INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY CONCERNING AN ACCIDENT WHICH OCCURRED ON THE MISSOURI PACIFIC RAILROAD AT SHELDON, MO., ON JULY 20, 1935.

October 7, 1935.

To the Commission:

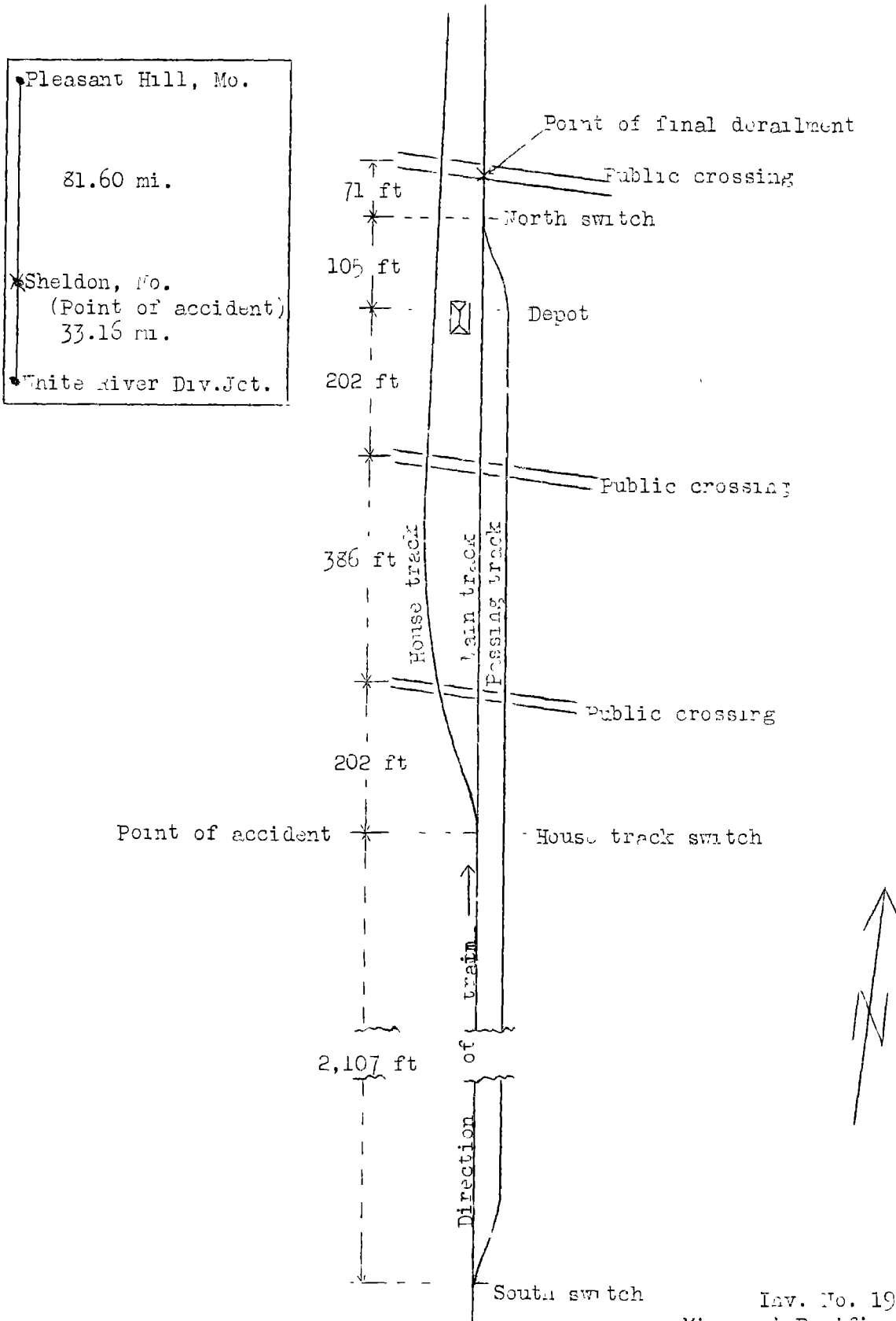
On July 20, 1935, there was a derailment of a freight train on the Missouri Pacific Railroad at Sheldon, Mo., which resulted in the death of 2 trespassers and the injury of 4 trespassers.

Location and method of operation

This accident occurred on the Pleasant Hill District of the Joplin and White River Divisions, extending between White River Division Junction and Pleasant Hill, Mo., a distance of 114.76 miles; in the vicinity of the point of accident this is a single-track line over which trains are operated by time table and train orders, no block-signal system being in use. The initial derailment occurred at the south switch of the house track at Sheldon and the final derailment occurred at a highway grade crossing located 966 feet farther north; the south house-track switch is a facing-point switch for north-bound trains and leads off the main track to the left, being located 790 feet south of the depot. The track is tangent for a considerable distance in each direction from the point of accident, while the grade is undulating, varying from level to 1.2 percent, being 0.3 percent descending for north-bound trains at the point of derailment. The passing track at Sheldon is 3,002 feet in length and parallels the main track on the east; the south passing track switch is located 2,107 feet south of the house-track switch. The depot is located between the main track and the house track.

The track is laid with 85-pound rails, 33 feet in length, with 20 ties and 6 rail anchors to the rail length, partly tie-plated, single-spiked, and ballasted with about 8 inches of chats; it is fairly well maintained. The speed of freight trains is limited to 45 miles per hour.

The weather was clear at the time of the accident, which occurred about 3:15 a.m.




Inv. No. 1996
Missouri Pacific Railroad
Sheldon, Mo.
July 20, 1935

## Description

Train No. 270, a north-bound freight train, consisted of 46 cars and a caboose, hauled by engine 1456, and was in charge of Conductor Braun and Engineman Foster. This train passed Lamar, Mo., 11.39 miles south of Sheldon, at 2:52 a.m., according to the train sheet, 1 hour and 48 minutes late, and while passing through Sheldon it was derailed while traveling at a speed estimated to have been between 40 and 45 miles per hour.

Engine 1456 and the first 31 cars were separated from the remainder of the train and were not derailed; the next 15 cars were derailed and the 10 rear cars and caboose remained on the track. The first 2 derailed cars stopped on their left sides, west of the track, about 450 feet north of the other 13 derailed cars, which were scattered about and piled up on the track within a distance of 275 feet; all of the derailed cars, with the exception of the last one, were more or less damaged.

## Summary of evidence

Conductor Braun stated that he took charge of the train at Cotter, Ark., which is on the Carthage District; the air brakes were tested at that point and worked properly, the train departing at 7:45 p.m., July 19. Approaching Cricket, 51.1 miles north of Cotter, the flagman observed fire flying from under the right side of the train about six or seven cars ahead of the caboose, whereupon the conductor applied the air brakes from the rear and after the train stopped it was inspected in the dark by the train crew, but nothing wrong was found with the brake beams, couplers and arch bars, nor was there anything down or dragging to account for the fire flying; he thought the fire which the flagman saw might have been caused by ballast flying up under the train, or a brake shoe swinging against a wheel. At Branson, 14.7 miles north of Cricket, a stop was made for water and coal and while that was being done the crew again inspected the train. At Crane, 30.4 miles north of Branson, work of setting out and picking up cars was performed, after which the brakes on the cars picked up were tested and the train departed; similar work also was performed at Carthage, 49.9 miles north of Crane. After leaving Carthage nothing unusual occurred until Sheldon, the point of accident, 33.27 miles north of Carthage, was reached; as the rear of the train was passing the south switch of the house track the conductor saw fire flying from under the left side of the train, at which time the speed was about 40 miles per hour; he immediately applied the air brakes, and the train stopped with the caboose opposite the depot. Conductor Braun then went forward and a short distance north of the depot he found a truck with a broken bottom arch bar which he thought came from the rear truck of GATX tank car 9570, the twenty-third car in the train, the location of this car being about where he saw fire flying from under the

train. The flagman previously had seen fire flying from under the right side of the train and only about six or seven cars ahead of the caboose but inspection failed to disclose anything wrong at that point. Marks found on the bottom of the overturned tank car after the accident indicated that the rear truck came out and permitted that end of the car to drop down and drag along the track. Statements of Flagman Corey were similar to those of Conductor Braun; the flagman also stated that on his way back to flag immediately after the accident he saw marks on the ties and rails of the south switch of the house track, while the turnout was damaged.

Engineman Foster stated that approaching Sheldon the speed was between 43 and 45 miles per hour and that he made a light air-brake application on the descending grade, then released and permitted the train to drift. Shortly afterwards the air brakes were applied in emergency, bringing the train to a stop. Engineman Foster left the engine in charge of Fireman Russell and went back to the wrecked cars, but as he did not have a lantern he did not make any effort to find out what caused the derailment.

Head Brakeman Bussinger was of the opinion that the accident was caused by a broken arch bar; the south switch of the house track was damaged and there were marks in the ballast on the west side of the track about halfway between the south switch of the house track and the south switch of the passing track, indicating that an arch bar or something of that nature had been dragging.

Master Mechanic Kling and Car Foreman Newman arrived at the scene of the accident within $1\frac{1}{4}$ hours after its occurrence. At a point approximately 1,400 feet south of the south switch of the house track they found that the ballast on the west side of the track was slightly higher than the tops of the ties, having been recently unloaded and not leveled off, and there were marks where something had been dragged through the ballast, 11 inches from the gauge side of the west rail. On reaching the house-track switch this dragging equipment passed over the outside rail of the turnout and then struck the inside rail of the turnout, where all the wheels of a truck became derailed. Marks of the derailed wheels then appeared on the ties until they reached the north switch of the passing track, where the truck began breaking to pieces, total disruption occurring at the highway crossing located 71 feet beyond the switch, where the truck engaged the concrete pedestrian walk and was torn apart and the pieces scattered about for a distance of from 50 to 75 feet. On the following day, after all of the damaged equipment had been picked up and the wreckage cleared away, the truck in question, of the arch-bar type, was definitely determined to have been the rear truck of GATX tank car 9570, under the A end. The bottom arch bar on the left side broke at a column bolt hole and this apparently was a

new break, although there was slight discoloration in the break on the inside of the rear column bolt hole, indicating that this portion might have been an old break. This break was completely hidden by the column casting and being on the inside of the bar it was wholly invisible to any inspection that could be made without dismantling the truck. The box bolts, which had every indication of having been tight prior to the accident, were sheared off when the truck was torn apart. The bottom arch bar showed some wear at the point where the pedestals engaged it, but neither the column-bolt holes nor the box-bolt holes showed more than slight elongation. The wheels and axles of the truck were in good condition. Tank car GATX 9570 was built in August, 1917, and the weight of the car and contents was 133,180 pounds; tare weight 43,900 pounds and lading 89,280 pounds; the total permissible weight on the axles was 136,000 pounds. The arch bar involved measured 1-3/8 by 4½ inches and the opposite bar on the same truck measured 1½ by 4½ inches; the column bolts were 1-5/8 inches in diameter and the box bolts were 1-1/8 inches in diameter; these arch bars were of the non-lip type.

Inspection of the track by the Commission's inspectors disclosed that the first mark on the rail was on the outside of the stock rail of the south switch of the house track, 12 feet north of the switch point, where the span between the stock rail and switch point was 7½ inches. This rail was bent badly and forced out of the track, and scars which were on the left side and top of the ball extending its full length, together with marks on the ties, indicated that some portion of a car was dragging 8 inches from the gauge side of the rail and was sufficiently substantial to bend and displace the rail. The adjacent rail to the north remained in place, but a scar on top of the ball indicated that something dragging had been raised slightly at this point. The next marks were flange marks on the ties about 10 inches west of the gauge side of the east rail and 36 feet north of the switch point, and at a point 38 feet north of the switch point there were marks on the ties outside of the west rail which appeared to have been made by a derailed wheel. The marks on the gauge side of the east rail continued for several hundred feet while the marks on the outside of the west rail appeared at intervals of from 25 to 50 feet, indicating that after the wheels became derailed the left wheel and the dragging portion of the truck were lifted at intervals above the level of the ties. At a point 588 feet north of the south switch of the house track a crossing plank which had been level with the top of the rail was torn out by the derailed left wheel; this derailed wheel did not mark the ties immediately before reaching the crossing. At a point 15 feet north of this crossing there was a mark on the east rail, apparently made when the second pair of wheels became derailed, probably caused by the lower end of the front column bolt on the right side of the truck contacting this rail and shearing off, and in turn accounting for the fracture in that arch bar directly

below the column bolt. From this point northward the marks on the ties, made by more than one pair of wheels, were continuous to the point of complete derailment of the car at the crossing. At a point 65 feet north of this crossing a sheared box bolt was found and 55 feet farther north a double truck spring was found, all on the west side of the track. Both bottom arch bars of the rear truck of GATX tank 9570 were found to have been broken; the one on the left or west side was partly fractured at the front column-bolt hole, the fracture extending between the outer edge of the bar and the bolt hole. This bar was broken in two at the rear column-bolt hole and the lower ends of both column bolts on this side of the truck had been sheared off. The break in the bottom bar on the right or east side of the truck also was at the front column-bolt hole and extended between the hole and the outer edge of the bar; the lower end of the front column bolt on this side of the truck also had been sheared off. All box bolts remained in the truck undamaged except the two front ones on the right side which had their heads sheared off.

Examination of parts of the rear truck of GATX 9570 by Engineer of Tests Jackson, showed that the broken arch bar had been reduced by wear and bending from 1-3/8 by 4½ inches to 1-5/16 by 4½ inches at the point of rupture. According to his statement, the quality of the material in this arch bar, as well as in the column bolts, was considered satisfactory but there was evidence to the effect that the assembly on the side on which the bar failed had been in poor mechanical condition; the column castings had worn approximately 1/8 inch into the bottom bar, which fact, together with the worn condition of the column bolts, indicated that the parts had been working for some time prior to the accident. The rupture occurred through a progressive fracture of old standing, having an area of approximately 6 percent of the total cross section and having its origin in the upper inside corner of the bolt holes; the fresh fracture was crystalline, with a medium grain size, and was free from interior defects. The opinion was expressed that the fracture resulted from shock delivered in tension and that the tensile stress causing failure was delivered to the arch bar by the column bolt.

The last regular inspection point by car inspectors for the tank car involved was at the terminal at Newport, Ark., located 125 miles south of Cotter and about 304 miles from Sheldon. There is only an intermediate terminal at Cotter, where this particular crew took charge of the train; no switch engines are worked there and the crews make up their own trains, inspect them, and make air-brake tests. At Crane, Mo., another intermediate point, there is a similar arrangement in effect, no regular inspection force being maintained. Engines are changed at Crane, as from that point northward the line is good for the 1400 class of power, and it is not good for that heavy power south of Crane. Carthage, at the junction of the Carthage and Pleasant Hill Dis-

tricts, is not a terminal for these freight runs and no inspection force is maintained there.

According to the record, the tank car involved was built in August, 1917, and was acquired by the General American Tank Car Company in 1930; that company was unable to advise whether the trucks had ever been changed and had no record of repairs prior to 1930. Subsequent to 1930 the tank car company's record showed the following arch-bar renewals: Bottom bar applied to left side, A end, at Gouldsboro, July 15, 1933, by the TP-MP terminal, and bottom arch bar applied to right side, A end, at Gouldsboro, Sept. 8, 1934.

The total number of defective arch bars discovered on the Missouri Pacific Railroad from January 1 to July 31, 1935, was 3,430; the number of arch-bar trucks repaired during that period consisted of 1,029 system cars and 2,401 foreign cars, a total of 3,430; the cost of these repairs amounted to $85,750.00. The total number of accidents caused by broken arch-bar trucks during the above period was 43, the expense resulting therefrom being $100,283.00.

## Discussion

The evidence indicates that an arch bar failed on the left side of the rear truck of the twenty-third car in the train, GATX tank car 9570, and that its failure allowed the west end of the body bolster and its appurtenances to sag. At a point 1,400 feet south of the south switch of the house track there was a mark in some undistributed ballast west of the west rail, apparently made when some portion of the sagging truck was dragged through it, and when the truck reached the turnout of the south switch of the house track the lower end of the left front column bolt encountered the stock rail, bending it and forcing it out of the track, causing the truck wheels to become derailed, in which position the car continued until the final derailment occurred at the highway crossing north of the depot. This train had been inspected by the train crew at the intermediate terminal where this crew took charge, and also en route but nothing was found to be down or dragging.

The weaknesses of arch-bar trucks have been pointed out repeatedly in previous accident investigation reports issued by this Bureau, particularly in the reports covering the accidents which occurred on the Missouri Pacific Railroad at Cunningham Spur, Ark., on February 25, 1935; the Chicago, Rock Island & Pacific Railway at Tiffin, Iowa, on April 4, 1935, and also at Ottawa, Ill., on the same date, and on the Western Pacific Railroad near Red Rock, Calif., on June 9, 1935; the dangers attendant upon the continued use of cars equipped with arch-bar trucks

are materially increased by the fact that in recent years car-inspection forces have been greatly reduced and many car-inspection points eliminated, resulting in lessened opportunity for detecting any defective condition before an accident occurs.

It is also noteworthy that in 1934 on the Missouri Pacific Railroad, repairs were made to 6,467 arch-bar trucks, about 70 percent of which were foreign cars, at a cost of $90,397.00, while during the same year there were 59 accidents caused by arch-bar trucks with a resulting expense of $93,420.00, or a total expense incident to these two items of $183,817.00. In connection with the accident here under investigation, figures furnished by this railroad show that for the first 7 months of the current year the expense for these same two items amounted to $186,033.00, or more than the expense for the entire year 1934.

## Conclusions

This accident was caused by a broken arch bar.

## Recommendations

Recommendations made in a previous report are here repeated:

1. That arch-bar trucks be removed from service at the earliest practicable date.

2. That until arch-bar trucks can be eliminated from service, a reduction sufficient to guarantee safety of operation should be made in the permissible load limit on cars equipped with such trucks.

3. That inflammables, explosives or other dangerous articles should not be transported in cars which are equipped with arch-bar trucks.

4. That provision be made in interchange rules whereby a receiving line may refuse to accept from a connecting line any car equipped with arch-bar trucks.

Respectfully submitted,

W. J. PATTERSON,

Director.