Rodgers' Ballast Car and Plow.

The ballast car and plow shown in the illustrations have been largely used on the railroads of New Zealand, where it has been adopted by the government for new construction and in maintenance. Mr. J. Henry Lowe, Engineer of Working Railways of New Zealand, writing under date of May 30, 1887, says:

"The ballasting on the railways of the South Island of New Zealand, some 1,027 miles, is now entirely carried on by ballast trains equipped with self-emptying hopper wagons. These wagons are filled by hand labor in the ballast pits, and thence run by locomotive to any point required. The ballast is discharged by simply opening the hoppers, the train is slowly drawn along, discharging as it goes the regulated quantity.

"A plow or ballast spreader is fitted on the break van at the rear of the train, and it spreads the ballast, at the same time leaving the track in running order. No hand labor whatever is used in the operation of discharging. The advantages are rapidity and regularity of discharge, the track is left much neater than by hand labor, and last but not least the traveling of men to discharge the ballast is entirely saved. The number of laborers required to man the train is reduced by half, and the number of trips the train makes in the day is increased by the dispatch in discharging, so that the saving is very considerable.

"Where gravel ballast is used the cost of ballasting is so greatly reduced that both the ballast plow and self-emptying hopper wagon cannot fail to be appreciated wherever economy is studied. They are equally suitable and advantageous for use, whether on construction of new railways or the re-ballasting of lines open for traffic wherever such is required."

The plow and car are described as follows:

Fig. 1 is a side elevation, and fig. 2 a cross section of the hopper body mounted on the frame of an ordinary car of the country. At the bottom of the hopper is a hinged door controlled by the lever shown. Hinged side doors are also arranged above, to drop when loading. The bottom of the hopper is placed low enough to prevent the discharge of too much ballast.

Figs. 3 and 4 are side elevation and plan of the plow fitted to the "brake van" or caboose at the tail end of the train. The plow is intended to spread and level the ballast. As will be seen, it has a double mold board to spread its ballast to the desired width. The plow is hung by links connected to the screw and hand wheel above, so that it can be raised or lowered. When it is in use it barely touches the top of the rail. It is further controlled by a link attached forward and by the inclined guides attached inside of the mold boards. The lower edge can be so shaped as to spread the ballast to the level of the tops of the ties, inside and outside the rails if desired.

Further particulars may be obtained from Messrs. Henry W. Peabody & Co., 70 Kilby street, Boston, where working models may also be seen.

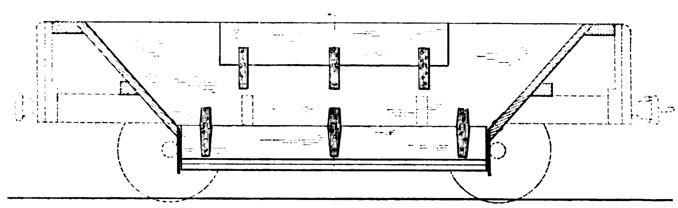


Fig. 1.

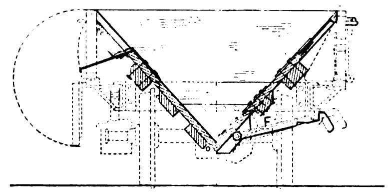


Fig. 2.

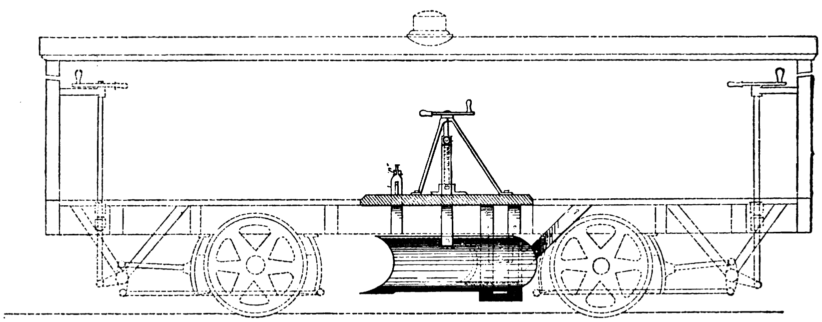


Fig. 3.

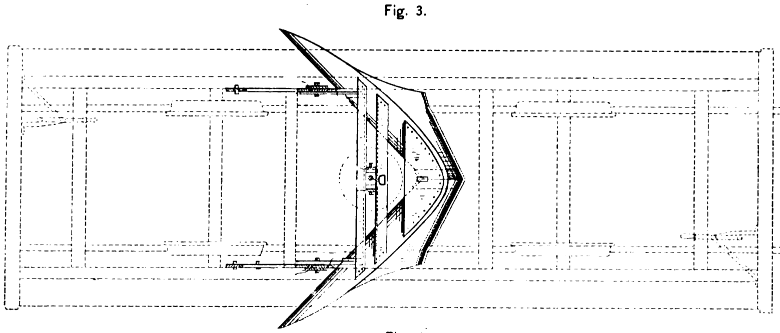


Fig. 4.

RODGERS' BALLAST CAR AND PLOW.

Interlocked Switches and Signals.

BY CHARLES R. JOHNSON, C. E.

IV.

JOHN IMRAY'S MACHINE.

John Imray, No. 1,354, *May* 3, 1872.—The principle of this machine is catch or preliminary locking of a type closely allied with the Saxby & Farmer. Horizontal hollow rocking shafts work in bearings fixed on the upper side of the top plate. These rockers coincide with the stroke of the lever working through a longitudinal slot in the rocker, and the slot has a recess at each end which engages with the lever and holds it in position when the catch handle is released at the end of the stroke, the well known segment and catch being dispensed with. The rocker has right and left hand lips at the back and front end of lever stroke respectively, which engage in turn with a cross on the end of the spring catch rod, thus performing the consecutive rotations of the rocker to do the locking and unlocking. The rocker has an extension in front of the lever, which carries short slotted arms engaging with studs mounted on locking bars, and these bars carry projections engaging and disengaging with slots in the periphery of the other rocker extensions. There are various modifications of this machine made by engineers in England and America, but although bearing the names of the makers they do not vary in principle from the invention of Mr. Imray.

MACKENZIE, CLUNES & HOLLAND MACHINE.

This machine may be described as "hook locking" and is of the lever locking type. There are two shafts, one carrying the dogs and the other the drivers, placed before and behind the line of levers respectively. The dogs are in the form of curved hooks, the hooks engaging with studs on the levers at certain times, and the shank, which is curved and radial to the lever centre, is held by the stud in the locked position at any portion of the lever stroke. The dogs are the full length of the lever stroke and are balanced by counterweights. The drivers are centred on the shaft behind the levers and are in the form of slotted links acting eccentrically to the lever centre in such manner as to have active motion at the beginning and end of lever stroke and a silent intermediate action. The motion of the drivers is communicated to the locking and releasing dogs centred on the shaft in front of the line of the levers by connecting rods and rocking shafts running in a horizontal plane in suitable bearings. In the early machines of this pattern all the locking connections are beneath the top plate, but in recent and improved machines the rocking shaft connections are carried above the top plate and in front of the lever.

R. C. RAPIER'S MACHINE.

This machine is manufactured by Messrs. Ransom & Rapier, of Ipswich, England, and is adapted to both lever and preliminary locking. The locking bars are carried in a framework facing the signalman, and are arranged in a circle or arc thereof. The bars have notches or dogs to engage with notches or stops of the periphery of a sector struck from the same centre as the bars. The dogs and sector notches are matched, so that the inventor can crowd a great many bars together, at the same time insuring safety against a dog entering the wrong notch. The sector of course approaches the complete circle in proportion to the number of locking bars. In the preliminary action type of this machine the bars are moved by hand to perform the locking and releasing, proper projections being affixed to the bars for that purpose. In the lever locking form the bars are driven by motion plates carried on the periphery of the sectors and engaging with studs screwed on to the lock bars. The distinct feature of this machine is the arrangement of locking bars in a circle or any arc thereof.

THE JOHNSON MACHINE.

The Johnson machine is thought to combine the best points of earlier machines, its new features being the movable rocker and the arrangement of special locking. Special or complex locking is much more used now than formerly through the introduction of appliances by means of which one lever is made to do the work of two, three and sometimes even four. The latest design of this machine is so arranged that every facility is given for alterations or additions, and so that one part can be taken out without disturbing another. A tappet can be taken out without disturbing locks or bars; a locking dog can be taken off without disturbing tappets or bars, and bars can be taken out without disturbing tappets and upon releasing the locking dogs that are upon it. This result has never been attained on any other machine. The other main features of the machine are that the locking is on Stevens' principle, the preliminary movement is that of Saxby & Farmer, and the handle is that of the London & Northwestern. An illustrated description of this machine will shortly be published.

THE FACING-POINT LOCK.

Interlocking machines were a great convenience, but a source of some danger until the facing-point lock was invented by Mr. Edwards and introduced by Messrs. Saxby & Farmer. The facing-point lock is an appliance by means of which a bolt is inserted into a hole formed in the front rod of the switch, to which it is attached and so arranged as not to enter until the points of the switch are close home to the stock rails on one side or the other. Attached to the same movement is a detector bar, hinged on clips fixed to the rail, and so arranged that its movement either for locking or unlocking cannot take place while the wheels of a car or engine are in such a position that the movement of the switch would cause a derailment. The object of the facing-point lock, therefore, is to insure that a switch shall be properly home and locked there before the signal to move over the switch can be given, and that the signal must be put to danger again before the switch can be moved, and this cannot be done while a car is standing on it or running over it. For many years the simple facing-point lock as above described was deemed sufficient. It was discovered, however, that one weak spot existed. If a switch set and locked say for the main track is required to be changed to the branch track, the order of movement is to first unlock the switch and then throw it. Suppose now the connections to the switch become dislocated in any way, the operator throws his switch lever, but the switch does not move. The operator will then again pull over his facing-point lock lever and lock the switch (as he supposes set for the branch). He can then lower his branch signal for a train which would run not on the branch but on the main line, and into any train that might happen to be on the main line. This very circumstance actually occurred recently, and only a few train lengths prevented a disastrous collision between two passenger trains. The difficulty and danger have been overcome, and duplex facing-point locks invented which insure that no matter how the connections may be tampered with or dislocated, a signal can only be given when the switch and lock are both in their proper positions. Only a very few of these duplex locks have as yet been used in this country.

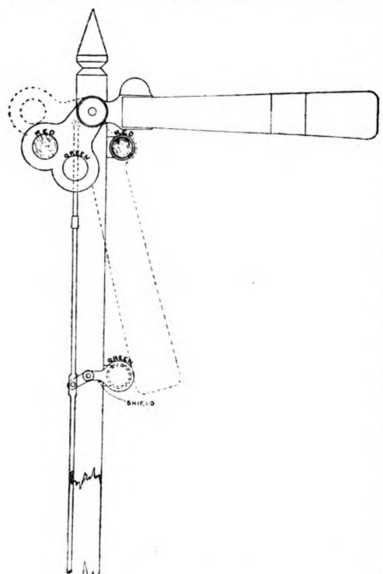
A great many kinds of detector bars are in existence, and the majority do their work fairly well, but there is still room for a bar that will work easily; be certain to stop the action of withdrawing the locking bolt while a train is on the switch; be difficult to break or damage, and not become useless through clogging by snow, ice or sand. The facing-point lock is never perfect unless fixed to an iron plate on the tie long enough to have lock, rails, rail braces, iron plate and tie all bolted together. When this is done the lock is always good, no matter how much the track may be moved.

Signal inspectors will do well to frequently examine facing-point locks to see that the holes in the front rod have not been tampered with. A very simple and rapid test is to place a piece of iron, one-eighth of an inch in thickness, between the switch tongue at the point and the rail, and then try to insert the bolt by having the lever pulled. If the bolt will enter the hole in the front rod, the hole is too large and a new front rod should be put in, or the old one altered to suit. The end of the plunger bolt should be square and not tapered, as is frequently done as a matter of convenience. If the switch is not properly home the bolt should not be able to enter, as its object is to hold the switch in position and not attempt to force it into position. Facing-point locks are too frequently taken as being in good order because they look so. Periodical tests are necessary to insure that the holes are correct, and also that the detector bar cannot be raised while a train is standing on the switch.

SIGNALS.

Notwithstanding the most persistent efforts to substitute some other form of signal, the semaphore signal is practically the standard to-day and is likely ever to be so. Disks and banners of various designs have been tried in all countries and by almost all roads, but all, with very few exceptions, have been displaced by the semaphore. It is so well known that all that need be said here is to describe the various methods in use for displaying the signal at night. The usual method for all stop signals, which include home, junction, starting, block and siding signals, is one red light for each blade when it is at "danger," and one white light when it is at "all clear." Distant signals show green for "caution" and white for "all clear," and by day are distinguished by having the blade forked.

A very perfect position signal is in use on the Boston & Albany and Old Colony railroads, but here although the signal is constructed in exactly the same way on both roads, one uses two white lights as a stop or danger signal, and the other two red lights, both, however, showing horizontal for "danger." The accompanying sketch will show the signal in its "danger" and "all clear" positions. This signal can-

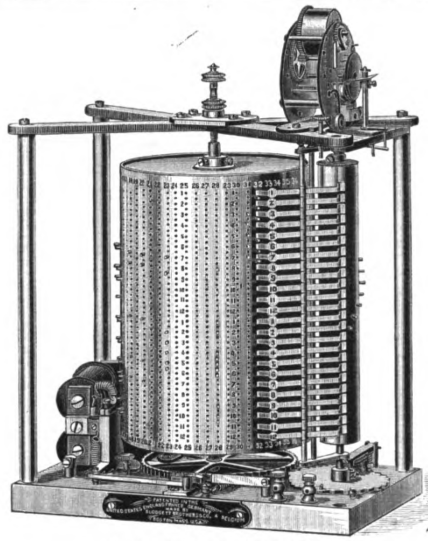


never give "all clear" lights unless the blade is at "all clear," and the lamps properly fixed, and no matter what glasses may be broken or lamps displaced the signal cannot be misunderstood.

A matter that is attracting some attention now is the best way of indicating fast and slow routes with the least complication. The usual method now in use is to have blades of a uniform size on a post, one being for each track to which a train can be turned from the track for which the signal is intended. There are two objections to this, one being that where several blades are on a post it necessitates the post being very high, and another and far more important one is that enginemen are sometimes in doubt as to which blade is for the fast running route, for there is scarcely ever more than one at any junction. This difficulty is overcome by having the top blade always for the fast running track; but when that is done the very excellent rule cannot be applied which makes the top blade of a signal for the track to the extreme right, and the next for the next track in order and so on. The writer introduced on the Boston & Albany the principle of having a large blade for the fast running track and a small blade or blades for the slow route or routes. At night the distinction was equally plain, for the small blades were illuminated, while the large one had the usual lights. Thus when an engineman is running at 60 miles an hour, he cannot for an instant be in doubt as to whether a signal is for or against him. The only objection raised to this system is that the illuminated blades cannot be seen at a sufficient distance at night, but this is a difficulty that can be overcome when necessary. On the road where the system was introduced no difficulty has been experienced.

An equally simple and perhaps more convenient method of giving a signal for every route is not to have more than two blades on a post for a main running track, the top blade to be in every case for fast running. If it is desired to further distinguish this blade it can readily be done. The lower blade will be for the slow route or routes, and these in their turn are distinguished by a number or letter equally well seen by day or by night, and which will only be shown when the signal is at "all clear." For siding and shifting signals only one blade and lamp is required, the indicator showing in front of the lamp when the signal is lowered to "all clear." This system of indicating numbers gives great satisfaction, and it is to be hoped it will be uniformly adopted. The construction of semaphore signals should always be such that the arm will be taken to the danger position when connections are broken at any point between lever and blade.

For shifting and siding movements, pot or disk signals have been used, but recently dwarf semaphore signals have to a considerable extent taken their place, and they are thought to be better and are certainly more consistent.



Blodgett's Electric Signal Clock.

Blodgett's Electric Signal Clock.

The problem of dispatching 50, 60 or 100 trains a day from a station, exactly on time, is not so simple as it may at first sight appear. Giving the signals for these trains to start is frequently put in the charge of the ticket agent, who, besides selling tickets, answering questions and making change, must strike the bells for the departure of each train. It is no wonder, then, that they are given irregularly, or occasionally omitted altogether. Even where this part of the business is done by a person specially detailed for the purpose, the errors are greater than would be supposed, and call for radical improvement.

It would probably be impossible, even for the ingenious inventor of the automatic machines, now well known, into which you can put a coin and draw out a stick of chewing gum or a Winchester rifle, to contrive a machine which would sell tickets, answer questions, or make change; but the following is a description of a machine which gives automatically the signals for the departure of every train in order, according to the time-table in use.

The essential principles of this apparatus are briefly these: The standard clock at the station is caused to close an electric circuit, in a well known way, once each minute. This vitalizes an electro-magnet, which, by means of a pawl and ratchet wheel of 60 teeth, gives motion to a vertical cylinder 6 in. diameter and 8 in. high, and causes it to make one complete revolution every hour. This cylinder is pierced with 24 rows of holes with 60 holes in each row; there is, therefore, a hole for each hour and minute of the day and night. Near this cylinder and at one side is a smaller one, furnished with 24 pins set in a spiral around the circumference, the spiral making one complete turn in the length of the cylinder. Between the two cylinders, and nearly tangent to each, is a vertical frame carrying 24 levers, each of which engages in turn with one of the pins in the smaller cylinder.

The time-table is set up on the larger cylinder. Since most railroads require two signals for every train—a preliminary signal given 2, 3, or 5 minutes before the train goes, and a departure signal sounded the exact moment it should start—all these signals are provided for in this instrument by inserting a short brass pin in those holes which correspond to the hour and minute when a signal should be given.

The larger cylinder makes a revolution each hour, and by means of a cam on its axis, moves the smaller one a space ahead, so that this latter makes one revolution in twenty-four hours. During each hour the rear end of one of the levers in the vertical frame rests on a pin in the small cylinder, and the front end of the same lever traverses the corresponding row of holes in the large cylinders.

The next hour the next lever comes into use, and so on through the series. If, while the rear end of a lever is supported on a pin in the small cylinder, the front end passes over a pin, the lever, and with it the frame in which it is pivoted, is moved a little distance away from the cylinder, and by means of a rocking shaft releases clock work, which, by means of a wheel with certain contact points in its periphery (in something the same manner as in a fire-alarm box), closes an electric circuit a definite number of times, and strikes the preliminary signal on the bells. After the lapse of the proper number of minutes, the lever passes a second pin, and the departure signal is sounded. The warning and departure signal for every train are given in like manner.

The frame carrying the 24 levers is supported on the edge of a cam having seven teeth, which is moved forward one tooth each day. A portion of the rim is cut away, and at midnight on Saturday the frame drops into this depression far enough to bring the 24 levers opposite intermediate rows of holes in the larger cylinder, on which the *Sunday* time-table is set up. On this day, therefore, the bells strike only for Sunday trains, and the week-day time-table is inoperative. At midnight Sunday, things are restored to the former condition for six days more. The machine is thus completely automatic, only requiring winding once a week, like an eight-day clock.

When the time-table changes the pins in the large cylinder are moved to the holes which correspond to the new times of departure of the trains. This can be done in a very few minutes, and the machine is then set till the time-table changes again.

This machine has been in use since 1882 or 1883 at most of the depots in Boston, and does its work with perfect satisfaction. One has recently been placed at the Union Depot in Worcester.

A marked improvement has taken place in the punctuality of passengers taking trains at stations where this instrument has been used. Formerly a belated passenger trusted to the humanity or timidity of the official not to strike the signal till he got aboard the train, but now it is out of his control, and passengers must be on time or lose their trains. They quickly fell in with the new system, and many now set their watches by the signal bells, which are reliable to a second.

An Automatic Time Indicator.

An instrument for the purpose of indicating to engineers the number of minutes which have elapsed since the departure of the last preceding train, and which acts on the same general principle as the devices for the same purpose which have been heretofore described, is now in use on the Syracuse, Geneva & Corning division of the Fall Brook