

clear when the shift started, hence the direct cause of how the increased accumulation came about can only be conjectured. If the air current had been cut off, or even reduced, we would naturally attribute it to such, but facts, as brought out by the evidence obtained through different sources, proved that the ventilation was at normality. There was no powder used in that particular section, and I did not discover the remotest evidence to indicate that dust took any active part in the explosion. Therefore, it can only be attributed to a sudden inflow of gas brought about by the squeeze of the superincumbent strata opening up fresh pores and thus exposing new feeders, and it is possible that the rapidity of transpiration of the gas was also augmented by a simultaneous fall of barometrical pressure.

While the cause of the explosion can not be charged to any negligence on the part of the officials, yet the occurrence teaches us that when pillars are being drawn under conditions so susceptible to a sudden inflow of gas from roof caves, and this occurring only locally and no danger for the same to reach any other part of the workings, safety lamps should be used exclusively in such particular districts.

JOHN D. JONES.

VERDICT OF JURY.

"That the above named men came to their death at Maitland mine at about 9 a. m., February 19, 1906. We furthermore find that the above named men came to their death by the suffocation caused by an explosion of gas in the fourth west Sunshine entry in No. 4 or 5 room of the Maitland mine. We, the jury, find, according to the evidence produced before us, that the death of the above named men was an unavoidable accident, and every known precaution which miners could take was taken to avoid the same.

"(Signed)

"E. L. TROUNSTINE,

Foreman.

"A. B. ONEIL,

"ROBERT YOUNG,

"RICHARD WEIN,

"VICTOR SANDOVAL,

"CARPIO ARCHULETO.

"S. JULIAN LAMME,

"Coroner of Huerfano County."

THE CUATRO EXPLOSION.

An explosion of "fire damp" occurred in the second north opening of the Cuatro mine at 10:25 a. m. (Sunday), April 22, 1906, and caused the deaths of nineteen persons.

LIST OF DEAD.

Name of person	Nationality	Occupation	Age	Single or Married
Frank Lisyak	Slav	Miner	..	Married
John Wrable	Slav	Miner	41	Married
Matt Ceroli	Slav	Miner	39	Married
Frank Smreka	Slav	Miner	30	Married
Albin Sulc	Slav	Miner	33	Married
Mike Coraz	Slav	Miner	38	Single
V. O. Manley	American	Driver	27	Married
William Reese	American	Fire-Boss	32	Married
Ernest Delaney	French	Miner	18	Single
Charles Delaney	French	Visiting Father	8
Fred Delaney	French	Miner	48	Married
Joe Depasse	French	Miner	28	Married
Paul Amichaux, Jr.	French	Miner	18	Single
Paul Amichaux	French	Miner	52	Married
Louis Torrosini	Italian	Miner	33	Single
David Manapace	Italian	Miner	25	Single
Pete Faure	Italian	Moving McGinties	29	Single
E. Manzuno	Japanese	Miner	26	Single
K. Kome	Japanese	Miner	38	Single

LOCATION, ETC.

The mine is located near the terminus of the Colorado & Wyoming Railroad, three miles west of Tercio, and thirty-four miles west of Trinidad, Las Animas county. It is owned and operated by the Colorado Fuel & Iron Co. The plant contains five independent openings, four drifts and one slope, all situated near the bottom of the narrow canyon and having their entrances within a radius of 150 feet of each other.

EXTENT OF OPENING AND METHOD OF MINING (WORKING).

The second north, the only opening considered from now on in this report, consists of two parallel entries, main and air course, which are in to a distance of nearly 4,000 feet, and 81 rooms. All the rooms are turned off the main entry, and are driven square up the pitch of 16 degrees, to a maximum distance of 500 feet. Operations are conducted on the "room and pillar" method. The vein has an average thickness of four and a half feet, and the coal is mined by blasting. All shots are fired by a "shot-lighter" when all the other employees are out of the mine and naked lights are used exclusively. There were forty-three men in the mine at the time of the accident.

VENTILATION, CONDITION OF MINE, ETC.

The ventilation is effected by means of a furnace which is, under ordinary conditions, capable of producing 10,000 cubic feet of air per minute, with a maximum capacity of about 12,000, and the air is conducted through the workings in one continuous current. During our previous inspections of the mine we never discovered the slightest trace of "fire damp" in any part of its workings, and the monthly and annual reports of the mine's officials, furnished regularly to the State Coal Mine Inspector's Department, does not contain record of any explosive gas having been found by them. Yet, as a precautionary measure, the mine is, and has been ever since its commencement, examined every morning by a fire-boss, whose daily report, which is kept at the mine office as per requirements of section 19 of the mining law, also showed that the mine was free from gas to date. It is the practice of the fire-boss to examine the old workings once each week, and the deceased "fire-boss" record book showed that he had made the usual weekly examination the day previous to the accident, and had reported as follows: "April 21st, 7 a. m., all goves examined and clear; air courses in fair condition." Signed, Wm. Reese.

Herbert Tyber, miner, who was working in the main entry, upon being questioned, testified that he filled the capacity of fire-boss in the mine for two years, from June, 1903 to 1905, and that he never detected any explosive gas in the mine during the entire period, nor any time after. I questioned several others who had worked in the mine, and all stated that they never had seen any indication of gas to exist there. Therefore, until the time of the explosion naturally the mine was regarded absolutely "non-gaseous."

DAMAGE TO MINE.

The displacement of one set of timber and all the cross-cut stoppings between the main entry and air course, from mouth to No. 29 room, included all the damage done to the mine.

RESCUING, LOCATION AND CONDITION OF VICTIMS.

Soon after the explosion occurred, a rescuing party, headed by Superintendent McDermott, entered through the main entry. The air was heavily contaminated with "fire damp," and they rebuilt temporary stoppings to restore the ventilating current as they advanced. Wm. Reese, fire-boss, E. Manzuno, miner, who worked in room 49, Richard Bickerton, foreman, and Claude Amichaux, driver, were found lying together on the entry between rooms 6 and 7. They were still alive, but unconscious, and it was after being removed to the surface that the first mentioned above died. Bickerton and Amichaux revived through the assistance of artificial respiration, and have since recovered from the effects of the burns inflicted upon their hands and faces. Evidence has shown that the other victims were all located be-

yond the extreme limit covered by the explosion when it occurred, and that they died from suffocation afterwards while making an effort to escape to the outside through the after damp filled passages. Albin Sulk, Mike Coraz and Joe Depasse were found on the main entry between rooms 17 and 28, in a state of unconsciousness. They were hastened to the surface, and artificial respiration was immediately applied, but to no avail. These three and a Japanese by the name of Y. Haro worked in room 29, and, according to Haro's statement, when they felt the shock caused by the explosion, all rushed towards the entry. Upon discovering that the passage to the outside was filled with after damp. Haro remarked to the others that "there was too much smoke," and he returned to work, but the other three rushed outward along the entry and were overcome at the points designated above. Haro walked out safely in about two hours afterwards. The bodies of the other fourteen victims were found in the main air course from a point opposite rooms 17 and 29. All these men were working from room No. 50 in, and suffocated while trying to pass through the air course. Victor Amichaux, who fell with the rest of the victims in the air course, recovered.

OUR INVESTIGATION AND CAUSE OF THE ACCIDENT

In company of J. D. Griffiths, deputy inspector, I arrived at the scene of the accident on the morning of the 24th. The only two men who were directly in the path of the explosion, that survived, namely Bickerton and Amichaux, at this time had gone to the company's hospital at Pueblo for treatment for their burns. Therefore, no available witness was at hand to testify what had been the direct cause of the explosion. Soon after our arrival we proceeded into the mine and were accompanied by Messrs. J. T. Kebler, general manager, Robert O'Neil, division superintendent, and Wm. McDermott, local superintendent. The condition along the main entry gave conclusive evidence from blacked props, etc., that the force of the explosion was confined exclusively to the territory lying between the entrance and room 26. Room No. 29 was the outer place in operation the day of the explosion, and all rooms from No. 29 out, excepting Nos. 7 and 8, both of which were idle at the time, were worked out and abandoned. Knowing that there were no shots fired, and that no one was working directly in the affected district, we naturally concluded that the explosive gas had unexpectedly accumulated in the abandoned district, and that the same had worked its way to the entry and there was ignited by one of the victims while passing along the entry. With this first supposition, we started at the outside rooms and made a thorough examination of the old workings as we advanced. When we reached room 27, the direct cause of the explosion was distinctly disclosed. Here a body of fire damp stood within 35 feet of the entry. It was discovered by Superintendent McDermott, who happened to be the first to enter the place. After this discovery we made a close examination of the props at the mouth of

room 27, and found the bark on them to be heavily charred, indicating that the heat had been very intense at this point. Room 27 is located near the center of a double parting, extending from No. 25 to 28; it is 55 feet in length and 18 feet wide. Between rooms 28 and 29 a fault cuts the seam at such an angle that the last few rooms on its outside were cut shorter than the usual length, and each had been driven to the fault.

In room 27 was a fall of roof which extended from a point 35 feet from the entrance to the face, a distance of about 20 feet, and throughout the width of the room. It was in this space the gas accumulated. We made a thorough examination of all the workings, and it was only in 27 that we found explosive gas. The room adjacent, No. 26, is about 50 feet longer than 27, driven against the same fault and having a larger fall at its face, but it was perfectly free from gas. The fall of the roof at the head of room 27 had opened a 2 foot vein of coal from 6 to 8 feet above the main seam, and it is very probable that the gas issued from this top vein.

When the above investigation was made, we knew that the four men found between rooms 6 and 7 were the only men within the direct embrace of the effective force of the explosion, and Bickerton and Amichaux, two of said four men, were, as stated above, at the hospital. Both have recovered from their injuries, and are now back at work. Since their return I made another investigation for the purpose of securing, if possible, information how and by whom the gas was ignited. Mine Boss Bickerton stated that "he and Wm. Reese, fire boss, were standing at the mouth of room 27, both unaware of the fact that gas existed, and that Reese entered the room with his naked light, and thus the gas ignited and the explosion followed. They both hurried back together over the entry, and when they reached the point given above, they became exhausted and fell. Amichaux was on his way out with a loaded trip, and Manzuno was riding with him."

The quantity of gas which was exploded being comparatively small, it was quite impossible for the volume which exploded to have made the volume of "after damp" which was found in the mine after the explosion.

The entry from 27 out to the mouth of the mine was dry, but free from excessive accumulation of dust, and from the statements of parties examined, was occasionally sprinkled for the purpose of laying the dust generating from the continuous grinding of the cars, and otherwise upon pieces of crumbling slate from the roof as well as coal particles. From 27 in, the entry was wet. Some of the props along the entry from 27 out were slightly coated with dust cokings, and I can account for the large volume of "fire damp" in no other way than from the fact that the gas explosion was accompanied by a slight explosion of coal dust along the course of the entry.

Great credit is due to John Mazzini, track layer, for the presence of mind and courage he displayed during the awful period

when he and many others were shut off by the fire damp. He stood on the entry at a point inside of where the after damp reached, and advised the men to stay inside and that they would be rescued in time. Had the fourteen men who died in the air course and the three from 29 remained inside, they, too, would have been saved, for the after damp was gradually forced into the air course and out as the rescuing party rebuilt the "stoppings." The little boy, Charley Delaney, who was visiting the mine with his father, Fred Delaney, was among those who died in the air course. He was not employed in the mine, and only unfortunate enough to visit it on this unlucky day.

Attached is a copy of the coroner's verdict, as rendered by the jury.

JOHN D. JONES,

VERDICT OF JURY.

An inquisition holden at Cuatro mine, in Las Animas county, State of Colorado, on the 24th day of April, A. D. 1906, before E. W. Coney, acting coroner of said county, upon the body of Frank Lisyak and eighteen others, there lying dead, by the jurors whose names are hereto subscribed; said jurors, upon their oaths, do say that the cause of the explosion was gas. Deaths due to suffocation caused by after damp. No criminal negligence on part of officials or employes of same.

In testimony whereof, the said jurors have hereunto set their hands, the day and year aforesaid.

W. H. WITNACH,
BURT MILLER,
HARRY BIRD,
SAM WILLIAMS,
JOE SOAROTTO,
WM. TYLER,

Jurors.

Attest:

JAMES G. ESPY,
Coroner of Las Animas County.

ESTIMATED AREA OF COLORADO COAL FIELDS. U. S. MINERAL RESOURCES.

Fields	Square miles
Grand River Field (Colorado portion)	6,950
Yampa Field, including part of Wyoming Field, in Routt county..	1,100
La Plata Field (Colorado portion)	1,250
Raton Field (Colorado portion)	1,300
South Platte Field	6,800
North Park Field	300
South Park, Canon City and Tongue Mesa Districts	100
Dakota Measures (Southwestern Colorado)	300
Total	18,100