

maximum of five wires used. Line wires were protected from grounding on guys by means of a hook-bolt through the crossarm holding the guy in one place.

The Union Switch & Signal Co.'s relays, Models 12 and 13, were used. Continuous insulated rail joints were used throughout, two at each signal and relay cut, and one at each battery cut. By using only one joint at each battery cut quite a material saving was effected. For the double-track work Irving to Experiment, polarized track circuits are used, eliminating line wire, except through Griffin interlocking. A maximum length of 3,000 feet was closely adhered to for track circuits, each circuit having three cells of Edison, type 502, 500-ampere hour cells in multiple and a Union Switch & Signal Co.'s adjustable resistance of one ohm capacity. At battery-battery and battery-relay cuts the track battery was housed in special wells, and at signal locations in the case, provision being made in all cases for easy inspection and changing out. Six cells of Edison, type 502, 500-ampere hour battery were used on line and local circuits, and sixteen cells for motor battery at single locations, and twenty cells for two signals at double locations. At all locations, signals are well banked, particular attention being given for providing proper drainage in cuts.

The testing out was handled by telephone exclusively, a man and telephone being stationed at each signal, a certain pre-determined stretch being set for test, preferably from headblock to headblock, and when a train was available the train movement was checked through from a central point, each man telephoning to central what happened as the train passed him. If a train was not available all men receiving instructions from central and the same course was pursued. Common and rail were used to telephone on and the breaks in common were bridged by 2MF capacity condensers, thus permitting these tests to be made without interfering in any way with the normal operation of the signals. A motor car was used for distributing the men, thus enabling quick work to be done when it was necessary to make a slight change, and considerable time was saved in getting the men over the territory. The signals were put in service by sections as rapidly as they were completed; special bulletins and diagrams illustrating signal aspects were furnished the trainmen who were required to become familiar with them, in fact, were examined on the bulletin the same as on the book of rules.

In view of the above-mentioned installations, it was necessary to organize a Maintenance Department, as the signal maintenance prior to this time had been handled by the Telegraph and the Bridge and Building Departments. The whole territory signaled is divided into six maintenance sections under the control of one supervisor, each section having a maintainer and an assistant. Included in the maintainer's equipment is motor car, hand speeder and necessary meters. Each maintenance section is provided with a maintainer's tool house.

## REAR END COLLISION ON MICHIGAN CENTRAL

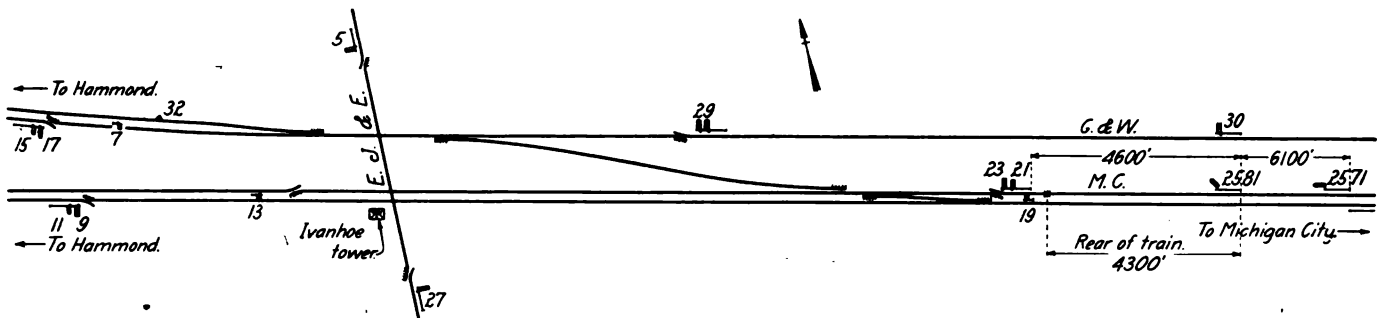
At 3:57 a. m., Saturday, June 22, an empty west-bound equipment train on the Michigan Central, consisting of 20 tourist sleepers and 1 coach, crashed into the rear of the second section of a circus train, at Ivanhoe interlocking plant, near Hammond, Ind., killing 72 and injuring 120 persons on the circus train, according to the latest available information. Trainmaster F. S. Whipple, who accompanied the second section of the circus train, was evidently killed in the accident, as no trace of him has been found. Many of the bodies recovered were charred beyond recognition and it is doubtful if the total number of killed and missing will ever be determined.

After a performance at Michigan City, Ind., the Hagenbach-Wallace circus was being moved in two sections over the Michigan Central to Hammond, Ind. These



A Close View of the Burning Debris

trains were being run over the Michigan Central to Ivanhoe, at which point they were diverted over the Gary & Western into Hammond. The interlocking plant at which the accident occurred is approximately five miles west of Gary and four and a half miles east of Hammond. The second section of the circus train, consisting of 27 cars, passed the Michigan City depot at 1:00 a. m., pulling up to Tenth street, where the loading was completed. This train left there at about 2:30 a. m., arriving at Porter, 11.8 miles distant, at 3:06 a. m.; at East Gary, 9.2 miles from Porter, at 3:30 a. m.; at Tolleston, 6½ miles from East Gary, at 3:44 a. m., and at Ivanhoe, approximately 3.3 miles from Tolleston, at 3:55 a. m. The train sheets show that the empty equipment train, pulled by engine 8485 and in charge of Engineman A. Sargent and Conductor L. Johnson, passed the Michigan City depot at 2:55 a. m., Porter at 3:20



The Track Layout of the Ivanhoe Accident, Showing Location of Rear of Circus Train



**A General View at Ivanhoe, Showing the Debris, the Gary & Western at the Right and the Home Signal in the Distance**

a. m., East Gary at 3:34 a. m. and Tolleston at 3:52 a. m. and crashed into the rear end of the second section of the circus train at 3:57 a. m.

This portion of the Michigan Central is a double track line completely equipped with automatic block signals. The track is on tangent for over a mile east of the point where the wreck occurred. At the point of the accident the Gary & Western tracks are parallel to and 85 ft. north of those of the Michigan Central. The night was clear, with nothing to obstruct the view, the accident occurring in the country with no manufacturing plants or factories near by. The westbound home signal for Ivanhoe interlocking plant is located 950 ft. east of a crossing of the Elgin, Joliet & Eastern and 270 ft. east of the crossover switch leading to the Gary & Western tracks.

The second section of the circus train traveled from Porter to East Gary, a distance of 9.2 miles, in 24 minutes, running at an average speed of 23.4 miles an hour. The empty equipment train traveled this distance in 14 minutes, running at an average speed of 39.1 miles an hour. The circus train covered the distance between East Gary and Tolleston, 6.5 miles, in 14 minutes, an average rate of 27.9 miles an hour, while the empty equipment train covered the same distance in 18 minutes at an average rate of 21.7 miles an hour. The distance between Tolleston and Ivanhoe, approximately 3.3 miles, was covered by the circus train in 11 minutes,

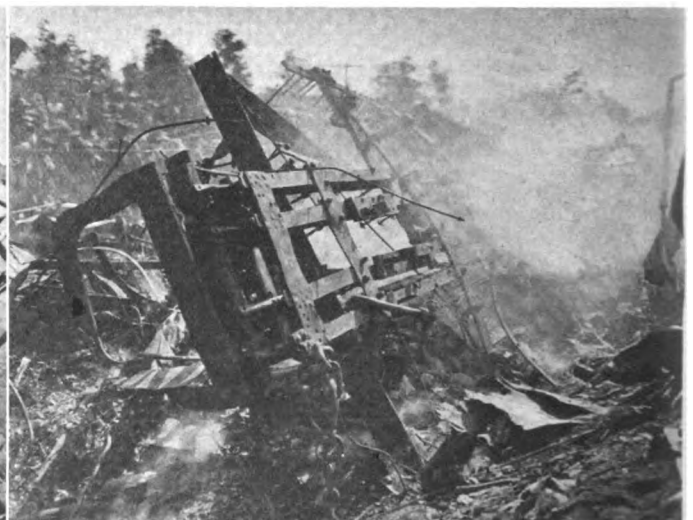
running at an average speed of 18 miles an hour, while the empty equipment train covered it in 5 minutes, running at an average speed of 39.1 miles an hour. The empty equipment train passed East Gary 4 minutes after the circus train, while at Tolleston the interval between the two trains was 8 minutes. From this it appears the empty equipment train slowed up materially between East Gary and Tolleston, or while passing through the city of Gary, but immediately resumed an average speed of 39 miles an hour at or near Tolleston.

The second section of the circus train consisted of stock cars, flat cars and four sleeping cars, which were just ahead of the caboose. These sleeping cars were converted wooden equipment. The engine plowed through the sleeping cars and after the crash these four cars and one flat car were destroyed by fire, which evidently started from the gas lighting system with which the sleeping cars were equipped. That the casualties were so large was due to the sleeping cars being of wooden construction and that they were equipped with three tiers of double deck bunkers to each car instead of two as in ordinary sleeping cars.

The second section of the circus train had a blazing journal box on one of the cars and stopped, after having started to cross over to the Gary & Western tracks with the rear of the train at a point approximately 300 ft. east of the home signal of the Ivanhoe interlocking plant of the westbound main track of the Michigan Central and



**Engine of Empty Equipment Train**



**Where a Large Number of Bodies Were Found**

4,300 ft. beyond or west of the distant signal. An automatic block signal was located 6,100 ft. east of the distant signal. When the second section of the circus train stopped to cool the hot box the flagman started back with fuses and lantern. It appears from the preliminary investigation that the automatic signals and the signals of the flagman were disregarded by the engineman of the empty equipment train, as, after the accident, the distant signal for the interlocking plant was found to be in the stop position with the red light showing, while the automatic block signal was found to be in the caution position with the yellow light showing properly. This shows that the signals were operated properly. The signal system consists of 1 arm, 3 position upper quadrant signals.

After receiving the caution indication, the engineman should have been prepared to stop at the next signal in advance. Rule 8 of the automatic block signal rules, in the Book of Rules for the operating department of the Michigan Central, reads, "a train passing an automatic distant signal which indicates caution must be under control, so it may be stopped on reaching the home signal." All employees involved in this accident, and in fact all employees in the entire transportation service, are examined on all block signal and operating rules once a year as required by the State of Indiana.

Engineman Sargent has been in the service of the Michigan Central 28 years, is an extra passenger engineman and is about 55 years old. He reported for duty at 9:30 a. m. on June 21, having been off duty since 1:30 p. m. on June 20. At the time of the accident he had been on duty 6 hrs. and 27 min., with a total time off duty of 32 hours prior to starting work. Mr. Kraus, fireman, was called for duty at 12:15 a. m. on June 22, after having been off duty 23 hrs. and 50 min. prior to starting work. He had been on duty 3 hrs. and 42 min. when the collision occurred.

Further investigation indicates that Engineman Sargent was dozing or asleep, which was the cause of the accident. The flagman of the circus train was back from six to eight hundred feet at the time of the accident. At the coroner's inquest at Hammond on June 25, Engineman Sargent, under his constitutional rights, refused to testify at this time. Conductor Johnson stated to Sargent after the wreck, "This is quite a bad mess," and asked him what was the matter. Sargent's answer was that "I must have been dozing." Circus officers on June 25 compiled a list of dead and missing, which totals 78. Railroad officers advise they know of no changes quoted in figures in casualties as given in the beginning of this article.

### MAINTAINING AN INTERLOCKING PLANT AT HIGH TIDE

**D**URING the early part of June strange things happened in the state of Iowa. The geographical setting of the country suddenly reversed itself. Maintainers, battery men, lampmen, in fact every one in the central portion of Iowa found themselves hard pressed to discover some means of reaching shore. Oceans of water seemed to have suddenly emptied into that particular portion of the country and inundated railroad tracks and the lowlands to such an extent as to cause a suspension of train movements on a number of lines for about 24 hours.

The Chicago & North Western experienced its greatest trouble in the vicinity of Tama, Iowa. At Tama the North Western maintains and operates a 60-lever mechanical interlocking plant for the protection of the

Chicago, Milwaukee & St. Paul double track crossing with the North Western double track main line and the Jewell Junction branch.

Exceptionally heavy rains, together with a cloudburst at Gladbrook, Iowa, northwest of Tama, filled to an overflowing capacity the small creek which flows from that point toward Tama, and empties into the stream, south of the tracks, at that place. The two pictures shown here gives one a very good idea of the condition that existed at the interlocking plant. The picture show-



Wanted—Motor Boat to Reach Dwarf Signal

ing the ground signal poles just to the right of the center also shows a dwarf signal at the extreme right, almost submerged. The other picture shows the accumulation of trash between tracks and the pipe lines, a portion of which is shown in the bottom left-hand corner of the picture. No particular damage was done to the plant, except to throw out of line a small portion of the pipe runs. In one or two cases the earth was washed away from



Shooting Track Trouble Under Difficulties

around concrete cable post foundations. At one location the earth around the battery well was washed away. The battery well, however, was not disturbed. The water in the tower rose to the top of the vertical cranks. The maintainers' greatest trouble was the removal of trash after the water subsided.

In the lower picture the signal formen is having a hearty laugh at the expense of one of the men, who inadvertently had the misfortune to step in a hole between the ties, receiving an involuntary ducking. If floods like this one were to occur often it would be necessary for the railroads to develop a combined motor track car and boat for the use of the maintainers so they could cover their territory.