

APPENDIX
TO
ANTHRACITE MINE REPORT.

A SPECIAL REPORT
ON THE
NANTICOKE MINE DISASTER,
AT THE
NO. 1 SLOPE, DECEMBER 18, 1885.

*Prepared by G. M. Williams, Inspector of Mines, at the request of
the Governor of Pennsylvania.*

OFFICE OF INSPECTOR OF MINES,
WILKES-BARRE, PA., *July 31, 1886.*
To His Excellency ROBERT E. PATTISON,
Governor of Pennsylvania:

SIR: In response to your respectful request of June 24, 1886, I have the honor of presenting herewith a special report on the disaster of December 18, 1885, at the No. 1 Slope of the Susquehanna Coal Company, at Nanticoke, Pa.

It contains a full history of the disaster; the circumstances which caused it; the efforts made to rescue the imprisoned workmen while the impression was entertained that they were possibly living, and the work done towards recovering the bodies after it became evident that they were dead. I have endeavored to explain the situation fully as I understand it, and I hope it will prove satisfactory for the purpose for which it was intended.

I have the honor to be,

Your obedient servant,

G. M. WILLIAMS,
Inspector of Mines, Third Anthracite District.



LETTER OF THE GOVERNOR REQUESTING A REPORT.

EXECUTIVE DEPARTMENT,
HARRISBURG, *June 24 1886.*

MR. G. M. WILLIAMS,
Inspector of Mines, Wilkes-Barre, Pa. :

SIR: Herewith I forward to you a translation of a letter in relation to the disinterred bodies of the victims of the Nanticoke mine disaster, and I respectfully request that if the mine is in your district, you will investigate the matter the inclosed letter refers to, and report to me, and that if the mine is not in your district, you will please hand this communication and inclosure to the proper inspector, that he may investigate the matter and report to me.

Very truly yours,

ROBT. E. PATTISON,
Governor.



PETITION TO THE GOVERNOR.

The relatives of some of the coal-miners who some months ago were buried alive at Nanticoke, implore the Governor to use his influence for the disinterring of them. Two of those that signed their names to this petition to the Governor are the parents of some of the victims of that catastrophe. One has a son amongst them, another three sons, who, as they allege, were the chief support of their bereaved parents. They say that there may be a possibility of some of the victims being yet alive, but, at any rate, they wish them to be disinterred and buried in consecrated ground.

They further state that the company has not done its duty in regard to the digging out of the unfortunate, and they beseech the Governor to induce the superintendent, Mr. G. Morgan, of Nanticoke to make the most strenuous efforts for the recovery of their bodies, whether alive or dead.

The petitioners also state that the company, and especially the above-named superintendent, showed an indifference in this matter which verges on heartlessness. For seven weeks all efforts for the disinterring of the bodies have ceased completely, and they appeal to a humane Governor to use his powerful influence in this matter.

They further say that for year and year they have worked hard, and sometimes for very scanty pay, in order to support themselves and family honestly, and they hope that this their reasonable request will not be disregarded.

One of the petitioners states that he has fought for his country as a soldier and has ever done his duty as a citizen, and that he expects the Governor to cause the digging for the recovery of the bodies to be immediately resumed.

Some men, the petitioners state, have volunteered their services for this purpose, (to continue the digging,) but the company has thus far persistently rejected their offers and prevented them from carrying out their humane undertaking.

They finally entreat the Governor to cause a commission to be at once appointed, which is to investigate this matter and report the results of their investigation.

(Signed)

WILLIAM ELKE,
MRS. M. K. ELKE,
WILLIAM KIVLER,
MRS. E. KIVLER,
MISS MARY KIVLER,
MICHAEL LANGERS,
MRS. MAGDALIEN BUCK.

NANTICOKE, *June 14 1886.*



TIME AND EFFECT OF THE DISASTER.

The deplorable disaster referred to in the preceding communications took place at about ten o'clock, Friday morning, December 18, 1885, in the Ross vein workings of the No. 1 slope, one of a number of coal mines owned and operated by the Susquehanna Coal Company, at Nanticoke, Pa.

Suddenly and very unexpectedly, a large body of quick-sand, saturated with water to such an extent that it flowed like liquid, broke into the mine at the face of the inner counter-gangway and rushed through the workings filling the main passages so rapidly that twenty-six persons failed to escape and were caught and perhaps killed before they had time to leave their working-places. It was one of the most unfortunate calamities, and, perhaps, the most distressing in its effects that has ever occurred in the coal mines of this region. The friends and relatives of the deceased persons were led to believe, for the first four days, that probably they had only been closed in at an open space, where the quick-sand had failed to reach them, and that possibly they might be living.

Upon finding the correct location of the "cave in," all hopes of their being living were instantly dispelled, for, to those who were familiar with the mine, it became evident that a space of sufficient area as would maintain the lives of so many persons for any length of time after the *debris* broke upon them was almost impossible. Those who were eye-witnesses of this terrible flood state that it ceased running in about one hour after it broke into the mine. In this remarkably short time, the lower portions of the workings were literally packed full of sand for a distance of more than three thousand feet from the source of the stream. It filled the chambers at some points to a height of two hundred feet from the gangway, on a rising grade of eighteen degrees. Mixed with the sand, a large number of stone boulders were found, some almost as large as a common flour-barrel, thrown up to the chambers to the same height as the sand. The sand, after the water drained out, was pressed almost as hard as a brick and the main gangway filled from floor to roof all the way to the entrance of the tunnel. A thickness of from three to four feet extended all the way down the slope and into the lower channel, a distance of over five thousand feet from the point where it broke into the mine. The quantity of water was so small that it drained off in a short time, and the increase at the pumps was hardly noticeable.

When tidings of the flood, which were immediately sent by the officers, reached the ears of the workmen below, in other lifts, they all fled out as speedily as possible. The inhabitants of the town were also shocked by the startling intelligence that a great calamity was taking place beneath them in the mines, and naturally the excitement caused thereby was intense. The following persons were found to be missing after a careful inquiry, shortly after the accident:

List of the Entombed Persons.

Oliver Kivler, miner, age thirty-two years, wife and three children.
William Kivler, laborer, age eighteen years, single.
Frank Kivler, miner, age thirty years, wife and three children. These were brothers
John W. Shutt, laborer, age twenty-eight years, wife and three children.
August Matule, miner, age forty-five years, wife and three children.
Isaac Sarver, miner, age twenty-six years, single.
John Sarver, laborer, age twenty years, single.
Andrew Low, miner, age twenty-six years, single.
John Hawk, laborer, age twenty-six years, single.
Vincent Luke, miner, age twenty-three years, single.
Wadislans Jeloshinski, laborer, age twenty-four years, single.
Peter Motulewick, laborer, age twenty-five years, single.

John Norwack, miner, age twenty-six years, single.

Adam Rubinski, laborer, age twenty-six years, single.

John Drajna, miner, age thirty-five years, wife and three children.

John Sloff, laborer, age twenty-seven years, wife and two children.

Joseph McCarty, miner, age twenty-five years, wife, no children.

Abram Lewis, miner, age thirty-five years, wife and two children.

Edward Mathews, laborer, age twenty years, single.

Thomas Williams, laborer, age twenty-two years, single.

Edward Hargraves, miner, age twenty-two years, single.

Michael Adomchick, laborer, age twenty-four years, single.

William Elkie, runner, age seventeen years, single.

Max Longoski, driver, age sixteen years, single.

William Danahay, driver, age fifteen years.

Thomas Clifford, door-boy, age fourteen years.

In all, twenty-six persons, eight of whom were married, leaving eight widows and nineteen children.

The gangway has been re-opened since a distance of more than two thousand feet, but not one of the bodies has as yet been recovered. No efforts to that effect have been made since April 21, the officials of the company being, as they say, afraid to risk the lives of the workmen and the safety of their property to proceed further with the work. It is their opinion that the bodies cannot be reached, and that the lives of the workmen would be jeopardized to an unwarrantable extent by continuing the excavation of the mine. In all the calamities that took place in the mines of this coal field since the one that occurred at the No. 1 drift at Carbondale, January 12, 1846, the bodies of the victims have invariably been restored to their bereaved friends. In some cases, it has been done at great expense and peril, but the difficulties were such as could have been surmounted with fair assurance of safety, and, therefore, it was done. In the disaster referred to, at Carbondale, Pa., about fifty acres of ground caved in suddenly while all the men were at work in the mine, and fourteen persons were buried under it. The company kept men working constantly for a period of six weeks trying to recover their bodies, and succeeded in finding eight. The other six were never found, and they are there still. During the forty years which have passed since, so far as I know, the character of the mine calamities has been such that it has proven practicable to recover the bodies within a few days, at most, after that which caused their death occurred; but in the case of the Nanticoke disaster of December 18, 1885, seven months have passed, and not one body has been recovered. Every one connected with the coal mines is pained with the thought of abandoning them, and would be greatly gratified if they could be found. It was a singular occurrence; nothing like it has ever caused such a calamity in this region heretofore, and, before censuring any one, all the circumstances should be well considered and treated justly and without prejudice.

DESCRIPTION OF THE MINES.

The No. 1 slope entrance is about half a mile west of the center of the town of Nanticoke. It was sunk on the south dip of the Red Ash vein, the lowest workable vein in this mine. Its total length is fifteen hundred and seventy feet, and the grade of its inclination about thirteen degrees. Below it, on the same seam, the workings of No. 2 shaft, which are very extensively opened, connect; and below that again the workings of No. 1 shaft. Thus it is seen that the workings of the three mines are connected by openings, are working the same vein, and are extended to a distance of forty-five hundred and seventy feet down from the entrance of No. 1 slope. Three tunnels were driven from this seam to the Ross vein, the next workable seam above the Red Ash. The first, in which the disaster occurred, was driven from the third lift, at a distance of one hundred and fifty feet west of the slope, and a distance of eleven hundred and seventy feet from its entrance. The second tunnel was driven at the foot of the slope, and the third from the west gangway of the No. 2 shaft.

In the No. 1 slope, the Red Ash seam was nearly exhausted, and most of the output of coal was mined in the Ross seam in the first tunnel. Another lift on the same vein

was worked from the surface opening known as No. 4 tunnel. This is a water level mine, from which the nearest lift to the outcrop has been mined to a distance of about two miles west of its entrance. A part of the workings of this tunnel is shown on the accompanying map, above the workings of the first tunnel in the No. 1 slope. In No. 4 tunnel, although the workings are the nearest to the outcrop, and are driven the distance stated, no trouble from quick-sand was ever encountered. Because the river rises, on some occasions so as to inundate the opening, a long pillar was left intact all the distance between this mine and the workings below. The gangway of No. 4 tunnel is about two hundred feet vertically higher than the gangway of the first tunnel in the No. 1 slope; the workings are on the same vein, and are higher on the pitch towards the outcrop.

The workings of the first Ross tunnel, in No. 1 slope, are shown below on the map, and these were the scene of the disaster under consideration. The tunnel is a horizontal one through the overlying rocks, a distance of four hundred and seventy feet, to where it penetrated the Ross vein. From here, the workings extend westward a distance of two thousand four hundred and fifty feet. The second opening was driven shortly after the vein was penetrated, at a point fifty feet east of the tunnel, and is terminated by a shaft about sixty feet deep, over which the ventilating fan was erected. The average thickness of the vein is from four to five feet, and the average pitch or inclination of the strata, in all the work to the north or right of the gangway and fourth counter, is about eighteen degrees. At a point one thousand eight hundred feet distant from the tunnel, the main gangway curves around the trough of an inclined synclinal. The axis of this synclinal rises to the west from ten to twelve degrees, and the fourth counter branches off at this point, and was driven up in the trough of the synclinal. Owing to the heavy grade of this counter, a connection road was made near its face to run the coal out through the third counter. This is also shown on the map near M.

From the trough of the synclinal, the main gangway passes on a south-east course, at the base of a series of breasts or chambers driven up a pitch of from thirty-three to forty-seven degrees, the heaviest pitch being at the western extremity of the fourth counter. At a distance of about six hundred feet from the trough of the synclinal, the gangway curves again, passing over an inclined anticlinal, and takes a nearly western course on the south side. The axis of this anticlinal also rises westward, on a grade of from ten to twelve degrees, so that opposite to the branch of the fourth counter, a difference of elevation of from eighty to ninety feet exists between the trough of the synclinal and the top of the anticlinal. For a distance of over three hundred feet, the face of the main gangway, on the south side of the anticlinal, was driven through a fault where the vein was pinched nearly to nothing, and the pitch is about ninety degrees. The fifth counter starts on the anticlinal, and passes a little north of the highest point, intersecting the breast driven up from the gangway, and from the fourth counter. At D, on map, a back branch gangway was driven south of the anticlinal, and nearly parallel with the gangway, but this is owing to the steep pitch, from twenty-five to thirty feet vertically higher. A number of the entombed men were working at various points in this locality as indicated on map. The fifth counter was driven up a distance of seven hundred feet beyond this back branch, and the refuse found was thrown down to the intersected breasts driven up from the gangway, and from the fourth counter. All these breasts were filled, more or less, with refuse, and walled at the bottom, except the inner one near the face at M. This was left open so the air-current could pass through it from the fifth to the fourth counter. At this hole, the pitch was forty-seven degrees, and the face of the fifth counter was forty-two feet higher, vertically, than the fourth counter road. There was a fall of at least seventy-one feet from the top of this hole to the branch of the fourth counter at the curve in the main gangway.

The fifth counter was eight yards wide all the way to a point within a distance of twenty-seven yards of the face. Here, the roof was so bad and wet, that its width had to be reduced to nine feet, and it had to be secured, also, by double timber. The water was dropping freely through the numerous interstices of the roof all along this twen-

ty-seven yards, and it became so wet and the air so far back, that they concluded to leave it stand idle until the cross-cut from below would break through, supposing, by that time, it would drain off and become dryer. This was, undoubtedly, evidence of the proximity of the quick-sand, but nobody suspected that, and they worked as usual without the slightest thought of danger. The gangways are frequently very wet in mines and though that is very inconvenient and disagreeable to the workmen, no danger is apprehended owing to its appearance, unless a dangerous body of water is known to exist somewhere near.

THE DISASTER.

The workmen of No. 1 slope went to work, as usual, on the 18th day of December, at about seven o'clock, A. M. The mine foreman, Michael Corgan, went into the mine the same time, and walked as far as the face of the gangway, where Abram Lewis and Edward Mathews were at work. From there he returned through the workings of the back branch on the anticlinal. He saw all the men in their respective working-places; then he walked out towards the slope, and on the way met the drivers going in with empty cars. In less than one hour after that, the quick-sand broke in and did its fatal work, and the drivers whom he met are among the number who were lost. There were ten persons employed, in various places, at the face of the third counter, and they all succeeded in escaping. One heard and saw the flood approaching, and he instantly gave alarm to the others, and by wading a short distance through water to higher elevation, they all escaped to the air-shaft; and upon reaching there found the officials of the company and others ready to help them out, when they were soon brought to the surface safe. John Zeperko, a Polish miner, who was driving the fourth counter, was the first to see the flood. At the request of John Nowack, deceased, who was driving a cross-cut at the face of his place up to the fifth counter, he went up to tap on the coal so as to enable them to guess the distance they had to hole through. Zeperko states that he was at the face of the fifth counter doing this about one hour before the disaster, and that he noticed the two collars nearest to the face broken, and that more water was coming than usual. At about ten o'clock, A. M., while standing on the gangway between the air-hole M and the face, he heard the water rushing, and instantly it was flowing towards him. He shouted to the others, and simultaneously plunged in to escape. This was accomplished only by an heroic struggle of wading and swimming for a long distance. He once saw his comrades up to their shoulders in the water, struggling for life, and this was the last seen of them. Upon getting ahead of the stream, he ran with all his might and alarmed all he met at the tunnel and slope of the coming flood. With all possible speed, the men were called out of the lower tunnel, and from the No. 2 and No. 1 shafts. If the flood should continue long enough, it was evident that over four hundred persons were in danger; but, fortunately, it stopped upon reaching the tunnel at the foot of the slope.

J. A. Stearns, general manager, and George T. Morgan, were near by the head of the slope when the tidings of the disaster came out, and they at once began preparations for the relief of the men. Learning that it was impossible to enter the mine in the usual way, they went to the air-shaft, and soon after heard the men, who had escaped to that point, shouting for help. A. Rees, the general inside foreman, and Michael Corgan, the foreman of this mine, descended at once, and while the escaped men were being hoisted out, they went to explore the mine and see if it was possible to reach the other men. In the meantime, a gang of men was set to work cleaning the gangway in from the slope. A large, funnel-shaped depression was also discovered to have taken place on the culm-bank, about three thousand feet away from the entrance of the slope. This indicated the point where the cave had taken place, but at the time it was not known what portion of the mine was directly under it.

Rees and Corgan examined the mine carefully, and found the lower passages filled at all points except the face of the third counter. Here they tapped on the rib expecting that if the imprisoned men were alive, and within hearing distance, they would tap in response, but they heard nothing. During their examination they noticed that the *debris* had reached a much higher elevation at the point marked N (see

map,) than on either side, and this led them to the conclusion that it had broken in at that point, and that probably the top of the anticlinal was not reached by the flood. In that case, there were good reasons to suppose that the men might be living, and could be saved if reached in time.

Upon their returning, a few minutes' consultation with the other officials enabled them to determine what to do, and they concluded to open a passage down through a breast directly opposite the air-hole M, leading from the fourth to the fifth counter near the faces. The course of this passage is indicated on the map by arrows. At noon Friday, A. Rees and M. Corgan led a gang of thirty men in and began the work. The sand was very wet, and had to be conveyed a long distance in buckets. The workmen were changed every six hours, and worked as faithfully as ever men did, regardless of danger, and in very foul air. Lest they should encounter fire-damp, they used no light but that of safety-lamps, which, all miners know, is a very feeble light. By Saturday, the air had become too foul for the men to work in, and an air compressor, already located at the top of the slope, was started and utilized to force fresh air into the mine. In a remarkably short time, Mr. G. T. Morgan procured three-inch gas-pipes and had them laid all the way to the top of the rescuing passage, a distance of more than four thousand feet. From here down it was conveyed by a water-hose, and the air was much improved.

By incessant work till noon, Monday, December 21, they reached the trough of the synclinal, and by this time the number of men employed on each shift was no less than sixty. The passage was very small, only three by four feet, and the buckets had to be handed from one to the other, constantly and rapidly. The work was extremely hazardous, for it was evident that the passage might close on them at any moment; but, regardless of danger, they pushed on bravely and fearlessly, as long as there was hope of saving their fellow-workmen.

At noon Monday, they reached the bottom of the air-hole M, leading to the fifth counter on the anticlinal, and they were greatly elated at their success, realizing that only nineteen yards was between them and the workings which was thought to be the harbor of the imprisoned men. They shouted, but heard no response, and though this was considered ominous, no one was discouraged. During the afternoon, several small rushes of *debris* came down from this hole admonishing them to work very cautiously. They realized that if a large rush should come it would be impossible for all to escape. The passage was about two hundred and fifty feet long on a dip of eighteen degrees, and it was a difficult matter to crawl up quick, being compelled to do so on their hands and feet. While thus cautiously working during the afternoon, a large rush burst upon them, filling the passage a distance of forty feet, which nearly caught a number of the men. This naturally caused some fear, and perhaps some depression of spirits, but the courage of the men was equal to the occasion, and believing that this was only the *debris* forced up the hole during the flood, they again went to work, and cleared it out by six o'clock that evening.

At this time the appearance of the place was much more encouraging; they could see up the air-hole as far as the light of a Clanny safety-lamp would show, and it led them to believe that a small passage was open all the way up.

This hole was rising on a pitch of forty-seven degrees, too steep to climb without steps or ladders, and these were ordered to be brought in as soon as they could be made. They hoped that after the ladders would come they would be able to go up to the fifth counter in a short time. Seven men only, were down in the passage making preparations to place the ladders in position, the others were all waiting above, thinking it better not to risk more than the number necessary for the work. Those who were down in the passage were Thomas Lloyd, John Morgan, James Turner, Lewis Morgan, Evan Dowies, John Dagnon, and John Winters. Three of these were mine foremen. Another mine foreman, Joseph Warne, and John I. Absalom, a coal inspector, were waiting at the upper end at the cross-heading.

At about seven o'clock, a strange, rumbling noise was heard, and instantly water and sand burst upon them with terrific force, and filled the passage up to a point fifteen feet higher than where it was begun. The men escaped only by the greatest ex-

ertion, and the last two had to be pulled out of the debris by the others having been caught before reaching the upper end of the passage.

It is the unanimous opinion of those who had this experience that if the sixty men had happened to be at their usual work in the passage at this time, more than half would have been caught and instantly killed.

This rush determined the fate of the entombed men beyond doubt, for it became evident that they could not be reached in the manner just tried, and all went out discouraged, and reported the occurrence to the hundreds waiting and expecting at the surface.

This second rush was a mystery to the officials, and caused them to think that perhaps a mistake was made in the location where the sand had broken into the mine, or that a second cave had taken place. In order to determine the point over which the depression on the culm-bank was, the surveyors were set to work to locate it as quickly as possible on the map. When this was done, it showed that the break was at the face of the fifth counter, on the anticlinal, and not at or near N, as they had at first supposed. Upon learning this, the great peril attending the attempted rescue became fully revealed, and made every one who knew the circumstances shudder at the very narrow escape had from another, perhaps more extensive, catastrophe. They had attempted to go up almost under the center of the cave at the point of greatest danger, and it is surprising how those who were exposed to the peril escaped.

Knowing the location of the cave, also revealed the impossibility of the entombed persons to be living, and that more than probable they were overwhelmed and buried in the sand when it broke in and rushed upon them. In justice to the officials of the company, I should state that George T. Morgan directed the work at the shaft during all the time they were at work in the attempt to rescue the entombed men. He never left his post for a minute from Friday at noon till midnight Monday night, when every hope of rescuing them was dispelled.

A. Rees, the general inside foreman, and Michael Corgan, the mine foreman of this mine, were in the mine with the workmen constantly, day and night, from the time they descended on Friday till Monday evening. These officers as well as the brave and trusty men who worked in that passage, are entitled to the highest credit and praise that can be bestowed upon them. All the mines of that company were kept idle till Wednesday, and the foremen and the most trusty workmen from all the collieries were employed in the rescuing passage, and also doing the needed attending work.

It was evident now from the result of this effort for rescue that the bodies could not be recovered for a long time, and that the work would become more or less hazardous as it advanced. Parties were steadily at work clearing the main gangway, and it was being opened at the rate of from forty to fifty feet a day, but there was a distance of nearly three thousand feet to be cleared, which could not be done in less than from two to three months at least.

When the peculiar formation of the strata and the relation of the workings thereto were taken in consideration, the probability of meeting perilous difficulties by clearing the gangway beyond a certain point approaching the curve at the synclinal was even then apparent. Many plans were suggested for the relief of the imprisoned men, such as bore-holes, shafts, &c., and all had fair consideration, but in view of the undoubted fact that the men were dead, bore-holes could not be of any practical use, and to sink a shaft through a bed of quick-sand over two hundred feet deep, and having an inexhaustible supply of water in it would take more time than it would to clear the gangway, even if it could be done successfully, which was very doubtful.

The only practicable course suggested was to clear the main gangway, and this was being done as rapidly as possible.

The Direct Cause of the Disaster.

Owing to great depth of gravel overlying the rocks at many points in the Wyoming valley, the work of mining the upper coal-seams is and will be, very hazardous. The only practicable method of finding the depth of gravel is by boring holes at points suspected to be deep, and test its depth in that manner, and also the thickness of the

rocks between it and the seam. The results obtained in this manner are very imperfect, as it tests the depth only at the point where the hole is sunk, when it may be much deeper even within a few feet off; but this is the only practicable method hitherto introduced, and until a better one is discovered, no better results can be obtained.

At many points in this valley, the face of the rocks is from one to two hundred feet below the present bed of the Susquehanna river. Seams of coal, which has a covering of from fifty to over a hundred feet of rock at the slope of the mountain, are washed away at many points on the flats, and their places filled with river-wash or gravel. It was found thus at the Maltby colliery during the fore part of January, 1882, while driving a tunnel from the Eleven-Foot up to the Six-Foot seam, at a point where they supposed the latter was covered by sufficient rock to enable them to mine it with safety. A round of blasts were fired, and instantly the sand and water broke in and filled the mine so rapidly that the men barely escaped. It filled to a height of about ninety feet in the shaft, and although they made strenuous efforts to re-open the mine for several weeks, they failed even to reach the pump at the bottom of the shaft, and eventually they abandoned the mine.

At the Fuller colliery, on the night of April 23, 1884, the workings of the Six-Foot seam were lost in a similar manner. A miner fired a blast in the coal at the face of the underground slope, nine hundred feet below the level gangway at bottom of the shaft, and simultaneously water and sand broke in and filled the workings up to the top of the slope, where preparations had been made to prevent it filling further. Here they knew that the covering of rock was not over thirty feet thick, and precautionary measures had been adopted to save the men and also the main shaft.

The disaster under consideration at Nanticoke occurred at a point several thousands of feet south-west of the gap through which the river passes out of the valley over the edge of the coal measures, and seven hundred feet north of the present bed of the Newport creek.

The rocks are exposed on both sides of the creek for a distance of several hundreds of feet south-west of the bridge. Another line of outcropping rocks is exposed about nine hundred feet north of these again in the vicinity of the barn, (see map.) The rocks exposed at the side of the wagon-road, which passes the south base of the culm-bank, is about forty feet higher in elevation than the creek, and those on the north side of the bank vary from twenty to seventy-five feet higher still. A slight hollow exists on the surface between these two points, where a small stream of water drained a small territory in the region back of the culm-bank. The culm-bank covers this hollow and several sand-hills, over an area of about twenty acres, and the stream, which only exists during wet seasons, is diverted to another channel.

The positions of the exposed rocks in this region are such as would deceive the most practical geologist to come to the conclusion that no great depth of gravel could exist between them.

A casual observation would lead one to think that these were only dry sand knolls, thrown up over the face of the rocks several yards higher than the bed of the creek; but the "cave" of December 18, 1885, demonstrated that there was but little, if any, thickness of rock overlying the Ross vein at this point—a depth of two hundred and sixty-five feet beneath the base or three hundred and twelve feet beneath the top of the culm-bank. A deep channel filled with gravel evidently exists between the two lines of outcropping rocks, exposed on the surface, and passes through the overlying rocks of the anticlinal described as seen in the mine. This anticlinal can be seen on the surface east of this point, lying diagonally across the valley, and passing beneath the culm-bank right under the depression caused by the cave.

The elevation of the roof of the mine under the "cave" is one hundred and thirteen feet below that of the low-water mark of the river. The depth of sand found in a number of bore-holes sunk along the edge of the coal basin varies from thirty-nine to seventy-eight feet, and no cause exists to doubt that the gravel is at a depth of from seventy to one hundred feet all along the buried channel, which caused the disaster. Everywhere along the flats of the Wyoming valley, if there exists a depth of gravel continuous from the river, the water is found at the same elevation as it is in the river,

and, evidently it is the same in the gravel of the buried channel at Nanticoke. A bore-hole was sunk by the Susquehanna Coal Company, at the request of the friends of the entombed miners, after the disaster took place, and the water was found in that at a depth of one hundred and forty feet from the top of the casing. At another time, later, when measured by A. Rees in the presence of a committee of miners, it was found at a depth of one hundred and twenty-seven feet from the top of the casing. It is also stated that the river was higher at this time than when the hole was bored. However, this suffices to show that a depth of water stands in the gravel, even after the "cave in," at nearly the same elevation as the water in the river. It was so, also, no doubt, before the "cave in" took place. As before stated, the fifth counter gangway was driven up on the north slope of the anticlinal a short distance below the highest point. It was believed that there were at least two hundred feet of rock strata above, or overlying it, but the "cave" has proven that there could not have been but very little over the gangway, and, perhaps, none at all to its left, on the highest point of the anticlinal. The large mass of boulders and rounded lumps of bone and coal conveyed into the mine at the fore part of the stream, tends to show that even the coal was washed and rounded by some agent prior to this occurrence, and that probably the eroded channel extended to the floor of the seam at the top of the anticlinal to the left of the gangway. Either the thickness of the pillar on the left or the thickness of the rock roof was not sufficient to sustain the enormous pressure of the great depth of water and sand overlying, and finally it gave way, permitting the *debris* to rush into the mine as already described. No doubt, the break is very large, perhaps extending over most of the twenty-seven yards found so wet near the face of the gangway. The great quantity of *debris* conveyed into the mine, not including the water, in the short time of one hour is sufficient to prove that the break must be of a very large area, otherwise it could not pass it into the mine in that time. It rushed in under a pressure of at least one hundred and twenty-five feet head of water, two hundred and sixty-two feet depth of gravel, and a thickness of forty-seven feet of culm, or a total depth of three hundred and five feet of culm, sand, and gravel, and sufficient water to make it flow.

At all points where the depth of gravel was supposed to be so deep as to endanger the mines, or even where it was suspected to be so, it had been tested by bore-holes. The Susquehanna Coal Company had sunk over two hundred holes for this purpose, and had ascertained the depth of the sand or gravel at every point where they suspected it might exist to a dangerous depth. It was not suspected that such a depth existed at the point where this "cave" took place, and consequently no thought of danger existed in the minds of any one connected with this mine: in fact, its occurrence was a startling surprise to every one concerned. In view of these facts, the accident was unavoidable, as it could not have been precluded without a knowledge of the peril to which the mine was exposed.

In reference to the buried channel which was the cause of this accident, Mr. Charles A. Ashburner, geologist in charge of the Second Geological Survey of this State, describes it in a paper recently published on "The Buried Valley of Newport Creek, near Nanticoke with Special Reference to the Mine Accident of December 18, 1885," from which the following interesting extract is quoted.

After describing the channel to the west of the coal separation, it continues as follows:

"From the south end of the Susquehanna Coal Company's coal separator to the Nanticoke Gap, we have no sufficiently precise data to exactly locate the bottom of the buried valley, in the same way that the bore-holes drilled to the south-west of the separator have permitted us to locate the bottom of the valley in that section. We have, however, sufficient facts to enable us to approximately locate it.

"From the Nanticoke station, on the Lehigh and Susquehanna railroad, there is an almost continuous line of outcrops toward the south-east. About seven hundred feet north-west of this station is located the mule stable, or what is commonly known as the 'Red Barn,' of the Susquehanna Coal Company. In the vicinity of, and to the north-west of this stable, there are exposed rock outcrops. Between the stable and the station, however, there are no outcrops, and the buried valley no doubt lies between these two points. The exact location of the buried valley from a line between

breakers Nos. 2 and 5, through the gap, cannot be determined absolutely by the facts at present at our command. Rock outcrops are found north-west of breaker No. 2 and south-east of breaker No. 5.

"A careful consideration, however, of all outcropping rocks in the Nanticoke gap, and of the bore-holes sunk by the Susquehanna Coal Company on the flat directly east of the Nanticoke bridge, suggests two or three lines as the center of the buried valley.

"Special reference to the location of the valley is deferred until a more detailed report on this subject, which it is proposed to make in conjunction with a careful topographical map now being constructed by the engineers of the Susquehanna Coal Company of the present surface of the Wyoming valley in the vicinity of Nanticoke. Additional records of bore-holes which the company propose to drill will permit of the more satisfactory consideration of this subject.

"It now remains to trace the buried valley from the southern end of the coal separator to a line between Nanticoke station (Lehigh and Susquehanna railroad) and the 'Red Barn.' It is safe to assume, from the facts already presented, that the elevation of the bottom of the valley in the Nanticoke gap is about three hundred and ten feet above tide, and the elevation of the bottom of the valley at bore-hole No. 38 as four hundred and fifty-four feet, so that between the coal separator and the gap there must have been a fall in the valley of one hundred and forty-five feet more or less. In locating the buried valley between these two points, an important question suggests itself for consideration, and that is, does the valley fall at an even grade in this distance of about one mile, or is the grade interrupted at one or more points by water-falls?

"To the right of the county road leading from the Nanticoke station (Lehigh and Susquehanna railroad) towards the coal separator, and about one hundred feet east of the separator trestle-work, a bore-hole was drilled after the 'cave-in' took place, as a relief measure.

* * * * *

(The position of this hole is shown on the accompanying map and the following is a record of it:)

1. Soil, sand, etc.,	218	
2. Sandstone and slate,	53'	10
3. Open space,	2 to 3'	
4. Loose material,	2' to 3'	

"At a depth of between one hundred and fifty and one hundred and fifty-five feet, water was encountered coming from the casing of the hole. The elevation of the top of the hole is about six hundred and fifty-six feet, the elevation of the solid rock encountered in the hole is four hundred and thirty-eight feet. This hole must be very near the center of the buried valley, which evidently makes a sharp turn around the south end of the separator and passes over the mine workings in the vicinity of the bore-hole.

"The slope of the bottom of the buried valley, between hole No. 38 and the relief bore-hole, must be at the rate of about three feet per hundred, unless there was a water-fall in the old stream occupying the buried valley between these two bore-holes. The buried valley must have approximately the position which is here suggested, since a rock exposure was found directly east of the point where the mine workings pass around the end of the anticlinal in coming from the 'cave-in' around to the position of the relief bore-hole. The elevation of the rock exposure, at the point referred to, is five hundred and seventy-five feet above tide, or one hundred and thirty-nine feet above the solid rock first encountered in the relief bore-hole.

"In the vicinity of the 'cave-in,' the buried valley doubtless makes a sharp turn, and pursues a north-east course to a point between the Nanticoke station and the 'Red Barn,' already referred to. The elevation of the top of the culm bank over the 'cave-in' was seven hundred and nine feet above tide, the elevation of the surface of the ground, at the base of the culm bank, is six hundred and sixty-two feet, and the elevation of the roof of the coal mine under the 'cave-in,' at the point where the 'cave-in' took place, was four hundred feet. The slate roof of the mine, between the mine workings and the bottom of the drift in the 'cave-in' at this point, was prob-

ably three or four feet thick, so that the elevation of the solid rock under the '*cave-in*' was probably about four hundred and five feet above tide.

"If the old buried valley had a gradual slope from the relief bore-hole to the position of the '*cave-in*,' the bottom of the valley sloped at the rate of nearly eight feet in a hundred. How far this north-west course which has been suggested for the buried valley, at this point, continued north-west of the '*cave-in*,' it is impossible to surmise, since we have no facts bearing upon the location of the valley beyond the '*cave-in*.' It is probable, however, that the valley made a sharp turn in the vicinity of the '*cave-in*,' and from this turn had a more or less direct course to a point between Nanticoke station, and the '*Red Barn*.' If, between the '*cave-in*' and a line between breakers Nos. 2 and 5, the buried valley should have a regular slope, it would amount to about four feet in a hundred.

"The creek which flowed in the buried valley, as it made a sharp turn in the vicinity of the '*cave-in*,' must necessarily have produced a whirlpool in the water at this point. The diameter of this whirlpool and its depth would, of course, depend upon the amount of water flowing through the buried valley and the velocity which it had at the point where the turn was made in its course, both of which must have been considerable, from the fact that the pool contained large rounded pebbles and boulders of rocks which were evidently whirled around in the pool by the force of the water. When the old valley was ultimately buried by being filled up by the drift which it contains, these boulders and pebbles were buried in the pool by the drift. When the '*cave-in*' took place, a large mass of these boulders and pebbles was found in the gravel and soil which flowed into the mine and filled up a large part of the workings. A large number of these boulders were taken out of the mine-workings by the relief-workers, when the effort was made to get to the mines by working along the tops of the chambers of the mine-workings.

"If the pool had not existed in the bottom of the buried valley where the '*cave-in*' took place large boulders and pebbles would not have been found at this point in the valley, since there must have been a low point or '*sump*' to have held the boulders and pebbles which filled the mine at the time the '*cave-in*' took place and which low point prevented the boulders and pebbles from being rolled down the Newport buried valley and into the ancient Susquehanna river down the valley prior to the time that it was filled by drift.

"As has already been said, it is impossible to determine, with the present facts at our hand, whether the grade in the bottom of the buried valley, from the end of the coal separator to the '*cave-in*,' was a gradual one, or whether it was interrupted by rapids or falls at different points; in fact, it is possible that the low grade in the bottom of the buried valley from Bore-hole No. 14 to Bore-hole No. 38 has continued at the same rate to the edge of the '*cave-in*,' and, if this is so, there was a considerable water-fall in the old valley at the point of the '*cave-in*.' In this case, the '*cave-in*' might be classified under the head of a pot-hole. It would be different, however, from the Archbald pot-holes from the fact that it must have been formed in pre-glacial times rather than near the end of the glacial epoch, during which the Archbald pot-holes were evidently excavated. The sharp turn that the buried valley must have taken at or near the '*cave-in*,' together with a number of other considerations, induces me to accept the former hypothesis, that is, that a whirlpool existed in the vicinity of the '*cave-in*' rather than a pot-hole.

"The latter hypothesis has, however, been more generally accepted although no special facts have been advanced by any one to support it.

"The recent discovery of the Archbald pot-holes, and a likeness in the essential features of these holes to the Nanticoke '*cave-in*,' have doubtless been the reasons why the pot-hole hypothesis has been suggested and generally accepted."

Consultation of Experts.

In view of the perplexing situation after the described failure to rescue the entombed workmen and the difficulties revealed by a knowledge of the correct location of the '*cave-in*,' the general manager, I. A. Stearns, requested a number of mining experts

to meet at Nanticoke December 24, six days after the accident, for consultation as to what was best to be done in order to recover the bodies of the entombed workmen.

In response to this request, the following persons met: B. Hughes and Thomas D. Davies, general inside foremen of the Delaware, Lackawanna and Western Railroad Company, of Scranton; R. G. Brooks, superintendent of the Lackawanna Iron and Coal Company, also of Scranton; Andrew Bryden, mine superintendent of the Pennsylvania Coal Company, of Pittston; John B. Law, assistant superintendent of the same company; Thomas H. Phillips, division superintendent, and William T. Smith, inside superintendent, of the Lehigh and Wilkes-Barre Coal Company, of Wilkes-Barre, and K. M. Smith, superintendent of the Alden Coal Company, of Alden.

All these persons have had long and extensive experience with coal mines. They went over the ground where the disaster occurred, examined the maps, and had the matter fully explained and discussed. Several plans which had been suggested were deliberated upon and carefully considered, but finally it was agreed that nothing could be done better than to clear the main gangway, as the company was already doing as rapidly as possible.

On January 2, 1886, Mr. Stearns addressed a letter to each of the above persons, again asking their opinions concerning the disaster and the work in progress searching for the bodies. A copy of his letter, and of the answers received in reply, is hereby appended:

WILKES-BARRE, PA., *January 4, 1886.*

DEAR SIR: Inasmuch as you have made a careful investigation of the premises and workings of the mines where the late disaster at Nanticoke occurred, we desire, in view of your long experience in mining, to submit to you the following questions:

First. Were the mining operations conducted in the vicinity of the cave with a due regard to the safety of the mine and the men employed therein?

Second. Whether, from your knowledge of the location of the cave, the size of the pillars left in for the support of the roof, the thickness of the overlying strata, taken in connection with the rock exposures on the surface, it would have been possible for the most vigilant to have foreseen any danger at the point where the cave occurred?

Third. Has the Susquehanna Coal Company in your opinion, through its officials, used all possible diligence to rescue the imprisoned men, and did they direct their efforts at the proper points and to the best advantage for that purpose?

Fourth. After the second filling-up of the channel opened by the rescuing party, with quicksand and *debris*, and the circumstances attending the same, would the company, in your opinion, have been justified in continuing the search at that point, in view of the imminent risk of the lives of the men prosecuting the work?

Fifth. Whether, in your opinion, the plan which the company is pursuing is the most judicious and speedy one for recovering the bodies of the men?

Sixth. Whether, in your opinion, the bodies of all the men can be recovered without great risk to the lives of the men engaged in the search?

Yours respectfully,

IRVING A. STEARNS,
Manager.

THE PENNSYLVANIA COAL COMPANY,
PITTSBURGH, PA., *January 4, 1886.*

IRVING A. STEARNS, *Esq.,*

Manager Susquehanna Coal Company, Wilkes-Barre, Pa.:

DEAR SIR: Having been called upon to meet yourself, Messrs. Morgan, Reese, and others, at Nanticoke, for the purpose of consulting in relation to matters connected with the late accident at one of your mines at that place, after showing us the map of mines, etc., and taking us over the ground to the cave and explaining the position of matters inside and out, at, and near that point, and detailing the various efforts made

by the officers and men to rescue the unfortunate persons inclosed therein, even at the great risk of their own lives.

Being asked to give my opinions in relation to the same by letter, I now take great pleasure in doing so, as I believe that every effort has been made that officers and men could make to reach the point most likely to contain some of the persons inclosed therein, and as it proved, they did so at the great risk of their own lives when driven out by the second cave, which came so near catching some of the men. The following are my decided opinions in regard to the questions propounded :

First. From the explanations of officers, taken in connection with map of the workings of the ill-fated mine, I would say, that the mining has been conducted in a proper manner, and with a view to the safety of the men and the property of the company.

Second. From the location of the cave, being on a hill, and the rock exposed upon the surface not far distant, with no creek or marsh near by, and from actual levelings, showing the depth of the natural strata or material overlying the vein to be two hundred and sixty-two feet, no person could foresee or anticipate danger from such a source; it is very evident that but little rock covered the vein at that point, or such an accident could not have occurred in a vein so small.

Third. From everything I could learn, it is my opinion that the Susquehanna Coal Company, through its capable and worthy officials, have used all proper diligence to rescue the imprisoned or entombed men, and have directed their efforts at the nearest and proper points, and to the best advantage, until driven out by the second cave or rush of quick-sand.

Fourth. After the second cave or filling in of the channel opened by the rescuing party with quick-sand and water, whereby the men were driven out at the imminent peril of their lives, I would not consider the company justified in prosecuting the search further at that point.

Fifth. The plan which the company is now pursuing in opening up the main passage is the most judicious, safe, and speedy way for recovering the bodies of the entombed men.

Sixth. I think it is very doubtful whether you can ever recover the bodies of all; if any are near the cave it will be impossible to find them, as you cannot work very near it without imperiling the lives of those engaged in the search.

After passing the point where the gangway turns around the basin, the work will become very hazardous on account of the steep pitching of the vein southwards, where some of the men are expected to be found. If the water has ceased to flow freely from the cave, and the break has choked or puddled up, then I would consider the risk too great to prosecute the search farther west, and would not advise the cleaning of the gangway farther until all entrances or openings west and south are properly secured, so that no sand or water could rush in upon them from those points.

Yours respectfully,

(Signed)

ANDREW BRYDEN,
Mine Superintendent.

THE PENNSYLVANIA COAL COMPANY,
PITTSBURGH, PA., *January 4, 1886.*

MR. IRVING A. STEARNS,

Manager Susquehanna Coal Company:

DEAR SIR: Having made a careful examination of the plans and elevations of the workings in the Ross seam of No. 1 slope, and have gone over the surface about the cave and examined the rock exposures on the surface, I submit the following as my opinion :

From the plan of your workings, I would give it as my opinion that the mining operations were conducted with a due regard to the safety of the mine and the men employed; that the size of the pillars was ample, had the thickness of the overlying strata been such as the rock exposures on the surface would naturally have led any party to believe, and I would have no hesitation in saying that the most vigilant

might have been deceived and never have foreseen any danger at the point where the cave occurred; I believe the Susquehanna Coal Company, through its officials, has used all possible diligence in trying to rescue the imprisoned men, and I believe their efforts were directed at the proper points and to the best advantage possible.

After the second filling-up of the channel made by the rescuing party and the circumstances attending the same, in my opinion, the company would not have been justified in continuing the search from this point, on account of the imminent risk of the lives of those prosecuting the work.

The plan now being pursued by the company I believe to be the most judicious and speedy one for the recovery of the bodies, and, I think, until the basin or synclinal is reached will be a comparatively safe one. After that point is reached, the closing back of this class of material and the working up a pitch of forty-five degrees in said material, with the possibility of a rush of the same at any moment, I consider will be a very difficult and dangerous undertaking, and I cannot say otherwise than, in my opinion, there would be great risk to the lives of the men thus employed.

Yours respectfully,

(Signed)

JOHN B. LAW,
Asst. Supt. of Mines, Penna. Coal Company, Pittston, Pa.

ALDEN COAL COMPANY,
ALDEN, PA., *January 4, 1886.*

MR. IRVING A. STEARNS

Manager Susquehanna Coal Company, &c.:

DEAR SIR: Your communication, with maps, in relation to the late misfortune in the Nanticoke mines carefully noted.

In reply, state we most positively affirm paragraphs one and five. In regard to the second, unhesitatingly say it was not possible to foresee the disaster.

Our answer to the third and fourth is, we believe ALL has been done that was possible, but in view of the additional knowledge gained since as to the proper location of the cave, the effort at this point should not have been made.

Sixth. At present, we are of the opinion that all the bodies cannot be recovered without too great a risk. However, this is a question of the future and can only be determined as your present work advances.

Yours respectfully,

(Signed)

K. M. SMITH,
Superintendent.

LEHIGH AND WILKES-BARRE COAL COMPANY,
WILKES-BARRE, PA., *January 5, 1886.*

IRVING A. STEARNS, Esq.,

Manager Coal Properties Pennsylvania Railroad Company:

DEAR SIR: Acknowledging receipt of yours of second inst., we would state that we were of the number who, at your invitation, met at Nanticoke on December 24 last, for the purpose of discussing the recent disaster in the Ross vein of slope No. 1, Susquehanna Coal Company, and the best method to be adopted for the recovery of the bodies therein entombed.

After a full and free expression of opinion on the part of all present, with a map of the workings before us, and afterwards a personal visit to a portion of the workings, we beg leave to present the following as our opinion:

First. That the mining operations on this level of the Ross vein, and particularly in the vicinity of the "cave," were so conducted as to provide a sufficient margin of safety for both the workmen and the mine, under circumstances and conditions such as we would ordinarily expect to meet.

Second. From the thickness of the overlying strata and the rock exposures on the surface, we consider that the pillars left in for the support of the roof were amply sufficient for that purpose: that the accident was not caused by weak pillars or insufficient

propping, later surveys having shown that the "cave" occurred at a point in the mine toward which the chambers were only approaching, and where nothing but the gangway had yet been opened; that this was an extraordinary case, the existence of which there was no reason to suspect, and the conditions were such that, even with the utmost vigilance and care, the danger which existed at this point could not have been foreseen or averted. We hold the opinion, from the evidences and facts in the case, that at some time in the past there was here formed what is known as a "pot-hole," reaching to, or possibly through and beyond, the vein in question; that this hole became filled with sand and sufficient water to keep it in a fluid state; that because of this fluid condition, it exerted pressure in all directions; that the upper gangway on the north side of the anticlinal approached so near to the edge of this hole that the resistance offered by the intervening coal was no longer able to withstand the pressure exerted against it by the water and sand, and that the barrier suddenly gave way, liberating, almost instantly, a volume of sand so large that, at the distance of half a mile from the source of the accident, a tunnel four hundred feet in length was so completely filled with it that the hand of man could not have done it so effectually.

Third. Acting upon the knowledge then at hand, and the conclusions arrived at from the apparent location of the "cave" as indicated from appearances inside, the efforts put forth by the officials of your company for the rescue of the imprisoned men, immediately after the accident were directed to the best advantage for that purpose, and the work was prosecuted with all diligence. Later developments lead us to think that the work if prosecuted at any other point, could not have been any more successful, and must have met with the same result.

Fourth. After the second rush of sand and *debris* filling the opening which had been made, and forcing its way up the incline some twenty feet farther than the line first reached, and from which the relief operations were commenced, and the miraculous escape of the entire rescuing party from the same fate that befell their imprisoned brethren, we think it would have been suicidal to have further continued the search at that point: it could not have been done except at the imminent risk of loss of life on the part of those engaged in the search, and the company would not have been justified in incurring this risk.

Fifth. We think that the plan now being pursued by the company for the recovery of bodies, viz: The clearing of the main gangway, and the making of safety-holes up through and to the surface of the sand-filling, as a way of retreat in case of another rush, is the safest, surest, and most speedy for the attainment of the desired end.

Sixth. It would be impossible to say where the bodies would be found, but we are of the opinion that the inflow of sand was so sudden as to give the men no time to escape, and the greatest number of them, if found at all, will be found in or near their working-places.

The work of recovery can, probably, be prosecuted with safety as far as the synclinal axis, or a foot of the gangway running up the basin, but we consider it extremely doubtful if any bodies beyond that point, and especially above the level of the main gangway, can be recovered.

Unless the work now being prosecuted should develop some new features which would throw more light on the subject, and change the conditions as we now see them, it could not be done except at great risk to the rescuing party, and the probability that the lives of some, if not all of them, would be sacrificed in the attempt.

We have the honor to be,

Yours very respectfully,

(Signed)

THOMAS H. PHILLIPS,

Division Superintendent L. & W. B. Coal Co.

(Signed)

WILLIAM T. SMITH,

Inside Superintendent L. & W. B. Coal Co.

LACKAWANNA IRON AND COAL COMPANY,
SCRANTON, PA., *January 8, 1886.*

I. A. STEARNS,

General Manager Susquehanna Coal Company:

DEAR SIR: In view of my having been on the ground and examined carefully the map of your Ross vein you ask that I give my opinion relative to the late disaster at Nanticoke. As to the mining in vicinity of cave, also as to the course pursued in your endeavor to rescue the entombed men, would say:

First. I consider the mining operations in vicinity of cave have been done with evident care for the safety of the mine and employé.

Second. Taking into consideration the thickness of vein, the size of the pillars left for support, the fact that you have never found, (if my memory serves me rightly,) more than ninety-six feet of surface at any point in that locality, knowing, as you did, that you had about two hundred and seventy feet from top of vein to top of surface, and that the rock is exposed upon the surface at several points in the vicinity of the cave, and it would have been, in my opinion, impossible for any person, no matter how great his experience, to have foreseen any danger.

Third. I consider, from what I have been able to learn, that the officials of the company have done all in their power to rescue the imprisoned men. It is evident to me that if it were possible to rescue the men in time to save their lives the *quickest*, and perhaps the *only* possible course, though very risky for the rescuing party, was pursued.

Fourth. After the filling up of the channel where the rescuing party were engaged, with quick-sand and other *debris*, it would, in my judgment, have been unwise, if not folly, on the part of the company, to have asked their men to again take the great risk they had just taken, for, from the moment the second filling occurred, there was no hope of finding the men alive.

Fifth. The plan which the company is pursuing is I believe, the most judicious, as the bodies may be found in the sand at different points along the gangway.

Sixth. I don't think, taking into consideration the pitch of the vein from all directions towards the gangway in which the rescuing party would necessarily be engaged, together with the possibility of finding the quick-sand, etc., in almost a liquid state, that all the bodies can be recovered without running considerable risk of losing more lives.

Very respectfully yours,

R. G. BROOKS,
Superintendent.

DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY,
OFFICE OF THE COAL DEPARTMENT,
SCRANTON, PA., *January 18, 1886.*

IRVING A. STEARNS, *Esq.:*

DEAR SIR: We beg leave to answer your questions as follows:

First. Were the mining operations conducted in the vicinity of the cave with a due regard to the safety of the mine and the men employed therein?

A. In our judgment, they were.

Second. Whether, from your knowledge of the location of the cave, the size of the pillars left in for the support of the roof, the thickness of the overlying strata, taken in connection with the rock exposures on the surface, it would have been possible for the most vigilant to have foreseen any danger at the point where the cave occurred?

A. No. We would believe it entirely safe.

Third. Has the Susquehanna Coal Company, in your opinion, through its officials, used all possible diligence to rescue the imprisoned men, and did they direct their efforts at the proper points, and to the best advantage for the purpose?

A. Yes.

Fourth. After the second filling-up of the channel, opened by the rescuing party, with quick-sand and *debris*, and the circumstances attending the same, would the company, in your opinion, have been justified in continuing the search at that point, in view of the imminent risk of the lives of the men prosecuting the work?

A. No.

Fifth. Whether, in your opinion, the plan which the company is pursuing is the most judicious and speedy one for recovering the bodies of the men?

A. Yes.

Sixth. Whether, in your opinion, the bodies of all the men can be recovered without great risk to the lives of the men engaged in the search?

A. We doubt it very much, if all the bodies can be recovered. The removal of sand and dirt, in which some of the bodies are probably buried, and through which you must pass to reach the chambers where the men were working, cannot be made without great risk and danger to those employed in doing it.

(Signed)

B. HUGHES,

General Mine Foreman D., L. and W. R. R. Co.

T. D. DAVIES,

Assistant General Mine Foreman D., L. and W. R. R. Co.

The gangway was being cleared as rapidly as possible. Four men were employed on each shift of eight hours, beside the drivers, and the work was continued incessantly, day and night, Sundays included.

For the purpose of securing proper ventilation, and a convenient escape-way in case the sand would move again the cross-cuts were opened occasionally on the upper side, and a passage opened up to the breasts above the sand-line. A passage of this description was made at every second or third cross-cut all the way to the ninth beyond the branch of the third counter.

Lest the lower workings would be imperiled, four strong doors, hinged to a strong frame at the top, were erected at various points on the gangway, (the locations are indicated on the map.) and a man was employed to watch and be ready to close them in case the sand would make another move. Lanterns were also placed at the corners of each open cross-cut to show the entrances and also along the passage, so that if the workmen should lose their lights they could see where to escape. Thus every precaution was taken to insure safety for the workmen who were clearing the gangway.

The Relief Bore-Hole.

Some of the relatives of the entombed persons could not be persuaded to believe that all the imprisoned persons were dead, and, on or about January 17, a number of them, accompanied by the Honorable W. H. Hines called on Mr. George T. Morgan and Mr. A. Rees, both superintendents of the Nanticoke mines, and complained that the company was not doing everything that could be done for the relief of their entombed relatives, &c. The result of this was that a committee of three men from Wilkes-Barre, who had in past time been practical miners was selected by relatives of the imprisoned men to examine the situation and make suggestions to the company, if they saw fit.

This committee visited Nanticoke January 20 1886, and examined the mine and its surroundings, in company with some of the officials, who explained everything relative to the accident, and showed them the records and maps necessary to obtain full knowledge of the situation. After deliberating upon the matter, they sent the following communication to the superintendent as the result of their labor:

WILKES-BARRE, PA., *January 20, 1886.*

GEORGE T. MORGAN, Esq.,

Superintendent Susquehanna Coal Company:

MY DEAR SIR: Our hurry to catch the train this afternoon prevented us from having a more extended conversation with you in regard to the business which brought us to Nanticoke, so we communicate to you in writing what we consider the most expedient

plan for your company to adopt for the relief of the imprisoned men and the satisfaction of their relatives. We would suggest that a hole be bored from the surface to the point we indicated on your map. By this means relief can be afforded the men if alive.

This suggestion, if adopted by the company, should be carried out at once. Our reasons for adding "all haste" is because at present every moment is precious. We also wish to extend our thanks to yourself and Messrs. Rees and Corgan for the courtesies extended and the kindness and attentions shown us in our investigations.

Truly yours,

(Signed)

MICHAEL MEEHAN,
M. McNERTY,
JOHN E. EVANS.

Committee Selected by Relatives of Imprisoned Men.

Though it was evident that a bore-hole could not be of any practicable service as a measure of relief, the company concluded to have it sunk as speedily as possible, and in two days thereafter a party was engaged to sink it. It was located at the base of the culm-bank on the wagon-road, about one hundred feet east of the separator trestle, and right over the back-branch road leading from the fifth counter in the mine. The location was good, for it was near to the places where a number of the entombed persons had been working. The hole was completed at five o'clock, P. M., February 23, 1886, and the following is a record of the section passed through:

1. Soil, sand etc.,	218'
2. Sandstone and slate,	53' 10"
3. Open space,	2' to 3'
4. Loose material,	2' to 3'

Its diameter is six inches, and it was cased by an eight-inch iron pipe to the bottom of the sand. At a depth of one hundred and forty feet from the surface, water was encountered in the casing, but when the hole broke through into the mine, the water sank, and could be heard rushing down continuously. George T. Morgan was present when it broke through, and was watching if any air escaped, thinking that if there was air compressed in the mine it could be detected escaping, but no perceptible quantity was seen. The pump was lowered several times, but it brought only black dust up, and after keeping the hole open for about half an hour, Mr. Morgan directed the workmen to have it plugged down at its entrance into the rock, so as to stop the water running into the mine.

A stream of water running into the mine at this point increased the peril of the workmen who were clearing the gangway below; consequently, as it could not be of any service by leaving it open, it was better to stop the water by plugging it, as done.

The Excavation of the Gangway Suspended.

By the middle of February, the gangway was excavated to a point within about two hundred and seventy-five feet of the curve at the trough of the synclinal. Though only a small stream of water was running, the sand, which was packed full, sank before them as they advanced to a distance of ten or twelve feet, showing that only a small quantity of water was sufficient to make it flow. They had reached a point, too, beyond which it would not be safe to open the cross-cuts and make escape passages up into the breasts. This, of course, added much to the difficulties of providing ventilation, which was found to be indispensable. The probability of the sand being in a liquid state farther in, and the whole mass extending down the steep-pitching breasts from the fifth counter, and beyond that from the source of the first rush pressing upon it, caused the officials to apprehend great danger, lest the point of equilibrium would be passed, and the sand rush upon the men again. The lesson of the second rush at the first rescuing passage was fresh upon their memories, enjoining caution, which caused them to hesitate to risk the lives of the workmen in a similar manner the second time.

To them the question was momentous and perplexing: on one hand, the relatives, friends, and the public expected them to recover the bodies of the entombed men and

restore them for proper burial: on the other, before they could be recovered the lives of a large number of persons working in the lower workings, as well as those who were employed clearing the gangway, would have to be jeopardized and placed in great peril, and that with nearly a hopeless prospect of succeeding in reaching the point where the bodies were supposed to be. Feeling the great responsibility resting upon them, and being undecided as to the proper course to take, the superintendent, Mr. George T. Morgan, addressed the following communication to the inspector of the district:

SUSQUEHANNA COAL COMPANY,
SUPERINTENDENT'S OFFICE.
NANTICOKE, PA., *February 15, 1886.*

G. M. WILLIAMS, *Esq.*

Inspector of Mines:

DEAR SIR: By the end of this week, I am of the opinion that we shall be along the gangway in slope No. 1, to a point in which I am also of the opinion that it will be dangerous, and every foot that we proceed further, the danger will be getting greater and too risky for life for men to work in. Therefore, on Friday or Saturday next, I shall notify the men employed therein that the company are fully satisfied to pay them their wages for said work, but will not be responsible for any accident that may occur to them, and if the men feel that it is safe and prefer to work, that they will have to do so at their own risk. I am desirous that you be present in person, or appoint some one to be present representing your office, when I notify the men of the same.

Yours respectfully,

GEORGE T. MORGAN,
Superintendent Susquehanna Coal Company.

In reply to this, the following communication was sent by the mine inspector:

DEPARTMENT OF INSPECTOR OF COAL MINES,
WILKES-BARRE, PA., *February 17, 1886.*

GEORGE T. MORGAN, *Esq.*,

Superintendent Susquehanna Coal Company:

DEAR SIR: In reply to your communication of the 15th instant, I wish to state that, so far, your work at the No. 1 slope towards rescuing the bodies of the missing men has been all that, in my opinion, could be done. As to the danger of proceeding further with the work of clearing the gangway, you and your assistants have better opportunities to know than I have. And, as you seem to be positive that the danger is great, it is not only wise and proper but a duty, to inform the workmen of it, and explain to them from what the danger is apprehended; so, if they choose to keep on working, they do so with a full knowledge of what you suppose they will have to contend with. The nature of the work is such that, in my judgment, the mine inspector should not interfere further than to see that every precaution is taken to insure the safety of the men at work. This has been done, and you have most readily complied with his suggestions to that effect. As you desire it, I will be present when the workmen are being informed of the situation, if you will inform me when that will take place.

Yours respectfully,

G. M. WILLIAMS,
Inspector of Mines.

At eleven o'clock, A. M., February 20, the workmen were called together at the head of the slope, and the whole situation was explained to them by Mr. Morgan and Mr. Rees; the general manager, Mr. Stearns, and the mine inspector were also present. However, the men concluded to continue at work. Then, upon learning this, the workmen employed in the lower tunnel became uneasy and apprehensive of the danger, lest the flood would start and rush upon them, and on the 27th of February, they became so distressed with the thought of their perilous situation that they left the mine, and refused to go to work. On the same day, the company concluded to barricade the sand in the gangway and abandon the search for the bodies.

A Committee Appointed by the Employees of the Susquehanna Coal Company and their Transactions.

At a meeting of the employ  s of the company, held during the fore part of March, a committee was appointed to call on the officers of the company to inquire if anything further could be done towards recovering the bodies of the entombed workmen. The matter was discussed in several meetings of the employ  s, and much dissatisfaction seemed to exist, because the efforts were abandoned. This committee called on the officers, stated their grievances, and elicited the following reply:

WILKES-BARRE, PA., *March 9, 1886.*

To the Committee of Miners appointed by the Employ  s of the Susquehanna Coal Company:

GENTLEMEN: Before giving a final answer to your request, we would respectfully suggest that a committee of eight or ten of the oldest and most experienced miners in the employ of the company, be appointed by the employ  s of the company, to confer with the officials for the purpose of discussing the question of the safety and practicability of continuing the work of rescuing the bodies of the men and boys buried in No. 1 slope.

Yours respectfully,

(Signed)

IRVING A. STEARNS,
Manager.

At another meeting of the employ  s, held at Broadway Hall, Nanticoke, March 10, a committee of the character described in the preceding communication was appointed, consisting of the following named persons:

Job Thomas and Rees T. Lewis of No. 1 shaft.
George Orbits and William Griffiths of No. 2 shaft.
Peter Conroy and John Griffiths, of No. 1 slope.
Daniel W. Rees and Eli Hughes, of No. 2 slope.
William Jenkins and John C. Hopkins, of No. 3 slope.
Enoch Francis and James Williams, of No. 4 slope.
Thomas B. Bevan and Evan L. Davies.

This committee met at once and organized, appointing Job Thomas chairman, and Daniel Rees secretary, and on the following day, March 11, they examined the mine, the surface surroundings, the depth of the water in the relief bore-hole, the maps of the mine and records of various bore-holes. The whole situation was explained to them by the officers of the company, and also by the mine inspector, who accompanied them into the mine.

Upon completing their deliberations on the 12th of March, the following communication was prepared, signed, and presented to the officers of the company as their final conclusions:

NANTICOKE, PA., *March 12, 1886.*

At a final meeting held by the committee appointed by the employ  s of the Susquehanna Coal Company to inquire carefully into the conditions of the workings in No. 1 slope, and the advisability of getting the bodies of the entombed men therein, and the safety of the men employed at the said work;

Resolved, That in our opinion we consider the plan of clearing the gangway impracticable and unsafe.

Resolved, secondly, That we, as a committee, deem it our duty, in justice to all, to offer the following plan to the company as the only hope of reaching the bodies of the entombed men—namely: To drive a tunnel across the basin, starting about one hundred and twenty-five (125) feet west of station No. 67, the course of said tunnel to be about due south; and that after the tunnel has been driven one hundred (100) feet to keep a bore-hole twenty (20) feet ahead of the face of the said tunnel. And we further state, in case we find it blocked with sand, same as in present gangway, we then consider that plan impracticable and unsafe. And we further state that, in case this

plan fails, there is no other means of obtaining the bodies of the entombed men in our judgment as a committee.

(Signed)

JOB THOMAS *Chairman*,
 THOMAS B. BEVAN,
 GEORGE HOBERTS,
 PETER CONROY,
 ELI HUGHES,
 ENOCH FRANCIS,
 WM. D. JENKINS,
 REES T. LEWIS.
 EVAN L. DAVIES
 WILLIAM T. GRIFFITHS,
 JOHN E. GRIFFITHS,
 DANIEL W. REESE, *Secretary*,
 JAMES WILLIAMS,
 J. C. HOPKINS

Mr. George T. Morgan, on behalf of the company replied promptly as follows:

NANTICOKE, PA., *March 13, 1886.*

To the Committee appointed by the Employees of the Susquehanna Coal Company:

GENTLEMEN: Referring to that portion of your report of the 21st inst., wherein you state that "we deem it our duty, in justice to all, to offer the following plan as the only hope of reaching the bodies of the entombed men, namely: To drive a tunnel across the basin starting about one hundred and twenty-five feet west of station No. 67, the course of said tunnel to be about due south. And that after the tunnel has been driven one hundred feet, to keep a bore-hole twenty feet ahead of the face of the said tunnel. And we further state that, in case we find it blocked with sand the same as the present gangway, we then consider it impracticable," the company desired to state that, although this plan had already been carefully considered by the company and deemed by its experts impracticable, it is nevertheless willing, (if such be the request and desire of the employés of the company, to be expressed at their general meeting to be held to-night,) to waive its former judgment. Noting, therefore, your further report that "in case this plan fail, there are no means of obtaining the bodies of the entombed men," and relying upon it, the company will at once proceed to drive the tunnel by you suggested, as a final effort, if it be the desire and request of the employés of the company as above stated.

Yours truly,

(Signed)

GEORGE T. MORGAN,
Superintendent.

On the evening of March 13, a meeting of the employés was called to consider the report of the committee, and also the reply of the company, and after listening to the reports and explanations of the committee, the following resolutions were passed, and a copy, signed by the chairman, was directed to be sent to the officers of the company, as follows:

BROADWAY HALL,
 NANTICOKE, PA., *March 13, 1886.*

A meeting of the employés of the Susquehanna Coal Company, held in the above-named hall, to hear the report of the committee appointed by the said employés of the company to confer with the officials in regard to the continuing of the search for the entombed miners in slope No. 1.

Resolved, That this meeting approve of the plans suggested by the committee to the company, namely: to drive a tunnel across the basin. [See agreement already submitted to the company.]

Resolved, That this meeting accept the answer of the company to the above plan and agreement referred to, to wit: Considering this the final effort in trying to recover the bodies of those entombed men in slope No. 1.

(Signed)

JOB THOMAS,
Authorized Chairman of the Meeting.

On March 17, the tunnel agreed upon in the preceding communications was started, and by April 15, it was driven a distance of ninety-three feet, and, at this point, two holes were bored in advance a distance of seventy-one feet, at which distance, the sand in the gangway beyond the curve was penetrated. A quantity of water, sand, and pebbles came out through the upper hole; the lower one had broken into the gangway against a sill, so the workmen thought, and, for that reason, nothing but water could come out. At this time, the work was abandoned again, and it has remained idle ever since. Some of the committee were present when the holes broke through and saw the result; however, they met again to consider the matter, and sent two reports to the officers of the company, one signed by nine of the members, and the other by five, which were as follows:

NANTICOKE, May 15, 1886.

To the Officers of the Susquehanna Coal Company:

SIRS AND GENTLEMEN: At a meeting of the committee, held on the above date, the following was resolved, viz:

That we, as a committee, consider that the only thing to be done is to drive the tunnel through and complete the same.

We submit this to you as a majority report of the committee. The names of persons who voted on the above resolution are as follow:

(Signed)

JOB THOMAS,
REES T. LEWIS,
PETER CONROY,
GEORGE OBERTS,
THOMAS B. BEVAN,
EVAN L. DAVIES,
WILLIAM T. GRIFFITHS,
ENOCH FRANCIS,
J. C. HOPKINS.

NANTICOKE, May 15, 1886.

To the Officers of the Susquehanna Coal Company.

SIRS AND GENTLEMEN: At a meeting of the committee, held on the above date, the following was resolved, viz:

That we, as a committee, are not satisfied with the present test of the tunnel, and would suggest to the company to drill another bore-hole to come out on the south side of the tunnel not less than two feet higher than the last hole drilled. In case we find black, wet sand this shall be final, but if only water, we want it drained, then drive the tunnel through.

We submit this to you as a minority. The names are as follows who voted on the resolution:

(Signed)

DANIEL W. REESE,
JAMES WILLIAMS,
ELI HUGHES,
WILLIAM D. JENKING,
JOHN E. GRIFFITHS.

N. B.—Please answer this, in writing, as soon as convenient.

This finished the transactions of this committee.

CONCLUDING REMARKS.

The Susquehanna Coal Company, after a careful consideration of all the circumstances, were convinced, as I am informed, that both the lives of the workmen and the safety of their property would be jeopardized to an unwarrantable extent by continuing the excavation of the sand or by driving the rock tunnel through into the gangway on the south side of the synclinal; consequently, the efforts to recover the bodies were indefinitely suspended, as before stated, on the 21st day of April, 1886, and nothing has been done to that effect since.

The gangway was cleared a distance of twenty-two hundred and twenty feet from the slope in seventy-one days, an average of thirty-one feet per day. I think this is

sufficient to prove that the work was energetically forced at a rate which could not have been exceeded.

Though the efficiency of a bore-hole had been discussed and considered to be of no practicable service, as it afterward proved, in two days after the friends of the entombed persons requested the company to have it bored, a party was engaged to sink it as quickly as possible, and they began as soon as the machinery could be placed in position.

The plan of driving the rock tunnel, suggested by the committee of practical miners of fourteen, had "been carefully considered by the company, and deemed by its experts impracticable." But, at the request and desire of the committee and employes of the company, they promptly consented to drive it as far as necessary to ascertain by bore-holes whether or not the gangway, beyond the curve, was full of water and sand; and on finding water and gravel coming out of the hole, as predicted, it was abandoned.

In justice to the company and to its officers, I think it my duty to state, that as long as work was continued with a view of rescuing the men or recovering their bodies, it was done energetically and with the greatest possible dispatch consistent with the safety of the workmen.

As to the practicability of recovering the bodies, the question is involved with so many uncertain conditions that it cannot be indubitably determined, only by pushing the excavations forward, regardless of all perils, until it has either proven a success or failure. A failure, in that case, especially if caused by another rush of the sand, would, most probably, result disastrously to the lives of the workmen, and, perhaps, destructive to a portion of the company's valuable property.

The sand, the culm, and the water stand to its former height over the hole where the first break occurred, and the supply of water, if coming from the river, as most likely it does, is evidently inexhaustible. This great column of *debris* is resting on the sand in the mine, ready to rush in the moment the equilibrium is broken. The fifth counter gangway under this column has a falling grade of from eight to ten degrees, and the breasts a fall of from thirty to forty degrees; consequently, the quick-sand in this portion of the mine is even bordering on a liquid state; to drive the tunnel into it, would certainly be attended with disastrous results, because, under these conditions, the quick-sand would, most assuredly, rush in again with as much force as it did at first. On the other hand, if it was possible to determine that the sand was comparatively dry, no one could determine, to any degree of certainty, the point of equilibrium or the point to which the sand might be safely removed.

All the experts who have taken pains to examine the situation hesitate to advise continuance of the search beyond the point already reached, lest to continue it might promote another disaster.

If the efforts should be renewed, no matter how it may be undertaken, extraordinary risk must be taken before the points where the bodies are supposed to be can be reached. Their remote position; the steep pitch of the breasts; the heavy grade of the counter-gangway; the peculiar formation of the strata in that locality; the probability of the quick-sand being saturated to almost a liquid condition; the great height of the column of *debris* resting upon that in the mine, and the depth and supply of water in the gravel and sand above, should all be taken in consideration, because all are unfavorable to a successful ending if the efforts should be continued.

The object of the anthracite mine law of Pennsylvania, as expressed in its title, was to "provide for the health and safety of persons employed in and about the anthracite coal mines of Pennsylvania, and for the protection and preservation of property connected therewith," and evidently, where there are no lives which might be saved, it would be at variance with the spirit of the law to place the lives of workmen in unwarrantable peril. For this reason, the mine inspector has deemed it his duty to refrain from advising continuance of work which might result in the loss of more lives, when there is not the slightest reason to hope that lives might be saved by it. As long as the work was in progress, he visited the mine frequently, and saw that every practicable precaution was taken to insure the safety of the workmen, and the officers of the company complied with his suggestions promptly and willingly.