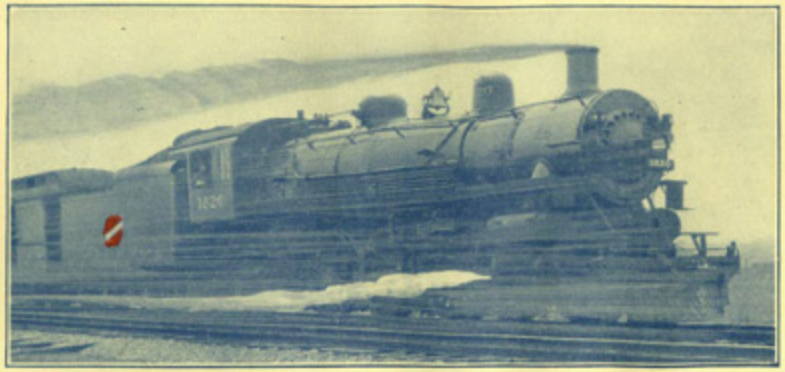
CHICAGO & NORTH WESTERN RY.
PASSENGER TERMINAL, CHICAGO

between

CHICAGO *and* OMAHA

A SUPERHUMAN ENGINEER PROTECTS THIS TRAIN

CHICAGO NORTH WESTERN LINE



Automatic Train Control

All Chicago & North Western passenger and freight trains operating on the main line between Chicago and Omaha, are under an invisible master control which is absolutely automatic.

Technically this is known as the G. R. S. Automatic Two Speed Train Control, which may be likened to a giant hand or *invisible guardian*, which continuously, day and night, under any and all conditions of weather, safeguards the movements of all trains and provides engineers with a constant check as to speed, and the condition of the track ahead.

Naturally you are curious to know just how this "superhuman engineer" operates in keeping the train on schedule time, especially in bad weather and in permitting the train to run safely at a maximum speed established by the conditions ahead. And, moreover, it is only natural that you should like to know just how the automatic train control operates *for your protection.*

"The Token"

JUST before the train starts on its journey, all this gigantic protection is set in motion when the engineer locks the train control system into the operating position by means of a Yale key, to which is attached a tag bearing the engine number (see figure 4). The key and tag are called a "token," and can only be removed when the train control device is in *locked position* for operation. The engineer must remove the key and give it to the train conductor, and until the conductor has received this "token ' he cannot allow the train to proceed. Thus the engineer and conductor are held jointly responsible for the operation of the train in train control territory.

Should you care to see the "token," ask the conductor to show it to you.

The "Eyes" and "Brains" of the Train Control System

LOCATED on the front of the locomotive, about six inches above each rail, is a pair of coils which are the *eyes* of the train control, as shown in figure 5. These are sensitive to the flow of the alternating electric current in the track rails. The inductive influence produced by this electric current is carried back to the "brains" of the system contained in a large box on top of the locomotive tender, as shown in figure 6. Here the current is amplified to sufficient strength and selected and controlled for its various duties such as

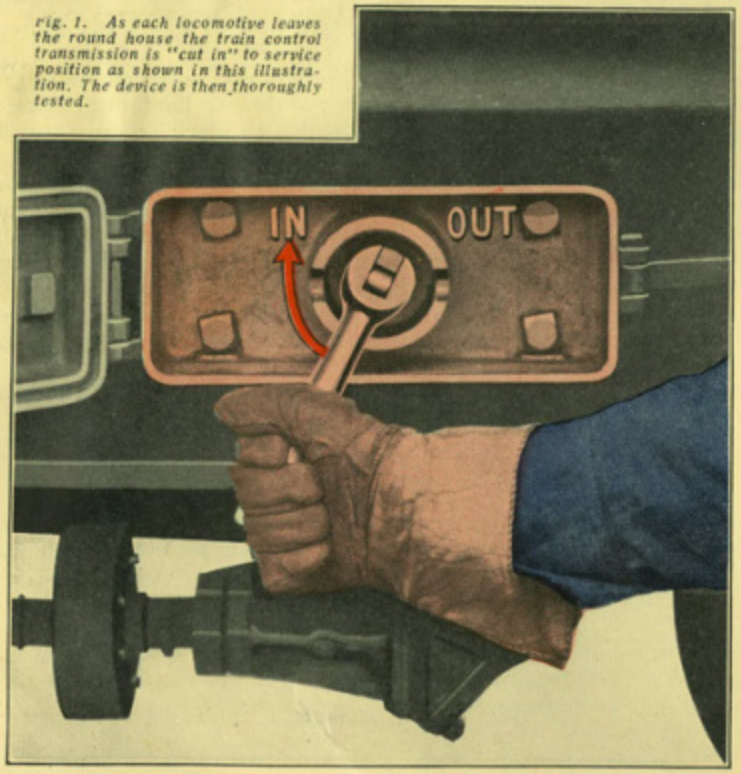
(1) Operation of the signal lights which indicate to the engineer how to control his train.

(2) Determining the maximum speed at which the train must be operated.

(3) The operation of horns and bells which remind the engineer of certain actions he is to take, described in detail elsewhere in this booklet, and

(4) Application of the brakes when occasion requires.

Fig. 1. As each locomotive leaves the round house the train control transmission is "cut in" to service position as shown in this illustration. The device is then thoroughly tested.



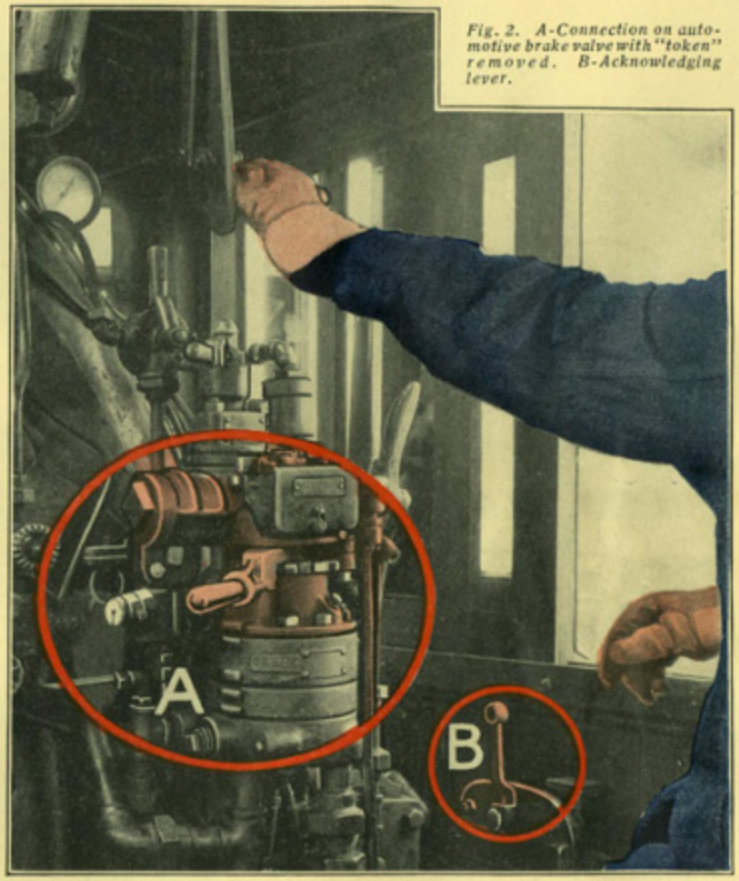


Fig. 2. A-Connection on automotive brake valve with "token" removed. B-Acknowledging lever.

How the Speed of the Train is Determined

WHEN the track ahead is clear for at least the full distance required to stop the train by means of the air brakes, there is an alternating electric current flowing down one rail and back in the other rail, but the presence of a train prevents any current flowing in the rails for at least a full braking distance behind that train. If the train should be running at a speed above 20 miles per hour and this electric current in the rails ceases, indicating the presence of another train, or other restriction ahead, then the train control device on the locomotive sounds an alarm in the cab and applies the brakes automatically, thus stopping the train unless the engineer is fully aware of the situation and takes immediate

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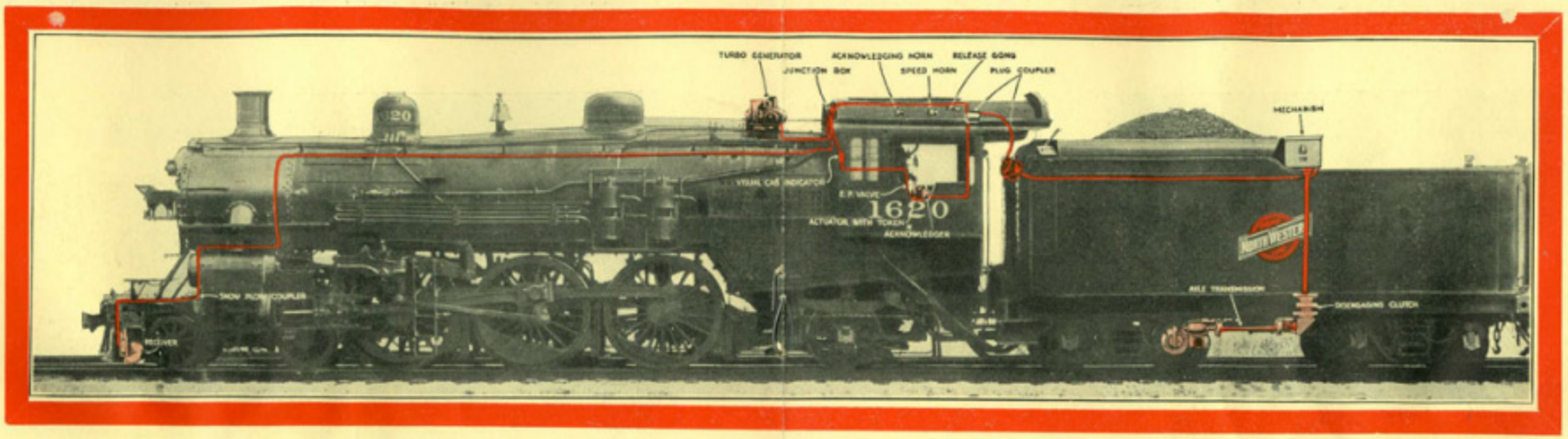


Illustration Shows Location of the Parts of the Automatic Train Control Equipment on each of 360 C. & N. W. Passenger and Freight Locomotives in service between Chicago and Omaha.

Receivers—or "Eyes" of the Train Control

Each of these receivers is mounted on the front of the locomotive above each rail at a distance of six inches from the top of the rail. (See figure 5.) They are supported from the pilot beam and hang just ahead of the first pair of wheels. In this position each receiver is in the inductive field of the train control current in the rail.

Visual Cab Indicator

This device is used for giving signal indications to the engineer—green light indicating that there is a clear block ahead and a yellow light when the train is in a caution or a danger zone.

Snow Plow Coupler

An emergency connecting device to enable the pushing of a snow plow of an engine without interfering with train control protection.

Turbo-Generator

This is a steam-driven turbine operating an electric generator to supply electric current for the Train Control device and also for headlight and other lights on the engine.

Junction Box

This device is located on the outside of the cab on the engineer's side, and all wires which pass through or into the cab are terminated in this box.

Acknowledging Horn

This is similar to an automobile horn with a deep attention-producing tone. This is located in the cab directly over the engineer's head, purposely to audibly warn him that the train is entering a danger zone and that he must handle the train safely.

Acknowledger

This is a lever located at the right of the engineer and which must be operated by him whenever entering a danger zone to prove that he is alert.

Actuator with Token

This device is located on the air brake control valve in the cab, by the side of the engineer. (See figure 2.) Its purpose is to set the brakes when necessity requires. The token is the key and tag bearing the engine number with which the train control system is locked into service.

Speed Horn

An automobile horn which is located in front of the engineer to warn him when the train is operating above the prescribed speed limit for a caution or danger zone or when exceeding the maximum speed limit.

Release Gong

An electric gong located in the cab to indicate to the engineer that the restricting condition ahead of the train has been removed.

Electro-Pneumatic Valve

A device for transferring the electrical control of the train control circuits to the air brake control of the train.

Axle Transmission

A device for transmitting speed and distance from the wheels of the tender to the mechanism of the case.

Disengaging Clutch

A lever (see figure 1) by means of which the train control mechanism is cut in or cut out when entering or leaving train control territory.

Mechanism Case

This is a box on top of the tender in which is located speed governor, cams, amplifier tubes and the control relays which together form the "brains" of the train control system. (See figure 6.)

OMAHA — CHICAGO

Fig. 3. Engineer handing the "token" to conductor after locking train control in service.

Fig. 4. The "token" consists of a Yale key and tag bearing the engine number. This is carried by the conductor. He cannot allow the train to proceed until the "token" is given to him by the engineer.

action by pulling the acknowledging lever, shown in figure 2, and immediately reducing the speed of his train to less than 20 miles per hour.

Why It is Called the "Invisible Guardian"

THE train control system allows the engineer to operate a passenger train no faster than 70 miles an hour and a freight train 50 miles an hour at any time if the track ahead is clear. Should he under these conditions approach too closely to a train or other restricting conditions ahead, or if another train approaches too closely to his train, this *invisible guardian*—the automatic train control system—will change a light in the cab of the approaching train from green to yellow and cause two shrill horns to sound. Immediately the engineer must acknowledge this condition which will stop one of the horns. He must reduce the speed of his train to below 20 miles an hour, otherwise the brakes will be automatically applied and the train stopped. The second horn continues to sound until the speed of the train is sufficiently reduced.

When running in a restricted zone, the engineer must acknowledge this condition to the *invisible guardian* every half mile by pulling the acknowledging lever, otherwise the train will be stopped. When once stopped, he can release the brakes of his train and proceed under the restrictions imposed by the system at that particular time.

As soon as the track ahead becomes clear, the train control system will change the light in the cab from yellow to green and cause a gong to sound which informs the engineer that he can resume full speed.

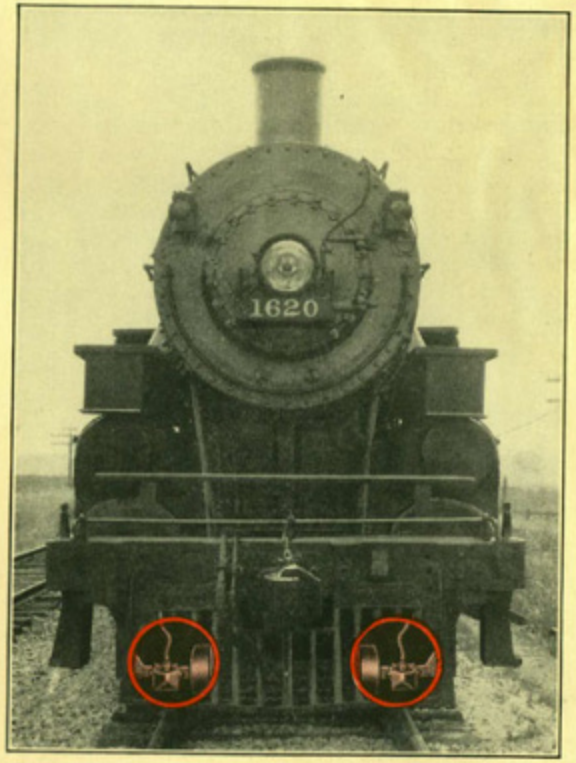


Fig. 5. This pair of receivers are really the eyes of the invisible guardian who never sleeps.

The Result of Over 20 years of Extensive Research Development

This highly perfected system is for your protection, and is an important factor of safety and railroad efficiency. It is the result of more than twenty years of extensive study, research and tests of automatic train control carried on by the General Railway Signal Company of Rochester, N. Y.

Of Inestimable Value

Automatic train control protects you in the worst kinds of weather, and materially aids in allowing your train to be brought through on schedule time.

It also is of immense benefit to shippers in bad weather, especially shippers of perishable goods, as much delay is avoided because the engineer can run at the maximum speed allowable in spite of weather conditions.

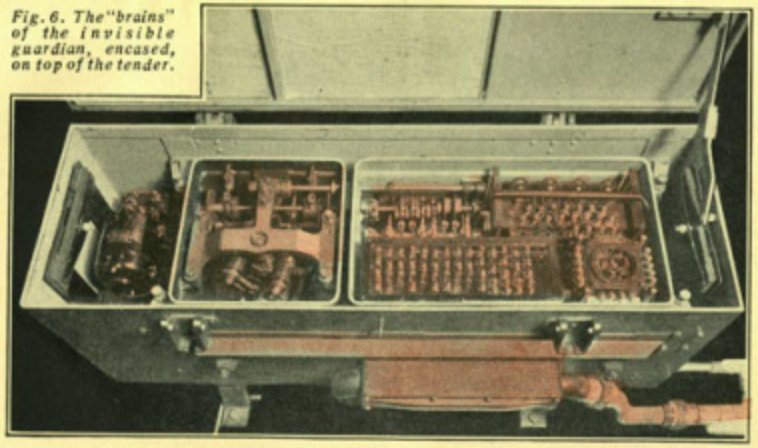
Although the installation of this vast improvement represents an outlay of three million dollars, not a penny has been added to your railroad fare nor to the cost of freight shipments.

The First Railroad to Install Continuous Automatic Train Control on so Large a scale

The Chicago & North Western was the first railroad to install *continuous* automatic train control on so large a scale and at so great an outlay. In order to accomplish this vast improvement between Chicago and Omaha, it was necessary to equip 360 locomotives and over 1,000 miles of track.

It is another indication of Chicago & North Western's progressive policy to provide its patrons with "The Best of Everything in the Best of the West."

Fig. 6. The "brains" of the invisible guardian, encased, on top of the tender.



The Pioneer Line West and Northwest of Chicago—In 1848 the Galena & Chicago Union, now the Chicago & North Western Ry., began construction of the first line west of Chicago to promote the settlement and development of the fertile Mississippi Valley.

First to Operate Trains by Telegraph—A telegraph line was erected on the right-of-way between Chicago and Freeport in 1854. This was the first western railway to control the operation of its trains by telegraph.

Pioneer Sleeping Car Route—The first sleeping cars used on any railroad west of Chicago were operated on the Chicago & North Western Ry. in 1858. In 1863 it was assigned one of the first two palace sleeping cars built by George M. Pullman.

Constructed First Railway Mail Car—The Chicago & North Western Ry., on its own initiative, built the first railway postal car in 1864 for use in the mail service.

First Double-Track Railway between Chicago and the Missouri River—In 1867 the Chicago & North Western Ry. was extended to Council Bluffs, Iowa, where it connected with the Union Pacific to form the famous OVERLAND ROUTE. It was the first double-tracked railway between Chicago and the Missouri River and now forms a part of the first and most direct of all transcontinental routes. It is the only route double-tracked all the way between Chicago and the Rocky Mountains.

First Dining Car Service—The Chicago & North Western Ry. operated the first dining car between Chicago and San Francisco in 1869.

Foremost in the Operation of All-Pullman-Car Trains—The all-Pullman car train, so popular among people traveling long distances, made its first appearance on a western railway in 1901 when the famous OVERLAND LIMITED between Chicago and San Francisco was equipped as a solid Pullman-car train.

Recently completed Proviso Yard—A $16,000,000 project for handling through freight traffic with utmost efficiency: total area 1250 acres, track capacity 26,000 cars, through cars per day 15,000.

Operates over 10,000 miles of line, much of it double tracked, in the states of Illinois, Iowa, Michigan, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin and Wyoming, affording convenient and dependable passenger and freight service to practically all business and commercial centers. Purchase your tickets and route your freight via the

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