Reports

Marianna Mine

THE EXPLOSION AT MARIANNA

One of the most disastrous explosions of recent years occurred November 28, about 10.30 in the morning, at the Marianna mine of the Pittsburg-Buffalo Company, located at Marianna, Washington county.

It seems almost incredible that a disaster of this kind could occur at the Marianna, as it was deemed by all persons who had ever seen it to be a model and safe mine. As soon as the report could be verified, the department notified all the inspectors located near Pittsburg to repair at once to the scene of the explosion and give such advice and help as might be necessary to rescue any of the entombed miners who might be living and properly to care for those that had been killed.

Mr. Henry Louttit, the inspector of the district, was at the mine when the disaster occurred. A number of other inspectors arrived at the mine on the afternoon of the same day, but as the casing leading to the fan was destroyed and the top of the outlet shaft and the head frame were badly wrecked, it was several hours before the ventilation could be even partially restored.

I arrived at the mine Monday noon and found that all the employes in the mine had been killed but one. About one hundred of the bodies had been taken from the mine and it was supposed that there were still from thirty to fifty remaining. At that time it was feared that the coal had taken fire and this belief was strengthened by the fact that considerable smoke was encountered while exploring the mine. It was a great relief to the management, the inspectors, and the other persons who knew what the danger from fire meant at that time, to find that there was no fire in the coal or in any of the timbers in the mine. All the entries of the mine that could be explored were examined by the inspectors and a few capable superintendents by Monday noon, and a number of the remaining bodies were located.

Owing to the dangers, both real and imaginary, that are connected with an exploration of this kind, it is hardly necessary to say that it required great courage on the part of these men to enter the mine. They knew that if fire had ignited the coal or even the timber it would be necessary to reach the fire and extinguish it before the ventilation could be restored. In the effort to do this, the Draeger helmets were of the greatest assistance, as without them the explorers could not have remained in the presence of the poisonous afterdamp and lived. In this connection it may be said that every company operating a gaseous mine should have at least a dozen practical young mining men drilled in the use of these helmets, so that at a moment's notice they could be put on and the men thus be enabled to get to work at once after an explosion or a mine fire. A sufficient number of helmets should be placed at a central point or at points convenient where they could be readily taken to the scene of the disaster. While the helmets were not the means of saving any lives at the Marianna, (unless it was the life of the man found near the shaft) nor would they have saved any lives at the Harwick, Naomi

or Darr disasters, it is possible that occasions may arise when they will be instrumental in saving lives. At any rate, they are invaluable for exploring purposes, particularly at the time of mine fires.

The work of restoring the ventilation was pushed as rapidly as possible and the bodies located and removed to the surface. By Wednesday morning all the bodies had been removed to the surface, except those covered by the debris and those in part of the dip workings which were covered with water. In the afternoon of Wednesday, Inspector Louttit, Mr. Walter R. Calverley, superintendent of the Berwind-White Coal Mining Company, Mr. F. B. Dunbar, one of the superintendents of the Monongahela River Consolidated Coal and Coke Company, Mr. A. C. Beeson, superintendent of the Marianna mine, Mr. John H. Jones, president of the Pittsburg-Buffalo Company, and the Chief of the Department of Mines descended the Rachel shaft in a bucket, three persons being taken down at a time The bucket was lowered and hoisted by a small temporary engine that had been installed for that purpose. All the bodies were taken from the mine by the same means. A thorough examination was made of all the entries not flooded with water, but no effort was made to locate the initial point of the explosion or to follow its course. We simply made an examination of the general conditions. Although the ventilation had been but partially restored, only a small amount of gas was found at the faces of any of the entries.

We spent about six hours in exploring the mine and were more than astonished to find so small an amount of gas, which was found only at the face of a few entries that were driven over two hundred feet in advance of the last cut-through. This was proof to my mind that the Marianna mine was not a very gaseous mine and that the cause of the destruction of life and property was nothing else than the dreaded coal dust held in suspension in the air, which was ignited by a small explosion of gas, an electric spark or a blown-out shot.

Heretofore when an accident like the one at the Marianna mine occurred it has been the custom of the coal company to send mining experts into the mine to examine it and make a report for submission to the jury at the inquest. The Department of Mines has also at such times sent a number of inspectors to the mine to investigate the cause of the accident and make a report to the Chief, to be submitted at the inquest.

When arranging with Mr. John H. Jones, President and General Manager, for the dates when the inspectors could enter the Marianna mine to make a final examination, he was asked when his experts were to examine it. He seemed surprised at the question, and said he did not think it necessary to have any experts employed in this case, as he was positive that the State inspectors could find no fault with the way the mine had been conducted and he was willing to abide by their decision. My advice to ask a half dozen or more superintendents to make an inspection in the interest of the company was declined, as he held to the opinion that as the company had always lived up to the letter of the law, having even accepted suggestions from the Department in regard to the operation of the mines, such an inspection was unnecessary.

After a personal inspection of the mine, I decided that it would be advisable to have an investigation made by a commission of expert, intelligent and disinterested engineers, in addition to the inspection by the inspectors, and to that end I requested Mr. George Whyel, Mr. G. E. Gay and Mr. L. W. Fogg, mining engineers, all of Uniontown, to make this investigation. I stated to them that it was very important to ascertain if possible the cause of the disaster, and requested them to make an investigation as soon as possible and to report the result to the Department of Mines. I selected Mr. Whyel as chairman of the commission and suggested that they arrange with the general manager of the mine in regard to the time for making the inspection.

A careful examination was made by the commission and a report forwarded to the Department, December 16. This report is included herewith together with the report made by the mine inspectors.

The inquest on the bodies of the victims of the Marianna explosion was held in the court house at Washington, Washington County, Thursday and Friday, December 17 and 18. At that time twenty-nine witnesses were examined.

Under the law, only an inspector can interrogate the witnesses. Inspector I. G. Roby, of the Fifth Bituminous District, was selected for this purpose, and suggestions were made to him in writing by the Chief of the Department of Mines and by the other inspectors. The coroner was a most intelligent man and conducted the inquest in a masterly manner, and his summing up of the case to the jury entirely from memory was remarkably well done.

The jury was composed of most capable men, who gave close attention to the evidence submitted and rendered a verdict according to the evidence.

By reason of having a coroner who understood the situation thoroughly all proper evidence on the case was admitted. The witnesses, or at least many of them, were men of high character and intelligence, and many of them men of prominence. They gave with great care their evidence and recommendations, which were very comprehensive and satisfactory.

Without impropriety I quote herewith some of the testimony.

Walter R. Calverley, Superintendent of the Windber District of the Berwind-White Coal Mining Company, who spent three days in the mine after the explosion, testified in part as follows:

"The plan of the mine was very good. I consider the system of ventilation an advanced system, with an extravagant volume of air; that with the volume of air passing, it was possible to have an explosion. Constant success begets carelessness, even among those who know the consequences that result from tempting Providence, but they still tempt it. I am positive that even though the explosion started from a slight accumulation of gas, it was the dust that caused the enormous pressure. The volume of air in this mine was unquestionably sufficient to dilute and carry off the gas, but the enormous velocity meant that there was an unusual quantity of dust floating in the air. A blown-out shot would have been sufficient to cause the explosion without any accumulation of gas. That tongue of flame coming in contact with the dust floating in the air would be sufficient."

Mr. H. K. Knopf, General Superintendent of the Pittsburg and Westmoreland Coal Company, with sixteen years' experience, testified in part as follows:

"I was at the Marianna mines three different times before the explosion, in a period of eight months, and my last visit was the last of October, or the first of November, twenty-nine days before the accident. The operation of the mine was very practical, and the method in which it was laid out was, in my opinion, unquestionably the best I was ever in. I went through nearly all of the entries and in none of them was any gas visible, and it was the safest mine, and the method of keeping it safe was the best in the region. I think they had six or seven fire bosses and assistant pit bosses, and even if they did not do the blasting themselves, they supervised it constantly. The dust was loaded out as fast as it was made, and the roads were new and clean. I was in the mine three days after the explosion and made special examination as to the cause of the explosion. In my opinion it was unquestionably a dust explosion caused by a blown-out shot in No. 3 Blanche entry. It would be impossible for a gas explosion to occur in that mine from the way the brattices were kept up and the places constantly inspected. They had water lines all through the mine, and before firing a shot they would water the side of the coal and sprinkle it before shooting. The system of watering in this mine was the only one in the Pittsburg district where they had gone into it liberally and tried to be thoroughly effective. It would be almost impossible with the large quantity of air which necessarily has to be put into a modern mine, for any method of sprinkling to take care of all the fine dust."

Richard Maize, Superintendent of the Pittsburg and Westmoreland Coal Company, at Hazel Kirk, with an experience of twenty years, testified in part as follows:

"I visited the Marianna mine about two weeks before the explosion and spent a day in the mine, and visited the face of every entry. Some of the entries were dry and some were wet. There was no accumulation of dust anywhere. I found no gas in any entry except in one of the Blanche entries, where there was a small cap found. I made no special effort to find gas in other places, as they were all worked with naked lights. I thought the Marianna mine was one of the finest mines I was ever in, and as safe as any mine I had ever been in, and the system they had for taking care of the mine and employes therein was the best I had ever seen. I have spent the greater part of three days in this mine since the explosion. I came to the conclusion that the explosion came out of the Blanche entries, on account of the way the timbers were strewn around. In regard to the system of watering the places, every entry had a water line and fifty feet of hose, and in one of the Blanche entries Mr. Kennedy had the water pressure turned on, the sides and roof were thoroughly wetted, and I was informed that was done before every blast was fired. It is possible to make every mine in this state safe by using the coke-region system and by making every man dig down his coal with a pick. If the air was saturated with spray, and the coal sheared in addition to undercutting, it would reduce the danger of a dust explosion from the fact that it would reduce the danger of a blown-out shot, and in that way would safeguard life."

George Whyel, a practic[redacted]er, mining engineer, superintendent, manager, general manager, [redacted]esent operator; L. E. Fogg a mining engineer of large experience, fourteen years as superintendent and general manager and at present the general manager of Tower Hill Coke Company; and George E. Gay, mining engineer and a graduate of the Lehigh University, with experience since 1884 in coal mines as a mining engineer and superintendent of mines, were selected by the Chief of the Department of Mines to make a careful investigation as to the cause of the explosion in the Marianna mine, and to make in connection therewith any recommendations that would have a tendency to prevent disasters in coal mines from the explosion of gas and dust. Their full report is given elsewhere, but I desire at this point to call attention to a few of their remarks and recommendations:

"We feel that it should be recognized that mines liberating gas and producing dust have to face the danger of ignition from three principal causes—open lights, blown-out shots and electric sparks. To reduce these dangers to a minimum without forcing a condition of sacrificing values of property should be the aim of our future laws. We feel that the danger from open lights can be more easily eliminated than the other two, and we do not believe it is a hardship to enforce the use of improved safety lamps in any or all of the mines that have given off, or are apt to give off, explosive gas. In regard to blasting, it is a recognized necessity that in mining the Pittsburg coal other means than hand-pick mining must be employed, and that the blasting of this, under proper regulations, can be accomplished with a minimum amount of danger. To do this, we feel it is necessary for the employment of competent shot firers who shall have charge of the explosives and be responsible not only for the firing of the shot but for the quantity and quality of the explosives used; that all holes should be tamped with clay; that the shot firers shall use only permissive explosives as furnished by the company; that all shots shall be fired by an electric battery, and that blasting for the complete safety of the miners can be done only between shifts when the men are out of the mines.

We recognize at the present time that one of the dangerous conditions of any mine is the accumulation of dust. To prepare and take care of it is a serious condition, and we cannot but recommend that the same care as used in the Marianna mine for distributing water for saturating the dust, be employed in every mine under like conditions. We also feel that it is not simply a question of the sprinkling of the dust, but that it should be a saturation; that unless the coal dust is saturated the sprinkling does not accomplish the purpose intended. We also feel that in all mines where machines are used for undercutting or mining of coal, the accumulations of fine coal and dust should be loaded and taken out of the mine before shooting. We recognize the present estimated commercial value of the use of electricity in mines, but we can only recommend its use on intake air currents, believing there is sufficient power otherwise obtainable to do the necessary work as economically, and, in eliminating electricity from all gaseous parts of the mine, we remove as great a danger as the open light. That there should be realized by the miner his importance as a factor in not only safeguarding his own life, but those of his fellow-employes in faithfully following the rules and regulations prescribed, and his education should be first

on these lines. That the employer and employe working together for mutual protection under intelligent guidance will reduce the liability to accident by explosion by removing the causes. We realize that following out the lines of our recommendations may mean an increased cost of operating expenses, and hardships might result between competitive fields unless similar laws are passed in all such fields."

J. L. Dixon, a mining engineer and superintendent of mines for about thirty years, said in part:

"I went into the Marianna mine after the explosion and visited about twenty entries, examined them carefully, and noted the condition of the mine. From what I saw of the mine and what I saw of the workings, I am fully convinced it was not a gas explosion, and from what I knew of the condition of the entries and the care taken to keep them free from dust, I came to the conclusion it was not an ordinary dust explosion. I believe the explosion was caused by a large amount of dust being carried in suspension in the currents, and also by gas being given off. I think the primary cause was a blown-out shot. It only takes a small temperature to start a destructive distillation of gas and dust, and I think it was caused by coal dust in suspension mixed with gas. In my opinion, mine explosions are caused by blown-out shots; therefore, the real protection is to have all the men out of the mine when the shots are fired. An additional safety would be the shearing of the coal. It would probably take only about one-quarter as much explosives to produce the same amount of coal as when the coal is not sheared. A shot takes the path of least resistance, and with shearing the least resistance is always along the laminations of the coal."

W. W. Keefer, at present Manager of Mines for the Monongahela River Consolidated Coal and Coke Company, a man of large experience and an expert on all mining matters, testified in part as follows:

"I visited the Marianna mine in October, being one of a party that went in with the foreign experts. I found nothing to criticize, but, on the contrary, the consensus of opinion was that the mine was very well arranged. I regarded the proposed plan of development and the actual development, so far as I observed it, as being excellent. I spent several days in the mine since the explosion, and was one of a party who made an exploration of the mine before any changes were made after the explosion and while all the bodies were still in their original positions, and while the equipment was still standing as left by the force of the explosion, and while there were evidences of counter forces from a series of explosions, as usually occur in cases of this kind, the bulk of the evidence points undeniably to the fact that the explosion originated about the Blanche headings. I think the weight of the evidence points to No. 3 Blanche with its blown-out shot, justifying the theory that that would have originated it. I do not believe the explosion could have been caused by an accumulation of gas; my judgment is that the dust had more to do with it than the gas."

In answer to the question, he said that "electricity is absolutely necessary in a mine such as this. It is folly to attempt to exclude it from the mine. As far as I know, no explosion has ever been traced to electricity."

REPORT OF COMMISSION

Uniontown, Pa., December 18, 1908.

Hon. James E. Roderick, Chief of Department of Mines, Harrisburg, Pa.

Dear Sir: In pursuance with your instructions to us, under date of December 4, 1908, 'To make a thorough inspection of the Marianna mine of the Pittsburg-Buffalo Company, located at Marianna, Washington County, Pa., for the purpose of determining, if possible, the cause of the catastrophe,' we, the undersigned, beg leave to report:

We began our inspection on Thursday, December 10, 1908. We met Mr. John H. Jones, president of the Pittsburg-Buffalo Company, at the mine, and he introduced to us J. E. Kennedy, his mine foreman, who was in full charge of the mine at the time of the accident, with instructions to conduct us through the mine and give us all information possible.

We first visited the main raise entries on the southeast side of the main shaft and traveled each of these entries to the faces, returning to the main dip entries on the northwest side of the main shaft, including the raise face entries and butt entries on the north side of main shaft; then passing from the main shaft along the main entries between the air shaft and main shaft; thence down the supply entries on the northwest side of the air shaft to the entries known as the "Blanche" entries, returning through to the face of the northwest dip entries known as the "Supply" entries into No. 1 right aircourse and into the sump entries; thence through the dip face entries on the right, passing into entries on the southeast end of the airshaft to the faces of 1, 2 and 3 supply entries. This completed our route through the mine, which covered the face of all entries throughout the mine.

Our object was to locate and follow as far as possible the primary force of the explosion but we very soon realized the impossibility of exactly locating in every entry the primary forces in a terrific explosion of this kind. We do feel positive, however, that in one section of the mine there should be no question in locating the direction of this force, which, in the end, brought to our minds the conviction of the location of the first explosion, regardless of the conflicting evidence of the forces in practically every direction.

The conditions we found are as follows:

In the raise entries on the southeast side of the main shaft, the primary forces were not in as good evidence as the reactionary forces; the latter were all in the direction of the main shaft, and it is our opinion that the primary forces were reinforced at the various faces of these entries and came back with increased violence toward the escapement at the main shaft. The evidence at the face of these various entries showed us that the primary forces had charred the face of these entries 20 to 30 feet back, and that the cars and mining machines in these entries had been driven against the face, but the reaction between this point and the main shaft showed greater violence than was shown at the face. We found every indication and evidence that all these entries had been bratticed up close to the face with canvas brattice. On the day of our examination, however, there was only one of these entries, known as No. 5, that showed any indication of giving off gas.

What we did consider remarkable under the conditions was that in the motor barn where no gas was detected, and where brattice had been maintained originally a distance of 280 feet, there was no brattice in evidence on the day of our examination and test for gas.

We also found evidence in a shot hole in the rib of No. 5 entry, where, contrary to written instructions, coal dust had been used for tamping instead of clay, and at a point approximately 50 feet from the face we picked up a paper cartridge filled with slack coal prepared for future use in tamping a shot, and at the mouth of the entry we found a small can of black powder, approximately 5 pounds.

We mention these facts not because they were in any way connected with the primary cause of the explosion, but to call to your attention the utter disregard of the company's rules and regulations, and the recklessness and carelessness of the employes in their daily occupation.

On the raise face entries north of the main shaft, the force was toward the face. The faces of these entries and ribs for some distance back were badly charred, indicating intense heat. On the first butt entry to the right of these entries, we found considerable gas being given off by a blower. The face of this entry and a parallel to it are in a fault composed of clay; this entry was bratticed with canvas very close to the face and a fair quantity of air was circulating. Gas was detected at the face of the first butt entry. The face of this entry and its parallel, from indications on the mine map, are directly under Ten-Mile Creek.

The same conditions apply to the butt entries to the left. No gas was found in either of these entries.

Passing down to the entries on the northwest side of the main shaft, we found little variation in the conditions existing there from those previously examined.

Entries 1, 2 and 3 showed evidence of considerable force, and in entry No. 1 gas was found on a fall near the face.

We found the condition in No. 4 main dip entry different from that of any of the entries found in this side of the mine. While the effects of heat were possibly not any more pronounced than in a few other entries, the line of the force was all in one direction, which was toward the main shaft, and showed evidence of being less violent than any of the other entries.

The sump entries to the right of No. 5 were filled with water and were not examined.

Passing up to the connecting entries between the air shaft and main shaft, we found the evidence of force marked in the direction toward the main shaft, and exhibiting greater power than possibly any other place in the mine. It was the location of this force and its direction that helped in a great measure to determine in our minds the location of the primary explosion. While it had its origin beyond the points that up to this time we had followed, we believe that the evidence is fully as strong to show that a secondary explosion might have occurred in No. 4 main dip entry.

The evidence of force in the empty return dip toward the main shaft is shown by brick walls that were completely torn out and by large portions of the material blown toward the main shaft. The steel beams located in these entries near the air-shaft were also torn off and piled in the direction of the main shaft.

Passing down into the supply dip entries the primary forces all point in one direction, that is, toward the air-shaft. In the faces of Nos. 1 and 2 supply dip entries and also in No. 1 right air-course and parallel the evidence of force and great heat is shown at the face. We, however, detected no gas in any of these four entries.

Passing up No. 3 Blanche entry, we found little evidence of force after passing No. 1 butt entry right and parallel. In the right hand corner of this entry, located about 3½ feet from the floor and 12 inches from the right-hand rib, was a drill hole in the coal 4½ feet deep with about 10 inches of face of hole blown out from the face of the coal. A careful examination was made of this hole and a piece of charred paper and some fine charred coal were taken out. The charred paper and coal were evidence that the hole had been fired, and that there had been at this point a blown-out shot. The probable blown-out shot, the single line of force shown in the upper part of this entry, and the directions that the forces took from this point have determined in our minds that this was the initial point of the explosion in the Marianna mine. The condition of this entry and the coking of the rib along the side of the entry give additional evidence of a blown-out shot. The explosion passing on down to the first cut-through began to distribute itself through the various headings or entries.

We found no evidence of gas in any of the three Blanche entries, nor in the right nor left butt entries leading from them, but the greatest force in all cases was leading out to the supply dip entries.

Continuing our examination into the dip face entries off No. 3 supply dip entry, the primary force was in the direction of the face. In the dip face entry there were indications of gas at the face of the entry. We believe that this gas was liberated from an under-cut. The face of this entry is under Ten-Mile Creek.

Coming up on the southeast side of the air shaft and examining the three supply entries, we found evidence of force in both directions, strongly marked in each case. No evidence of gas was found at the face of either entry. In the middle entry there was evidence in a shot hole along the rib that the tamping at that point had been made with clay. These last entries showed very little evidence of heat.

In studying the layout, both inside and outside of the Marianna mine, we find that the methods of construction outside and the plan of the workings inside are the best, both in material and plan, that could be devised, and evidently no expense has been spared in this respect to bring the property up to its greatest efficiency. The numerous main entries provided will give, without question, ample ventilating facilities for developing and mining a large tract of coal, if continued on the lines already begun.

The evidence produced previous to the explosion, including the necessity for bratticing each entry, brings to our minds the conclusion that Marianna should be classed as a gaseous mine, and it has always been our experience in the virgin field of the Pittsburg coal in shaft mines that more or less gas has always been given off and continually released. Consequently we cannot but recommend the exclusive use of an improved safety lamp in every mine under similar conditions.

We feel that it should be recognized that mines liberating gas and producing dust have to face the danger of ignition from three principal causes: Open lights, blown-out shots and electric sparks. To reduce these dangers to a minimum, without forcing conditions that would sacrifice the value of property, should be the aim of our future laws. We feel that the danger of open lights can be more easily eliminated than the other two, and we do not believe it is a hardship to enforce the use of improved safety lamps in any or all mines that have given off or are apt to give off explosive gas.

It is a recognized necessity that in mining the Pittsburg coal other means than hand-pick mining must be employed. It can be blasted under proper regulations with a minimum amount of danger. To do this we feel that it is necessary that competent shot firers be employed who shall have charge of, and be responsible not only for the firing of the shot, but for the quantity and the quality of the explosive used; that all holes be tamped with clay; that the shot firers use only permissible explosives as furnished by the company; that all shots be fired by an electric battery, and that blasting for the complete safety of the miners be done only between shifts, when the men are out of the mine.

We recognize at the present time that one of the most dangerous conditions of any mine is the accumulation of dust. To prepare and take care of it is a serious problem, and we cannot but recommend that the same care as used in the Marianna mine for distributing water for saturating the dust be employed in every mine under like conditions. We also feel that it is not simply a question of the sprinkling of the dust, but that it should be a saturation; that unless the coal dust is saturated, the sprinkling does not accomplish the purpose. We also feel that in all mines where machines are used for undercutting the coal, the accumulations of fine coal and dust should be loaded and taken out of the mine before shooting.

We recognize the present estimated commercial value of the use of electricity in mines, but we can only recommend its use on intake air currents, believing there is sufficient power otherwise obtainable to do the necessary work as economically; and in eliminating electricity from all gaseous parts of the mine we remove as great a danger as the open light.

The miner should realize his importance as a factor in not only safeguarding his own life, but those of his fellow-employes by faithfully following rules and regulations prescribed, and his education should be first on these lines. That the employer and employe working together for mutual protection under intelligent guidance will reduce liability to accident by explosion by removing the causes.

We realize that to follow out on the lines of our recommendations may mean increased costs of operating expenses, and hardships might result between competitive fields unless similar laws are enforced in all such fields.

George Whyel, Mining Engineer, Chairman,
George E. Gay, Mining Engineer,
L. W. Fogg, Mining Engineer."

REPORT OF MINE INSPECTORS

"Pittsburg, Pa., December 18, 1908.

Hon. James E. Roderick, Chief of Department of Mines, Harrisburg, Pa.

Dear Sir: After the explosion occurred at the mines of the Pittsburg-Buffalo Company, situated at Marianna, Washington County, Pa., at the extreme end of the Ellsworth Branch of the Pennsylvania Railroad, November 28, 1908, at about 11 o'clock A. M., we were requested by you to proceed to the scene of the disaster and render all assistance possible in the recovery of the bodies of the victims. and to keep in close touch with the management of the mines to the end that the rescue work be proceeded with in a safe manner.

When we arrived at the Marianna mine we found the District Mine Inspector and the company officials busy making temporary arrangements to facilitate the recovery of the dead. We found the supply or Agnes shaft partition between the intake and return airways and the cages badly wrecked and out of commission, but fortunately the fan and its casing remained practically intact.

As soon as possible after our arrival at the mine on Saturday evening and Sunday morning, November 28 and 29, we descended the Rachel or main shaft, which is 460 feet deep, in an improvised bucket arrangement, and immediately began the work of rescue, penetrating every part of the mine by 7 o'clock Monday morning, the 30th. The mine was in a badly wrecked condition. The ventilating apparatus, stoppings, et cetera, were nearly all destroyed; timbers were dislodged and in many places the roof had fallen; mine cars, electric wires, and brattice material were in great confusion, and the mine was full of deleterious and explosive gases. A complete and speedy recovery of the bodies was necessarily retarded.

Up to this date 153 bodies have been recovered. As soon as the work of recovering the bodies was completed, we were again requested by you to make a thorough and detailed examination of said mine and to locate the initial point of said explosion and the causes leading thereto, if possible to do so. This investigation began on the morning of the 9th instant, and was continued through the 10th to the 11th, inclusive.

As you are well aware, there are two shafts at this plant, both of which are about 460 feet in depth, sunk to the Pittsburg coal seam, and are about 300 feet apart. The Rachel shaft, which is 20 feet by 30 feet, will eventually, when its equipment is completed, be the main hoisting shaft, and the Agnes shaft, which is of much less area, will be used as a supply shaft and for the lowering and hoisting of the employes.

The ventilation of the mine was produced by a fan 18 feet in diameter and 6 feet wide. Just prior to the explosion the fan was running at 120 revolutions per minute, developing a water gauge of 3.25 inches, and producing 190,000 cubic feet of air per minute at the outlet. It was working on the exhaust principle. The above air measurement was taken about 30 or 40 minutes prior to the ex-

plosion by the District Mine Inspector and the speed of the fan on top of the shaft was taken by him just 15 minutes before the explosion. The mine was ventilated by six separate air splits or divisions, and all stoppings and overcasts in the mines were substantially built of brick or concrete.

The general equipment, as far as it was completed, was of the most modern design and all projected work was laid out on the most modern plans. We found that in the inner workings of the mine the ventilating currents were being conducted near the face of the entries by means of brattice cloth, and in one place we found the distance from the last cross-cut to the face to be 300 feet, thus necessitating the excessive use of such material for this purpose. Explosive gas is being generated in said mine, which is generally being worked with open lights, but it is not what would be considered an extremely dusty mine. We are of the opinion, however, that at the time of the explosion, owing to the character of the coal, much fine dust was held in suspension in the atmosphere of the mine and much adhered to the side walls, due to the great ventilating pressure developed and the strong currents of air in some portions of the mine. The coal seam was being undercut by electric mining machines and the hauling was being done by electric locomotives.

We found in the mine such explosives as carbonite, fulminite, and black powder, which were probably the explosives used by the miners in blasting down the coal. We also found that electric wires had been taken in past the last cut-throughs in many entries. According to present plans the coal property is being developed on the 2, 3, 4, 5, and 6 entry systems. The coal seam, which is about 6 feet in thickness as far as it is developed, lies practically level, with no grades over one per cent.

We also found that a water system, so arranged as to water the face of the entries, had been installed and was being used. The entries, et cetera, of the mine have reached a distance of about 6 miles, all of which were minutely examined by us, and the direction of the forces developed by the explosion was traced and located, and after considering carefully the notes of all the inspectors relative thereto we have arrived at the conclusion that the initial point of the explosion was toward the face of the Blanche entries.

We found a blown-out shot at the face of No. 3 Blanche entry and this in our judgment was in all probability the initial point of the explosion, and the blown-out shot was the cause, yet there was some strong evidence in the other Blanche entries that might lead some experienced mining men to the opinion that the explosion occurred there from gas and an open light. Tremendous forces were developed from a mixture of gas, dust and atmospheric air. We are also of the opinion that in the main dip entries a secondary explosion occurred almost simultaneously with the original explosion that took place in the Blanche entries.

In order to secure greater safety for persons employed in mines where explosive gas is being generated, we again desire to emphasize some of the recommendations made in the past in similar cases. We urge the employment of experienced shot-firers; that the use of black powder or other high flaming explosive in such mines be excluded; that the excessive use of brattice cloth be prohibited; that all charges of explosives be stemmed with clay; that safety lamps be

used exclusively in gaseous [redacted]; that an efficient water system be installed to wet thoroughly the dust in all parts of the mines, and that the coal be sheared in addition to being undercut so as to reduce the excessive use of explosives.

All of which is respectfully submitted.

District 1, Henry Louttit
District 2, C. B. Ross
District 5, I. G. Roby
District 8, Joseph Knapper
District 9, Thomas D. Williams
District 13, John F. Bell
District 14, F. W. Cunningham
District 16, David Young
District 17, Charles P. McGregor
District 19, W. J. Neilson."

The description showing the detailed course of the force of the explosion is omitted from the inspectors' report as it has been covered completely by the Commission of Expert Engineers.

CORONER'S CHARGE

"Gentlemen of the Jury:

You are impanelled by me on November 29th for the purpose of investigating the cause of the death of the miners who perished in the Marianna mine. You have viewed the bodies and it is your duty to find out what caused their death; finding the cause, then to find whether it was the fault of any individual, whether it is the fault of the company that operates the plant, or whether it was an accident due to the neglect or fault of no one.

Some of the evidence would go above your head and mine in some of the technical points. That probably does not have any bearing upon the direct cause and results of the disaster, but it has a bearing insofar as concerns legislation which may hereafter be made in the State of Pennsylvania in behalf of the miners. I realize we have no way of bringing back to life the poor men who were killed, but we have this idea in view when we go into an inquest of this kind, that thousands of other men must go into mines throughout the country and risk their lives, and it is for the protection of those to come that we desire to have such open and exhaustive testimony.

We find that the company planned to make a mine that would be the model mine of the country. The president of the company tells us, and shows us by his books, letters and conversations with his subordinates at the mine, that he was looking after the safety of the men in the mine, and did not desire at any time to produce a ton of coal stained with the blood of any one. In October a number of people visited this mine at his solicitation, along with some officers of foreign countries. At that time they found the mine, so far as they went into it, to be a model. Not an inspector nor a man we had here

offered any suggestions as to anything that could be done relative to the safety and the working of the mine, other than had been done already.

Then, we have the testimony of the superintendent, mine foreman, assistant mine foreman and fire boss. They tell us that their instructions were always first for the safety of the men. We had some of the miners who were working in this mine. Two of them tell us that they had lit gas off the feeders at the faces, which is a common thing for the miner to do, according to other testimony, and it was not an explosive quantity. Every one of the officials of the mine has testified that no suggestions were ever offered and turned down by the Joneses for the purpose of reducing expenses at the mine. This mine was officered and policed by certificated men to such an extent that two or three inspections were made each day. The law requires an inspection before the men go to work. We find no violation of the mining laws in the operation of this mine insofar as the testimony shows.

We then have the testimony of the experts, all of whom have been in the mining business for from 14 to 41 years. They tell us this mine was a model and that it was well taken care of, and a great many operators and experts say it was one of the best they were ever in. The inspectors and experts have gone over the ground.

Mr. Beeson first said he came to the conclusion it was a blown-out shot in No. 3 Blanche. We come down to Mr. Calverley, and he says that on his first inspection he found what he believed to be a blown-out shot in No. 3 Blanche. No. 1 and No. 2 were being worked with safety lamps, but No. 3 was not. From the testimony of Mr. Beeson, Mr. Calverley, the experts, and the mine inspectors of Western Pennsylvania, we find that they all agree on the probable cause of the explosion.

The gas found by Mr. Louttit was not in any of the Blanche entries. They all state the volume of air was sufficient to dilute and carry off the gas being produced on the faces of the workings. One or two of them admit that one-half of the volume would have been sufficient. If that is the case, we will have to eliminate the question of ventilation.

They had double the number of officers required by law, and we also find from Mr. Louttit's statement that he found the mine in perfectly safe condition, as he tells you that if that had not been the case, he would not have left the mine. A number of the men in there were great friends of his. He has been an inspector for 24 years, and it is his duty as a mine inspector, if he finds danger, to get the men out first, which no doubt he would have done. He made an inspection which was as thorough as could be made. There was not a working which he did not visit.

I don't know that it is necessary for me to go into any further details. The only thing I will say to you is that all the Mining Inspectors of this State want, all that the public want, or all that you and I want, is justice. If you find the mine was improperly worked, and the disaster was caused by any violation of the law on the part of the company, say so. If you find it was not, be men and say "Nay."

We leave it with you, and it is your duty to find out what caused these men's death and who is responsible. They tell you that a blown-out shot has often occurred to regular shot firers and practical men, and some of them have admitted that a blown-out shot has occurred to them, showing you that a blown-out shot is liable to occur to any one.

I would say that after your findings, if you find that this explosion was caused by dust with a mixture of gas in the air, and from a blown-out shot, if you have any recommendations to make, there is no doubt in my mind but that they will be carried to the Legislature of Pennsylvania which meets next month in Harrisburg.

Now, gentlemen, I don't know that I have anything more to say unless you have some questions to ask."

Verdict:

"We, the Jury, after hearing the evidence of mining experts, inspectors, miners and operators, find that John J. Ivill came to his death from an explosion in Marianna mine, West Bethlehem Township, Pa., Saturday, November 28, 1908.

Said explosion was due to a blown-out shot in Blanche Entry No. 3, which ignited the gas and dust, and that a secondary explosion occurred in the Main Dip entries almost simultaneously, and we further find that no blame is attachable to any one for said accident, and we recommend that the mine inspectors frame and submit to the incoming Legislature a set of rules to be adopted into laws, for the employment of experienced shot firers to fire all shots, and that all shooting be done between shifts, and that black powder or other inflammable explosives be excluded, and that the excessive use of brattice cloth be prohibited; that all charges of explosives be stemmed with clay, and that safety lamps be used exclusively in gaseous mines; that an efficient watering system be installed, and the dust in all parts of mines thoroughly wet; and, further, owing to the fact that the laws governing electricity in mines are very meagre, that a more rigid set of laws be submitted for adoption."

It is to be regretted that explosions of this kind cannot be entirely prevented, but while that is impossible they could be greatly reduced in number if all the persons concerned in mining would co-operate intelligently in their work. Personal responsibility enters largely into this matter, for it is known and has often been demonstrated that the oversight, neglect or carelessness of one person in a mine may cause the death of hundreds of others. This uncertainty is always present, and often when we think a mine, such as the Marianna, is safe, some one becomes heedless of the rules and regardless of consequences, and as a result an explosion occurs. Nor is it always the ignorant foreigner who is the culprit; frequently the most intelligent miner, over-confident regarding the safety of the mine, is the one to bring on disaster. It is very evident, however, that it is the plain duty of the Commonwealth of Pennsylvania to teach the foreign miners the language of the country and how to mine coal with safety to themselves and to others.

Magazine Articles

Dated
12/12/1908

mines in the Ohinemuri district; with some assistance from the mines in the new Tairua district. The dredging returns from the West Coast and Otago districts are declining. The Waihi continues to make good its position as one of the great gold mines of the world.

Indications are that the gold production of Australasia for 1908 will be larger than appeared probable earlier in the year; it may equal that of 1907, and if not, the decrease will be small.

California Quicksilver Mines

SPECIAL CORRESPONDENCE

The closing down of the Great Eastern quicksilver mine, in Sonoma county, California, marks the end of a mine which has been productive for the past 20 years. Under present conditions of the quicksilver industry it is no longer profitable. Indeed, few mines in California are making any money out of cinnabar ore. The exception is the New Idria, of San Benito county, where the operations are conducted on a large scale and under economical conditions. B. M. Newcomb, the manager of that as well as other California quicksilver mines owned by Boston capitalists, has bent all his energies toward reducing expenses, both of mining and reducing the ores, and has installed every labor-saving device possible. He spent much money in overhauling the plant and putting it in shape to handle very low-grade ores, and in this has been specially successful. The mine has been for some time the largest producer in California, taking the place of the old New Almaden in this respect.

Water Power Plants for California Mines

SPECIAL CORRESPONDENCE

On Dec. 10 the new plant of the Great Western Power Company, at Las Plumas, on the Feather river, about 20 miles above Oroville, Butte county, will be put in operation. Work has been going on there for several years, and many millions of dollars have been spent in construction and machinery. It is supposed that this is the largest electric generating plant in the world, as it will produce 144,000 h.p. The whole river will be turned through the three-mile tunnel, gaining a fall of 75 ft., and at the lower end of the tunnel there is a drop of 540 ft. to the power house. The entire tunnel is lined with concrete and smoothly finished inside. An old mining tunnel was utilized, extended and widened for this purpose. There are eight generators of 18,000 h.p. each, four of which will be put in operation next month. The new Cowell cement works in Contra Costa county, 150 miles distant, will start at once as soon as this electric power is turned on. The power will not only be furnished to mines, but small towns and to the cities of Oakland and San Francisco. This new plant is nearly five times as large as that of the California Gas and Electric station at Electra, heretofore the largest in the State.

The Northern California Power Company, which already has three large electric plants in operation, has commenced work on a fourth one, on Battle creek, in the Manton district, Tehama county. Owing to the difficulty of hauling in steel pipe, a boiler and machine shop is being built on the site of the power plant where the pipe will be manufactured. The water of several irrigating ditches will be added to the waters of Battle creek to furnish an adequate supply for the new power plant.

Ore Treatment at Mount Morgan, Queensland

There are three classes of ore at Mount Morgan, Queensland, Australia, (Bull. No. 6, *Mineral Resources,* Department of Mines, New South Wales, p. 68): The oxidized, non-cupriferous, free-milling ore found above the 300-ft. level; the slightly cupriferous pyritic ore, treated by roasting and leaching and found between the 300- and the 600-ft. levels; the cupriferous pyrite ore, treated by smelting and found below the 650-ft. level. The gold in the first class of ore is recovered by ordinary milling and chlorination. The slightly cupriferous ore, which contains about 1 per cent. copper, is treated by roasting, leaching with sulphuric acid, and then by chlorination to obtain the gold. The ore is crushed in ball mills to 20 mesh, and then roasted in reverberatories. After that, the roasted ore is charged into vats of large capacity (several holding 1000 tons). This ore is first treated with a weak solution of sulphuric acid (waste liquor from cementation canals) which dissolves most of the copper. The roasted and washed ore is then treated with chlorine solution so as to dissolve the gold. As this solution dissolves more copper, after the gold is removed by precipitation on charcoal filters, the solution is passed through copper-precipitating canals; the solution is then brought up to proper chlorine strength and used again.

The timbers and ironwork, such as ladder hangers, etc., in the Moruya silver mine, Australia, after being under water for 35 years, according to *Bulletin* No. 6, page 58, Department of Mines, New South Wales, were found to be in good condition. The ore is mainly arsenopyrite with some zinc blende. The preservative agent was, therefore, probably arsenic.

Coniagas Mines, Ltd.

The report of the Coniagas Mines, Ltd., for the fiscal year ended Oct. 31, 1908, states that the concentrating mill has been extended and 20 stamps have been installed together with a gas engine and additional concentrating machinery. Ten more stamps are to be added and the capacity of the mill will be increased from 45 to 90 tons per day. A new shaft has been sunk near the mill and all ore is now hoisted from this shaft and dumped directly into the mill.

During the year development was as follows, the total to date being given in parenthesis: Shaft sinking, 272 ft. (422 ft.); drifting, 2096 ft. (3756 ft.); crosscutting, 96 ft. (641 ft.); winzes, 94 ft. (94 ft.); total, 2558 ft. (4913 ft.).

It is estimated that from these openings the following quantities of rock have been excavated: Crosscutting, 2280 tons; drifting, 12,980; stoping, 13,680; open cutting, 4680; shaft sinking, 1400; winzes, 320; total, 35,340 tons. Of this amount 2530 tons were barren, 14,796 tons are mill rock on surface, 3950 tons are mill rock in stopes and 14,064 tons have been put through the mill. The rich ore was hand-picked from about 33,000 tons and the 14,064 tons milled yielded 297 tons of concentrates. The property has produced 3,444,000 oz. silver to date of which 1,444,229 oz. were produced in the year ended Oct. 31, 1908.

A statement of working expenses follows:

Receipts:	
From ore	$709,415
From camp	15,392
Interest and rent	2,388
Total	$727,195
Expenses:	
Mining	$ 84,165
Fuel	26,315
Milling and sorting	30,196
Taxes and royalty	24,459
Sale of ore	11,372
Administration and all other	48,970
Total	$225,477
Profit for year to Oct. 31, 1908	$501,718
Balance from previous year	264,762
Total	$766,480
Dividends paid	440,000
Surplus	$326,480

The works at Thorold, Ont., are producing silver and white arsenic and the company expects soon to refine and market the oxides of cobalt and nickel.

Correction

In the JOURNAL of Nov. 21, 1908, p. 1006, owing to a mistake in the revision of the article, "Las Chispas Mines, Sonora, Mexico," by B. E. Russell, an incorrect illustration was used. The cut indicated as "Las Chispas Mines, Mexico," illustrates the new concentrator of the Montezuma Copper Company, at Nacozari.

Facts Concerning the Marianna Explosion

The Fan Indicator Diagram Shows That Ventilation Stopped 25 Minutes before the Explosion. Mine Inspector Says the Clock Was Slow

BY FLOYD W. PARSONS

The Marianna explosion will soon be recorded as past history and will only be remembered and referred to, by the general mining fraternity, because of the lessons it has taught. At this writing, the final verdict of the coroner's jury has not been rendered, and as a consequence the greater number of material facts are reserved by the mine officials and the State inspectors for the inquest that will be held. It is, therefore, useless to theorize and attempt to draw conclusions until this important evidence has been heard.

The most unfortunate fact concerning these coal-mine explosions is that we heretofore have benefited so little from each succeeding disaster. At this time last year we were in the midst of a series of frightful mine accidents, from which we emerged with a firm determination to search for enlightenment that once secured would place our coal mines in a position of greater safety and reduce mine fatalities to a minimum. Although the past eleven months has been practically free from explosions of gas and dust, the interest aroused last winter has lagged but little and we are justified in feeling that more progress has been made during the year than in any equal period of time that has preceded.

The United States Geological Survey at its testing station in Pittsburg has installed one of the most complete plants ever designed for the scientific investigation of causes leading to accidents in coal mines. We are also profiting at present by the frank statements of experienced mine engineers who have heretofore either neglected or refused to stand committed, and thus lend their aid to a better solution of the problems involved.

The Marianna Mine is Ideal in Its Plan

If I had been handed the mine maps showing the underground development plans of all the mines in western Pennsylvania, I feel safe in saying that a casual examination of the different drawings would have caused me to pick most any other mine as the probable location of the next mine explosion rather than the operation at Marianna. Mr. Jones, the president of the company, is a man who has spent many years in the operation of coal mines, and being somewhat idealistic in his views, had used his past experience as a guide in creating at Marianna an operation embodying the most modern of approved ideas, both on the surface and underground.

The accompanying map shows plainly the plan of operation here intended for the development of the property. Instead of having two main entries, or even four as was recently considered the best practice, the development scheme here called for six main entries. Two of these are used to take empty cars to miners at the face of the workings; two other entries return loaded cars from the face of the workings to the bottom of the shaft; the two remaining entries are used for special air courses to return the impure air and gases to the air shaft, and deliver this dangerous atmosphere to the outside of the mines in such a way that no person at any time might be injured by coming in contact with this exhaust air. All return airways were separated from the gangways where men were working by brick or concrete walls, or pillars of coal.

Up to the present point of development, the only work done in the Marianna mine is that of driving entries, which is commonly called "narrow work." Not a single room has been turned and driven. The general scheme of development is to work everything on the panel system retreating.

The entries so far driven are included in the dotted line surrounding the shaft on the drawing. Large barrier pillars have been left between each pair of entries, with still larger pillars protecting the outside entries. As is evident from the map, the development already accomplished extends only a distance of about 1200 ft. from the main shaft.

The System of Ventilation

In planning the ventilation for this mine, trap doors have been entirely eliminated and overcasts are used to carry the currents of air to the return. Overcasts are conceded by all mining men to be safer and eventually cheaper than trap doors. The large fan shown in Fig. 3 is only a temporary installation and will be replaced by a ventilator designed to deliver more than 500,000 cu.ft. of fresh air per minute at the face of the workings. It is the intention of the company to place another fan at the second shaft which is shown fenced in in Fig. 4. This last view was taken immediately after the explosion and the temporary fence was placed around the shaft merely as a safety precaution. The fan at the Rachel shaft, shown in Fig. 3 was operated as an exhaust, the air being drawn in through the shaft in Fig. 4. It is not the ultimate intention of the company to use both fans at the same time, but rather to have one ventilator as a duplicate installation to be used in case of necessity for repairs or for emergencies. The plan inaugurated, is to have not more than 50 men working in each section or panel, and every panel is to be ventilated by one current of air.

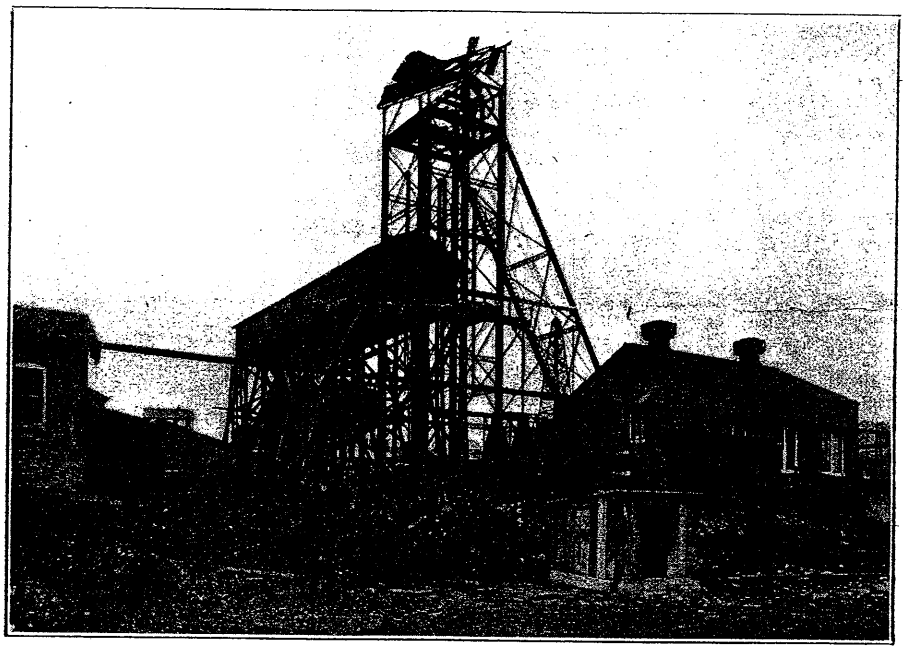
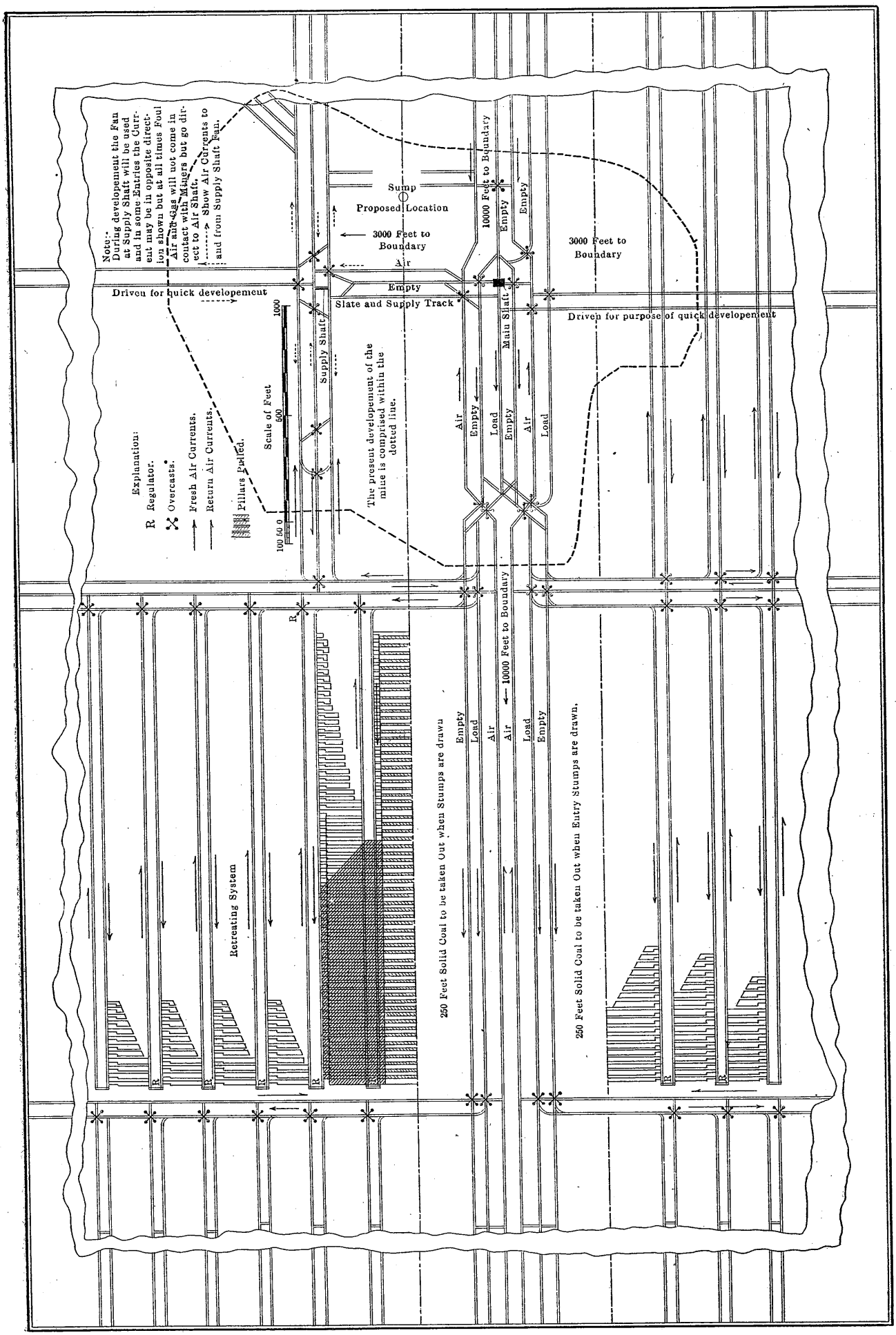


FIG. 1. TEMPORARY TIPPLE AND HEAD FRAME OVER MAIN SHAFT AT MARIANNA. TOP OF HEAD FRAME SHOWS EFFECT OF EXPLOSION



MAP SHOWING GENERAL PLAN OF DEVELOPMENT AS OUTLINED FOR MINING THE COAL SEAM AT MARIANNA. THE ENTRIES ALREADY DRIVEN ARE INCLUDED WITHIN THE DOTTED LINE

FIG. 2. SHOWING GENERAL VIEW OF MARIANNA PREVIOUS TO EXPLOSION. THE MAIN SHAFT IS AT LEFT OF PICTURE WHILE THE SECOND SHAFT IS JUST BELOW THE POWER HOUSE. A GAS WELL DERRICK IS BEHIND THE LARGE TREE AT RIGHT OF MAIN SHAFT

The First Shaft was Begun in May, 1906

The sinking of the shafts at the town of Marianna was begun in May, 1906, and completed in the latter part of 1907 and the early part of 1908. As an example of the modern and thorough manner in which the company has started to develop this property, I may state that the miners' houses will be built of brick and contain four, six and eight rooms each. Each house is to be electric lighted and furnished with a bath. The town is also to be sewered and lighted by electricity. The mine is designed to give employment to 5000 men, which will insure a population in the town of Marianna of from 10,000 to 20,000 people.

The Rachel shaft is 460 ft. deep and is 20x31 ft. in the clear. The pump and stairways are 4x20 ft., the cageways each 6 ft. 2 in. by 20 ft. in the clear, and the airway is 10x20 ft. It is the intention of the company to hoist two steel mine cars at one time, and with an average of 1250 hoists in eight hours, the capacity will be 10,000 tons daily.

The Mine was Visited this Fall by the Foreign Experts

When the expert engineers from England, Belgium and Germany visited our country this past fall, they included the Marianna mine in their trip of inspection; it having been selected as one of the operations near Pittsburg that was worth seeing. President Jones in receiving this visit of these mining men, presented each member of the inspection party with a detail description of the many advanced plans that were to be followed in the development of the property. This description which is too lengthy to be published here in detail is most convincing proof that the principal aim of the owners of the property was to here complete a mining plant which would be the equal of any similar operation in our country. Electric cutters are to be used in the mine, also electric lighting and haulage with a current of 300 volts. After the construction of the coke ovens is completed, the boilers are to be fired by the gases from these ovens.

The present tipple shown in Figs. 1 and 3, is only a temporary structure to be replaced by a steel building equipped with six dumps and an elaborate system of screens.

In concluding the prospectus before mentioned, which was given to the mine experts, Mr. Jones says: "On the whole, every known precaution will be taken to make the factor of safety a maximum, and in addition thereto many of our newly devised schemes will be added to reinforce the others." I have cited the foregoing to show not only the plan of mining carried on at the time of the accident, but to fully explain that the real keynote most pronounced in the development of the property was the single idea of efficiency and safety.

Details of the Accident

The explosion occurred at 10:52 on the morning of Saturday Nov. 28. Mine Inspector Henry Louttit made a trip of inspection through the mine that morning and came out of the workings about 30 min. before the explosion occurred. Mr. Louttit found everything in the mine thoroughly satisfactory and immediately on reaching the surface made an examination of the fan and the air entering the mine. At the time of this examination the water-gage stood at 3¼ in.; the fan revolved at a speed of 120 r.p.m. The examination of the air at the upcast shaft showed that about 190,000 cu.ft. of air was being drawn through the mine. After completing this examination Mr. Louttit went to the power house to look at the engines and see that all provisions of the law were here being complied with. While in the power house, Inspector Louttit heard the explosion, and immediately hurried from the power house to the shaft; it was readily evident just what had happened and Mr. Louttit's first examination was of the fan.

This inspection showed that the fan had stopped and the problem then was to determine whether the fan should be continued as an exhaust or reversed to blow air into the Rachel shaft. The latter course was decided upon and Inspector Louttit firmly believes from the subsequent results and the saving of the life of one of the miners that this plan of reversing the fan was the proper thing to do.

Efficient Aid Extended by Members of the U. S. Geological Survey Testing Station

Among the first rescuers on the ground were several of the engineers connected with the U. S. Geological Survey Testing Station in Pittsburg. These men were equipped with rescue apparatus of the Draeger type and soon instructed volunteers in the proper use of these safety devices. Great progress in advancing into distant parts of the workings was quickly made by those rescuers equipped with the life-saving apparatus. This is practically the first opportunity offered the experts at the testing station to be of real service, and there is no doubt but that their heroic work resulted in much good and was greatly appreciated by the officials and inspectors in charge of the rescue operations.

The Marianna mine contains small quantities of gas at the face of the workings, but there were no evidences that the property was unusually dangerous. It was also generally known that the region surrounding Marianna was within the natural-gas zone, and one of these wells had been drilled only a short distance from the main shaft of the mine. In Fig. 2, the derrick of this well can be seen through the foliage of the large tree at the left of the picture, and in the foreground. Immediately after the explosion, a story

was widely circulated that the mine workings had encountered a large pocket of gas which had been tapped by this well. This theory, however, like many other early surmises, has yet to be proved. It was also stated that the explosion was caused by a windy shot, which story if true, will probably be brought out in the coroner's inquest.

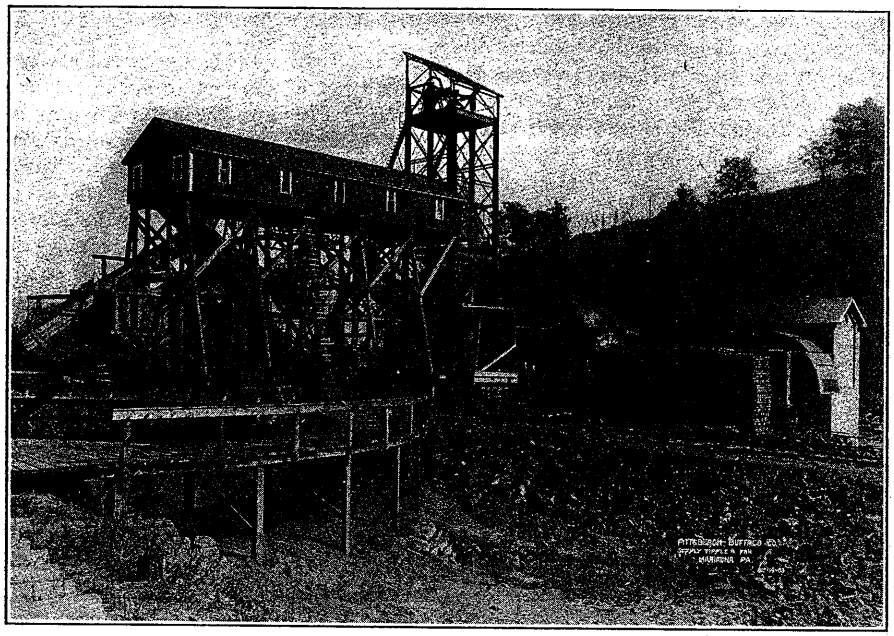


FIG. 3. TIPPLE AND TEMPORARY FAN AT THE MARIANNA MINE

The greater number of recent coal-mine explosions have shown clearly that dust has been the principal factor in sustaining and carrying forward the force of the initial explosion. In this accident, however, from preliminary and incomplete facts, it seems that gas has played the more important part, although dust has perhaps added somewhat to the force generated.

Conflict of Opinions

As is always the case in the event of such a disaster, there are any number of conflicting statements. Several witnesses who were present on the surface at the time of the accident differ in their opinions as to the number of reports that were heard. One man with whom I talked stated that he distinctly heard three successive rumblings, while other witnesses are as positive in their statements that but one report occurred.

It was the custom in the mine to use safety lamps at all dangerous points, while naked lights were largely used in other parts of the workings. This practice of requiring safety lights in a mine where electricity is used has been frequently condemned as most inconsistent; this question, however, was well answered by one of the inspectors with whom I talked, when he stated that "electricity exists only where you put it, while a naked light occurs where you take it."

The Statement that the Fan was Stopped Prior to the Explosion

On November 30, it was stated by one of the company's employees that a 2-in. steam pipe which operates a ring-pump 80 ft. down the main shaft, burst at the top of the shaft at an "ell" connection. It is asserted that the mine superintendent ordered the power shut off until the break could be repaired. I immediately dismissed this theory as being unworthy of consideration as several of the company's officials assured me that there was no basis for the belief. On Friday, December 4, I saw the fan indicator card which plainly showed that the fan stopped at about 10:27 on Saturday morning, Nov. 28. A careful investigation also showed conclusively that the explosion occurred about 10:52 Saturday morning. This indicated that the fan stopped 25 min. before the explosion occurred.

My notes, as before stated, showed that Mr. Louttit, the mine inspector, came out of the workings about 30 min. before the explosion was heard, so that if the ventilation was shut off before the accident, as the indicator diagram showed, the fan must have been stopped immediately after Mr. Louttit's inspection on the surface had been completed.

At a subsequent interview I was positively assured by those in authority that although the indicator card showed that the fan had stopped 25 min. before the explosion, that the clock governing the indicator diagram was about 25 min. slow, and that ventilation had not stopped until the explosion occurred. I also learned from the same reliable source that the indicator card was held by but one thumb tack, placed in the center of the card, and that for this reason it was possible the card had slipped a sufficient distance to account for the interval of 25 min. between the stopping of the fan and the occurrence of the explosion. The indicator card that was used at the time of the explosion was removed immediately after the explosion and a new card inserted in its place.

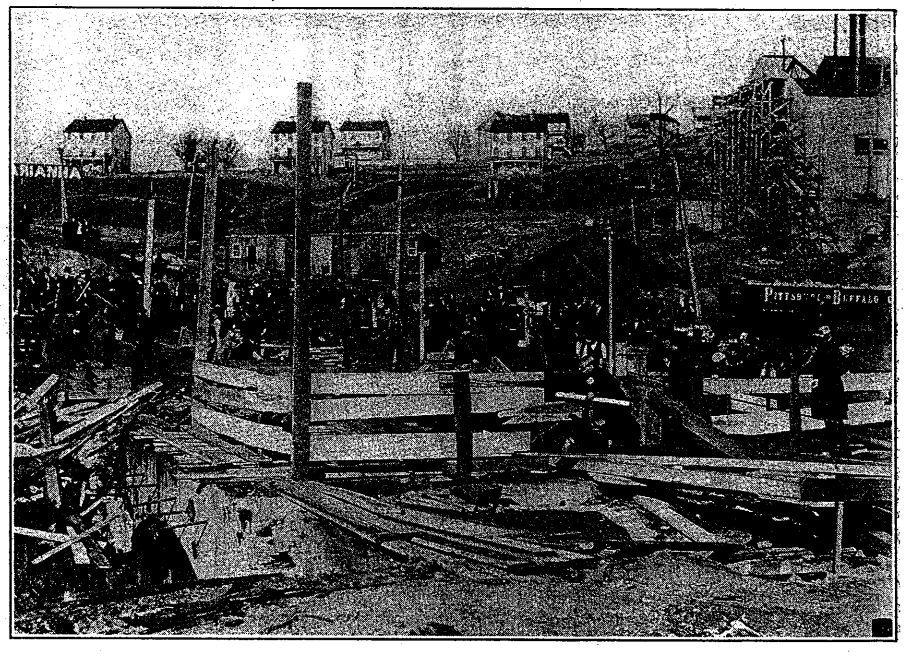


FIG. 4. VIEW OF SECOND SHAFT AFTER EXPLOSION. A TEMPORARY FENCE HAS BEEN BUILT AROUND THE SHAFT

If the fan did stop 25 min. before the explosion, this would probably have given sufficient time for the mine atmosphere in some entries to have reached a dangerous point, and the gaseous mixture could then have been ignited by a naked light or perhaps from one of the mining machines. This is pure guessing, however, and as I

have confined myself solely to facts about which there is not the slightest doubt, I will refrain from theorizing in the hope that the evidence presented to the coroner's jury will clear up all disputed points.

In conclusion, I may say that the location of the victims who perished in the explosion will be of considerable importance in substantiating or disproving that the fan was stopped. It seems incredible that the ventilation could be shut off for 25 min. before the accident without many of the miners noticing the lack of air and leaving their working places to investigate the cause. It is to be sincerely hoped that all charges of negligence and other criticisms of the company will be thoroughly dismissed when the correct evidence is presented. There is absolutely no doubt but that the highest officials of the company had endeavored to make the Marianna mine a safe operation. Mine foremen, in their eagerness to make a good showing, sometimes take chances in rushing entries too far ahead of crosscuts, just as miners themselves often face unnecessary danger in neglecting precautionary measures, so that they may get the maximum tonnage for the day. In the case of the Marianna mine, the entries were, in some instances, considerably ahead of the crosscuts; however, the mine inspector himself is authority for the statement that brattices were built up the center of all such entries, and that these brattices were kept within from 12 to 15 ft. of the face.

From Thursday morning until the explosion occurred Saturday, the barometer at Marianna rose steadily, registering an advance of ½ in. Conditions, therefore, were rather unfavorable to a gas explosion.

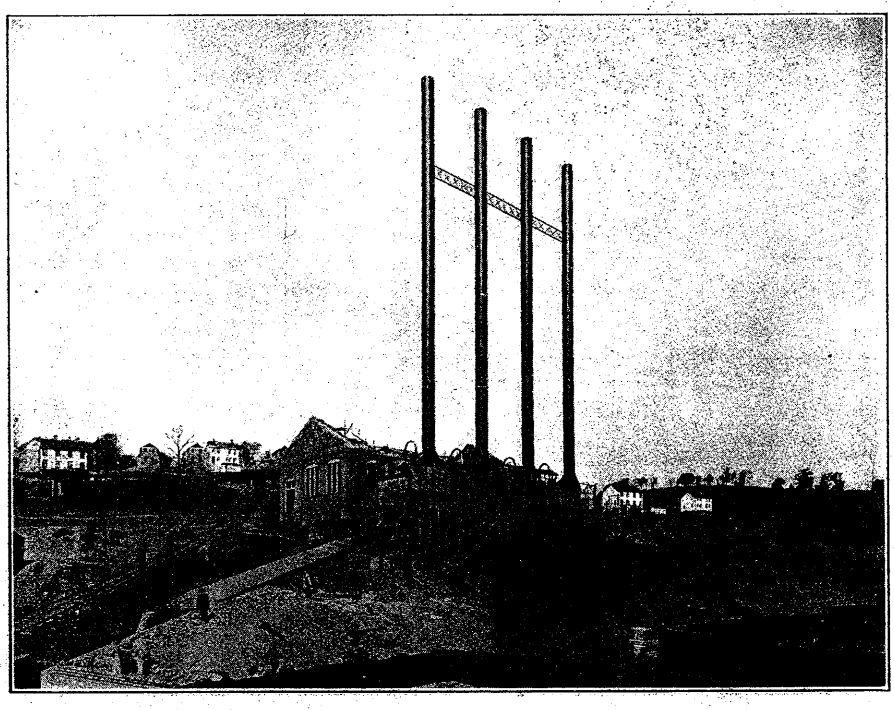


FIG. 5. POWER HOUSE AT MARIANNA DURING CONSTRUCTION.

Colliery Notes

Expansion joints of steam pipes in a shaft should be brass lined on the sliding surfaces. Where the pressure is over 40 to 50 lb. per sq.in., such an expansion joint must be tied together by means of long bolts to limit the amount of movement in the joint.

At Arley colliery, North Warwickshire, England, workmen at a depth of 1020 ft., came across the bed of an old river more than 450 ft. wide; it is stated that at one point the stream runs into a lagoon or lake of considerable size. The river and lake have either dried up or have been diverted by some huge upheaval.

The life of mules and horses in our coal mines is anything but pleasant, and as a consequence, every effort made to benefit the lot of these animals is most commendable. A practice that might be successfully followed in this country has been inaugurated in England, where extraordinary enthusiasm was aroused by the parades of pit ponies, and thousands of pitmen with their wives and families, crowded around the ring where the little animals were judged. Each pony was attended by a pit boy, and all the animals wore the harness in which they work in the mines; they were also equipped with the skull-caps of stout leather which they need to prevent them from cutting their heads as they draw the cars of coal along the low entries. Various prizes were awarded to the different collieries whose animals were in the best order. Many of the ponies that were exhibited had been underground for five or six years and were a little dazed by the brilliant sunshine. In showing what good care will do for a pony that is used underground, mention was made of one pony which was taken down in June, 1887, 21 years ago, and has never since seen daylight. This animal continues to work eight hours a day and is still in fine condition. Exhibitions of this sort if started in our own country would do much to create a better feeling toward the animals now used underground.

Where rotary tipplers are used, the coal should not be dumped from the car onto a screen without some means of preventing the coal being thrown forward. This practice of dashing the coal on the screen is not only detrimental to the coal itself, but lessens the efficiency of the screening. Instead of having the rotary tippler revolve toward the screen, it should be arranged to turn backward, a circular plate being provided to receive the coal. The tippler should also be provided with a hood which accurately fits close to the circular extension of the screen, so that the coal is first received in the hood and gradually discharged upon the screen. It is also most important that the tippler should turn as slowly as possible. Many tipplers revolve too quickly, with the result that they stand several seconds, between each car; it is better to occupy more time in turning and thus insure less breakage. The best plan is to install an extra tippler rather than lower the selling price of the coal by having one tippler working at its maximum capacity and handling the coal roughly.

The committee appointed by the English Government to investigate the accident which occurred at the Roachburn colliery, Cumberland, England, early this year, has just submitted its report. In this accident three men lost their lives and 130 other miners barely succeeded in escaping to the surface. The bodies of the men entombed could not be recovered, and as a consequence, no inquest was possible. In the report of the inspectors, it is stated that the accident was caused by working the coal up to the outcrop at a point where the surface deposits were so saturated with water that they gave way and poured into the mine, the quantity being estimated by the manager to be about 90,000 cu.yd., forming a subsidence or cavity on the surface extending over nine acres and having a depth of 49 ft. The most interesting fact concerning this disaster is contained in the statement that the inflowing materials passed downward into the mine, and extended a distance of 2240 yd. by the shortest route to the bottom of the exploring dip. The sudden inflow of water into a mine has been known to overtake and destroy many miners, but this is one of the first instances where fluid moss has been known to flow with such rapidity. As a result of extending the workings so close to the outcrop under such surface deposits, the entire colliery is lost to the owners, besides the fatalities that resulted to the men.

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Contents

Colliery Accidents

In an impassioned address at Pittsburg, last week, John Mitchell expounded the views of organized labor as to the great question of conservation of life and limb in coal mining. The reduction of the disgraceful loss of life that has occurred in American coal mining is a subject upon which everyone may meet upon the common ground of humanity, but opinions differ widely as to the paths to the meeting place. John Mitchell takes a path that leads through pitfalls, bogs and quagmires, and abruptly comes to an end—in short, a blind alley—yet among his specious reasoning and misstatements there are glimmerings of sense.

He argues, in the first place, that the price for coal is too low. He does not want the domestic user to pay more. Indeed he considers that this class of consumer pays too much already. But on the other hand there are large consumers who do not pay enough. The addition of a few cents per ton to the general average would enable colliery operators to mine their coal more safely. Undoubtedly that would be so. Probably, moreover, many large consumers at present obtain their coal too cheaply. But how is this condition to be changed? How is the price for coal to be raised in an industry which enjoys such unfettered competition?

Mr. Mitchell does not accede to the views of some persons that a solution of this sad problem will gradually work out, and we must be patient in the meanwhile. He thinks that the evil ought to be corrected right away. In this we agree with him. Mr. Mitchell says that the danger of loss of life by explosions can be eliminated immediately by taking the men out of the mine, in other words, by employing shot-firers, at a cost of not to exceed 2c. per ton of coal. On its face this suggestion looks well. Certain States, Illinois for example, have already tried the expedient of making the employment of shot-firers compulsory. The defect of this procedure is that the shot-firer must not only explode the charge, but also must load all the holes if an extraordinary mortality among shot-firers is to be avoided. The miner who is not going to shoot his own charge is apt to be careless how he loads it. Nevertheless, there is a way around this difficulty, viz., the employment of electric shot firing, already introduced in a number of collieries with success and at an expense of only about 2c. per ton of coal, which Doctor Douglas reports as the experience at his colliery at Dawson, N. M. Electric shot firing eliminates the danger of loss of life by gas or dust explosions, and if properly supervised there need be no great danger of blowing up the whole mine, as happened in an early trial of this method in Utah. We advocate the further employment of electric shot firing, and insofar as taking the men out of the mine is concerned, when that method is employed we agree with Mr. Mitchell.

We do not agree with Mr. Mitchell in his specious reasoning that the operation of collieries is safest with organized labor. Although he supported his contention with statistics showing that the loss of life is greatest in West Virginia, where the union has least hold, we may point out that (1) conclusions should not be drawn from the experience of a single year in which some extraordinary disasters occurred in West Virginia; and (2) comparative statistics fail to show differences in mining conditions, the mines of West Virginia, for example, being notoriously more gaseous and more dusty than those of Missouri. Instead of unionized labor being a panacea for safety in coal mining, we believe that it is one of the factors contributing to danger. When the operator is able to dismiss an employee for breach of discipline without risking a strike, a great step toward safety will have been accomplished.

What then shall be done to counteract the dangerous ignorance of the foreign horde that we employ in our coal mines? Dictation by the union, which Mr. Mitchell suggests, is surely the last thing that will enter the mind of any intelligent operator. Not that, but rather the expedient which Dr. Douglas suggested, with his characteristic keenness of perception and clarity of thought, namely, the employment of more bosses, who will see that the unskilled miners do not break rules and endanger their fellows. This also would increase the cost of coal, which in the opinion of Dr. Douglas ought to be met by the consumers. Again, we agree.

Dr. Douglas came near to the real solution of the difficulty, which Mr. Mitchell does not see at all. This is the enforcement of our laws by adequate inspection, and the unbiassed determination of blame for disobedience and carelessness of the laws, whether by operators or miners. Mr. Mitchell and his union make t'

slogan. Not the employment of shot-firers, the unionization of labor, and State indemnity for accidents covered by a tax on the coal product (which would be unconstitutional as class legislation); but rather the appropriation by the respective States of such sums of money as will provide for severe mine inspection, the appointment of experienced and honest mining engineers as mine inspectors, free from political and all other kinds of influence, the *enforcement of the laws,* the abolition of the absurd coroner's jury, and competent means for fixing the blame for accidents. If this were done, everyone would be surprised at the speed with which our mortality rate would decline. The statistics show how much room there is for betterment in this respect. During the last 10 years upward of three American miners out of every 1000 employed have been killed annually. In Europe the rate is but little more than 1:1000.

The ignorant, and those who seek to pull wool over the eyes of the ignorant, talk about the mysterious conditions that exist in coal mining. A lot of this was heard at Pittsburg last week, which finally led the National Institute of Mine Inspectors to enter a protest, distinguished for its sanity amid the flood of wild talk. There is nothing mysterious about the conditions in a coal mine. The technologic branch of the U. S. Geological Survey, with its elaborate experimental station at Pittsburg, is going to arrive at a good deal of data that will be of value to engineers, but it is not going to unveil any mystery, or inaugurate a new era of safety in coal mining, although Mr. Mitchell and some politicians who spoke at the opening ceremonies may think so, or pretend to think so. Everybody who has had any experience in coal mining knows that a mixture of methane and air will explode; also that dust in suspension in the air will explode under certain conditions. Moreover we know well enough what those conditions are and how to obviate the danger. The trouble is simply that knowing this our operators become careless and take chances.

The great explosions—Monongah and Marianna—which more than anything else have aroused public sentiment in 1908 were in no way mysterious. They were not "acts of God." They were acts of carelessness by man. The coroner's jury ided that the Monongah explosion was a blown-out shot, making it consequently "an act of God," for which the company was not responsible, either legally or morally. The JOURNAL expressed the opinion, after an examination on the ground immediately following the explosion, that the cause was a runaway trip of cars. This was also the report of the mine inspector for the district. We have not had any reason to change our opinion, although in holding it we have stood alone in America, at least so far as public expression goes. However, we have had the endorsement of M. Taffanel, directing engineer of the French experimental station at Lièven, who came to America especially to study the cause of this explosion and arrived at the same conclusion that we did.

The more recent Marianna explosion was at first regarded as exceptionally mysterious. Here was a loss of life in one of the model mines of Pennsylvania, which moreover occurred within less than an hour after the mine had been examined by the inspector for the district and had been pronounced safe. Surely, it was said, this was an "act of God" if ever there was. However, we found upon investigation that there had been an accident to a steam pipe in the shaft; while repair was being made it is alleged that the fan was stopped and the explosion occurred while the fan was stopped. The mine was known to be gaseous and safety lamps were supposed to be employed exclusively in it; but—carelessness again—there were some naked lamps.

We do not yet say that the Marianna explosion occurred because the fan was stopped. The recording diagram shows that it did stop at about 10.27 a.m. The explosion happened at about 10.52 a.m. Officials of the company deny that the fan was stopped at the time of the explosion and claim that the clock of the recorder was slow, or that the record-paper slipped! All that we pronounce at present is that when the real investigation has been made—quite irrespective of the finding of the coroner's jury, which probably will be as farcical as usual—the Marianna explosion will be learned to have been due to carelessness by someone, somewhere.

Here, then, we have the solution of the problem: 1, Electric shot firing; 2, more bosses; 3, non-interference with discipline by the union; 4, adequate inspection; 5, enforcement of the laws; 6, intelligent adjudication of blame; 7, legal collection of damages. Let Mr. Mitchell and his union consider this and act accordingly. Let the operators meet him on this ground.

Has the Value of Gold Depreciated?—A Correction

In the article by Mr. Ingalls in the JOURNAL of Nov. 28, it was stated that "the fixity of the value of an ounce of gold at $20.67 is arbitrary, resulting from the dictum of Congress in 1792 that 270 grains of gold, 916⅔ fine (equal to 247.5 grains of pure gold), shall be stamped $10." Our attention has been called to the fact that according to these figures the value of an ounce of gold would be $19.39. Mr. Ingalls made an error through overlooking the change that was made in the weight of the American gold dollar.

The Act of April 2, 1792, provided for the coinage of eagles, each to be of the value of $10 or units, and to contain 247.5 grains of pure gold, or 270 grains of standard gold. By the Act of June 28, 1834, the weight of the eagle was reduced to 258 grains, of which 232 grains were to be pure gold. The Act of Jan. 18, 1837, did not change the gross weight of the coin, but caused the fineness to be 0.900.

The reference to the old English act stamping 113 grains of fine gold as £1, which was intended to be figurative, is, of course, incorrect if construed literally. The present gold standard was adopted in England in the 14th year of the reign of George III. Although accounts were kept in England in pounds, shillings and pence, the pound was not coined until after the Act of 1816. Previous to that date the English gold coin was the guinea of 21 shillings.

Of course, these figures were merely introductory, and the error as to how the value of an ounce of gold is established at $20.67 had no effect upon the argument of the article.

THE ESTIMATE of the iron ore resources of the United States made by the National Conservation Commission appears to be open to exceptions. The Commission does not say where the line between "high-grade" and "low-grade" ores is to be drawn. An important part of our iron industry has been built upon what some miners would call low-grade ores; such ores are yearly coming into increased use, and with improved methods and increased attention to economy in smelting, there is no reason to fear that we shall be depending upon imported ores by "the middle of the present century"—or at a much later date.

Newspaper Accounts

DISASTER AT MARIANNA IS CRUEL STAB OF FATE

President of Company One of Leaders in Efforts to Reform Mining Operations.

ARRANGED FOR CONGRESS.

Geological Station of Government Will Be Opened in Arsenal Thursday.

Fate seldom takes a more cruel turn than it did in the case of Saturday's catastrophe at Marianna, on the eve of an occasion when John H. Jones, head of the Pittsburgh-Buffalo Company, expected to exhibit the mine to an army of experts as the model of modern perfection.

Mr. Jones, as one of the principal members of the executive committee on entertainment of the American Mining Congress, which convenes here Wednesday, was largely responsible for calling a conference of governors from 16 States to decide upon uniform State legislation for the prevention of mine disasters and for providing State insurance to compensate those left dependent as the result of miners killed or maimed while on duty.

Just before the convention and conference, Mr. Jones own mine is a charnal house and the wreckage of a blasted hope. Provided, as it was with modern preventives, the mine will become an object of deep study by the visiting scientists, mining engineers and officials.

View Model of Marianna.

Hundreds gathered in the Carnegie art galleries around the exhibit of the modern town of Marianna yesterday afternoon. As a part of the civic exhibit, and in the department given over to town planning, the town of Marianna holds a conspicuous place. The town is represented in its entirety modeled in clay, while photographs and architects' drawings are shown.

Each miners' house is equipped with a bath room, and in such a modern manner was the town planned that the civic exhibit committee pointed to the display as a comparison for other industrial towns.

As the first building of the great University of Pittsburgh group has been dedicated to the school of mines, the university has made many preparations for the entertainment of delegates to the mining congress. Chancellor S. B. McCormick, of the university, said yesterday:

"I am pleased that this important congress is to be held in Pittsburgh—a wonderful center of mining industries and interests. We are endeavoring to make arrangements so that the students in our mining department, under the care of the eminent dean, Dr. M. E. Wadsworth, may enjoy the advantage of hearing the papers [illegible] the discussions. I am looking forward with great interest to this gather[illegible] sure that the men who

AMONG THE KNOWN DEAD.

JOSEPH HOLMES
JOSEPH GRESINGER
ROBERT LOCKET
CHARLES McELRAH
WILLIAM HALL
WILLIAM BEETZ
PATRICK DONLIN
CLARENCE WILLIAMS
ALFRED MACLAIN
SAMUEL LIPTON
FRANK JENKINS
JOHN IVILL
JOHN BENNINGTON
HARRY BENNINGTON
GEORGE THOMAS
CHARLES TAHANEY
CHARLES MUCHKLERAT
CAL HARDEN
FRANK P. BERRY
JOHN FRIEDHOF
FRANK LAPINE
DOMINICK QUAYLBERS
MILTON ECKENROD
OWEN BURNS
JOHN A. JACOBSKY
GEORGE AIKENS
FRANK EAGAN
ALEX STOORSE
RICHARD BLAT
MIKE SLOVINSHOT.
JOHN BORMESKY.
WILLIAM RUMSKY.
BUNNIERMAN OSREY.
GEORGE LAWLANOSS.

BODIES OF 100 VICTIMS LOCATED IN WORKINGS.

CONTINUED FROM PAGE ONE.

the horrible scenes they encounter. It is seldom that a body is found intact. A leg is picked up on one side of the entry and an arm on the other, and the head and trunk found. In many instances, some distance away.

As each body is found it is carefully wrapped in brattice cloth and carried to the foot of the Rachel shaft. There it is placed in a bucket and hoisted to the surface. A force of men quickly transfer it to a cot, it is covered with a blanket and six men bear it to the boiler house 400 yards away. Only a few bodies have thus far been identified.

Fourteen miners from Coal Center arrived here this evening, driving over land to volunteer their services in the rescue work.

Most of the bodies are mangled beyond recognition, and a large number of them will probably have to be buried as "unknown."

In Marianna to-night there are at least 200 relatives and friends of men known to have perished in the mines. They have hovered around the temporary morgue all day, seeking in each fresh victim the one they love. Some of these people have traveled 100 miles. Others have come 50 or 60 miles in buggies.

They are fathers seeking sons, wives seeking husbands, boys seeking fathers and brothers looking for brothers. Not one of them has any hope of finding their relatives alive. They are all reconciled to the fact that every man in the mines is dead.

Pittsburghers at Mine.

A train in the morning brought many from Pittsburgh and intermediate points, while over 500 vehicles of all descriptions could be seen on the hillsides surrounding the mine.

One boarding house, at Marianna, was almost wrecked by persons desiring accommodation. This small house was packed to almost suffocation, and over

IS VENTILATION SYSTEM NOW IN VOGUE AT FAULT?

Marianna Disaster Causes Renewal of Discussion Among Experts.

SOME THEORIES ADVANCED.

Is Inspection Adequate? Another Question for Consideration.

BY JOHN R. BALL

MARIANNA, Pa., Nov. 29.—Is the system of ventilation now in vogue in coal mines defective? Is the system of inspection as conducted by the State of Pennsylvania wrong? Or is the general system of operating bituminous mines, especially gaseous workings, bad?

These questions have become p ent as a result of the disaster wrecked the Rachael and Ag the Pittsburgh-Buffalo Cor admitted that these mines nearly perfect as possible mining systems. They we only for Pennsylvania, but

Much Food for Thc

Those questions have st mine owner and engineer Pennsylvania, at least, thinkir sensus of opinion among mi on the scene here is that the of food for thought in the Ma aster. They are all asking wi the explosion. One of the most mining experts in the country here, offers the following explar

"This disaster presents m problems. The mines were con be superior to any others in the try, and every modern appliance to the mining world was installed the mines were laid out perfectly, cording to the present mining syste Where, then, is the trouble?"

"The mines were inspected just a few minutes before the explosion. That raises the question of inspection. Is the system adequate? I believe this is a point for serious consideration.

Question of Ventilation.

"Let us take up the question of ventilation. In a gaseous mine it is admitted that when the ventilation is ob structed for a period of but five or minutes the accumulation of gas is d gerous.

"In the case of this disaster ve tion might have been obstructed in way, although there is no evidence it was. It might have been cause a blown-out shot. A pocket of might have been liberated, whic lowed too rapid an accumulation f fans, and an open light would rest."

GENERAL NORD ALEX DOOMED TO [illegible] WITHIN F

Dream Brings Warning Of Impending Disaster And Miner Escapes

Impression So Vivid That He Shuns the Workings on Fatal Day.

BY A STAFF CORRESPONDENT.

MARIANNA, Pa., Nov. 29.—Disaster, as seen in a dream, saved the life of one of the men who was employed in the ill-fated mine here, according to the story he tells to-day.

Pierre Santos, a Frenchman, says that Friday night he had a vision of a frightful disaster in which hundreds were killed and that he was the only one who escaped. He awoke and so vividly was the dream impressed upon him that he decided that he would not go to work. He acted on his resolution and thus probably escaped the fate of the companions with whom he had been laboring for several months.

He attributes his being alive to-day solely to his dream.

Elinger Is Near Death.

Fred Elinger, the only man taken alive from the mine, and believed to be the only one in the workings at the time of the explosion who survived, is lying near death at the Monongahela City hospital. Slight hope is entertained of his recovery. He is frightfully burned and otherwise injured. He is 25 years old and has a wife and two children in Germany.

After carefully examining their payroll this afternoon, the officials of the Pittsburgh-Buffalo Coal Company announced that the number of men who met death would not exceed 138.

They are not positive that these figures will prove exact, but feel reasonably certain that it will not vary up nor down very much. The Company has endeavorede to trace all of the men on the payroll and by this means have learned the number missing.

100 Bodies Located.

By daylight this morning 61 bodies had been removed from the mine and prepared for burial. A total of about 100 have been located and are being rushed to the surface as fast as the rescue parties can get them to the foot of the Rachel shaft. The officials believe they will be able to get most of the bodies out by to-morrow evening.

Coroner W. H. Sipe has direct supervision of the bodies. He has impaneled a jury, and the members are viewing the bodies as they are removed. Late this afternoon the relief workers came upon 10 bodies huddled in one group. Only four skulls were found, the others having been torn to pieces. Mine superintendents from all sections of the country are on the scene, co-operating.

Chief Roderick to Inspect.

James E. Roderick, chief mine inspector of the State, will arrive here to-morrow for an inspection of the mines. He will be assisted by the district inspectors already on the ground, and together they will determine what caused the explosion and in what part of the mine it occurred.

They will represent the Commonwealth at the inquest.

There was but little excitement at the mine to-day. The State constabulary surrounded the opening, and held back the curious.

Whenever a body was brought up it was tenderely lifted and carried to the boiler house, past the uncovered heads of the crowd. Admission to the boiler-house was denied to everyone, and the weeping women frequently became hysterical. To-morrow, after the bodies have been prepared for burial, those which

bodies. Wives
hearts who ha tives i
came occasionally, nd with
looked longingly. When they were assured that none of the bodies of their relatives had been recovered, they went back, weeping, but there was no open display, and this was accounted for by the fact that the most of them are American women, and understand.

Attempt to Run Excursion

Early this morning an attempt had been made to run an excursion train to the scene of the horror, but the officials of the railroad and mine officials forbade it.

It is estimated 5,000 persons visited Marianna to-day. Every livery and automobile in Washington was pressed into service and the National pike from here to Beallsville was lined with the morbid.

All of the six main entries have been thoroughly explored and all but four of the 39 side entries. Those yet to be searched are near the Agnes shaft and are blocked with debris. As soon as a good current or air can be carried to that part of the mine, a force of men will be put to work removing the coal and timbers. It is believed that a large number of bodies will be found in these entries.

Directing the Work.

All work around the mines is being directed personally by President John H. Jones. He is assisted by his three brothers, David G., Harry P. and Thomas P. Five of the State mine inspectors are here lending all assistance possible and are working with the corps of Government experts under Clarence Hall and J. W. Paul.

Most of the bodies thus far recovered were horribly mangled. Only two were found with clothing on. The others had been completely stripped by the force of the explosion or their clothing had been burned off.

According to experts who have exam ined the mine carefully, it was a seeti ing furnace for several minutes followir the explosion. The miners who escape death by the force of the explosion wer caught in the sheet of flame and literall cooked to death. A few escaped both o these forces by quickly dropping to th floor of the mine and placing their face into water. However, their relief was only temporary, as the fatal after-damp, from which there was no escape, completed the destruction of lives.

Co-Operation of School of Mines.

"We are glad that our school of mines is able to co-operate in even a small way with those who are planning for the success of the congress."

George Wilfred Pearce, formerly chief engineer for the late John W. Mackey, the bonanza king, will arrive to-morrow morning from New York with John Hays Hammond.

The formal opening of the United States geological survey's experiment station at the Allegheny arsenal, in Lawrenceville, for the investigation of mine explosions will take place Thursday, in the presence of several hundred invited guests, among whom will be members of Congress, scientific men, coal mine owners and operators, State mine inspectors, and officers and members of the United Mine Workers, representing the miners. It is also expected that Secretary James R. Garfield, under whose general direction this Government station was established, will be present.

The station has been in operation for several months, and in that time a number of experiments have been made which tend to show the methods by which the death rate among American miners can be reduced. At present it is the highest of all the coal-producing countries in the world, 4.86 in every 1,000 men employed.

Lower Death Rate in Europe.

In European countries, where similar governmental stations have been established, the rate has been lowered from one as high as the present rate in this country to 1 and 2 in every 1,000 employed.

At the Pittsburgh station a number of so-called "safety" explosives have been tested and found to be anything but safe. These explosives have been fired in quantities of fire damp and in many instances terrific explosions have followed. Those results have been startling to mine owners and miners alike and will undoubtedly lead to the use of better explosives, which will in itself reduce the death rate in the mines.

Perhaps the most important demonstration and the one that will be the furthest reaching in stopping the slaughter of the miners was that in which it was repeatedly shown that coal dust, without the presence of gas, is an explosive equally as dangerous as the fire damp itself, if not more so.

Several weeks ago the Ohio mining commission visited the experiment station, taking with them 20 samples of coal dust. Tests were made of these samples in the explosives chamber and hardly one of them failed to explode. The explosions were as a rule more severe than those caused by the fire damp.

Will Cause More Watering.

These experiments will lead to a more careful watering of the mines, and this, it is thought, will be a big factor in reducing the mine death rate.

From unofficial sources comes the estimate that the number of men killed this year in the mines will be from 700 to 900 less than in 1907, providing there is no unusual accident like the Marianna affair during December. Even with as disastrous a month as December, 1907, in which 700 men were killed in four explosions, the number killed this year, it is said, will not equal that for the year before.

This large reduction in the number of men killed is due, it is believed, to the agitation that followed the big explosions last December, the decision of the Government to probe the causes of the disasters and the experiments already conducted at the experiment plant.

1,000 hungry sightseers drove five to 10 miles in order to appease their hunger.

All Catholics killed in the disaster will be buried in the Catholic cemetery, at Monongahela City. Protestants identified will be interred as directed by relatives. All this will be done at the expense of the company.

To-night the undertakers are making preparations for many funerals to-morrow. When possible, the bodies of the victims ~~are being embalmed.~~ The bodies recovered to-night will be interred before Monday evening, owing to rapid decomposition.

Around the mine mouth to-night and the boiler house nearby, which is being used as a temporary morgue, there is a sickening odor. Disinfectants are being used in large quantities, and the situation is greatly relieved by the present cold weather. It is feared had the weather remained warm an epidemic of disease would have followed.

Fire Quickly Extinguished.

During the early day a small fire broke out in the mine. Several fire bosses, equipped properly, were rushed into the mine, and succeeded in extinguishing the blaze, before any serious damage resulted.

Reports have been in circulation all day that a second and more terrific explosion is liable to occur at any moment. The company officials allege this is not true. There is considerable gas in the mine, however, and there is danger of a second explosion.

Under orders from Coroner Sipe, the sale of intoxicating liquors has been prohibited in Marianna, and his orders that all intoxicated persons shall be escorted away from the scene of the disaster are being rigidly enforced.

MINISTERS PREACH ON MARIANNA DISASTER.

Uncertainty of Life Is the Theme Dwelt on in Many Pulpits.

Despite the fact that yesterday was World's Temperance day, and the fight between the church and the saloon was given consideration in many pulpits of the city, a number of pastors took advantage of Saturday's mine disaster at Marianna to turn the trend of their sermons upon the uncertainty of human life.

Upon theme: "We Know Not What the Morrow Will Bring Forth," the frailty of man in the eyes of his Maker was elaborated upon, showing that the lives of all men of all nations, are in the hands of a higher power.

Whether or not the mine disasters of the last year, happening as they have during the months of November and December, are a warning to those delving into the bowels of the earth, was commented on at some length.

Coal Dust Ignited At Marianna

Well-Known Mining Expert Reports to The Dispatch on Disaster's Origin.

REPETITIONS PREVENTABLE

Smuggling of Black Powder and Ignorance of Aliens Factors in Explosions.

THE DISPATCH presents below the report of J. L. Dixon, E. M., on the cause of the great disaster in the Rochel mine at Marianna. He is a nationally known mining expert, and was employed by THE DISPATCH specially to make his own investigation. THE DISPATCH similarly employed him to report on the Monongah and Darr mine disasters a year ago. The report is definite, and will be recognized as authoritative in mining circles.

By J. L. DIXON, E. M.

The Marianna mine, on account of the unprecedently large shafts designed for unprecedentedly large outputs, and because of the unstinted expense and care taken to make the mine all that could be desired in the way of safety, has become known far and wide as the model mine of the world, and notwithstanding the recent deplorable disaster it will yet become a model mine in safety, sanitary conditions and output.

I personally made an examination of the mine on 8th inst. to ascertain its present condition, and also the cause of the explosion on the 28th ultimo. I was surprised to see how little material damage had resulted from the explosion. There

J. L. Dixon, E. M.

were only a few falls, and these of a trivial nature, and so far as they are concerned the mine could be started up at any time. Of course, all along the entries there were unmistakable evidences of the explosion in the shape of tracks torn up, broken cars and small falls and overcasts torn down, but none of those manifestations of unmeasured and unmeasurable force so evident in recent coal dust explosions.

I found absolutely no gas in the mine, and this notwithstanding the fact that the ventilation had only been temporarily and partially restored, and many of the entry faces were from 100 to 270 feet ahead of the air. Here, if anywhere, there would have been gas, for, mark you, there are neither gobs nor rooms in this mine, nowhere as in most mines where gas could accumulate.

After my examination I would not have hesitated to have made the full round with a naked light, for the entire mine was entirely free of gas. On cannot say that no gas is given off, for in all mines in the Pittsburg seam more or less gas is given off, but in most of them not enough to be detected by an ordinary safety lamp in an ordinary current.

Four mine certificated foremen were employed in this mine. Mr. Kennedy, who was in charge, had just come up the shaft

Continued on Sixth Page.

Coal Dust Ignites at Marianna

Continued From First Page.

in company with Mr. Loutitt, the State inspector, who had completed his examination and declared the mine free from gas and in safe condition. The other three foremen lost their lives and were each found in the respective divisions under their charge. These faithful officers were Messrs. Crawford, Henderson and Hopkins, and Mr. Kennedy was spared only through a fortunate incident.

Mine Was Well Policed.

The above proves how well the mine was policed and is evidence of the fact that no question of expense was considered where the safety of the men was concerned, for whoever heard of four mine bosses for an undeveloped mine, and every other safety device to boot?

In its present condition the Marianna mine cannot be placed under the head of dangerous gaseous mines, and I say without hesitation that the explosion was not caused by gas, but there was an explosion most disastrous in loss of life, and not being of the opinion of the eloquent gentleman who said in a speech before the Mining Congress a few days ago: "The miner's lamp still burns in a chamber of unsolved mystery."

God forbid that we should fold our hands in despair and say these things are mysterious, or partake in any way of the mysterious. That is harking back to the days of yore when all explosions were attributed to the evil spirits of the mine and some young students of Padua were burnt at the stake by the ecclesiastical authorities for daring to dispute their dictum. But that's all pushed behind us long ago and far away.

There are only two agencies which cause explosions, gas and coal dust, separately or in combination. Ergo, if this was not a gas explosion it must have been a coal dust explosion. Such is my opinion and that it was assisted and made more virulent by whatever gas was being carried in the current. The cause of the explosion was a blown out shot in combination with a hitherto unrecognized condition.

Air Supply Was Ample.

In order to understand this fully it is necessary that the reader understand the layout of the mine and what has been done by the management of the Pittsburg-Buffalo Company to provide for the safety of its men. In the matter of ventilation the air supplied was more than ample. One hundred and fifty men were employed, and for each of these there was over 1,000 cubic feet of air furnished. The mine law prescribes 100 feet for each man, and in a mine where firedamp has been detected not less than 150 cubic feet per man. In this case more than 1,000 feet per man was furnished and was conducted by brattice within 12 feet of the face. In my opinion one-half of the air in circulation would have been amply sufficient to render the mine perfectly safe.

In addition to this copious ventilation the management had installed a first-class water system, and there is ample evidence that it had been faithfully used. No dust had accumulated on any of the roads. They had all been kept scrupulously clean. There was no gob, no old or disused places, no rooms in which dust or gas could accumulate, and yet notwithstanding I believe that it was a dust explosion. It was impossible that gas could accumulate in any place where such a tremendous current was in circulation, even granting that a large amount of gas was given off for a short time. I am still of the opinion that the enormous amount of air in circulation would dilute it below the explosive point, but there is absolutely no evidence of such an occurrence.

What Produces the Dust.

All of the work done in this mine so far is development work, consequently all the working places are narrow entries. There are about sixty working places in the mine; all of these are undercut by machines, blasted by safety powder (except when the miner smuggles in black powder) and loaded out by hand in the ordinary way. Every revolution of the mining machine, every turn of the drill, every blow with the pick, every shovelful of coal thrown back or into a car, and every yard the cars travel, each and every one of these operations makes more or less coal dust.

Take 60 places where these operations are going on continually, and to this the loaded cars constantly traveling along the entries, each car furnishing its quota of coal dust, then take into consideration the powerful current sweeping through the entries; imagine this current picking up dust in every place, carrying it along from entry to entry, the current accumulating more and more dust until it is surcharged; add to this the gas which the mine is making; keep in mind the fact that this dust-laden current is sweeping across the entry a few feet from the face; into this discharge a blown-out shot, which sends a tongue of flame 20 or 30 feet into the current which is traveling all around the mine, and you have the solution of this apparently mysterious explosion.

Direct Cause of Explosion.

The explosion was due to dust carried in suspension in the high velocity current, aided by whatever gas was being given out by the mine. There is some very convincing internal evidence which can be adduced in support of this solution. As I have already said, the explosion apart from the loss of life was not very destructive of property; it did not acquire force as it progressed. The manifestation of force was not cumulative as in mines of large excavated areas, where dust or gas had been allowed to collect. It was fairly uniform along the entries, showing the coking of fine dust on the ribs, by which the direction of the explosion could be ascertained. Most of the overcasts were destroyed, but none of the iron beams was twisted or broken, though most of the masonry was blown down. All of this indicates that the explosive was carried in the current and was not due to any accumulation of dust or gas.

On the day when the explosion occurred atmospheric conditions were just right for such an accident, and realizing this the president, John H. Jones, had sent letters to all his mines only a few days before, warning all his officials to take extra precautions and telling them the reasons why, and this was only one of many letters of the same import which had been sent out from time to time, which I have read, and noted the dates, all of them evincing the greatest solicitude for the safety of his miners. Not only has this solicitude been shown in the shape of letter, but in a manner more earnest and practical by sparing no expense, no time or trouble to eliminate all danger of an explosion.

Every Safety Device Used.

Not only this, but in addition he has not hesitated to seek advice from mining men everywhere, besides the experienced mine managers and mining engineers on his own staff. He has had advice from some of the highest-skilled men in the coal mining world, and men from abroad eminent in the mining councils of their own country have visited the mine and have been loud in their praises of its splendid condition and of its brilliant future. Then like a crash of thunder from a clear sky the appalling news is flashed across the continent and over the world that the Marianna mine has exploded and all its miners are lost. Soon with a heroism that no poor words of mine can depict those unsung heroes have descended to the black depths and find one solitary survivor, who by a miracle has been preserved and lives to tell of his awful experience.

No one, I think, will dispute or deny that the management of the Pittsburg-Buffalo Company have more than fully complied with the law and no unbiased mining man but will fully absolve them from any blame, and do them the justice to say that they have earnestly and unselfishly made the safety of their men their first consideration. An old Grecian proverb says, "God Himself cannot undo the past," but we can profit by the past and these men shall not have died in vain if by their deaths we can learn and put into effect lessons which will teach us to avoid such dreadful occurrences in the future. What are the lessons that we can learn from this explosion?

Ways of Preventing Recurrence.

First—That currents of high velocities are dangerous and I have already in the foregoing given some reasons why and other reasons will readily suggest themselves to the mining man.

Second—That you positively cannot trust the miners to care or look after their own safety. For example, at Marianna no black powder is sold or allowed to be sold and its use is absolutely forbidden by the company and yet the miners bought it on the outside, smuggled it into town, smuggled it down the shaft and used it there. This is not from hearsay; I had ocular evidence of the fact. When it is well known that the safety of all the men in the mine depends on the honesty, the carefulness and skill of each individual workman such a violation of the rules is unpardonable.

A blown-out shot is the result of ignorance or carelessness, or both, and when it is known that nine out of every ten explosions are caused by blown-out shots one cannot but doubt the wisdom of allowing the use of explosives by the mine crew. In my opinion we will continue to have frequent explosions as long as this condition obtains. If blown-out shots were not preventable and naturally incidental to and an inevitable feature of the mining it would be enormously add to the safety of mining and has some compensating features. It adds very greatly to the amount of lump coal and makes it better for shipping and rehandling, it conserves the roof and makes it less dangerous because not more than one-quarter of explosive is necessary. It gives a straight, unshattered rib on the track side, the benefit of which is appreciated when withdrawing the rib; it renders the mine more sanitary because of the enormously decreased amount of gases which are generated by explosives.

Above all and immeasurably before all it would abolish the deadly blown-out shot of which we are in constant dread. But notwithstanding these obvious advantages it cannot be denied that this method would add materially to the cost of coal. In fact, nearly all measures for safety do add to the cost, and we cannot afford to ignore this. The price of coal is far too low. In Europe coal brings three times as much at the mine as it does here. We have the cheapest fuel in the world and we are proud of it, but we are not proud of the price at which it is mined.

Law Must Be Invoked.

If the reformations I have suggested are adopted they ought to be enforced by law so that the burden would fall equally on all, and all miners equally share in the benefits to be derived therefrom. I would like to say something here about the enormous loss of life from other causes, especially the loss of life and injuries from falls of roof and coal, which are very much in excess of deaths by explosions, but are not noticed because death steals them away quietly by ones, twos or threes, but the annual death list is appalling and equally as disgraceful as appalling.

It makes one blush with shame to read that in little Belgium, where are situated the deepest and most dangerous mines in the world, their death rate last year was .9 of a man for every thousand men employed, while in the United States it was 4.86 men for every thousand men employed, and in one State it ran up to 12. These figures include fatalities from all causes and need no comment from me. They are a standing disgrace to the mining community and to the Government of this country. Ninety-five per cent of all miners killed or injured by falls of coal or rock meet with these accidents in the immediate working face. A small percentage of these are possibly unavoidable, a small percentage due to carelessness, but the great majority are due to inexperience and ignorance, and this is not surprising when we take into consideration the fact that hordes of peasantry from nearly all over Europe, who never saw a mine, are set to work where dangers surround them on every hand.

Ignorance of Aliens.

They have no idea how to protect themselves or how to avoid these dangers, and are a constant menace to the safety of others. These men are with us, and they are here to stay, and the only solution is education. We must teach these men how to care for themselves. We must impress on them the fact that the safety of all depends on the care of each one. We must make them realize the responsibility they have assumed in entering a coal mine. This is not an impossible thing; it can be done and by the method I am about to outline. The death list can be immediately reduced and in a comparatively short time we will in this respect compare favorably with any country in the world.

Pittsburgh, Pa., Mar. 5, 1909.

Chronicle-Telegraph

Two More Bodies Found.

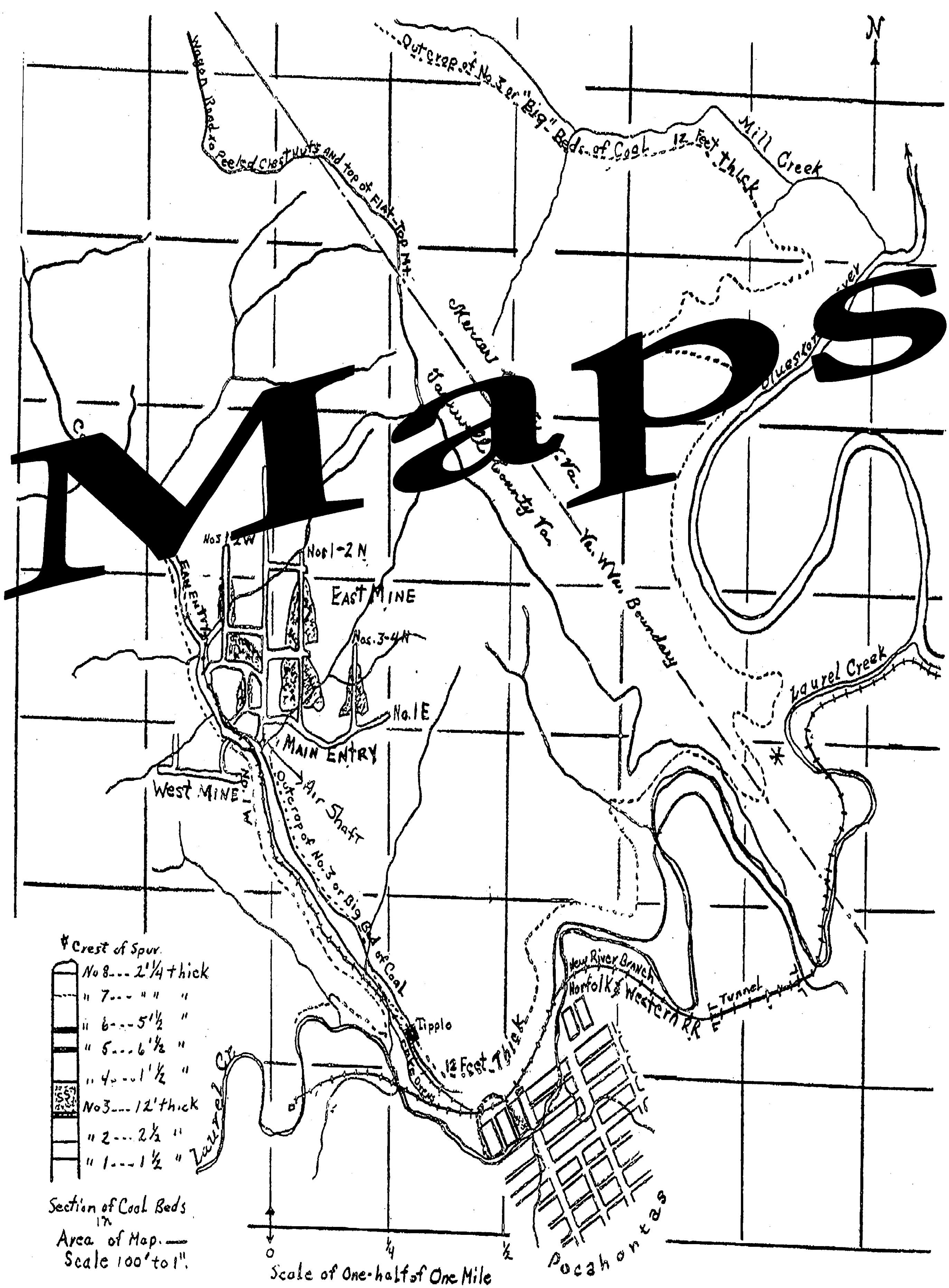
Monongahela City, Pa., March 5.—Two more bodies were found in the ill-fated Marianna mine yesterday afternoon. The miners were cleaning out a "sump hole," which is used to drain the water in the mine and which is afterward pumped out of the mine, when they found the bodies of the two miners. There was a leg and arm off one body. Both bodies were decomposed and their features could not be recognized. The coroner was notified. It is supposed the men were knocked in the "sump hole" by the explosion.

Press

Two More Bodies Taken From Mine

Monongahela City, Pa., March 5.—Two more bodies were found in the ill-fated Marianna mine yesterday afternoon. The miners were cleaning out a "sump hole," which is used to drain the water in the mine and which is afterward pumped out of the mine when they found the bodies of the two miners. There was a leg and arm off one body. Both bodies were unrecognizable. It is supposed the men were knocked in the "sump hole" by the explosion.

Maps


N
Outcrop of No. 3 or "Big" Beds of Coal 12 Feet thick
Mill Creek
Wagon Road to Peeled Chestnuts and top of Flat-Top Mt.
Mercer Co. W. Va.
Tazewell County Va.
Va. W. Va. Boundary
Bluestone River
No3 1-2W
No1-2 N
EAST MINE
Nos. 3-4 N
No. 1E
MAIN ENTRY
Fan Entry
West MINE
Air Shaft
Outcrop of No. 3 or Big Bed of Coal
Laurel Creek
New River Branch
Norfolk & Western R.R.
Tunnel
Tipple
12 Feet Thick
Laurel Cr.
Crest of Spur.
No 8 --- 2' 1/4 thick
" 7 --- " "
" 6 --- 5' 1/2 "
" 5 --- 6' 1/2 "
" 4 --- 1' 1/2 "
No 3 --- 12' thick
" 2 --- 2 1/2 "
" 1 --- 1 1/2 "
Section of Coal Beds in Area of Map. — Scale 100' to 1".
0
1/4
1/2
Scale of One-half of One Mile
Pocahontas

Map

—:LEGEND:—

A-SHOT HOLE TAMPED WITH COAL DUST.

B-PAPER CARTRIDGE FILLED WITH SLACK COAL, FOR FUTURE USE IN TAMPING SHOT.

C-CAN OF BLACK POWDER.

D-HEAVY GAS BLOWER FROM CLAY VEIN.

E-GAS OVER FALL IN ROOF.

F-LOCATION OF SUPPOSED SECONDARY EXPLOSION.

G-TWO HEAVY BRICK STOPPINGS BLOWN DOWN.

H-STEEL I BEAMS AND BRICK WALLS DISRUPTED.

I-GAS BLOWER FROM MACHINE CUT.

J-SHOT HOLE THAT HAD BEEN TAMPED WITH CLAY.

K-LOCATION OF BLOWN OUT SHOT AND PROBABLE ORIGIN OF EXPLOSION.

E:-

NUMERICALS REFER TO LOCATION OF BODIES AS FOUND AFTER THE EXPLOSION.

→ ORIGINAL FORCES.

➡ ACCUMULATING AND REACTORY FORCES.

➡ FORCES SHOWING GREATEST VIOLENCE.

MARIANNA MINE

— OF THE —

PITTSBURG – BUFFALO CO.

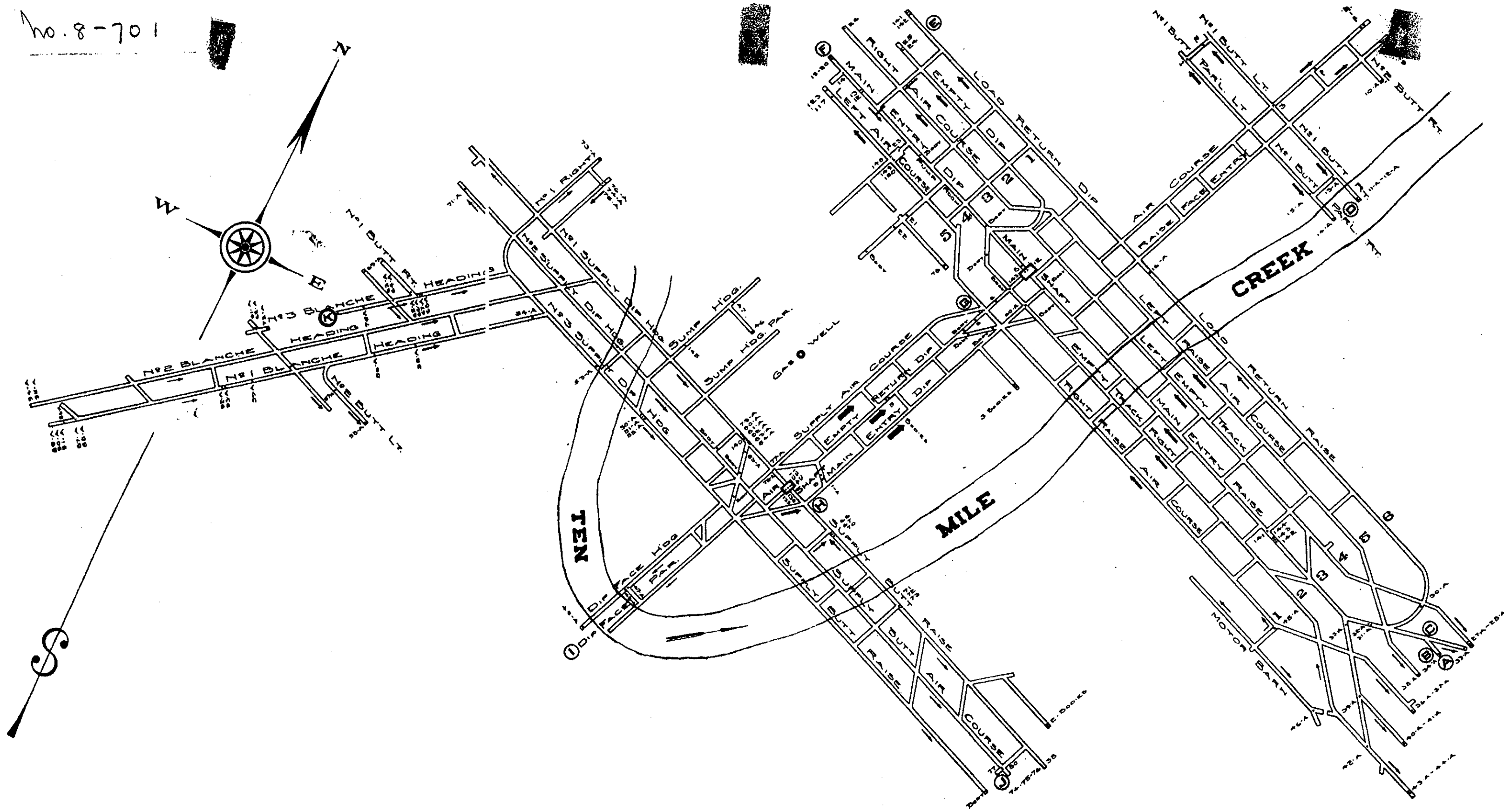
MARIANNA, WASHINGTON CO. PA.

SCALE 1" = 250' UNIONTOWN, PA. NOV. 28, 1908.

NOTE:- REDUCED FROM BLUE PRINT OF 100' MINE MAP, BY E. POWELL.

701

No. 8-701



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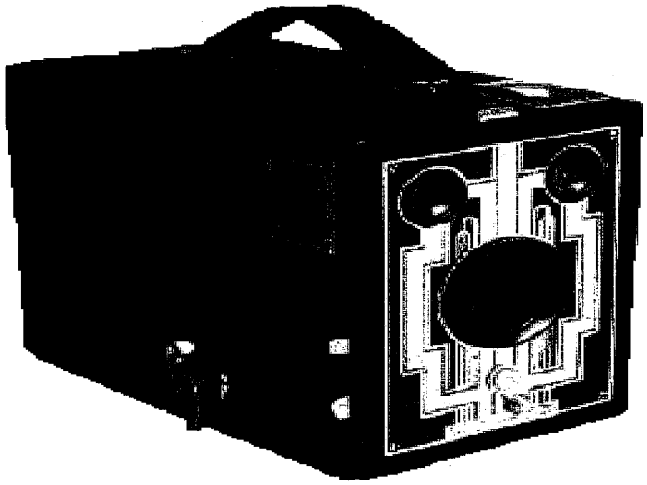
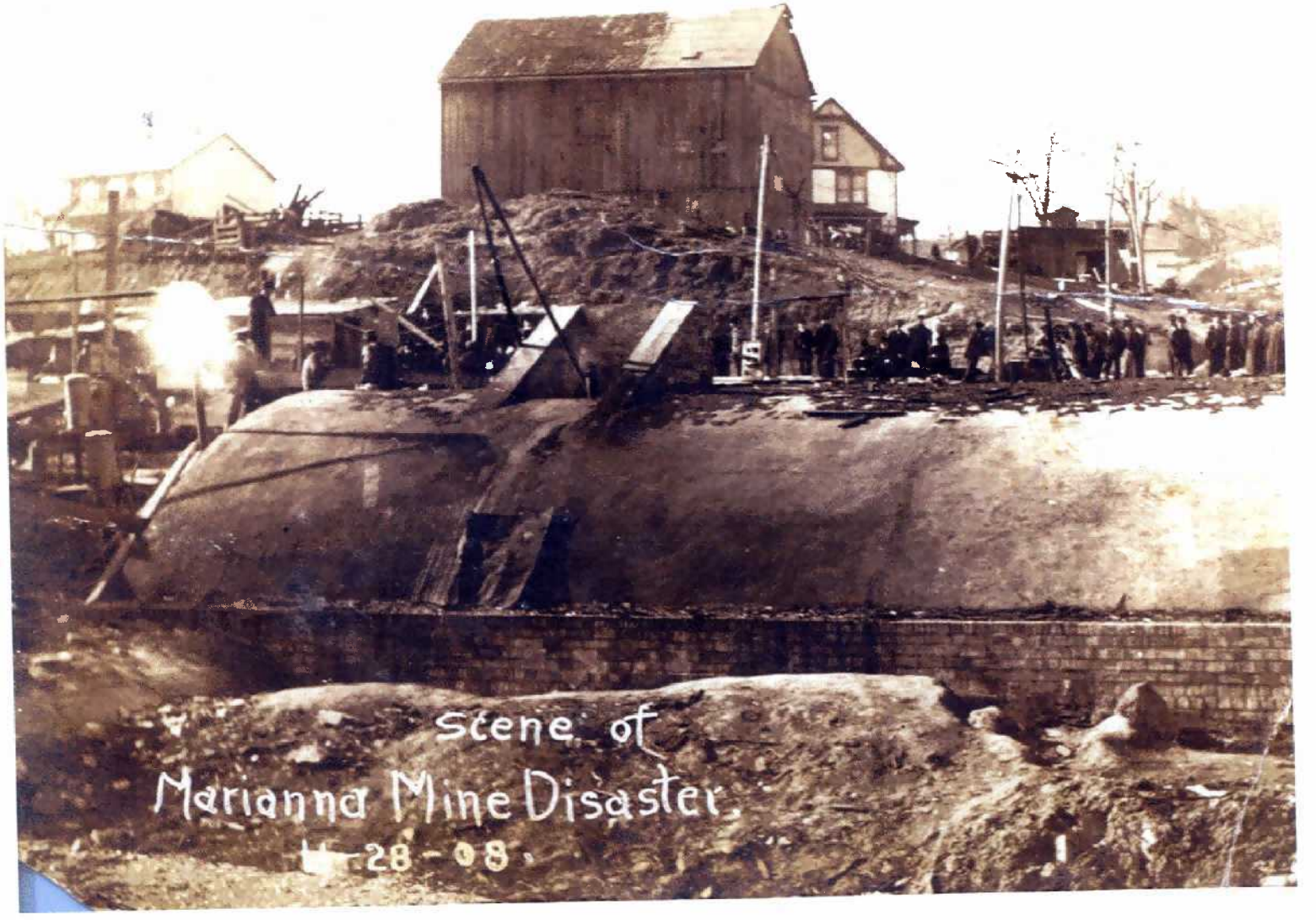


Photographs


Scene of
Marianna Mine Disaster
28-08


P. R. R.
28
PSCWI
Marianna Mine Disaster
Nov 28, 1908

Marianna Mine Disaster 1908

Photos from:

Wells C. Hammers

507 Woodward Avenue

Charleroi, PA 15022

(724) 483-1227

Mr. Hammers works at Cumberland Coal Mine in Kirby, PA, UMWA Local 2300 Member

MARIANNA MINE DISASTER 1908

PHOTOS FROM

WELLS C. HAMMERS

FROM CHARLEROI, PA

WORKS AT CUMBERLAND COAL MINE IN KIRBY, PA

UMWA LOCAL 2300 MEMBER

PHOTOS GIVEN TO HIM BY HIS GRAND FATHER WILLIAM LILLY WHO WORKED IN NEMICOLIN MINE IN NEMICOLIN, PA

HIS GREAT GRANDFATHER IS IN PHOTO OF MASS GRAVE FRONT ROW FAR RIGHT

HIS NAME WAS ALEXANDER LILLY WAS ALSO A COAL MINER

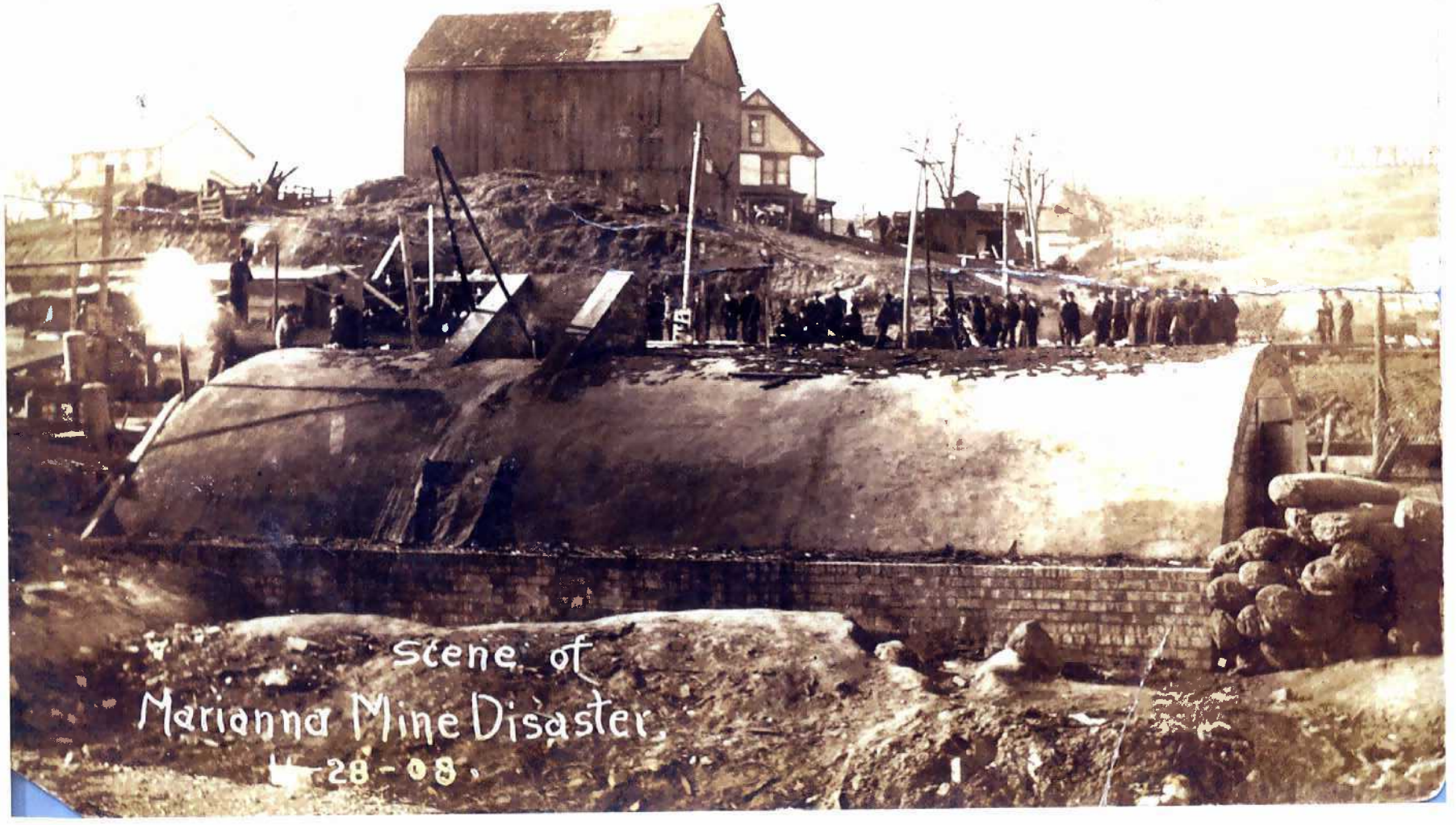
TRACING FAMILY HISTORY BACK FAMILY CAME FROM SCOTLAND AND MOST MEN IN THE FAMILY WERE COAL MINERS IN SCOTLAND.

WELLS HAMMERS

507 WOODWARD AVE
CHARLEROI, PA 15022

(724) 483-1227


Temporay Morgue for Victims of Marianna Mine Disaster.
11- 28 - 08.


Scene of
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Marianna Mine Disaster 1908

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P R R K
28
PSCW
Marianna Mine Disaster
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