

# Accident at Automatic Plant

Evidence indicates that enginemen did not properly observe and obey signal indications

ON JUNE 13, there was a side collision between a passenger train of the Chicago, Rock Island & Pacific and a freight train of the Minneapolis & St. Louis, at Morning Sun, Iowa, which resulted in the death of one employee. An abstract of the report of an investigation of this accident by the Bureau of Safety, I.C.C., in conjunction with the Iowa Board of Railroad Commissioners, is as follows:

The crossing of these two single-track lines is protected by an automatic electric interlocking plant, consisting of signals without derails; the distant signals, of the semaphore type, are inoperative and fixed in the caution position, while the electric home signals are of the color-light type, approach-lighted, the indications being

on either road passes its respective distant signal, provided there are no conflicting train movements and the interlocking block is unoccupied, a proceed indication is automatically displayed on its home signal for the movement of the train over the crossing, while a stop indication is automatically displayed by the home signal of the other road when an approaching train passes the distant signal; the home signal, which displays a proceed indication for an approaching train, retains that indication until the engine passes it, unless a train on the other line overruns its home signal; while the stop indication of the home signal on the other road continues to be displayed until the rear end of the first train passes the opposing home signal on its own line. The speed of all trains over the crossing is limited to 20 m.p.h. The weather was clear at the time of the accident, which occurred about 6:45 a.m.

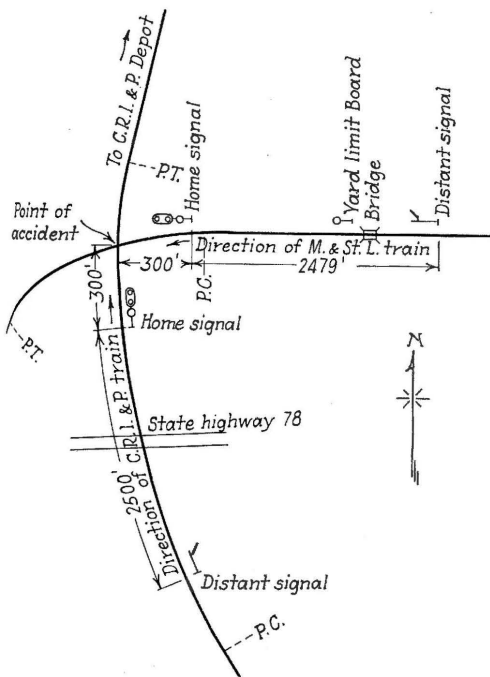
## Description

Minneapolis & St. Louis train No. 95, a westbound freight train, consisted of 44 cars and a caboose, hauled by engines 475 and 627, and was in charge of Conductor Ross and Enginemen Loe and Helm. This train passed the distant signal, which was displaying a caution indication, passed the home signal, and while traveling at a speed estimated to have been between 12 and 25 m.p.h. it struck about the middle of the right side of the second car of C.R.I. & P. train No. 63 on the crossing.

Chicago, Rock Island & Pacific train No. 63, a northbound passenger train moving over the crossing, consisted of 1 combination mail and baggage car, 2 baggage cars and 1 coach, all of steel construction, hauled by engine 833, and was in charge of Conductor Stonebraker and Engineman Herman. This train passed the distant signal which was displaying a caution indication, passed the home signal, and while moving over the crossing, at a speed variously estimated to have been from 20 to 50 m.p.h., it was struck by M. & St. L. train No. 95. The employee killed was a baggageman of the C.R.I. & P. train.

Engineman Loe, of the lead engine of M. & St.L. train No. 95, stated that the air brakes on his train had been tested and worked properly en route. When more than a mile from the crossing at Morning Sun the speed of his train was about 25 m.p.h. He closed the throttle to the extent that only enough steam was used to cushion the engine, permitting the train to drift; he did not make any air-brake application, or open the throttle again. The distant signal was displaying a caution indication and he passed that signal at a speed of 20 or 22 m.p.h.; the home signal immediately lighted and displayed a proceed indication, and he acknowledged the indication by sounding two short blasts on the engine whistle. Fireman Turner also called the indication. He continued to watch this signal, and it remained green until his engine passed it. When about half way between the distant and home signals, on the ascending grade, the fireman told him that a C.R.I. & P. train was approaching, and he supposed that the C.R.I. & P. train would stop accordingly. Nothing further was said until the lead engine reached or passed the home signal, at which time the speed was about 14 or 15 m.p.h., and then the fireman shouted to him that the C.R.I. & P. train was not going to stop, whereupon the engineman immediately applied the air brakes in emergency, when about 100 ft. from the crossing, and jumped from the fireman's side when about 40 ft. from the crossing, estimating the speed at the time of the accident to have been about the same, 14 or 15 m.p.h.

Fireman Turner, of the lead engine of M. & St.L. train No. 95, was on his seat box approaching Morning Sun, and after passing the distant signal, which was displaying a caution indication, he saw the proceed indication of the home signal and called it to the engineman. After passing over a small trestle at the foot of the ascending grade, the trestle being located about 700 ft. west of the M. & St.L. distant signal, he looked toward the south and saw the C.R.I. & P. train approaching but still some distance south of the C.R.I. & P. distant signal, and at that time he thought the C.R.I. & P. train would stop for the crossing.



Sketch showing location of accident

red for stop, and green for proceed; a marker light, giving a red indication, is also located on the mast of each home signal, 5½ ft. below the two governing top lights. The home signal on each road is located 300 ft. from the crossing; the C.R.I. & P. distant signal is located 2,500 ft. south of its home signal, and the M. & St. L. distant signal is located 2,479 ft. east of its home signal.

The automatic interlocking is so arranged that when an approaching train

As his train approached the home signal at a speed of about 15 or 16 m.p.h., Fireman Turner looked across and the C.R.I. & P. passenger train was then somewhere between the C.R.I. & P. home signal and a state highway, located 981 ft. south of the C.R.I. & P. home signal. The passenger train was traveling at such a rate of speed that he thought it could not be stopped for the crossing. He called a warning of danger to the engineman and jumped just before the C.R.I. & P. train started over the crossing. He called the warning of danger about the time the lead engine of his train passed the home signal and at that time the C.R.I. & P. train was north of the state highway and about 3 or 4 car lengths from the C.R.I. & P. home signal, traveling at a speed of about 50 m.p.h.

#### Statement of Rock Island Engineman

Engineman Herman, of C.R.I. & P. train No. 63, stated that he had been in the service of this railroad for over 25 years; this was not his regular run but he had had this run intermittently for about 15 years. On the morning of the accident, when approaching Morning Sun the distant signal governing his train was displaying a caution indication, and he said he reduced speed to 20 m.p.h. as required. He said that the top light of the C.R.I. & P. home signal went green, and the bottom light showed red; he called the indication and sounded two short blasts on the whistle, and the fireman repeated. Immediately after passing the distant signal, he looked across and saw the M. & St.L. freight train, but he could not say just where that train was then as it would be hard for him to judge the distance owing to track curvature. However, he did not think the M. & St.L. train was as close to the crossing as his own train.

Approaching the state highway he sounded the crossing whistle signal; he did not continue to watch the M. & St.L. train as he was looking at the C.R.I. & P. home signal, which he passed at a speed of about 20 m.p.h. He paid no more attention to the M. & St.L. train until his own engine reached the crossing, depending entirely upon the signal indication and expecting the M. & St.L. train to stop for the crossing. It did not occur to him that anything was going to happen until he got to the crossing, and then he got a good view of the M. & St.L. train, which he said was traveling about 25 m.p.h. and the lead engine was just about passing the M. & St.L. home signal; he immediately opened the throttle wide and

worked steam in an endeavor to get over the crossing in time to avert an accident. He estimated the speed of his own train to have been increased about 1 or 2 m.p.h. after he opened the throttle wide, and said it was about 21 or 22 m.p.h. when his train was struck.

Engineman Herman said that the C.R.I. & P. home signal was green from the time his train entered upon the circuit until he passed it. On further questioning concerning this signal indication, he drew a sketch illustrating the light indications on the C.R.I. & P. home signal and said the top light was green, the second one red, and no indication was shown on the bottom or marker light. When he first saw the M. & St.L. train, the engines were working steam, and it looked like they were coming out of a dip at the bottom of the sag just before his own train reached the C.R.I. & P. distant signal. However, he figured that the M. & St.L. train was far enough away so that it would not bother him.

#### Signal Investigation

Signal Maintainer Shallabarger, of the C.R.I. & P., stated that he had charge of and maintained the automatic interlocking plant at Morning Sun for both railroads. On May 19, 1935, he made a general inspection of the plant, and, on May 28, 1935, he inspected the lights, on both of which occasions he found everything to be in proper condition. He was at Morning Sun on his way from the hotel to make a regular inspection of the plant when the accident happened, and he reached the crossing a few minutes later. The instrument case which was located about 15 ft. from the tracks in the northwest intersection of the crossing was demolished, and the batteries and relays housed in the case were destroyed, due to the accident. Therefore, the signal lights involved were extinguished. He then made a test of the home signals, using dry cells, and found the lights in good condition and the lenses of the proper colors. No report of any false-clear signal indication at this plant had ever been received, and to his knowledge there had been no failures of any kind; there was nothing to indicate that the plant had failed to function as intended. He could see no possible way for a green light and red light to be displayed close together on the home signal, as stated by the engineman and fireman of the C.R.I. & P. train.

Subsequently the undamaged signal apparatus involved at the automatic interlocking plant was tested by Assistant Signal Engineer Duffy, Signal

Supervisor Kinney, Signal Draftsman Bartholomew, Signal Foreman Schmitt and Signal Maintainer Shallabarger, of the C.R.I. & P., and Signal Supervisor Stanley, of the M. & St.L., and a representative of the State Board of Railroad Commissioners. These tests developed that the operating characteristics of the relays were well within prescribed limits. The light circuit to the green C.R.I. & P. home signal involved was free from crosses or grounds, and showed no current passing from these wires to the ground or other wires, and everything indicated that the apparatus functioned as intended. Mr. Bartholomew stated no report had ever been made of any false-clear signal indication on the C.R.I. & P. in a plant of this type.

Various residents of the vicinity, not employed by either railroad involved, including farmers, an electrician, a day laborer and a school boy, who saw the trains involved as they approached, made statements to the effect that the M. & St.L. freight train approached the crossing and entered the block first, traveling at a speed estimated to have been between 12 and 20 m.p.h., and that the C.R.I. & P. passenger train then approached, traveling at a speed estimated to have been between 40 and 45 m.p.h., or about twice as fast as the M. & St.L. train.

#### General Statement

The evidence clearly shows that under the conditions which existed just prior to the accident a proceed signal indication should have been displayed for the M. & St.L. train, and a stop signal indication should have been displayed for the C.R.I. & P. train. The controlling track circuits extend to the distant signals on both roads which are located practically equal distances from the crossing; the C.R.I. & P. passenger train was moving down a 0.14 per cent grade from a distance of 1,000 ft. south of the crossing, while the M. & St. L. freight train was moving within yard limits and up a grade varying from 0.2 to 1.0 per cent from a distance of 2,000 ft. east of the crossing; the testimony of several residents of Morning Sun who were eye-witnesses of the accident was to the effect that the speed of the M. & St.L. train was from 12 to 20 m.p.h., while the speed of the C.R.I. & P. passenger train was about 40 or 45 m.p.h. approaching the crossing, or about twice as fast as that of the M. & St.L. freight train, and that the M. & St.L. freight train entered the block first.

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ary circuit which may be desirable. This circuit derives part of its energy continuously from the battery, depending on the adjustment of the resistor between the rectifier and the battery. This resistor can be adjusted to compensate for the load imposed

by the normally-energized circuit, shown dotted, but allowing a 5 m.a. drain on the battery. The application of the rectifier output to the operating load can be adapted to any type of crossing-signal circuit arrangement.

## Avoiding Light-Out Signal Failures

*"What methods are used to safeguard light-out failures in color-light signals, caused by a broken filament in the normal-burning light? Please answer for searchlight type signals having but one lamp and for multiple-unit color-light signals."*

### Light-Out Relays Utilized

R. A. Sheets

Signal and Electrical Engineer,  
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In addition to the careful observance of manufacturers' recommendations concerning the proper handling, testing and voltage adjustment to prevent failures of electric lamps used in color-light signals, two different methods are used to safeguard light-out failures on such signals:

Where multiple unit color-light signals with single-filament lamps are used as automatic block signals governing movements at speed, a light-out relay is placed in series with the filament of the normally-burning light, generally the green light (Proceed indication). In case of a burn-out of the filament, the light-out relay becomes de-energized and transfers the light indication to the yellow or "approach" signal unit. Where the yellow or approach indication is the indication normally displayed by the signal the greater proportion of time, an auxiliary light unit displaying the yellow approach indication is provided as a reserve. This light-out arrangement is not provided for in dwarf or slow-speed signals, nor on interlocking signals having two or more lights normally burning red. The circuit arrangements are shown in Fig. 1a and 1b.

Where searchlight type signals with double-filament lamps are used, the high-wattage filament is in multiple with a low-wattage filament, and this in itself provides considerable protection against light-out failures. However, in order that an additional safe-

guard might be secured, it is the practice on the North Western to place a light-out relay in series with these

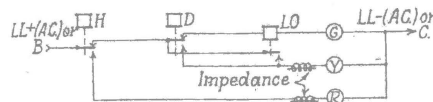


Fig. 1a Circuit for color light signal where the Yellow indication is used as a reserve for the Green.

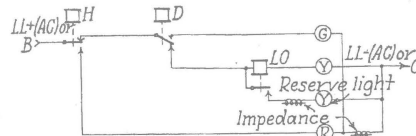


Fig. 1b Typical circuit for color light signal with a reserve Yellow light unit for use where the signal normally indicates Yellow.

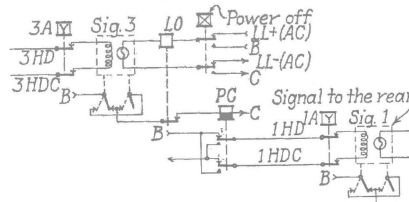


Fig. 2 Typical circuit for searchlight type signal.

Lighting circuits in use on the  
North Western

filaments, this light-out relay having a drop-away high enough to insure that when the high-wattage filament burns out, the light-out relay will drop. This light-out relay controls the circuit of the next signal to the rear in such a manner that when it is de-energized an "approach" indication is displayed by the signal to the rear, thereby regulating the approach of a train up to the signal that has the light out, or the light with only the low-wattage filament burning. This circuit is shown in Fig. 2.

THE NUMBER OF PERSONS killed at highway grade crossings in the month of May, as reported by the Association of American Railroads, was 108, as compared with 140 in May, 1934; injured, 297, as compared with 303.

## Accident Report

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According to the record the C.R.I. & P. train covered the distance from Mediapolis to the crossing, 7.3 miles, in 10 minutes, or at an average speed of 43.8 m.p.h., while the M. & St.L. train covered the distance from Monmouth to the crossing, 41.6 miles, in 1 hour and 50 minutes, or at an average speed of 22.7 m.p.h. Furthermore, Engineman Herman of the C.R.I. & P. train said that his train had not yet reached the C.R.I. & P. distant signal when he first saw the M. & St.L. freight train, and that it looked as though that train was then coming out of a dip; the dip in the M. & St.L. track is located about 500 ft. west of the M. & St.L. distant signal, and, therefore, according to this statement also, the M. & St.L. freight train was the first train to enter the limits of the automatic electric interlocking plant. The foregoing corroborates evidence given by six members of the M. & St.L. train crew, all of whom stated that the home signal governing movement of their train displayed a clear indication.

While Engineman Herman and Fireman DeFore, of the C.R.I. & P. train, both stated that the C.R.I. & P. home signal displayed a proceed indication for their train, there was no other evidence to that effect. The engineman said that the light went to green when his train passed the distant signal, and he called the indication which the fireman acknowledged, although the fireman said he did not see the signal until the front end of the engine was only a short distance from it.

The destruction of some of the signal apparatus as a result of the collision made it impossible to re-establish the operation of the plant at the time of the accident, and, therefore, a positive conclusion cannot be reached. However, the test of the undamaged apparatus disclosed that it was in proper operating condition, and this fact together with the fact that the M. & St.L. home signal cleared properly for the approaching train, and the record of proper operation of the plant since its installation, supports the opinion that the C.R.I. & P. home signal was displaying a stop indication which was not properly observed or obeyed.

### Conclusion

It is believed that this accident was caused by failure of Engineman Herman of C.R.I. & P. Train No. 63 properly to observe and obey a signal indication governing the movement of his train over a railroad crossing.