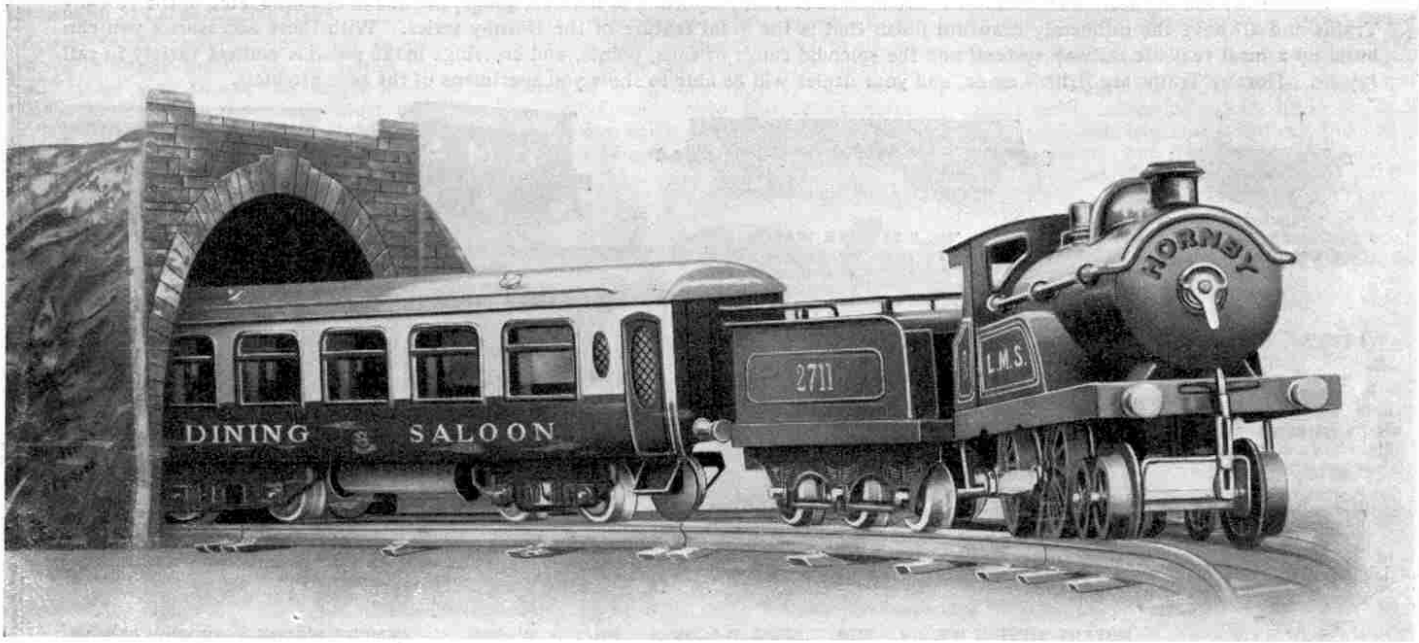
How to Run a Miniature Railway System



These articles, which have been specially written by an expert who has made a life-long study of miniature railways, are intended to show how to get the most fun out of a miniature railway system. A system built up on the lines described will not only be efficient in working and pleasing in appearance, but it will give untold hours of happiness and fun to its owner.

IN spite of the rival attractions of radio, motor-cars and aeroplanes, railways still maintain their fascination, and deep down in the heart of almost every boy there is a longing for a railway of his very own. But it must be a real railway, not just a rickety, foreign-made engine dragging a couple of absurd-looking carriages round and round a small circular track. It must be a correctly-laid-out railway with main line, branch lines and sidings, stations, tunnels and bridges, and fully equipped with points, crossings and signals. A real railway of this kind is easily built from the component parts of the Hornby Train System, and the object of this new series of articles is to show just how this can be done.

Unique Features of the System

The Hornby System has many unique features that place it in a category quite by itself. The clockwork motors are perfect pieces of mechanism with accurately-cut gears that ensure smooth and steady running, and the trains throughout are beautifully finished in every respect and are enamelled in the standard colours of the leading British railways.

Several train sets are available, each consisting of Loco, Tender, two Passenger Coaches or two Goods Wagons, and a set of rails including curves and straights. These train sets are only the foundation of the system, however, and exactly in the same way that the smallest Meccano Outfit may be converted into a No. 7 by the addition of Accessory Outfits, so a Hornby Train Set may be built up into a complete and elaborate railway system by the addition from time to time of various accessories. These accessories include a great variety of Wagons, Bridges, Tunnels, Level Crossings, Signals and Signal Cabins, Water Tanks and all the essential features of a real railway. The track, too, is capable of almost infinite expansion, and the many different types of Points and Crossings enable any desired layout to be developed on sound railway principles.

It is well known that all the Meccano parts are carefully designed so as to take their appointed place in the complete system. Similarly each of the Hornby Train accessories is in perfect proportion to all the others. The result of this is that a layout built up entirely from Hornby Trains and accessories not only works perfectly, but also has a very attractive appearance on account of the symmetrical inter-relation of all its components.

Hornby Locos are Guaranteed

The great confidence of Meccano Ltd. in the perfect mechanism and workmanship of their locos is shown by the fact that they are guaranteed. Meccano Limited will repair or replace, free of charge, any loco that fails to run satisfactorily from any cause other than misuse, within 60 days of the date of purchase.

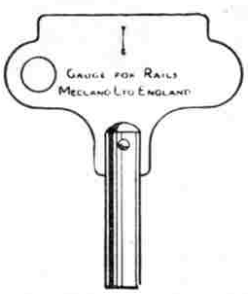


Fig. 1. The top of the Winding Key forms a Gauge for examining the track

Space Available

In contemplating the acquirement of a model railway the first point to be considered is the amount of space available. Some boys are fortunate in having at their disposal an attic or other spare room, where a large track may be laid and kept down more or less permanently. This arrangement is greatly to be preferred, but it is not all who are able to play under such ideal conditions; most boys have to make the best of the floor space of a living room, where the track has to be taken up after use and laid down afresh each time it is wanted. Of course, during the fine days of summer the track may be laid out of doors and great fun may be had in this way, but it is necessary for the rails to be taken indoors at night or they will rust badly, even if no rain falls, for the dew will quickly collect on them.

All Hornby Trains and Rails are gauge 0. In reference to railways the word gauge means the width of the track measured from inside to inside of the heads of the rails. Just as there is a standard gauge for full-sized railways—4 ft. 8½ ins. in Great Britain—so there are various standard gauges for miniature railways. Gauge 0 is the smallest of these standard gauges, and the width of the Hornby Rail is 1¼ in.

Although the whole of the Hornby track is thus the same width, it is made on different scales as regards curves. In the larger sets a complete circle made

(*Continued on page* 293)

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/-**

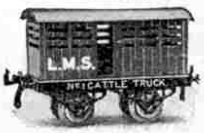
No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2 ft. radius rails only. Price **5/-**

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/-**

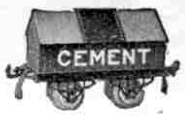
No. 2 CATTLE TRUCK
Splendid model fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**

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/-**

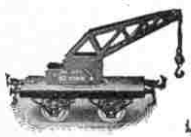
SECCOTINE VAN
Price **4/-**

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

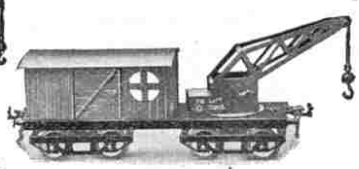
PETROL TANK WAGON
Finished in colour.
Price **3/-**

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

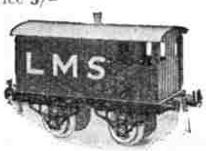
SNOW PLOUGH
Finished in grey, with revolving cutter driven from front axle.
Price **5/6**



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/-**

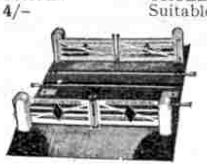
TROLLEY WAGON. Finished in colour. Suitable for 2 ft. radius rails only. Price **6/-**

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**

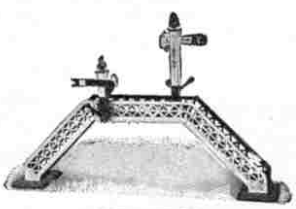
SIGNAL CABIN
Dimensions: height 6½ in., width 3½ in., length 6½ in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired. Price **6/6**

SIGNAL
Price **2/6**

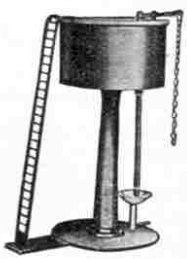


LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7½ in., with Gauge 0 Rails in position.
Price **6/6**

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

Miniature Railway System—(*cont. from p.* 291)

of the curved rails has a diameter of 4 ft., whereas in the smaller sets the circle is only 2 ft. in diameter. As the straight rails are exactly the same in both sets, it is clear that the amount of space occupied by any particular layout will depend upon the class of curved rails used.

Advantages of Large Radius Rails

Apart from considerations of space there is another matter to be borne in mind. If we wish to use the larger locomotives and rolling stock we must use curved rails of the larger radius. The reason for this is that, on account of their length of wheel-base, the larger vehicles cannot negotiate curves of the small radius rails. On the other hand, the smaller locomotives and rolling stock run even better on the large radius rails than on the small ones. Where they are so affected, the accessory points, etc., are made in both sizes, so that a layout may be made equally complete whichever radius of rails is used.

Before deciding upon which radius rails to use, all the points mentioned above should be carefully considered. If sufficient space is available, and particularly if the track can be laid down permanently in a spare room, there is no doubt about the superior advantages of the large radius rails, especially in permitting the use of the fine-looking No. 2 locomotives with bogies.

What to Buy

Having decided which rails are to be used, the next question is what to buy. Probably, most boys will buy one of the complete sets, each of which contains a Locomotive, Tender, either passenger Coaches or Goods Wagons, and a number of Rails. Then, when quite familiar with the working of this set, they will purchase the remaining pieces necessary to construct a complete railway layout as opportunity allows.

Laying the Track

Let us suppose we have purchased a complete set, either passenger or goods, and are now ready to set it to work. The first thing is to lay the track. The rails are fitted together by inserting the projecting peg at the end of one rail into the hollow railhead of the next. A very valuable feature of the Hornby Rails is the alternate pegs, the advantages of which will shortly become evident. It will be noticed that the sleepers carrying the rails are not flat, but are elevated at one end. The object of raising one rail of the track in this way will also be explained later, but in the meantime it should be noted that the rails must be fitted together so that all the sleepers slope in the same direction.

If the rails were merely pegged together, any movement of the track or an accidental knock would very likely cause two rails to come apart. If this were to occur without being noticed at the time, a very realistic accident would result when the engine reached the gap! In order to make certain that the rails cannot come apart, ingenious locking clips are provided. The clip at the end of one rail fits into a slot in the end of the next, and in this manner the two rails are firmly attached together. It is perhaps a little trouble to fit in all these clips, but neglecting to do so will cause a great deal more trouble later on.

Provided that the track is laid carefully, the train should run along quite smoothly and easily. If it does not do so, there must be a defective place somewhere in the track, and this must be found and made right. An ingenious arrangement has been adopted in order to make the examination of the track a simple and at the same time an accurate process. The back of the handle of the key for winding the loco mechanism is specially designed to the exact inside width between the track rails (Fig. 1). The key thus forms a perfect track gauge, and by sliding it along the track a defective place is discovered at once.

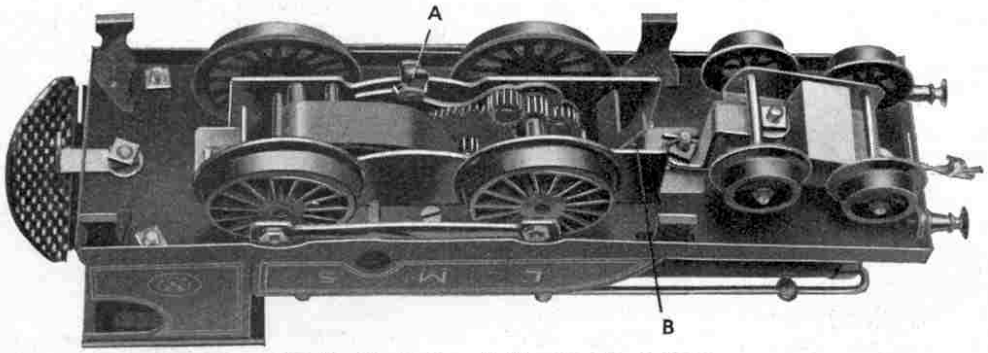


Fig. 2. Underside of Hornby No. 2 Loco

A. Reversing Mechanism. B. Brake-operating Mechanism.

Winding Up the Motor

A question that is very often asked by purchasers of Hornby Trains is "How many turns of the key may I safely give in winding up the clockwork motor of the loco?" Anxiety on this point is generally the result of sad experience with cheap Continental engines, the clockwork mechanism of which is liable to collapse from the very smallest overstrain. The clockwork motors of the Hornby locos are very stoutly built, however, and the danger of damaging them by over-winding is remote. It is a perfectly safe plan to turn the key as far as it will go *without forcing*, and you will soon be able to tell when to stop turning by the "feel" of the spring as you wind it.

It is very important to remember that the winding key should never be turned backward, for carelessness in this respect may result in a broken spring. Another point to remember is that the key must be pressed well home and as far as it will go on the winding shaft. When the spring is run down the loco should not be pushed along the track by hand.

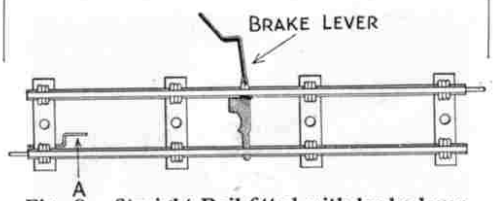


Fig. 3. Straight Rail fitted with brake lever

We now come to the operation of the locomotives, and in order to avoid the possibility of misunderstanding we will take each type separately.

Hornby Loco No. 2

The Locomotive in the No. 2 set is fitted with reversing gear and brake, both of which are controlled by pushing in or pulling out the two levers fitted inside the cab. The lever on the right-hand side of the cab operates the reversing gear, and the one on the left-hand side operates the brake. If the engine is held upside-down in the hand while each lever in turn is pushed in and pulled out a few times, the operation of the mechanism will be readily followed.

These levers must always be pushed fully in or pulled fully out. This is specially important in regard to the reversing lever, for if this is left half-in or half-out the gear wheels cannot fall into mesh, and therefore they are liable to be "stripped" by any attempt to force the locomotive to work.

A very valuable feature of this No. 2 Loco is that it may be reversed or braked from the track, without touching the cab levers. This gives a very realistic effect, and is accomplished by means of a special curved rail included in every Hornby No. 2 Train Set. This curved rail is fitted with trip-pieces operated by two levers, and by pushing these levers inwards and at the same time turning them, the trip-pieces are made to project above the track, and they will remain in that position until turned down again. When these trip-pieces are erected it will be noticed that one is to the right of the centre of the track and the other to the left. Looking along the track from the direction in which the engine is approaching, the trip-piece nearest the right-hand side of the track operates the reversing gear and the trip-piece nearest the left-hand side operates the brake.

Reversing from the Track

Suppose now we wish to reverse the engine from the track. The requisite trip-piece is erected, the clockwork wound up, and the train sent off on its journey. When the loco reaches the trip-piece the latter strikes against a small lever projecting downward from the clockwork mechanism (A, Fig. 2) and forces it along, thus reversing the motor. What actually happens is that the loco travels a little way past the trip-piece, pulls up and then starts to run backward. Immediately the engine has passed over the trip-piece the latter must be quickly lowered again, for if this is not done

(*Continued on page* 311)

How to Run a Miniature Railway System—

(*Continued from page* 293)

the trip-piece will operate the reversing gear again, but in the opposite direction, when the engine reaches it on its backward journey.

In order to make a success of reversing from the track it is necessary for the train to have sufficient momentum for the loco to run quite clear of the trip-piece before changing its direction, so as to allow time to lower the trip-piece and get the track clear.

The method of braking from the track by means of the special rail is similar, except that the alternative trip-piece is used. This actuates another lever projecting from the underside of the loco (B, Fig. 2).

After reversing or braking from the track the loco mechanism may be restored to its original condition by means of the levers in the cab. The Hornby No. 2 Tank Loco mechanism is exactly the same as that of the No. 2 Loco, so it requires no further description.

No. 1 Loco

The Loco in the No. 1 Set has reversing gear and brake, controlled from the cab in the manner already described, the left-hand lever operating the brake and the right-hand lever the reverse. This loco can be braked but not reversed from the track. For the purpose of braking, each No. 1 Hornby Train Set contains a special curved rail fitted with a lever and a trip-piece.

The No. 1 Tank Loco is the same as the No. 1 Loco in construction and operation.

Other Locos

The Zulu Loco is not fitted with reversing gear, but may be braked either from the cab or from the track in the same manner as the foregoing locos. A curved brake rail is supplied with every Zulu Set.

The George V. Set Loco is not reversible but may be braked from the cab. Incidentally, it may be mentioned that this set has curved rails making a circle 1 ft. 6 in. in diameter.

Straight Brake Rails

In addition to the curved braking and reversing rails already mentioned, a straight rail fitted with one lever and trip-piece is also made and sold separately. By means of this rail the No. 2, No. 1 and Zulu Locos may be braked from the track, and the fact that this brake rail is straight is of particular value in bringing the train to a standstill in a station in a realistic manner.

Before any loco is set to work it should have all its gears and bearings oiled thoroughly with good machine-oil, such as that used for sewing machines and typewriters. The bearings on all rolling stock should also be oiled. While doing this it is advisable to see that the trunnions are not bent inwards so that they press against the side of the wheels thus preventing free running. It is also necessary to guard against any oil getting on to the rails, and to prevent this the face of the rails should be occasionally rubbed over with a clean rag.

NEXT MONTH:—

Points and Crossings—a simple layout.

Runaway Engine in Flames

MECCANO BOY INTERVIEWS FIREMAN HERO

A THRILLING incident took place on a London suburban train a few weeks ago when an engine-fireman's brave act saved five hundred City workers from a terrible disaster.

One morning the passengers waiting at Totteridge Station were horrified to see the 8.44 a.m. High Barnet to Broad Street (London) train dash through the station at 50 miles an hour. The engine was enveloped in flames and the driver and fireman were clinging for their lives to the back of the tender, whither they had been driven by the terrific heat. A few seconds later the driver, William Barnett, was thrown from the swaying engine, but luckily he rolled clear of the train as it swept by. He was picked up and taken to hospital suffering from injuries to the head.

George Bowles, the fireman, knowing that certain disaster awaited the train unless it was stopped, climbed back through steam and flames into the cab, and although he was suffering great pain from burns, he succeeded in bringing the train to a standstill, thereby saving many lives.

On the following day I visited Fireman Bowles at his home at Forest Gate, and found him little the worse for his adventure, with the exception of burns on the arms. In fact he made light of the whole affair, although he confessed that he did not want another experience like it!

"At the time of the accident," he said, "our engine (a 4-4-0 tank loco) was running backwards, that is, coal-bunker first. Just outside High Barnet the vibration of the engine must have caused the steam outlet in the smoke box to close, and this shut off the steam-blast that 'draws' the fire. The result was that the back-draught from the smoke-stack to the furnace forced fire and smoke straight into the cab.

"The flames shot up to a height of ten feet, and we were driven back along the tender by the heat and fumes, which became unbearable. We stood on a narrow ledge and clung with our hands to the rail at the top. Meanwhile the engine was completely out of control, and we tore through Totteridge Station at a terrific speed. It was here my mate was thrown off, although I did not see him go as he was on the opposite side.

"As the train flew past Woodside Park Station I realised that it would mean certain disaster if it reached the next station, Finchley, as it would be thrown from the rails at the junction there. Also a train was due on the down line, which in passing was bound to strike me as I hung in my present position. A momentary impulse came over me to jump from the engine, but instead I pulled my cap down over my face and dashed back into the cab. Groping amid the flames I found the regulator, closed it, applied the brakes and the train came to a standstill.

"The passengers, who had scarcely realised the peril they had been in, continued their journey in another train. That is all there is to tell," modestly concluded Fireman Bowles.

Photographed by our Representative

Fireman Geo. Bowles

When I left Mr. Bowles I told him I felt sure all Meccano boys would join me in appreciating his splendid act and in wishing him well.

H.L.

Lives of Famous Engineers—

(*continued from page* 279)

canal, about 600 men in all being employed.

After two years' work 22 miles of the canal had been cut and finished, and 409 yards of the Harecastle tunnel cut and vaulted. Further progress on the tunnel was very slow, however, and it was not until 1777—five years after Brindley's death—that the work was completed. The cutting of the remainder of the canal went forward without any striking incidents and does not call for further mention.

Close of Brindley's Career

Brindley afterwards planned a number of other canals. Some of these he executed himself, but many of them were carried out by others. He was also called upon to give his opinion upon plans prepared by other engineers for various canals, one of the most important of which was the Leeds and Liverpool Canal, 130 miles in length, which brought the manufacturing district of Yorkshire along the valley of the River Aire into communication with Liverpool and the intermediate districts of Lancashire.

Brindley's career was now drawing to a close, for like many other famous engineers, he died at a comparatively early age. His mode of life—long hours of work, irregular meals and exposure to all kinds of weather—gradually undermined his constitution, and one day, while surveying a branch of one of his canals, he caught a chill from which he never recovered. He was ill only a few days, and died on 27th September, 1772, in his 56th year.

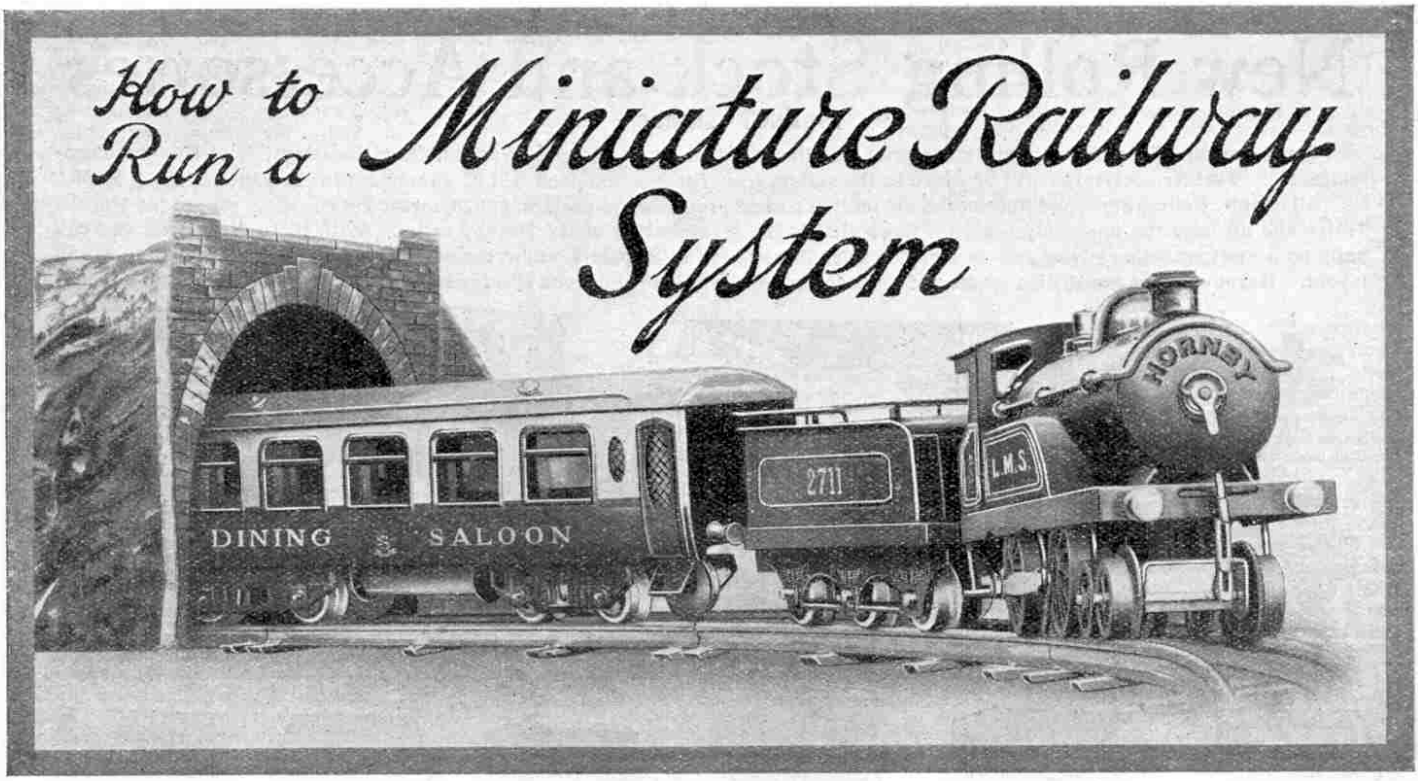
A Self-Taught Genius

Brindley was one of the most remarkable of all self-taught engineering geniuses. He could scarcely read and was therefore unable to profit by the recorded experiences of others. The only education he had was the result of his own observation and experience. He tackled his problems as they came along and overcame them by sheer ability, added to great determination. It is curious to learn that, when any specially serious difficulty occurred in the progress of one of his undertakings, he used to go to bed and remain there for two or three days until he had thought out a way of dealing with the trouble!

Brindley's self-confidence and independence are well illustrated by the following story. The King of France, hearing of the remarkable success of his work for the Duke of Bridgewater, desired to see him, and sent a message inviting him to inspect the Grand Canal of Languedoc. Brindley replied: "I will have no journeys to foreign countries unless to be employed in surpassing all that has been already done in them."

NEXT MONTH:—

Telford: His Bridges, Roads and Canals



II. POINTS AND CROSSINGS: SIMPLE LAYOUTS

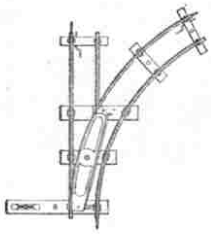


Fig. 1

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.

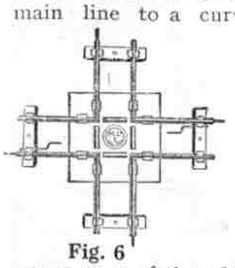


Fig. 6

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.

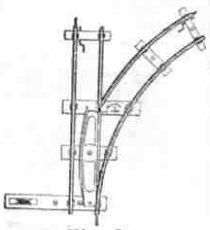


Fig. 2

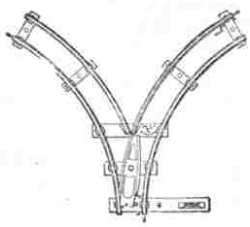


Fig. 3

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

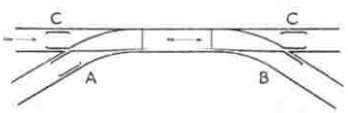


Fig. 4

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,

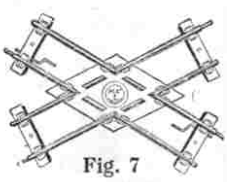


Fig. 7

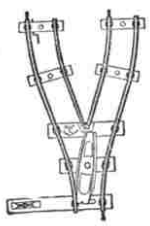


Fig. 5

(*Continued on page* 337)

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.

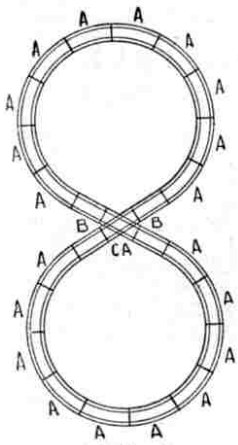


Fig. 8

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.

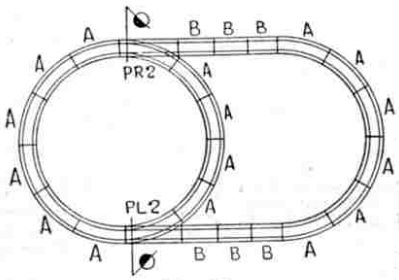


Fig. 10

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.

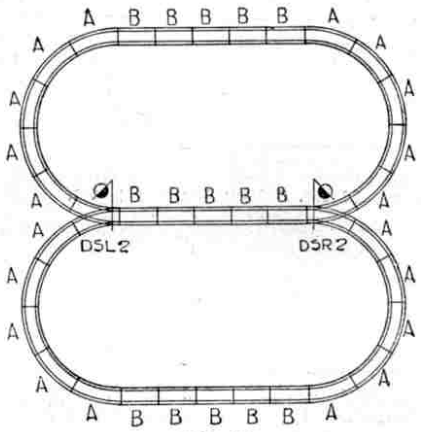


Fig. 11

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).

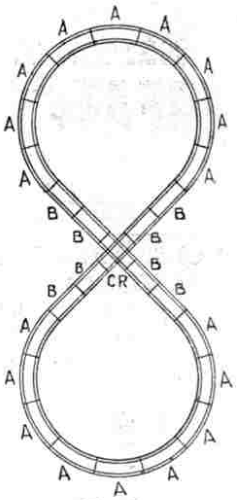


Fig. 9

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

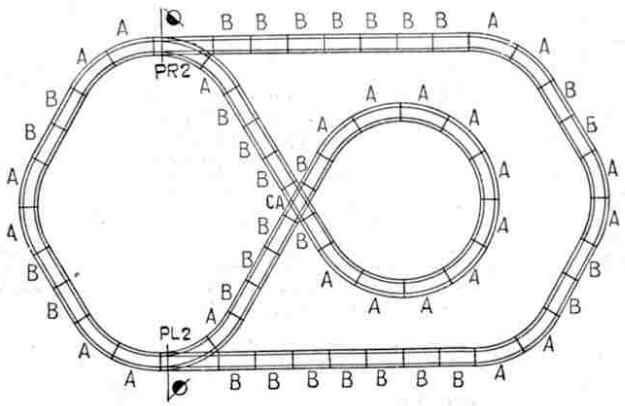


Fig. 12

(*Continued on page* 344)

CHOOSE YOUR OWN CHRISTMAS PRESENT

An opportunity for "*M.M.*" readers

It is a wonderful sensation to sit down and study illustrations and descriptions, and select your own Christmas present. Try it! The Special Christmas Number of the "*M.M.*" will contain advertisers' announcements of all kinds of splendid toys, books, and all manner of articles for giving pleasure to boys at Christmas. We are going to make at least one boy happy by giving him the very thing he wants, from amongst the articles advertised in our columns.

Let us know what you want—
On a Postcard

Obtain a copy of the Christmas number of the *Meccano Magazine*, which will be ready on 1st December, look at *all* the articles advertised and then decide which you would like the postman to hand to you on Christmas morning. Write the name of it on the top of your postcard, marking it No. 1. Then write the name of the article that you would like second best and mark it No. 2. Do this with six articles altogether, write your name and address at the bottom in very plain letters, and send the postcard to "Christmas Presents, *Meccano Magazine*, Binns Road, Liverpool."

To the boy whose list corresponds most nearly in order of merit with the total voting we will post the article that heads his list, to reach him on Christmas morning.

"Christmas Presents" postcards must reach us not later than 20th December.

Miniature Railway System—

(*Continued from page* 337)

rail plan is more interesting than perhaps it appears, and if two separate trains are used many hours of fun and excitement may be obtained. The pieces required are:—Large radius—24 Curves (A2), 30 Straights (B1), Acute-angle Crossing (CA), Right-hand Points (PR2) and Left-hand Points (PL2). Small radius—11 Curves (A1), 12 Straights (B1), 4 Quarter Straights (B$\frac{1}{4}$), Acute-angle Crossing (CA), Right-hand Points (PR1) and Left-hand Points (PL1).

Fig. 11 shows a formation making use of the Double Symmetrical Points. This layout is useful for introducing some of the interesting accessories of the Hornby system. The splendidly-designed "Windsor" Station, for instance, may be placed outside the straight side of one of the ovals, a Brake Rail being substituted for one of the ordinary Straight Rails so as to bring the train to a standstill in the Station when so desired. The Station itself may be made to look very much more realistic by the use of some of the new Miniature Platform Accessories. The general effect of the layout is also greatly improved by the addition of the Footbridge or the Lattice Girder Bridge and the Tunnel.

The pieces required for constructing this layout are:—Large radius—20 Curves (A2), 15 Straights (B1), Double Symmetrical Points, right (DSR2) and Double Symmetrical Points, left (DSL2). Small Radius—8 Curves (A1), 12 Straights (B1), Double Symmetrical Points, right (DSR1) and Double Symmetrical Points, left (DSL1).

(*To be continued*)

A Narrow-Gauge Railway

Railways of all kinds are interesting, but there is something particularly fascinating about narrow gauge lines and their sturdy little locomotives, which haul with the greatest ease loads that appear far too big for them. A noteworthy example of a 15-inch gauge line is the Ravenglass and Eskdale Railway in West Cumberland, which not only carries a steady stream of passengers but also hauls coal, food, and other stores to the villages through which the line passes, besides conveying His Majesty's mails. In short, this infant line is thoroughly capable of earning its own living, and it has attained the dignity of having the times of its trains recorded in "Bradshaw." The story of the line is told in an interesting manner by Mr. Henry Greenly, A.I.Loco E., in a booklet entitled "The Ravenglass and Eskdale Narrow Gauge Railway." This booklet may be had for sevenpence, post free, from the company's office at Ravenglass, Cumberland, and it is well worth the attention of all our readers who are interested in railway matters.

A Miniature Cycle

The miniature cycle appears to have come to stay, and already it has reached great constructional perfection. The "Smithfield Nibs" cycle produced by Messrs. Lintines, of Birmingham, an excellent example of this type of machine, is built on the lines of an ordinary full-sized bicycle, its frame being constructed of heavy gauge weldless steel tubing. The wheels are genuine Westwood, and specially resilient cushion tyres are fitted. The bicycle also has ball-bearing rubber pedals, free wheel, raised handle bars with front pull-up brake, and mudguards. The plating and enamelling are of the best quality and the general appearance of the machine is very smart. Further particulars will be found in our advertisement pages.

For Your Xmas Party

It is often said that "seeing is believing," but we are strongly inclined to doubt the accuracy of this statement after looking through the catalogue of the Midland Magic Co., of 42, Stanley Road, Earlsdon, Coventry. Certainly anyone who masters even a tenth part of the tricks and illusions described in this catalogue will be able to mystify his friends to his heart's content. The tricks range from simple card tricks to a remarkable packet of tea that apparently travels from one paper bag to another and then suddenly transforms itself into an afternoon tea-set! Aspiring magicians would do well to write for this interesting catalogue, which will be sent for 2d. post free to all readers mentioning the "*M.M.*"

How Air Traffic is Controlled—

(*Continued from page* 345)

one indicating a point of the compass. Each light is connected with one of a circle of contact studs beneath a wind vane. At the base of the vertical axis of the wind vane is a contact arm that moves over the studs, each of which occupies the same position in the circle as its corresponding lamp in the lamp circle. Each of the lamps is of a different colour, according to which point of the compass it represents, and the airman can tell, from the colour of the lamp that happens to be lit, which way the wind is blowing.

The aeroplanes themselves have red and green lights on their wing tips, the electric current for the lights and for the wireless apparatus being supplied by a wind-driven dynamo on the machine.

In order that the machines may land safely at night, brilliant searchlights and flares are used to illuminate the ground, and altogether the arrangements made for the safety of the pilots and their passengers are very complete.

H. ATKINS (Leatherhead).

Lives of Famous Engineers—

(*Continued from page* 325

only emotion he felt was a strong desire to go to sleep!

Telford's First Bridge

Telford's duties as county surveyor included the building and repairing of bridges, and in this work his early experience at Langholm proved of the greatest value to him. He always maintained that in order to be a thorough judge of work a man must himself have been practically engaged in it, and he often expressed his satisfaction that he had been obliged to begin his career by working with his own hands. The first bridge designed and built under his supervision was a stone bridge across the Severn at Montford, four miles west of Shrewsbury. This consisted of four elliptical arches, one of 58 ft. span and two of 55 ft. each. The work was executed in red sandstone and the bridge proved a very serviceable part of the high road from Shrewsbury into North Wales.

This bridge was completed in 1792, and in the same year Telford prepared the design and superintended the construction of the new Parish Church of St. Mary Magdalen at Bridgenorth. He completed this church to the satisfaction of all concerned, but he felt that his knowledge of the best forms of church and other architecture was insufficient, and he therefore made a journey to London and many of the principal towns of the south and west of England, examining carefully the finest buildings in each.

NEXT MONTH:—

TELFORD AS CANAL-ENGINEER

DRAGLINE CONTEST

A large number of excellent entries have been received, and we hope to announce the result of this contest in our next issue. We shall illustrate some of the winning models.

III. THE STORY OF SIGNALLING

Previous articles in this series have dealt with Laying-Out the Track, Points and Crossings, and Simple Layouts. In this article we give some interesting details of signalling in railway practice, on which the signalling of miniature systems is, of course, based. Next month our article will deal further with this side of the subject, with special reference to signalling arrangements on a miniature railway.

ONE of the most interesting features of modern railway working is the system of signalling, which ensures the safety of the millions of passengers who travel daily throughout the year.

The first train driven over the Stockton and Darlington line was preceded by a horseman carrying a flag. This arrangement worked quite well so long as the horse could travel faster than the train, but when the relative speeds became reversed the idea obviously would not work! Later, flagmen were stationed at various points on the line to regulate the traffic, and for some time the number of trains was so small that this method answered the purpose very well. Before long, however, the steady increase in the amount of traffic and in the speed of the trains made it vitally necessary to have a more efficient method of control, and on several lines a system of flag and lamp signalling was introduced. At certain points on the line a red flag by day or a red light at night was normally displayed, the red colour signifying danger and meaning "stop." A few minutes after a train had passed, the red flag or light was replaced by a green flag or light, the green signifying "go steadily," on some lines, and "right away" on others.

A Costly Joke

Red has always been recognised on railways as signifying danger. A story is told of a man who, while trespassing on the railway line, took it into his head that it was easier riding in a train than walking. He therefore tied his large red handkerchief to the end of his stick, waited until he saw a train approaching, and then vigorously waved his improvised flag. The driver of the train, taking it for granted that the man was trying to warn him of some danger ahead, promptly applied his brakes and brought his train to a standstill. The guard immediately enquired what was the matter, and the man calmly replied that he wanted a ride! He certainly got a ride in the luggage van, but at the next station the guard handed him over to the police, and shortly afterwards the local magistrates gave him a smart sentence to convince him that stopping a train for fun was apt to turn out a costly form of amusement!

Photo courtesy [*L.N.E.R.*

Pullman Leaving King's Cross. First Stop Leeds

Early Semaphore Signals

Before long the flag and lamp were placed on a post about 5 ft. in height. Later, the height of the post was increased to 12 ft. and a disc was substituted for the flag. The first semaphore used in railway signalling was set up at New Cross in 1841, and from it have developed the signal posts and arms with which we are all so familiar.

The early semaphore signals had three positions. When the arm was horizontal, that is at right angles to the post, danger was indicated, as is the case with our present-day signals. "Caution" or "Proceed slowly" was signified by lowering the arm to an angle of

about 45 degrees, and for "all right" or "line clear" the arm was lowered until it was hanging down vertically and had practically disappeared inside a slot in the post. These three-position signals were abandoned after a time in favour of the two-position signals in use to-day. It is interesting to note, however, that the three-position signal in an improved form has been re-introduced during recent years, but it is not in general use.

An Ingenious Porter

For some time the semaphore signals were operated by men stationed at the foot of the posts, each man having one or two posts to attend to. The next step was to operate the signals by mechanical means from signal boxes. The story goes that a porter who had two posts under his care got tired of walking backward and forward between them, and set his wits to work to discover some method of saving himself this trouble. Finally he thought out a scheme of ropes and wires connecting the signal arms on the two posts, by means of which he could manipulate the signals from his hut without any walking at all. An inspector chanced to come round and see this ingenious arrangement and reported the scheme to the railway company, and instead of being reprimanded the porter found his idea generally adopted. There is a good deal of doubt as to the accuracy of this story, but at any rate it is certain that the signals came to be operated by wires from signal boxes.

Interlocking and its Advantages

Afterwards came another great improvement known as "interlocking," which consists of the combination of signal and points levers.

The object of interlocking is to prevent a signalman from accidentally setting points and signals in conflicting positions, which might lead to serious results. For instance, the interlocking mechanism prevents a signalman from lowering a signal to allow a train to approach until after he has set the points in the correct position for it to pass, and also it makes it impossible for him to have two signals at the same moment in such positions as can lead to a collision between two trains. Further, once a signalman has lowered a signal to allow a train to pass, he is prevented from moving any points connected with the line on which the train is travelling. Interlocking mechanism is very complicated, but in a future article we shall explain the principle on which it is operated.

Present-day Signals

The great railways of to-day are provided with a wonderfully complete system of safety devices, and travelling by rail—even at the highest speeds—is as free from danger as human ingenuity can make it. Signalling methods have reached a very remarkable degree of perfection, and trains are shepherded from their starting point to their destination with unceasing watchfulness.

Signal boxes are placed at various points all along the line, and from them the signals and points are operated by specially trained signalmen. The signals themselves are in the form of semaphore arms fixed on high posts by the side of the line. These signal posts are usually placed at the left-hand side of the line of rails to which they refer, and the signal arms are on the left-hand side of the posts as seen by the driver of an oncoming train. There are thus separate sets of signals for both "up" and "down" lines, "up" lines being lines leading towards a main terminus and "down" lines those coming from such a terminus.

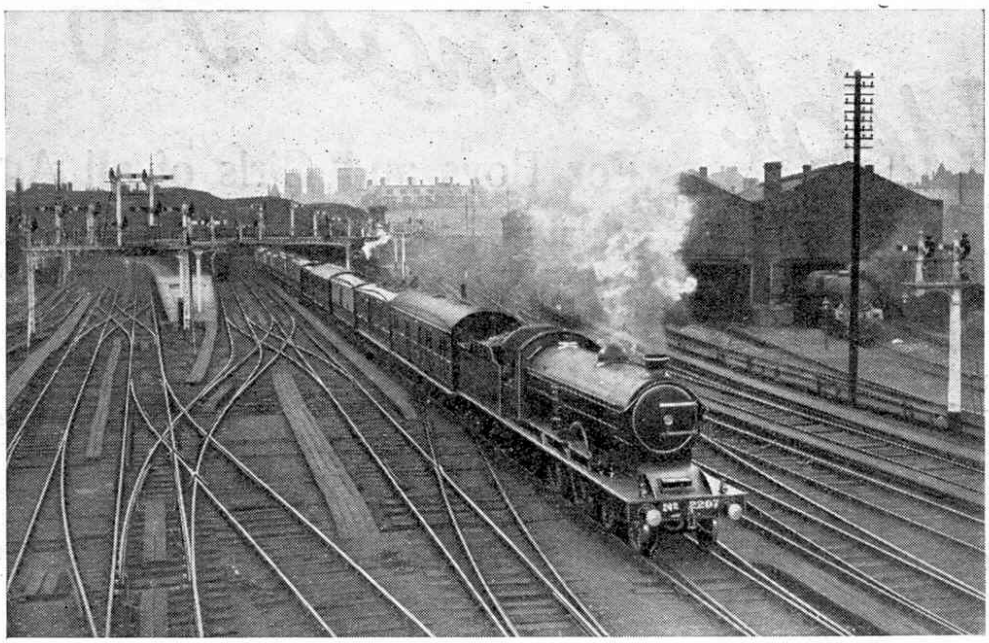


Photo courtesy [*L.N.E.R.*

Scarborough to Liverpool via Leeds. 3.30 p.m. leaving York

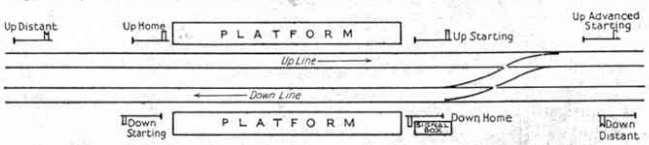


Fig. 1 Showing Position of Main Line Signals at a Small Station

Lights for Night Use

The front of the signal arms, that is the side seen by the engine driver, is painted red with a white stripe, and the back is painted white with a black stripe. Each signal post is also fitted with a lamp which is kept burning continuously and which requires replenishing with oil only about once a week. Coloured glasses, called "spectacles," are attached to the signal arms, and through these the engine driver views the light at night.

The normal position of a signal arm is horizontal, signifying "danger," and when the arm is in this position a red glass covers the light, also signifying danger. The "line clear" or "all right" indication is given by lowering the arm to an angle of about 60 degrees, and in this position a green glass is in front of the light. At one time a white light was used for this purpose, but its use proved to be dangerous. Drivers found it extremely difficult to decide whether a particular light was their signal or not, and there was always the possibility of a light in the window of a house close to the line being mistaken for a signal, with possibly disastrous consequences.

Signals are also provided with a small white light showing at the back. These "back-lights" are for the purpose of enabling the signalman to tell at night whether the lamps of his signals are burning and also whether the signal arms are working correctly in cases where the signals are in such positions that he cannot see the red and green lights.

A Safety Device

As we have already seen, the normal position of a signal arm is at danger, and the arm is held in this position by a weighted lever placed close to the foot of the post. Connection between the lever and the arm is made by means of an iron rod. Before the arm can be lowered the weighted end of the lever must be raised, and this is done by the movement of a lever in the signal box, which pulls a wire connected to a chain attached to the weighted lever at the opposite end to the weight. If the chain or the wire should break while the signal is in the "all right" position the weight on the lever will automatically raise the arm, and thus prevent the possibility of the signal still showing "all right" if the signalman does not immediately notice the breakage.

Signal arms are made either with square ends or "fish-tailed" ends. The square-ended arm is a stop signal and the fish-tailed arm is a "distant," or cautionary signal.

Why "Distant" Signals are Used

The first signal seen by the driver of a train approaching a signal-box is the fish-tailed "distant" signal, so called because it is the signal at the furthest distance from the box. The object of the "distant" signal is to warn the driver when the next or "home" signal is likely to be at danger, and so give him time to reduce the speed of his train ready to stop at the "home" signal if necessary.

(*Continued on page* 415)

Lives of Famous Engineers

(*Continued from page 373*

bridging of this river was very difficult on account of the violence of the periodical floods. Telford designed a light cast-iron arch of 150 ft. span with a rise of 20 ft. The arch was composed of four ribs, each consisting of two concentric arcs forming panels, which were filled in with diagonal bars. The roadway was 15 ft. wide and was formed of another arch of greater radius, attached to which was an iron railing. Robert Stephenson objected to the use of two dissimilar arches as being liable to subject the structure to unequal strains, but nevertheless this bridge, like many others built by Telford on a similar plan, proved perfectly serviceable.

From the Atlantic to the North Sea

As soon as the construction of Highland roads and bridges was in progress, attention was given to the improvement of harbours around the coast. It would require too much space to describe the many harbours constructed or improved by Telford, but mention may be made of those at Aberdeen and Dundee which, after Leith, the port of Edinburgh, form the principal havens along the East coast.

The construction of a navigable highway through the chain of lochs crossing Scotland diagonally from the Atlantic to the North Sea had long been looked upon as a work of great national importance. As early as 1773 James Watt surveyed the country, pronounced the canal practicable and indicated the best means of construction, but nothing was done in the matter at the time. In 1801 Telford was requested to report on the project, and it is interesting to know that his survey, as regards the most important particulars, agreed closely with that of Watt.

Caledonian Canal Begun

This time the scheme took practical form, and early in 1804 work was begun by the formation of a dock or basin adjoining the intended tide-lock at Corpach near Bannavie. This basin formed the southernmost point of the intended canal. The difficulties of the undertaking were very great. For instance, the difference between the levels of Loch Eil and Loch Lochy was 90 ft., while the distance between them was less than eight miles, and it was necessary to climb up the side of the hill by means of a flight of eight huge locks which Telford named "Neptune's Staircase."

A Great Undertaking

Between the two extremities of the Canal, Corpach on the south-west and Clachnagarry on the north-east, extended the chain of fresh-water lochs. The whole length of the navigation was over 60 miles, of which the navigable lochs constituted about 40 miles, leaving only some 20 miles of canal to be constructed, but of unusually large dimensions and through a very difficult country. The summit loch was Loch Oich, 100 ft. above high-water mark both at Inverness and Fort William, and the navigation had to climb up to this sheet of water by a series of locks from both the eastern and western seas, the total number of these locks being 28.

The construction of all these works in such a wild country involved vast labour and a great deal of anxiety, and many years elapsed before the task was completed. In the meantime the cost of construction had very greatly exceeded the original estimate, and after all, when the canal was opened, it was comparatively little used. This was a bitter disappointment to Telford, and he felt very keenly the attacks made upon the Government because of their expenditure on the undertaking. Telford, of course, was not in any sense responsible for the commercial success or failure of the canal. He was simply called upon to construct it, and having done so in the best possible manner his work was ended.

NEXT MONTH:—

TELFORD BUILDS THE MENAI SUSPENSION BRIDGE.

CHOOSE YOUR OWN CHRISTMAS PRESENT

An opportunity for "*M.M.*" readers

It is a wonderful sensation to sit down and study illustrations and descriptions, and select your own Christmas present. Try it! In our pages this month there are advertisers' announcements of all kinds of splendid toys, books, and all manner of articles for giving pleasure to boys at Christmas. We are going to make at least one boy happy by giving him the very thing he wants, from amongst the articles advertised in our columns.

Let us know what you want—on a Postcard

Look carefully at *all* the advertisements and decide which article you would like the postman to hand to you on Christmas morning. Write the name of it on the top of your postcard, marking it No. 1. Then write the name of the article that you would like second best and mark it No. 2. Do this with six articles altogether, write your own name and address at the bottom in very plain letters, and send the postcard to "Christmas Presents, *Meccano Magazine*, Binns Road, Liverpool."

To the sender of the list that corresponds most nearly in order of merit with the total voting we will post the article that heads his list, to reach him on Christmas morning.

"Christmas Presents" postcards must reach us not later than 20th December.

Next Month:

Our next issue will be published on the 1st January. The price is 3d. and the Magazine will include the following splendid articles, in addition to our regular features :—

The World's Mightiest Electric Loco
Giant Block-setting Cranes and Their Work
The Menai Suspension Bridge
Stamp Tour Round the World
Discoveries in Meccanoland (Part II)
The New "Flying Scotsman"
Taking Care of Bicycles in Winter
The Triumphs of Famous Men over Poverty
Electric Signs and How they Work

Order your copy to-day from your Meccano Dealer, or from any News-agent

Miniature Railway System—

(*Continued from page 407*)

As the train is likely to be travelling at a high speed when the driver first sees the "distant" signal, it is clearly necessary that this signal should be sufficiently far in advance of the "home" signal to allow the driver time to pull up at the latter if required. The standard distances from "distant" to "home" vary from 600 yards on a rising gradient to 1,000 yards on a falling gradient.

As long as the "home" signal is at danger the "distant" signal also is kept at danger, and the driver slows down and proceeds cautiously towards the "home" signal. If the latter is at danger when he reaches it he must stop dead, and must on no account go on until the signal is lowered to the "all right" position.

Starting Signals

The third signal to be reached is the "starting" signal, the function of which is to prevent a train that has passed the "home" signal from starting away until the line ahead is known to be clear. Sometimes there is a cross-over road or a siding connection ahead of the "starting" signal. In such cases a fourth signal is necessary and this is called an "advanced-starting" signal. The shape of "starting" and "advanced-starting" signals is similar to that of "home" signals. Fig. 1 shows the relative positions of the various main line signals at a small station.

NEXT MONTH:—

SIGNALLING ON A MINIATURE RAILWAY

IV. SIGNALLING AND TRAIN CONTROL

LAST month we showed how the signalling of railways developed from crude beginnings to the perfect system of to-day, and we explained the use of the principal signals, "home," "distant," "starting" and "advanced starting." To complete our account we must add that sometimes signal boxes are not far enough apart to allow the "distant" signal to be placed at the standard distance from the "home" signal, and where that is the case the "distant" is placed on the same post as the "advanced-starting," "starting," or "home" signal of the previous box, its position always being below the other signal.

Protecting Junctions

Junctions are usually protected by two "distant" and two "home" signals. The two signal arms are arranged on a "bracket" as shown on page 21, the left-hand and right-hand arms applying respectively to trains proceeding to the left or to the right at the junction. One of the arms is generally placed higher than the other, the higher arm applying to the more important line.

In addition to the signals already described, there are many others employed for special purposes, such as shunting, backing, etc.

The approaches to and the exits from important stations present a bewildering array of lines, points and crossings, and at such places sets of signals are often carried over the rails on a sort of bridge called a "gantry."

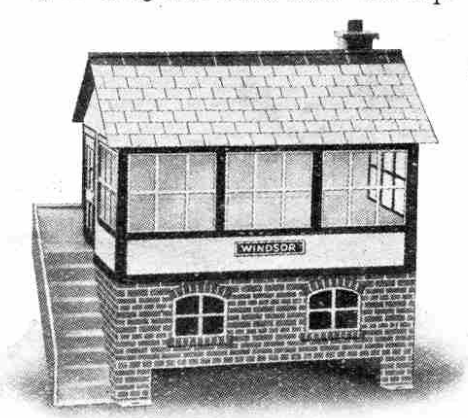
Signalling Miniature Railways

The signalling of miniature railways as far as it is carried out should follow the principles on which real railways are signalled. Generally speaking, however, the fewer the signals used the better, unless the layout is on a very elaborate scale. A large number of signals scattered about a miniature system may look pretty, but if they are not serving some railway-like function they are worse than useless.

A great deal depends upon the size of the layout. If it is very small it may be advisable to dispense altogether with "distant" signals, using only "home" and "starting" signals. In a layout of fairly large size, however, the employment of "distant" signals adds considerably to the interest and realism of the railway.

The diagram in last month's issue showed the signalling arrangements for a simple station, where there is a double track and either a cross-over as illustrated or a siding branching off beyond the "home" signal. If there is no cross-over or siding, or if a single track is being used, only "distant," "home," and "starting" signals are necessary. The arrangements in this diagram may be followed successfully in a Hornby layout using the Windsor station.

The best fun is obtained by working the signals along with brake rails. The trip-pieces on these rails may be set either to stop the train or allow it to pass, according to whether the signals are at "all right" or "danger." With a little ingenuity the signalling of trains into and out of a station may be made quite a realistic operation, adding very greatly to the interest of the layout.



Windsor Signal Cabin (Hornby Series)

Providing Real Fun

Most boys do not get half the fun out of their Hornby railways, a fact that is due very largely to working without any definite plan. Running trains aimlessly round and round the track, and starting and stopping them at random without any particular object in view, soon becomes monotonous. The best method is to decide beforehand exactly what is to be done. For instance, if two locos are available, so that two trains can be run, the first train may be made a passenger express stopping only at the Windsor station or perhaps at one wayside halt, while the other train may be a goods train calling at various points and being shunted into sidings in order to allow the express to go through. Such a scheme at once introduces a purpose into the layout and therefore provides real interest. If a third loco is available the interest may be further increased by putting on a slow passenger train, and so on.

If two or three locos and a fair number of carriages and wagons are available, it is a good idea to draw up a simple time-table and run a regular service of trains in accordance with it. The main thing in every case is to work to a plan, however simple this may be. Once the owner of a Hornby railway has experienced the fascination of running a service of trains he will not rest until he has brought his layout to the highest possible pitch of perfection and made it in a real sense a miniature railway.

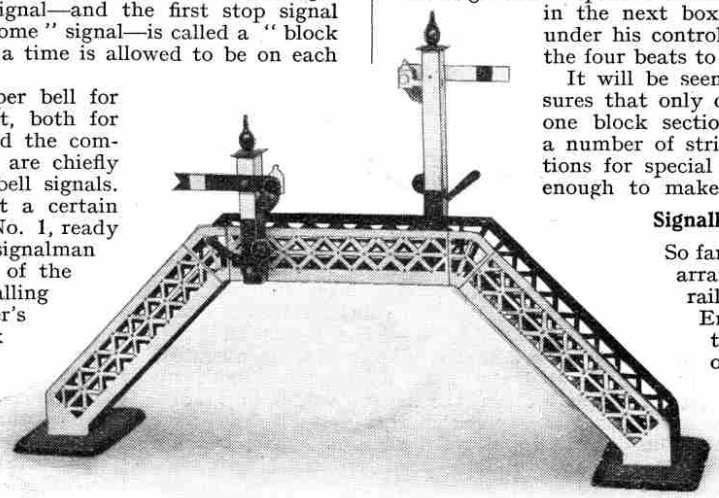
(*Continued on page 21*)

Signalling and Train Control—*(continued from page 19)*

Returning now for a little while to real railways, we must see how trains are actually controlled on their journeys. Every signal box is electrically connected with the box on each side of it, and is provided with telegraph and bell instruments. Trains are worked on what is called the "block system," The length of line between the last stop signal of one box—that is the "starting" or the "advanced starting" signal—and the first stop signal of the next box—that is the "home" signal—is called a "block section," and only one train at a time is allowed to be on each section.

Every signal box has a tapper bell for each section on each side of it, both for "up" and "down" lines," and the communications between signalmen are chiefly made by means of a code of bell signals.

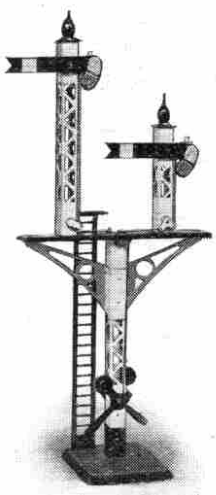
Let us suppose a train is at a certain signal box, which we will call No. 1, ready to commence its journey. The signalman in this box calls the attention of the signalman in No. 2 box by signalling one beat on the bell in the latter's box, and the man in No. 2 box acknowledges this signal by repeating it so that one beat sounds on the bell in No. 1 box. Signalman No. 1 then gives four consecutive beats on the bell in No. 2 box, which in the railway code means "Is line clear for an express passenger train?" The signalman in No. 2 box, after making certain that the line is clear for a quarter of a mile inside his "home" signal, that is, as far as his "clearing point," repeats the four beats, thus indicating "line clear" to the man in No. 1 box.



Footbridge No. 1 with Signals (Hornby Series)

At the same time signalman No. 2 brings into use his key-disc instrument. This is a box-shaped apparatus having three positions —"line clear," "line blocked," that is the normal position, and "train on line." In this case signalman No. 2 pegs his instrument to show "line clear" and so causes the "line clear" indication to appear on a similar but keyless instrument in box No. 1. This gives signalman No. 1 permission to send forward the train and he lowers his "starting" signal, and his "advanced starting" signal if there is one, and the train moves forward into the next section. Immediately after lowering his signals the man in No. 1 box gives two beats on the bell signifying "Train entering section," which signalman No. 2 acknowledges by repeating it and at the same time altering his key-disc instrument, and consequently the keyless instrument in box No. 1, to "Train on line." As soon as the train has passed the No. 1 box the No. 1 signals are restored to the normal "danger" position.

The signalman in box No. 2 does not wait for the train to arrive, but immediately calls the attention of the signalman in box No. 3 by giving one beat on the bell, and the process just described is repeated. In this way the train is passed along to box No. 3, and so on from one box to another throughout its journey, each step in its progress being prepared in advance.



Junction Signal (Hornby Series)

The Use of Tail Lamps

When the train has passed the "clearing point" at box No. 2 the signalman in that box gives to box No. 1 the "Train out of section" signal—two beats, followed by a pause and then one beat—and at the same time unpegs his instrument so that both it and the instrument in box No. 1 return to the normal position.

Before a signalman gives the "Train out of section" signal he must be certain that the whole of the train has passed and that no part of it has become detached during its journey from the previous signal box. For this purpose every train always carries a lamp at the rear. This lamp, which is called a "tail" lamp, is painted red and at night shows a red light. When a signalman sees this lamp at the rear of the train he knows that the train is complete, but if he does not see the lamp he assumes that some portion of the rear of the train has broken away and is left somewhere in the section. He then takes immediate steps to prevent any other train entering this section and at the same time he signals to the box ahead "Train passed without tail lamp," and accordingly the train is stopped at the next box and held up until the matter is investigated.

If a signalman in any particular box gives four beats on the bell, enquiring if the line is clear, and the line happens not to be clear, the signalman in the next box makes no response. The first signalman repeats his four beats at intervals, but the man in the next box does not respond until the line under his control is clear, and then he gives back the four beats to indicate this as already described.

It will be seen that this method of control ensures that only one train at a time shall be in any one block section. In actual practice there are a number of strict rules and also certain modifications for special circumstances, but we have said enough to make clear the general procedure.

Signalling on Single Lines

So far we have spoken only of signalling arrangements for double lines of railway. Thousands of miles of English railways have only a single track, that is, there is only one pair of rails for both up and down trains. For such lines there are several systems of signalling in operation, the ultimate object of them all being to ensure that the driver shall have in his possession some visible evidence that the signalman has given him permission to take his train into a particular section of line.

The simplest method of single-line working is that known as the "train staff" system, and this is very suitable for a short length of line worked by one loco only. The staff is either a piece of wood about 14 inches in length and two or three inches in thickness, or a light hollow rod of steel of similar proportions. It is marked with the names of the stations at each end of the section. On a branch line of this kind there is obviously no possibility of collision, and the staff therefore serves merely as the driver's authority for commencing his journey.

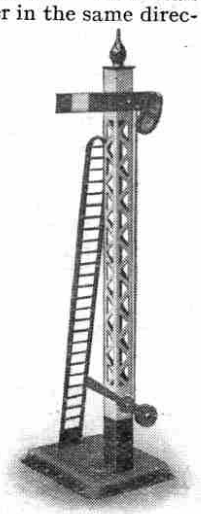
On single lines where two or more trains are operating, the line is divided into block sections in the same manner as double lines. A staff is provided for each section, and to avoid any confusion these staffs differ one from another in shape and colour. In the ordinary way the staff for a particular section is handed to the driver at one signal box, carried by him to the box at the other end of the section and handed over, and taken back to the first box by the driver of the next train in the opposite direction. Sometimes, however, there may be two successive trains in the same direction without an intermediate train in the opposite direction, and consequently the staff is not brought back to the box from which it was issued, ready for the second train.

"Train Staff and Ticket"

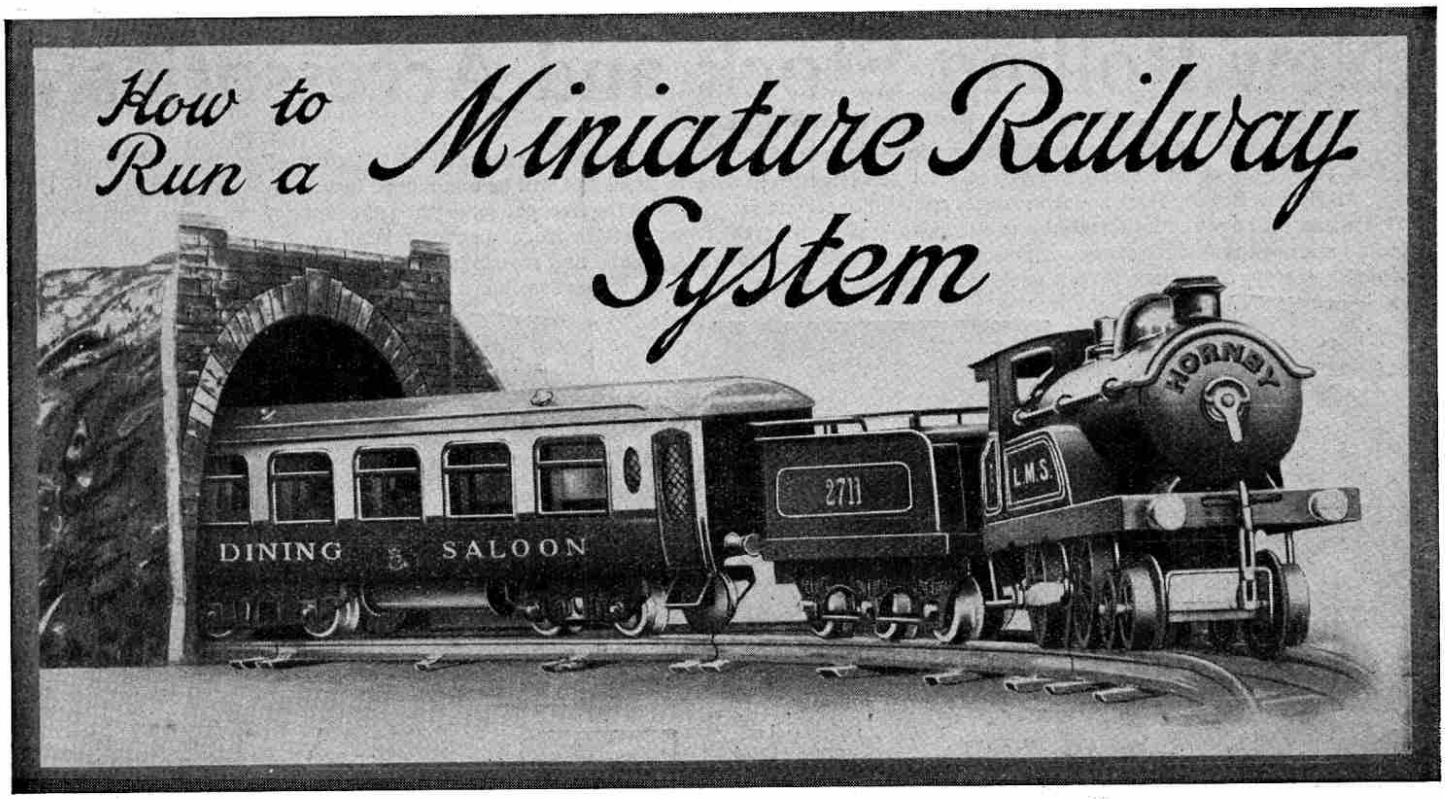
This difficulty is surmounted by the use of the "train staff ticket." Where one train has to follow another in the same direction the driver of the first train is *shown* the staff and *handed* a train staff ticket as his authority to proceed. Train staff tickets are made of the same shape and colour as the staff of the section to which they apply, and they are kept in a special box, the key of which is attached to the end of the staff, thus making it impossible to remove a ticket without having the staff.

In cases where a number of trains may have to be run in one direction without an intermediate train in the opposite direction, one or other of the various electric staff or tablet systems is used. In these systems an instrument containing the staffs or tablets is provided for each section of the line. These instruments are electrically connected and are fitted with mechanism which ensures that a staff can only be withdrawn by the combined action of the signalmen at both ends of the section, and also that only one staff for a particular section can be out at one time. We shall refer to these electric staff systems in a later article.

(To be continued)



Signal (Hornby Series)



V. MORE LAYOUTS AND LOCO CLASSIFICATION

IN giving advice in regard to planning a miniature railway one is always up against the great difficulty that domestic conditions and circumstances vary so much. In the absence of detailed information as to individual requirements it is impossible to give a really satisfactory answer to the question : " How shall I plan my Hornby Railway ? " All that can be done is to make practical suggestions for miniature railway planning in general, and leave it to the unfailing ingenuity of Meccano boys to adapt these to their own needs, making whatever modifications may be necessary.

Care in Handling Rails

The comparatively few cases in which a spare room can be devoted to a permanent layout will be passed over, for the time being, consideration being given only to the Hornby Railway owners who are not so fortunate.

It is not often that an ordinary table is large enough for an interesting layout, even using the small (one foot) radius rails. Thus, in most cases the track has to be laid on the floor and taken up each time after use. In laying and re-laying the track on the floor it is necessary to use a reasonable amount of care in handling the rails, and particularly the points and crossings, so that they shall not become bent out of shape, thus causing derailments and accidents of all kinds. Incidentally, it may be remarked that the rails will remain in good condition much longer if they are packed away neatly each time according to some plan, and not simply crammed into a box in a confused mass.

Long Oval Layout

After geometrical layouts (such as those described in the November " *M.M.*") have been tried, most railway enthusiasts begin to wish to experiment on something rather more realistic. Here almost everything depends upon the size and shape of the room, but generally speaking a long oval is the best plan from which to commence operations. In order to economise space the oval should be made as large as possible, and the various sidings, etc., planned to come inside it. Fig. 1 shows the kind of simple layout that may be developed in this way. Here we have a station with a loop line and, leading off from the main line, sidings for passenger coaches and goods wagons. One of the sidings terminates in a turntable. If sufficient space is available to allow the sidings to branch off from the main line close to the station, so much the better, but it will be found that this necessitates more room.

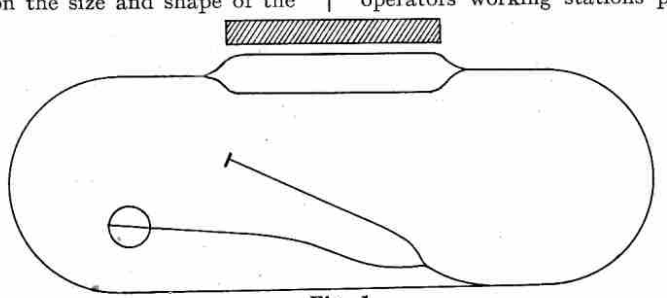


Fig. 1

With two locos hauling respectively a passenger train and a goods train a great deal of fun may be had with this layout. Two brake rails should be fitted in such a position that a train may be stopped in the station or on the loop line, and two other brake rails are required for the sidings. The exact position of these brake rails must be found by experiment.

According to the space available the plan may be developed almost indefinitely. Branch lines and more sidings may be added, but it will be found that a too elaborate system of sidings is very troublesome to work, and unless planned with the greatest care, is impracticable.

Non-Continuous Layouts

Continuous layouts are best suited to steam locos, but for clockwork locos non-continuous plans such as that in Fig. 2 are better. The greatest fun with these layouts is obtained by working out a time-table and running a number of trains in strict accordance with it. The distance between the two terminal stations will, of course, be determined very largely by the size and shape of the room, but in any case it should be adjusted according to the length of run of the locos on one winding. Nothing is more aggravating than to see a loco slow up and come to a standstill with its train half way round the track. The only way to avoid this is to make the distance between the terminals such that the locos will traverse it once, twice, or more times on one winding, with a margin to spare sufficient to allow trains to be shunted out of the way on to the loop line if required.

If the two stations are placed close together they may be attended to quite well by one operator, but more fun is obtained with two operators working stations placed as far apart as possible. If each operator has a copy of the pre-arranged time-table and follows it closely, many hours of real fun may be had, not to mention a good deal of excitement when one operator or the other makes a mistake in despatching a train. The layout shown in Fig. 2 may, of course, be developed by the addition of sidings and one or more branch lines.

(*Continued on page* 81)

Miniature Railways

(*Continued from page 79*)

Layouts on Landings

In a very small room, the terminal stations often cannot be placed far enough apart to give a satisfactory length of run between them, and in such cases the layout in Fig. 3 is useful. Here the terminal stations are both outside the oval, and a train starting from either of them may be sent round the continuous line as many times as desired, and then run into the other terminus. This layout, developed to the limits of space available, is one of th best for a small room. In order to obtain the best results two operators are needed, but if necessary one operator can manage fairly well. In this and the previous layout brake rails must be inserted in the track to bring the trains to a standstill at the correct points.

In many quite small houses there is often a fairly long hall or landing that can be pressed into service, thus making possible a much longer run than could be obtained in one of the rooms. Sometimes the layout can be extended so as to pass into and round a bedroom, and it is quite exciting to watch the trains disappear into the room and come into view again in business-like fashion shortly afterwards. The use of a room in this way makes the return of the trains to their starting point quite a simple matter.

Outdoor Railways

In dry summer weather (when shall we get any !) the railway may be taken out of doors if a small level piece of close-cropped grass is available, or failing that a level stretch of path. Unless the conditions are particularly favourable, however, it will be found necessary to provide a foundation of planks of some kind in order that the track may be sufficiently firm to allow of safe running.

In countries where they really do get a long spell of summer an outdoor railway may be made a great success. An Australian Meccano boy, for instance, has laid out a most interesting out-door line. This passes partly along gravel walks and partly over a lawn. The track is laid down on thin planks supported on a light wooden trestle framework about 3 ft. high. The line winds its way round various shrubs and bushes and passes through two tunnels—one of them 6 ft. in length—and over a miniature lake by means of a realistic trestle bridge. This boy finds that he can safely leave his track down for quite a long period in the dry hot weather, but in this country, unfortunately, this appears to be impossible without the rails becoming very rusty.

If a room with French windows opening on to a lawn is available a combined indoor and outdoor line may be arranged, the terminal stations being inside the room and the track passing through the open windows on to the lawn, sweeping round a circle and finally returning to the room again. A big layout of this kind worked by two or three operators is quite an exciting affair.

The Classification of Locos

The letters I receive day by day from boys all over the world regarding their Hornby railways contain a great variety of questions on various railway matters. Beginners appear to have some difficulty in regard to the classification of locomotives according to the number and arrangement of their wheels. The modern method of representing the classification by a system of numbers is really very easy to understand. For this method the normal arrangement of wheels in every loco is assumed to be :— first, leading wheels ; second, driving wheels; and third, trailing wheels. The wheels of the tender are left out of consideration.

For example, take a loco having four leading wheels, four coupled driving wheels and two trailing wheels. Such a loco would be described as being of 4–4–2 type, and it will be seen that the figures indicate quite clearly the wheel arrangement. If a loco has either no leading wheels or no trailing wheels, a cipher, " 0," is used instead of a figure. The Hornby No. 2 Loco is an example of the 4–4–0 type, that is to say it has four leading wheels and four driving wheels, but no trailing wheels. Stephenson's " Rocket," the winner of the famous Rainhill competition, was a 0–2–2 loco, being without leading wheels and having only two driving wheels and two trailing wheels.

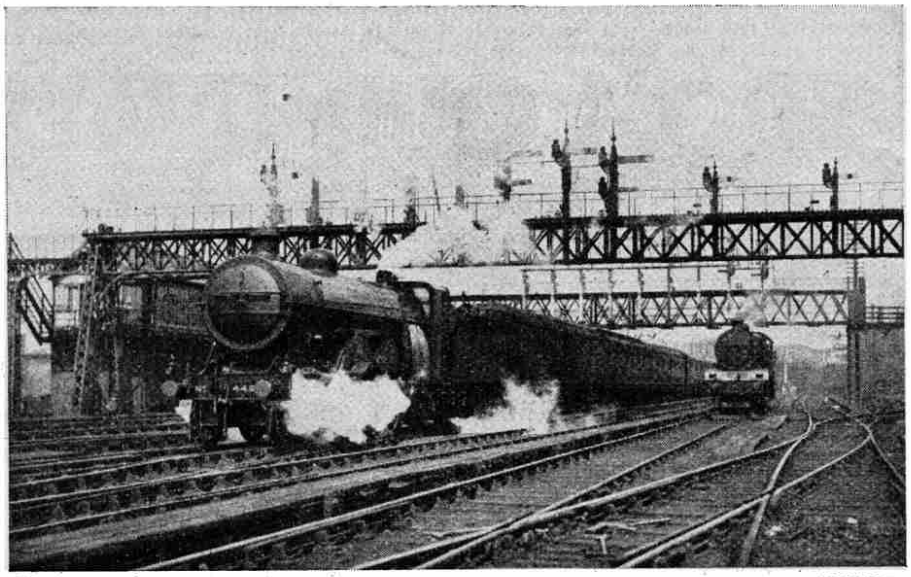


Photo courtesy [*L.N.E.R.*

Aberdeen-London Express

Some Named Types

Certain types of locos are known by special names, most of which originated in America. Among these are " Atlantic," 4–4–2 ; " Pacific," 4–6–2 ; " Consolidation," 2–8–0 ; " Prairie," 2–6–0, and so on. Tank locos are distinguished from locos having tenders by placing the letter " T " under the figures, as for example $\frac{4\text{–}4\text{–}0}{T}$, or $\frac{2\text{–}4\text{–}2}{T}$ The Hornby No. 2 Tank Loco is of $\frac{4\text{–}4\text{–}4}{T}$ type.

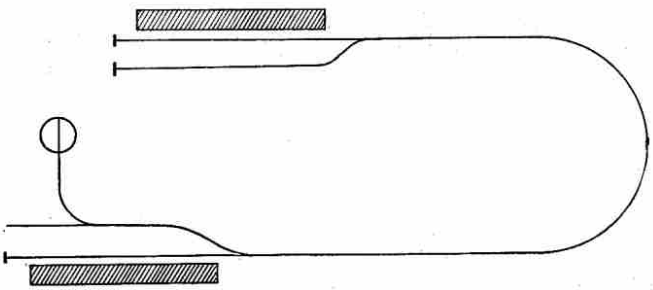


Fig. 2

Why Wheels are Coupled

Locos are also classified as passenger, goods, or shunting engines according to the work they are intended to perform. Roughly speaking, passenger locos are designed for speed and goods locos for power. One of the simplest types of loco is the " single-driver," now looked upon as out of date. In this type there are no coupled wheels, but instead there is one very large driving wheel, not connected with the other wheels, which are a good deal smaller.

The reason for the passing of the " single-driver " is that modern loco designers have established the principle that as many wheels as possible must be coupled together in order to achieve the best results. The effect of coupling wheels together is to distribute the driving force among the wheels, which increases the adhesion to the rails and gives greater stability. For this reason locos with a great number of wheels coupled together are used for hauling heavy goods trains. Tank locos, intended primarily for short-distance runs, are suitable for all kinds of work, passenger traffic, goods traffic or shunting.

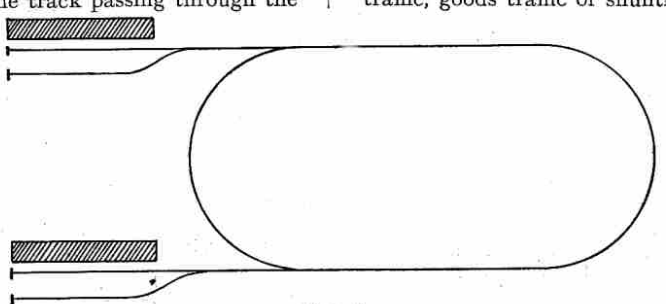


Fig. 3

American and Canadian Locos

Some young railway enthusiasts are a little worried about the American and Canadian locos on account of their strange appearance, and imagine that these locos must be constructed on very different princples from ours. As a matter of fact, however, these locos are similar in all essentials to British locos. Their peculiar appearance to British eyes lies mainly in the fact that

(*Continued on page 92*)

How to Run a Miniature Railway

(*Continued from page* 81)

their designers pay little attention to appearance so long as the locos do their work satisfactorily. British loco designers, while equally keen on efficiency, always endeavour to secure a good appearance for their engines by placing as much of the mechanism as possible under cover, and giving the whole loco a high outward finish. American and Canadian engines on the other hand appear to have as much as possible of their mechanism on the outside.

American and Canadian locos are, of course, much larger than ours—a direct result of the scale on which the bridges in these countries are built. The British designer is severely limited by the "loading gauge," that is the height that must not be exceeded by any railway vehicle. On British railways the gauge is 13 ft. 5½ in., whereas in America it is 16 ft.

American locos differ from ours also in another respect. British locos are built with a view to each one having a very long working life, whereas in America 10 years is considered a good life for any loco, after which it is ready to be scrapped to make way for something more up-to-date.

NEXT MONTH:

The Use of Meccano in Miniature Railways

Lucky Dundee Boys

That enterprising firm of Meccano dealers, Messrs. Draffen and Jarvie Ltd. (Nethergate, Dundee), recently organised a Puzzle Competition in which a special Meccano Cross-Word Puzzle was drawn up and printed on sheets that were given to applicants at the toy store. To every boy who correctly solved the puzzle a free subscription to the *Meccano Magazine* for a whole year was awarded. The Competition was a great success and we congratulate the organisers on their enterprise in this connection. We think it would certainly be a good idea if every other toy store followed this example.

Typewriting for Authors

The value of typewriting to anyone with literary aspirations cannot be over-estimated. Editors have such an enormous amount of material to read through day by day that, as a rule, they insist on all contributions being typewritten. The fact that a contribution submitted to an editor is typewritten may indeed secure its acceptance where the same article, if handwritten, would have been pushed on one side without consideration. Messrs. A. W. North (47, Parchment Street, Winchester), who are regular advertisers in our columns, have opened a typewriting department for the quick and accurate copying of articles, letters, circulars, etc., and any of our readers who require service of this kind would do well to communicate with this firm.

Block-Setting Cranes

—(*Continued from page* 55)

however, and it was decided to call in engineers from abroad to repair the damage and to report on the improvement of the work generally, as no English engineers had had any experience of this class of work.

During the reigns of Elizabeth and James, various additions to the harbour works were made, and subsequently such distinguished engineers as Perry, Smeaton, Rennie, and Telford all examined the question. Subsequently, considerable sums were spent on improving and extending the harbour works, but no satisfactory results were obtained until after the invention of Portland Cement, which revolutionised this branch of engineering.

(*To be continued*)

Readers frequently write to me asking if I can recommend books that are both of interest and of use. In this column I hope to review books that I consider specially appeal to Meccano boys. I do not actually supply these books, which may be obtained either through any bookseller or direct from the publishers.—EDITOR.

Stamp Collecting for All

By Stanley Phillips.

(Stanley Gibbons Ltd., London, W.C.2, price 1/–).

To the boy first taking up stamp collecting this fascinating hobby appears fairly simple and straightforward, but as a matter of fact there are many difficulties which, if not properly explained, are apt to cause the young collector to lose heart and abandon the hobby. "*Stamp Collecting for All*," by Stanley Phillips, is specially written to make the way easy for the beginner, and to point out the various pitfalls so that they may easily be avoided. The book is well illustrated and can be recommended strongly to any boy who has just commenced, or who is thinking of commencing, this delightful hobby.

The Radio Year Book

(Sir Isaac Pitman & Sons Ltd., London, price 1/6).

This handy volume, now in its third year, fully maintains its value as a book of reference for all interested in radio. The amount of ground it covers is remarkable, and this result has been attained by skilful condensation. All radio enthusiasts, whether interested in broadcasting or in the more technical aspects such as wireless television, are fully catered for, and broadcasting enthusiasts will examine with interest the photographs of various announcers and "uncles" at the B.B.C. stations, and of a number of the favourite broadcasting artists. The book includes a list of stations and radio societies and a useful trade directory.

Photographic Handbook

(Burroughs & Wellcome Ltd. Price 1/6).

The "Wellcome" Photographic Handbook in its pleasant green cover comes year by year as an old friend to all photographers desirous of getting the utmost out of their hobby. The 1925 edition retains all the valuable features of the past, and in addition has many interesting new features. Pages packed with information on the most accurate and at the same time the simplest methods of development and printing are followed by tables giving the comparative speeds of all well-known makes of plates, films and bromide and gaslight papers, and at the back of the book is the well-known "Wellcome" Exposure Calculator, possibly to many readers the most valuable feature of the book.

Radio for the Millions

(Hodder & Stoughton Ltd., London. Price 2/6).

"*Radio for the Millions who Listen*" is the title of an interesting book by "Experimenter" of the Manchester Evening News.

In this delightful book the author aims at assisting two classes of amateurs—those who are intending to take up wireless, and those who already possess some apparatus and desire to know more intimately how it works. For either of these readers this book can be recommended. It is written in a clear and easy style, and even the most complicated subjects are placed before the reader in an admirably lucid manner.

"The Story of Broadcasting."

By Arthur Burrows.

(Cassell & Co. Price 3/6).

Mr. Burrows, once familiarly and even affectionately known throughout Great Britain as "Uncle Arthur" at 2LO, is now one of the senior officials of the British Broadcasting Company. In this volume he presents information on subjects interesting to hundreds of thousands of listeners. He explains in a homely way the theory of wireless; sketches its development in peace and in war; reveals many romantic facts associated with the growth of broadcasting in Britain, and takes readers behind the scenes at the London and Provincial Broadcasting Stations. Finally there are startling speculations upon the future. Every page has a strong appeal for all wireless enthusiasts and the book will prove very interesting even to the general reader.

"Wireless World."

The latest issue of the *Wireless World* to hand—No. 283—contains detailed instructions for making up a high-grade power amplifier having two low frequency stages. The design is not at all complicated, and the average beginner should not find it difficult to make this apparatus. The mechanical construction of a new electron relay, invented by an American is described, and the applications of the relay are discussed. Among the interesting illustrations is one shown of Mr. Max Howden (3 BQ) of Box Hill, Victoria, the first Australian amateur to effect two-way communication with America. The photograph shows the simplicity of the apparatus used by Mr. Howden. The regular features of the paper are fully up to their usual high standard of interest.

A Useful Transformer

We have recently tested a transformer made by the Electro Supplies Co. (of 19a, The Broadway, Wimbledon, S.W.19). This transformer is a well-constructed piece of apparatus wound for a primary current of from 200 to 220 volts and gives a secondary current of 6v. 5 amps. It was tested on 100v. and gave 3v., which current remained practically constant as the load increased. After two hours on full load (5 amps.) there was no heating-up, showing that the transformer is decidedly well-insulated. An interesting feature is the wide contacts of the adapter with which the transformer is fitted, this being a great improvement on the usual style.

VI. MECCANO AND HORNBY LAYOUTS

IN the previous articles of this series we have endeavoured to show some of the many ways in which Hornby track may be laid out, and also to give suggestions as to the best methods of working a layout so as to obtain the greatest amount of fun. It is probable that the majority of boys who are the happy owners of a Hornby Train set are also Meccano enthusiasts, and in this article we intend to show how the two may be combined with the most interesting results.

Loading and Unloading Wagons

The fun of running a Hornby Goods Train, for example, may be increased very greatly by the use of one of the many types of Meccano Cranes for the purpose of loading and unloading the wagons. Several of the simpler types of crane may be set to work in this manner by the exercise of a little ingenuity.

Among these are Models Nos. 30, 38 and 42, which can be made with a No. 0 Outfit; and 105, 113, 119 and 127, made with a No. 1 Outfit. The simplicity of all these cranes makes the various loading and unloading operations quite a straightforward matter. Of course very many other Meccano cranes may be used for this purpose, and we only mention the foregoing models as being easily and quickly built with small outfits.

As regards the loads for the wagons, the miniature Meccano Sacks (part No. 122) are very useful, and in addition an almost infinite variety of loads of different kinds may be improvised from materials to be found in every house. Empty cotton reels may represent casks and barrels, and beads or dried peas make excellent material for tipping wagons.

A particularly interesting combination consists of a Hornby Goods Train and a Telpher Span (Models Nos. 36 or 108). The Telpher Span may be connected up across the room and made to convey material from, say, an imaginary quarry to a goods siding, ready to be loaded into the wagons by means of one of the cranes already mentioned.

Fun with Telpher Span

This operation may be made a great success if two or more boys are working together. The material may be brought from the quarry, loaded into the wagons and then the train despatched to its destination. There the wagons may be unloaded at once, or they may be shunted into a siding and another train of empty trucks made up. In the meantime the Telpher Span is at work bringing fresh material for a second load. With a little experiment in timing the various operations the process may be developed on quite realistic lines. There are also possibilities of a similar character in the Endless Rope Railway (Model No. 109).

A goods warehouse is a very useful addition to any railway, and for this purpose Model No. 406 can be recommended. Many extremely interesting operations may be carried out by means of this warehouse worked in conjunction with a crane. One of the best schemes consists in combining the warehouse with the Overhead Crane, Model No. 116.

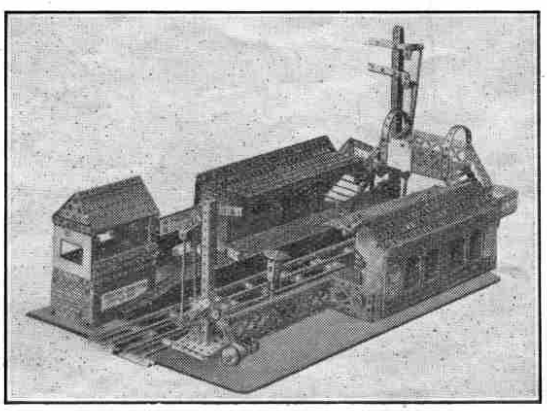
Goods Warehouse Combined with Crane

It will be found that the two models need slight alteration in order to make them work well together. One of the Flanged Sector Plates forming the base of the crane may be reversed so as to come inside the upright Strips instead of outside. This will enable the crane to be brought close up to the rails on which the wagon to be loaded is standing. The other Flanged Sector Plate may then be removed and the uprights bolted by means of Angle Brackets to the 5½" Strip in the base of the Warehouse, in order to allow the crane to travel far enough forward to lower its loads into the warehouse cage. Before this can be done successfully, however, the 5½" Strip bolted to the Angle Girders at the level of the first floor of the warehouse must be moved a good deal higher up in order to allow of the unobstructed movement of the crane.

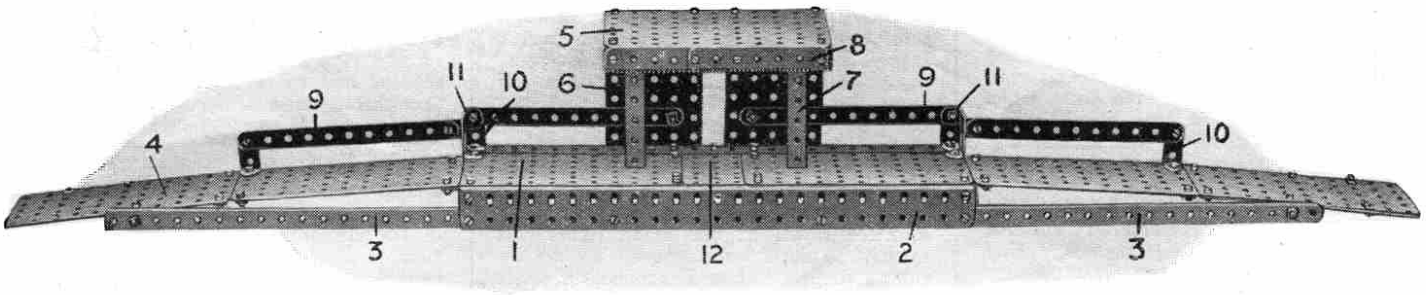
The more elaborate warehouse, Model No. 372, also may be adapted in a similar manner, but of course this model is only available to boys fortunate enough to possess a No. 7 Outfit.

Boys who have large outfits may be recommended to experiment also with the following models: Gantry, No. 425; Travelling Gantry, No. 575; and Travelling Crane, No. 526. The Dredger, Model No. 762, should not be overlooked,

(*Continued on page* 119)



A Meccano Model of a Station by D. Crankshaw, of Nelson



" Windsor Station " reproduced in Meccano. The following parts are required :—

6 of No. 1	2 of No. 9A	6 of No. 12B	3 of No. 52A	1 of No. 72	2 of No. 110
4 ,, ,, 2	1 ,, ,, 9B	82 ,, ,, 37	2 ,, ,, 53A	2 ,, ,, 103B	2 ,, ,, 124
2 ,, ,, 8	8 ,, ,, 12	2 ,, ,, 48B	4 ,, ,, 70	1 ,, ,, 103H	

Miniature Railways—(*Continued from page 117*)

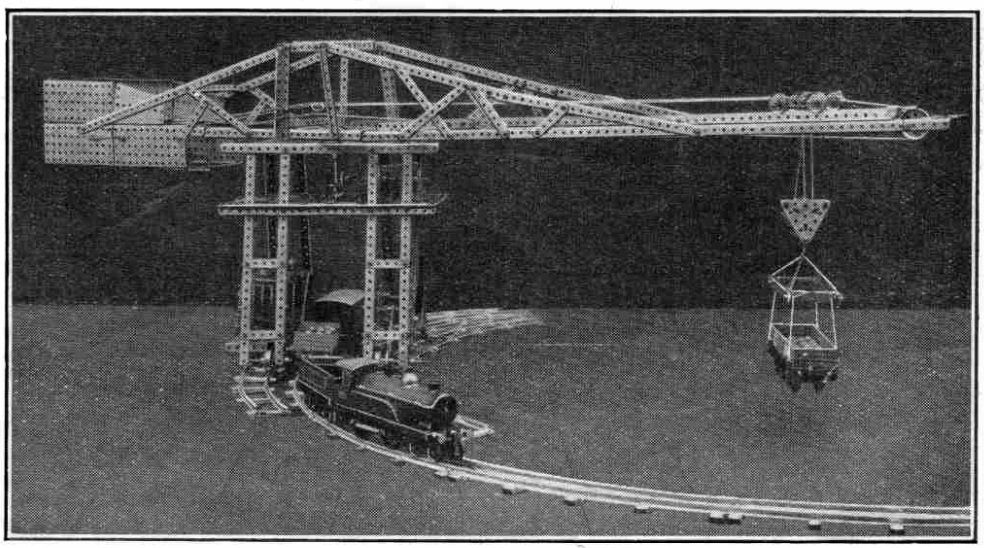
for if carefully adjusted it forms a remarkably effective combination with a railway.

Layout including Forth Bridge

For Exhibition purposes there is nothing more effective than the Forth Bridge, Model No. 722, in connection with a fairly extensive layout, and this combination may be strongly recommended to those Meccano Clubs which have not yet launched out in this direction. The spectacle of Hornby Trains running over this bridge never fails to attract a great deal of attention, and has often been the means of making people realise for the first time how great are the possibilities of combining Meccano with the Hornby system.

A Meccano Station

Two of the layouts illustrated in last month's Model Railway article required two stations. Many readers who have Hornby Train sets have only the one " Windsor " station and we have frequently been asked for a design for a station in Meccano. On this page we therefore reproduce a photograph of a very fine station built entirely in Meccano. This station is approximately the same length as the " Windsor " station and the platform is the same height. The two stations therefore may be placed facing one another thus forming a very effective double-road station.



A Fine Model, from the 1924 Model-Building Contest

Constructing the Station

The main platform is composed of $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plates (1), bolted to $12\frac{1}{2}''$ Angle Girders, and supported by $12\frac{1}{2}''$ Flat Girders (2) forming the sides. Secured at each end of the front Flat Girder (2) are $12\frac{1}{2}''$ Strips (3) overlapped 8 holes, which, by means of Angle Brackets bolted in the second hole from their outer ends, hold in position the approaches (4). The latter are constructed with $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates butted together and mounted on further $12\frac{1}{2}''$ Strips, which are overlapped 3 holes and bolted to the main platform.

The shelter (5), the roof of which is formed by a $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate, is supported by two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates (6) bolted to the main platform. The roof also rests upon $3\frac{1}{2}''$ Double Angle Strips (7) and has for ornamentation two Rack Strips (8) bolted by Angle Brackets to its outer edge.

The rails enclosing the platform are constructed from $5\frac{1}{2}''$ Strips (9) supported by $1'' \times \frac{1}{2}''$ Angle Brackets (10). The corners of the main platform are negotiated by means of 1" reversed Angle Brackets (11). The space between the two large Flat Plates (1) in the main platform is bridged by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate (12).

A $1\frac{1}{2}''$ Flat Girder is bolted across the top of the opening at the back of the shelter, and in order to add further to the appearance of the model, steps lead down from this opening to ground level. These steps may be constructed by bolting a $4\frac{1}{2}''$ Angle Girder to the back of the platform, in the second hole from the ground. To the projecting flange of this Girder a second $4\frac{1}{2}''$ Angle Girder is bolted, and to the latter a further $3\frac{1}{2}''$ Angle Girder is then secured.

Wayside Stations

No doubt Meccano boys will find many ways in which this model may be improved, such as in the addition of name-boards, seats, etc., but we have purposely made the model as simple as possible, well knowing that such obvious details usually suggest themselves to our readers without any help from us !

It is possible that some ambitious readers will also start building wayside stations, island platforms, and all kinds of railway buildings with Meccano. For a wayside station the model described above may prove a little large, except, of course, for those boys who are the fortunate owners of almost unlimited stretches of track! This defect, however, may very easily be remedied by shortening the " approaches " on either side of the platform. Quite an effective arrangement is obtained, for example, by using one $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate instead of two for the slopes at each end. Where parts permit, an excellent plan, of course, is the addition of booking offices and other familiar features of a railway station.

Island Platforms

" Island " platforms are very simple to construct. The roof, shaped like an extended V inverted, should be supported by columns—constructed from, say, Meccano Rods held in position by Cranks—arranged down the centre of the base. In this way the base is divided, as it were, into two platforms, which may be used for the " Up " and " Down " lines.

As another example of this type of Meccano model we illustrate a railway station which, readers will remember, was constructed by D. Crankshaw, of Nelson, for our big model-building competition last year. Comprising two platforms, signals, footbridge, signal-box, etc., the model shows many new and ingenious uses of Meccano parts.