REPORT

on

EXPLOSION

in

BOTTOM CREEK MINE

Vivian, W. Va.

November 18, 1911.

Reported

by

J. T. Ryan and H. I. Smith.

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EXPLOSION AT BOTTOM CREEK MINE

by

J. T. RYAN AND H. I. SMITH.

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Introduction: At 11:00 a. m., Saturday, November 18, 1911 an explosion occurred in the Bottom Creek mine of the Bottom Creek Coal and Coke Company resulting in the death of 18 men. Seven other men were gotten out alive from the explosion area, four of whom were badly burned and the other three escaped uninjured. The explosion was caused by the ignition of a body of gas by an open light carried by one of the engineers of the Crozier Land Company. Four out of five of the members of this corps of engineers lost their lives and the fifth was badly burned.

Location: The Bottom Creek coal mine is located seven miles east of Welch, W. Va., and one-half mile west of East Vivian, McDowell County, W. Va. Postoffice address is Vivian, W. Va. The mine is situated along the main line of the Norfolk & Western Railroad.

Ownership and Operators: The Bottom Creek mine No. 1 was opened in 1892 by William Spencer of Pottsville, Pa., and it has been working continuously since that time. The old workings are quite extensive but it is estimated that the mine will last for thirty years at the present rate of production.

This tract of coal is owned by the Crozier Land Association at _____, W. Va. and has been mined by the Bottom Creek Coal and Coke Company since 1896. The Superintendent was George Patterson; the Mine Foreman, John Maurice; the Fire Boss, G. Wilson and the Assistant Fire Boss, Mr. Hollins. The selling agents, Castner, Curran and Bullit were located at Philadelphia, Pa. The trade name of the coal is "C.C.B. Smokeless Coal" or Cindrella Coal".

Geology: Bottom Creek flows through a narrow gulch and empties into the Elkhorn Creek nearly at right angles. Vivian is situated on Bottom Creek a short distance from the mouth of the mine which has an elevation of 1553 feet above sea level. The coal bed outcrops about fifteen feet above the level of the creek and affords convenient facilities for handling on the surface. The coal bed mined is the Pocahontas No. 3. It is a semi-bituminous coal of the Carboniferous age, Pottsville series. It dips about 1.5 per cent in a N. 45° W. course and is fairly regular.

Coal: The thickness of the coal as mined ranges from about 5-1/2 feet to 6-1/4 feet with an average of about 5 feet 10 inches. It has a characteristic bony parting about the middle of the seam which averages about 2-1/2 inches in thickness. The coal is screened, the screenings being coked at the mine in bee-hive ovens. The coal is bright in appearance. (See appendix for analyses of coal.)

Roof: The immediate roof is a treacherous draw slate about 8 to 25 inches in thickness. Overlying this is about 12 inches of black shale. The main roof is a solid grey ~~shale~~ slate. The

draw slate does not come down when the coal is blasted, however, it is taken down in the entries also in the rooms when the mine foreman think it dangerous. Horse backs are not very common.

Floor: The floor consists of a hard grey shaly underclay which is rather rough but does not mix to any great extent with the coal in loading.

Moisture: The coal is naturally very dry and the mine in general does not make much water.

Methane: Methane is given off, coming principally from the coal near the roof and from the roof. (See appendix for gas samples.)

DESCRIPTION OF MINE AND METHOD OF WORKING.

Layout of Mine: The mine is worked on the triple entry system; two entries are for intake air and one for haulage and return air. The main entries are driven straight for about three thousand feet where a set of three entries, known as the No. 12 entries are driven about seventeen degrees to the right. Seventeen hundred feet farther another set of three entries are turned to the right at an approximate angle of fifty-five degrees. From the latter are turned four pairs of entries approximately parallel to the first or main entries. These pair of entries are designated in the order as we approach them as No. 11 entries, No. 10, No. 9 and the Lease Line entries. These last four with the No. 12 entries constitute the working places and includes the area affected by the explosion.

The mine is worked on the retreating room and pillar system.

However, they deviated from this plan and occasionally worked sufficient rooms on the advance to supply coal for the drivers on each entry. In which cases it was necessary to place a check on the entry to ventilate these rooms. It was in a pair of these rooms in which the explosion originated.

Mining: The coal is mined by electric chain cutting machines exclusively. They use one Sullivan longwall machine and one Jeffrey breast machine. The miners drill the hole, place the charge and fire under the direction of the entry boss; some fire by fuse and others by squibs. There are no restrictions as to the time of firing. About one hundred and twenty-five pounds of powder is used daily. They obtain about one hundred and ten tons of coal to every keg of powder. The maximum diameter of the drill hole is about one and one-half inches, there is no limit to the amount of powder used per charge.

Explosives: The explosive used in blasting the coal is "FFFF" black blasting powder. It is carried to the working faces in five pound cans by the miners. Monobel is used for blasting down the roof or in raising the bottom and is carried into the mine by the miners in their pockets or in sacks. The powder is kept in the mine either loose or in boxes. The powder is charged in paper cartridges.

Electrical Equipment: The mine is operated principally by electric power. The trolley wires carry two hundred and fifty volts under a full load of nine hundred and ten amperage. The lights on the main roads, operated by two hundred and twenty volts, are taken

from the haulage system and the coal cutting machines and pumps are operated by electric power.

Haulage: The coal is hauled on the main and diagonal entries by electric motors and on the side entries and in the rooms by mules. One seven ton motor is used to gather on the diagonal entry and three thirteen-ton motors for hauling to the tipple. The cars weigh thirty-two hundred pounds and have a capacity of two and three-quarter tons. The rails on the main headings are forty to fifty-six pounds per yard and twenty pounds in the rooms. The track gauge is forty-four inches.

Lighting: The haulage roads are lighted by 250 volt incandescent lamps. The power is taken from the trolley wires. The miners use open lights burning lard oil.

Ventilation: The mine is ventilated by a sixteen foot Capell force fan driven by a steam engine with an average water gauge of two and eight-tenths inches. The air enters the mine near the main opening and travels along two of the three entries to the diagonal entry, hence following the entries on the left side returning through the haulage roads on the right side thus working its way around the working portion of the mine returning to the outside along the main haulage road. In the old workings a Clifford fan is used to boost the air at the place indicated on the map.

Humidity: The exhaust steam from the fan engine is carried in the center of the intake air way through a ten inch spiral pipe for

a distance of 1000 feet. The steam fogging the air for a distance of 1500 feet. The humidifying system by exhaust steam has been in operation for two years and has given very good satisfaction. Sprinkling cars are also employed to assist in keeping the dust moist. They are used as deemed necessary by the foreman. The coal is naturally dry but some of the goaves become moist when standing idle for some time. The ribs and roof are coated with dust. The floor is very dry and dusty but is mixed with a large per cent of ash.

The following are the humidity readings as taken by the mine inspectors and writers on November 21 and 22:

	Dry	Wet		Humidity.
11-21	34	31	outside 5:00 a. m.	72 per cent
"	52	51	Main return at drift mouth.	94 "
"	65	64-1/2	No. 2 on 8th haulage way.	98.5 "
"	60	60	Main entry (intake).	100 "
"	61	60	No. 13 entry.	94 "
"	63½	62	Taken in No. 9 room on 11th entry near face.	98 "
11-22	28½	26	outside 9:40 a. m.	71 "
"	63½	62½	Between rooms 3 and 4 off No. 12 entry	95 "
"	65	63½	No. 9 pillars.	92 "
"	62	61	Near mouth of No. 10 main, 9000 ft.	94 "
"	63	62	Tenth left air course, 1140 cu.ft. of air	94 "
"	38	32	Entrance of main drift, 7:00 p. m.	51 "

Air Measurements:

Last break through off No. 13, 7,000 feet.

Last break through off No. 12, 10,500 feet.

Elevation of 12th entry, ~~1,500~~ 1503 feet.

Barometer 28.38. Corrected to sea level, 30.03.

Drainage: The mine is laid out in such a way that there is a natural drainage at the working places. This water runs to the main entries and three electric pumps have been installed at the local sumps to unwater them.

STORY OF THE EXPLOSION.

On the morning of November 18, the fire bosses, Wilson and Hollins, entered the mine at 3:00 a. m., completed their examination of all the live workings, and returned to the outside at 6:00 a. m., and recorded in the fire bosses record book "no gas found". Between 6:30 a. m. and 7:00 a. m. approximately 150 men entered the mine and shortly afterwards five engineers of the Crozier Land Company (said company being lessor of the coal) entered the mine for the purpose of measuring up the workings on the eleventh and twelfth entries, they having been in the mine on the two previous days and completed their survey of all the other workings. The eleventh left entries are turned off the main about 2-1/4 miles from the entrance and were being driven to the boundary line, the rooms to be worked on the retreating system. However, they occasionally drove a pair of rooms to make places so as to keep a mule going in that section. As a result of this system, about 1500 feet from mouth of entry, Nos. 6 and 7 rooms were driven up a distance of 400 feet, butted off at the face, and temporarily abandoned about two months prior to the explosion. When the track was removed from No. 7 room, the entry boss, Mr. Gotchen, had a board placed across the mouth with "STOP" written on it. The canvas check on the

entry between rooms Nos. 6 and 7 had been destroyed about two weeks before the explosion and had not been replaced. It had been the custom for the Crozier Land Company's engineers to survey this mine once or twice a year. The other mines surveyed by this corps are non-gaseous and the men were not accustomed to gas or the proper precautions to be taken in a gaseous mine.

The fire boss stated that he saw the engineers on the morning of November 18 as they got off the motor trip at No. 11 entry but did not know where they were going.

The engineers started at the face of No. 11 entry and worked back to No. 7 room. Two of them started up the No. 7 room at 11:00 a. m., the third one (note keeper) stepped inside the room about 20 feet. The fourth stood on the switch and gave line. The fifth, Mr. Williams, came down the entry with the transit and passed the mouth of room No. 7. When he had reached a point about mid-way between Nos. 7 and 6 he heard a noise which he describes as sounding like a "Puff" and turning his head saw the flame coming out of room No. 7. He dropped the transit and threw his coat about his head and at that instant the flame struck him and the force knocked him down. The next instant the flame returned over him. The atmosphere was intensely hot, his light was out, and he did not know which way to go. His brother, who had been standing at the mouth of room No. 7 giving line, ~~hollered~~ halloed a couple of times but Williams was afraid to open his mouth and did not answer. He then lost consciousness and when he again became conscious he thought he saw a light coming and halloed. The next he remembers was being carried out. Williams was interviewed by the

writers in the Miners Hospital at Welch four days later and although badly burned about the face and especially on the **hands** and arms, will recover. At the time of the explosion, Andy Gotchen, entry boss in Nos. 11 and 12 entries, was standing at the mouth of No. 11 entry a short distance outby the air door. The force of the explosion blew open the door and knocked him down. He recovered in a few minutes. Thinking something was wrong he sent the motorman to get out all the men on Nos. 10, 9 and 8 entries. Mr. Wilson, the fire boss, was at the mouth of No. 12 entry when the explosion occurred. He felt the rush of air but it was not very strong. He walked to the mouth of No. 11 entry and met Andy Gotchen and they started up No. 11 entry. Before doing so, they sent word of the accident to the office on the outside and the man in the office called on adjoining mines for assistance. The above two men, aided by some men from the other sections of the mine, went up No. 11 entry and succeeded in bringing out five men who were burned or overcome and two others escaped without assistance. When assistance from the outside arrived a rescue party was organized and proceeded up No. 11 air course on the intake, repairing the stoppings as they went by means of brattice cloth until the face of the entry was reached. Working from this point, sisteen bodies were recovered in the afternoon. The location of these bodies is shown on the map attached to this report. The remaining two bodies were recovered about midnight by a second rescue party. They were found in room No. 7 behind heavy falls.

SURVIVORS STORIES.

Frank Galino was working in diagonal air course about 100 feet

back from face of No. 11 entry at the time of the explosion. He heard the noise and felt the shock and thought some one had fired a heavy shot. His light was extinguished and he halloed for a light. Someone gave him a light and then they started out. All the lights soon went out. Galino thought of his dinner bucket and went back to get it and after groping around in the dark for several minutes found it and started out. He reached the mouth of the entry, passing many of the bodies on the way.

Mr. Pryor working in room No. 5 off No. 11 entry when the explosion occurred. He was loading a car and the force of the explosion threw the car off the track. Pryor was knocked down and his light was extinguished. He crawled out and along the entry until he encountered a fall which he was too weak to make his way over. Here he lost consciousness and was found shortly after by Andy Gotchen and taken to the mouth of No. 11 entry where he was revived.

Harvey Spencer and Sam Bailey were interviewed by the writers in the Miners Hospital at Welch. Spencer was trapper on the second trip going up No. 11 entry. He was seated along side of the driver, Sam Bailey, in the front end of the car which had reached a point just inby No. 3 room, when the explosion occurred. The force of the explosion knocked him down into the car and dislocated his right shoulder and was burned about the face and on the left hand. He lost consciousness and was recovered by A. Gotchen and William Davis. Bailey the driver was not knocked from his position and consequently he was badly burned and had a bad gash on the left leg as if struck by a piece of rock. He was unable to talk.

Aleck Williams, the engineer who escaped, was also in the hospital and is badly burned. His story as he related it is given under "Story of the Explosion". He reported that he dropped the transit when he saw the flame coming toward him. While making our examination we ~~looked high and low~~ made a diligent search for this transit but could find no trace of it. Evidently it had been covered by the heavy falls.

NOTES TAKEN AT CORONER'S INQUEST.

2:00 p. m. November 20,1911.

Coroner's inquest held at Vivian, W. Va.

First witness, Andry Gotchen: Entry boss for No. 11 and 12 entries worked four years in this mine. Entry boss since June 1911. Mr. Moress taught him to use safety lamp. He never saw gas, nor tested for gas before coming to this mine. The first time he found gas was in No. 7 room off No. 11 entry where he got one-quarter inch cap. He was at the mouth of No. 11 entry when the explosion occurred, a distance of 800 to 1000 feet from No. 7 room. He had not been in No. 7 room for two months. This room had not been working for two weeks before this visit. The check doors on entry between six and seven were torn off two weeks before the explosion. When the track was taken out of No. 7 room Gotchen put a board up at the mouth of the room and wrote on it "STOP". Mr. Amos Hollins was section fire boss. Mr. Gotchen did not know the Crozier Land Company's engineers were in the mine on the Saturday morning of the explosion.

Second witness: Frank Galuic; Austrian. Worked in mines 5 years for Fairmont Coal Company. Used safety lamps for three years and worked in the Bottom Creek mine one week. Was in No. 11 entry about 100 feet from face in diagonal air course, at the time of explosion. He heard the noise and felt the shock. He thought someone fired a shot. His light went out and he hollered for a light. Someone gave him a light and then he started out, and all the lights went out; the slate kept falling. He stopped to get his bucket and coat. He was the last man out, all the others kept falling down as they went.

Third witness: Mr. Wilson, fire boss. Lived in Welch County two years. Fifty years old. Worked in mines three years. Worked in Pennsylvania bituminous mines for seven years. Was fire boss in Sunnyside mine. When he enters mine in the morning he puts up a red light at mouth of mine, and when he comes out he puts up a white light in its place. He examined Nos. 8, 9 and 10 entries on the morning of the explosion. Mr. Holton assistant fire boss examined the eleventh and twelfth entries. Mr. Wilson was in rooms six and seven off the eleventh entry about a week before and he found no gas. He went into the mine Saturday morning at 3:00 o'clock and came out and reported everything alright and went back in. When the explosion occurred he was at the mouth of No. 12 entry.

Fourth witness: George Patterson, Secretary, Treasurer and Acting superintendent.

He believed the origin of the explosion was in No. 7 room off the eleventh entry and that it was a gas explosion.

Fifth witness: Mr. Hilton, a mining engineer went into the mine with Messrs. Hannon, Smith and Wells and found a man whose clothes were on fire. They went to put the fire out but as they could not do this they tore his clothes off. They were then joined by Mr. Nicholson and Campbell. Four men were found at No. 7 room across the inby, one man found lying across the track. The surveyors were working with the transit; the plumb bob was hanging from a spad, but the spring was burned off. The tape was stretched up in the room. Mr. Hilton had worked at the mine six years. Fire boss in Nos. 11 and 12. Was in room seven on Oct. 30 and found no gas. There was a danger board at the mouth of six and seven marked "STOP". He examined old abandoned pillar workings once a week with Mr. Wilson. He thinks some slate must have fallen and broke the board stoppings between rooms six and seven, allowing gas to accumulate in the gob, and the engineers ran into it and lit it.

Sixth witness: Mr. F. Tarquesen. Mine foreman; twenty years experience in gaseous mines. Went in mine after explosion with Mr. Nicholson; said props were thrown inby above room seven and outby below room seven.

Seventh witness: Mr. Ed. Nicholson. Forty-four years old, mine foreman for King Coal Company. Went into the mine 2:15 Saturday afternoon with rescue party and told about finding body of man whose clothing was on fire. He was of the opinion ~~xxx~~ that the explosion originated in No. 7 room off No. 11 inby.

Eighth witness: Mr. Pryor, colored. Twenty-~~eighth~~ eight years old. Worked at Bottom Creek mine eight years. Worked in the eleventh

entry, fifth room. Was in when explosion occurred. Was loading a car and explosion pushed it off the track. Blew out his light. Had to crawl out over a fall of slate. The air stifled him; someone brought him out; he regained consciousness when he got out from No. 11 entry.

Ninth witness: Pat Grady. Mine inspector eleventh district; was formerly fire-boss at this mine for two years. He had found explosive gas in small quantities when he was fire-boss.

Tenth witness: Mr. Earl Henry, Deputy mine inspector, stated that in his opinion it was a gaseous explosion, ignited in No. 7 room off eleventh entry as the debris was thrown towards mouth of entry.

CORONER'S VERDICT.

We find that eighteen men met death by an explosion of gas in an abandoned room No. 7 on the eleventh entry of the Bottom Creek Coal Company's mine at Vivian, McDowell,County, W. Va., on November 18, 1911 at about 11:00 a. m. and further find that said gas was ignited by an open lamp carried by some members of an engineering corps then working in room seven of entry eleven of said mine. In testimony whereof, the said coroner and jurors hereto set their hand.

JURORS
J. L. Deaton.
T. C. Griffith
Geo. T. Strother.
C. B. Smith.
H. H. Crutchfield
A. E. Hardinan.

Coroner. J. H. McCulloch.

Fire-Bosses Report:

November 18 entered mine at 3:00 a. m. fan running. Visited eleven, twelve and thirteen main entries and did not detect any gas. Came out at 6:00 a. m.

Report of Air Measurements on Nov. 15, 1911.

No. 1 inby, 11,160 cu. ft. per minute.
No. 9 inby, 11,900 " " "
No. 11 " 15,000 " " "
No. 12 " 9,000 " " "
No. 13 " 12,600 " " "
Main entry 10,400 " " "

NOTES OF EVIDENCE OBTAINED BY THE BUREAU OF MINES ENGINEERS.

About 10:00 p. m. on the evening of the explosion, Mr. Paul at Pittsburgh received a telegram notifying him of the explosion and asking for assistance. He immediately notified car No. 7 at Pineville, Ky., and arrangements were made to send the car to the scene of the disaster by way of Columbus, Ohio. Before the car could get under way, Inspector Nicholson notified Mr. Paul that the bodies had all been recovered and the assistance of the car would not be needed. Mr. Paul then notified the car to that effect.

J. T. Ryan, mining engineer, arrived at the scene from Pittsburgh, Pa., at 7:40 p. m. November 30. On arrival of Mr. Ryan he was met by Chief Inspector Laing, and Deputy Inspectors Nicholson, Grady, Martin and Henry, who were preparing to enter the mine for the purpose of making an investigation to determine the cause of the

explosion. He accompanied the inspectors and made a hurried examination of the entire affected area of the explosion. In the afternoon of the same day, Mr. Ryan attended the Coroner's inquest. That evening he was joined by H. I. Smith, mining engineer, from Pittsburgh. From this time on the writers made a joint investigation. On the morning of the 21st, the writers accompanied by Inspectors Nicholson, Martin, Grady and Henry made inspection of the entire mine, the writers taking humidity readings, air and road dust samples. The coal having been sampled in 1909 by J. J. Rutledge (See appendix for analysis) no additional samples of face coal were taken. On the following day additional air samples were ~~taken~~ collected and ~~inspection of~~ the two mules which survived the explosion, were also an interview was held with the survivors in the hospital at Welch, West Virginia. inspected

Notes of Evidence: Entering the mine at the drift mouth, the first evidence of the explosion was found on No. 11 entry at the mouth of room No. 3. Near this point there were falls of roof and an empty car stood on the track. At the time of the explosion this car was being drawn into No. 11 entry by two mules. The rear mule was killed and the front mule was gotten out alive, but was badly burned. The driver, Sam Bailey and the trapper Harvey Spencer were found by Andy Gotchen, the entry boss, and taken out alive about one-half an hour after the explosion.

The stoppings at this point were not damaged. At the mouth of No. 4 room there was another empty car which was off the track, and which was also also being drawn by two mules. The front mule was killed; the rear mule was badly burned. The driver and trapper were both killed.

Near the mouth of room four there were heavy falls. Two men working at the face of rooms four and five got out uninjured. The stoppings opposite room No. 5 were slightly damaged. The two stoppings inby mouth of room No. 5 were slightly damaged. About 50 feet inside the second cross cut from room No. 5 a man was gotten out alive by Andy Gotchen. This man, when found, was croutched along lower rib and was conscious. See story of survivors, page 9.

From this point inby to No. 7 room there were heavy falls. The top of the next two stoppings in the next cross cut was blown toward the air course. At this point audible gas feeders were detected coming from over the draw slate. About fifty feet outby mouth of No. 6 room, engineer Alec Williams was found. He was unconscious and was badly burned about head, face and arms but will recover. He was interviewed by the writers in the Welch hospital. (See Survivors' Story)

From this point to mouth of room No. 6 there was found evidence of the force having come outby as shown by the timbers as they were blown down and in an outby direction. Timbers, ribs, and all projections were heavily coated with dust on both faces, but no coking was evidenced. About the mouth of No. 7 room five bodies had been found, also the transit box, two lamps, caps and pair of pliers. One of these bodies was that of Trevon Williams, the engineer who was standing on the entry giving line. He was found against the lower rib of the entry badly burned. The other bodies were men from the face of the entry who had been overcome at this point while trying to escape. The body of H. T. Henderson (Chief of the Engineering corps) was found in room No. 7 twenty feet from mouth. He

was badly burned and skull was fractured. The bodies of the other two engineers were found badly burned in room No. 7, 217 feet from mouth. This is without doubt the exact initial point of the explosion.

The force came out of this room as shown by the direction in which the props were blown out. Both this room and No. 6 room had heavy falls almost the entire length from mouth to face. A sample of air was taken at face of room No. 7 where audible gas feeders were being given off. The Inspectors tested with normal flame (Wolf lamp) and found no evidence of gas. The writers tested with a non-luminous flame (Wolf lamp) and detected faint cap. See analysis No. 1960 in appendix.

On No. 11 entry, thirty feet inby mouth of No. 7 room one body was found facing outby. Seventy feet further four bodies were found under a fall all facing outby, also one dinner pail. The first stopping inby No. 7 room was damaged and blown toward the air-course. Thirty feet inby the point where these four bodies were found there was another body along the upper rib and facing outby. Thirty feet inby this body two more were found along the upper rib and facing outby. Opposite this point was a haulage break-through, the brattice curtain of which was blown toward the air-course. Fifty feet outby No. 8 room another body was found facing outby. Thirty feet outby the same room the body furthest inby was found. This body was in the center of the roadway and doubled up. His clothes were on fire and flesh roasted when found by the rescue party about two hours after the explosion. It is supposed that in lighting or

attempting to light his open lamp his clothing caught fire.

Across the entry Nos. 8 and 9 rooms there were canvas curtains and a line of brattice cloth extending up both rooms for the purpose of ventilating these rooms as the break-through between them was not completed. Both canvasses across the entry were blown inby and part of the canvas in both rooms was blown down and toward the face of the rooms. At the time of our investigation an indication of gas was found near the mouth of both rooms, and at the face a cap one inch high was detected on the Wolf lamp. The gas was pretty well distributed from top to bottom. Gas sample No. 4 was taken at the face of No. 9 room. (See analysis No. 1963.) Audible gas feeders were detected at these faces. Stoppings along the entry inby No. 8 room were not damaged. Conditions from this point to the face were normal except that a line brattice from the last break-through on this entry to the face was blown down. Dinner pails were found near the face which had not been touched. Gas was also detected at the face of the entry.

No. 11 entry and workings were the only parts of the mine affected by the explosion.

CONCLUSIONS AND LESSONS.

The cause of the explosion can be indirectly attributed to the system of working in No. 11 entry and lack of proper care and examinations on the part of the foreman and fire-bosses of places adjacent to working places and known to generate explosive gases and this failure to put up proper danger boards or signals. The explosion was directly caused by an engineering corps, not familiar with the dangers inherent in a gaseous mine

being permitted to enter the mine with no lamp other than open lamps and allowed to go about the mine without being accompanied by one of the officials who would be familiar with conditions and who should have examined places not working with a safety lamp before the engineers were allowed to enter with open lamps.

The important lesson to be drawn from this explosion is the danger resulting from allowing even a comparatively small accumulation of gas to remain in an abandoned place. The explosion while local and comparatively small resulted in the death of eighteen men. Five of these died as a result of burns and violence due to the force of the explosion. The other thirteen died from the effects of afterdamp. Had these thirteen men remained at their working places they probably would have escaped alive. Instead of this they rushed right into the afterdamp a few minutes after it had been formed and before it had time to be diluted with fresh air. Had they gone out slowly, or delayed their attempted escape for a few minutes they probably would have gotten out alive. This was shown by the man who returned to get his dinner pail and who escaped alive.

Had there been an equipment of breathing apparatus and trained men at this mine there would have been an excellent opportunity to have saved several lives.

An interesting thing to be noted is the fact that though the mine is comparatively dusty in the section in which the explosion occurred, yet so far as could be ascertained, the dust took no part in the explosion. No coked or charred dust was observed. A comparison

of the analysis of road dust taken from the explosion zone from the point where the explosion died out and from a section not effected by the explosion, show a decided uniformity and also show that the ash content was not high enough to render the dust non-explosive.

The Inspectors and Mine Officials stated that the cause of the dust not propagating the explosion was due to the exhaust steam method of humidifying the intake air.

It is true that the walls and floor were for the most part moist in the live workings and entries and the humidity was 94% or over every place except in the pillar workings, yet by comparing the moisture content of face coal samples and road dust samples there is no great absorption of moisture by the dust. If the humidity did have a beneficial effect it is due, I think, to the fact that the walls and floors were damp and lowered the temperature of the flame wave below the ignition point of the gas near the walls and floor.

Howard I. Smith

J. T. Ryan

Assistant Mining Engineers.

APPENDIX.

Mine Air Samples.

Laboratory No. 1960 from face of No. 7 room off eleventh entry, sample taken at 2:05 P. M., 11-21-11.

Laboratory No. 1961 taken on No. 10 main, 200 feet inside the mouth. It represents the return air from from Nos. 10 and 11 entries.

Laboratory No. 1962 taken on No. 10 air course just inby the point where room No. 3 off eleventh left entry holes through. It represents the return from No. 11 entry and is the intake for No. 10 entries.

Laboratory No. 1963 taken at face of room No. 9 off eleventh entry.

Sample No.	1	2	3	4
Laboratory No.	1960	1961	1962	1963
CO_2	0.10	0.05	----	0.18
O_2	20.54	20.81	20.86	19.86
CO	0.00	0.00	0.0	0.00
CH_4	1.28	0.50	0.25	3.21
H_2	79.08	78.64	-----	76.75
Total	100.00	100.00	100.00	100.00
Cu. ft. of air per min. where sample was taken.		10,127	11,418 cu. ft.	

Road Dust Samples.

Laboratory No.	Moisture	Volatile matter	Fixed Carbon	Ash	Sulphur	Fix. Carbon Vol. Ratio
12,989 F.) as received)	6.72	15.13	48.88	29.27	(.52)	
						(76.4
Moisture free	----	23.64	76.36	-----	(.82)	(23.6
12,990 F.						
As received	4.16	14.32	55.46	26.06	(.62)	
Moisture free	----	20.52	79.48	-----	(.89)	(79.48
						(20.52
12,988 F.						
As received	5.79	15.90	50.19	28.12	(.49)	
Moisture free	----	24.06	75.94	-----	(.74)	(75.94
						(24.06

Sample No. 12,989 F. is a grab sample taken along No. 11 left main entry from side track to mouth of room No. 3. November 22, 1911. Taken about the point where flame died out going outby.

Sample No. 12,990 F. is a grab sample of road dust taken in room No. 8 off eleventh left entry where conditions would be about the same as in room No. 7 where explosion originated.

Sample No. 12,988 F. is a sample of road dust taken along No. 10 main entry beginning 50 feet inby side track. November 22, 1911.

Analysis of coal samples from the Bottom Creek Mine, Vivian, West Virginia.

Sampled September, 1909 by J. J. Rutledge and H. M. Wolflin.

Lab. No.	Moisture	Vol. Combustible.	Fixed Carbon	Ash	Sulphur	Designation
8571	.6	12.5	81.3	5.6	.60	Coal air dried
	2.2	12.5	79.8	5.5	.60	" as received
		12.5	81.9	5.6	.60	" moisture free.
		13.5	86.5		.65	Percentage referred to moisture and ash free.
8581	.6	12.5	81.5	5.4	.85	Coal air dried
	3.0	12.5	79.2	5.3	.60	" as received
		13.0	81.6	5.4	.65	" moisture free
		13.5	86.5			Moisture and Ash free.
8582	.7	12.2	82.4	4.7	.60	Air-dried.
	3.0	12.0	80.4	4.6	.60	As received.
		12.5	82.7	4.8	.60	Moisture free
		13.0	87.0			Moisture and Ash free
8583	.6	12.5	81.3	5.6	.60	Air-dried.
	2.2	12.5	79.8	5.5	.60	As received.
		12.5	81.9	5.6	.60	Moisture and Ash free.
		13.5	86.5			
8584	.6	12.0	82.4	5.0	.60	Air dried.
	2.1	12.0	81.0	4.9	.60	As received.
		12.0	83.0	5.0	.60	Moisture free
		13.0	87.0			Moisture and Ash free.

Proximate analysis of composite of 8583, 8582 and 8581.

Lab.No.	Moisture	Vol. Combustible	Fixed Carbon	Ash	Sulphur	Designation.
8674	.6	13.5	80.7	5.2	.62	Air dried
	2.7	13.0	79.2	5.1	.61	As received
		13.5	81.3	5.2	.63	Moisture free
		14.5	85.5			Moisture and ash free.

Ultimate analysis of the above sample.

Lab. No.	Hydrogen	Carbon	Nitrogen	Oxygen	Sulphur	Ash	Designation.
8674	4.19	83.73	1.14	3.16	.62	5.16	Air dried.
	4.33	83.93	1.12	4.96	.61	5.05	As received.
	4.14	86.27	1.15	2.62	.63	5.19	Moisture free
	4.37	90.99	1.21	2.77	.66		Moisture and ash free.

SECTIONS OF COAL BED IN BOTTOM CREEK MINE.

McDOWELL COUNTY, WEST VIRGINIA.

	Sec. A		Sec. B		Sec. C		Sec. D		Sec. E.	
Laboratory No.	8571		8584		8581		8582		8583	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof: Sandstone	Sandstone		Sandstone		Sandstone		Sandstone		Sandstone	
Treacherous grey shale	Shale		Shale		Shale		Shale		Shale	
"Draw slate"	2" Dr. Sl.		Dr. Sl.		Dr. Sl.		Dr. Sl.		Dr. Sl.	
Coal	1	8¼	0	4-1/2	2	1	0	3	0	3-1/2
Sulphurous bone	-	-	[a] 0	0-1/4	-	-	[a] 0	0-1/2	[a] 0	0-1/4
Bony coal	0	1-1/2	-	-	-	-	-	-	-	-
Coal	-	-	1	5	-	-	0	11	1	7-1/2
Grey coal	-	-	-	-	-	-	0	2	-	-
Coal	-	-	-	-	-	-	0	9-1/2	-	-
Bone (sometimes with slate)	[a] 0	2-3/4	[a] 0	4	[a] 0	2-1/2	[a] 0	3-1/2	[a] 0	5
Bright hard coal	1	6-1/2	-	-	-	-	-	-	-	-
Hard grey coal	0	2	-	-	-	-	-	-	-	-
Soft coal (mother coal streaks)	2	1-1/2	-	-	-	-	-	-	-	-
Coal	-	-	3	6	3	9-1/2	3	2-1/2	3	6
Floor: Hard shaly underclay										
Thickness of coal bed	5	10-1/2	5	7-3/4	6	1	5	8	5	10-1/4
Thickness of coal sampled	5	7-3/4	5	3-1/2	5	10-1/2	5	4	5	5

Note: [a] These impurities are not included in the sample for the reason that they are generally removed from the coal in mining and shipment.

Section A, sample 8571, cut from No. 8 Pillar opposite siding on No. 1 Cross Entry, about 550 feet southeast of drift mouth.

Section B, sample 8584, cut from Chain Pillar No. 8 Entry opposite No. 45 Room, about 9300 feet northeast of drift mouth.

Section C, sample 8581, cut from last room off Main Entry, about 7300 feet, approximately N. 45° E of drift mouth.

Section D, sample 8582, cut from face of 12th Cross Entry, about 8700 feet N 63° E of drift mouth.

Section E, sample 8583, cut from last breakthrough in 9th Cross Entry, about 12500 feet N 63° E of drift mouth.

A composite sample was made by mixing pillar samples 8571 and 8584 for an ultimate analysis, the results of which are shown under laboratory number 8673.

A composite sample was made by mixing face samples 8571, 8582, and 8583 for an ultimate analysis, the results of which are shown under laboratory number 8674.