MECCANO MAGAZINE

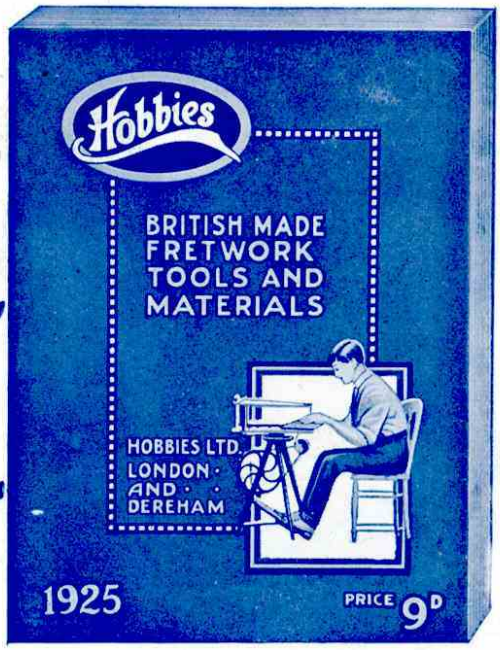
NOVEMBER 1924

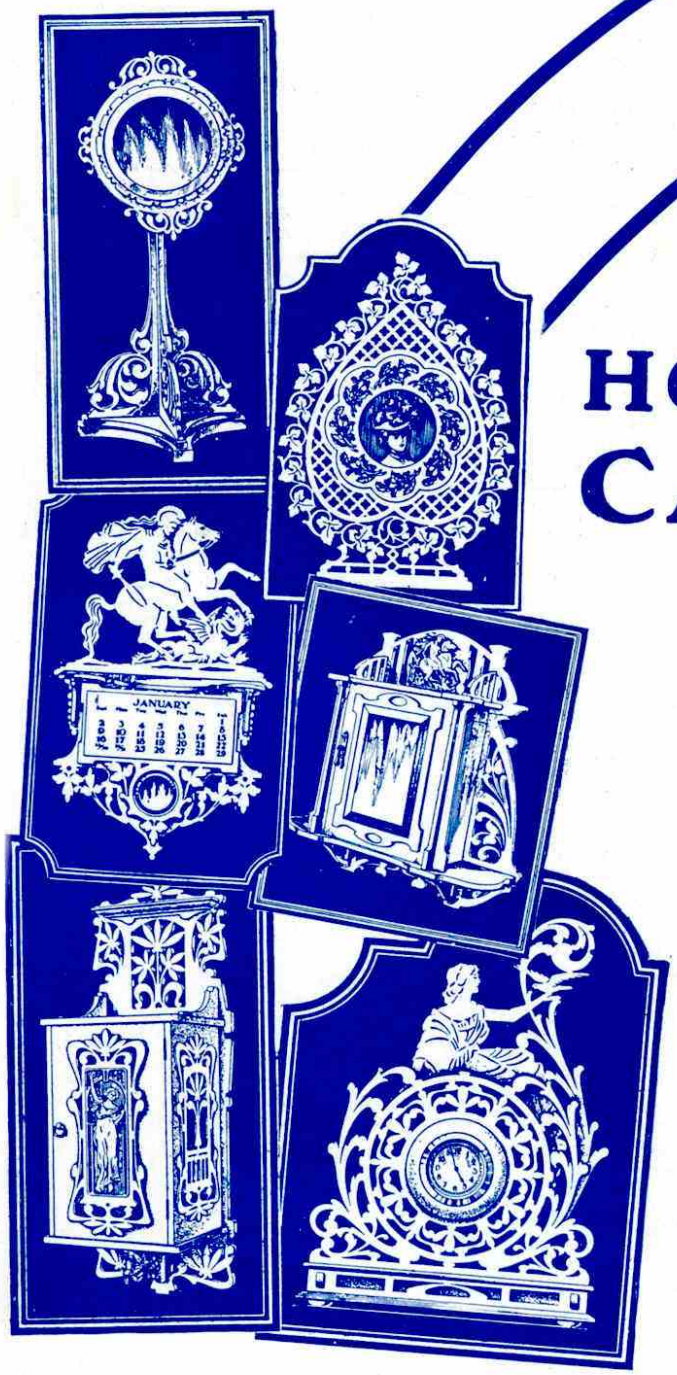
PRICE 2D

VOL. IX
No 11

MAGNETS IN INDUSTRY
(see page 322)

640 Designs are illustrated in this top-hole Catalogue





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EDITORIAL OFFICE
Binns Road,
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MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

Vol. IX, No. 11. November 1924

Our Cover

OUR cover this month shows one of the many applications of the electro-magnet in industry, and requires very little description. A travelling overhead crane is lifting a huge casting by means of an electro-magnet. Electric cranes of this type are in everyday use in engineering shops, and prove themselves to be very helpful in saving time and labour. The method of operation is quite simple. When it is desired to move a casting or a steel billet from one part of the works to another, all that is necessary is for the electro-magnet to be brought over the casting to be moved. This magnet is not permanently magnetised, of course, but only becomes a magnet when the current is switched on. With the current switched off, the magnet is lowered to the casting. Then the crane-man switches on the current, the coils in the magnet are immediately energised, and the casting is attracted with such strength that it may be lifted and transported elsewhere. Until the crane reaches the spot where it is desired to deposit the casting, the switch remains "on" and the current continues to pass through the coils of the magnet. When the load has been lowered, the current is switched off and the magnet at once releases its load. This ease of picking-up and releasing a load saves a great deal of the time required to manipulate the chains and hooks necessary with the ordinary type of crane. The electro-magnetic crane has many other advantages also, as for instance when lifting bolts or metal scrap. On this work the magnet attracts large quantities of the loose metal, thus eliminating the necessity for loading by hand. Further details of the application of magnets to industry are given in our article on this subject.

Special Christmas Number

As was the case last year, our December issue will be a Special Christmas Number in every sense of the word. The number of pages will be increased and there will be several very attractive features. These will include the first of a new series of articles on models—on altogether original lines—that may be constructed with a No. 1 Outfit. The cover will be specially attractive and will show a huge pulley in mid-air. A special article, written by an expert engineer, will explain "*Pulleys and How they Work.*" There will also be included a short engineering story entitled "*Two Minutes Slow,*" which I think will prove of great interest to our readers. Railways will be represented by a special article "*Driving an Express Train,*" and Radio by "*Saving Lives at Sea by Wireless.*" There will be further instalments of our regular features—the life of Telford will be continued; the electrical article will deal with Electric Bells, Indicators and Burglar Alarms, which article, I may here remark, has been "crowded out" this month. In addition, the Stamp Collecting, Meccano Guild and Fireside Fun pages will be strengthened. There will be several other noteworthy features, not the least interesting of which will be the instructions for building the revised model of a High-Speed Ship-Coaler—an article that has been anticipated for a long time, and for which there has been a considerable demand. I have always thought that this is one of the most interesting of our Meccano models, for all the movements for coaling a miniature ship are controlled from the gear-box. The High-Speed Ship-Coaler will appeal to every Meccano boy, because when it has been built it affords endless fun, and no little dexterity is required for its operation. There are so many movements that the operator has to use his intelligence and has to be quick with his fingers in order to carry out all of them successfully.

Order Your Copy Now

The Christmas Number will be ready on the 1st December, and readers are asked to note that the price will be increased to 3d., post free 4d. Our regular subscribers will, of course, be debited with the increased price, which point they should bear in mind when their subscriptions are due for expiry. Now, there is certain to be a very large demand for this Special Christmas Number, and as the number we print is limited to the number of orders we receive beforehand from our dealers and newsagents, it is very desirable that you should place an order for your copy now. If you have not already placed your order you will avoid disappointment and will assist me also by going to your Meccano dealer or your newsagent right away, and ordering the December issue of the "*M.M.*"

Hints for Competitors

I hope we shall have a record entry for our new Essay Competition, announced elsewhere in this issue, in connection with our series of articles "*How to Run a Miniature Railway System.*" I should like to take this opportunity of drawing the attention of intending competitors—and, incidentally, of my numerous correspondents also—to the value of introducing neatly-executed sketches in their essays and letters when this is possible. I frequently receive letters from readers advancing some theory or describing a mechanism but I often find it impossible to understand these on account of some confusion in a sentence or something omitted. In such cases had sketches been sent as well as descriptions, everything would probably have been quite clear. Sketches encourage readers to develop the habit of making drawings of any mechanism in which they are interested, and there is no better method of securing a thorough grasp of every detail than by drawing it. Sometimes boys tell me "I would have sent a sketch but I have no drawing ability." It is quite true that many boys are not able to draw a landscape or a portrait, but surely every Meccano boy can make a drawing of a piece of mechanism, provided he understands its construction. Perhaps he will not be able to turn out a workman-like scale drawing without tuition, but he can at least produce a sketch that will show all the essential parts of the mechanism. To any boy who thinks he cannot do this I give one word of advice: "Try." I venture to assert that after a few serious attempts he will be agreeably surprised at his progress.

Replacing Damaged Parts

Now that a new Meccano season has commenced, I take this opportunity of reminding my readers that damaged or rusty Meccano parts may be replaced at any time by bright new parts at half list prices. The old parts should be returned either through your regular dealer or direct to Meccano Limited, Binns Road, Liverpool. In the latter event your parcel should be addressed to "Returns Department," and should be accompanied by a list of the parts enclosed and a remittance covering the cost of new parts, based on half current list prices, plus postage. This is a good opportunity for all Meccano enthusiasts to overhaul their Outfits, and so ensure that the models they build during the coming months will not be defaced by broken or rusty parts.

Electricity

IX. MAGNETS IN INDUSTRY

IN the article under this heading in our July issue we described how a rod of soft iron may be made into a magnet by winding round it a number of turns of insulated wire and passing an electric current through the wire. We showed further that the iron has magnetic powers only while the current is flowing. Magnets made by the passage of an electric current are called "electro-magnets" and they play a very prominent part in present-day industrial processes.

Lifting Great Masses of Metal

The most obvious industrial application of electro-magnets lies, of course, in the lifting of heavy masses of iron and steel. In steel mills, iron foundries, machinery factories, shipyards, etc., a considerable amount of time is spent each day in moving masses of metal from one place to another. Cranes of various types, ranging from the small portable crane to the huge electrically-driven overhead travelling crane, are installed to facilitate the handling of the metal. In the ordinary way, their use involves a considerable amount of accessory mechanism such as chains, ropes, grappling hooks, etc. If a crane is fitted with an electro-magnet, however, these accessories at once become unnecessary. The magnet is lowered on to the load it is required to lift, the electric current is switched on and the crane then lifts the magnet with its load held in a tenacious but invisible grip. Dropping a load is equally simple. The magnet is swung into place, the current is cut off and the load is immediately deposited exactly where it is required. It is quite clear that, by the use of powerful magnets in connection with cranes for lifting purposes, both time and money are saved to a considerable extent, and also the workmen are spared labour of a particularly heavy nature.

Lifting-magnets are also very largely employed in various operations connected with the loading and unloading of ships. For instance, take the case of a vessel loaded with 1,800 tons of pig iron. With 28 men working, the time required to unload the vessel was two days and two nights, which corresponds to about 15 tons per man per day of 10 hours. When two lifting magnets were used, however, the ship was unloaded in 11 hours by two men whose duty consisted in operating the switches in the crane cabs. Thus two men and two magnets did the work of 28 men in about one-quarter of the time.

Types of Magnets and Their Work

The various tasks that magnets have to perform may be divided roughly into two classes—the very heavy work of handling billets, castings, pig iron and scrap, and the lighter task of dealing with plates, bars and tubes. The circular magnet shown on our cover is typical of powerful magnets specially designed for very heavy work. The working surface of this magnet is heavily ribbed on the underside, so that it will withstand rough use and at the same time provide better gripping power on the irregular shapes with which it has to deal. The illustration on this page shows a pair of rectangular magnets designed for lighter duty. In this case the working surfaces are flat in order to obtain a good grip on smooth surfaces. Rectangular magnets have the advantage that two or more may be mounted on a spreader-bar, as shown in the illustration, in order to prevent thin sheets or long thin bars being torn away from the magnet by whipping action.

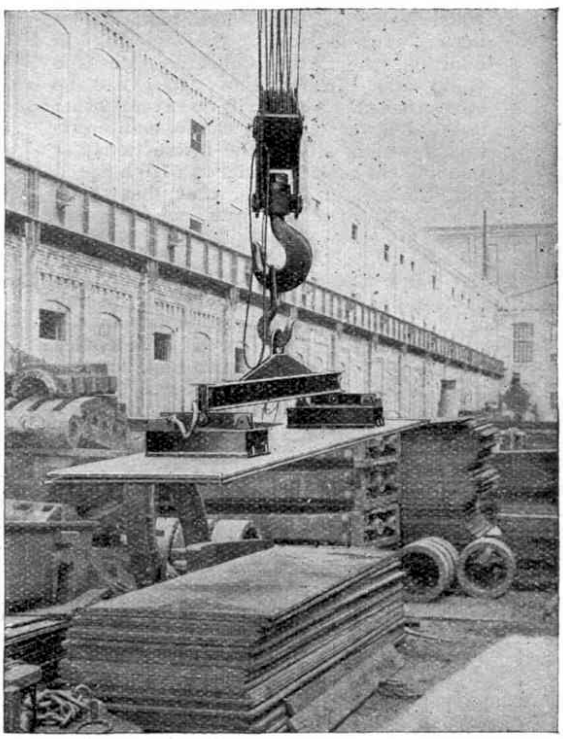


Photo courtesy of [*Messrs. Igranic Electric Co. Ltd.*

Lifting Ships' Plates with Electro-Magnets

For example, a $\frac{1}{2}$" plate 10 or 15 ft. in length, attracted by a single magnet, would droop at both ends to such an extent that the plate would make contact with the magnetic pole along one line only, so that it would not be attracted with sufficient strength to ensure its being transported with safety.

Large lifting-magnets are frequently employed in the open air. They will work successfully under the severest weather conditions and actually may be used under water for salvaging magnetic material.

The amount that any particular magnet will lift depends not only upon the strength of the magnet but also upon the nature of the material it is lifting. For example, a magnet weighing 110 lb. will lift up to 4,000 lb. on a flat surface, but will not lift half this weight when handling pieces of pig iron or scrap material of rough and uneven shape.

Powerful Magnetic Pulleys

Another extremely important application of magnets in industry lies in the separation of iron and steel from other materials, an operation performed by what are called "magnetic separators." The iron may be extracted for its intrinsic value, or in order to prevent damage to crushing or grinding machinery, or to ensure the purity of food and other products.

In the case of materials that can be conveyed on a belt an effective device for removing stray iron is the magnetic pulley, which is a powerful electro-magnet made in the form of a pulley. The accompanying drawing shows clearly the principle on which magnetic pulleys work. The material from which the iron is to be separated passes along the conveyor belt and at the point of discharge the pulley, by means of its powerful magnetic attraction, draws the iron vigorously towards it. The belt interposed between the pulley and the material

automatically carries the iron out of the general direction of flow of the material, and on leaving the lower side of the pulley causes the iron to be discharged.

These pulleys are specially designed to obtain the greatest possible magnetic power, and some idea of their strength may be gained from the photograph published on page 357 of this issue. This shows a man suspended head downwards from a magnetic pulley. This man is held entirely by the attraction of the pulley for the nails in his boots!

Magnetic pulleys are employed in a number of industries. Many kinds of ore, for instance, are sent from the mines to be passed through crushing machines. These machines are very strongly constructed of the hardest metal, but if pieces of iron mixed with the ore find their way into the crushers, damage is always caused. Sometimes, indeed, the crusher is absolutely wrecked. To safeguard the crushers, therefore, magnetic pulleys are used to extract all iron before the material reaches the crushers. The iron that finds its way into the ore may include pick or hammer heads, tools, nuts, bolts or nails, and any one of these articles might cause a breakdown if it reached the crusher.

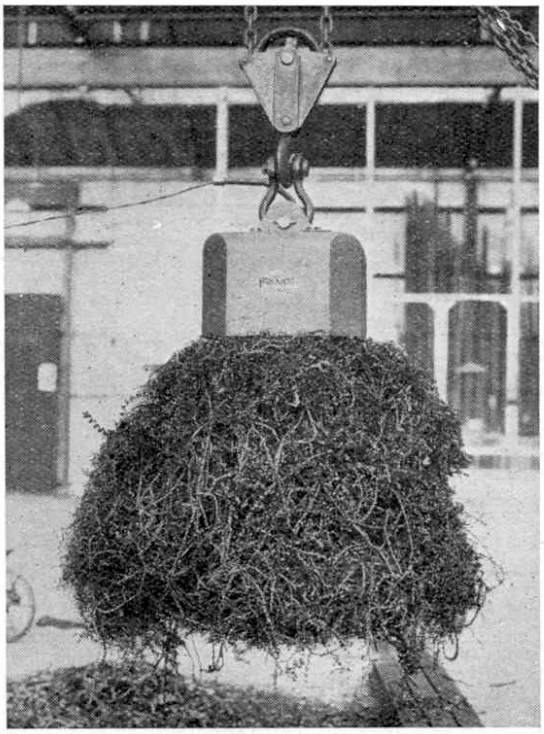


Photo courtesy [*Messrs. Igranic Electric Co. Ltd.*

Electro-Magnet—Lifting Iron Turnings

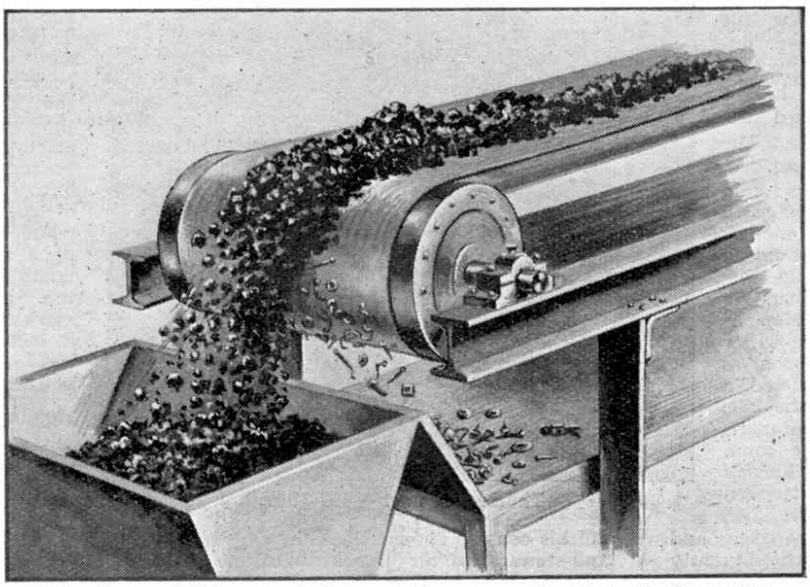
Magnetic Separators at Destructors

Electro-magnetic separators play an important part in municipal salvage works and destructors. At the recently-opened Brookdale Road Salvage Works at Birmingham, where the plant is of the most up-to-date type, the household refuse is cleared of all magnetic material by means of specially-designed magnetic separators. The main objects of the process are to recover the tins, which have a commercial value, and to increase the value of the subsequent clinker by freeing it from iron.

In this case fixed electro-magnets are used. The refuse passes through a screen into a cylinder of brass revolving inside an electro-magnet of half-moon shape. The magnetic material is attracted against the inside of the brass cylinder and carried round and round until it passes beyond the electro-magnetic influence, and is discharged from a chute to one side. The remainder of the refuse passes straight on and falls on to conveyors of the band type, which carry it along to undergo further treatment.

Finally the refuse passes into the destructor furnaces, where it is burnt to clinker. After leaving the destructors the clinker is crushed, and then a final magnetic separation takes place to eliminate any magnetic material that may have been embedded in some combustible substance in the refuse and not taken out in the first separating process. The crushed clinker is fed on to the top of a revolving drum. The non-magnetic material drops into the main chute and is carried forward, but the magnetic material, as it comes under the influence of the electro-magnet, is attracted to the surface of the drum, carried round, and then released into a separate diverting chute.

The magnetic separation plant just described was designed and constructed by Messrs. The Rapid Magnetting Machine Co. Ltd., of Birmingham, to whom we are indebted for our information.



Extracting metal from material on belt conveyor by Magnetic Separator.

Eliminating Danger in Food

In flour mills, where there is a good deal of dust in the air, a spark produced by a fragment of iron getting into the grinding machinery may cause a serious explosion and fire. By passing the grain over magnetic separators, before it is ground, this danger is removed, and also flour absolutely free from iron is ensured. Magnetic separators are used also for extracting fragments of iron from prepared feed for cattle. In spite of the greatest care particles of iron are liable to find their way into the ingredients from which cattle-feed is made, and animals may be killed by swallowing these particles. The use of separators ensures that the prepared feed is free from all danger from this source.

Recovering Unburned Coal from Ashes

An interesting process has been devised for recovering coke and unburned coal from furnace ashes. Almost all kinds of coal contain a certain amount of iron, but this is in the form of iron pyrites, and is not magnetic. The process of combustion, however, changes this iron into iron oxides, which have magnetic properties. The ashes from the furnaces are passed over a revolving magnetic drum, and while the slag containing the iron is attracted to the surface of the drum and diverted, the coal and coke pass on, and in this way are recovered for use as fuel.

The principle of magnetic separation is made use of in many industries where we should scarcely expect to find it. In the making of china, for instance, separators are employed to remove any particles of iron that may be in the clay, because such particles would produce blue specks and tiny blisters in the ware—defects that may be seen occasionally in cheap ware of inferior quality. Other industries in which separators are utilised are glass-making and paper-making, the object in each case being to improve the quality of the finished product by removing all traces of iron.

An Interesting Effect

Electro-magnets for all ordinary purposes are energised by continuous current. If an alternating current is sent through a coil of wire an alternating magnetic field is produced, and a core of iron placed inside the coil will undergo corresponding alternating magnetisation. Electro-magnets intended to be used with alternating currents have their iron cores laminated, that is built up in sections or strips instead of being solid, and fewer turns of wire are used in the coil than is the case where continuous current is to be employed.

A remarkable effect may be produced by means of an electro-magnet having a long laminated core of iron. If a ring made of aluminium is placed loosely over the core and an alternating current is sent through the coil, the ring is repelled and thrown up into the air, sometimes to a height of several feet. This repulsion is due to the fact that the currents induced in the aluminium ring are in opposite directions to those in the coil. If the ring is forcibly held down it very quickly becomes quite hot.

NEXT MONTH:—

Electric Bells, Indicators and Burglar Alarms

Lives of Famous Engineers

TELFORD
BRIDGES, ROADS AND CANALS
X

Telford's career is a striking example of great natural ability combined with unceasing industry. Beginning life as a working stone-mason, he became one of the greatest civil engineers of the day, but in spite of all his brilliant successes he was never satisfied with his work. He was always endeavouring to improve it still further, and his example is one that we can all follow.

THOMAS TELFORD was born on 9th August, 1757, in the parish of Westerkirk, which lies in a narrow part of the valley of the River Esk in the county of Dumfries, Scotland. His father was a shepherd on the farm of Glendinning, and the cottage in which he lived consisted simply of four mud walls covered by a thatched roof. It was as lonely a spot as could be imagined. At Glendinning the road ended, and beyond it stretched an unbroken solitude of moorland.

A Happy, Smiling Boy

Before Telford was four months old his father died, leaving his widow and child altogether unprovided for. The widow had a hard struggle to maintain herself and her boy, but she faced the task with undaunted courage. The warm-hearted farmers of the dale took pity on the fatherless child and by turns had him to live with them, and also gave his mother such employment as they could in the way of milking or hay-making. Telford grew up a happy, smiling lad, so full of fun and good spirits that he became known in the valley as "Laughing Tam." As soon as he was old enough he assisted a relative to attend sheep on the hills in the summer, and in winter he helped the farmers with the cows, ran errands and made himself generally useful. Later he attended a parish school at Westerkirk, where he learned reading, writing and some arithmetic, and also benefited greatly by the intercourse with the sons of neighbouring farmers and land-proprietors.

Presently the time came for the lad to be put to some regular calling, and at the age of fifteen he was apprenticed to a stone mason at Lochmaben, a small town a few miles away across the hills. This proved an unfortunate beginning, for his master treated him so badly that he ran away and returned to his mother, greatly to her consternation.

Attracted by Books

Telford was willing to go anywhere except back to his Lochmaben master,

Thomas Telford (1757-1834)

and his cousin, Thomas Jackson, who was land-steward to Sir James Johnstone of Wester Hall, induced a mason at the neighbouring town of Langholm to take the boy for the remainder of his apprenticeship.

This venture proved a great success and Telford completed his apprenticeship very happily. About this time the Duke of Buccleuch, the principal land-owner of the district, introduced many improvements on his estates, and this produced a demand for masons' labour. Telford thus obtained a considerable amount of useful experience, not only in erecting walls and farm enclosures, but also in building bridges across various streams where prepared roads were substituted for the existing cart tracks.

At this time Telford was rapidly developing a great love for reading that lasted throughout his life. He quickly exhausted the slender book resources of his friends and there appeared to be little opportunity for enlarging the scope of his reading. By good fortune, however, an elderly lady named Miss Pasley, who lived in the little town, took a fancy to the smiling, rosy-cheeked apprentice, invited him to her house and placed her little library at his disposal. This was a great day for the lad, and through this kindly act he became acquainted with much of the finest British literature. At the same time he made regular attempts at composition, including poetry, and by the time he was out of his apprenticeship, at the age of 22, he had become so good a penman that he was often called upon to write letters for his neighbours to their distant friends. In this respect Telford provided a marked contrast to Brindley, who, it will be remembered, was to the end of his days a shocking writer and an even worse speller!

Holding-up a Bridge

An amusing incident occurred during Telford's life at Langholm. His master and he had been employed upon a bridge across the Esk. Soon after this was finished a great flood came roaring down the valley and everybody thought the bridge would be carried away. The master-mason happened to be away at the time and his wife "Tibby," knowing that he was bound by contract to maintain the bridge for seven years, was in a state of great alarm. Telford did his best to reassure her, but it was no good, for she insisted that the bridge was shaking and was doomed. Presently she declared that she heard the bridge rumbling and set her back against the parapet as if

to hold it up. The absurdity of this action tickled Telford immensely, and the sight of him standing there shaking from head to foot with laughter at length convinced Tibby that there was no danger.

Having learned all that his native valley could teach him in the art of masonry, Telford went to Edinburgh, where extensive building operations were then in progress. He found abundant employment and he remained there for two years, during which he had the opportunity of taking part in first-class work and also of studying the ancient architecture in the neighbourhood. He then determined to go to London, and returned to his birth-place to take leave of his mother and his old friends.

Telford Goes to London

A piece of good fortune enabled him to make the journey to London on horseback instead of having to walk. Sir James Johnstone, of Wester Hall, wished to send a horse to a relative in London, but could not find anyone to take charge of it. Mr. Jackson, Sir James's steward—who, as we have already mentioned, was a cousin of Telford—suggested that Telford should ride the horse to London. The matter was quickly arranged, and in order to make the journey more comfortable, Mr. Jackson lent Telford his buckskin riding breeches. Telford reached London without any difficulty, and in after years Mr. Jackson used to tell with great glee the story of his cousin's ride, never forgetting to wind up with the words: "But Tam forgot to send me back my breeks!"

On his arrival in London, Telford duly delivered the horse and sought out Mr. J. Pasley, a prosperous merchant, to deliver to him a letter of introduction from his sister, Miss Pasley, who had befriended Telford in Langholm. Mr. Pasley gave Telford letters of introduction to Sir Wm. Chambers, the architect of Somerset House, which was then being erected. Sir William was in need of good workmen and he at once employed Telford. There was a great deal of fine masonry work to be done on this building, and Telford's ability and steady perseverance soon singled him out as being fitted for something better than the work of an ordinary mason.

About this time Telford was consulted by Mr. (afterwards Sir William) Pulteney in regard to certain alterations in the mansion of Wester Hall. Mr. Pulteney was the second son of Sir James Johnstone of Wester Hall, and took the name of Pulteney upon his marriage to Miss Pulteney, niece of the Earl of Bath, by whom he succeeded to a large fortune and extensive estates in the neighbourhood of Shrewsbury.

Work at Portsmouth

Telford's next move was to Portsmouth. How this came about is not clear, but at any rate in July 1784 he was engaged in superintending the erection of a house for the occupation of the Commissioner at Portsmouth Dockyard. Telford's letters written from Portsmouth showed that his work was greatly appreciated by the Commissioner.

His duties fully occupied the day, but at night he worked hard to increase his knowledge of everything connected with his trade. In one of his letters he wrote:—"I am not contented unless I can give a reason for every particular method or practice which is pursued. Hence I am now very deep in chemistry. The mode of making mortar in the best way led me to inquire into the nature of lime. Having, in pursuit of this inquiry, looked into some books on chemistry, I perceived the field was boundless; but that to assign satisfactory reasons for many mechanical processes required a general knowledge of that science. . . And I am determined to study the subject with unwearied attention until I attain some accurate knowledge of chemistry, which is of no less use in the practice of the arts than it is in that of medicine."

He adds rather quaintly that he has his hair powdered every day!

Telford's work at Portsmouth finished at the end of 1786, and shortly afterwards he was employed by Mr. Pulteney to superintend alterations necessary to fit up the castle on the latter's Shrewsbury estate as a place of residence. While engaged on this work Telford was fortunate enough to obtain the appointment—probably through the influence of Mr. Pulteney—of Surveyor of Public Works for the County of Salop. From this time Telford's labours became much wider in scope and he was occupied in surveying and repairing roads, bridges and gaols, and in supervising all the public buildings under the control of the magistrates of the county. Writing to a friend at Langholm at this time he says he is working very hard to improve himself in branches of knowledge in which he feels himself deficient, and he describes a notebook that he always carries, in which he crams all sorts of facts likely to be of use to him.

A Remarkable Incident

During Telford's term as surveyor, the church of St. Chad in Shrewsbury was in urgent need of repairs to the roof, which let in the rain. Telford was sent for by the churchwardens to advise them as to the best method of procedure. He accordingly examined the building, which was about 400 years old, and found it to be in such a dangerous condition that he refused to give any advice as to the repair of the roof until the churchwardens had decided to have the more essential parts of the structure made secure.

A vestry meeting was held and decided against Telford's advice. As Telford wrote at the time to a friend, popular clamour overcame his report, and the vestry men refused to admit that there was any danger from the fractures in the walls, on the ground that these had been there from time immemorial! Telford ultimately left the meeting with the parting advice that if they wished to discuss further they had better adjourn to some other place where there was no danger of the roof falling on their heads.

This advice was received with jeers and ridicule, and the meeting called in a local mason and directed him to cut away the injured portion of the north-west pillar of the tower, which was the chief danger spot, in order to underbuild it. This work was commenced, and two days later in the early morning, while the workmen were waiting at the church door for the key, the great bell of the clock in the tower struck four. The vibration at once brought down the tower, which crashed on to the nave and shattered the whole structure. "The very parts I had pointed out," wrote Telford a few days after the disaster, "were those which gave way, and down tumbled the tower, forming a very remarkable ruin, which astounded and surprised the vestry and roused them from their infatuation, though they have not yet recovered from the shock!"

One of Telford's duties at this time was that of keeping the gaol prisoners at work. He had to think out schemes for employing them without risk of their escaping, and this gave him a great deal of anxiety. "Really," he wrote, "my felons are a very troublesome family!"

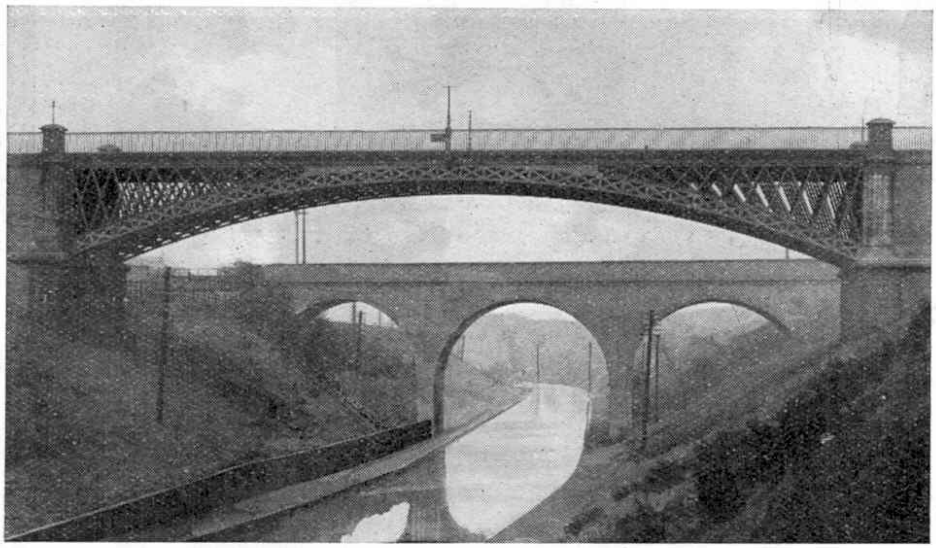


Photo courtesy [*Messrs. The Horsley Bridge and Engineering Co. Ltd.*

Telford's Iron Bridge at Smethwick

A Musical Experience

In our account of the life of James Brindley we described how his first and last visit to the theatre so upset him that he was incapable of doing any work for several days. Telford's experience was very different, and his first sight of Mrs. Jordan, the actress, at the Shrewsbury Theatre, appears to have worked him up to a pitch of rapturous delight. On the other hand he was utterly disappointed with a concert he heard about the same time. He could make nothing of the music. The only difference he recognised between one tune and another was that there was a difference of noise, and the

(*Continued on page* 344)

A NEW MECCANO MODEL

Model No. 717. Boat-Lowering Gear

ALTHOUGH models of a Boat-Lowering Gear are not entirely new to Meccano users, this model has recently been revised and very considerably improved, as will be seen from the illustration on page 329. Before describing how to construct the model, let us see something of boat-lowering arrangements in every-day use, for by studying actual practice we shall be better able to understand our model and to see exactly what principles are employed and what are the limitations in the method of construction and design.

Board of Trade Regulations for Ships

Travelling by sea to-day is safer than at any previous time. Not only are the great passenger ships built on the strongest possible lines, but also the provision for the safety of all on board in case of collision or other accident is marvellously complete, nothing being left to chance.

The latest Board of Trade regulations require that every foreign-going passenger steamship shall carry sufficient lifeboats to accommodate all on board. The regulations also require that the ship shall be equipped with the necessary appliances for getting these boats quickly and safely into the water.

Where the number of lifeboats is more than ten, one of them must be fitted with a wireless installation. Where there are more than fifteen boats, one must be a motor-boat fitted with wireless, and when the number exceeds twenty, two must be motor-boats so fitted. Motor-boats of this kind also must have searchlights. In addition each ship, according to her size, must carry a certain number of lifebuoys, and one life-jacket must be provided for each person on board.

The equipment for lifeboats is laid down in the regulations in great detail. Besides the necessary rowing and sailing tackle, each boat must carry sufficient fresh water to allow one quart for each person carried, and 2lb. of biscuits for each person. Oil for pouring on the water in rough weather and self-igniting red lights are also required to be carried. Each boat must be fully equipped before the ship leaves harbour, and the equipment must remain in the boats throughout the whole time the ship is at sea.

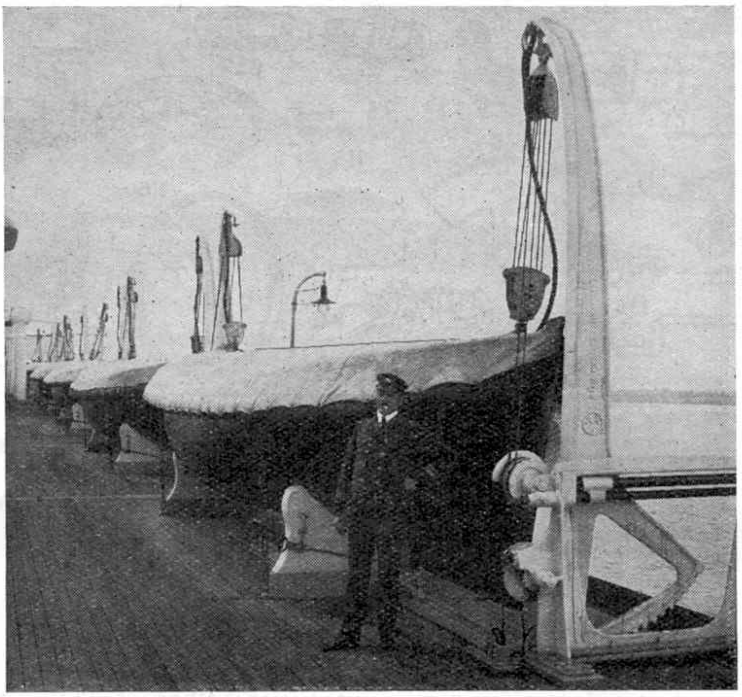
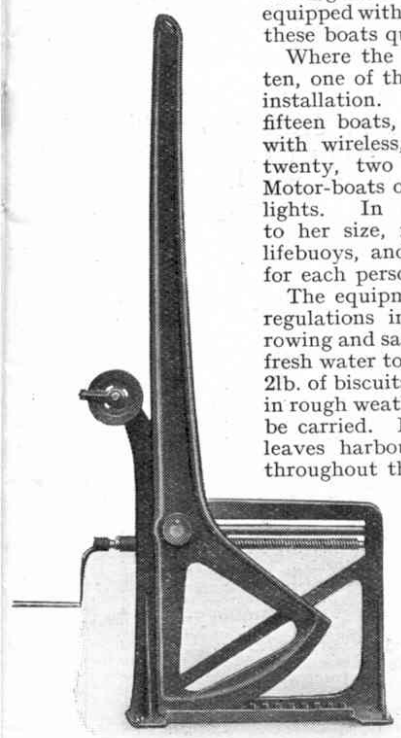


Photo courtesy of [*Messrs. Welin Davit & Engineering Co. Ltd.*

Fig. 1. The Boat Deck of R.M.S. "*Berengaria*"



Photos courtesy of

Fig. 2. Davit Arm—Inboard Position

Inspection Before Sailing

Before any passenger liner sails, her boat-lowering gear is inspected by a Board of Trade official to ensure that all the mechanism is in thoroughly efficient working order. At this inspection one or more boats selected by the official are actually lowered into the water, and the lifeboats generally are examined to see that they contain their stipulated equipment.

Boat-Lowering by Davits

The lowering of ships' lifeboats is carried out by means of what are called "davits." Davits are really small cranes that can be rotated about their mountings so that a boat can be turned outboard and lowered, or lifted up from the water and turned inboard.

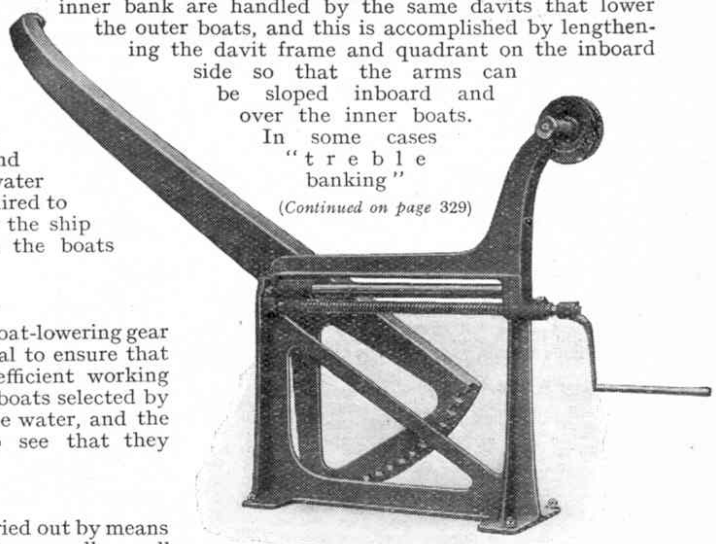
The majority of passenger liners are now fitted with the Welin davit, the principle of which is clearly shown in Figs. 2 and 3. The boat rests on chocks, the outboard portion of which falls flat on deck when released by means of a rod, fitted on the inboard portion and shown in Fig. 1. The arms of the davit, which carry the boat by rope and pulley falls, have quadrant-shaped bases with projecting teeth that engage in a rack bolted down to the deck of the ship. Each arm is pivoted on a sliding block which travels along a horizontal guide-bar close to the top of the frame, and is operated by a hand-controlled screw placed immediately below the guide-bar. Starting from the inboard position as in Fig. 2, the arms travel outboard to the position shown in Fig. 3, carrying the boat with them. At this point the boat hangs over the ship's side and is then lowered to the water.

A Big Liner's Boat Deck

Although the working principle of the davit is simple, the task of stowing away the large number of lifeboats carried by a big liner is somewhat complicated. The boats are usually housed on the top or boat deck of the vessel.

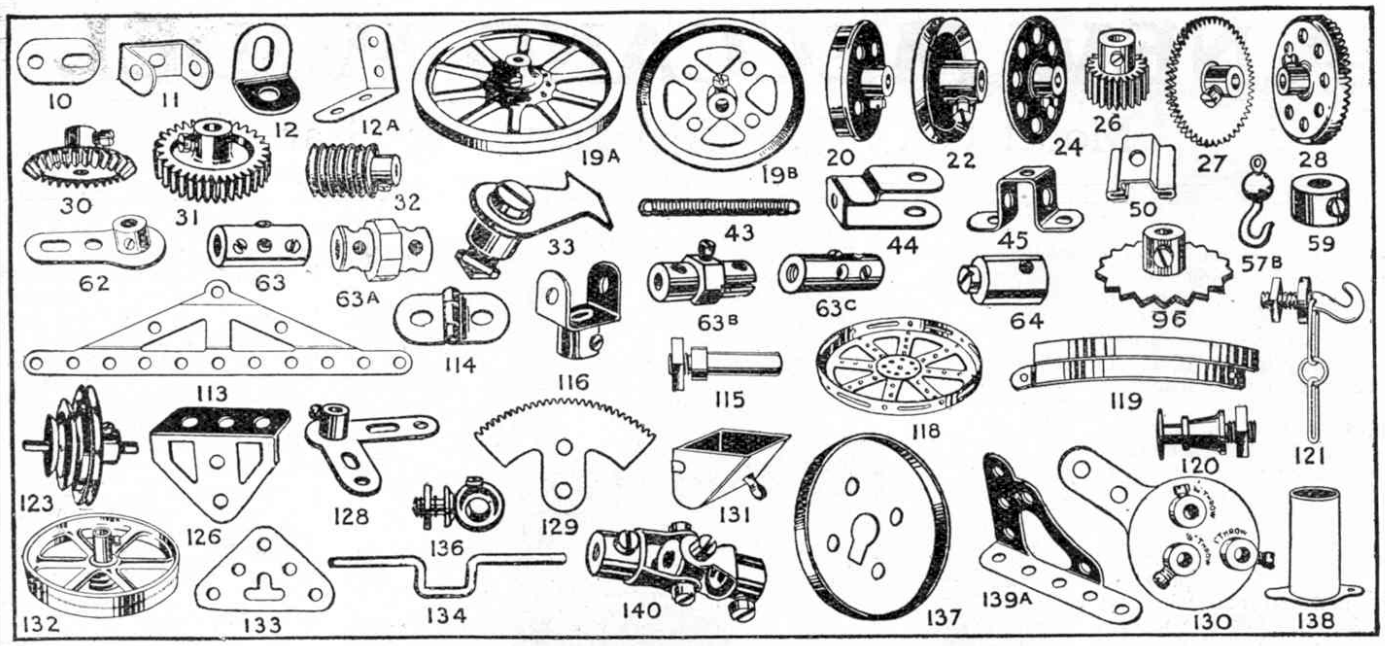
It is of the greatest importance that the amount of space occupied by the boats should be as limited as possible, consistent with perfect accessibility, and this problem is solved on the larger ships by a combination of interesting devices. Instead of "single banking," that is a single row of boats along each side of the boat deck, "double banking" is resorted to, so that there is a double line of boats along each side. The boats forming the inner bank are handled by the same davits that lower the outer boats, and this is accomplished by lengthening the davit frame and quadrant on the inboard side so that the arms can be sloped inboard and over the inner boats. In some cases "treble banking"

(*Continued on page* 329)



[*Messrs. Welin Davit and Engineering Co. Ltd.*

Fig. 3. Davit Arm—Outboard Position



MECCANO

ACCESSORY PARTS

We illustrate above a selection of accessory parts that every Meccano boy will find useful for building the larg r and more interesting models. Sometimes a model may be described in these pages that is beyond the capabilities of one of the smaller Outfi s, but by purchasing a few extra parts, it becomes possible to build the model.

Then again, where it is not desired to purchase an Accessory Outfit in the first instance, an Outfit may be gradually converted into a higher Outfit by purchasing the necessary parts, from time to time.

Many of these parts have only recently been introduced, and although we know that they have a universal use (were it otherwise they would not have been added to the system) we may not yet know *all* their applications. There are endless possibilities in the application of Meccano parts, and brainy boys endeavour to find new applications for them, and they make possible the invention of entirely new models, which gives more fun than merely copying the models in the Meccano Manuals.

If you have any difficulties in connection with using these parts, or any suggestions for new parts not already in the system, write to Meccano Ltd., Binns Road, Liverpool, and mark your envelope "Bright Ideas."

No.		s.	d.
10.	Flat Brackets ... ...½ doz.	0	2
11.	Double Brackets ... ... each	0	1
12.	Angle Brackets, ½″×½″ ... ... doz.	0	6
12A.	„ „ 1″×1″ ... ... each	0	1
12B.	„ „ 1″×½″ ... ... „	0	1
19A.	Wheels, 3″ diam. with set screws ... „	0	8
20.	Flanged Wheels ... ... „	0	6
	Pulley Wheels.		
19B.	3″ dia. with centre boss and set screw each	0	8
19C.	6″ „ „ „ „ „ „	2	6
20A.	2″ „ „ „ „ „ „	0	6
21.	1½″ „ „ „ „ „ „	0	6
23A.	½″ „ „ „ „ „ „	0	4
22A.	1″ „ without „ „ „ „	0	2
23.	½″ „ „ „ „ „ „	0	2
24.	Bush Wheels ... ... „	0	6
25.	Pinion Wheels, ¾″ diam. ... ... „	0	6
26.	„ „ ½″ „ ... ... „	0	4
27.	Gear Wheels, 50 teeth ... ... „	0	9
27A.	„ „ 57 „ ... ... „	0	9
28.	Contrate Wheels, 1½″ diam. ... ... „	0	9
29.	„ „ ¾″ „ ... ... „	0	6
30.	Bevel Gears ... ... „	0	10
31.	Gear Wheels, 1″, 38 teeth ... ... „	1	0
32.	Worm Wheels ... ... „	0	6
33.	Pawls (complete) ... ... „	0	4
33A.	Pivot Bolts with Nuts ... ... „	0	2
43.	Springs ... ... „	0	2

No.		s.	d.
44.	Cranked Bent Strips ... ... each	0	1
45.	Double Bent Strips... ... ... „	0	1
50.	Eye Pieces ... ... „	0	2
57.	Hooks ... ... „	0	1
57A.	„ (scientific) ... ... „	0	1
57B.	„ (loaded)... ... ... „	0	5
58.	Spring Cord ... ...per length	0	9
59.	Collars with Set Screws ... ... each	0	2
62.	Cranks ... ... „	0	3
62A.	Threaded Cranks ... ... „	0	4
63.	Couplings ... ... „	0	6
63A.	Octagonal Couplings ... ... „	0	8
63B.	Strip Couplings ... ... „	0	8
63C.	Threaded Couplings ... ... „	0	6
64.	Threaded Bosses ... ... „	0	2
65.	Centre Forks ... ... „	0	2
94.	Sprocket Chain ... ...per length	0	6
95.	Sprocket Wheels, 2″ diam. ... ... each	0	5
95A.	„ „ 1½″ „ ... ... „	0	4
95B.	„ „ 3″ „ ... ... „	0	6
96.	„ „ 1″ „ ... ... „	0	3
96A.	„ „ ¾″ „ ... ... „	0	3
109.	Face Plates, 2½″ diam. ... ... „	0	4
113.	Girder Frames ... ... „	0	2
114.	Hinges ... ... per pair	0	4
115.	Threaded Pins ... ... each	0	2
116.	Fork Pieces ... ... „	0	3
117.	Steel Balls, ⅜″ diam. ... ... doz.	0	6

No.		s.	d.
118.	Hub Discs (5½″ diam.) ... ... each	1	3
119.	Channel Segments (8 to circle, 11½″ diam.) ... ... „	0	4
120.	Buffers ... ... „	0	2
120A.	Spring Buffers ... ... per pair	0	8
121.	Train Couplings ... ... each	0	4
122.	Miniature Loaded Sacks ... ... „	0	2
123.	Cone Pulleys ... ... „	1	3
126.	Trunnions ... ... „	0	3
126A.	Flat Trunnions ... ... „	0	2
127.	Simple Bell Cranks ... ... „	0	3
128.	Boss Bell Cranks ... ... „	0	4
129.	Rack Segments, 3″ diam. ... ... „	0	6
130.	Triple Throw Eccentrics ... ... „	1	3
131.	Dredger Buckets ... ... „	0	2
132.	Flywheels, 2¾″ diam. ... ... „	2	3
133.	Corner Brackets ... ... „	0	3
134.	Crank Shafts, 1″ stroke ... ... „	0	3
136.	Handrail Supports ... ... „	0	3
137.	Wheel Flanges ... ... „	0	4
138.	Ship's Funnels ... ... „	0	4
139.	Flanged Brackets, right ... ... „	0	2
139A.	„ „ left ... ... „	0	2
140.	Universal Couplings ... ... „	0	9
141.	Wire Lines (for suspending clock weights) ... ... „	0	9
142.	Rubber Rings ... ... „	0	4
143.	Circular Girders, 5½″ diam. ... ... „	1	0

You may obtain these parts from your dealer, or direct from MECCANO LTD., BINNS ROAD, LIVERPOOL.

Boat-Lowering Gear—

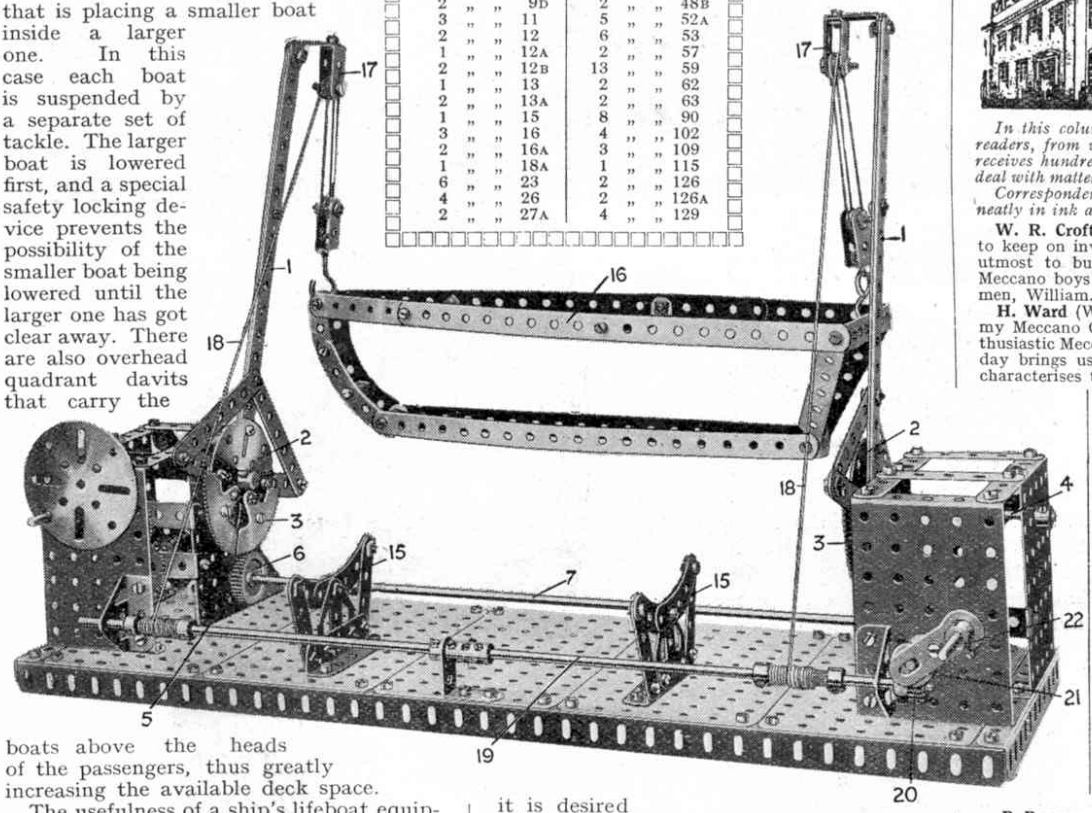
(*Continued from page 327*)

is employed. "Double tiering," that is a second line of boats suspended above the first, is also regularly used.

Still another space-saving method consists of "nesting," that is placing a smaller boat inside a larger one. In this case each boat is suspended by a separate set of tackle. The larger boat is lowered first, and a special safety locking device prevents the possibility of the smaller boat being lowered until the larger one has got clear away. There are also overhead quadrant davits that carry the boats above the heads of the passengers, thus greatly increasing the available deck space.

Parts required :

10	of No.	1A	2	of No.	31
2	" "	2A	2	" "	32
6	" "	3	4	" "	33A
7	" "	5	142	" "	37
8	" "	6	14	" "	38
2	" "	7A	1	" "	40
2	" "	9	5	" "	48A
2	" "	9D	2	" "	48B
3	" "	11	5	" "	52A
2	" "	12	6	" "	53
1	" "	12A	2	" "	57
2	" "	12B	13	" "	59
1	" "	13	2	" "	62
2	" "	13A	2	" "	63
1	" "	15	8	" "	90
3	" "	16	4	" "	102
2	" "	16A	3	" "	109
1	" "	18A	1	" "	115
6	" "	23	2	" "	126
4	" "	26	2	" "	126A
2	" "	27A	4	" "	129



The usefulness of a ship's lifeboat equipment may be still further added to by the employment of traversing gear, by means of which boats may be quickly transported from one side of the ship to the other.

Constructing the Model

Having now seen something of "the why and the wherefore" of boat-launching gear in practice, we may proceed to construct the Meccano model, as follows :

The davit arms (1) are connected to Face Plates (2) to which are bolted two Rack Segments (3) forming the usual geared quadrants. The davit arms are then secured to Rods (4) journalled in the Face Plates (5), the Rack Segments (3) being engaged and driven by 1" Gear Wheels (6) on an Axle Rod (7).

This Rod (7) carries a Pinion (8, Fig. 6) driven by a Worm (9) and a Rod, to which is secured a 1½" Gear Wheel (10). This is driven by a ½" Pinion (11) on a Rod, to which is also secured a 1½" Gear Wheel (12). This is driven by a ½" Pinion (13) rotated by a hand wheel formed by a Face Plate (14).

As the hand wheel is rotated the davit arms are moved outboard when launching the boat (16) or inboard when it is desired to deposit the boat on the chocks (15).

The boat (16) is raised or lowered from the blocks (17) by the ropes (18) which wind on to a Rod (19). On this Rod is secured a ½" Pinion (20) engaged by a Worm (21), which is rotated by the Crank Handle (22) formed of two Cranks bolted together. In this way the boat may be lowered over the ship's side.

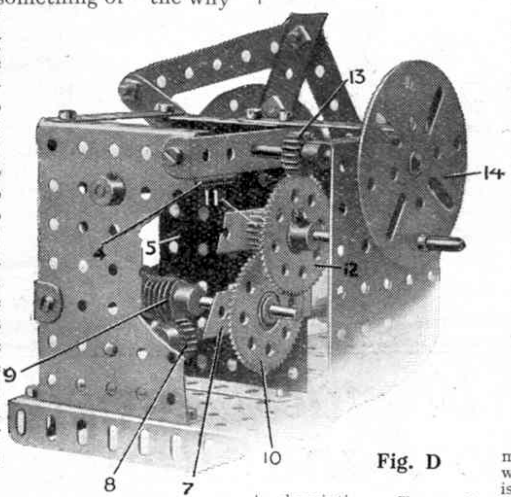


Fig. D

Next Month's "New Meccano Model"—**THE HIGH-SPEED SHIP-COALER.**

How to Build the MECCANO LOOM

The Meccano Loom demonstrates the process of weaving more perfectly than is possible by any written description. To see the shuttle flying from side to side and to see the reed and the picking-stick at work is a revelation, even to the Meccano boy accustomed to the marvels of model-building. With this Loom and a supply of "Silko" you may weave ties, hatbands, and similar fabrics. These make splendid gifts for your friends, who will be amazed when they learn that the gift is your own handiwork and not the product of some large factory. Full instructions for building this wonderful model are now available in the form of an illustrated leaflet on art paper, price 4d. (post free).

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.

W. R. Croft (Pontesbury).—"I seem to be forced to keep on inventing, thinking, and trying to do my utmost to build more new models." That is why Meccano boys grow up into brainy, useful, successful men, William.

H. Ward (Wigan).—"I live three miles away from my Meccano Club, but what are three miles to an enthusiastic Meccano boy?" Quite right, H. W. Every day brings us evidence of the wonderful spirit that characterises the dwellers in Meccanoland.

R. A. Gammans (Shoreham).—Nothing pleases us more than to receive thoughtful criticisms of the "*M.M.*" and suggestions for its improvement. You may be interested to hear that your proposal for the extension of the scope of our cycling article to include hints on motor-cycling has been made by several other readers. At present we have too many other important articles on hand to find room for such a feature, but it is quite possible that we shall be able to do so next year.

D. J. Kendrew (Southport).—Considering that you have been a reader of the "*M.M.*" for three years, we certainly think you should have written to us before, Donald! We hope you will atone for your neglect by writing regularly in future. As to short stories, we shall publish one or two occasionally, but many of our readers are of opinion that fiction is out of place in the "*M.M.*"

B. Pearson (Lye).—We hope you are well on the way to complete recovery now. The knee trouble from which you suffered is always difficult to get rid of, but with the care you are getting we feel sure you will eventually be quite all right again. Write us often.

W. S. Purves (Carlisle).—That's an extraordinary rabbit of yours, W. S. P., and we can understand your being so fond of such a clever animal. We think you are right in judging it to be a White Angora. We have no room just yet for a "How to Make" or a "Conjuring" page.

W. Harvey (Thornton).—No doubt you lost your medal at the time you fell off the 'bus, which made it a double calamity! However, as you were not damaged and as the police have restored your medal, all is well. We congratulate you on gaining a Scholarship. We find that many successes of this kind are won by Meccano boys.

D. Maclean (Chasetown).—We are glad you had such a fine time in London. We have seen all the sights you mention except Big Ben having his face washed, and that particular one has so far been denied to us!

N. F. J. Ward (Berkhampstead).—Thanks for photographs of the Bridgewater Monument, of which we had not heard before. What a fine view from the top! Your description makes everything clear.

A. V. King (767 Mess 46 London).—What magnificent experiences you have had during your tour round the Empire in H.M.S. "Hood." We are very glad to know that it was through the Meccano Guild and the "*M.M.*" that you formed a friendship with Mr. Sherwood and his son out in Canada. We appreciate all you say regarding us and our work amongst boys.

G. Corby (Cheadle).—We congratulate you on having won three prizes in our various Model-Building Competitions. We have a great variety of new Competitions this season and no doubt we shall resume the big Model-Building Contest later.

H. R. Dorsey (Leeds).—We also congratulate you on winning three prizes in succession in Model-Building Competitions. We wonder how many Meccano boys besides yourself and G. Corby have performed the hat trick!

B. Green (Enfield Wash).—We are glad to know that your thorough knowledge of Meccano has enabled you to secure a job with a first-class engineering firm. We are also very interested to hear that your Meccano Correspondence Club friend in Ceylon is coming over to see you, and we well understand your excitement at the prospect of meeting him.

Edouard Branly: Wireless Pioneer

Grants Special Interview to *"M.M."* Representative

IN an article in our June issue, describing how Marconi transmitted the first wireless signals across the Atlantic, we referred to the invention of the coherer by a Frenchman, Edouard Branly. Although the coherer is now a thing of the past, it played a great part in the early days of radio and it made possible the first successes of Marconi. Wireless communication has made such vast and rapid strides that to us to-day its beginnings seem very far off, and this makes it all the more interesting to know that Professor Branly, at the age of 80, is still in good health and working away at his beloved science in his laboratory in Paris.

A Valuable Discovery

Professor Branly was born at Amiens on 23rd October, 1844. He studied first at the Lycée de Saint Quentin, and afterwards at the Lycée Normale Supérieure in Paris. He took the degree of Doctor of Science in 1873, and became Professor of Physics at the Université Catholique de Paris. From that time up to the present day, in spite of his arduous lecturing duties, he has never ceased to devote himself with the greatest enthusiasm to scientific research.

In our June issue we described the coherer—a little glass tube containing metal filings which, so long as they lie loosely, offer a very high resistance to the passage of an electric current, but which, when electric waves fall upon them, undergo some mysterious change so that their resistance is greatly lowered and a current can easily pass through them. The fact that a mass of loose-lying filings changed from a bad conductor to a good one when the discharge from a Leyden jar was passed through it was known as far back as 1835, but it was left for Branly to make practical use of this phenomenon. His invention of the coherer dates from 1890, but at first it attracted little attention, and it was not until Sir Oliver Lodge produced an improved form of the apparatus that the value of the invention was realised. Marconi improved the coherer still further and in his hands it became an important unit in the first practical form of wireless reception.

Branly Describes his Early Work

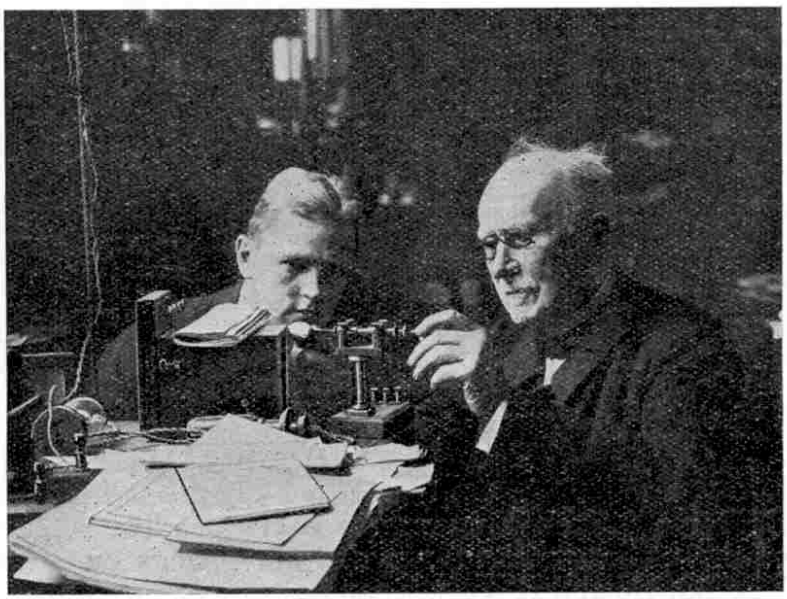
Knowing the keen interest taken by readers of the "*M.M.*" in all great scientists and inventors, we asked our Paris representative to interview Professor Branly for us. Accordingly he called upon the veteran scientist a few weeks ago and received a characteristically warm welcome. We give our representative's account of his visit in his own words:—

"I found Professor Branly hard at work in his laboratory engaged in some important research. After he had greeted me he said: 'I have read your account of my work in the *Meccano Magazine*,* but you have got my age wrong. I was born in 1844, but I am not yet too old to work, and very soon I hope to finish my present research. In the meantime I cannot say anything about it.

'As for my coherer, I suppose I did help the progress of radio-telegraphy. For years I studied the conductability of isolated bodies, and at last, in this very building, I made my first discovery. I hardly imagined at the time that similar results could be obtained at greater distances.

'In making my experiments I placed in the corner of the yard opposite my laboratory a spark coil, and in my laboratory a tube filled with soft iron filings, closed at both ends by two conductor stoppers communicating by means of a cell and a bell. Although the circuit was closed the bell did not ring, but as soon as the current entered the spark coil the bell rang continuously. The principle of wireless telegraphy was thus found, for it was possible to collect the waves transmitted by the spark coil without using a metallic conductor. I noticed that this conductability, once started, continued, and in order to make it cease I had to tap the tube slightly.

'Marconi profited by these experiments, and on achieving tangible results he sent me a testimonial of his admiration and thanks by a Marconigram sent from St. Margaret's, England, reading: 'Marconi sends Mr. Branly his respectful compliments across the Channel, this fine achievement being partly due to the remarkable researches of Mr. Branly.'"



M. Edouard Branly in his Laboratory in Paris

* Professor Branly refers to the articles "The Men Who Gave us Radio" that appeared in our March 1923 to December 1923 issues inclusive.

A Message to "*M.M.*" Readers

"I asked Professor Branly about his researches.

'Oh,' he said, 'my difficulties have always been tremendous. I have never been well off and so have always lacked appliances. That forced me to study medicine and earn a living as a doctor. Of course it has helped me, and by making others well I know how to look after myself. I am never ill, and although I know monkey glands are good for some people, I do not think I will bother!'"

"How soon do you hope to finish your present work—in five years?"

"'Oh, less than that. After 80 one has had one's day—but when I succeed you can come and have another chat with me.'"

"Asked if he had any special message for Meccano boys, the Professor thought for a moment and then said: 'Tell them that nothing comes without hard work.'"

"Finally I asked Professor Branly if he still had a model of his first coherer. With a merry twinkle in his eye he replied: 'After thousands of experiments there is no first and no last, but here is a recent photograph of me which shows also one of my models.'"

* * * *

It is pleasant to know that the value of Professor Branly's scientific work has been recognised and that many honours have been awarded him. He was a prizeman of the Académie des Sciences in 1898, and at the Universal Exhibition of 1900 he was awarded a Grand Prix. Later he became a Chevalier of the Legion of Honour with the following mention in the official Gazette: "Has discovered the principle of wireless telegraphy." In 1910 the Society for the Encouragement of National Industry awarded him their "Argenteuil" prize, and since that year he has been an Associate Member of the Belgian Royal Academy. A further honour was bestowed upon him last year when he received the order of Commander of the Legion of Honour.

We feel sure that our readers will join us in sending our best wishes to this eminent French scientist, and we one and all hope he may long be spared to continue those great researches that lie nearest to his heart.

How Wireless Valves are Made

An Industry of Marvellous Exactitude and Efficiency

IN our last two instalments of this article we have dealt with the making of the grid itself, the making of the electrodes and the sealing and evacuating of the bulb. We are now to learn how the valves are finished and tested before they are packed and sent away to the retailer for sale.

When the bulbs have been exhausted and fitted with a nickel-plated shell, the standard four-pin plug is fitted to the base, and the copper wires from the electrodes are threaded through the holes in the disc beside the pins, to which they are finally secured by solder.

Careful Testing

The shell is then pinched in three places, so that it fits into three grooves in the edge of the disc. These grooves prevent the disc from being twisted round inside the shell and so causing possible short circuits.

The valves are allowed to stand for a short time so that they will settle down, or "age" as it is called, before being tested. They are then carefully examined and passed to the test rooms.

In the first place, the total emission obtainable under specified conditions is measured, and must exceed a certain minimum value if the valve is to be passed. This test is followed by another that ensures that the valves are sufficiently silent in operation, and that they will function equally well as detectors and amplifiers. All tests are made with the most delicate instruments and the slightest defect in the performance of a valve causes it to be summarily rejected.

When the valves have passed all tests satisfactorily they are ready for cleaning, etching, and packing.

Dull-Emitter Valves

During the past few months considerable attention has been devoted to a comparatively new type of valve, known as the "dull-emitter." The main advantages of this type are—(1) it has a much longer operating life, (2) the filament energy required to give the necessary emission is considerably less than that necessary with the ordinary type of valve and (3) it is generally much quieter in operation than the ordinary valve. These advantages are directly due to the lower temperature at which the valve operates.

The difference between a dull-emitter valve and a valve of the ordinary type is that the filament wire contains a small quantity of thorium, which is the factor that enables the necessary emission to be obtained at a comparatively low temperature.

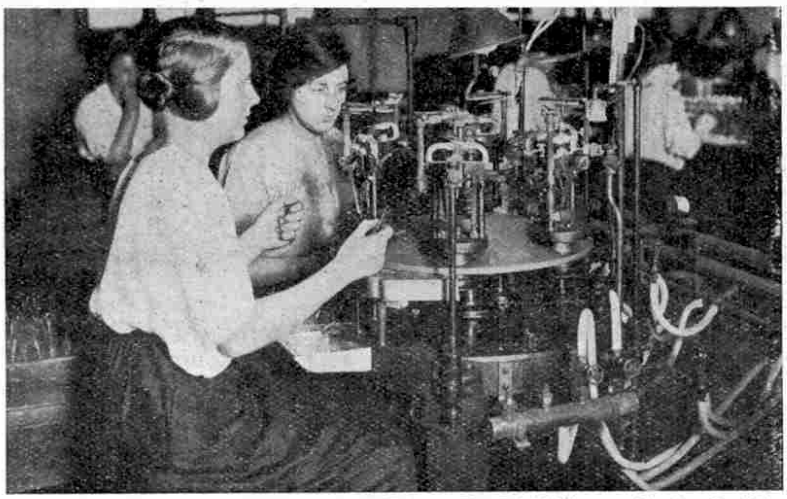


Photo courtesy of [*Messrs. The British Thomson-Houston Co. Ltd.*

Making the Stems of Wireless Valves

A special rotating machine is used for this work, the operator feeding it with the necessary parts as it rotates.

A Layer One Atom Deep!

There is not a great deal of difference between the manufacture of dull-emitter valves and ordinary valves until after the exhausting and capping processes have been completed. As the wire used for dull-emitter filaments is more liable to loss of emission by contamination with certain gases than is the ordinary tungsten wire, great care must be taken that exhaustion takes place under the best possible conditions. Then the valves undergo a more complicated ageing process than is necessary for the ordinary valves, in order that the emission may be developed. The result of this ageing process is that a layer of thorium—supposed to be one atom deep—is formed on the surface of the filament.

When a dull-emitter valve is being used the thorium gradually evaporates from the surface of the filament. As long as the valve is not run above its normal voltage, however, the reactions taking place inside the filament are such that the rate of evaporation is equalled by the rate at which the thorium is produced.

Assuming that a dull-emitter valve is treated with ordinary care, its life will be terminated only by loss of emission. When this stage is arrived at, although the filament may remain intact, the valve will not function at the normal filament voltage, because no thorium remains.

At present, the information on the performance of dull-emitter valves is somewhat scanty, because they are a comparatively recent development. It is interesting to know, however, that some of the B.T.H. B5 valves have been burning continuously for 2,000 hours at normal filament voltage and with 40 volts on the anode. At the end of that time the thorium emission that remained has been sufficient for the continued working of the valves.

A "Tip" to Restore Efficiency

Occasionally, after a dull-emitter has been in use for a short time, the valve may cease to function. Usually this may be traced to a falling-off of the emission, caused by the filament having been operated

(*Continued on page 357*)

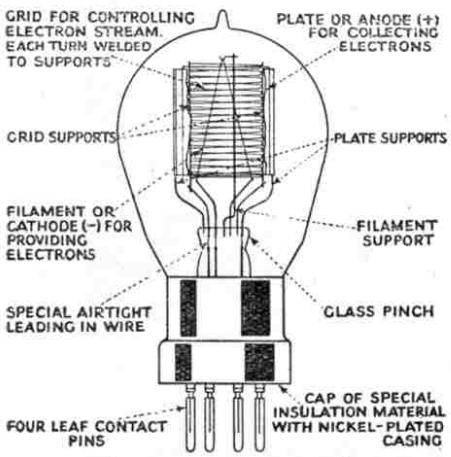


Diagram of B.T.H. Valve—Type B4

The filament of these valves normally operates at 6-volts and the anode at from 40–100 volts according to whether the valve is being used as a detector or as an amplifier.

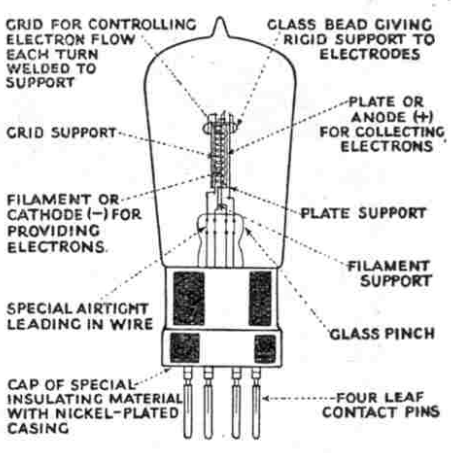
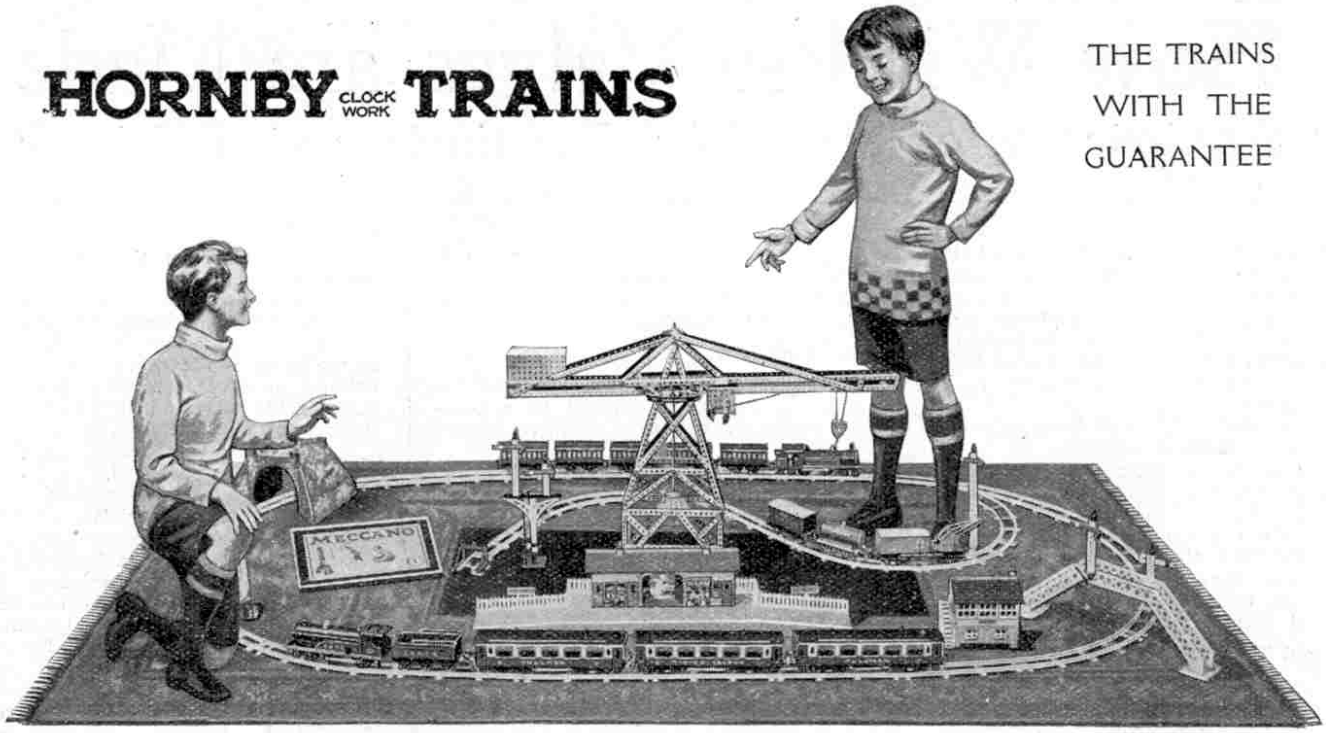


Diagram of B.T.H. Valve—Type B5

The filaments of these dull-emitter valves operate at 3 volts and take 0.06 ampere. The anode voltage should not exceed 40 volts. Good results may, however, be obtained with 20 volts.

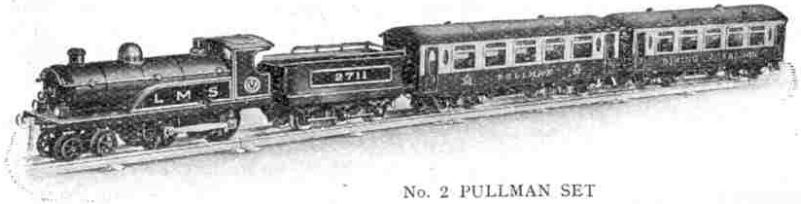
HORNBY CLOCK WORK TRAINS

THE TRAINS WITH THE GUARANTEE



YOU can have any amount of fun playing with a Hornby Train. Shunting, coupling-up the rolling stock and making up trains will give you hours of pleasure. Hornby Trains are beautifully finished, strongly made, and will last for ever. One of their most valuable features is that all the parts are standardised, and any lost or damaged part may be replaced with a new one.

Every train is guaranteed, and you are therefore sure of satisfaction if you buy a Hornby.



No. 2 PULLMAN SET

No. 2 Pullman Set

The No. 2 Loco with Tender measures 17 in. in length. The Loco is fitted with superior mechanism and the accurately-cut gears ensure smooth running. Loco, Tender and Coaches are superb in appearance and finish, enamelled in colours and stoved at a high temperature to ensure durability. The Loco is fitted with reversing gear, brake and governor.

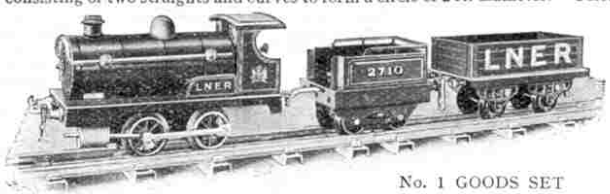
Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each set contains Loco, Tender and two Coaches, with set of rails to form a circle of 4 ft. diameter. Price 60/–.

No. 1 Passenger Set

The Loco is fitted with reversing gear, brake and governor. Loco, Tender and Coaches are superb in appearance and finish, enamelled in colour and stoved at a high temperature to ensure durability. The doors of the Coaches open.

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each set contains Loco, Tender, two passenger coaches and set of rails consisting of two straights and curves to form a circle of 2 ft. diameter. Price 30/–

No. 1 PASSENGER SET



No. 1 GOODS SET

No. 1 Goods Set

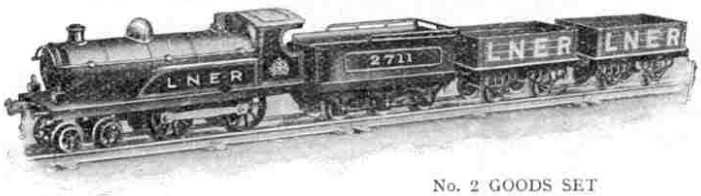
Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each Loco is fitted with reversing gear, brake and governor. Each set comprises Loco, Tender, one Wagon, and set of rails as in the No. 1 Passenger Set. Price 22/6

No. 1 Hornby Loco Price 15/–
" " Tender " 2/6
Hornby Passenger Coach Price 5/–
No. 1 Hornby Wagon " 2/6

No. 2 Goods Set

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling stock. This set contains Loco, Tender and Rails as in the No. 2 Pullman Set, and two Wagons. Loco fitted with reversing gear, brake and governor. Price 37/6

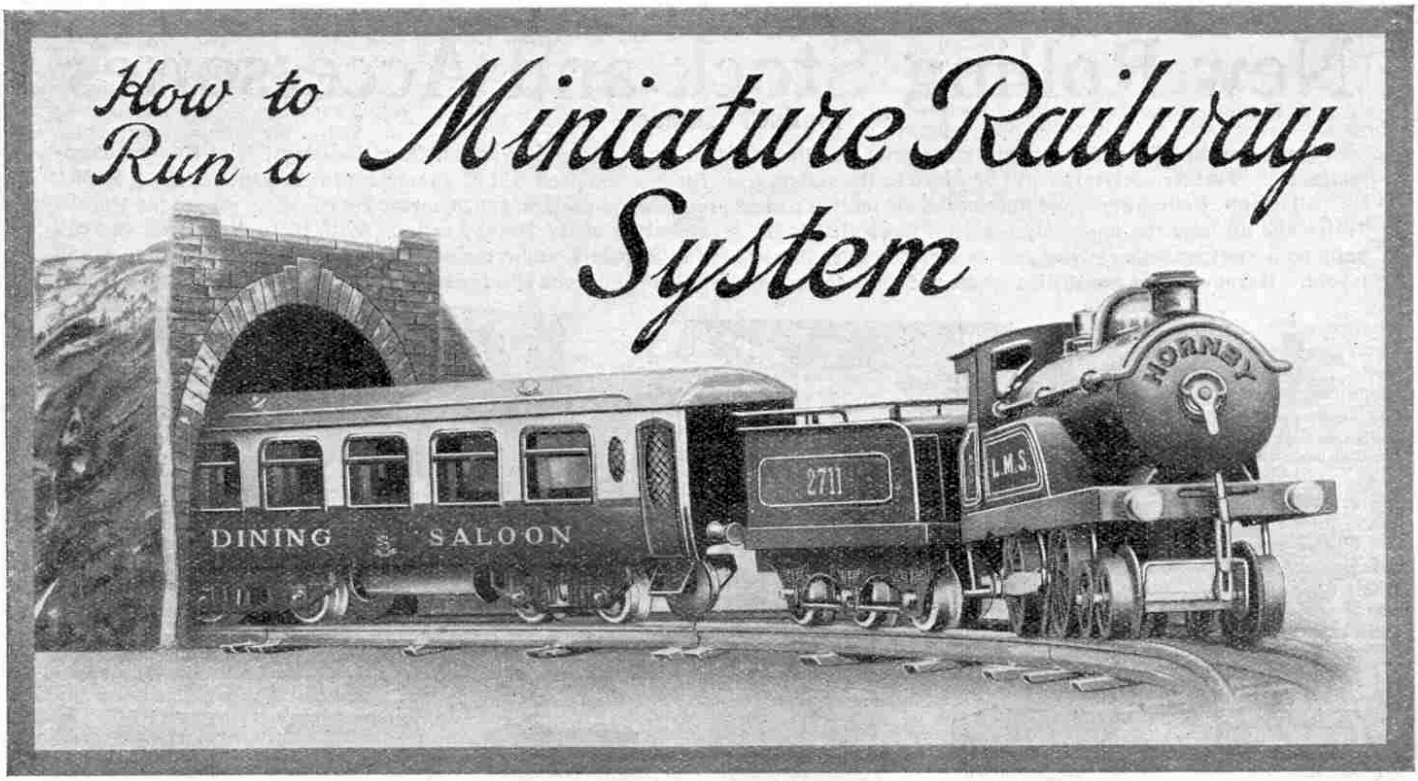
No. 2 Hornby Loco ... Price 22/6
" " Tender " 3/6
Hornby Pullman or Dining Car ... Price 15/–
No. 2 Hornby Wagon " 3/6



No. 2 GOODS SET

Ask to see Sample Sets at your Toy Store

MECCANO LTD., BINNS ROAD, LIVERPOOL



II. POINTS AND CROSSINGS: SIMPLE LAYOUTS

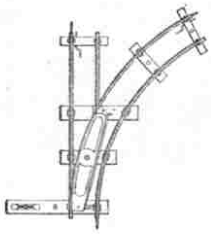


Fig. 1

LAST month we described the chief features of the various types of locomotives in the Hornby train system, and now we must turn our attention to the track itself. The simplest rail formation is, of course, a circle, but merely running trains around a circle soon becomes monotonous. Although a circle may be converted into an oval of any desired length by the insertion of straight rails, this does not improve matters very much, and in order to introduce variety we must make use of points or crossings.

Hornby System Points

Points are employed to enable a train to be transferred from one line to another. They consist of two moveable rails called "switch-tongues," placed on the inner side of running or "stock" rails which do not move. The switch-tongues are worked from side to side by a rod operated by a lever. Fig. 1 shows an illustration of Hornby Right-hand Points, the purpose of which is to divert a train from the straight main line to a curved line branching off to the right. The actual course of the train, that is whether it shall continue along the main line or take the branch line, is determined by the way in which the points are set. For instance, if we wish the train to continue along the main line the points must be set as shown in Fig. 2.

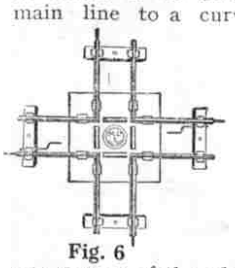


Fig. 6

The flanges of the wheels pass along the inside of the rails, and therefore on reaching the points the left-hand wheels would continue along the stock rail while the right-hand wheels would pass along the right-hand switch tongue. Thus the points would have no effect on the train, which would continue along its original course.

In order to divert the train to the branch line the switch-tongue must be pulled over by means of the lever into the position shown in Fig. 1. In this case the right-hand wheels of a train, on arriving at the points, obviously would follow the stock rail while the left-hand wheels would pass along the left-hand switch-tongue, with the result that the train would be diverted to the branch line.

Diversion to a line branching away to the left of the main line would be effected by means of Left-hand Points working in exactly the same manner, but in the opposite direction.

In addition to the ordinary Right-hand and Left-hand Points the Hornby system includes Double Symmetrical Points, Fig. 3, and Parallel Points, Fig. 5, the purpose of which is evident from their design. These points work on exactly the same principle as the points just described, and their action is quite easy to understand.

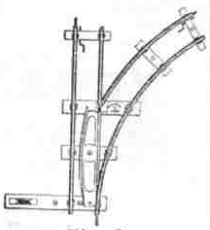


Fig. 2

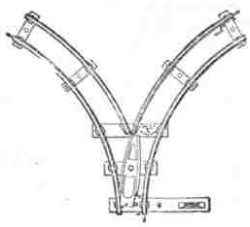


Fig. 3

The design of the points in the Hornby system is based upon that of the points on real passenger-carrying railways, and therefore there is little difference in principle between the two, although the latter are fitted with certain safety devices. One of these safety devices consists in the provision of check rails laid inside the stock rails to prevent the possibility of the wheel flanges mounting the rail.

"Facing" and "Trailing" Points

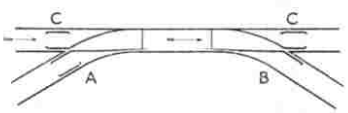


Fig. 4

Points are known as "facing points" or "trailing points" according to whether they face the direction of an on-coming train or not. Fig. 4 shows trailing points at A and facing points at B, with check rails at C. Generally speaking, trailing points are used wherever possible in making crossings from main lines on account of their safety in the event of incorrect setting of the points. In order that a train shall pass safely over points it is essential that the tip or "toe" of one of the switch-tongues shall be against the stock rail so that the wheel flanges cannot pass between the two. In the case of facing points, failure to set the switch-tongues correctly would most probably result in derailment of the train, because the wheel flanges would either get between the toe of the switch-tongue and the stock rail, or strike and mount the toe. With trailing points derailment would not follow incorrect setting,

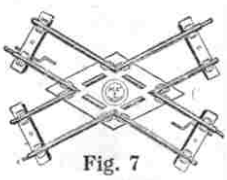


Fig. 7

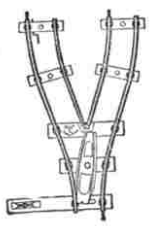


Fig. 5

(*Continued on page* 337

New Rolling Stock and Accessories

(HORNBY SERIES)

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

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

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

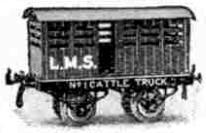
No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2 ft. radius rails only. Price **5/-**

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

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

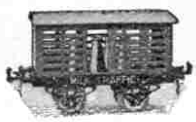
No. 1 TIMBER WAGON
Beautifully enamelled in colour and stoved. Price **2/-**

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



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

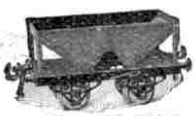
No. 2 CATTLE TRUCK
Splendid model fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**



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

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

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



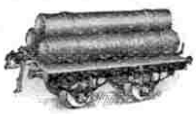
HOPPER WAGON
Mechanically unloaded. Finished in colour. Price **4/-**

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

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

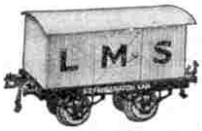
BISCUIT VAN
Price **4/-**

SECCOTINE VAN
Price **4/-**



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

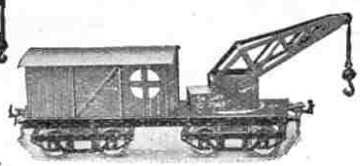
PETROL TANK WAGON
Finished in colour.
Price **3/-**



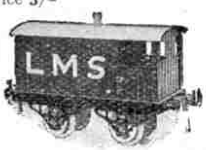
REFRIGERATOR VAN
Enamelled in white, lettered black. Price **4/-**

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

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

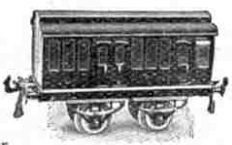


BREAKDOWN VAN AND CRANE
Excellent finish. Beautifully coloured. Suitable for 2 ft. radius rails only. Price **7/-**



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

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

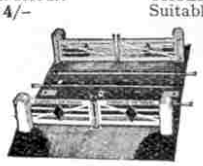


GUARD'S VAN
Price **5/-**

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

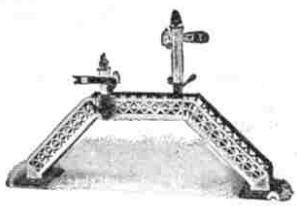
SIGNAL CABIN
Dimensions: height 6½ in., width 3½ in., length 6½ in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired. Price **6/6**

SIGNAL
Price **2/6**

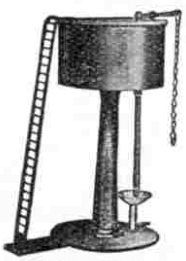


LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7½ in., with Gauge 0 Rails in position.
Price **6/6**

TUNNEL
Price **7/6**



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



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

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

PLATFORM ACCESSORIES No. 3 Price (per set) **2/-**

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

ASK YOUR DEALER TO SHOW YOU SAMPLES

A Miniature Railway System—(*continued from page* 335)

however, because the wheels of the loco would force the switch-tongues out of the way, and the train would pass on in safety.

On all passenger lines special safety appliances are fitted at facing points. These appliances make it impossible for a train to be sent over the points unless the switch-tongues are in the correct position, and they also prevent a signalman from altering the points until the wheels of the rear vehicle have passed clear.

Points are controlled from a signal box and are operated by means of iron rodding. Their working is, of course, closely connected with signalling operations, and we shall refer to this later when dealing with signals.

Hornby Crossings

Besides the various points, the Hornby system has two types of crossings, the Acute-angle or diamond crossing, Fig. 7, and the Right-angle Crossing, Fig. 6. These have no moveable parts and, of course, are always in the correct working position.

All the points in the Hornby system are made in two different sizes for curves of 1 ft. radius and 2 ft. radius respectively. If large radius rails are being used, then large radius points are necessary, while the small radius rails require small radius points. This is very important, and in buying points great care should be taken to specify the particular radius required. The use of small radius points with the No. 2 Loco or No. 2 Tank Loco always involves derailments, for these bogie-locos cannot negotiate the small curve with safety, unless running very slowly. It should be added that the ordinary Right-hand and Left-hand Points are also made on the 9 in. radius scale to suit the 9 in. radius rails of the "George V" train sets.

The two types of crossings—Acute-angle and Right-angle—do not involve curves and are therefore made in one size only.

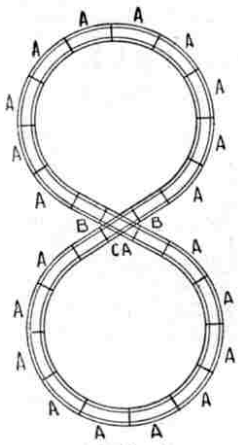


Fig. 8

A Simple Layout

Now let us suppose that we have become tired of a simple circle or oval track and are considering methods of developing our layout. Perhaps the simplest scheme is that shown in Fig. 8. Here the only new element is the Acute-angle Crossing (CA), but its use certainly produces a layout of much greater interest. Using the 2 ft. radius rails, 20 Curved Rails (A2) and 4 Straight Rails (B1) are required, in addition to the Acute-angle Crossing (CA). With 1 ft. radius rails, 10 Curved Rails (A1) and 4 Straight Quarter Rails ($B\frac{1}{4}$) are needed. The four Quarter Rails occupy the same position as the four Straight Rails (B) in the diagram.

By altering slightly the shape of this layout a Right-angle Crossing may be substituted for the Acute-angle Crossing. Fig. 9 shows the modified arrangement. In addition to the Right-angle Crossing (CR) the rails required are 18 Curves (A2) and 8 Straights (B1) for the large radius rails; and 8 Curves (A1), 2 Half Curves ($A\frac{1}{2}$), 4 Half Straights ($B\frac{1}{2}$) and 4 Quarter Straights ($B\frac{1}{4}$) for the small radius.

Interesting Experiments

Layouts such as these are very simple, but a great amount of fun may be had with them. They provide us with a long stretch of continuous run and are therefore particularly useful for experiments in speed and hauling power. Many happy hours may be spent in timing a loco round the track with different loads behind it and in testing its hauling powers to the last ounce. If two locos are available it is very interesting to compare their capabilities in speed and power, and also in regard to the time taken in picking up speed.

The possibilities of braking and reversing from the track should not be forgotten, and the use of the rails specially made for this purpose adds greatly to the interest of the layout. If the large radius rails and locos are being employed quite an exciting time may be had by using two or more of the special rails. Two trains then may be started off in opposite directions from different points on the track and the apparently inevitable and disastrous collision averted at the last moment by skilful manipulation of the reversing or braking mechanisms.

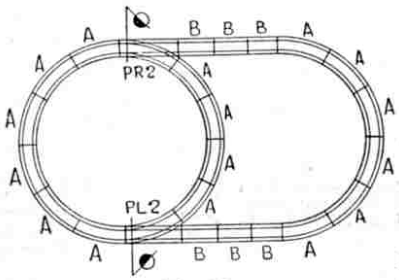


Fig. 10

The weak point about all layouts of this character is that the course of the train cannot be controlled, apart from simple reversing. Half the fun in playing with toy railways lies in being able to divert our trains to a branch line or siding whenever we wish, and in order to do this we must develop our layout still further.

Developing our Track

A simple but useful layout is shown in Fig. 10. It will be seen that this consists of a combination of our old friends, the circle and the oval. We now have the power to control the course of our train, the two sets of points enabling us to send it along the outer oval or to divert it round the inner circle. This little layout is an excellent one for demonstrating the working of Right-hand and Left-hand Points, and also for showing the necessity for constant watchfulness in regard to the setting of the points. It is surprising how easy it is to overlook the fact that certain points are wrongly set. We get so interested in watching the train as it forges its way in business-like fashion along the track that we quite forget t at the setting of the points it is rapidly approaching is wrong, and the resulting derailment is really very exasperating. With large and complicated layouts having several branch lines and sidings the control of the various points becomes quite exciting. There is very little time to manipulate the levers so as to make the necessary changes, and one needs to be constantly on the alert if derailments or collisions are to be avoided.

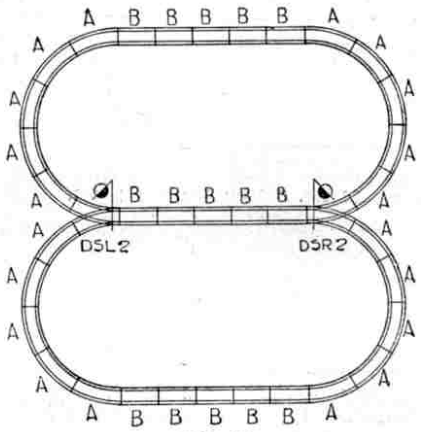


Fig. 11

A simple layout like that in Fig. 10 provides lots of fun, and at the same time it gives excellent practice in the art of line control. One learns to keep one eye on the train and the other on the points, so to speak, and to realise quickly what will be the effect of certain settings upon trains running in different directions.

The component parts for the layout in Fig. 10 are:—Large Radius—16 Curves (A2), 6 Straights (B1), Right-hand Points (PR2) and Left-hand Points (PL2). Small Radius—7 Curves (A1), 4 Straights (B1), Right-hand Points (PR1) and Left-hand Points (PL1).

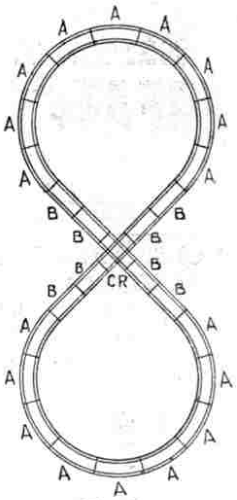


Fig. 9

Other Rail Plans

The foregoing layout may be further developed in various ways if more straight and curved rails are available, without the need of any additional points. Instead of having the circle inside the oval it may be placed outside, at a point half way along one of the straight sides. Other similar plans will quickly suggest themselves, and it will be found that the only limiting factor is that of the space available. For those fortunate boys who have plenty of room at their disposal the layout shown in Fig. 12 can be strongly recommended. This

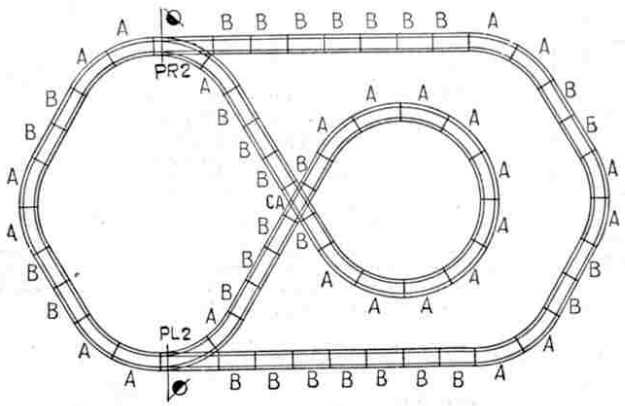


Fig. 12

(*Continued on page* 344)

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(See also page 356).

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