

It is difficult to say how many cubic feet of coal should be allowed for a ton, as we had no means to ascertain at the time, but will assume it at 40 cubic feet, hence the following :

$$422 + (40 \times 6) = 1.7583 \text{ tons per day of 24 hours. Therefore, } \frac{2,240 \times 1.7533}{1.516 \times 24} = 109.7$$

lbs. per horse power per hour.

This does not take into account the difference between the temperature of the mine and that of the outside which was 3°.

In connection with the above figures it may not be out of place here to state that the above results are nearly similar to what was found in England.

It will be seen by referring to the "Transactions of the North of England Institute of Mining Engineers," for April 10th, 1868, page 102, that a Mr. Morrison gave a table of experiments that had been conducted to compare the work of a Guibal fan and a furnace, when it was claimed that the annual expense was reduced in favor of the former £100. Also, the following table exhibiting the effective power :

EFFECTIVE POWER.

	Coal consumed per fortnight	Coal consumed per 24 hours	Coal consumed average	Coal consumed per horse power per hour	Horse power in shaft bottom of up-cast	Cubic ft. of air per minute,	Water gauge at bottom of shaft
	Tons.	T. cwt. qr. lbs.	Lbs.	Lbs.	H. P.	Cubic feet.	Inches.
Furnace....	96	6 17 0 16	640	101.75	6.29	36,350	1.1
Fan	62	4 8 2 8	413	19.82	20.83	64,700	2.05

B. Hughes, general mining superintendent; Thomas D. Davis, assistant; James George, mining boss.

Jersey mine.—This mine is located a short distance north-west of Plymouth, and has a tunnel opening into the Red Ash vein. All the coals are hoisted by a slope to the water level, and are brought to the surface through the aforesaid tunnel.

Condition.—The condition of this mine has not been flattering to any person interested in it, although somewhat better perhaps now than it has been hitherto. A new air shaft 230 feet deep has been sunk; and a fan similar to that at Avondale is in contemplation, which will give better ventilation than this mine has had in the past. A new travelling road has been made there; also a good wash house, furnished with hot and cold water, and a stove, all of which are kept in good order. B. Hughes, general superintendent of mines; F. J. Phillips, mine boss.

Avondale shaft. This colliery is located about two and a-half miles west of Plymouth. It is 237 feet deep, and sunk into the Red Ash vein.

Condition.—This mine has been kept in a very good condition ever since it was re-built after the calamity of 1869, and is better arranged than most of the mines; yet there is one important part that has been overlooked in this, as in the majority of other mines, to wit: No preparation for the protection of the air currents, by having double doors so as to keep the currents steady; this is very difficult to do unless provided for in the opening out of the mine. The hoisting carriages were provided with bridle chains and safety catches. The gates were put on at the head of the shaft, and a brake on the hoisting drum prior to my first visit, in 1870, all of which were of the best kind in use, except the brake, which has since been replaced by a better one. It has 400 pounds dead weight upon a compound lever, and is conveniently placed; it will bring the pair of engines, 14 inch cylinders, to a dead stand with a full head of steam, (80 pounds pressure,) and the load in a revolution and a half of the drum. I would here state that there is one more change desirable to this brake, so as to have it arranged in a manner that it can be used independent of the dead weight, as a brake is seldom used when there is dead weight attached to it, unless in a case of emergency, when the engineer is very liable—not being accustomed to the use of his brake—to forget that he has one, hence I prefer an efficient lever brake, that may be used

Sugar Notch Shaft.—No. 1 carriage dropped, first trial, 6 inches; second trial, 4 inches; third trial, 5 inches. No. 2 carriage dropped, first trial, 7 inches; second trial, 5 inches; third trial, $4\frac{1}{2}$ inches.

Empire Shaft.—No. 1 carriage dropped, first trial, $1\frac{1}{4}$ inches; second trial, $1\frac{1}{8}$ inches; third trial, $1\frac{1}{4}$ inches. No. 2 carriage dropped, first trial, $1\frac{1}{2}$ inches; second trial, $1\frac{1}{4}$ inches; third trial, $1\frac{1}{2}$ inches.

Diamond Shaft.—No. 1 carriage dropped, first trial, 1 inch; second trial, $1\frac{1}{4}$ inches; third trial, $1\frac{1}{2}$ inches. No. 2 carriage dropped, first trial, $1\frac{1}{4}$ inches; second trial, $1\frac{1}{4}$ inches; third trial, $1\frac{1}{2}$ inches.

IMPROVEMENTS.

Among other improvements of importance that have been made during the year, quite a number of ventilating fans have been built, all in the most suitable places, according to the views of the parties erecting the same. Some were erected on the surface, others were erected under ground.

The Delaware and Hudson Canal Company had one fan 20' 0" dia, built at the Mill Creek colliery. This fan exhausts about 72,000 cubic feet of air per minute. Of this amount, 38,000 are from the Pine Ridge shaft workings, and 34,000 are being circulated through the Mill Creek slope workings, in addition to 106,000 cubic feet exhausted by another fan, making an aggregate quantity of 140,000 cubic feet of air per minute circulated through the workings of the Mill Creek slope. The current exhausted from the Pine Ridge shaft ventilates the workings north of a large fault lying between the workings of the two collieries. Besides the amount of 38,000 cubic feet of air caused to be circulated by the aforementioned new fan, there is another current circulated and exhausted by another fan 20' dia, located at the Pine Ridge shaft, averaging about 70,000 cubic feet, giving a total of 108,000 cubic feet of air per minute for the workings in the Pine Ridge shaft.

The Delaware, Lackawanna and Western Railroad Company had a fan erected at Jersey colliery, near Plymouth. This fan is similar in dimensions and construction to that at Avondale, being a short iron casing revolving disk, 12' 8" dia, with open periphery. Much better ventilation is had in said mine since the fan has been started.

The Wilkes Barre Coal and Iron Company has had the following fans built during the year, to wit: At the Diamond shaft a fan 15' 0" dia was built inside the shaft workings for the purpose of ventilating the workings in the new slope. This fan receives its fresh air from the hoisting shaft, which is some few hundred feet east of the point where the fan is located, and it discharges its foul air into a large air-way, conveying it to the main upcast leading to the surface. The main air-ways, both in the upcast and intake, are of large areas. This fan, when being driven about 75 revolutions per minute, exhausts 40,000 cubic feet of air.

At the *Sugar Notch colliery* a fan 15' 0" dia has been built inside the shaft workings to ventilate the workings of the new slope. It is built under similar circumstance to that at the Diamond shaft. Other things not being quite ready, the fan has not yet been started.

The Franklin Coal Company has had one fan 15' 0" dia erected to ventilate their new tunnel workings on the Red Ash vein. This is comparatively a new mine, and the fan having but very recently been built, has not yet had much trial; but there can be no doubt of its being just what is required.

Prospect Shaft, L. V. C. Co.—This mine has had a second opening by connecting with the Oakwood shaft just sank, which is intended to give a lawful second opening and an additional means for ventilating Prospect shaft, besides that it will be used as a separate and independent hoisting shaft. Depth, 600 feet, nearly.

D. & H. C. Co.'s No. 4 Shaft, Plymouth Mines.—This shaft, having been sank from the Baltimore to the Red Ash seam, required a second opening, which was effected through sinking a new shaft west of the hoisting shaft, at the proper distance. The said new shaft is intended to be used for pumping and ventilation.

SHAFTS AT PRESENT WITHOUT SECOND OPENINGS.

- D. & H. C. Co.'s No. 3 Shaft, near Plymouth.*
- L. & W. B. C. Co.'s Hollenback Shaft, located in the city.*
- S. C. Co.'s Nos. 1 and 2 Shafts, East Nanticoke.*

BALTIMORE MINES FIRE.

The fire in the mines above named, which was described in my report for 1874, has not yet been extinguished, although confined within the barricade made of earth and clay, except that occasionally it breaks out, besides that the roof or covering, which is so thin and broken, falls in once in awhile. The force of persons that was required is now reduced to a very few men.

The steam from the boilers, mentioned in my last report as being forced into the fire, has been discontinued for some time.

EMPIRE FIRE.

It is not definitely known whether the fire in the above named mine, which was also described in my last report, is still burning or not. When last that the enclosure was penetrated the heat was so great in some parts, near the surface or crop of the seam, that it was considered advisable to close it up again, although it causes no other inconveniences than the expense of keeping a man or two to watch for fear of surface caves, which they had to guard against from the breaking out of the fire.

The coal that would have been brought to the shaft, being hoisted through No. 5 slope, has been done just as successfully through the new opening made west of the tunnel into No. 4 slope workings, and mining carried on just as extensive as prior to the fire.

STEAM BOILERS UNDER GROUND.

Nearly all the steam boilers located under ground in this district have, within the last few years, taken them out, and especially so since the great fires in the Empire and Baltimore mines. The boilers of Nos. 4 and 5 slopes, at the Empire mines, have been taken out, and a bore-hole 9 inches in diameter was put down with a diamond drill at No. 4, through which steam pipes were taken from boilers on the surface, and steam is conveyed from the surface to the No. 5 engines, the pipes being about fifteen hundred feet in length.

At Sugar Notch a hole has been put down preparatory to taking out boilers from said mine.

Franklin Coal Co.'s Old Slope.—The steam boilers that they have had inside of their mines for many years have this year been taken out.

Jersey Mine.—The steam boilers, located near the head of their inside slope, have been taken out about two or three years ago.

MINES THAT HAVE STEAM BOILERS YET UNDER GROUND.

Hartford Colliery.—In this mine there are a few boilers that may remain there for some time, from present indications.

Hollenback, No. 2 Slope.—This mine will soon be abandoned, from exhaustion of the coal in the Baltimore seam within its territory, hence it is presumed that the few boilers remaining there will not be disturbed until the mine is finished.

INSPECTION, NUMBER OF STEAM BOILERS, &c.

In my reports for the years 1872 and 1874 I have called attention to the very unsatisfactory manner in which, it appeared to me, those boilers were being examined, and fearing as I do that at some future time, no telling how soon, a fearful catastrophe may occur, causing death and injury to many human beings; hence I wish to reiterate my former warnings of the utter inadequacy of our present system of inspection, and sincerely hope that some better system may be adopted by our law makers.

There are six hundred and sixty-four boilers in this district, used for generating steam to be used by our stationary engines. In some cases twelve and in a few as many as eighteen boilers are in place at one and the same colliery. These boilers are arranged in nests of two, three, four or six for convenience of cleaning, firing, &c., yet the whole of them are placed, if possible, within one boiler room, so as to reduce the expense of the same to the lowest possible amount.

As a matter of course, if any one of those boilers should happen to burst it is likely to either cause several others to blow up or at least to so disturb them as to cripple them, and make the whole unfit for use for some time at least. The question that will naturally be asked right here is this: What has that to do with more or other kind of inspection? And my answer to the same would be: First, that the cause of danger is very much increased by those sudden changes, and break-downs by bursting of steam boilers, or breaking of ropes or machinery, and especially so when we come to consider that lives of nearly each and every employee about the mine, wherever it may be, is depending more or less upon the safe condition of the steam boilers and the whole hoisting tackle—embracing the wire rope, engines, sheaves and safety-catches.

It is true that those employed outside, in and about the breaker, are not subjected to any serious danger from the imperfection of the hoisting tackle; but it is not so regarding to the steam boilers, when they are day after day and week after week walking by and working within a few yards of the same.

Again each person who is required to descend a slope or shaft by said machinery his life must depend directly upon the condition and careful handling of the same, at least twice each day, while being hoisted and lowered morning and evening. There are over ten thousand persons working inside the mines in this district, and we see by this that the majority of those ten thousand must take this risk twice each day, equal to twenty thousand once per day.

The matter above referred to is not all the bearing this matter has by any means. Suppose that an explosion of the steam boilers take place is it not liable to disarrange the hoisting machinery, cut away the steam supply from the ventilator, and probably be the cause of stagnation in the ventilating current, and thereby cause an explosion of gas, killing and maiming perhaps its scores of human beings? If the same should happen, after that every ordinary precaution has been taken to provide against such accidents, persons interested would undoubtedly feel more satisfied.

sary to make provisions to meet the forces, and difficulties here pointed out, and in addition thereto a demand for extraordinary ventilation, to meet the large amounts of gas generated and encountered. We have mines in this district generating a much larger amount of explosive gas per minute than this mine, but they are not as difficult of handling, on account of the irregular lay of the seam and its thickness. Then it is just as true, that the management has been very unsuccessful here. Mr. Weir, was the fourth mine boss, and Mr. William T. Smyth, second general mine foreman, under whose administration the terrible calamity, from which eight persons were horribly burned, and from which six died, and in consequence of which the mine was flooded, and subsequently the breaker burned. Mr. Weir has also been superseded by Mr. M. R. Morgans.

HARTFORD COLLIERY.—Great improvements have been made at this colliery during the year just past. A new slope has been sunk from the surface in a north-westerly course, and reaching down to the bottom lift, being No. 3 slope, south-west side, and is being driven downward from there towards the center of the basin lying between the south-west and north-west gangways in the said No. 3 slope, on the Baltimore seam. A pair of first motion engines, from No. 3, Hollenback slope, have been placed at the head of the said slope. Two tunnels have been commenced there also: one from the Ross to the Red Ash seams, in No. 2 slope, and the other from No. 3 slope, Baltimore, to the Ross seam. A new fan, twenty-five feet diameter, of the Guibal pattern, has been erected near the head of the aforesaid new slope, which will be very convenient and timely, as the old ones are too far away, besides being too small to properly ventilate the said extensive workings.

WANAMIE COLLIERY, No. 19.—A new tunnel has been driven here, from near the slope foot southward, to cut the Ross and Red Ash seams, besides opening of two drifts higher up on the mountain on the Ross seams. Another tunnel has been started near the No. 18 breaker, to prove a territory formerly left for some reason untouched, yet being quite convenient to the said colliery.

I should have said also that a new slope is being sunk to the north-west in the No. 2 slope, or No. 19 colliery.

EMPIRE COLLIERY.—A new fan, twenty feet diameter, has been erected at this colliery, on the Hillman workings, to substitute the one on the south side of the basin, which was only fifteen feet diameter, but which had done valuable services, having been run to one hundred and thirty revolutions per minute at one time. A little of the history of the ventilation of the Hillman seam, from 1872 up to the close of this year, probably, would not be out of place here. In April of 1872, I notified the officers of the company, being then Messrs. G. H. Parrish and John T. Griffith, to suspend all further mining in the Hillman seam, until properly ventilated. They complied in stopping, but the first day after it was done, or the same evening, a committee of five miners waited on me to beg of me to let the mine

is continued, but another year, at least, will pass before it will reach its destination.

In the Red Ash seam of the Empire mine, a slope was made to hoist the coal from the lowest point in the mine to a point on a level with the bottom of shaft. It is one thousand one hundred and sixty feet in length, on a grade of about twenty-five degrees, and it facilitates the drawing of coal from a wide extent of territory which was hitherto out of their reach.

The old **Hartford** breaker took fire and burned down about eight o'clock in the evening, January 22, and the old Jersey, or No. 8 breaker, was remodeled to take its place. This, however, is not large enough to pass the coal of more than one opening—the new slope, the other two slopes remaining idle. The tunnel at the bottom of the new slope was extended from the Ross to the Red Ash seam, a distance of 380 feet, from which a large extent of coal can be mined. The slope was also extended to a further depth of 950 feet where it touched the synclinal of the basin and opened a wide field of the Baltimore seam.

In the Stanton mine a slope was driven towards the basin in line with the bottom of the new air-shaft, which opens a new lift of excellent coal. The hoisting-engine is located at the top of the air-shaft on the surface and the rope is passed down the shaft and to the slope over pulley-wheels. It works admirably, and the inconvenience of having steam pipes in the mine, and the detrimental effects of the heat radiating therefrom, is thus successfully avoided.

A tunnel is being driven from the Baltimore to the Hillman seam, the size of which is 16×8 feet on a rising grade of nineteen degrees. By the close of the year, it was driven a distance of 222 feet, and it is expected to cut the Hillman seam at a distance of about 775 feet.

In the No. 11, or Lance colliery, a slope was sunk reaching from the level of the shaft-bottom to a length of 1,350 feet, the average grade of the coal-seam being seven degrees. A new gravity plane was made also in the same mine to lower the coal from the highest point of the workings.

Delaware and Hudson Canal Company.

A new shaft was started by this company in April, 1884, and completed to the Baltimore seam before the end of the year. It is located about a quarter of a mile south-east of the Mill Creek colliery. The depth of the shaft is 132 feet, and its size 10ft.×22ft. 8 in. It was sunk for the purpose of working the coal from a small basin, which cannot be reached from the Mill Creek slope. The coal will be shipped from the Mill Creek breaker. Therefore, it is intended to maintain the present production of the colliery, although some portions of the slope are about being exhausted.

The Baltimore Red Ash shafts reported last year are still in progress of sinking. The depth of No. 1 was 304 feet at the end of the year, and of No. 2, 382 feet. Both these shafts are located in Wilkes-Barre township, and are intended to work the Red Ash seam. For dimensions see table in this report.

The Parrish Coal Company.

This company began to operate the Parrish colliery, and started the breaker in the latter part of December, 1884. The breaker is a model of neatness, and everything in the structure is well arranged for producing its intended work. There are two forty-horse-power engines, one to hoist the coal over the inclined plane up to the breaker, and the other to run the breaker machinery. Both are supplied with steam from two new boilers located close to the structure. They are mining the Baltimore and Ross seams, have four horizontal openings or drifts, one of which is on a level with the bottom of the breaker-plane, and the coal from the others is lowered over gravity planes. It is a new colliery operated by a company organized in 1884.

Destruction of Coal Breakers by Fire.

The old **Hartford**, or No. 6, breaker of the Lehigh and Wilkes-Barre Coal Company, at Ashley, took fire in some mysterious manner about eight o'clock, P. M., January 22, 1884, and was burned to the ground. It was the oldest structure of this kind in this valley, and was still capable of passing a large quantity of coal.

The Forty-Fort breaker of the Wyoming Valley Coal Company took fire early in the morning of November 27, and was totally destroyed. It is not known how it took fire, and this will very probably remain a mystery. The coal is now taken to the Harry E. breaker and shipped from there.

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appeared leaving nothing but the bones. Frank Cull had lost one leg and this enabled them to identify his bones; but the others could not be identified and all were interred together.

The men who made the daring attempt to rescue the missing men are entitled to the highest commendation for their intrepid courage and humane efforts to save their fellow workmen. The officials of the Stanton mine and District Superintendent M. R. Morgans, without apparent hesitation, took the most perilous position. They knew that under ordinary circumstances this part of the mine would fill with gas in five minutes were the ventilation to cease, and that, if the South Wilkes-Barre fan, being a new one tried for the first time and at such high speed, would break or be retarded in motion, the smoke would be drawn upon them instantly by the Stanton fan. They also knew that if the double doors at H would burn down, the air fan No. 3 would take a short circuit that way to the No. 5 shaft; but, trusting that the tunnel would choke by falls so as to prevent this, all did their part bravely and well without betraying any hesitation.

THE DISASTER AT THE NEW JERSEY OR No. 8 COLLIERY, ASHLEY.

At about 9 o'clock a. m. on the 15th day of May, 1890, an extensive part of the workings of this colliery unexpectedly caved in, closing the usual escape-way of twenty-eight persons and closing them in at the inner part of the first lift west, on the top split of the Baltimore seam, at B in the accompanying sketch.

It was reported to the workmen before they entered the mine that their working places had been examined and found safe. Shortly before 9 o'clock a. m., a message was sent in to tell the employes that the colliery would stop working at 9 o'clock, owing to the scarcity of railroad cars. At about this time also the cave-in took place, closing in not only all the men that happened to be working in the top split, but four others also who were working in the bottom split. The four persons from the bottom split were at their work shortly before the occurrence of the cave-in and the cause and manner of their going to the top split remains a profound mystery. The bottom split gangway did not cave and is still open. The rock passage leading from one split to the other at C was not closed and is still open. At first it was thought fortunate that John Allen, one of the fire bosses, was with the party, because he knew that an opening could be made from the surface at A and to one of the breasts inside of the cave in a short time, and that this would allay their fears and anxiety and guide them in their conduct; but he, through a thoughtless act, caused the death of all but two, twenty-five of his companions and himself.

The driver, Willie Matthews, and Thomas Lloyd, a door-boy, were the last that came out of the top split before the cave-in. They stated that a few minutes before they left, while they were at the back branch (B on

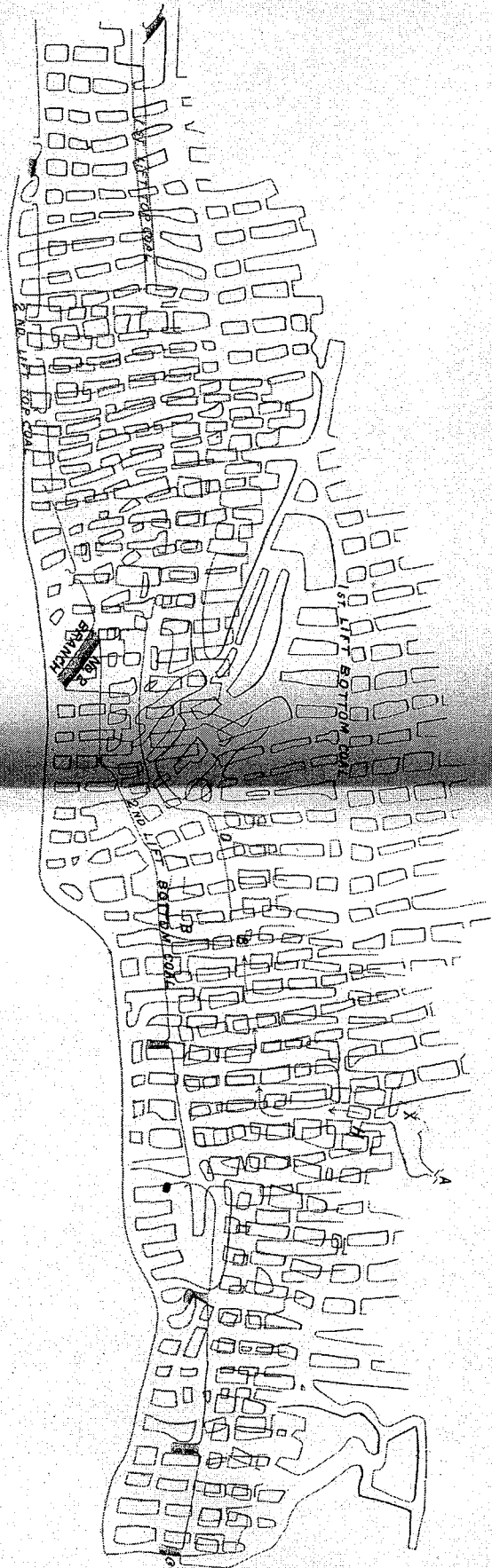
map) getting ready to distribute cars, John Williams came to Matthews and told him not to go in the gangway, that the roof was bad. In five or ten minutes after that the boys started out, and when they had gone a distance of about three hundred yards, the cave-in occurred and extinguished their light. From this we know that there were indications of the cave-in for a short time before it took place, but it is evident that the men expected no such a cave-in as would endanger them. If Allen, immediately on finding that the gangway through which they traveled had been closed, had conducted the men down through the rock passage connecting the bottom and top split at C and out at the bottom split gangway (the passage was open and familiar to him), they could have all walked out and been saved, but this passage filled with gas in a short time, which made it impassable. In about two hours after the cave-in, the mine foreman made an effort to go in that way to rescue them, but he met a body of fire-damp that made it impossible. At about 11 o'clock, just before this attempt of the boss, the concussion of an explosion was felt by a party of rescuers in the bottom split gangway, but its cause was not discovered until the two living men, Robert W. Roberts and Anthony Frayne, were rescued and they explained it as having happened as follows: At about 10 o'clock, after finding that they were closed in, John Allen, accompanied by Robert W. Roberts, Anthony Frayne and Michael Scally, started away from their companions, leaving them all sitting in darkness at B on the gangway, while they were going to search for an opening to go out. A, on map, is the entrance of an old drift, the mouth of which was caved in and to which a hole had been driven from one of the breasts at x. They went up to the old drift workings, and although there was fresh air passing in, they failed to find an opening out through the cave-in. Returning to the breast they went in through the faces to the fourth breast where they met a body of gas. Allen carried a safety lamp and the others followed in the darkness. On returning towards the holed breast again at H, he struck a match to light his naked lamp, and the gas having by this time followed them, ignited and exploded. Beyond this these men cannot give any account. They were painfully burned and soon became unconscious from the effects of the after-damp.

At about 6 o'clock p. m., the old drift was opened and the rescuers on approaching the hole at x heard moaning. The breast below x was full of gas, and it not being safe to take even a safety-lamp down, parties were lowered in the dark guided by a rope, and they soon brought up John Allen, Robert W. Roberts and Anthony W. Frayne alive, and in a short time after, Robert was able to tell what had happened, and where the other men were when they parted from them. The breast was so full of gas that it was impossible to go down the gangway, and a large force of men was set to work to enlarge the opening to admit a larger volume of air.

Made for G. H. Williams' Report.

SKETCH OF WORKINGS
N
JERSEY COLLIERY
WHERE ACCIDENT OCCURRED

MAY 15 1890.



After this was accomplished some of the gas disappeared, and an attempt was made to go down the breast; but on reaching the first cross-heading it was found still to be full of gas below, and too dangerous to attempt to go farther unless it could be removed.

Doubtless the gas was being carried away as rapidly as might be expected under the circumstances; but, owing to our anxiety, its disappearance seemed exceedingly slow and tardy, and rather than wait there in idleness all the company officials, except Mining Engineer W. Richards, went over to the slope accompanied by all the workmen to close headings for the purpose of reversing the course of the air-current which, if successful, might drive the gas away from the point we desired to reach. At 6 o'clock a. m., the writer having tired waiting for their return, and accompanied by Mr. A. Rees, superintendent Susquehanna Coal Company, and Mr. W. Richards, concluded to go in and see whether or not the gas was disappearing. Leaving Mr. Richards at the top of the breast at *x*, Mr. Rees lead the way down on the right side of the breast followed by the writer, and finding no gas we soon reach the gangway. Here we saw at once the effects of a terrible explosion. The gangway road was covered with broken cars, pieces of props, pieces of sheet-iron and refuse of all description. After making an examination of the gangway on both sides of the breast and finding it comparatively safe, we shouted to Mr. Richards to go outside and send a message over to the slope to tell all hands to come back at once and leave the ventilation as it was.

When Mr. Richards returned to his post, he was accompanied by Mr. Scott, the superintendent, who had just returned from the slope. The latter feared that we were in danger and tried to persuade us to return, but we knew that there was no danger and told him so, yet he went outside and left us, and he did not go down that mine until after all the bodies had been carried out. The most contemptible conduct on the part of a mining man that I have seen in an experience of thirty years in the mines of this valley. Mr. Rees and I continued our examination and found the bodies of twenty men strewn along the gangway between the points *b b* and *d*, and immediately returned to notify Richards of the fact, and tell him to send men with stretchers down as soon as possible. By 1 o'clock p. m. the bodies of were all brought out. The persons present having been there since the previous day were tired and hungry and they went home to rest. There being no provision made to relieve them with fresh men, the search had to be suspended till the same men returned at 7 o'clock May 17. They, accompanied by the writer, went in again and found the body of Michael Scally in the breast *h* near where the gas was ignited. Three more were found a short distance below the point where Mr. Rees and I went on the previous morning in the breast *b b*, and another was found covered by a pile of *débris* on the gangway between *b* and *d*. This completed the number missing, making twenty-eight altogether, two of whom are living.

It needs no more than a statement of the facts to show that Fire-boss Allen made a serious and inexcusable blunder, and thereby caused the death of himself and twenty-five of his companions. He had made another error a few months before which proved his unfitness for the important position he held, and the officials were informed of that, because the company paid a sum of money to settle the claims of the man who was burned through that act, and the writer told the superintendent that it was evident that Allen lacked the experience and knowledge necessary to fill his position properly. I have learned also that he was promoted to this position and held there against the will and judgment of the mine foreman.

I noticed several men who were not employes of the company helping, willingly and bravely, to carry the bodies out. Among them were two or three old officials of the company who had shortly before resigned their positions.

It is unusual to suspend efforts to rescue or recover the bodies of persons from mines after accidents, and it was exceedingly humiliating and disgraceful for a company which employs thousands of men and dozens of officials to depend on a few persons, and have to suspend operations for a whole night because these few failed from fatigue. There should have been men to relieve them, and the work should have been continued incessantly until all that remained of the lost had been restored to their friends. Such a state of things was unheard of in this region prior to this time, and let us trust that it will never occur again. The names of the victims of this disaster may be seen in the list of fatal accidents.

DISASTER AT THE HOLLENBACK COLLIERY.

As explained in another part of this report, the breaker of this colliery was damaged by a cyclone on the 19th day of August, 1890, and the colliery had not worked any from that date until this disaster occurred. They were making preparations to begin work on Monday, September 22, and on Saturday, the 20th, Larry Casey and James Sullivan, two young men, were sent to bail water at the bottom of the No. 2 underground slope. The water had to be hoisted to the head of the slope, and the hoisting engine is located on the surface. Edward Button was sent in to be headman of the slope. The No. 2 slope is at a distance of 2,000 feet east of the shaft on a north dip of about fifteen degrees. It had thirteen lifts, seven on the west and six on the east. These men went to work at 7 o'clock. It appears that no examination had been made of the place or of any of the workings of this slope since the cyclone. The fire-bosses and boss had been employed at the colliery all the time, and one examination of the other parts of the mine had been made. It has invariably been an exceedingly gaseous mine, and it has never been considered safe to enter any part of it at any time

At the Empire colliery several short tunnels were driven from the top split of Red Ash to Ross seam and through a fault on the west side.

A new pair of hoisting engines 20"×36" were put up at the No. 2 shaft to hoist from the underground slope.

At the South Wilkesbarre shafts, the damage that was done by the fire of 1890 was repaired, and a much more reliable system of ventilation was effected by driving new passages. A new fan 35'×12', having an engine 20"×48", is also in course of construction. The experiment of trying to ventilate this gaseous mine by a twelve-foot Cappell fan has not proven satisfactory, and the new fan is expected to effect a much desired improvement.

At the Stanton colliery the damaging effects of the cave of 1890 were repaired, and so was the effects of the South Wilkesbarre fire on the rock plane connecting the two collieries. This plane is now in working shape and openings are being driven to connect with the air-shaft, which when effected, will place the Hillman vein workings of this mine in good condition for work.

A tunnel was driven across the basin in the Baltimore seam, near the bottom of the underground slope, a distance of 456', which has enabled them to ventilate a very gaseous portion of workings which has been idle for more than four years, owing to the prevalence of an unusual quantity of explosive gas.

A new air-shaft was also sunk for the Red Ash seam a depth of 318' upon which a ventilating fan 24' diameter, an engine 20"×36", and two batteries of Babcock & Wilcox boilers were erected.

At the Jersey No. 8 colliery a new air shaft was sunk, having an area of 12'×12' and a depth of 57', upon which a new fan 24' diameter, having direct acting engine 30"×36," were erected. Several other minor improvements were also made at this colliery.

At the No. 9 colliery, Sugar Notch, the underground slope was regraded and a new lift opened. The hoisting engines were taken out and new ones erected on the surface to do the work. These engines are 24"×48" direct-acting on a parallel drum 9' diameter. This has made a very agreeable change in the ventilation. Three tunnels were driven at different levels to work the Twin, Shaft and Top-split seams.

At the Lance No. 11 colliery a new tunnel was driven from the Bennett to the Cooper seam, a distance of 222'. They have also improved the ventilation by enlarging the airways at contracted points through the mine. They also put in a system of water pipes in the gaseous gangways to be ready for extinguishing fires in case the gas-feeders should be ignited. A 100-horse power Dimmick & Smith high-pressure boiler was added to the plant on the surface.

At the Nottingham colliery the third and fourth east gangways closed by the cave of last year were reopened, and the standing gas removed by driving airways around the cave.

A short rock tunnel for ventilating purposes, 43 feet long and 7×12 feet area from the top to the bottom split of the Red Ash seam, was driven.

At the No. 8 Jersey colliery two new tunnels were driven from the Baltimore to the Ross seam, one in each of the two lower lifts of the new slope, and they are continued to tap the Red Ash seam. Size of each is 7×12 feet, and their lengths will probably be 600 feet each when completed. They are now at work driving second openings for the Ross seam.

At the No. 9 colliery, Sugar Notch, the underground slope is being extended, and a traveling way has been completed 900 feet in length on a grade of 20 degrees.

At the No. 11 Lance colliery a new air shaft is in progress of sinking, 12×30 feet area, and it will be about 600 feet in depth when completed. At the close of the year it was at a depth of 40 feet. Three new gravity planes of various lengths were completed, to run coal down from elevated workings. A new Guibal fan thirty-five feet diameter was erected as an auxiliary to the old one. It exhausts 229,630 cubic feet of air per minute when running fifty revolutions. This also has a self-recording pressure meter connected to the return air and an automatic alarm attached to give alarm in case the ventilation is reduced.

At the Nottingham colliery a new air shaft has been sunk to the Ross seam. It has an area of 12×30 feet and a depth of 175 feet.

A new fan 24 feet in diameter is in progress of erection and will be operated by a horizontal direct-acting engine 20×36 inches.

At Wanamie Nos. 18 and 19 two new tunnels have been driven at different points from the Baltimore to the Cooper seam. Each is 165 feet in length and 7×12 feet area.

The No. 19 slope is being extended to open another lift.

Beside improvements recorded above, a number of new steam boilers were added to the plants of several of the collieries, and several other minor improvements were effected.

Improvements by the Delaware and Hudson Canal Company.

At the Baltimore Tunnel colliery, the underground slope on the Red Ash seam was extended a distance of 500 feet, making the total length of the slope equal 900 feet. The average grade is 18 degrees. At the Boston colliery a new fan has been erected on the foundation of the old one which was torn down. This is 20 feet diameter and running 100 revolutions exhausts 50,000 cubic feet of air per minute under a pressure of 0.75 inch water gauge. The size of the engine is 14×48 inches, running the fan by a belt transmission.

At the No. 2 colliery, Plymouth, an underground slope has been sunk to a length of 500 feet on a grade of 12 degrees, which is the inclination of the seam. It opens a lift of excellent Baltimore vein coal. The engine to hoist from this, is located on the surface.

and it appears to have occurred wholly unexpectedly, in falling; it drove the air away with such force that it was felt at the bottom of the shaft, a mile and a quarter away from the seat of the cave. The coal in this part of the mine was nearly exhausted, and only a few persons were employed there, chiefly in robbing pillars or drawing back the gangways. The pillars adjacent to this cave continued to crumble, so that the squeeze spread and extended over a very large area of workings. On February 1 a body of firedamp was ignited from the naked lamp of one of the fire-bosses, causing a terrific explosion, killing eight men and injuring several others. (See article on Disasters.) The squeeze continued to spread until March 7th, when the rocks broke and the whole region caved-in, covering an area of about 1,600 feet square.

CAVE-IN IN THE **JERSEY** No. 8 COLLIERY.

At 9 o'clock a. m., May 15, the workings of the first, second, third and fourth lifts west of the main slope in this mine suddenly and unexpectedly caved-in. In each of these lifts the Baltimore seam was mined in two splits, separated by about 15 feet of rock. The workings of the second, third and fourth lifts were nearly exhausted. There being only three parties working in the fourth, and one in the third lifts, but a large number of miners were employed in each of the splits in the first lift. At 9 o'clock word was sent into the mine that work was suspended for want of railroad cars, and at the same time the workings described above caved and cut off the escape of the persons employed in the top split in the first lift. (See description of accidents.) The bottom split gangway was not closed, and if the persons inclosed in the top split had gone down through the airway at the face to the bottom split gangway before the fire-damp had accumulated they could have walked out, but this opportunity was lost, and through a fatal mistake of an official the fire-damp was ignited, and all the men, except two, were killed. It is claimed by the officials of this company that this cave-in came so suddenly that no time was given to warn the workmen of their peril, and this is undoubtedly true as to its effects in the vicinity of the gangways where the workmen were employed, but it is not probable that a cave-in of such a large extent as this was, occurred without first crushing the pillars around the point where the squeeze originated for a considerable time. The origin of all caves-in is a squeeze on one or more pillars at a weak point in such pillars, and from thence it spreads, crushing every pillar in its path, until a point of sufficient strength to stay it and break the overlying rock is encountered, then the whole of the crushed region caves-in. During the few hours just prior to the collapse, it generally spreads very rapidly, because the weight, having become so great, causes the pillars to give way quickly. Undoubtedly it did so in this case, when it spread over the gangway in which the workmen were closed in at the Jersey colliery. The fire-bosses at this mine were all strangers, having

had no time to become familiar with its extensive old workings, and most probably those of the three lower lifts had not been as thoroughly examined as the case required, or the existence of the squeeze would most probably have been discovered in time to avert the dire calamity which followed.

This cave-in caused a large flow of water into the mine, which accumulated at the bottom of the slope. A large volume of fire-damp was also liberated, causing the air in the west workings to become explosive. The colliery was thrown idle for over three months.

A CAVE-IN IN THE STANTON COLLIERY.

On Saturday, August 30, one of the fire-bosses noticed some of the pillars chipping and cracking in the breasts east of the No. 5 plane in this mine, and at once notified the officials. From this on to September 6 efforts were made to stay the progress of the squeeze, but with no apparent effect. At this date the enormous volume of explosive gases released made it too dangerous for men to be in the mine, and all, except the foreman and fire-bosses, were withdrawn. They watched its progress until it finally abated and settled, after spreading over a large area of the workings. Although this mine is one of the most dangerous in the region, this period of extreme peril passed without an accident. The gangways are now re-opened, and the mine is in a safe, workable condition.

FATAL MINE ACCIDENTS AND MINE MANAGERS.

Before entering upon a detailed description of the disasters which occurred in this district during the year 1890, it is necessary to explain the relation of mine-foremen and superintendents to the mines, and the part they take in causing or preventing accidents. Whenever a disaster occurs in a coal mine, the public is inclined to believe that the mines, in general, are badly managed, and that the officers have no regard for the safety of the workmen, and that the causes which result in disaster have always existed, needing only a slight mistake, or a heedless act, on the part of one of the employes to cause it. This is wrong and unjust. The conditions which make a disaster even possible are seldom known to exist before the moment it takes place, and, in most cases, the existence of danger has not even been suspected. Five disasters occurred in mines of this district in 1890, and in only one was it known that danger existed before the occurrence of the disaster, and it occurred in that one while efforts were being made to remove the cause of danger. It was the one at No. 4 slope, Nanticoke. With the exception of the case at the Hollenback and Jersey collieries, it is not probable that any unusual danger existed which could have been discovered twenty-four hours before the time at which the disasters occurred.

Superintendents and mine-foremen are generally exceedingly careful, but they have hundreds of points to watch, and must trust a large share

Rock airway, Baltimore to Five Foot, 20 yards. Tunnel from bottom to top split red ash, 10 yards. Steel head frame at shaft.

Jersey Colliery.—Rebuilt Jersey breaker to screen culm banks of collieries No. 6 and No. 8.

Sugar Notch Colliery.—Steel head frame at shaft. New trestle from head frame to breaker.

Lance Colliery.—Tunnel from Cooper to Five Foot, 55 yards. Tunnel from Baltimore to Cooper, 35 yards. Rock airway, Baltimore to Cooper, 35 yards. Pair of 18x30-inch engines erected at No. 2 airshaft for operation of Red Ash plane.

Wanamie Colliery.—Tunnel, Baltimore to Cooper, 20 yards. Annex to breaker to secure better preparation and increase output. Two hundred and fifty horse-power Babcock & Wilcox boilers.

Maxwell Colliery.—Rock airway, Ross to Baltimore, 50 yards; 30x48-inch Corliss engines for Red Ash shaft. Two hundred and fifty horse-power Babcock & Wilcox boilers.

Improvements by the Delaware and Hudson Company, 1899.

Baltimore No. 2 Colliery.—No. 5 slope in Red Ash vein now down 1,300 feet and probably in basin; 820 feet driven in 1899. No. 1 tunnel from bottom split, Red Ash to top split, 307 feet long. Rock return airway for No. 1 tunnel, 87 feet long. One Ingersoll air compressor 20x18x30 inches. Air used for 10x12-inch engines on plane in Red Ash vein carried down bore hole 630 feet long at Pine street.

Baltimore Tunnel, No. 4 Shaft.—Completion of No. 5 slope in Red Ash vein, 1,600 feet long. Now in operation. Engines, pair 18x36-inch on surface, in stone engine house, 20x40 feet. Rope runs through bore hole. Boiler plant, three locomotive type boilers, 60x23 feet 3 inches in brick boiler house, 46x60 feet. This plant displaces the twelve cylinder boilers at mouth of tunnel and one locomotive boiler at Pine street. No. 6 slope, Red Ash vein, now down 1,000 feet.

Baltimore Slope.—No. 3 slope in Red Ash vein extended. Now down 1,700 feet and in basin; 300 feet driven in 1899. Endless rope haulage, 900 feet long, transporting coal from head of slope to foot of shaft. Engines, 10x10 inches, located at head of shaft. Ropes carried down pump shaft. The track gauge was changed in July, 1899, from 4 feet 8½ inches to 3 feet.

Conyngham.—No. 6 plane, Abbott vein, now up 1,400 feet, still driving. No. 7 plane, Kidney vein, now up 1,020 feet, completed. No. 2 slope, in Baltimore vein, down 900 feet in basin. The air shaft at main shaft has been retimbered and relined, as has the one at Hillman shaft. One Ingersoll air compressor, 20x18x30 feet. Air pipes passes down shaft to Hillman vein, where the air is used to operate two hoisting engines, 10x12 feet, and one pump, 24x10x24 feet.

for No. 10 tunnel return, 124 yards. Rock plane airway, Kidney to Abbot for No. 9 tunnel return, 70 yards. Rock plane airway, 3d West Hillman to No. 9 tunnel Abbot, 90 yards. Three inch drainage bore hole, No. 5 slope Hillman sump to Baltimore.

Stanton No. 7 Colliery

Outside.—Duplex air compressor, simple steam, compound air. Five hundred H. P. battery, B. & W. boilers. Colliery shop.

Inside.—Triple-expansion, condensing, duplex pump, brick arch pump room, and sump tunnel to shaft sump. No. 4 Rock slope, from surface to Abbot, 100 yards.

Jersey No. 8 Washery

Conveyor, railroad and steam shovel equipment to work Hartford No. 6 culm bank.

Sugar Notch No. 9 Colliery

Outside.—Five hundred H. P. battery, B. & W. boilers.

Inside.—Compound duplex pump and brick and structural steel pump room, located on 3rd West Ross. Rock plane airway, Red Ash to Baltimore, 100 yards. No. 15 tunnel, Baltimore to Stanton vein, 195 yards.

Maxwell No. 20 Colliery

Outside.—Five hundred H. P. battery, B. & W. boilers. Duplex air compressor, simple steam, compound air. Brick engine house for compressor and electric lighting plant.

Inside.—No. 10 tunnel, extended from Ross to Baltimore, 312 yards. No. 16 tunnel, Hillman to Hillman across basin, 37 yards. Compound condensing duplex pump, pump rock in rock, and tunnel Baltimore to Twin for sump, Baltimore shaft to level. Sanitary barn to accommodate thirty (30) mules, Red Ash shaft level.

LEHIGH VALLEY COAL COMPANY.

Dorrance Colliery

Hillman vein slope extended 654 feet into the basin north of cemetery anticlinal. Tunnel finished from Abbot to Snake Island—Middle plane level. Tunnel commenced on Upper level to same vein. Tunnel is being driven from Hillman to Five Foot vein, 232 feet. New slope started from lower Bennett gangway to reach the basin below Slant slope. New inside slope started to work river warrant—Hillman vein. Preparations are being made and work started to sink main hoist shaft from Baltimore to Red Ash, also second opening rock slope for same. A new stable is being made, and improvement to pump houses. Fire emergency water lines extended during the year. A series of test holes were put down from surface

Lance colliery.—Condition good as to safety, drainage and ventilation.

Reynolds colliery.—Condition good as to safety, drainage and ventilation.

Wanamie 18.—In safe condition; drainage and ventilation fair.

Wanamie 19.—Condition good as to safety, drainage and ventilation.

Plymouth No. 2.—Condition good as to safety, drainage and ventilation.

Plymouth No. 3.—Condition good as to safety, drainage and ventilation.

Plymouth No. 4.—Condition good as to safety, drainage and ventilation.

Plymouth No. 5.—Condition good as to safety, drainage and ventilation.

Boston.—Condition good as to safety, drainage and ventilation.

West End.—In safe condition; drainage and ventilation fair.

Dodson.—Condition good as to safety, drainage and ventilation.

Woodward.—Condition good as to safety, drainage and ventilation.

Avondale.—Condition good as to safety, drainage and ventilation.

Parrish.—Condition good as to safety, drainage and ventilation.

Buttonwood.—Condition good as to safety, drainage and ventilation.

Kingston No. 2.—In safe condition; drainage and ventilation fair.

Kingston No. 3.—In safe condition; drainage and ventilation fair.

Gaylord.—In safe condition; drainage and ventilation fair.

Chauncey.—In safe condition; drainage good, ventilation fair.

IMPROVEMENTS DURING THE YEAR

DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

Avondale Colliery

This mine was flooded during the year 1902. This great accumulation of water has now been pumped out and the pumps lost during the flood have been recovered.

Jersey Mine Fire

This most disastrous and serious underground conflagration is known to the people of this region from one end to the other, on which volumes could be written, giving the experiences that we have met with and the difficulties we have had to contend with in fighting

this most dangerous enemy to the underground worker. I am glad to be able to report to you at this date that we are led to believe that we have succeeded in surrounding this affected district with incombustible material to prevent further spreading of the fire, and expect to be able to report in the near future that this destructive fire has been taken care of.

Woodward Colliery

Outside.—The improvements at this breaker during the year consist of labor-saving machinery, automatic slate pickers, conveyors, elevators, shakers, etc., together with a 15-foot dust fan which is materially assisting in improving the conditions at this breaker.

Inside.—The installation of two $7\frac{1}{2}$ ton electric locomotives, two electric hoists. Cooper and Abbot veins have been opened at No. 2 shaft, which will materially assist in increasing the output of this colliery in the future.

The condition of the colliery has been improved by a general cleaning up, white washing and painting of the buildings, on the outside, and the cleaning and ballasting of the roads on the inside.

DELAWARE AND HUDSON COMPANY

Plymouth No. 2 Colliery

Reopening Hillman vein, repairs to No. 1 shaft, concreting, etc., making branches, etc., at foot of No. 9 plane; electrical machinery for lighting this division, buildings, etc., two large boilers added to the present boiler plant, extension of boiler house Hillman vein improvements; pump room and tunnel; additions to the washery, fifty new mine cars.

Plymouth No. 3 Colliery

Tunnel from bottom to top split of Red Ash vein. Additional compressor with house additions, etc. Additional boilers; fifty new mine cars.

Plymouth No. 4 Colliery

Mountain plane in the outcrop, conveyor for fuel to boiler house; fifty new mine cars.

Plymouth No. 5

Fifty new mine cars; coal conveyor.

Boston Colliery

No. 4 plane, bottom to top split Red Ash; one additional compressor; compressor house, addition to boiler house; rope haulage and extension, 100 new mine cars; chain hoist from tunnel to foot of shaft.

J. J.

Woodward

Notwithstanding the fact that this colliery was operated almost continually during the year, considerable improvements were made, consisting of the following:

Installing a 600 H. P. Cross compound engine and generator to furnish electric power for locomotives and hoists. Also new electrically driven centrifugal pump to furnish water for shakers, screens, etc., and one rope driven dust fan. All of which have added to the efficiency of this breaker.

Inside improvements consists of driving two rock tunnels, one from Cooper vein to Lance vein, and one from Cooper vein to Cooper vein through fault.

The ventilation in this colliery has been improved by the erection of six concrete brick and iron air bridges.

The condition of the haulage roads and return air-ways have been improved by cleaning up and enlarging.

Report of Jersey Fire

I am pleased to be able to report that this most stubborn and serious mine fire, if not entirely extinguished, has been so surrounded by incombustible material that it will be practically impossible for it to spread into any other part of the adjacent old workings.

This fire was discovered on May 18, 1901. The origin has always been a mystery. It has cost the company a tremendous amount of money. The officials and workmen engaged at this work have also suffered a great many trying ordeals, and are very well pleased with the conditions existing at the present time, as the work of fighting a fire of the magnitude of this one in old abandoned workings, where no system of ventilation could be adopted or applied, is a problem that taxes the ability of the most competent mining men.

The most important question in fighting a mine fire is to produce a sufficient quantity of air to dilute and render harmless noxious and dangerous gases, so as to enable the mine workers to attack their most insidious enemy.

A great deal of credit is due the men in charge of this work and those who have worked with them.

WEST END COAL COMPANY

West End

One 110 and one 250 K. W. electric generator installed in concrete power house. One 7 ton electric locomotive, No. 1 Lee, and one 7 ton electric locomotive, R. A. Split. One 4 stage Worthington turbine pump, electrically driven, No. 1 Lee, one 5 stage Worthington pump, electrically driven, Lee shaft, one 15 foot Guibal fan, No. 1 Lee, electrically driven, and two Flory electric hoists. Three 300 H. P. Maxim water tube boilers, in concrete boiler house; 54 steel mine cars.