

REPORT OF MINE EXPLOSION

AT HASTINGS, COLORADO, APRIL 27, 1917.

BY

C. A. HERBERT.

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At about 9:30 a.m. on the 27th of April, a disastrous explosion occurred at the Hastings mine of the Victor-American Fuel Company, causing the death of 121 men. Only one of the 122 men reporting for work that morning escaped alive.

The Hastings mine is located at Hastings, Las Animas County, Colorado, on the Colorado and Southeastern Railway, about 12 miles north-west of the City of Trinidad.

The mine is owned and operated by the Victor-American Fuel Company, one of the largest coal producing corporations of Colorado. It was originally opened up in what is locally known as the "A" seam; the available acreage in this seam becoming exhausted the main slope was driven down to what is known as the "B" or Berwin seam and was operating in this at the time of the explosion.

On July 13, 1912, while the "B" seam was being developed, just prior to the abandonment of the "A" seam, an ex-

losion occurred in this same mine, causing the death of 12 men and severely injuring one other, all of whom were working in the lower seam. Thirty men who were at work in the upper or "A" seam escaped uninjured, only two of them felt the shock of the explosion. A full account of this first explosion appeared in the 15th Biennial Report of the State Inspector, covering the years 1911 to 1912, and is herewith appended.

About two miles up the canyon from Hastings is the Delagua mine, belonging to this same company, which was also the scene of a disastrous explosion in November 1910, making three explosions this company has suffered within this same locality in a very few years.

State Mine
The Inspector's report on the Delagua explosion is also appended.

This district has the reputation of being a very dangerous one, a reputation that is certainly well earned, considering the number of explosions that have occurred in both this company's mines as well as in adjoining mines.

The personnel of the Victor-American Fuel Company is as

follows: John Bartlett, President; William Murray, Chairman of the Board of Directors; David Griffiths, District Superintendent, and James Cameron, Local Superintendent.

The country in the neighborhood of Hastings is very rough and broken, the town as well as the mine being located in what is known as Canyon Delagua, the hills forming the sides of the canyon rising rather abruptly for several hundred feet.

The coal bearing measures are of the Upper Cretaceous Age, the seam being worked at this mine, known as the Berwin or "B" seam is the lowest of the lower group of the Laramie formation. The entire field shows the effect of very violent igneous activity, evidenced at this mine by the number of faults and dykes encountered. These dykes are of igneous rock, cutting the coal entirely out, the coal on either side of them being coked to a depth approximately equal to the thickness of the dykes themselves.

The coal is of exceptionally good quality, averaging about six feet in thickness, and having approximately the following analysis:

<u>Moisture</u>	<u>Volatile</u>	<u>Fixed Carbon</u>	<u>Ash</u>	<u>Sulphur</u>	<u>B. t. u.</u>
1.54	34.74	54.09	9.63	0.63	13,660

A washery and coke ovens are operated in conjunction with the mine; the fine coal from this mine as well as from Delagua is washed and coked.

The roof is a dark, hard shale, generally very good. The floor is a fire-clay that is hard when dry, but which soon softens up and becomes muddy in the presence of moisture.

The coal and roof are generally dry, although when going to the dip the coal in places gives off considerable water, the floor also appears to give considerable water when going to the dip, especially when faults and dykes are encountered. The rock slope between the "A" and "B" seams is very wet in places, a large per cent of the water coming from the roof.

Large quantities of gas are given off at all times from both the floor and coal; gas blowers are often struck in drill holes, giving off such large quantities of gas that the noise of the escaping gas can be heard for a considerable

distance.

The mine is worked on the double entry room and pillar system, entrance being had by means of a slope, the upper 1300 feet of which is the old slope of the "A" or upper seam. From the "A" TO THE "B" seam the slope passes down through the intervening 40 feet of rock at a uniform pitch of about 6 percent.

The entries are driven about 12 feet wide, the rooms having an average width of 20 feet; the coal is all undercut by hand, in some instances the rooms are mined across the entire face, requiring three shots to break down the coal - a center of "buster" shot and two rib shots. In other instances the track side of the room is driven up one or two cuts in advance of the gob side.

Monobel No. 5 is the explosive used, one and one half sticks per hole, or a maximum of eight sticks being the amount allowed for any one working place, each miner taking in his day's requirements in a fibre container. The miners drill the holes, and prepare the tamping dummies from dobe or clay sent in from the outside.

The holes are charged and fired by shot firers after the men are all out of the mine, the firing is done by means of a hand firing battery^{and} No. 6 electric detonaters.

Electricity is used for both pumping and operating a breast machine used to drive the main slope. Electric signals are also used on the main haulage road.

The coal is all gathered to the partings by mules, from the partings it is hauled to the surface by means of a single rope, there being sufficient grade on the main road to take back the empty cars and cable.

The cars are of wooden construction with one tight and one hinged end gate. It is the practice of this mine to put about a foot of topping on the cars.

Electric Miner's lamps are used throughout the mine; in fact this company was among the first to adopt the electric Miner's lamp in this field. The lamp used is known as the "Victor" and was gotten out by employees of the coal company. The only other lamps allowed in the mine are the Wolf safety lamps, used by the fire bosses and other officials.

The mine is ventilated by means of a Sirócco Blowing Fan, that can be reversed to a suction fan in a few moments; the fan is equipped to be driven by either an alternating or direct current electric motor from two independent sources of power.

The Mine is generally quite damp, especially in the lowplaces, the air although low in moisture when entering the mine leaves at or near the saturation point. The surplus water not taken up by the air is pumped to the surface by electric pumps.

The Victor-American Fuel Co,pany maintains a mine rescue car equipped with mine rescue and fire fighting apparatus, which they can send around to their various camps in case of an emergency, Instruction in the use of the apparatus, also in first-aid work is given on the car to crews sent from their various camps, At the time of the explosion the car was stationed at Hastings. Unfortunately, Dave Reese, the foreman in charge of the car, and other members of the crew were working in the mine at the time of the explosion and lost their lives.

Mr. James Cunningham, now first-aid miner on bureau of

Mines Rescue Car No. 2, and at one time employed by the Victor-American Fuel Company, volunteered his services and was placed in charge of the car during the recovery work.

During the work of recovering the bodies from rooms one of the members of Cummings' crew went down, due to the Apparatus not feeding sufficient oxygen. In his excitement the man pulled the mouthpiece out of his mouth, breathing enough noxious gas to render him unconscious. The other members of the crew not being thoroughly familiar with the apparatus became excited and ran out for assistance. Cunningham forced the mouthpiece back into the man's mouth and managed by almost Herculean efforts to drag him several hundred feet, to the fresh air base, the greatest part of the way without any assistance. In coming down over one bad fall of rock Cunningham fell, the two rolled to the bottom, the unconscious man on top. He managed, however, to extricate himself and continue on with the fallen man, until met by one of the other members of the crew.

On the morning of the explosion it was snowing hard and the barometer was exceptionally low. The explosion occurred at about 9:30 a. m., some two hours after the day shift started; the fan was operating at normal speed, and not being affected in any way continued to run.

There were two fire bosses employed, one going on at 8:00 p.m. and completing his shift at 6:00 A.M. , the other going on at 3:00a.m., and completing his shift at 11:00 a.m., thus enabling both men to be in the mine and commence making examinations three hours before the day shift started. Tom Davis, the Fire boss who came off at 6:00 a. m., and whose duty it was to examine the north side of the mine, reported his territory free from gas. The other fire boss Millard, whose duty it was to examine the south side, who would have come off shift at eleven a.m., and who lost his life , also reported his territory free from gas.

The testimony brought out at the inquest, and other information obtained, indicated that unless a cap of more than 5/8" was obtained the place examined was reported free of gas.*

The entire mine is aired by a single split, the fresh air entering on the north side, airing in turn the various north

* See testimony of Davis. Page 106 Coroner's Inquest.

butt entries, then passing through the last cross-cut near the face of the main slope, thence through the successive south side butt entries and out the main slope or haulage road, the air being forced up each pair of butts by means of a door on the main between the two butt entries. Thus each time a door on either entry was opened the air was short-circuited from the butts between which it was placed.

Mr. Joe Watson, safety inspector for the Mutual Insurance Company, and others who had occasion to test for gas, state that it was possible to obtain a $1\frac{1}{2}$ to $5\frac{5}{8}$ inch cap on the main return at all times. When it is remembered that the gas is being diluted with some 50,000 cubic feet of air per minute, some idea can be had of the enormous amount of methane that is given off at all times in this mine. The evidence further shows that the greater part of the gas was being given off by the workings on the south side of the mine. Taking these facts into consideration it is easy to understand how an explosive mixture could accumulate in any one of these south entries in a very short time, due either to a door being left open, or its failing to close properly on account of some obstruction on the road,

such as a piece of coal or rock from one of the cars.

The main slope entries were being driven by a 17-A Jeffery breast machine, and it was at first supposed that the explosion had been caused by the sparking of the commutator on the motor of this machine; investigation, however, proved conclusively that this could not have been the case as the controller was on the off or negative side; the feed cables were also entirely disconnected. Further investigations proved almost without question that David Reese, the company's safety inspector, was the person responsible for the explosion. His body was found at a point on the 7th south entry that has been conceded to be the initial point of the explosion. He had disassembled his safety lamp supposedly with the intention of relighting it. 22 matches were found in his pockets - an absolute violation of the law.

The general opinion is, that in striking the match to relight the lamp he ignited an accumulation of gas, causing an explosion that spread with great violence throughout almost the entire mine, the flame

having been propagated by both the gas content of the mine air and the dry or damp coal dust along the roadways.

At the time of the explosion there were 121 men at work in the mine, all of whom were killed, and from the appearance of the bodies, were killed almost instantly, a great many of them being badly mutilated due to the force of the explosion, and a great many having their clothing entirely burned off, showing that the heat in some places had been intense.

One thing that seems remarkable is the fact that in spite of the great violence and extent of the explosion, not a sound was heard outside, even the trip rider who was going in with a trip of empty cars and who had reached a point approximately 1300 feet in by the mouth of the slope where the rock tunnel from the "A" to the "B" seam commences, neither heard nor felt any effect from the explosion. The trip stopped at this point ^{because} ~~due to~~ the signal wires becoming crossed down in the mine from the force of the explosion, giving the engineer one long bell, the signal to stop. Just as the trip stopped

the trip rider saw the smoke coming towards him, thinking the mine was on fire hurried out to give the alarm.

The combustion of gas and coal dust must have been practically complete, as very little smoke issued from the mine, in places small fires had started, due to curtains taking fire, but in every instance even though the timbers were badly charred, the fire had been smothered out ^{from a} due to the lack of oxygen and the large quantities of carbon dioxide formed.

Rescue and recovery work began immediately after the explosion, and owing to the fact that the forces of the explosion had been confined entirely to the lower seam and the ventilating fan remaining undamaged, the rescue parties were enabled to penetrate a considerable distance into the mine without apparatus by following the intake air course. No evidence of any violence was encountered until the main back entry was reached, from this point in every stopping in the mine was blown out.

While apparatus was used to make explorations and recover

bodies from the rooms, the greater part of the work of restoring the ventilation to the entries was carried on without its aid. The work was hazardous in the extreme, being carried on in an atmosphere that was highly charged with methane, in some instances to the explosive point. That a second explosion did not occur is due largely to the care and watchfulness of Mr. James Dalrymple, State Mine Inspector, and his Deputies, Messrs. Graham, Oberding and King, also Mr. Joseph Watson, Safety Inspector for the Mutual Insurance Company. A great deal of credit and praise is certainly due all of these men.

The Colorado Fuel and Iron Company sent their rescue cars and crew to Hastings as soon as word was received of the disaster, and gave valuable service under the direction of Mr. George Parker.

Bureau of Mines Rescue Car No. 4, stationed at Pittsburg, Kansas, in charge of Mr. J. J. V. Forbes, was immediately sent to Hastings and was able to render assistance, especially during the latter part of the recovery work.

Owing to the fact that the main haulage road had caved so badly that it could not be cleaned up for considerable time, all the recovery work had to be done through the intake air course, making it necessary to carry in by hand all the material needed, also to carry out all the bodies recovered, a distance of over a mile, in many places over bad falls of rock, making traveling very slow and arduous.

During the recovering of the bodies on the 7th north entry, Pat Kerr, one of the C. F. & I. Coal Company's helmet men died of heart failure. The autopsy disclosed the fact that his heart had become so weakened ^{by} ~~due to~~ excessive cigarette smoking that it was ruptured under the severe strain of wearing apparatus.

Mr. D. Harrington, District Engineer, ^{for U.S. Bureau of Mines,} located at Butte, Montana, arrived at Hastings, Monday, the 30th. C. A. Herbert, Engineer in Charge of Car 2, arrived from Pittsburgh, Pa., the morning of May 1st. Professor J. C. Roberts, Golden, Colorado, also aided in the investigation. Unfortunately, owing to the condition of the mine it was necessary to seal up the entries as

fast as the bodies were recovered from them, ^{during} due to the fact that the main slope or return air course was so badly caved that scarcely enough air for one pair of butts could be forced into the mine, ^{thus} making a thorough investigation on the part of the Bureau engineers impossible; their time was largely taken up in aiding in the recovery work at times when it might have been possible to have made investigations.

With the exception of that part of the intake air course known as the Third North, and the portion of the return air course outby the parting between the 2d and 3d North entries, practically the entire mine showed the effect of terrific violence.

In going into the mine on the intake air course the first evidence was found on the 3d North about 900 feet inby the foot of the rock tunnel, from the "B" to the "A" seams. At this point the insulation on the upper of two electric wires was slightly charred, about 15 feet farther in, evidence of charring was noted on the tower wire, from this point on in for a distance of some

400 feet considerable evidence of heat was noted, there being specks of coke on the inby side of nearly all the timbers, from hereon, however, the evidences shows that the heat and flame gradually lessened until it ceased entirely at an old parting about 150 feet out by the main back entry. The evidence would seem to indicate that the heat was caused by the burning ^{of gas} ~~was~~ forced out of the old workings by the explosion, probably up the first and second west ~~entri~~

The main back entry from the third to the fourth North is very wet, a considerable stream of water running down the entry at all times, and while there is evidence of extreme violence along this entry there is no evidence of any heat, the inby side of props and timbers not blown out are plastered over with mud and dirt to a thickness in some places of nearly three inches.

At the junction of the main back entry and the 4th North there seems to have been a combination of forces, a mine car at this point was pushed off the track by the force coming up the main entry, while the end of the car was stove in by the force coming

along the 4th from the main slope entry. The cars on the 4th North parting also show the effect of the force traveling inby along the entry, the cars were all jammed together, the outby ends of several being crushed in, the inby ends of the cars and inby sides of timbers were heavily coated with coke.

Between the 4th and 6th North, the main back entry shows the effect of greater force than between the 4d and 4th, the 4th entries evidently offered considerable relief. While there is little or no evidence of heat, a great many timbers were blown out, causing many bad falls of rock.

The 6th North entries showed the effect of both heat and great violence, timbers and crossbars were blown inby, while in the rooms there were streamers of soot hanging from the roof, the bodies of the men found in the first three rooms were blown against the face, the clothing being either blown or burned from their bodies. All stoppings in these as well as in all other entries in the mine were blown out.

On the main back entry between the 6th and 7th North entries the force of the explosion was very severe indeed, the force of the explosion still being outby as indicated by the direction in which the timbers were thrown.

In the 7th North entries the force of the explosion was inby as indicated by the direction the timbers were thrown, neither the heat nor the force of the explosion seemed as severe in these entries as in the outby entries. Owing to the fact that the bodies were quickly recovered from the entries and the entries sealed off immediately, a thorough examination was ^{now} possible.

It was impossible to get to the face of the main back entry owing to the falls of rock and the depth of the accumulated water. It could be seen, however, that the force on this entry was inby. It was possible to get to the face of the main entry only by wading through water waist deep. In the water near the face of the entry were found the bodies of two men working in the entry at the time of the explosion. While there had been considerable violence in this entry, the timbers were thrown in toward the face, there was

little or no evidence of heat.

The Bureau representatives were unable to make a detailed examination of the 7th south entries owing to their having been sealed off during the night immediately after the finding and recovery of the bodies. From the information it was possible to obtain, the evidence all pointed to the 7th South entries as the origin of the explosion, the force had evidently gone both ways from the mouth of these entries.

An account of the finding of the body of David Reese, Safety Inspector, with his Wolfe lamp ^{dis}dissembled and with 22 matches in his pockets, is given in the testimony of Inspectors Dalrymple, Graham, Oberding, King and Watson, and Fire Boss Tom Davis. From the testimony it is evident that Reese took his lamp apart with the intention of lighting it, and in striking the match ignited an accumulation of gas. All the evidence in regard to the finding of coke on timbers and the direction in which the timbers were thrown proves almost conclusively that the origin of the explosion was at the point where Reese's body was found.

As far as it was possible to investigate, the main entry outby the 7th South entries showed very plainly the tremendous force that had rushed out the 7th South and on out the main entry. At the junction of the main slope and the 6th South back entry there seemed to have been a second combination of forces, this was possible owing to the fact that No. 3 room off the 7th South had been holed into No. 5 room off the 6th South back entry, allowing the explosion to travel both out the 7th onto the main and up through these rooms on to the 6th South entries. A car on the main entry at the mouth of the 6th back indicated this combination of forces, the door on the inby end of the car was crushed in by the force coming up the main entry, while the side of the car next the 6th South was crushed in by the force coming out that entry. A 1-1/2 inch water pipe lying along the bottom of the main entry was bent in a bow away from the 6th.

On the 6th South back entry the timbers were thrown each way from the mouth of No. 5 room, showing plainly that the explo-

sion had traveled both ways along the 6th entries, the track on the 6th back entry was torn up for some distance each side of No. 5 room indicating the extreme violence at this point. A great many timbers on both the 6th and 6th back entry were blown out with accompanying bad falls of rock.

The roof in the rooms off the 6th south entries was heavily coated with soot, in many places hanging in long streamers, the bodies found were all badly burned, the clothing on some being almost entirely burned off. There was also plenty of evidence of violence in the rooms, some of the bodies having been thrown up against the face, with their arms and legs broken and twisted. The streamers of soot would indicate a rather slow burning of the gases after the force of the explosion had passed.

On the main entry parting out by the 6th South the cars were jammed together in such a way as to practically close the entry. The bodies found along this part of the entry were badly mutilated, indicating the terrific violence.

Outby the 4th there was a gradual diminution of the explosive force until it finally died out entirely in the rock tunnel between the two seams, due to the damp and muddy condition of the entry and the absence of coal dust to propagate the flame. There is considerable water running down the side of the entry at all times, in many places there are droppers from the roof, especially in the rock tunnel from the "A" to "B" seam.

The red figures on the accompanying map indicate the approximate location of the bodies, also the order in which they were removed from the mine.

The following air measurements and psychrometer readings were taken during the course of the investigation:

Main intake air course just inby fan, 52,200 cubic feet - psychrometer, wet, 30 degrees; dry, 33 degrees; relative humidity, 70 per cent.

Main return air course in new slope to "B" seam, 150 feet inby intersection of old "A" seam slope, 16,087 cubic feet - psychrometer, wet, 67.5 degrees; dry, 68.5 degrees; relative humidity,

96 per cent.

Main intake air course just inby bottom of rock tunnel from "A" to "B" seam, 16,850 cubic feet - psychrometer, wet, 49 degrees; dry, 55 degrees; relative humidity, 67.6 per cent.

At the time the above readings were taken the fan was operating under a pressure corresponding to 3.1 inches water gauge; at normal times the pressure is equivalent to 2.9 to 3 inches.

The difference in the amount of air being delivered by the fan and the amount measured at the foot of the rock tunnel in the "B" seam represents the leakage into the old workings of the "A" seam.

At approximately the same place on the main return where the air measurements were taken, two air samples were taken, one about one foot from the roof, and the second about one foot from the bottom. The top sample gave the following results:

CO ₂	0.25
O ₂	19.70
CO	-----
CH ₄	3.20
N	76.85

While the one near the bottom gave the following:

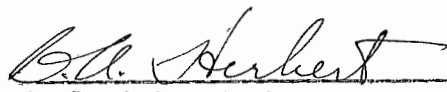
CO ₂	0.27
O ₂	19.89
CO	-----
CH ₄	3.03
N	76.81

At the time the above samples were taken a $\frac{3}{4}$ " cap was obtained with a round wick Wolfe lamp.

Air samples were also taken in the 6th North back entry, 10 feet in by the main back slope entry, giving the following results:

Sample one foot from roof -	CO ₂	0.17
	O ₂	19.96
	CO	-----
	CH ₄	3.55
	N	76.52

Sample one foot from bottom -	CO ₂	0.19
	O ₂	19.92
	CO	-----
	CH ₄	2.89
	N	77.00


Coal Mining Engineer.

LESSONS AND CONCLUSIONS.

CONFIDENTIAL

Inasmuch as both the explosion in 1912, as well as this last explosion were caused by key-locked safety lamps in the hands of men supposed to be above the average in knowledge and experience, it should point to the danger of allowing this type of lamp in the mine. The lamps should all be of the magnetic lock type and be thoroughly examined for tightness by both the lamp man and the person using them.

After an explosion, when the ventilation of the mine has become deranged and large and dangerous quantities of methane have accumulated, the number of safety lights allowed in the mine should be restricted to as few as possible, and then only in the hands of those known to be absolutely capable of using them. Several instances came to the notice of the Bureau representatives where safety lamps were carelessly handled by inexperienced men. It was only by the merest good fortune that a second explosion did not occur from this cause alone.

The Victor electric lamps used at this mine are a flimsy, dangerous looking contraption and should be given a thorough test to prove their safety before they are again put into use. It is

possible to disconnect the battery from the lamp cord connectors while in the mine, and seems to be a common practice, although it would appear to be a dangerous one.

The system of electric signaling on the main return or haulage road is also a very dangerous one to use in a gaseous mine. It consists of two bare wires about a foot apart, strung along the side of the entry connected to the electric signal bell in the engine room, in order to close the circuit and ring the bell a short heavy copper wire is placed across the two bare wires. As a voltage of about 30 is carried on these wires, a considerable number of sparks are given off each time a signal is given.

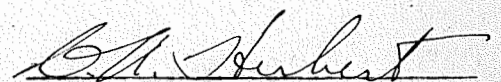
The use of an electric coal cutting machine with open type motor is also a very dangerous practice, as it is impossible to keep the commutator on this type of machine from sparking. There will also be more or less arcing on the controller each time the current is turned on or off.

There should also be more care used to prevent the miners taking matches into the mine; they should be searched oftener, and

when matches are found on their person they should be prosecuted.

The airing of a large and gaseous mine like this one on a single split or continuous current of air should not have been allowed. There should have been a separate split or current of air for each pair of butt entries. It is also a mistake to attempt to air a mine of this character with a single main intake and return air course. A greater number of airways would have made it possible to air the mine with much less pressure at the fan and at the same time effecting considerable saving in the current consumption required to operate the fan, also avoiding a great deal of the leakage at the stoppings, getting the air into the insideworkings where it is needed to dilute the gas.

The apparatus and equipment on the Victor American Rescue Car was in very bad shape, it was actually dangerous to attempt to wear it in noxious gases. There were very few supplies, and those they did have were so old as to be practically worthless.


Coal Mining Engineer.

STATE MINE INSPECTOR'S REPORT

OF THE 1912

EXPLOSION AT HASTINGS

REPORT OF THE HASTINGS EXPLOSION.

The Hastings explosion occurred on the 18th of June, 1912, at 9:30 p.m., and caused the death of twelve men and injured one man badly.

The mine is situated two miles from Ludlow and fifteen miles nearly due north from the town of Trinidad, Las Animas County, on the Colorado Southeastern Railroad. The property is owned and operated by the Victor-American Fuel Company, with head offices in Denver: W. J. Murray, General Manager, William McDermott, Division Superintendent, and James Cameron, Local Superintendent; with John Yates as Mine Boss.

Manner of Opening by Slopes.

The Hastings mine is opened by three parallel openings. Two of the openings are used as return airways. One of the return airways is the main haulage road, and the other return airway is used as a traveling-way by the men in going to and coming from their work. One of the openings is used as an intake airway.

The new slope to the B seam turns off the main slope at an angle of 35 degrees, 1300 feet from the surface. The dip of the new slope varies from 5 to 7 per cent, and at a distance of 850 feet off the main slope a rock tunnel is driven down into the lower seam, known as the B seam. The stratum between A and B seam is forty feet.

In this section of the mine the explosion occurred. From the inside of the rock tunnel two parallel entries are driven down the dip a distance of 3400 feet, from the injunction with the third

south and main slope. Three pairs of entries are turned off on each side of the slope. The distance of these entries is approximately 500 feet.

Cross-entries are driven to the raise in the second south, also the second north, up a distance of 200 feet. On the third north no cross-entries have yet been started, but on the third south two cross-entries have been driven up a distance of 200 feet. The two parallel slopes are driven below the third north 250 feet.

Ventilation.

The ventilation is produced by a 94" x 72" Sirocco fan. This fan is driven by electric power from Trinidad. The lower speed of the fan is 117 revolutions per minute, producing from 93,000 to 95,000 cubic feet per minute; the higher speed, 220 revolutions per minute, producing from 110,000 to 115,000 cubic feet of air per minute. The fan house stands 100 feet north of the main haulage slope, and is built of concrete floor, sides, and roof; in fact, it is fire-proof. The fan is run as a blowing fan, but can be changed in a few minutes to an exhaust fan.

Two electric motors are installed, and in case anything should go wrong with the electric power applied, or the working motor injured in any way during the day, a change can be made to the other motor, or a different electric power applied, in a few minutes.

A gong at the blacksmith shop gives notice to the men on top whenever the fan stops, and they at once make the change necessary. During the night the fan is visited once every hour by the night watchman, who records his visits. The night engineer also visits the fan every hour.

The new slope, or B seam, is ventilated by a split of air from the main intake at the sixth south, main slope, and the air travels south to a point where the two parallel dip entries begin. On the lower, or B, seam a shaft forty feet in depth is put down, which forms the intake for the B seam. This intake airway lies to the north of the new slope, which is the return airway for the B seam.

Manner of Conducting the Air on the B Seam.

The air is split at the first south. An overcast is built by six twenty-four-inch galvanized pipes, with concrete walls. The air continues down the intake, and at each pair of entries goes in one entry, returning to the main intake on the other entry, and in this manner all the other entries are ventilated; that is to say, only one continuous current around the workings. After the air passes the first-south, it returns to the main haulage road to the surface.

Mode of Working.

The B seam, or lower seam, is what is known as the Berwind seam. It is five feet thick and is a coking coal. At present the workings in the B seam are not extensive. So far, only entry work has been done, except that on the first south

four rooms were turned off; but on account of the coal being bad and faulty, the first and second south, as also the first north, have been abandoned.

Manner of Haulage.

Mules are used in taking coal from the working face to the double partings at the slope. An electric hoist situated between the second and third south entries, delivers coal to this point, wherefrom the surface engine takes it to the tibble.

Number of Men at Work the Night of the Explosion.

Thirty men were working in the A seam, or upper seam, the night of the explosion, but only two men felt the shock of the explosion. All the men in the A seam got out of the mine in safety.

On the lower, or B, seam thirteen men were at work that night, and twelve men met death from the effects of the explosion. One man, whose name is George Pappas, a rock man, who was working on the slope near the first entry, was taken out alive.

Precautions Taken By the Company.

Only safety and electric lamps were used in the mine in both seams. Safety lamps were used by the fire bosses and the company's inspectors. Electric lamps were used by the workmen. Permissible powder was used in the mine exclusively. Clay only was used for tamping the holes. Shots were fired by an electric hand battery.

Two fire bosses were employed in the lower, or B, seam.

One fire boss inspected the places before the day shift went to

work; the other fire boss inspected the places before the night shift went to work.

The company employed an inspector, whose duty it was to inspect the B seam once a day. The company also employed a chief inspector, who inspected the mine two or three times a month.