In re investigation of an accident which occurred on the Pennsylvania Railroad near Elizabethtown, Pa., March 15, 1918.

April 19, 1918.

On March 15, 1918, an accident occurred on the Pennsylvania Railroad near Elizabethtown, Pa., caused by a rock falling from the side of a cut against the side of a westbound passenger train, which resulted in the death of two passengers and injuries to 18 passengers and one railroad and three Pullman Company employees. After investigation of this accident the Chief of the Bureau of Safety reports as follows:

The Philadelphia Division of the Pennsylvania Railroad on which this accident occurred, extends from Overbrook near Philadelphia, to Harrisburg, Pa., a distance of 98.3 miles, and at the point of accident is a double-track line used principally for passenger traffic. The freight traffic is generally routed over a low grade line not adjacent to the passenger tracks. The movement of trains on this division is protected by an automatic signal system.

From a point one mile east of the point of accident and proceeding westwardly, the direction in which the train was moving, the track is tangent for a distance of about two miles and the grade is .7% ascending to the point of accident which occurred on the summit in a cut which is one-half mile long and has a maximum depth of eighty feet. The accident occurred 500 feet from the west end of the cut where the depth is about 35 feet.

The train involved was westbound passenger train No. 19, en route from New York to Cincinnati and Chicago, and consisted of 1 combination car, 1 coach and 6 Pullman sleeping cars, all of all-steel construction. It was hauled by locomotive No. 1771, and was in charge of Conductor E. E. Edwards and Engineman E. Bennett. It left Philadelphia at 10.53 p. m. March 14th, 3 minutes late and passed KU Block station, the last open telegraph office east of the point of accident at 12.57 a.m., March 15th, on time, and while passing through the cut about one mile west of Elizabethtown, Pa., and 16 miles east of Harrisburg, Pa. at 1.02 a.m. at a speed of about 40 miles per hour, a rock about 24 feet long, 8 feet thick and 12 feet wide, fell out of the north face of the cut against the side of the train. The rock slightly grazed the roof of the rear-end of the second car from the engine and struck full the first sleeper which was the third car in the train, penetrating and crushing in the side, half the length of the car, swerving the car to the south side of the eastward track where it turned over and came to rest in an inverted position in the ditch. The next sleeper or fourth car in the train was also thrown across the eastward track, but remained partly upright. The following sleeper or fifth car in the train mounted the rock and came to rest in a partly upright position at an angle of about 40 degrees above horizontal. Two wheels in the forward truck of the next sleeper were derailed. When the rock came in contact with the

train, a knuckle broke between the coach and first sleeper, causing the train to separate and a consequent application of the automatic air brakes brought the engine and first two cars to a stop about 800 feet west of the point where the rock fell. The first and second sleepers were practically destroyed and the third sleeper was badly damaged. The balance of the train suffered very little damage.

The cut in which this accident occurred was constructed in 1900. It consists of very large boulders mixed with a small amount of clay, the boulders mostly being in contact with one another separated only by a seam which is in some instances barely visible. In the construction of the cut the rock was more or less shattered by blasting material and it is not always possible to distinguish these cracks from the natural seams. The rock is a trap formation and is very hard. The country in this vicinity shows many out-cropping boulders and has the appearance of glacial drift formation. The cut is patrolled both day and night by watchmen, who alternate positions weekly. The night watchman is required to make one roundtrip through the cut each hour, leaving the watch box on the even hour concluding the roundtrip at 40 minutes past the hour. His performance is checked by the use of a Newman watchman's clock at three stations located in the cut, viz: watch box west of the center of the cut, the starting point, and key box post at west end and key box post at east end of the cut. An examination of the clock dial indicated that the watchman had performed his duty with respect to patrolling the cut up to the time of the accident.

Day Watchman Jacob H. Conrad stated that he has been employed as watchman in this cut since June, 1905, and that there has been no fall of big rock within the past 5 or 6 years. He makes frequent inspections. On the day before the accident he inspected that side of the cut and if there had been any change in the position of the rocks he would have noticed it. He remembered the particular rock before it fell. Its position was leaning away from the track and there were no visible signs of getting loose.

Night Watchman Daniel F. Taylor stated that he has been in the employ of the Pennsylvania Railroad at different periods during the past 13 years and has been employed as watchman in the Elizabethtown cut since October 15, 1917. He had known small rocks to fall from the cut. The largest he had ever found was about the size of a water bucket. He remembered the position of the large rock that fell and stated that it had looked secure. There was nothing to show that it was loose and he never thought it would fall. He went on duty at 4:30 p. m. March 14th and had

made his hourly trips of inspection as close to the schedule as he could make them and was at the watch box, located about 200 feet east of the point where the rock fell, ready to start on another tour at one o'clock when he heard No. 19 approaching. The weather was foggy and drizzling rain. He knew there was nothing down. No train had passed through the cut within the hour, and if any rock had slipped or fallen he would have heard it. He was standing in front of the watch box and gave No. 19 a proceed signal with his lantern and was standing in that position when the accident occurred.

Track Foreman Harvey Foltz stated that he inspected the top of the cut on March 4th and observed no apparent dangerous conditions. On March 5th and 6th, while new rail was being laid in the cut he was in that vicinity most of the time and went through the cut numerous times on those dates. He also went through the cut twice on the day preceding the accident, once in the morning and one in the evening, and observed no appearance of danger. He further stated that if any cracks had opened up or any rocks had become displaced, he would have noticed them.

General Track Foreman H. L. Stoll stated that he and Assistant Supervisor Carrow had made an inspection of the cut during the latter part of February and that he had been through the cut a dozen or more times during the week preceding the accident, and observed no change in the position of any of the rocks since the preceding inspection. He remembered the particular rock that fell and stated that it stood partly vertical, leaning slightly away from the track. It appeared to be the projection of a ledge running back into the bank and rested on rocks underneath surrounded by dirt.

Engineman Edward Dennell of train No. 19 stated that he was running about on time. The night was very dark and foggy. He saw the watchman in the cut and observed nothing unusual until a jerk occurred in his train and his brakes applied in the emergency bringing his engine to a stop after running about six car lengths. He thought an air hose had burst and after preparing to replace it, he walked back and discovered the wreck.

The testimony of all the officers and employees who were interrogated indicated that there was nothing in the appearance of the rock to give any warning that it was about to fall, in fact in the opinion of some of the employees who were familiar with the cut it was one of the last rocks they would have expected to fall. It was shown that recent inspections of both the top and face of the cut had been made and disclosed no unusual condition, and that the night watchman on one of his regular hourly trips had passed the point where the rock fell only one hour before, and had observed nothing nor heard any sound at that time, nor at any time during the night that would indicate any preliminary slipping.

Apparently the rock was in nearly a vertical position, but inclined slightly from the track and had the appearance of being firmly imbedded. It apparently fell over, pivoting around on its base leaving another rock above it which was later removed by blasting. The large rock was estimated to weigh between 150 and 200 tons. Three smaller rocks also came down. Altogether it was necessary to remove about 600 tons of rock. The last preceding fall of rock of any consequence in this cut as shown by the records, occurred on April 17, 1912.

It seems probable that the water penetrated the seams in the rock to a greater depth than usual and owing to the severe winter had frozen deeper, thus producing a greater wedging effect than usual which followed by the heavy rains of the few previous days caused the rock to part from the larger body of stone and slip away. The causes leading up to the falling of the rock which was the direct cause of this accident, appear to have been such that they would not have been reasonably foreseen or anticipated.

The fact that the cars comprising the train involved in this accident were of all steel construction, undoubtedly minimized the fatalities and emphasizes the superior protection afforded travelers upon railroads by this class of equipment.