GENERAL REPORT

on

Explosion at Royalton North No. 1 Mine

Operated by

The Franklin Coal and Coke Company

at

Royalton, Franklin County, Illinois

October 27, 1914.

By

J. W. Paul, Mining Engineer.

H. I. Smith, Assistant Mining Engineer.

G. T. Powell, Foreman Miner.

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Introductory Statement

An explosion occurred in the No. 1, or North Mine, at Royalton, Illinois, at 7:25 a. m. Tuesday, October 27, 1914. There were 357 men in the mine at the time of the explosion, of which number 52 were killed. Eighty to ninety miners near the shaft bottom were saved by a prompt reversal of the fan, and rapid rescue work by the mine officials, while approximately 220 miners from unaffected sections were later conducted to the hoisting shaft without injury. These miners did not know that an explosion had occurred. One man was rescued from the affected section 10 hours after the explosion by a rescue party from Benton, Illinois, wearing breathing apparatus.

Probably 36 were killed by violence or burns, while the remaining 32 died from the effects of afterdamp. Very efficient rescue work was conducted by the mine officials, mine inspectors, and the oxygen breathing apparatus crews under the direction of Oscar Cartlidge, Manager of State Mine Rescue Stations; also the apparatus crews of the Madison Coal Corporation from Dewmaine, Ill., and the Saline County Coal Co. from Harrisburg, Ill. The inside workings of the mine suffered but slight damage.

General Information:

Royalton is a town of 2,000 population in the southwestern corner of Franklin County on the St. Louis, Iron Mountain and Southern Railway, 85 miles southeast of St. Louis. The Franklin Coal & Coke Company operates two mines near Royalton, known as the North and South mines.

Ownership and Operation:

The North Mine was opened in 1907 and operated by the Big Muddy and Carterville Coal Co. In 1910 the operation was taken over by J. L. Mitchell, President of the Franklin Coal & Coke Co. This company also operates the South Mine, one mile from the North Mine, — these being the only two mines near Royalton.

The personnel of the organization is as follows:

J. L. Mitchell, President and General Manager.

R. B. Mitchell, Secretary-Treasurer and General Supt.

James B. Brown, Mine Manager.

Don W. Mitchell, Assistant to Mine Manager.

Chas. A. Sine, Supt.

Working Conditions, Character of Coal, etc.:

The North Mine operates in the No. 6 bed of coal, Carboniferous Age, Carbondale formation. The coal is operated by a shaft 315 feet deep, the coal being very firm in character and averaging very uniformly 9 feet 5 inches in thickness. A "blue band" or "dirt band" is found 18 to 30 inches from the bottom, consisting of bone coal and shale, averaging 1/2 to several inches in thickness. The bed was measured and sampled at six points in the North Mine by J. W. Paul, H. I. Smith and G. T. Powell. (See addenda for sections and analyses.) These samples average 32 per cent. volatile matter, 50 per cent. fixed carbon, 9 per cent. ash, 8 per cent. moisture, and 1 per cent. sulphur.

Roof:

Above the coal is a bed of gray impure shale varying in thickness. This shale does not stand well after the coal is removed, therefore from 18 to 30 inches of coal is usually left as a roof protection.

The spalling off of this roof coal tends to increase the accumulations of coal dust along all haulageways, and in other parts of the mine, thus increasing the liability of dust explosions.

Floor:

Underneath the coal is a hard brittle clay of considerable thickness. This clay is used by the miners for tamping their shots. This bottom clay does not tend to mix with the coal dust to any great extent.

Moisture:

The coal is naturally very dry. All the water in the mine is handled by several water cars, no pumps being required. The coal dust on the roadways seemed very dry, as was noted in the State Mine Inspectors' report previous to the explosion.

Gas:

It is usual to find "gas bleeders" in the faces of all development entries and rooms in the North Mine, which is rated by the State Inspection Department as "gaseous". The coal field of Franklin and Williamson counties is known as the most gaseous in Illinois. Return air samples secured by H. H. Barton on March 25, 1912 (Bulletin 72) showed .09 per cent. methane, or 14½ cubic feet per minute on the southwest return, and .36 per cent. methane, or 21½ cubic feet per minute, on the southeast return, -- averaging 33 cu. ft. of methane for each ton of coal mined.

Air samples collected November 1, 1914, in the main return air by J. W. Paul and H. I. Smith showed .24 per cent. methane. Other

samples taken at gas "feeders" near the faces of the 4th North Entries showed as high as 68 per cent. methane, which demonstrated that dangerous gas accumulations were possible at the working faces, whenever derangements of the ventilation might occur. The mine examiners' record book showed that gas had been reported very frequently in the Northeast and Northwest sections of the mine.

Ventilation:

The mine was ventilated by a reversible, steel, steam-driven Sirocco fan 20 feet in diameter, and operated at 225 revolutions as a blowing-fan previous to the explosion, -- the hoisting shafts being the upcasts. At the bottom of the air-shaft the ventilating current was divided into four splits, one for each quadrant of the mine workings. The fan was housed in a non-combustible brick building.

The man-way or escapement shaft containing a stairway adjacent to the fan shaft was always ventilated by fresh air by means of an arrangement of doors regardless of whether the fan was run as a "force" or exhaust fan. This wise provision permitted two men to escape by this manway after the explosion.

The following are extracts from the reports of the State mine inspectors regarding conditions in the North Mine as to gas, ventilation, coal dust, and a fire previous to the explosion:

"The fire is in 3d and 4th West South entries and is being sealed off, and several conditions need improving for better protection of the lives and health of the employees. Would recommend the following: That ventilation be carried to the faces by repairing stoppings and curtains; that gas be taken out of West South, West North, and the shaft entries; that places that are dry be sprinkled

and places driven more than 60 feet be stopped until cross-cuts are made; all electric wires be covered, and kept away from lumber and canvas." Signed - Inspector Frank Rosbottom, 11th District, November 14, 1913.

"Ventilation slack over entire mine, and several other conditions need improving." Signed - Inspector Morgan, 11th District, May 27, 1914.

Development and System of Working:

The mine is operated by a shaft 315 feet deep, and is worked on a modified panel room and pillar method with cross entries. From the shaft bottom double main entries extend at right angles North, south, east and west for average distances of 3,000 feet, thus dividing the mine workings into four quadrants. Entries are driven 12 feet wide with a 40-foot pillar between main entries and a 24-foot pillar between cross entries. Rooms are driven 24 feet wide on 50-foot centers and from 250 to 325 feet in length. Very little pillar robbing has been done.

(See mine map accompanying this report, Page 45A.

Timbering:

Very little timbering was done in the entries. The timbering in the rooms consisted usually of a single row of props set from 10 to 15 feet apart, placed near the center of the room.

Employees, Production and Equipment:

On the day of the explosion the full shift of 357 men had entered the mine. Fifty additional men worked on the surface. The average daily production of 2600 tons was said to be the full capacity

of the surface plant, which consists of a steel head-frame, power plant, wooden tipple structure, and a structural iron coal preparation plant in which the coal is prepared in seven sizes.

Explosives and Mining:

The coal is blasted with F.P. black blasting powder, which is delivered in kegs at the room necks each evening after the shot-firers have completed their rounds. All shooting is done by "shot-firers" after all others are out of the mine; however, the miners drill and charge their own holes.

Of the 20 mines operating in Franklin County [redacted] 17 use "permissible" explosives, the North Mine being one of the three mines in which black powder is used.

The coal is mined in two benches, 18 to 30 inches of top coal being left as a roof. The coal cutting is done by Sullivan, Goodman and Morgan Gardner machines, 250 voltage.

Haulage:

The coal was gathered from the rooms and entry faces by mules and hauled to the shaft-bottom by electric locomotives. The mine cars are end-dump with lift gates, which allows the fine coal to sift through onto the haulageways. The high topping of the cars also causes much loose coal to be dropped on the haulageways.

Lighting:

Carbide and oil lamps were used exclusively by the miners. The shaft bottom was lighted [redacted] by electricity. The mine examiners or "fire-bosses" made their preliminary examinations with Wolf safety

lamps, using the long or luminous flame, -- the use of Clanny lamps having been discontinued. During the recovery, rescue, and exploration work following the explosion safety lamps were supplied by neighboring mines, the Miners and Mechanics Institute, Bureau of Mines Rescue Car No. 3, the Hirsch Electric Lamp Company, and the Koehler Safety Lamp Company.

Drainage:

The dry condition of the coal bed did not require an extensive drainage system, several water cars being employed for this work. The largest flow of water to be handled was that which entered the mine through the shafts from the overlying strata.

Humidity:

No provision had been made for humidifying or sprinkling the mine, although the company's attention had been called to this by the various state inspectors.

Fire Protection:

Water barrels were placed at intervals throughout the mine as a fire protection. Owing to the dry character of the coal and the use of black powder fires were likely to occur frequently following the firing of shots. For this reason "fire-runners" are employed, who follow the shot firers on their rounds. As noted previously in this report, a fire had occurred November, 1913, in the Southwest quadrant of the mine and the fire area sealed off.

Story of the Explosion:

Local Conditions -

Tuesday morning, October 27, was cold (40° F.) and windy, the temperature having dropped considerably during the preceding 18 hours. The mine was working as it had the day previously and 357 men had been lowered to the shaft bottom. The company men were at the shaft bottom awaiting instructions from the Mine Manager, while the majority of the miners had reached their working places. The fan was reported to be running at its normal speed and no derangements in ventilation had been reported by the mine examiners. The examiner of the Northwest quadrant, where the explosion occurred, had recorded gas in his book in the 3rd and 4th North Entries off the Northwest, in room 4, and at the face of the 1st and 2nd West Entries.

The Disaster:

At 7:25 a. m. Mine Manager James B. Brown had given instructions on the surface and was about to step on the cage, when a blast of air accompanied by dust came up the hoisting shaft (upcast). Knowing that an explosion had occurred he immediately summoned General Supt. Ralph Mitchell from the office and secured several other men nearby to assist him in reversing the fan, so as to render the hoisting shaft an "intake" and save the lives of the many men who he knew were gathered near the shaft bottom. The work of reversing the fan was accomplished in a very short time, undoubtedly saving the lives of 60 or more men near the bottom of the hoisting shaft.

The fan was in no way damaged by the explosion and even in the affected district the indications of violence were not very great.

Hundreds of miners in other portions of the mine did not know that an explosion had occurred.

Stories of Survivors, The Human Element:

The stories told by the survivors from around the shaft bottom are very consistent; they nearly all relate that they were first struck by a blast of wind from the east side of the shaft, which extinguished practically all their lights. Many sought protection behind timbers or by lying down, and after a few seconds' interval there came a second and more severe blast from the west side of the shaft accompanied by dust, lumps of coal and other debris.

Extract from Testimony of Superintendent Chas. A. Sine:

"When the first explosion wave came men were knocked down and their lights extinguished. An instant later there came another shower of dust, coal and debris from the west side. Many men sought protection behind the steel timbers and others lay down on the bottom."

"Many of those who tried to regain their feet were overcome, although some got as far as the hoisting shaft. One man who was in the shanty near the shaft bottom came running out and gave orders to those about him, he rang once for the cage but before he could ring again a second time he was overcome and fell down. Those who were most active were overcome more quickly than others who were inactive. It is reported that about 20 men came out of the Main South and were overcome as soon as they encountered the gases on the Main East."

Extract from Testimony of Assistant Manager Don Mitchell:

"The explosion occurred at 7:25 a. m. At that time I was

on the Main North about 285 feet from the shaft bottom, and about two thousand feet from the point where the explosion originated. I first felt a blast of air from the Main East, then a second blast from the Main North, which knocked me down. I had a piece of waste in my pocket which I soaked in water and held over my mouth and nose, and began to crawl towards the shaft bottom. We were rescued and brought out on the cage and at 10:30 that morning I returned to the mine on one of the rescue squads. The entries mainly affected by the explosion were the 1st and 2nd Norths of the 1st Northwest, and the 3rd and 4th Norths off the 1st Northwest. No apparent damage was done at the shaft bottom, although some debris was blown there. The men had time to reach their working places before the explosion occurred."

Extract from Testimony of J. Neill, Miner:

"When the explosion occurred I was in the Main Air Course one thousand feet from the hoisting shaft. The explosion knocked me down and I rolled about, finally landing in some water, the shower of dust and debris blowing over me for some time. Then a cold breeze struck me (probably when the fan was reversed) and a foreigner near me struck a match and began looking around.

"We both finally got to the air shaft and climbed out through the escapement shaft." (These were the two men who escaped by climbing the stairway up the escapement shaft.) "I did not see any flame when the explosion occurred. I knew that there was a lot of gas in some places in the mine, the Main Air Course had gas, also rooms 35 and 36 off the Main Air Course. There was a slight explosion in this mine a month ago in the ~~1st and 2nd~~ 3rd and 4th North caused by

lighting the gas there, and in my opinion this explosion was caused in the same way."

The live man found by the rescue party in room 15 off the 2nd North West Entry was reported to have remained in his room for some hours, and then to have ventured out to the door in the first cross-cut, where he saw a dead man in a huddled position. (See detail map.) This frightened him and he returned to his room, but afterward ventured out again, only to return. He said that he filled his carbide lamp four times, using an oil lamp for light while renewing his carbide. This would indicate that he had not been unconscious at any time but dazed and frightened.

Of the 52 men killed, 46 were miners, 2 were machine men, and 4 were shift men; 30 were married and 22 single. Six were Americans, 28 Slavs, 14 Italians, 3 Scotch and one Welsh.

Need of Apparatus:

The rescue apparatus at the Benton Station was available within two hours, yet even with this delay would have been fatal to the 30 or more men near the shaft bottom had not Mine Manager Brown acted so promptly in reversing the fan.

From the evidence submitted it seems doubtful whether with rescue apparatus on hand at the mine any more lives could have been saved. Upon reversing the fan, Mine Manager Brown with a rescue party entered the hoisting shaft at once and engaged in the work of saving the dazed men near the shaft bottom. Upon the arrival of the oxygen apparatus crews complete explorations were made, and one miner was rescued by the Benton crew after many hours in room 15 off the 2nd North West.

Rescue and Recovery Work:

According to the testimony submitted the first and most important rescue work was the prompt action of Mine Manager Brown in reversing the fan.

Extract from Testimony of Mine Manager James B. Brown:

"When the explosion occurred I was standing in the door of the engine room and I saw smoke coming out of the hoisting shaft. I stopped and studied for a moment and then called to Messrs. Jilds and Mitchell to help me reverse the fan, which had not been stopped nor damaged by the explosion. After getting the fan reversed we got onto the cage and were lowered to the bottom at once. We found many men there and helped them onto the cage, and I then went to the Northeast section and warned the men to come out. Then went to the southwest and got 50 or 75 men to come out, and afterward met some men going towards the air shaft (return), brought them back to the hoisting shaft and sent them up on the cage. Most of the men in the other sections did not know that an explosion had occurred."

When the rescuers reached the shaft bottom there were probably 80 miners in that vicinity, all of them more or less overcome by after-damp. These rescuers must be given great credit for using first aid sense. Their first move was to help the ones who were able to stand onto the cage. The more unfortunate ones were straightened out and laid on their stomachs with an arm under their heads, artificial respiration administered, and many soon revived.

It is stated that 50 men required medical attention, 19 of whom needed more than temporary attention. Six of these injured were

sent to the nearest hospitals -- three each to Ziegler and Herrin, Ill. The Pulmotor was used on at least one man, who was still warm, but he did not revive.

Eleven men were dead among those found in the vicinity of the shaft, while the remaining eighty were rescued by this efficient work, after which about 200 others were warned out from other portions of the mine, where they were nearly all at their working places, not realizing that an explosion had occurred.

Meanwhile, General Superintendent R. B. Mitchell had telephoned the Superintendent of the Illinois State Rescue Station at Benton (18 miles northeast of Royalton) and the crew there responded at once in automobiles.

Work done with Breathing Apparatus:

The following is quoted from the report of Oscar Cartlidge, Manager of Illinois State Mine Rescue Stations, and describes the work done with breathing apparatus following the Royalton explosion:

"The call for help reached the Benton station, through State Inspector of Mines George L. Morgan, at about 8:00 a. m., October 27. Benton is about 18 miles northeast of Royalton, and the roads being good the trip was made by automobile, part of the crew arriving and entering the mine at 11:00 a. m.

"Preceding their arrival the mine manager, James Brown, and others, who were on top at the time of the explosion, descended into the mine and brought out the uninjured, the wounded and the dead from the unaffected area." (Perhaps this should read, "brought out the uninjured, the wounded and the dead from the vicinity of the shaft bottom, and also the uninjured from the unaffected portions of the mine.") "Before going below, Mr. Brown, we understand, had

the fan reversed, making the hoisting shaft the downcast. At the time of the explosion the air was being forced into the mine at the escapement shaft.

"I have no personal knowledge of the manager's reasons for this action, but I assume that he knew in what part of the mine the explosion originated and also that there were many men at the shaft bottom and along the main entry on the way to the interior. I have no hesitancy in saying that this reversal of the air current saved many lives. Two men, however, found near and to the east of the escapement shaft, may have perished because the direction of the air was changed. An inspection of the map will show that reversing the air caused the noxious gases to return directly to the air shaft, principally over that part of the mine that had been worked out and abandoned.

"In the party that descended into the mine at 11:00 a. m. were W. L. Morgan, inspector; Edward Laughron, county inspector; James Brown, mine manager; Dr. Springs (colored); Shep Clayton, miner; James Towal, Supt. Benton Rescue Station; M. J. Carraher and Walter Nichols, assistants at Benton Rescue Station. (The last three were breathing apparatus.)

"All of the party were able to get to within one hundred feet of the air shaft by the heading on the west side of the shaft. At this point bad air was encountered, whereupon Messrs. Towal, Carraher and Nichols explored to the air shaft with apparatus but discovered no bodies.

"The entire party then returned to the hoisting shaft and

went up the Main East Entry to the Main North and up the Main North to the 2nd West off the Main North. Up to this point ventilation was fairly good and but little disturbance evident, except at the east side of the shaft bottom, where a large pile of debris had been thrown against a trip of loaded cars. This material had evidently come from the west.

"Leaving the rest of the party at the 2nd West off the Main North, where foul air was again encountered, the men wearing breathing apparatus proceeded up the 2nd West to a point about one hundred feet from the 1st North, where one body was found, and about fifty feet inbye two more. The clothes were stripped completely off these bodies, except that the trousers of one man were still hanging over the shoes.

"At the 1st North West off the 2nd West they found a car turned upside down with two bodies, much mutilated, lying on top of the car. Another body was found just inside the 2nd North.

"The rescuers next explored the cross cuts between the 1st and 2nd North Wests and carried out three bodies to the 2nd West, from where men without breathing apparatus carried them to the hoisting shaft. This party then returned to the surface.

The rescue team (colored) from the Madison Coal Corporation, Dewmaine (10 miles from Royalton), -- John Lyons, Captain, having arrived with equipment, -- a first team composed of Towal, Carraher, Dixon, Hudson and George Clayton, and a second team comprising Nichols, Lyons, Hawley, Hooper and Bass (the last three colored) proceeded to the 1st North West off the 2nd West where a base for further operations was established. Supporting these breathing apparatus squads was a crew

to reestablish ventilation, -- including James Dunn, Thomas Carraher, E. Laughron, A. J. Skelton, James Brown, Shep Clayton, John Duncan, R. P. Medill, Thomas Watts, Evan D. Johns, John Eddy, Bernard Cosgrove, Charles Story, John Mutall, James Forrester, William Burton, George Bagwill and Dr. Springs, all mining men from the southern part of the State.

"Before going inside a curtain was hung on the west side of the shaft across the Main Entry, one in the "forty five slant," to the east of the shaft, and a regulator curtain placed in the Main East at the 1st South, -- all for the purpose of forcing more air into the base of operations. See Mine Map Page 45 B.

"At about this time in the afternoon I arrived from Springfield, Ill. After consulting with the state inspector, the superintendent of the Benton station and the mine officials, and learning that everything was progressing favorably, I concluded that we had enough rescuemen and equipment on the ground, counting the team that was on the way from Eldorado, Ill. It did not seem necessary to send for any of the state rescue cars. Subsequent events proved that this conclusion was justified.

"No one at that time had done anything towards erecting permanent stoppings, and there was a dearth of safety lamps, so we busied ourselves in securing one to work at tightening the stoppings, procuring safety lamps, extra oxygen, soda, etc., leaving Mr. Towal in charge of the inside rescue crews, while we alternated between the inside and surface works

"Up to the point where the base was established (1st North West off 2nd West), the ventilation had been made fairly efficient with

temporary stoppings. The first apparatus crew then explored the 2nd West as far as the 4th North West and advanced up the 4th North West to the face and returned out the 3rd North West. Eight bodies were located on this trip.

"The apparatus crew then ventured down the 4th North West Southward a short distance and retreated by the 1st West to the base of operations. No more bodies were discovered. The parting on the 2nd West (see detail map.) was nearly blocked with cars, and much violence was indicated, -- the forde of the explosion travelling towards the east and inbye the 1st and 2nd West, and towards the south from the junction of the 1st and 2nd West with the 3rd and 4th North Westa which indicated the probable origin inside the 3rd and 4th North Westa

"This trip occupied one hour and forty-five minutes and satisfied everybody that no fires had resulted from the explosion.

"The second apparatus crew then explored up the 1st North West, exploring all the 35 rooms which were not fallen in, and then inspected 10 rooms on their return down the 2nd North West. In the crossout between Rooms 25 and 24 a man was found still alive, but in a dazed condition, reclining on his powder box. (See detail map.) His carbide lamp was burning at his side. Two of the squad returned to the base for assistance and then this miner was carried through to the 1st North West where the air was better, due to the work of the temporary ventilation squads. He was then brought out and later recovered. The dead man found at the door between the 1st and 2nd North West had a pinkish color, and the pulmotor was tried on him for possible signs of life, but to no avail. On this trip the men in the apparatus travelled for one hour and forty minutes. While the rescue squads rested the ventilation squads worked in the 1st North West below the 2nd West and found three bodies.

"The breathing apparatus squad reported that all stoppings between the 1st and 2nd North West were intact, and after the air had been turned into them, Messrs. Dunn, Johns and party explored the balance of the 2nd North West (lower rooms) without finding any dead.

"A third breathing apparatus squad composed of the Dewmaine team and part of the Benton team explored to No. 12 room on the 4th South off the 2nd West. On this trip three bodies were found, one at room 13 under a car, and two in room 14. Four more bodies were found later, farther in. It was now 6:00 p. m. and the apparatus teams rested, - the ventilation squads working inbye the 2nd West.

"A mixed breathing apparatus squad composed of Dewmaine, Benton and Herrin men then carried the bodies out of the 3rd and 4th North West to the base, and then explored to the faces of the 1st and 2nd West. This pair of entries was advanced about 325 feet farther than the map indicated. Two bodies were found about 300 feet from the face, and the rescue crews carried them out, four men being detailed to each stretcher.

"Nichols and his apparatus crew then started to explore the 3rd and 4th South, but only got a short distance when one of the team became sick and the men returned to the base. This sickness was due to using an apparatus that had previously been in service, and in which the soda had not been renewed, as it was thought it would last for the short trip contemplated. The sick man was left at the fresh air base and the crew then completed their exploration in the 4th South and returned by way of the 3rd South.

"The O'Gara Coal Company's team, having arrived from Eldorada, was then sent in under the captaincy of W. G. Taylor to explore the rooms in the 3rd and 4th South. They located and brought out eight

bodies.

"This completed the exploration of the entire explosion area except the escapement entries. Fresh air was turned down this pair of headings and two bodies were found, -- one near the escapement shaft and one about a hundred feet outbye. One body was afterward found in the sump at the hoisting shaft.

"At 5:30 a. m., October 28, or twenty-two hours after the occurrence of the explosion, forty-seven dead bodies had been removed from the mine by the rescuers, nearly all having been carried to fresh air by the apparatus men. According to the company records five were still missing, but it seemed certain that no others were alive in the mine.

"It not being necessary for breathing apparatus to be used further the general manager informed us that his men could handle the rest of the work, and the mine manager organized regular shifts for the cleaning up of the mine, with competent men in charge, and while this was in progress 5 more bodies were found.

"We remained at the mine October 28, and upon leaving instructed Mr. Nichols to remain at the mine with apparatus as long as the mine manager wanted him.

"The dead were located as follows: 11 at the shaft bottom (one being in sump), 5 in 2nd West up to the 1st North; 3 in the 1st and 2nd North West; 3 in the 1st South; 8 in the 3rd and 4th North West; 2 in the 1st and 2nd West faces; 8 in the 3rd South; 7 in the 4th South; 2 in the back West at 3rd South; 2 in the escapement entry; 1 in the 1st West off Main South -- totaling 52 men.

"Summary

"The rescue work at this explosion was performed almost entirely by the aid of breathing apparatus, the wearers utilizing their oxygen for the full time limits. The only failure was due to a chance being taken with a spent apparatus. Crude American soda was used in the Fleuss apparatus instead of the imported article.

"Need for more safety lamps and electric lamps and better identification tags was manifest. By reason of the use of breathing apparatus and the absence of fire, the mine was practically recovered in 20 hours.

"This recovery was the occasion of much successful work, conducted largely by men wearing breathing apparatus, the bodies of all but 15 of the total 52 dead being carried back to fresh air by apparatus men.

"This work was done by the rescue teams of the Illinois Mine Rescue Commission and the Madison Coal Corporation. Car 3 of the Bureau of Mines, from Evansville, Indiana, did not take any part in the work.

"This is stated to show that the hope of Director Holmes of the Federal Bureau of Mines has been fully justified, and Illinois is now in position to give adequate assistance in case of such unfortunate disasters. The rescue work proceeded without a hitch and the 16 apparatus proved to be equal to the full time service for which they are rated. Two Draeger apparatus were used, all others being of the Fleuss type.

"Conclusions

"This was the first large explosion in Illinois since the establishment of the State mine rescue stations in 1910, and we believe the exploration of the mine and recovery of the dead in less than 24 hours after the explosion occurred justify the efforts put forth by the Mine Rescue Commission for the propagation throughout the State of mine rescue and first aid training.

"We have demonstrated the fact to our own satisfaction that breathing apparatus worn by trained men is of great value in the exploration of the mine, and the recovery of the dead after an explosion. It has been shown that the types of breathing apparatus used are practically safe when worn by experienced men, and that long exploration trips to locate the living and the dead, and ascertain the presence of fires, can be made in irrespirable air.

"We also found that crude caustic soda can be used for rescue work with Fleuss apparatus, as our men used this absorbent exclusively.

"We also learned that there were not enough safety and electric lamps at the average Illinois mine, and suggest that every mining man who goes to an explosion take with him all the safety lamps he can secure. We also learned that the reversal of the air current following an explosion is sometimes justified.

"All the men who wore the breathing apparatus are, I believe, with the possible exception of Mr. Lyons, holders of the Illinois Mine Rescue Commission certificates."

(signed) Oscar Cartlidge, Manager,
Mine Rescue Station Commission,
State of Illinois.

Bureau of Mines Rescue Car 3 at Duquoin, Illinois.

As noted by the preceding report, Bureau of Mines Car 3, in charge of Foreman G. T. Powell, did not participate in the rescue work at Royalton. Car 3 was at Evansville, 100 miles distant from Royalton, and was at once transferred to Duquoin (20 miles distant from Royalton) at 4:00 p. m. October 27, where word was received that all rescue and recovery work had been completed.

Alleged Causes: Current Theories --

The three most prevalent theories are as follows:

1. (Receiving the support of the Mine Inspectors, Mine Managers and others.)

The explosion originated near the face of the 3rd North West Entry off the 2nd West, gas being ignited at this point by an open light. It is estimated that there may have been an accumulation of gas at the faces of these entries amounting to at least 1,000 cubic feet.

2. (Receiving the support of the Mine Superintendent and others.)

The explosion originated in rooms 8 or 9 off the 3rd South West off 2nd West and was due to the ignition of a keg of black powder opened with a pick. The doubt naturally arises here as to the liability of a miner opening a keg of powder before starting time, as shot-firing is not commenced until after 4:00 p. m.

3. (Receiving the support of many miners.)

The doors on the Main West entries between the 3rd and 4th North West were left open on the evening previous, thus causing an accumulation of gas in the old rooms off the 3rd and 4th North Entries. This gas accumulation was ignited by the open light of a miner who went into

one of these old rooms on his way in to work.

State Mine Inspectors' Report

"It is the general opinion of the undersigned that the gas explosion which occurred at the Franklin Coal & Coke Company's North Mine at Royalton, Ill., October 27, 1914, was started by some one crossing the mine examiner's "danger mark" and igniting the gas in the 3rd North West Entry."

(signed)

George L. Morgan, State Mine Inspector.
John McClintock, " " "
James S. Reed, " " "
Edward Laughran, County " "
John Bolander, Pres. State Mining Board.
E. D. John, Gen. Supt. C. & C. Coal Co.
James M. Brown, Mine Mgr., Franklin C.& C. Co.
R. B. Mitchell, Gen. Supt. " " " "
Charles Krallman, General Inspector, Peabody Coal Co.

The testimony of the mine examiners is given here, as pertinent to this decision as rendered by the State Mine Inspectors.

Extract from Testimony of Mine Examiner A. P. Southworth:

"I have worked at the North Mine as mine examiner for 13 months. I commence my round at 6:30 p. m. and finish at 12:30 or 1:00 a. m. (midnight). I carry both an open light and a safety lamp and examine the 1st and 2nd South Wests, the 3rd and 4th Northeasts, the 5th and 6th Southwests, the 3rd and 4th Northwests, South of 2nd West and the 3rd and 4th Southwests, about 150 places in all.

"I examined the 3rd and 4th Northwests at about 10:00 p. m. and found a little gas at both faces, perhaps one cubic foot of gas in each place, which I did not consider dangerous. There had been a small gas explosion in these places once before.

"There was some dust in these places and they had not been sprinkled for some time; I suppose there was enough dust there to cause an explosion, but I do not consider dust as violently explosive as gas.

"I did not report the dust in these places as that was not part of my work.

"I indicated that there was gas in these places by placing a rail across the track at the cross-cut about 15 feet back from the face, and marked on the rail with chalk, 'Gas, 10/26/14'. (see Detail Map.)

"I did not make any further examination of these places."

Extract from Testimony of Mine Examiner Jones:

"I examined the 1st and 2nd Northwest Entries and about midnight found gas in room 35 off the 2nd Northwest. It was about 3 inches of gas and ten feet back from the face, and I put a 'danger board' across the track at the mouth of the room. This room was about 25 feet wide and 7½ feet high. I had found gas in this room before, also in room 22 off the same entry; since October 21 had found gas in these rooms every night excepting one.

"I didn't see any crosscuts open on that entry during that inspection and I always look to see that all stoppings are in. Sometimes stoppings are knocked out by windy-shots."

Coroner's Inquest and Verdict

The most important testimony from the coroner's inquest has been quoted in this report.

The verdict of the Coroner's Jury was simply "Death by an explosion." No blame was placed on any one for the disaster.

Notes of Evidence Obtained by Bureau Engineers.

Personnel:

H. I. Smith and G. T. Powell arrived at the mine at 7:00 a. m. October 28 (the morning following the explosion). J. W. Paul arrived on the evening of October 29 (coming from Charleston, W. Va.), and with H. I. Smith and G.T. Powell made a detailed examination of the direction of forces, coked coal dust, and other evidence.

The writers wish to acknowledge their indebtedness to Pres. J.L. Mitchell General Superintendent R. B. Mitchell and other officials of the company for furnishing all information at hand and cooperating with the investigative work of the Bureau of Mines.

EXTENT OF EXPLOSION. PORTION AFFECTED.

Only the Northwest quadrant of the mine was affected by the explosion, the evidences of force being confined to a comparatively small area, - the first and second West Entries, the first, second, third and fourth Northwests, the Main Norths and the Main Wests.

The stoppings between the Main North and the Main North Air Course were constructed of brick with a pilaster in the center for reinforcement (see attached photograph #6266), and none of these stoppings were seriously damaged by the explosion, consequently the Northeast quadrant of the mine was not disturbed, and the workmen from that section escaped uninjured, which was also true of the Southeast and Southwest quadrants. (See mine map.)

DETAILS OF EVIDENCE. ENTRY BY ENTRY.

Shaft Bottom and Main Norths.

Entering the mine by way of the hoisting shaft and traveling eastward to the Main North, then northward 1100 feet to the first and second Wests, evidence was apparent of a strong sweeping force towards the hoisting shafts. However, the brick stoppings in the cross cuts between the Main North and the Main North Air Course were not damaged. There was very little timber along the Main North Entry and no damaged cars were observed.

The overcast at the mouth of the airshaft entry was damaged slightly, so as to permit leakage, but this was probably a previous condition, as the force of the explosion was not even great enough to disturb the fan.

Sixteen cars standing in the first cross cut on the first

East Entry off the Main Norths were all heavily coated with dust but not damaged.

Along the Main North the float dust covered all the exposures into and beyond the second West. Soot was in evidence from the hoisting shafts to some distance southward on the Main South Entry and first Easts off the Main South. Float dust and soot was also deposited along the first and second Easts off the Main Norths. Ten bodies were found in the vicinity of the shaft bottom, also one in the sump.

1st and 2nd WEST ENTRIES OFF MAIN NORTH.

Entering the second West from the Main North some debris was found along the haulageway and the forces had apparently traveled eastward. The board stoppings in the first three cross cuts had apparently been forced out northward onto the second West Entry. A door partly covered with debris was found opposite the second cross cut, this door had evidently been blown eastward for a distance of 150 feet from its original position on the second West Entry between the first and second Northwests.

At the junction of the second West with the first North Entry a car had been blown against the Northeast rib corner. This car was lying upside down with sides flattened out and bodies 16 and 17 were found lying on top of the car. At the junction of the second West with the second Northwest, a turnbuckle was thrown into the 2nd Northwest for a distance of 55 feet, also an 8"x12"x6' timber and the insulators at the mouth of second Northwest were bent inbye, and the roadway swept clean. The switch stand on second West just inbye of second Northwest was blown eastward or towards second Northwest.

This evidence indicated that the forces traveled outbye on second West and inbye into the first and second Northwests.

Proceeding along the second West Haulageway inbye the first and second Norths it was found that the next seven wooden stoppings in the cross cuts between the first and second Wests had been blown out, apparently northward upon the second West by an expansion of forces traveling eastward on the first ~~Northwest~~ West Entry.

A double track extended from the second cross cut inbye to the sixth cross cut, and beginning opposite the second cross cut there was a trip of 22 loaded cars on the south track and seven empty cars on the north track opposite the fourth cross cut. These trips were badly wrecked by forces which apparently traveled eastward or outbye along the second West Entry, and Manager Cartlidge of the rescue crews reported that at one point the entry was completely blocked and some cars had to be moved in order that the oxygen apparatus crews might proceed inbye.

The first car outbye of the loaded trip was thrown over sideways southward. Cars 2 to 10, inclusive, were not derailed nor damaged. Car 11 was diagonally across the track the coupling with Car 10 being spread. Car 12 was on the track but Car 13 was raised up off the track, and Car 14 remained coupled to Car 13 but was forced towards the south rib, as were cars 15, 16, 17 and 18 - Car 15 being turned over on its side southward. Car 19 was turned over on its side northward and uncoupled. Car 20 had the west end gate crushed in and practically all coal dumped out, while Car 21 was crushed and turned completely upside down lying diagonally across the track, and Car 22 was broken and forced against Car 21. Cars 20, 21 and 22 were opposite the fourth cross cut and opposite to them on the north track were the seven empty cars also badly wrecked.

The first empty had its front end buried in the bottom, and a wheel broken, the second car was turned over end for end and the other five badly crushed and jammed in with loaded Cars 20, 21 and 22, as pre-

viously described. The manner in which these trips were wrecked at this point indicated strong force traveling eastward on the second West Entry. The second West Entry was very dusty in this vicinity.

At the junction of the second West with the third and fourth Northwest Entries were found strong evidences of both force and heat. The coal ribs were blistered and at the intersection of the third Northwest with the second West the rib contained coke insitu and fine grey globules of coked dust.

The door across the second West between the third and fourth Northwests had been blown out and apparently inbye the third Northwest. The trolley wire opposite the third Northwest had been blown down and the trolley hangers on the second West outbye of the intersection with third Northwest indicated force traveling eastward.

Beyond the junction with third and fourth Northwests the first and second West Entries were advanced a distance of 500 feet, there being six crosscuts between them. The board stoppings were intact in the first, second and fourth crosscuts, also a half canvas curtain in the third, - while the last two crosscuts were open; so that, apparently the forces had not extended strongly into these entries at this point. However, there was considerable evidence of heat in this section, the first board stopping being seared, nearby props showed evidence of charring and coke granules and soot being found both on ribs and roof.

Beyond the third crosscut these evidences of heat diminished and at the faces of the first and second Wests no evidences of heat were noticed.

A car containing about ten bushels of coal stood undisturbed near the face of the first West Entry and in the second (open) crosscut back from the face wasa box containing two kegs of No.F black powder and

a roll of fuse. Gas feeders could be heard near the roof opposite the last crosscut, and an air sample collected near the face gave .42 per cent of Methane, while a sample from the face of the second West showed 1.6 per cent. Bodies 35 and 36 were found on the first West Entry at a point about 400 feet from the face.

1st and 2nd NORTH WEST ENTRIES OFF 2nd WEST.

Near the mouths of the first and second Northwests was found considerable evidence of force, which had apparently swept into these entries from the second West. Opposite the first crosscut between the first and second Northwests a trip of 6 empty cars was derailed and scattered about across the second Northwest, although the door in this crosscut was not disturbed. The trolley was also down and twisted about at this point. Two bodies were found in this crosscut, one out at the mouth of the second Northwest and two on the wrecked car at the mouth of the first Northwest.

Inbye the first and second Northwests conditions were apparently normal there being found no indications of disturbance. Much dust had been thrown inbye these entries and covered the rails for some distance inbye. The float dust extended as far up these entries as Room 18, but there was no evidence of severe heating. [redacted] The fact that one man was found alive (See pages 11 and 17) 10 hours after the explosion in Room 25 off the second Northwest, with his carbide lamp still burning, was sufficient evidence that no great heat or violence extended very far inbye on these entries. The rescue of this miner from Room 25 seemed to indicate that others may have escaped from these entries following theexplosion, although there was a total of eleven dead miners found near the junction of the first and second Northwests with

the first and second Wests, also two others (suffocated) on their way to the air shaft at a point 500 feet outbye on the first Northwest.

Thirty six rooms were turned off first Northwest, - also thirty six off second Northwest, (beyond intersection with second West) and as there were no stoppings disturbed on these entries the ventilation was readily established following the explosion.

3d and 4th NORTHWESTS NORTH OF 2nd WEST ENTRY.

These entries were advanced for a distance of 450 feet north of the second West, and in both entries considerable force and heat was indicated, these evidences being more pronounced towards the junction with second West.

There were six crosscuts between the third and fourth Northwests, the sixth one being open and the other five had been closed with board brattices. The second, third and fourth brattices were blown eastward into the third Northwest, the first was blown westward into and the fourth Northwest and the fifth stopping was undisturbed, being slightly coked, however, on the eastern exposure.

3d NORTHWEST ENTRY AND SEVEN ROOMS.

Proceeding into the third Northwest Entry a door was found thrown against the west rib outbye the first crosscut. This door had previously been either on the second West between the third and fourth Northwests, or on the third Northwest between the first and second Wests. In either event it had been blown about 30 feet northward, as the forces in this vicinity had seemingly expanded in several directions.

Against the northeast corner of the rib at the mouth of the third Northwest was a pile of fine dirt and debris two feet high. Flame was indicated throughout the entire third Northwest Entry and its seven rooms by coked dust on props and ribs. The chipping off and discoloration of the

ribs gradually diminished towards the face, indicating that the flame near the face had been less intense and of shorter duration.

Room 1 was advanced 180 feet. Body 26 was found 20 feet inside the room. The outbye rib corner of the room was coked and blistered. A loaded car was on the track near the face of the room.

Against the eastern entry rib between Rooms 1 and 2 was thrown machine, cable, trolley wire and other debris. The machine was in Room 2.

Room 2 was advanced 200 feet. Body 27 was found near an undercutting machine in the room mouth. An empty car was derailed opposite the room mouth, and body 28 was found on the entry inbye this car. Coked dust was found on props and roof well up into the room and in the crosscut to Room 1. Loose coal was down at the face.

Room 3 was advanced 50 feet, and the coal was down at the face. Just inbye the room was a miner's box containing fuse, powder-jack and a keg of powder. There was coked dust on the box and ribs but no indication of strong force.

Room 4 was advanced 15 feet and there was no coal at the face. A loaded car was undisturbed on the turn into the room mouth. Coke globules on south rib.

Room 5 was advanced 10 feet and there was no coal at the face. Body 29 was found just inside the room neck. Coking was found on the south rib corner.

Room 6 was advanced 10 feet and there was no coal at the face. In the crosscut opposite this room neck was a powder keg marked "gas", which had probably been used at some previous time as a danger sign.

Room 7 was advanced 10 feet and there was no coal at the face. The ribs were blistered, also the adjacent entry ribs indicating the gas had burned in this vicinity.

At the last crosscut, which was open, body 30 was found on the entry. A cap and carbide lamp were found nearby. This body was reported as badly burned. A tie lying across the track in line with the inbye rib of the crosscut was marked "gas - 10-27". The entry was advanced 35 feet beyond this crosscut and there was coal down at the face.

Samples collected at the face of this entry near the roof October 30 analyzed 20, 19 and 30.10 percent methane.

4th NORTHWEST ENTRY AND 7 ROOMS.

Going through from the third Northwest into fourth Northwest this entry was found to be advanced 18 feet beyond the last crosscut, and some coal down in the northwest corner of the face, also two holes drilled in the northeast rib. Samples collected at these holes on October 30 analyzed 58.70 and 68.33 percent of methane. Cartridge paper was found in these drill holes indicating that they had been fired. Analyses of samples taken from these drill holes indicated that these shots had been fired.

An empty car just outbye the last crosscut was undisturbed on the track, although the dust on the outbye endgate was charred. Dust collected along the entry rib between rooms 7 and 6 showed many coke bubbles.

Room 7 was advanced 6 feet and coke globules were found on the south rib, also the north rib was polished and showed evidence of heat.

Room 6 was advanced 10 feet and no coal at the face. A coil of fuse was found unburned lying beside a miner's box at the face. In the entry crosscut opposite the room was an empty water barrel undisturbed. From Room 6 outward the violence seemingly increased judging by the debris scattered along the entry. Fifteen or more crushed powder kegs were found on the entry between Rooms 6 and 5, possibly dropped there by the "kickback lash" of the explosion wave.

Room 5 was advanced 10 feet and the coal had been shot down at the face. A full dinner bucket was found in this neck, and some indications of heat on the roof.

Room 4 was advanced 75 feet and a car containing about 5 bushels of coal was undisturbed near the face. On October 30 safety lamps indicated 1.25 percent of methane at the face. Both ribs were blistered and coked at the room mouth, also the top wasblistered. A water barrel lay between the rails opposite the room mouth, having evidently been thrown outbye about 12 feet. A water barrel in the entry crosscut inbye of Room 4 was undisturbed.

Room 3 was advanced 18 feet and there was no loose coal at the face. An empty car in the room mouth was thrown endwise against the north rib. There was coked dust on the south corner of the room neck. Bodies 31 and 32 were found on the entry near this room and they may have run out of Room 4 and 5 onto the entry.

Room 2 was advanced 150 feet and there was some loose coal down at the face, and an empty car in the room mouth partially covered by a large fall of top coal. Just inbye this fall bodies 33 and 34 were found. The ribs and roof were blistered but a keg of powder was undisturbed in the crosscut to Room 1.

On the entry opposite to Room 2 there was a heavy fall of top coal and the trolley was down. Outbye the entry beyond Room 1 the trolley was broken and badly twisted in the form of an "S" by the explosive forces.

Room 1 was advanced 150 feet and the face was cleaned up. Opposite the room mouth some timbers and debris was thrown against the east entry rib. The room ribs were spalled off and the roof blistered indicating intense heat, there was also a considerable deposit of coked dust on the south rib of the room neck.

At the junction of the fourth Northwest with the second West Entry there was a large amount of debris indicating an expansion of forces at this point in practically all directions.

3d and 4th NORTHWESTS SOUTH OF 1st WEST ENTRY.

The third and fourth Northwests extended southward 1050 feet from the first West Entry to the Main West or West Shaft Entry, and there were 16 rooms turned off the third Northwest and 15 rooms off fourth Northwest. Throughout these entries and rooms there was found strong evidences of heat and violence. The door in the crosscut between the third and fourth Northwests, 50 feet south of the first West Entry was blown northeastward into the third Northwest; while nine board stoppings in the crosscuts southward were apparently blown westward onto the fourth Northwest. There had apparently been a division of forces on these entries,- as from Rooms 5 to 15, the general movement had been northward, while from Room 5 to the Main Wests the forces had traveled southward and piled up debris against the ribs of the Main West Air Course. Exploded powder kegs were found in Rooms 12 and 7 off fourth Northwest, and in Rooms 11 and 9 off the third Northwest - these explosions undoubtedly causing the expansion of forces in various directions.

Sixteen bodies all burned were found in these entries and rooms.

3d NORTHWEST SOUTH OF 1st WEST ENTRY.

At the intersection of the third Northwest with the first West Entry the movement of force was apparently northward. The dust on the four rib corners was fairly even. at the first crosscut to fourth Northwest the door had been blown through onto the third Northwest, and at the mouth of this crosscut an empty car was thrown and crushed against the northwest rib corner.

Room 16 was advanced 80 feet and was not working. Seven props had been thrown against the face. Coked dust was deposited on both ribs

of the room neck, also in the crosscut to Room 15.

Room 15 was advanced 135 feet and there was loose coal down at the face and a loaded car nearby with coke deposited on the lump coal. Debris was thrown against the face and charred paper was found in the crosscuts leading to both Rooms 16 and 14, also coking on the south rib. Body 37 was found in the room mouth.

Room 14 was advanced 160 feet and there was loose coal down at the face. Coke was found on roof and ribs and also charred props. Encircling the northeast rib corner at the room mouth there was a pile of debris 30 inches high heavily covered with coal dust. There was a heavy coating of dust on both inby and outby exposures along the north rib.

Room 13 was driven 180 feet and there was loose coal down at the face. The roof inby crosscuts from Rooms 12 and 14 was heavily coated with coked dust, also the east ribs of these crosscuts. The props were charred and coked. Body 38, badly burned, was found near the crosscut to Room 12.

Room 12 was driven 150 feet and there was loose coal down at the face. Coke was found on both ribs and coke blisters on the roof. The crosscut to Room 13 was swept clean. Body 39 was found near the face with clothes practically burned off.

Room 11 was driven 150 feet and the face had been cleaned up. The roof was blistered, props charred and heavy coking found on both ribs. Off the crosscut from Room 11 to 12 was driven a 25 foot stub in which was found a miner's box, a fall of top coal, and an exploded powder keg. The heat from this explosion was manifested by the severe blistering of nearby roof and ribs.

Room 10 was fallen from the mouth.

Room 9 was fallen towards face, but in crosscut to Room 8 was a powder box with the top blown out and an exploded powder keg, also some burned fuse. There was powder residue on adjacent rib and roof and evidence of severe heat. Body 40 was found about 20 feet southward in Room 8.

Room 8 was driven 240 feet with coal down at the face [illegible] and heavily coked dust on ribs and roof. The second crosscut to Room 7 was very narrow and ribs heavily coked. Body 40 was found at the northend of this crosscut.

Room 7 was driven 240 feet with coal down at the face which was heavily coked. A miner's box containing powder keg was turned upside down 70 feet from the room mouth but not otherwise damaged. The first crosscut towards Room 6 had not been driven through. The opposite crosscut northward contained a drill set up and hole partly drilled. Heavy soot was found on roof near the face.

Room 6 was advanced 245 feet and there was a fall of coal at the face with a loaded car undisturbed in the south crosscut.

There was a heavy soot deposit on the roof throughout almost the entire room and some coking on ribs and roof.

Room 5 was driven 240 feet and the face was cleaned up, the track extending through the east crosscut from Room 6 to Room 5. Just outhye the last crosscut the roof and ribs of Room 5 were heavily coked. Opposite the other two crosscuts there was slight coking and the roof blistered. Body 41 was found close to the south rib at a point opposite the first crosscut.

Room 4 was driven 250 feet and the face was cleaned up. Considerable debris was thrown about inside of the room and out of the room mouth onto the entry, indicating that force had passed through the crosscuts from Room 5 into Room 4 and thence out onto the entry. A broken miner's box was found between

the second and third crosscut containing burnt fuse and cartridge paper, and nearby was a keg of powder badly battered but not exploded. Bodies 42 and 43 were found in this room inbye the second crosscut to Room 3. Beyond Room 4 the explosive forces apparently traveled southward on the third Northwest Entry.

Room 5 was advanced 250 feet and contained no track. There was a heavy fall of top coal in the room mouth. The trolley hanger opposite the room mouth was bent westward, indicating a force coming out of Room 3, the same being true for Rooms 4, 2 and 1, and the trolley was down opposite these room mouths.

Rooms 2 and 1 were advanced 240 feet, but contained no tracks and were partially blocked by falls.

From Room 4 for a distance of 400 feet southward the third Northwest Entry contained much debris which had evidently been blown southward and near the junction with the Main West Air Course among the debris were found Bodies 50, 51 and 52.

It was interesting to note that no gas was found at the face of any of these 16 rooms, also that the caps were intact on the exploded powder kegs found in Rooms 11 and 9.

4th NORTHWEST SOUTH OF 1st WEST ENTRY.

At the junction of the first West Entry with the fourth Northwest considerable force was manifested. The trolley leading out of the first West into the fourth Northwest was still up, but the hangers were forced eastward, and going south into the fourth Northwest the trolley was twisted and doubled back on itself. At the first or diagonal crosscut leading through to the third Northwest a car was badly wrecked, the trolley wire wrapped around the car, one pair of wheels being blown off the car and north-

eastward into the crosscut; the door in the crosscut was also blown northeastward onto the third Northwest. The trolley hangers and debris indicated a force traveling northward.

Room 15 was driven only 10 feet and its northwest corner was filled with broken boards, powder cans, and debris which had been blown in with considerable violence from the south.

Room 14 was driven 190 feet and the coal at the face had been partly shot down. A mining machine was on the track in the room mouth with debris piled against its southern exposure, and the machine cable was badly tangled.

Coked dust was found on the north rib at the room neck and opposite the first crosscut also in the crosscut to Room 15, - the props being badly charred in this crosscut.

Room 13 was driven 175 feet and there was some loose coal at the face. There was a car near the face containing about ten bushels of coal, and a shovel in the coal at the face. Body 44 was found near the car, and from all appearances this miner had been loading coal when the explosion occurred and had been almost instantly overcome. Coked dust was found on both ribs in the room mouth, also on the ribs and roof of the crosscut leading to Room 12 and on the roof opposite this crosscut.

Room 12 was driven 200 feet and there was some loose coal at the face. The ribs and roof throughout the room contained heavy coking indicating severe heat. An empty car was on the track near the face and Body 46 was found near this car. Body 47 was found out near the room mouth not far from an exploded keg of powder inside a bursted miner's box. The box was charred as though it had been on fire,- and the adjacent ribs and roof coated with powder residue. Two powder kegs near the bursted box had been opened with a pick, and one of them was evidently a new keg. The two crosscuts to Room 11

were heavily coked.

Room 11 was advanced 220 feet and there was loose coal down at the face. The roof and ribs were heavily coked from the room mouth up to a point 15 feet from the face. The trolley wire had been doubled back into this room mouth for a distance of six feet, and debris was piled up against the Northwest rib corner at the room mouth. The props were charred and coked at many points.

Room 10 was advanced 200 feet and the face was cleaned up. A ½ inch gas cap was found at the face October 30. The roof and ribs contained coked dust for the outbye half of the room but not towards the face. The crosscuts to Rooms 11 and 9 were heavily coked.

Room 9 was advanced 200 feet and there was some loose coal down at the face. A ½ inch gas cap was found at the face October 30. Coking was found on ribs and roof from room mouth to a point 50 feet from the face. An empty car was overturned and apparently blown eastward just outbye the crosscut from Room 8. A miner's box was upset but a keg of powder and fuse were found intact on the north rib of the room neck and Body 45 was found nearby.

Room 8 was advanced 200 feet and there was some loose coal at the face. A ½ inch gas cap was found at the face October 30. Coked dust was found on the ribs and roof from the room mouth to within 30 feetof the face,- also in the crosscuts to Rooms 9 and 7.

Room 7 was advanced 292 feet and there was some loose coal down at the face with a car ½ loaded standing on the track. Coked dust was found on ribs, roof, and props to within 50 feet of the face. On the south rib 60 feet inside the room mouth was a broken miner's box and an exploded powder keg, along with burned fuse, paper, and a scorched miner's coat. Bodies 48 and 49 were found near this point.

Room 6 was advanced 330 feet and was finished. Some coking was

found on roof, props and ribs, also in the two crosscuts leading to Room 7 and the three crosscuts to Room 5. A prop at the mouth of the room had been thrown against the trolley wire, forcing it into the room.

Room 5 was advanced 350 feet and contained no track. A ½ inch gas cap was detected at the face October 30. There was coking on roof and ribs from room mouth to within 100 feet of the face.

Rooms 4, 3 and 2 were abandoned and fallen in, there being some coked dust in each room neck.

Room 1 was driven 120 feet and abandoned, being cut through to a room off the Main West Air Course.

Beyond Room 5 the forehead apparently traveled southward on the fourth Northwest Entry onto the Main West Air Course. A portion of a wood stopping measuring 5'x7' was found near the mouth of the fourth Northwest and opposite the entry mouth a large amount of debris had been blown southward against the south rib of the Main West Air Course, consisting of probably 4 carloads of dirt, a dozen props and timbers, and a score of empty powder kegs.

It is noted from the ~~previous~~ preceding data that gas was found October 30 at the faces of Rooms 5, 6, 9 and 10, and exploded powder kegs in 7 and 12.

MAIN WEST OR WEST SHAFT ENTRY.

From the mouths of the third and fourth Northwests debris was thrown southward against the ribs of the Main West Air Course, thence through a crosscut onto the Main West Entry, which led to the shaft bottom. Six wooden stoppings were blown southward into the Main West, and in the seventh crosscut a door had been forced open but not damaged. The concrete stopping in the eighth crosscut was intact, but at the ninth crosscut the concrete overcast was partially wrecked, the top portion being blown down. The force

had evidently swept eastward towards the shaft bottom along the Main West Entry as indicated by debris found along that entry.

At the wye, (100feet west of the shaft bottom) where diagonal entries branched off to the right and left from the Main West Entry two empty cars had been thrown eastward against the north rib corners and badly damaged,- one car was thrown almost upright against the rib and the other was turned over sideways and forced up against the rib. Against the opposite or south rib corner debris and pieces of plank had been thrown with great violence.

These evidences made it clear that the explosive wave traveling eastward had swept into the shaft bottom with considerable violence; so that, with the large number of men gathered in that vicinity it seemed fortunate that so few were injured by the force and flying debris.

SUMMARY OF THE EVIDENCE. TWO THEORIES.

First Theory:

From the evidence as found the ~~least~~ probable origin of the explosion seemed to be at the face of the third or fourth Northwest Entry through the ignition of gas by an open light. As noted in the preceeding evidence Body 30 was found at the last crosscut near the face of the third Northwest Entry and the evidences of heat were found throughout this entry. The mine examiner had "boarded off" this face on the night prior to ~~morning of~~ the explosion, and it is possible that there was a considerable accumulation of gas there when the miners came into their work.

Following the explosion the writers of this report secured air samples at the faces of these entries which analyzed high in methane, and it is reasonable to suppose that an explosive accumulation was a possibility under the existing conditions.

Underground Manager Booth of the Northwest Section informed the writers that in September 1914 (over a month previous to the explosion) a

miner, who worked in the fourth Northwest face had ignited gas there and was badly burned. Mr. Booth thought that on this occasion the miner had lighted the gas 70 feet from the face, which would indicate a dangerous condition, notwithstanding the fact that no explosion occurred at that time. However, on the morning of October 27 the conditions may have been such that the lighting of the gas at this point was followed by an explosion. The fact that the mine examiner had found gas at the faces of the third and fourth Northwest Entries (see pages 8, 23 and 24) at 10:00 P.M., or 9½ hours before the explosion, and placed a danger board across the third Northwest Entry, is significant.

Assuming that the gas was ignited at the faces of the third or fourth Northwests and the burning mixture moved rather slowly out from the faces of these entries, gathering inflammable dust enroute until the explosion occurred. The forces traveled from the third and fourth Northwests in a southerly direction outbye the first and second West Entries, extending a short distance eastwardly into the first and second Northwests. Inbye the third and fourth Northwests, the explosive forces did not show much violence along the first and second Wests. But southward along the third and fourth northwests the greatest heat and expansion of forces seemingly occurred about 500 feet south of the intersection of the third and fourth Northwests with the first and second Wests, as in this vicinity four sealed powder kegs were apparently exploded, causing secondary explosions, which accounted for the radiation of forces in contrary directions.

From the southern extremities of the third and fourth Northwest Entries the explosive wave traveled into the Main West Entries and thence 700 feet to the hoisting shafts, there being, however, no evidence of heat along the Main West Entry. Altogether the explosive wave traveled 2300 feet southward and eastward to the hoisting shafts, and 1500 feet southward and eastward to the intersection of the first and second Wests with the Main Norths, there being ample room for

expansion along these paths, and the flame wave being checked along the second West haulageway by a superabundance of dust (see analyses attached), on the first West Aircourse by a shaly condition along the roadway; at the mouths of the third and fourth Northwests by heavy top falls covering the coal dust, and finally on the main west by the shale and clay covered bottom, where the bottom had recently been "taken up".

Second Theory:

From the evidence of forces as found on the third and fourth Northwest Entries, where the forces apparently traveled out of Rooms 8 and 9 off ~~the entry~~ Third Northwest and then spread in both a northerly and southerly direction on the entry and blew the stoppings through into the fourth Northwest, the more probable theory seemed to designate the origin in the crosscut between Rooms 9 and 8 (see detail map) at which point an explosion of powder occurred, probably igniting the coal dust, which was plentiful in this vicinity and propogating the explosion north and south along the third and fourth Northwests, thence eastward along the first and second Wests and Main Wests. The checking of the flame wave as described previously under the discussion of the First Theory would likewise hold good in this case. Body 40 was found 20 feet from the exploded keg. The additional evidence obtained regarding the direction of forces, deposits of coked dust, and severity and duration of flame all seemed to indicate the origin in Rooms 9 and 8. However, against this theory stands the fact that the exploded cans in crosscuts off Rooms 9 and 12 had closing caps in place, and there were no holes in the cans; so that these cans may have been exploded, like the other cans found, by external heat from the initial explosion. The explosion of these kegs of powder probably set up secondary explosive waves, which were evidently more violent than the initial wave, thus adding to the severity and scope of the initial explosion.

LESSONS TO BE LEARNED.

(1.) The careless handling of black powder is an ever present menace. Any explosive for use in coal mines should be distributed in small quantities, and is most safely handled by trained shot-firers.

(2.) The use of "permissible" explosives greatly reduces the danger of explosions in gaseous or dusty mines. As noted previously in this report the Royalton mine is one of the few in Franklin County where "permissibles" are not used.

(3.) Coal dust should be loaded out of all working places daily and all working places should be sprinkled daily if necessary.

(4.) The examination of a mine for gas more than three hours before the beginning of the working shift is to be condemned.

(5.) Every place where gas is detected in any quantity should be considered dangerous, and no miners admitted to work in that section of the mine, until officials using safety lamps have entirely removed the gas by erecting the necessary brattices.

(6.) The operation of any coal mine is most safely conducted by the exclusive use of locked safety lamps or permissible electric lamps.

(7.) Following the occurrence of this explosion it was undoubtedly the best plan to reverse the fan. The prompt decision and rapid execution of this work by Mine Manager Brown resulted in the saving of many lives.

(8.) The use of oxygen breathing apparatus by trained men is of great value in the rapid recovery of a mine following an explosion, - exploring for fires, locating live men, and dead men. However, the transportation of dead bodies by men wearing apparatus is not advocated, excepting over very short distances.

J. W. Paul

10/1/15

No.	Name	Ck.No.	Nation.	Married.	Age	Relatives/
1	W.D .Williams	428	Welsh	No.	35	
2	Orlento Bartolina	448	Italian	"	26	
3	Phil Parrott	546	Ger.Amer	Yes	30	Wife 1 child.
4	James Johnson	189	Scotch	No	45	
5	Pete Young	570	Scotch	"	21	
6	Russell Harris	445	American	"	21	
7	Lewis Sakaly	77	RussoHung.	Yes	-	Wife 1 child.
8	Jno Terionins	47	Russian	No	29	
9	George Balsis	300	Lithuanian	"	38	
10	Tony Bonzainia	391	Italian	"	36	
11	William Borta	262	Russian)Lit)	"	30	
12	Joe Havlik	171	" Hun	Yes	31	Wife
13	Adam Moleski	172	" Slav	"	38	Wife 2 Child.
14	Georeg Dronovich	164	" "	"	32	Wife
15	Barta Barta	166	Italian	"	45	2 sons Wife Dea
16	Neal Mullen	176	Scotch	No	19	Parents here
17	Jno Barclay	177	Scothn	"	20	
18	Mack Kavich	174	Slavish	Yes	30	
19	Chas Patrone	179	Polish	"	40	5 children
20	Jno Babich	264	Austrian	"	36	5 "
21	Jno Smith	580	American	"	30	Wife
22	Pete Cornelli		Italian	"	38	Wife Child.
23	Chas Bellamy	347	American	No	28	
24	Harry Litkus	424	Russian	Yes		7 children
25	Dom Ogilini	309	Italian	No	26	
26	Guy Mozella	305	"	Yes	32	4 children
27	Felix Cetric	310	Russian	"	30	wife 1 child
28	M Grachino	229	Italian	No	30	
29	Phil Michitich	398		Yes	42	W 3 children
30	Steve Bolinski	485	Polish	"	31	W 1 child
31	Mike Polkac	223	Slavish	"	30	
32	George Kolk	227	"	"	26	
33	Joe Antonnacci	307	Italian	"	41	1 child.
34	George Howay	427	Russian	"	37	Wife
35	Andy Sholler	163	Russian	"	40	W & 5 childrn
36	B. Meregildo	308	Italian	"	39	W & 2 childrn
37	Pete Bardsora	233	"	No	33	Italy
38	Alex Hollodonk	175	Russian	Yes	23	Wife Italy
39	Steve Shonder	435	Russian	"	38	W & Child
40	Pete Kerele	430	"	"	40	W & 2 Childn.
41	V. Bondi	306	Italian	"	36	W & 2 "
42	Tony Albosky	299	Russian	No	45	Brothers St.Lo
43	Sam Smiddy	508	American	Yes	55	Family Tenn.
44	Lewis Benegro	293	Italian	"	36	W & childn Ital
45	Dom Lutastanski	180	Polish	No	24	
46	John Kazar	173	Polish	Yes	34	5 Children OC
47	M. Vorga	374	Slavish	No	19	Brothers
48	Lewis Juhis	295	Russian	No.	27	
49	Pete Holupki	291	Russian Pole	Yes		2 Children OC
50	Alex Mersi	302	Italian	No	24	Brothers
51	Tony Plusnic	298	Lithuanian	Yes	43	W & children
52	Dominec Lorento	-	Italian	No	-	Brothers.

COPY.

Royalton, Ill., Oct. 29, 1914.

It is the general opinion of the undersigned that the gas explosion which occurred at the Franklin Coal & Coke Company's North Mine, at Royalton, Illinois, October 27, 1914, was started by someone crossing the Mine Examiner's "Danger" mark and igniting the gas in the Third North West Entry:

Signed

George L. Morgan, State Inspector,

John Bohlander, Prés. State Mining Brd.

John McClintock, State Inspector

Evan D. John, Genl. Supt. C.& C. Coal Co.

James S. Reid, State Inspector.

Edward Laughron, County Inspector,

James B. Brown, Mine Manager FC&CC

R.B. Mitchell, Supt, Franklin C&C Co.

Chas. Krallman, Genl-Inspect. Peabody Coal Company.

Royalton, Ill., October 30, 1914.

357----------Went down between 6:30 and 7:25 o'clock, majority between 7:00 and 7:25. Explosion occurred at 7:25 on morning of October 27th--A particularly cold and windy morning.

52----------Dead
43 in North West
9 at bottom.

305----------Rescued.
About 213 were in NE and SE and did not know about accident until Mine Manager, J.B.Brown, who had reversed the air, went down and told them. 38 knew about accident, They were working in West, and rushed toward bottom of air shaft. Two escaped that way. the 38 were found later by Brown, who brought them out by short cut. 52 were at bottom of shaft when Brown first went down, headed toward the air shaft, when he called them back.

14 per cent-------Killed
26 " " -------Knew about accident and were escaping.
60 " " -------Did not know about accident until told.

Of the Dead

Married------30	Americans	10	----3 were Scotch and 1 Welsh.
Single ------21	Slavs	28	
Doubtful----- 1	Italians	14	
52		52	

Miners ------46
Machine Men 2
Shift men 4
52

19 Were injured. 3 Went to Zeigler Hospital and 3 to Herrin Hospital. 1 has since left Zeigler.

Only two were seriously injured. They are in Herrin Hospital.

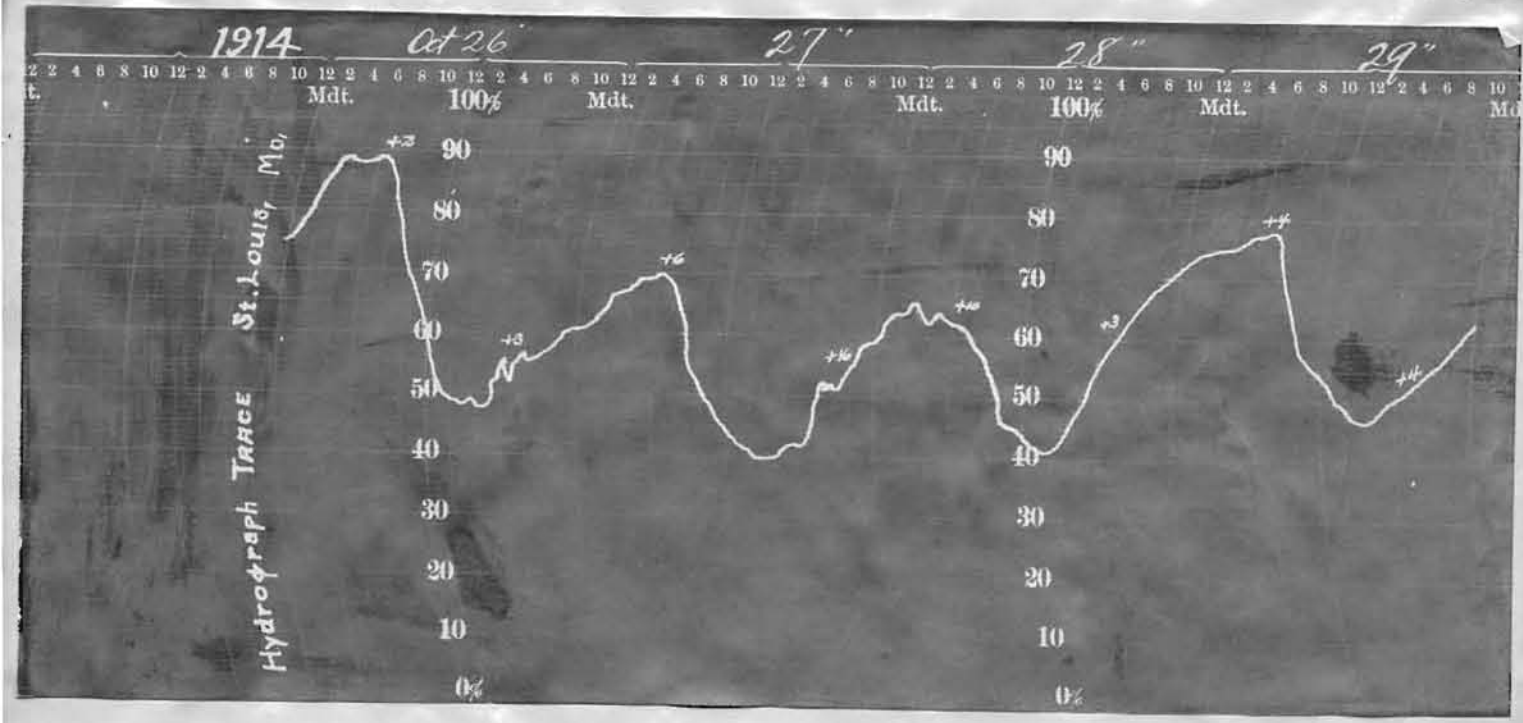
Town of about 2000---550 miners on Union Roll. 600 miners have been on Company Pay Roll.

Explosion is supposed to have occurred in the third NW Entry, caused by some person, unknown, crossing the mine examiner's "Danger" mark placed there some time before 3 AM., and igniting the gas.

Two Italians worked in this entry.

Shaft sunk about six years ago. This company has been working it about 4½ years. The North Mine, in Royalton, is about 85 miles SE of St.Louis, in SW corner of Franklin County, about 4 miles from Zeigler.

Practically no distress among dependents of the dead. State and Local Union Benefits.


1914 Oct 26
27"
28"
29"
Mdt.
100%
90
80
70
60
50
40
30
20
10
0%
Hydrograph Trace St. Louis, Mo.

G

6265

North Mine.

Type of fire proof stopping used between the Main North and South haulage ways and air course. Picture taken by S. O. Andros.

26-A

North Mine.

Burst powder kegs found in the rooms off 3rd and 4th N.W. off 1st and 2nd West Cuthits. The cap on these kegs show that they were ignited by external heat.

45-A.

Railroad box cars converted into homes for miners.

1-B.

Royalton; from coal sizing plant of North Mine.

1-A

North Mine. Fire proof fan house and connections to the top of the air shaft.

12-A.

Royalton, Ill.
Coal sizing plant. Power plant.
Tipple and head frame.

7-A

North Mine. Coal sizing plant.
Royalton, Ill.

7-B