MECCANO MAGAZINE

TAPPING AN ELECTRIC FURNACE

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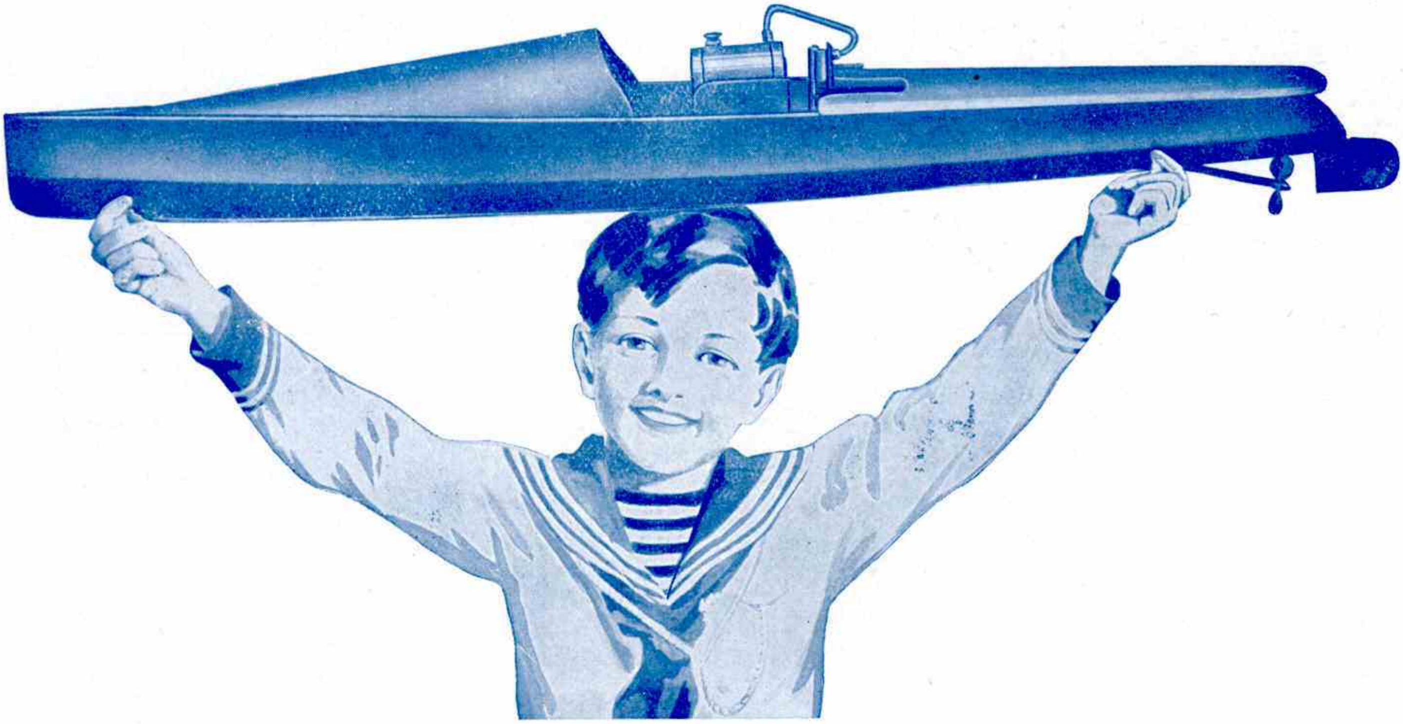

EDITORIAL OFFICE
Binns Road,
LIVERPOOL

MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

THIS month our cover depicts one of the huge electric furnaces at the steel works of Messrs. Hadfield Ltd., of Sheffield, to whom we are indebted for the original photograph on which our artist has based his picture. Looking at this furnace we are struck by the huge dimensions of the three terminals that carry the current to form the electric arc. Comparing them with the size of the man in the foreground, we are better able to realise what a tremendous temperature must be attained in the body of the furnace. Indeed, it is so great that it melts steel so that it runs like water! In our picture the man in charge of the furnace is viewing the stream of molten metal through a dark-tinted screen, which he holds in front of his eyes. At the same time he regulates the angle at which the furnace is inclined, by controlling a lever with his right hand. As soon as the giant ladle is filled he will move this lever and the furnace will return to a horizontal position. The huge ladle, full of molten steel, will then be carried by an overhead crane to a position above certain moulds, and into these the metal is poured to make the required castings. The full story of these wonderful processes is being told in "*The Story of Iron and Steel*" now appearing in our pages. As we read this article we cannot but admire the genius of the inventors who conceived the principle, and of the ability of the engineers who responded and made the idea practicable by constructing such huge furnaces and their attendant appliances. So easily do these work that they make the handling of huge quantities of molten metal an everyday event in the lives of the workmen who are associated with them.

Our Cover

Since I wrote my last notes in this column I have paid two further visits to the British Empire Exhibition at Wembley, and I have thoroughly revelled in the wonderful displays that have been arranged by British engineers in the Palace of Engineering and the Palace of Industry. The visitor to Wembley can almost imagine the feelings of Aladdin when he saw the wonders of the world at his feet, for at the Exhibition is the greatest collection of wonders that has ever been brought together at one spot. Every Meccano boy who can do so should most certainly visit the great Exhibition, and even if he gets no further than the Palace of Engineering he will obtain enough material to stimulate his imagination in the way of ideas for new Meccano models to last him all next winter! In this issue we print an article that gives some further particulars of the wonders of Wembley.

The Empire Exhibition

I am pleased to say that the circulation of the Magazine continues to increase rapidly, and I take this opportunity of welcoming to our ranks some thousands of new readers and of assuring them that the interest of the "*M.M.*" will be well sustained in our future issues. A number of articles are now being prepared for publication in the immediate future—articles that cannot fail to interest every reader. I look forward to the time when the number of our pages can be increased even further, for only by so doing shall I be able to deal with all those subjects that my readers constantly demand. Our programme this autumn includes articles dealing with the story of the Quebec Bridge across the St. Lawrence; particulars of the wonderful new bridge at Sydney Harbour, Australia—to be the largest bridge in the world—and articles on Hydro-electric power-stations; Steam-turbines; Cranes; Levers; Pulleys and a host of other topics of absorbing interest. I am also preparing an article on Fire-Engines, and railway enthusiasts will be interested to learn that the special railway articles, that have been a regular feature for some time, will be continued and will deal with many details of railway practice. These are only a few of the good things in store, and more definite particulars in regard to their publication will be announced from time to time as opportunity allows.

Good Things in Store

IMPORTANT NOTICE.

We are constantly asked to supply back numbers of the "*M.M.*" We print only sufficient copies to fill our regular orders, and as a rule back numbers cannot be supplied. In order to prevent disappointment our readers are advised to place a regular order with a Meccano dealer, a newsagent, or direct with us. (Subscription rates on page 236).

"*M.M.*" Back Numbers

In the advertisement columns of the "*M.M.*" a reader recently offered 2/6 per copy for certain early numbers of the "*M.M.*" in order to complete his file. This offer indicates the value placed upon the "*M.M.*" by Meccano boys, and we suggest that you should see that your file of copies is complete. Have your Magazines tastefully bound by some local book-binder or keep the Magazines in the special spring-back binder illustrated here. This binder has a strong stiff back, holds a large number of copies, and keeps them neat and clean. Covered in black imitation leather, tastefully tooled, lettered gold, its price is 3/- (post free) from—

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BINNS ROAD - LIVERPOOL

The September number of the "*M.M.*" will contain a further instalment of the story of that famous engineer, James Brindley, the pioneer of Canal-building in England. In this article I shall describe Brindley's remarkable ingenuity in the construction of the Bridgewater Canal. This issue will also contain a further instalment of the serial "*Electricity*" and will describe Power-Stations and their work. Railways will be represented by an article "*Driving an Express Train,*" and another new Meccano model will be described. An interesting article on "*Wireless Time-Signals,*" and the usual regular features, including Stamp-Collecting, Competitions, Cycling page, Fireside Fun, and Guild matters will all help to make the September issue one of the most interesting "*M.M.'s*" we have published. Order your copy *now* and see that your friend orders his!

Our Next Issue

The Story of Iron & Steel

IV. THE OPEN HEARTH PROCESS AND THE ELECTRIC FURNACE

LAST month we saw how the Bessemer process for steel-making was brought from failure to success, and now we must turn our attention to the Open Hearth process, which has largely superseded the Bessemer process.

About the year 1844 J. M. Heath attempted to make steel by melting together wrought iron and pig iron. The method failed, however, because at that time it was not possible to produce sufficient heat. In 1865 a Frenchman named Martin brought out a similar but improved process, but this was not a commercial success until Sir William Siemens introduced his system of regenerative heating, by which the intense heat required for the process could be obtained.

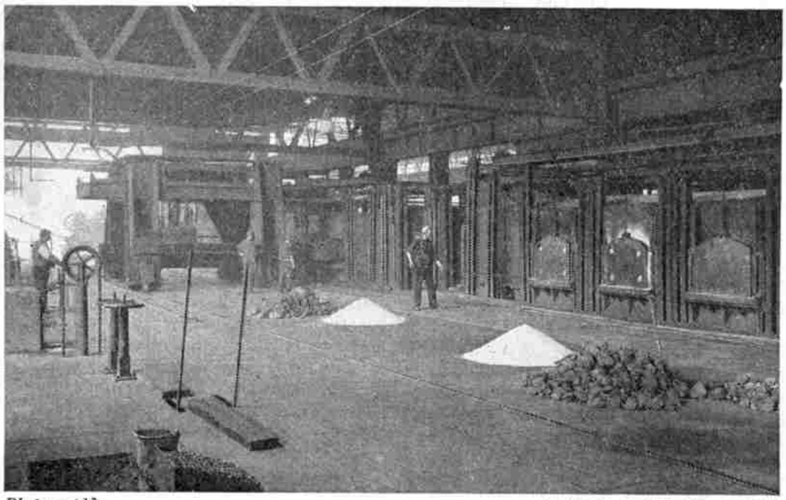
The Siemens Furnace

In the Siemens furnace hot gas produced by burning coal with a limited supply of air is passed through a chamber of chequered brickwork called the regenerator chamber. This chamber is previously heated, and in passing through it the already hot gas is further increased in temperature. Air is passed through a similar chamber and raised to a very high temperature, and the hot air and the hot gas are brought together in the furnace and combustion takes place at once.

The gases resulting from this combustion are drawn out of the furnace at a very high temperature and passed through chambers exactly similar to those through which the air and gas passed previously. The combustion gases part with their heat to the brickwork and then, by means of valves, the whole process is reversed—the air and the unburned gas passing through the chambers heated by the gases produced by combustion, and the latter gases passing through the chambers that have become cooled by giving up their heat in the first place to the air and active gas. This reversal is continued at regular intervals, and results in a gradual increase in the furnace temperature up to the point required.

The Open Hearth Process

As with the Bessemer process, the open hearth process may be either acid or basic. In the acid process the furnace is constructed of silica bricks, and the bottom, made of sand burned in in layers, is formed to the shape of a saucer with a slope towards the tap hole at the back. Pig iron is placed at the bottom of the furnace and scrap is then added. When the mixture is melted a sample is withdrawn to test the amount of carbon, any excess of which is oxidised by adding ore. By this time the silicon is eliminated, and when the proportion of carbon is correct the metal and slag are drawn off into a ladle.



Photograph] [*courtesy Messrs. Vickers Ltd.*

Open Hearth Furnaces

In the basic open hearth process, magnesite bricks are used for all parts of the furnace that come in contact with the metal. Ore and limestone are put in, followed by molten pig iron from the "mixer," a kind of storage vessel for the metal coming from the blast furnaces. After a few hours the ore and limestone melt, and samples of the metal are drawn off at intervals and analysed. Ore and other materials are added until the quality of the metal is correct, and when the temperature also is correct, the furnace is tapped and the molten steel run off into a ladle. Ferro-manganese is added to the steel while it is running into the ladle, to give the proper amount of manganese and silicon and to assist in the formation of sound ingots.

As in the case of the Bessemer process, the steel is now run into ingot moulds, and while the moulds are being filled pieces of aluminium are thrown in with the object of preventing the production of blow holes caused by gases dissolved in the metal separating out as the metal cools and solidifies. After about half an hour the moulds are stripped off and the ingots are placed in gas-fired or coal-fired re-heating furnaces, which serve exactly the same purpose as the soaking pits used for ingots of Bessemer steel.

Bessemer and Open Hearth Processes Compared

We have already said that the open hearth process is superseding the Bessemer proeess, and it will be interesting now to compare the two processes in rather more detail. The great advantage of the Bessemer process lies in its rapidity of working, with consequent large output. As compared with the open hearth process, however, its yield of steel per ton of iron is smaller and the steel itself is less regular in quality. The basic Bessemer process has an advantage over the acid process on account of the fact that iron containing phosphorus can be employed, so that the resulting slag is rich in phosphoric acid, and, when ground up into fine powder, forms a valuable manure.

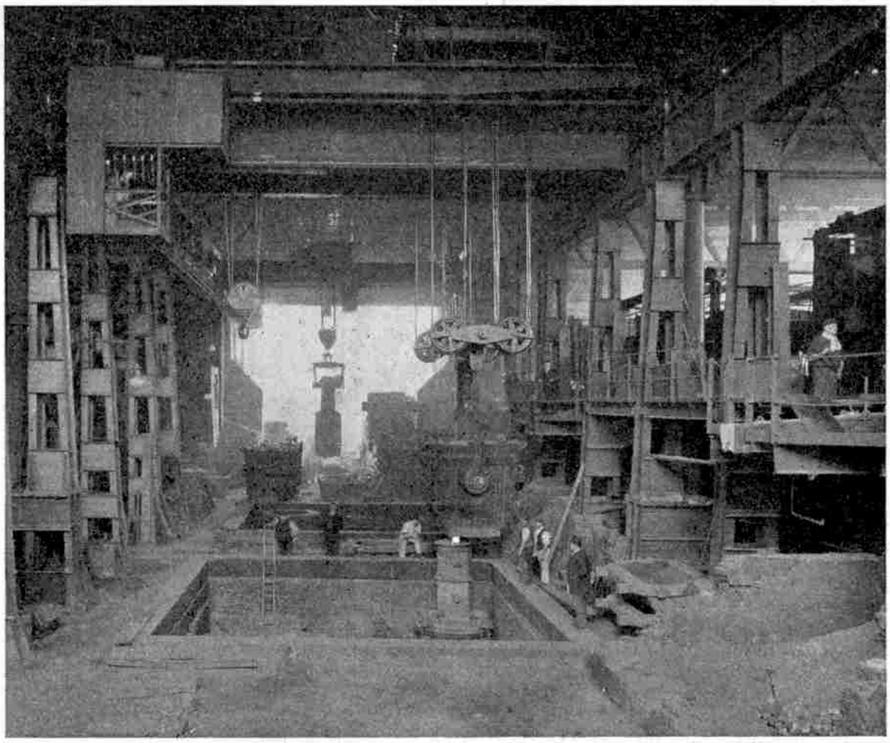
Compared with the Bessemer process the open hearth process produces a much smaller amount of steel, but, besides having a smaller consumption of iron per ton of steel, the quality of the steel can be regulated exactly as desired. The open hearth process has the further advantage that scrap can be used in larger quantities.

Steel-Making by Electricity

We come now to a later development—the electrical process of steel-making. The furnaces used for this process may be divided into two entirely distinct groups, arc furnaces and furnaces in which the arc is avoided.

In 1802 Sir Humphrey Davy, one of our greatest scientists, was experimenting with a huge voltaic battery of 2,000 cells at the Royal Institution, where he was lecturer on chemistry. In the course of his investigations he connected a carbon rod to each terminal of the battery, and he found that if the two rods were first made to touch one another, and then gradually separated, a brilliant arch or arc of light was formed between them.

The intense brilliance of this arc at once suggested the possibility of utilising it for lighting purposes, and by degrees was developed the arc lamp which was such a familiar object in our streets a few years ago, but which now has been largely superseded by the latest type of incandescent electric lamps. The brilliance of the light from the electric arc is due to the intense heat of the stream of vaporised carbon particles passing between the carbon rods, and this great heat is made use of in electric arc furnaces.



Photograph] *[courtesy Messrs. Vickers Ltd.*

Running-off Open-Hearth Steel from Huge Ladle

Arc Furnaces

Of the arc furnaces, the Heroult is perhaps the oldest and the one that has been most frequently adopted. In 1908 Messrs. Edgar Allen & Co. Ltd. (to whom we are indebted for much useful information about steel-making with the electric furnace) installed in Sheffield the first Heroult furnace in Great Britain. This was of three tons capacity, taking single-phase current, and gave very satisfactory service both before and during the war. This furnace was only dismantled in 1918 to make room for a larger and more modern furnace of the same type, taking three-phase current.

The types of arc furnaces are legion, and every patent office must be drawing a good revenue in patent fees on electric furnace proposals. Besides the Heroult, the Electro-Metals, Greaves-Etchells and Stobie furnaces have given good service in this country. There is also the American Snyder furnace, which differs from the general type in use in this country in that it is acid-lined, and does not purify the metal. The general practice is to have the furnace basic-lined, and to melt down the charge—generally steel turnings or other scrap—with lime and iron ore to oxidise the phosphorus. When this process is completed the furnace is tipped, and the phosphoric slag is removed and a fresh slag introduced. This consists of lime and fluorspar with carbon or ferro-silicon to form a reducing slag, for only by this means can the sulphur be reduced to the lowest limits.

Coming now to electric furnaces in which the arc is avoided, there are several types of induction furnaces, that is to say, furnaces in which the bath of metal is heated by inducing a current in it. These furnaces, which avoid the use of electrodes, are very attractive from an electrical point of view, but in this country they have not met with a great deal of success. The Kjellin, Frick, and Rochling—Rodenhauser induction furnaces, however, have all achieved some measure of success on the Continent.

Value of Electrically-Produced Steel

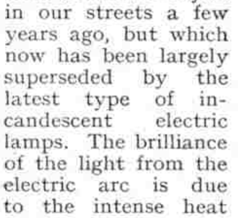
In the manufacture of alloy steel for motor vehicles and aircraft the electric furnace played a very important part during the war, and there is no doubt that it has more than made good. With the electric furnace, alloy steels are made in the furnace itself rather than in the ladle, and in this way there is better opportunity for increasing solution, diffusion, and homogeneity in the product. All these things make for high quality, and at the present day quality is the first consideration.

In addition to these advantages the electric furnace performs an economic function because of its adaptability for handling and recovering alloy values in scrap. This was of particular importance during the war, when alloys of all kinds had to be conserved, and it is specially true with regard to chrome and vanadium. The alloy contents of these elements in scrap used in the Siemens open hearth process are only recovered to a very small extent, and not only is the alloy value lost, but the oxides formed are frequently a source of trouble.

The field for electrically-produced steel in the future is very promising, and when its merits are more fully recognised new uses for it will rapidly be found.

NEXT MONTH:—

STAINLESS IRON AND STEEL



BRIGHT IDEAS

H. M. Upward (St. Albans).—Do we understand from your suggestion to substitute a square rod in place of the round rod operating the cam in the hopper wagon, that yours has worked loose? We have had no other complaints in this direction. Should such a contingency arise we shall bear your suggestion in mind. (2) We scarcely see any advantage in the half eye piece you mention. Perhaps you could quote an instance where used.

Jack Sears (Watford).—(1) There would be no advantage in introducing a flanged wheel that is a degree or two smaller than the present one. (2) See our reply (below) to G. Ralph, Sydenham, re tie-rods.

C. S. Bott (Oxford).—Our present standard flanged wheel is slightly over one inch. A 2¼" flanged wheel may be made by attaching the flanged disc to the face plate. Would not these serve the same purpose as your suggested 1" and 2" flanged wheels?

W. R. Skelton (Kingsdown).—(1) We have experimented with the type of screwdriver you suggest, and find that firm leverage cannot be obtained. (2) A cork clutch similar to your sketch would not give any grip.

Geo. Ralph (Sydenham, S.E.).—We are not favourably disposed towards tie-rods for the reason that they would have to be introduced in a variety of lengths. We shall, however, give the matter further consideration.

J. Palmer (Norwich).—We now list a special brake-actuating rail for Hornby Trains.

H. Dennis (Kirkby, Notts.).—Curved sections are exercising our attention. The difficulty is to decide which is the most suitable diameter to adopt.

F. N. Haward, A.M.I.E.E. (London, E.C.).—The discrepancy in the teeth of the rack segment has already been noted. We are giving attention to the better division of the teeth.

M. Doig (Endunda).—Flat angle strips are under consideration. Two wrappings of the cord round the crank handle and secured with two ordinary half hitches will give a firm fastening.

C. I. Boland (Murchison).—We hope to have a sliding element ready shortly.

J. A. Jones (Pontypridd).—We already list a 6" pulley wheel. What do you consider are the advantages of your flat plate 4½"×3" over our 4½"×2½" plate?

P. Bourne (Beamish S.O., co. Durham).—Solid wheels on our train rolling stock would entail too much weight behind the engine.

N. I. Blundell (Seaforth).—A water tank is included in our list of new Train accessories this year.

A. Savona (Malta).—We are experimenting with a recessed type of screwdriver similar to your suggestion.

VII. JAMES BRINDLEY: The First English Canal Engineer.

Before railways opened up communication in this country, and before the development of the locomotive made this possible, attempts were made to relieve the situation by constructing canals. James Brindley was one of the pioneers of this movement in England, and in reading of his work we should remember the object he had in view, and how greatly he contributed to the advance of our country by his ability and integrity. His steady rise to eminence, his remarkable ingenuity, and his dogged determination, mark him as one of the great men of his time, and we may profitably strive to emulate his example.

In our articles on the lives of George and Robert Stephenson we saw how England led the world in regard to railways and locomotives. It was very different, however, in regard to canals. At the time when Holland had brought to completion her splendid system of waterways, and when France and Germany had opened-up important inland communications, England had scarcely begun to regard the canal as a serious commercial proposition.

John Trew: Pioneer of Canals in England

The first English canal was cut in 1566 by John Trew, a native of Glamorganshire. His canal ran from Exeter to Topsham, a distance of about three miles, and contained the first lock constructed in England. Like many other men whose ideas were in advance of their time, Trew had to fight against all sorts of obstacles, many of them deliberately placed in his way, and although his work was successful, he himself realised from it only loss and disappointment. He became involved in legal proceedings which ultimately ruined him, and in a pathetic and quaintly phrased letter to Lord Burleigh he wrote: "The varyableness of men, and the great injury done unto me, brought me in such case that I wyshed my credetours sattisfyd and I away from earth; what becom may of my poor wyf and children who lye in great mysery for that I have spent all."

Trew's canal appears to have attracted very little public attention, and it was not until about the middle of the 18th century that England really awoke to the fact that her commerce was in urgent need of inland water communications, and the first important English canal was constructed in 1761 by James Brindley.

The Millwright's Apprentice

Brindley was born in 1716, in the third year of the reign of George I. His home was a humble cottage standing midway between the Derbyshire hamlets of Great Rock and Tunstead, two or three miles from Buxton. His father appears to have maintained his family by the cultivation of his little croft, but he was a man of unsteady habits and neglected his children. Fortunately, the mother was a good, capable woman, who brought up the children to follow her own example of steady industry. James was the eldest child, and he had to turn out to work at a very early age to help to provide for the family needs.

Until he was 17 years old he was obliged to take any casual labouring work that came along, but he showed his mechanical ability by making little working models of mills and water-wheels, and his mother encouraged him in his determination to become a millwright. In 1733 he became apprenticed for seven years to Abraham Bennett, wheelwright and millwright at the village of Sutton, near Macclesfield.

Brindley's Opportunity

For some time Brindley made poor progress, and his master thought him slow and even stupid. At that time apprenticeship was very different from what it is to-day. Bennett was a man of intemperate habits and gave very little attention to his apprentice, leaving him largely to the care of his journeymen, who were a rough and drunken lot of men. Consequently the lad had practically no tuition, and had to pick up the principles of his trade from his own observation. Very often he was left alone in charge of the shop for fairly long periods, and when urgent repairs came along he had to tackle them as best he could. On account of his lack of tuition he did not know how to do these jobs properly, and in most cases he made a mess of them, to the great anger of his master. Indeed, on one occasion Bennett threatened to cancel the lad's indentures and send him back home to resume farm labouring work.

Although Brindley apparently made such slow progress he was really learning a great deal, and presently an opportunity came which enabled him to show his ability. Towards the end of 1735 a silk mill at Macclesfield was seriously damaged by fire, and Bennett was employed to carry out the necessary repairs. Brindley was sent to the mill to remove the damaged machinery under the direction of the supervisor, a Mr. Milner. While engaged on this work Brindley had several conversations with Milner, and the latter was so impressed with the youth's intelligence that he asked Bennett to permit him to assist in some of the repair work. Bennett very reluctantly agreed, and to his great surprise Brindley carried out his share of the work in a most satisfactory manner.

A Novel Wager

The completion of the repairs was celebrated by a supper at the village tavern, and Bennett's men took the opportunity to jeer at Brindley's share in the work. Milner heard this and offered to make a wager that the lad, before his apprenticeship was out, would be a better workman than any of them. It is not stated whether the wager was accepted, but at any rate it had a good effect on Brindley, who determined to do his very utmost to fulfil the prediction. From that time his progress was rapid, and by the end of his third year of apprenticeship his master was forced to admit that the lad was not the "blundering blockhead" he had thought him.

The excellence of Brindley's work brought him into great favour with the local millers, and often, to the surprise of Bennett, he was specially asked for to execute repairs. On one occasion Bennett went to inspect the gearing of a mill after Brindley had done some repairs, and he found the work carried out so well and so substantially that he protested to Brindley, telling him that if he did his work so solidly it would last too long, and trade would be ruined!

Brindley "Makes Good"

Brindley had another opportunity of proving his mechanical ability in connection with a paper mill that was to be erected on the banks of the River Dene. The arrangements to be adopted were to be the same as those at a mill near Manchester, and Bennett, who was employed to do the work, went to Manchester to see this mill. Apparently, however, he spent more time in the taverns at Manchester than in the mill, and he returned little wiser than when he went. As a result, the work was carried out on altogether wrong lines. The machinery when built would not work, and Bennett got into a state of hopeless bewilderment. Brindley, who was now 21 years old, was greatly concerned about the failure of his master, and he determined to go to Manchester himself to visit the mill which was to be taken as a model.

Saying nothing to anybody, Brindley started off one Saturday and walked the 25 miles to Manchester. The proprietors of the mill received him kindly and allowed him to inspect the machinery. He spent nearly the whole Sunday in the mill, storing up in his head the details of the machinery, and at night walked back to Macclesfield. On the following morning he set to work with great energy, and soon showed that he knew exactly what was to be done. Bennett, who by this time was in despair about his contract, was only too glad to hand over the direction of the work to Brindley. The whole design was revised, and work progressed so rapidly that the mill was completed successfully within the stipulated time, to the great relief of Bennett and the delight of the proprietors of the mill.

Commences on His Own Account

By this time Brindley had established his position as an expert millwright, and during the remainder of his apprenticeship Bennett left him in principal charge of the shop, Brindley bore his master no ill-feeling for the way in which he had treated him in the early years of his apprenticeship, and indeed, for several years afterwards he maintained Bennett and his family in comfort. When Bennett died Brindley carried on the concern until all work in hand had been completed, and then removed to Leek in Staffordshire to begin business on his own account.

James Brindley

Brindley, now aged 26, had neither capital nor influence to help him in his business, and for a time he obtained very little employment. Gradually the excellence of his work became known, however, and he began to prosper. His ingenuity in dealing with repairs to all kinds of machinery and his ability in suggesting improvements in various mechanical arrangements soon attracted attention, and won for him the local nickname of "The Schemer."

Several of his note-books dealing with his work at this time are still in existence, and they show the great variety of problems he was called upon to solve. Many of the entries in these note-books are extremely difficult to read, for although he had taught himself to write during his apprenticeship at Macclesfield, his writing always remained bad, and his spelling was even worse!

It is interesting to learn that among Brindley's patrons at this time were Earl Gower, and the brothers John and Thomas Wedgwood, whose pottery work was paving the way for the brilliant success of Josiah Wedgwood, who may be regarded as the creator of English art pottery.

Draining a Coal Mine

While at Leek Brindley was consulted in regard to clearing the water out of a coal mine which remained flooded, in spite of all efforts. After a great deal of thought he hit upon the idea of utilising the fall of the River Irwell, which ran close to the mine, to pump out the flood water. The owner of the mine was greatly impressed by this proposal and Brindley was given full powers to carry out his scheme.

His first task was to drive a tunnel some 600 yards in length through the solid rock to the river. Through this tunnel he led the water to a large water-wheel fixed in a chamber 30 ft. below the surface of the ground. After exerting its power on the wheel the water flowed from here back again to the river at a lower level. The plan proved successful, and the water-wheel worked the pumps so well that in a very short time the mine was clear and the men were able to resume work.

Later we find Brindley engaged in erecting mills for grinding flints, which were rendered necessary by the increasing demands of the growing pottery industry. In particular he erected a mill for John Wedgwood in which, probably for the first time, the plan was adopted of grinding the flints in water. This avoided filling the air with fine particles of flint which were very injurious to the workmen. It is not certain whether this plan was Brindley's own invention or not, but at any rate he designed a special grinding vat for the purpose which became generally adopted throughout the Potteries.

NEXT MONTH:—

The Bridgewater Canal

OUR MAIL BAG

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

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

A. H. Roy Chowdbury (Calcutta).—We do not think we shall be able to deal with Carpentry, but your suggestion that we publish "a series of articles on choosing careers for boys when they leave school" is one that we shall keep before us. The Calcutta Meccano Club has our warmest wishes.

E. Norman (Gateshead-on-Tyne).—You may be quite sure that engineering topics will always have first place, and we have some wonderfully interesting articles in preparation. Our "Fireside Fun" page is proving exceedingly popular, and we are sure that most of our readers would be sorry if we were to drop it. We much appreciate your friendly criticism.

A. V. King (H.M.S. "*Hood*").—We were pleased to hear from you again, and we read your long letter with great interest. You have seen much of the world for one so young, and you appear to have profited by your experiences. We should like you to try your hand at writing down the things that strike you as being particularly interesting in your travels, and sending what you have written along to us, with any photographs that you can obtain.

R. J. Peace (Halifax).—Perhaps it was "absurd" to ask you if you still read the "*M.M.*" However, we know now that you are a regular reader, and we hope to hear from you often.

R. Gandey (Wainscott).—You carry with you our best wishes for your success in Canada. We hope to find you a suitable correspondent in this country.

Rev. D. W. Robson (Chesterfield).—"My boys and myself are too much interested in Meccano, and in your fine Magazine, for us to cease taking it in." We thank you for your kind communication, and we are gratified that Meccano has brought additional pleasure to your home.

B. G. Papaconstantino (Athens).—We quite believe that few boys understand the theory of Relativity, and the great difficulty is to explain it in simple language to boys who have not yet acquired a knowledge of the numerous and powerful forces that are operating in our universe. All this, however, will probably not deter us from making the attempt some day.

P. Harthill (Wolverhampton).—Thank you for your nice group photograph, Philip. Your combined smiles come like a ray of sunshine to us. Father certainly looks a little stern, but being a father ourselves, we know why! Mother is just mother, and you are all lucky children.

J. Locke (Victoria, B.C.).—"I got a bike the other day and I like it. I fell off it the day before yesterday and now I can't ride it. Darn!" You shouldn't say that, Junior! We hope the bruises are all healed up now and the bandages off; but go carefully in future. We think we shall be able to use your riddle.

F. W. Johnson (Paddington).—We are pleased to hear that your Meccano Club is making good progress. The little infirmity you mention is not worth fussing over; we know lots of boys who started like that and grew right out of it. Best wishes for your birthday.

K. Dunlop (Blackrock).—It was good of you to send the 22-year old Meccano advertisement. Mr. Hornby was particularly interested to see this. We are glad you like our new covers. Future covers will be even better than those we have already used.

H. Griffiths (Dunedin, N.Z.).—We have no doubt that all our readers who read your article in our July issue would find it most interesting, as we did. A Nature column will be added to the "*M.M.*" later.

B. Green (Enfield Wash).—We are particularly pleased to know that your employers gave you your post because you had acquired so much engineering knowledge from using your No. 6 Outfit. We are writing to you separately about the formation of a Meccano Club in your district.

J. Brackett (Upper Tooting).—We are interested in hearing of the formation of a Model Railway Club in your district, and we note that the Hon. Sec. is Mr. R. Shepherd, 27, Bernard Gardens, Wimbledon, S.W. Perhaps some of our readers in that part of London may care to join.

S. Hopkinson and **T. Cardon** (Chiddingstone).—The phrase "I am a Meccano Boy" does not now appear on the Meccano writing pads, and the writing paper is therefore quite suitable for girls to use. Thanks for your suggestion for Meccano brooches which we will carefully consider.

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MECCANO

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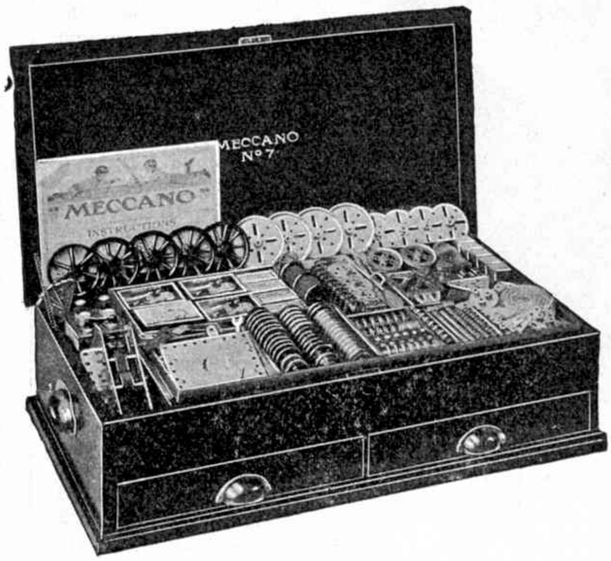
For convenience, Meccano parts are sold in nine Outfits of varying size, numbered 00 to 7. The quality and finish of the parts are of the same high standard throughout the series, but as the Outfits increase in size they contain larger quantities and greater varieties of parts. Each Outfit may be converted into the one next higher by the purchase of an Accessory Outfit. Thus, if a No. 2 is the first Outfit bought, it may be converted into a No. 3 by adding to it a No. 2a. A No. 3a would then convert it into a No. 4, and so on up to No. 7. In this way, no matter with what Outfit you commence, you may build up by degrees to a No. 7 and so be able to make *all* the hundreds of models shown in the Books of Instructions.

PRICE LIST

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 & key)	85/-
No. 6 (In well-made carton)	105/-
No. 6 (In superior oak cabinet with lock & key)	140/-
No. 7 (In superior oak cabinet with lock & key)	370/-



No. 7 Outfit. Builds all the models in the Complete Manual, and many others. Packed in beautifully-finished oak cabinet with lock and key.

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No. 0a	4/-
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BUILD BIGGER AND BETTER MODELS

No. 6 Outfit. This Outfit builds 360 splendid working models. A No. 6a Outfit, costing 210/- in splendid oak cabinet, converts this Outfit into a No. 7, with which any Meccano model may be built.

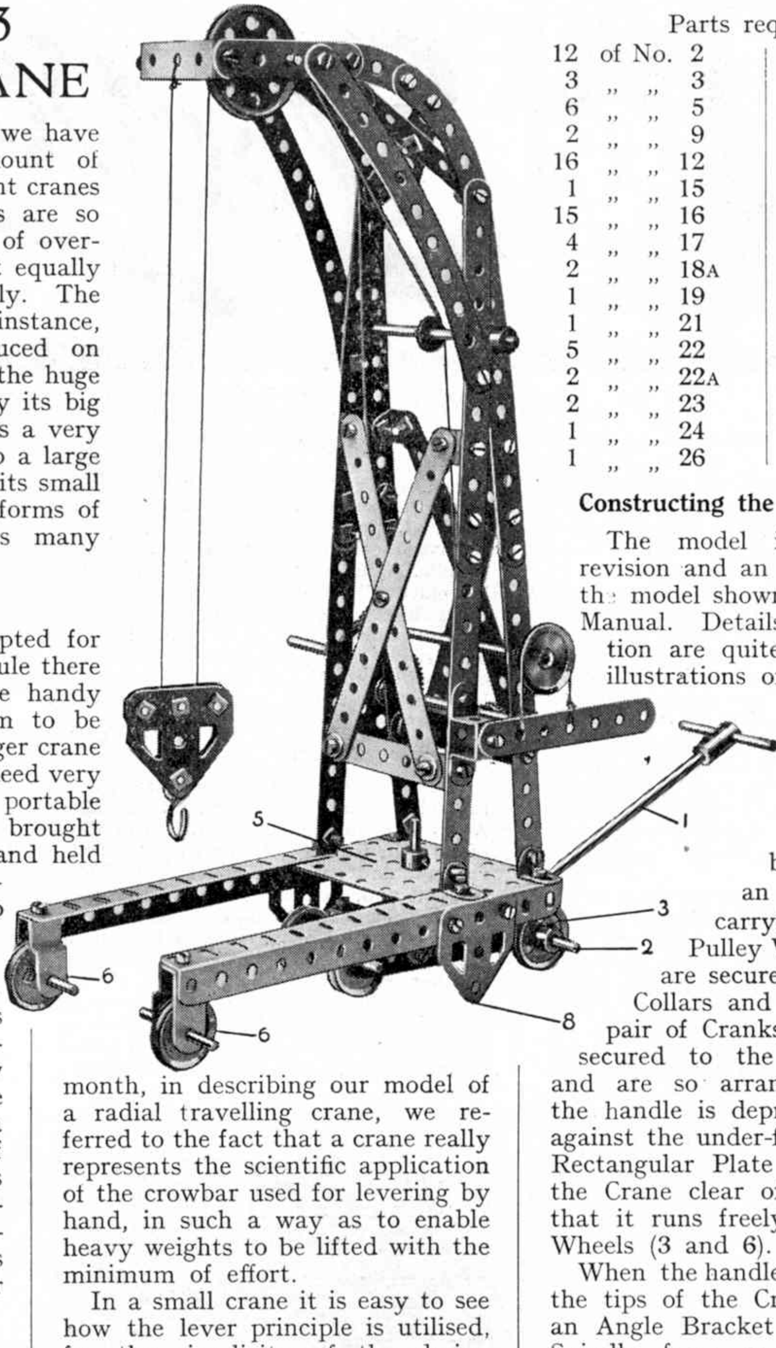
ACCESSORY OUTFITS ARE OBTAINABLE FROM ANY MECCANO DEALER

MECCANO LTD. Binns Road LIVERPOOL

A NEW MECCANO MODEL

Model No. 603
PORTABLE CRANE

DURING the past few months we have devoted a considerable amount of space in the "*M.M.*" to giant cranes of various types. These monsters are so impressive that there is a danger of overlooking altogether the smaller, but equally useful, members of the crane family. The ordinary type of portable crane, for instance, illustrated in the model reproduced on this page, is not capable of lifting the huge loads that are handled so easily by its big brothers, but none the less it plays a very prominent part in industry, and to a large extent its value is actually due to its small size. It is also used on the platforms of railway stations, where it serves many useful purposes.

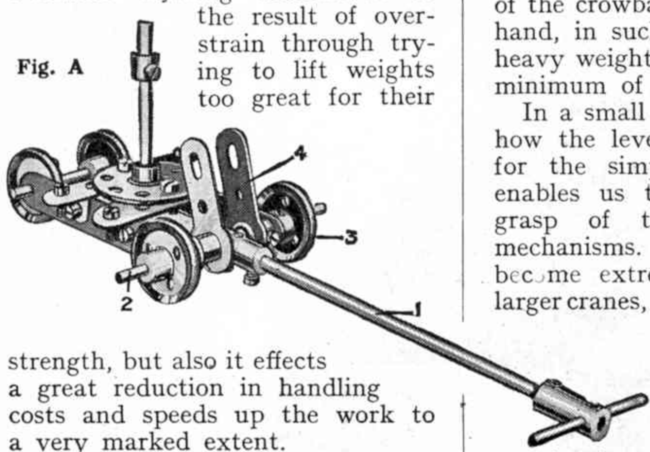


Advantages of Portable Cranes

Portable cranes are specially adapted for use in machine shops, where as a rule there is very little room to spare. The handy size of these cranes enables them to be manipulated with ease, where a larger crane would not only be useless, but indeed very much in the way. By means of a portable crane, a heavy casting may be brought close up to a particular machine and held suspended until the necessary adjustments are made to bring it into position for the machine to commence operation.

The usefulness of this type of crane, however, is by no means confined to machine shops. Wherever comparatively small but heavy materials have to be lifted from one place to another, the use of such a crane not only avoids all danger of workmen injuring themselves as the result of over-strain through trying to lift weights too great for their strength, but also it effects a great reduction in handling costs and speeds up the work to a very marked extent.

Fig. A



Cranes are Levers

Small cranes are interesting also from another point of view. Last month, in describing our model of a radial travelling crane, we referred to the fact that a crane really represents the scientific application of the crowbar used for levering by hand, in such a way as to enable heavy weights to be lifted with the minimum of effort.

In a small crane it is easy to see how the lever principle is utilised, for the simplicity of the design enables us to obtain a thorough grasp of the various essential mechanisms. These movements become extremely complicated in larger cranes, in which a greater range is required. If the working principle of a small hand crane is once thoroughly understood, there is really very little difficulty in understanding the working of even the most complicated steam or electrically-driven giants.

Parts required:

12	of No. 2	1	of No. 27A
3	" " 3	74	" " 37
6	" " 5	16	" " 38
2	" " 9	1	" " 40
16	" " 12	2	" " 44
1	" " 15	1	" " 45
15	" " 16	1	" " 48
4	" " 17	2	" " 48A
2	" " 18A	1	" " 53
1	" " 19	1	" " 57
1	" " 21	10	" " 59
5	" " 22	2	" " 62
2	" " 22A	2	" " 63
2	" " 23	2	" " 89
1	" " 24	2	" " 90
1	" " 26	4	" " 126A

Constructing the Model

The model illustrated is a revision and an improvement on the model shown in the Complete Manual. Details of its construction are quite clear from the illustrations on this page.

The Crane is moved about by depressing the handle (1) fixed by a Coupling to an Axle Rod (2) carrying 1" Loose Pulley Wheels (3), which are secured in position by Collars and set screws. A pair of Cranks (4, Fig. A) are secured to the Axle Rod (2) and are so arranged that when the handle is depressed they bear against the under-face of the small Rectangular Plate (5), thus lifting the Crane clear of the ground so that it runs freely on the Pulley Wheels (3 and 6).

When the handle (1) is depressed, the tips of the Cranks (4) engage an Angle Bracket to prevent the Spindle from coming completely away from engagement with the Plate (5).

When the Crane is brought to rest, its weight forces down the Cranks (4) and this raises the handle (1) so that the Flat Trunnions (8) together with the front wheels (6) then support the Crane.

NEXT MONTH:—

STONE-SAWING MACHINE

Electricity

VI. DYNAMOS AND ELECTRIC MOTORS

IN the year 1831 Michael Faraday, one of the greatest of British scientists, discovered that a current of electricity could be induced in a coil of wire by moving the coil towards or away from a magnet, or by moving a magnet towards or away from the coil.

For example, if we connect the ends of a coil of insulated wire to a galvanometer and move a bar-magnet in and out of the coil, the galvanometer shows us that a current is induced in the coil when the magnet is inserted, and again when it is withdrawn. Last month we saw that a magnet is surrounded by lines of magnetic force, and Faraday found that a current was induced when the lines of force were cut across. He also found that the two currents produced in the experiment we have just described flowed in opposite directions.

This discovery formed the basis of the first dynamo, or machine for generating electric current. The dynamo is well-named, for the word comes from the Greek *dynamis*, meaning "force."

The First Dynamo

Faraday's first dynamo consisted of a copper disc rotating between the poles of a horse-shoe magnet so as to cut the lines of force at each revolution. The current flowed from shaft to rim, or *vice versa*, according to the direction of rotation, and was conducted from the machine by means of two wires having spring contacts, one pressing against the shaft and the other against the disc. This arrangement, however, did not prove satisfactory, and Faraday soon substituted rotating coils of wire for the disc. Gradually the dynamo was developed into an efficient machine, one of the greatest advances being the abandonment of permanent magnets in favour of electro-magnets, which gave a much more powerful field of magnetic force.

Fig. 1 is a diagram of a dynamo in its very simplest form. Between the poles of the magnet (marked N and S) revolves a coil of wire (A^1 A^2) mounted on a spindle. This revolving coil is called the "armature." The two insulated rings (R R) are each connected to one end of the coil, and the brushes (B B) made of copper or carbon, each press on one ring. The current is conducted away from these brushes into the main circuit, where we will suppose it to be used to light a lamp.

Alternating Current

Let us suppose the armature to be revolving in a clockwise direction. Then A^1 is descending and cutting the lines of force in front of the north pole of the magnet, and so a current is induced in the coil and, of course, also in the main circuit. Passing on its way, A^1 reaches the lowest point of its circle and begins to rise in front of the south pole, inducing another current, but this time in the opposite direction. The general result is to produce a current that reverses its direction every half-revolution, and such a current is called an "alternating current."

In a dynamo such as our diagram represents there are only two magnetic poles, and the current flows backward and forward once every revolution. By using a number of magnets, however, arranged so that the coil passes the poles of each, successively, the current may be made to flow backward and forward several times. One complete flow of the current backward and forward is called a "period," and the number of periods per second is the "periodicity" or "frequency" of the current. A dynamo having one coil or set of coils gives what is called "single-phase" current, that is a current having one wave that flows backward and forward. If the dynamo has two distinct sets of coils a "two-phase" current is generated, in which there are two separate waves, one rising as the other falls. Similarly, by employing more sets of coils, "three-phase" or "polyphase" currents may be produced.

Continuous Current

Alternating current is unsuitable for certain purposes, and by making a small change in the dynamo this current may be converted into "direct" or "continuous" current, which does not reverse its direction (see Fig. 2).

The difference between a direct and an alternating current dynamo lies in the rings. In place of the two rings in Fig. 1 there is a single ring divided into two parts, each half being connected to one end of the revolving coil. Each brush thus remains on one half of the ring for half a revolution and then passes over on to the other half. Thus, during one half-revolution the current is flowing from brush B^1 in the direction of the lamp. During the next half-revolution the current will reverse its direction, but as brush B^1 has now passed over to the other half of the ring, the current is still leaving by it.

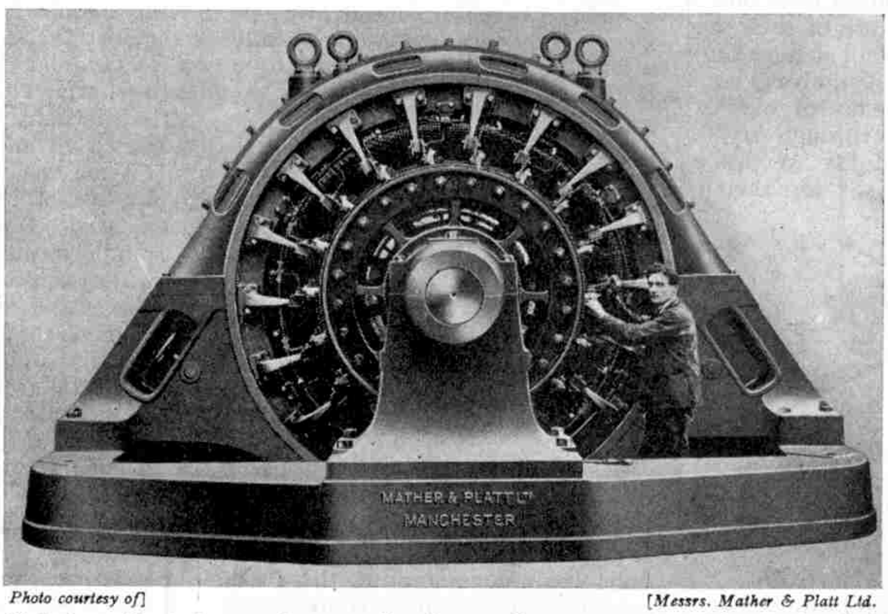


Photo courtesy of] [*Messrs. Mather & Platt Ltd.*

End view of large dynamo for generating the very heavy currents used in the electrical production of chemicals

A moment's thought, therefore, will show that the current must always flow in the same direction in the main circuit. This arrangement for converting an alternating current into a continuous current is called a "commutator," from the Latin *commuto* meaning "I exchange."

The dynamos used in actual practice are much more complicated than the simple device we have just described. Each one has a set of electro-magnets, and the armature consists of many coils of wire mounted on a core of iron, which has the effect of concentrating the lines of magnetic force. In small dynamos the armature usually revolves, but in larger ones the electro - magnets revolve.

Current for the Electro-Magnets

The electro-magnets in a dynamo, of course, require a current to be flowing through their windings before they acquire magnetic powers. A continuous current dynamo starting for the first time has its electro-magnets supplied with current from an outside source, but afterwards the dynamo will always be able to start again because the magnet cores retain sufficient magnetism to set up a weak magnetic field. The repeated cutting of the magnetic lines of force sets up a weak current, which, acting upon the magnets, gradually brings them up to full strength. Once a dynamo is generating current it continues to feed its magnets by sending through them either the whole or part of its current.

What has just been said applies only to continuous current dynamos. An alternating current dynamo cannot feed its own magnets, and these are supplied with current from a separate continuous current dynamo, which may be of quite small size.

As dynamos require the application of mechanical power to revolve their moving parts, they are therefore machines for converting mechanical energy into electrical energy. If, on the other hand, we supply a dynamo with electric current instead of mechanical power, we find that its armature begins to revolve. The machine is now no longer a dynamo but has become an electric motor—in other words, an electric motor is simply a dynamo reversed.

The Electric Motor

Bearing in mind what we have learned about the principle on which the dynamo works, it is quite easy to understand the operation of an electric motor. Suppose, for instance, we wish to use the dynamo illustrated in Fig. 2 as a motor. First of all we take away the lamp and substitute for it a second continuous current dynamo. We know from the article on Magnetism in last month's "*M.M.*" that when a current is sent through a coil of wire the coil becomes a magnet, having a north pole and a south pole. In the present case the coil in our dynamo becomes a magnet immediately the current from the second dynamo is switched on, and the attraction between its poles and the opposite poles of the magnet causes it to make half a revolution. At this stage the commutator reverses the current, and consequently also the polarity of the coil. There is now repulsion where before there was attraction, and the coil makes another half-revolution. This process continues until the armature attains a very high speed. The operation of an electric motor is thus entirely based on the attraction of unlike and the repulsion of like poles.

In general construction there is little difference between a dynamo and a motor, but there are differences in detail that adapt each to its own particular work. By making certain alterations in their construction, electric motors may be run with alternating current.

A Profitable Accident

The possibility of reversing a dynamo and using it as a motor was known probably as early as 1838, but it was not until 1873 that the enormous industrial value of this reversibility was realised. In that year a great industrial exhibition was held at Vienna. One day a machinery attendant at this exhibition happened to connect two cables to a dynamo that was standing idle, and to his great astonishment the machine began to revolve at a great speed. Investigation showed that the cables led to another dynamo that was running at the time, and that the current supplied to the first dynamo had converted it into a motor. This incident drew general attention to the great possibilities of the combination of the dynamo and the electric motor.

To-day the electric motor is one of the most wide-spread of all machines. If we first instal a powerful dynamo and a suitable engine to drive it, we can place electric motors wherever we like, driving them by current supplied through a connecting cable. In large factories or workshops motors may be placed close to the machines they are required to drive, thus doing away with elaborate systems of shafting and belts. More than this, electric motors may be used for purposes for which no other mechanism will serve. We find these motors at work driving the domestic sewing machine, the dentist's drill—the mere thought of which makes us shudder—and ventilating fans of all sizes and in every conceivable position. It would be very difficult to think of any other means by which such machines could be driven satisfactorily.

Other points in favour of the electric motor are its compactness, its comparatively silent running and its ability to work for long periods with practically no attention.

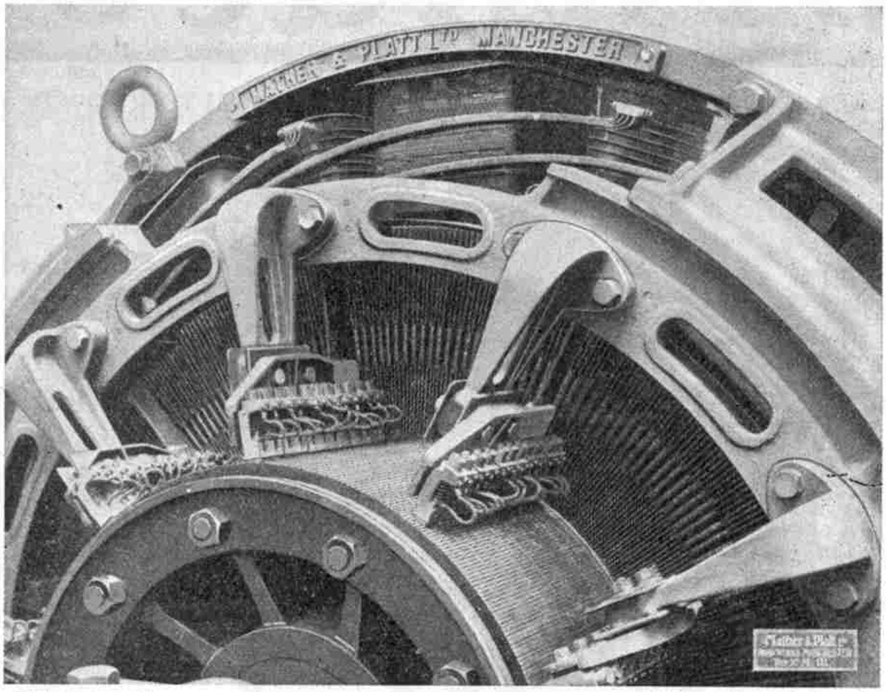


Photo courtesy of] [*Messrs. Mather & Platt Ltd.*

Close-up view of large dynamo, showing the carbon brushes pressing on the copper segments of the commutator. The poles and their windings are also seen, at the top of the photograph.

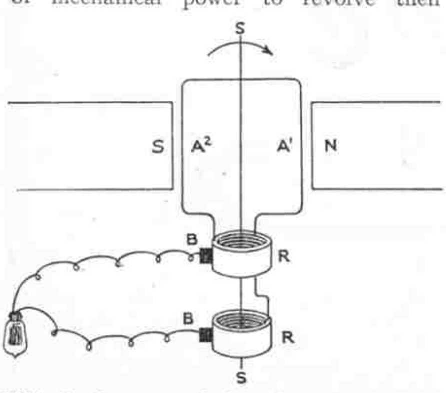


Fig. 1. Dynamo producing Alternating Current

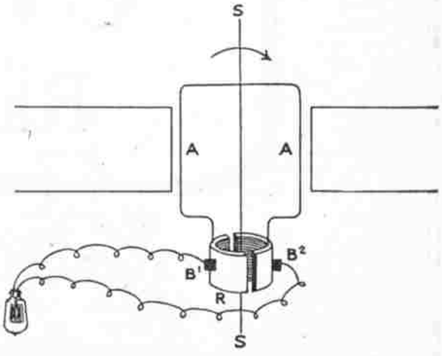


Fig. 2. Dynamo producing Continuous Current

WIRELESS ON TRAINS

Trains Travelling 75 miles an hour Send and Receive Signals

GREAT interest has been aroused by the experiment performed by the Radio Society of Great Britain on 4th July on a railway train travelling at 75 miles an hour between London (King's Cross) and Newcastle-on-Tyne. A wireless transmitter and receiver were carried on the train in a special coach, and with them continuous communication was maintained with various wireless stations throughout the journey.

On leaving King's Cross at 7.30 p.m. the operators on the train picked up the London station of the Radio Society, with which communication was maintained in Morse on a wave-length of 185 metres until Doncaster was reached. At one time, however, the messages were stopped to enable those on the train to hear Big Ben strike, and also to receive messages from Bedford. After Doncaster was reached the London messages became faint, but communication continued with Bedford and also with Newark, Sheffield, and Bradford. A pianoforte solo from 2LO, London and also a vocalist from 51T, Birmingham, were plainly heard. The experiment, which was a complete success throughout, points to the possibility in the near future of every passenger in long-distance expresses being provided with head-phones with which to listen to broadcast.

Tunnels and Limestone Interfere

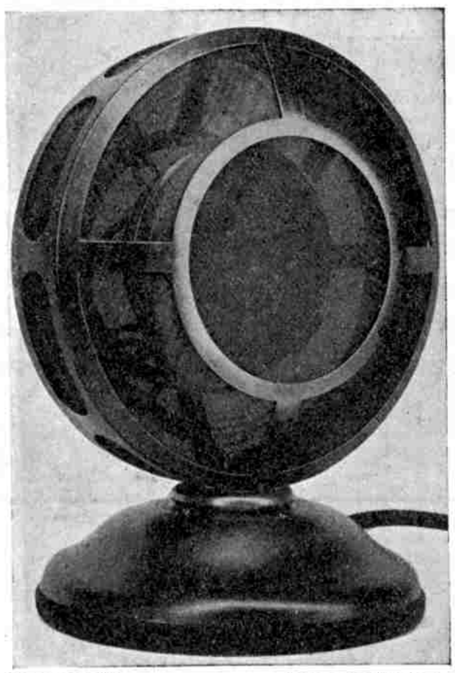
Two difficulties, however, appear to require conquest before the transmission and reception are perfect. During the experiment it was found that all communication ceased immediately the train entered a tunnel, while cuttings also had an adverse effect. It is stated by the Society that this was quite expected, although it may be remarked that in previous experiments, both in this country and in America it has been found that tunnels make no difference. This inconsistency may, perhaps, be caused by variations in the nature of the soil and rock through which the track runs.

An unexpected hindrance was met in the form of limestone under the railway, for whenever the train passed over this kind of rock the signals "were lost for an appreciable period." We have never heard that people situated over limestone have any difficulty in broadcast reception, and the effect is certainly mysterious.

The Advantages of Railway Wireless

The possibilities opened up by this important experiment are enormous. Although in England every mile of track is signalled and constantly under supervision, wireless communication between driver and signalman would be a valuable additional safeguard. Often a train has to be diverted owing to a block on some line, and it would be very convenient if the driver could be notified of the altered route without having to stop for instructions. A train that had an overload of passengers could wireless the next stopping station for more coaches to be in readiness, and thus much delay would be avoided. Information also could be wirelessed informing a station how many passengers intended to alight there, thus allowing time for any necessary preparations to be made.

The advantages to be anticipated from wireless installations on trains in this country, however, are exceeded by those that would follow their use in other countries. In the United States, for instance, between the Atlantic and the Pacific seaboards there are many hundreds of miles of line unsignalled and practically unwatched. It is a frequent occurrence for a heavy wind to tear down mile after mile of telegraph wires, isolating long sections of the lines, and because of this trains often have been "lost" for hours and sometimes even for days at a time! Such accidents are impossible in this country, owing to the small distances traversed without a stop.



Photograph by] [*Western Electric Co.*

The Sensitive Microphone

used in the studio to convert waves of music and speech into electric waves. These are amplified many millions of times before being radiated from the antenna.

Experiments in the United States

Experiments in wireless communication between trains and stations were begun in 1909 on the Lackawanna and Western Railroad but, owing to the primitive apparatus employed, they were not entirely successful. Further experiments were made in 1912, and a year later the apparatus was considered to be sufficiently reliable to be installed as a permanency. Four stations were chosen to have receiving and transmitting apparatus, these being Hoboken (near New York), Scranton, Binghampton, and Buffalo, the first two having a wave-length of 3,000 metres and the others 1,800 and 1,600 metres respectively. The trains were supplied with similar receiving and transmitting apparatus, working on a wave-length of 600 metres.

At the end of one of the coaches of the train a specially-built cabin contains the apparatus and the operator. The aerial on the train is supported on porcelain insulators fixed on short poles about 18 in. in height, fixed at each corner and half-way along each side of each coach. Wire is strung down each side of the coach and across each end, and runs along each coach down the centre about three inches above the roof. The aerials of the several coaches are linked together by simple, non-permanent connections.

The question of the aerial was not the least of the many problems that had to be solved, only very short poles being permissible owing to the small head-room when the train is passing under bridges and through tunnels. The earth wire is connected to one of the bogies, which leads the currents to earth by way of the running rails. The power for transmitting and for lighting the valves is obtained from the train lighting dynamos, which are coupled to the axles of the coaches.

How the Country Affects the Reception

Many curious variations take place in the reception as the train passes different points along the line. On bridges there is a slight reduction in signal strength, due to waves earthing themselves on the ironwork of the bridge, and consequently fewer reach the aerial on the train unhindered. On curves there is a most peculiar, although brief, break in the reception. Running parallel to a river, toiling uphill, or coasting downhill all have their own characteristic effects, so much so, indeed, that the operators can tell, after practice, where the train is without looking out of the windows! On this line, curiously enough, tunnel interference has not been met with in any way, no difference whatever being noticeable.

The installation has been most successful and has shown itself to be thoroughly reliable. On several occasions when all other train services in the district have been disorganised for many days owing to the breakdown of telegraphic communication during storms, the Lackawanna service has been carried on as usual, controlled entirely by wireless.

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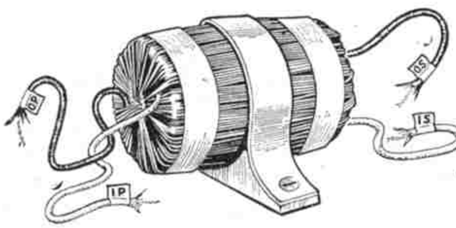

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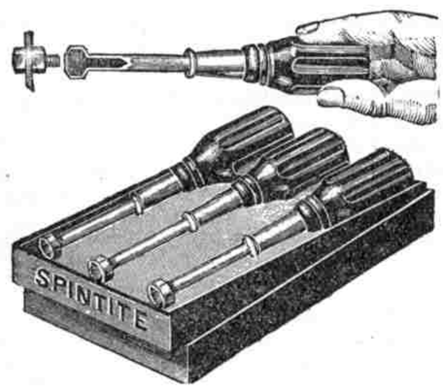

SET No. 71

To-day 'SPINTITE' wrenches enable you to fill that great need for the first time.

The 'SPINTITE' Wrench has a hollow stem so that projecting screws do not interfere with the tightening up of the nuts. The hexagon socket gives a firm grip on the nut.

Set No. 71 consists of three most popular radio sizes for nuts, ¼", 5/16" and 11/32" across flats. Price 5/- per set.

Set No. 73, consists of seven sizes for nuts ranging from 3/16" to ½" across flats. Price 16/- per set.

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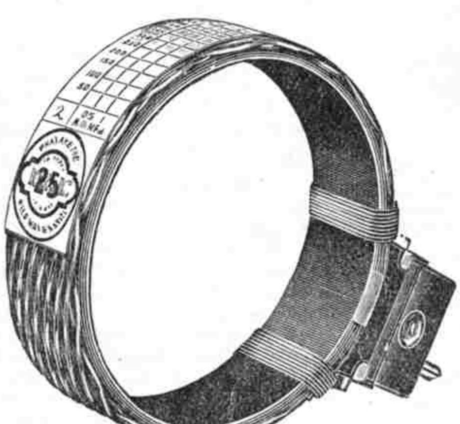

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These coils have justly earned a high reputation for their efficiency and performance.

In addition to the existing range of plug and gimbal mounted coils, we have now developed a set of concert coils which, as a result of tests carried out by independent radio engineers, we claim are infinitely superior in purity of tone, distortionless reproduction and signal strength to any other type of coil, concert or otherwise.

The well-known features of the Honeycomb Duolateral Winding are maintained, and the range of wavelengths covers all the British Broadcasting Company's stations. The smaller coils are eminently suitable for receiving on very short wavelengths.

These coils are supplied in sets of four.

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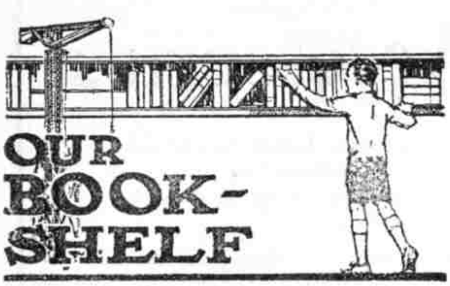


The Boy's Own Guide to Stamp Collecting

by Fred J. Melville

(Pub. by The Philatelic Institute. Price 1/- net).

The name of Fred J. Melville on a book of philately is a certain guarantee of the value and interest of its contents. His latest booklet is no exception to the rule and should prove exceedingly popu'ar with every young follower of this fascinating hobby. There are separate chapters on albums, buying and mounting stamps, finding watermarks, measuring perforations, and many other matters of equal importance are dealt with in an interesting manner. The book is well illustrated with over 150 diagrams of stamps and the final pages of questions and answers should satisfactorily dispose of many doubtful points.

Building Model Yachts

(Cassell's "Work" Handbooks. Price 1/6).

Additions to the well-known "Work" series of handbooks are always welcome, and the present volume shows that the high standard of its predecessors is being maintained. "*Building Model Yachts*" contains detailed instructions for designing and building racing-yachts, show models and power boats, and the text is fully illustrated by clear and practical diagrams. It is a book that can be recommended to any boy who wishes to take up this interesting hobby.

Wireless World and Radio Review

(Wireless Press, London. Price 4d. weekly).

For articles of real practical utility to the wireless amateur this popular publication would be difficult to beat. Recent issues have included interesting articles on the theory and practice of the crystal detector, which are timely in view of the rapid extension of broadcasting relay stations and the consequent greater employment of crystals. Other outstanding items are three articles dealing with simultaneous broadcasting; an important contribution by Captain Eckersley on faithful reproduction by broadcast; and instructions for making a power amplifier and a multi-circuit tuner.

"Model Railways"

The price of Mr. Henry Greenly's book, "*Model Railways*" (Messrs. Cassell & Co. Ltd.), was incorrectly given as 1/6 in our review ast month. The correct price is 6/-.

An Interesting Invention

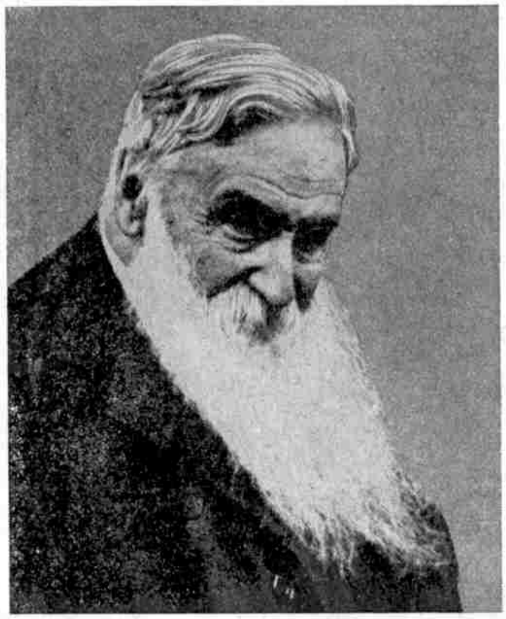
Model-builders know the difficulty encountered in tightening up small nuts in inaccessible places, or where there is insufficient space for turning the wrench or pliers. The recently-introduced type of wrench known as "Spintite" should therefore prove exceptionally welcome, as it embodies an entirely new feature which successfully overcomes all difficulties. "Spintite" wrenches have hollow stems, so that a projecting screw does not interfere with the tightening up of the nuts. A hexagon socket fitted at the head of the tool secures a firm grip on the nut and requires very little space indeed in which to turn. The wrench is neatly and strongly finished with a fluted ebonised handle, enabling the user to give that last turn which makes all the difference between a "sound" and a "rushed" job. "Spintite" wrenches are sold in sets and their sizes cover a wide range. The makers (Messrs. Rockwood Co. Ltd., of 147, Queen Victoria Street, London, E.C.) will be pleased to send an illustrated leaflet describing these wrenches, post free to any reader mentioning the "*M.M.*"

A Hero of the Indian Mutiny:

The Late Sir Dighton Probyn, V.C.

The death of General Sir Dighton Probyn, V.C., G.C.B., G.C.S.I., G.C.V.O., at the age of 91, removes a prominent figure in the rapidly-diminishing ranks of the veterans of the Indian Mutiny.

Sir Dighton, who was born in 1833, entered the Bengal Army at the age of 16. When the Indian Mutiny broke out he was serving on what was then known as the Trans-Indus frontier, engaged in operations against the hill tribes. Soon afterwards he was appointed to the command of a detachment of the Punjab Cavalry, and he took part in almost the whole of the fighting during the long siege of Delhi.


The Late Sir Dighton Probyn, V.C.

Flying Column to the Rescue

After the rebels had been cleared out of Delhi, Lieutenant Probyn, as he then was, played a conspicuous part in a flying cloumn under Colonel Greathed, sent to strike a blow at the enemy before they had time to re-organise. His great chance came at Agra, where Colonel Greathed's column was rushed to relieve the small and hard-pressed garrison.

On arrival there it was found that the enemy had ceased their attack and disappeared. The column therefore encamped on the parade ground outside the town, and, feeling quite secure, officers and men were taking things very easily. Suddenly enemy artillery came into action from the jungle a short distance away, and for a few moments the little camp was thrown into confusion. The enemy had expected to find only the small garrison and when they became aware of the presence of the relieving column they hesitated in their attack. Seeing this hesitation, Sir Dighton, at the head of his detachment, together with another body of cavalry, instantly charged straight at the enemy, throwing them into disorder and finally into full flight.

Awarded the V.C.

During this charge Sir Dighton became temporarily isolated from his men, and found himself hotly attacked by five or six of the enemy. In circumstances of this kind he was a host in himself, however, and he fought so fiercely that he had already killed two of his assailants by the time assistance came.

He appeared absolutely to revel in desperate single combats, and his exploits were watched by officers and men alike with admiration and amazement. A typical instance of his daring occurred during a particularly fierce fight. Suddenly noticing an enemy standard-bearer he rode at him straight through the ranks of the enemy, cut him down, and brought back the colour in triumph.

As a result of his brilliant work in the field, Sir Hope Grant strongly recommended him for the Victoria Cross. He was awarded this decoration in 1857, only about eighteen months after it was instituted. Afterwards Sir Dighton took part in the relief of Lucknow, and his services in that campaign were twice mentioned in despatches.

"Probyn's Horse" Turn Tide of Battle

In 1860 trouble broke out in China and Sir Hope Grant's force, including two regiments of Sikh cavalry (one of which was known as "Probyn's Horse") were sent there from India. Sir Dighton's resourcefulness found full scope in China, and he distinguished himself on several occasions, particularly at the battle of Chan-chia-wan, where the road to Pekin was barred by a large army of fierce Tartar tribes. The issue of the fight was hanging in the balance when Sir Hope Grant decided upon a turning movement on the enemy's left. In order to inaugurate this movement successfully it was necessary to disperse some squadrons of horsemen on that flank and the task was entrusted to "Probyn's Horse." With their dashing leader at their head, the corps charged at full gallop and attacked the hostile cavalry so fiercely that in a few minutes their formation was broken up and they were riding for their ives n all directions across the plains! This magnificent charge shook the confidence of the Chinese, and from that time they began to give ground.

Sir Dighton afterwards returned to India and commanded the mounted troops in the Umbeyla expedition, during which he further added to his reputation as a fighting leader.

Fifty Years of Court Service

This expedition brought Sir Dighton's field-service to a close. He returned to England, and for the rest of his life he was closely connected with the Court. From 1872 to 1877 he was Equerry to King Edward, then Prince of Wales. He was

(Continued on page 229)

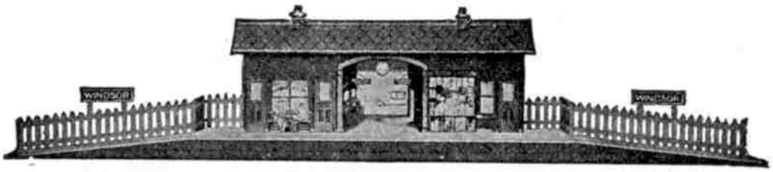
New Rolling Stock and Accessories

(HORNBY SERIES)

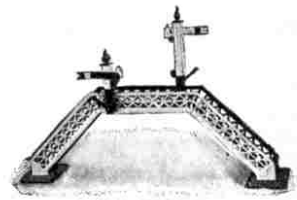
WE announce below several new train accessories, including Level Crossing, Signal Cabin, Snow Plough, Tunnel, New Wagons, Junction Signals and Platform Accessories. All are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains. Most important of all they have the uniformly beautiful finish which is the great feature of the Hornby System. To use cheap-looking rolling stock or a foreign-looking station with a Hornby Train completely spoils the effect.

THE WINDSOR STATION is a thing of beauty—the only really British station obtainable. Its bright colouring and realistic appearance will bring joy to the heart of every boy who sees it.

TUNNEL
Price **7/6**



WINDSOR STATION
Excellent model, beautifully designed and finished
Dimensions: Length 2 ft. 9 in., breadth 6 in., height 7 in. Price **12/6**

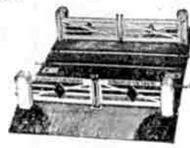


FOOT BRIDGE
With detachable signals. Price **6/-**
Without signals. Price **3/6**
Signals, per pair **2/9**

CARR'S BISCUIT VAN
Price **4/-**

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

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



LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7¼ in., with Gauge 0 Rails in position.
Price **6/6**

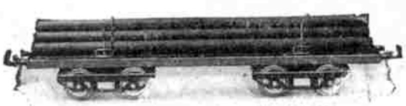
SNOW PLOUGH
Finished in grey, with revolving cutter driven from front axle.
Price **5/6**

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**

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

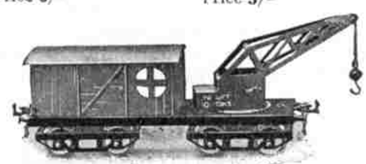
GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **3/-**



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

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

SPRING BUFFER STOP Price **1/6**

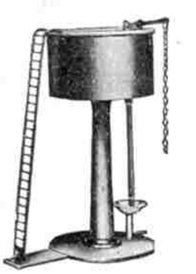


BREAKDOWN VAN AND CRANE
Excellent finish. Beautifully coloured. Suitable for 2 ft. radius rails only. Price **7/-**

PLATFORM ACCESSORIES No. 1
Price (per set) **2/-**

PLATFORM ACCESSORIES No. 2
Price (per set) **2/-**

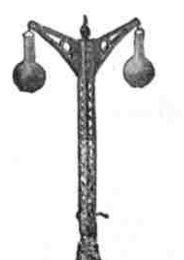
PLATFORM ACCESSORIES No.
Price (per set) **2/-**



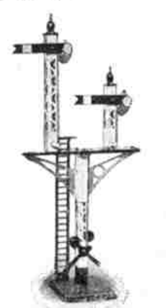
WATER TANK
Brightly coloured in red, yellow and black, 8½ in. in height, with flexible tube and pump lever.
Price **6/6**

LOADING GAUGE
Price **1/9**

SIGNAL CABIN
Dimensions: height 6½ in., width 3¼ 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**



DOUBLE LAMP STANDARD
Four-volt bulbs may be fitted into the globes.
Price **4/-**



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

ASK YOUR DEALER TO SHOW YOU SAMPLES

How Trains are Lighted & Heated

IN last month's issue we showed how railway coaches have developed from crude imitations of the road coach to the magnificent vehicles of to-day. One of the most important details in this development has been the method by which the coaches have been lighted and heated.

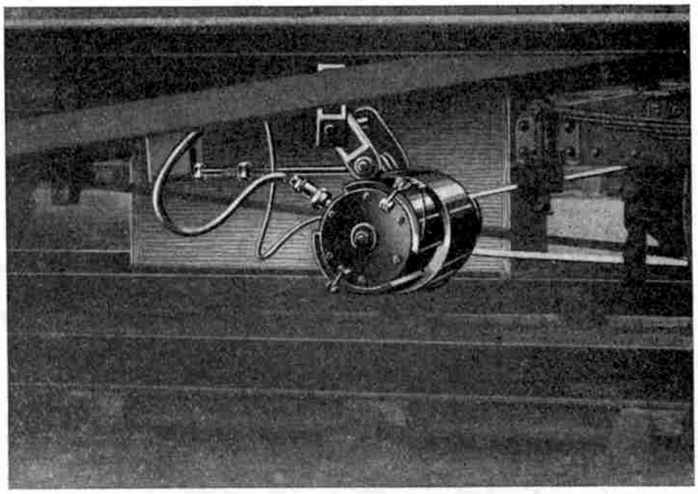
In the earliest coaches no serious attempt at artificial lighting was made, but as the numbers of trains and passengers increased it became necessary to provide some regular system of lighting. Oil lamps were therefore introduced, and judging from descriptions written by passengers, night travelling in those days must have been a very trying experience. The lamps were evil-smelling, smoky contrivances, and they gave such a miserably poor light that it was quite impossible to read. Oil lamps continued to be used for some years, however, with a few small improvements in their burning.

Gas Lighting

Gradually the public began to demand better illumination for night journeys, and oil-gas was introduced. This made an enormous improvement in the amount of light and quickly came into general use. At first ordinary flat flame burners were used, but later these were superseded by the far more efficient incandescent burner, which is still largely used. The gas is pumped under pressure into large reservoirs carried beneath the coach, and is led through pipes to the burners in the roof of the coach. The burners are lighted through openings in the roof before the train starts, by men who walk along the roof carrying a flare lamp for the purpose.

Incandescent gas lighting has reached a very high pitch of perfection in modern railway coaches, and as regards illuminating power it is all that can be desired. It has certain disadvantages, however, the chief of which is danger from fire. If an accident occurs and the reservoir of compressed gas under one of the coaches is damaged, the escaping gas may easily become ignited, and in a few minutes the coach, and indeed the whole train, may be ablaze. This has actually happened in a number of collisions. A serious railway accident is always a terrible thing, but when the wrecked coaches catch fire the situation is indeed awful for the passengers who are pinned in the wreckage. For this reason the present-day tendency is to do away with gas entirely and to substitute electric lighting.

On electrified railways, such as the London Underground Railways, it is, of course, quite easy to provide for the electric lighting of the coaches, for the necessary current supply is there already.



Photograph] [*courtesy G.W. Railway*

The Dynamo Beneath the Coach

On steam-driven trains, however, special arrangements to supply electric current have to be made. Let us examine an up-to-date system of electric lighting such as that adopted on the Great Western Railway.

A Miniature Power Station

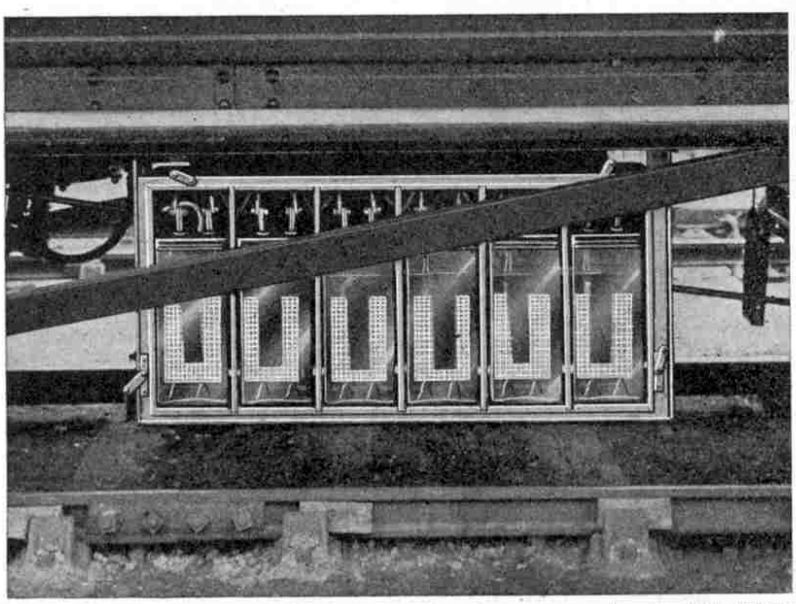
The method really consists of providing each coach with a miniature power station of its own. Beneath the coach is a small dynamo driven by a belt from a pulley fixed to one of the bogie axles of the coach. The dynamo is suspended so that it can swivel freely and so adjust the tension of the belt caused by the bogie pivoting when the coach is running on a curve.

The train, however, is not always running in the same direction, nor at the same speed. As regards direction, this presents no difficulty, as the dynamo is reversible and runs equally well either way, but the variation in speed has to be dealt with by special devices. The lighting of the coaches must be maintained at a steady brilliance whether the train is running at top speed or standing in a station, and this is accomplished by means of a battery of accumulators and an ingenious and interesting automatic controller.

Automatic Control

As long as the train maintains a speed of 25 miles per hour or more, the dynamo is able to provide current for both lamps and battery. As soon as the train slows down, however, the voltage of the current falls below the minimum for keeping up the lights, and an automatic switch then disconnects the dynamo. The battery now comes into action, and maintains alone the current supply to the lamps until the train again attains 25 miles an hour, when the dynamo once more takes up its duty.

The battery requires a pressure of 33 volts to charge it fully, but this pressure is too high for the 22-volt lamps, and would quickly ruin them. An automatic regulator is therefore provided which allows the full pressure of 33 volts to reach the battery, but reduces this pressure to 22 volts before the current passes to the lamps. The regulator also automatically switches off the current supply through the battery when the latter is fully charged.



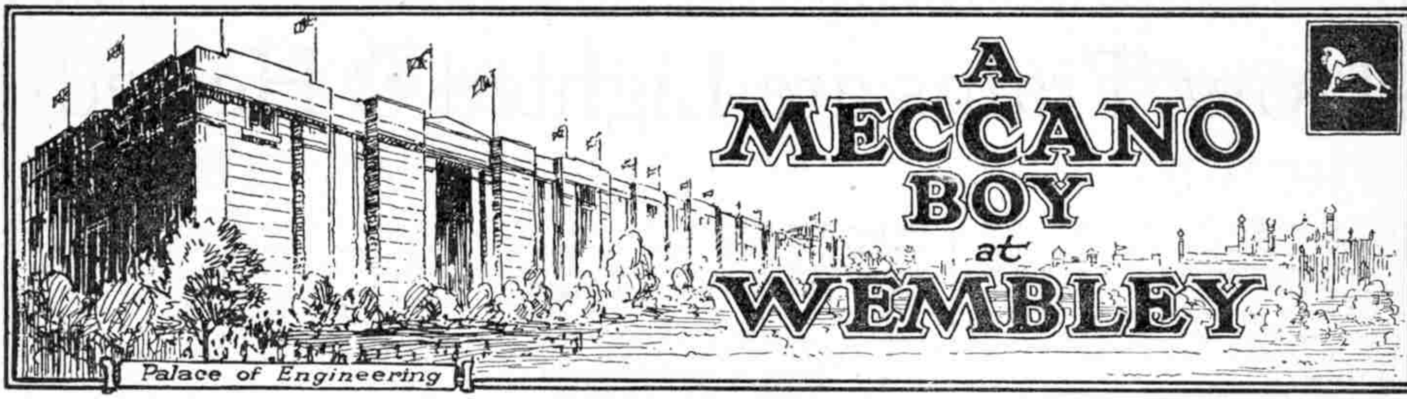
Photograph] [*courtesy G.W. Railway*

The Accumulators

Heating by Steam

The heating of passenger coaches, like the lighting, has made great progress. For many years foot-warmers were the only source of heat. These consisted of flat iron pans containing hot water. They were not capable of warming the whole of the compartment even when they were freshly filled with hot water, and they very

(*Continued on page* 229)



A MECCANO BOY at WEMBLEY

Although I was expecting something big, I must admit I was fairly staggered on entering the British Empire Exhibition at Wembley. It was as though I had suddenly stepped off the earth on to some other planet, where there was so much to see and do that I did not know where or how to begin.

I had heard the Exhibition called the "family party of the British Empire," and this description seems to just fit it down to the ground! All the colonies of our great Empire, from the largest to the smallest, are gathered together, and form the biggest Exhibition the world has ever seen. It seemed to me that each was endeavouring to "go one better than the other" in their displays, and as I stood at the North Entrance the wonderful buildings stretched away on every side as far as eye could see.

At Wembley there is not time to stand and gasp, however, so I just made a bee-line for the Palace of Engineering, which I knew would be certain to interest me more than anything else. Apart from its contents, the building itself is a remarkable piece of work. Like all the buildings at Wembley it is built of ferro-concrete, and not only is it the largest building in the Exhibition but also it is the biggest concrete building in the world. It is six-and-a-half times as large as Trafalgar Square, and those who know London will be able to realise its size from this fact!

The Hum of a Thousand Factories

I felt something like Gulliver must have felt in the presence of the giants as I entered this huge building, and my imagination was stirred by the sound of innumerable machines at work. The air was filled with a hum like that of a thousand factories, and each machine seemed to be doing its best to drown its neighbour with noise, in order to make its own importance known!

Photo [*Campbell-Gray Ltd.*

A Small Part of the Palace of Engineering

Five different railway lines run into the Palace of Engineering, and all are connected to the chief railways of England. These lines were used to bring in the six locomotives exhibited in the Transport Section, and also to facilitate the transport of the hundreds of other exhibits.

The building is divided into bays, and above each there run huge overhead cranes that are able to hoist loads of 20 tons with ease. These cranes were very necessary for getting the heavy exhibits into position.

Every imaginable kind of machine is on view here, ranging from the finest and most delicate instruments to gigantic engines weighing 150 tons each. As I walked through the long avenues looking at the exhibits, I could not help but let my imagination run back to the history of all these great machines, remembering that each had behind its development a thrilling story of reality, more stirring than any romance of fiction. I remembered how they were made, how the masses of metal first came from the great furnaces, and how steam-hammers, hydraulic presses, lathes, drilling, planing and boring machines had all played their parts in making possible the building of these wonderful machines.

Speech and Song from Below Water

I entered by the Nasmyth Gate, and the first exhibit that attracted my attention was a huge glass tank filled with sea-water. On the platform above the tank there was a hand-pump, and a crowd of people were watching two sailors encase a diver in his suit and screw on his helmet. Then the pumps were manned and the diver descended into the tank of water and we could see him walking about inside. There was a loud-speaker on the platform above the tank and the diver's telephone was connected to it by a cable, so that although under water he was able to talk to us, his voice being amplified by the loud speaker. Soon he obliged us with a song, and very appropriately selected "*I'm for ever Blowing Bubbles,*" for streams of air bubbles were coming out of his helmet the whole time he was under water!

A few yards further on is the "Window of the Empire," the largest sheet of plate glass in the world, made by the famous firm of Pilkington's. It is 24 ft. in length, 14 ft. in height, weighs 1,700 lbs. and covers an area of 336 square ft. "Some" window!

Wonderful Power-Station

I was next attracted by the hum of turbines working at high speed. Here in a corner of the building are the machines that supply the current for the whole Exhibition—a complete power-station in full working order, with boilers, economisers, turbo-generators, switch-boards and transformers. There are three direct-coupled steam turbines and generators, and underneath are the condensers, by which the steam, after driving the turbines, is condensed and sent back to the boilers to be used again. The switch board is arranged down one side of the power-station and through it is distributed the current for the entire Exhibition. The engineer told me that about 3,500 kilowatts are generated at this station. The current sent out is not of the correct voltage for all the purposes for which it is required, however, and so sub-stations and transformer stations are placed in various parts of the Exhibition. One of these, for instance, converts the alternating current, as supplied by the generators, into direct current for use in the Amusement Park.

By descending some steps I was able to pass through to the boiler-house, where I saw how they feed the furnaces by mechanical stokers. The coal is carried to the roof of the building by elevators, automatically weighed out, and distributed to the boilers. It is feeding time all day long in the boiler-house, yet the boilers are always ready for more! The engineer can tell by a glance at the indicators what amount of coal is being used, the temperature at various parts of the boiler, and the amount of steam being supplied to the turbines.

Ancient and Modern Locos

Near the Power-Station is a stand on which two full-sized Pullman cars are shown, and as I passed through these I noted the details with increased interest, remembering the article on Pullman cars that appeared in last month's "*M.M.*"

Close to this stand is the L.N.E.R. exhibit of the "*Flying Scotsman*" (4–6–2), the largest loco in this country, weighing 150 tons with tender. This loco can pull a load of over 600 tons at over 80 miles per hour, and it travelled over 62,000 miles during 1923, running between London and Edinburgh. It is beautifully cleaned and polished, and stands an inch or so above the rails to allow a powerful electric motor to drive its wheels around to show the action. This "Pacific" loco is a magnificent piece of work, and I could have stood and watched it for hours.

It gives a splendid idea of the great advances that have been made in railway engineering to see alongside it "*Locomotion No. 1*," which was described in the March "*M.M.*" This is the actual loco, the first to be used on a public railway, and was built by George Stephenson in 1825. Although not as big even as the tender of the "*Flying Scotsman*," Stephenson's engine appears to be fairly bristling with pride, as much as to say: "It is *I* who am responsible for all these great locos. Were it not for *me* they would not be here!" The rear-light on the "*Locomotion*" was an ordinary bucket—similar to those used at night by watchmen—in which coke was burnt, for oil lamps were not known in those days!

On the Footplate of a Famous Loco

The next stand is the G.W. Railway's exhibit with another full-sized loco, none other than the famous "*Caerphilly Castle*," the most powerful express passenger engine in Great Britain.* It is in spick-and-span condition, although within a week of coming to the Exhibition it had been working the 10.30 a.m. London to Plymouth Cornish Riviera train, the longest daily non-stop run in the world. We were allowed to mount the footplate and pass through the cab, and it was quite a thrilling experience to stand here and imagine the loco tearing along the track at 70 miles an hour, with hundreds of passengers in the coaches behind. It made me feel that I wanted to be an engine-driver, and I kept going back into the queue until I had been through the cab seven times!

Photo courtesy] [*Messrs. Davidson & Co. Ltd.*

The Mystery-Ball: What keeps it up?

Grabs, Road Rollers, and Models

On another stand the working of Westinghouse signals is demonstrated, and full-sized railway signals, with their lamps lit-up, are in operation. A large part of the building is devoted to motor-cars and motor-cycles, but I did not stay long here as I decided that I would rather spend my time among the larger exhibits.

* This loco was illustrated and described in the "*M.M.*" for March last.

My next stop was made in Bay 30, where the Garrett Engineering Co. were showing a working 175 k.w. steam-generating plant, the engine of which, of the semi-stationary condensing type, is claimed to be the most economical prime mover for all purposes. I next noticed some beautiful silver-plated models of road-rollers on Robey's stand, and interesting models of grabs lifting corn from a grain-steamer on Priestman's stand. Close to this is the stand of Messrs. Stuart Turner Ltd., with numbers of working-models of launch and marine-engines. I recognised this firm almost as old friends, having seen their advertisements in the "*M.M.*"

A Mysterious Ball

A crowd round Stand 142 (Davidson & Co. Ltd.), were watching a large rubber ball, which was twisting and turning in the air "without any visible means of support." I was fortunate enough to get a photograph of this stand, which is reproduced on this page. It was quite a few minutes before I discovered how this mysterious ball is kept in position, and I wonder how many readers of the "*M.M.*" will be able to solve the mystery of this unsupported ball?

There were dozens of other stands that I had to hurry past, and every conceivable form of engineering appliance is to be seen, including Coke-Ovens, Castings, Steam Rollers, Water Pumps, Cranes, Fans, Wire Ropes, Diesel Engines, Motor Boats, Elevators, Boilers and "everything that opens and shuts," in fact! I had already been in the Exhibition over four hours, and felt that time was slipping away far too quickly.

Photo courtesy] [*L.N.E. Rly. Co.*

"*Locomotion No. 1*" and the "*Flying Scotsman*" at Wembley

An exhibit that interested immensely was the geared Turbine-Condensing Locomotive, exhibited by the North British Locomotive Works, and it is a gem! It is a huge locomotive, looking longer and larger than anything I had yet seen, and the cab and control arrangements inside are a perfect dream. I could have stood there an hour or more just looking at this beauty, but I was pushed on from behind by some other boys who seemed just as anxious to see it as I had been!

Turbines are shown by Messrs. Parsons, and Merryweathers show a wonderful 85 ft. Turntable Fire Escape. On Stand 113 is a model of the Assouan Dam about 20 ft. in length and showing the 180 sluices that were sent out to Egypt by the makers (Messrs. Ransomes and Rapier).

(*To be continued*)

Competition Corner

RESULTS OF Recent Contests

Seventh Photo. Competition

The fine weather, with the lighter and longer days, is no doubt responsible for the decided improvement in the quality of the entries for the Seventh Photographic Competition. The usual large number of entries was received, and some (especially those sent in by the older competitors in Section B) were exceptionally good, showing an intelligent understanding of the ever-difficult questions of correct exposure and effective rendering of light and shade in their correct values.

The prize in Section A (Meccano goods to the value of half-a-guinea) has been awarded to Master Fred Driscoll, of Buckingham, for an excellent snap of an express train rounding a bend at speed, the impression of speed being very realistic.

The winner of Section B is Master Bryan Pearson, of Lye, who also chooses Meccano goods to the value of half-a-guinea. His photograph submitted was a study of a waterfall near Stourbridge, and shows a very faithful representation of detail.

Favourite Model Competition

The Meccano Motor Chassis is easily the most popular model, according to our recent essay competition for model builders, in which it was acclaimed favourite by Meccano boys of all ages. Judging from the descriptions of the fascinating times that may be spent with it, the Chassis well deserves its proud position. As many readers took care to point out, however, not only is it a splendid toy, but it is an exact replica in miniature of a real automobile-chassis, and is therefore of considerable instructional and experimental service, which makes it a model of great value and interest.

Second in popularity was the Swivelling Jib Crane, with which some of the entrants have had splendid times, ranging from loading a Hornby train from the top of a dining table to giving some unsuspecting kitten the ride of her life! The Travelling Gantry, Dredger, Roundabout, Pit-Head Gear and many other models all had their respective champions, and there is no doubt at all that Meccano boys know how to get the fullest enjoyment out of their hobby.

The prize for the best essay in each section of this contest was a Film-pack Camera, and these have been awarded to the following two competitors, whose essays were considered the best by the judges. Section A: Master L. Greenland, whose favourite model was No. 106, the Motor Van, and if he will send his address we will despatch his prize. Section B: Master E. A. Robbins, of Kidderminster, who chose the Motor Chassis, No. 701, as the subject of his essay.

Further essay competitions will be announced in the "*M.M.*" from time to time, and we trust that those competitors who have been unsuccessful this time will have better luck in the near future.

Cycle Essay Competition

There are many keen and experienced cyclists among readers of the "*M.M.*" and a large number attempted to secure the coveted prize of a Veeder cyclometer, offered in our first Cyclists' Essay Competition. The subject of this contest was "*My Ideal Bicycle*," and some of the entries described very strange types of "jiggers" indeed. One enthusiastic but slightly-confused reader from Ireland described at length a truly wonderful dream-machine fitted with a three-speed gear *and an Eadie Coaster hub*—fixed on the front wheel, we presume!

Popular opinion seems equally divided on the merits or otherwise of dropped handlebars. One competitor definitely stated that his ideal bicycle would on no account be fitted with dropped bars, as this riding position invariably resulted in round shoulders and other physical deformities, while the very next essay received casually remarks that one of the world's finest athletes is a keen cyclist and particularly favours dropped handlebars. Similarly, chain-cases do not seem to find universal approval, and the majority of competitors have discarded this fitment on account of its extra weight, rattle, or general inconvenience.

The majority of essays reached a very high standard, and with few exceptions the competitors knew what they were writing about and were obviously devoted to their hobby. Master Leslie G. Davy, of Ealing, London, whose description of his ideal machine was particularly well written, has been awarded the prize of a Veeder Regular Cyclometer, and we trust that it will give even further interest to his riding in future. We announce below a further competition for cyclists and hope that all our readers will enter.

Two New Contests

Bargain Spotting

A Novel Competition for Stamp Collectors

In view of the many different stamp advertisements featured in the "*M.M.*," and because of the great interest shown by our readers in this hobby, it has been decided to arrange an entirely new type of competition. This will take the form of a bargain-hunt through the Stamp Dealers' announcements in this month's issue.

Competitors first of all should read through very carefully all the stamp dealers' announcements. Then, from their knowledge and experience of stamps, they are required to decide which item out of the whole of the announcements offers the greatest value. After this they must decide which is the second-best item and then the third-best. The three should then be written down in order of merit on a postcard, together with the name, address and age of the competitor. The entry must not carry any other correspondence.

The first prize in the contest will be a packet of stamps, value 10/6, to be chosen from any firm advertising in the "*M.M.*" It will be awarded to the entry which most nearly corresponds with the general order of voting. There will also be three consolation prizes for the next three competitors in order of merit, and these prizes will entitle the winners to a free advertisement (value 2/6) in which to announce their own bargains or wants in our advertisement columns. The stamp dealer in whose advertisement the biggest bargain was found will have his advertisement, up to one inch space, inserted once free of charge. Closing date 31st August (Overseas 31st October).

New Contest for Meccano Cyclists

As there are evidently very many enthusiastic cyclists among readers of the "*M.M.*," it has been decided to announce another cycling essay competition. The essays received in the last contest were of a very high standard, and entrants in the new competition should not find any difficulty in describing their "Most Enjoyable Cycle Outing."

Nearly every cyclist has happy memories of some particular ride which he enjoyed more than any other. This run may perhaps have been into the country, down to the sea, or even into a local town. A few moments' thought will soon recall the details of that most enjoyable trip, and as the essay may run to 500 words there will be quite sufficient space to do full justice to the subject.

The entries in this competition will be judged by "Rover," and the prize offered is a supply of puncture-sealing solution sufficient for two tyres, to be chosen by the winner from an advertiser in the "*M.M.*" Entries should be plainly written in ink on one side of the paper only, and each sheet must bear the competitor's name and address on the back. Envelopes should be marked "Cycling" in the top left-hand corner and should reach this office before 30th September.

FOR *OVERSEAS READERS*

RESULT OF First "Lynx-eyed" Contest

In whatever part of the world they may be situated, Meccano boys are all very much alike. The same things that appeal to a boy at home appeal to a reader in our Dominions. This common interest was evidenced by the great popularity of the Lynx-eyed Contest, for several thousands of entries were received from Overseas and there were few countries that were not represented in the entries. Evidently the pictures were not difficult enough, however, and as numerous entries were quite correct, the prizes have been awarded to those whose entries were the neatest, in accordance with the rules relating to a tie.

The names of the successful competitors are as follows:—

FIRST PRIZE (No. 2 Hornby Passenger Train):—J. J. SMITH, of Grange, Adelaide, South Australia.

SECOND PRIZE (Zulu Goods Train):—HAROLD SHAROOD, of Halifax, Canada.

THIRD PRIZE (Meccano Electric Motor):—H. G. VAN DER SLUIS, of Den Haag, Holland.

TWELVE CONSOLATION PRIZES (Complete Manuals of Instructions):—Teddy Albon (Malta), J. D. Andrews (Victoria, Australia), Leonard Fisher (Johannesburg, S. Africa), Tan Chong Ghee (Federated Malay States), Philip Handley (Natal, S. Africa), G. P. Hertwood (Auckland, New Zealand), A. F. Mody (Bombay, India), James Rudd (New South Wales), B. P. Mitra (Delhi, India), Richard M. Thomas (Kimberley, South Africa), H. Wilkinson (Queensland, Australia), Alick Young (Grahamstown, South Africa).

TWELVE CONSOLATION PRIZES (Meccano Writing Pads):—P. V. R. Babu (Bangalore, India), Maurice Barge (Whangarie, New Zealand), Allwyn Calder (Southern Rhodesia), Wilfred H. Clowe (Cape Town, South Africa), Sidney Cooke (Cape Province, South Africa), Bob Cramudinckel (Holland), Charles Edwards (Santa Isabel, Argentine), Lionel T. Jones (Cape Town, South Africa), Donald B. Marsh (New Brunswick, Canada), Bert Moyses (Adelaide, South Australia), Douglas Murison (Coghlan, Buenos Aires), J. Roinski (Tczew, Poland).

We congratulate the winners on their success, and we trust that those who were unsuccessful will be having another attempt at the Second Series already published. Overseas closing date: 31st October.

Drawing Competition Result

Our recent Drawing Competition, which met with such a great reception from readers at Home, has proved equally popular with our Overseas readers, and there is certainly a large number of budding artists among Meccano boys. Pencils, ink, wash, crayons, water-colours and even oils were used in the endeavour to do full justice to such an important subject! Entries have been received from all parts of the world, including such distant places as British Guiana, Barbados, Bermuda, Jamaica, Malta, Straits Settlements, and Ceylon.

The winners are:—Section A—Master Jock McIsaac, of Bangalore, India; and Section B—Master J. W. Thompson, of Durban, South Africa, who have each been awarded a Film-pack Camera as first prize. We congratulate these two young artists on their success, and hope to see their entries in future Photographic Competitions, in which they will now be able to participate.

Auto-Scooter Contest Result

That splendid toy, the Auto-Scooter, is apparently just as popular with Meccano boys overseas as it is in this country. Hundreds of "Sporty Boys" overseas entered this essay contest. The First Prize of a Model-de-Luxe Auto-Scooter has been awarded to Master D. Abel, of India. The Second Prize of a Popular Model Auto-Scooter has been won by Master J. E. Cattell, of Johannesburg, South Africa. The prizes have been despatched to these lucky winners by the organisers of this competition, Messrs. Auto-Scooter Company, of Stockport. This firm, familiar to all readers of the "*M.M.*" as regular advertisers in our pages, will be pleased to send a complete list of their various models of Auto-Scooters post free on application.