



Reports

Reports of Recovery

Dated

07/10/1910 - 08/20/1910

Zeigler Mine

To the Director,

Bureau of Mines,

Washington, D. C.

R E P O R T

on the

R E C O V E R Y O F T H E Z E I G L E R M I N E ,

Z E I G L E R , I L L .

Respectfully Submitted by

R. Y. Williams
Mining Engineer

7/7/10.

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INTRODUCTION:-

The mining town of Zeigler, Illinois, is located in the southeast part of Franklin County, 300 miles south of Chicago and 84 miles southwest of St. Louis. It is connected with the Illinois Central Railroad, the Chicago, Burlington & Quincy Railroad and the Missouri Pacific Railway by the Chicago, Zeigler & Gulf Railway. Money has been lavished on this town in the endeavor to make it the most up-to-date coal camp in Illinois. The date "2904" cut in the corner-stone of the engine house is intended to show that this mine is one thousand years ahead of the times.

The Zeigler Coal Company began hoisting coal early in June, 1904. The mine was developed on the double and triple entry room-and-pillar system in the No. 6 seam of the Illinois Series (formerly known as the No. 7 seam because of its superiority over the No. 6 to the northwest). This seam has here an average thickness of 12 feet, lies practically level under a cover of ⁵⁰⁵ 417 feet, and generates considerable quantities of marsh gas. Sensational labor troubles and disasterous fires and explosions have given great notoriety to this Zeigler mine.

THE FIRST EXPLOSION:-

The first explosion occurred at 7:10 a m April 3rd, 1905. The indirect cause of this disaster was the failure of the ventilating machinery at 11:30 p m March 31st, making it necessary to shut down the fan for 55 hours and 40 minutes. During this period an attempt was made to obtain ventilation by means of three air-compressors, the total catalogue capacities of which were 3,600 cubic feet of free air per min-

ute. This volume of fresh air proved insufficient to dilute the marsh gas being generated by the mine, and a squad of men (without having made any previous examination for gas) entered the south run-around between "B" entry and the west aircourse and with their naked lights "touched off" The body of gas which had collected here because this was a high point in the mine. The explosion which followed killed fifty seven men and badly wrecked the mine. Its force was augmented by the exploding of forty one kegs of black powder stored underground in the mine magazine, and of a large number of additional kegs at the working faces.

The mine was put in shape after this explosion and the development work progressed for three and a half years until the production was brought to a maximum output of 3,600 tons in one day.

THE MINE FIRE:-

About 5 o'clock in the evening, November 3rd, 1908, after the day shift had left the mine, a fire originated at the door in the crosscut between the 1st and 3rd west "C" south entries opposite room No. 17 as shown on the mine map at the point marked "G". This fire is supposed to have been caused by crossed electric wires, and small as it was in the beginning it caused the mine to be idle for a year and ten months, originated several explosions, and brought about the death of 31 men who attempted to put it out.

This fire was not discovered until 6:30 p m, November 3rd. The ventilation at the time was forcing air up the 2nd west "C" south entry and returning it through the 3rd west "C" south, and when the rescue

squad entered at 8:30 p m the fire had made headway east along the 3rd west "C" south entry to the neck of room No. 12. To check its advance, a stopping was built at the entrance of the 2nd west "C" south, this being completed at 11:00 p m. At midnight the fire burned the gases, the flame traveling along the 3rd west "C" south and setting on fire the overcast across the south cut-off at the point on the mine map marked "H". The seven men in the mine at the time reached the surface in safety, and by 10 o'clock the following morning the work of sealing both shafts was completed.

Several attempts from the surface were made to put out the fire. A bore-hole carrying carrying a 4 inch pipe was put down at the location of the above mentioned crosscut across the south cut-off, and by this means a stream of water was pumped into the mine steadily for 5 or 6 days. Then 60 barrels of sulphur were burned in a specially constructed furnace and the sulphur dioxide gas thus generated was forced down the airshaft and bore-hole by a blower fan. Finally steam under an initial pressure of 100 to 150 pounds was turned into the mine for 5 days through the bore-hole.

In the meantime eight Draeger oxygen helmets were purchased. Shortly after the introduction of the steam, a negro wearing one of the helmets was sent alone into the mine to reconnoiter.. It is reported that he had been drinking liquor, that the potash cartridges were badly caked from previous use, and that there were no fresh cartridges on hand. The negro finding his breathing getting more and more difficult became frightened, pulled off the helmets and perished.

THE SECOND EXPLOSION:-

About the 1st of January, 1909, the seals over the hoisting and airshafts were removed, the fan was started as an exhaust, and a squad of men entered the hoisting shaft. They hung curtains across the 1st and 3rd west "C" south entries and all the north workings, but left the 2nd west "C" south and the south workings open. They then began to ventilate and clean up the mine. The work was successful until a point was reached where the double parting connecting the 1st west "C" south and the 1st west "C" north narrows down to a single entry, as shown by "K" on the mine map. Fresh air coming from the 1st west "C" north was forced through this point, thence up the 1st west "C" south and was returned through the 3rd west "C" south. The upper end of each of these west "C" south entries was filled with marsh gas, and when this was carried over the region where the fire had previously raged there was an explosion which killed twenty six men and again wrecked the mine. This occurred at 12:15 the morning of the 10th of January, 1909. Two miners were brought out alive, and it is reported that if there had been 2 cartridges for the helmets eleven more men might have been recovered as the rescuers were close enough to the dying men to hear their groans but could not reach them on account of the poisonous gases. Forty hours later black smoke issued from the airshaft and immediately both shafts were sealed.

THE THIRD EXPLOSION:-

The hoisting shaft has three compartments, two for the ten-ton coal skips and one for the lowering and raising of men. A separate hoist-

ing equipment operates the manway cage. On January 29th, 1909, an airlock was built above the manway compartment, and men wearing helmets entered the mine and began to curtain off the 1st, 2nd, and 3rd west "C" south entries and all the north workings. During this work one man wearing a Draeger helmet lost his life. It is reported by men who were with him that the pneumatic cushion was so inflated as to cause the man's jaws to ache, and that he opened the release valve for relief thereby allowing gases to enter the machine. Furthermore, he had previously been under the doctor's care for heart trouble.

On February 9th the fan was started as an exhaust and a squad of men entered the mine and built board and plaster stoppings across the north side of the shaft bottom, and across the west aircourse immediately north of the first southwest crosscut. They also hung a curtain on the "C" entry just north of the same crosscut, causing the air to be deflected south on the "C" entry. Two hours after this curtain was hung, 11:15 am February 10th, three men who had advanced down the "C" entry to the 1st west "C" south saw fire light a body of gas ahead of them on the "C" entry. This caused an explosion which killed three men at the shaft bottom. The three men who saw the fire were successful in reaching the surface, as were also five men who were on the "C" entry at the first southwest crosscut, and three men who were plastering the stopping on the west aircourse. The same afternoon both shafts were again sealed and remained closed for fifteen months.

THE FINAL RECOVERY:-

The Bell & Zoller Mining Company obtained a lease on this property from the Zeigler Coal Company and early in May, 1910, made another attempt at recovery which finally proved successful. This work was under the general direction of Superintendent W. S. Burris, formerly State Mine Inspector in Illinois. Friman Coar, mine manager, had charge of the day shift, and Ed. Loughron and Nelson Johnson bossed the evening and midnight shifts respectively. Each shift numbered eight men and a boss. Acting on the Bell & Zoller Mining Company's invitation to assist in this work, James M. Webb and the writer arrived at Zeigler May 18th with the equipment of the Government Mine Rescue Station at Urbana, Illinois.

Experience during the previous explosions had demonstrated that if the mine-bottom could be ventilated and all the falls loaded out, the final complete recovery of the mine would be assured. The following paragraphs explain in detail the various steps taken in the recovery of the twenty three acres forming the mine-bottom; and for the sake of clearness this description is divided into four periods.

FIRST PERIOD:- May 9th to June 4th, 1910. See Mine Map #2.

On May 9th, 1910, the seal over the hoisting shaft was removed and a 5-foot Stevenson paddlewheel fan was installed and connected with the airlock over the manway compartment by a wooden conduit. May 11th the fan was started as a blower. Riding on the manway cage men then succeeded in building a partition from the surface to the shaft-bottom, carrying the air down the manway compartment and returning it up the skipways.

When the shaft-bottom was reached, it was found that a heavy fall of top-coal and rock, beginning fifty feet north of the shaft, completely blocked the entry. A board and plaster stopping was then built in front of this fall. Another large fall prevented progress south from the cage on the main bottom, and a board and plaster stopping was erected in front of it. These stoppings are marked #1 and #3 on the mine map.

Because these falls blocked progress both north and south of the main bottom, a wooden tunnel was constructed leading from the shaft south along the west side of the main bottom as far as the first crosscut leading west, and through this crosscut to the west aircourse. This tunnel was 6 feet high, 4 feet wide and 230 feet long, was built of 1" x 6" pine flooring on the two sides and top, and was plastered with wood fibre plaster on the inside. Fresh air was conducted through this tunnel, and by this means board and plaster stopping #4 was erected in the west aircourse. A temporary canvas brattice was hung from the end of this tunnel to the "C" entry to allow the building of board and plaster stopping #5 on "C" entry.

The south leg of this tunnel was then joined to the northwest rib of the intersection of the west aircourse and this first southwest crosscut, making the air intake north along the west aircourse and returning it through the "C" entry to the above mentioned crosscut, through that crosscut on the outside of the wooden tunnel to the shaft bottom, and thence out the skipways.

Board and plaster stoppings #5 to #20 were then built as shown on the mine map, after which stopping #1 was removed and the fall immediately north of the shaft was cleaned up. This fall contained 490 tons of roof-coal and rock, which was hoisted in the skips and loaded into railroad cars under the tipples. This completed what may be designated as the first period in the recovery of the mine.

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SECOND PERIOD:- June 5th to 23rd, 1910. See Mine Map #3.

Stoppings #2 and #13 were removed, a curtain brattice was hung across the entrance to the wooden tunnel, and board and plaster stopping #21 was built. This arrangement changed the ventilation, taking the fresh air directly north from the manway compartment of the hoisting shaft, conducting it on the east side of the mine, and returning it through the first southeast crosscut. Under this arrangement the work of erecting stoppings #22 to #55 was successfully accomplished.

Two bodies of water were encountered in this region; the first water lay along the "A" south entry at the location of stoppings #35 to #41 and was removed by three 2-inch siphons running three days. The second body of water, lying near stopping #52 was pumped out in 39 hours by a Cameron pump (4-inch suction, 3-inch discharge, and operated by compressed air).

During the progress of this work a great deal of difficulty was met with in moving the marsh gas. The temporary ventilating machinery never furnished over 5,000 cubic feet of air per minute, and as the area of the entries measured 100 to 150 square feet, the velocity was consequently low. Each afternoon when the barometer fell, the gas had a tendency to back on the men, often making it impossible to advance. In such cases the Draeger helmets proved of great advantage. A single illustration of this will here be given:-
June 20th the Cameron pump referred to above was taken from the surface down the hoisting shaft in order to install it twenty feet west of stopping #51. The following table shows how this was done:-

June 20th, 1910.

Time.	Barometer.	Methods.
7:00 a m.	29.185	
8:00 a m.	29.185	Men were able to work at setting the pump without having to wear helmets
9:00 a m.	29.160	
10:00 a m.	29.155	
11:00 a m.	29.150	
12:00 noon.	29.125	
1:00 p m.	29.100	Men could not get to pump without helmets.
2:00 p m.	29.060	
3:00 p m.	29.040	
4:00 p m.	29.020	Men wearing helmets continued the work of setting the pump.
5:00 p m.	29.015	
6:00 p m.	29.025	
7:00 p m.	29.045	
8:00 p m.	29.045	
9:00 p m.	29.045	Men were able again to work at the pump without the aid of helmets.
10:00 p m.	29.045	
11:00 p m.	29.055	
12:00 midnight.	29.065	

Helmets were used also to make an inspection of the bottom of the air-shaft before stopping #31 was erected; to hang curtain brattices on the "A" south entries to make possible the building of board and plaster stoppings #49 and #50, and to perform other feats impossible without them. It was found that six out of the eight helmets purchased by the Zeigler Coal Co. 16 months previous could not be used because of deterioration through misuse and disuse. The following list specifies the defective parts, the numerator showing the number of spoiled items and the denominator giving the total number required for the eight machines:-

- 8/8 Breathing Bags
- 9/16 Breathing Pipes
- 6/8 Inflation Tubes
- 5/8 Inflation Bulbs.

Zeigler Mine Fire

by R. Y. Williams.

On November 3, 1908, at about 5 P.M., a fire originated in Zeigler mine, which is situated at Zeigler, Franklin County, Ill. The mine was owned and operated by the Zeigler Coal Company. The mine was opened in 1904 and worked the No. 6 seam of the Illinois series. The seam is 12 feet thick, is practically level, and is under a cover of 417 feet. The mine generates considerable quantities of marsh gas. Labor troubles, explosions and disastrous fires form a large part of the history of this mine.

The first explosion occurred at 7:10 a.m. April 3, 1905. The indirect cause of this disaster was the failure of the ventilating machinery at 11:30 p.m. March 31, making it necessary to shut down the fan for 55 hours and 40 minutes. During this period an attempt was made to obtain ventilation by means of three air-compressors, the total capacity of which was 3,600 cu. ft. of free air per minute. This volume of fresh air proved insufficient to dilute the marsh gas being generated by the mine, and a squad of men (without having made any previous examination for gas) entered the south run-around between "B" entry and the west air-course and with their naked lights "touched off" the body of gas which had collected at this high point in the mine.

The explosion which followed killed 57 men and badly wrecked the mine. Its force was augmented by the explosion of 41 kegs of black powder stored underground in the mine magazine, and of a large number of additional kegs at the working faces.

Origin of the Fire

The mine was reopened after this explosion and the development

work progressed 3-1/2 years until its production amounted to 3600 tons per day.

On November 3, 1908, about 5 p.m., after the day shift day left the mine, a fire originated at the door of the crosscut between the first and thisrd west "C" south entries, opposite room No. 17, as indicated on the accompanying map. It is supposed that the fire originated by the short circuiting of electric wires. Small as this fire was in the beginning it caused the mine to be idle for one year and ten months, originated several explosions, and brought about the death of 31 men who attempted to put it out. The fire was not discovered until it had been burning about one and one-half hours. The ventilation was forcing the air up the second west "C" south entry and returning through the third west "C" south entry. A rescue squad entered the mine at 8:30 p.m. and found that the fire had made headway to the neck of room No. 12. A stopping was built at the entrance of the second west "C" south entry to check the fire. This was completed at 11:00 p.m.

At midnight the gases were burning. The flame was traveling along the third west "D" south and setting on fire the overcast across the south cut-off at the point on the mine map marked "H". The seven men in the mine at the time reached the surface in safety, and by 10 o'clock the following morning the work of sealing both shafts was completed.

Several attempts, from the surface, were made to put out the fire. A bore-hole carrying a 4-inch pipe was put down

over the above mentioned cross-cut across the south cut-off, and by this means a stream of water was pumped into the mine steadily for 5 or 6 days. Then 60 barrels of sulphur were burned in a specially constructed furnace and the sulphur dioxide gas thus generated was forced down the air-shaft and bore-hole by a Blower fan. Finally, steam under an initial pressure of 100 to 150 lbs. was turned into the mine for 5 days through the bore-hole.

In the meantime eight oxygen helmets were purchased. Shortly after the introduction of the steam, a negro, wearing one of the helmets, was sent alone into the mine to reconnoiter.

It is reported that he had been drinking liquor, that the potash cartridges were badly caked from previous use, and that there were no fresh cartridges on hand. The negro finding his breathing getting more and more difficult became frightened, pulled off the helmets and perished.

The Second Explosion

About January 1, 1909, the seals over the hoisting and air shafts were removed, the fan started as an exhaust. Men entered by the hoisting shaft, and ~~hung~~^{hung} curtains across the first and third west "C" south entries, and all the north workings. The second west "C" south entry was left open. They began to ventilate and clean up the mine.

The work was successful until a point was reached where the double parting connecting the first west "C" south and the first west "C" north narrows down to a single entry, as shown by

"K" on the mine map. Fresh air coming from the first west "C" north was forced through this point, thence up the first west "C" south and was returned through the third west "C" south. The upper end of each of these west "C" south entries was filled with marsh gas, and when this was carried over the region where the fire had previously raged there was an explosion which killed 26 men and again wrecked the mine. This explosion occurred at 12:15 a.m. January 10, 1909.

Two miners were brought out alive, and it is reported that if there had been cartridges for the helmets 11 more men might have been recovered as the rescuers were close enough to the dying men to hear their groans, but could not reach them on account of the poisonous gases. Forty hours later, black smoke issued from the air-shaft and immediately both shafts were sealed.

The Third Explosion

On January 29, 1909 an air lock was built above the man-way compartment of the shaft, and helmet men entered the mine to curtain off the first, second, and third west "C" south entries and all north workings.

During this work one man wearing a helmet lost his life. It is reported by men who were with him that the pneumatic cushion was so inflated as to cause the man's jaws to ache, and that he opened the release valve for relief thereby allowing gases to enter the machine. Furthermore, he had previously been under the doctor's care for heart trouble.

On February 9 the fan was started as an exhaust and a

squad of men entered the mine and built board and plaster stoppings across the north side of the shaft bottom, and across the west air-course immediately north of the first southwest crosscut. They also hung a curtain on the "C" entry just north of the same crosscut, causing the air to be deflected south on the "C" entry. Two hours after this curtain was hung, 11:15 a.m. February 10, three men who had advanced down the "C" entry to the first west "C" south saw fire ^{ignite} ~~light~~ a body of gas ahead of them on the "C" entry.

This caused an explosion which killed three men at the shaft bottom. The three men who saw the fire were successful in reaching the surface, as were also five men who were on the "C" entry at the first southwest crosscut, and three men who were plastering the stopping on the west aircourse. The same afternoon both shafts were again sealed and remained closed for 15 months.

Recovery work

The Bell & Zeller Mining Company obtained a lease on this property from the Zeigler Coal Company, and early in May 1910 made another attempt at recovery which finally proved successful. This work was under the general direction of Superintendent W. S. Burris, formerly State mine inspector in Illinois. Friman Coar, mine manager, had charge of the day shift, and Ed. Loughron and Nelson Johnson bossed the evening and midnight shifts respectively. Each shift numbered eight men and a boss. Acting on the company's invitation to assist in this work, James M. Webb and the writer arrived at Zeigler May 18 with the rescue equipment of the Urbana station.

Experience during the previous explosions had demonstra-

