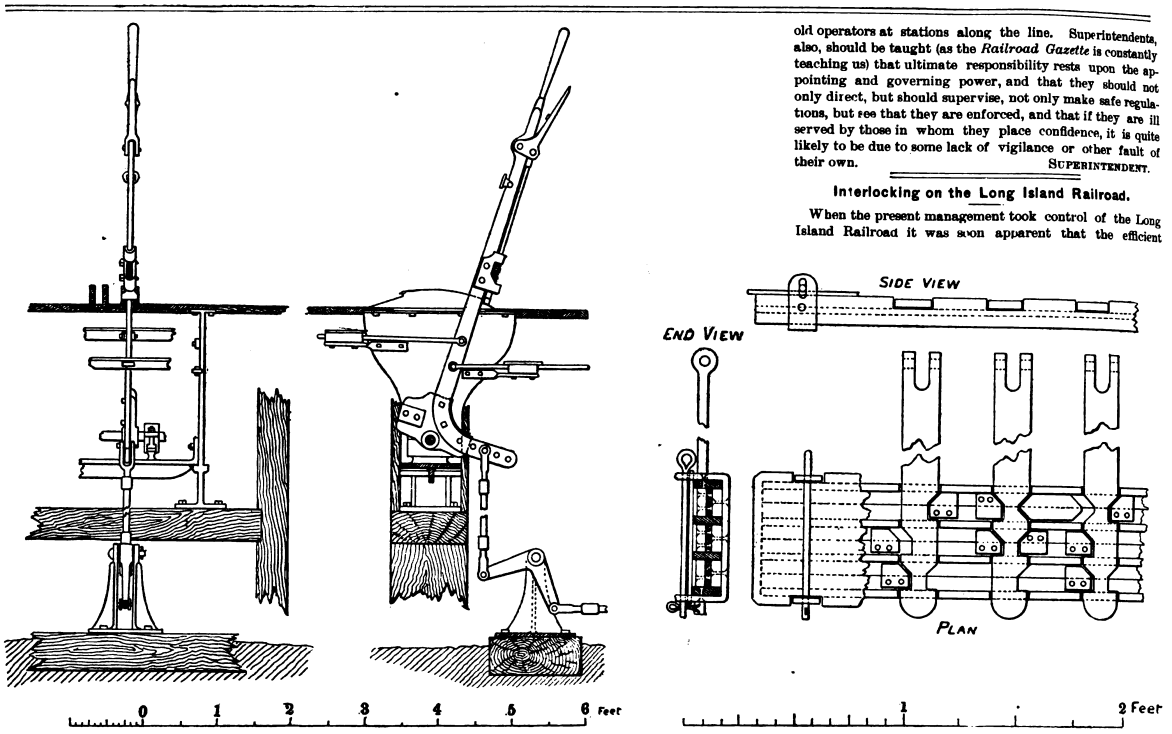


INTERLOCKING APPARATUS OF THE LONG ISLAND RAILROAD.

about it, because it forcibly illustrates about the only weak spot in the new train rules. (The Baltimore & Ohio's rules are not identical with those of the uniform code, but on this point they embody the same essential principles.) Excellent as these rules are, they would be infinitely more excellent if that important rule 510 contained a few words less; if the first sentence were omitted, and if there were also erased the qualifying words, "whenever practicable," which now serve to weaken a rule otherwise admirable in its simplicity and strength. It should read: "The signature of the conductor and engineman of the train of superior right must be taken to the order before the train of inferior right is allowed to act on it." Or, for the sake of clearer expression: "The signatures of the conductor and engineman of a train of superior right must be taken to an order restricting their schedule rights before 'complete' is given to an order to a train of inferior right that will permit the latter to use the time and rights of a superior train."

What a guarantee of safety would be afforded by a rule of this kind! But the addition of the words "whenever practicable," at once casts doubt upon the practicability of the rule, and extends an invitation to train dispatchers to throw responsibility upon operators, by "completing" their orders to an inferior train before the conductor and engineman of a superior train are heard from; and this once done, what is to prevent a disastrous collision, with possibly heavy loss of life, but the unerring and sleepless vigilance of perchance a lad of 16, or of a young girl, or, it may be, of a sufficiently mature person, but one who may have ticket selling, freight business, baggage checking, mail delivery, and Western Union work to attend to, in addition to the delivery of this life-and-death order to a superior train? Is it any wonder that, often, such orders are not delivered? In such cases it is easy to throw all the blame on the operator. The researches of a coroner's jury usually do not go far below the surface of the testimony; but the moral responsibility rests on older and broader shoulders than those on which it is often placed, and in these days of state and national railroad commissions, it is but a question of time before keen and searching scrutiny will in some of these cases put the blame where it belongs.

It is from this standpoint that the suggestion of your correspondent, "Orders," is to be regarded with the greatest interest. Is it possible to abolish the phrase "whenever practicable," and to hold a train dispatcher to a rigid cast-iron rule of assuring himself of the delivery of the order to the ruling train before allowing the inferior train to use a corresponding order against it? Possibly a majority of train dispatchers and superintendents will at once say "No, it can't be done. If we try to do it, the greatest delays will be caused. Even if telegraph offices are increased until the capacity of the wire is overtaxed, still grievous delays will result, for superior trains will still be held between telegraph offices by utterly unlooked for causes, and under the operation of such a rule, we could not help the inferior train to the slightest extent until the superior train finally turned up at a telegraph office." And so, upon this reasoning, this good rule 510 is emasculated, by the use of the qualifying term, "whenever practicable;" and upon warrant thus given, train dispatchers proceed as before to move inferior trains upon the mere O. K'ing (or receipting) of orders to superior trains by the operators who have received them and have not yet delivered them. What is O K.'ing under such circumstances but a legalized "flag and hold?"—and yet "flag and hold" orders when so expressed without circumlocution are a generally admitted abomination. Truly, it would take a Philadelphia lawyer to define the exact shade of difference between the one form of chance-taking and the other.

In its issue of Dec. 30, 1887, after commenting upon this same Finleyville accident, the *Railroad Gazette* remarked, editorially, as follows: "Where the rule requiring the consent of the ruling train to be always first obtained is laid aside or suspended simply from lack of offices, operators, or dispatchers, it will be well to consider whether the lives of passengers and train men and the reputation of the road do not demand an increase of facilities in this direction."

Wise words those; and now promptly comes forward your correspondent "Orders," to testify that it has been found practicable to move trains in both directions by telegraph without the risk incurred by giving the running right to the inferior train previous to obtaining the understanding of the conductor and engineer of the superior train that their rights have been curtailed, and without delay to either train, and without multiplication of telegraph offices. And he explains how this is done: * * * Three men are responsible and "interested in the delivery of the orders." Could precautions in the way of making a safe meeting point go further, or could chances for delay be reduced to a smaller minimum, or is it surprising that on the road referred to—a single track road, with business for fifty crews—there has not been a collision from misdelivery of orders during the entire period of over thirteen years that this system has been in use?

"Orders" does not claim, nor do I, that this advance order system is new and original. It may be, for aught we know, common enough on plenty of roads, and if so, we venture to assert that those using it are well pleased with it; but it does not seem to be in common use hereabouts, possibly because some may think, as does the *Gazette* of Jan. 20, that it might offer a temptation to lapse into the old single order system. If so, they may be assured that the duplicate order system, once tried, is not likely to be departed from; but that if they will try "advance orders" to superior trains, *in connection with the duplicate system*, they will find the grafting process a very easy one; that train dispatchers will soon fall into the habit of using excellent forethought in order to gain the best results from their "advance orders;" and that it will be found possible for safety and celerity in train movement to go hand in hand. Then, with chances for delay largely eliminated, may we not adopt rule 510 in the strength and simplicity which it would present with the evasive, shuffling "whenever practicable" erased from it. * * * The rule should appear without any hazardous qualifications, and if unusual circumstances at any time necessitate departure from it on the part of a train dispatcher, let him explain all the facts to his superintendent as soon afterward as possible, if he cannot do so at the time.

Dispatchers should be taught that the primary responsibility for safe train running is upon them, they being experienced men, carefully selected for their positions on the score of fitness and relieved from all other duties that may conflict with their important business of running trains, and that they must not delegate this responsibility to young or old operators at stations along the line. Superintendents, also, should be taught (as the *Railroad Gazette* is constantly teaching us) that ultimate responsibility rests upon the appointing and governing power, and that they should not only direct, but should supervise, not only make safe regulations, but see that they are enforced, and that if they are ill served by those in whom they place confidence, it is quite likely to be due to some lack of vigilance or other fault of their own.

SUPERINTENDENT.

## Interlocking on the Long Island Railroad.

When the present management took control of the Long Island Railroad it was soon apparent that the efficient operating of it demanded the best possible system of train protection. There are numerous junctions and crossings, and the business of the road consists to an unusual degree in the movement of passenger trains, running short distances, and at considerable speed between stations. Some notion of the relative importance of this part of its business may be got by comparing it with the Pennsylvania lines east of Pittsburgh and Erie, and with the Erie. The Pennsylvania does a very large suburban business out of several cities, and the Erie a large but less important one. We will compare the passenger train miles, freight train miles, passenger miles and ton miles *per mile of road operated* on each of the three roads, and take the Long Island traffic as unity. The comparison will not give the absolute traffic per mile operated, but will show the relative density of each kind of traffic on each of the three lines. The figures are for 1886, and are taken in round numbers.

| | Long Island. | Penna. | Erie. |
|---|---|---|---|
| Pass. train miles | 1 | 0.83 | 0.67 |
| Freight " | 1 | 11.2 | 7.88 |
| Passenger miles | 1 | 0.78 | 0.55 |
| Ton miles | 1 | 31.00 | 31.00 |

It will be apparent from these figures how important a part of the business of the road the short distance passenger trains are, and within a radius of 20 miles there are some 20 junctions and crossings. Although the first expenditures of the present management were necessarily in the improvement of roadbed, track and rolling stock, they early began that system of interlocking which has since been carried out with great thoroughness. The Union Switch & Signal Co. first put up three towers—at East New York junction 24 levers, at Fresh Pond 16 levers and at Winfield 24 levers. The East New York tower is an iron structure spanning the Manhattan Beach tracks at a crowded point, where rapid transit trains are run independently of the regular traffic.

The company then began building its own interlocking apparatus. The mechanism adopted is shown in the illustrations herewith. It is a modification of the old Stevens apparatus, and was devised by Mr. T. W. Burley, foreman of the interlocking work at Long Island City. The interlocking systems have been designed and carried out under the immediate orders of the General Roadmaster, Mr. G. W. Offutt. The interlocking is actuated by the motion of the levers. The arms extending forward and backward from the levers give motion, by means of the beveled lugs shown in the plan, to bars which move longitudinally of the frame. These arms are in turn interlocked by the motion of the sliding bars. The mechanism is so simple that its action can be readily understood from the engravings. It will be seen that the principle of actuating the interlocking by the movement of the spring latch is abandoned, and this must be regarded as a departure from the best practice. On the other hand, the machine is simple and comparatively inexpensive, and it may be found in practice that the objections to other devices working on this principle, which have arisen, will not obtain in this case.

There are now in service 14 towers aggregating 302 levers, as follows: Montauk junction, 48 levers; Fresh Pond junction, 16 levers; Winfield, 24; Glendale junction, 12; East New York junction, 24; Manhattan Beach junction, 8; Jamaica cross switches, 48; Rockaway junction, 12; Valley Stream junction, 24; Pearsall's junction, 14; East Hinsdale,

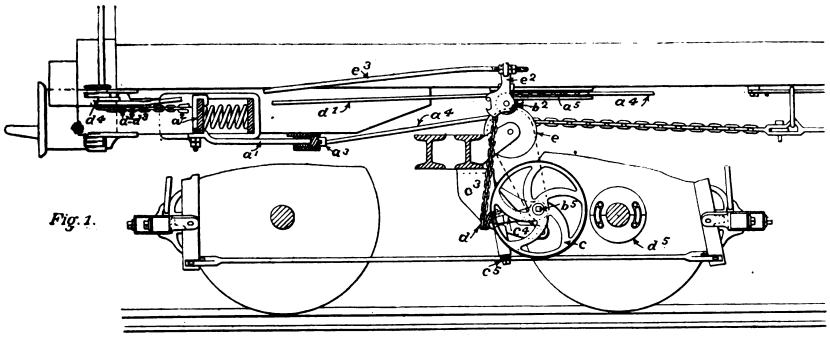

Fig. 1.

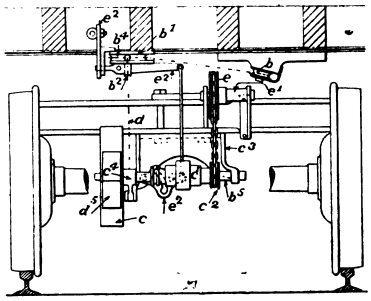

Fig. 3.

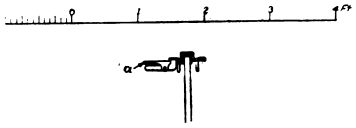

Fig. 4

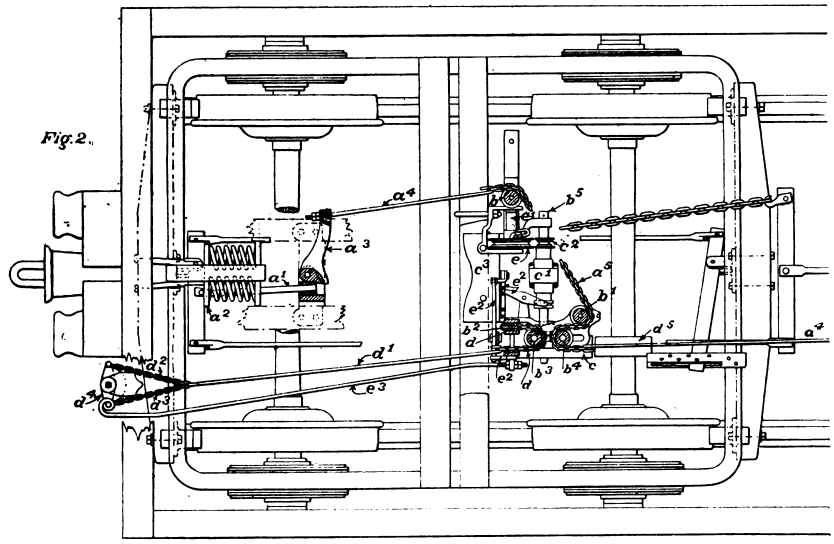

Fig. 2.

THE TURNER-BEARD BUFFER FREIGHT BRAKE.

24; Bethpage junction, 20; North Shore, 16; and Wood Haven, 12 levers.

The most important points protected by the interlocking are Montauk junction, just outside the main yard, at the Long Island City terminus, and the Jamaica cross switches. Each is worked by 48 levers. The Montauk junction tower stands in a position from which switches can be handled and signals set protecting all trains east-bound from the yard, and all west-bound trains from the North Shore division, the old Long Island road, all main line and Montauk division trains, as well as Long Beach, Rockaway and Manhattan Beach tracks; 239 regular trains are handled by the two operators in this tower daily, besides the immense amount of drilling necessarily performed at this point. Though not required to handle so many trains, the apparatus at Jamaica cross switches is fully as important and as complete in all its appointments.

At East Hinsdale a set of arm gates for a highway crossing is worked from the tower and interlocked. At this point, as well as at all the towers lately constructed, derailing switches are used, and the statement is made that "they work very effectually in preventing engines passing the home signals," which no one can doubt.

A few other points on the line of road remain as yet unprotected, but will receive attention as fast as the work can be pushed. The most important of these are Garden City, Belmont Junction, Hicksville, Mineola and Van Wicklens.

### The Turner-Beard Buffer Freight Brake.

The accompanying illustrations represent a form of buffer brake that is now being applied to 100 freight cars on the Boston & Albany.

It will be seen that the brake is primarily actuated by any compression of the draw-springs caused by a check in front of the train or by the application of the brake on the engine. The inward movement of the drawhead causes a friction wheel connected with the chain of the ordinary foundation brake rigging to engage with a friction wheel fast on an axle. The brake chain is then wound up by the rotation of the friction wheels which continue to revolve until the car wheels skid or the pressure on the drawhead is released. It is claimed that a spring limits the maximum force with which the brake is applied. The brake must be set for the direction in which the train is moving, and is inoperative in backing unless a lever is moved by hand for that purpose.

Mr. W. B. Turner, the president of the Turner-Beard Brake Co., writes us as follows:

"The brake is known as a friction brake and the action is as follows: The drawheads of the car are connected by means of levers and a rod and chain connection through which the first ⅝-in. of inward motion is transmitted to a lever that brings the friction wheel into contact with a friction collar that is secured to the car axle. The power to apply the brake is derived from the revolution of the axle by the pressure of one wheel against the other. An adjustable spring is interposed in the connection by which the power of the brake is determined, said spring is adjusted so that the brake will not slide the wheels. A lever is located on the top of the car, by which the brake is made to operate in the direction in which the train is going or rendered entirely inoperative, as desired. When this lever is set for the train to run east, the brake will not operate if the train be run west. Hence the train may be backed with impunity.

The combined action of both drawheads is necessary to apply the brake, and releasing the pressure on either drawhead releases the brake.

We have made stops at 28 miles an hour in 376 ft., and have graduated trains of 40 cars down 80-ft. grades by using the hand brake on the two front cars (this was where there was no brake on the engine), and have also let trains down grades with the tender brake.

The points of superiority which we claim for the brake are:

1. Its independent character, by which mixed trains may be handled without extra switching.
2. The brake will stop a train in the least possible distance consistent with safety.
3. It will not cause sliding of wheels.
4. It is very simple in construction.
5. Its cost is but nominal when compared with others.

Its extreme cheapness and its independent character are the strongest points in its favor for freight service. These, combined with the fact that it is under the control of either the engineer, conductor or brakeman, and that it will handle a train either on the level or on grades equal to, if not superior to, a continuous brake, and that we can graduate the brake pressure in proportion to the weight of the car and its load, and in fact perform every function necessary to the proper and economical handling of freight trains, render it the most adaptable brake for freight service.

It causes no shock in stopping trains. The power of the brake can be graduated in proportion to the weight of the car when empty, and can also be automatically graduated in proportion to the weight of the load.

We can stop the rear portion of a train that becomes accidentally detached, and, in fact, it will perform any and every duty required of a brake in the freight train service.

We have experimented with it on the Boston & Albany for over two years, in which time all our improvements have been made. The brakes were turned out into actual service and carefully watched and as soon as any defect was found it was corrected. This line of operation we followed until there was no further improvement to be made.

We not only submitted the brake to the tests of actual service, but we made various tests to determine its practicability in stopping trains without causing shocks and to see in what distance it could be done, and in fact any and all tests that the freight service would require.

The results of our tests were so satisfactory that the Boston & Albany have equipped nearly 100 cars at their own expense and from present prospects the day is not far distant when they will begin the equipping of their entire freight equipment."

The following detailed description of the brake will be best understood by referring to the engravings.

The following sign is printed on every car: "In use point this handle towards the engine, in the centre notch the brake is inoperative." The handle $a$ fig. 4 being pointed toward the engine, the brake will be operative when running in this direction, under the control of the engineer. If he wishes to stop or slow up, he shuts off steam and applies a brake to his engine; this causes a closing up of the train, which produces a push inward on the draw-bars of each car. When the draw-bar is pushed in ⅝ in., the rod $a^1$ attached to the follower and acting on the lever $a^2$, draws the rod $a^4$ back 3 in. This operation is alike on both ends of the car and the rods $a^4$ are connected with each other by the chain $a^5$. The guide pulleys $b$, $b^1$ and $b^2$ are fixed, but the pulleys $b^3$, $b^4$ are movable lengthwise and connected with each other. The shaft $b^3$, fig. 1, carrying the friction wheel $c$, the reversible clutch $c^1$ to which is attached the sprocket wheel $c^2$, has one bearing in the bracket $c^3$ and the other in the lever $c^4$. One end of said lever $c^4$ rests in the bracket $c^3$, the other end is supplied with the spring $c^5$ to which is attached the chain $d$. Said chain $d$ passes round the pulley $b^3$ and is by the rod $d^1$ connected with the chains $d^2$ $d^3$, fastened to each end of the lever $d^4$, this being operated by the handle $a$. When the draw-bars are in the ordinary position and the lever $d^4$ in its centre one, as shown on fig. 2, there is 6 in. slack in the chain $d$. But when the lever $d^4$ is turned 90 degrees to either side, there is 3 in. slack in the chain $d$. When now the lever $d^4$ is in its centre position and the rods $a^4$ have gone back 3 in., the pulleys $b^3$ $b^4$ will be moved 3 in. in opposite direction of lever $d^4$, thus taking up 6 in. slack of the chain $d$, but leaving the position of the lever $c^4$ unaltered, consequently the brake is inoperative. But when the lever $d^4$ is turned 90 degrees to either side corresponding with the direction in which the car is going, and the rods $a^4$ have gone back 3 in. each, the pulleys $b^3$ $b^4$ will be moved 3 in. in opposite direction of the lever $d^4$, thereby taking up the 3 in. slack in the chain $d$ and lifting the lever $c^4$ until the friction wheel $c$ is brought into contact with the friction collar $d^5$ and compressing the spring $c^5$ until the rest of the 6 in. is taken up. The friction wheel $c$ will now revolve, taking with it the shaft clutch and sprocket wheel. This transmits the power to a larger sprocket wheel $e$, which winds the brake chain on the drum $e^1$, thus bringing into action the ordinary brake mechanism of the car and gradually, yet forcibly, to any extent applying the brake. By a set of common levers, all marked $e^2$, connected with the rod $e^3$, attached to the lever $d^4$, the clutch can be reversed in order to correspond with the direction in which the train is going. But when the handle $a$ is pointed in one direction, the brake will not work in the opposite direction, when, for instance, the friction wheel $c$ by backing is brought into contact with the collar $d^5$, thus allowing the whole train to be freely backed.