readings the power company calculates the charges at the rural lighting rate.

Each switch machine is powered by a battery of 16 Edison B4H 80-a.h. cells, which is tapped at the mid-point to feed the 12-volt control circuits. At the fan house, a battery of 12 Exide DMG07 cells, tapped at the mid-point, energizes the polarized-control line circuits, as well as the local annunciator circuits. These batteries are on a-c. floating charge through Union copper-oxide rectifiers.

Proposed Train-Order Signal

In order to eliminate the present necessity of westbound trains running slower than necessary in order that the engineman may observe the indication of the train-order signal at the west portal, adjacent to the fan house, it is proposed to install a color-light repeater signal at Winston. This signal, which will probably be mounted on the steel relay house, will consist of a lunar white unit which will be (approach) lighted when the westbound train-order signal is clear and extinguished at all other times. Thus, the engineman will be able to determine, before he enters the east portal of the tunnel, whether or not to expect to pick up train orders at the west portal.

Maintenance Force Not Increased

No additions to the regular maintenance force have been necessitated by the installation of this remote-control system; a signal maintainer and his helper maintain a 24-mile section of double-track automatic signals, including the new signals and switches. Therefore, the savings mentioned in the introduction represent a conservative estimate of the economy in operating expenses that has been effected by this installation. Add to this the greater flexibility and safety of train operation in the new system, and a compelling picture of the possibilities of remote- and centralized-traffic-control systems is presented.

The installation was designed by engineers of the Union Switch & Signal Company, which company also supplied the signal equipment. The field work was handled by the railroad company's regular signal construction forces, under the direction of T. H. Kearton, general signal inspector.

Report on Milwaukee-Omaha Collision

Engineman's failure to control speed responsible for accident on crossing at Camp Douglas, Wis.

ON February 28, 1931, there was a side collision between a passenger train of the Chicago, Milwaukee, St. Paul & Pacific and a passenger train of the Chicago, St. Paul, Minneapolis & Omaha at the crossing of the tracks of the two railroads at Camp Douglas, Wis., which resulted in the death of 1 employee and the injury of 17 passengers, 2 employees, 6 mail clerks and 1 Pullman employee. The following report on this collision has been abstracted from the report of the director of the Bureau of Safety of the Interstate Commerce Commission:

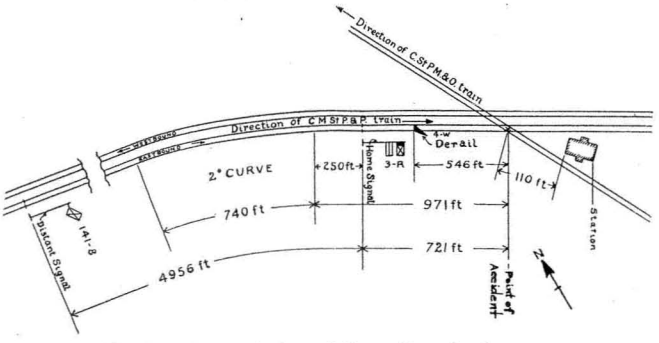
Location and Method of Operation

The Milwaukee is a double-track line over which trains are operated by time-table, train orders, an automatic block-signal system, and an automatic train-stop and cab-signal system of the continuous-inductive type. Train movements on the Omaha, which is a single-track line, are governed by time-table, train orders and an automatic block-signal system. The movements of the trains of both railroads over the crossing are controlled by means of an electric interlocking plant. The crossing is located at a point about 110 ft. west of the station, which is situated in the 27-deg. angle between the tracks of the two railroads.

Trains approaching the crossing on the Milwaukee eastbound main track are governed by interlocking distant signal 141-8, a one-arm signal which is also used as an automatic block signal and which is located 4,956 ft. west of home signal 3-R, which is a two-arm signal located 721-ft. west of the crossing. Except for the bottom arm of signal 3-R, which is fixed, these signals are of the 3-position, upper-quadrant type, displaying white, green, and red indications, for proceed, caution, and stop, respectively.

A split-point derail operated in conjunction with the signals is located in the south rail of the Milwaukee eastbound track between the home signal and the crossing, the point of the derail being 546 ft. west of the crossing. The weather was cloudy at the time of the accident, which occurred about 3:47 a. m.

Westbound Omaha train No. 515 arrived at Camp Douglas at 3:43 a. m., three minutes ahead of its scheduled departing time, and was standing with the tender of the engine on the crossing when it was struck by Milwaukee train No. 16.



Track and signal plan of Camp Douglas layout

Eastbound Milwaukee train No. 16 passed Tomah, the last open office, 12.8 miles west of Camp Douglas, at 3:36 a. m., 16 min. late, passed distant signal 141-8 displaying a caution indication, passed home signal 3-R displaying a stop indication, passed over the open derail, and collided with train No. 515 while traveling at a speed estimated to have been from 30 to 40 m.p.h.

Summary of Evidence

Engineman Taylor, of Milwaukee train No. 16, stated that approaching distant signal 141-8 he could see the

indication for a distance of 1 or 1½ miles; it was displaying a caution indication and when about one-half mile from the signal he shut off steam and made a 12-lb. brake-pipe reduction, and as he passed the signal a green light or caution indication was displayed by the cab signal, accompanied by the cab whistle indicator. He operated the acknowledging lever of the automatic train-stop device, and as soon as the cab whistle ceased sounding, [this whistle continuing for seven seconds] he made a second brake-pipe reduction of 10 or 12 lbs. Due to smoke from his engine drifting back along the right side of the cab, he was unable to ascertain his location or determine whether or not the speed of his train had been materially reduced, and after passing the distant signal he did not determine his location again until he was passing the stockyards, which are located approximately 1,700 ft. west of the crossing; he at once applied the air brakes in emergency and told his fireman that he would be unable to stop the train before reaching the derail. He stated that he did not release the air brakes at any time after he made the first reduction some distance west of the distant signal, and he did not think the brakes held properly when he applied them in emergency. Engineman Taylor stated, however, that an air-brake test had been made at La Crosse, a running test was made after departure from that point, and a stop was made at Sparta, 29.2 miles west of Camp Douglas, and each time the brakes functioned as intended.

Traveling Engineer Little, who arrived at the scene of the accident shortly after its occurrence, stated that he inspected engine 6409 and found the throttle closed, the reverse lever in the full forward gear, the automatic brake valve in the emergency position, and the lever of the acknowledging valve in the acknowledging position. He also inspected the rear nine cars in company with Car Foreman Moran, and found that the brakes were set on these cars.

Roadmaster McMahon stated that he arrived at Camp Douglas about three hours after the occurrence of the accident and on inspecting the track and derail, he found the derail open and the point still connected. The derail was not broken, but the heel-joint casting and bolts were broken, and the main-track rail at the heel joint also was broken at a point about 14 in. from its receiving end and its end badly battered. The heel of the split-point derail was displaced to the north 4 or 5 in., leaving the receiving end of the main-track rail at gage, which permitted all the wheels, excepting the engine-truck wheels, to be rerailed at that point, and it was his opinion that the flange marks found on the ties and tie-plates on the south side of each main rail between the derail and the crossing, beginning 15 ft. east of the point of derail, were caused by the wheels of the engine truck.

Seven of the cars in train No. 16 were equipped with UC brake equipment and six with LN equipment. General Air Brake Supervisor Elder stated that in his opinion an emergency application following a heavy service application might or might not have been effective on the cars having LN equipment, but that full emergency effect was obtained on all the cars having UC equipment. Mr. Elder also stated that a test had been made of the train-stop device and they found it would stop a train in a little less than 3,000 ft. from a speed of 60 m.p.h on a slightly descending grade.

Conclusions

This accident was caused by the failure of Engineman Taylor, of Milwaukee train No. 16, properly to control his train in accordance with the rules and signal indications when approaching a crossing upon which a train of the other line was standing.

In operating the acknowledging device at the distant signal and thereby forestalling an automatic application of the brakes by means of the automatic train-stop device, Engineman Taylor was acting in conformity with the rules and instructions in effect. His statement that his view became obscured by smoke does not constitute an excuse; when that occurred he should at once have taken the necessary steps to bring his train under proper control.

In this connection, it is believed the rules of the railroad company are not wholly adequate to guard against an accident of this character. In the "Catechism for the Instruction and Examination of Enginemen on the U. S. and S. Co.'s Automatic Train Stop Equipment," issued by General Air Brake Supervisor Elder of this road, the following appears:

> p. 105 * * * This immediately causes the "Green" caution light to be displayed, and the warning whistle to be sounded, and requires the engineman to operate the acknowledging valve to avoid an automatic brake application.

The rules of this company are not as definite and explicit as they should be concerning the action which should be taken by the engineman after receiving a restrictive indication and forestalling an automatic brake application. The approach indication of an automatic block signal means "approach next signal prepared to stop"; the caution indication of the cab signal means "proceed with caution." In reports of this bureau and of the commission it has been repeatedly pointed out that the approach or caution indication should require some definite action at once on the part of the engineman, and not leave it wholly to his judgment to take some action at a point in advance or a time in future.

In the American Railway Association's standard code of block signal rules, as revised in January, 1928, the approach indication of a block signal as shown in rule 285 is "Prepare to stop at next signal. Train exceeding medium speed must at once reduce to that speed." A number of railroad companies have adopted rules in conformity with this provision of the standard code. This principle is recommended.

The foregoing statements apply with even added force where automatic train-stop devices are in service. These devices, or the greater portion of them, were installed by the carriers pursuant to orders of this commission. By the order of June 13, 1922, prescribing specification and requirements for automatic train-stop devices, it was required that the device bring the train to a stop, after which the engineman could restore the apparatus to normal condition and the train be permitted to proceed. At the solicitation of the carriers, however, this requirement was modified by the order of July 18, 1924, by permitting the use of a forestalling device by means of which the engineman could forestall an automatic application of the air brakes and then "control his train in the usual manner in accordance with hand signals or under limits fixed by train order or prescribed by the operating rules of the company." The use of a forestalling device is not required, and the statement was made in the concurring opinion in the proceeding upon which the order of July 18, 1924, was based, that "If experience shows that the permissive feature does not fulfill its purpose we can at any time require its elimination."

On some railroads the rules provide that an engineman shall not forestall an automatic brake application until a restrictive signal has been observed and "is being obeyed." This provision, together with the interpretation of approach and caution indications referred to in the foregoing, evidences a proper appreciation of the safety questions involved and should be incorporated in the rules of all railroads using devices of this character.