

Colorado Fuel and Iron Company from all blame in said accident and death.

"J. M. STEELE,
"Foreman.

"SAM. BROWN,
"ALEX. LINDSEY,

"J. W. BOYD,

"T. E. GUFFS,

"W. C. HUNT,

"Jurors.
"DR. J. B. WRIGHT,
"Coroner."

SPECIAL REPORT ON THE SUNSHINE COAL MINE EXPLOSION

To His Excellency,
ALVA ADAMS,

Governor of Colorado:

Dear Sir—In compliance with your wishes, I humbly submit to you my report on this sad disaster.

LOCATION OF MINE.

The Sunshine mine is situated about sixteen miles south-east of Glenwood Springs, the county seat of Garfield county, on a branch of the Colorado Midland railroad. Four-mile creek is flowing in an easterly direction through the mining village, bearing the same name as the mine.

OWNERS AND OPERATORS.

The Grand River Coal and Coke Company commenced operations on this property in 1887, and operated the mines continually up to the fall of 1892, when the property was transferred to its present owners, The Colorado Fuel and Iron Company. From the time of transfer up to the fall of 1895, very little mining was done on the property. In the fall of 1895, and up to June 1, 1897, the property was operated under a lease by Messrs. Renstrom & Ludlum, and since June 1, 1897, the mine is operated and managed by The Colorado Fuel and Iron Company.

MANAGEMENT OF THE MINE.

Mr. J. A. Kebler is second vice president and general manager of the company; Mr. W. P. Thompson, general superintendent; Mr. Harry J. Elliott, local superintendent, and Mr. B. L. Davies, mine foreman.

GEOLOGICAL FEATURES OF THE PROPERTY.

The coal-bearing measures at Sunshine are very thick, and belong to the Laramie series. They contain several workable seams of coal. A, B and C seams underlie the Sunshine seam, which is the fourth in geological order, and about nine feet in thickness. The measures dip westward about 40 degrees. Four-mile creek flows easterly, nearly at right angles to the strike. At the dumping location, the hills on the north rise abruptly to an elevation of 750 feet above the bed of the stream, a partial cross section of the coal-bearing measures being prominent. On the south side of the stream, the hills rise gradually and attain an elevation of about 1,100 vertical feet above the bed of the stream, the measures being entirely obscured by a varying thickness of debris and vesicular lava boulders. The present workings are confined to the south side of the stream.

CHARACTER OF COAL.

The coal of the Sunshine seam is hard and compact, lustrous in appearance, and a free-burning nature, and is considered the best coal in the series for domestic use, and during the winter months the product is in great demand.

ANALYSIS BY GEORGE C. TILDEN.

Water	3.40 per cent.
Volatile matter.....	40.32 per cent.
Fixed carbon.....	48.82 per cent.
Ash (light brown).....	7.46 per cent.
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No sulphur.	100.00 per cent.

MODE OF WORKING, ETC.

At a point a little below the outcrop of the seam in the bed of the stream, a high trestle, spanning the cañon, has been constructed, from which the product is dumped into the railroad

cars. The No. 1 levels on the north and south sides are driven on the strike of the seam, and on the same plane as the trestle. A small range of coal has been worked from lower levels, called the slope levels, which, with Nos. 1 and 2 levels, have been worked out. The present operations are confined to Nos. 3 and 4 levels on the south side. The product is dropped down the brow of the hill by a gravity plane from No. 3 level to the same dumping location. The product of No. 4 level is dumped into a counter chute (No. 22 room in third level) and reloaded for further transit. The rooms are turned up the pitch about forty-three feet from center to center, and are driven narrow for about twenty feet; then the rooms are widened out to thirty feet, thus leaving about thirteen-foot pillars between rooms. About fifty feet of a chain pillar is left under each level. This pillar is penetrated by a narrow cross-cut as often as it becomes necessary to connect the levels for the better conduction of the air current.

VENTILATION OF THE MINE.

No artificial means of providing ventilation has been used in the upper workings of this seam. The current of air is produced by a difference of two hundred feet in the elevations of the levels; therefore, the direction of the current and the amount circulating through the workings is dependent on the natural conditions of the atmosphere. During the summer months, the air enters the upper level and comes out through the lower level. In the winter months the direction is reversed, and the amount circulating slightly increased. Average volume of air circulating, about twelve thousand cubic feet per minute. This quantity was passing through the mine the day after the explosion, and the natural conditions being the same, we have every reason to believe that the same amount was passing at the time of explosion. During our term of office the working places were never better supplied with air, which was not due to an increase of volume passing, but to the better conduction of the same.

GENERAL CONDITION OF THE MINE.

We made several inspections of this mine at the time it was operated under a lease by Messrs. Reustrom & Ludlum, and found the entries and rooms at all times well secured and in excellent condition. The air volume passing in and out of the mine was adequate to keep the working places in a sanitary condition, but they lacked in its conduction.

On the ninth of June, I made an inspection of the mine, and found the third level in a deplorable condition; timbers were broken in several places, other places were too narrow for the cars to pass, etc. Briefly, the entry was not safe for travel and haulage. Mr. Davies, mine foreman, informed me that he had only been in charge for a few days, and that he would have same secured with all possible haste. On arriving in Denver, I wrote Mr. H. J. Elliott, superintendent of the mine, a letter (copy of same in the records), asking him to give the matter his immediate attention. A few months previous to the expiration of their lease, Reustrom & Ludlum were aware that the company intended to operate the mine themselves. Thus the neglected condition of the mine is obvious—saving expenses.

On the third of August, John D. Jones, assistant inspector, made an inspection of the mine, and reported as follows: "The general condition of this mine has been greatly improved since our previous visit. The haulage roads have been retimbered and are now in good shape. The ventilation has received marked attention, as the air is conducted through the working faces and not allowed to escape through the old workings, as it usually did." So the dangers we knew to have existed had been rectified. In the slope level, on the north side, a small quantity of explosive gas was encountered near the fault. In all the levels on the south side, no explosive gas has ever been found, and if it existed, it would have been discovered transpiring through the holes used for blasting and set off by the naked lights used by the miners. Thus, I conclude that the mine was absolutely free of any accumulations of explosive gas. The dusty condition of the mine we never considered to be dangerous. No accumulations of dust were allowed on the entries and the room workings are naturally moist. If we classify the coal mines of Colorado into dust-producing and dust-suspending magnitudes, placing a very wet mine for a base with a maximum of ten for the most dusty, the Sunshine mine would be about the fifth magnitude. In the winter months the overlying hills are snow-clad, and the underlying strata is kept moist by the thaw; in the autumn months the mine is drier than at any other time. However, we had no cause to be alarmed of any existing danger from the dust in the mine, and I am satisfied that neither the miners working therein nor the management thereof had any idea of dangerous conditions existing in the mine. Mr. Davies, the mine foreman, is an experienced coal miner, having been in charge in or around the coal mines of this

field since operations commenced in 1887. If he had known of any dangerous conditions existing, I am sure he would have advocated precautionary measures to avoid an explosion, and I have every reason to believe that any measures advocated by him would be adopted by the company.

TIME OF THE EXPLOSION.

The explosion occurred about 5:45 p. m., September 3, 1897. The time allotted for firing all the shots in the mine was from 5:30 p. m. to 6 p. m. On this day the mine was not in actual operation. The miners working therein were engaged in getting coal ready for the next day's run, and the three company hands were engaged in repairing the entry. We were notified of the explosion by wire on the same evening, and on the Monday morning following the jury (six in number) accompanied myself and deputy to the scene of the accident, and we made a thorough examination of the mine, with a view of finding the cause of the explosion.

CAUSE OF THE EXPLOSION.

I have elsewhere stated that no explosive gas, $C H_4$, had ever been found in the seam on the south side of the cañon; therefore, it was not an explosion of gas. Some of the jury were inclined to believe that the explosion originated from a keg of powder, and if not thus originated, that it had been augmented by powder. This hypothesis was greatly strengthened by the testimony of the first explorers, stating that there was an unusual amount of powder smoke in the mine after the explosion. However, on careful examination of the entry, we could not find any evidence of a powder explosion. I have every reason to believe that if a keg, or even less powder, had exploded, that we could easily have localized the same. Furthermore, on close investigation, there was no powder missing in any of the working places. On examining all the working faces, we found that all the shots had been exploded and that their burden had been removed in the ordinary manner, with the exception of one shot in room 41. This had been exploded, but a portion of the hole, about two feet, was left in the solid; the burden was not too great to be removed. Therefore, I am of the opinion that the hole did not have sufficient powder. It was customary for the outside room men to have their shots fired in turn, the entry being last to fire. It will be observed that the air current going out through the third level was passing through the

room faces and coming into the entry at room 40. Previous to the morning of the explosion, the air entered the entry at room 38. During the day the manways in rooms 38 and 39 had been closed, thus confining the air current into room 40. Now, it is obvious that the shots exploded in the outside rooms agitated and produced dust. The same being cumulative, was carried in suspension into the entry by the air current. In our observations after the explosion, we found that intense heat had been created in the entry at room 41. This, in my opinion, was the initial point of explosion; through the agency of heat, chemical action took place, explosive ingredients were formed, and the dust in suspension from the outside shots augmented the same.

At no time during our term of office had the working places been so well ventilated, and I candidly believe that by putting the working places in a healthier condition, at the same time, explosive conditions were aggravated. This can be accounted for in the following manner: When the working places are not well ventilated, the air is contaminated by exhalation, powder fumes, burning of lights, etc. A great percentage of oxygen, the life and great supporting element of combustion, is absorbed, and carbonic acid gas is formed, in the presence of which a dust explosion is not liable to occur, if not rendering the same impossible.

EFFECT OF THE EXPLOSION.

The disastrous effect of the explosion was confined to the third level. All the rooms off this level were found in their normal condition, and no evidence of unusual commotion was found in the face of the entry. At room 41 the dust particles were slightly charred, the same having a glazed appearance under the microscope, and the chips on the "caps" were scorched. From this point outward we did not find the effect of heat on any of the timber, or any other susceptible materials. The first explorers state that the bodies found at room 30 were burned worse than those found near room 16, indicating that the heat, developed in the explosion, diminished in its outward course. The direction and intensity of the force of the explosion were easily obtained from the position of the bodies (when found) and the gatherings on cars, timber, etc. From room 38 to room 18, the gatherings on the timber increased perceptibly, and increased from there outward. Very little damage was done to the entry; a few sets of timber had been removed at the mouths of the abandoned rooms, thus leaving small quantities of slack

coal to slide on to the entry roadway. The timber that was removed did not have a great weight to sustain, and only on one place in the entry did a small fall of coal and slate occur. The force of the explosion was not very violent; if it had been, the damage to the entry would have been much greater. However, the force was sufficient to kill all the men who were on the entry, twelve in number, and from the position in which their bodies were found, their deaths must have been instantaneous.

NAMES AND OCCUPATIONS OF THE VICTIMS.

John Mattivi.....	Miner
Joe Cassagrande.....	Miner
John Andreatte.....	Miner
Emil Andreatte.....	Miner
Anton Eppich.....	Miner
John Joanning.....	Miner
Louis Rissl.....	Miner
Anton Martintoni.....	Miner
Louis Zaunin.....	Miner
Francis McCloud.....	Driver
Theodore Pallassi.....	Loader
Louis Andreatte.....	Timberman

PRECAUTIONARY MEASURES NOW ADOPTED.

A few days after the explosion, I had a consultation with Mr. J. A. Kebler, and Mr. W. P. Thompson, general officials of the company, and the following precautionary measures were outlined, and are now adopted in the mine:

First—Two men are appointed for shot firing, and all holes shall be drilled and charged under their direction.

Second—No men allowed in the mine at firing time, only those aforesaid appointed.

Third—Wood pulp to be used exclusively for tamping the holes.

Fourth—The "Atlantic flameless powder" is used in the entries; black powder to be used in rooms, and all coal to be mined.

Fifth—No more than the requisite amount of powder for use in one day to be kept in each working place.

The shot firers are specially warned that if excessive concussion is produced under the present regulations, they are to

report the same at once, and the officials of the company will have the shots fired by electricity.

All the precautions thus adopted are not covered by the present statute law governing coal mining in Colorado; therefore, it is obvious that the present law should be revised. The dangers encountered in coal mining are so diversified that too many precautions can not be taken for the protection of the health and life of our coal miners.

EXPLANATIONS ON MAP.

Arrow indicates direction of air current.
"O" indicates points where bodies were found.

CONCLUSION.

In this report I have endeavored to give you all the facts relating to the subject. If anything has been omitted that I can more fully explain, I will do so with pleasure, and be at your command.

I am,

Your obedient servant,

DAVID GRIFFITHS.

VERDICT.

Attached find verdict of jury:

"We, the undersigned, after hearing all of the evidence and making a personal examination of the mine, find that the said deaths were caused by an explosion, the origin or cause of which is to this jury unknown.

"T. W. THOMAS,

"J. R. DE REMER,

"F. M. PAGE,

"C. V. MESTICK,

"M. DEMASTRIO,

"FRED C. SCHRAM,

"Jurors."