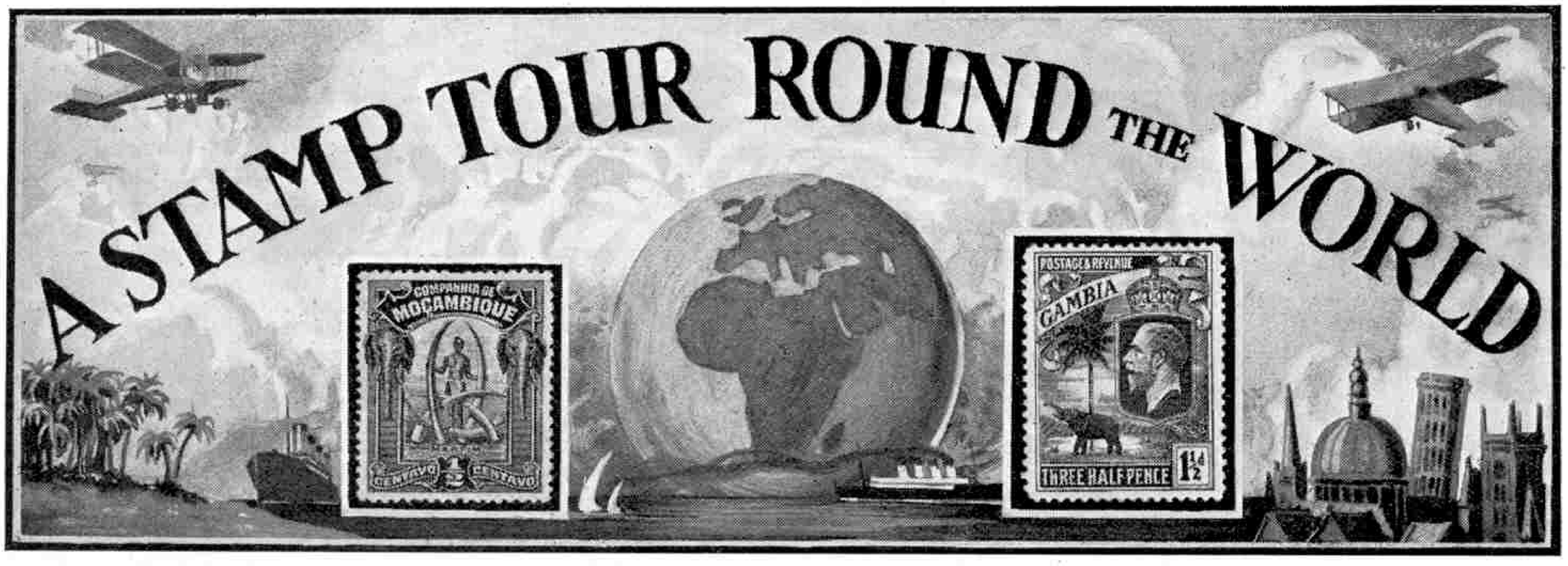


X. THE CAPE, ST. HELENA and MOROCCO

WHEN we have completed our visit to the Victoria Falls, we fly in a south-westerly direction over the Kalahari Desert and across the Orange River, well known to stamp collectors, until we enter the province of the Cape of Good Hope. We eventually reach Cape Town, the capital, an illustration of which is shown in the 1d. stamp depicting a view of Cape Town and Table Mountain as seen from Table Bay. This stamp was issued in January 1900, and was designed by Mr. Sturman. The watermark is a single-lined anchor and the perforation is 14 holes every two centimetres.

Beautiful Scenery at the Cape

Another view of Table Bay showing the mountain had been issued previously. This design, which showed the figure of Hope standing in the centre leaning on an anchor, was the work of Mr. Mountford and was issued in October 1893, with the same watermark and perforation as the stamp already described. These two stamps form a very attractive addition to a collection of the Cape.

Table Mountain forms the northern end of a range of hills that continues southwards into the cape itself. The side of the mountain overlooking Table Bay, at the foot of which is Cape Town, rises as a huge wall over 3,500 ft. in height and two miles in length. At the eastern side of the mountain is the Devil's Peak (3,300 ft.) and at the western side the Lion's Head (2,100 ft.), both of which may be seen in the 1d. value issued in 1893 and described above.

Table Mountain is well known throughout the world for its beautiful scenery, and looking seaward the view from the summit is truly magnificent.

The Great Congo

At Cape Town we regain our ship, which has passed round the Cape while we have been flying inland, and we now sail northwards until the mouth of the great Congo river is reached. Here we anchor our liner in the harbour of the town called Banana, which—to use the words of a famous song—has no bananas! This town stands near the mouth of the river and is one of the finest natural harbours on the west coast of Africa. It affords ample shelter for vessels of the greatest size.

We now board our aeroplanes again so that we may fly up the river until we reach Matadi, a town situated on the left bank of the Congo, 85 miles from its mouth. Matadi is at the highest part of the river that ocean-going vessels can reach, and is the starting point for the railway to Stanley Pool. At Matadi the river is about half a mile in width and the tall cliffs that have hemmed it in higher up its course here sink away and allow it to broaden out.

A view of Matadi was shown on the 5c. values of the 1894 (illustrated on this page), 1910 and 1915 issues, which were engraved and printed by the London firm of Waterlow and Sons, Ltd. The views were taken from the diorama of M. M. R. Mols and P. van Engelm shown in Antwerp (Belgium) in 1894.

The Congo was formerly known as the Zaire and is the second largest river in the world, only being excelled by the Amazon. It is over 3,000 miles in length and drains an area estimated at nearly one and a half million square miles.

Falls Named after Famous Explorer

David Livingstone, one of the first explorers of the Congo, commenced a survey at its source and until his death firmly believed that it was the same river as the Nile. In July 1877, however, H. M. Stanley, whose name will always be associated with this river, was successful in showing that the Congo of Livingstone was the same river as the Zaire of the Portuguese. Thus the identity of the river was finally established and an epoch marked in the political, commercial, and geographical history of Africa.

The Stanley Falls, to which we now fly, mark the division between the upper and middle Congo. They extend along a curve of the river for nearly sixty miles and begin a few miles south of the equator. They consist of seven cataracts and are not of any great height. The last is only about 10 ft. in height, but the river at this point is so suddenly narrowed and the volume of water is so great, that they are more imposing than many cataracts of far greater height. The Stanley Falls were pictured on the 10c. values of the three issues already mentioned.

French Equatorial Africa

We now fly from here to the French Colony of Gaboon on the west coast of Africa, about 1,000 miles away. Our course lies entirely along the equator, for both Stanley Falls and Libreville, the capital of the Gaboon, are practically on this line. The Gaboon is one of the colonies into which French Equatorial Africa (known as French Congo previous to 1910) is divided. The other colonies are Middle Congo, Oubangui-Chari, and Tchad. The last two of these are spelt in various ways and Gaboon is also sometimes spelt Gabun.

All these colonies issued their own distinctive stamps between 1910 and 1924, but in the latter year all were superseded by the stamps then issued under the new combined title for the whole area—French Equatorial Africa.

In 1910, Gaboon issued a view of Libreville town (illustrated here) and in 1900 the whole district under the title of French Congo issued a view of a grove of cocoanut palms growing in the vicinity. Libreville, which has a population of about 3,000, stands at the mouth of the river Gaboon and is a fairly important coaling station for ships.

An Island Prison

Leaving Equatorial Africa and sailing in a south-westerly direction, we come to St. Helena, famous in history as being the last home of Napoleon Bonaparte. This famous man was "detained" here by the British government from 1815 (after the battle of Waterloo) until his death in May 1821.

(*Continued overleaf*)

A Stamp Tour Round the World—

(*Continued from page* 299)

There is now a very small and decreasing population at St. Helena and there is only one town.

Two views of Jamestown have been pictured on St. Helena stamps. The ½d., 2d., and 1/- values of the King Edward issue, the ½d., 2d., 3d., and 1/- values of the 1912 and the 1d. and 1½d. values of the January 1922, King George issues, show the Government House, while the remaining values of the same series show the wharf. This is an open roadstead on the leeward side of the island at St. James's Bay. The invention of preserved foods rendered it unnecessary for ships to call at St. Helena for new supplies of food. Also, the opening of the Suez Canal has been another factor in lessening the amount of trade done by the island.

The Beautiful Stamps of Morocco

From St. Helena we turn northward and following the great sea-route from the Cape to Europe pass by Ascension, through the Canary Islands and arrive at Morocco in the north-west corner of the great continent.

The French Post Office established in this country has been responsible for some of the most beautiful view stamps that have ever been issued. J. de la Nézière has the credit of having designed them, while A. Mignen, A. Desarrois, A. Delzers and C. Coppier have engraved the various values.

First issued in 1917, perforated 13½ to 14, the series of seventeen values from 1c. to 10fr. makes a magnificent page in the stamp album. In 1923 the series was reissued with the same views but re-drawn and printed by the new heliogravure process by the Helio Vaugirard and perforated 13½. These stamps are even more handsome than the earlier issue, the new method of printing being ideal for this class of work. They may be distinguished from the earlier issue by the words Helio Vaugirard at the foot below the frame.

In the meantime a series from 25c. and 2fr. had been issued for the aeroplane post in 1922 showing a view of Casablanca from the air. This also was designed by J. de la Nézière and printed by the Helio Vaugirard.

Casablanca, or Dar el Baida meaning "the white house," is the port to which our ship makes its way on arrival at Morocco. It is the wool and grain port for the central parts of Morocco and is third in importance of the towns on this coast.

The stamp already mentioned, which is illustrated here, clearly shows the harbour wall and the wharves. These have been constructed since 1907 to afford sheltered accommodation for ships at all states of the tide. Previous to this time the roadstead had been exposed to the north-west winds and ships anchored therein were consequently not well protected from storms.

NEXT MONTH:—

THE MEDITERRANEAN.

"*Tête-bêche*" Stamps

Tête-bêche stamps are always of great interest to collectors. "*Tête-bêche*" signifies a stamp printed upside-down with reference to its neighbour.

Until about 1890, plates for printing stamps consisted of a large number of separate blocks, or "*clichés*" as they are called, each containing the impression of one stamp, and all held together in a frame. In these circumstances it sometimes occurred that one of the stamp-blocks fell from the frame and was replaced upside-

down in error. Nowadays, with improved printing methods, it is not often that this occurs, and with the closer inspection of all printed sheets it is rarely that an accidental *tête-bêche* makes its appearance.

All stamps that are made up into booklets are now printed in sheets of a special form. These have half the stamps one way up and the remainder the other. Why these are so arranged will be seen from the accompanying diagram, which represents two rows of such a sheet. The stamps A and C are normal, while B and D are inverted. The spaces 1, 2 and 3 form the paper through which passes the stitching to bind the books.

Imagine a sheet of stamps composed as shown, but having twenty rows instead of only two. A sheet of covers for the booklets is taken and laid on the table, then a sheet of advertisements is laid on top, followed by a sheet of stamps, then another sheet of advertisements, and so on until the other cover is reached. Four rows of stitching are now run up the sheet, one at 1, two at 2, and a fourth at 3. Afterwards the bound sheets are cut between A and B, the two rows of stitching in Fig. 2 and between C and D, and also between every two horizontal rows. Thus 40 books of stamps are made out of each bound sheet.

Usually these special sheets are not sold complete, but only cut up and bound in the booklet form. Sometimes, however, as recently in the Union of South Africa, there is an alteration in postage rates and a value previously used in the booklet is no longer so required. These special sheets are often sold over the counter and then *tête-bêches* may be purchased in the ordinary course, as in the case of the pair illustrated.

1	A	A	A	B	B	B	2	C	C	C	D	D	D	3
1	A	A	A	B	B	B	2	C	C	C	D	D	D	3

Electricity—(*cont. from page* 289)

and the lever L is touching contacts Q T; that is, suppose it is in the "spacing" position. Further, suppose that a dot comes over rod B. This rod will immediately rise into the upper hole and thus, through crank D, rod G and collar J, throw the lever L over to the "marking" position, as already described.

The rod X then removes the rod B from the hole and the tape is moved forward one hole. This brings the second hole of the "dot" over rod A, which will enter it, and, through crank C, rod H and collar K will return the lever L to the "spacing" position. Thus a short reversal of current will have taken place in the line circuit, recording a dot at the receiver.

If, on the other hand, a dash had been punched in the tape, B would have entered the first hole as before and sent the current reversal to line. The rod B would be removed from the hole, but the tape would have to be propelled forward twice before the other hole came over the rod A and allowed it to return the lever L to "spacing." Thus a longer reversal of current would have taken place, recording a dash at the receiver.

This somewhat elaborate mechanism thus translates the perforations in the tape into short and long reversals of current, which in turn operate the receiver and cause short and long ink marks to be made on its roll of tape. The ink-marked tape is handed to operators who transcribe it into written characters on telegram forms, which are then despatched to their destinations.

In Fig. 2 is illustrated a complete station set equipped for working on the Wheatstone automatic system. On the extreme right is shown the receiver. Next to it at the back is shown the galvanometer that is connected in the line circuit to indicate whether or not the set is working correctly. In front of this is a transmitting key for working by hand when necessary, and with this is associated the sounder in its screen on the extreme left. Between the hand key and the sounder is the transmitter and behind this is the "artificial" line, consisting of adjustable condensers and resistances, the use of which was described last month.

In the past four articles we have traced the fascinating story of the land telegraph from the early attempts of Charles Morrison in 1753 to the elaborate systems of to-day. We have seen how the pioneers overcame their difficulties one by one and we have followed the working of the many different circuits.

Very great advances have been made during the past century and one wonders what will happen during the next hundred years. Wireless is the line telegraph's most immediate menace, but it is scarcely probable that it will entirely replace the line telegraph owing to the small number of different wave-lengths available. Until some super-sensitive yet constant tuning circuit is evolved, the line telegraph will undoubtedly maintain its supremacy for medium distance signalling.

In the next article in the Electrical series we shall commence the wonderful story of the Submarine Telegraph. First we shall describe the difficulties, failures and conquests of the pioneers. Then we shall pass on to a description of how the cables are constructed and laid, and finally we shall describe how the various pieces of apparatus operate.

Wonders of Wembley

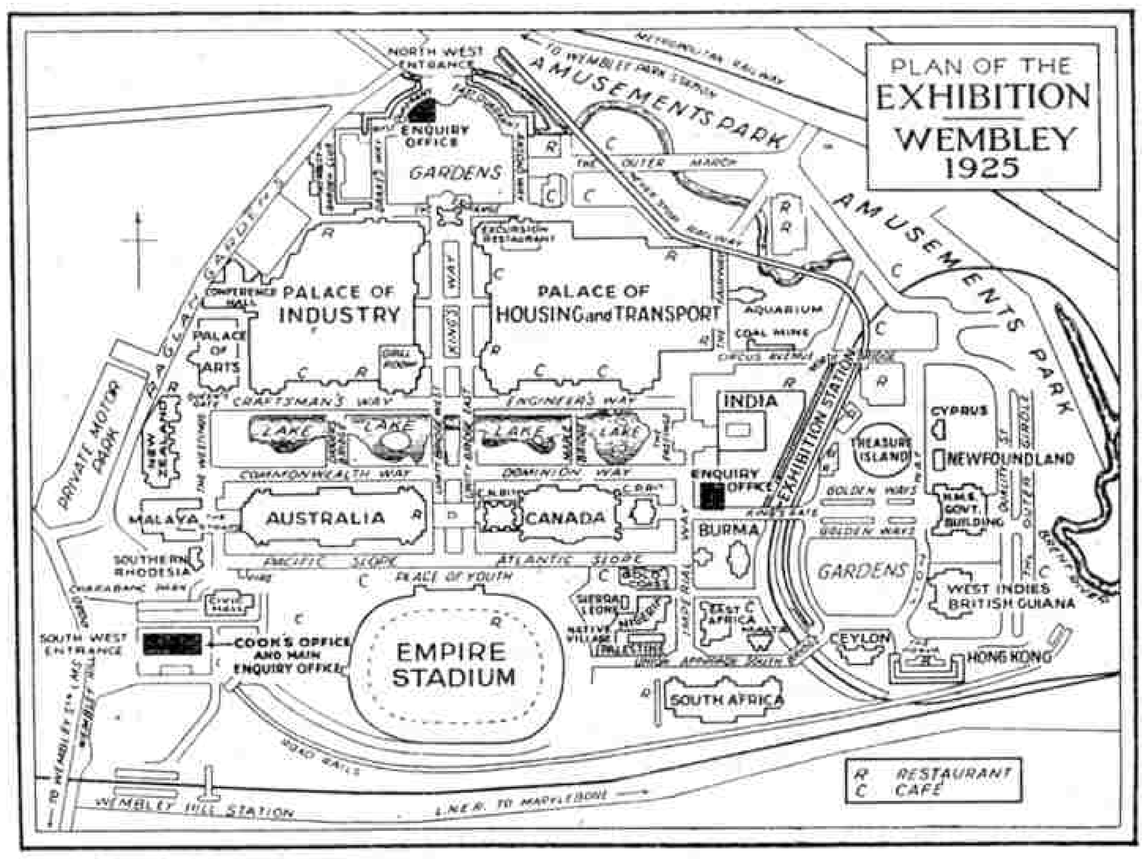
New Attractions of the 1925 British Empire Exhibition

THE great Exhibition at Wembley has opened for its "second innings." Once more an ever-increasing crowd streams through its pavilions and fills the broad walks and avenues from "Drake's Way" to South Africa, and from New Zealand to the "Outer Girdle."

The Transport Exhibit

Those who visited Wembley last year will find many new attractions—indeed, this year's Exhibition promises to more than equal in interest that of 1924. One thing that Meccano boys may be inclined to regret, however, is the passing of the great Palace of Engineering. This year the building is now known as the Palace of Housing and Transport and although the latter section is undoubtedly of fascinating interest, Housing, which is just now a subject of vital importance to the welfare of the country, has not, perhaps, quite the same thrill for Meccano boys as Engineering.

An area of 60,000 sq. ft. is devoted to the exhibit. Visitors are shown the latest devices by which the modern house may be built without detracting in the least from the beauty of the countryside, while in the Transport section an elaborate motor exhibit shows how cars and trucks are produced and assembled in every detail.



Plan of the 1925 Exhibition

Wonderful Working Models

In the British Government building, which again occupies its imposing site at the end of the Golden Ways, the exciting events of the famous Zeebrugge raid are again re-enacted.

Wonderful new working models are on view in the Palace of Industry where the exhibits of home industries include chemicals, printing, wool, jewellery, pottery and domestic utilities. The pavilion, as a whole, provides a splendid monument to the romance of trade. As one passes through it, the story is unfolded of man's ingenuity in devising wonderful methods by which raw materials are turned into food, clothing, or articles of luxury, without which our modern civilisation would be impossible.

In the Canadian pavilion a huge diorama—a series of pictures let into the walls of the main building—may be seen. Said to be the largest scenic effect of the kind ever produced, it is illuminated by over 2,000 lights and there are working models throughout.

Last year the Palace of Arts attracted two million people during the six months that the Exhibition was open, and it is fully believed that it will prove equally as popular this year.

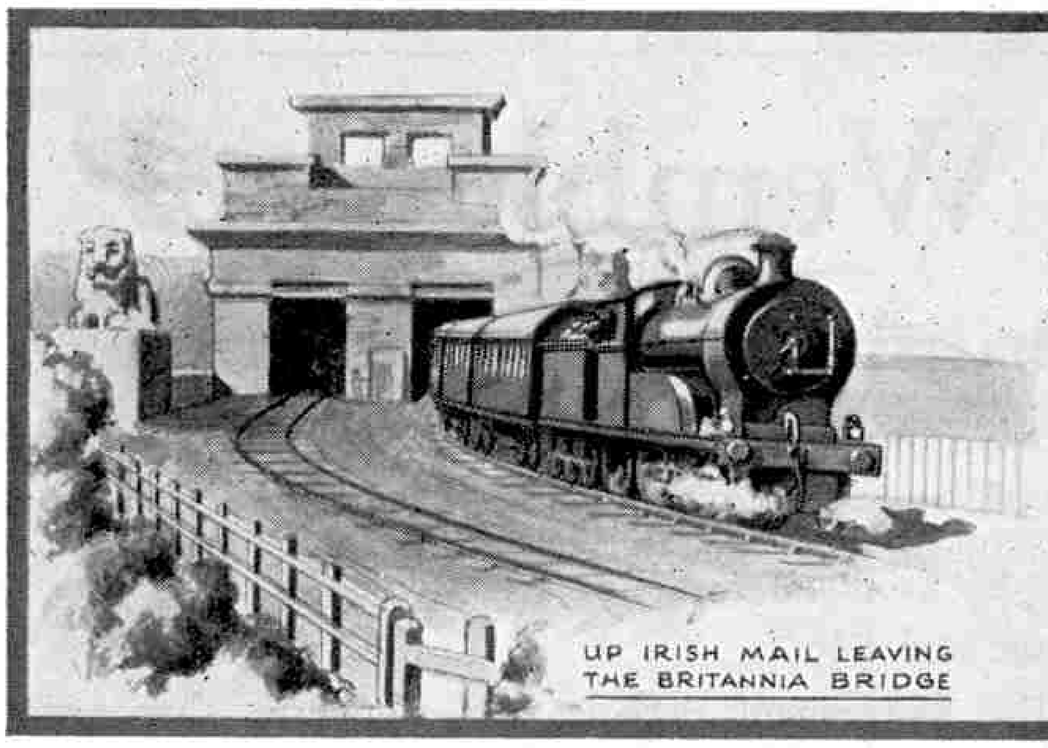
Frolic and Fun

The Amusement Park is more wonderful than ever. "Treasure Island" is veritably a children's paradise, with perfect miniature steam railways, swings, roundabouts, and other such fascinating things, and it is inhabited with marvellous people whom every child who reads a story-book would instantly recognise! Even real-life kings and queens have been seen there, although no one was more surprised than little Joan Mollison of Ealing, when told that the "kind gentleman" who lifted her up into the seat beside him on the miniature railway was the King of England. It may be easily understood why she was quite overcome with shyness when she realised afterwards that hundreds of people had been watching her all the time as she rode with the King, followed a few coaches behind by the Queen with a coach-load of fortunate children whose faces were wreathed in smiles.

Modern locomotives form an important feature of the Transport exhibition. The Great Western Railway shows the "*Pendennis Castle*," which took part in the recent important loco tests described elsewhere in this issue, while the London, Midland and Scottish Railway is represented by one of their splendid "Baltic" tank locos described in our April issue. The London and North Eastern Railway sends one of the new "Mikado" mineral engines, the "*Flying Scotsman*" Pacific Loco, and the latest in luxurious sleeping cars; the Southern Railway a 2–6–0 engine of the "810" class and a Pullman Car, and the Metropolitan Railway an electric locomotive of the latest design, with side panels removed to disclose various mechanical details.

A machine that prints, counts and numbers tens of thousands of railway tickets per hour forms another very interesting exhibit.

One section in the Palace of Industry provides a striking display of the important part that gas plays in manufacturing, as well as illustrating the wonderful manner in which it is nowadays used in overseas homes. A stall in this exhibit looks something like a village "general" store, for it is covered with a variety of products, from shoe-laces to salmon tins. Gas was necessary to the manufacture of all these objects, and is used in about 3,000 trades.



UP IRISH MAIL LEAVING THE BRITANNIA BRIDGE

Railway News of the Month

L.M.S. Rolling Stock

No less than 2,591 new passenger coaches and 30,000 wagons and trucks for goods traffic have been ordered from the various works owned by the L.M.S. and by private firms at Nottingham, Birmingham, and Leeds. The passenger coaches are mainly to be vestibuled saloons, or corridor vehicles, and include 235 vestibuled third-class coaches, 35 having brake compartments, to be built almost entirely of steel, the only wood necessary being Australian "Karri," practically non-inflammable. Forty kitchen cars of a similar construction will be used in connection with this stock.

* * * *

Wembley Railway Exhibit

One of the most interesting exhibits at this year's Exhibition will be a complete working model railway, exhibited by the combined railway companies. The model will show all the details of signalling and train control. Other interesting exhibits by the railway companies will include a Pullman car, a sleeping saloon, and a 1,200 h.p. electric locomotive. Of particular interest will be the double-line junction with crossover road with a signal box for working it. A loco, brake van, goods wagon and passenger coaches form the rolling stock for this exhibit.

* * * *

New Railway for Canada

A new railway, 230 miles in length, is to be built at an estimated cost of £600,000 in North Western Quebec, to connect the National Trans-Continental Line with the direct lines to Ottawa and Montreal. The railway, which will open up some ten million acres of undeveloped land, will be known as the Southern Abitibi. It will connect up Amos with Mont Laurier and Maniwaki, from where connection will be made over existing lines with Montreal and Ottawa.

* * * *

L.M.S. Loco under Test

Besides the Midland type compound locos being tested on the old L. & N.W. line, tests of various locos are being carried out on the northern part of the Midland Section between Settle and Carlisle. The Horwich "Dynamometer" car is being used to keep a record of the work done on various trains by the locos under notice. These are 4–4–0 super-heater compounds of the Midland design, a Caledonian 4–4–0 superheater, and two superheated 4–6–0 L. & N.W. locos, one a two-cylinder "Prince of Wales" class, the other the powerful four-cylinder loco "Sir Francis Dent" of the well known "Claughton" class.

Re-numbering of Locomotives

The L.M.S. is re-numbering its 10,000 locomotives and as British railway locos are classified and numbered according to power within their groups, each of the present divisions of the L.M.S. is being regarded as a separate entity. There are 35 companies—8 constituent and 27 subsidiary—in the L.M.S. group and each division is to have its own block of locomotive numbers.

These are Midland Division, 1—4999. Western Division A, 5000—9999. Western Division B, 10,000—13,999. Northern Division, 14,000—17,999.

The L.M.S. owns 10,344 locomotives, which figure will be substantially increased as a result of the £14,000,000 development scheme referred to in our last issue. Many years must elapse, however, before all the numbers in the present allocation are exhausted.

* * * *

L.N.E.R. Locos

During 1924 the several works of the L.N.E.R. built 204 new locomotives, private firms completed orders for 44 express locos, and 125 heavy 2–8–0 goods locos—built to Great Central Railway designs during the war for foreign service with the British army—were bought.

The passenger locos constructed included 24 of the Great Central 4–4–0 "Director" type, three of the North Eastern "Pacific" type, and 40 of the Great Northern "Pacific" type.

There is now at work a stud of 57 "Pacifics," 52 being of Mr. Gresley's design, and five of Sir Vincent Ravel's "North Eastern" type. The latter have been named after famous cities on the N.E.R. section.

Some 295 new locos including 74 for passenger service, will be built this year. Darlington Works are to build 10 of the G.N. "1000" type express goods or mixed traffic locos 2–6–0 type in addition to a batch of 50 already under construction there. They are three cylinder locos with a boiler 6 ft. in diameter, and can take their turn with the "Pacifics" on 500-ton expresses if necessary.

Other locos to be built here are five North Eastern type 4–8–0 tank locos for goods traffic; 15 express 4–4–0 type, probably Great Central "Director" type; and 43 goods locos of a new 0–6–0 class.

Gorton Works (Great Central Section) has an order for 50 six-coupled tank locos of Great Eastern Railway design for local passenger trains. A Manchester firm has an order for twelve 0–6–2 tank locos, and a Newcastle company one for 13 Great Central 4–6–2 type fast tank locos.

Economy of Longer Trains in U.S.A.

According to American estimates, the use of cheaper coal and longer trains has saved something like £20,000,000 during the past twelve months. Old engines have been gradually replaced by modern locomotives, pulling heavier loads with scarcely any increase in the amount of coal burned. Classes are arranged on many of the Railways where employees are taught by experts how to economise in fuel. The economy in fuel alone for the first half of the year is estimated at about £3,000,000.

* * * *

Improvements on G.W. System

The G.W.R. is arranging to carry out extensive improvements on its Devon and Cornwall sections. These include the extension of the locomotive shops at Newton Abbot; the re-arrangement of the Plymouth engineering depot.; a steel girder bridge, of 60 ft. span, to replace the present stone bridge over the Laira Old Road at Plymouth; an embankment to take the place of the present viaduct at Truro; the extension of the present Newquay branch line from Blackwater Junction to Chacewater; and the reconstruction of Paignton Station to deal with the increased passenger traffic.

* * * *

Preventing Rail Corrosion

The Delaware, Lackawanna and Western Railroad (U.S.A.) spray the permanent way once a year with a mixture of 45% asphaltum, and 55% crude oil, in order to prevent the corrosion of the rails, keys and bolts. A truck carrying the spraying apparatus, which includes a steam driven air compressor, is pushed in front of a train of tank trucks containing the mixture. The trucks are all supplied with steam heaters for the purpose of heating the oil, which is forced through strainers to the sprays by means of compressed air. The sprays are mounted one on each side of each rail, and the train travels at about 25 m.p.h.

The cost of keeping the track free from corrosion is less than £1 per mile per annum.

* * * *

G.W.R. Record

The G.W.R. claim as a record a run recently made by one of the new "Castle" class locomotives, the "*Carnarvon Castle.*" The train was the 11.15 a.m. Paddington to Bristol and the distance of 106.7 miles was covered in 98 minutes. It should be mentioned, however, that this is a slip service and consequently has an advantage over the usual "start to stop" run with the complete train, the scheduled time for which is 106 minutes.

Speed on the G.W.

Recently 160 signal boxes between Plymouth and Paddington were linked up in a chain 227 miles in length, sending each other the code "Line clear for Plym B." Meantime the special train conveying the new American Ambassador thundered along on its way to London. Its load of 350 tons was drawn at a speed of 60 miles an hour, by the G.W.R. giant locomotive "Shooting Star."

To facilitate signalling all the ocean specials leaving Plymouth are coded as "Plyms," the letters A, B, C, etc. being added according to the weight and route of the train. "Plym A" is the fastest schedule and is timed to do the non-stop run of 227 miles in 4 hours 4 minutes. "Plym B" works under a schedule of 4 hours 10 minutes, and sometimes knocks as much as 10 minutes off her handicap, and so beats the fastest schedule by 4 minutes.

On a subsequent occasion to that mentioned above, passengers landed from the Mauretania did the 227 miles journey in 243 minutes, or seven minutes under schedule in spite of three minutes' delay by signals.

We hope to give further details of these trains in an early issue.

* * * *

Lost—a Ring !

The old colour of the L.M.S. Rly. steamship funnels (buff, topped with a ring of red and a black cap) is being changed to buff and black only, the red ring disappearing.

* * * *

Loud Speakers at St. Pancras

Loud speakers are being used at St. Pancras to announce the time and platform of departing trains. Passengers waiting for a train recently were astonished to hear a loud voice saying, "Hurry up for the 3.30 to Leeds, Platform Five."

* * * *

Eggs-traordinary !

Just above the buffer on the front of a railway wagon that arrived at Hull recently was a bird's nest containing several eggs !

* * * *

Hostel for L.M.S. Railwaymen

With a view to giving stranded crews of engines more comfortable quarters when away from home, the L.M.S. have decided to build a new hostel at Camden Town for the benefit of drivers, firemen and guards. The hostel will contain 90 bedrooms, reading, dining and recreation rooms, and will be fitted with central heating. In addition to a modern laundry, a special room will be reserved as a drying room for clothes after long journeys in bad weather.

* * * *

Automatic Signalling Posts

Automatic signalling has saved £12,000 a year in signalmen's wages on the Metropolitan Railway, and enabled a 60% increase in the number of trains. Similar arrangements on the City Railway have enabled eleven boxes to be closed altogether whilst four more need only be opened at certain times.

Alterations at Paddington

The Directors of the G.W.R. have authorised an extensive re-arrangement scheme for Paddington Goods Station, to be carried out at the same time as the renewal of the roof and the columns supporting it. This roof has been in existence since 1868 and the respacing of the columns will enable a greater width of platform to be provided for the introduction of the latest mechanical handling appliances. A considerable reduction in working costs is anticipated as a result of these alterations.

Handling a 53-ton Girder

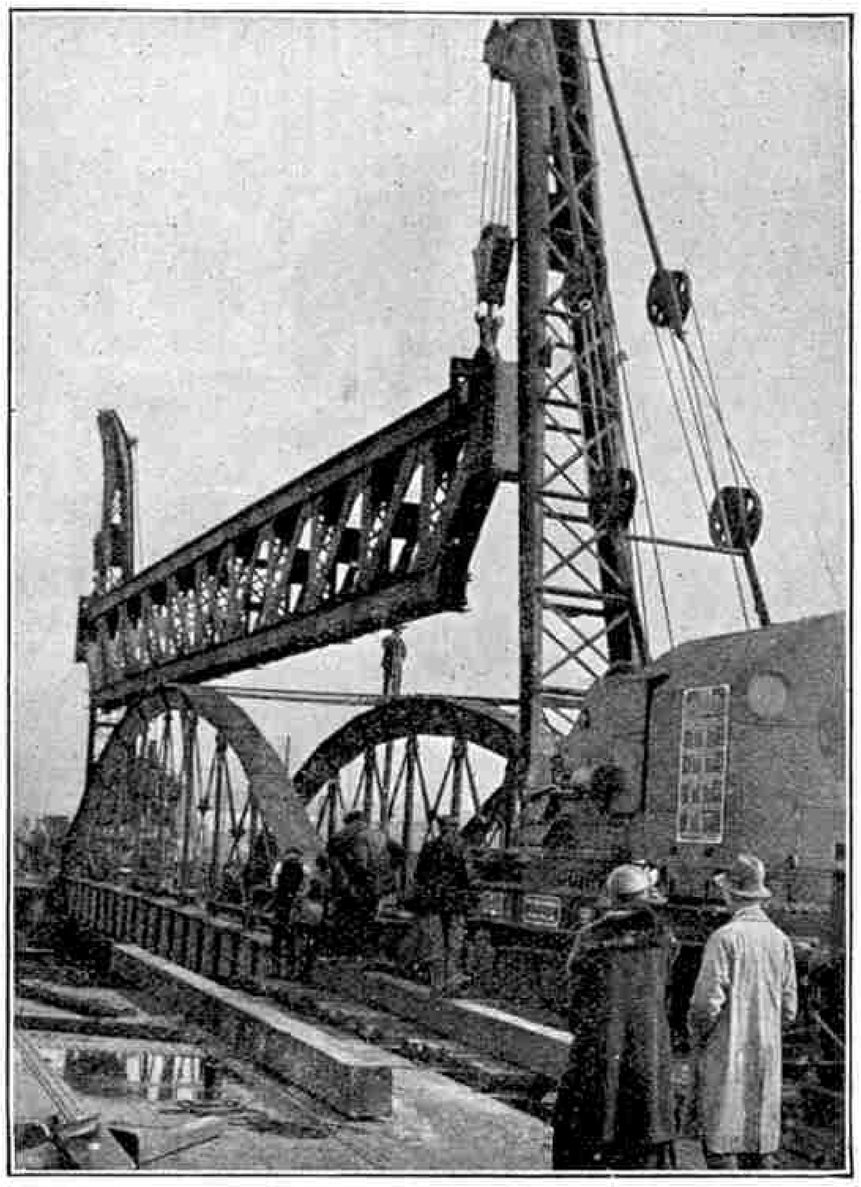


Photo courtesy] [*G.W. Rly.*

Our illustration shows two 36-ton Railway Cranes placing a girder in position on the Viaduct that spans the main channel of the River Usk. The girders are 102 ft. 6 in. in length, 10 ft. 6 in. in depth, 2 ft. 6 in. in width, weigh 53 tons, and support the new "up" line of the G.W. Railway. The new girder is seen, after it has been unloaded from its truck—which is standing on the existing bridge—being lifted over the top of one of the old main girders, 16 ft. 6 in. above rail level.

L.M.S. Locos

This year the L.M.S. proposes to build 220 heavy passenger and goods locos and 15 light 0–4–4 tank locos for local service round Glasgow (Caledonian section).

Crewe, Derby, and St. Rollox (Glasgow) Works are turning out 70 Midland type 0–6–0 superheated heavy goods locos. St. Rollox is also to build five of the 0–4–4 tanks mentioned above, the other 10 being on order with a Manchester firm, which is also building five 4–4–2 tank locos for the London, Tilbury and Southend Section of the old Midland line.

A large number of 0–6–0 goods tank locos of the Midland "1900" class are being placed in service, many coming from a private works at Leeds.

On various parts of the system numbers ranging from 7100 to 7163 have been noted on these locos which, although of Midland design, are strangely being numbered in the L. & N.W. group (5.000–9999).

"Flying Scotsman" Returns to Wembley

The "Flying Scotsman," the world-famous "Pacific," which has travelled more than 100,000 miles in somewhat less than two years of service, has arrived at Wembley again and was jacked broadside over a space of 30 ft. from the railway siding to a standard track in the Palace of Housing and Transport, where she will remain during the Summer. On this occasion she was accompanied by one of the new L.N.E.R. sleeping cars, which embody the latest ideas in luxury travel.

* * * *

Alterations at Crewe

Owing to the great increase in size and weight of modern locomotives, the L.M.S. has decided to considerably alter the locomotive works at Crewe, at a cost of nearly £500,000. High-speed electric cranes will be provided for the old erecting shops, all the steel plant will be remodelled, and the latest types of machinery will be introduced. The scheme will be begun almost immediately, plans already having been passed.

* * * *

New Whistle for Electric Locos

A new type of whistle has been devised for use on electric locomotives. The compressed air type already in use gives quite sufficient warning, but its drawback lies in the fact that in the event of a number of locos being near one another it is difficult to detect which one is whistling, owing to no steam being seen. The new whistle has a small tube adjacent to it and at the same time that the whistle sounds a puff of white "smoke" is discharged through a special fluid being atomised and discharged by compressed air.

* * * *

Three "Garratt" Locos for Chili

Messrs. Beyer, Peacock & Co., of Manchester, have recently received an order from the Nitrate Railways Co. Ltd., for three "Garratt" locomotives of the 2–8–2: 2–8–2 type. The locos will have coupled wheels 3 ft. 6 in. in diameter, the cylinders being a bore and stroke of 21¼ in. by 20 in. They are designed to burn oil fuel and will have a rigid wheelbase of 12 ft. with an overall length of 75 ft. The total weight of each loco will be 170 tons.

The locos are being specially constructed for service in Chili, between Iquique and Cartas, a difficult section 20 miles in length with an average gradient of 1 in 25. Over this route they will haul loads of 360 tons.

The "Garratt" type of loco was fully described and illustrated in the October 1924 number of the "*M.M.*"

* * * *

Non-Stop Train Trials

A series of trial non-stop runs is being held by the L.M.S. over Shap summit with the object of ascertaining the capabilities of different types of locomotives. The experimental train is timed at pre-war speed and recently was drawn by th Crewe-built loco "Kestrel," betwee Carlisle and Preston.

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-for Young Bill

The fever of the experimenter has fired young Bill's ambition. In the picturesque vernacular of our American friends he's "cottoned on to the hull bunch"—vacuum tubes, hook-ups, new wave bands, right down to the last binding post. He tunes in the distant stations now with his *Matched Tone* Headphones, and is content. They bring in the faintest signals, their delicate supersensitivity making them unexcelled for long range telephony.

And the *Table-Talker* is just fine. To his credit, Bill refuses to acknowledge the family's praise. "It's not me tinkering about," he says, "the *Table-Talker* always came through as if you were actually in the studio, and with no scratchy notes." *Ask your Dealer for Brandes.*

Table Talker
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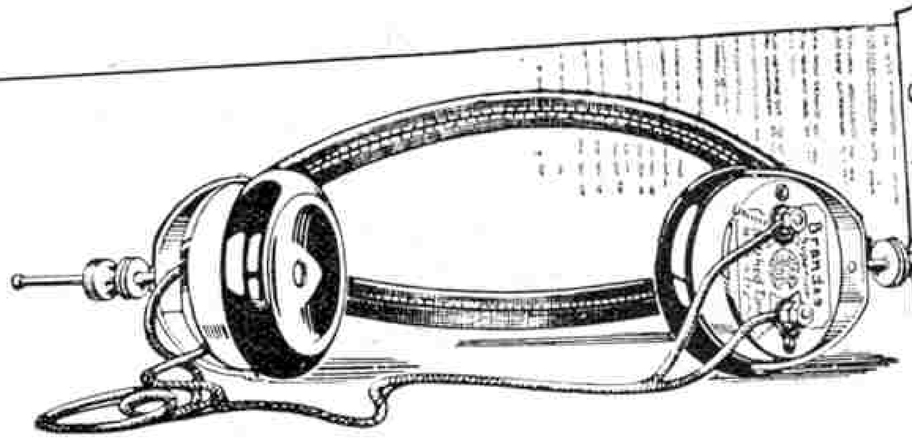


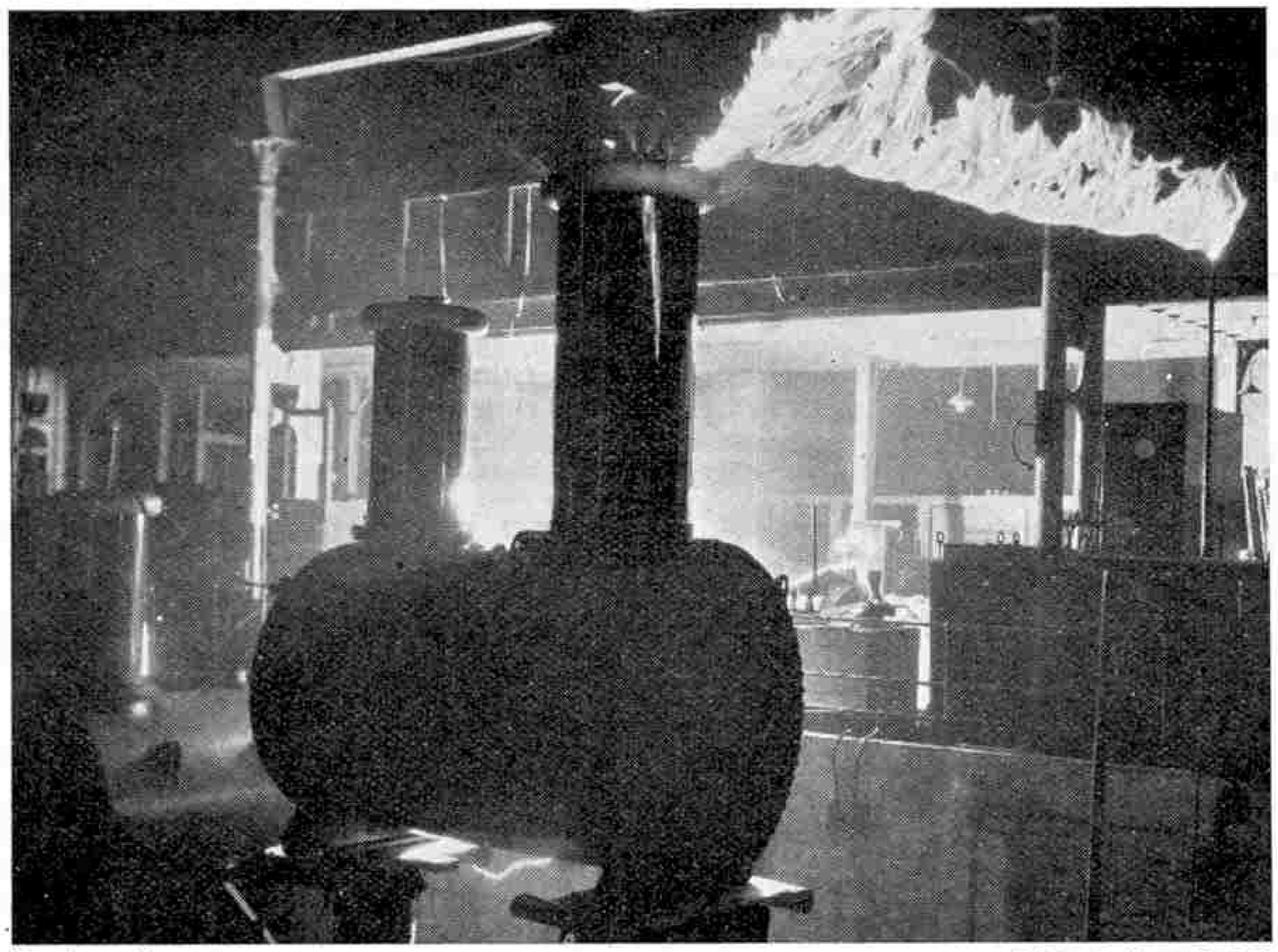
Matched Tone Headphones
20/-

A One-Million Volt Arc

Wonderful Electrical Experiments With High Voltages

AN event of great historical interest in the progress of electrical engineering in this country took place a few weeks ago at the works of Messrs. Ferranti Ltd., Hollinwood, Lancashire, when for the first time in Great Britain a pressure of one million volts (R.M.S.) above earth was obtained.

Our illustration gives an excellent impression of the experiment. Three pressure transformers were connected in cascade under the Dessauer patent, of which Messrs. Ferranti are the sole licensees for the greater part of the British Empire. The primary of the first transformer, not shown in the photograph, was supplied with alternating current at 12,000 volts and gave 333,000 volts on its secondary. The second transformer seen on the left, was insulated from earth, and one end of its primary winding was connected to the 333,000 volt terminal of the first transformer, the other end being connected to a 321,000 volt tapping. In this way the secondary winding of the second transformer raised the pressure to 666,000 volts. Similarly the third transformer, seen in the centre of the photograph, was insulated from earth and supplied from the second transformer, and thus the pressure was raised to one million volts above earth, resulting in a wonderful sustained arc 9 ft. 6 in. in length.



Courtesy of] [*Messrs. Ferranti Ltd.*

A Million-Volt Arc, 9 ft. 6 in. in length

Some Curious Effects

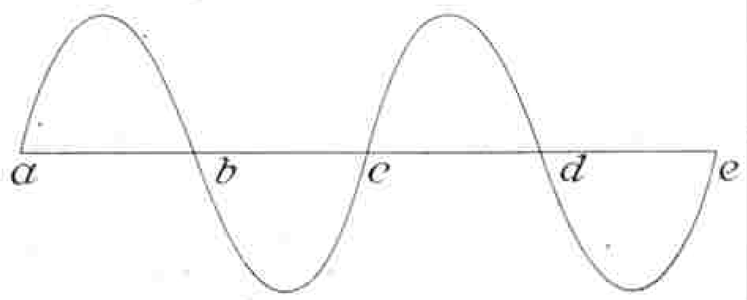
During the experiment a number of curious effects were observed. In the illustration an arc is seen underneath the third transformer in the centre of the picture. This is due to the transformer not being far enough away from the side of the testing pit, with the result that an arc jumped from the metal sheet on which the transformer stood to the pit side. The glow behind this transformer resulted from a short circuit that occurred in a lamp holder, fixed on a pillar of the building, through high pressure being induced in the wiring.

All the voltage figures given are what are known as "R.M.S." values. These three letters stand for the words "root-mean-square," which are employed to express virtual voltage or current values. No doubt few of our readers are sufficiently far advanced in their electrical studies to have reached the question of virtual values, and although the matter is complicated and difficult to understand, we will try to explain it in the easiest possible manner.

Alternating Current Waves

A direct or continuous current is one that flows constantly in one direction only, whereas an alternating current, such as was used to produce this great arc, changes its direction at regular intervals of time and attains the same value in each direction. Alternating currents therefore flow in waves. Various wave forms are obtained in practice, according to the construction of the generator and the kind of load it is supplying. The simplest form is the symmetrical wave shown in the accompanying figure.

In this curve the current flows through a set of positive values during the interval of time represented by the distance a—b, and through a corresponding set of negative values during the equal interval represented by the distance b—c. When the current has passed through a complete set of values, positive and negative, we say that it has performed one "cycle." In the diagram the period required for the completion of one cycle is represented by the distance a—c. The time of duration of one cycle is called its "period." Messrs. Ferranti passed into the first transformer a current of 12,000 volts at 60 periods. This means that the current performed one complete cycle in one-sixtieth of a second.



"R.M.S." Values

When a continuous current is passed through a wire it produces a certain heating effect. An alternating current also produces heat in the same way, and if its heating effect is the same as that of a certain continuous current, then the value of that continuous current is the "virtual value" of the alternating current. As our diagram shows, the value of the alternating current is not constant, but rises and falls from zero to maximum and back to zero, and its heating effect at any instant is proportional to the square of the current flowing at that instant. The mean heating effect during one half-period is thus proportional to the mean of the squares of all the varying instantaneous current values during that time. In order, therefore, to obtain the virtual value of the current, we must find the square root of the mean of the squares of all the instantaneous values. For this reason the virtual value of an alternating current is often called its "root-mean-square" or "R.M.S." value. This value is, of course, lower than the maximum or "peak" value, and the actual peak value of the pressure across the 9 ft. 6 in. arc was 1,400,000 volts.

During the past few years Messrs. Ferranti have made many interesting testing transformers, including one to give 500,000 volts in a single unit.

This experiment illustrates in a striking manner the great practical value of alternating current in that it may be readily transformed to very high pressures. Similarly it may be re-transformed to low pressures when required. It should be remembered that such transformations do not result in any increase or decrease of the total energy of the current. Apart from a very slight loss of energy in the form of heat, a transformer delivers the same number of watts as it receives, but at a different voltage.

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2/-	Box, O	...	6 Models.
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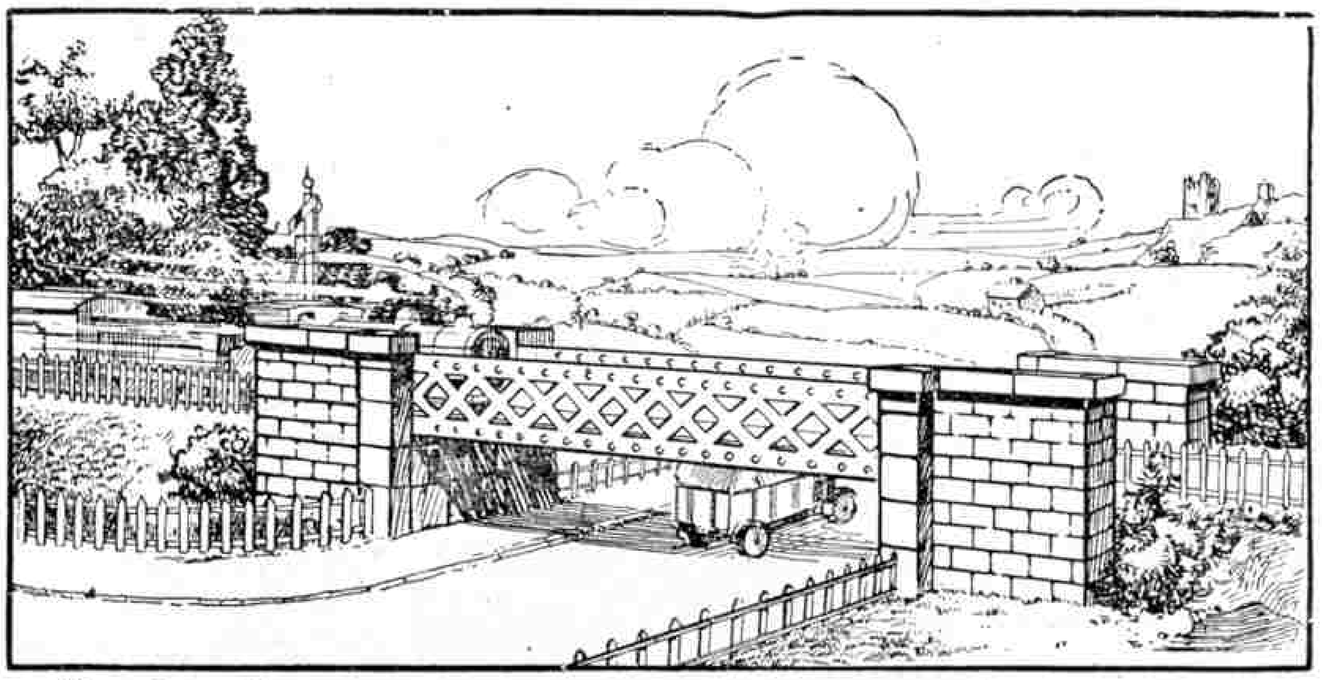

The above illustrates a simple type of Girder Bridge constructed with stone blocks and girder and angle strips. The brickwork is built with F's and G's, the piers with E's and F's, and the coping with D's, F's and H's. The metal work used is "Meccano."

Bridges of any style can be constructed to carry the heaviest type of passenger carrying model locomotives. The piers illustrated have been tested to carry weights of over one ton, although the stone work is only one inch in thickness. If desired, structures of this type can be permanently erected in the open, the bricks being cemented with a special preparation.

Bricks and all component parts can now be purchased separately from any of our advertised stockists.

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"TUDOR BLOCKS"

Box 1.	6 Models	...	3/6
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Box 1 contains Trees, Fences, Roofs, Shrubs, Shells, and Golden Sand 4/-

Box 2. Larger Size ... 6/-

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Walsall	–	–	W. Sherwood Miller.
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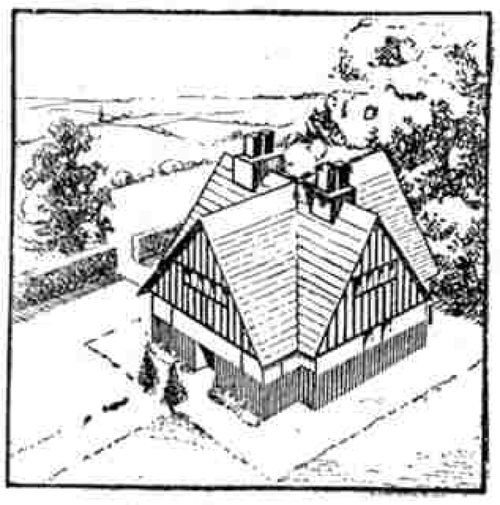

A Model from Box 2
Tudor Blocks

BRIDGE COMPETITION

Cash prizes of £1 1 0 and 10/6 are offered monthly for the two best accepted designs of bridges of metal and stone.

Famous bridges, or portions can be copied as practicable. The designs submitted must be drawn or suitably photographed for reproduction and posted to "LOTT'S BRICKS LTD.," WATFORD, marked "BRIDGE COMPETITION," not later than the 20th of each month. Approved designs will be published in the "M.M." five weeks later.

ENTRY FORM Class .....

Signature and Acceptance of Conditions .....

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WRITE FOR ILLUSTRATED LIST AND NAME OF NEAREST AGENT.

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Competition Corner

"Where I Should Like To Go For My Summer Holiday"

We have now reached a period of the year when the majority of boys want to be out in the open air every possible minute, and when they have little inclination to stay indoors to write essays. At the same time there is one topic that is of interest to every boy and that is the approaching summer holiday. Probably all boys can raise a considerable amount of enthusiasm in discussing where they would like to go for their summer holiday if they were free to choose, and we want our readers to try their hand at setting down briefly their ideas of this interesting problem.

We do not wish this to be looked upon as an Essay Competition, but as a short talk to us, as it were, on "Where I should like to go for my Summer Holiday."

Prizes will be awarded to the four competitors who put forward what appear to us to be the most interesting holiday schemes, and in judging the essays we shall attach much greater weight to a good scheme than to accuracy of spelling and other similar matters.

The contest will be divided into class A for those of 14 and over, and class B for those under 14, and the prizes will be Meccano goods to the value of £1/1/– and 10/6 for the first and second in each section respectively.

Essays must be written on one side of the paper only, and the competitor's name, address and age must appear on the back of each sheet used. Closing date 31st July.

Sixth Drawing Competition

For our Drawing Competition this month we intend to tear ourselves away from the fascination of locos and motor vehicles and transfer our attention to Ships. The subject will be "A GREAT PASSENGER LINER."

No subject gives more scope to a boy possessing artistic ability, while at the same time every boy without exception must feel interested in trying his hand at reproducing, on paper, one of the great floating palaces that have made crossing the oceans of the world a thing of everyday routine.

All our readers have access to illustrations of the great ships of the White Star, Cunard, P. & O. and other famous lines, and therefore a reader living inland will be at no disadvantage as compared to one living in a great seaport such as Southampton or Liverpool.

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

If a competitor wishes his drawing to be returned, he must send a request to this effect along with his entry, at the same time enclosing a stamped envelope of suitable size.

Closing date 31st July (Overseas: 31st October).

For Club Members Only

Suggestions for Programmes

As we have stated on previous occasions, we are anxious that 1925 should be a record year for Meccano Clubs and for the Guild generally. During the past winter many clubs have widened the scope of their programmes to include many new and interesting subjects and by so doing have greatly increased, not only their membership, but the spirit of enthusiasm throughout the club. From time to time club members write to us to make suggestions which, in their opinion, would improve club programmes. Some of these suggestions are impracticable for various reasons, but on the other hand quite a fair proportion are of real value. We believe that many other club members must have ideas of this nature that they have not yet sent us, and in order to impress upon every member that we are anxious to receive suggestions of any kind, we announce this month a competition open to club members only, the subject being "MY THREE SUGGESTIONS FOR IMPROVING CLUB PROGRAMMES."

Prizes—10/6 for the winning entry and a Morocco leather wallet for each of the two next best entries.

All that a competitor has to do is to write down briefly and clearly three ideas that have occurred to him as being likely to increase the interest of a club programme. Each entry must be clearly marked with the competitor's name and address, and also the name of the club of which he is a member. Closing date 30th June (Overseas: 31st October).

Results

March Essay Competition

The most interesting feature about the large number of entries in this competition was the great variety of ambitions shown. As we expected, the majority of competitors expressed a preference for an engineering career of some kind, but the remaining entries covered practically the whole range of professions and trades. In some cases the reasons given for choosing a particular avocation were somewhat quaint, but generally speaking competitors showed that they had thought out the matter carefully and intelligently, and that they were looking forward to the time when they would set out upon their chosen career, full of enthusiasm and determination to succeed. It was particularly encouraging to notice the many instances in which Meccano had pointed out the way to a career.

After considering from all points of view the essays submitted, we decided to award the prizes as follows:—First Prize (Meccano goods value £1/1/–), Charles W. Pear (Hoxton, London, N.1). Second Prize (Meccano goods value 10/6), Norrie Ward (Halifax).

April Puzzle Contest

Our Cross Word Puzzle No. 77 proved a stumbling block to more competitors than we expected, the chief point of difficulty being No. 13 Horizontal.

The awards in this contest are as follows:—First Prize (Meccano Goods value £1/1/–), D. F. Armstrong (Dumfries). Second Prize (Meccano goods value 10/6), Alan Robson (Dudley, Worcester). Third Prize (Meccano goods value 5/–), D. W. Robson (Chesterfield).

Overseas Results

Third Lynx-Eyed Contest

As will be seen from the prize list, this contest attracted competitors ranging from Holland to New Zealand, and provided yet another striking proof of the great popularity of our competitions among boys all over the world. Judging by the high quality of the entries there is very little to choose between our home and our overseas readers in the matter of sharpness of eyes and knowledge of the Manual of Instructions.

The First Prize (Hornby No. 2 Pullman Set) has been awarded to J. J. Smith (Grange, South Australia). There was nothing to choose between the next best, and instead of Second and Third Prizes we are awarding two equal Prizes (Meccano No. 1 Radio Receivers or Headphones or Meccano Goods value 15/–) to J. Byrne (Toowoomba, Queensland, Australia) and M. V. Jaya, (Trichinopoli, South India).

Consolation prizes of Meccano writing-pads or Meccano Complete Manuals are awarded to:—J. de' Conti Manduca, Sliema, Malta; M. T. St. John Pattle, Keetmanshoop, S. W. Africa; A. Abollen, Utrecht, Holland; F. Y. Koot, Rotterdam; Mattei Alessandre, Napoli, Italy; Carel Begemann, Java, Dutch East Indies; A. J. Lewis, K. Lewis and P. Henwood, Takapuna, Auckland, N.Z.; Philip Begemann, Java, Dutch East Indies; Edward Wood, Pretoria, South Africa; Bruce Spooner, Onehunga, Auckland, N.Z.; H. C. A. Van Doorn, Utrecht, Holland; J. C. Rishworth, Tiptur, India; K. Taibhai, Karachi, India; Mario Cavallini, Rome, Italy; Senji M. P. Sammie, Trichinopoli, S. India; Wm. T. Turnbull, Alberta, Canada; Mansour A. Shawky, Cairo, Egypt; Lionel Twentyman Jones, "Alpha," Cape Town, S. Africa; H. V. Reynolds, Georgetown, B.G.; S. M. P. Shotam, Madras, India; A. G. Calder, Gatooma, S. Rhodesia; Nabokumar Singh Dudhoria, Bengal, India.

Second Drawing Competition

This highly popular competition brought in entries from every corner of the British Empire and young artists living hundreds of miles from an important railway line sent us splendidly-executed drawings of a modern locomotive. An interesting fact was that most of the competitors chose British locomotives in preference to the more complicated and often ungainly machines built abroad.

The chief features of the drawings submitted were careful treatment of details and skilful light-and-shade effects, but a weakness was evident in obtaining correctly the perspective—always a difficulty in subjects of this kind. To draw a modern locomotive viewed from an angle is no easy task, and competitors who were brave enough to forsake the conventional broadside view came in for particular commendation.

The judging resulted in awards as follows:—Class A, First Prize (Meccano goods value £1/1/–), Joseph de Conti Manduca (Malta); Second Prize (Meccano goods value 10/6), Roy A. Evans (Christchurch, New Zealand). Class B, First Prize (Meccano goods value £1/1/–), N. Greenslade (Wellington, New Zealand); Second Prize (Meccano goods value 10/6), Harold Turner (Hastings, Hawkes Bay, New Zealand).

(*Continued on page* 295)

The Secretary's Notes

Last month I commented on the fact that practically every Meccano club had found it possible to hold an exhibition of some sort during the past session. Indeed, the up-to-date method of procedure seems to be to wind up the long winter programme with such an event. I have already drawn attention to the valuable publicity that club exhibitions provide, but there are also other advantages to be derived. An exhibition provides an incentive to all members to do their utmost towards enhancing the reputation of their club, and further, what is equally if not more important from the Leader's viewpoint, a good exhibition as a climax to the winter session provides a solution to the programme problem. As the days grow longer and the club approaches the end of a long session of steady work and periodic social evenings, things are apt to become stale. The attendance falls off and the interest of the members in the usual club happenings loses its edge. Thoughtful Leaders recognise this, and in their plans they give prominence to a big end-of-session event, to act as a sort of tonic. The period of preparation is a time of hard work and keen excitement, and when the exhibition is successfully over the session comes to an end amid resolves to do even better next time.

Successful Exhibitions

I want to mention here two recent and exceptionally successful club exhibitions. While it is always splendid for clubs to organise entirely their own event, feeling that it is a real function of their very own, in many cases Leaders will find it an advantage to make their show part of some larger local event. Greater publicity is obtained in this manner, for large numbers of people who would be very unlikely to attend a purely Meccano club display are invariably to be found at the show of a local horticultural or other society, and once the people are on the spot a Meccano exhibit is certain to attract their attention. Recently the 1st Herne Bay Meccano Club had a stand at the annual Spring Show and Trade Fair and during the two days of the show the hall was thronged with people. The Meccano stand was well arranged and the model Transporter Bridge surmounting it awakened great interest and brought crowds to inspect this and the other models and also the Hornby Railway layout. In the model-building competition all the entries were of such high standard that additional consolation prizes were added so that each competitor received a prize. The judge praised the model-building very highy and a full description of the whole exhibit appeared in the local paper. The 1st Herne Bay Club therefore can look back on the show with feelings of pride, and as one practical outcome they have received many inquiries in regard to membership of the club and of the Guild. I advise every Leader who is keen on enlarging the scope and influence of his club to get in touch, before it is too late, with local societies who hold an annual show, and if it is at all possible to book a stand. The St. Nicholas (Harwich) Meccano Club also have recently held a very successful exhibition. In this case the club undertook the whole of the arrangements and had no outside help of any kind. There were many difficulties to be overcome, but all members rose to the occasion and everything passed off even better than had been hoped.

Two Recent Examples

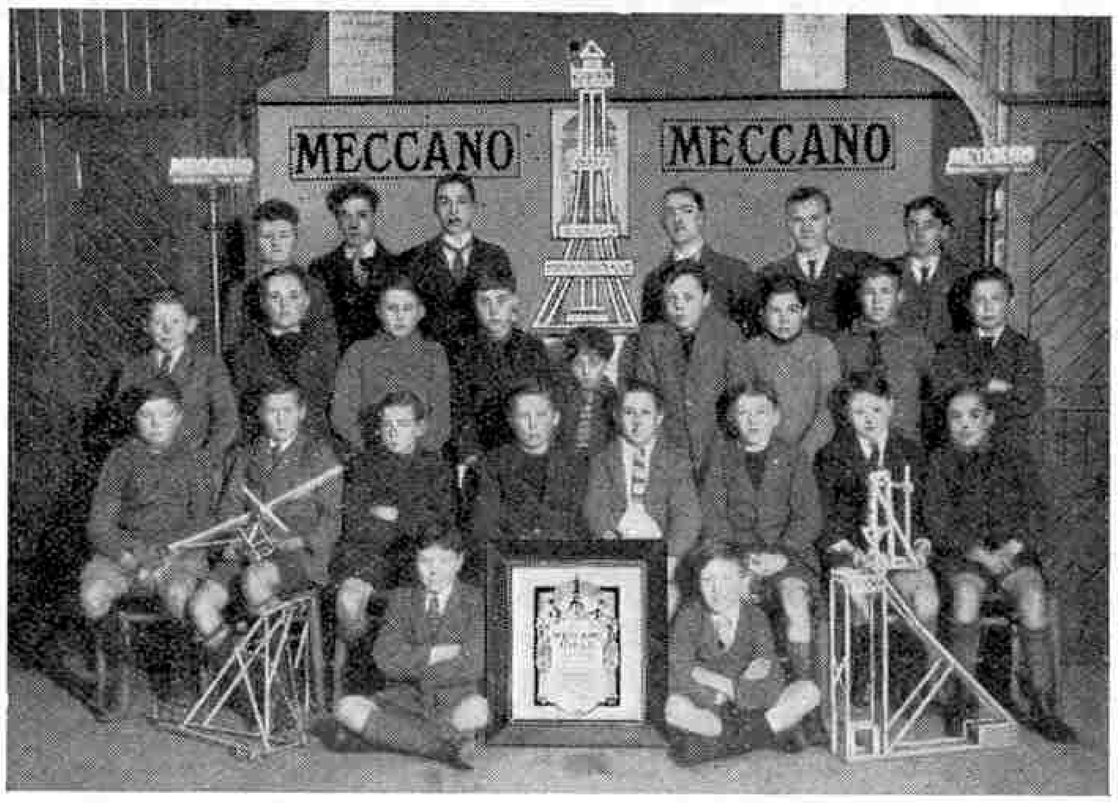
Every progressive club should endeavour to include in its summer programme at least two or three visits to places of interest such as electric power stations, factories, engineering works, etc. It is very necessary however, that such visits should be properly arranged beforehand. In the majority of cases a courteous letter of request from the Leader of the club to the chief official of the place it is proposed to visit will produce a favourable reply. This request should be made two or three weeks beforehand, and particulars should be given regarding the number of members to be included in the party and the day and time on which it would be most convenient to come, subject of course to modification if required. An assurance should also be given that the whole party, down to the youngest member, will be "on their best behaviour." Visits of this kind are a very great privilege and it should be borne in mind that any mishap or unpleasant incident may spoil the chance of other would-be visitors. At the conclusion of the visit a few words of thanks from the Leader to the guide, with in some cases a small gift, and a letter of thanks to the company or proprietors, are very desirable and should not be omitted.

Planning Summer Visits

One of the habits that engineers, whether amateur or professional, should cultivate is that of observing keenly and storing the ideas thus gained. When faced with a mechanical problem it is a great advantage to be able to reproduce from one's mental storehouse an idea that occurred perhaps years before, and which is applicable to the job in hand. There are always opportunities for training of this kind but perhaps the best opportunity of all comes with the summer holidays, when most boys leave for a short time the surroundings with which they are so familiar and find themselves in places where on all sides there is something new, and therefore keenly interesting, to be observed. I should like every club member to make up his mind that during his summer holiday he will store up in his mind something of interest that is new to him. Ideas of this kind often lead to the most surprising results, and even if they do no more than form the basis for new Meccano models, the little time and trouble involved in absorbing the ideas is fully repaid. In addition to this a holiday frequently affords ideas for new papers to be read during the long nights of the winter, and this is especially the case if the observations made during the holiday are afterwards supplemented by reading one or two books dealing with the particular subject, and from which details previously lacking can be filled in

Summer Holiday Hints

Harwich St. Nicholas' M.C.



This month we reproduce a photograph of a group of members of the Harwich St. Nicholas' Meccano Club. This club was formed in October 1924 and affiliated with the Guild in January of this year. The membership is 34 and the average attendance at meetings is 28, which indicates unabated enthusiasm on the part of all members.

In April the Club held their second Exhibition, which was an immediate success. More than 200 people paid for admission, and the general sentiment was one of astonishment at the number and variety of the models on view, and the cleverness of their arrangement. The local press paid the club a very high compliment.

The Leader, Mr. A. S. Hogg, is an enthusiastic model-maker, and combines Meccano activities with art, for he is a capable painter. His right-hand man is Alfred E. W. Ward, the club secretary, and the enthusiasm and ability of these officials, coupled with the keenness of the members, are the chief factors in the success of the club.

CLUB NOTES

1st Herne Bay M.C.—The exhibit at the Spring Show of the local Horticultural Society and District Chamber of Commerce was a great success. In the Model-building Competition such all-round ingenuity was shown that five consolation prizes were added so that each competitor received a prize. The exhibit was extremely popular and has resulted in many inquiries about membership. Club roll: 24. *Secretary*: W. Russell, 4, Clifton Villas, South Road, Herne Bay, Kent.

Marsh Street (Walthamstow) M.C.—The Church Bazaar in which the club took part proved very successful. The model of a tower with a revolving light, lent by Headquarters, was the centre of attraction. Grouped around it were various Cranes, an Aeroplane, the Meccanograph, Letter Scales, Roundabouts, etc., while around the room was a miniature Railway with Stations, Signals and seven Hornby Locos. Nearly 800 people visited the club stall, and of the £500 realised by the Bazaar the club collected £3/4/0. During the exhibition several applications for membership were received. Club roll: 20. Average attendance: 15. *Secretary*: C. W. Redfern, 34, Church Hill Road, Walthamstow, London, E.17.

Holy Trinity (Blackburn) M.C.—Arrangements have been made to meet every Monday during the summer. At each meeting a collection is made to swell the funds for picnics and rambles, which are to be started this month. Recently a local gentleman gave an interesting lecture on the "Rules of Cricket." A Special Merit Medallion has been awarded to E. Fryer for the best all-round work. Club roll: 28. Average attendance: 19. *Secretary*: H. Jepson, 11, Pine Street, Blackburn.

Rosyth M.C.—Recent activities include a Model Vehicle Building Competition. Marks were given by the Leader for the best models which ranged from a Motor Lorry to a Locomotive. Lectures were given by the Leader (Mr. G. A. Cook) on "Pulleys" and some of the "World's Famous Bridges." The Summer syllabus includes Cricket, Rambles, Outings, Tracking Expedition and Model-building. Club roll: 10. *Secretary*: E. T. Hunter, 79, Admiralty Road, Rosyth.

Stationers' School M.C.—Report a very successful term. Among the most interesting events were visits to the G.P.O., London Studios of the British Broadcasting Company, Marconi House, and several large factories. *Secretary*: R. J. Greenway, 435, Green Lanes, Harringay, London, N.4.

Christ Church (Stratford) M.C.—A recent development is the Club Library to which several useful books have been presented. Members have had a special outing to the Science and Imperial War Museums at S. Kensington, and the next outing is to be a tour round Historic London. The Annual Exhibition is fixed for 4th June and hard preparation is the order of the day. Club roll: 28. *Secretary*: R. H. Bently, 81, Abbey Lane, Stratford, London, E.15.

Knutsford Lecture Hall M.C.—Prominent features in the past session have been Model-building, Wireless Talks and Boxing. A Special Merit Medallion has been won by E. Edwards, who joined the club two years ago. The Annual Excursion has been arranged for July. Club roll: 16. *Secretary*: C. W. Morris, 3, County Terrace, Knutsford.

Victoria Park (Glasgow) M.C.—A successful Exhibition was held in January, and in addition to the usual model-making activities various members and friends have read valuable papers. Club funds show a balance of over £5. An interesting programme has been arranged for the Summer, including visits to many places of interest. When these lines appear in print the club will have visited the s.s. "Cormorin," Port Dundas Electricity Station, a Newspaper Office, and a modern Brick-works. Club Roll: 40. *Secretary*: R. White, 22, George Street, Whiteinch, Glasgow.

Chalmers U.F. Church (Alloa) M.C.—Has a waiting list of would-be members as club accommodation is limited. Rambles and outdoor activities are fixed for the Summer. Club roll: 65. *Secretary*: W. Henderson, 13, Paton Street, Alloa.

Handsworth (Birmingham) M.C.—Recent activities include Model-building, Lecture by Mr. G. Harrison on "Freak Locos"; Lantern Lecture by Miss J. Heathley, the President, on the "Tower of London," and a debate on "Meccano v. other Hobbies," Meccano winning by one vote. Club roll: 34. Average attendance: 26. *Secretary*: N. J. Robertson, 30, Hinstock Road, Handsworth Wood, Birmingham.

Ilfracombe M.C.—Excellent work was exhibited in a recent Model-building Contest and there was keen competition for the prizes. Other activities include Lectures and Debates. Club roll: 28. Average attendance: 22. *Secretary*: W. Webber, 14, Springfield Road, Ilfracombe.

Westcliff and District M.C.—It is hoped soon to arrange the summer outing with the St. Mary (Newington Butts) M.C.—A visit will be paid to the Southend Gasworks in the morning, followed in the afternoon by a ramble. Club roll: 2 (including two girls). Average attendance: 19. *Secretary*: D. S. Cecil, 22, Valkyrie Road, Westcliff-on-Sea.

Accrington M.C.—A Social Evening was recently held on the occasion of a visit by 24 members of the Holy Trinity (Blackburn) M.C. Several novel Competitions have been held, notably one for designing a new poster for the club. R. Rush was adjudged the winner, and for this and other excellent work he has been awarded a Special Merit Medallion. Club roll: 23. Average attendance: 17. *Secretary*: V. Waterhouse, 45, Ramsbottom Street, Accrington.

St. Mark's (London S.E.) M.C.—Model-building has been the club's chief feature and in a recent competition a prize of Meccano parts to the value of 2/6 was awarded to E. Sadler for the best original model built in the course of an evening. It has been found necessary to increase the subscription to meet the additional club expenses. Club roll: 23. *Secretary*: G. C. Green, 21, Hafton Road, Catford, London, S.E.6.

Meccano Club Secretaries

No. 3. Stanley A. G. Bone

Stanley A. G. Bone is Secretary of the Holy Trinity (Barnsbury, London, N.1) Meccano Club, which holds the distinction of having been the first Meccano Club formed and the first affiliated. The foundation of the club dates back to 1918 and affiliation was granted in the same year. From its earliest days Holy Trinity has been a most progressive and enterprising club and, under the able Leadership of Mr. Stuart H. Wilson, it affords a striking example of what may be accomplished by enthusiasm and good organisation. The members work in sections, each with its particular officer, and at present there are sections for Model Railway Building, Engineering, Fretwork, Radio, and Motor and Dynamo Construction. Classes in Esperanto form another interesting feature of the club's programme.

Stanley Bone was an original member of the Holy Trinity Club and he became joint Secretary in June 1922. In addition to his Meccano activities he is also a lecturer and writer of considerable ability.

West View (Nottingham) M.C.—Special features in the programme have been Model-building and Lectures on Wireless, Stamp Collecting, Famous Men and the Manufacture of Coal Gas. F. Plank also gave a lecture on "How to construct a Crystal Set." There are now two sections, the House of Meccano and the House of Hornby, and great competitions are carried on in which the members show keen interest. Club roll: 30. *Leader*: Mr. H. W. R. Cousens, 494, Mansfield Road, Sherwood, Nottingham.

Cheltenham Grammar School M.C.—Continues to flourish and increase in membership in spite of difficulties experienced in the early part of the year through absence of the secretary and illness of masters. Preparations have been made to ensure a successful summer session. It is intended to hold an Exhibition at an early date, to include a Factory, an Aerodrome, a Quarry and Hornby Railway Layout. Club roll: 15. Average attendance: 12. *Secretary*: E. W. Griffith, "Hadleigh," Nounton Park Road, Cheltenham.

South Australia

Glenelg M.C.—To mark the close of a very successful session Mr. R. Patrick, the Leader, and Mr. Moody invited members to take part in a most enjoyable Social Evening at which many visitors were present. Original models were exhibited and the Leader explained some of them for the benefit of the visitors. At the close of the exhibition supper was served by the ladies. Club roll: 63. *Secretary*: K. Holmesby, 22, Partridge St., Glenelg, South Australia.

South Africa

Durban M.C.—A very interesting address on "Meccano" was recently given by the Leader, Mr. Patterson, through the Durban Municipal Broadcasting station. This proved so popular that Meccano Lectures will be given every month at the station. Club roll: 15. *Secretary*: A. Altman, P.O. Box 1941, Durban, Natal.

Simon's Town Meccano and Wireless Club.—The club's first Annual Meeting was held some weeks ago, when the year's progress was reviewed, the evening concluding with a short musical programme given by the members. Club activities have included Model-building, Model Racing, Inventors' evenings, Ambulance work, Lectures, Problem evenings, Gramophone recitals, and Physical Drill. Models were displayed at the War Memorial Exhibition arranged in conjunction with the Observatory M.C., and a 3-valve set for club use is in course of erection. Club roll: 21. *Secretary*: Mr. Ben Geo. Randall, c/o Municipal Office, Simon's Town, South Africa.

Malta

1st Malta M.C.—Recent activities include a visit to the Malta Tram Works, and a Model-building competition in which a prize was offered for the most correct and smartly built model. During the Summer Session it is hoped to have Outings, Excursions and Sports, Rowing being the chief feature. Club roll: 18. *Secretary*: A. J. Grech, 173, Prince of Wales Road, Sliema, Malta.

Clubs not yet Affiliated

Selby M.C.—Preparations are going forward to hold a Fancy Dress Carnival, the proceeds to be divided between the Hospital and the club. The cricket team are busy arranging their fixture list. Club roll: 17. *Secretary*: R. Bainbridge, 24, River View, Cliff Bank, Selby.

Dalton-in-Furness M.C.—Very successful meetings have been held in Corlett's Cafe and recently Mr. D. H. Ray, the Leader, gave an interesting lecture on "Switzerland," where he has spent several months. An outing to the Woods on the Duddon Estuary was arranged and it is hoped shortly to explore the Lake District and see the homes of Wordsworth, Southey and Romney. Club roll: 15. *Secretary*: L. Corlett, Ulverston Road, Dalton-in-Furness, Lancashire.

Blagdon St. Andrews M.C.—A prize is awarded each session to the member having the best record of attendance. Each member pays a small subscription weekly towards buying a Meccano Outfit for the use of the club. Several rambles and picnics have been arranged. Club roll: 11. *Secretary*: Kathleen R. Day, Seymour Arms, Blagdon, nr. Bristol.

Ibrox and District (Glasgow) M.C.—Has been divided into three sections—Model Engineering and Railway, Wireless, and Photography. Mr. Lodge, the Leader, has resigned and great efforts are being made to obtain a new Leader. Club roll: 8. *Secretary*: A. Lyle, 185, Copland Road, Ibrox, Glasgow, S.W.

St. John's (Sevenoaks, Kent) M.C.—Happy evenings are spent in a room kindly lent by the St. John's Church School. Recent activities include Lectures on "Stamp Collecting" and "Wireless." Club roll: 9. *Secretary*: S. Williams, 20, Greatness Lane, Sevenoaks, Kent.

Ruthin School (N. Wales) M.C.—The first meeting was held in the school and proved a great success. The Headmaster, Mr. Lovegrove, gave an interesting lecture on "Railways," and all present had a very enjoyable evening. *Secretary*: E. Evans, Ruthin School, Ruthin, N. Wales.

Reading M.C.—A "Contractors" evening was recently held, during which a splendid model of the Reading Bridge was built. On another occasion an "Electrical" evening was spent in wiring up electric bells, lights, etc., and this proved very popular. Further activities include Cycle Runs, Rambles, Sports and Visits to Works. The financial position is sound, members paying sixpence monthly. Club roll: 20. *Secretary*: H. G. Rogers, 135, Liverpool Road, Reading.

Crediton Grammar School M.C.—The Meccano boys in the school held an Exhibition of Models on Speech Day, and this received much attention. A club has been formed and the membership continues to increase: Club roll: 14. *Secretary*: J. F. Clarke, The Grammar School, Crediton.

Urmston Grammar School (Manchester) M.C.—A club has been formed successfully, and many more boys have promised to join. Club roll: 12. *Secretary*: T. L. Linfoot, 92, Railway Road, Urmston, Manchester.

Wangford (Lowestoft) M.C.—Have obtained a Leader and a suitable club room. The present club roll is 7, and it is hoped to increase the membership very soon. The secretary, C. Smith, High Street, Wangford, Lowestoft, Suffolk, would be pleased to hear from any Meccano boy wishing to join the club.

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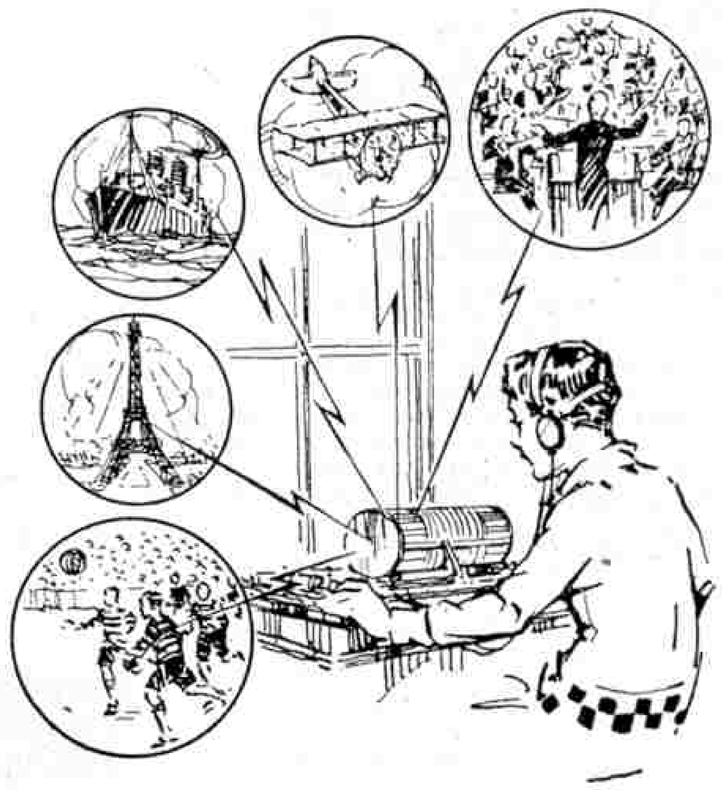

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R.S.2. Parts to make the No. 2 Receiver, complete in strong carton, including single 'phone, 2000 ohms resistance. PRICE (Post free) **23/3**

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British made, 4000 ohms resistance, and of the highest quality procurable, giving loud, clear and undistorted reception. Comfortable to wear and easily adjusted.
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Word-Building Puzzles

Since my announcement on this page last month that I had decided to abandon Cross Word puzzles, at any rate for the time being, I have had many letters from readers expressing keen satisfaction at my decision. There appears indeed to be a general feeling that the cross word puzzle has had a good long run and that it is time it moved on and made room for something else.

As a substitute for the cross word puzzle I introduced last month the puzzle known as the "Palindrome," or reversible sentence, and offered prizes for the three best specimens sent in. I have received a fair number of entries for this contest, many of them extremely ingenious, but I have also received a number of mild protests from various readers on the ground that the mental effort required to concoct a Palindrome is greater than could reasonably be expected from a boy who is bursting with anxiety to get out of doors to his games at the earliest possible moment!

I mentioned last month that I was very anxious for readers to write and let me know what particular features they like on this page and also what new features they would like to see introduced. During the past fortnight I have received several letters from readers asking for puzzles on the word-building principle. The idea is to have a word given and to form from its various letters as many other words as possible. For instance, take the word "Water." From this word we can without any difficulty make a number of shorter words such as "war," "wart," "ate," "tea," "rate," "wear," "rat," etc.

This kind of puzzle strikes me as being very interesting and also one which has the merit of not being too strenuous for summer days. This month therefore I am introducing a puzzle on these lines and offering prizes for the three best solutions together with solutions of any six other puzzles on the page.

June Puzzle Competition

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

Every reader who wishes to enter for the June Puzzle competition must send in his solutions to the three sections of the Word-building Puzzle, No. 90, together with the solutions of *six* other puzzles selected from this page.

Closing date 30th June.

Note to readers—There is no Overseas section in this competition.

Puzzle No. 90.
Word-building Puzzle:—
From the letters forming each of the following three words construct as many other words as possible. Each of the three words must be treated separately, so that there will be three separate sets of solutions. The method is indicated in the introduction in the first column of this page:—

1. Abominable.
2. Reactance.
3. Transcommunication.

* * * *

Puzzle No. 91.
On a sheet of paper draw a large square, and divide it into 36 smaller equal squares. The problem is to arrange 12 coins in these small squares so that there are only two coins in each row of squares, horizontally, vertically or diagonally.

* * * *

Puzzle No. 92.
The Postal officials at a certain office were puzzled over a letter containing these words in this position—

Wood
John.
Hants

After a while a quick-witted postman solved the mystery. What was his solution?

* * * *

Puzzle No. 93.
By placing the letter A at the proper points in the following diagram a sentence can be made. The end of a line does not necessarily mean the end of a word.

T H T M
N S Y S
T H T M
R Y N D
J C K S
W M N Y
S M L L
B G S T
N R T B
Z R T M
N D L Y

* * * *

Puzzle No. 94.
In a certain room were one grandmother, three mothers, two aunts, four sisters, two brothers, four daughters, two sons, five cousins, three nieces, two nephews, three grand-daughters and two grandsons. How many persons were there in the room?

* * * *

Puzzle No. 95.
Single acrostic:—
My first in the sea is often seen,
My second by girls is held in esteem,
My third a globule of pretty colour,
My last when bad gives unpleasant odour,
My whole is a thing in which you move,
Upon a liquid rough and smooth.

* * * *

Puzzle No. 96.
The missing words in the following sentences each consist of the letter or letters of the previous missing word plus one extra letter:—"Yes . think he .. a great man ..., and that he will .... to take the ..... of Government, helping to revise many Acts of Parliament. For he will .... of ..... in the Statute Book, and, by the ..... of faulty clauses he will improve our laws."

* * * *

Puzzle No. 97.
At a certain wedding everybody and everything had the name of a bird.
(1) What was the bride's name?
(2) What was the bridegroom's name?
(3) Who was the best man?
(4) Who signed the register?
(5) What sort of a ring did the bridegroom wear?
(6) What did the bride wear round her neck?
(7) What military rank was represented?
(8) Who did most of the talking?
(9) What king was present?
(10) What did the rowdy guests do?
(11) What did the guests do when they ate?
(12) Where did the bride and bridegroom go for their honeymoon?
(13) What did the bridegroom make with his money?

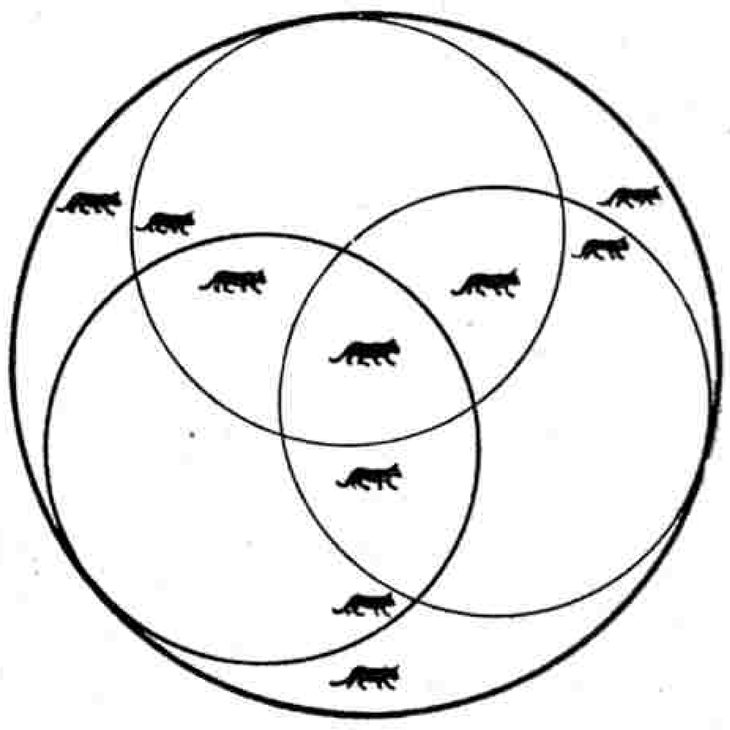
Answers to Last Month's Puzzles

No. 83. The various arrangements of the volumes were as follows:—

$\frac{6729}{13458}=\frac{1}{2}$; $\frac{5832}{17496}=\frac{1}{3}$; $\frac{4392}{17568}=\frac{1}{4}$; $\frac{2769}{13845}=\frac{1}{5}$;
$\frac{2943}{17658}=\frac{1}{6}$; $\frac{2394}{16758}=\frac{1}{7}$; $\frac{3187}{25496}=\frac{1}{8}$; $\frac{6381}{57429}=\frac{1}{9}$;

* * * *

No. 84. The following diagram shows how the three circles were drawn.



No. 85. The number on the engine was 9819.

* * * *

No. 86. Bill is still living with Jim Smith in this big city.

* * * *

Puzzle No. 87.
Bear.
Etna.
Anti.
Rain.

* * * *

No. 88. Ragamuffin.

* * * *

No. 89. The number is 2.

Puzzle No. 98.
In each of the following sentences the second of the two missing words is the first reversed. What are they?

1. At any —— a volcano may —— smoke.
2. —— we have —— the war.
3. Load —— to exceed one ——.
4. Put the —— on the —— of the stove.
5. The light is very —— at —— night.
6. He is —— to try to —— the river.

* * * *

Puzzle No. 99.
Each of the following jumbles of letters contains a well-known proverb. What are the three proverbs?

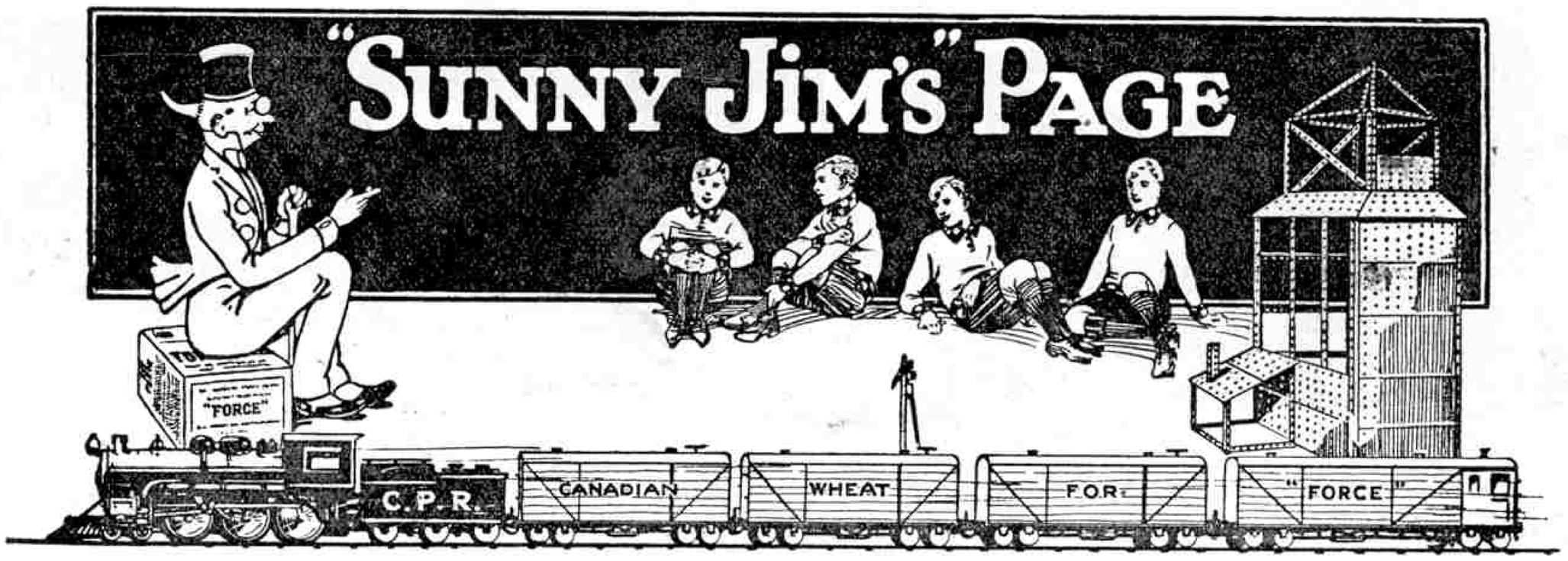
1. AEEGGHILLMNNNOOOORRSSSSTT.
2. AABDEEEEEFFFHIIIKMNNRRSST.
3. AAADDEEFIIIMMNNNOORTTTW.

* * * *

Puzzle No. 100.
Owing to certain alterations that became necessary in an old house, a certain window had to be increased to twice its original size. It was found possible to do this without increasing either the original height or width of the window. How was this possible?

* * * *

Puzzle No. 101.
What town is indicated by each of the following lines?
The city that wanders abroad,
The town that's never behind.
The town that's so thin that it cannot be seen,
And the town that is nothing but rind.
The town that's a savoury bulb,
The town that's a bark of a tree.
The town that's needed on board every ship
And the town where they're all on the spree.
The town that is always a very bad fit,
The town that's never too short.
The town that is used in the fields in the spring,
And the town that's a game and a sport.



WITH "SUNNY JIM" AT WEMBLEY

What! You didn't know Sunny Jim was at Wembley!

Oh yes he is, and so busy that he has had no time to write his usual "page!" Instead he has asked us to come and see him.

Let us imagine we have arrived at the great gates of the British Empire Exhibition, Wembley. We pay at the turnstile—click—click—clack—and we're inside the grounds. What a crowd of things there is to see. The rattle of a switchback gives us the direction of the Amusements Park. The crowded avenue ahead leads to Australia, New Zealand, Canada, India. Ah! Canada! That's where Sunny Jim is! "FORCE," the flaky whole wheat food he represents, is made in Canada, so naturally we find it among the other exhibits in the wonderful pavilion the Dominion has built.

We walk between clusters of blue and golden electric lamps. On our left is the Palace of Housing and Transport, and on our right the Hall of Industry.

Clang! ting-ting. Look out! An electric rail-o-dock car passes. There are seats vacant. Let's board it.

We ride to the top of the avenue and there, across the boat dotted lake, lies a great edifice glowing yellow in the Summer Sunshine. It is Canada! Too eager to tour the borders of the lake in the rail-o-dock car we leap to the ground and dash across the high arched bridge that links the banks. Up the steps we run between the bronzed lions that guard Canada's doors.

We are now in the main hall of Canada. *There's* "Sunny Jim," shouts someone. Yes! It really is. How well he looks. Just a little plumper than his pictures. He greets us with a handshake all round.

"Well, I suppose you've come to see the 'FORCE' exhibit," he says.

"We have," we answer enthusiastically.

"Come along then."

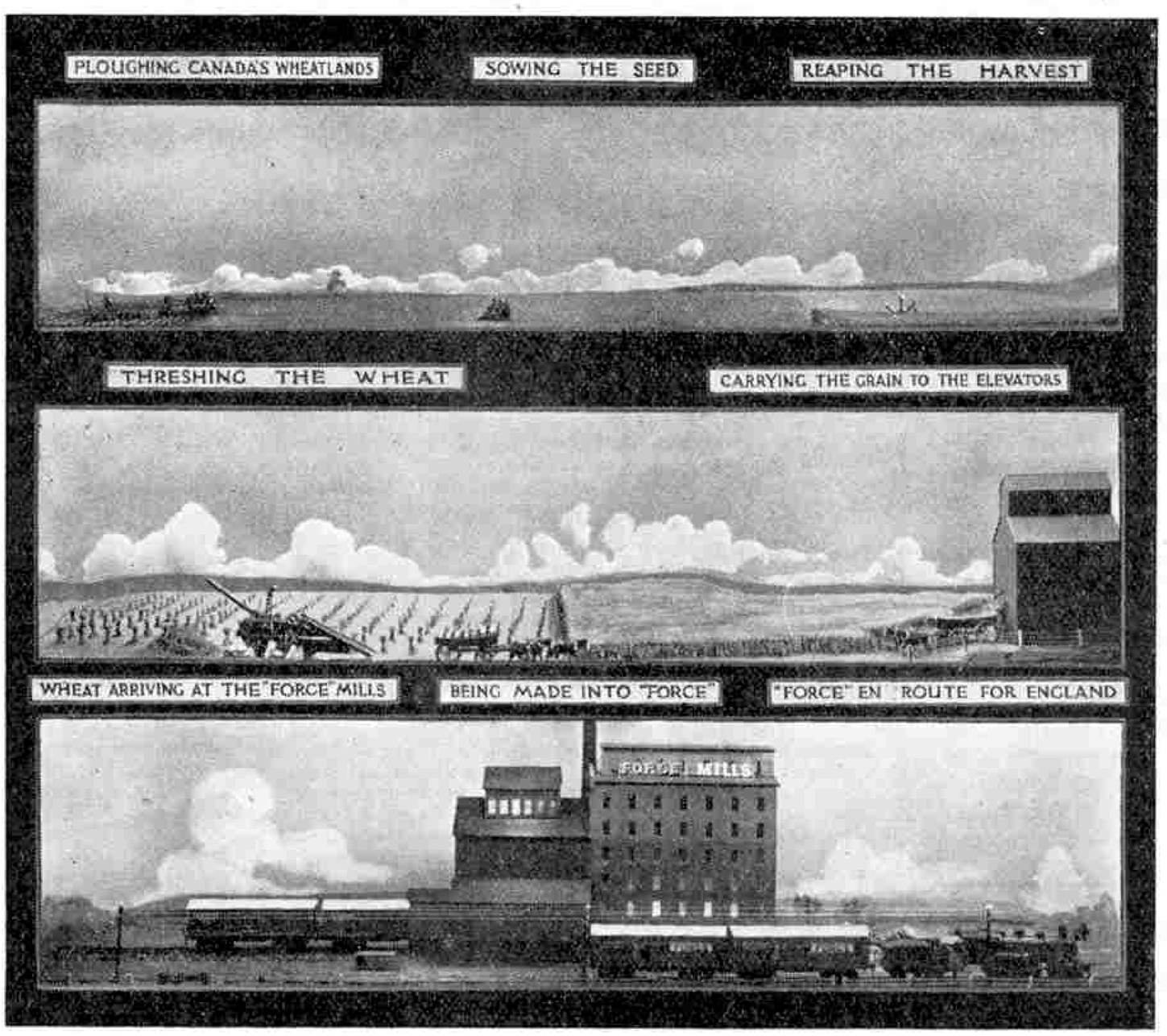
Sunny Jim hurries off, his little coat bobbing in the breeze.

Past yards and yards of Canadian pictures and panoramic models he hurries us, till at last, with a flourish, he halts before a panoramic model on an interesting looking Stand that has counters spread with free tastes of "FORCE."

"Here we are," he says—as he mops his forehead with a big coloured handkerchief.

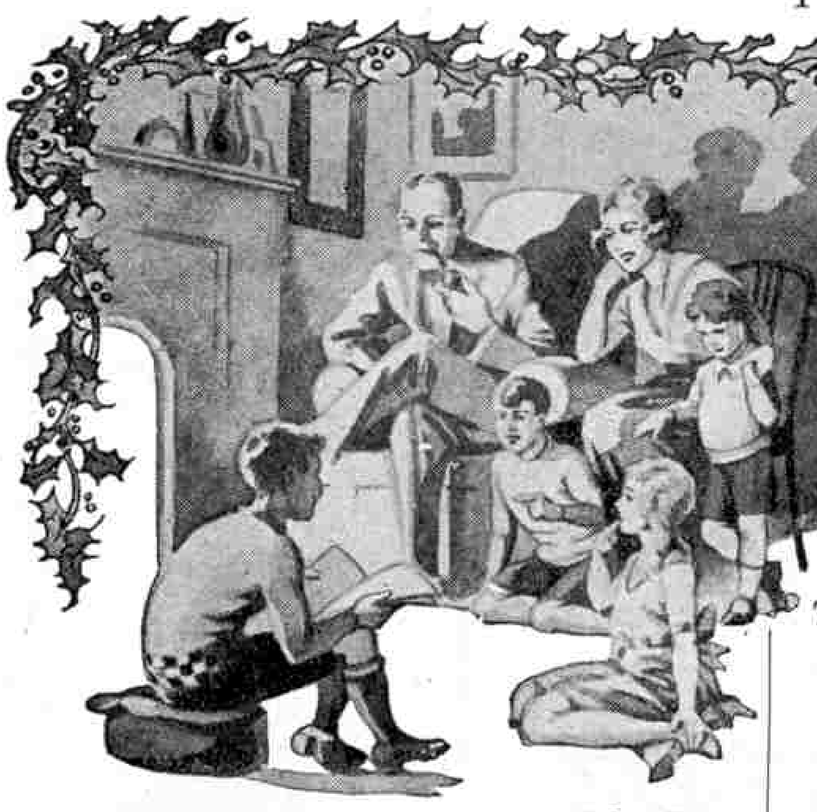
"My! What an interesting model," exclaims the artist in our party. Sure enough it is. It shows the making of "FORCE" from the time the earth is ploughed until the wheat, converted into "FORCE," leaves the mills en route for England. We take a picture of this (it is printed on this page).

After we have regaled ourselves with "FORCE" and fruit we say good-bye to our friend Sunny Jim, and off we go in search of further adventures.



Panoramic Model at the "Force" Stand, Wembley

Boys *and* girls. When you go to Wembley be sure you see Sunny Jim at the "FORCE" Stand in Canada. Ask him to let you taste "FORCE." If mother is with you she might buy you a packet. "FORCE" is eaten with milk or fruit and needs no cooking at all. If you are going to Blackpool this year, you will find, at the Ideal Homes Exhibition on the South Shore, a working model railway showing the wheat being taken to the "FORCE" mills. Free tastes of "FORCE" can be had here also.



Fireside Fun

NOT THERE AT THE TIME

Rastus: "Doesn't that mule ever kick you?"

Sam: "No, sah, but he frequently kicks de place where Ah recently was."

* * * *

Motorist (Telephoning after smash): "Send assistance at once, I've turned turtle."

Voice (from the other end): "This is a garage. What you want is an aquarium."

* * * *

Teacher (to junior chemistry class): "What does sea water contain in addition to the sodium chloride I have just mentioned?"

Smart boy: "Fish."

* * * *

THE STATE OF TRADE

An editor once sent a reporter round to interview various local business men in order to get their views on the state of trade. The reporter was told to make his report as brief as possible, and he handed in the following:—

"Looking up," said the Astronomer. "Dead," said the Undertaker. "Fine," said the Judge. "Looking better," said the Beauty Doctor. "Fair," said the Tram Conductor. "Hard to beat" said the Drummer. "Looking brighter," said the Bootblack.

* * * *

An elderly gentleman entering a bus noticed a drunken man in the far corner.

"Do you allow drunken men in your bus?" he asked the conductor.

"Not as a rule," replied the conductor, "but slip in, quietly!"

* * * *

Teacher: "Which of our second set of teeth do we get last?"

Bright child: "False ones, teacher."

* * * *

Q. Why did the rubber tyre?
A. Because it saw the foot brake.

This Month's Short Story

Little boy,
Cherry stones,
Empty plate,
Awful groans.

* * * *

Passenger: "This train is very late."

Guard: "Yes sir, the train before is a bit behind and it has often been behind before."

* * * *

First Boy: "I bet that I was on a faster train than you."

Second Boy: "I bet you wern't."

First Boy: "The train I was on went so fast that the telegraph poles looked like a wooden fence."

Second Boy: "That's nothing. I was on a train going through the country. We passed a field of beetroot, a field of corn, a field of onions and then a pond, and we were going so fast that it looked like vegetable soup!"

* * * *

DRAUGHTY!

Sam: "I tore my best silk handkerchief yesterday."

Tom: "That must have been an awful blow."

* * * *

Teacher: "Mike, give me a definition of salt."

Mike: "It is the stuff that makes potatoes taste bad when you boil them and don't put any in."

* * * *

A small boy wrote in his diary: "Got up at seven. Went to bed at eight." His teacher suggested that it would sound better if he put "Rose at seven." So the boy crossed out his entry and briefly chronicled: "Rose at seven. Set at eight."

* * * *

A young man took his uncle, aged 85, to see moving pictures for the first time. After the show he asked his uncle how he had enjoyed himself.

"Well," said the old man, "the pictures were alright," but the piano made so much noise I couldn't hear a word they said!"

* * * *

Wanted—A room by two gentlemen about 30 ft. long and 20 ft. broad.

SLIGHT MISUNDERSTANDING

Artist: "I'm going to paint your pretty cottage to-morrow."

Farmer: "That's fine sir. I'll get you a couple of good long ladders!"

* * * *

Smith: "That college turns out some fine men."

Briggs: "Yes. When did you graduate?"

Smith: "I didn't graduate, they turned me out."

* * * *

Mother: "Willie, just run across the street and see how old Mrs. Tompkins is this morning."

Willie (returning with a worried expression): "She says it's none of your business how old she is!"

* * * *

Jim: "Do you know that in all history they've never hanged a man with a wooden leg?"

Jack: "Why not?"

Jim: "Because they have always used a rope!"

* * * *

LEARNING BY EXPERIENCE

A boy struck a match to see whether his petrol tank was empty. It wasn't!

A boy patted a strange dog's head to see whether the animal was affectionate. It wasn't!

A boy touched an electric cable to see if it was charged. It was!

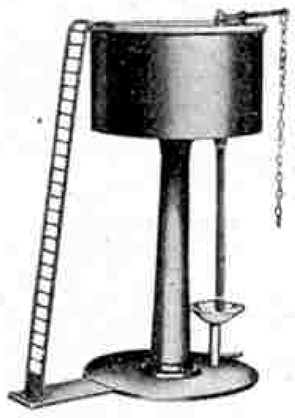
* * * *

A man named Dodgin was appointed foreman of the gang. The first day he was on duty he came across two men sat in a corner smoking. The men did not know him and one of them said: "Hello, who are you?" "I'm Dodgin the new foreman," he replied. "So are we, sit down and have a smoke," they said!

* * * *

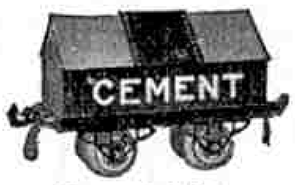
A very fat woman with her arms full of parcels was struggling to mount the steps of a motor bus. The conductor, a very small man, stood looking on helplessly. The woman reached the second step with an effort and burst out angrily, "If you were half a man you'd help me up."

The small conductor calmly replied: "If you were half a woman I would."



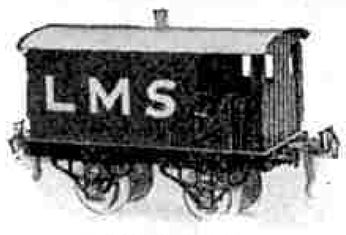
Water Tank
Price **6/6**

Gas Cylinder Wagon
Price **3/–**

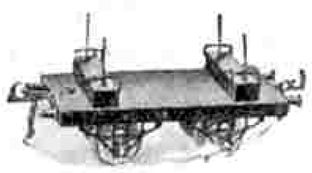


Cement Wagon
Price **4/–**

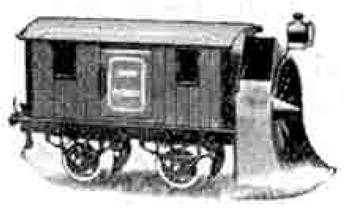
Milk Traffic Van
Price **4/6**



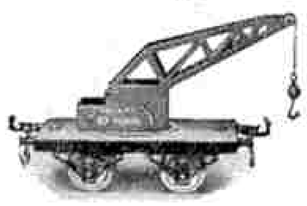
Brake Van
Price **4/–**



No. 1 Lumber Wagon
Price **2/–**



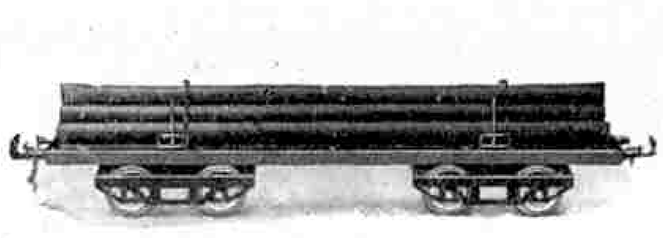
Snow Plough
Price **5/6**



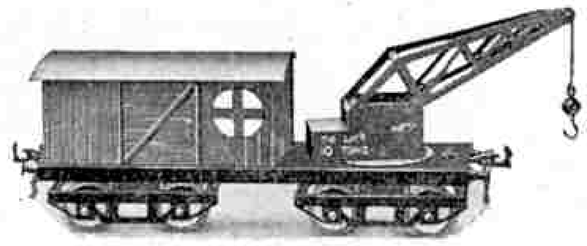
Crane Truck
Price **4/6**

Rotary Tipping Wagon
Price **4/–**

Tunnel
Price **7/6**



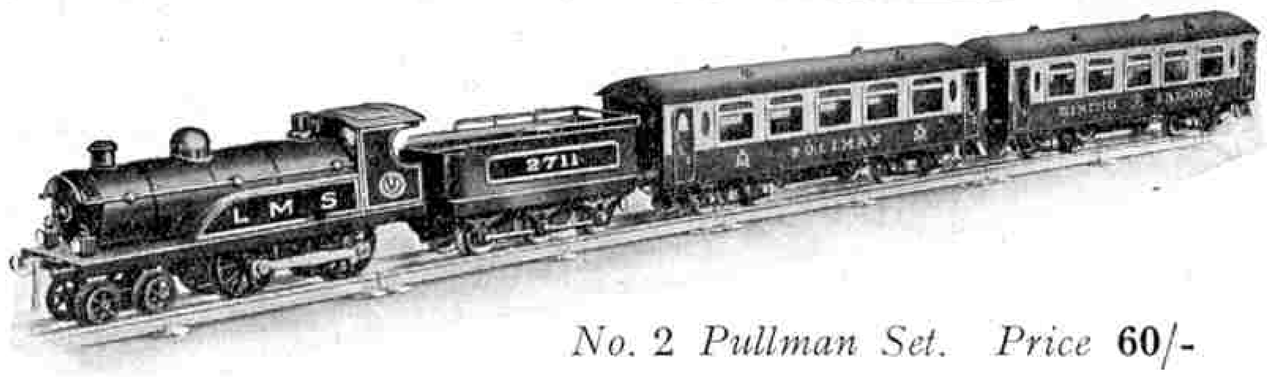
No. 2 Timber Wagon
Price **4/6**



Breakdown Van and Crane
Price **7/–**

HORNBY CLOCK WORK TRAINS

BRITISH AND GUARANTEED

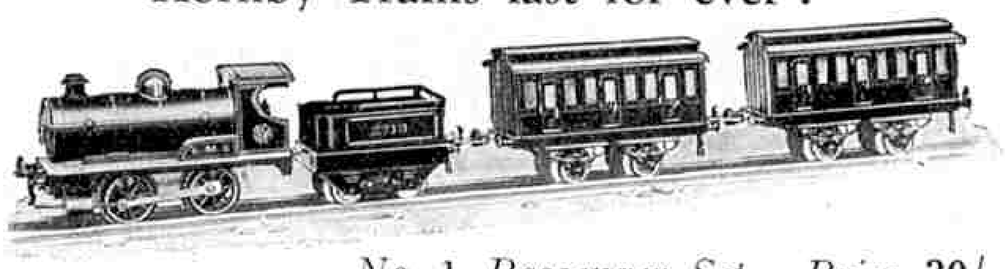


No. 2 Pullman Set. Price **60/-**

Only when you have a real train like the Hornby, can you enjoy the fun of running your own railway system. Really, it's the finest fun in the whole world, and you will find that even your Father will want to help you when you've fixed up a Hornby Railway !

See the fine and sturdily-built Hornby Locos. How real they look. How beautifully they are enamelled in the correct colours ! Every part of a Hornby Railway is like that—strong and beautifully finished. Stations, Tunnels, Goods Wagons, Signals, Breakdown Vans, Snow Ploughs, Pullman Cars—all the real things in miniature. If any part gets broken, you simply buy a new part and fix it yourself.

Hornby Trains last for ever !

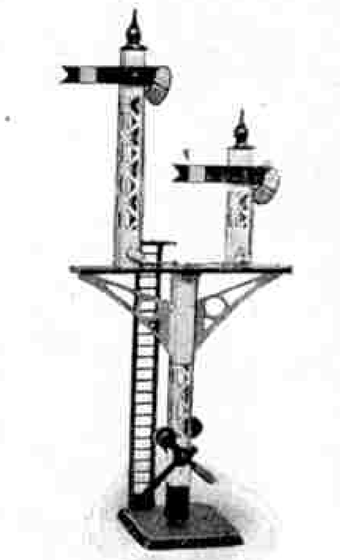


No. 1 Passenger Set. Price **30/-**

Guarantee

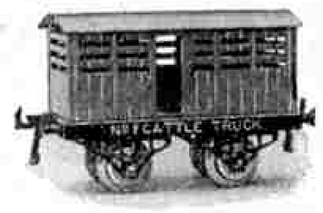
Hornby Trains are tested and their efficiency is guaranteed. A form of guarantee is furnished with each loco, and we undertake to repair or replace, at our option, any loco that fails to run satisfactorily from any cause other than misuse, within 60 days of date of purchase.

MECCANO LTD. :: BINNS ROAD :: LIVERPOOL

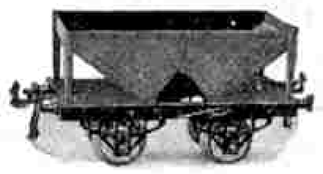


Junction Signal
Price **5/6**

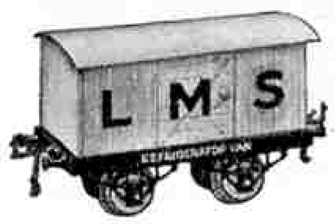
No. 1 Timber Wagon
Price **2/–**



No. 1 Cattle Truck
Price **4/–**



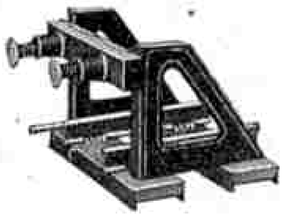
Hopper Wagon
Price **4/–**



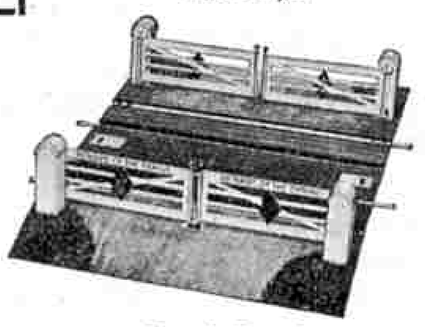
Refrigerator Van
Price **4/–**

Petrol Tank Wagon
Price **3/–**

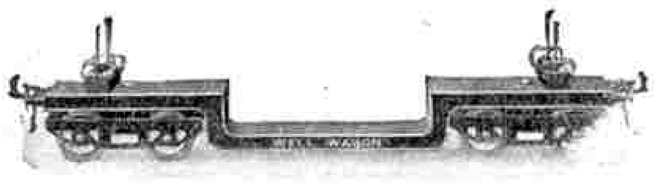
Seccotine Wagon
Price **4/–**



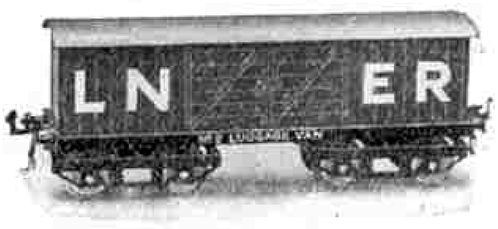
Spring Buffer Stop
Price **1/6**



Level Crossing
Price **6/6**



Trolley Wagon Price **6/–**



No. 2 Luggage Van Price **6/6**

ROLLING STOCK AND ACCESSORIES

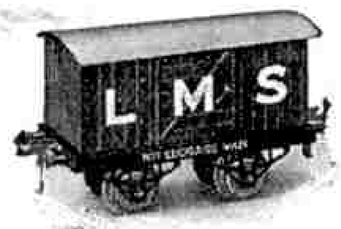
(HORNBY SERIES)

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

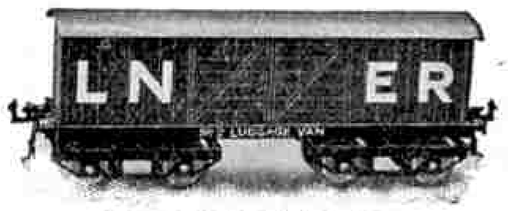
All Hornby Rolling Stock and Accessories are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains and all have the uniformly beautiful finish that is the great feature of the Hornby series. With these accessories you can build up a most realistic railway system,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

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

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

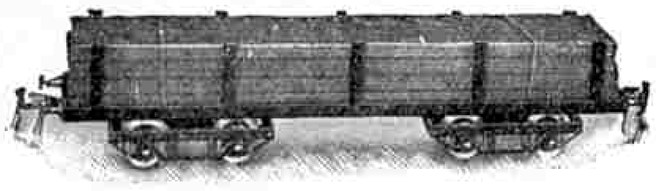


No. 1 LUGGAGE VAN
Representative colours.
Price **4/-**

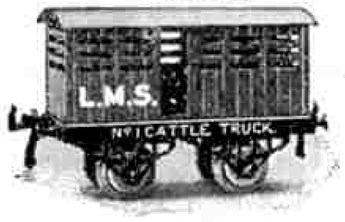


No. 2 LUGGAGE VAN
Finished in colour. Fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**

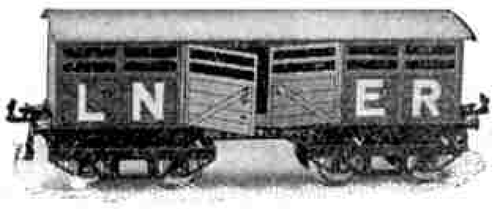
SECCOTINE VAN
Price **4/-**



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



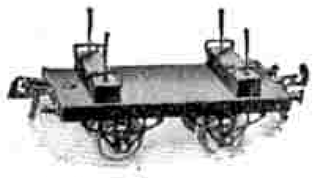
No. 1 CATTLE TRUCK
Fitted with sliding door. Very realistic design.
Price **4/-**



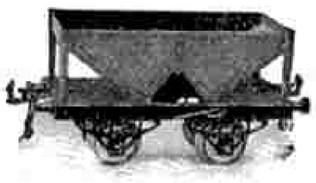
No. 2 CATTLE TRUCK
Splendid model fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**

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

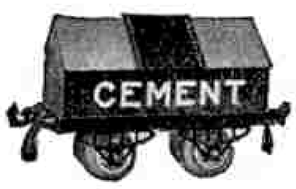
ROTARY TIPPING WAGON
Finished in colour.
Price **4/-**



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

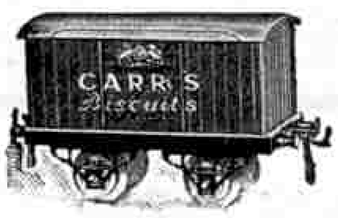


HOPPER WAGON
Mechanically unloaded. Finished in colour. Price **4/-**



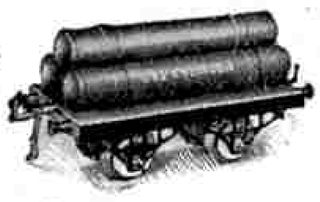
CEMENT WAGON
Finished in colour.
Price **4/-**

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



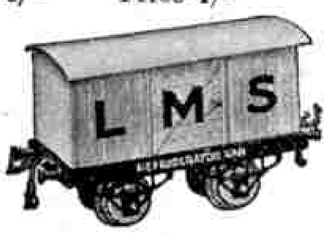
BISCUIT VAN
Price **4/-**

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



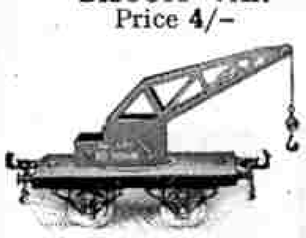
GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **3/-**

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



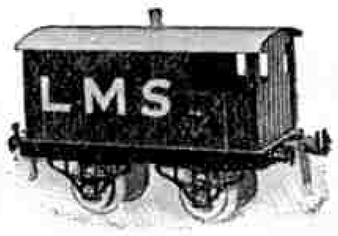
REFRIGERATOR VAN
Enamelled in white, lettered black. Price **4/-**

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

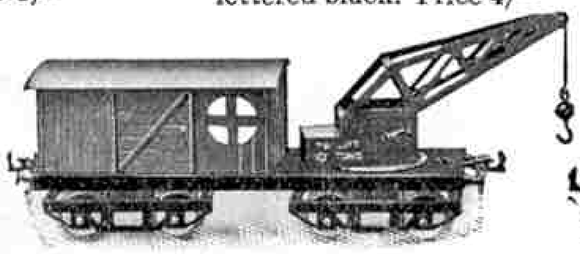


CRANE TRUCK
Working model. Finished in colours.
Price **4/6**

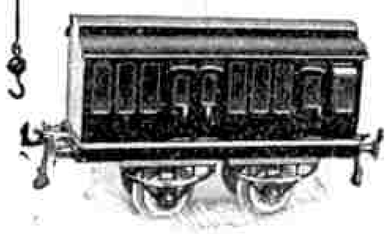
TROLLEY WAGON. Finished in colour. Suitable for 2 ft. radius rails only. Price **6/-**



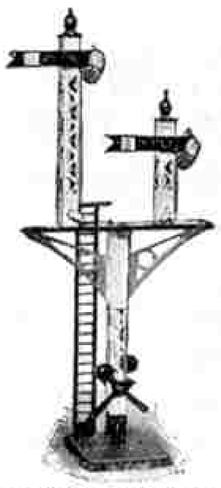
BRAKE VAN
Finished in colour.
Price **4/-**



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

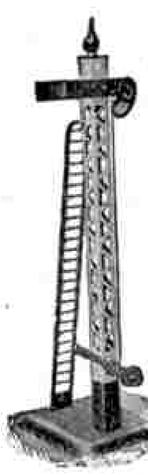


GUARD'S VAN
Price 3, 6

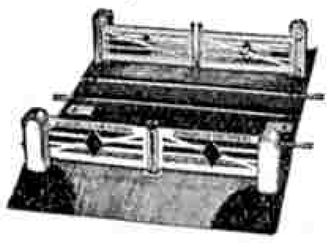


JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14 in. in height. Price **5/6**

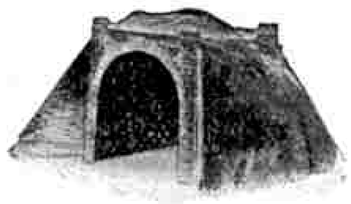
SIGNAL CABIN
Dimensions: height 6½ in., width 3½ in., length 6½ in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired. Price **6/6**



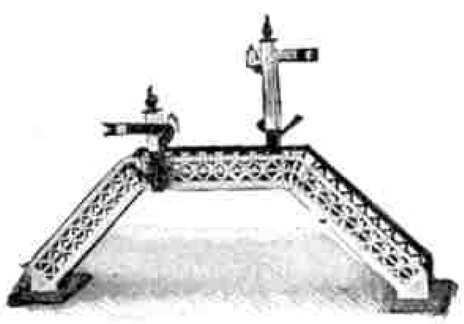
SIGNAL
Price **2/6**



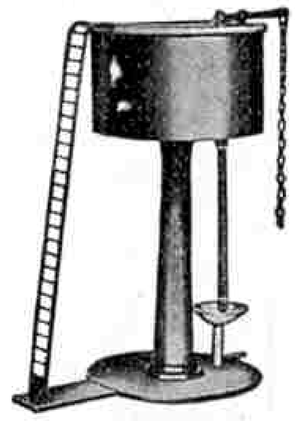
LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7½ in., with Gauge 0 Rails in position.
Price **6/6**



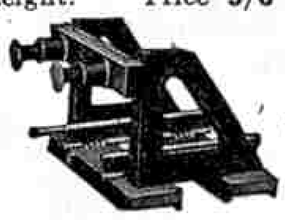
TUNNEL
Price **7/6**



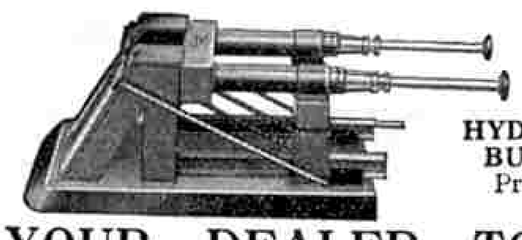
FOOT-BRIDGE
No. 1. With detachable signals. Price **6/-**
No. 2. Without signals. Price **3/6**
Signals, per pair **2/9**



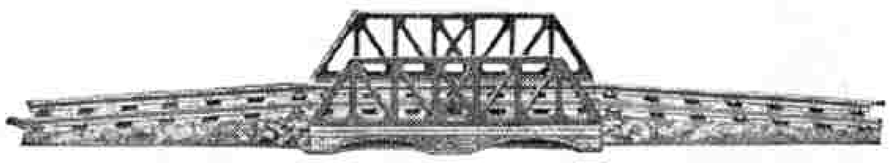
WATER TANK
Brightly coloured in red, yellow and black, 8½ in. in height, with flexible tube and pump lever.
Price **6/6**



SPRING BUFFER STOP
Price **1/6**



HYDRAULIC BUFFERS
Price **5/-**



VIADUCT, complete with approaches. Price **7/6**

ASK YOUR DEALER TO SHOW YOU SAMPLES

JAEGER
Pure Wool

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

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

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

Three-quarter Hose, Turnover Tops to match

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

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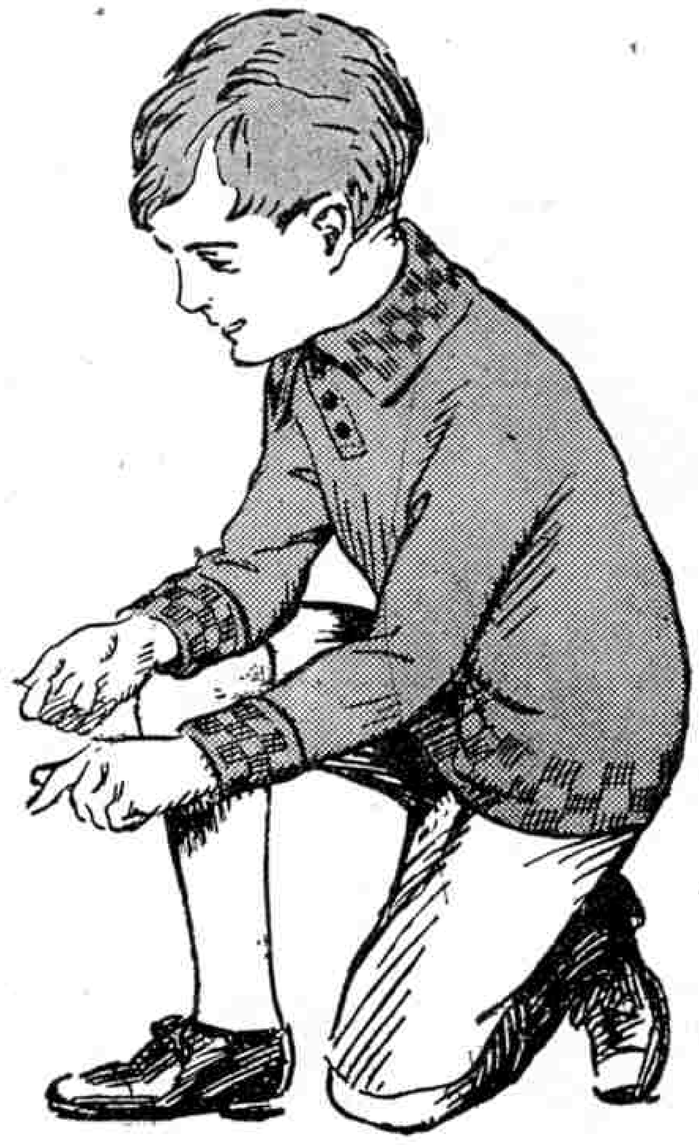

The New "Meccano" Jersey

THE MECCANO BOY'S STAND-BY
THE TUBE OF
SECCOTINE

The World's Great Adhesive. **Registered Trade Mark.**

WITH it he can mend a thousand things—his bats, balls, boats, boxes, bags, books, &c. He can make numberless things that a boy likes. He can help his mother by mending breakages in house furniture, anything—everything.

NOTE. There is nothing messy about Seccotine. Use the spike or pin supplied to open a new tube—at top of cone—press gently at end of tube (at folded part) for as much adhesive as is needed—then replace spike or pin which acts as stopper. Keep folding tube end as contents are withdrawn. Give mended article adequate time for drying.

TUBES are 4½d. (vest pocket box), 6d. and 9d. each. Sold everywhere.

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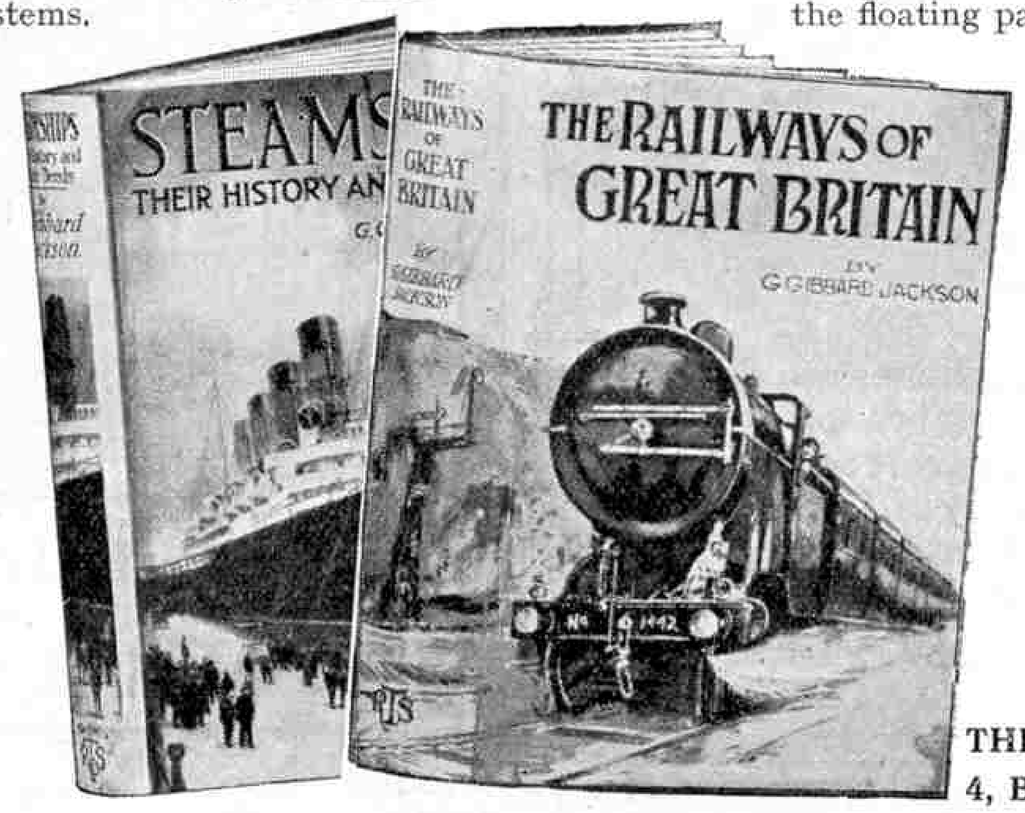

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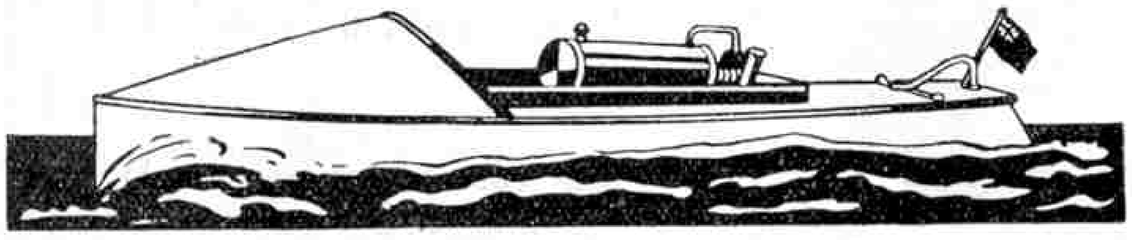

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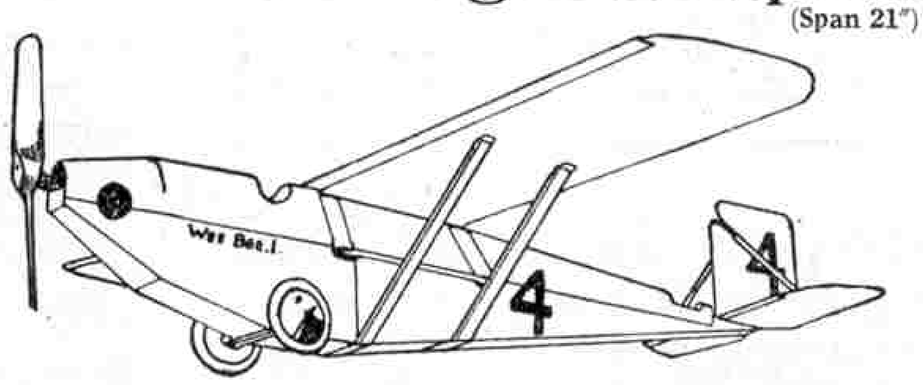

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Complete Set of Parts and Materials with Book of Instructions,

Price 1/6 Postage and packing 6d. extra.

Finished Spare Parts.

Finished carved propeller,	1/6	Special aluminium disc wheels,	9d. per pair.
Hank of elastic ...	3d.	Steel cup washers ...	1d. "
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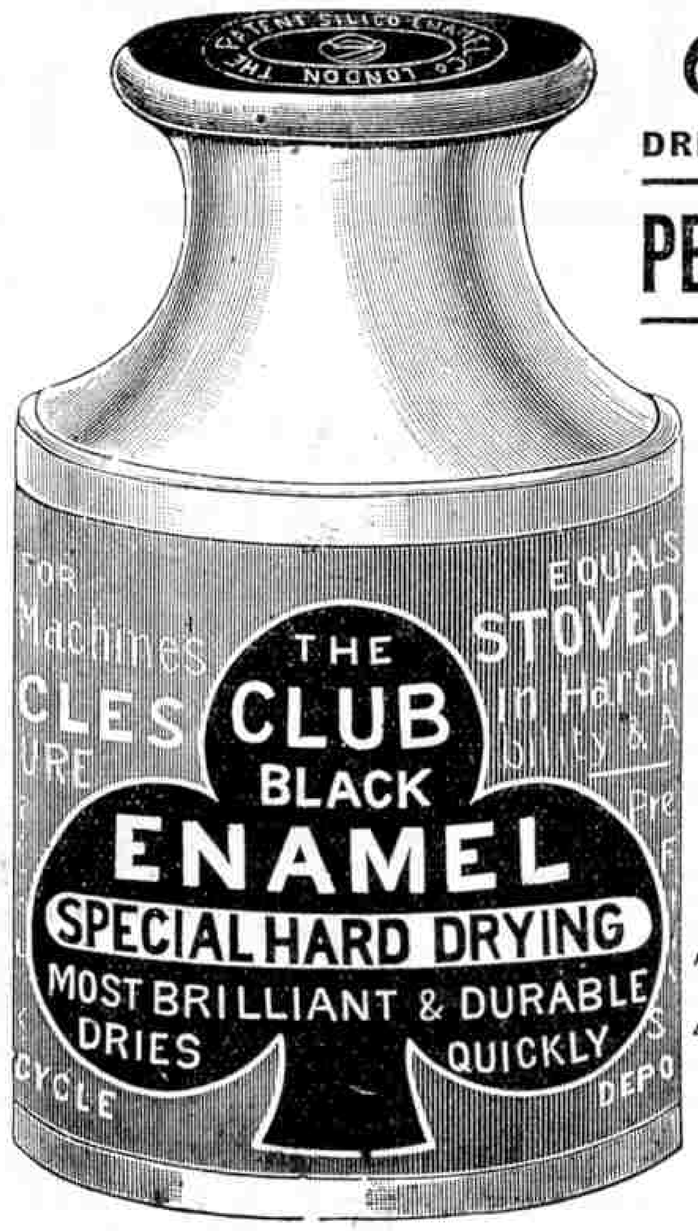

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Use CLUB BRUSHES—10d., 1/1, 1/8, 2/3

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Plates mounted in grooved glass boxes, special type for Dull Emitter valves giving approximately 400 hours on one charge using 0.06 valve. Price including packing and postage, **7/6** per cell, 2 for **14/-**. Full List of other sizes on application, suitable for all kinds of model, experimental and wireless work.

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Cowboys, Indians, Animals, Zulus. Model Station Staff, Rodeo, etc. Our CASTING MOULDS make thousands from any scrap lead WITHOUT PREVIOUS EXPERIENCE Send stamp to-day for illustrated catalogue.

Complete mould ready for work 2/6

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Mention "Meccano."

Be sure and read

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A helpful serial on the mathematics of Wireless will appear during the summer.

ASK YOUR NEWSAGENT FOR IT.

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Life's greatest joy for girl or boy is RIDING A "MIDGET" MEAD So buy the bairns Mead Runabouts. And let invigorating exercise awheel put the tinge of health in your loved ones' cheeks and make their little limbs strong and sturdy. You can obtain twin pedal Scooters, tiny Tricycles and miniature Cycles suitable for children of all ages *direct from factory* from **30/-** cash, or low WHOLESALE **credit** prices. Sent Packed Free and Carriage Paid on 15 Days' Free Trial. Money refunded if you are dissatisfied. *WRITE TO-DAY* for reduced factory quotations and save middlemen's profits.

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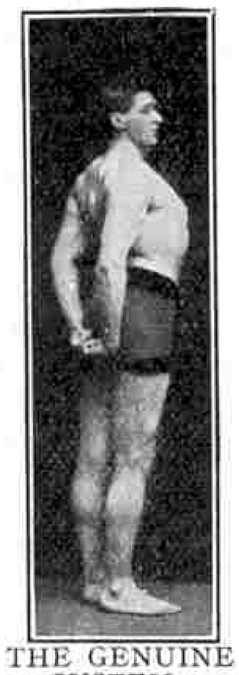

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THE ROSS SYSTEM OF HEIGHT INCREASE

Has increased my own height to 6 ft. 3⅜ ins.

FIRST IN 1907. FIRST TO-DAY.

No appliances, no drugs, no dieting.

ROSS SYSTEM NEVER FAILS.

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A Client, aged 37, reports : "I have increased my height nearly an inch, and I have not been a full month yet!"

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Send at once as there is only one Camera of each kind.

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Gent.'s Solid Nickel Silver Pocket Watches.
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The only Watch with a guaranteed Main Spring.
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"Owing to the great number of replies in consequence of my advert. in November I was unable to advertise in December number. Yours is undoubtedly the finest advertising medium I have ever tried." P.J.D.

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

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Fine Weather, Fine Roads, & Fine Quality Skates at the **lowest prices** in the trade, have all combined to create a **record demand** for **ROLLER SKATES.**

They provide **ideal outdoor exercise** for growing **boys** and **girls,** and to use the words of one of our delighted customers,

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No. 3 with Threaded Clamps and Case-hardened Steel Wheels are only **5/-** pair
No. 5 with best Ball-bearing Wheels, **10/-** ,,
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Postage and Packing 9d. pair extra.

Send at once to
Bateson's Sports Depôt, Blackpool

1/6 THE BULLY BOY 1/6

The Pea Pistol you have been looking for! 20-Shot Repeater. Perfect action; fires a pea 25 feet; bright nickel finish; each in box with Ammunition. A better Shooter than you have ever had before. Send **1/6** and don't miss our latest and best pistol.

Foreign and Colonial postage 9d. extra.

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FAMOUS STEAM LAUNCHES

Peter Pan	22¾" long	...	9 6
Miss America	31" ,,	...	12/6
Peggy	31" ,,	...	22/6
Pioneer	34½" ,,	...	30/-

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Dixie, clockwork or steam	...	25/-
Revenue cutter	... ...	35/-
T.B.D., clockwork or steam	...	50/-

Special Offer.

SAILING BOATS

Long	16"	18"	21"	23"
	5/-	6/6	9/6	11/6

RACING YACHTS

Long	18"	21"	23"	26"
	19/6	23/-	25/-	27/6

Postage 9d. extra. Price List Free. Money returned if not approved.

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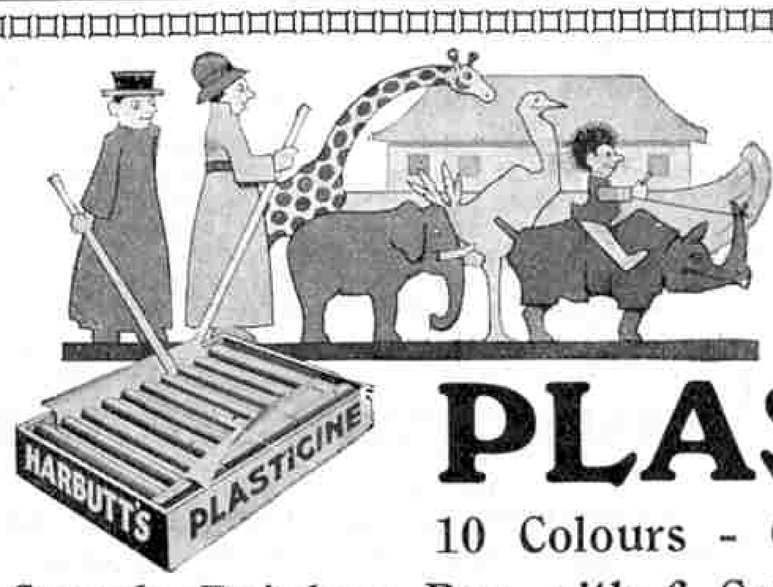

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10 Colours - Clean in Use - Ever Plastic

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

Write Us for Illustrated Circulars:

HARBUTT'S PLASTICINE LTD.
99, BATHAMPTON, BATH

FREE GIFT

Every boy wants the Best.
MERCITE Crystal is the Best obtainable and will help you to make your set, whether single Crystal or Crystal Valve Set, just what you want it to be.
MERCITE is 100% sensitive.
MERCITE costs 1/6, so purchase to-day, or send direct postal order or stamps for this amount and a Crystal will be sent post free. Also if you mention Meccano you will receive ABSOLUTELY FREE a tube of experimental Catwhiskers, which are usually sold at 6d.
There is a money back guarantee and if you are not satisfied, simply return the goods and your money will be refunded.
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Our 64 page Catalogue tells you for **3d. how to do it** and what accessories to choose. **Motors** in 25 sizes, from **9/-**; Tone arms, **4/-**; Speakers, **2/-**; Headphones, **10/6** pair; Cabinets from **9/-**. Gramophones from **25/6**. Carr. paid.
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MODEL SHIPS' FITTINGS
Send 6d. for Scale Drawing of Splendid Ocean Liner and List of Realistic Fittings. **A. Rodway,**
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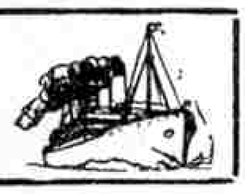

MAKE YOUR OWN ELECTRIC LIGHT

These marvellous Dynamos light brilliantly 4-6 volt Lamps, and are very easy to work. List Free. Send for one now! **5/-** (Post 6d.) (Abroad 1/6)

5/-

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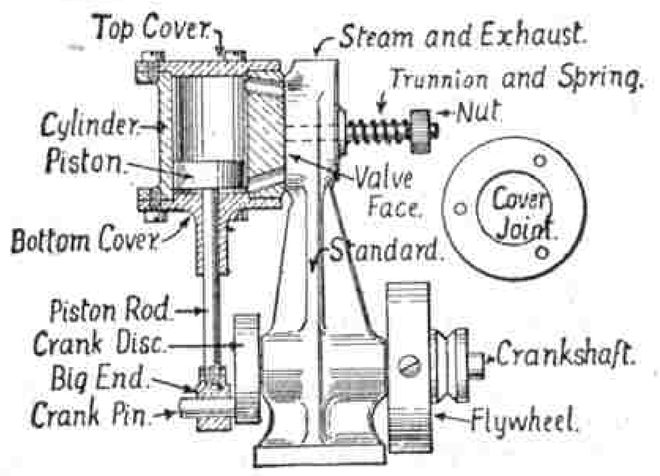
Packed Free. Carriage Paid. *Fifteen Days' Trial*
£4 19s. 6d. CASH or 2/6 WEEKLY.
Prompt delivery. Buy direct from Factory. Save Dealers' Profits. Factory Soiled and Second-hand Cycles CHEAP. Juveniles' Scooters stocked. Tyres and Accessories at popular prices. Satisfaction guaranteed. Write for **Free List** and *Special Offer* of Sample Bicycle.

Est. 38 Yrs. **Mead** CYCLE COMPANY, Inc. Dept. B911 BIRMINGHAM.



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

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

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

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

Stuart Turner Ltd.

HENLEY-ON-THAMES

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

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

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

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

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

READERS' SALES

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

Cigarette Cards 639, 1/– hundred, sets 25, 4½d.—Hollingworth, High Street, Westerham.

Crystal Set, fitted Daventry coil. Complete with phones. Practically new. Cost 35/–. What offers?—Barnard, 31, Tollington Park, N.4.

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For Sale. 2 Brownie Camera. Case, portrait attachment. Practically new, 10/–.—M. C. Kemp, White Cottage, Etonwick.

For Sale. First eleven parts Cassell's "Pageant of Nature," also first five parts Hutchinson's "Birds of our Country." What offers.—Bass, 14, St. Albans Crescent, Woodford Green, Essex.

Will sell my fine 1 Valve Wireless Instrument for 32/–, new condition and worth treble.—Waine, Compton, Wolverhampton.

Wanted. Jubilee Stamps only. Every country. Give in exchange Jubilee's or newly issued Holl. Letters need 2½d. postage.—J. Klaversteyn, Harbingen, Holland.

Ensign Camera and Vertical Steam Engine. Particulars:—Lamond, 150, Byres Road, Glasgow.

Meccano Magazines, 22 onwards, 4d. each. Electric Motor, new, 4 to 6 volts, cost 12/–. Sell 6/–.—Stainton, Tettenhall College, Staffordshire.

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

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

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MONEY EASILY EARNED by selling Rubber Stamps, in spare or full time. Particulars Free.—Richfords Ltd., Snowhill, London.

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

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THE NAME FOR PERFECT RADIO.

12 Months' Guarantee

The Phones and Loud Speakers guaranteed for 12 months.

Revo Lightweight Headphones

4,000 Ohms. 19/6 EACH.

REVO LOUD SPEAKERS

25/-, 48/- AND 80/-

Complete with Cord.

Experts say—They are the best Loud Speakers made.

Revo Little Gem Crystal Set, 6/-

Obtainable from any dealer or the manufacturers:

THE CABLE ACCESSORIES CO. LTD., TIPTON, STAFFS.

London Depot - - 28, SHOE LANE, E.C.4.

New Meccano Model—(*Continued from page* 275)

Wheel (7) forming the base of the jib.

The cords (19 and 20) are prevented from fouling the uprights as the jib rotates by the guide-pulleys (9).

Brakes are provided in the form of weighted levers (34), applying tension to the cords engaging 1" Pulleys secured to the Rods (18 and 21). This method prevents falling-back of the jib or hoisting-block when the gears are released.

Parts required:

2 of No.	2	3 of No.	16A	1 of No.	48C
6 „ „	3	4 „ „	17	2 „ „	52
2 „ „	4	9 „ „	18A	2 „ „	52A
12 „ „	5	5 „ „	18B	1 „ „	57B
2 „ „	6	6 „ „	20	50 „ „	59
5 „ „	7	1 „ „	21	1 „ „	62
4 „ „	7A	2 „ „	22	1 „ „	63
5 „ „	8	15 „ „	22A	2 „ „	76
2 „ „	8B	2 „ „	26	1 „ „	94
6 „ „	9B	3 „ „	27A	2 „ „	95A
2 „ „	9E	2 „ „	31	1 „ „	95B
3 „ „	9F	1 „ „	32	2 „ „	96
2 „ „	12	3 „ „	35	2 „ „	103
2 „ „	13A	79 „ „	37	3 „ „	126
4 „ „	14	88 „ „	38	1 „ „	133
1 „ „	16	2 „ „	40		

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

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

MECCANO MAGAZINE

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

EDITORIAL AND ADVERTISING OFFICES:—

BINNS ROAD, LIVEROOL.

Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 3d. per copy. It will be mailed direct from this office, 2/– for six issues and 4/– for twelve issues.

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

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

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

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

Small Advertisements. 1/– per line (average seven words to the line), or 10/– per inch (average 12 lines to the inch). Cash with order.

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

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

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

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

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

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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 "*M.M.*" is sold Overseas at 3d. per copy, or mailed (post free) direct from Liverpool, 2/– for six issues, or 4/– for twelve issues.

IMPORTANT.

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

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NEW ZEALAND:	Messrs. Browning Ifwersen Ltd., P.O. Box 129, Auckland.
SOUTH AFRICA:	Mr. A. E. Harris (P.O. Box 1199), Textile House, Von Brandis St., Johannesburg.

TWO GOOD PEA PISTOLS AT LAST

No. 1. New 15 Shot Pea Repeater, brightly nickelled ... **1/9** post free

No. 2. 25 Shot Pea Repeater, heavy model, black finish ... **2/6** post free

Each Pistol is **Guaranteed Perfect.**

Instructions, and a supply of ammunition with each one.

Postal Orders or 1½d. stamps accepted.

HERBERTS', 27, Adys Road, Peckham, London, S.E.15.

THE AUTOMATIC PEA REPEATER

The most reliable pistol on the market. Takes 25 shots at one loading, best black finish, each in box with instructions and supply of ammunition, post free **2/6.**

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FAIRYCYCLE

Regd. Trade Mark

It's Great Fun!

PRICE NOW

49/6

ONLY

The De Luxe Fairycycle

Specification includes $\frac{7}{8}$" white ribbed cushion tyres, ball bearing tangent spoke wheels and rim brake.

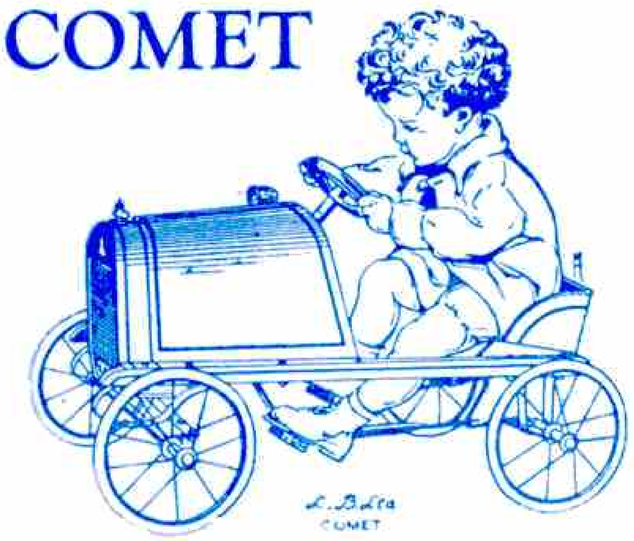
Price **61/6** only

If only you had a **FAIRYCYCLE** just think what fun you could have, and what splendid exercise you would get in riding it.

The **FAIRYCYCLE** is a real Cycle—not a make-believe. It is beautifully constructed, runs with remarkable ease, and is safe because the low riding position makes it easy to control. And it is BRITISH.

BE SURE YOU RIDE A FAIRYCYCLE

The COMET



This natty little racing model is the very thing for the youngsters. It is built for sturdy boys and girls, and will stand any amount of rough wear. The double crank movement makes it very speedy.

As illustrated 27/–

THE METEOR, a larger size 34/6

ℂ Look for the Triangle Trade Mark on all these toys

The PEDAL FAIRYKAR

Regd. Trade Mark

Baby will love this Pedal Fairykar. There is nothing to beat it. It is beautifully painted a bright red with nickel-plated handle bar and stem, rubber pedals, etc. A splendid health-giving toy.

No. 4 as illustrated 15/–

No. 5 larger size with spider wheels 22/6

OBTAINABLE FROM ALL GOOD TOYSHOPS

Sole Manufacturers:

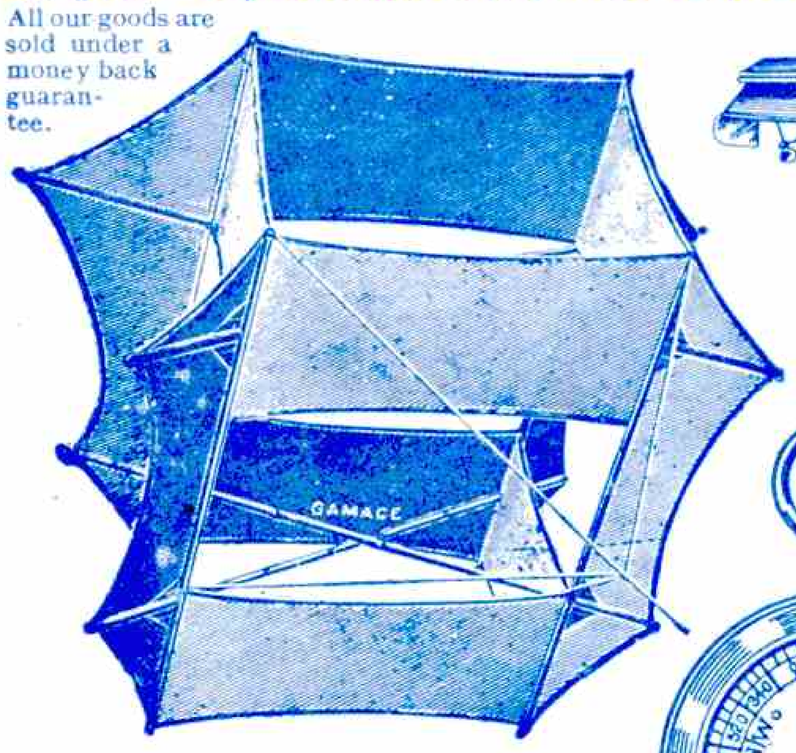
LINES BROS. LTD., 9, FORE STREET, LONDON, E.C.2

All These Things and More at

GAMAGES

In the splendid showrooms in Holborn you can see the result of fifty years' study of what boys and young men want. Just what you need is there, waiting for you. If you cannot call, order by post direct from this announcement.

All our goods are sold under a money back guarantee.



Quadroplane Kite

Similar to illustration but with one stretcher in centre.

This is the man's kite, the kite which has taken the prizes for high flying. The very thing for fellows between the ages of 13 and 18.

Show off your skill in kite flying when you take it out, and *take plenty of cord.*

No. 1 Model, 29" high, costs **3/6**

Other Models:

No.	2	3	4
Height	32"	35"	38"
Price ...	4/6	5/11	7/6

Postage 6d. extra.

GET THIS RACING LAUNCH

The famous "Miss America"

Unsinkable. Built of selected timber and highly enamelled, 30" long, 4" beam. Special speedy oscillating type engine, polished brass, built to last. Capable of 4,000—5,000 revolutions per minute. Power unit may be removed to drive stationary models indoors. Will run for 20 minutes and cover a mile on the water. Post free. Packed in strong box **12/6**

COMPASSES

Magnetic, watch pocket size. Best nickelled hunter cases, luminous floating dials. Price **5/6**

JUST THE KNIFE YOU NEED

The Boy's Own Knife

Fitted with two blades, Hoof Pick, Leather Borer, Corkscrew, and Shackle complete with chain, is yours for Post 2d. **5/-**

This is just the "handy" type of knife that the Scout really needs. Everything is there, packed away neatly into the haft of an ordinary knife.

CRICKET!!

Here again and by now you have found out what you want.

Before you decide on anything write for our Summer Sports Catalogue, which shows everything that Summer sportsmen need—it will pay you.

We list a few lines, any of which are first class match lines.

CRICKET BATS, size 4	10/6
CRICKET BALLS	8/6
28" CRICKET STUMPS, per set	4/-
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BATTING GLOVES	4/6
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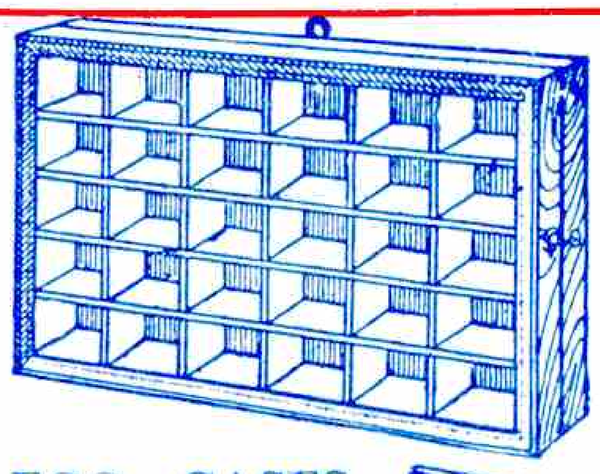
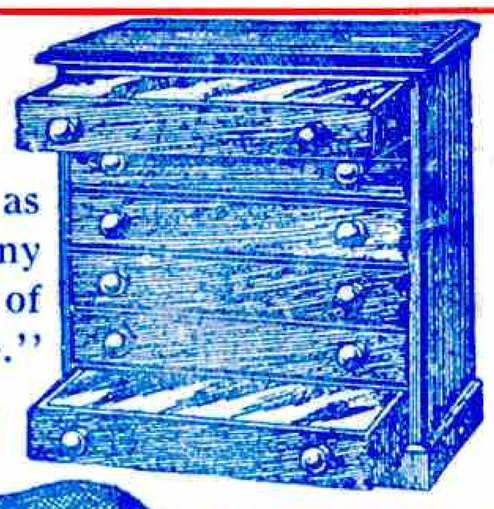
CRICKET FLANNELS (WHITES) ...	12/6

EVERYTHING FOR THE YOUNG NATURALIST





The lines we show will help you with such well-known sections as Butterfly collecting, but everything that is necessary to any branch will be found inside our Naturalists' Catalogue, a copy of which will come Post Free if you mention "Meccano Magazine."

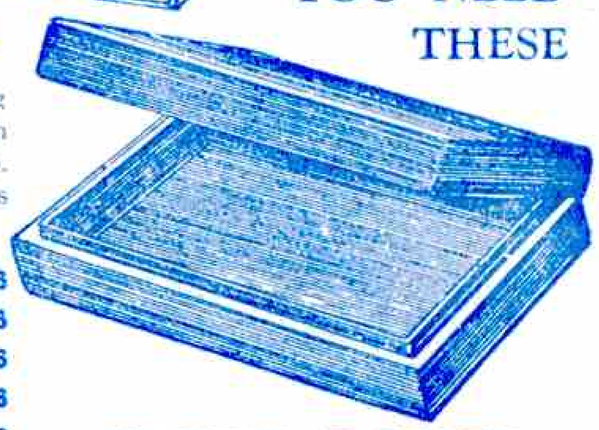
EGG CASES

Just the thing for showing off your specimens. With partitions, glass framed top. Polished imitation partitions in mahogany.

18" × 18" ...	64 ...	12/6
18" × 14" ...	48 ...	10/6
16" × 12" ...	35 ...	9/6
16" × 10" ...	28 ...	8/6
14" × 10" ...	24 ...	7/6
13" × 9" ...	24 ...	5/6
10" × 8" ...	20 ...	4/6

Polished mahogany or oid English oak to order only. Prices on application.

YOU NEED THESE



STORE BOXES

Will keep spare specimens till you either display or exchange them with other collectors. Corked and papered, with camphor cells.

17½" × 12" ...	10/-	16" × 11" ...	8/6
14" × 10" ...	7/3	13" × 9" ...	5/6
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Pocket Size, 6" × 4" **2/6**

THE AQUARIUM For Your Specimens

Best London make and finish. With Cover.

14" × 10" × 10" ...	25/-
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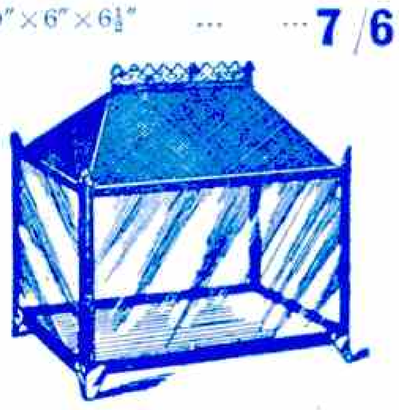
14" × 8" × 9" ...	21/-
10" × 6" × 6½" ...	7/6



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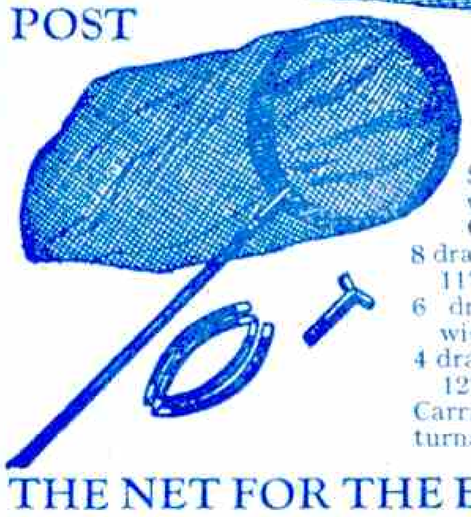

BUTTERFLY CABINETS

Stained deal, drawers with sliding glass tops. Corked and papered.

8 drawers, 18" high, 22" wide, 11" deep **66/-**

6 drawers, 15" high, 16½" wide, 9" deep ... **36/-**

4 drawers, 13" high, 12" wide, 8" deep **27/6**

Carriage extra. Crates (returnable), charged 2/6.

THE NET FOR THE ENTHUSIAST

Plain Cane Ring, with square brass fork, good net and cane handle ... ... **3/11 & 4/11**

Pocket Nets, Folding Cane Ring, travelling joints, with square brass fork, folds in three sections, with net and cane handle **5/11**

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