

Electric Train Staff Installation

Refinements Added to the Ordinary System for Different Locations on the Canadian Pacific

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The Canadian Pacific has in service on the Eastern Lines a number of electric train staff installations on short sections of single track, over which a large number of train movements are made. In addition to these, several installations have been made recently on portions of the Lake Superior division. It is the intention to double track the entire division, and the double track not being entirely completed, the staff system was installed on the remaining single track portions in order to eliminate train orders.

There are now in operation a total of twenty-one staff blocks, comprising in all forty-six staff instruments. No attempt has yet been made to operate an entire division with this system, the installations now in service being installed to take care of local conditions.

INSTRUMENTS.

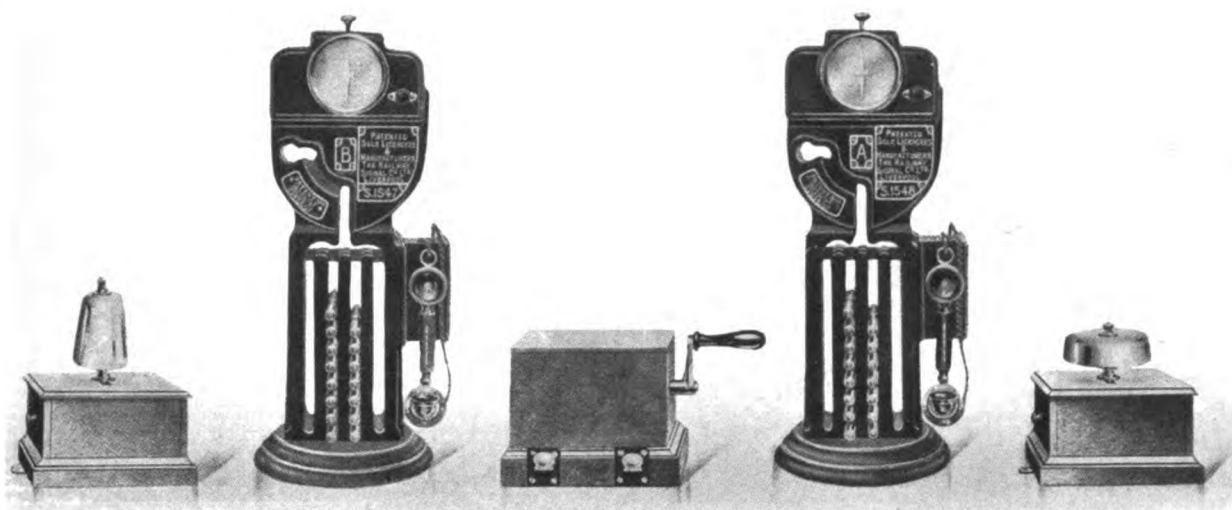
The instruments used are manufactured by the Railway Signal Company, of Liverpool, England, and are known as their type

TRAIN STAFFS.

The staffs are steel rods, nine inches long, on which four brass rings are mounted. The staff marked A, Fig. 1, shows the appearance of this type, but the ordinary staff is indivisible. On one end a brass handle is mounted, on which is engraved the type of instruments to which a staff belongs, there being four types, and these are designated A, B, C and D. An "A" staff cannot be inserted in a "B" instrument, etc., making it impossible for the staff belonging to one block to be inserted in the instrument of an adjoining block.

Also, when two or more blocks adjoin one another, a brass plate on which is engraved the names of the stations at each end of the block, is riveted to the handle, in order to identify the staff with the particular block it governs. These name plates may be removed and new ones substituted should a pair of instruments be moved to another location.

Permissive movements through a staff block are made by



Electric Train Staff Instruments on the Canadian Pacific.

S miniature instruments, as shown, and were supplied by Messrs. Saxby & Farmer, Ltd., Montreal. The instruments are operated over a metallic circuit, consisting of two 210-lb. B. & S. bare copper wires strung on the telegraph poles. Current for the operation of the staff instruments is furnished by a magneto generator. The chief advantage of magneto over battery working is that it is impossible to reverse the polarity, as has been done with battery working by a careless maintainer connecting cells wrongly, when recharging.

The armature of the magneto can be rotated in one direction only, the handle of the magneto being provided with a ratchet and the driving gear with a special lock. Each magneto is equipped with two tapper keys so that one magneto serves current for block on each side of station. The keys are mechanically interlocked to prevent current from being sent in both directions at the same time.

Each staff instrument is equipped with an indicator which shows whether the instruments are "free" or "blocked," the indicator on both instruments reading "staff out, line blocked" when a staff has been withdrawn from either instrument, and "staff in, line clear" when no staff is out.

staffs which are divisible into two parts (Fig. 1). The two parts of the staff must be tightly screwed together before the staff can be replaced in the instrument.

Each set of instruments is provided with forty staffs, twenty of these being divisible when the permissive feature is used. At one or two points where traffic is not heavy, and where train movements are nearly equal in both directions, only thirty staffs are provided. The capacity of each staff instrument is forty staffs.

Each staff instrument is provided with a telephone, which is worked over the staff line wires, providing a means of communication between operators, which is found of great convenience.

The method of operating the instruments is clearly shown in the instructions which are posted at each staff station, a reproduction of which is shown herewith.

AUTOMATIC OPERATOR.

On staff sections over which there are few train movements at night, the operator has been dispensed with at the office at one end of the block by the installation of an "automatic

operator" attachment. This attachment makes it necessary to use a battery instead of magneto generator. The automatic operator consists of a stick relay, the armature of which is balanced, and on which there is one normally closed, and one normally open contact, the other members of these contacts being on pivoted weights. There is also a key for giving bell

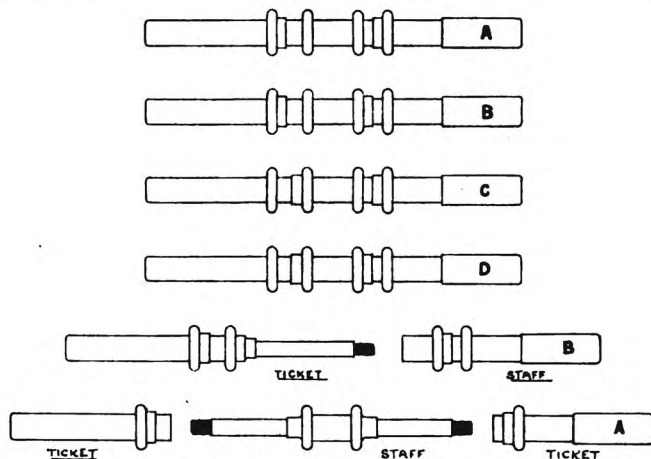


Fig. 1. Divisible Electric Train Staff, C. P. Ry.

signals to station at opposite end of block. The wiring for a staff section, equipped with one automatic operation, is shown in Fig. 3. It is possible to operate a staff block without an operator at either station, by using this attachment at each end. Twenty No. 8 dry cells are used to furnish current for the operation of each automatic operator. When current is passed through the line, the armature is rotated in a direction to cause it to lift the weight on which the normally closed contact is fixed. When current through the line is broken, this weight causes the armature to rotate in the opposite direction a sufficient distance to close the other contact and cut-in a local battery. Current from this battery passes through a pair of coils holding the armature in this position, and releases the staff at opposite ends of block. When circuit is again broken, armature resumes its normal position by gravity, and battery is then cut off the line.

Manawaki Junction, it was necessary to install an auxiliary pair of instruments between Hull and Maniwaki Junction, Fig. 4. These four instruments are the same type, so that a staff from one instrument may be deposited in any other instrument, and a train obtaining a staff for this block, may move from This attachment has now been installed on four staff sections on the Ontario division, and is operating satisfactorily. One

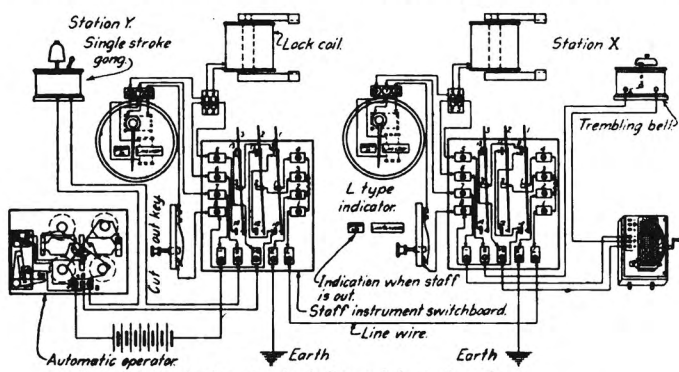


Fig. 3. Wiring Diagram for Automatic Operator.

has also been installed on the Eastern division near Ottawa, in connection with an auxiliary staff block which is shown in Fig. 4.

AUXILIARY PAIR OF INSTRUMENTS.

In the staff block between Hull and Sparks Street Station, Ottawa, on account of a branch line joining this section at Hull to Sparks Street, Hull to Manawaki Junction, or Manawaki

Junction to Sparks Street, or vice versa. When there is no staff out of the instruments, one or the other of the two pairs are out of phase, and a staff can only be obtained from the pair which is in phase. For instance, if a train is required to move from Hull to Maniwaki Junction, and the pair of instruments between Hull and Sparks Street are in phase, and the other pair out of phase, a staff must be withdrawn from the Hull Sparks Street pair at Hull, thus causing both pairs of instruments to be out of phase. Upon arrival of the train at Manawaki Junction, the staff will be deposited in the instrument there, causing the Hull Manawaki Junction pair to be in phase. Should a train now be required to move from Sparks Street to Hull, it will be necessary for Hull to withdraw a Staff from the

INSTRUCTIONS

TO OPERATORS, CONDUCTORS AND ENGINEERS FOR THE OPERATION OF ELECTRIC TRAIN STAFF INSTRUMENTS.

BELL CODE.

- ONE RING.—TO DRAW ATTENTION THAT STAFF IS REQUIRED. And acknowledgment.
- TWO RINGS.—ANSWER TELEPHONE. Acknowledgment by one ring.
- THREE RINGS.—ASKING FOR CURRENT TO RELEASE STAFF. Acknowledgment by one ring and continue turning handle with Bell Key depressed.
- FOUR RINGS.—STAFF IS RELEASED. Acknowledgment by one ring.
- FIVE RINGS.—STAFF HAS BEEN INSERTED IN INSTRUMENT at the opposite end of block. Acknowledgment by one ring.
- SIX RINGS.—SPECIAL STAFF HAS BEEN INSERTED IN INSTRUMENT. Acknowledgment by one ring.
- SEVEN RINGS.—STAFF HAS BEEN REPLACED IN INSTRUMENT AT SAME END. Acknowledgment by one ring.
- EIGHT RINGS.—TESTING.

1.—Each depression of Bell Key will cause the Bell to ring once. Bell Key must be depressed WHILE HANDLE OF MAGNETO IS BEING TURNED, excepting where an Automatic Attachment is installed, which case no Magneto is provided. Make distinct pause between each depression of Bell Key if more than one ring is being given.

2.—WHEN IT IS DESIRED TO WITHDRAW A STAFF, the Bell Key must be depressed once to draw the Operator's attention at the opposite end that a staff is required. The Operator at the opposite end must then depress the Bell Key three times, when the Operator at the other end must hold the Bell Key depressed until the Needle has moved once to the vertical position, when the Bell Key can be released.

WHEN THE STAFF HAS BEEN WITHDRAWN the Operator must press the button on the upper right hand side of the Holder, and when the Needle has returned to the vertical position, the Operator must then depress the Bell Key four times, and the Operator at the other end must acknowledge by depressing the Bell Key once.

WHEN THE STAFF HAS BEEN INSERTED IN THE INSTRUMENT at the opposite end from which it was withdrawn, the Operator who inserts the staff must depress the Bell Key five times and the Operator at the other end must acknowledge by depressing the Bell Key once.

IF THE STAFF IS REPLACED IN THE SAME END from which it was withdrawn, the Operator who replaces the staff must depress the Bell Key seven times and the Operator at the opposite end must acknowledge by depressing the Bell Key once. A STAFF MUST NOT BE RAISED into the upper vertical slot of the instrument until the current is being received from opposite end, which is indicated by Galvanometer Needle being away from the vertical position.

IF THE STAFF CANNOT BE WITHDRAWN, lower staff from upper vertical slot and try again.

AUTOMATIC ATTACHMENT.

1.—WHERE AN OPERATOR IS NOT EMPLOYED an automatic attachment is provided. THE CONDUCTOR OR ENGINEER, as the case may be, must obtain the staff from, and insert the staff into, the holder in the manner described in Rules Nos. 1 and 2.

THE OPERATOR at the opposite end of block must obtain release of staff in the manner described in Rules Nos. 1 and 2 excepting that Bell Signals will not be received by him, and he must always, after using the instrument, press the button at the upper right hand side of the holder until Bell ceases to ring.

UNATTENDED PASSING TRACK ATTACHMENT.

4.—SPECIAL STAFF ATTACHMENTS ARE PROVIDED, and when it is desired that two trains shall meet at an unattended passing track, the Operator at the initial station must withdraw an ordinary staff from the holder in the manner described in Rules Nos. 1 and 2, and insert it in the bottom drawer of the Special Attachment and push the drawer in. The Operator must then open the upper drawer of the Special Attachment and withdraw the Special Staff. Operator must then turn handle of the Magneto and depress the Key to give current for the release of the Special Staff at the Station at the opposite end of the block. The Operator at the opposite end must then close the top or dummy drawer of the Special Attachment, and while current is being received from opposite end, as indicated by Galvanometer Needle, open bottom drawer and withdraw Special Staff.

TO REPLACE SPECIAL STAFFS. Operator at initial station must replace Special Staff in the upper drawer, and push the drawer in. The bottom drawer cannot be opened to allow ordinary staff to be withdrawn until the Operator at the opposite end has inserted the Special Staff in the bottom drawer at his Station, and closed it and opened the top drawer. Operator must then turn handle of Magneto and depress the Key to give current for the release of the Special Attachment at the initial Station. The Operator at the initial Station must then open the bottom drawer and withdraw ordinary staff from Special Attachment. The staff must then be inserted into the holder and the Bell Signals given, as per Rules Nos. 1 and 2.

SPECIAL PUSHER STAFF ATTACHMENT.

5.—WHEN A PUSHER ENGINE IS REQUIRED TO ASSIST A TRAIN THROUGH A PORTION OF A BLOCK:—The Operator, to obtain the Special Pusher Staff, must, after withdrawing the ordinary staff, insert it in the drawer of the Special Pusher Staff Attachment, and push the drawer in. The drawer containing the Special Pusher Staff must then be opened and the Special Staff withdrawn. The drawer containing the ordinary staff must then be opened and the ordinary staff must be withdrawn. The ordinary staff must be inserted into the Conductor of the train, and the Special Pusher Staff inserted into the drawer of the Special Attachment and push the drawer in.

The Operator receiving the Special Pusher Staff must insert it in the drawer of the Special Attachment and push the drawer in. See Special Rules in Time Tables governing movement of trains under Electric Train Staff System.

Fig. 2. Instructions to Trainmen for Operating Electric Train Staff Apparatus.

Hull-Manawaki Set, and deposit in Hull-Sparks Street Set. This will allow Sparks Street to withdraw a staff.

On account of Manawaki Junction being a day office only, and to avoid the possibility at night of Hull depositing a staff in Hull-Manawaki Junction instrument by mistake, and thus making it impossible to withdraw a staff from either pair, on account of Manawaki Junction being closed, an automatic operator was installed at Manawaki Junction, which enables Hull to withdraw a staff from that pair, without any action being taken by Manawaki Junction.

SEVERAL AUXILIARY INSTRUMENTS.

It will be seen from the arrangement of instruments in Fig. 4 that this scheme may be carried out with as many auxiliary pairs as desired by arranging the wiring of the instruments so that only one pair will be in phase when no staff is out. Fig.

5 shows an installation of this character, having two auxiliary pairs instead of one, and with an automatic operator at each Junction point. This installation is now under consideration, and will govern movements of C. P. R. trains between N. Y. & O. Junction & Grand Trunk Junction, New York & Ottawa trains between N. Y. & O. Junction and the point where these

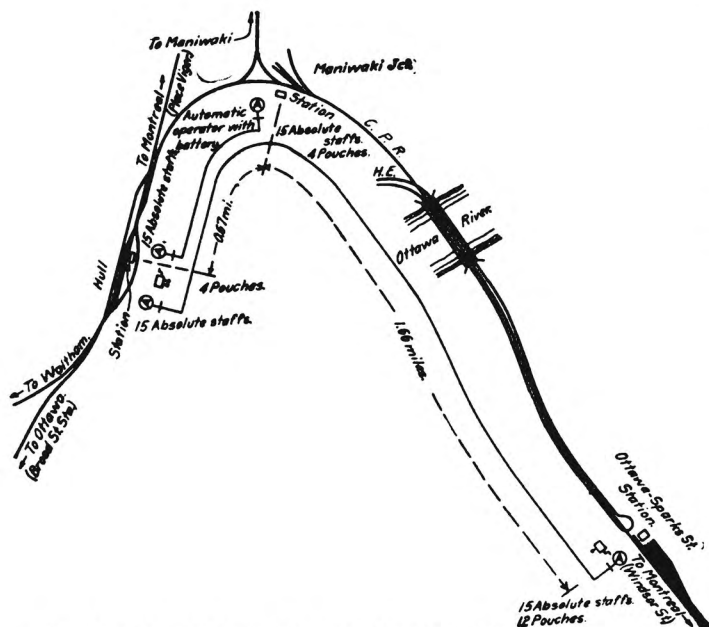


Fig. 4. Electric Train Staff Installations With Auxiliary Instruments for Maniwaki Junction.

trains leave the C. P. R. line, and C. P. R. locomotives between Grand Trunk Junction and Round House. No operator will be required at N. Y. & O. switch location, or at C. P. R. round house. Although the staff block will govern only to or from Grand Trunk Junction, staffs will be carried to Sparks Street station where instrument will be placed. As magneto generators are only equipped with two keys, capable of operating two pairs of instruments, a special switch will be provided at N. Y. & O. Junction to enable one magneto to be used to operate any one of the three sets of instruments.

SPECIAL DESIGN FOR PASSING TRAINS AT A SIDING

Between McAdam Junction, N. B. and Vanceboro, Me., Atlantic division, a staff block has been installed, with an unattended passing track attachment to allow trains to pass at Burpee, Fig. 6. Through movements between McAdam Junction and Vanceboro are made in the regular manner.

When it is desired to pass two trains at Burpee, special staffs are used. At McAdam, which is designated as the "initial" station, a special instrument is provided, having two drawers. The top drawer contains the special passing staff, and is me-

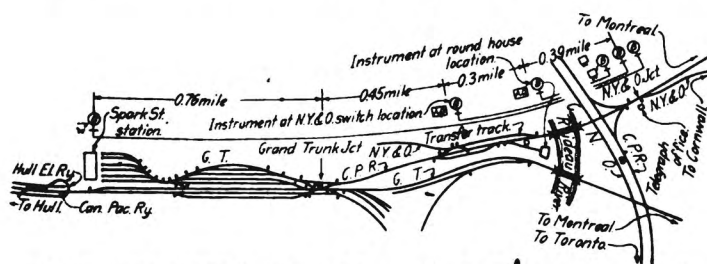


Fig. 5. Proposed Installation Between N. Y. & O. Jct. and Sparks Street Station.

chanically locked in the closed position. The bottom drawer is normally open and cannot be closed until a regular staff has been inserted in it.

At Vanceboro a similar instrument is provided, the top drawer of which is normally open, and is called the dummy drawer, as it is used for the operation of the circuit controller, and no

staff is ever placed in it. The bottom drawer contains the special passing staff, and is mechanically locked in the closed position. These instruments are operated over a separate line wire from the regular instruments.

To withdraw the special staff, McAdam first withdraws an ordinary staff, which is inserted in the bottom drawer of the special instrument at that station. This drawer is then closed, which mechanically unlocks the top drawer on that instrument and the special staff is withdrawn. Opening the top drawer operates the circuit controller which connects one of the keys of the magneto generator to the line wire operating the special instrument. Vanceboro then closes the dummy drawer which

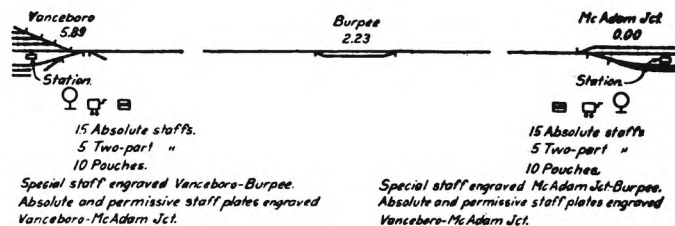


Fig. 6. Electric Train Staffs With Special Instruments to Permit Trains to Pass at Burpee.

operates the circuit controller on that instrument, cutting the lock coil in circuit, which releases the drawer containing special passing staff. McAdam then unlocks bottom drawer at Vanceboro by turning handle of magneto. Both special staffs and a regular staff have now been withdrawn, the regular staff being locked in drawer of special instrument at McAdam. The special passing staffs are then delivered to the trains which are to pass at Burpee. These special staffs confer right only from the station at which they are issued, to Burpee. When the trains reach Burpee, they exchange staffs and proceed, the special staffs thus always being returned to the stations from which they were originally issued. The handles of these special staffs are engraved McAdam-Burpee, and Vanceboro-Burpee.

McAdam replaces special staff in top drawer and closes

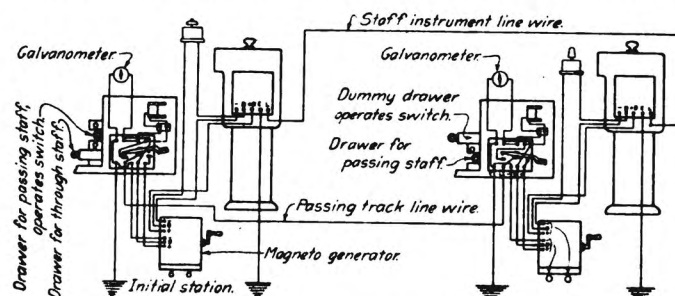


Fig. 7. Wiring Diagram for Unattended Passing Track.

drawer. The bottom drawer, containing the regular staff, cannot be opened until Vanceboro has inserted the special staff in the bottom drawer of that instrument and closed it, and opened the top or dummy drawer. The bottom drawer at McAdam is then released by Vanceboro turning handle of the magneto, and the regular staff is withdrawn and inserted in the instrument at McAdam in the usual manner. Fig. 8 shows the wiring of these instruments.

PUSHER STAFF.

Where it is necessary for a train to be assisted through a portion of a block, a special pusher staff attachment is provided. This consists of an instrument with two drawers, one of which contains the special pusher staff and is mechanically locked in closed position. The other drawer receives the regular staff.

To obtain the pusher staff a regular staff is withdrawn in the usual manner, and deposited in the open drawer of the pusher attachment and the drawer is closed. This mechanically releases the drawer containing the pusher staff. After the pusher staff is withdrawn, the regular staff is also withdrawn. The

opening of the drawer containing the pusher staff operates a circuit breaker which opens the line. When the pusher returns, the pusher staff is replaced in its drawer and the drawer closed. The line is thus closed, and the regular staff carried

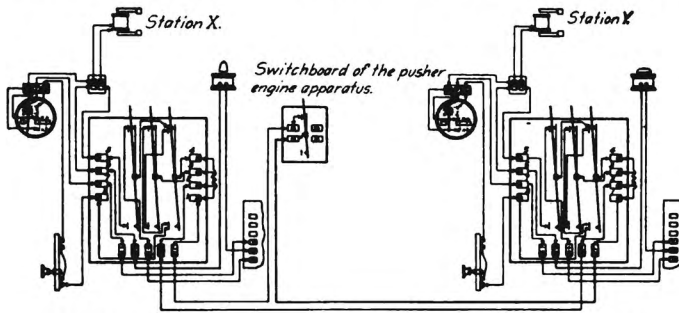


Fig. 8. Wiring Diagram for Special Pusher Attachment.

by the train can now be deposited in instrument at opposite end of block, and bell signals given.

The use of staff instruments for moving trains between congested points has not only been found to relieve the despatcher of issuing a large number of train orders, but has proven more reliable and quicker than train orders.

TRAIN ACCIDENTS IN OCTOBER, 1914.*

The following is the list of the most notable train accidents that occurred on the railways of the United States in the month of October, 1914:

COLLISIONS.

Date.	Road.	Place.	Kind of Accident.	Kind of train.	Kil'd.	Inf'd.
13.	Georgia.....	Madison.	bc.	P. & F.	0	38
18.	New York Central	Indian Castle.	rc.	F. & F.	2	1
22.	Pennsylvania.....	Kane.	rc.	F. & F.	1	4

DERAILMENTS.

Date.	Road.	Place.	Cause of Accident.	Kind of train.	Kil'd.	Inf'd.
3.	Hoosac T. & W....	Readsboro.	unx.	P.	0	15
7.	B. & O.....	Cove Run.		P.	0	39
17.	D., L. & W.....	Fulton, N. Y.	malice.	P.	2	31
18.	Morgan's L. & T..	Broussard.	malice.	P.	0	15
18.	Pennsylvania.....	Glen Union.	b. axle	P.	0	6
19.	Missouri, K. & T..	Bartlett.	unx.	P.	3	12
28.	Ches. & Ohio.....	Barboursville.	unx.	P.	0	18
31.	D., L. & W.....	Alford.	b. rail.	P.	0	33

OTHER ACCIDENTS.

Date.	Road.	Place.	Cause of Accident.	Kind of train.	Kil'd.	Inf'd.
11.	Denver & R. G....	Grand Junc.	rock fall.	P.	3	14

A misplaced switch was responsible for a collision at Madison, Ga., on the 13th, where eastbound passenger train No. 2 ran over the switch into the head of a freight train, which was standing on the sidetrack. Thirty-five passengers and three employes were injured. The responsibility for this collision is charged against the crew of the freight train.

On the 18th two eastbound through freights on the New York Central collided near Indian Castle, N. Y. The fireman and one brakeman were killed and one other employe was injured. The collision was due to excessive speed in a dense fog while running under a caution card. The conductor and the flagman of the leading train were held partly responsible for not affording proper flag protection.

The trains in collision near Kane, Pa., on the 22d were eastbound through freights. The caboose of the leading train, which was moving slowly, was wrecked. An engine-man was killed and four other trainmen were injured. There was a dense fog at the time of the collision.

In the passenger train derailment near Readsboro, Vt.,

on the 3d, fifteen passengers were injured. Three cars fell down an embankment.

At Cove Run, W. Va., on the 7th, northbound passenger train No. 4 was derailed and 36 passengers and 3 employes were injured, most of the injuries being slight. The train was running about 25 miles an hour. The tender was the first vehicle to jump the track.

Near Fulton, N. Y., on the evening of the 17th, a train was derailed while running at full speed and all the cars except the last one left the rails. The engineman and fireman were killed and 26 passengers and 5 trainmen were injured. One steel passenger car was turned completely around, but its occupants suffered only minor injuries. The derailment was due to the malicious misplacement of a switch, the lights on which had been manipulated so that the green light showed, indicating clear.

Loosening of spikes, presumably by persons who had intended to rob the train, was responsible for the derailment at Broussard, La., on the 18th. The train was westbound passenger No. 11 and every car left the rails, but the number of persons injured is reported as only 15.

At Glen Union, Pa., on the 18th, eastbound passenger No. 52 was derailed. The baggage car fell down an embankment and the locomotive and entire train of seven cars left the rails. Only six passengers were injured and none seriously, the cars being steel coaches. The cause of the derailment was the breaking of one of the axles of the tender.

The train derailed near Bartlett, Tex., on the morning of the 19th, was northbound passenger No. 6. The locomotive was overturned, and the first three cars of the train were turned crosswise of the track, but the cars behind these were little damaged and most of the passengers felt no great shock. The men on the locomotive were killed and six passengers and six other employes were injured.

On the 28th, at Barboursville, W. Va., westbound passenger No. 1 was derailed. Three cars left the track and 18 passengers were injured.

Near Alford, Pa., on the 31st, eastbound passenger No. 32 left the track on account of a broken rail. The train consisted of five cars, three of which fell down a bank. Three employes and thirty passengers were injured.

A mass of rock which fell on the tracks from about 200 feet above was responsible for the wreck of westbound passenger No. 3 near Grand Junction, Colo., on the 11th. The train was running at ordinary speed when a rock weighing 10 tons fell on the rear end of the smoking car, which was the third car from the locomotive, and broke the coupling. This applied the air brakes and the train was soon stopped, but at almost the same instance a boulder weighing perhaps five tons fell on the day coach. The roofs of the two cars were wrecked. Three passengers were killed and 14 injured.

Electric Car Accidents.—Of the half-dozen serious collisions or derailments on electric roads reported in the newspapers during the month of October, three appear to have been attended by fatal results: One at Denison, Tex., on the 3d, in which two persons were killed; one at Syracuse, N. Y., on the 9th, in which four persons were killed, and one at South Glastonbury, Conn., on the 23d, in which one person was killed.

THE RAILROAD SITUATION.—At a meeting of the Chamber of Commerce in New York, December 3, 1914, Samuel Rea, president of the Pennsylvania Railroad, outlined in some detail the necessity for a constructive policy in all matters influencing public relations of railways. He stated that the serious condition of the railroads is not new, but is now acute, and that the present situation is not the result of premeditated action or of a clearly defined punitive public policy, but is the result of our failure to thoroughly adjust our national conception of the right and duty of these common carriers, and to adopt our new laws for public relations to the rapidly changing commercial and financial conditions.

*Abbreviations and marks used in Accident List:
rc, Rear collision—bc, butting collision—xc, Other collisions
b, Broken—d, Defective—unf, Unforeseen obstruction—
unx, Unexplained—derail, Open derailing switch—ms, Mis-
placed switch—acc, obst., Accidental obstruction—malice, Ma-
licious obstruction of track, etc.—boiler, Explosion of locomotive
on road—fire, Cars burned while running—P, or Pass., Pas-
senger train—F, or Ft., Freight train (including empty engines,
work trains, etc.)—Asterisk, Wreck wholly or partly destroyed by
fire—Dagger, One or more passengers killed.