Report on a Mine Explosion That Occurred at the Smith Mine, Washoe, Montana, on February 27, 1943

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MONTANA COAL & IRON COMPANY

BILLINGS, MONTANA

June 10, 1943

Prepared by

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The Montana Coal & Iron Company having received a detailed report from the Bureau of Mines, Washington, D. C., and the State Industrial Accident Board of Helena, Montana, on the mine explosion that occurred in its Smith Mine at Washoe, Montana on February 27, 1943 in which 74 men lost their lives, hereby explains in detail, its views as to the probable cause of the explosion, and comments on certain remarks and statements made in the above-mentioned Federal and State reports.

The Company realizes the extent of the suffering and grief brought about by this disaster, and knowing that an explosion from a similar source can happen at other coal mines, believes that every possible cause of this explosion should be given consideration so that its findings may be of help in preventing the occurrence of disasters at other mines in the future.

The State Coal Mine Inspector is of the opinion that the explosion probably started in the 8th West Main Entry at a point inby the brattice that had been erected across the entry and continued inby to the mouth of room No. 5. The Bureau of Mines' Examiners believe that it probably started in room 5, of the 9th South East. The Company's officials, mine examiners, and foremen are of the opinion that the explosion did not start at the place picked by the Bureau of Mines or the place chosen by the State Coal Mine Inspector.

Before giving the Company's views as to the place where the explosion probably started, we would like to comment on certain happenings, some of which may have played a part in causing the explosion. Other than disagreeing with the State Coal Mine Inspector as to the place where the explosion started, there is little in the State Industrial Accident Board's report that requires comment on the Company's part. We did not notice, however, in the State Inspector's

report certain testimony he made at the Inquest held in Red Lodge, Montana, on April 12, 1943. At said Inquest, Mr. Ed Davies testified to the effect that during his many years as State Coal Mine Inspector, he had never had occasion to stop any employee in the Smith Mine from working in any part of the mine on account of hazardous conditions, but that on several occasions he has had to stop men from working in other Montana coal mines on account of dangerous working conditions.

After reading the explosion report of the Bureau of Mines made by Messrs. G. O. Arnold, M. C. McCall, and F. J. Bailey, which report was received by the Company on May 25, 1943, we noticed that several important matters were omitted, and sufficient credit was not given the Company for its efforts (notwithstanding a labor shortage due to the War effort) in completing many of the Bureau of Mines recommendations between the time of their mine examination in November and the time of the explosion.

At a meeting in the Company's Washoe office immediately after the completion of the inspection of the Smith Mine by Messrs. G. O. Arnold and M. R. Evans, which meeting was called at the request of Mr. Arnold, the following employees of the Montana Coal & Iron Company were present in addition to the above Federal Inspectors:

J. M. Freeman, Vice President & General Manager
W. A. Romek, Assistant Manager
W. R. Freeman, Mine Superintendent
Elmer Price, Mine Foreman
David Murray, Mine Foreman
Frank Mourich, Inside Master Mechanic
T. H. Freeman, Outside Foreman

At said meeting Mr. Arnold mentioned that he and Mr. Evans had found traces of methane gas in many of the working places in the Smith mine, and recommended the use of electric cap lamps in place of the open lights that had been in use during the past twenty years or more. Messrs. Arnold and Evans were particularly concerned about the large amount of gas they found in temporarily abandoned entries off the 4th Southeast entry, as some of these abandoned entries contained a larger amount of methane gas than most of the places in other parts of the mine. Mr. Arnold thought that some of these entries, on account of not being worked, should be blocked off as soon as possible, and he suggested that concrete stoppings be built in some of the entries without delay. As the Company expected to work these abandoned entries in the future, Mr. Elmer Price, the Mine Foreman, thought it best to handle the gas in the manner that was in effect during the past year or more. The Federal inspectors, however, thought that it would be dangerous to leave these entries open in case the mine fan stopped from a power failure, as the gas from these entries, under such a condition, could reach the places where the men were working and endanger their lives. As a result of these comments and in order to comply with the wishes of the Federal Examiners the Management issued instructions to the Mine Officials that concrete stoppings be

completed as soon as possible in all abandoned entries off the 4th Southeast Entry that were making gas.)

(The Federal Examiners' comments about the gas in the entries off the 4th Southeast and the gas hazards in other parts of the mine were so convincing that J. M. Freeman, the Vice President and General Manager, concluded that there might be danger and risk to the men's lives if the No. 3 Smith Mine continued operating with open lights and knowing it would take several months to get electric cap lamps because of the war effort, and also realizing it would take a long time (with the labor shortage due to the war) to complete the Bureau's many ventilation recommendations, suggested that the No. 3 Smith Mine be temporarily closed down.) Mr. Freeman said he could double-shift the Foster Mine, open the old No. 2 Smith Mine, and start the new No. 3 opening east of the mine office, which would soon provide work for the men who would be temporarily laid off. (The Federal Inspectors did not think that conditions in the Smith Mine warranted closing the mine down and said it would also be inadvisable to do this on account of the unusual demand for coal due to the War effort.)

We do not want to give the impression that the Company is blaming the Federal Mine Examiners for suggesting that concrete stoppings be built to wall off gas in abandoned entries in the Smith Mine, as we realize that no one present at the November meeting could foresee that a fall of rock might occur nearby one of the recently-built cement stoppings, on the morning of the explosion, and cave to such an extent that it would release a large quantity of explosive gas that had accumulated during the three months between the Federal inspection in November and the time of the explosion on February 27, 1943. (We estimate that there was space enough in these abandoned entries behind the two concrete stoppings to store about 200,000 cubic feet of methane gas) (enough gas to cause one hundred explosions).

Our purpose in bringing up this probable cause of the explosion is that we hope something will come from our views that will help prevent explosions in the future. (We are now convinced that it is a very serious matter to block-off old workings in any coal mine where methane is being generated, and sincerely believe that if in the future the Federal Mine Inspectors believe that places making methane gas be blocked-off, they should provide instructions in the erection of stoppings, etc., wherein every precaution is taken, so that falls of rock or squeezes cannot bring about a condition where this gas can quickly escape in large quantities.)

(As the Management is of the opinion that the exposion resulted from an accumulation of explosive gas behind concrete stoppings, that probably would not have been built had the Smith Mine not been inspected in November, the Company's Foreman and Fire Bosses were requested not to disclose their views to anyone until the State and Federal Examiners reported their final findings as to the source of the explosion.) As the Federal and State findings were not reported until after the Inquest, the Company withheld its views at the Inquest, expecting that the final report of the Federal Examiners would change the Management's theory as to where the explo-

sion started. Before receiving instructions not to disclose their views, however, one of the Company's Mine Foremen said he had already mentioned to Federal Inspector, Pat Holland, that he thought the exposion started from the gas that had accumulated behind the above-mentioned concrete stoppings.

In their report, the Bureau of Mines Representatives go into considerable detail on underground mining methods, conditions, and equipment at the Smith Mine. Before answering their statements, some of which are very misleading, we would like to mention that the Bureau of Mines report on the explosion was prepared mainly by G. O. Arnold, the Federal Inspector, who was in charge of the November examination of the Smith Mine, prior to the explosion, and whose suggestions to the Management might have indirectly had something to do with the explosion, in which case, it was to his interest to unduly criticize the Company.

COAL DUST AND ROCK-DUSTING

The Smith Mine during the past five years was considered to be a damp mine. On page 7 of the Federal Explosion Report, we quote as follows:

> "At the time of the inspection in November, the interior of the mine was generally moist, although dust was apparent throughout."

The Management cannot understand why the words "although dust was apparent throughout" were included in the above statement, as Messrs. Arnold and Evans, at the November meeting in the Smith Mine office, said that the Smith Mine was too damp, and the damp air was not good for the men's health. In their preliminary report, (the only report received from the Bureau of Mines prior to the explosion), they did not mention that they had noticed coal dust in the Smith Mine. They did say, however, that the Smith Mine would become drier when we completed their ventilating recommendations, and that in the future the Company would have to consider rock-dusting. The Management got the impression from what Messrs. Arnold and Evans said that there was no hurry about rock-dusting the Smith Mine on account of it being too damp. They said that the Bureau of Mines would recommend that all coal mines use rock-dust. In view of the latter statement, we made an effort to locate a source of rock-dust and to secure information on rock-dusting equipment. Based on the manufacturer's promise of delivery, a rock-dusting machine could not have been received by the Company, even if it had been ordered when the Federal Inspectors were here in November. The Federal inspectors did not mention in their report that during the past ten years no Montana Coal Companies rock-dusted their mines.

PERMISSIBLE ELECTRIC CAP LAMPS AND GAS CONDITIONS AT THE SMITH MINE.

Montana coal mines have never used permissible electric cap lamps exclusively to our knowledge. Many of the men in the Smith Mine objected to using them on account of batteries, etc. There were only about one-half of the men using electric lamps at the time of the Federal inspection in November and most of these men worked on loading and haulage crews and were using

the electric lamps to prevent delays in output, and not for the purpose of preventing gas explosions, because at that time, the miners, the State Coal Mine Inspector, and the Management did not consider the Smith Mine dangerous.) In view of the fact that there had been no explosion during the 35 years it had operated with open lights, and that only one employee in the Smith Mine, to our knowledge, during this entire length of time had to be treated for gas burns, and this was from his own negligence, it is no wonder that it is now so difficult to find what caused the explosion. On page 12 of their report, the Federal Examiners mention one other case in the district (about 25 years ago) in the No. 3 bed workings in the old Washoe mine, (operated by the Anaconda Copper Mining Company) five men were burned from gas, but all recovered. The management did not know about this until it was brought to light by the Federal Inspectors. On account of the fact that only one man was treated for burns from gas at the Smith Mine in 35 years, it could hardly be considered very hazardous as far as explosive gas was concerned.

The Management, however, was heartily in accord with the recommendation of the Federal Examiners, that permissible electric cap lamps be used exclusively in the Smith Mine, and sufficient electric lamps for all of the men were ordered as soon as possible and are now on hand.) Getting priorities from the Government and delays in securing quotations from manfacturers, etc., slowed up the purchase of these lamps, but on account of Government priorities, etc., the lamps would not have reached the mine prior to the explosion.

At the meeting between the mine officials and the Federal Inspectors, following the Inspection of the Smith Mine in late November, the impossibility of immediately completing all of their recommendations was understood by the Federal Inspectors, due to a critical labor shortage and priority restrictions on mining equipment and mine supplies. They agreed, however, that the Company should proceed to the best of its ability,) and that one of them would return at a not too distant date to determine what progress had been made. This promised inspection never came about, but a great deal was accomplished by the Company in completing their recommendations between the first of December and the date of the explosion. (We list below some of the Federal recommendations that were completed inside of the Smith Mine prior to the explosion, nothwithstanding a critical labor shortage.) The many Federal recommendations that were completed on the outside of the Smith Mine are not listed. (It must be remembered that we had only the Federal preliminary report to follow because the much more lengthy and final report was not completed by Mr. Arnold until after the explosion had occurred,) and was not mailed to our Company until March 18th.

VENTILATION AND OTHER FEDERAL RECOMMENDATIONS COMPLETED BY THE COMPANY AFTER THE NOVEMBER FEDERAL EXAMINATION AND PRIOR TO THE EXPLOSION.

1. Two concrete stoppings were installed in the 2nd East Main and back entries.
2. The size of the air shaft from the No. 2 vein to the No. 3 vein was increased.
3. Rock was removed from the No. 2 overcast and air leaks repaired.
4. Air leaks in all stoppings in the No. 2 haulageway were fixed, also three doors repaired.
5. The door that enters into the airway from the No. 2 slope was repaired.
6. All narrow places in the intake airway were cleaned out by removing dirt and leveling off caves.
7. In the No. 3 vein all of the large stoppings were plastered.
8. At the bottom of the tunnel near the first right entry, a concrete stopping was erected and the door repaired by plastering.
9. An additional stopping was erected in the main south slope outby the overcast, and the pillar broken through inby, which doubled the airway area at that point and generally improved the mine ventilation.
10. All stoppings were repaired and plastered to the first west entry in the No. 3 seam, a distance of approximately 3,000 feet.
11. The fan was moved from the bottom of the shaft in the 2nd north back entry to the back entry of the main South near the 5th Southeast main entry on the inside of the 5th Southeast main door, which very substantially increased the ventilation in the 5th, 6th, and 7th Southeast entries and rooms.
12. An airway was being constructed to the surface at considerable expense and was completed within a few feet of the No. 2 seam. It was located in the first crosscut between No. 9 and No. 10 rooms in the 5th South East entry.
13. Foremen and haulageway men were instructed not to leave ventilation doors open.
14. Mine foremen were instructed to carry safety lamps at all times, and they were examining all places before men entered them.
15. An additional brattice man was employed to improve ventilation in working places.
16. Cleaning was done in both the No. 2 and No. 3 return haulageways.
17. A water tank was installated on the new Sullivan cutting machine so that all cutting equipment in active use carried water for the curtailment of dust.
18. Safety man-holes were provided in the No. 2 slope.
19. A safety bridle was installed to connect the motor with the man trip.
20. Additional mine safety lamps and sufficient electric cap lamps for all employees in the mine were ordered.
21. Canvas bags for carrying powder were ordered and were placed in the mine prior to the explosion.
22. Additional powder boxes, properly locked, were installed throughout the mine, and powder supplies contained therein were reduced.
23. Wooden tamping bars were ordered and sent into the mine, and any metal tamping bars in use were copper tipped in accordance with the State Law.

24. Tamping dirt had been sent into the mine.

25. Permissible powder and electric caps were ordered and received and were being tested by Engineers of the Atlas Powder Company and DuPont Powder Company to determine the best grade for our operations.

26. The wooden flooring around the No. 3 hoist was replaced with concrete, and the wooden posts were replaced with structural iron. The rope, hoist gears, and reducer were guarded.

27. All pumps were guarded and defective wiring removed.

28. Other fire hazards in the way of movable material were removed.

29. The mine electricians were instructed to install cut-off switches and to install insulators for carrying feed wire. A part of this work had been completed, but in view of their death, the full details are not available.

30. Transformers in the No. 2 slope were fenced and danger signs installed.

31. Motors on the booster fans were changed from D.C. to A.C. current so that all D.C. power could be cut off when no one was in the mine.

EXPLOSIVES AND BLASTING

Shortly after the November Federal inspection, the representatives of both the Atlas Powder Company and the DuPont Powder Company were contacted with respect to making tests to determine the proper grade of permissible powder best adapted to our operations. Orders for 13,900 lbs. of nine different grades of permissible powder were placed, and also requisitions for electric blasting caps. These supplies arrived at the Smith Mine in January, 1943, but as the schedules of the powder company engineers were filled, they did not arrive to conduct permissible tests at the Smith Mine until the two-week period prior to February 27th. In accordance with the Inspector's recommendation, dirt was sent into the mine for stemming, but it did not prove entirely satisfactory for tamping purposes, particularly in wet holes, and in some cases it was mixed with scrapings from cross-cut floors, which gave better results. In wet holes the dirt became mud and was useless. Powder storage boxes had been installed throughout the mine, and the quantity of explosives stored in one place had been materially reduced. Canvas bags were ordered and had been taken into the mine shortly before the explosion. Wooden tamping bars had been ordered and were being tried in the mine, but proved too light for tamping pellet powder and resulted in blownout shots. The metal tamping bars which were used were copper tipped in accordance with the State law. It is true that pellet powder was still being shot with fuse, but the Federal examiners knew this was only temporary until the proper grade of permissible powder could be determined.

GENERAL SAFETY CONDITIONS

While it is a minor point, the Federal examiners report that only two all-service gas masks were kept at the mine. This is incorrect as we had four such masks. Their preliminary report

did not recommend that inside employees be furnished with self-rescuers. The Company has, however, furnished 98 self-rescuers to its employees and has ordered enough for all the men in the mine.

On Page 11 of the Federal explosion report under Supervision and Discipline, the Federal examiners complain at length to the effect that additional supervisory officials were needed in the Smith Mine. There was no mention to the management of a lack of supervision by the Federal examiners when they inspected the mine prior to the explosion. Neither did they mention this in their written preliminary report received by the Company about December 15, 1942. The Management would have gladly, and immediately, employed more mine bosses if the Bureau examiners had mentioned that it was advisable, and would have also made any other change in supervision that they would have recommended. The Company had more supervisory officials at the Smith Mine at the time of the explosion than in previous years.

(On Page 12, they report that when Mr. Newman was placed on the graveyard shift as night foreman, another fire boss was not hired to replace him, which made it appear that the task of extending brattices and keeping all places clear of gas on the day shift, was left to one fire boss. This is not correct, as an extra day-shift brattice man was employed; and at the time of the explosion, the Company had the largest crew of brattice and ventilation employees it ever had.) John Meiklejohn, Sanfred Huhtala, Dan Sekulich, and Loren Newman were acting as fire bosses on the three working shifts. Sam Alexander, Ned Laird, and Dick Mallin were day shift brattice men and were assisted by John Meiklejohn when his fire boss duties permitted. Sekulich and Huhtala also did brattice work on the night shift in addition to inspecting the mine. In addition we tried to employ Leland Newman, the only other experienced fire boss in this district, but without success.

(On Page 14, the Federal examiners report that according to testimony at the Inquest the haulage men continued to leave doors open across haulageways and leave brattice curtains up at room entrances. According to our recollection, the preponderance of the testimony at the Inquest was exactly opposite to that statement.) All haulage men had been instructed by the Management to adhere to the State law, as the law makes it the employee's duty to keep ventilation doors closed, and any known violations would not have been tolerated by the Company. We quote from Montana Statute 3527:

> "Motormen, trip riders, and drivers in charge of hauling trips, passing through doors used as a means of directing the ventilation, shall see that such doors are closed promptly after the trip passes through."

As for the continuation of smoking in the mine, a practice that has always been in effect in all Montana coal mines, it was not reasonable to expect the men not to smoke as long as they had to use open lights, due to the fact that electric cap lamps were not available. Extra precautions were taken with regard to testing for gas before employees were permitted to enter for work.

All bosses carried safety lamps; and in addition to the fire bosses' inspections, they examined every working place before the men entered, which was not the case previous to the Federal inspection. No matter how busy or how rushed the mine foremen were, all places were tested before employees entered them, and no evidence to the contrary was ever presented. (As for the air reaching the 5th, 6th, and 7th South East entries, the preponderance of the testimony at the Inquest was that the air had been substantially improved following the November examination.)

(On Page 15 of their report, they state that much dust was made during the cutting of coal. The two Sullivan cutting machines, which did all of our cutting in the No. 3 seam were equipped with water tanks and water was applied to both cutter bars.) The Jeffrey cutting machine was taken to the No. 2 seam, and was operated very infrequently in working places that were wet.

(Item 4 on Page 17 deals with the practice of "nipping." The shortage of trailing cable due to the War is known to every mine operator, and our Company was ordering cable to the full extent permitted by its quotas. The quantities we asked for were drastically reduced by the War Production Board.) To indicate this shortage we cite that on August 26, 1942, we ordered 1400 feet of trailing cable, and gave the highest ratings permitted by the War Production Board. Nothwithstanding these high ratings, only four hundred feet were received prior to the explosion.

(The statement on Page 17 of their report that there was very little cooperation between employees and Management in connection with the establishment and enforcement of safety practices is incorrect. Every United Mine Worker who testified at the Inquest testified that there was cooperation, and the only exception mentioned to the Management was the difficulty of preventing the men from jumping off the man trip before it stopped.)

The Federal report, in our opinion, places Dave Murray, Mine Foreman, and John Meiklejohn, Fire Boss, in an unfavorable light, by intimating that it was their negligence in not examining Room 5 of the 9th South East entry on the morning of the explosion that indirectly probably caused the explosion. The Company can prove that the explosion did not start in Room 5 of the 9th Southeast panel and that neither Mr. Murray or Mr. Meiklejohn were negligent in their duties on the morning of the explosion. No evidence or testimony has ever been presented or brought to the attention of the Management that either of these men was ever careless or negligent while on duty. In support of our contention that they had no part in causing this explosion, (we wish to say that Federal Bureau examiner, M. C. McCall, when he and other Federal examiners went into the 9th South East entry during the rescue effort and after they stopped in the slant and looked at the post on which the slant door hung prior to the explosion, made the remark, after noticing that the angle irons that supported the door were bent inwards toward the face of the 9th South East entry, "that leaves out the mine foreman with the safety lamp at the mouth of Room 6.") The mine foreman referred to in this remark was Dave Murray. This remark of Mr. McCall's is very good evidence that the explosion could not have started in Room 5 of the

9th South East panel, where the Bureau examiners are trying to establish the source of the explosion.

It is quite evident from the above comments that the Federal examiners didn't give the Company much credit for its unusual effort, under abnormal War conditions, in completing so many of their recommendations, and trying so hard to get electric cap lamps, permissible powder, and rockdusting equipment.

WHY THE EXPLOSION COULD NOT HAVE ORIGINATED IN ROOM NO. 5, OFF THE 9TH SOUTHEAST PANEL, THE PLACE PICKED BY THE FEDERAL EXAMINERS AS THE PROBABLE SOURCE.

Initial Force of the Explosion

The initial force of the explosion was inby and opposite to what it would be if it started in the 9th Southeast panel for the following reasons:

1. The transit box and tripod that were in the supply room off the machinery repair shop located North of the 9th Southeast panel and near the 7th Southeast panel, were blown down hill (South) or inby from the Northeast side of the supply room in a direction towards the East Main South Back entry, indicating that the initial force came down all three of the Main South entries. The transit box and tripod were blown against one of the posts located in the center of the supply room, which post supported the shelves back to back. The initial force came in from the Main South entry and destroyed these shelves, one of which contained boxes filled with welding rods, which boxes fell on the tripod and transit and crushed them. Six feet of a row of shelves in the shop were blown inby from the Main South entry in a Southerly direction to the East Main South Back entry.

2. Most of the sand boxes, which usually contain about two tons of sand for haulage purposes and which were located in several places on the Main South entries, definitely indicate that the initial force of the explosion was inby and came from the North, as these sand boxes were moved down the hill towards the 9th Southeast panel in a Southerly direction.

3. Three loaded mine cars on the main parting, located in the 1st West entry, at the North end of the active working places in the Smith Mine and near the 4th Southeast entry, near which entry the Company thinks the explosion started, were blown on their side against the South rib of the parting, which is definite evidence that the initial force that upset these loaded cars, which weighed more than five tons each, was terrific and definitely inby and came from the North and not from the South as the Federal examiners are trying to establish.

4. Six cars of props in the slant between the Main South entry and the East Main South Back entry, which is part of the 9th Southeast Back entry, and near the place picked by the Federal

inspectors, were blown with such an inby force, which force came from the North, that the West end car was jammed against the rib of the 9th Southeast Back entry and the props in this car were moved out of the car in an inby direction, a distance of three feet. If the explosion had started in this 9th Southeast panel, as they think, the initial explosion certainly would have blown these cars against the opposite rib as the force of the explosion was particularly terrific in this section of the Mine.

5. In a slant in the 9th Southeast panel, picked by the Federal men, the initial force was definitely inby and opposite to what they claim it was because on the post on which the slant door formerly hung, the initial force of the explosion bent the angle irons inwards toward the face of the 9th Southeast entry. These angle irons would have been bent in the opposite direction had the explosion started in Room 5 in this entry.

Comments on the Federal Examiners' Theory

On page 27 of the Bureau's report under "Probable Cause of the Explosion," we quote from their report as follows:

> "According to various information received, the line brattice was extended to within 70 to 100 feet of the face. The place was drilled and shot about 10:30 p. m. the night before the explosion. Gas was recorded as found in the place February 20, 21, 22, 23, 24 and 25. The man who acted as fire boss on the night shift (up to midnight) on February 26 stated to the investigators that he found gas in the place that night, before the face was drilled and blasted. For some reason, a record was not made of gas being found in the place on February 26. On the morning of the explosion, the fire boss who was killed examined this panel, and there is no record of his findings."

The Company challenges the Federal inspectors to prove the statement "the line brattice was extended to within 70 to 100 feet of the face of Room 5" (where they think the explosion started). Sanfred Huhtala, the man who acted as fire boss on the night shift on February 26th, the night previous to the explosion, and referred to in the above statement, says he made the following statements to Mr. Arnold in the presence of Federal Inspector F. J. Bailey, and Mr. Loren Newman, a Company foreman:

Sanfred Huhtala said he told Mr. Arnold he inspected the 9th Southeast entry on the night of February 26th, the night previous to the explosion, that his inspection started about 4:30 p.m. and that he examined all of the rooms and the Main and Back entries in the 9th Southeast panel. He said he also told Mr. Arnold in the presence of the above men that he discovered only a trace of gas (less than 5 cubic feet) in Room 5 and reported it to Mr. Martin Rapp, the mine foreman, who instructed him to install a line brattice at once to remove this gas. Mr. Huhtala says he also told Mr. Arnold that a line brattice was built as soon as possible to within 18 feet of the face, (not 70 to 100 feet mentioned in the Federal report), and the line brattice was completed at once. Mr. Huhtala says he further told Mr. Arnold that he and Mr. Rapp inspected Room No. 5 shortly after the line brattice was completed and could not find a trace of gas in their examination of this room on the night before the explosion.

During the questioning of Mr. Huhtala as to the above, he told the Management that shortly after the explosion, with the above line brattice destroyed by the force of the explosion, and normal ventilation destroyed which resulted in less than one-half the air circulating in No. 5 room than was in this place prior to the explosion, that he found less than ten cubic feet of gas in Room No. 5. He also said that several weeks after the explosion, and after the line brattice had been rebuilt, and nothwithstanding that there was less than one-half the normal ventilation in the Smith Mine at that time, Room No. 5 was clear and free from explosive gas.

Considering that the Federal examiners during their thorough examination in November never reported to the Management that they found even one active working place in the Smith Mine where there was enough gas to even burn a man, let alone cause an explosion, and also considering the above statements by Mr. Huhtala, which Mr. Arnold should know to be the facts, it is difficult for the Management to understand the Federal examiners' explanations as to the probable cause of the explosion.

In further proof that the explosion did not start in Room 5 we mention the following:

The fireboss's date for February 27, showing he inspected Room 5 on the morning of the explosion, is on the roof at the face of No. 5 room in the 9th Southeast panel, which is evidence that there was not a large amount of gas in the place when he examined it about six o'clock on that morning. Also there is evidence that the trackman had worked in Room 5 for over an hour that morning, as he had broken the track and cleaned it out to make room to lay a switch. He had taken the materials into the place, and had worked at least thirty feet inby the point at which he was working when the explosion took place. It is difficult to see how he could have moved about the room doing that work for over an hour before lighting the gas. Also, if he had ignited the gas, he would have been blown toward the entry and not toward the face of the room as the gas would have been between where he was working and the face. The foreman, while making his rounds, always visited the places where men were working, and it doesn't seem reasonable that he would have walked by the place where men were preparing to lay a switch and go to a place where there was no one working to test for gas. The evidence shows that the foreman was preparing to test for gas in Room 6 at the time of the explosion.

Under the Federal representatives' theory, (it is difficult to understand how so little gas, if there was any, (as the Company claims Room 5 was absolutely free from explosive gas on the morning of the explosion) could develop enough force in such a short distance to move a sand box down hill on the Main South entry in the next entry) below the 9th Southeast panel, (and turn on an angle of about 135 degrees to do this.) The explosion force would also have to reverse its course in the 8th Southeast entry, just a short distance from Room 5 and develop enough force to derail a 20-ton mine locomotive and move a fan a distance of 285 feet in the 8th Southeast entry (the next entry immediately above the 9th Southeast panel and a very short distance away). It is not reasonable to assume that enough coal dust in a comparatively damp mine like the

Smith Mine, or even a dry mine, could add to the force of the explosion to such an extent, and do such damage in a reverse direction, in such a short distance.

The Company's Views on the Probable Cause of the Explosion

On account of the comparative dampness of most of the entries in the Smith Mine, prior to the explosion, the Management has always been of the opinion that it required the ignition of an unusually large amount of methane gas to disturb the comparatively damp coal-dust into suspension, so that it would add to the fury of the explosion. No quantity of gas in an amount even large enough to burn a man was ever reported in any of the places where men were working in the Smith Mine by the Federal examiners during their lengthy inspection, which is substantiated in their preliminary report.

In view of this and the fact that only one man was severely burned in 35 years in the Smith Mine by gas, and as this was in a place that was not being actively worked, and considering the above evidence, it would seem impossible that enough gas could accumulate between shifts in room 5 or any other active working place in sufficient quantity to start an explosion of this magnitude.

The only place near where the men were working in the Smith Mine where a large quantity of methane gas could accumulate was in the abandoned 2nd East Main and Back entries, which entries were blocked off by cement stoppings in accordance with an understanding with the Federal inspectors at a meeting held in the Washoe office in November. The building of these stoppings permitted a three-months' accumulation of gas, and as these abandoned entries were generating more methane than the entries where the men were working, it is not unreasonable to assume that an extremely large amount of gas accumulated behind these stoppings between the time the Federal inspectors examined the mine in November and the time of the explosion. The air or gas area behind these stoppings was about 200,000 cubic feet.

Regarding the drying of the mine and the coal-dust hazard, it is to be expected that the mine did dry out to a certain extent during January and February from the improved ventilation resulting from the completion of the ventilation recommendations suggested by the Federal inspectors. As an example of this better ventilation, we refer to the preliminary report of the Federal examiners wherein they state the West panel entries were well ventilated, but the air in the East panel entries (which is on the last of the air current) should be increased. The last reading obtained by the Federal inspectors in November in the 2nd Southeast panel entries was only 10,000 cubic feet. The last air-reading of record taken in the same last cross-cut by Mr. Elmer Price, mine foreman, on February 23rd (four days prior to the explosion) shows the reading to have been 20,000 cubic feet, which indicates that the air volume was doubled in this part of the mine

just prior to the explosion. This improvement in ventilation, no doubt, did help dry out certain parts of the mine and make the coal-dust easier to explode.)

The Company's theory as to the probable cause of the explosion is as follows:

Up until the time the concrete stoppings were constructed in the 2nd East Main and Back entries off the 4th Southeast, methane gases produced in these entries were safely controlled through direct ventilation. However, through the sealing up of this section, a vast storage reservoir was created, which each day added to its capacity by the pressure of the incoming gases. (Examination of these concrete stoppings after the explosion plainly shows that a cave had occurred prior to the explosion, directly over the cement stopping in the back entry, leaving an opening approximately 2 feet high by the width of the entry (about 12 feet wide), providing a large opening for the pentup gases to escape quickly and in large volume into the return airway, a short distance from the air shaft leading up to the No. 2 seam and old No. 2 workings. These gases, released by the cave over the cement stopping and, no doubt, under pressure, united with the return air, creating a very highly explosive mixture. The air shaft from the No. 2 seam contained a 3-phase high-voltage transmission line with fuse terminals at the bottom of the shaft. Examination of these fuses, after the explosion, showed that one of the phases had blown a fuse. The heavy load carried by this transmission line, sufficient to blow a fuse, would create quite a flash or arc, making this the most probable source of ignition.) Ignition of the gases at this point worked both inby and outby. (Forces from this initial explosion working inby, blew the main entry cement stopping completely in, and also blew in the exposed part of the back entry cement stopping that was not protected by the cave. The fact that the cave in the back entry protected most of the cement stopping from moving in either direction, is proof that the fall of rock that released the gases fell immediately before the explosion started.) The increased size of the back entry opening, as the result of the top part of the cement stopping having blown down, permitted more of the pentup gases to escape. Ignition of this additional large volume of gas created forces that were strong enough to stir up even damp coal-dust and develop a major explosion. All the above is plainly indicated by the telltale trail of the major forces. (Major forces working from the probable point of ignition at the bottom of the air shaft, near the pentup gases, rushed down the No. 1 room of the 1st West entry, upsetting three loaded cars on the main parting, and pushing them against the lower (South) rib, definitely proving that the major force traveled from the above-mentioned point of ignition in a Southerly direction which direction is opposite to what it would have been had the explosion originated in the 9th Southeast panel, the place picked by the Federal examiners.) The forces then went down the main South entry, destroying the switching gear at the Rotary-Converter stations and destroying the machine repair shop, and probably stirred up a great amount of coal-dust, which permitted the explosion to gain in intensity as it travelled inby to and beyond the 9th Southeast panel, where the Federal examiners think it start-

ed. The enclosed map, prepared by the Company, will explain the source of the explosion in more detail.

Lessons to be Learned from this Explosion

On page 30 of their report, the Bureau of Mines examiners, under the above heading, try to leave the impression that the Company is the only party that should learn a lesson from this terrible disaster. We certainly do not agree with this conclusion. Whether or not the Company's choice of the origin of this explosion has any merit, and we sincerely believe it has, and is more sound than any theory yet submitted, it would be a terrible mistake, for the sake of saving of lives in the future, if the Bureau of Mines did not impress upon its coal mine examiners to do the following things in their examination of coal mines in the future:

1. That before suggesting that coal companies block-off places that can accumulate considerable quantities of explosive gas, the Federal examiners should take into account, that falls of rock and squeezes might release this gas quickly in dangerous amounts and cause an explosion, and they should also recommend to the coal operators that double concrete stoppings and other precautions be taken to prevent this extremely dangerous source of explosions from causing disasters in the future, especially in mines where they know that open lights, trolley mine locomotives and non-permissible electric equipment are being used, as was the case at the Smith Mine.

2. That Federal mine examiners should be very careful in suggesting to coal operators that ventilation improvements be made, that will have a tendency to dry out a mine and increase a coal-dust hazard, before rock-dusting equipment can be made available, especially in mines where open lights and non-permissible electrical equipment are used, or cannot be procured for an indefinite length of time, as was the case at the Smith Mine.

SUMMARY

The Company would like to mention that it believes the above comments prove that since the Federal inspection in November, it did everything within reason, under War conditions, to avoid accidents. In November, when the Federal representatives were at the Smith Mine, the Company offered to close down this mine at considerable loss in revenue, rather than place its employees in a position where their lives might be endangered.

The Federal examiners convinced the Management that the Smith Mine was not dangerous, even though it was absolutely necessary to use open lights in the mine, as the Bureau representatives knew that electric cap lamps, because of the War effort, could not be purchased by the Company for several months. In support of our contention that the Federal men thought the Smith Mine safe, we wish to state that at a public meeting in March, 1943, held at the mining town of Bearcreek, where the Smith Mine is located, and in answer to a question as to whether he con-

sidered the Smith Mine a dangerous mine when he inspected it in November, we understand Mr. Arnold stated that he did not consider this mine dangerous, and if he had, it would have been his duty to notify the State Coal Mine Inspector to that effect.)

(The State Coal Mine Inspector thoroughly examined the Smith Mine on January 27, 1943, only one month prior to the explosion, and the State Industrial Accident Board of Helena issued a Certificate of Inspection, approving of the condition in the Smith Mine as of that date.)

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Notwithstanding a very strenuous effort (which was to be expected as the result of such a terrible disaster) there was no testimony at the Red Lodge Inquest that indicated that the Company did anything in operating the Smith Mine that was contrary to the State mining laws of Montana, or did anything in the operation of the Smith Mine that was radically different from what was being done in all Montana coal mines.

In conclusion, the Company wishes to say that the two things, that it sincerely believes contributed more than anything else to causing this explosion, viz., the accumulation of methane gas over a three-month period in temporarily abandoned workings, by the building of cement stoppings that apparently would not have been built immediately after the inspection were it not for the November Federal examination, and the drying out of the coal dust in the mine to a certain extent on account of improved ventilation resulting from completing certain recommendations of the Bureau of Mines, were things that the Company was not directly responsible for.

In further support of our contention that there was not enough gas in any of the active working places in the Smith Mine on the morning of the explosion to even burn a man, particularly in Room No. 5 in the 9th Southeast panel (where the Federal Men think the explosion started) we want to mention that notwithstanding the Smith Mine has been closed down for three months and the only work done in the mine is the repairing of stoppings that were destroyed by the explosion and the removal of machinery, equipment, and mine tracks, and that there is only about one-half of the volume of air in the mine that there was on the morning of the explosion, there is still not enough gas in any of the said active working places to cause an explosion. The Fire Bosses report that since they replaced the line brattice, in the above-mentioned Room No. 5, that was blown out by the explosion, that this room has been entirely free of gas during the past three months, which proves that this room certainly must have been free of gas on the morning of the explosion and the disaster could not have started in this room where the Federal Examiners think it originated. This room can be examined by anyone who wishes to do so at this time.

The Company, however, does not blame anyone for the disaster, as it realizes that the fall of rock that permitted this accumulation of gas to quickly escape was not predicted by anyone present at the November meeting. The Company also realizes that neither the Federal examiners nor the Company mine officials anticipated that the Smith Mine would dry out to such an extent in the short time between the November inspection and the time of the explosion.

The Company believes the Federal examiners were very unfair in their report on the explosion in withholding essential facts and making many misleading statements. Nothwithstanding the Management agreed to close the No. 3 workings if the Federal inspectors thought there was danger of anyone losing his life, and also notwithstanding the inspectors agreed in November to the use of open lights in the Smith Mine until electric cap lamps could be procured, which they knew would take months on account of the War effort, they blame the Company for using open lights (which they themselves permitted) and try to prove that the explosion started from an open light in a place where the Company's mine foreman and fire boss might be proven negligent.

In no sense of the word, are the foregoing comments intended to reflect in any way upon the United States Bureau of Mines or its efforts to save lives, which efforts, the Company is heartily in accord with and desires to cooperate with to the fullest extent.

We cannot speak too highly of the speed with which the Bureau of Mines men and equipment arrived at the Smith Mine for the rescue effort. The quality of leadership displayed by the Representatives of the Bureau, and the individual courage and self-sacrifice of each one, are praiseworthy to the extreme. The Company is grateful for their help in this disaster and feels greatly indebted to every Representative of the Bureau of Mines who assisted in the rescue effort.

Respectfully submitted,

MONTANA COAL & IRON COMPANY

By.....

J. M. Freeman, Vice President and General Manager.

By.....

W. A. Romek, Assistant Manager.

FINAL REPORT OF MINE EXPLOSION
SMITH MINE, MONTANA COAL & IRON COMPANY
WASHOE, CARBON COUNTY, MONTANA
FEBRUARY 27, 1943

By

G. O. Arnold
Senior Coal Mine Inspector

M. C. McCall
Mining Engineer

F. J. Bailey
Senior Mining Engineer

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

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FINAL REPORT OF MINE EXPLOSION
SMITH MINE, MONTANA COAL & IRON COMPANY
WASHOE, CARBON COUNTY, MONTANA
FEBRUARY 27, 1943

By

G. O. Arnold[1/]
M. C. McCall[2/]
F. J. Bailey[3/]

INTRODUCTION

An explosion occurred at this mine about 9:30 a.m., February 27, 1943. Seventy-seven men were underground at the time; seventy-four men died in the explosion, and three men were rescued. The three rescued men were along the haulageway in No. 2 bed, outby and above the workings in No. 3 bed, at the time of the explosion; these men have not fully recovered from shock and exposure to noxious gases.

The cause of the explosion, as determined by the Bureau of Mines' investigating party, is thought to have been an ignition of explosive gas by a miner wearing an open light in No. 5 room off the 9 southeast entry in No. 3 bed.

The explosion was confined to the workings in No. 3 bed, and evidences of force and heat were found in about two-thirds of the workings. Propagation of the explosion was made possible by the presence of coal dust throughout the mine, and there was evidence of gas having burned in many places. The explosion was violent only in parts of the mine, and property damage was limited to the destruction of three booster fans, nearly all stoppings and doors (which were constructed of wood) in No. 3 bed, some damage to haulage locomotives and rotary-converter stations, and to the derangement of trolley and power wires.

According to the locations where the bodies were found, 44 of the men moved distances ranging from 40 to 2,000 feet, and 30 were killed instantly. Several of the men who moved had been burned, but most of them apparently had not been exposed to flame or violent forces. The bodies of most of the men who were killed instantly were badly burned, and the others were burned to some extent; about seven of the bodies were mutilated as a result of the forces of the explosion

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1/ Senior Coal Mine Inspector, Salt Lake City, Utah.
2/ Mining Engineer, Health and Safety Service.
3/ Senior Mining Engineer, Mineral Production Security Division.

Water apparently was being used on the cutter bars of two track-mounted cutting machines, while cutting coal, but not in conjunction with any other face operation. The mine had not been rock-dusted.

Word of the explosion was transmitted about 11:45 a.m. by John L. Boardman, chairman, Bureau of Safety, Anaconda Copper Mining Company, to J. A. Johnson, engineer-in-charge of the Butte, Montana, office of the Bureau of Mines. Mr. Johnson notified the Salt Lake office about 12:00 noon by telephone. Messrs. Johnson and Emery C. Olsen, together with 12 rescue men and equipment provided by the Anaconda Copper Mining Company, left Butte by Army transport plane, landed in Billings, Montana, at 3:40 p.m., and were taken to the mine by Montana State Highway patrolmen, arriving at Washoe about 5:00 p.m. Messrs. Edward F. Courtney, Phil B. Dolman, M. R. Evans, and James K. Hayball left Butte by automobile and arrived at the mine about 7:35 p.m. Messrs. Arnold, P. H. Holland, and M. C. McCall left Salt Lake City, Utah, by automobile at 3:30 p.m. with rescue apparatus and arrived at the mine about 11:30 a.m., February 28. Also Mr. D. F. McElhattan, district manager of the Mine Safety Appliance Company, arrived about 2:00 p.m. of the same day with rescue equipment. Messrs. R. D. Reeder, Acting Supervising Engineer of the Salt Lake station, and Fred J. Bailey left Salt Lake City by automobile at 10:00 a.m. on March 2 and arrived at the mine about 9:15 a.m. on March 3. Mr. E. H. Denny, Chief, Coal Mine Inspection Division, Pittsburgh, Pa., arrived at the mine about 9:30 a.m., March 5.

Rescue men, together with equipment, also came from the Defense Chrome Account Mines at Benbow, and Mouat, Montana. The State coal mine inspector, Mr. Edward Davies, a number of mine officials, and a large number of miners from near Roundup, Montana, assisted in the recovery work. Mr. Harold Graves, Chief of the Red Lodge Fire Department, took two all-service gas masks and an oxygen inhaler to the mine; he assisted in treating men affected by exposure to noxious gases.

Recovery operations, without the use of any protective equipment other than two or three all-service gas masks and a few canisters, were started by local employees immediately after the explosion. Three of the five men working near the underground hoist in No. 2 bed, about 2,600 feet inby the mine portal, were rescued, and the bodies of the other two men were recovered, between 10:30 and 11:00 a.m., or within 1-1/2 hours after the explosion. Mr. Davies arrived early in the afternoon from Billings and entered the mine about 2:00 p.m. As the ventilating system was being repaired without suitable protective masks or oxygen breathing apparatus, and without means of testing for carbon monoxide, many of the workmen became ill, but all recovered. After the arrival of Bureau of Mines representatives with necessary protective equipment, work was started toward extending the ventilation, and the recovering of the bodies was expedited.

The first bodies from the workings in the No. 3 bed were brought to the surface on Thursday, March 4. The last two bodies, including that of the mine foreman, Elmer Price, were brought to the surface about 6:00 p.m., Sunday, March 7.

After recovering the bodies, it was necessary to wait a week before workmen could be procured to reestablish ventilation in the mine. The work was completed on March 20, and the investigation to determine the cause and origin of the explosion was made from March 22 to 29 by the following persons:

Representing the Company:
W. A. Romek, Assistant Manager
Tom Freeman, Outside Foreman
Loren Newman, Mine Foreman
Martin Rapp, Mine Foreman

Representing the United Mine Workers of America:
W. A. Boyle, President, District 27
Joe Masini, International Board Member
Joe Yanchisin, District Board Member
Joe Bosone, Secretary Local Union No. 4457

Representing the State of Montana:
Edward Davies, State Coal Mine Inspector
Ben Henry, State Metal Mine Inspector
Archie Browning, Mine Foreman, Giffin mine,
Great Northern Railroad Company, Giffin, Montana

Representing the Bureau of Mines:
G. O. Arnold, Senior Coal Mine Inspector
Fred J. Bailey, Senior Mining Engineer

GENERAL INFORMATION

An inspection was made of this mine November 19 to 30, 1942, by G. O. Arnold and M. R. Evans,[1/] and the final report is now available for study.

Location and Operating Officials

The Smith mine is owned and operated by the Montana Coal & Iron Company. The mine is on a branch line of the Montana, Wyoming & Southern Railroad Company at Washoe, about 50 miles northeast of Laurel, Montana.

1/ Mining Engineer, Butte, Montana.

The officials of the company and their addresses are as follows:

C. R. Smith	President	Menasha, Wisconsin
J. M. Freeman	Vice President and General Manager	Washoe, Montana
W. A. Romek	Assistant Manager	Billings, Montana
W. R. Freeman (resigned)	Superintendent	Long Beach, Calif.

Employees and Production

Prior to the explosion, the mine was operated two 7-hour shifts and produced about 1,800 tons of coal each day; the few men employed on the third shift did such cutting, drilling, and blasting as was left over from the other shifts; two hundred forty-five men were employed as follows:

	First Shift	Second Shift	Third Shift	Total
Surface	59	36	8	103
Underground	77	53	12	142
Totals	136	89	20	245

Openings

The old mine in No. 2 bed was opened by three slopes driven down in a southwesterly direction on the full pitch of the coal bed. About 3,700 feet inby the portal a rock slope was driven down to the No. 3 bed, and the workings in the No. 3 bed were developed from this point. An inside shaft was driven between the two beds, near the junction of the rock slope with the No. 3 bed, to provide the second airway. A rock slope from No. 2 bed up to the No. 1 bed and thence to the surface, and an untravelable connection with the old Foster mine in No. 2 bed are the only other openings to the surface.

Coal Bed

The mine is in the No. 3 bed of the Bear Creek coal field. Classed as subbituminous, the coal ranges from 9 to 10 feet in thickness, and dips from 3 to 10 percent in a southwesterly direction. A maximum cover of 1,200 feet is over the workings in No. 3 bed.

A face sample was collected August 15, 1939, by a representative of the Bureau of Mines. This sample, designated as Laboratory No. B-42518, was analyzed August 31, 1939, in the laboratory of the Bureau of Mines in Pittsburgh and gave the following results:

Moisture	10.5	Percent
Volatile matter	33.6	do.
Fixed carbon	43.1	do.
Ash	12.8	do.
Total	100.0	do.

Sulfur	0.8	Percent
B.t.u.	10,490	

The ratio of volatile matter to the total combustible matter, as given above, $\left(\frac{\text{Volatile matter}}{\text{(Volatile matter plus fixed carbon)}}\right)$ is 0.438.

Experiments conducted by the Bureau of Mines have shown that dust from coal having a volatile to total-combustible ratio of 0.12 is explosive, and that the explosibility increases as the ratio increases. Accordingly, dust from the coal in this bed is highly explosive and would readily initiate or propagate an explosion.

The immediate and main roof, above the 8 to 10 inches of top coal left for protection, consists of shale, or thin layers of sandy shale, which is very fragile. The floor consists of the same material and is smooth and medium hard.

UNDERGROUND MINING METHODS, CONDITIONS, AND EQUIPMENT

Method of Mining

The mine was worked on the room-and-pillar method. Cross entries, in pairs, were driven right and left off the main south slopes at 300- and 400-foot intervals. Entries were driven about 14 feet wide and rooms were driven 22 feet wide. Crosscuts between rooms and between entries range from 100 to 150 feet apart. Rooms and entries were driven on 70-foot centers.

Coal is top cut and center sheared to a depth of 9 feet, and is loaded into mine cars by track- and tractor-mounted mechanical loading machines.

The top coal, left in place, makes a good roof. All entries and working places were reasonably well timbered with the exception that timber usually was not set close enough to the working faces.

Pillars were not recovered in the workings in No. 3 bed.

The air is circulated by a 5-foot centrifugal fan, installed on the surface, but in direct line with the airway. Three booster fans were used underground to increase the circulation of the air and all three were destroyed

in the explosion. After the explosion, the main fan was forcing 36,400 cubic feet of air per minute into the mine; at the time of the inspection in November, the fan was forcing 43,470 cubic feet of air per minute into the mine, aided by the underground booster fans.

The air was circulated through the mine in one continuous current; it passed down the west side and back out the east side, and ventilated all panels and working places. During the recovery operations, and also when the ventilation was being restored, methane was found generally throughout the mine. Progress was retarded in several panels because of the difficulty of removing the accumulations of methane.

Three sets of air samples were taken and the results are shown in Table No. 1. These samples indicate that the mine was liberating 387,130 cubic feet of methane in 24 hours on March 26, one month after the explosion. Samples collected at these same points in November indicated that the mine was liberating 409,100 cubic feet of methane in 24 hours at that time. Considering that the mine had been idle for one month, the volume of gas being liberated in 24 hours on March 26 may indicate that, with the mine in full operation, the volume of gas that would be liberated in 24 hours now might be substantially greater than the figure shown for November.

All stoppings in the No. 3 bed workings were constructed of double thicknesses of wood with a layer of bituminous-treated paper between, and all doors were erected singly.

Drainage

Very little water is encountered in the No. 3 bed. Several small pumps installed near swamps along the haulageways take care of all drainage.

Dust

At the time of the inspection in November the interior of the mine was generally moist, although dust was apparent throughout. The winter was cold, and the management stated that the volume of air reaching the working sections had been increased, which would result in some drying out of the mine. The mine was extremely dry during March, no doubt because of the heat of the explosion, and unusual coatings of fine dry coal dust were evident in all areas affected by the explosion.

Water apparently was being used on the cutter bars of two cutting machines, while coal was being cut, but otherwise water was not used to allay coal dust in any other operation. Rock dust has never been applied in the mine. Dust samples were not collected following the explosion, but four samples collected in November are included herein Table No. 2.

TABLE 1. - Analyses of air samples collected in Smith (Mine)

(Company) Montana Coal & Iron Company

(Location) Washoe, Carbon County, Montana (Date) March 26, 1943

Laboratory No.	Location in mine	Percent				Cubic feet air per minute	Cubic feet methane in 24 hours
		Carbon Dioxide	Oxygen	Methane	Nitrogen		
82038	Intake above 4 east	0.04	20.88	0.00	79.08	20,880	
82039	" " "	0.05	20.92	0.00	79.03	"	
82040	Upcast shaft in 4 east	0.30	19.70	1.36	78.64	13,600	Average
82041	" " "	0.33	19.59	1.49	78.59		279,072
82214	2 Left return, above 4 E.	0.27	20.01	0.80	78.92	9,380	Average
82215	" " " "	0.28	20.04	0.80	78.88		108,058
		Total return air and methane				22,980	387,130

Above analyses made April 1, 1943 in Gas Laboratory, U. S. Bureau of Mines, Pittsburgh, Pa.

TABLE 2. - Analyses of dust samples collected in Smith (Mine)

(Company) Montana Coal & Iron Company

(Location) Washoe, Carbon County, Montana (Date) Dec. 8, 1942

Laboratory No.	Location of mine	Kind of sample	Percent			Cumulative	Remarks
			Combustible, V. + F. C.	Incombustible moisture + ash	Through 20-mesh	100 percent through 20-mesh Percent through	
B-90770	5 West haulage road, inby main south	Ribs	74.1	25.9	76.2		
B-90771	" " "	Floor	53.8	46.2	66.0		
B-90772	5 south east haulage road, inby main south	Ribs	74.7	25.3	74.1		
B-90773	" " " "	Floor	67.8	32.2	61.7		
	The above analyses were made in the Coal Analysis Laboratory, U. S. Bureau of Mines, Pittsburgh, Pa.						

Haulage

Haulage from the tipple to the underground hoist in No. 2 bed is handled by the main hoist on the surface. The underground hoist was used in hoisting and lowering trips from and to the 1 west parting near the outby end of the workings in No. 3 bed. Trolley locomotives were used for all gathering and main line haulage in No. 3 bed.

Lighting

Permissible electric cap lamps were being used by some of the men. At the time of the explosion, 34 of the 77 men underground were using permissible electric cap lamps and the others were using open lights. Seventy-five permissible electric cap lamps were available for use by the 142 men employed underground.

Electric lights were installed along the haulageways, but at the time of the inspection in November additional lights were needed, especially near doors, at switches, and along partings. Trip lights or markers were not being used on moving trips.

Machinery and Electricity Underground

All electrical equipment in use underground is of a nonpermissible type. Some of the loading and cutting equipment, used near the faces, is of an enclosed type, but the protective covers over electrical parts are missing on most of the machines.

Trolley wires are reasonably well installed, although the insulated bases are missing from many hangers. Frogs are missing at some turnouts, and cut-out switches are not installed at the entrances to panels.

Bare feeder cables, supported on nails or spikes driven in posts, extend along the main haulageways. There are no cut-out switches on the direct-current distribution system, except at the rotary-converter stations. The entire system was energized when the power was on.

Bare feeder wires extend into all rooms. The wires are attached to the trolley circuit by twisting one end about the trolley wire hangers. These feeder wires extend past the last open crosscuts in most places and the wires are generally supported on nails or spikes driven into posts. Some insulators have been installed along these feeder wires since the inspection in November. Cut-out switches are not provided on these feeder wires at the entrances to rooms.

Mobile electrical equipment was moved into and out of rooms by "nipping."

Explosives and Blasting

All coal was blasted with black pellet powder; shots were fired with fuse ignited by matches or open lights. Some experiments had been made with permissible explosives, but all coal was being blasted with black pellet powder at the time of the explosion.

Fine coal, or coal dust, was being used for stemming material, and shots were being fired near the end of the shift, before the men left the mine.

Explosives were being hauled about the mine in a car attached to the mobile electric drills. Small storage boxes had been provided for storing explosives in the various sections of the mine. Some insulated bags had been provided for use in carring explosives to the faces, but they had been used very little, and were not in general use.

One wooden tamping bar was observed which was being used to tamp holes charged with permissible explosives. Otherwise, metal tamping bars were in general use.

GENERAL SAFETY CONDITIONS

First Aid and Mine Rescue

About 11 men were trained in first aid in October of 1942, and 9 men were trained in mine rescue work in 1930.

First-aid supplies in the mine consisted of 4 blankets, 2 stretchers, and a small quantity of dressing materials. On the surface, 4 blankets, 2 stretchers, and 2 hospital beds fitted with canvas-covered mattresses are kept in the first-aid room. Supplies and equipment inside the mine were inadequate.

Five 2-hour self-contained oxygen breathing apparatus, and the necessary pump and tools to maintain them, are kept in one of the supply houses, but this equipment has been neither used nor maintained for a number of years.

Two all-service gas masks were kept at the mine, one underground and one on the surface. A supply of canisters was not maintained.

None of the employees had self-rescuers.

The question was asked Arnold at the Coroner's inquest as to whether any of the men might have saved themselves after the explosion, had they been equipped with self-rescuers. He replied that it is possible that all men working near the hoist in No. 2 bed might have saved themselves, but that it is highly improbable that any of the men in the No. 3 bed workings could have reached fresh air while wearing a self-rescuer. It was mentioned that the passageways through which these men would have had to travel very likely were filled with an atmosphere heated to a point where it would have been difficult to breathe, regardless of the noxious gases present.

During the recovery operations, the question was raised as to whether some of the men in the lesser affected panels night have saved themselves had they erected proper barricades. This is difficult to answer, but it does appear highly probable that some of the men could have been saved had they erected proper barricades.

Instructions in the erection of barricades are included in the standard first-aid course. It is evident that most of the men have not received such instructions in recent years.

Emery C. Olsen, principal first-aid instructor, stationed at Salt Lake City, called at the Montana Coal & Iron Company office in Washoe on September 21, 1942, and discussed the subject of first-aid training with Mr. J. M. Freeman. As a result of this discussion, Mr. Freeman wrote to the Salt Lake Office requesting that classes in first aid be held at the mine. Mr. Reeder replied to this letter stating that he would take the matter up with Mr. Olsen, upon his return to Salt Lake City, October 2, and infrom Mr. Freeman as to the date it would be possible for him to be there.

Mr. Olsen's itinerary was full and it was not until February 2 that an open period approached. Mr. Reeder wrote to Mr. Freeman on that day stating that Mr. Olsen would be available after February 20 to give the training.

A reply to this letter, suggested that the training be postponed until late May or early June because of the men working full time and of the severe winter weather being experienced in Montana at that time

Safety Organization

A safety organization is not maintained at the mine. One of the employees was designated as a "safety man" whose duty it was to go about the mine and report any unsafe conditions. This man was not certified as a mine official.

Supervision and Discipline

Prior to the explosion, two foreman supervised the 77 men employed on the day shift, one foreman supervised the 53 men employed on the second shift, and one foreman supervised the 12 men employed on the third shift. The foreman on the third shift examined a portion of the mine as a fire boss, in addition to his other duties. It is apparent that additional supervisory officials were needed.

According to testimony at the Coroner's inquest, April 12, 13, and 14, the four foremen employed at the mine were all on an equal status. None was in charge of the other or of the entire operation. Supervision of the entire mine was the responsibility of the mine superintendent and it would appear that he did not personally look after a very large portion of the work. One of the important needs of any mine is a competent, aggressive, mine manager or foreman, with complete charge of the entire underground operation, who will actively and personally supervise all phases of the work.

Testimony at the Coroner's inquest also indicated that one of the regular fire bosses, Mr. Newman, was taken off that job sometime in December and placed on the 11:50 p.m. to 7:00 a.m. shift as night foreman. In addition to supervising a small crew of men, Mr. Newman served as fire boss and examined a portion of the mine before the day shift entered. However, according to his testimony, he fenced off any places in which gas was found and entered the record in the fire bosses' record book, but he did not have time to clear any of the places of gas. Another fire boss was not hired to replace Mr. Newman; therefore, it would appear that the task of extending brattices and keeping all places clear of gas on the day shift, when the largest number of men was working, was left to one fire boss. This may have something to do with the gradual increase in the number of places, daily, in which gas was reported after December 10, which fact is discussed later in this report.

Fire-Fighting Equipment

A fire-fighting organization is not maintained. Equipment and facilities for fighting fires on the surface are usually good.

A number of small fire extinguishers is provided underground, but the pipe lines are not equipped with taps to make water available about the mine. Fire hose on the surface is available for use underground.

None of the fire-fighting equipment is inspected at regular intervals.

Commendable Safety Practices

The final report covering the inspection made in November included this paragraph: "The management and officials are to be commended for establishing the practice of topcutting the coal and avoiding the disturbing of the unsound roof; they also are to be commended for their receptive attitude toward suggestions made during this inspection."

It was apparent from observations made during the period following the explosion that some improvements had been made since the November inspection, but, unfortunately, some unsafe practices had not been corrected, and efforts to keep the working places clear of gas were apparently relaxed shortly after the inspection was completed.

PREVIOUS EXPLOSIONS IN THIS OR NEAR-BY MINES

A gas explosion is reported to have occurred, February 1918, in the No. 3 bed workings of the old Washoe mine. This mine adjoins the Smith mine and was closed down several years ago. The ignition of the gas is reported to have been caused by an open light. Five men were burned but all recovered. Otherwise, there is no record of explosions in mines in the district.

MINE CONDITIONS PRIOR TO DISASTER

At the time of the inspection of the mine, November 19 to 30, 1942, it was apparent from a study of the fire bosses' record that gas was being reported in too many places, which in turn indicated that efforts toward keeping the ventilating current up to the working faces were either insufficient or unsuccessful. This condition was emphasized to the mine foreman and a substantial reduction was made immediately in the number of places daily in which gas was reported. Twenty-six places were recorded as containing gas at the beginning of the inspection and a minimum of eleven places was shown on November 27. According to the fire bosses' record book, the number of gassy places reported ranged up to 23 on December 4 and back down to 11 on December 9 and 10. After December 10, the number of gassy places reported increased gradually, reaching a maximum of 30 on January 20, 21 and 22, 1943. Gas was reported in an average of 24.3 places for 10 days prior to the explosion.

The State coal mine inspector made an inspection of the mine on January 27, 1943. He reported finding gas in 5 working places and that the places were "deadlined," or fenced off. Two of the places, rooms 1 and 2 off 10 southeast entry, were not recorded in the fire bosses' book. Whether such oversights by the fire bosses were common is not known.

After the inspection in November, certain recommendations were discussed with the management, and later with the State coal mine inspector, and these recommendations were included in a preliminary report, one copy of which was sent December 10, 1942, to the State coal mine inspector, and two copies were sent December 10 to the management, which included one copy for posting at the mine. The most important recommendations made in the preliminary report, and steps taken to correct them prior to the explosion, are as follows:

Ventilation and Gas

1. "The intake airway should be enlarged along the narrow portions and caved material should be cleared away; the size of the intake airshaft should be substantially increased." Some clearing of the intake airway and enlarging of the airshaft were accomplished. Recommendation also was made orally to the management that an airshaft, or rock slope, be driven to the surface from the workings in No. 3 bed. This shaft was started between Nos. 9 and 10 rooms on the 5 southeast panel, was driven to within a few feet of the No. 2 bed, and, according to testimony at the inquest, work was temporarily stopped the latter part of January. It is unlikely that the shaft could have been completed before the explosion, had work been continued, as it is more than 400 feet from No. 2 bed to the surface.

2. "Leaky stoppings and doors should be repaired." Some work was apparently done toward remedying these defects. At the time of the inspection in November, less than half of the air entering the mine was reaching the working section. This fact was included in the preliminary report.

3. "All doors should be kept closed, except when the haulagemen and equipment are actually passing through them." Haulagemen, according to testimony at the inquest, continued to leave doors open across haulageways and brattice curtains up at the entrances to rooms.

4. "It is important that the fire bosses examine daily all workings through which the ventilating current passes before reaching the outby workin places. Old workings should be examined each week." This was not being done.

5. "Explosive gas should not be permitted to accumulate and stay in any part of the mine." Accumulations of gas were apparently present for weeks in a number of places, and, according to testimony at the inquest, the ignition of gas in working places by men using open lights was a frequent occurrence.

6. "The presence of indications of gas in the air current generally, outby the 7 southeast panel, makes it important that the volume of air

reaching this portion of the mine be substantially increased." The management reported that the volume of air reaching this part of the mine had been increased. Air readings were not taken at the mine in such a manner that this can be substantiated.

7. "Line brattices generally should be extended closer to the working faces." According to testimony at the inquest, and observations made in the mine after the explosion, line brattices were too far back from the faces, being more than 100 feet from the face in at least one place, and averaging not less than 30 to 40 feet from the faces in most places.

8. "The use of open lights and the permitting of smoking in a mine, as apparently gassy as this mine, is highly dangerous. Smoking should be discontinued immediately and all men should be searched regularly and frequently for smoking materials. Permissible electric cap lamps should be provided for all employees as soon as is reasonably possible. Until closed lights are provided for all employees, the mine officials should see that every place in which a man with an open light works is tested with a flame safety lamp for gas before the men enter and several times thereafter during the working shift." Smoking was not discontinued. Permissible electric cap lamps were not ordered for all employees until February 8, 1943. It is apparent from testimony at the inquest that very little precaution was taken in testing for gas in places where men with open lights were sent to work.

9. "The mine foremen should carry flame safety lamps at all times while on duty and test every place for gas during their examination of the working places." The foremen were not carrying their flame safety lamps with them at the beginning of the inspection in November but began carrying them when reminded of the necessity for doing so in the interest of safety. They were carrying the lamps with them prior to the explosion.

Dust and Rock-Dusting

1. "Preparations are being made to provide water for the Arcwall cutting machine and the shearing machine; water should be provided at these machines as soon as is reasonably possible and used on the cutter bars while coal is being cut." These machines were not being used regularly prior to the explosion, but they had been equipped with water tanks and the necessary fittings for applying water to the cutter bars. Evidence at the inquest indicated that much dust was made during the cutting of coal, which would imply that water was not being used effectively, or was not being used at all in some instances.

2. "Efforts should be made to secure an approved type of rock dust and the mine should be rock-dusted. Haulageways and working sections should be rock-dusted first. The rock-dusting of coal mines is the most dependable method of combating the coal-dust-explosion hazard." At the time of the inspection in November the mine was generally moist, and the

coal-dust-explosion hazard was secondary to, although a factor in, the gas-explosion hazard. The possibility of the mine becoming much dryer, and the coal-dust-explosion hazard being increased, when the ventilation in the mine was improved, was explained to the management following the November inspection. The management had made inquiry as to suitable rock-dusting equipment and sources of rock dust, but no action was taken. No rock dust had ever been applied in the mine.

Explosives and Blasting

"The management should consider using a permissible type of explosives in place of black pellet powder for blasting coal. Certain hazards exist when black powder is used, and, until replaced by a suitable type of permissible explosives, precautions should be taken to minimize the hazards, as follows:

1. "Instantaneous electric squibs, fired by permissible blasting units, should be used for firing all shots. Fuse, ignited by open lights or matches, should not be used." The practice of using fuse, ignited by open lights or matches, for firing shots was continued.

2. "Blasting should not be done until all men other than the shot-firers are out of the mine." The practice of firing shots near the end of the shift, while all men were still in the mine, was continued.

"Regardless of the type of explosives used, certain precautions should be taken on the interest of safety, as follows:

1. "Only sufficient explosives to last one day should be taken into the mine at one time. Too large a supply of explsives is being stored underground at this time." The supply of explosives stored underground was reduced.

2. "Explosives should be stored in substantial boxes, provided with locks and kept locked when not in use, in each working section. Explosives should be carried in canvas bags to the faces by the shot-firers, as needed. Explosives should not be hauled about the mine in a car hitched behind the drilling machine, as is now the practice." Boxes with locks were provided, also carrying bags, but the practice of hauling explosives about the mine in cars hitched behind the drilling machines was continued.

3. "Holes should be stemmed only with adobe or other incombustible material. Fine coal should not be used, as is now the practice." According to testimony at the inquest, some clay for stemming material was taken into the mine, but most holes were still being stemmed with "dummies" made of fine coal.

4. "Holes should not be charged while electrical equipment is in the place." The practice of charging each hole immediately after it was drilled was continued.

5. "Tests for gas should be made with a flame safety lamp before and after firing each shot, or round of shots." This was not being done.

Electrical Equipment and Wiring

1. "All bare feeder cables should be supported on insulators." No improvement was made over the existing condition of supporting these cables on nails or track spikes driven into posts.

2. "These wires (bare feeder wires) should be installed on insulators and proper fittings should be provided for attaching the wires to the trolley-wire hangers." These feeder wires were installed in all rooms, supported on nails or track spikes driven into posts, and one end of each wire was twisted about a trolley hanger for a connection to the direct-current circuit. Many of these wires extended beyond the last open crosscut; this was called to the attention of the management, who agreed to correct same, and therefore it was not mentioned in the preliminary report. Insulators were installed to support some of the wires, but proper fittings were not provided for attaching the wires to the trolley circuit. The wires are still extended beyond the last open crosscut in many places.

3. "A number of sectionalizing switches should be installed on the direct-current feeder and trolley wires so that power can be cut off any idle protions of the mine. Also, cut-out switches should be installed on trolley wires at the entrance to each panel and on feeder wires at the entrance to each working place." The direct-current distributing system continued to be entirely interconnected. No switches were installed as recommended above. On the night before the explosion a small roof fall in a place off the inby end of the 5 southeast panel knocked the trolley wire down on the track, near a switch, and an 8-inch section was burned out of each of two 40-pound rails before the "short" was discovered.

4. "It is a common practice in this mine to move cutting, drilling and loading equipment, and cable-reel locomotoves by 'nipping.' This is an unsafe practice and should be discontinued." In discussing this immediately following the inspection, it was suggested to the management that immediate steps be taken to secure the necessary lengths of trailing cables so that this unsafe practice could be stopped. It was not evident, in the investigation made following the explosion, that anything had been done toward correcting this practice.

Haulage

1. "Considerable timber and wooden planking are used about the underground hoist and this creates a serious fire hazard. An effort should be made to reduce to a minimum the combustible material about this installation." Steel posts and concrete flooring were installed here to replace the wooden posts and flooring. The job was well done.

General

1. "It would appear that there is very little cooperation between employees and management in connection with the establishing and enforcing of safety practices. The management and employees should mutually assist and support all efforts toward greater safety in and about the mine." In November about 10 percent of the employees were wearing safety caps and safety shoes; only 75 permissible electric cap lamps were available and in use; it was a common practice for employees to jump on and off moving man-trips. Recommendations were included in the preliminary report for the correction of these unsafe practices. In the discussion following the inspection, the management expressed doubt as to their ability to induce the employees to conform to these recommendations, and also the recommendation that smoking in the mine be stopped immediately. The inspectors offered to discuss these matters with the district president of the U.M.W.A. and did, the district president agreeing to discuss the items with the employees and urge compliance; what was done about this is not known. However, no change was made in the practices.

Following the completion of the inspection in November, the inspectors called on the State coal mine inspector and permitted him to read a pencil draft of the preliminary report. The report was discussed, and the State coal mine inspector was told of the efforts the mine officials and management were making to minimize the hazards and of further efforts and improvements they agreed to take. It was suggested to the State coal mine inspector that he could cooperate by checking up soon and by seeing that the company continued to do as they had agreed. This the State coal mine inspector agreed to do. The State coal mine inspector made his next inspection of the mine on January 27, 1943, according to the report posted at the mine.

The barometric pressure on the day of the explosion is not known. Gas was reported in 20 places, but the report of one fire boss, who was killed in the explosion, had not been recorded.

Saturday, February 27, 1943

The underground hoistman, Alex Hawthorne, in his testimony at the inquest, stated that the most terrific wind he had ever experienced came up the slope out of No. 3 bed. He apparently did nothing for a few minutes, while endeavoring to figure out what had happened, then called the outside, saying - "There's something seriously wrong down here and I'm getting the - - - - out." He stated that was the last he remembered. This call was answered by one of the mechanics in the shop on the surface, the message was not understood, and the mechanic went to another telephone but could not get anyone underground to answer. The time was shortly after 9:30 a.m., Saturday, February 27.

The first actual knowledge on the surface that something was wrong underground came when two boys working near the mine portal either smelled noxious gases or saw smoke or dust issuing out the haulageway portal and notified the mine office. This was very soon after Mr. Hawthorne's telephone call to the surface. A quick survey confirmed the fact that something was wrong; however, the fan was undamaged and continued forcing air into the mine. Word of the disaster was immediately broadcast by telephone, and shortly thereafter by radio from Billings.

According to Adloph Steinmasel, master mechanic, Matt Woodrow, Howard Freeman, Harold Wadsworth, and he entered the mine about 9:45 a.m. It was necessary to travel about 300 feet down the haulageway to a door outby the old 1 right panel before they could get into the intake airway. Doors were not provided at the fan house on the surface for entrance into the airway. Air exhausting naturally out an airshaft to the surface, just outby the underground hoist, tended to reduce the contamination of the air in the haulageway outby this point. However, the men got a headache in traveling to the door. They had one all-service gas mask, equipped with a partly used canister, and a flame safety lamp for protection. They entered the intake airway, and traveled down to the old 7 right panel to a door opening to the haulageway. Upon opening the door they found that the body of Ignac Marinchek, trackman, had been lying against it, as though he had managed to get to the door but became unconscious before he could open it. They carried the body into the intake airway, applied artificial respiration for about two hours, but could not revive him. In the meantime, Steinmasel went out onto the haulageway again and found Eli Houtenin, the trip rider who rode the trips, operated by the underground hoist, to and from the 1 west parting. Houtenin was about 25 feet from the door and unconscious. They carried him into the intake airway, applied artificial respiration, and after 10 minutes he showed signs of breathing. This man survived. When rescuing Houtenin, a light was observed up the entry; Steinmasel and Woodrow

went up there as quickly as possible and found Willard Reid, a pumpman. He was unconscious. They carried him into the intake airway, applied artificial respiration, and he survived. Steinmasel and Woodrow then walked down the intake airway to a telephone near the centrifugal pump and called outside for more help. After some looking around, they returned to the point near 7 right where they met Loren Newman and Martin Rapp, foremen on the other two shifts, who had just arrived, and who had two all-service gas masks with them. Someone had taken the two rescued men to the outside.

Newman and Rapp entered the mine about 10:45 a.m., proceeded down the intake airway to the 7 right door, and met Steinmasel, Woodrow, Howard Freeman, and Wadsworth. Newman and Rapp went out onto the haulageway and 400 feet outby to the underground hoist, where they found Alex Hawthorne in an unconscious condition. They carried him into the intake airway, someone started applying artificial respiration, and Hawthorne survived. Newman and Rapp then went back out onto the haulageway and, 250 feet outby the underground hoist, they found Dewey Hardy, the trip rider on trips hoisted to the surface, and who apparently was dead. They got his body down to the 7 right door, into the intake airway, and artificial respiration was applied, but without success. Newman, Rapp, Steinmasel, and Woodrow then went inby along the intake airway and down the rock slope or shaft connecting the No. 2 bed airway with the No. 3 bed airway. They found the No. 1 booster fan blown to pieces and began work toward replacing the stoppings along the 2 left airway. Only one stopping in No. 2 bed was damaged but all stoppings, except a few near the outby end, along the main airways in No. 3 bed were destroyed. Hawthorne was assisted to the surface after he had recovered his strength. The two bodies also were removed from the mine.

In the meantime, the State coal mine inspector, Mr. Davies, arrived and entered the mine about 2:00 p.m. Other rescue workers from the vicinity of the mine, and from near Roundup, Montana, arrived through the afternoon and evening and immediately began assisting in the recovery work. During these early operations, many of the rescue workers became ill from exposure to noxious gases but all recovered.

Messrs. J. A. Johnson and Emery C. Olsen, representatives of the Bureau of Mines, arrived from Butte and entered the mine shortly after arriving at 5:00 p.m. They traveled in the intake airway to the 1 west parting in No. 3 bed, the farthest point to which ventilation had been restored. Many of the workmen were ill as a result of exposure to noxious gases, when installing stoppings, and many of the stoppings were leaking air. In the meantime, the other Bureau representatives from Butte, Messrs. Courtney, Dolman, Hayball, and Evans, arrived at the mine about 7:35 p.m. Workmen were organized into crews, shifts allotted, and efforts pushed toward getting supplies into the mine and toward repairing and replacing the stoppings in No. 3 bed.

Four additional bodies were discovered, but not removed from the mine; one was along the 2 left haulageway, above the 1 west parting, and three on or near the parting. All had apparently been killed instantly, three violently.

Sunday, February 28, 1943

Bureau representatives Arnold, Holland, and McCall arrived from Salt Lake City about 11:30 a.m. After consultation with other Bureau representatives and company officials, it was decided to rush the installation of an exhaust fan at the old Foster mine openings. These openings connected with the workings in No. 2 bed in the Smith mine, which in turn were connected by an inside rock slope, or shaft, with the upper workings in No. 3 bed. Work on the installation of this fan was begun immediately and was personally supervised by Marcel Cenis, superintendent of the Foster mine.

Two or more Bureau representatives were now available for each of the four 6-hour shifts worked daily during the recovery operations.

Requests were sent out for additional workers as the carrying of supplies from the door at 7 right down the intake airway to the workings in No. 3 bed was a slow and tiresome task. Work continued toward extending the ventilation down the intake airway of the main south slopes.

Monday, March 1, 1943

Work continued on the extending of the ventilation.

The emergency fan at the old Foster openings was placed in operation at 10:50 a.m. Tests of the atmosphere exhausted by the fan showed 0.30 percent carbon monoxide and 0.50 percent methane. The volume of air being exhausted could not be measured but at least 75 percent of the air entering the mine was being exhausted by this fan.

In the meantime the ventilation had been carried down to the 5 west panel, the first panel in which workmen were thought to have been working.

Tuesday, March 2, 1943

The atmosphere exhausted by the emergency fan at the old Foster openings tested the same as on Monday. The main haulageway down to the underground hoist tested clear and man-trips were operated on it that night.

The 5 west panel was cleared and 6 bodies were found along the haulageway outby room No. 4, more than 1,000 feet outby the place in which the

men had been working. These men apparently died from exposure to noxious gases. The 5 west panel was affected very little by the explosion.

Wednesday, March 3, 1943

The working crew was called out of the mine at 5:00 p.m. because of a report that what appeared to be smoke was issuing from the old Foster openings. A check proved this to be false and work was continued. Tests showed 0.15 percent carbon monoxide and 0.50 percent methane in the atmosphere exhausted from the mine.

The main haulageway was cleared to the foot of the rock slope in No. 3 bed and the man-trips were operated to this point.

The 6 west panel was cleared. Five bodies were found in room No. 2. All were burned to some extent and the forces had been violent. One watch was found stopped at 9:30. The men had not moved.

The 7 west panel was cleared and one body was found along the haulageway between rooms Nos. 2 and 3. The clothes of this man were burned. He had been working on a stopping along the haulageway, 600 feet inby, where his cap and open light were found later.

Thursday, March 4, 1943

A check at the Foster emergency fan showed the carbon monoxide reduced to 0.10 percent and the methane still at 0.50 percent. The 2 left haulageway in No. 3 bed was cleared to the 1 west parting. Man-trips now operated to this point. Supplies also were transported to this point.

The 8 west panel was cleared. Five bodies were found in a slant between room No. 2 and room No. 3; all were burned and the men had been killed instantly. Nine additional bodies were found along the haulageway inby room No. 2. Several of these men had been burned; all had moved from 40 to 400 feet from where they had been working.

In the meantime, men with oxygen breathing apparatus had explored portions of the main south haulageway (return air) and recovered two bodies, one from near 4 west and one from near 5 west. Two bodies were found in the underground shop, opposite to 3 west, but the bodies were not recovered at this time.

The ventilation was carried forward rapidly now as the inby end of the main south entries was not far from 3 west. Three bodies were found at the face of the left side slope of the three main south slopes. The clothing and bodies had been burned to some extent, and the men had apparently been

killed instantly by violence. Starting up the east, or southeast as it is called, side of the mine, one body was found on the main south slope, near the 11 southeast panel.

Thirty-two bodies had been carried to the 1 west parting, awaiting the clearing of the 2 left haulageway so that the bodies could be hoisted to the surface. These bodies were removed from the mine that night.

Friday, March 5, 1943

The 9 southeast panel was cleared. Three bodies were found, two in room No. 5 and one on the haulageway near room No. 6. Two men apparently were killed instantly, one of whom was thrown some distance; his body was badly mutilated, and his clothes were entirely burned off or torn off by the forces and heat of the explosion. Clothes on the other two bodies were burned to some extent. The man outby room No. 6 had moved about 40 feet.

The 8 southeast panel was cleared sufficiently to locate twelve bodies along the haulageway between room No. 2 and room No. 3. A motorman and "nipper" had been struck violently by the forces of the explosion and thrown about 50 feet; the clothes on the two bodies were partly burned. The other men had walked out from the inby end of the panel, about 2,000 feet, and apparently were overcome by the noxious gases.

The 7 southeast panel was cleared sufficiently to find eleven bodies along the haulageway. Six bodies were grouped near room 13, one was near room 15, four were near room 18, and one was near room 23. The man near room 23 was a tracklayer and usually stayed at work when the mine was forced to shut down because of a wreck or breakdown. It is assumed that these men may have thought the air disturbance, caused by the explosion, was the result of a wreck. The panel was affected very little by the explosion. The men moved up to 1,800 feet from where they had been working before being overcome by noxious gases.

The 6 southeast panel was idle at the time of the explosion.

The 5 southeast panel tested "clear" along the haulageway and an exploring party was able to go to the face without protective equipment. Seven bodies were found, which still left one man unaccounted for. The motorman and "nipper" were found along the haulageway, some distance apart, near the inby end, and the evidence indicated that they were taking a trip of empty cars to the face when the force of the explosion struck them. The motorman was knocked off the motor and the "nipper" apparently stayed on the motor and fell off after the motor and cars had drifted downgrade toward the face. The other five men were found in a group in one of a pair of entries turned 45 degrees to the right and driven about 200 feet on a down grade. These men left notes indicating that they had lived until 11:05, no doubt, of the morning of the explosion. The notes are included in the appendix.

Fifteen bodies had been carried to the 1 west parting and were removed from the mine that night.

Saturday, March 6, 1943

It was not certain who the missing man was and some thought he was a pumpman, so a systematic search was started of all places in which he might be found. Later in the day, word was recieved that the body of the pumpman had been identified, and that the body of Elmer Price, one of the mine foremen, had not been removed from the mine.

Twenty-three bodies had been carried to the 1 west parting and were removed from the mine that night.

Arrangements were made for one searching party only, including eight men equipped with rescue apparatus, to report at 1:00 p.m. the following day.

Sunday, March 7, 1943

The searching party entered the mine about 1:00 p.m. and, beginning at the 5 southeast panel, they examined each room carefully, four-man rescue crews alternating in examining the rooms. About 3:15 p.m. the body of Elmer Price was found in room No. 12. He evidently had started up this room when the explosion occurred and apparently fell against the rib of the place upon being struck. It would appear that he was killed instantly.

The last two bodies, including one body from 7 southeast panel, were removed from the mine about 6:00 p.m.

INVESTIGATION OF CAUSE OF EXPLOSION

After the recovery of the bodies, the miners were reluctant to return to work until all funeral services were held. Very little work toward restoring the ventilation was accomplished during the period of March 8 to 13. A substantial crew of men began work Sunday, March 14, and the clearing of all places necessary for the investigation was completed Saturday, March 20.

M. C. McCall, of the Bureau, assisted up to this point and was then called to Salt Lake City. He contributed to the reasoning and findings which follow.

The investigation to determine the cause of the explosion began Monday morning, March 22, and continued through March 29. The personnel of the joint investigating party is included near the beginning of this report.

Forces

Forces of the explosion are indicated on the map appended to this report. A study of the evidences of forces and propagation of the explosion indicates that the ignition occurred in the 9 southeast panel. The explosion very evidently propagated outward from near room No. 5, and at the junction with the main south slopes traveled outby and inby.

Traveling up the return, or left side entry, of the main south slopes, the forces entered both entries of the 8 southeast panel, destroying and moving a booster fan 235 feet in the back entry, and derailing and causing some damage to a locomotive a short distance inby on the haulageway. The major forces continued up the return airway, and also the main haulageway.

It is evident that the violence of the forces traveling down the return airway, and also the middle entry, or haulageway, moved a filled sand box in the return airway, just outby the 10 southeast haulageway. The sand box 2 by 2-1/2 by 6 feet in size was originally parallel with the track, and across the airway, and one end was moved 2-1/2 feet toward the track. The explosion very evidently propagated on down the return airway, increasing in intensity, and struck the drilling crew at the face of the entry. These men were struck hard and their clothing and bodies were badly burned. Black pellet powder was evidently being transported in the car behind the drilling machine, and it was burned. The linings and doors of the powder-storage boxes on the utility car behind the drill were blown outby on the entry, no doubt by the rebound of the forces.

The forces also traveled down the haulageway, or middle entry, from 9 southeast. Most positive evidence was a filled sand box on the entry and near the entrance to the 11 southeast panel. The end of this sand box faced up the entry but the sand box was definitely moved 2 feet toward the face. It was evident that the major force went down the haulageway and that a later force came back up from the lower end, no doubt the result of propagation across into the west side panels.

All stoppings along the main airways were destroyed, but many stoppings in a number of the panels were not affected. The explosion did not propagate to the interior of the long panels, no doubt because of the presence of some moisture and also the cooling effect of the large number of rooms into which the heated gases could expand.

The forces of the explosion were violent along the main entries in the upper part of the workings in No. 3 bed, but not nearly so violent as in the southeast panel, and from this panel inby to the face of the main south slopes, and outby to the 8 southeast panel. The forces in the upper part of the workings in No. 3 bed extended to the outby end of the intake airway, but only 1,300 feet up the haulageway.

The limits of the extent of the forces of the explosion are shown on the map in the appendix.

Evidence of Heat or Flame

Evidence of heat and flame is very apparent along the main entries in No. 3 bed from the faces outby to points on the haulageway and intake airway 1,300 feet outby the 1 west parting. The workings in some panels were nearly all exposed to heat and flame, but considerable portions of other panels were not affected. The extent of heat and flame is shown on the map in the appendix.

Property Damage

Property damage included the destruction of 3 booster fans, some damage to locomotives, the destruction of switch panels at rotary-converter stations, the deranging of trolley and power wires, and the destruction of all stoppings (wooden) and doors along the main entries and many inside the panels. Some timbers were blown out resulting in several caves of roof material.

Summary of Evidence as to Cause, Origin, and Propagation

Unlike most explosions, the difficulty in this investigation was to determine which one of a number of possible sources of gas ignition started the explosion. Facts related to the explosion are as follows:

1. Efforts toward keeping line brattices up to the working faces were inadequate. Line brattices generally were much too far from the faces. Gas was being found in entirely too many palces daily.

2. Accumulations of gas were permitted to stay in places for weeks at a time.

3. Haulagemen generally left doors across haulageways open and brattice curtains at room entrances up when gathering coal. Doors were erected singly.

4. It is questionable whether the total volume of air reaching the working section of the mine had been increased to where the gas content of the return air generally on the east side of the mine had been materially reduced.

5. Very little precaution was taken as to where men with open lights were sent to work. All employees were not equipped with permissible electric cap lamps.

6. Smoking was permitted in the mine.

7. Evidence at the inquest indicates that the application of water on cutter bars, while coal was being undercut, was ineffective or inadequate, and that water was not being used on the cutter bars of certain machines.

8. The mine was not rock-dusted.

9. Shots were being fired by fuse which was ignited by matches or open lights.

10. Electrical equipment was moved in the face regions by "nipping."

11. Feeder wires extended beyond the last open crosscuts in many places.

12. The entire direct-current system was interconnected and was energized whenever the power was on. Section and cut-cut switches were not provided.

Probable Cause of the Explosion

It is the belief of the Bureau investigators that the explosion originated in room No. 5 off the 9 southeast panel. This room is 260 feet deep and is connected with No. 4 room by a "slant" about 100 feet in from the entry.

According to various information received, the line brattice was extended to within 70 to 100 feet of the face. The place was drilled and shot about 10:30 p.m. the night before the explosion. Gas was recorded as found in the place February 20, 21, 22, 23, 24 and 25. The man who acted as fire boss on the night shift (up to midnight) on February 26 stated to the investigators that he found gas in the place that night, before the face was drilled and blasted. For some reason, a record was not made of gas being found in the place on February 26. On the morning of the explosion, the fire boss who was killed examined this panel, and there is no record of his findings.

At the time of the explosion, two men were working in the place. A timber- and brattice-man, wearing a permissible electric cap lamp, had apparently been working, or standing, in the room near the "slant." His body was found 30 feet outby the "slant," and his electric cap lamp and belt were near the "slant." He had been hit hard and his clothing was burned to some extent. A trackman, wearing an open light, apparently was laying a switch about 70 feet outby the face. His naked body, badly mutilated and burned, was found on top of the coal pile at the face, his track hammer was under his body. A spike bucket with some bolts and a drill bit in it, a shovel handle and other debris were found on the coal pile. The man's badly burned

clothing was found near where the switch was to be laid and his battered carbide lamp was found about 60 feet from the face. On a later visit into the mine fungus growths were observed on the roof a short distance inby where this man had been working on a switch. These fungus growths were similar to those on the floor where bodies had lain and no other such fungus was evident on the roof, any place in the mine. It would appear that this man was thrown to the roof almost directly above where he had been working and then into the face more than 60 feet away. He apparently had his track hammer in his hand and clung to it.

Also, at the time of the explosion, David Murray, one of the foremen, was at the face of room No. 6 apparently testing for gas. This room is only about 25 feet deep. Murray's hard hat and safety lamp were found at the face and his body was found at the switch on the entry. He had traveled 40 feet after the explosion.

Evidences of intense heat and forces are present in room No. 5 and inby to the face of the entry, about 280 feet distant. The major forces appear to originate near room No. 5.

It is thought that the initial ignition occurred when the accumulation of gas in the place came in contact with the open light of the trackman. An unusual accumulation would have to be present to make this possible, and also to make possible the intensity of the explosion resulting in these places. The initial ignition probably resulted in an explosion that propagated instantly to the face of the entry and then back into the place with increased intensity. The two stoppings along the entry opposite to and inby room No. 5 were blown toward the back entry and the two stoppings outby these were blown up toward the haulageway.

There were no other men in this panel at the time of the explosion. Other possibilities of ignition, such as smoking, could be considered, but there is no evidence to substantiate it. According to statements of local men assisting in the recovery work, the 9 southeast panel was very dry prior to the explosion. Explosive gas was present in room No. 5 during the investigation.

There was some discussion as to whether it was not likely that the mine foreman would have gone into room No. 5 first, because men were working there. This would be logical at most mines, but there is nothing in the evidence pertaining to the operation of this mine that would indicate such a practice was to be expected. The evidences of gas having burned in and about room No. 5 are such that had the mine foreman gone in there first he would probably have found conditions that would have necessitated removing the men in the interest of safety.

In considering other possible sources of ignition it was impossible to reconstruct a path of propagation that would fit in with the very definite path of propagation as defined in the mine by the evidences of intense heat and by the violence and direction of the forces.

Source of the Explosion as Arrived at by Edward Davies, State Coal Mine Inspector

As a result of the investigation, Mr. Davies is of the opinion that the explosion originated near the face of the 8 west entry, and that the initial ignition was caused by an open light worn by a trackman.

The face of the 8 west entry is about 140 feet ahead of the last open crosscut. Room No. 6 was turned a short distance inby the crosscut and was driven about 70 feet. A "slant" had been started 30 feet outby the face of the entry and had been driven about 15 feet. A line brattice had been constructed across the entry, outby the open crosscut, and extended just past room No. 6, which room is about 110 feet from the face of the entry. On this morning, and several days prior to the explosion, these places had been reported clear by the fire boss.

On the morning of the explosion, the machine crew had cut the "slant," the face of the entry, and had sumped the cutter bar in the upper left-side corner of room No. 6 when the explosion occurred. These men were wearing permissible electric cap lamps. Their bodies were found on the haulageway a short distance outby room No. 6. The trackman had worn an open light. His body was found on the haulageway, just inby the open slant.

Mr. Davies analyzed the situation as follows: "The trackman's tools and lunch bucket were in room No. 1. He probably had laid the switch at the inby "slant" the day before and had returned there to get some tools or material needed in room No. 1. The "slant" and near-by face had just been cut and no doubt considerable gas was liberated and had accumulated there. The trackman, upon reaching the "slant," had ignited the gas with his open light. There are evidences of flame and of gas having burned in all the inside places in 8 west. A cave found in the return airway of the 8 west panel, just outby the second "slant" from the face, may have occurred that morning, and it would definitely have retarded the flow of the air current. Small quantities of explosive gas were found at high points in all three places during the investigation, nearly a month after the explosion, the door in the "slant" leading to the 8 west entry, from the main south haulageway, was blown outward, and the two stoppings in "slants" along the main intake airway, just outby 8 west, were blown toward the main haulageway." All of the above facts are substantiated by evidence in the panel. The reasoning is good, but the only difficulty in accepting the solution is that of reconciling this solution with the definite path of propagation as described in the discussion of the 9 southeast panel.

In analyzing conditions in the 8 west panel, Bureau representatives considered seriously the possibility of the explosion originating in the "slant" between room No. 2 and room No. 3. A body of explosive gas had stood in the dead-end "slant" turned to the right off room No. 2 for about two months, and it was considered possible that increased ventilation up room No. 2, caused by the loading out of more than half of the last cut of coal in the "slant," which gradually enlarged the opening into room No. 3, had drawn a streamer of this gas over open lights worn by some members of the loading crew, the bodies of whom were found in the slant. This appeared to be a very likely source of the initial ignition.

In trying to tie this possible origin into the path of propagation defined by the evidences of violent forces, it was difficult to reason how the explosion could propagate from 8 west and react as follows:

1. Develop force enough to move a sand box down the main haulageway, or slope. This sand box is about 400 feet down the slope from the "slant" leading to 8 west.

2. Propagate outby and then reverse and propagate inby with sufficient violence to move one end of a sand box, near the 10 southeast panel, 2-1/2 feet toward the face of the slopes. The 10 southeast is opposite to, and about 400 feet outby the 8 west panel.

3. Get outby the door across the main haulageway, just inby the 9 southeast panel, and blow the door inby toward the face of the slopes with the force evident in the condition of the door posts and hinges. This door is about 800 feet outby the entrance to 8 west.

4. Enter the "slant" to the 9 southeast panel against the direction in which the door opened and leave the positive evidence that the door was blown outward with great force. The door post, which must be very solid, was moved outward at the roof.

In analyzing the evidence that the door at the entrance to the 8 west panel was blown outward, it was reasoned that the explosion, in propagating from 9 southeast down the return airway and the main haulageway, expanded through some of the stoppings to the intake airway. As the door in question swung in toward 8 west, the forces opened the door, but without sufficient violence to destroy it, and entered the panel. The explosion propagated through all workings in the panel and the force of the expanded gases moved out of the panel, closed the door, and blew it outward and up the slope, or main haulageway. There are evidences of forces in both directions in the 8 west panel.

Lessons to be Learned From This Explosion

It is evident from the foregoing discussion that the most necessary safe mining practices were being disregarded in the operation of this mine. A repetition of the facts set forth, and the lessons self-evident, in the dis-dussion of "Mine Conditions Prior to the Disaster" would be superfluous.

Coroner's Inquest

The Coroner's inquest into the explosion was held in Red Lodge, Montana, on April 12, 13, and 14, 1943. The verdict of the jury and the names of the victims of the explosion are included in the appendix.

Testimony in general at the inquest, although contrary in several instances, was to the effect that conditions in the mine had been improved since the inspection made by the Federal inspectors in November 1942, and that conditions prior to the explosion were normal. Facts disclosed in this report do not substantiate this testimony fully.

RECOMMENDATIONS

It is believed that compliance with recommendations included in the preliminary report covering the inspection of this mine in November 1942 will provide reasonable security against a repetition of such a disaster in this or other mines.

These recommendations could be expanded and amplified in the interest of greater safety, and have been in the final report covering the November inspection of this mine, but this is purposely avoided here to stress the fact that reasonable protection against the gas-explosion and dust-explosion hazards can be attained by compliance with the recommendations included in the preliminary report.

ACKNOWLEDGMENT

Opportunity is taken here to acknowledge the outstanding service rendered by the local women and the representatives of the American Red Cross during the recovery operations at the mine.

The Montana Highway Patrol is to be commended for placing patrolmen and automobiles at the service of the rescue workers and transporting them to and from Red Lodge during the very severe winter weather experienced the week of the recovery operations.

The Anaconda Copper Mining Company of Butte and the Defense Chrome Account Mines of Benbow and Mouat, Montana, are to be commended for sending rescue crews and an abundance of rescue equipment.

The many rescue workers, including volunteers from other occupations, are to be commended for their untiring efforts and willingness to do any task assigned them.

The representatives of the Bureau of Mines also wish to acknowledge the courtesies extended and the full cooperation given to them by the officials of the Montana Coal & Iron Company. Every request for additional assistance, materials, or equipment was immediately complied with.

Respectfully submitted,

/s/ G. O. Arnold
Senior Coal Mine Inspector

APPROVED:

/s/ E. H. Denny
E. H. DENNY, Chief
Coal Mine Inspection Division

/s/ M. C. McCall
Mining Engineer

/s/ D. Harrington
D. HARRINGTON, Chief
Health and Safety Service

/s/ Fred J. Bailey
Senior Mining Engineer

APPENDIX

VERDICT OF JURY

STATE OF MONTANA,)
)ss.
COUNTY OF CARBON,)

AN INQUISITION Taken at Red Lodge in the County of Carbon, on the 12th, 13th and 14th of April, A. D. 1943, before Edward Olcott, Jr., Coroner of the said County of Carbon, upon view of the bodies named on the attached list, lying there dead, by the oaths of the Jurors whose names are hereto subscribed, who, being sworn to inquire, on the behalf of the State of Montana when, how, and by what means, the said persons came to their deaths, upon their oaths do say:

That on February 27th, 1943, at the coal mine of the Montana Coal & Iron Company located at Washoe, Montana, met their deaths due to concussion and to gas poisoning caused by gas and dust explosion.

As a part of this verdict, we, the jury, impanelled on the Coroner's jury recommend that our present mining laws be amended and new laws be enacted as follows:

1. That the State and Federal Coal Mine inspectors be given power to close any mine or part thereof where said inspector finds any hazard that he considers dangerous to the health and safety of employees.

2. That blasting of coal be not permitted when men are working in the mine, unless permissible powder is used.

3. That every underground employee be furnished with self rescue equipment.

4. That helmets and gas masks in workable condition, in sufficient quantities, be kept at the mine to supply rescue crews in case of emergency.

5. That rescue crews be trained for rescue work and be supplied with all necessary equipment.

6. That all coal mines be rock-dusted.

7. That ventilation systems be improved immediately when requested by mine inspectors, and that booster fans be discontinued.

8. That a competent employee, selected by employees, must also accompany the state mine inspector on his official mine inspection.

9. That the intake air system should be on the man-way or haulage-way when the mines have regular man trips.

10. That each local union of the mine involved be furnished a copy of each mine inspector's report.

IN TESTIMONY WHEREOF, The said Coroner and Jurors of this inquest have hereunto set their hands, the day and year, to-wit, this 14th day of April, A. D. 1943.

C. F. Chamberlain
Edward Bloom
Eli Pekich
J. J. Gerondale
Celeste Roat
John Mikesell
John Mance
Anton Columbus
William C. Godina
JURORS.

ATTEST:

Edward Olcott, Jr.
Coroner of Carbon County, Montana.

LIST OF MEN KILLED IN MINE EXPLOSION
AT SMITH MINE OF MONTANA COAL & IRON COMPANY
February 27, 1943

NAME	AGE	OCCUPATION
James Allison	51	Track-layer
Emil Anderson	40	Greaser & Repairer
Sam Alexander	57	Bratticeman
William C. Appleton, Sr.	50	Goodman Helper
Sam Barovich	56	Faceman
William F. Barry	26	Shaft Sinker
William Benny	53	Machineman
Jules Besinque	51	Goodman Operator
John Bone	59	Laborer
Leland J. Cline	26	Nipper
David J. Davis	42	Motorman
William DeBourg, Sr.	55	Machine Repairer
August Deruelle	62	Tracklayer
Patric Doran	38	Nipper

NAME	AGE	OCCUPATION
Marcel Fages	40	Motorman
Joe Ferro	51	Tracklayer
John Germanetti	60	Tracklayer
Pete Giovetti	38	Motorman
Matt Hallils	57	Timberman
Art Halpin	42	Motorman
Admiral Dewey Hardy	42	Rope Rider
James Hawthorne	30	Motorman
John Hodnik	31	Tracklayer
Walter Joki	30	Tracklayer
Wayne Jones	31	Nipper
Andrew G. Jordan	21	Nipper
Mike Korinko	33	Shooter & Driller
John Krop, Sr.	59	Tracklayer
Louis Kuhar	56	Faceman
Edward O. Kumpula	35	Timberman
Edward Laird	55	Timberman
Edward J. Laird	49	Joy Helper
Clement Scarr Lodge	51	Goodman Operator
Abe McDonald	59	Joy Helper
Joe McDonald	32	Nipper
Robert McDonald	42	Machineman
James McNeish	65	Faceman
John Maden	53	Motorman
Ignac Marinchek	57	Tracklayer
Frank Mourich	42	Head Electrician
Jack Philip Mourich	36	Machine Repairer
Richard Mallin	68	Timberman
John Meiklejohn	51	Fire Boss
Herman Mejcan	19	Trapper
Joe Meyer, Jr.	39	Goodman Helper
Wilbur Muller	22	Nipper
David Murray	56	Foreman
Earl Mus	51	Tracklayer
William A. Nelson	51	Machineman
William Noble	68	Shooter
Frank Pajnich	53	Timberman
William Mathew Polo	46	Laborer
Elmer Price	53	Foreman
William Pryde	32	Motorman
Eino Rahkola	27	Timber Helper
Ferdinand Rasborchek	61	Faceman
Martin Ratkovich	46	Goodman Helper
David B. Reid	33	Joy Operator

NAME	AGE	OCCUPATION
Lawrence Reid	41	Machineman
George J. Searela	33	Laborer
William Shepard	69	Safety Man
William Slaby	38	Tracklayer
David Sommerville	60	Faceman
John Sommerville	34	Goodman Operator
Frank Starkovich	64	Laborer
John Sudar	28	Joy Operator
Frank Sumisek	65	Tracklayer
George Thomson, Sr.	63	Laborer
Adam Wakenshaw	72	Tracklayer
Robert Lee Wakenshaw	39	Shooter
Robert Whitehead	47	Motorman
Clarence Carlye Williams	42	Motorman
Lloyd Williams	45	Pumpman
Vid Zaputil	50	Tracklayer

STATEMENT OF EMPLOYEES, AS MADE TO FRED J. BAILEY

No. 1

Adolph Steinmasel - Machinest

"Matt Woodrow, Howard Freeman, Harold Wadsworth, and I were the first persons going underground after the explosion. We left the surface about 9:45 a.m., had one smoke mask (seal was broken on it.) When we entered the slope portal the air was bad and I got a headache from it. We traveled on the slope haulageway about 300 feet to 1st right where we entered the airway. Matt Woodrow had a flame safety lamp and was leading the party. We entered the haulageway at 7 right door. Matt Woodrow opened the door and we found Ignac Marinchek, trackman's body lying against the door. We carried his body back into the airway. Freeman and Wadsworth applied artificial respiration about 2 hours without reviving him. I walked out on the haulageway and saw Eli Houtenin, No. 3 rope rider, about 25 feet from the door. He was unconscious. Matt Woodrow, Howard Freeman, and I carried him back into the airway and started artificial respiration; after about 10 minutes he showed signs of breathing. I did not hear him speak. At the time I found Houtenin I looked up the entry and saw a light. Later Matt Woodrow and I went to the light and found Willard Reid, pumpman. We carried him back into the airway. He was unconscious. Artificial respiration was applied, but he never spoke. We left two men to apply artificial respiration and Matt Woodrow and I walked down the airway to a telephone at the centrifugal pump and called outside for help. We walked on down the airway to a point about 100 feet above the first booster fan. We then walked back up the airway, then went into the No. 2 seam, intending to go down to the airshaft that connects No. 2 and No. 3 coal seam, but we could not find the airshaft. We returned to 7 right door. Newman and Rapp were there. They had two smoke masks. Someone had taken the injured men, (Houtenin and Reid) to the outside. Woodrow, Newman, Rapp, and I went down the airshaft to the No. 3 seam to a point about 100 feet above the booster fan. We stopped there a short time then went on down to the booster fan and found it had been blown to pieces. We repaired two stoppings below the booster. I left then and went to the outside.

"Sometime during the early afternoon I went underground. At 7 right door I met Matt Woodrow. Two men were assisting him to walk. I was busy getting material down during the afternoon."

No. 2

Loren Newman - Foreman, Night Shift. (11:50 p.m. to 7:00 a.m.)

"About 10:30 a.m. February 27, 1943 I was notified by telephone to come to the mine. About 10:45 a.m. Martin Rapp and I took two gas masks

and went underground, traveling on the slope haulageway to 1st right, then into the airway, then to 7 right door. The trackman (Marinchek), rope rider (Houtenin), and pumper (Reid) had been carried into the airway.

"Martin Rapp and I went out on the haulageway, then up same to the No. 3 hoist. We found Hawthorne, (Hoistman). He was unconscious. (We were wearing gas masks at the time). We carried him down to the 7 right then into the airway. Someone started artificial respiration. We then went back out on the haulageway and up outby the hoist and found Dewey Hardy about 250 feet above No. 3 hoist. He was dead. He was lying on his back alongside the rear car of a loaded trip (13 cars) and his dinner bucket was between his knees. We put his body on a locomotive which was nearby and let the locomotive coast down to near 7 right door, where Matt Woodrow and Roy Wadsworth came out on the haulageway and helped us carry Dewey Hardy's body back into the airway. Artificial respiration was started on him. Matt Woodrow, Martin Rapp, Steinmasel, and I went on down toward No. 3 seam repairing stoppings."

No. 3

Johnny Reid - Mechanical Loader Operator

"I was dressed and ready to start to Billings, Montana. About 10:50 a.m. 2-27-43 I was notified of the explosion. I went immediately to the Smith mine, arriving there about 10:55 a.m. Joe Naglich went underground with me. We traveled the main slope from the portal to the No. 3 hoist. We found Dewey Hardy first, his chin was quivering. I walked down to about 20 feet above No. 3 hoist. I fell on my knees, then got up, and returned to Dewey Hardy. He did not have any pulse. We ran out the slope to the surface and secured more men and went underground again, down the airway to 6 right door, then out on the haulageway, then down past No. 3 hoist, then to 7 right door. We then walked back up the haulageway passing No. 3 hoist and entered the airway at 6 right door. We then helped carry Willard Reid about 1,000 feet when another crew took him and I returned to 7 right."

Notes left by men found near the inby end of 5 southeast panel. The notes were written with chalk on scraps of boards.

Front and Back of one Board

Front

"We 5 men pass 11 oclock
dear Agnus & children
I'm sorry we had to go this
God bless you all Emile with lots
kiss"

Back

"Frank Pinich
John Sudar
and Joki
We tried our best but could not
get out."

Second Board

"Walter & Johnny Good-bye
Wife & daughter to
We died an easy death
love from us both
Be good."

Matt Woodrow

Matt Woodrow passed away April 7, 1943 at the age of 61, after a short illness. Mr. Woodrow had retired several years ago but returned to work when the shortage of men became acute. He was employed on the surface prior to the explosion, and was one of the first group to enter the mine after the explosion. He was overcome by noxious gases the first day but recovered quickly and assisted in the recovery operations until the last body was found. He had assisted for a number of days in the restoration of the ventilation in the mine when he became seriously ill. His illness may or may not have been a result of exposure to noxious gases during the recovery operations. His passing is regretted by his many friends in the Bureau, and has added greatly to the grief of the stricken Red Lodge, Washoe, and Bear Creek Communities.

Question

Why was this mine not inspected prior to November 1942?

This question was asked the Federal coal mine inspectors and was answered by Arnold at the inquest about as follows:

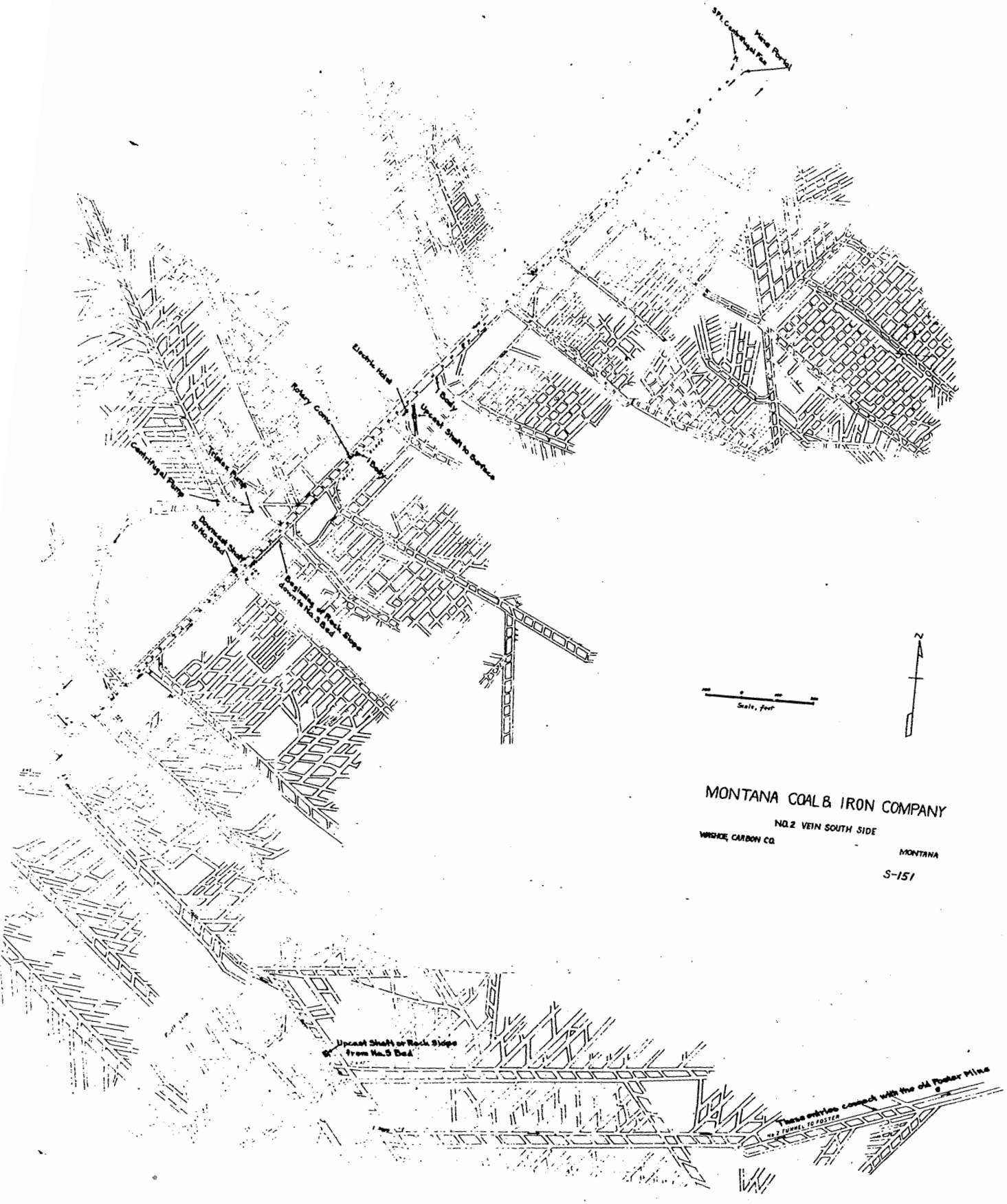
"Mr. Frank J. Stortz, coal mine inspector, was assigned to the Seattle office of the Bureau of Mines, and reported for duty February 11, 1942. His duties were to inspect coal mines in Washington and Montana. He completed the inspection of one mine in Washington and was working on the inspection report when, being an officer in the Army Reserve Corps, he was called to the service. He resigned February 23, 1942.

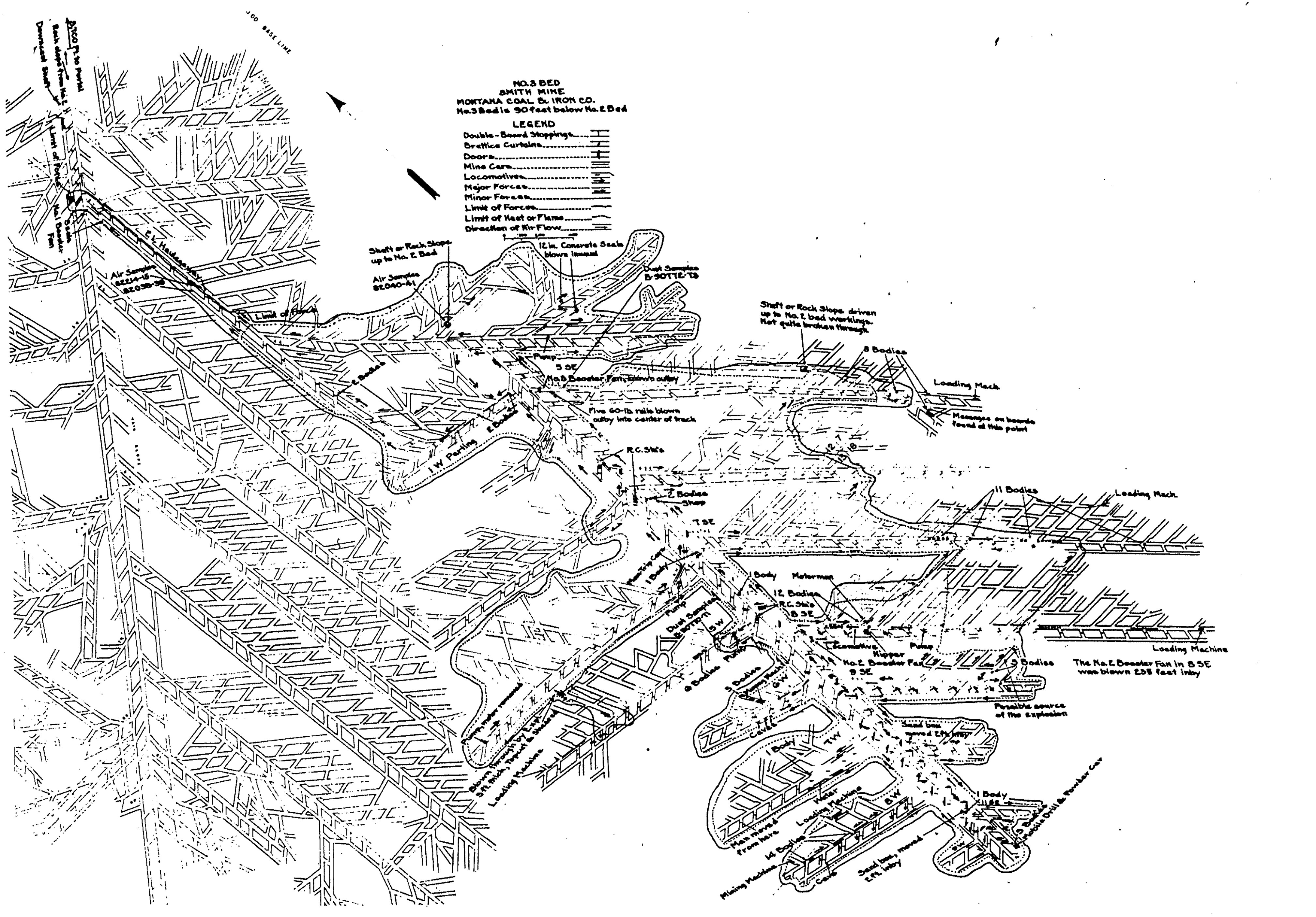
"Another man was not available for assignment to Washington and Montana until August 17, 1942, when W. H. Walsh, coal mine inspector, reported for duty in Seattle.

"Mr. Walsh's first duties were to complete the report started by Mr. Stortz, after which he inspected another mine in Washington.

"In the meantime, Mr. Denny, Chief of the Coal Mine Inspection Division, became concerned over the fact that no coal mines had been inspected in Montana, and about November 1 suggested to the Salt Lake office that inspectors be sent to Montana to inspect a couple mines. Plans were made to do this when a letter arrived stating that it would be satisfactory for M. R. Evans, mining engineer, Mineral Production Security Division, who was stationed in Butte, to make inspections of coal mines. I explained that the Division in which Mr. Evans worked had been created by a separate act of Congress and that special permission had to be obtained, because of the different provision for funds, before men in the Mineral Production Security Division could be permitted to inspect coal mines.

"As Mr. Evans had not been given the course of instruction provided for men in the Coal Mine Inspection Division, I was sent to accompany Mr. Evans during the inspection of two mines. As this was Mr. Evans' first inspection following Bureau procedure, I took charge in making the inspection of the Smith mine, and Evans took charge in making the inspection of the Foster mine of the same company."


Electric Hoist
Rotary Conv.
Centrifugal Pump
Triplex Pump
Downcast Shaft to No. 3 Bed
Upcast Shaft to Surface
Upcast Shaft or Rock Slope from No. 3 Bed
Scale, feet
N
MONTANA COAL & IRON COMPANY
NO. 2 VEIN SOUTH SIDE
MONTANA
S-151


NO.3 BED
SMITH MINE
MONTANA COAL & IRON CO.
No.3 Bed is 90 feet below No.2 Bed
LEGEND
Double-Board Stoppings
Brattice Curtains
Doors
Mine Cars
Locomotives
Major Forces
Minor Forces
Limit of Forces
Limit of Heat or Flame
Direction of Air Flow
Shaft or Rock Slope up to No. 2 Bed
Air Samples 82040-41
12 in. Concrete Seals blown inward
Dust Samples B-30772-73
Shaft or Rock Slope driven up to No. 2 bed workings. Not quite broken through
8 Bodies
Loading Mach.
Messages on boards found at this point
Pump
5 SE
No.3 Booster Fan, blown outby
Five 60-lb rails blown outby into center of track
2 Bodies
1 W Parting
E.V. Haulageway
Limit of Force
Air Samples
No.1 Booster Fan
Downcast Shaft
R.C. Sta's
Shop
7 SE
11 Bodies
Loading Mach.
1 Body
Motorman
12 Bodies
R.C. Sta's
8 SE
Locomotive
Nipper
Pump
Loading Machine
No.2 Booster Fan
9 SE
3 Bodies
The No.2 Booster Fan in 8 SE was blown 235 feet inby
Possible source of the explosion
Dust Samples
Pump
5 W
6 Bodies
5 Bodies
6 W
Cave
1 Body
7 W
Sand box moved 2 ft. inby
Blown through by Expl.
Loading Machine
1 Body
11 SE
5 Bodies
Mobile Drill & Powder Car
Heater
Loading Machine
8 W
Man moved from here
14 Bodies
Mining Machine
Cave
Sand box moved 2 ft. inby

Supplementary Data

Coal Mine Explosion

Smith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

Abstracts and Exerpts From Report of Company.
Explanation of Graph Pertaining to Fire Bosses' Records.
Report on Explosion by Montana State Mine Inspectors.
Report on Explosion by the United Mine Workers of America.
Preliminary Federal Mine Inspection Report of November 19 to 30, 1942.
State Coal Mine Inspection Report of January 27, 1943.
Conclusions.

Abstracts and Exerpts From Report of Company
on Mine Explosion, Smith Mine, Montana Coal & Iron Company
Washoe, Carbon County, Montana
Discussion by G. O. Arnold[1]

Introduction

Upon receipt of the Bureau of Mines report of the mine explosion that occurred in the Smith mine of the Montana Coal and Iron Company on February 27, 1943, the company, through its officials, J. M. Freeman, vice president and general manager, and W. A. Romek, assistant manager, published a report giving the company's version as to the cause and point of origin of the explosion. This report disagrees with the findings of the Federal investigators and suggests that the carrying out of certain recommendations by the company, alleged to have been made by Federal coal mine inspectors, may have contributed to the cause of the explosion.

From the standpoint of the Bureau of Mines, publication of the complete company report by the Bureau would be desirable so as to enable readers to obtain a complete picture of the company's point of view; however, Mr. Freeman requested in a letter dated August 2, 1943, that the report not be published by the Bureau. Accordingly the most important statements and comments in the report by Messrs. Freeman and Romek have been abstracted for the purpose of this discussion and grouped under the following appropriate headings: Evidence of Gas in the Mine and Precautions Taken; The Coal-Dust-Explosion Hazard; The Sealing Off of Certain Entries in the Mine; Probable Source and Cause of the Explsion; and Miscellaneous.

It is suggested that persons desiring to study the company report in its entirety write the Montana Coal and Iron Company.

Several references are made in this discussion to the preliminary Federal inspection report, posted at the mine following the inspection of the Smith mine in November 1942; therefore, a copy of this report is also included following this abstract and discussion.

During the study into the cause of the explosion, a record was made of all information in the fire bosses' report book back to November 1, 1942. A chart was prepared later showing each individual place in the mine in which gas was reported within this period, and the daily findings of gas, as reported, were entered on this chart. A graph was prepared from this chart which shows the number of places each working day in which gas was reported within this period. The graph and an explanation thereof also are included in "Supplementary Data" and will be referred to in this discussion.

1/ Senior Coal Mine Inspector, Bureau of Mines, Salt Lake City, Utah.

Evidence of Gas in the Mine and Precautions Taken

It is stated in the report that "On account of the fact that only one man was treated for burns from gas at the Smith Mine in 35 years, it could hardly be considered very hazardous as far as explosive gas was concerned." It is stated also in the report that "Many of the men in the Smith Mine objected to using them" (electric cap lamps) "on account of batteries, etc. There were only about one-half of the men using electric lamps at the time of the Federal inspection in November and most of these men worked on loading and haulage crews and were using the electric lamps to prevent delays in output, and not for the purpose of preventing gas explosions, because at that time, the miners, the State Coal Mine Inspector, and the Management did not consider the Smith Mine dangerous. . . . . The Management, however, was heartily in accord with the recommendation of the Federal Examiners, that permissible electric cap lamps be used exclusively in the Smith mine, and sufficient electric lamps for all of the men were ordered as soon as possible and are not on hand. . . . . At the meeting between the mine officials and the Federal Inspectors, following the Inspection of the Smith mine in late November, the impossibility of immediately completing all of their recommendations was understood by the Federal Inspectors, due to a critical labor shortage and priority restrictions on mining equipment and mine supplies. They agreed, however, that the Company should proceed to the best of its ability, . . ."

At the meeting with the management and mine officials on November 27, 1942, the importance of eliminating sources of ignition from the mine, because of its gassy condition, was stressed. These sources of ignition were specifically: the use of open lights; smoking in the mine; the use of fuse, ignited by matches or open lights, for firing shots; the moving of electrical equipment in the face regions by "nipping"; and the keeping energized of all direct-current circuits in the entire mine.

The management agreed to order permissible electric cap lamps immediately for all underground employees and, in the meantime, to exercise the precautions stressed in the preliminary report; they agreed to stop smoking in the mine immediately; they agreed to get immediately and use electric squibs for use in firing shots and to exercise the precautions stressed in the preliminary report; they agreed to equip the mobile electrical equipment with trailing cables as quickly as cables could be secured; they agreed to install a cut-out switch on the direct-current circuit at the entrance to each panel and to install a cut-out switch at the entrance to each room.

It was recognized that it would take some time to get electric cap lamps, trailing cables, and sufficient electrical switches to complete these jobs. Electric cap lamps, according to statements at the inquest by W. A. Romek, were ordered February 8, 1943, and were received about March 31,

1943, a waiting period of about 51 days. Had these lamps been ordered immediately after the November 27th meeting or even immediately after the mailing to the company of the Federal preliminary mine inspection report (December 10) and placed in use as soon as received, the mine could have been placed wholly on a closed-light basis before the explosion occurred and, thereby, the explosion perhaps could have been prevented.

The report states that "On Page 12," (of the Federal Explosion Report) "they report that when Mr. Newman" (a fire boss) "was placed on the graveyard shift as night foreman, another fire boss was not hired to replace him, which made it appear that the task of extending brattices and keeping all places clear of gas on the day shift, was left to one fire boss. This is not correct, as an extra day-shift brattice man was employed; and at the time of the explosion, the Company had the largest crew of brattice and ventilation employees it ever had." It is explained by the company report that at the time of the explosion two certified men and two uncertified men were acting as fire bosses on the three shifts (this included the night foreman, Loren Newman) and that three barticemen were employed to assist the one certified fire boss on the day shift. It is also stated that an unsuccessful effort was made to employ another certified man.

Upon being questioned at the inquest, Loren Newman, the foreman on the midnight to 7:00 a.m. shift, testified as follows:*

> Q. "Do I understand, Mr. Newman, that you did not make the removal of gas?"
>
> A. "No, not since I was on this shift. When I was on the other shift, I did - when I was working as fire boss. . . . . I had nothing to do with the removal of the gas."
>
> Q. "In his work the fire boss saw to the removal of gas?"
>
> A. "Yes, as far as he could. When he could not look after it, Dave Murray and Mr. Price (mine foremen on the day shift) did. They had several men, and it was their duty to bring the canvas and do things necessary in the removal of gas. Anything that Meiklejohn did not have time to supervise in his time on shift Mr. Murray and Mr. Price looked after it."

Mr. Newman made it clear that he, with 12 men to supervise, did not do any work toward the removal of gas, but that the two mine foreman, with a total of 77 men underground, and all operations on the major producing shift to supervise, did have time to assist in the removal of gas.

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*Proceedings of the inquest are available for public inspection at the Pittsburgh Experiment Station, Bureau of Mines, Pittsburgh, Pa., and at the Carbon County Courthouse, Red Lodge, Montana.

Attention is called to the graph in the appendix to show that the efforts toward keeping the faces clear of gas from about the middle of December on, which is about the time Mr. Newman was taken off as one of the regular fire bosses and placed on the night shift as foreman, were even less successful than previously.

One method used by the foremen and fire bosses in the removal of gas is indicated by the testimony of certain men at the inquest, as follows:

Ben Sekulich, operator of a mobile drill:

Q. "Who did the brushing (of gas)?"
A. "Usually the fire boss or brushmen with brushes (bratticemen with brattice cloth) or the foremen."

Q. "How often have you heard of brushing the gas?"
A. "Why, every once in a while."

John L. Reid, operator of mechanical loader:

Q. "What do you know with reference to the proposition of brushing gas?"
A. "I have helped foremen on several occasions to brush out gas while waiting on a place to load. There was no places clear. 'Well,' he would say, 'there's a small amount of gas in here. We can clear it out for you.' On several occasions I went in with him and brushed it out, and then went on with the work."

Alex C. McDonald, operator of a mobile drill:

Q. "Do you know anything about the brushing of gas in any of those places over there?"
A. "Yes, I have seen it done."

Q. "Tell us what you know about it."
A. "On our particular job I know that the fire bosses were brushing gas out so that we could go in and drill the place."

Q. "Was that what you might call a frequent occurrence?"
A. "Oh, no, I would not say it was a frequent occurrence."

Clarence Wadsworth, operator of mechanical loader:

Q. "Will you tell us in your own way what you know about that (brushing of gas)?"

A. "Well, when we were loading on different territories, if we were short of coal and there was gas in some of the places, the fire boss or the foreman would brush it out sometimes to give us enough coal to operate the remainder of the shift."

Ira Maxwell, operator of mechanical loader:

Q. "Do you know anything about the brushing of gas?"
A. "It was done on every shift on my entry."

Q. "Who does the brushing of gas?"
A. "Either the fire boss or somebody with a lamp."

Martin Rapp, foreman on the 4:00 p.m. to midnight shift:

Q. "You say you are the foreman. Did you ever individually brush gas out of places in the mine."
A. "In case of emergency that have to be cleared away for some purpose - a small pocket or something like that."

William R. Brown, faceman (test roof, timber, brattice):

Q. "Were these gas fires (ignitions) over there a matter of frequent occurrence?"
A. "Well, we would find indications of gas in these rooms when we would go on shift. Some of them were brushed out. Others we would have canvas strung up directing fresh air to the face, and sweep them out by means of that. A little gas in it might be brushed out. If there is much gas there, it means the curtain is back and not sufficient fresh air is directed up to sweep it out."

Q. "You speak about brushing the gas out. Who would do the brushing?"
A. "It was always done by a boss or fire boss."

The one fire boss, from about 4:30 to 11:30 a.m., and the two foremen were the only men on the day shift qualified to test for and remove gas.

In the testimony at the inquest there were frequent references to the ignition of gas in the working places, but apparently no one was seriously burned. For example:

Ben Sekulich, driller and loader:

Q. "Did the shot-firer - that is, did you light the gas before you lit the shot?"
A. "Yes."

Q. "Do I understand that sometimes before you went in and lit the shot, you had to burn the gas out before you went in there?"

A. "Sufficient to light the gas, yes."

Q. "Do you mean that that would be an accidental lighting of the gas or a - -."

A. "No."

Q. "They lit it on purpose?"

A. "I do not know. Maybe it would be from a light and went off."

Alex C. McDonald, driller:

Q. "Had you encountered gas down there in any part of the mine you had worked?"

A. "Yes, Sir."

Q. "Where?"

A. "We lit gas in room No. 18 south. I could say when. It was a couple of years ago."

Q. "Yes. Tell us about it."

A. "Coming out from the working place already drilled. We came out and was working the place, what they call a crosscut, and lit the gas with the nipper, a spark from the - -"

Q. "Have you noticed any ignition of gas at any other times down there?"

A. "Yes, Sir."

Q. "Tell us about that. Go along and tell us what you know about it."

A. "Yes, in small quantities, right at the face where we was drilling."

Q. "From?"

A. "From an open light."

William R. Brown, faceman:

Q. "Would it be possible, Mr. Brown, to set off a gas explosion from that open light?"

A. "I have."

Q. "Have you set off any in this mine?"
A. "I have."

Q. "When was that that you set off that gas?"
A. "Well, the largest gas fire we had was on Tuesday night before the explosion on Saturday."

In addition to the instances shown in the foregoing testimony other instances are brought out on pages 242, 271, 288, 302, and 311 of the proceedings of the coroner's inquest.

The company report says that, "On Page 14, the Federal examiners report that according to testimony at the Inquest the haulage men continued to leave doors open across haulageways and leave brattice curtains up at room entrances. According to our recollection, the preponderance of the testimony at the Inquest was exactly opposite to that statement."

Testimony at the inquest, regarding the leaving of doors open and curtains up, was as follows:

John S. Kastelitz, main-line motorman:

Q. "After this (preliminary) report was made by the Federal inspectors, was that habit (the leaving of doors open) changed?"
A. "Yes. All doors were kept closed."

William R. Brown, faceman:

Q. "What was the procedure or common practice with the motormen and the nippers in connection with the curtains in these places with reference to closing them immediately after they went through the curtains?"
A. "To keep it up while they were there. To leave it up while they were loading the face out."

Q. "Do you know of any concerted efforts on the part of the company through instructions to keep these brattice cloths down by the motormen and nippers?"
A. "They did not require it. If there were any orders given - -"

Q. "They are permitted to leave them up?"
A. "They were up."

Q. "And that caused several gas ignitions in the mine, to your knowledge?"
A. "That was the cause of most of our gas accumulations."

The following statement is contained in the company report: "As for the continuation of smoking in the mine, a practice that has always been in effect in all Montana coal mines, it was not reasonable to expect the men not to smoke as long as they had to use open lights, due to the fact that electric cap lamps were not available. Extra precautions were taken with regard to testing for gas before employees were permitted to enter for work."

Whether the two mine foremen, and the one fire boss, working for about four hours, on the day shift, had time to examine every place a man went with an open light, every place a man with an electric cap lamp went to smoke, and every place fuse was ignited with an open light or match is certainly open to question, with sufficient frequency to assure that such places were free of gas.

It is stated further that: "As for the air reaching the 5th, 6th, and 7th South East entries, the preponderance of the testimony at the Inquest was that the air had been substantially improved following the November examination."

Brief extracts of testimony regarding the improvement of the air, following the Federal inspection in November, are as follows:

Ollie Anderson, cutting-machine operator:

"Air improved immediately after Federal inspection, and continued to improve; was better on east side also."

Ben Sekulich, operator of a mobile drill:

"Air on west side improved after Federal inspection; stayed about same on east side."

John L. Reid, mechanical-loader operator:

"If there was any improvement in the air (following the Federal inspection) I did not know it."

Clarence Wadsworth, mechanical-loader operator:

"Right after the inspection the air was really good; better than any other time. Three or four days before the explosion we did not have the volume of air that we had before."

Ira Maxwell, mechanical-loader operator:

"Ventilation on the main entry was very good, but there was scarcely any at the face of the room where I worked; it was

worse in the east entries than in the west entries; refused to work in some places because of bad air, think it was November or December."

John Mc Donald, mechanical-loader operator:

"Air was a lot better after the Federal inspection. On Monday preceding explosion refused to go in place at lower end of mine on west side because of bad air."

The company report states that: "The last reading obtained by the Federal inspectors in November in the 2nd Southeast panel entries was only 10,000 cubic feet. The last air-reading of record taken in the same last cross-cut by Mr. Elmer Price, mine foreman, on February 23rd (four days prior to the explosion) shows the reading to have been 20,000 cubic feet, which indicates that the air volume was doubled in this part of the mine just prior to the explosion. This improvement in ventilation, no doubt, did help dry out certain parts of the mine and make the coal-dust easier to explode."

The Federal inspectors did not take an air measurement in any entries designated as 2nd southeast at the time of the November inspection. If this reference in the report means the 2nd east entries, an air measurement was not taken in the 2nd east entries in November by the Federal inspectors, and the mine foreman could not do so in February as they were sealed off at that time.

The mine foreman recorded the air measurement as taken in the 1st south entry which is the main south entry. At the time of the November inspection an air measurement was taken in the intake entry of the main south or 1st south entries, at a point opposite the 5th south entry. A volume of 21,600 cubic feet of air a minute was obtained. If the foreman's measurement of 20,300 cubic feet of air a minute was taken near this same point it would not indicate that an improvement had been made in the ventilation.

The company report states that: "Item 4 on Page 17" (the Federal Coal Mine Insepction Report of November 1942) "deals with the practice of 'nipping.' The shortage of trailing cable due to the War is known to every mine operator, and our Company was ordering cable to the full extent permitted by its quotas. The quantities we asked for were drastically reduced by the War Production Board."

The company report states that: "The Federal Examiners' comments about the gas in the entries off the 4th Southeast and the gas hazards in other parts of the mine were so convincing that J. M. Freeman, the Vice President and General Manager, conculded that there might be danger and risk to the men's lives if the No. 3 Smith Mine continued operating with

open lights and knowing it would take several months to get electric cap lamps because of the war effort, and also realizing it would take a long time (with the labor shortage due to the war) to complete the Bureau's many ventilation recommendations, suggested that the No. 3 Smith Mine be temporarily closed down. . . . . The Federal Inspectors did not think that conditions in the Smith Mine warranted closing the mine down and said it would also be inadvisable to do this on account of the unusual demand for coal due to the War effort."

On November 27, 1942, near the completion of the Federal inspection, the inspectors met with the management and mine officials in the Washoe mine office. An outline had been prepared of the conditions found in the mine, as later described in the preliminary report; these conditions were explained in detail and the hazards stressed.

After listening to the inspectors' description of the hazards in the mine, Mr. J. M. Freeman stated: "If I thought the mine was in as dangerous a condition as you picture it, I would close it down tomorrow." Arnold replied: "The mine is exactly as dangerous as we have told you." Folowing a pause, Arnold stated: "The mine can be operated with reasonable safety provided certain precautions are taken." A discussion of the recommended safety measures followed, and Mr. Freeman stated that they would comply immediately with such recommendations as they could and comply with those requiring the purchase of equipment or material as soon as possible. He gave instructions to the superintendent and officials to begin right away. Mr. Freeman expressed concern only over the problem of inducing the underground employees to accept electric cap lamps, quit smoking, wear safety caps and shoes, and stop jumping on and off the moving man-trip. This point was mentioned in the Federal report on the explosion. The coal-dust-explosion hazard will be discussed under that subject heading.

The inspectors did not mention the fact that the immediate action of the mine foreman (Elmer Price) in carrying out suggestions made during the inspection reduced the seriousness of the hazards substantially. Immediate improvements were: The foreman and fire bosses began carrying their safety lamps with them during the entire shift and testing for gas in each place visited; the two large bodies of explosive gas found in the mine were properly removed; the ventilation of working places was improved, as is indicated on the graph by the decreased number of places in which gas was found. The foremen explained to the Federal inspectors that the superintendent or the management would have to pass on the other recommendations.

In the general discussion at the above meeting, the inspectors did mention the desirability of keeping all coal mines operating because of the need for coal, but there was no intimation on the part of the inspectors that the need for coal justified the neglect of generally accepted safe mining practices.

The inspectors purposely avoided giving the company any credit in the preliminary report for the improvements in practice made during the inspection, as any decrease in the efforts would result in a serious hazard. It was intended that the preliminary report should describe the conditions as found.

The Coal-Dust-Explosion Hazard

The company report states that: "The Smith Mine during the past five years was considered to be a damp mine. On page 7 of the Federal Explosion Report, we quote as follows:

> 'At the time of the inspection in November, the interior of the mine was generally moist, although dust was apparent throughout.'

The Management cannot understand why the words 'although dust was apparent throughout' were included in the above statement, as Messrs. Arnold and Evans, at the November meeting in the Smith Mine office, said that the Smith Mine was too damp, and the damp air was not good for the men's health. In their preliminary report, (the only report received from the Bureau of Mines prior to the explosion), they did not mention that they had noticed coal dust in the Smith Mine. They did say, however, that the Smith Mine would become drier when we completed their ventilating recommendations, and that in the future the Company would have to consider rock-dusting. The Management got the impression from what Messrs. Arnold and Evans said that there was no hurry about rock-dusting the Smith Mine on account of it being too damp. They said that the Bureau of Mines would recommend that all caol mines use rock-dust. In view of the latter statement, we made an effort to locate a source of rock-dust and to secure information on rock-dusting equipment. Based on the manufacturer's promise of delivery, a rock-dusting machine could not have been received by the Company, even if it had been ordered when the Federal Inspectors were here in November. The Federal inspectors did not mention in their report that during the past ten years no Montana Coal Companies rock-dusted their mines."

The company report also states that: "On Page 15 of their report," (the Federal Mine Explosion Report) "they state that much dust was made during the cutting of coal. The two Sullivan cutting machines, which did all of our cutting in the No. 3 seam were equipped with water tanks and water was applied to both cutter bars."

As the word "dust" is commonly understood to mean a dry, powdery substance, it should have been more clearly stated in the report that the dust also was generally moist.

The inspectors did not state that the mine was too damp, as this was a highly desirable condition, but they did say, "The humid condition of this air current (east side), together with the contamination resulting from ventilating other workings, make it desirable that the volume of air reaching the east side of the main south entries be substantially increased." The inspectors did state that working in such an atmosphere was not good for the men, and that the men would do more work if the ventilation in the working sections was improved.

At the time of the inspection in November, the interior of the mine was moist to wet; the inspectors stated to the management that, although the necessity for rock-dusting at the time was not urgent, any drying out of the mine, by improved ventilation or otherwise, would make rock-dusting immediately necessary for safety. The hazards present in the use of black powder were stressed in this discussion, also the transporting of explosives about the mine in a car behind the mobile drilling machine,

It is not clear whether the management actually was aware of any drying out of the mine, but it is evident that the management understood what was told them on the subject by the inspectors.

Operators of mobile electric drills testified concerning the dust made by the mining machines, as it was their duty to drill the places soon after they were cut. Operators of mechanical loading machines also testified as to the dryness of coal, especially after it had been shot down for a while. The mining machine at the face of the room neck, near the inby end of the 8th west entry, had been used to cut a slant, the face of the entry, and had begun to cut the room neck when the explosion occurred. The water tank on the machine was within two inches of full; and close examination of the machine cuttings, a week after the explosion, showed the cuttings to be dry.

Explosives and Blasting

Relative to Explosives and Blasting the company report states as follows:

"Shortly after the November Federal inspection, the representatives of both the Atlas Powder Company and the DuPont Powder Company were contacted with respect to making tests to determine the proper grade of permissible powder best adapted to our operations. Orders for 13,900 lbs. of nine different grades of permissible powder were placed, and also requisitions for electric blasting caps. These supplies arrived at the Smith Mine January, 1943, but as the schedules of the powder company engineers were filled, they did not arrive to conduct permissible tests at the Smith Mine until the two-week period prior to February 27th. In accordance with the Inspector's recommendation, dirt was sent into the mine for stemming, but it did not

prove entirely satisfactory for tamping purposes, particularly in wet holes, and in some cases it was mixed with scrapings from cross-cut floors, which gave better results. . . . . It is true that pellet powder was still being shot with fuse, but the Federal examiners knew this was only temporary until the proper grade of permissible powder could be determined."

Testimony at the inquest, concerning the type of stemming material used, was as follows:

Ben Sekulich, operator of mobile drill:

"Used slack before; used dirt from outside after Federal inspection."

John L. Reid, mechanical-loader operator:

"Used clay for stemming; have used fine coal dust, or 'bug' dust."

Alex C. McDonald, operator of mobile drill:

"Used coal dust or 'bug' dust."

The inspectors knew that black powder would be used until a suitable type of permissible explosives was determined, but they stressed the importance of doing away with all kinds of open lights and using instantaneous electric squibs for firing shots.

The Sealing Off of Certain Entries in the Mine

The company report states that on the occasion of the meeting in the company's office at the completion of the November 1942 inspection "Messrs. Arnold and Evans were particularly concerned about the large amount of gas they found in temporarily abandoned entries off the 4th Southeast entry, as some of these abandoned entries contained a larger amount of methane gas than most of the places in other parts of the mine. Mr. Arnold thought that some of these entries, on account of not being worked, should be blocked off as soon as possible, and he suggested that concrete stoppings be built in some of the entries without delay. As the Company expected to work these abandoned entries in the future, Mr. Elmer Price, the Mine Foreman, thought it best to handle the gas in the manner that was in effect during the past year or more. The Federal inspectors, however, thought that it would be dangerous to leave these entries open in case the mine fan stopped from a power failure, as the gas from these entries, under such a condition, could reach the places where the men were working and endanger their lives. As a result of these comments and in order to comply with the wishes of the

Federal Examiners the Management issued instructions to the Mine Officials that concrete stoppings be completed as soon as possible in all abandoned entries off the 4th Southeast Entry that were making gas."

The entries in question were well ventilated at the time of the inspection in November, the inspectors did not find any gas in them, there was no apparent reason for sealing them off, moreover, the inspectors did not recommend sealing them off. The inspectors did find a body of explosive gas in a dead-end place, driven up the pitch, a short distance outby where the seals were placed and suggested that it might be safer to seal off this dead-end place, as ventilation was dependent upon a line brattice, and because it was such a place a man might go to sneak a smoke after smoking was discontinued.

Federal coal mine inspectors recommend that all entries, rooms, panels, or sections that cannot be kept well-ventilated throughout or cannot be inspected regularly and thoroughly, or that are not being used for coursing the air, travel, haulage, or the extraction of coal, be sealed by strong fireproof stoppings.

Probable Source and Cause of the Explosion

In the introduction to the company's report it is stated that: "As the Management is of the opinion that the explosion resulted from an accumulation of explosive gas behind concrete stoppings, that probably would not have been built had the Smith Mine not been inspected in November, the Company's Foreman and Fire Bosses were requested not to disclose their views to anyone until the State and Federal Examiners reported their final findings as to the source of the explosion.

The report also states that: "We estimate that there was space enough in these abandoned entries behind the two concrete stoppings to store about 200,000 cubic feet of methane gas."

Under the heading "The Company's Views on the Probable Cause of the Explosion" the report states: "Examinations of these concrete stoppings after the explosion plainly shows that a cave had occurred prior to the explosion, directly over the cement stopping in the back entry, leaving an opening approximately 2 feet high by the width of the entry (about 12 feet wide), providing a large opening for the pentup gases to escape quickly and in large volume into the return airway, a short distance from the air shaft leading up to the No. 2 seam and old No. 2 workings. These gases, released by the cave over the cement stopping and, no doubt, under pressure, united with the return air, creating a very highly explosive mixture. The air shaft from the No. 2 seam contained a 3-phase high-voltage transmission line with fuse terminals at the bottom of the shaft. Examination of these fuses, after the explosion, showed that one of the phases had blown a fuse. The heavy

load carried by this transmission line, sufficient to blow a fuse, would create quite a flash or arc, making this the most probable source of ignition."

The roof over the No. 3 coal bed is sandy shale of a fragile nature. From 8 to 12 inches of top coal usually is left to protect the natural roof. The sandy shale roof normally tends to disintegrate when exposed to moist air. Had the roof begun to get bad at either of these two seals this fact would have been discovered, long before the condition got bad, by those men who traveled the return air courses regularly. Should such a bad roof condition not be noticed, the roof material is such that it would shear off at the inner and outer wall lines of the seal; an exposed opening of any size would be unlikely to develop over a concrete wall 12 inches in thickness, where the cave was only two feet high.

Examination of the seals, following the explosion, disclosed that the seal in the main entry was definitely blown inward. The major portion of the seal in the back entry also had been definitely blown inward. A small cave of roof material was evident, but there were no indications that the cave might have occurred before the explosion.

The booster fan, just outby the 5th southeast entry, was forcing an unknown volume of air through the airway ventilating the seals. A major portion of this air current would pass up the airshaft, which is about 700 feet outby the seals by way of the return air course. At the time of the November inspection, a volume of 15,520 cubic feet of air a minute was passing up the shaft, and a small unmeasurable volume was continuing across, under the shaft, and out the 4th east entry to the 2nd left haulageway, which also is a return airway. Three fuses were installed in the high-voltage circuit a few feet outby the shaft and about 3 feet below the roof. A small portion of the air current would continue past the shaft and over this switch. The fuses used were of a type enclosed in a cardboard cylinder which was filled with an inert powder. The fuses were not examined by the Federal inspectors.

It is likely that the fuse burned through as a result of a short circuit near one of the rotary-converter stations during the explosion. The probability of this type of fuse emitting flame is not known to the inspectors. The possibility of sufficient gas being released quickly enough to make an explosiv mixture of the entire air current, under the circumstances described by Messrs. Freeman and Romek, is considered to be very remote, if not impossible. Any difference in pressure between the sealed area and the mine had no doubt been equalized by leakage through the seal, and, in the event of an opening quickly developing at the top of one of the stoppings, the sealed-off gases near the opening would tend to bleed off slowly, and not rapidly. Most of any escaping gas in such a case probably would stay near the roof in flowing through the return airway, would pass up the airshaft, and would not reach the "fused" cut-out in question.

In regard to direction of forces the company report says: "Forces from this initial explosion working inby, blew the main entry cement stopping completely in, and also blew in the exposed part of the back entry cement stopping that was not protected by the cave. The fact that the cave in the back entry protected most of the cement stopping from moving in either direction, is proof that the fall of rock that released the gases fell immediately before the explosion started. . . . . Major forces working from the probable point of ignition at the bottom of the air shaft, near the pentup gases, rushed down the No. 1 room of the 1st West entry, upsetting three loaded cars on the main parting, and pushing them against the lower (South) rib, definitely proving that the major force traveled from the above-mentioned point of ignition in a Southerly direction which direction is opposite to what it would have been had the explosion originated in the 9th Southeast panel, the place picked by the Federal examiners."

In discussing the initial forces of the explosion the company report says: "The transit box and tripod that were in the supply room off the machinery repair shop located North of the 9th Southeast panel and near the 7th Southeast panel, were blown down hill (South) or inby from the Northeast side of the supply room in a direction towards the East Main South Back entry. . . . . Most of the sand boxes, which usually contain about two tons of sand for haulage purposes and which were located in several places on the Main South entries, definitely indicate that the intital force of the explosion was inby and came from the North. . . . . Three loaded mine cars on the main parting, located in the 1st West entry, ... were blown on their side against the South rib of the parting, which is definite evidence that the initial force that upset these loaded cars, ... was terrific and definitely inby . . . . . Six cars of props in the slant between the Main South entry and the East Main South Back entry, which is part of the 9th Southeast Back entry, and near the place picked by the Federal inspectors, were blown with such an inby force, which force came from the North, that the West end car was jammed against the rib of the 9th Southeast Back entry and the props in this car were moved out of the car in an inby direction, a distance of three feet. . . . . In a slant in the 9th Southeast panel, picked by the Federal men, the intital force was definitely inby and opposite to what they claim it was because on the post on which the slant door formerly hung, the initial force of the explosion bent the angle irons inwards toward the face of the 9th Southeast entry."

Forces on the main south entry and the return, or east-side entry, definitely moved outward from the 9th southeast panel, as described in the final report on the explosion. The report by Messrs. Freeman and Romek very apparently overlooks the five 60-pound rails blown outward at the 5th southeast entry, and the booster fan, normally located just outby the 5th southeast entry, which also was blown outward. Shelves and supplies in the machine shop were in the end near to, and partly projecting out into, the

return airway; these were definitely blown outby, or in a northward direction. In the final report on the explosion, the inspectors overlooked mentioning a 1,000- to 1,200-pound drill press, normally standing in the main south entry, near the entrance to the shop. This drill press was moved about 10 feet outby, in a northerly direction.

The reported movement of the two sand boxes agrees with the Federal report on the explosion and such inward movement would be likely with an explosion strating in the 9th southeast entry.

Three loaded mine cars were turned on their side on the 1st west parting by the major force shown coming down room No. 1. The forces in this district were as shown on the Federal explosion report.

The front end of the outby car of props in the "slant" below the "slant" to the 9th southeast entry was derailed and moved about a foot to the inby rib of the "slant." The endgate on the car was lifted, but the props remained in the car. None of the other cars was affected. The forces on the main south slope were as shown on the Federal explosion report.

The "slant" in which the six cars of props were sidetracked did not contact the return airway at the same point as the back entry of the 9th southeast panel, but about 25 feet inby. The map is not correct in this respect. This "jog" accounts for the major forces coming out the 9th southeast back entry and turning down the back entry. The angle with which the "slant" joined the back entry prevented the forces in the back entry from moving outby through it.

The hinges on the door post at the entrance to the 9th southeast panel did indicate that the door had been blown inward. However, the evidence indicated that the major forces came outward from the 9th southeast panel, produced a definite "sweep" on the floor in an outward direction at the junction with the back entry, moved the door post outward about 10 inches at the top, with the door attached and held open, and that later forces, coming back up the main south entry, blew the door inward and twisted it off the hinges. The door post was still solid enough to remain in alinement.

The management cannot reconcile the evidences of forces with the source of the explosion arrived at by the Federal investigators. In one place in the report it is stated: ". . . . . we wish to say that Federal Bureau examiner, M. C. McCall, when he and other Federal examiners went into the 9th South East entry during the rescue effort and after they stopped in the slant and looked at the post on which the slant door hung prior to the explosion, made the remark, after noticing that the angle irons that supported the door were bent inwards toward the face of the 9th South East entry, 'that leaves out the mine foreman with the safety lamp at the mouth of Room 6.'"

Up to the time Mr. McCall left for Salt Lake City, he and a number of others, including Arnold, were of the opinion that the explosion originated in the 8th west entry. The subsequent study of the evidence of forces and heat convinced Inspectors Bailey and Arnold that the most probable source of the explosion was in the 9th southeast panel. Archie Browning, representing the State of Montana, accompanied the Federal inspectors and assisted in the determining of the direction of forces as shown on the map included with the Federal report on the explosion.

There is disagreement as to the exact place where the explosion originated, but all investigators, other than those of the company, agree that it originated in a working place in the interior of the mine and it traveled outward toward the shaft and slope.

Under the heading "Comments on the Federal Examiners' Theory" the company report states: ". . . . . it is difficult to understand how so little gas, if there was any, (as the Company claims Room 5 was absolutely free from explosive gas on the morning of the explosion) could develop enough force in such a short distance to move a sand box down hill on the Main South entry in the next entry . . . . . and turn on an angle of about 135 degrees to do this."

Gas in dangerous quantities could accumulate in any place or many places in the mine if the ventilation was neglected, doors left open, curtains left up, or brattices not extended. Evidence in the mine after the explosion indicated that gas had burned in many places. The management does not seem to be aware of the fact that a mixture of as little as 150 cubic feet of gas and air, in which there is about 9 percent of gas, is sufficient to initiate an explosion that will propagate through coal dust and extend throughout a mine provided the coal dust is dry. Where the quantity of gas is large, even wet coal dust will enter into an explosion.

During the study into the cause of the explosion, the inspectors asked Loren Newman, the supervising foreman-fire boss, to indicate about where he usually found gas in the "slant" off room No. 2 in the 8th west entry. He chose a point about 25 feet from the face of the place, which is 16 feet wide. This would give 400 cubic feet of gas for each foot of thickness of the accumulation. There probably was, at the least, the equivalent of a layer of gas two or three feet thick in the place, or 800 to 1,200 cubic feet. Recordings in the fire bosses' book showed 100 cubic feet of gas in the place, and that the accumulation had stood for nearly two months.

The company report states that: "On account of the comparative dampness of most of the entries in the Smith Mine, prior to the explosion, the Management has always been of the opinion that it required the ignition of an unusually large amount of methane gas to disturb the comparatively

damp coal-dust into suspension, so that it would add to the fury of the explosion. No quantity of gas in an amount even large enough to burn a man was ever reported in any of the places where men were working in the Smith Mine by the Federal examiners during their lengthy inspection, which is substantiated in their preliminary report.

"In view of this and the fact that only one man was severly burned in 35 years in the Smith Mine by gas, ... it would seem impossible that enough gas could accumulate between shifts in room 5 or any other active working place in sufficient quantity to start an explosion of this magnitude.

"The only place near where the men were working in the Smith Mine where a large quantity of methane gas could accumulate was in the abandoned 2nd East Main and Back entries, which entries were blocked off by cement stoppings in accordance with an understanding with the Federal inspectors at a meeting held in the Washoe office in November."

In testimony at the inquest, Loren Newman, the foreman-fire boss, explained recordings in the fire bosses' book as follows:

> "We just made an estimate (in cubic feet) as to how much (gas) was there. The purpose was mostly for the record to show whether there was a lot of gas in a place or only a little bit. . . . . We do not pretend to be accurate, but we give an idea whether there is a lot or a little bit."

Testimony indicated that gas was ignited accidentally by shot-firers on frequent occasions. Shots were fired by fuse ignited by matches or open lights, and it is evident that places were not tested for gas or made safe before firing shots.

Testimony of William R. Brown, face man:

> "One of the worst gas fires was on Tuesday night before the explosion. At shooting time, I went into room 20 (7th southeast) to light shots, and the room caught fire about 40 feet from the face. An open light was used. Was out of a place 15 minutes for lunch one day and ignited gas at face upon return. Was working with open lights. Meiklejohn (deceased fire boss) told me of an argument with Newman and Murray. He said, 'they think I'm finding gas where they say there is none.' He said, 'I'm willing to brush out gas if there's only a little; but when I know the volume of the gas in there is too great and that my brushing out won't keep it out until they go in and load, I've got to report that place as having gas.' This discussion occurred after the holidays."

Upon receipt of the analyses of air samples collected during the November inspection, the Salt Lake office wrote to Mr. Freeman under date of December 15: "..... Sufficient gas is liberated in the mine to require serious consideration of the ventilating system. An immediate improvement is needed in the interest of safety. I trust that you will take steps to improve the situation and warn the mine officials of the hazards involved ....."

Under date of December 22, Mr. J. M. Freeman replied to our letter of December 15 calling his attention to the results of the air analyses. Mr. Freeman stated: " ..... Copy of letter ..... has been placed in hands of the superintendent and mine foreman. (Various improvements in the ventilation system were enumerated)..... our fire bosses report merely traces of methane in just a few places."

A reference to our copy of the fire bosses' records showed gas reported as follows on December 22:

Number of Places	Volume of Gas
5	Trace
7	Gas (volume not given)
3	25 cubic feet
2	50 cubic feet
1	100 cubic feet
18 places	

Gas had been reported daily in six of the places for some time.

Testimony at the inquest indicated that W. R. Freeman resigned as mine superintendent on January 26, 1943. Information obtained from J. M. Freeman indicated that he (J. M.) left for California a number of days ahead of W. R. Freeman. Attention is called to the indications of gas as recorded in the fire bosses' book for January 19, 20, 21, 22, and 23, 1943.

Quantities of Gas	Number of Places				
January	19	20	21	22	23
Trace	4	3	7	12	7
Gas (volume not given)	9	15	15	4	6
10 cubic feet	0	1	0	1	0
25 cubic feet	7	5	1	5	7
50 cubic feet	7	4	4	5	6
100 cubic feet	2	2	3	2	1
200 cubic feet	0	0	0	0	1
Total places	29	30	30	30	28

There is no evidence that either the management or the mine officials were aware of, or concerned about, the unusual gassy condition of the mine at this time.

For the week before the explosion, gas was reported as follows:

Quantities of Gas	Number of Places					
February	22	23	24	25	26	27
Trace	5	11	11	10	2	9
Gas (volume not given)	3	3	3	1	1	0
10 cubic feet	0	1	2	0	1	1
25 cubic feet	11	4	3	4	7	1
50 cubic feet	5	2	3	6	8	5
100 cubic feet	2	1	1	1	2	4
200 cubic feet	0	0	1	0	0	0
Total places	26	22	24	22	21	20

Attention is called to the fact that the report of one fire boss, Mr. Meiklejohn (deceased), was not recorded in the fire bosses' book for February 27. All of the reports of gas, with a very few exceptions, are for places in working sections of the mine.

The company report states that: "We are now convinced that it is a very serious matter to block-off old workings in any coal mine where methane is being generated, and sincerely believe that if in the future the Federal Mine Inspectors believe that places making methane gas be blocked-off, they should provide instructions in the erection of stoppings, etc., wherein every precaution is taken, so that falls of rock or squeezes cannot bring about a condition where this gas can quickly escape in large quantities."

This statement by the company might be taken to imply that the sealing of abandoned workings had never been practiced at this mine until the subject was mentioned by the Federal inspectors, and further, that the company had no knowledge of the correct way to install a seal and were entirely dependent upon instructions from the Federal inspectors for information on the subject.

Other sections of the mine have been sealed off for years, and the seals are well constructed and in good condition. Two of the sealed areas are in No. 2 bed. The old main slope section in No. 3 bed is sealed off by three well-constructed seals at the top of the slopes. These seals are ventilated by the main intake air current which ventilates all workings in No. 3 bed. These seals presented a much greater hazard to the mine before the explosion than the seals placed across the 2nd east entries. When seals are installed in a mine it immediately becomes the management's responsibility to see that they are inspected frequently and maintained in good condition.

Miscellaneous

The company report states that: "the Federal examiners didn't give the Company" (in the Federal explosion report) "much credit for its unusual effort, under normal War conditions, in completing so many of their recommendations, and trying so hard to get electric cap lamps, permissible powder, and rockdusting equipment.

"We list below some of the Federal recommendations that were completed inside of the Smith Mine prior to the explosion, notwithstanding a critical labor shortage.

1. Two concrete stoppings were installed in the 2nd East Main and back entries.

2. The size of the air shaft from the No. 2 vein to the No. 3 vein was increased.

3. Rock was removed from the No. 2 overcast and air leaks repaired.

4. Air leaks in all stoppings in the No. 2 haulageway were fixed, also three doors repaired.

5. The door that enters into the airway from the No. 2 slope was repaired.

6. All narrow places in the intake airway were cleaned out by removing dirt and leveling off caves.

7. In the No. 3 vein all of the large stoppings were plastered.

8. At the bottom of the tunnel near the first right entry, a concrete stopping was erected and the door repaired by plastering.

9. An additional stopping was erected in the main south slope outby the overcast, and the pillar broken through inby, which doubled the airway area at that point and generally improved the mine ventilation.

10. All stoppings were repaired and plastered to the first west entry in the No. 3 seam, a distance of approximately 3,000 feet.

11. The fan was moved from the bottom of the shaft in the 2nd north back entry to the back entry of the main South near

the 5th Southeast main entry on the inside of the 5th Southeast main door, which very substantially increased the ventilation in the 5th, 6th, and 7th Southeast entries and rooms.

12. An airway was being constructed to the surface at considerable expense and was completed within a few feet of the No. 2 seam. It was located in the first crosscut between No. 9 and No. 10 rooms in the 5th South East entry.

13. Foremen and haulageway men were instructed not to leave ventilation doors open.

14. Mine foremen were instructed to carry safety lamps at all times, and they were examining all places before men entered them.

15. An additional brattice man was employed to improve ventilation in working places.

16. Cleaning was done in both the No. 2 and No. 3 return haulageways.

17. A water tank was installed on the new Sullivan cutting machine so that all cutting equipment in active use carried water for the curtailment of dust.

18. Safety man-holes were provided in the No. 2 slope.

19. A safety bridle was installed to connect the motor with the man trip.

20. Additional mine safety lamps and sufficient electric cap lamps for all employees in the mine were ordered.

21. Canvas bags for carrying powder were ordered and were placed in the mine prior to the explosion.

22. Additional powder boxes, properly locked, were installed throughout the mine, and powder supplies contained therin were reduced.

23. Wooden tamping bars were ordered and sent into the mine, and any metal tamping bars in use were copper tipped in accordance with the State Law.

24. Tamping dirt had been sent into the mine.

25. Permissible powder and electric caps were ordered and received and were being tested by Engineers of the Atlas Powder Company and DuPont Powder Company to determine the best grade for our operations.

26. The wooden flooring around the No. 3 hoist was replaced with concrete, and the wooden posts were replaced with structural iron. The rope, hoist gears, and reducer were guarded.

27. All pumps were guarded and defective wiring removed.

28. Other fire hazards in the way of movable material were removed.

29. The mine electricians were instructed to install cut-off switches and to install insulators for carrying feed wire. A part of this work had been completed, but in view of their death, the full details are not available.

30. Transformers in the No. 2 slope were fenced and danger signs installed.

31. Motors on the booster fans were changed from D.C. to A.C. current so that all D.C. power could be cut off when no one was in the mine."

The company was given credit, in the final report on the explosion, for everything which could be observed that they had done toward complying with the recommendations made in the preliminary report.

The company report states that: "The Company challenges the Federal inspectors to prove the statement 'the line brattice was extended to within 70 to 100 feet of the face of Room 5' (where they think the explosion started). . . . . Sanfred Huhtala said he told Mr. Arnold he inspected the 9th Southeast entry on the night of February 26th, the night previous to the explosion, that his inspection started about 4:30 p.m. and that he examined all of its rooms and the Main and Back entries in the 9th Southeast panel. He said he also told Mr. Arnold . . . . . that he discovered only a trace of gas (less than 5 cubic feet) in Room 5 and reported it to Mr. Martin Rapp, the mine foreman, who instructed him to install a line brattice at once to remove this gas. Mr. Huhtala says he also told Mr. Arnold that a line brattice was built as soon as possible to within 18 feet of the face, (not 70 to 100 feet mentioned in the Federal report), and the line brattice was completed at once."

The statement concerning gas being found in room No. 5, 9th southeast panel, was made to Mr. F. J. Bailey of the Bureau of Mines, and not to Mr. Arnold. The Federal inspectors are satisfied that the line brattice was not extended in room No. 5 the night before the explosion, and believe they can prove this, should it be considered of sufficient importance. Had the line brattice been extended, and the gas removed the night before, why was the bratticeman in this place with his tools on the morning of the explosion?

The company report states: "The statement on Page 17 of their report that there was very little cooperation between employees and Management in connection with the establishment and enforcement of safety practices is incorrect. Every United Mine Worker who testified at the Inquest testified that there was cooperation, and the only exception mentioned to the Management was the difficulty of preventing the men from jumping off the man trip before it stopped."

The company maintains that, contrary to the Bureau of Mines report, good cooperation existed between miners and management in the establishment and enforcement of safety measures. Several miners testified at the inquest to the existence of such good cooperation although two of them testified that the company had never asked them to cooperate along safety lines. It is hard to reconcile such good cooperation with the prior statements made by company officials to the Federal inspectors that they had been unable to stop the employees from jumping on and off the moving man-trips, to induce all of them to wear safety caps or safety shoes, to induce all of them to use permissible electric cap lamps, and that it doubted that they could induce them to quit smoking. If such good cooperation existed, the responsibility for the continuation of these unsafe and dangerous practices was the responsibility of the company alone.

Infromation is given in the company report that "The State Coal Mine Inspector thoroughly examined the Smith Mine on January 27, 1943, only one month prior to the explosion, and the State Industrial Accident Board of Helena issued a Certificate of Inspection, approving of the condition in the Smith Mine as of that date."

Mr. Edward Davies, State coal mine inspector, testified at the inquest as follows: "Well, Sir, I could have been present with these Federal mine inspectors when they made their inspection, but of course the rules of the U. S. Bureau of Mines required that their Federal inspectors - if they found a condition that they considered to be an immediate menace to the lives of the men in that mine they were inspecting - to notify and send for the State coal mine inspector. That is the reason I did not accompany them."

On December 7, one week after the completion of the November inspection of the Smith mine, Federal Coal Mine Inspectors Arnold and Evans

met with State Coal Mine Inspector Edward Davies, and President of United Mine Workers of America, District No. 27, W. A. Boyle, at Billings, Montana, and discussed with them in detail the contents of the preliminary report of the Smith mine inspection. Mr. Arnold informed Mr. Davies of the improvements the company had made and those which it had agreed to make, and suggested that Mr. Davies go to the mine and check up on the efforts of the company to comply with the recommendations. Mr. Davies agreed to do this, and on January 27 he rendered a report of his inspection of the Smith mine, a copy of which is included herewith. Reference to the report will disclose that there is nothing in the report to indicate that the State inspector either approved or disapproved the condition of the mine as it was when he inspected it. Reference is also made to the attached graph showing the frequency of the occurrence of gas at the Smith mine, particularly at the time of the State inspection.

The company report states: "In support of our contention that the Federal men thought the Smith Mine safe, we wish to state at a public meeting in March, 1943, held at the mining town of Bearcreek, where the Smith Mine is located, and in answer to a question as to whether he considered the Smith Mine a dangerous mine when he inspected it in November, we understand Mr. Arnold stated that he did not consider this mine dangerous, and if he had, it would have been his duty to notify the State Coal Mine Insepctor to that effect."

At a public meeting called by the Local Union of the U.M.W.A., near Washoe, the latter part of March, Arnold was asked why the inspectors did not close the mine down at the time of the inspection in November. Arnold replied that the inspectors did not have authority to close any mine down, but had the inspectors considered the Smith mine to be in a dangerous condition it would have been their duty to inform the State coal mine inspector of it immediately. Arnold did not mention at this meeting the steps taken during the inspection to reduce the hazards, but the State coal mine inspector had been told of the improvements shortly after the inspection was completed in November 1942.

The company report states: "In their report, the Bureau of Mines Representatives go into considerable detail on underground mining methods, conditions, and equipment at the Smith Mine. Before answering their statements, some of which are very misleading, we would like to mention that the Bureau of Mines report on the explosion was prepared mainly by G. O. Arnold, the Federal Insepctor, who was in charge of the November examination of the Smith Mine, prior to the explosion, and whose suggestions to the Management might have indirectly had something to do with the explosion, in which case, it was to his interest to unduly criticize the Company."

The company report also states: "It must be remembered that we had only the Federal preliminary report to follow because the much more lengthy

and final report was not completed by Mr. Arnold until after the explosion had occurred, ..."

In a section of the company report entitled "Lessons to be Learned from this Explosion" the following suggestions are made:

"1. That before suggesting that coal companies block-off places that can accumulate considerable quantities of explosive gas, the Federal examiners should take into account, that falls of rock and squeezes might release this gas quickly in dangerous amounts and cause an explosion, and they should also recommend to the coal operators that double concrete stoppings and other precautions be taken to prevent this extremely dangerous source of explosions from causing disasters in the future, especially in mines where they know that open lights, trolley mine locomotives and non-permissible electric equipment are being used, as was the case at the Smith Mine.

"2. That Federal mine examiners should be very careful in suggesting to coal operators that ventilation improvements be made, that will have a tendency to dry out a mine and increase a coal-dust hazard, before rock-dusting equipment can be made available, especially in mines where open lights and non-permissible electrical equipment are used, or cannot be procured for an indefinite length of time, as was the case at the Smith Mine."

The final report, covering the inspection in November, was completed and typed in final form, except for a portion of the recommendations, on the day the explosion occurred. On Tuesday, March 2, a wire from the Washington Office of the Bureau of Mines to rush the report was forwarded to Arnold at the mine. The remaining recommendations were completed Wednesday, between the hours of 2:30 and 4:30 a.m., and the untyped portion of the report was air-mailed to Salt Lake City that day. These facts are verified by records in the Salt Lake City Office of the Bureau of Mines.

Some remarks have been made that much of this final report was written after the explosion. Bureau representatives, including Arnold, were on duty at the mine from 12 to 16 hours a day during the recovery operation, which extended through Sunday, March 6.

It is stated in the report of the company that the comments are not "intended to reflect in any way upon the United States Bureau of Mines or its efforts to save lives, which efforts, the Company is heartily in accord with and desires to cooperate with to the fullest extent."

In conclusion the company report states: "We cannot speak too highly of the speed with which the Bureau of Mines men and equipment arrived at the Smith Mine for the rescue effort. The quality of leadership displayed by

the Representatives of the Bureau, and the individual courage and self-sacrifice of each one, are praisworthy to the extreme. The Company is grateful for their help in this disaster and feels greatly indebted to every Representative of the Bureau of Mines who assisted in the rescue effort."

Supplementary Data

Coal Mine Explosion

Smith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

Explanation of Graph
Pertaining to Fire Bosses' Records
Smith Mine, Montana Coal & Iron Company
Washoe, Carbon County, Montana
By G. O. Arnold

Explanation of Graph
Pertaining to Fire Bosses' Records
Smith Mine, Montana Coal & Iron Company
Washoe, Carbon County, Montana
By G. O. Arnold

This graph was prepared from a chart onto which all records in the fire bosses' books had been copied. The graph was prepared to read from right to left as it was felt that the period directly preceding the explosion would be of greater interest. Idle days were purposely left off the graph, as complete fire-boss examinations were not made on such days.

Attention is called to the following dates on the graph, reading from right to left:

11-20-42

The inspection of the mine began. Gas reported in 26 places.

11-21-42

The foremen begin signing the fire bosses' record book, as suggested by inspectors.

11-23-42

Gas reported in only 12 places.

11-24-42

The fire bosses begin entering their reports with ink, as suggested by the inspectors. Suggestion also was made at this time that all references to gas should be made in red ink.

11-27-42

Gas reported in only 11 places.

11-28-42

The number of places in which gas was reported increased to 19, indicating that the fire bosses were having difficulty, no doubt because of the small volume of air they had to work with. This difficulty is apparent, on the graph, up to December 4, 1942, when the number of gassy places reported increased to 23.

12-10, and 12-11-42

Gas reported in only 11 places on both days.

12-11-42, and thereon

With the exception of December 21, when gas was reported in only 11 places, the number of places daily in which gas is found begins to noticeably increase. It was about the middle of this month that Newman was taken off as a regular fire boss and placed on the night shift as foreman.

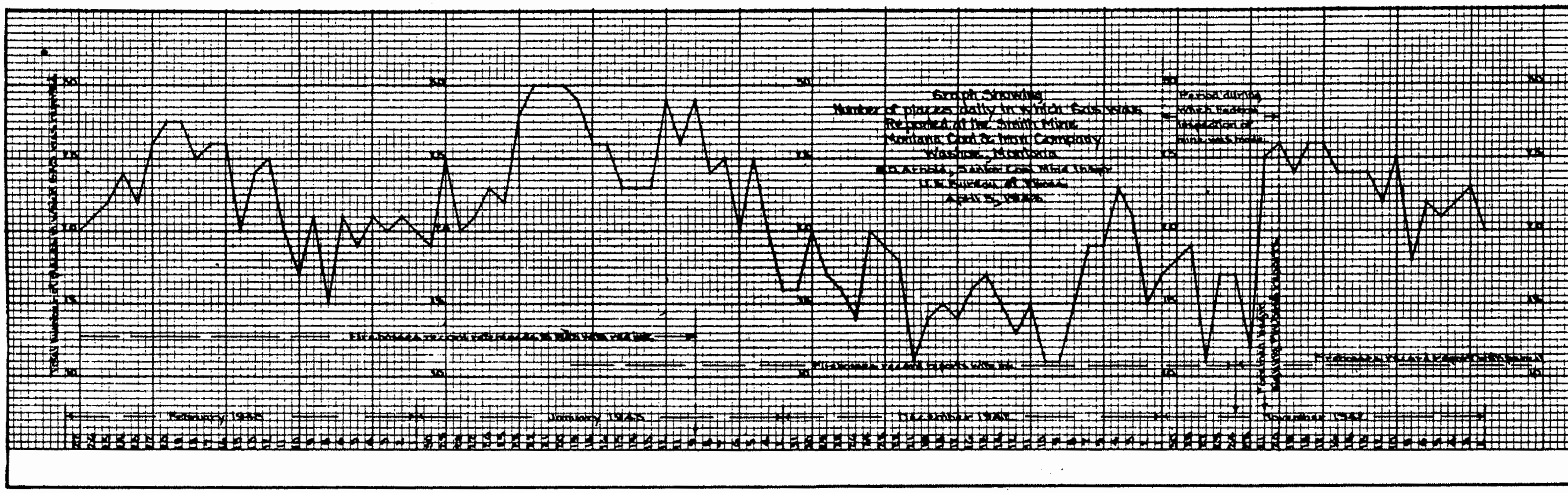
12-22-42

This is the date on which Mr. Freeman wrote the letter stating that the fire bosses "..... report only traces of gas in a few places."

1-9-43

The fire bosses begin recording all references to gas in red ink. It would be interesting to know why this suggestion of the Federal inspectors was recalled so long after the inspection. Could it be that someone wanted to call attention to the gassy condition of the mine?

The graph will prove interesting to study in reference to conditions prior to the explosion.


Graph Showing
Number of places daily in which Gas was
Reported at the Smith Mine
Montana Coal & Iron Company
Washoe, Montana
Period during
which federal
inspection of
mine was made
February
January
December
November

Supplementary Data

Coal Mine Explosion

Smith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

Report on Explosion by Montana State Mine Inspectors

Comments on Report on Explosion by Montana State Mine Inspectors
By G. O. Arnold

9894

Report on Explosion by Montana State Mine Inspectors

Billings, Montana May 3rd, 1943.

To the Industrial Accident Board,
Helena, Montana.

Gentlemen:-

We, the undersigned, herewith submit our report of the explosion that occurred at the Smith Mine, Washoe, Carbon County, on Saturday, February 27th, 1943.

The explosion occurred at about 8:35 A.M. There were 77 men in the mine at the time, and of these only 3 were rescued. The engineer at the hoist in the #2 vein (Hawthorne) telephoned to the surface to the effect that something very serious had taken place and that he was getting out.

Outside employees immediately entered the mine, traveling through the main air course to a point opposite the hoist, and then through a connecting cross cut to the main slope parting. At various relatively short distances from the hoist they found the engineer and 4 others who had been overcome by the after-damp. Three of these responded to rescuscitation treatment but two could not be revived. The 5 men were taken out of the mine before noon.

The news of the disaster quickly spread and the miners of the community hastened to the mine in order to assist in possible rescue work. But of the 72 men who were in the #3 vein when the explosion occurred not one escaped. Within one hour after the explosion occurred the Red Cross organization established a canteen in the machine shop a short distance from the entrance to the mine. The quality and the quantity of the food and the services rendered by the women in charge of the canteen won the sincere appreciation of all the men who took part in the recovery operations.

The State Highway Patrol attended to the transportation needs of all. The service which they rendered at a time when it was most needed, their courtesy, discipline and efficiency left nothing to be desired. It may be said that the county, state and federal agencies were united in an effort to rescue possible survivors of the disaster in the #3 vein. We regret to report, as the record reveals, that their labor and hopes were all in vain.

Miners and mine officials hastened to the scene as quickly as possible from Klein and Roundup and Stockett, and the Moat and Benbow mines in nearby Stillwater county to offer their services. These men demonstrated

once again the traditional disregard for danger that miners always display as long as any hope remains and those who have been trapped in a mine by an explosion may be rescued.

Mine rescue squads from Butte and the Moat and Benbow mines of the A.C.M. lost no time in arriving at the mine. These Helmet men possessed a high degree of courage. They were ably led, and they brought to their work the skill and experience that they had acquired through training in mine rescue and recovery operations. They remained at their task, which combined danger with horror, until it was completed. They cannot be too highly praised.

The U.S. Bureau of Mines officials from Butte and Salt Lake City arrived Saturday evening and Sunday. They immediately took charge of operations which necessitated the restoration of ventilation, and which at the time of their arrival had been advanced to the 1st west parting in the #3 vein, a distance of 7,000 feet from the mine portal. This advance was made by local crews and mine officials without the use of mine rescue apparatus.

The advance had been made possible because the force of the explosion did not reach the main fan at the mouth of the mine at the intake airway.

However, the 3 booster fans in the #3 vein were destroyed by the force of the explosion and the work of restoring the ventilation became increasingly more difficult and dangerous as only one of the booster fans could be replaced during the following week. The work of rebuilding the stoppings was exhausting and hazardous due to the presence of Carbon Monoxide in the mine atmosphere and every precaution had to be taken in order to safeguard the lives of the men engaged in recovery work.

Under the able supervision of the U.S. Bureau of Mines officials, Messrs. Arnold, Evans, Johnson, McCall, Bailey, Reeder and Denny ably assisted by Messrs. McElHatton of the M.S.A. Company and M. Mullen of the Atlas Powder Company the recovery of the bodies of the victims of the disaster was accomplished without injury to any of those engaged in the work.

The last body recovered was that of Elmer Price, mine foreman, on Sunday March 7th at 3 P.M. in room #12 in the 5th South East entry. The bringing of the body to the surface at 6 P.M. brought to a close one chapter in the greatest coal mine disaster in the history of the State.

The work of improving the ventilation continued with considerably reduced working forces during the following two weeks.

On Monday March 22nd, the work of investigation to determine, if possible, the point of origin and the sequence of events that led up to the explosion commenced.

The U.S. Bureau of Mines was represented by G. O. Arnold and F. Bailey from Salt Lake City.

The State was represented by Ed Davies, State Coal Mine Inspectors, Billings, and Ben Henry, State Quartz Mine Inspector, Helena, and Archie Browning of Great Falls.

The United Mine Workers organization District #27 was represented by W. A. Boyle, District President, J. Masini, International Board Member, and Joe Yanishsin, District Board Member, and Joe Bosone, Secretary of Foster mine L. U.

The Montana Coal & Iron Co. was represented by W. A. Romek, Assistant General Manager, Thomas Freeman, outside foreman. Loren Neuman and Martin Rapp, mine examiners.

These men were assisted by John McDonald, Alex McDonald, John Reed, and Ira Maxwell, all of whom are employees of the Montana Coal & Iron Co. Their knowledge of the mine workings, and the mining practices and conditions together with their practical knowledge, was of value to all the investigators.

The investigators were at liberty to consult with each other or reach their own conclusions independently.

We are of the opinion that the determining of the point of origin of an explosion by noting the direction of its forces is far from being an exact science.

In many mines after explosions, the evidence has been conclusive as to the point of origin while in others it has been so confusing and contradictory that agreement in regard to it could not be reached by the investigators. Such was the case in regard to the point of origin of the Smith mine explosion. When the evidence is not clear the investigators reach different conclusions which are necessarily based upon assumptions and probabilities. The investigators quite naturally stress the points which appear to them to support their conclusions. Most of us cling tenaciously to our theories and assumptions.

Men with experience as investigators of mine explosions have made certain definite assertions which are generally accepted. We quote the following:

"In determining whether an explosion was a purely gas explosion or dust explosion, it must be remembered that in a gas explosion it can only extend as far as the amount of gas exploded can expend. It must also be remembered that the afterdamp of an explosion invariably contains much Carbon Monoxide, which, owing to its wide explosive range is not as liable to be extinguished by the expansion and cooling in more open workings as Marsh gas is. This accounts for the phenomenon of what is termed the recoil or return flame of a dust explosion."

And also: "As the first explosive blast sweeps through an entry, it leaves behind it a trail of hot and generally inflammable gases, consisting chiefly of carbon Monoxide and Nitrogen. The immediate cooling of these hot gases, due to expansion, causes a depression or fall of pressure in the entry and, as a consequence air rushes out from the rooms or other workings. Thus a fresh supply of Oxygen is furnished, and the flame having been arrested in its advance by the increasing effect of the depression behind, or by its own expansion and cooling starts to turn back on its own trail."

It soon became evident that the explosion in Smith mine was not a purely gas explosion. Though gas may have originated the explosion by being ignited with an open light. It was the dust that propagated it through the workings of the mine.

There also was evidence that the explosion in some places had recoiled and traveled back over its original course.

The mine had been in production since the turn of the century. It was opened on the #2 vein and the main slope driven approximately due South, and dipping slightly in that direction.

The #3 vein, in which the explosion occurred, lies about 80 feet below the #2 vein and is entered through a rock tunnel which was driven from a point about 3,600 feet from the mine portal. The rock tunnel extends for a distance of 450 feet and continues the main haulageway to the face of the Main South entries for a total distance of 11,000 feet.

The 3 main entries in the #3 vein dip slightly towards the face, the middle entry being the main haulageway. The panel entries were driven East and West off the Main right and Left back entries. The left panel entries were driven at an angle of 45 degrees, and the right panel entries at an angle of 90 degrees. The rooms generally were driven at an angle of 45 degrees off the panel entries at distances of 100 feet.

The faces of the rooms and entries were ventilated by line brattices.

The coal was top cut and center sheared the vein being about 10 1/2 feet thick. Coal varying in thickness from ten inches to eighteen inches was left to form the roof as the over-lying shale roof was difficult to support.

The working forces worked in crews or units. Each crew consisted of a loading machine operator and helper, one face man, usually two track-layers, one timberman, and an electric locomotive haulage operator and a nipper.

Two cutting and shearing machines were operated by four men who did all the cutting and shearing of the coal preparatory to its being blasted. The two drilling machines were operated by four men together with two shot-firers who did the drilling and blasting for the entire mine.

The powder car was attached to the drilling machine, and while the drillers drilled the holes the shot-firers made up the charges and loaded and tamped the holes which were fired at the end of each shift.

Black Pellet powder was chiefly used and was set off with fuse lit with an open light. Preparations were being made to use Permissible powder and Permissible detonators.

Closed electric battery lights and open lights were used by the employees. An order for additional electric lights had been placed by the company but owing to priority regulations they had not been delivered. The priority rating of the company was recently changed and delivery of the lamps was recently made.

The electrically operated cutting and loading and drilling machines used at the working faces were not of the permissible type.

The haulage from the working faces to the 1st West rope haulage parting was done by electric trolley line locomotives, and from that point to the surface by two electric rope haulage hoists. One of these was located in the #2 vein and the other outside the mine. All machinery was regularly inspected and kept in good condition.

The mine was ventilated by a main fan located at the intake portal of the mine and 3 booster fans in the #3 vein. The first booster fan was located in the main aircourse in by the air shaft that connects the #2 and the #3 veins. The second was located in the 8th South East back entry outby the first slant, and the third was located in the 4th South East inby the air shaft which connects the #2 and the #3 veins, in the return air course.

The mine was ventilated by one continuous current and the volume of air circulated was sufficient, if properly directed and controlled, to dilute and render harmless the amount of gas normally generated at the working faces. The last readings taken by the mine foreman (Price) and recorded in the mine office, shows that the lowest reading obtained in entry last cross cuts on Feb. 23rd was 13,800 cubic feet per minute. The main fan delivered 43,470 cubic feet per minute.

The mine did not normally generate excessive volumes of Methane. It was regularly inspected by certified mine examiners, and their reports were recorded in the mine office at the end of each shift in accordance with the provisions of the state mining laws. The reports, since the inspection of the mine in November, by the Federal coal mine inspectors, were signed by one or both day mine foremen. The mine foreman also inspected working places with safety lamps.

Due to the increased demand for coal on account of the national emergency the mine worked double shift.

The number of men employed was 257, and of that number 109 worked on the outside of the mine.

One mine superintendent was employed, three mine foremen, two on the day shift and one on the night shift. These officials were men whose experience in the Smith mine and neighboring mines in Carbon County ranged from 20 to 30 years. They were men who appeared to have confidence in their ability to carry out their duties in accordance with the provisions and requirements of the state mining laws.

By authority granted under the provisions of the Federal Coal Mines Inspection Act of 1941, federal mine inspectors inspected the Smith mine during the latter part of November 1942. Their recommendations are embodied in two reports. One, a preliminary report, which was posted at the mine immediately after the completion of their inspection, and a final report which was issued March 18th 1943. Copies of the preliminary report were received by the management, the state coal mine inspector, and the District President of the United Mine Workers organization in Dec. 1942. As already stated the final report was issued in March 1943.

Lacking police powers the Federal coal mine inspectors, under the direction of the U.S. Bureau of Mines, seek the cooperation of the State Mining Departments, officials of the United Mine Workers of America Organization, the management and the men employed in the mines.

It is only through the close cooperation of all the above mentioned that the recommendations of the Federal Inspectors can be made effective.

In case the Federal mine inspectors find a condition in a mine which they consider to be an immediate menace to the lives of the men employed in the mine, and the mine management refuses to take immediate action to remove the danger, after it has been brought to their attention, it then becomes the duty of the Federal mine inspectors to notify the state coal mine inspector or the State department that controls the office of the state coal mine inspector, in order that the police power of the state may be exercised.

The Federal Coal mine inspectors who inspected the Smith mine during the latter part of Nov. 1942, did not consider the mine dangerous in the sense that the exercise of the police power of the State was necessary in order to make it reasonably safe.

The Federal Coal mine inspectors bring to their work the technical knowledge which they acquire through years of study, and the practical experience which they have gained as miners, mine foremen, mine superintendents, mine engineers and general managers of mines or groups of mines. In addition they receive intensive training at the U.S. Bureau of Mines station at Pittsburgh, Pa., before they are assigned to the various regional districts set up by the Bureau in order to facilitate the carrying out of the provisions of the Federal Coal Mines Inspection Act.

All of the major recommendations of the Federal Coal Mine Inspectors should be incorporated in our state mining laws as soon as possible in order to meet the changes that have resulted on account of modern mining methods and the mechanization of our coal mines.

RECOVERY OPERATIONS

Eleven of the bodies of the victims were found between the portal of the mine and the face of the Main South entry. This number includes the two found in the machine shop located between the 6th and 7th S.E. entries. The others were found in the order and the entries designated.

Between the portal of the mine and the face of the Main South entry. (1.2.3.4.5.6.7.8.9.10.11).

5th West Main entry. On entry at room #3. (12.13.14.15.16.17.). The men had walked about one thousand feet before being overcome by the after-damp.

6th West Main entry. In room #2. All found within 25 feet of the face. (18.19.20.21.22).

7th West Main entry. On entry at room #3 (23). This man had walked from slant inby room #7, a distance of 600' before being overcome.

8th West entry. In a cross cut between rooms #3 and #4. (24.25.26. 27.28). They had moved but a few feet if at all. Between rooms #3 and #5 on the entry, (29.30.31.32.33.34.35.36.37.). They had walked varying distances up to 160 feet.

Main South Left back entry. (38.39.40.). Two of these were found at the face, one fifty feet outby.

9th South East entry. (41.42.43.). Two were found in room #5, and the other at mouth of room #6.

8th South East entry. (44.45.46.47.48.49.50.51.52.53.54.55.). Ten had walked variable distances to room #3, distances were from 1,600 to 2,000 feet.

7th South East entry. (56.57.58.59.60.61.62.63.64.65.66.). Ten men moved variable distances from 400 to 1,000. Tracklayer at room #23 evidently did not move.

5th South East. (67.68.69.70.71.72.73.74.). Five men moved variable distances up to 600'. Some of these wrote farewell messages to their relatives. It is estimated that 55 men had moved variable distances and that 19 apparently did not move.

SMITH MINE INVESTIGATION

In an effort to determine (if possible) the point of the origin of the explosion in the #3 vein.

Smith Mine #3 vein, Monday, March 22nd, 1943.

Starting point;

2nd West panel entries.	No men were employed in these entries on the day that the explosion occurred. Direction of the force of the explosion uncertain. No indications of heat, and no indications of any significance. Clear of gas at 2nd cross cut.
3rd West panel entries.	Indications of gas. Direction that explosive forces traveled uncertain. No men were employed in these entries on Feb. 27th, date of explosion.
4th West panel entries.	Forces of explosion traveled East to West and West to East. Stoppings between the main and back entries, indicated that forces traveled North

to South. Evidence of intense heat in rooms. At the face of the main entry there was a trace of gas. Canvas opposite last cross cut burned to ash. Pump at 2nd cross cut from the face but no motor attached. The door in the slant between the Main South East middle and right back entries was blown West to East.

No men were employed in the above mentioned entries and after considerable checking of the directions that the explosive forces traveled, they were eliminated as probable points of origin of the explosion.

Smith Mine #3 vein, Tuesday, March 23rd, 1943.

Starting Point;

5th West panel entries; Between rooms #6 and #7, stopping between the main and back entries was intact. Force of explosion traveled from North to South. At room #10 on main entry clear of gas. Room #11 clear of gas. Explosive mixture on top of cave 30 feet from entry face. Loading machine at room neck of room #12. Controls in off position. Force of explosion in last slant North to South. The door in the dip workings was intact. Motor with empties servicing the loading machine. Room #1 in dip workings clear of gas. The cross cut to room #2 not completed but clear of gas. Six loaded cars on parting near mouth of main entry. Trolley wire hanger showed that the force of the explosion had traveled East to West. The five men in this entry had walked from room #12 inby to room #3 outby on the main entry a distance of approximately 1,000 feet. There were no signs of heat. The door in the 5th West slant between the Main B.E. middle and right back entries was blown East to West. The force of the explosion in the air course between the 5th and 6th West entry panels traveled North to South.

6th West panel entries; In the main entry the force of the explosion traveled East to West. Cutting machine in room #2. Water tank blown off the top of the machine North to South. There were indications that the explosive force had first traveled to the face of the room and then back over its path. The bodies of the 5 men

found in room #2 were burned. Safety lamp test showed no gas. Force of the explosion traveled East to West in the back entry. Air reading taken in the Intake airway between the 6th and 7th panel entries, 4,800 cubic feet per minute.

7th West panel entries; In room #5 explsive gas found but no indications of heat. Cap and lamp and a coat found at second slant from main entry face, the coat was almost completely burned. The cap and lamp and coat belonged to the man who was found outby on entry at room #3. He had walked approximately 600 feet. He was building a stopping in the slant, where his lamp and cap and coat were found, at the time that the explosion occurred. He had found his way without light the distance of 600 feet that he had walked to room #3. The 7th West slant door between the Main South middle and right back entries was blown East to West. In the Main South Right back entry, which is the intake airway of the #3 vein, between the 7th and 8th West panel entries evidence of heat was found and little evidence of force.

Of the panel entries mentioned above the 7th were given considerable attention during the following weeks by checking and rechecking the directions in which the explosive forces had traveled through them. They were later eliminated as the probable source of origin of the explosion.

Wednesday, March 24th, 1943.

Starting Point;

8th West panel entries; There were indications that the forces of the explosion had traveled East and West on the Main entry, and both North and South in the cross cuts or slants between the entries. In room #1, the tracklayers' tools and dinner pails were found. Preparations were being made to lay a switch. The fire boss' report (Neuman's) showed traces of gas in the room on his early morning inspection on Feb. 27th. His report was the last recorded. He had deadlined room #1. The deadline had been removed and it is assumed that the gas had been removed by the day shift officials before the track layers entered the room. The track layers entered the room. The track layers were not in the room at the time of the explosion.

Room #2 had also been deadlined by Neuman on his early morning inspection Feb. 27th. The deadline in this room had also been removed. His report shows an explosive mixture at the face of room #2 and the same in a slant or cross cut being driven outby to connect with room #1. The cross cut had not been completed. A cross cut, or slant, being driven from #2 room to connect with room #3 had been holed through at the face on the left side. The hole had been enlarged by Neuman on his morning inspection and he traveled through it to room #3 where he found an explosive mixture at the face. There is a cave of roof in room #3 which Neuman did not cross. Before passing through the cross cut to room #3 he examined for gas at the face of the cross cut and found it clear. At the time of our inspection we found it clear of gas. The loading machine was in this cross cut at the time of the explosion. Three of the five men who were found near the machine used open lights. The machine crew had loaded 12 cars of coal out of the cross cut, and this fact clearly proves that there could have been no body of standing gas in the cross cut when the crew first entered it.

The cutting machine was found in room #5 "sumped in", with the controls in the off position. The cutting in Smith mine was top cutting, the coal being cut near the top of the vein near the roof, and not near the bottom of the vein next to the floor as is the practice in the other mines in the state. The Main entry had been cut and center sheared, as had also a slant being driven to the left near the face of the entry.

In room #5 the cutting machine had been "sumped in" near the roof at the left side of the face. On our inspection we found explosive gas in the top cut in the entry, and the same in room #5, and indications of gas in the slant being driven to the left to connect with the Back entry. It is, we believe, significant that the fire boss' report, (Neuman's) does not report any gas being found in any one of the three places when he inspected them before the day shift entered the mine on the

morning of Feb. 27th, the day that the explosion occurred. A brattice had been erected the day before outby the last slant or cross cut that connects the Main and Back entries, and a line brattice extended from that point, to the mouth of room #5 inby a distance of 42 feet. There is a cave in the Back entry between the third and fourth slants from the face. When the cave occurred we do not know.

The distance from the end of the line brattice at the mouth of room #5 to the face of the Main entry is 102 feet, and the distance to the face of room #5 is sixty feet.

The brattices were blown outby, and the indications were that the explosion gathered force as it traveled towards the mouth of the Main entry.

The stoppings between the Main and Back entries were blown, some North and the others South. The stopping in the Main air course between the two 8th West panel entries was blown South, and the door in the 8th West slant was blown outby and found in the Main S.E. middle entry. The stoppings in the two slants, between the Main South middle entry and the Main air course, outby, were blown in the same direction as the door.

The two machine men who cut the places referred to in the 8th West Main entry, the face of the entry, and the slant being driven to the left to connect with the Back entry, and room #5 where the machine was sumped in, used electric battery closed lights. They were found on the entry outby between rooms #5 and #4.

One of the tracklayers who had made preparations to lay a switch in room #1 outby, was found on the entry at the mouth of room #5. He used an open carbide light. It is assumed that he had left room #1, and proceeded along the entry towards the face in order to obtain material to be used in connection with the laying of the switch in room #1. Whether he had traveled inby the point where his body was found, either towards the face of the entry or into room #5 could not be determined.

8th West panel entries; There were indications that the explosive forces had traveled East and West. Explosive mixture was found at the face of the Main entry. Back entry face, holes loaded and ready to shoot. Explosive mixture at the face. Face of slant next to the face in Main entry loaded and ready to shoot. Powder box between entries in Main air course blown 35 feet South, powder intact. The door on the Main S.E. Middle entry was blown South by initial force of the explosion. There was evidence of intense heat between the 8th West and 8th West panel entries in the air course. The door in the 8th West slant indicated that parts of it had been blown inby and parts of it outby.

Main South East entries; There was very little evidence of force in the Middle, and Right back entries. The face of the Middle entry and a slant just in a few cuts outby had been drilled and the holes charged and ready to shoot.

Main South East,
Left back entry; Face of the entry clear of gas. Drilling machine with powder car attached near the face. Powder car on morning of Feb. 27th contained Pellet powder. Monobel powder and electric detonators and a coil of fuse. Some of the detonators exploded in the car and the powder and fuse were burned. The powder car was not badly wrecked. The cover of the car was found outby a short distance. Two men were drilling a hole at the face at the time of the explosion, their caps and electric battery lamps were blown towards the face of the entry. The third member of the crew was the shot-firer who was preparing a charge. He was badly burned. The two men who were drilling at the face were not burned. It was estimated that the powder car contained from 100 to 150 pounds of powder. A powder box in the 2nd slant outby was blown apart but the three cases of Pellet powder that it contained were intact.

The burning of the powder provided the necessary elements which enabled the initial explosive force to recoil and travel back over its path.

The powder car was eliminated as the probable source of the origin of the explosion as the three men used electric battery closed lights, and the shot-firer was a non-smoker. The evidence indicated that he was handling a detonator at the time of the explosion but his hands were not injured.

11th South East panel entries; There were indications that the force of the explosion traveled towards the faces of both of the Main and Back entries. There was an explosion mixture 200 feet from the face of the Main entry. There was evidence of heat in both entries. No men were employed in the 11th S.E. on February 27th.

10th South East panel entries; The stoppings in the slants between the Main and Back entries were blown North. The stoppings in the Main S.E. Left Back entry that forced the air current into the 10th S.E. Back entry was also blown North. The sand box directly opposite this last mentioned stopping was blown South. And the door in the slant immediately to the left was blown East. Explosive mixtures were found in rooms #1, 2 and #3. There was evidence of heat 200 feet from the faces of both entries. There were no employees in these entries or rooms on February 27th.

9th South East panel entries; The evidence indicated that the initial force of the explosion traveled inby or East in the Main entry. The stoppings in the slants between the entries were blown some North and others South. In room #5 an explosive mixture was found at the face. There was also evidence of heat and great force. A crosscut 160 feet from the face of the room connected rooms #4 and #5. The direction of the explosive force in this crosscut was from West to East. Two tracklayers were found in this room, one inby the crosscut at the face on top of the coal that had been shot down. His track hamme and a part of a shovel, the spike bucket, pieces of canvas, a cap piece, and smaller pieces of wood were also found on top of the coal. The other tracklayer was found outby the crosscut. The evidence indicated clearly that the explosive force

traveled through the crosscut from room #4 to room #5 and then North and South in room #5.

One of the mine foremen (Murray) was found at the mouth of room #6 on the entry. His safety lamp was found intact 39 feet inby room #6 near to the face which had been shot down. The date and the initials of the night fire boss (Mickaljohn) was indistinct in room #5 but they are clear and distinct in room #6. The map of the 9th South East panel entries and rooms, with arrows to indicate the direction of the explosive force, which we are forwarding with this report is not in agreement with that of the Federal mine inspectors. Their map shows the explosion originating at the face of room #5 and its force being propogated throughout the mine from that point. We have a duplicate of their map with arrows indicating the directions of the explosive forces and other data. Very few of the investigators accept the view that the explosion originated at face of room #5.

Thursday, March 25th, 1943.

Starting Point.

8th South East panel entries;

The direction of the explosive force was from West to East in both entries. The booster fan in the back entry was blown inby a distance of 235 feet. A 20 ton motor in the Main entry at room #2 was blown off the track. The stoppings in the slants between the entries were blown North. The stoppings inby room #8 were intact. There was no evidence of force beyond that point inby for a distance of 1500 feet. The loading machine was found 100 feet from the face of the Main entry. The haulage motor with 8 loaded cars was between rooms #16 and #17. There was moisture from room #17 to the face of the entry and no evidence of violence. At the break-through to the 7th South East Back entry at the face of room #10 the direction of the force of the explosion was from South to North.

7th South East panel entries;	The force of the explosion traveled East in the back entry towards the face. From room #17 to the face the Main entry was wet. The stopping outby had been blown in different directions. Rooms #17, #18, #19 and 20 contained explosive mixtures, but there was no evidence of heat. The loading machine was in room #18. The fire boss (Micklejohn) was found on the entry at room #18. His safety lamp was intact. The haulage motor with two cars partly loaded with rails and ties was near the face of room #20. There was a coat partly burned on the entry at room #18. There were 4 loaded cars on the entry between rooms #18 and #19. The controller on the loading machine in room #18 was open and the nips on the feeder wire. Outby at the mouth of the entries the explosive force traveled from West to East. At the break-through to the 6th South East panel entries at the face of room #6 the explosive force traveled North.
6th South East panel entries;	Explosive force traveled North at break-through to 5th South East Back entry at the face of room #4. Operations had been discontinued in 6th S.E. panel entries and rooms, and track taken out. There were no indications of any significance.
2nd South East entries;	The door in the slant was intact. The line brattice in the Back entry was blown inby. Five bodies were found inby the slant connecting both entries. There was no evidence of heat or violence. These men had erected a brattice in an attempt to barricade themselves in. They wrote messages to their relatives. They were alive at 11.5 A.M.
5th South East panel entries;	Explosive gas was found at the face of the Back entry. The loading machine was found at the face of the Main entry with controls in the off position and the nips on wire. The roadway near the face of the entry was wet. In room #12 the body of one of the mine foreman was found about 80 feet inby from the entry. His lamp was found intact in the middle of the track nearby. At the top of the air shaft between rooms #9 and #10, one percent of gas was found. The 5th S.E. fan was blown outby 12 feet from its base.

Friday, March 26th, 1943.

4th South East panel entries; The explosive force traveled from West to East inby the junction point with Main South East and traveled West outby. In the 2nd North entries driven off the 5th S.E. entries two 12 inch concrete stoppings were blown towards the face. The 4th S.E. and 2nd North entries and rooms are old working with the track removed. There was a pump in the 1st North Main entry that required attention and that was the only work performed. The air shaft connecting the #2 and the #3 veins is in the 1st North Back entry outby the Main 1st S.E. entries. Part of the return air current reaches the #2 vein through the air shaft and the remainder reaches it by traveling on the 5th S.E. entries and then over the Main haulage way.

Saturday, March 27th, 1943.

1st West parting; Explosive force traveled East to West. There was a 20 ton motor or locomotive at inby end of the parting with six loaded cars attached. One of the cars was turned on its side. The cover of the motor was blown outby. There was a small cave of roof near the cars. There was evidence of heat outby on the Main haulage road.

Monday, March 29th, 1943.

Starting Point;

Main South East entries; The evidence and indications in these entries in regard to the directions the explosive forces traveled are so conflicting and contradictory that no other statement in regard to them can as adequately and satisfactorily explain them.

Tuesday, March 30th, 1943.

Several entries and rooms were reinspected with the view of rechecking previous observations. These were the 8th West entries and rooms, and the 9th South East entries and rooms #4 and #5 and #6.

As a result of our investigation we have concluded that the explosion originated in the 8th West Main entry at a point inby the brattice that had

been erected across the entry and continued inby to the mouth of room #5. The cross sectional area at the end of the line brattice was 12 square feet, and the distance from the end of the line brattice to the face of the entry is 102 feet, and to the face of room #5, 60 feet.

These places, as previously stated, were outby the machine men on the morning of the explosion, and on our inspection nearly a month later two of them, the entry and room #5, were still giving off explosive gas, and a test revealed a trace of gas in the third, the slant being driven to the left, near the face of the entry. There is a cave in the Back entry between the third and fourth slants from the face which fills the entry and cannot be crossed. We do not known when the cave occurred, but if it occurred on the morning of Feb. 27th it would have greatly reduced the quantity of air entering the 8th West Main entry. The fire boss' report (Neuman's) for the morning of Feb. 27th does not show gas in any of the three places, the entry, the slant being driven to the left near the face of the entry, and room #5 where the machine was "sumped in".

The two cutting machine men used closed lights which could not ignite the gas that the cutting had released in the three places, but one of the tracklayers who were going to lay a switch in room #1 outby, was found inby the point where the brattices had been erected across the entry on Feb. 26th. The tracklayer used an open Carbide light. The brattice was blown outby and the explosion gathered force as it traveled along the entry to the Main air course and the 8th West slant. It traveled both North and South in the Main air course, and blew the door in the slant outby on to the Main South entry.

As previously stated the determination of the point of origin of an explosion, by noting the directions which the explosive forces traveled, is far from being an exact science as it involves assumptions and probabilities. However, most of the rooms and entries in the mine were eliminated as possible points of origin by all investigators. The process of elimination continued until but a few places remained, and of these the 8th West Main entry appeared to us, as the result of the evidence we obtained and our personal observations, to provide the answer as to the point of origin of the explosion. The majority of the investigators accepted our conclusions.

About fifty men are now being employed in the #3 vein removing machinery, track and other equipment. The company has decided to abandon the mine. A new opening from the surface to the #2 vein has been started, and this will eventually provide employment for all the employees who are now idle as a result of the disaster.

Respectfully submitted,

Edward Davies
State Coal Mine Inspector.

Ben Henry
State Quartz Mine Inspector.

Comments on Report on Explosion by Montana State Mine Inspectors
By G. O. Arnold

The explosion was investigated jointly by representatives of the Bureau of Mines, the Montana Industrial Accident Board, the Montana Coal and Iron Company, and District 27 of the United Mine Workers of America, but separate reports were rendered by each of these organizations.

In its investigations and reports of mine explosions, the Bureau of Mines does not definitely indicate a point of origin of an explosion unless the evidence is conclusive. It does, however, register the opinion of its investigators, based on factual evidence, as to the possible source of the explosion and the probable cause or causes. In the case of the Smith mine explosion, the evidence as to the point of origin was not conclusive, and therfore, the exact cause of and source of the explosion were presented merely as probabilities. The opinions of the Federal investigators did not agree with those of the State investigators as to the point of origin; however, these authorities were in agreement on the following points:

1. That the explosion was caused by the ignition of explosive gas at or near a working face.

2. That the ignition was caused by an open light.

3. That the explosion was propagated throughout the active portion of the mine by coal dust.

4. That the explosion originated at some point inby the entrance to 9 southeast entry and traveled outby.

5. That the explosion did not originate at the fuse terminals of the high-voltage transmission line at the bottom of the airshaft as claimed by the Freeman-Romek report.

Supplementary Data

Coal Mine Explosion

Smith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

Report on Explosion by the United Mine Workers of America

Comments on Report on Explosion by the
United Mine Workers of America
By G. O. Arnold

Report of Mine Explosion

SMITH MINE, MONTANA COAL & IRON COMPANY

Washoe, Carbon County, Montana

February 27, 1943

Prepared by

W. A. Boyle
President

Joe Yanchisin
Board Member, Subdistrict #3

Joe Masini
International Board Member

Representing District #27

UNITED MINE WORKERS of AMERICA

Billings, Montana

Mr. John L. Lewis, President
United Mine Workers of America

My dear Mr. Lewis:

The worst coal mine disaster in the history of Montana occurred about 9:30 a.m. February 27, 1943 in the Smith Mine of the Montana Coal and Iron Company at Washoe, Montana. We, the undersigned representatives of the United Mine Workers of America, as members of the investigation committee of the explosion, in which 72 members of our organization and 2 mine officials lost their lives, herewith submit to you our report and findings.

Smoke pouring from the mine entrance about 10 o'clock that morning, was the first indication of trouble. Alec Hawthorne, hoisting engineer, called the surface and said, "There's something wrong down here. I'm getting out." He was rescued alive with two others. Two bodies and the three injured men were carried from No. 2 vein which had been used only as the haulageway. The 72 other trapped men were in #3 vein.

Ed Davies, State Coal Mine Inspector, arrived at the mine shortly after the accident and immediately entered the mine to direct the working of the rescue crews.

Smith mine employees worked throughout the day repairing stoppings which were damaged, while a rescue squad was flown to Billings from Butte, equipped with masks. Experienced coal miners from Musselshell and Cascade counties, and chrome miners from Benbow and Mouat mines, aided the rescue squads made up of local men.

The rescue crews worked in six hour shifts, under the supervision of the United States Bureau of Mines officials. We recognize that the Federal Inspectors with their years of experience in the coal mining industry, the technical knowledge they have acquired through years of study, along with the efficient manner in which they directed the rescue operations, was of great value during the time of the disaster. We wish to acknowledge and highly commend the assistance and services of Mr. D. F. McElhatton of the Mines Safety Appliance Company, his knowledge in the use of mine safety appliances and suggestions offered by him during the rescue operations was also valuable.

The crews penetrated deeper into the mine workings as stoppings were repaired and fresh air circulated. The installation of the exhaust fan in the

old Foster mine openings aided in withdrawing of the poisonous gasses. As the rescue squads worked their way into the mine openings they began discovering the bodies, which they wrapped in canvas and carried them to the First West rope parting to await removal to the outside.

The first bodies to be removed from the First West parting were 32 in number, taken to the outside the night of March 4th. On the nights of March 5, 6, and 7, there were 15, 23, and 2 bodies respectively removed to the outside. The signers of this report were present at the removal of all the bodies.

Death notes written in chalk on rough boards by five of the victims, not found until the seventh day, told their own story of how the men calmly awaited the poisonous gas they knew would come. The messages were found near the inby end of 5 Southeast panel.

Front and Back of one Board

Front

"It is five minutes past 11 o'clock
Dear Agnes and children, I am sorry
we had to go this way. God bless
you all. Emil, with lots of kisses."

Back

"Frank Pinich
John Sudar
and Joki
We tried our best but could not get
out."

Second Board

"Walter & Johnny Good-bye
Wives and daughters. We died an
easy death. Love from us both.
Be good."

These men made a futile attempt to barricade themselves from the noxious gasses.

Words cannot express the gratitude of the United Mine Workers to the Local Women and the Red Cross for the service they rendered throughout the sorrowing community, and at the mine during the recovery operations.

The Red Cross set up an emergency hospital which was used principally to revive rescue squads who were overcome by the noxious fumes in the mine. The Local Women and the Red Cross in caring for the rescue workers and the bereaved families, served hot food continuously at the mine. Wives, children and relatives stood at the mine entrance for days refusing to give up hope; standing mutely by, or praying audibly that their loved ones would be brought to the surface alive.

The Anaconda Copper Mining Company of Butte, and the same company operating the Defense Chrome Account Mines at Benbow and Mouat, along with the other companies throughout the state, are to be commended for making it possible that the employees and rescue equipment could be available at the time most needed.

The Montana Highway Patrol should be praised for the services they performed in the transporting of the rescue workers to and from the mines during the terrible winter weather that we had at the time of the disaster.

Governor Sam C. Ford visited the scene of the disaster and offered any State assistance in the emergency. In his special message to the Legislature, which was still in session, he asked that an investigation fund be allowed for an inquiry by the State into this disaster. The Montana legislature passed a bill appropriating $5,000.00 for a thorough examination into the cause of the Smith Mine Disaster. Governor Ford's investigating Committee is now at work investigating the explosion. On behalf of District 27, United Mine Workers of America, we extend our sincere thanks to his Excellency.

To Mr. R. V. Bottomley, Attorney General, we offer our thanks and appreciation in the lending of his able assistant, Mr. George S. Smith, to the County of Carbon to assist in the investigation held over the bodies of those men killed in the explosion.

District 27, United Mine Workers of America, takes this opportunity to express our gratitude to Mr. J. Burke Clements, Chairman of the Industrial Accident Board for his assistance, and prompt work in preparing the claims of the sorrowing dependents.

We wish to make mention of the fine work done by Mr. Barclay Craighead, Chairman of the Unemployment Compensation Commission in his handling the matter of unemployment claims of those who survived the disaster at the Smith Mine. To Mr. Craighead we also offer our thanks.

The Smith Coal Mine comes under the jurisdiction of Local Union #858, United Mine Workers of America, and the writers of this report attended the first meeting held after the explosion and disaster that rocked this community.

It was a sad meeting for anyone to attend. President Lewis's message of condolence was read at this meeting, along with an explanation that the International Union had arranged for a cash contribution of $7,400.00 to be placed at the disposal of District President Boyle, to be distributed among the dependents of the 72 members of the United Mine Workers and those dependents of the 2 bosses who were also the victims.

The investigation of the explosion, in an attempt to determine its cause, began on Monday, March 22nd, and continued throughout the week; conducted by Federal Bureau of Mines inspectors, Messers Arnold and Bailey, and State Mine Inspectors Davies and Henry, the Smith Mine Company officials, Messers Romek, Newman and Freeman.

We wish to make it clear that we do not pretend to possess the technical mining knowledge of the Federal and State inspectors. We have studied their reports and the report of the Company officials and we find that they disagree as to the point of origin of the explosion, and the direction that the explosive forces traveled. All agree that the explosion was caused by the ignition of an explosive mixture and that dust propagated it from the point of origin throughout the rest of the mine.

Our study of the reports and examination of the mine has led us to the conclusion that we cannot accept the findings of the Federal Inspectors and those of the Company officials as to the point of origin of the explosion.

The Company officials selected the 2nd East off the 4th Southeast, as the starting point of a sequence of events that led up to the explosion. They declare that concrete stoppings were erected in the main and back entries, one in each entry, at the insistence of the Federal Inspectors who inspected the mine during the latter part of November, 1942. The stoppings sealed off old workings that generated small quantities of gas, and the area sealed off is estimated as sufficient to contain 200,000 cubic feet of gas.

The Company assumes that a cave occurred directly over the concrete stopping in the back entry. The cave released the explosive gas which entered the return air current and traveled to the upcast shaft that connects the #3 and the #2 veins in the mine. The gas was set off by the blowing of a fuse in the high power line at the bottom of the shaft. From that point, the explosive force traveled back to the concrete stoppings and blew them towards the face of the entries. They declare that only the exposed part of the stopping in the back entry, where the cave occurred, was disturbed by the force of the explosion. The rest of the stopping was protected by the cave, and judging by a sketch of the same on a map prepared by the company in support of their contention, remained intact.

The difficulty in accepting the Company's conclusions is that two miracles were necessary in order to bring about the sequence of events which they believe led to the explosion. The cave over the stopping in the back entry which they declare took place could not have happened. A roof that is supported in any manner, by props, cross bars, or even concrete stoppings, cannot fall unless the supporting medium gives way on account of the pressure exerted upon it. There is but one departure from this rule, and it occurs when the prop, or cross bar or other support, remains intact and the nature of the roof is such that it gradually crumbles. Examples of this particular kind of roof can be found in almost every mine. They can be found in the Smith mine in an entry adjoining the 2nd East.

If we accept the Company's conclusion in regard to the cave, then we must believe that a concrete wall one foot wide and about eight feet in height and twelve feet in length could not support two feet of over-burden, a part of which was coal; and that the roof fell but the concrete stopping was undamaged, and remained intact until the force of the explosion that traveled from the upcast shaft below the exposed portion towards the face of the entry. We must disregard the fact that the door in the slant off the 2nd East entry was blown inby, and this could not have happened if the original explosive force had traveled from the shaft inby to the 2nd East entries.

The other miracle was the blowing of the fuse at the shaft at practically the same time that the cave over the concrete stopping occurred. If this were not a miracle, it could be described as a most remarkable coincidence.

We do not know which of the Company's investigators formulated this theory as to the point of origin of the explosion, but it was not mentioned by any of them while the investigation was in progress. We were assured by the management at the time of our investigation was being conducted that the mine officials had been instructed to keep nothing that they knew, or that they had discovered, from the Federal and State investigators. Now, we find the statement in the Company's report to the effect that their officials had been instructed not to make known to anyone their findings in regard to the cave that released the gas in the 2nd East entry, and the blowing of the fuse at the air shaft.

We are of the opinion that if such an extraordinary cave had occurred, the Company officials would have brought it immediately to the attention of the other investigators, and the necessity of straining their imaginations would have been avoided. As the result of their failure to cooperate with the other investigators they cannot now produce their number one exhibit in support of thier theories. The evidence has been covered by bigger caves where the concrete stopping stood in the entry, as the result of the destruction of the stopping.

We have found from our experience that investigators usually emphasize, stress, and point out every factor that in any degree supports their theories. We are now informed that such was not the case with the Company's investigators. Yet, strange to say, we are now asked to accept their findings without any corroborative evidence from any of the other investigators.

All the investigators, while investigating, were in agreement in regard to the impossibility of explaining the conflicting evidence as to the paths that the explosive forces traveled throughout the mine.

This problem presented no difficulties to the Company's officials when they made their map. A glance at their map of the mine with red arrows indicating the initial direction of the explosive forces justifies this statement. A note on the map states "that in order to avoid confusion, initial inby force and direction of liberated gases is all that is shown on the map." We know that the direction of the initial force of the explosion as indicated on their map, cannot be followed as easily as the red arrows make it appear.

To the layman, the Company may appear to have made out a strong case in support of their contention as to the point of origin of the explosion and the events that led up to it. However, any mining man of experience will readily agree that the case they have made out is based upon an impossibility, namely that a concrete wall of the dimensions stated could not support an over-burden of two feet, and that when the cave occurred the concrete stopping was intact and undamaged.

We submit that it is far more reasonable to assume that the cave occurred after the concrete stopping was destroyed by the explosive forces, than to assume that a cave occurred directly over the stopping while the stopping remained undamaged and intact.

The State Mine Inspectors' report covers the entire mine and is based on the evidence which they discovered, and they reached the conclusion that the point of origin of the explosion was near the face of the 8th West Main entry.

The Federal Mine Inspectors Report has this to say of the report made by the State Inspector:

> "All of the above facts are substantiated by evidence in the panel. The reasoning is good, but the ony difficulty in selecting the solution is that of reconciling this solution with the definite path of propagation as described in discussion of the 9 S. E. panel."

The above quoted statement of the Federal Mine Inspectors report leads to the conclusion that the point of origin of the explosion was in the 8th West main entry as assumed by the State Inspectors. Our reason for so concluding, is that the definite path of the initial force of the explosion in the 9 S. E. panel entries traveled from the mouth of the main entry towards the face.

In helping us to arrive at our conclusions as to the point of origin as stated, we have carefully studied the Federal Inspectors report, the Company Officials report, and the report of the State Inspectors. The report of the State Inspectors appears to us to be a plain statement of the conditions that they found; and we are in agreement with the statement contained in the Federal Mine Inspectors report that all of the facts that they mentioned in regard to the 8th West "are substantiated by evidence in the panel."

The Executive Officers of District 27, United Mine Workers of America, requested a joint meeting with the Montana Coal Operators Association. The meeting convened on December 22, 1942 for the purpose of discussing purposed legislation, and those recommendations already made by the Federal Mine Inspectors in their preliminary report of the Smith Coal Mine. The Officers of the District organization requested that the Coal Operators lend a cooperative hand at the coming session of the Legislature, convening the first week in January 1943, to the end that at least the major recommendations made by the Federal Mine Inspectors would become part of the Montana statutes. All of the efforts on the part of the Coal Miners at this meeting met with failure, and the meeting adjourned without the miners receiving the necessary cooperation in order that the recommendations be embodied in the Montana Laws. Therefore, we, the signers of this report, feel that had those major recommendations made by the Federal Inspectors been incorporated in the Montana Coal Mining Laws at the last session of the Legislature, January 1943, and had they been enforced, that in all probability we never would have experienced an explosion of this magnitude in the coal mines of this state.

We are of the opinion that the only sure prevention against another such disaster in our mines, is the amending or rewriting of the Montana State Coal Mining Code, and embodying therein those recommendations made by the Federal Mine Inspectors, those that may be recommended by the Governors Commission, and also those of the Coroner's jury verdict that we are submitting herewith:

VERDICT OF JURY

STATE OF MONTANA)
: ss
COUNTY OF CARBON)

An inquisition taken at Red Lodge in the County of Carbon, on the 12th, 13th, and 14th of April, A. D. 1943, before Edward Olcott, Jr., Coroner of the said County of Carbon, upon view of the bodies named on the attached list, lying there dead, by the oaths of the Jurors whose names are hereto subscribed, who, being sworn to inquire, on behalf of the State of Montana when, how, and by what means, the said persons came to their deaths, upon their oaths do say:

That on February 27th, 1943, at the coal mine of the Montana Coal & Iron Company located as Washoe, Montana, met their deaths due to concussion and to gas poisoning caused by gas and dust explosion.

As a part of this verdict, we, the jury, impanelled on the coroner's jury recommend that our present mining laws be amended and new laws be enacted as follows:

1. That the State and Federal Coal Mine inspectors be given power to close any coal mine or part thereof where said inspector finds any hazard that he considers dangerous to the health and safety of employees.

2. That blasting of coal be not permitted when men are working in the mine, unless permissible powder is used.

3. That every underground employee be furnished with self-rescue equipment.

4. That helmets and gas masks of workable condition, in sufficient quantities, be kept at the mine to supply rescue crews in case of emergency.

5. That rescue crews be trained for rescue work and be supplied with all necessary equipment.

6. That all coal mines be rock-dusted.

7. That ventilation systems be improved immediately when requested by mine inspectors, and that booster fans be discontinued.

8. That a competent employee, selected by employees, must also accompany the state mine inspector on his official mine inspection.

9. That the intake air system should be on the man-way or haulage-way when the mines have regular man trips.

10. That each local union of the mine involved be furnished a copy of each mine inspector's report.

In testimony whereof, the said Coroner and Jurors of this inquest have hereunto set their hands, the day and year, to-wit, this 14th day of April, A. D. 1943.

[Signed] C. S. Chamberlain
Edward Bloom
Eli Pekich
J. J. Gerondale
Celeste Roat
John Mikesell
John Manee
Anton Columbus
William C. Godina

ATTEST

Edward Olcott, Jr.
Coroner of Carbon County, Montana.

LIST OF MEN KILLED IN MINE EXPLOSION AT SMITH MINE OF MONTANA COAL & IRON COMPANY FEBRUARY 27, 1943.

NAME	AGE	MARRIED OR SINGLE	NUMBER OF DEPENDENTS IN ADDITION TO WIFE
James Allison	51	M	2
Emil Anderson	40	M	1
Sam Alexander	57	M	0
Wm. Appleton, Sr.	50	M	0
Sam Barovich	56	Widower	2
Wm. F. Barry	26	M	1 Prospective
William Beeney	53	M	0
Jules Besinque	51	M	1
John Bone	59	S	0
Leland Cline	28	M	1
David J. Davis	42	S	0
William DeBourg	55	M	0
August Deruelle	62	M	0
Patrick Doran	38	M	0
Marcel Fages	40	S	0
Joe Ferro	51	S	0
John Germanetti	60	M	1
Pete Giovetti	39	M	3
Matt Hallila	57	S	0

NAME	AGE	MARRIED OR SINGLE	NUMBER OF DEPENDENTS IN ADDITION TO WIFE
Art Halpin	42	M	2
A. D. Hardy	42	M	0
James Hawthorne	30	M	1
John Hodnik	31	M	0
Walter Joki	30	M	1
Wayne Jones	31	M	0
Andrew Jordan	21	S	0
Mike Kerinko	33	M	4
John Krop, Sr.	59	M	0
Louis Kuhar	56	M	0
Edward Kumpula	35	M	1
Edward Laird	55	M	0
Edw. J. Laird	49	M	1
Clem Lodge	51	M	0
Abe McDonald	59	M	0
Joe McDonald	32	M	2
Robert McDonald	42	M	3
James McNeish	65	M	0
John Maden	53	M	0
Ignac Marinchek	57	S	0
Frank Mourich	42	M	1
Jack Mourich	36	M	2
*Richard Mallin	68	M	0
John Meiklejohn	51	M	0
Herman Mejean	19	S	0
Joe Meyer	39	M	1
Wilbur Muller	22	M	1
David Murray	56	M	0
Earl Mus	51	M	3
Wm. A. Nelson	51	M	0
William Noble	68	M	0
Frank Pajnich	53	M	0
William Pelo	46	M	2
Elmer Price	53	M	0
William Pryde	32	M	2
Eino Rahkola	27	S	0
Fred Rasborschek	61	S	0
Martin Ratkovich	46	S	0
David B. Reid	33	M	3
Lawrence Reid	41	M	2
Geo. J. Saarela	33	S	0
William Shepard	69	M	0

NAME	AGE	MARRIED OR SINGLE	NUMBER OF DEPENDENTS IN ADDITION TO WIFE
William Slaby	38	M	1
David Sommerville	60	M	0
John Sommerville	34	M	2
Frank Starkovich	64	M	0
John Sudar	28	M	1
Frank Sumisek	65	S	0
Geo. Thomson, Sr.	63	M	0
Adam Wakenshaw	72	M	0
Robert Wakenshaw	39	M	1
Robert Whitehead	47	M	0
Clarence Williams	42	M	1
Lloyd Williams	45	M	2
Vid Zaputil	50	M	0

*Richard Mallin, was the uncle of President W. A. Boyle

Respectfully submitted,
District #27
UNITED MINE WORKERS OR AMERICA

/s/ W. A. Boyle
W. A. Boyle, President

/s/ Joe Yanchisin
Joe Yanchisin, Sub-District Board Member

/s/ Joe Masini,
Joe Masini, International Board Member

Comments on Report on Explosion by the United Mine Workers of America By G. O. Arnold

A report issued by an investigating committee of District 27 of the United Mine Workers of America also disagrees with the views of the company regarding the point of origin and cause of the explosion. In this report it is stated that the difficulty in accepting the company's conclusions is that the two miracles were necessary in order to bring about the sequence of events which the company believes led to the explosion.

The first miracle was the caving over the stopping in the back heading in the 2nd east entry just prior to the explosion. It is asserted that this caving could not have happened until after the explosion occurred, and a logical explanation of the committee's contention is given in the report. The report states further that the other miracle was the blowing of the fuse at the shaft at practically the same time the cave over the concrete stopping was supposed to have occurred. The comment is made by the mine workers that if this were not a miracle, it could be described as a most remarkable coincidence. As a matter of fact, it is obvious that the fuse burned out as a result of a short circuit near one of the rotary-converter stations immediately after the explosion.

The report asserts that the investigators were assured by the management that the mine officials had been instructed to keep nothing that they knew or that they had discovered from the investigation at the time of the explosion, yet there is a statement in the company's report to the effect that the company officials had been instructed not to make known to anyone their remarkable discovery that the explosion was caused by the breaking down of a seal in the 2nd east and the coincidential blowing of the fuse at the airshaft. It is claimed by the union investigators that as a result of the failure of the company officials to cooperate with the other investigators in calling attention to their discoveries, the company cannot now produce their "number one" exhibit in support of their theories because the evidence has been covered by larger caves at the point where the concrete stopping stood in the entry. The miners feel that the evidence supporting the company's claim should have been presented at the time of the investigation and object to the acceptance of the findings of the company without any corroborative evidence from any of the other investigators.

The United Mine Workers' investigators do not agree with the Bureau of Mines as to the exact point of origin of the explosion, but they do agree so far as the cause of the explosion is concerned.

Supplementary Data

Coal Mine Explosion

Smith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

Preliminary Federal Mine Inspection Report of November 19 to 30, 1942

9894

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

PRELIMINARY REPORT

Company Montana Coal & Iron Company Mine Smith

Location Washoe (Town) Carbon (County) Montana (State)

Date of Inspection November 19 - 30, 1942 Inspectors G. O. Arnold and M. R. Evans

The facts disclosed by the inspection of this mine, including both commendable conditions and practices and those which should be given corrective measures, will be embodied in a detailed report to be made available to the public, in accordance with the Federal Coal Mine Inspec- and Investigation Act of 1941, H. R. 2082.

The purpose of this preliminary report is to point out good features as well as certain unsafe practices and conditions that should be corrected promptly.

Ventilation: The mine is ventilated by a centrifugal fan on the surface, assisted by three booster fans installed underground. The 43,470 cubic feet of air per minute entering the mine is sufficient to provide ventilation; however, only about half of this air is reaching the working section in No. 3 bed.

Numerous caves and narrow stretches along the intake airway in No. 2 bed, together with the small cross-sectional area of the shaft down to No. 3 bed, offer excessive resistance to the flow of the air current. The intake airway should be enlarged along the narrow portions and caved material should be cleared away; the size of the airshaft should be increased substantially.

Stoppings between the intake and return airways in No. 2 bed are mostly constructed of concrete. Considerable air is leaking past a number of doors in these stoppings and the doors should be made airtight.

Stoppings between the intake and return airways in No. 3 bed are constructed of two layers of boards, with a layer of bituminous-treated, reinforced paper between. According to air readings taken, leakage through these stoppings results in a substantial loss of air. All of these wooden stoppings should be repaired and made airtight.

Single, wooden doors are used across the main south haulageway and in the entrance to each panel to confine the continuous air current to the working panels. A trapper tends two of the doors on the main south haulageway and one door to a working panel. Otherwise, haulagemen leave the doors open, when entering a panel, and the doors stay open until the locomotive and crew pass through when leaving the panel.

All doors should be kept closed, except when haulagemen and equipment are actually passing through them. Leaving doors open while trips are being gathered interferes with the ventilation of the working places.

Air at Working Places: The working faces are ventilated by a continuous current of air. Panels on the west side of the main south entries are well ventilated as the continuous air current passes through them first.

Leakage of air through doors and wooden stoppings reduces the volume of air reaching the panels on the east side. The humid condition of this air current, together with the contamination resulting from ventilating other workings, make it desirable that the volume of air reaching the east side of the main south entries be substantially increased.

Stoppings between rooms are constructed of brattice cloth, and line brattices are used to conduct the air current from the last open crosscuts to the working faces. A number of these stoppings and line brattices are in need of repair.

Gas: According to the fire-bossess' report, gas is reported daily in a number of places in each of several panels. During this inspection, traces of gas were found in a number of rooms, a small quantity of explosive gas in room 10 off 6 southeast panel, and substantial quantities of explosive gas at the inby end of the 6 southeast panel entries and in an old place driven to the rise off the inby end of the old 4 east panel. The return air current generally, in panels outby the 7 southeast panel, shows indications of gas.

It is important that the fire bosses examine daily all workings through which the ventilating current passes before reaching the outby working places. Old workings should be examined each week.

Explosive gas should not be permitted to accumulate and stay in any part of the mine. When a quantity of gas is discovered, work should be

suspended and electric power cut off in that portion of the mine outby the body of gas, and the power should remain cut off until the gas is properly removed by improved ventilation.

The presence of indications of gas in the air current generally outby the 7 southeast panel makes it important that the volume of air reaching this portion of the mine be substantially increased. All doors and stoppings should be made as airtight as is reasonably possible and line brattices generally should be extended closer to the working faces.

Both open and closed lights are used in the mine and smoking is permitted. The use of open lights and the permitting of smoking in a mine, as apparently gassy as this mine, is highly dangerous. Smoking should be discontinued immediately and all men should be searched frequently and regularly for smoking materials. Permissible electric cap lamps should be provided for all employees as soon as is reasonably possible. Until closed lights are provided for all employees, the mine officials should see that every place in which a man with an open light works is tested with a flame safety lamp before the man enters and several times thereafter during the working shift.

The mine foremen whould carry flame safety lamps at all times while on duty and test every place for gas during their examination of the working places.

Control of Coal Dust: Water is used to allay coal dust on one combination cutting and shearing machine only. Preparations are being made to provide water for the arcwall cutting machine and the shearing machines; water should be provided at these machines as soon as is reasonably possible and used on the cutter bars while coal is being cut.

Rock-Dusting: Rock dust has not been applied to any part of the mine. Efforts should be made to secure an approved type of rock dust and the mine should be rock-dusted. Haulageways and working sections of the mine should be rock-dusted first. The rock-dusting of coal mines is the most dependable method of combating the coal-dust explosion hazard.

Explosives: The management should consider using a permissible type of explosives in place of black powder for blasting coal. Certain hazards exist when black powder is used and, until replaced by a suitable type of permissible explosives, precautions should be taken to minimize the hazards, as follows:

1. Instantaneous electric squibs, fired by permissible blasting units, should be used for firing all shots. Fuse, ignited by open lights or matches, should not be used.

2. Blasting should not be done until all men other than the shot-firers are out of the mine.

Regardless of the type of explosives used, certain precautions should be taken in the interest of safety, as follows:

1. Only sufficient explosives to last one day should be taken into the mine at one time. Too large a supply of explosives is being stored underground at this time.

2. Explosives should be stored in substantial boxes, provided with locks and kept locked when not in use, in each working section. Explosives should be carried in canvas or similar bags to the faces by the shot-firers, as needed. Explosives should not be hauled about the mine in a car hitched behind the drilling machine, as is now the practice.

3. Wooden tamping bars should be used in place of copper-tipped metal bars.

4. Holes should be stemmed only with adobe or other incombustible material. Fine coal should not be used, as is now the practice.

5. Preferably, all holes should be stemmed to the collar, but in no case should the tamped stemming extend less than 24 inches from the charge.

6. Holes should not be charged while electrical equipment is in the place.

7. Tests for gas should be made with a flame safety lamp before and after firing each shot, or round of shots.

Electrical Equipment, Wiring and Guarding: Electric power is transmitted into the mine through a 3,800-volt 3-wire circuit enclosed in metal conduit. This circuit enters through a borehole and extends to the working section in No. 3 bed. A three-wire branch circuit extends from near the drill hole to a set of transformers in a crosscut below the inside hoist. These wires should be placed in a metal conduit, or an armored cable should be used.

Five rotary converters installed underground provide 250-volt direct-current power. Large-size bare feeder cables extend from the converters to various parts of the mine. These feeder cables are generally supported on posts by track spikes or nails. All bare feeder cables should be supported on insulators.

Most of the trolley circuits are supported properly on insulated hangers; however, the insulated portion of the hanger is missing in many places. Properly insulated hangers should be used to support all trolley wires.

Solid bare feeder wire is used to extend the direct-current power from the trolley circuit into each working place and the wires are supported on nails driven into posts or crossbars. Connection with the trolley circuit is made by twisting one end of the feeder wire about the uninsulated portion of a hanger, just above the trolley wire. These wires should be installed on insulators and proper fittings should be provided for attaching the wires to the trolley-wire hangers.

At the time of the inspection all feeder and trolley wires on the direct-current circuit were continuous and not provided with cut-out or sectionalizing switches. As one of the booster fans is operated by a direct-current motor, one of the rotary converters is operated continuously and the entire direct-current system is energized as a result. The management reports that a sectional switch has since been installed inby this fan and that power is now cut off the trolley and feeder wires in the No. 3 bed workings when the mine is idle.

A number of sectionalizing switches should be installed on the direct-current feeder and trolley wires so that power can be cut off any idle portions of the mine. Also, cut-out switches should be installed on trolley wires at the entrance to each panel and on feeder wires at the entrance to each working place.

Electrical equipment generally is well installed, except as follows:

High-voltage danger signs are needed at a number of installations. Insulated platforms are needed at a number of 440-volt and 3,800-volt switches.

Exposed gears should be guarded on three of the small plunger pumps.

The belt on the air compressor being used in the 4 west panel should be guarded. The open-type controller, which is on the belt side, should be covered.

Guards should be placed over the emery wheels in the underground shop. Several belts on the shop equipment should be guarded also.

The flexible coupling on the inside hoist should be guarded. A passageway into the hoist room leads in under the hoisting rope. A covering should be constructed over this passageway, in under the rope, to protect persons from contacting the rope when traveling through.

Timbering: Working places, haulageways, and passageways are generally well timbered. However, timber generally is well back from the working faces. An effort should be made to keep timber set as close to the faces as is reasonably possible, considering the type of loading equipment used.

Haulageways, Roadways, etc.: The slope in No. 2 bed is narrow and shelter holes are needed, especially for several hundred feet inby the portal, to provide a safe place for workmen when trips are passing.

The rock slope extending from No. 2 bed down to No. 3 bed is very narrow and a number of shelter holes should be provided as soon as is reasonably possible. All employees normally travel into and out of the mine in man-trips, but it is necessary for officials and workmen to travel the haulageways occasionally.

Clearance along other haulageways is reasonably good, except at partings where proper clearance is provided along one track only. Center props at these partings constitute a hazard. The roof is such that is is questionable whether the partings could be widened sufficiently to give proper clearance on both tracks. Haulagemen should be cautioned frequently by the mine officials as to this hazard.

The coal ribs along haulageways in some parts of the mine tend to slough and it would not be good practice to remove all the loose coal. However, road cleanings have been piled along the ribs in places and this refuse should be loaded into mine cars and removed from the mine.

Roadways generally are reasonably clean but there are a number of switches and other places where some coal spillage is evident. This spillage should be loaded into cars and removed from the mine.

Lighting: Illumination along the haulageway is fair. Additional lights are needed generally at switches, partings, and doors.

An old trolley-wire circuit extends into the large centrifugal pump. This circuit is used to provide power for lights only. The wire is nailed to wet timber, is in under the gob in places, and is generally poorly installed. Preferably, this wire should be removed and insulated wires installed for a lighting circuit.

Underground General: About 10 percent of the employees wear safety caps and safety shoes. None was observed wearing goggles. All employees should wear safety caps and safety shoes, and all employees should wear goggles, preferably at all times while at work, but at least when doing work that is hazardous to the eyes.

Additional first-aid dressing material should be available in the mine. If necessary, at least one metal box containing first-aid supplies should be taken into each of several working sections daily and returned to the mine office at the end of the shift.

When the man-trip is being hoisted from the mine, a safety bridle, extending from the motor to the first car, should be used.

Employees were observed jumping off the man-trip on the surface, and underground, before the trips stopped. This is a hazardous practice and will lead to a serious or fatal injury if continued. Employees and management should cooperate in stopping this dangerous practice.

It is a common practice in this mine to move cutting, drilling and loading equipment, and cable-reel locomotives by "nipping." This is an unsafe practice and should be discontinued.

A guard rail is needed around the top of the downcast airshaft extending from No. 2 to No. 3 bed.

Considerable timber and wooden planking are used about the underground hoist and this creates a serious fire hazard. An effort should be made to reduce to a minimum the combustible material about this installation.

The handles of all axes used underground should not be over 18 inches in length.

Surface Hazards: The tipple, washery, and small-coal storage bins have numerous mechanical and electrical installations in and about them. Very few of the gears are guarded and there are many exposed gear assemblies that should be guarded immediately. None of the belt or chain drives is guarded and proper guards should be installed. Numerous floor and wall openings are in need of guardrails.

Two hoists near the railroad tracks below the tipple, used for moving railroad cars, have exposed gears that should be guarded.

The small hoist used to handle empty mine cars has exposed gears that shoud be guarded.

Insufficient clearance is provided between railroad cars and tipple bents, also the bents of the tipple carrying the mine truck. Suitable warning signs should be posted at all such points and workmen should be warned frequently as to the hazards.

A number of small holes are present in the flooring of the trestle extending from the tipple to the mine. Apparently, rollers have been removed at these points. These holes should be covered. A portion of the guardrail along the west side of the trestle is loose and should be repaired.

At least two entrances should be provided in the wash house. The entrances should be on opposite sides of the wash house so as to provide safe exits for the men in case of fire.

The drive chain and belt from the motor to the head shaft of the elevator at the sand-drying house should be guarded.

In the shop, the following equipment is in need of guarding: two emery wheels; all belts; old control panel for the lathe motor; flywheel on compressor; and one circular saw.

About 10 percent of the outside employees wear safety caps and safety shoes. Goggles are provided in the shop for use when welding, using emery wheels, and running lathes. Mechanics appear to wear the goggles when doing this type of work. Otherwise, goggles are not worn by employees on the surface.

All employees on the surface should wear safety shoes and all employees in and about the tipple should wear safety caps. Goggles should be worn by all employees, preferably at all times while at work, but at least when doing work that is hazardous to the eyes.

Excellent fire protection is provided on the surface.

Cooperation: It would appear that there is very little cooperation between employees and management in connection with the establishing and enforcing of safety practices. The management and employees should mutually assist and support all efforts toward greater safety in and about the mine.

General Comments: Full cooperation was extended during the period of this inspection by both employees and management. All maps and information requested were given freely.

/s/ G. O. ARNOLD
Inspector

/s/ M. R. EVANS
Inspector.

Note by D. Harrington:

One copy of this preliminary coal mine inspection report was mailed from Butte, Montana to the State Coal Mine Inspector on December 10, 1942

and on the same date two copies were mailed to the management of the Smith Mine (one of the two copies was for posting at the mine). Receipt of the report was acknowledged by Mr. J. M. Freeman for the mining company on December 15, 1942 and by State Coal Mine Inspector Davies on December 22, 1942. A copy of this report was mailed on December 23, 1942 to President W. A. Boyle of the United Mine Workers of America, Billings, Montana, at his request. The explosion occurred February 27, 1943.

Supplementary Data

Coal Mine Explosion

Sinith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

State Coal Mine Inspection Report of January 27, 1943

(Original of this report was typed on stationery of the Montana Coal & Iron Company.)

January 27th, 1943

AIR READINGS TAKEN AT SMITH MINE

5th West - Back entry last x-cut 4,000 Cu.Ft. - 10 men
Room X-cut 8 and 9 - 3,200 Cu. Ft.
Room X-cut 7 and 8 - 2,600 Cu. Ft.
Room X-cut 6 and 7 - No reading.
Room 5 end of canvas - 1,200 Cu. Ft.
9th South Room #1 end of canvas - No reading
Room #2 end of canvas - No reading
Room #3 end of canvas - 1,800 Cu. Ft.
Room #4 end of canvas - 2,700 Cu. Ft.
Room #5 Clear of gas - No reading
9th South Entry end of canvas - 15,600 Cu. Ft.
9th South Entry Last X-cut - 10,000 Cu. Ft.
10th South East Room #1 end of canvas - 6,200 Cu. Ft.
Room #1 gas at face deadlined
Gas at face of Room #2 to be removed
End of Canvas Reading Room #3 - 5,800 Cu. Ft.
End of Canvas in Entry - 1,800 Cu. Ft. - 10 men
11th South East Entry end of canvas - 7,500 Cu. Ft.
1st South Back Entry X-cut - 10,600 Cu. Ft.
Main entry X-cut - 14,500 Cu. Ft.
9th South, Back Entry X-cut - 16,000 Cu. Ft.
" " Main Entry, end of Canvas - No reading
8th West Back Entry X-cut - 10,500 Cu. Ft.
8th West Main Entry end of canvas - 3,500 Cu. Ft.
Room #2 end of canvas 500 Cu. Ft. - 10 men
Room #2 deadlined on account of gas
7th West Back Entry X-cut - 8,500 Cu. Ft.
" " Main Entry - No reading - 10 men
Room #3 Deadlined - End of canvas - No reading
Room #5 No reading- Room #1 deadlined
Room #1 end of canvas - 1,500 Cu. Ft.
Room #2 X-cut - 2,500 Cu. Ft. - 10 men
8th South, Room #11 end of canvas - 5,300 Cu. Ft.
" " " #12 end of canvas - 6,200 Cu. Ft.
" " " #13 end of canvas - 6,300 Cu. Ft.
" " " #14 end of canvas - 6,800 Cu. Ft.
" " " #15 end of canvas - 2,300 Cu. Ft.
" " " #16 end of canvas - No reading
" " " #17 end of canvas - 2,000 Cu. Ft.

8th South Back Entry X-cut - 18,000 Cu. Ft.
" " Main End of Canvas - 8,600 Cu. Ft.
7th South East Main - End of canvas - 6,400 Cu. Ft.
Room #22 - End of canvas - No reading
Room #22 and 21 X-cut - 7,200 Cu. Ft.
Room #21 end of canvas - 1,500 Cu. Ft.
Room #20 end of canvas - 3,500 Cu. Ft.
Room #18 and 19 X-cut - 2,400 Cu. Ft.
Rooms 15-16-17-18 No readings - 10 men
2nd South Back Entry end of canvas 15,000 Cu. Ft.
2nd South Main Entry end of canvas 5,800 Cu. Ft.
5th South East Back end of canvas - 3,600 Cu. Ft.
5th South Main end of canvas - 3,000 Cu. Ft.
Room #15 - 2,500 Cu. Ft. Room #14 deadlined Room 13 - No reading

Required quantity of air to be conducted to all working faces.

Signed, Ed Davies
Coal Mine Inspector.

Supplementary Data

Coal Mine Explosion

Smith Mine, Montana Coal and Iron Company

Washoe, Carbon County, Montana

February 27, 1943

Conclusions

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Conclusions

Engineers of the Bureau of Mines have reviewed the various reports of the Smith mine disaster published or summarized herein, have studied the mine map, and have considered the circumstances of this explosion as compared with other explosions where the origin was definitely known. This study has lead to the following conclusions and comments:

The explosion, originated by the ignition of explosive gas probably with an open light, started in the face region of the mine. Dry coal dust was in turn ignited and a general explosion traversed a large portion of the mine.

The explosion traveled through numerous passageways with consequent destruction of stoppings and doors, with forces traveling occasionally from air course to entry, and entry to air course through broken stoppings and thereby producing locally movements of light material in opposite directions but, nevertheless, presenting a general picture of movement of heavy objects outward from face regions.

The origin of the explosion may have been in No. 5 room off 9 south-east entry or at or near the face of 8 west entry or conceivably in working places in this or other entries.

The fact that the Federal, State, company, and union investigators failed to reach an agreement as to the exact point of origin of the explosion is, however, of little consequence. The important fact is that this explosion, resulting in the death of 74 men, was brought about by faulty mining practices and conditions which were bound to result sooner or later in disaster. The conditions and practices which led to this explosion were recognized by the Federal inspectors at the time of the November 1942 inspection, and appropriate recommendations were made for their correction. In making the recommendations, the Federal inspectors did not expect that all suggested corrective measures would be put into effect immediately because they realized that time would be required to carry some of the recommendations into effect. They had reason to believe that the management would give the appropriate attention to all of the recommendations as soon as it was reasonably practicable to do so. Unfortunately, delays occurred, from one cause or another, that prevented the placing into effect of measures that might have forstalled this explosion.

The efforts of the company to put into effect certain recommendations of the November inspection are commended, particularly certain steps toward improvements in ventilation; the placing of purchase order for permissible electric cap lamps, the decision to use permissible explosives when the proper kind could be determined, the decision to rock-dust the mine when

equipment and rock dust could be procured, and the improvement of electrical installations in the mine. But this explosion has demonstrated again that good intentions will not prevent mine disasters.

The Bureau of Mines does not have the authority to close mines in which potential explosion hazards exist. If mines were closed down immediately upon the recognition of potential explosion hazards, there are few coal mines that would continue to mine coal because nearly all coal mines have potential explosion hazards against which complete safeguards have not been provided. The Federal inspectors did not recommend the closing of the Smith mine at the time of the November inspection because they found no imminent hazards in the mine that could not be taken care of immediately. They did, however, find a large number of potentially dangerous practices and conditions and made appropriate recommendations for their correction.

Gas-ignition hazards together with consequent dangers of dust ignitions and the possibility of general and widespread dust explosions are frequently found by Federal inspectors. In such cases, if the company thereafter improves its inspection procedure and also improves the ventilation of face regions to such an extent that gas accumulations do not occur, the risk is thereby for the most part removed and continued operation of the mine made reasonably safe until other more permanent safeguards, such as rock-dusting, application of water, and removal of ignition sources, can be made. There are relatively few coal mines in the United States that do not have potential coal-dust-explosion hazards because few mines are completely rock-dusted.

During the 6 days immediately preceding and including the day of the explosion, gas was reported by fire bosses on an average of 22 places each day in quantities from a trace to 200 cubic feet. On the morning of the explosion, quantities of from 50 to 100 cubic feet were reported in nine places. Tests*/ in the experimental mine of the Bureau have shown that the ignition of as small a quantity as 150 cubic feet of a uniform mixture of methane and air (15 cubic feet of methane and 135 cubic feet of air) is sufficient to initiate an explosion of coal dust which can traverse an entire mine.

The large number of places in which gas was being reported daily in the Smith mine is in itself a positive indication that the face regions of the mine were not being ventilated properly. In well-ventilated mines, it is a rare occurrence when gas is found in working places even in mines that liberate much more gas than is liberated in the Smith mine; moreover, the reprehensible practice of "brushing" gas is one that has long since been abandoned in most mining regions. When such conditions exist, especially when open lights, open-type electrical equipment, and black powder are used at working

*/ Bureau of Mines Report of Investigations 3028 entitled "Some Experiments on the Initiation of Coal-Dust Explosions by Gas Explosions."

faces, and smoking is permitted, ignitions of gas are sure to occur. According to the testimony given at the inquest, ignitions of gas by open lights occurred frequently in this mine; one instance was reported 4 days before the explosion.

A local gas ignition can easily develop into a widespread mine explosion when the right combination of circumstances is present. Regardless of how much water is being used on the cutter bars of mining machines in face regions, and apparently little or none was being used on machines at the time of the explosion, the only practicable way to positively prevent a local gas ignition from developing into a widespread coal-dust explosion is to have the mine thoroughly rock-dusted. The use of water in a mine for allaying dust, commendable as the practice may be, can be considered only as an auxiliary in increasing the efficiency of the rock-dusting procedure.

The means for preventing gas ignitions and widespread coal-mine explosions are known, and the safety standards of the Bureau of Mines relative to such matters are public information. It would seem that operators who desire to protect the lives of their employees and mine property as well would not wait for Federal inspections and specific recommendations but would apply the safeguards that are known to be necessary if coal-mine explosions are to be prevented.