



# Reports

--:-- EXPLOSION IN THE FRANKLIN MINE No. 2 --:--

GAMBRIA STEEL COMPANY

NEAR JOHNSTOWN, GAMBRIA COUNTY, PENNSYLVANIA.

OCTOBER 31, 1909.

BY GEORGE S. RICE.

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On Sunday afternoon, October 31st, 1909, at 3:15 p. m., an explosion occurred in the Franklin Mine No. 2 of the Cambria Steel Company, near Johnstown, Pennsylvania, in which eleven men were killed outright and two others died shortly after the explosion from the effects of afterdamp, one soon after reaching the hospital and the other on the following day. Two more men were seriously affected by afterdamp and at the time of the investigation, it was not known whether they would recover.

The explosion was local in character. There were about 30 men in the mine and some of these were not aware there had been an explosion until they had finished their shift. The extreme range of the explosion was probably not over 1500 feet, although it was severe locally.

The morning following the explosion upon seeing the reports in the newspapers, the writer telephoned the operating company to see if rescue apparatus was needed, but it was found that it was not as the section of the mine where the explosion occurred had been searched by rescue parties during the night and all the living men and the bodies recovered.

Messrs. Paul, Jones and the writer reached the mine that evening and investigated during the night.

ENTRIES AFFECTED BY EXPLOSION:

The entries affected by the explosion were the fourth left heading for a distance of 1500 feet, the ninth and tenth parallel, 300 feet to the east of the intersection of the fourth left heading and 800 feet to the west of same. The flame area was much less in extent.

We started the investigation at the second left heading near the point where there had been found two dead men; also two living, though overcome by afterdamp. These men formed a timber gang in charge of Joseph Jones, and had been working in the eighth parallel on the east side of the fourth left heading. They were engaged in putting up timbers when the explosion occurred, but were outside of the range of force. They went out the eighth parallel to the fourth left heading, passed up this heading over the path of the explosion, and thence into the tenth parallel, where they were overcome within about 200 feet of fresh air. They lay there for some hours and Mr. Jones and one of the others died.

In going east along the tenth parallel, evidences indicated a small amount of force that had gone outbye; that is, to the west, but no flame effects were observed until a swamp or wet place about 150 feet long was passed, which was near the junction with the fourth left heading air-course. The door frame between the aircourse and the fourth haulage had been blown 180 feet outbye or west along the tenth parallel. Coked dust, the first observed, was found in crevices in the tenth parallel facing the fourth left heading near the junction of same.

FOURTH LEFT HEADING (inbye tenth parallel)

Going in the fourth left heading from the tenth parallel, the following evidence was noted:

The switch-stand inbye the tenth parallel was bent outbye.

Three cars of slate just inbye the switch were not damaged. There was some dust on the inbye end of the inner car.

The concrete stopping in the first crosscut inbye the tenth, 20 feet from the fourth left entry was intact. Caked dust was observed on either rib of the crosscut and on the roof at a point 4 to 5 feet from the corner.

On the ribs of the fourth left, inbye the crosscut, there was more or less coked dust on the outbye exposures.

Beyond this point, there was a car of slate, blocked by props, which had a heavy mass of coked dust 2 inches thick at the bottom of the door on the inbye end, but the car showed no effects of violence. A sample was taken of this coked dust and analysis will be given later.

There was a tool box at the east rib 20 feet outbye from a blind slant started for the eleventh parallel, the hinged door of which was open but the contents were not disturbed. Some unscorched paper was found in it. The outbye end had much coke. The inbye end had coke particles only on the edge of the door.

An empty car, a little inbye the tool box, had no coke on the outbye end but a thick crust of coked dust on the inbye end.

At the mouth of the eleventh slant, there was an inch and a half pipe line which had been hung up against the roof, but was now down on the track and bent west. A connecting pipe laid through the opposite

crosscut had been broken loose at the tee and swung inbye 2 feet.

A tool box which had stood at a corner of this crosscut had been thrown west a few feet and swung around. There was a heavy coked dust scale on the corner of the rib facing the slant.

In the next and last crosscut which had just been broken through into the aircourse, a loaded car was standing against a pile of coal. There was coked dust on the end of the car facing the fourth left heading. Coked dust was observed on these exposures on the left rib which were near the aircourse and faced toward it. This dust had seemingly been deposited as the flame swung around the corner into the aircourse.

There was no coked dust showing at the end of the heading which was about 50 feet past the crosscut. The ribs were damp; the heading had not been worked for a time.

ELEVENTH SLANT OFF FOURTH HEADING:

At the face of the eleventh slant, which was a blind stub in about 100 feet, three or four shots had recently been fired. It was stated that two men had been sent into this heading to take up rock bottom and extend the heading; also that these men were instructed to use dynamite. It was claimed that the men had said on going into the mine that they were going to "shoot up bottom."

The coal in this slant was 21 inches thick, below which was 10 inches of slate and below that  $3\frac{1}{2}$  feet of hard fire clay.

At the time of the investigation, the face was in very rugged condition. The bottom had evidently been lifted by shots, but there was a mass of fine coal on top of the broken rock and there were four holes with

dead ends in the coal 14 inches to 21 inches in depth. A loaded car with small pieces of rock and coal on the bumpers was standing near this pile. A layer of coked dust had been deposited on top of the loaded car and also a coke scale on the bumper on the outbye end.

The shots in the coal were evidently dangerous; the bottom shots were concealed. It was not entirely clear whether the shots in the coal had been fired after the bottom shots but that was the appearance. There was no cutting in the coal. The shots were directly on the solid. Dynamite was supposed to be used only in the brushing and "Coal Special", (a permissible explosive) in the coal.

Subsequent investigation indicated that shots in this entry were undoubtedly responsible for the explosion, but whether coal or bottom shots was not decided.

There was not a large amount of coked dust on the ribs of the slant, but there was some showing near the mouth. The roof had water drops on it. Little violence was indicated in this road. At the latter point, two shovels stood against the south rib; probably just as they were left by the men before preparing the shots; they were covered with dust.

Near the mouth there was a prop under a pipe along the rib which had coke on the outbye end.

The fact that the pipe line which crossed the mouth of the slant had been bent outbye from same and that there was coke on the corner of the opposite crosscut, also that a tool box had been moved west and a branch pipe line swung inbye on the heading, as referred to in the notes of the fourth heading, all indicates that the explosive flame sweeping out the slant spread inward and outward on the fourth heading.

TENTH PARALLEL HEADING (inbye the fourth left heading)

The tenth parallel heading was about 500 feet in length from the fourth left heading to the face. A short distance in from the fourth left heading, a few ties were displaced, but otherwise no violence was indicated by movement.

At a distance of about 100 feet from the mouth, there was some coke on the inbye-facing exposures of the ribs.

At the corner of the slant, there was a coke crust on the inbye-facing corner.

Just past the inner corner, there were additional coke deposits on inbye-facing exposures.

A little further in, coked particles were adhering to the roof.

The floor of the entry from the slant inbye was generally damp. The entry walls inbye the slant were mainly rock where a roof had been passed through, the coal being very thin. At the next and last open crosscut and on the opposite ribs, heavy coke crusts had been deposited. The coal in this vicinity had partings of slate. When the molten coked dust was deposited, it appeared to have stuck to the coal, but not to the slate partings so these were made conspicuous by the absence of the coked dust which covered the coal in the vicinity.

The flame did not appear to have penetrated to the head of the entry, but just outbye the last crosscut not yet connected to the ninth parallel, coked dust on the outbye exposures was noted. In the last open crosscut on the inner (east) rib, the coke was on the exposures facing north

or the direction from which we supposed the flame to have come. On the opposite or west rib, the coke was on the south-facing exposures.

At the end of this crosscut, where it entered the ninth parallel, there was a tool box at the east rib. There was coked dust on both ends of this box. On the same rib a few feet further along near where it corners with the ninth parallel, there was a pile of props, the top of which had the appearance of having moved slightly toward the ninth. On both the east and west corners of the crosscut, there were crusts of coke on the open exposures.

#### NINTH PARALLEL:

From the last open crosscut to the face, a distance of about 120 feet, it was quite damp. No dust and no caking was observed. Outbye the last crosscut, there was a pool of water. Further out, some coked dust had been deposited on each rib, alternately on inbye and outbye exposures. The same was true on the slant leading to the fourth left heading.

#### FOURTH LEFT HEADING AND AIRCOURSE OUTBYE THE TENTH PARALLEL:

In going out on the fourth heading, starting from the tenth parallel, there were three cars near the junction with the ninth parallel which were not disturbed. On the other hand, in the ninth parallel, there had been a 10 inch concrete stepping standing a few feet from the fourth left aircourse. This had been burst into the parallel and the fragments thrown west from 75 to 180 feet along the entry. These fragments weighed from 50 to 100 pounds each. It was apparent that the main force of the explosion travelled out the aircourse inasmuch as the stoppings in the crosscuts between it and the haulage road were blown toward the haulage road. The aircourse was the



intake and the haulage road the return.

In the fourth left heading opposite the entrance to the ninth slant, there was coked dust on an outbye facing exposure. This deposit of coked dust was the last one observed by the writer as he went out the heading. There had been some men working at the switch into the slant. These were killed outright. It was not reported whether they were burned or not.

A short distance further out, there were two cars off the track, but undamaged. Beyond these on the fourth left, there were some men making a manhole. One shot had evidently been fired immediately previous to the explosion, the pile of coal remaining. As this coal was covered with soot and dust, the shot was probably not connected with the explosion. Three or four men were working in this vicinity and these were killed outright. Between the manhole and the switch above mentioned, two men were said to have been found partly overcome by afterdamp, and who were still living at the time of investigation. Their location at the moment of the explosion is not known to the writer.

At the eighth parallel, there was a large pile of dust and timber, evidently blown through the crosscut from the aircourse. Further out the fourth left heading, there were the fragments of a door which had been blown from a point near the eighth parallel.

Opposite a crosscut, there was a pile of dirt blown from the aircourse. There was no evidence of disturbance at the seventh slant and it was apparent that the explosive wave had not entered either the eighth or seventh parallel. The four men who were found near the second left heading had been working in the eighth at a point about 400 feet from the mouth.

In the next crosscut outbye the mouth of the seventh slant, there were wood fragments and debris from the crosscuts, evidently blown from the aircourse side. Beyond this crosscut, there was a pair of doors which were opened inbye at the time of the explosion and had remained so. In the crosscut beyond, fragments of the concrete stopping had been blown into the heading from the direction of the aircourse. This was the last piece of evidence noted in going out.

CONCLUSIONS: The mine was not considered a gaseous one and a "cap" was not obtained in a Wolf Lamp in the course of the investigation. The case appears to be a very simple one. Shots bored straight into the solid coal in the face of the eleventh slant, probably charged with dynamite, had partly <sup>ly</sup> ~~fully~~ blown out and the flame of the dynamite had in all probability ignited the dust, or else bottom lifting shots had gone off after the coal shots and the flame of the dynamite had exploded the coal dust. In either case, the writer would attribute the explosion to dynamite and coal dust. The explosive wave passed out of the slant, part of it going inbye on the heading and the other part outbye, killing near the mouth of the slant the two who were responsible for the shots.

At the tenth parallel, the explosion divided, part of it bursting the door and going west, the flame dying away on a swamp. The part going east passed to the last open crosscut and thence back through the ninth to the fourth heading, joining or following the explosive wave that passed straight out the fourth heading. A branch of the explosion entered the ninth west parallel, burst a concrete stopping, showing more violence here than at any other point. The wave passed down the fourth left aircourse,

bursting the stoppings toward the fourth left heading. The branch wave that passed straight out the fourth left heading killed the men who were working near the ninth slant and those who were working on manholes further out. Beyond this point, there was no evidence of flame, although there was considerable dust more or less dry.

The total distance traversed by the flame did not appear to have been over 800 feet.

The dust does not seem to be of a very explosive nature. Some samples of coal picked from the face of the eleventh slant showed the following analysis, reported under laboratory number 9260:

Moisture	...	...	...	1.28
Volatile combustible	...	...	...	19.88
Fixed carbon..	...	...	...	68.11
Ash	...	...	...	<u>10.73</u>
				100.00

Sulphur	...	....	...	2.99
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Analysis of the coked dust from the inbye end of a car in the fourth left heading just a little outbye of the mouth of the eleventh slant showed the following analysis, reported under laboratory number 9261:

Moisture	...	...	...	.71
Volatile combustible	...	...	...	11.09
Fixed carbon .	...	...	...	67.65
Ash	...	...	...	<u>20.55</u>
				100.00

An analysis of coked dust collected from a rib in the tenth parallel is as follows, reported under laboratory number 9262:

Moisture	...	...	...	1.38
Volatile combustible	...	...	...	8.48
Fixed carbon .	...	...	...	52.59
Ash	...	...	...	<u>37.55</u>
				100.00

It will be unsafe to reason from the increase in the ash contents that any considerable amount of the fixed carbon had been burned, inasmuch as there was perhaps some shale or rock dust mixed with the coked dust.

The change in the fixed carbon - volatile combustible ratio is of interest as shown in the following table:

	Coal	Coked dust	
	9260	9261	9262
Volatile combustible	22.60	14.09	13.89
Fixed carbon	77.40	85.91	86.11

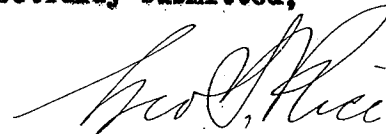
The naturally low volatile combustible matter of this coal makes it less susceptible to explosion. It probably requires a strong initial flame to ignite the dust and propagate an explosion. This is probably one reason why the explosion failed to sweep through the mine. The other is that owing to the thin coal in this part of the mine, there was a large amount of brushing to make head room. This would cause shale and fire clay to be mixed with the coal dust and thus decrease its explosibility.

The mine appeared to be well laid out and generally well administered. However, there was not sufficient sprinkling done and it also seemed to be tempting Fate to allow "shooting off the solid", particularly with an explosive like dynamite, the flame of which will readily ignite coal dust. Dynamite is used for demonstration purposes in the French, Belgian and German galleries and invariably ignites any ordinary bituminous coal dust.

Even if permissible explosives are used in shooting coal, if in the same mine dynamite or other long flame explosive is used in brushing,

or in rock adjacent to the coal, it is equally as dangerous as if fired directly in the coal face, unless the coal dust is removed or made safe by thorough wetting.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Geo. C. Rice".

Mining Engineer.

Pittsburgh, Penna.,  
July 20, 1910.