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M/NM FATAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
BY W. H. TOMLINSON

SUBJECT: Major roof-fall accident in Kansas zinc mine, Treece, Kansas, January 31, 1939.

A fall of roof, resulting in the death of five men, occurred about 1:30 p.m., Tuesday, January 31, 1939, in the Southern mine, operated by the Dines Mining Company, near Treece, Kansas. Two other workmen were injured, requiring hospitalization; one so seriously that it is thought he may die. In addition, two other men who were in the workings in which the fall occurred escaped unhurt.

The Southern mine is situated about one mile north of Treece, Cherokee County, Kansas. It is a relatively small operation employing only about forty-five men above and below ground, and produces about 600 cans (1,500 to 1,600 pounds per can) of ore daily. The ore is not milled at the mine but is treated at a distant central mill operated by the same company, to which it is hauled by auto trucks.

The mine was sunk about twenty years ago and subsequently developed high-grade ore, with the result that mining was done to the full width of the ore body with a few pillars left. The ore is hoisted in open cans and dumped by hand at the hoist level on the derrick into a chute leading to a bin, whence it is loaded into trucks for transportation to the mill. Men are also lowered and raised in ore cans. The ore is loaded by hand and the cans are pushed by the shovelers (or muckers) to and from their working places and local sidetracks. Haulage to and from the shaft bottom is performed with mules. The mining system, typical of the district, is open stope with pillar support. Drilling and charging of the holes is done during the working shift, and the blasts are fired after the shift leaves the mine. Dynamite fired with cap and fuse is used for underground illumination by workmen and the officials also carry high-powered flashlights for inspection of high places.

The fall occurred in a chamber about 400 feet west of the shaft. There were nine men working in this area: the five that were killed, the two injured, and the two machinemen (drillers) who escaped unhurt. The driver in this section was on his way to the shaft at the time of the accident and was out of the zone where rock fell.

The depth of this chamber from the entrance to the farthermost point in the heading possibly 275 feet and its width varies

from sixty to eighty-five feet, this development having been made many years ago. The work being done at the time of the accident and for some time previous thereto in these openings consisted in excavating about six feet of stope (taking up six feet of rock from the floor of the original workings), and in driving a heading for a short distance near the roof of the original excavation, sufficient ore having been discovered to justify this procedure. As fast as is known, the present company has not robbed or slabbed the pillars left in first mining. In driving the heading on the left side of the chamber, the height of the workings had been increased by taking down about eight to ten feet of the original roof, leaving a dome-shaped cavity possibly twenty-five feet in circumference. This left an open end through which, it is thought, the remainder of the roof over the chamber was affected b weathering, since these strata include a thin shale seam, locally called "salvage", which lacks cohesive qualities of the strata above and below this seam. This salvage is said to weather rapidly when exposed, as it was in this case in the cavity where the additional roof had been taken down. the roof over this chamber, about 275 feet by sixty to eighty feet, was supported by a single pillar about twenty-five feet square.

At the time of the accident the stoping had progressed on two sides just beyond the foot of the supporting pillar, and the heading had been advanced about twenty feet into the wall (solid strata) at the roof in the farthermost point of the chamber. Three tracks had been extended on the left side of the pillar and two on the right side, terminating at the foot of the slope or bottom of the muck pile. The victims, including the two injured men, all shovelers or muckers, were loading ore at these points. The two drillers were up in the heading and, although they witnessed the fall, they were out of the way of the falling rock.

The rock that fell was approximately eight feet thick and covered an area of about 170 feet by 50 feet; the weight was estimated from 6,000 to 8,000 tons, which fell from a height of about forty feet. In addition to the roof rock that fell, the pillar mentioned above gave way and toppled over. The upper portion of the pillar, possibly 10 to 12 feet long, capped by a huge piece of roof rock about 20 by 30 feet in area, is till to be seen resting on the broken rock at an angle of about 45 degrees.

Work towards recovery of the bodies was begun within 1-1/2 to two hours after the accident. Mr. Howard Snodgrass, State mine inspector, had just returned to the surface from another mine in the district and he, together with volunteers from nearby mines, began to remove the fallen rock in search of the bodies. The recovery work was difficult due to the presence of large boulders, some so heavy that they could not be moved or broken until they were blasted. More than 150 shots were fired in boulders before the fifth body was located. Search was first made along the racks until the fallen rock became so heavy that progress was too slow.

Holes or pits were then made to the floor at accessible places until all bodies were found. Some of the rock moved was loaded into cans and dumped on the surface, while much of it was thrown aside and rehandled at times.

During the recovery work the entire chamber was illuminated by large floodlights, and men were stationed at each lamp to keep close watch on the roof. Before anyone was permitted in the area, ladders were placed against the overhanging rock and the roof was inspected and that found extremely dangerous was taken down before the recovery work was begun.

The Kansas Department of Mines took charge of the recovery work and made an excellent job of it. At times there were as many as 80 men doing recovery work, but only about 40 could be steadily employed until the last body was located; then only about 10 men could be used. Many of these men were volunteers from nearby mines, but some companies sent crews and paid them for their work.

The direct cause of roof failure probably will never be known. There is considerable difference of opinion as to which gave first--the pillar or the roof surrounding it. Representatives of the State Department of Mines are of the opinion that the roof fell first, and the drillers who saw the fall stated that this is what occurred. Others, including officials of the Tri-State Zinc and Lead Ore Producer's Association, Mr. McNight of the U.S. Geological Survey, and Mr. G. M. Fowler, local geologist, think that the pillar crushed first, removing the only support in the entire chamber, and the immediate roof, being "openended" with the salvage exposed and probably badly weathered, became incapable of self-support.

Mr. Tomlinson concurs with the latter opinion. The one pillar left in support of the roof in this chamber was definitely inadequate, especially since the roof which fell contained frequent horizontal bedding planes and numerous vertical cross fractures which cut the strata like a jigsaw puzzle in all directions, each piece of rock being "keyed" in by those adjacent to it, and when the pillar failed the immediate roof was not strong enough to hold. The exposure of the salvage in the open end probably greatly aided its deterioration; in fact, it is stated that this stratum deteriorates rapidly even when not entirely exposed as in this case.

Regardless of the immediate cause of failure, the initial cause is the absence of sufficient pillar support. In view of the type of rock encountered, at least one more, preferably two or three, additional pillars should have been left. The original development was in high-grade ore and the tendency, especially in former years, was to take out as much as possible.