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 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 signals to station at opposite end of block. The wiring for a staff section, equipped with one automatic operator, 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 Manawaki 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 which has now been installed on four staff sections on the Ontario division, and is operating satisfactorily. One 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 Manawaki 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 following diagram for the Automatic Operator:

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

Fig. 3. Wiring Diagram for Automatic Operator.

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

BELLS CODE.

ONE RING—TO DRAW ATTENTION TO STAFF THAT IS REQUIRED. And acknowledgment.

TWO RINGS—ANOTHER TELEPHONE. Acknowledges by one ring.

THREE RINGS—ASKING FOR CURRENT TO RELEASE STAFF. Acknowledged by one ring and continue so long as necessary.

FOUR RINGS—STAFF IS RELEASED. Acknowledged by one ring.

FIVE RINGS—STAFF HAS BEEN INSETED IN INSTRUMENT at the opposite end of block. Acknowledged by one ring.

SIX RINGS—SPECIAL STAFF HAS BEEN INSETED IN INSTRUMENT. Acknowledged by one ring.

SEVEN RINGS—STAFF HAS BEEN REPLACED IN INSTRUMENT AT SAME END. Acknowledged by one ring.

EIGHT RINGS—TESTING.

1. When a personnel key button is released, the bell key must be depressed before HANDLE OF MAGNETIC VIEWING TUBE, swinging which is supposed to be mounted, in which case no Maggie is provided. Make double passes between ringing of Bells Key at one end and ringing of Bell on the position.

2. When it is desired to withdraw a staff, the Bell key must be depressed here to note the operator's attention, and then the entire operation must be repeated. The operator at the opposite end of the block must then deposit the Bell key here, and then receive the key at the opposite end of the block. The key will then be permitted to withdraw the Bell at the opposite end of the block.

3. When it is desired to withdraw the Bell key to note the operator's attention at the opposite end of the block, the key must be depressed here to note the operator's attention, and then the opposite Bell key must be deposited here. The key will then be permitted to withdraw the Bell key here.

4. These four instruments are the same type, so that a staff can, therefore, be deposited in any other instrument, and a train obtaining a staff for this block, may move from one instrument to another.

AUTOMATIC ATTACHMENT.

1. When an operator is not equipped with a special attachment, the conuder on engine, or the case may, if possible, obtain a bell from the bell holder at the opposite end of the block, and insert the staff. This will be necessary in the event of a fault in the instrument.

2. The operator at the opposite end of the block must receive a bell from the bell holder at the opposite end of the block, and insert the staff. This will be necessary in the event of a fault in the instrument.

3. When the staff has been withdrawn, it will be necessary for the staff to be inserted in the instrument at the opposite end of the block, and the operator at the opposite end of the block must insert the staff.

4. When the staff has been inserted in the instrument at the opposite end of the block, it will be necessary for the operator at the opposite end of the block to insert the staff, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

5. If the staff cannot be withdrawn, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

6. If the staff cannot be inserted, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

7. If the staff cannot be withdrawn, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

8. If the staff cannot be inserted, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

9. If the staff cannot be withdrawn, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

10. If the staff cannot be inserted, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.

11. If the staff cannot be withdrawn, it will be necessary to insert the staff in the instrument at the opposite end of the block, and the operator at the opposite end of the block must then receive staff from the bell holder at the opposite end of the block.
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 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 mechanically 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 locks 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 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 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.
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.

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.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Road</th>
<th>Place</th>
<th>Kind of train</th>
<th>Kind of Accident</th>
<th>Kind of Train</th>
<th>Kd. &amp; Inj'd.</th>
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<tbody>
<tr>
<td>12</td>
<td>Georgia</td>
<td>Madison</td>
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<td>Accident</td>
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<td>Pennsylvania</td>
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<td>F. &amp; F. 1</td>
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**DERAILMENTS.**

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<th>Place</th>
<th>Cause of Accident</th>
<th>Kind of train</th>
<th>Kind of Accident</th>
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<th>Kd. &amp; Inj'd.</th>
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<td>31</td>
<td>D. L. &amp; W.</td>
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**OTHER ACCIDENTS.**

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<th>Place</th>
<th>Cause of Accident</th>
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<td>31</td>
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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 employees 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 employee was injured. The collision was due to excessive speed in a dense fog. The locomotive 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.

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 track. 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 employees were injured.

On the 28th, at Barbourville, 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 employees 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.