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REPORT OF

Mine Explosion, No. 9 Mine, Fidelity Coal & Mining Co.

December 13, 1916.

Located,

One-Half Mile North-East Stone City, Kansas.

by

J. J. RUTLEDGE, MINING ENGR.
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An explosion occurred in the No. 9 mine of the Fidelity Coal and Mining Company, located near Stone City, Kansas, at about 12.05PM, Dec. 13, 1916. Sixty-seven men were in the mine at the time of the disaster, and of this number twenty were killed as the result of the explosion, eleven were partially overcome with afterdamp, and the balance escaped up the hoisting shaft during the interim from about 12.30 PM until 1.45 PM.

The names of the men who came to their death as the result of this explosion are as follows: Mr. William H. Windsor, (two sons) Frank Windsor, Lud Windsor, William Hay and son Lyrt Hay, Mat Roth, Rudolph Trelz, J. W. Paige, John Lauretic, Domenic Kelso, Charles Roth, (son of Mat Roth), John Fry, W. H. Roycroft, Carlo Tavernaro, Gregory Berger, Paul Konatz, Tony Krotchel, Mike Uresk, Frank Jerina, Paul Lefever. The men who were partially overcome with afterdamp are as follows: Tony Steffler, Frank Bauret, George Tarina, Louis Mandley, Floyd Brezovaar, Joe Brezovaar, Jacob Volk, Timothy Reedy (lessee), John Broblesek, Frank Pogacnik, Frank Grobelseck. Ten of the men that were partially overcome with afterdamp worked in the first west entry off the main north entry, the other man who was partially overcome with afterdamp was Mr. Timothy Reedy, (lessee of this mine). Mr. Reedy worked on the rescue crew prior to the arrival of the apparatus squad. Seven of the men who were partially overcome with after damp were revived by the use of the lungmotor operated by Mr. John Pellegrino, State mine inspector of Kansas, and Dr. E. C. Lightfoot of Carona, Kans.

All of the men who were partially overcome with afterdamp were removed from the mine before the apparatus crew arrived.

Location: The No. 9 mine of the Fidelity Coal & Mining Company, represented by Mr. John Mayer and leased to Messrs. Edward Ryan and Timothy Reedy is situated about one half mile northeast of Stone City, Mineral Township, Cherokee County, Kansas, or three and one-half miles northeast of West Mineral, Kansas, being located on a spur off the Main line of the M. K. & T. Railway operating between Parsons, Kansas, and Joplin, Missouri.

Output: About seventy-three men are employed at this mine, producing a daily output of 300 tons.

Ownership and Operators: The No. 9 mine of the Fidelity Coal & Mining Company is owned by Mr. John Mayer, but incorporated under the name of the Fidelity Coal & Mining Company. This mine was leased by Mr. John Mayer to Messrs. Edward Ryan and Timothy Reedy six months prior to the date of the disaster, and these two men operated the mine on December 13, 1916. Both Messrs. Ryan and Reedy reside in West Mineral, Kansas, and Mr. John Mayer who represents this company has a local office at West Mineral, Kansas, and a central office in Kansas City, Missouri.

Geology and Coal: The topography of the country in the vicinity of this property is flat and farming conditions are excellent. The coal measures belong to the Pennsylvanian series of the Carboniferous Age, and are a part of the southwestern extension of the Iowa and Missouri field. The coal is of a good quality and the roof and floor conditions in this mine are fairly good. The coal is of a good quality

and the roof and floor conditions in this mine are fairly good. The coal is "typical" Cherokee County seam, and will average about three feet in thickness. "Horse backs" are very troublesome at this mine and are found cutting through the coal seam frequently. The coal carries considerable iron pyrites in the form of fine seams and bands. In the region of the explosion area of this mine "clayslips" and "horsebacks" have been encountered frequently, thereby, increasing the cost of "dead work" and consequently the cost of mining. The faulty condition of the coal seam plays a very important part in ascertaining the cause of the explosion at this mine December 13, 1916.

Roof: The roof is a hard blue shale which disintegrates quite readily when exposed to air and to moisture. The roof is blasted down or "brushed" principally by means of black powder in haulage ways to afford overhead clearance for men and mules. The brushed roof continues to fall along the roadways in small slabs and is trampled to a pulverized condition by passing men and mules and intermixed with coal that falls from loaded mine cars during transit. In the judgment of the writers, the shale dust and coal dust found along roadways in this mine is practically inert and more or less non-explosive. (Refer to analyses of road dust samples taken in the little north entry off the straight main west entry, and the first west entry off the main north entry where the explosion died out.)

Floor: The floor is a pyritiferous fire-clay, locally called "black jack". The floor is somewhat wavy and dips slightly to the northwest.

Moisture: The coal, roof, ribs, and roadways in this mine were found by the investigating party on Dec. 15, 1916, to be very dry and dusty.

Gas: The No. 9 mine of the Fidelity Coal & Mining Company generates but little gas. Gas feeders or blowers are almost invariably found in the mine, occurring in the shattered coal at the intersections of the coal seam with "horse-backs", "clay-slips," and faults. The north section of this mine is of a very faulty character, and as a result gas feeders are encountered frequently. On the morning of December 13, 1916, Mr. Alex. Brown, gas man at this mine reports, that he found gas in one room in the mine but only in sufficient quantity to draw the flame on his safety lamp a little. Brown further states in his report on the "run" of the mine that he observed a horse-back at the face of No. 2 room off the straight north entry; and that he reported this condition to Edward Ryan (lessee). Brown advised Ryan to stop the miner, (Mike Uresk) from drilling through this irregularity. On the morning of Dec. 15, 1916, Mr. J. J. V. Forbes, Bureau of Mines, Mr. James Sherwood, deputy mine Inspector, and Mr. Alex Brown, gas man, "run" this mine prior to the investigating party entering the mine, and found gas to about three to four per cent, in room No. 2 off the straight north entry. Gas was also found in this room with an approved Koehler safety lamp by the investigating party this same day, and again on Dec. 19, by Mr. J. J. Rutledge, Mr. J. J. V. Forbes both of the Bureau of Mines, and Mr. James Sherwood, Deputy mine Inspector of Kansas.

Development and System of Mining: This mine is worked by means of a shaft 155 feet deep, containing two hoisting compartments and two self dumping cages. Two return tubular boilers of one hundred

and fifty horse-power capacity each and of the Erie City type furnish steam to operate the hoisting engine and the fan engine. All the buildings that compose the surface plant are of wood, and are poorly kept. The "wash-house" is of wood and is supplied with steam from the boiler house.

The mine is developed by the room and pillar method of mining. Entries are driven twelve feet wide and on thirty foot centers. Thirty-six inches of the roof is "brushed" in all haulage entries for clearance. The material from the brushing is "gobbed" on each side of the roadway thereby leaving the entry about six feet wide. Rooms are driven off the straight and back entries on thirty-six foot centers, twenty-four feet wide, and an average of one hundred and fifty feet deep.

Mining: Shooting off the solid is the method employed exclusively at this mine, and in fact, throughout the entire district. The coal is being undercut with a mining machine at No. 15 mine of the Clemens Coal Company, and at the present writing an undercutting machine is being tried out at the Pete Russell mine near Weir, Kansas. Drill holes vary in this mine from one and one-half inches to two and one-half inches in diameter and from three to seven feet in depth.

Explosives: FF black powder is used in blasting down the coal and forty per cent dynamite is used in cutting through horsebacks. About twenty-six kegs of black powder of twenty-five pounds each, and about ten sticks of dynamite are used daily at this mine. Powder is delivered by the drivers in twenty-five pound kegs, and any powder left over after the day's run is left in the mine. Mr. Forbes observed

in this mine on the days of investigation that very little regard was paid to the handling and storing of powder and other explosives. He observed that almost all kegs were opened by the point of a pick, that almost invariably boxes containing explosives were unlocked and in unprotected places, that open kegs of powder, blasting caps, fuses, dynamite, and matches were stored in juxtaposition in the same box, that the boxes were placed promiscuously in room necks, along ribs in entries unlocked; and that full kegs of powder were left standing unprotected on the outside of tool boxes. The foregoing enumerated dangerous handling and storing of explosives is common practice throughout the entire district, and is a constant source of annoyance to the Mine Inspection Department. The careless handling of explosives is responsible for a large number of the fatal accidents in this field this year.

Haulage: The coal is conveyed to the shaft bottom by nine mules. The mine cars are of the loose end-gate type, and weigh when empty about nine hundred pounds, and when loaded with a six to eight inch top about one ton. Considerable coal and dust is shaken off the cars onto the roadways during transit. The roadways have a two to five inch cover of road dust in some parts of the mine, and there doesn't seem to be very much of an effort on the part of the management to keep the roadways clean.

Ventilation: The mine is ventilated by means of a 14' reversible fan located over the air shaft and operating at about sixty-five revolutions per minute. At the time of the disaster the fan was running and operated on the forcing system of ventilation, the air shaft being the down-cast and the hoisting shaft constituting the up-cast. The

intake air is split at the bottom of the air shaft and travels northward and southward from point of splitting. Wooden doors and gob stoppings, and canvas curtains are provided throughout the entire mine for deflecting the air current. On the morning of the investigation an air reading was taken on the main north entry, and the main return from the north side of the mine near the shaft bottom by Messrs. James Sherwood, deputy mine inspector, and J. J. V. Forbes, Bureau of Mines, for a period of two minutes. The average velocity of the air current at this point was 385 feet per minute, area 30.78 sq. ft.; giving the quantity of air in circulation of 11,835 ft. (see map for ventilation of mine).

Fire protection, First Aid and Rescue Equipment: There is no fire fighting equipment at this mine in the way of water plugs, storage tanks, and fire hose. There is no first aid or rescue equipment at this mine. On the day of the disaster J. J. Forbes asked the mine foreman if there were any available trained men at the mine and he informed him that there was not a man trained in mine rescue or first aid work. Mine Rescue car No. 4 with J. L. Boardman in charge was in close proximity to this mine in December 1915, but no men responded for training.

Humidity and Moisture: At the time of the explosion December 13, 1916, the barometric pressure was 29.55 inches. The mine is very dry and dusty and sprinkling the roadways and live working places is very uncommon. There is no method employed at this mine for the humidifying of mine air. The mine is sprinkled about once per month, as near as Mr. Forbes could ascertain, by means of a barrel of water transported on a flat mine car.

Story of the Explosion: On Dec. 13, 1916, at about 1.10 p.m. a

telephone call was received by Mr. John Pellegrino, State Mine Inspector of Kansas at his offices in the Commerce building at Pittsburg, Kansas, notifying him that an explosion had occurred at the No. 9 mine of the Fidelity Coal & Mining Company, and further advising that all of the men were in the mine. Mr. Pellegrino immediately informed Mr. J. J. V. Forbes, Bureau of Mines, of this accident, (Mr. Forbes being in conference with the inspector at the time the sad news was received), the latter lost no time in procuring an automobile and proceeding to the Mine Rescue Station. Eight sets of breathing apparatus of the two hour type with ample supplies and spares for fifteen rescue apparatus for four hours' work, safety lamps, and sufficient first aid supplies together with lung motor were loaded into automobiles. In the meantime Mr. Pellegrino got into communication with Mr. Phil Roeser, Superintendent of the Western and Weir Companies of Pittsburg, Kansas, district, and asked him to furnish the ten men from their mine No. 14 located near Fleming, Kansas, and who were trained and organized in mine rescue work the week of Dec. 6, 1916, by Mr. Forbes. Mr. Roeser promptly furnished the men required.

The party including Mine Inspector Mr. John Pellegrino, Deputy Inspectors, Sherwood and Katzman, and Mr. Forbes proceeded to the scene of the disaster, and enroute at Fleming, Kansas, picked up eight men trained in mine rescue work and seven additional sets of rescue apparatus. The party arrived at the mine about 2.25 p.m. running a total distance of 26 miles by automobile. On arriving at the mine Mr. Pellegrino took charge of the situation. The mine foreman, Ed. Ryan, lessee, was consulted in regards to the accident and he informed the party that twenty men were still in the north section of

the mine. The ventilating fan was examined and found to be intact. Mr. John Pellegrino, state mine inspector, and Dr. E. C. Lightfoot of Carona, Kansas, commenced to work at once with the lungmotor on the men that were partially overcome who had already been removed from the first west entry off the main north entry. The rescue squad composed of Mr. James Sherwood, deputy mine inspector, Mr. George Price, mine foreman, Western Mine No. 14, Messrs. Blaine Dunlap and Fred Jones, both of No. 14 Western mine and J. J. Forbes, Bureau of Mines, all wearing breathing apparatus were lowered into the mine at about 2.40PM, hoisting shaft being intact, and proceeded north along the straight main north entry to the second west entry off the straight north entry, followed the air course in the second west entry, proceeded north in the air course in the little north entry, and in the air course in the second west entry off the little north entry, arrived at the junction of the first west off the little north entry, and main north entry at about 2.50 P.M. At this point the rescue squad was met by volunteer rescue crews not equipped with breathing apparatus. These men were unable to proceed into the explosion area and were waiting at this point for the arrival of the apparatus crew. The two doors in the back and straight north entries were repaired temporarily by the time the apparatus crew reached this point. The greater part of the stoppings that were blown out in the straight north and east entries were curtained by the time the apparatus crew arrived, and the ventilating current was practically restored. The junction of the main north and first west entry was chosen as a fresh air base. The apparatus crew proceeded into and explored the back north entry, the rooms and

and working places off the straight and back east entries and collected all the bodies and transported them without delay to the fresh air base. (See map). Here the Schaeffer method of artificial respiration was administered on some of the bodies, but to no avail. After instructing several of the men who were stationed at the fresh air base how to administer Schaeffer method of artificial respiration the rescue squad proceeded into the straight north and explored all the rooms and working places off of this entry; and collected and transported the bodies to the fresh air base. Here again methods of resuscitation were tried, but to no avail. All the recovery work being completed about 4.50 P.M. three car loads of dead totalling seventeen in all were hauled to the shaft bottom, and removed to the surface and transported in ambulances to undertaking parlors at Mineral, Kansas. The apparatus squad recovered and transported nine bodies from the back north entry and straight and back east entries, (see map). The names of these are as follows: A. H. Roycroft, W. H. Windsor, Frank Windsor, John Lauretic, Carlo Tavernero, Domenic Kelso, Walter Paige, Matt Roth, and Charles Roth. The bodies that were recovered in the straight east entry were as follows: Mike Uresk, Paul Konatz, Tony Krotchel, Wm. Hay, Gregory Berger, Rudolph Trelz, Frank Jerina, and John Fry. The three bodies that were recovered before the arrival of the apparatus crew were, Paul Lefever, Lyrt Hay, and Lud Windsor.

The explosion occurred in this mine as near as can be ascertained about 12.10 p.m., for at this time the mine foreman and day men who were engaged in work in proximity to the hoisting shaft stated, "that they felt a slight concussion of the air". Mine foreman, Ed. Ryan be-

came suspicious that something had gone wrong in the north section of the mine as the concussive force seemed to come from that direction. He at once proceeded with Leonard White(mule driver), who pulls from the north section of the mine), to the northeast stub off second west entry, (see map), and examined these entries carefully with a view to ascertaining what had happened. The Six men that worked in these entries were met by Ryan and White, and they made their escape out the intake from the north side of the mine. (see map). After Ryan and White were convinced that nothing had gone wrong in this section of the mine they retreated and proceeded to the switch. Here they were met by George Dillman (driver) who had started into the mine from the shaft bottom. Ryan order these two men to remain at this point, and to direct any men who would chance to pass there. Ryan proceeded into the little north entry through the smoke and at about one hundred feet from the switch met Frank Pogacnik and Jakob Volk, (these men worked in the first west entry off the main north entry, see map), coming out the little north entry in the dark. Ryan inquired of the men what the trouble was and they replied, "that there must have been an explosion." These two men traveled through the afterdamp and smoke from their working place in the first west entry to the surface unassisted. These men further informed Ryan that Paul Lefever (see point where Lefever's body was found) was lying in a helpless condition about a thousand feet inby. Ryan proceeded without further delay to aid Lefever but on arrival found that the man was dead. Ryan made his way to the turn in the straight north entry (point where fresh air base was established), but was forced to return to the bottom of the hoisting shaft and phone

for Mr. Alex Brown, the gas man, and notified him of the accident, time about 12.30p.m. Brown proceeded, after receiving the news without delay to the mine. After being lowered into the mine, he made his way to the first west entry off the straight north entry. He examined the straight north entry and found that the stoppings were blown out. He then returned to the surface for supplies and help. Francis Ryan and Francis Blainer remaining by order of Brown at the first west entry off the straight north entry (see map) to repair the two doors that were blown down. These two men were unable to do any further work for they were rendered very weak from the effects of the afterdamp. Brown returned to the back north entry with Mr. Timothy Reedy, lessee, and they both curtained about three of the crosscuts between the straight and back north entries. Timothy Reedy bacame very sick from the effects of the afterdamp and at once returned to the surface. Brown and Charles Dillman then made their way to the face of the first west entry off the straight north entry (see map) to look for Lyrt Hay and Lud Windsor, as all of the other men who worked in the first west entry were accounted for with the exception of these two men, and all escaped from this section of the explosion area with the exception of Paul Lefever, Lyrt Hay and Lud Windsor. A number of the miners who worked on the south side of the mine arrived at the junction of the first west off straight north by the time Brown and Dillman returned out of the first west off of the straight north entry. The bodies of Lyrt Hay and Lud Windsor, (see Map for location of these bodies) were found in the meantime by this new arrival of men, about fifty feet inby from the door in the straight north

entry. These two men got confused and lost their way and proceeded into the straight north entry. It might be of interest to mention here that Lyrt Hay's father worked in the back north entry, and Lud Windsor's father worked in the straight east entry, and it is possible that they had their father's in mind when they took this course. There were no further attempts to rescue or recover the bodies in the first north, back north, and east entries, and from here on all recovery work was completed by the apparatus squad.

Three rescue squads held themselves in reserve at the surface. The Mine Inspector's office at Pittsburg, Kansas, was used as a connecting link for volunteer rescue squads from mining towns in the north field. The reserve rescue squads were under the direction of Martin Katzman, Deputy Mine Inspr., who remained on the surface.

Alleged Causes: Opinion is divided as to the cause of this disaster. Some people contend that the explosion had its origin in the No. 2 room off of the straight north entry, and was caused by the ignition of an accumulation of gas in this room, (see map and detail of this room). The man who worked in the room, Mike Uresk, drilled through a "horse back" at the face of this room somewhere in the interim between starting time and the time of the accident and that he tapped into and released the occluded gas. Gas man, Alex. Brown, testified that the "horse back" was not "holed" through when he examined this room the morning of the accident. Other people contend that the explosion had its origin somewhere in the straight east entry off the back north entry (see map) by the ignition of a

keg of powder, and further that the ignition of the powder was caused from the point of a pick, spark from an open light, or spark from a cigarette or pipe. It might be well to mention here that all empty powder kegs examined by the writer showed that they were opened from the point of a pick and further that full kegs of powder in unprotected places were found in the straight east entries, and other places. The investigating party found a flattened-out and exploded powder keg laying against the rib in the back north entry and opposite the entrance in the straight east entry. (see map). This flattened-out keg is now in the possession of the owner (John Mayer) of this property.

Notes of evidence obtained on day of investigation: The investigation of this disaster was made by the following men, Friday, Dec. 15, 1916; Messrs. Joseph Fletcher, W. C. Kennhart, E. M. Roberts, Joseph Humble, Phil Roeser, all mine superintendents operating various coal properties in the Kansas field, Mr. John Mayer, Lessor of this mine, Mr. Edward Ryan, lessee, Messrs. Francis Ryan and Joe Ryan, brothers of Mr. Ed. Ryan, Mr. Alex. Brown, gas man at this mine, Mr. George Richardson, operator's commissioner in the Kansas Field, Messrs. Al. Williams and E. L. Burton attorneys for the Mayer interests, Mr. Alex. Howat, Pres. Miners' Organization, Dist. No. 14, Messrs. Earl Draper, John Gore and Charles Harvey, Miners' legislative Committee; Messrs. Ignotz Sherney, L. B. Smith and George Horn, pit committee at this mine, Mine Inspr., Mr. John Pellegrino, Deputy Mine Insprs., James Sherwood and Martin Katzman, and Fred Green and Mr. George Knoll, Inspector's Stenographer, Messrs. George Dillman and Charles Dillman, both miners who worked in the north section of the No. 9 Fidelity mine,

Mr. George Price, mine foreman of Western Mine No. 14 (Mr. Price was member of Rescue squad day of disaster), Mr. R. E. Walsh, mine engineer for Fidelity Coal & Mining Company, and Mr. J. J. Forbes, U. S. Bureau of Mines. On Dec. 19, 1916, this disaster was reinvestigated by Mr. James Sherwood, deputy mine inspector, Dr. J. J. Rutledge and Mr. J. J. Forbes, both of Federal Bureau of Mines. Mr. Forbes returned to this mine on Dec. 15-16-18 and 28 respectively for the purpose of collecting additional evidence of the disaster.

When the investigating party arrived at the mine Mr. Pellegrino state mine inspector, detailed Mr. James Sherwood, deputy mine inspector, Mr. Alex. Brown, gas man at this mine, and J. J. Forbes to enter the mine and make an examination of the mine before the party entered the mine. At the face of room No. 2 off the straight north entry a "horseback" was observed into which was drilled a hole 7' 4" in depth. (See Sketch No. 3). There was a goodly quantity of gas emanating from this hole. The sound of the gas blower in fact could be readily heard 100' outby from the face of the room. A cap corresponding to 3½ per cent of gas was found by this first party with an approved Koehler Safety lamp 40' from the face of the room. Gas man Alex Brown "dead lined" the entrance to this room, and the party proceeded to the bottom of the hoisting shaft awaiting the arrival of the rest of the party. The gas man went to the surface and reported to the mine inspector the results of the examination. The mine inspector issued orders that no open lights would be permitted in the mine while the investigation was being made. The party proceeded from the bottom of the hoisting shaft 400' inby along the old main north entry, thence west on the straight main

west entry to point where little north entry is turned off straight main west, thence north on the little north entry to the point where the first west is turned off the little north, where the first indications of coking were found on the inby and outby recesses of timbers. (see sketch No. 2). The party then proceeded into the back little north entry and found coking on the outby end of timbers. Powder kegs and deposits of dust and debris were quite pronounced along the entry, and these evidences indicated without a doubt that the direction of the force was inby in the back entry. Evidence of movement of materials was fou about 200 feet inby in the back entry. The party returned to the straight entry off the little north entry, and proceeded inby along the little north entry, deposits of dust, empty powder kegs and debris were found strewn all along the little north entry. The party proceeded into the straight entry off the 2nd west entry off of the little north, and at 125 feet inby in room neck examined the plade where Paul Lefever's body was found. (see sketch No. 2) Deposits of dust, debris and coking on the inby end of timbers was observed inby on this entry. Coking was quite pronounced at this point where the 2nd west entry connects the main north entry, showing without a doubt that the explosive force worked outby against the ventilating current. The party examined the door in the sly that connects the straight and back entries, and found that it had been blown outby or towards the straight north entry. The party proceeded into the back north entry and observed coking on inby end of timbers, empty powder kegs scattered here and there along the entry, heavy deposits of dust along this roadway, sticks off timbers and debris pointing outby. All gob stoppings blown out in the

direction of the straight north entry or westwardly and further observed the location where the bodies of W. H. Roycroft, W. H. Windsor, and son, Frank Windsor, were found by the apparatus crew. The canvas curtain (see sketch No. 2) that deflects the air current into the smoke room off the back east entry was charred, showing that flame was present at this point. Opposite the straight east entry at rib in back north entry, three full kegs of powder were found and about two feet inby from this point a flattened out or exploded powder keg was found. (see sketch No. 2) There was quite a lengthy discussion over the finding of this exploded powder keg, considerable debris was piled along side of the three kegs of powder, indicating that the force of the explosion was outby from the straight east entry. At the entrance to the straight entry pieces of tool boxes were found, and it was further observed that the sticks of wood pointed outby. Coking was found but not pronounced on both sides of timbers at entrance to the straight east entry. The place where the body of John Lauretic was found by the rescue squad was examined. All stoppings between the straight and back north entries inby to room No. 4 seemed to be blown in the direction of the straight north entry. Coking was found inby on timbers between rooms No's. 1 and 3, and heavy deposits of coke were observed on both the north and south faces of timbers in crosscut opposite room No. 2. An empty mine car was found in the neck of room No. 3 undisturbed, and at 5' inby in the east entry a tool box was found apparently undisturbed. Heavy deposits of coke crust and spalling, indicating intense heat was found on the outby necks of rooms No's. 3, 4 and 5 respectively. Five feet outby in the straight east entry from room No. 4 heavy deposits of coke crust

were found on the roof. Two tool boxes were found in the neck of room No. 4 containing two full kegs of powder, and in one of the boxes was a 50 foot roll of blasting fuse that was completely burned. Ten feet inby from the entrance of room No. 4 were a number of empty powder kegs on ends showing very little disturbance. A canvas curtain in sly opposite room No. 4 in the straight entry was burned, pieces of wood and debris was scattered here and there in this sly, and pointing in the direction of the back entry (see sketch No. 2). Coking was observed on the outby side of loaded cars in neck of rooms No. 5 and 7 respectively. In room neck No. 5 a charred shirt was found, and in the straight entry beyond sly considerable movement of materials was manifested towards the face of the entry, the first gob stopping inby from sly was blown towards the straight entry, a canvas curtain in sly opposite room No. 6 was not charred, but intact. The party proceeded thru last crosscut between the straight and back east entries into the back north entry and traveled outby in the back entry, coking and deposits of dust were found on the outby recesses of timbers, heavy deposits of dust, and scattered kegs were found along the roadway, heavy deposits of coke crust were found on the inby side of a loaded mine car in room No. 2 off the back entry, and between rooms 2 and 3 respectively a miner's watch was found, and it was further observed that this watch had stopped at 11.20 o'clock. Coking was found on inby recesses of timbers outby from room No. 1 in the back east entry and the direction of movement from room No. 1 in back entry was outby. The party proceeded to the entrance of the straight east entry, here the exploded powder keg was examined again.

From the evidence collected in this entry, it would seem apparent that powder exploded somewhere in the straight east entry. Onex of the writers of this report personally viewed and handled all the bodies that were taken from the back north, straight north and east entries. Mine foreman, Edward Ryan, stated, "that previous to the explosion eleven miner's boxes were in the straight east entries," the investigating party could find but eight of this number, the rest being demolished by the explosion. A sample of residue or incrustation was taken from room necks 3 and 4 in the straight east entries and were analyzed for products of [redacted] of combustion of explosives. The samples showed that no products of detonation or combustion of an explosive was present. A complete analysis of these samples known as No's. M-2085 and M-2057 is given at the end of this report; also the analysis of rib samples taken on the left rib of room neck No. 3, samples numbers 366,90, and 23741 and 23751. Heavy deposits of coke crust were found in the crevices of the roof opposite room No. 4 in the straight east entry. Nearly all the bodies that were removed from the straight east entires were burnt about the hands and face. Domenic Kelso, who worked in room No. 3 off the straight east was severely burned about the head, face, arms and hands. The left side of this man's head was badly mashed, showing that he was violently thrown against the rib. All bodies removed by apparatus crew from the straight east and back north entries, with the exception of Charles Roth were found with head north and face down. Charles Roth was found at place shown on sketch in a sitting posture against right rib of entry inby. All the bodies recovered by the apparatus squad were found

in the straight east entry, and about 75'-100' outby in back north entry from entrance to straight east entry. After the party had completed the investigation work in the east entries they followed the back north entry as far as sly between back and straight north entries. All stoppings were observed to be thrown towards the straight north entry, heavy deposits of dust was found on the floor in the back entry. Coking was quite pronounced on the outby recesses of timbers for about 50' inby from entrance to straight east. There was not much evidence of coking or movement in the back entry beyound 50' inby. A loaded car opposite Wm. Hay's working place showed no signs of coking or disturbance. The party proceeded thru next to last sly between straight and back north entries, and examined point where Hay's body was found. This man travelled about 50' from his working place, was found head north, face down, and was not burned. Hay was the last man found by the apparatus crew. Coking was found in the north and south faces of timber at entrance to sly between north and back entries. The party proceeded inby in the back north entry to the face, here two loaded cars twenty feet and fifty feet respectively outby from face showed no signs of movement or coking. At the face of the north entry one shot on the right rib was tamped and flagged for shotfirer. It might be well to mention here that this is the only shot in the east and north entries and working places thereof that was tamped and ready for firing. The point where the body of Gregory Berger was found by apparatus crew was next observed. This man was not burned, a shirt presumably belonging to Berger was found in room neck intact. This man when found by apparatus crew was found head in direction of straight north entry, face

down and behind a small pile of coal at the entrance to his room. Following the straight entry outby it was observed all gob from stoppings was thrown onto the straight entry, the stopping opposite the straight east entry being thrown more to the center of the straight north than the stoppings inby and outby from this point. A miner's tool box fix feet inby from room No. 2 was found opened but apparently undisturbed, and alongside of this box was a full keg of powder undisturbed. Five feet outby from room No. 2 another box was observed, but intact. The party next proceeded into face of No. 2 room off the straight north entry (see sketches and notes on sketches), and found the following evidence: About one per cent of gas [redacted] forty feet from face of room (Note three and one-half per cent of gas was found about this point in room by Messrs. James Sherwood, deputy inspector, Mr. Alex. Brown, gas man, and J. J. Forbes, Bureau of Mines, prior to investigating party entering mine,). Coking but not pronounced on the inby faces of timbers, paper along roadway in room unburned, a miner's cap and carbide lamp about fifty-seven feet from face and room, slight deposits of dust along roadway. At the face of room No. 2 a "horse-back" was observed, into which (see sketch No. 3) was drilled a hole 2½" in diameter and 7'4" in depth, at the left of room face a drilling machine was set up and intact, and another hole six inches in depth had already been started. All posts in this room were intact, and there was very little evidence of disturbance in general. There was no evidence of intense heat. The gas feeder or blower at the face of this room could readily be heard 100 feet outby from the face. This room is of an exceedingly faulty

character, a horse-back had been encountered fifteen feet from the face of the room and it was observed that all drill holes were drilled practically horizontal. Holes in the horseback had been fired with forty percent dynamite, and when shots are fired in tight rooms with holes drilled horizontally, the tendency is for the shot to throw considerable fire; and it is possible that the slight coking on the inby end of timbers in this room can be contributed to this method of firing. On the other hand, it is possible that the gas which emanated from the hole in the horse back was ignited by the man who was at work at the face of this room, by igniting same with an open carbide lamp. It is a fact that a greater quantity of gas will flow from a horse back when it is freshly cut than thereafter. After an extended consultation in room No. 2 the party proceeded into the straight entry and examined the X loaded car where four bodies had been found by the rescue squad. The probable names of these bodies were: Rudolph Trelz, Mike Uresk, Paul Konatz and John Fry. A full keg of powder and a miner's box was found about 4 feet inby from loaded car apparently undisturbed, and no coking was observed on loaded car. Twenty feet outby from loaded car, another full keg of powder was found, but intact, and alongside of keg thirty feet of blasting fuse was found intact. Falls of roof and deposits of dust were observed outby from room No. 1 in the straight north entry. The party observed the door in the straight north that is used to deflect the ventilating current into the first west entry. This door was blown outby by the force of the explosion, and indicated without a doubt that the explosive force worked with the air outby in the straight

north entry as well as against the air. The party proceeded into the straight west entry off the straight north entry, and were unable to find any disturbance so to speak beyond 200' inby in this entry. All the men who worked in the first west entry escaped with the exception of Paul Lefever who traveled approximately 1000' in the afterdamp, and Lyrt Hay and Lud Windsor who lost their lives by proceeding into the straight north entry. The work of the investigating party being completed here they proceeded to the surface.

Conclusion: From the details of evidence collected, it is thought that the explosion was caused by a combination of burning mine gas, coal dust and black powder, the inception of the explosion being the ignition of inflammable gas from an open miner's light. When a hole is first drilled into a horseback, fault, or other irregularity in a coal seam, a very much greater quantity of gas will issue from such a drill hole, than later after the pressure of the gas has been reduced and this gas which first issues from the drill hole will be pure and unmixed with air. As the gas continues to issue from the hole it becomes mixed with the air of the working place until finally there is an explosive mixture. When a naked flame is then brought into contact with the gas an explosion results. This is doubtless what happened in the present instance. The gas was probably ignited from the flame of an open carbide lamp on the miner's cap. The explosive force operated against the ventilating current as well as with it in the straight north entry, and with the ventilating current in the back north entry and straight east entry, being propagated by the fine film of coal dust on the ribs and roof of the entries. In the straight east entry up to

No. 4 room, black powder was ignited by the flame of the explosion and as a consequence the air was heated to a very high temperature inby on the straight east entry as far as No. 4 room. The gradual decrease in temperature in the straight east entry caused a retonation wave which impinged violently, with consequent high pressures in the straight east entry, back east entry and back north entry, and dislodged the stoppings between these entries. It is believed that the explosion originated in room No. 2, straight north entry, and was due to an ignition of inflammable gas at that point, though dry coal dust and black blasting powder, which substances were ignited by the flame of the burning gas, also entered into the explosion. The following details of evidence appear to point to this place as the origin of the explosion.

(1). No material damage was done to the mine workings and no great amount of disturbance was noted on the Main North Entries outby the mouth of the 1st Straight west entry. All of the men working in the 1st straight west entries escaped, (though somewhat affected by the afterdamp,) except Paul Lefevre, who went outby along the 2nd West Entry, instead of going outby on the main north straight entry, and Lyrt Hay, and Lud Windsor, who went toward the face of the main North Straight Entry inby the mouth of the 1st West Straight Entry. Lefevre, could not have gone the distance which he did if he had not been outside of the explosive area. Lyrt Hay and Lud Windsor, were, no doubt, proceeding into the face of the main north straight entries, and the east entries, off the main north straight entries, and the east entries, off the main north straight entries, where their respective fathers worked. These

two young men evidently felt the disturbance of the air caused by the explosion and started inby to satisfy themselves of the safety of their parents. They met the afterdamp and were overcome by it and could not retreat in time to save their lives. Frank Pogacick, Louis Mandlay, Jacob Volk, John Problesek, Floyd Brezovaar, Joseph Brezovaar, Geo. Tornia, Frank Bauret and Tony Steffler, escaped by going outby along the Main North Straight entry, although they were affected to a considerable degree by the afterdamp.

(2). The men on the straight 1st east entry were found on this entry as if they had been very suddenly overcome, and one of them, Charles Roth, was sitting against the gob on the entry opposite the mouth of No. 5 room as if asleep. One man was found lying on his right side facing toward the face of the entry and his back and shoulders were severely burned, evidently by some flame which must have come inby this entry. A quantity of empty twenty-five pound powder cans were found resting in an up-right position, undisturbed, inside of and near the mouth of room No. 3 on the straight 1st entry east. No great degree of force had been manifested in the rooms of this entry, but there was considerable evidence of violence on this entry. The powder boxes had been destroyed and the debris of same scattered about, undoubtedly some black powder was explosded on this entry by the flame of the explosion, and the products of the exploded black powder together with the afterdamp from the explosion near the face of the main north entry caused the death of the men whose bodies were found in 1st straight entry east.

(3). Occurrence of Gas. It is said that the methane in the

Kansas coal mines is found in the soft clay seams or the horseback and in the coal immediately inby the hard clay seams or horseback. The face of Room No. 2 off the main north straight entry had been in a hard horseback for the last twenty feet and it had evidently been the practice of the miner driving this room to drill a long, flat hole on each rib parallel with the roadway of the narrow place to which the room had been reduced on account of the presence of the horseback, and to charge these two holes with dynamite. In this manner he "burned" his way through the horseback. On December 19th, the noise of this blower in the horseback at the face of this No. 2 room in the main north straight entry could be heard at a distance of one hundred feet from the face of the room. There was a cavity in the roof just at the point where the room had been narrowed and a safety lamp showed the presence of considerable rich gas at this point. A hole had been drilled on the right hand rib at the face and the post drill was set for drilling and a hole six inches deep had been drilled on the left hand rib of the face. It appears that Uresk, the miner working in this room, had drilled the right hand hole and had set up his post and begun to drill the hole on the left hand rib and probably had gone out of the room to eat lunch, or for some other purpose, leaving the freshly drilled hole open. The drill had tapped the methane held in thecoal seam, immediately behind the horseback, and the gas being under high pressure and fresh had issued into the room and filled the narrow face, after which it had filled the cavity in the roof over the roadway, and probably extended some distance toward the mouth of the room. Uresk, returning to the face of his room with his naked light on his head,

had ignited the gas in the pocket and a considerable quantity of gas which had issued into the room, and the burning gas issued from the room and out on the main north straight entry, burning the oxygen out of the mine air, scorching those men found on the entry, and setting fire to some of the black powder and filling the entry with afterdamp and the products resulting from the explosion of the black powder. Uresk turned and fled to the entry, dropping his cap and lamp, after he had ignited the gas. The explosion spread from this room, to the First straight entry east, igniting and exploding some kegs of black powder in these entries.

Lessons learned:

1. Mines in this district should be provided with efficient standardized sprinkling systems.

2. Powder should not be placed promiscuously in unprotected places around the mine.

3. The practice of permitting miners to carry kegs of powder weighing twenty-five pounds each should be discouraged. On the other hand, only enough powder for an average day's work should be permitted each miner, and no powder, other than that in charges ready for loading or firing should be left in mines when shots are fired.

4. Miner's boxes containing powder and other unsafe materials should be kept in proximity to their working place and in a safe place and away from traveling and haulage roads.

5. Oxygen breathing apparatus should be provided at mines in this district for emergency use.

6. A full equipment of First-aid supplies should be on hand at all times in the mines of this district for emergency use.

7. The use of naked lights for illuminating purposes in this district should be discouraged.

8. Mine in this district should be provided with a supply of approved types of safety lamps and electric lamps sufficient to equip rescue parties.

9. Safety lamps should be used by mines in this district when work is being done on foreign bodies such as, "horsebacks", "clay slips", and "faults" that intercept the coal seam. Especial attention should be paid to any places where horsebacks occur and the fire-boss should return to such places as soon after the beginning of the shift as possible and if any drilling is being done or is proposed the fire-boss should remain with the miner, examine carefully for gas, and give the miner instructions regarding proper precautions to take.

10. The mine workings should be carefully inspected by a capable fire boss equipped with an approved flame safety lamp at least three hours before any other employees enter the mine. When methane is found in a room provision should be made for removing it by means of the ventilating current, and not by brushing with a cloth or coat. A line curtain should be carried to the faces of rooms where blowers are found, and the gas removed as fast as it is made, by the ventilating current.

11. Roadways should be brushed slightly from time to time, as mining operations are continued, and the shale brushing permitted to fall upon and remain on the roadways to be broken up by the feet of the mules, this furnishing a covering for any coal dust which may be deposited on the roadways.