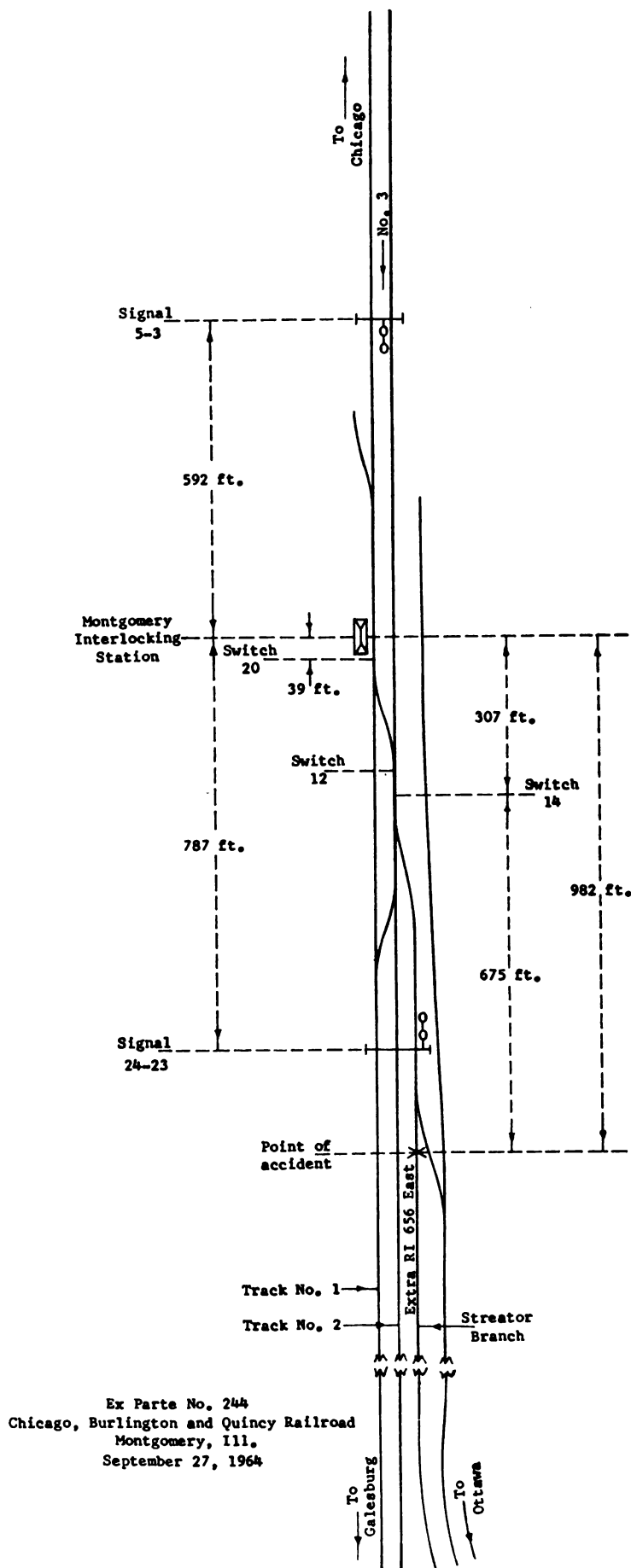


Indication locking



Failure to maintain the Montgomery interlocking in a safe condition for train movements was the cause of an accident on the Chicago, Burlington & Quincy at Montgomery, Ill., on Sept. 27, 1964. So ruled Division 3 of the Interstate Commerce Commission. The accident involved a head-end collision between passenger trains of the CB&Q and the Chicago, Rock Island & Pacific, resulting in the death of 4 railroad employees, and in the injury of 37 railroad employees, 2 railway post office employees and 201 passengers. The following is an abstract of the report of the ICC following an investigation and hearing.

The accident occurred on that part of the CB&Q between Chicago and Galesburg, Ill. This is a double-track line in the accident area. Trains operate in both directions on either main track by signal indications of automatic block-signal and interlocking systems. From the north, the main tracks are designated as tracks No. 1 and No. 2.

Montgomery, a mechanical interlocking, is 40 miles west of Chicago and 2.2 miles west of the station at Aurora, Ill. Movements through the interlocking are controlled by the operator from an interlocking machine, which is in a station.

The Streator Branch, a single-track line, diverges southwestward from track No. 2 at switch 14 of the interlocking. This switch is facing point for westbound movements on track No. 2. A crossover connects tracks No. 1 and No. 2 within the interlocking. Its switches are designated as No. 12 and No. 20. The latter switch is facing point for westbound movements on track No. 1.

The accident occurred on the Streator Branch main track 982 ft west of Montgomery interlocking station and 675 ft west of switch 14.

A signal bridge spans tracks No. 1 and No. 2 at a point 592 east of the interlocking station. Semi-automatic signal 5-3, fixed to a mast on this signal bridge, governs westbound movements through the interlocking on track No. 2 and westbound movements from track No. 2 to the Streator Branch main track via switch 14.

nadequate says ICC in report

A signal bridge spans the Streator Branch main track and tracks No. 1 and No. 2 at a point 787 ft west of the interlocking station. Semi-automatic signal 24-23 governing east-bound movements from the Streator Branch main track to tracks No. 1 and No. 2, is fixed to a mast on this signal bridge.

The Montgomery interlocking was of the mechanical pipe-operated type. Approach, route and indication locking were provided. The interlocking machine had 24 mechanical working levers in a 28-lever frame. Levers 3, 5, 23 and 24 were four of the signal levers and each controlled its corresponding numbered interlocking signal unit. Levers 14, 12 and 20 were three of the switch levers and each controlled its corresponding numbered interlocking switch. Lever 15, one of the locking levers, controlled the locking of switch 14. At the time of the accident, Montgomery interlocking was being converted to the electrical power-operated type for remotely controlled operation under a forthcoming traffic control system. Switches 14, 12 and 20 had been converted to power-operated switches and were controlled through circuit controllers operated by the corresponding numbered interlocking machine levers.

A track model board was attached to an inside wall of the interlocking station. It was equipped with indicator lights to show track occupancy within the interlocking. A temporary panel was suspended below the track model board. The letters "R" and "N" were printed a few inches apart on the top center portion of the panel. A red indicator light was below the letter "R" and a white indicator light was underneath the letter "N". The number "14" was printed on the panel below the indicator lights and immediately under this number, the panel bore a handwritten notice reading in part as follows:

NOTICE

#15 lock lever must not be moved until #14 switch indicator light is lit.

The indicator lights over the num-

ber 14 were associated with switch 14. Their circuits were so arranged that when switch 14 was in normal position, lined for movements on track No. 2, the white indicator light was illuminated. When the switch was in reverse position, lined for movements between track No. 2 and the Streator Branch main track, the red indicator light was illuminated. A similar set of indicator lights was on the panel to indicate the position of crossover switches 12 and 20.

CRI&P CONNECTION TO CB&Q

CRI&P is connected to the CB&Q at Ottawa, Ill., which is on the Streator Branch 41 miles west of Montgomery. A few days before the accident, CRI&P trains started detouring over the CB&Q tracks between Ottawa and Chicago because of a defective CRI&P bridge over the Desplaines River at Joliet, Ill. Some time before 8:45 p.m. on the day of the accident, CRI&P passenger trains No. 4 [Golden State] and No. 10 [Corn Belt Rocket] were combined at Ottawa to detour eastward over the CB&Q to Chicago, via Montgomery interlocking. This combined train, consisting of 6 CRI&P diesel-electric units and 19 cars, operated on the CB&Q as Extra RI 656 East. It left Ottawa at 8:45 p.m. with a CRI&P engine crew, a CB&Q engineer-pilot, and a CB&Q road foreman of engines in the control compartment at the front of the locomotive. A CB&Q conductor-pilot and a CRI&P train crew were at various locations in the cars.

Approximately 2 hr after leaving Ottawa, Extra RI 656 East arrived at Montgomery interlocking, where it stopped on the Streator Branch main track with the front end 675 ft west of switch 14 and 195 ft west of signal 24-23, which indicated Stop. About the same time, the men on the locomotive saw a detouring westbound CRI&P passenger train, Extra RI 634 West, stopped on track No. 1 east of the interlocking station. A few minutes later, they saw the headlight of No. 3 [Ak-Sar-Ben Zephyr], a westbound CB&Q passenger train, approaching on track No. 2 and surmised that their train

would be routed eastward on track No. 2 after No. 3 passed. While Extra RI 656 East was waiting for No. 3 to pass, a warning device sounded in the control compartment of the first diesel-electric unit and the CRI&P fireman went into the engine room of this unit to determine why the warning device had sounded. Immediately after the fireman left the control compartment, the CB&Q road foreman of engines noticed No. 3 had been diverted to the Streator Branch main track at switch 14 and was closely approaching at high speed. He promptly called a warning to the CRI&P and CB&Q engineers and ran to a side door of the control compartment, where he started to jump from the locomotive. Before he could jump, however, No. 3 struck the front end of Extra RI 656 East, killing the CRI&P engineer and the CB&Q engineer-pilot. The CB&Q road foreman of engines and the CRI&P fireman were injured.

No. 3, a westbound first-class passenger train, consisting of 3 diesel-electric units and 15 cars, left Aurora at 10:45 p.m., 3 minutes late, and proceeded westward on track No. 2. A few minutes later, it approached Montgomery interlocking at 63 mph, as indicated by the speed-recording tape. The engineer and firemen were in the control compartment at the front of the locomotive, and the other crew members were at various locations in the cars. Signal 5-3 indicated Proceed as the train approached Montgomery interlocking, and this indicated to the enginemen that the route was lined for movement of No. 3 through the interlocking on track No. 2. The route, however was improperly lined for movement of No. 3 from track No. 2 to the Streator Branch main track, via switch 14. The engineer apparently first became aware of this when the train reached the area of the interlocking station at which time he initiated an emergency brake application. A few moments later, the train passed the interlocking station, entered the Streator Branch main track at switch 14 and, while moving at 52 mph, struck the front end of Extra RI 656 East. Both

the engineer and fireman of No. 3 were killed.

About 50 minutes before the accident, Extra RI 634 West, a detouring westbound CRI&P passenger train, stopped on track No. 1 at Montgomery interlocking with the front end a short distance east of the signal bridge bearing signal 5-3. Both the CB&Q engineer-pilot and conductor-pilot of this train noticed that signal 5-3 indicated Stop at this time. The conductor-pilot walked ahead to the interlocking station and was there when No. 3 approached on track No. 2. He noticed nothing unusual until the locomotive units of No. 3 passed the interlocking station, at which time he saw the train brakes had been applied heavily.

A few minutes after the accident occurred, the interlocking first-trick operator, who had gone off duty at 2:15 pm, returned to the interlocking station to assist the third-trick operator, the operator on duty. He determined from the third-trick operator that none of the interlocking machine levers had been moved since the accident and noticed that lever 14 was in the position that causes switch 14 to move to normal position, lined for movements through the interlocking on track No. 2, and that levers 5 and 3 were in the positions that cause signal 5-3 to indicate Proceed. In addition, he noted that despite the fact lever 14 was in normal position, the red light of the indicator lights associated with switch 14 was illuminated, indicating that switch 14 had not moved to normal position, but remained in reverse position.

The engineer-pilot of Extra RI 634 West saw the indication of signal 5-3 change from Stop to Proceed shortly before No. 3 approached the interlocking and this indicated to him that the interlocking operator had established the route for No. 3 to proceed through the interlocking on track No. 2. Immediately after No. 3 passed the locomotive of Extra RI 634 West, the engineer-pilot saw the brakes of No. 3 become heavily applied, about the same time he saw No. 3 enter switch 14. He and a CB&Q assistant trainmaster examined this switch after the accident and found it undamaged and in reverse position, lined for movement from track No. 2 to the Streator Branch main track.

The third-trick interlocking oper-

ator reported on duty about 35 minutes before the accident and at this time, signals 24-23 and 5-3 indicated Stop. Switch 14 was in reverse position, lined for Extra RI 656 East to enter track No. 2 and continue eastward to Aurora and Chicago. The red indicator light associated with switch 14 was illuminated, which indicated to the operator that the switch was in reverse position. About 10:30 pm, after determining that Extra RI 656 East was not closely approaching on the Streator Branch and that No. 3 would operate on track No. 2 from Aurora, the third-trick operator began establishing the route for movement of No. 3 through the interlocking on track No. 2. He operated interlocking machine lever 14 to the position that causes switch 14 to move to normal position, lined for movements on track No. 2, and waited about two minutes, according to his statements, before taking further action. It is his statement that at the end of this period, he operated lever 15 to the position that locks switch 14 in normal position and then caused signal 5-3 to indicate Proceed by operating lever 5. He could not remember whether he had looked at the indicator lights associated with switch 14 between the time levers 14 and 15 were operated, but felt sure that he had. He stated that he was familiar with the notices on the panel of the indicator lights associated with switches 12, 20 and 14, and that he understood the reason for these notices.

TESTS MADE AFTER ACCIDENT

Tests made after the accident revealed that when switch 14 was in reverse position and interlocking machine lever 14 was operated to move switch 14 to normal position, it took 2.6 seconds for the switch motor to start moving the switch to normal position. If the latch of locking lever 15 was operated within 2.6 seconds after the operation of lever 14, the motor of switch 14 became de-energized and the switch remained locked in reverse position. In such event, the red indicator light associated with switch 14 remained illuminated to indicate that switch 14 was in reverse position. However, the operator could operate lever 5 and cause signal 5-3 to indicate Proceed with switch 14 in improper position.

The Commission's rules, standards and instructions for the installation, maintenance and repair of automatic block-signal and interlocking systems (Ex Parte No. 171) read in part as follows:

SUBPART C, INTERLOCKING

Standards

Sec. 136.303 Control circuits for signals, selection through circuit controller operated by switch points or by switch locking mechanism.—The control circuit for power-operated or slotted mechanical signal governing movements at higher than restricted speed in the facing direction over switches . . . shall be selected through circuit controller operated directly by switch points or by switch locking mechanism, or through relay controlled by such circuit controller, for each facing-point switch . . . in the routes governed by such signal. Circuits shall be arranged so that such signal can display an aspect to proceed only when each such switch . . . in the route is in proper position. . . .

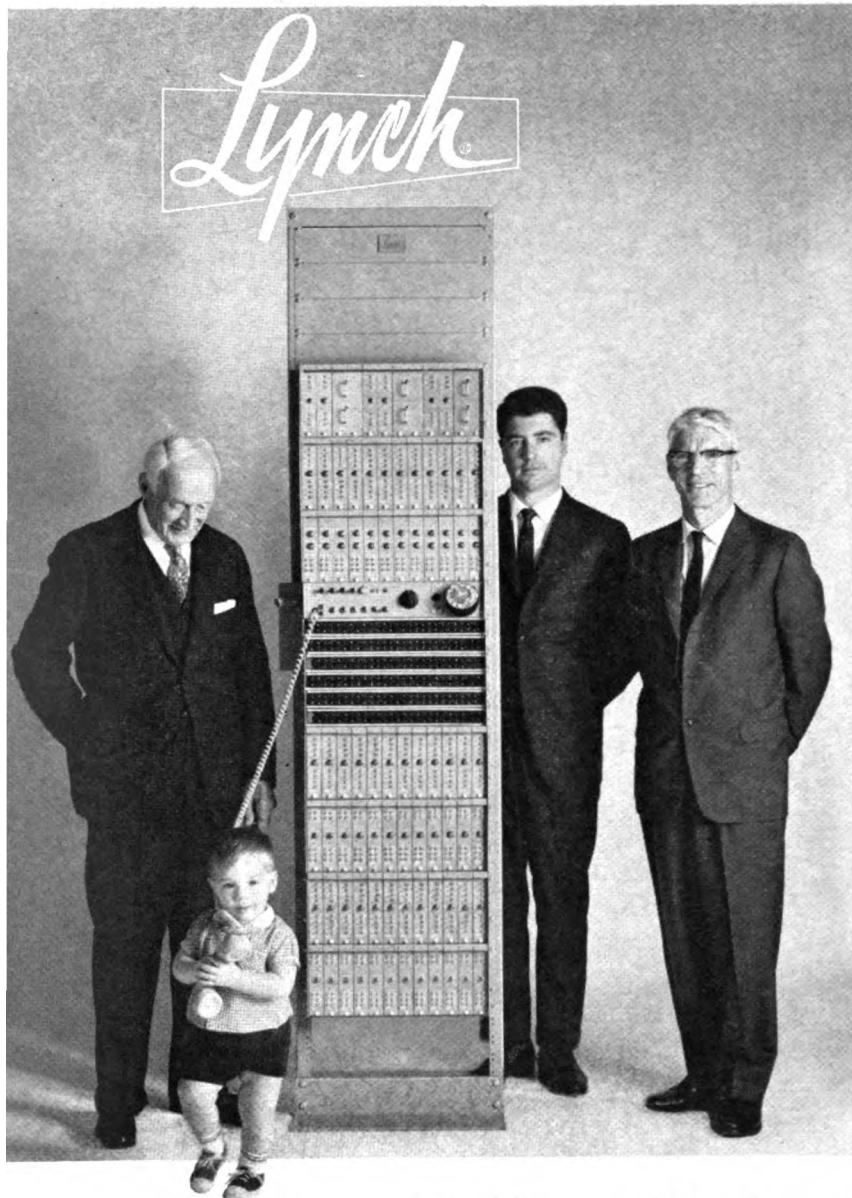
Sec. 136.307. Indication locking.—Indication locking shall be provided for operative approach signals of the semaphore type, power-operated home signals, power-operated switches, . . .

DEFINITIONS

Sec. 136.762 Locking, indication.—Electric locking which prevents manipulation of levers that would result in an unsafe condition for a train movement if a signal, switch, or other operative unit fails to make a movement corresponding to that of its controlling lever, or which directly prevents the operation of a signal, switch, or other operative unit, in case another unit which should operate first fails to make the required movement.

It is evident in this case that switch 14 was in reverse or improper position for the intended route through the interlocking, and that the circuits of signal 5-3 were not arranged as required so that signal 5-3 would indicate proceed only when switch 14, and other switches in the intended route, were in proper position. It is also evident that the indication locking of the interlocking did not conform with the Commission's regulations, and that the indication locking provided did not prevent manipulation of levers that would result in an unsafe condition for a train movement when switch 14 failed to move to normal position after lever 14 was moved to that position. The absence of indication locking for power switch 14 permitted the operation of signal 5-3 after switch 14 did not make the required movement to normal position.

From all indications, the inter-
(Please turn to page 30)



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ICC ACCIDENT REPORT

(Continued from page 20)

locking operator failed to heed the handwritten notice attached to the panel bearing the indicator lights associated with switch 14, and operated locking lever 15 and cleared signal 5-3 while the red indicator light was indicating that switch 14 was still in reverse position. However, had the interlocking system conformed to the Commission's regulations, the operator would not have been able to clear signal 5-3 while switch 14 was in improper position and the accident probably would have been averted.

We find that: (1) The trains involved were operated in conformity with the CB&Q operating rules. (2) The interlocking operator failed to determine that switch 14 was not in proper position when he cleared home interlocking signal 5-3 for No. 3. (3) Signal 5-3 indicated Proceed although a switch in the interlocking route was not in proper position. (4) The indication locking of the interlocking was not sufficiently adequate to prevent an unsafe condition for a train movement through the interlocking. (5) The accident was caused by failure to maintain the Montgomery interlocking in a safe condition for train movements.

In an appendix to the report the Commission noted:

The circuits were intended to be so arranged that when the appropriate interlocking machine levers had been operated to establish the route for a westbound movement from track No. 2 to the Streator Branch main track via switch 14, signal 24-23 would indicate Stop and signal 5-3 would indicate Proceed-at-Reduced Speed. It was also intended that when the appropriate levers had been operated to establish the route for a westbound movement through the interlocking on track No. 2 and the block of signal 5-3 was clear, signal 24-23 would indicate Stop and signal 5-3 would indicate Proceed. The circuits, however, were actually so arranged that signal 5-3 would be caused to indicate Proceed regardless of whether switch 14 was in reverse or normal position.

The maximum authorized speed for passenger trains on tracks No. 1 and No. 2 is 79 mph, but is restricted to 75 mph near Montgomery interlocking. **RS&C**

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