

diameter; when being run as at present, about 180 revolutions per minute, it exhausts about 128,000 cubic feet of air per minute, with a water gauge of .8 of an inch. The other new fan is not quite ready, it is 20 feet diameter. Number of persons employed inside 128.

Air report for December.—Inlet 135,800; face of mine 73,700 cubic feet of air per minute; fan revolutions 180. The drift workings are in good condition; they do not generate so much gas as the slope workings; number of persons employed 58. The ventilation is produced by a furnace. Amount of air at out-let about 30,000; face of mine 20,000.

A. Nicholls, general superintendent; Mr. Simptson, assistant superintendent; John E. Cock, mining boss since July, 1872.

Young's slope.—This mine is new. It is located half a mile east of Wilkesbarre. It is a slope just sunk, on the Hillman vein. The gangways east and west have been started preparatory to driving for a second opening. A new breaker is now being built, which will be ready to break coal early in the spring of 1873.

Conyngham shaft.—This is a new shaft, located a short distance north-east of Wilkesbarre, and is down about 516 feet. There is some very fine masonry at the head of this shaft, which is divided off into five compartments, two for hoisting coal, one to place the pumps in, one for repairing pumps, &c., besides hoisting and lowering of men and machinery, and one compartment for air. Dimensions 42×18 feet. Mr. Philip Repp, contractor.

DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY'S MINES.

Boston shaft.—This mine is located about one mile and a-half north-west of Kingston, on the Baltimore vein, which is split at this point. The shaft is 160 feet deep.

Condition.—This mine is kept generally in good condition. One important improvement has been made by building stone and mortar stoppings instead of wooden ones. The only complaint now is too long a route for the air to travel, it being coursed in one current around the whole mine.

The power used to create ventilation is a furnace, dimensions 8 feet, fire grate bars, width 7 feet, and usually moves about 35,000 cubic feet of air per minute at the furnace, and 14,000 at face of mine. This furnace is favorably located, having about 274 of air column to heat before it reaches the surface, and 18 feet of a stack on top of air shaft, total 272 feet, which gives it advantage over some of the furnaces in use elsewhere in this district, most of which moves from 18,000 to 20,000 cubic feet per minute.

The following experiments were made on this furnace in December, 1870, by my solicitation, and assisted by the following gentlemen: Messrs. C. S. Snyder, Head Engineer for the D. L. and W. R. R. Co.'s works, and Benjamin Hughes, General Superintendent of mines for the same company, both the above from Scranton; also R. P. Rothwell, M. and C. Engineer, Wilkesbarre, and myself.

The furnace is located about — feet away from the down cast or main shaft, and is nearly level with the foot of the same. Dimensions of furnace: Length of fire bars 8 feet, width of fire grate 7, area=56 square feet; ash pit 3 feet below the fire bars; from fire bars to spring of arch 2½ feet; and 6 feet from grate bars to arch, which has 3½ feet radius. The furnace was fired up only six days per week, and it burned 4 mine car loads of coal during that time, equal to two-thirds of a car load per day of 24 hours. The mine car contained 95-83 cubic feet of coal, exclusive of topping, which made it=105.5 cubic feet, and equal to 422 cubic feet per six days. This coal was loaded especially for the use of the furnace.

Air Measurements.—A small instrument of the Cassella make and one of the Biram four inch anemometers were used with the following result:

In six consecutive trials the Cassella instrument indicated a velocity of 720.67 feet per minute. Table of correction used—6=714 cubic feet. The Biram instrument indicated $v = 598.33 \times .97 + 47 = 627$ cubic feet.

Area $57.375 \times v / 627 = 35,954$ cubic feet per minute.

Area $57.375 \times v / 714 = 41,064$ cubic feet per minute.

The water gauge on main gangway door, about 800 feet from furnace and about the same from down cast shaft, indicated .25 of an inch. Hence, by taking the average of the measurements of both instruments, which=38,504 cubic feet of air per minute \times by the water gauge, $.25 \times 5.2 + 83,000 = 1.516$ P.

CONSUMER'S COAL COMPANY'S SHAFT, KINGSTON, PA.

East Boston Shaft.—No. 1 carriage dropped, first trial, $13\frac{3}{4}$ inches; second trial, 6 inches; third trial, $9\frac{1}{2}$ inches. No. 2 carriage not used for hoisting or lowering persons.

DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY'S SHAFTS.

Avondale Shaft.—No. 1 carriage dropped, first trial, 2 inches; second trial, $1\frac{3}{4}$ inches; third trial, $1\frac{3}{4}$ inches. No. 2 carriage dropped, first trial, $1\frac{1}{2}$ inches; second trial, $1\frac{1}{2}$ inches; third trial, $1\frac{1}{2}$ inches.

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

RIVERSIDE COAL COMPANY'S SHAFT, PLAINSVILLE, PA.

Enterprise Shaft.—No. 1 carriage dropped, first trial, 4 inches; second trial, $\frac{3}{4}$ inch. No. 2 carriage not used for hoisting or lowering persons.

LUZERNE COAL AND IRON COMPANY'S SHAFTS, PLAINSVILLE, PA.

Henry Shaft.—No. 1 carriage dropped, first trial, 2 inches; second trial, 2 inches. No. 2 carriage not used for hoisting or lowering persons.

Prospect Shaft.—No. 1 carriage dropped, first trial, 2 inches; second trial, 2 inches; third trial, 2 inches. No. 2 carriage not used for hoisting or lowering persons.

DELAWARE AND HUDSON CANAL COMPANY'S SHAFTS.

Pine Ridge Shaft.—No. 1 carriage dropped, first trial, 2 inches; second trial, 2 inches; third trial, 2 inches. No. 2 carriage dropped, first trial, 2 inches; second trial, 2 inches; third trial, 2 inches.

Conyngham Shaft.—No. 1 carriage dropped, first trial, 12 inches; second trial, 14 inches; third trial, 8 inches. No. 2 carriage not used for lowering or hoisting persons.

NORTHERN COAL AND IRON COMPANY'S SHAFTS, PLYMOUTH, PA.

No. 1 Shaft.—No. 1 carriage dropped, first trial, 2 inches; second trial, 2 inches. No. 2 carriage dropped, first trial, 2 inches; second trial, 2 inches.

No. 2 Shaft.—No. 1 carriage dropped, first trial, 3 inches; second trial, 2 inches. No. 2 carriage dropped, first trial, 3 inches; second trial, 2 inches.

No. 3 Shaft.—No. 1 carriage dropped, first trial, 3 inches; second trial, 2 inches. No. 2 carriage not used for hoisting or lowering persons.

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

WILKES BARRE COAL AND IRON COMPANY'S SHAFTS.

Dodson Shaft.—No. 1 carriage dropped, first trial, 6 inches; second trial, 6 inches; third trial, 6 inches. No. 2 carriage dropped, first trial, 6 inches; second trial, 6 inches; third trial, 6 inches.

Lance Shaft.—No. 1 carriage dropped, first trial, 5 inches; second trial, 4 inches; third trial, 6 inches. No. 2 carriage dropped, first trial, 6 inches; second trial, 6 inches; third trial, 6 inches.

been lowered to a depth of about one hundred and forty feet, and the superintendent stated that they had about fourteen feet more to go before striking the solid rock. Subsequently I have been informed that the whole operation has been suspended for some time.

Second Opening.—The following shafts at present have no lawful second opening: Nos. 1 and 2, Susquehanna coal company, at East Nanticoke; **Conyngham shaft**, Delaware and Hudson coal company, near Wilkesbarre; Ellenwood shaft, Ellenwood coal company, near Kingston. The respective parties are driving for the second opening in each case, except the latter; operations in the same having been suspended since 1875.

MINES ON FIRE.

The Empire mine fire is not extinguished altogether yet. Although it causes but very little inconvenience or expense as at present. Whatever amount of fire that there is in the said old mines is located very near the crop of the seam. The same being above water level is hard to overcome in any manner, as the periphery of so large an area is almost impossible to be made perfectly air tight; hence a certain amount of fresh fuel is added to the fire, no doubt continually. The inclosed space having been opened at the lower level several times, the carbonic acid gas has been drained from the higher point, and to get another fresh supply sufficient to fill the whole space, the same being manufactured by the slow process of the consumption of oxygen by the present fire is almost out of the question.

The Baltimore Old Mine Fire.—This old mine is still burning. It is confined to the boundaries, as described in my last report, and requires but a few persons to attend to the same.

Prospect Shaft Fire.—The Prospect shaft colliery was again visited by the ravages of a fire during the year of a very severe character.

On the — day of January, at about 8 P. M., a blast was fired in the face of the north-west gangway, from which the gas ignited around the face. The men began to combat the fire, but by some mishap one of the water connections would not work, hence they could not employ their hose and force of water upon which they depended. Before they got the same changed and in order to work, requiring perhaps three-quarters of an hour, the fire had gained such headway that they were unable to cope with it. The fire had crept back opposite them through the airway or return, they being in the intake. In the combat the boss, Samuels and two of his men were more or less burned on their faces and hands, but not seriously, but before twelve o'clock midnight they were all compelled to abandon their efforts and retreat to the surface, after which the water from the reservoir was turned in to flood the mine. They had a two and a-half inch gas pipe from the shaft's foot to the face of the gangway, connected immediately with the reservoir on the surface, thus having a head of six hundred (600) feet. This appliance had been kept in readiness and often successfully employed since the great fire of 1874. The operation of flooding the mine by letting in the water from the large reservoir near the shaft's head, and pumping from the river and canal, sufficient to prevent the admittance of atmospheric air, took several days. After that the water had reached a height of about one hundred (100) feet, or sixty (60) feet above the highest point excavated in the workings—pumping water into the shaft was discontinued. Having given ample time for cooling the strata, the hoisting of water from the mine was now commenced. Some of the chambers on the pitch had been worked up quite a ways, having reached perhaps, in some cases, as high as forty feet vertical above the shaft gangway.

On the seventh of March they had reached or got the water out to within about forty (40) feet of the shaft's bottom.

therefrom to fall and intermingle with a current of fresh air, and be drawn into their other workings.

ASHLEY COLLIERY FIRE.—This colliery has been the scene of a serious fire this year, necessitating the flooding of that portion of the mine where it occurred, called No. 3 slope, being the deep workings on the Baltimore seam. This fire occurred, it is stated, from the gas igniting from a miner's lamp; he having, a short time previously, fired a blast, and on his return to the face of the gangway, where he worked in company with his laborer, the gas ignited along the roof, and all efforts towards extinguishing it failed, on their part. They then went out of the mine to report and seek assistance. In their excitement they forgot to call upon, and inform another party of men driving a gangway and air-way in an adjoining part of the same mine; and it was with great difficulty that those men made their escape, the gas affecting them so seriously that two of their number were left prostrated on the gangway, while the other two went wending their way, as best they could, to escape its deadly contact, and to send succor to their dying comrades. Fortunately they were met on the way by a fresh gang of men from the surface, and assistance rendered just in the nick of time to save the whole party, thus averting the loss of any human lives in this catastrophe. It was found that the fire had made such headway that the only way to be certain of its speedy extinguishment was in the flooding of the deep slope where the fire existed; an operation requiring some weeks of time, to say nothing of the many months of time to be taken in pumping the same out of the mine to enable them to resume mining operations again.

Mine Improvements.

Improvements in mining, as in other branches of business, have been very limited in 1877.

MALTBY COLLIERY.—C. S. Maltby has not done anything towards completing his circular shaft, but has erected a new breaker near the old shaft. North-easterly from the same, a new shaft is being sunk to be used as a second opening, pumping, and ventilating shaft, in conjunction with the old one. Also, he has driven the tunnel on the mountain side further on, and penetrated the Cooper, Bennett, and Ross seams, some of which, it is said, are in very good condition. It would appear, from the very extensive improvements going on at this colliery, that it is destined to be one of the finest on that side of the river. There is about 600,000 feet of lumber in the said new breaker, and contains, it is claimed, all the modern improvements to be found anywhere in said branch.

No other improvements of importance were done in the district during the year.

Second Openings.

The **Conyngham** shaft, Delaware and Hudson Canal Company, the Nos. 1 and 2 shafts of the Susquehanna Coal Company, are the only shafts now

in operation, not in communication with and having a lawful second opening. Each of those places are being operated according to law, by confining their operations to labor required to make or facilitate the making of a second opening; and the last named, at least, will have had a connection made to No. 1 slope, ere that another report will be made relating thereto.

Steam Boiler Explosions.

An explosion of a steam boiler in one of the nests of boilers in use at the No. 1 shaft, Delaware and Hudson Canal Company, near Plymouth, occurred, which destroyed considerable property; but it so happened that no person was injured or killed thereby. It was only by good luck that the fireman was saved in this case, as he had just turned out of the boiler-room. The usual *matter of form* report of the safe condition of said boilers had been filed in this office in proper time. I say *matter of form*, because I claim that our present examinations are not conducted, in all cases, as they should be; neither are they made, in many cases, by boiler makers or other *qualified persons*. Some persons assuming the responsibility of shielding themselves, as they suppose, behind the wording "or other qualified person." I am inclined to the belief that should some of those parties happen to be called up before a court of justice, and there be required to explain in regard to their assumed qualifications, that they may come to the conclusion that they were carrying too much responsibility, by endeavoring to save a few dollars to their employers, and at the same time earn for themselves a little honor, at the risk of sacrificing the lives of innocent men and boys, and finally their own reputation.

I am still of the opinion, expressed in my other reports, that steam boilers, and all machinery, in and around the coal mines, should be placed under separate inspection; or, otherwise, that there should be a law requiring that each steam boiler, employed in or about the mines, should be insured in a responsible insurance company, when that they would receive *proper* examinations.

I am sincerely afraid that there may be some terrible catastrophe in some one of those districts yet, before that the Legislature has awakened to this danger. Then public opinion will raise a cry for a proper system of boiler inspection.

This being an imminent danger it ought to be provided against in time. I intend to call attention to this matter, in each annual report, unless the cause be removed, that I may have the honor to make.

Inspectors' Annual Reports.

These reports being intended for the perusal of those connected with mining coal, both in the branch of excavating the mineral, as well as those who have the managing of the same, then it is but a simple fact to state that there is not one tenth the required number of those had for distribution among our people connected with the mines. Every miner, and every

care and attention, this colliery ought not to be deficient of proper ventilation in the future, for some years to come, at least.

SECOND OPENINGS.

The Conyngham Shaft.

Has not yet been connected, by completion of its second opening, to the No. 3 Baltimore, where it is intended to reach, work having been suspended upon it since the last spring, and nothing else done at the shaft, except the putting in of large Bull pump.

Maltby, No. 2, Shaft.

A second opening has been made, from the new to the old shaft. Having commenced operations of mining coal for market before the said connection had been completed, it became my duty to require them to stop all work in the new, or No. 2 shaft, except the second opening, which they did, until the connection was made.

Shaft No. 1, Nanticoke.

The connection between the said shaft and No. 2 slope, was completed in the upper, or Hillman seam, during the summer. But it will require a length of time to make a connection in the lower seam, now being driven in the shaft, being a part of the Big or Baltimore seam.

Shaft No. 2, Nanticoke.

The connection between this shaft and No. 1 slope was completed on the 22d day of February, and on the morning of the 27th, the temporary head house and pump house took fire by some means, generally supposed to have ignited from spark from passing locomotive engine, and was entirely consumed in less than three quarters of an hour. There were some fifteen or twenty persons down in the shaft at the time, all of whom immediately made their escape through the second opening, except Mr. Thomas R. Williams, the mine boss, and one other person, both of whom remained down about the foot of the shaft and around the mule stable for over an hour, when they also came out. Williams stated that at first the smoke descended the shaft, and was forced towards No. 1 slope in part, and part drawn up through up-cast to the fan. But that very soon the whole current reversed, No. 1 slope becoming the down-cast, and remained so until the most of the wood had been consumed, when it again reversed, the air and smoke passing towards No. 1 slope, until Williams made another change, by manipulation of the doors, when he and his partner ascended by way of the outlet, just in time to meet parties in search of them from the surface, fearing some wrong had happened them. Had the general inside foreman, Mr. George T. Morgans, the mine boss, Williams, and a first class set of miners not done extraordinary work in driving out the said outlet, it is more than likely that some lives would have been lost by the burning of said head house, although, as above stated, there were but few persons working there until the outlet was through.

TABLE No. 8—Continued.

Number of fan.	LOCATION OF FAN.	FAN DIMENSIONS, REVOLUTIONS, AND WATER GAUGE.						ENGINES.			Discharge in cubic feet per minute.
		Diameter—feet.	Width—feet.	Number of side inlets.	Diameter—feet.	Revolutions per minute.	Water gauge—Inches.	Number of.	Vertical or horizontal.	How connected.	
<i>Erected 1875—Contin'd:</i>											
60	Waterman & Beaver col'y,	15	5	2	7.5	...	...	1	Horizontal	Direct, . . .	24,000
61	Waterman & Beaver col'y,	21	7	2	10	60	.5	1	Horizontal	Belt, . . .	66,000
62	Audenreid colliery, . . .	15	5	2	7.5	80	1.2	2	Vertical, .	Direct, . . .	54,000
<i>Erected during 1876:</i>											
63	Nanticoke, No. 2, slope, .	15	5	2	6.5	76	.75	1	Vertical, .	Direct, . . .	21,181
64	Franklin colliery, . . .	16	4.5	2	7.6	50	.4	1	"	"	52,000
65	Wyoming colliery, . . .	16	4.5	2	7.8	44	.4	1	Horizontal	"	102,000
66	No. 4 shaft, D. & H. C. Co.,	25	8	1	12.6	8					
67	No. 3 shaft, D. & H. C. Co.,	16	4	2	8						
<i>Erected during 1877:</i>											
68	Forty Fort colliery, . . .	15	5	2	7.5	...	...	1	Vertical, .	Direct.	
69	Sugar Notch slope, . . .	15	5	2	7.5	...	...	1	"	"	
70	Nanticoke, No. 4, tunnel,	15	5	1	7	...	...	1	"	"	
<i>Erected during 1878:</i>											
71	Maltby colliery,	8	†	2	...	147	...	1	Horizontal	Belt, . . .	31,200
72	Maltby tunnel,	6	†	2	...	250	.6	1	"	"	25,750
73	Nottingham colliery, . . .	24	8	1	12	...	...	1	"	Direct.	
<i>Erected during 1879:</i>											
74	Hollenback shaft,	15	5	2	7	...	...	1	Horizontal	Belt.	
75	Hutchison colliery,	16	5	2	7.5	68	...	1	Vertical, .	Direct, . . .	41,000
76	Hollenback air shaft,	35	11	1	17	35	...	1	Horizontal	"	70,000
77	Hollenback air shaft,	24	8	1	12	...	...	1	"	"	
78	No. 5, D. and H. C. Co., . . .	20	6.5	2	10	...	...	1	"	"	
79	Empire colliery,	20	6.5	1	10	...	...	1	"	"	
80	Nanticoke, No. 4, slope, . . .	20	6.5	1	10	70	...	1	"	"	50,000
81	Nanticoke, No. 1, shaft, . . .	20	6.5	1	10	...	...	1	"	"	
82	Hartford colliery,	25	8	1	12	...	...	1	"	"	
83	Prospect shaft,	30	10	1	15	40	1.25	1	"	"	145,620
84	Kingston C. Co., No. 2, sh't	25	8	1	12	...	...	1	"	"	

* Breaker engine.

† Murphy fan.

A new fan is promised to be built at the Ellenwold shaft, and another at the Waddell drifts, early in the spring of 1880.

I here insert the drawings or sketches of a few of the most important hand-drilling machines, patented by the respective parties whose names accompany the same. This is done, not as an advertisement for the benefit of the patentees, but to show what is being done in that line, as it is generally known that we have had hand-drilling machines in operation for some time in our anthracite coal mines, and I do so without comment for or against either one.

Second Opening.

CONYNGHAM SHAFT.—The second opening commenced in the said shaft has not been driven any further; but a rock tunnel is being driven there through an anticlinal axis, which was met with in driving the same. This tunnel is intended to cut through said anticlinal at a point so that it reaches

about the level of the bottom part of the synclinal axis beyond the same, whereby the second opening may be continued to the point of destination in the Baltimore No. 3 slope. There is nothing else being done in the said shaft at this time.

HOLLENBACK SHAFT.—This shaft is operated by Charles Parrish & Co. A second opening to the above shaft was had by driving to the air shaft sunk on the anticlinal axis between it and the Diamond shaft workings, at a distance of about fourteen hundred feet from the main or hoisting shaft. A law suit grew out of work done in the said colliery while the second opening was going on, as follows: The company commenced to drive more places than those requisite to make or facilitate the making of a lawful second opening, such as driving a gangway and air-way to the westward, while others were being driven eastward, from which the second opening proper was to be driven to the air-shaft; and finally, after remonstrating with the company's officers, and their continuance of the same, I instituted proceedings against them, by applying for an injunction to restrain them from working more than the actual number of persons required to make or facilitate the making of the said second opening, as decided by His Honor Judge Harding, in the cases of the Commonwealth vs. The Seneca Lake Coal Company, and Lance or Bonnell. The said decisions had been rendered, giving a construction to that part of the law, hence I had no other course to pursue. Another case bearing also on the matter of a second opening, regarding a shaft at Nanticoke, owned by the Susquehanna Coal Company, was brought up the same time, and, after a postponement or two the cases were tried, and were decided in favor of defendants in both cases, which will be found mentioned elsewhere in this report.

NO. 1 SHAFT, SUSQUEHANNA COAL COMPANY, NANTICOKE.—A second opening was secured in the upper seam operated in this shaft last year, but the one in the lower seam is not yet completed, but may be so before the time arrives to make another annual report. As mentioned above, the case of this second opening was taken into court the same time as that of the Hollenback shaft, operated by Charles Parrish & Co., and the case was decided in favor of the defendant, of which further particulars will be found under the heading of legal proceedings.

Legal Proceedings.

The only cases taken into the courts this year by the writer were two, and both regarding the matter of second openings.

The one was that against Messrs. Charles Parrish & Co., operating mines of the Lehigh and Wilkes-Barre Coal Company, and the one here referred to, called Hollenback shaft. The courts having decided the points involved in this case, as I thought, several years ago, in the case of the Commonwealth, *ex. relatione*, Thomas M. Williams, inspector of mines for the Middle district of Luzerne and Carbon counties, vs. Samuel Bonnell, junior, William L. Lance, senior, Walter W. Lance, and De Haven Lance.—No. 6, October term, 1871. In equity.

which has improved the ventilation of that colliery greatly. For full description of the fan, see Table No. 1.

At the Baltimore tunnel, a new tunnel is now in progress, from the Baltimore to the Red-Ash seam. It is at present about twelve hundred feet in length, and is expected to go about three hundred feet further before striking the coal. It is intended for a mine locomotive to haul the coal out from this tunnel when completed, and is driven large enough for that purpose.

At the **Conyngham** shaft, the second opening is through, and a breaker is now in course of construction at the top of the shaft. By the time they will be ready to ship coal through the breaker, the gangways will be driven a goodly distance, and will have room to open a number of chambers, and give a good quantity of coal when they start.

Susquehanna Coal Company.

The No. 5 breaker, a large structure capable of shipping over one thousand five hundred tons per day, erected by this company at Nanticoke, was completed ready to ship coal on the first day of April, 1880.

A new fan was erected at No. 1 slope, a description of which is given in table No. 1. The ventilation of this mine was much improved by the erection of this fan, and is now in pretty good order.

At the grand tunnel, West Nanticoke, a new underground slope was driven down to a basin, which was a considerable distance below their workings. The slope is one thousand four hundred feet in length, and has an average grade of seven and a half degrees. It opened a convenient territory of excellent coal.

Delaware, Lackawanna and Western Company.

At the Avondale colliery a new underground slope was opened a distance of one thousand eight hundred and forty-five feet, on an average grade of twelve degrees. A large territory of excellent coal can be worked from this slope, and is convenient to the shaft.

They also drove a new plane, extending above their present workings a distance of one thousand four hundred feet, from which a large amount of coal is expected to be mined. This makes the fourth plane, one extending above the other, on the same pitch.

The Kingston Coal Company.

This company is sinking a new shaft near their present No. 2 shaft. The sectional area of it is twelve by thirty-three feet, and it is down at the time of this writing four hundred and seventy-five feet. They contemplate sinking it through the Ross and into the Red Ash veins, both of which are to be worked from it.

In the No. 2 shaft an underground slope was driven down to a length of one thousand three hundred and fifty feet, on a grade of one in twelve. They also drove a tunnel from the Cooper to work the Bennett vein.

they have concluded to leave the shaft for the present at this depth, and proceed to work the Hillman seam as soon as a second opening can be effected to the Stanton air-shaft, where it is intended it shall be made.

The Delaware and Hudson Canal Company.

At the Laurel Run mine a short tunnel was driven from the lowest split of the Baltimore seam, a distance of 129 feet and 7×12 feet area, to the checkered vein $5\frac{1}{2}$ feet thick, from which that seam will be mined to a more or less extent, and there is a large area of it intact.

At the Conyngham shaft, a pair of new fans $17\frac{1}{2}$ feet diameter was erected to supersede the old one, which proved inadequate for the ventilation required in the mine. These fans are of Mr. Scharar's pattern, and are giving satisfaction.

At the No. 5 shaft, Plymouth, a second opening was effected to the workings of the Cooper seam by sinking a shaft thirty feet depth and sixteen feet area, which can be used as an escape for the men in case it be required.

The Susquehanna Coal Company.

This company has under way a number of improvements, some of which are the following: At the Grand Tunnel, the water was pumped out of the old slope workings, with a view of re-opening them and sink a slope to mine the coal lying below these workings, of which a large area lies intact.

A large air-shaft is in progress of sinking for the purpose of ventilating the No. 4 slope and other workings, which was, at the end of the year, 160 feet deep, having an area of 13×18 feet, upon which, when completed, a pair of double fans will be erected to create the ventilation.

At No. 2 shaft, a new slope was sunk from the level of the shaft to a length of 381 feet, and is still in progress of sinking at this writing. It passed through a series of rolls, but is now opening a track of good coal, in which two lifts have already begun to be mined. A new tunnel is also in progress, and has already reached a length of 672 feet, having an area of 7×15 feet, which is destined to open the Ross and Twin veins at that level.

The No. 4 slope is being extended also, and had reached a depth of 318 feet from the old foot at the close of the year.

The Wyoming Valley Coal Company.

This company bought the Albright Coal Company's colliery, formerly called the Ellenwold, and they have pumped the water out of the shaft and are mining the coal from there since. A new fan was also erected on the air-shaft, a description of which can be seen in the table of New Fans in this report.

The Kingston Coal Company.

Another new shaft is in progress of sinking for the Red Ash seam by this company, the size of which is 10×30 feet; and it was down over 200 feet at the close of the year 1882.

The General Condition of the Mines.

During the year 1883, several new collieries began to operate in this district, swelling the list to an appreciable degree, and increasing the inspection work in the same proportion. The Clear Spring colliery began to send coal through the breaker January 3; the Alden colliery began January 18; the Hanover March 10; the Fuller colliery the last week in August; the Schooley breaker started September 3, and the Hillman vein breaker September 28. Beside these, the new breaker at the Lance colliery started to ship coal June 30, and the new breaker at the Stanton mine September 1. Thus eight new breakers are added to the list of this district for 1883. These new collieries are all equipped with the latest improved colliery-plant, and each is starting the operation of mining in good condition.

The ventilation of the Lance, Stanton, and Fuller collieries is largely in excess of the need of the present workings, and evidently it will continue so for some time. The ventilating systems of the other new collieries have not been completely established yet, but I expect it will be efficient when the contemplated work is accomplished.

In the old collieries, the good condition reported last year is generally maintained. A few instances exist where there is sufficient ground to complain, but even in these a slow progress is being made, and I am promised that a more satisfactory condition will soon be effected.

With the large amount of coal mined at present, the workings underground spread out rapidly, requiring extraordinary care in the manipulation of the air-currents to supply an efficient quantity of ventilation at the face of the workings. This is done remarkably well, considering the difficulties of the work.

Some difficulty is experienced in maintaining an effective discipline, from which laxity accidents frequently arise, causing injuries to the workmen which might easily be avoided provided the discipline was more effective.

Events Causing Fire-Damp to Accumulate in Collieries.

Great danger exists when a large body of fire-damp accumulates in a coal-mine, and this danger had to be contended with at three of the collieries of this district for several months in 1883. During the first part of January the pillars of a large extent of workings in the Baltimore slope were crushing and showing the usual signs of an approaching cave, and about five o'clock, A. M., January 25, the expected cave transpired, breaking the strata clear through to the surface, and damaging a number of houses. While the pillars were being crushed, all the hitherto occluded gases were suddenly relieved and evolved into the cavities of the mine, causing the atmosphere of a large area of workings to become explosive. At the same time, from the same cause, the second opening of the **Conyng-ham** shaft was deranged and made for a while unavailable as an escape for the latter colliery's workmen in case of emergency. The ventilation of this mine was also affected, so that a large section of the workings became

full of fire-damp, and it was explosive. Through the extraordinary care of the managers and workmen employed to remove the danger no accident occurred, and the usual safe condition of the mines was finally restored.

On the 27th day of June, again, the Baltimore and Conyngham mines experienced another trouble which complicated the condition of both to a certain extent. During an unusually heavy rain storm a dam located on surface above the Baltimore mines gave way, and the water broke into the workings through an old cave-hole near the outcrop of the seam. A large stream of water poured into the mine for nearly two days, carrying with it thousands of tons of mud, stone, and sand. Two small houses were also washed in, with all they contained, the inhabitants barely escaping. The water was finally stopped by throwing large trees, stones, and bales of hay into the hole. Fortunately this happened early in the morning, when only a few persons happened to be in the mines, and they all escaped without injury. The lowest point in the workings was at the bottom of the Conyngham shaft, and the water filled this shaft to a height of three hundred and forty feet. The mud and débris of all descriptions filled the airways and gang-ways of the Baltimore slope above the level of the water, and prevented the air from traveling its usual courses; consequently all the workings accumulated fire-damp. The cars and roads were torn up and washed down by the rushing streams of water to a heap of rubbish at the lowest points in the workings, making the work of restoring order very tedious, expensive, and dangerous.

By the end of the year, through strenuous efforts, nearly all the useful passages were cleaned out, and the ventilation circulated so as to clear out the fire-damp. But the second opening of the Conyngham was permanently destroyed, and a new one had to be effected through solid coal to another point in the Baltimore slope workings. This work is in progress, but is not yet completed, and evidently two or three months will elapse before it can be effected. Much praise is due to the bosses of these mines and to the workmen for the care and intelligence exercised in the trying, dangerous situations encountered while restoring order in these mines and removing the dangerous gases. During a year of extraordinary dangers, no accidents occurred to any of the persons employed at this perilous work.

During the latter part of March the workings of the old slope of Franklin mines caved and filled with fire-damp, and they have not been able to mine much coal from there since. The sump-pillar in the upper lift was somewhat damaged by the crush, letting the water run to the lowest lift, beyond reach of the pumps; but they have succeeded in removing both water and some of the fire-damp, and they are now at work re-opening the lowest lift, where nearly all the unmined coal is left, and from which it can again be mined. By exercising care and watchfulness, they succeeded in accomplishing the work without any accidents to the workmen, and they are at present comparatively past their peril.

General Condition of the Mines.

Eighty-four openings, including the new shafts and slopes in progress of sinking, were in operation in this district during the year 1884. All of these except eleven produced more or less coal for the market. The underground workings are maintained in about the same condition as they were upon my previous report for the year 1883, excepting that a marked improvement was made in some of the mines in which the ventilation was not then satisfactory. A fan was erected in the West End mine, which improved the ventilation very effectively. The workings are now kept clear of smoke, and are much healthier for the workmen therein. Since the present proprietors began operating the Black Diamond colliery, in Luzerne borough, the colliery has been very effectively improved, and a new shaft is now being sunk upon which a new fan is to be erected to produce a more effective ventilation. I have complained frequently of the ventilation of this mine, but under the old management the required improvements were continually deferred. Now the improvements in progress will shortly bring the mine to a satisfactory condition.

The **Conyngham** and Baltimore Slope mines, both of which were seriously damaged by inundation of water the latter part of 1883, have since been restored to their former order. The second openings, and all matters pertaining to the safety of the men employed therein, are satisfactory.

At the Warrior Run colliery the ventilation, for some time past, was rather small, but they have succeeded in increasing its volume to a small extent by enlarging the outlet air-passages. Now it is in a fair condition; still, the margin is small, and they will have to be watchful, or, as the workings advance, it may soon become inadequate again.

The air-ways in every mine, where practicable, should be made of sufficient area to have the cars follow the miners. The old system of wheeling the coal in a wheelbarrow should be abandoned; it is both laborious and expensive, and the miners very reluctantly drive the air-ways wider than is necessary to pass the wheelbarrow, where such system is in vogue. The inevitable consequences of having small air-ways is a small quantity of air for ventilation.

At the Old Slope Franklin colliery a marked increase of ventilation was effected by making a change in the construction of the outlets of the double fan, and also by enlarging the main air-ways in the mine. This mine is now in much safer and better condition generally than it was at the beginning of the year 1884. Other improvements are contemplated, which, if made, will still enhance the safety and producing capacity of this mine.

The mines of the large companies, those of the Lehigh Valley, Lehigh and Wilkes-Barre, Susquehanna Coal Companies, and Delaware and Hudson Canal Companies, are generally in good condition. I find, though, that even in the mines of these companies the ventilation is conducted through the faces of the workings better in the gaseous mines than in the ones producing no gas. The bosses of some of the mines in which no explosive gases

Delaware and Hudson Canal Company.—A new opening was effected for the **Conyngham** colliery, connecting with the workings of the Baltimore slope, in October, 1887. It provides a convenient escape way for the workmen of both collieries, and makes everybody connected with those mines feel safer in case anything should happen to prevent exit through the main openings.

The No. 2 Baltimore shaft is now at a depth of over 500 feet, and is expected to cut the Red Ash seam at a depth of 670 feet. At No. 3, which is to constitute the second opening, gangways are being driven to open work, and to be ready to ship coal when the main shaft shall be completed.

At the Boston mines the fan at No. 3 was applied to ventilate its workings, and it gives fair results. Still the ventilation of this mine is not satisfactory, but when the air-ways are fully prepared, an improvement is confidently expected.

Susquehanna Coal Company.—At the No. 1 shaft of this company two new underground slopes were sunk, one in the Forge seam and the other in the Buck Mountain. To avoid the trouble arising from the heat radiating from the steam pipes, the hoisting engines are located on the surface, and the ropes pass through bore-holes made for the purpose. Telephones and electric bells are used to converse and give signals.

At the No. 6 colliery, Glen Lyon, a new fan twenty-five feet diameter was erected. The engine is 24"x36", connected directly to the shaft of the fan. It is used to ventilate the workings of the shaft. The second openings for the workings of this shaft are now completed to each of the seams.

Kingston Coal Company.—The new breaker erected at the No. 4 shaft of this company was started to prepare and ship coal in October, 1887, and has been running since. It is one of the largest structures in the district. It is heated throughout by steam, and is equipped with the most efficient machinery.

Delaware, Lackawanna and Western Railroad Company.—At the Avondale colliery a new fan was erected on the new air-shaft. It is an open fan sixteen feet diameter, connected with a horizontal engine by belt gearing. Under a ventilating pressure equal eight-tenth inch of water-gauge it is exhausting 137,600 cubic feet of air per minute. A new opening was made from the lower lift of the Red Ash seam to the Ross. It is a rock tunnel 226 feet long on a grade of 18½ degrees and 7x18 feet area. It opens an extensive field of this coal seam.

The new breaker at the Woodward shafts is nearly completed. Four cages are in operation in the main shaft, and workings are being opened in both the Bennett and Red Ash seams. Second openings are being driven in both seams to connect with the air-shaft.

West End Coal Company.—A new fan was erected on this colliery sixteen feet in diameter and connected directly with the engine. It is

11'x46½'. The engine cylinders are 26"x48", connected directly to a cone drum having a diameter of 10' in center and 6' at the ends.

At the Conyngham colliery a shaft was sunk from the surface to a depth of 93' where it penetrated the Hillman seam. It is equipped with a pair of hoisting engines, drum and cages and makes a second opening for the workings of the Hillman seam. The sectional area of the shaft is 11'x25'.

At the Boston mine the underground engine hoisting from the slope was taken out and another to do the same work was erected on the surface. These are a pair of engines having 22"x48" cylinders, having a parallel drum 7' in diameter attached. The rope passes over a wheel and down through a bore-hole 8" in diameter, incased by a 6" pipe. The slope from which this is hoisting was extended a distance of several hundreds of feet during this year. The temperature of the air in the mine was considerably reduced by the removal of the hoisting engine to the surface, and the condition of the ventilation was much improved.

At the No. 3 shaft a new underground slope was sunk to work coal to the dip from the shaft in the Cooper seam. The hoisting engines were located on the surface and the rope passing down into the mine through a bore-hole. This slope opens a wide range of good coal at a very convenient point to the shaft.

At the No. 5 colliery six new boilers were located at a point convenient for the underground hoisting engines and slope pumps. They were erected on the surface and the steam-pipe passes into the mine through a bore-hole 340' deep.

Susquehanna Coal Company.

In the No. 1 shaft, Lee vein, a tunnel was driven from the Lee to the Ross seam, a length of 1,460'. Its sectional area is 7'x16'. The second opening will be effected by driving opening to connect with the Ross vein workings of the No. 2 shaft.

The underground slope in this mine was extended to a length of 1,030', on an average grade of 6½°, which is the average inclination of the strata. The hoisting plant is located on the surface, and the rope passes down a bore-hole 929' deep. Electric bells are used for signals and a telephone used for conversation between the slope men and the engineer.

A telephone was also placed at the main shaft by which conversation can be held between the footmen and the hoisting engineer.

At the No. 4 slope the main slope was extended through the strata intervening between the Mills and Hillman seams, at a point where a small anticlinal intersected the slope in the Mills seam. The extension was 220' long on a grade of 15°. Second opening was also effected by driving a passage through the rock on a grade of about 30°.

great and then it was abandoned. The men who were underground escaped through the second opening, and soon after an explosion occurred. In about six hours after the cyclone had passed, they had the steam pipes repaired and the fan running again. Soon afterwards the bosses and some workmen, descended into the mine and succeeded in extinguishing the fire before it had done much damage. They considered themselves exceedingly fortunate since the danger had been so great. No one was injured, although there were many narrow escapes. The colliery was idle for about seven weeks until the damage to the tower and breaker had been repaired.

THE CAVE-IN AT THE CONYNGHAM COLLIERY.

On the first day of January, 1890, the workings to the southwest of the No. 1 plane in this mine caved in and completely closed that portion of the mine. They were working the Baltimore seam from a small local basin right under the Lehigh Valley railroad shops; the pillars were fully as large as they were in other parts of the mine, but, notwithstanding that, they began to crumble and yield under the weight, so that in a few days the workings collapsed. A large volume of fire-damp was released and filled the region of the cave; but the officials of the mine were looking for this and had provided for it.

That portion of the mine was not re-opened and, with the exception that provision was made to have the fire-damp removed, nothing has been done since.

THE CAVE-IN AT THE NOTTINGHAM COLLIERY.

On the second day of January, 1890, a portion of the workings of the third and fourth lifts east of the underground slope in the Red Ash seam in this colliery caved in breaking clear up to the surface and causing the track of the Lackawanna and Bloomsburg railroad to sink about two feet below its former grade. An unfortunate feature of this cave was that it opened crevices under the sandy flats west of the Susquehanna river and admitted a large increase of water, which had to be pumped from the lower workings. It has also left a break in the strata, only a short distance from the river, which for all future time will be a weak point, inasmuch as the coal is being mined from under the river in the fifth and sixth lifts adjacent to these caved workings.

This colliery is the property of the Lehigh and Wilkes-Barre Coal Company, and it is the largest producing mine, from one opening, in the anthracite coal region. In the year 1874, when Mr. James B. Davies took charge of the mine, they were not able to produce more than 250 mine car loads per day, but he went to work and re-arranged the foot of the shaft and the tracks leading thereto; made gravity planes to run the coal down from the upper workings, and sunk an underground slope to mine the coal below the shaft level, and made it practicable to produce

bore hole was made to permit the pent-up gases and air to escape so as to allow the water to flood the highest points in the workings. An enormous quantity of explosive gases escaped through this hole, and it kept that part of the mine in a very dangerous condition for several weeks.

On March 21 they commenced to hoist the water out, but in a short time met obstructions which showed that the fire-clay roof had generally fallen in, and this made the work of reopening tedious and expensive. In October a squeeze originated in the lifts above No. 7 which finally caved a portion of the workings of both Nos. 2 and 4 slopes. This complicated the situation in the No. 4 slope so that the work of reopening the lower lift had to be suspended until the airways were reopened through the caves; a work of several months' duration. At the close of the year this had not been completed, but the work was progressing favorably, and although the danger was very great, by the unremitting care of the officials and workmen a condition of comparative safety was restored without an accident.

FIRE IN THE CONYNGHAM COLLIERY.

In December, 1890, the water gained in the pump in the Conyngham shaft and finally reached a height of about 125 feet vertical. By placing additional pumps in the Baltimore slope and using tanks on the cages to hoist water in the Conyngham shaft, in lieu of the pump which was disabled, they succeeded, after many mishaps, in lowering the water to a point about two feet below the roof of the gangway by the 9th day of July, 1891, when, to their surprise, an explosion occurred. The concussion of this explosion was felt by men who were at work in the shaft and also by men who were in the Baltimore slope. It occurred at 7.30 a. m., and for ten succeeding days explosions of more or less force took place at irregular intervals, once and sometimes twice in a day. The cause was a profound mystery, as it was not known nor suspected that a fire existed anywhere in the mine prior to this time. The workings had been filled with fire-damp during all the time the water had caused the ventilation to cease circulating, and yet nothing occurred indicating the existence of a fire.

During the time that the explosions of July occurred, the return air of the Baltimore slope was highly charged with carbonic acid and other noxious gases, and soon after this it became irrespirable and fatal to life.

The air currents were changed so that the poisonous gases were driven down towards the Conyngham fan, in order to make the workings safe for an exploration to ascertain the location of the fire, but the water had caused the roof to fall so that every passage leading to that locality was closed and inaccessible.

On September 15 the return air at the Baltimore slope fan was examined and found to contain 4 per cent. of carbonic acid in a current of about 60,000 cubic feet per minute, and the temperature was above 90°

Fah. This was a decided proof of the existence of a fire, and the direction from which this air came showed that the fire was somewhere west of the line of the Baltimore slope. The Conyngham and Baltimore slope workings are connected at a number of places, and the latter mine has been worked out and abandoned. A large extent of the abandoned workings west of the slope is caved and cannot be examined from above, or from the slope. The Conyngham workings are all below those of the slope on the same dip and are really a continuation of workings towards the dip in the same seam of coal.

The company finding no means by which the fire could be located decided to flood the mine again, and fill it to a height that would beyond doubt cover the fire, a height of about 460 feet vertically.

The writer apprehending danger to the employes of the Hollenback mine if the pillar between the two mines should fail to sustain the pressure, informed the officials of that colliery and cautioned them to keep a careful watch on said pillar.

October 13 the writer, in company with Superintendent E. H. Lawall, Superintendent M. R. Morgans, W. J. Richards, mine engineer, and the mine foreman, Samuel R. Morgan, all officials of the Lehigh and Wilkesbarre Coal Company to whom this colliery belongs, and Mr. William T. Smyth, ex-superintendent, went in and examined the pillar carefully and saw nothing to indicate danger. We walked up the passage C C (see map showing pillar between Conyngham and Hollenback). At this time the Lehigh and Wilkesbarre Coal Company started to bore a hole from the surface to penetrate this passage at the location shown on map, and wash culm down to fill the passages C C and D D with the view of strengthening the pillar.

On November 7 before the hole was finished, the writer examined the pillar again in company with Messrs. Morgan, Richards and C. H. Scharar, mining engineer of the Delaware and Hudson Canal Company, and found the coal cracking as if the pillar was yielding under the pressure of water on the other side. The water was then at a height of 235 feet vertically. At the request of the Inspector the employes of the Hollenback colliery were withdrawn until such time as the two passages mentioned were filled with culm. The Delaware and Hudson Canal Company ceased pouring water into the Conyngham also, until the said passages were filled. The coal continued to squeeze and crack for a distance of about 200 feet between the points A and B and a considerable quantity of water was issuing from the coal at several points.

If the pillar is as wide as the surveys represents it to be, it is strange that a weakness was shown at A to B where the width of pillar is greater than it is from there down. The bore-hole verified the accuracy of the surveys on the Hollenback side, but the cracking and squeezing of the pillar at the points stated, caused more or less mistrust as to the thickness of the pillar shown in the survey on the Conyngham side. The

breasts may have been driven farther than the map shows, or the coal may have run since the breasts were driven, and this would cause the pillar to be less than the width represented at the points where the cracking of the pillar occurred. It was the intention of the Delaware and Hudson Canal Company to have the workings re-surveyed, in order to test their accuracy, but they were prevented by the accumulation of water.

At the close of the year the Lehigh and Wilkesbarre Coal Company was preparing to apply for an injunction to prohibit the Delaware and Hudson Canal Company from filling the Conyngham mine with water, lest it might burst the pillar and damage their property. Additional account of this trouble will be given in the report for 1892.

A DISASTROUS EXPLOSION OF GAS AT No 1 SHAFT, NANTICOKE.

Shaft No. 1 at Nanticoke, is the property of the Susquehanna Coal Company. It is a double shaft having four hoisting cages, two of which are used to hoist the coal from the Forge or Hillman seam, and the other two to hoist the coal from the Lee or Red Ash seam, three hundred feet deeper than the former. The Red Ash seam is known at Nanticoke as the Lee vein, and the Hillman as the Forge vein. The Ross seam lying between these two, is not worked directly from the shaft, but is worked from a horizontal tunnel driven through the overlying rocks from the Lee seam at a point 1,440 feet south of the main shaft. In order to enable the reader to understand the circumstances of this accident, a map embracing the scene of the disaster is herewith furnished. The workings in red are those of the Lee seam and the workings in black are those of the Ross seam, which are connected to the Lee workings by a rock plane and a horizontal rock tunnel, and also by an underground shaft, designated on the map as the Bore Hole shaft. Thus there were three openings connecting the workings of the two seams. The Bore Hole shaft extends from the Ross east gangway to the Lee seam, a depth of 180 feet. It has two hoisting cages; the engines are located on the surface and the ropes pass down through bore-holes to the Ross seam over the shaft. A second opening for this shaft was recently completed, leading down the bottom of shaft and connecting to old workings near the door 3, the vicinity of the disaster, all in the Lee seam. Near the upper end, this second opening enters in the upper member of a lap-fault, while for a distance of about 50 feet a passage was driven down to meet it from 5 to 6 in the lower member of the fault and enters beneath the upper one at a vertical distance of about 12 feet. Connection was made at this point by a short rising passage through the rock (see fault). The passage from above (5 to 6) dipped at a pitch of about 30 degrees towards the fault, and the passage from the shaft up, was rising all the way and had an increased pitch as it approached the fault, terminating at the fault in a rising pitch of about 40

EXAMINATION OF APPLICANTS FOR CERTIFICATES OF QUALIFICATION FOR
THE POSITIONS OF MINE FOREMAN AND ASSISTANT MINE FOREMAN.

The annual examination of applicants for certificates of qualification for mine foremen was held in this district August 5 and 6 at the Union street school building, Wilkes-Barre. The board of examiners was G. M. Williams, Inspector of mines, of Wilkes-Barre; Elmer H. Lawall, superintendent of mines, of Wilkes-Barre; Patrick McGrane, miner, of Sugar Notch, and David W. Thomas, miner, of Plymouth.

Thirty-one applicants appeared for examination, fourteen of whom were recommended for certificates, viz:

David Lloyd Richards,	Wilkes-Barre.
Thomas C. Lewis,	Wilkes-Barre.
William S. Rodgers,	Wilkes-Barre.
John Kelley,	Wilkes-Barre.
John Hunt,	Wilkes-Barre.
Daniel P. James,	Wilkes-Barre.
George Kramer,	Plymouth.
William Benson,	Nanticoke.
George Burleigh,	Nanticoke.
Thomas Ford,	Nanticoke.
Jesse Britten,	Nanticoke.
Frank Thomas,	Plymouth.
John R. Morris,	Plymouth.
Henry H. Beddoe,	Plymouth.

Forty-seven applied for certificates of qualification for assistant fireman and forty-five of them were recommended to have certificates.

The Fire in the Conyngham Colliery.

An account of the fire in the Conyngham mine and of the work done towards extinguishing it to the end of the year 1891, was given in the report of this district for the last year.

The Lehigh and Wilkes-Barre Coal Company filled the two airways parallel with the pillar on their side with culm, and also bored three holes with a view of determining the thickness of the pillar. These three horizontal holes were drilled at points near the one bored from the surface to fill the airways with culm, though the maps show the breadth of the pillar between the workings of the Conyngham and the Hollenback collieries, at this point, to be 95 feet. The first hole was bored a distance of 95 feet in coal, when it entered a bed of slate, and was bored in that again a distance of 59 feet, making total length of 154 feet. The second hole was drilled a distance of 97 feet in coal, and 28 feet in slate. The third was bored a distance of 125 feet all in coal. Neither of the three holes broke through to the water on the Conyngham side, but they satisfied everyone that the pillar is fully as large as

it is represented on the maps. These test-holes were at an elevation of 240 feet higher than the bottom of the Conyngham shaft.

The water in the Conyngham workings was filled to a vertical height of $346 \frac{6}{10}$ feet from the bottom of the shaft, being 106.6 higher than the test holes in the pillar. Considerable water percolates through the pillar into the Hollenback workings, and the cracking noise on that side is supposed to have been caused by the pressure of the water when working its way through the pores of the coal and scaling off the surface. This cracking was moving upwards within a short distance of the level of the water on the other side, and it ceased in a few weeks, so that there was no indication of it. The water is now kept at a height of about 345 feet, and at this height it seals the workings north of the anticlinal running through the workings of the Conyngham mine. When the water was at a height of 310 feet, the fan was started and the mine was cleared of gas as far as practicable, and on March 31, Wm. Armstrong, the mine foreman of the Baltimore slopes, accompanied by his fire-bosses, went in from the Baltimore slope and they were able to go about 200 feet down the No. 7 slope. They found it comparatively clear of noxious gasses, but there was much steam, and a temperature of 110 degrees Fah. Work was started to enlarge the airways and increase the air current. The water has been filled since then to the height of 246 feet, and the temperature has been taken every few days since October 17, 1892, when it was found to be over 130 degrees in the sixth lift. The thermometer could not show higher. November 12 they found the thermometer broken, evidently the expansion of the mercury being greater than the space for it in the tube, caused it to break. November 25 the temperature of the air was 100 degrees, and of the water 98 degrees. The latter part of December the air was 94 degrees, and the water 88, showing that it cools slowly. It is believed now that the fire is submerged or at least confined and sealed in high spaces by the water. The roof and surrounding material had been so intensely heated that it will require a long time for the standing water and the small current of air in circulation to cool it.

EXPLOSIVES USED IN GASEOUS GANGWAYS.

The difficulty of blasting coal and rock in gaseous gangways, so as not to ignite the copious gas-feeders, has been felt in this district for several years. When using the ordinary black powder, which is the best explosive for blasting coal, the gas-feeders are ignited with nearly every blast. In some instances it has caused serious and expensive fires, and this is liable to occur in exceedingly gaseous places, every time a powder blast is exploded.

Dynamite in its various forms is found to be safer and less liable to ignite the gas. It is a mixture of nitro-glycerine with absorbants, such as pulverized silex, silicious ashes, infusorial earth, sawdust or wood

openings on the side of the slope were closed and a hole was bored down from the surface and culm and water was flushed in. In a few days after closing the openings the air became so mixed with incombustible gases that lights were extinguished and then it was considered safe to work in the other parts of the mine.

This is another instance where recklessly using naked lights where common usage suggested the necessary precaution of using only safety lamps, caused the death of the one who was responsible and also caused an endless amount of trouble and expense. It has been demonstrated in this district many times that it is a good rule to not permit a fire boss to carry a naked light at any time, because he is more inclined to take chances than any other employe, owing to his familiarity with the mine.

The Fire in the Conyngham Mine of the Delaware and Hudson Canal Company.

In my report for the years 1891 and 1892, an account of the fire in this mine was given. At the close of the year 1892 the mine was filled with water to a height of 346 feet. Since then it has been pumped out and in the latter part of 1895, finding that all the workings had caved under the effect of the water, the operators put a force of men to clean and re-open the gangways and second opening. An examination of the workings on the head of the gravity plane revealed that the temperature was still several degrees higher than the normal. It could be seen where this heat came from but those parts of the workings were all caved and could not be examined. By the middle of February, 1896, the heat was becoming more intense and the gaseous products of fire began to appear in the returns. Efforts were made to effect openings, so that it could be determined positively that fire was existing.

On August 19 the Mine Inspector, accompanied by Mine Inspectors Hugh McDonald, of the Third district, and Edward Roderick, of the First district, made an examination and were convinced beyond doubt that the caved part of the workings east of the head of the plane was on fire and so reported to the company. The Inspector received a notice on August 24 that the pumps were stopped and that it was decided to fill the mine with water to a height of 400 feet.

By January 13, 1897, the water had filled to a height of 313 feet and the Inspector being apprehensive of danger to the employes of the Hollenbach colliery of the Lehigh and Wilkes-Barre Coal Company, from the pillar between the two collieries giving way under the pressure, notified the officials of that colliery to suspend all work in the Hollenback shaft until the water in the **Conyngham** had reached the required height; they complied by suspending work the next day. (See map of the pillar in report for 1891.)

The Delaware and Hudson Canal Company had a hole bored from the surface to the highest point in the workings, so that the confined gases might escape. A second hole is being bored at present lest one might prove insufficient. The water was filled to a height of 394 feet, when it was concluded to be high enough.

A Fire and Narrow Escape of Men at the Baltimore No. 2, Delaware and Hudson Canal Company.

Between ten and eleven o'clock Monday morning, December 21, 1897, a blast ignited some strong gas feeders in the gangway leading from the bottom of the inside slope of this mine. The miners and others including the mine foreman and fire bosses did all in their power to extinguish the fire, but the water pipe (a newly laid one), did not deliver the water with sufficient force. The air current conveyed the smoke and gases produced by the fire through extensive old workings, and then through all the working places on the inclined plane, which sickened the men who were working on the planes. At about three o'clock P. M. some of the sick men managed to reach the bottom of the planes and reported that all the men were dying up there. The foreman, John Matthews, and two or three other men went up both planes and found one man lying on the gangway insensible. They picked him up, intending to bring him out, but feeling the effect of the poisonous gases, they had to drop him and make their own escape. The air was heavily charged with smoke and noxious gases and they concluded it to be too dangerous to permit anybody to go up the planes, and they resumed the efforts to extinguish the fire. At five o'clock the writer heard of the accident and repaired to the colliery promptly, and in a brief consultation with the officials he decided to split the air-current at a point between the fire and the plane workings, and send the smoke back over the fire into another air-split and send a fresh current up to the plane workings. The conditions were favorable and it was accomplished in about half an hour. The air on the plane improved in a few minutes, and having plenty of help, the men were all carried out alive, but unconscious. There were a number of physicians on the surface who succeeded in restoring all to consciousness. There were fourteen men carried out. One, Mike Kushinski, was very severely burned by his mining lamp setting his clothes on fire, and he died at the hospital a few days after. They were all found lying along the road between the head of the upper plane and their working places. All had fallen while on their way out.

The air current was restored to its former course immediately after the men were rescued. The following morning, after learning that several explosions of gas had occurred in the vicinity of the fire,

they should always be withdrawn when it is seen that their work does not produce the desired effect, and this can at all times be determined several hours before the collapse or final cave-in occurs. In all the caves that occurred in this district during 1896 the men were all withdrawn long before the cave took place. Caves of more or less extent took place in each of the following mines:

In the old workings of the No. 5 colliery at Plymouth a squeeze started in the latter part of 1896 and extended into the workings of the Boston and afterwards into the workings of the No. 3 colliery. On account of this, the Boston and No. 3 were suspended during the month of January, and No. 3 worked only two days in February. Considerable damage was done to both mines, but No. 3 has been re-opened and is now in fair condition.

In July another squeeze occurred in the Baltimore seam workings of the Boston mine, east of the slope. This affected all the work in that seam. The workmen were all withdrawn and they have done no work in that seam since, but they can mine the remaining coal again when needed. In the early part of February a squeeze appeared in the old workings of No. 5 Plymouth which extended down into the workings of No. 2 and affected the two seams. It did considerable damage to the openings, and the company concluded to leave all stand for the present and sink the shaft to the Red Ash seam. They have not shipped any coal from there since April, 1896.

In the Hillman workings of the Conyngham mine the damage done by a squeeze in 1895 was repaired ready for work in the latter part of January, 1896, but it recommenced in July and affected the upper seams so that they did not get in condition to mine coal up to the end of the year.

For the first three months of the year a squeeze was in progress in the workings west of the planes in the Empire mine, but it abated without doing much damage, although quite a large area had closed in. In the latter part of November another squeeze took place in the workings east of the planes. This required the suspension of all work on the planes for the remainder of the year and has caused great loss to the company and the workmen.

The Method of Mining in this District.

The method or system by which the largest quantity of coal can be extracted from a given area of land with the greatest degree of safety to the employes and at the least cost is the desideratum in every coal field.

Coal is too valuable to leave in the earth if it is practicable to extract it. The plan or system which enables the miner to extract the largest quantity, per acre of land, with equal degree of safety is certainly the best and most economical method.

gas to make an air current of 75,000 cubic feet per minute explosive, and kept it so for several weeks, but it gradually lessened until it was exhausted. They have cleared out the gangways and airways of Hillman seam and have been working steadily day and night to open those of the Baltimore seam, but it will take two or three months more to complete it. Extraordinary care was exercised in working, and so far they have been successful, having had not one accident. The work has been extremely dangerous.

The **Conyngham** Mine, Delaware and Hudson Canal Company.

This mine has had a fire in it for several years and was filled with water the second time in an endeavor to extinguish it. On January 14, 1897, the water had filled to a height of 313 feet. The Inspector being apprehensive of danger to the employes of the Hollenback mine lest the pillar should give way, requested that all employes of the latter mine be prohibited from entering the mine until it was considered safe, and the following day work at the mine was suspended. The water was poured into the Conyngham until it attained a height of 394 feet. Two bore holes were drilled to let the pent up gases escape.

On March 2, they started to hoist and pump the water out and the Lehigh and Wilkes-Barre Coal Company was permitted to work in the Hollenback, and started on March 8. By Saturday, September 18, the water was all pumped out and early in November evidence of the existence of a fire became noticeable again. A wide extent of the workings are caved, breaking down all to the surface and the fire lurks somewhere in the heart of the cave. On November 13 a current of noxious gases and steam that came out from the cave had a temperature of 100 degrees F., which at this writing has risen to 150 degrees.

Having flooded the mine with water twice and failed, they are now flushing culm in to fill a circuit of old workings around it, so as to shut the air entirely off and have it so isolated that it cannot do any injury. At this writing they are flushing the culm in at three points, viz: At the Baltimore air shaft, at one of the bore holes and at the Conyngham shaft. It is hoped and believed that this plan will have the effect of extinguishing the fire.

The Hillman, Kidney and Bowkley seams of the Conyngham are worked from the No. 2 shaft. This was idle for the first eleven months of 1897 owing to a squeeze which had taken place in 1896. Work was resumed there at the beginning of December, 1897. The mine was inspected December 10 and found restored to a satisfactory condition. The ventilation was ample and the gangways and breasts were well secured with excellent timbering work.

Fourth Anthracite District.

(LUZERNE COUNTY.)

Office of Inspector of Mines,
Wilkes-Barre, Pa., February 15, 1899.

Hon. James W. Latta, Secretary of Internal Affairs, Harrisburg, Pa.:

Sir: I have the honor of presenting herewith my report as Inspector of Mines for the Fourth anthracite district for the year 1898.

It contains tables prepared as required on the blanks formulated in the office of the Bureau of Mines, an article describing a mine fire in the Alden Coal Company's No. 2 shaft, and a brief record of lessons derived from mine fires in this district during the last eighteen years.

The mine fire in the **Couyngham** mine of the Delaware and Hudson Canal Company was isolated by flushing the surrounding workings with culm. This was completed by September 9, 1898, since which time no indication of the existence of fire has been discovered.

The effects of flooding the South Wilkes-Barre shafts to extinguish a fire have been repaired and all the explosive gases have been expelled from the workings.

A brief report of inspections of mines and of the condition of the mines when inspected, together with a record of work for every day, also a copy of the report and description of every accident that occurred during the year was sent to the Chief of the Bureau. My remarks on the condition of the mines and on mine accidents in the report for the year 1897 will be as appropriate for 1898, and it is not necessary to repeat them.

I deeply regret that the number of accidents has been increased in 1898. The fatal casualties were 75 against 60 in the year 1897, and the serious non-fatal accidents were 278 against 269 in 1897. The tons of coal produced per life lost was 104,883 against 124,290 in 1897. The only explanation for this is that men become less watchful during intermittent work than when working continuously, and a much poorer class of miners is now employed than ever before.

The average number of days worked was 143.27 against 133.92 days in 1897.

The total production was 7,866,277 tons against 7,457,418 in the year 1897.

Yours very respectfully,

G. M. WILLIAMS,

Inspector of Mines, Fourth Anthracite District.

(99)

PA Mine Inspection 1898

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.

Wanamie Colliery.—Tunnel top to bottom split, Baltimore, 44 yards. Tunnel Red Ash to Ross, 85 yards.

Maxwell Colliery.—Opening Red Ash vein in deep shaft. Two tunnels from bottom to top split Red Ash vein, each 30 yards. Remodelled portion of breaker and installed jigs. Two hundred and fifty horse-power Babcock & Wilcox boilers installed.

Improvements by the Delaware and Hudson Company During the Year 1900.

Baltimore Slope—Sinking No. 5 shaft, which is the old Meadow shaft, enlarged from 9 feet 6 inches x 19 feet to 12x28 feet from surface to Baltimore vein, 385 feet. This shaft will be continued in solid, same size to Red Ash vein.

Baltimore No. 2.—No. 6 slope, in Red Ash vein, sunk 700 feet, operated by 10x12 inch engines, with air, only temporary.

Washery relieving breaker and saving small sizes. Refuse is taken down a new 10-inch bore hole 530 feet deep to Red Ash vein.

Baltimore Tunnel.—No. 6 slope, Red Ash vein, extended 800 feet, with a total depth of 1,400 feet.

No. 10 plane completed 3,300 feet, and is operated by pair of 16x36 inch engines, the rope running through bore hole 132 feet deep. New engine house, brick, 20x40 feet, for No. 10 plane engines.

Conyngham.—No. 6 plane, in Abbott vein, now up 1,450 feet.

No. 2 slope, in Baltimore vein, down 900 feet, completed.

Rope haulage operating No. 6 Abbott and No. 7 Kidney planes and delivering coal to foot of No. 1 Hillman slope. Operated by 14x30 inch engines, located on surface, ropes running through 8-inch bore hole, 477 feet deep, to Hillman vein. Haulage is 4,750 feet long.

Plymouth No. 1.—This shaft is completed to the Bennett vein. Plymouth pumping plant.

Another pump room, 22x54 feet, stone side walls and brick arch, is completed.

A compound pump steam cylinder, one 26-inch and two 38-inch, with three plungers 11x48 inches, built by the Dickson Manufacturing Co., has been set up, and will soon be in running order. This pump has a capacity of 3,000 gallons per minute.

New fan 10x28 feet, brick house 48x48 feet.

Fan driven by two engines, 16x36 inches, to ventilate Plymouth No. 2, Red Ash vein.

Plymouth No. 2.—New set hoisting engines, 26x48 inches, with half cone drums. Engine house brick, 42x38 feet.

Washery, relieving breaker and saving small sizes; refuse is taken down a new 10-inch bore hole, 600 feet long, to Bennett vein. No. 13 tunnel to top split in 200 feet; still driving.

A second opening from the Five Foot to the Stanton seam, for the purpose of ventilation.

Wanamie No. 18.—Erection of ten double blocks of houses for the use of employes.

A return airway from the Red Ash to the Ross seam at No. 19 Slope, for the purpose of ventilation.

Maxwell No. 20.—Erection of a forced fan draft system in shaft boiler house.

Erection of new engine house, and installation of one pair of 24"x48" double drum friction engines for operating No. 6 Baltimore Slope and No. 7 Red Ash Slope.

Improvement by the Lehigh Valley Coal Company During 1902.

Dorrance Colliery.—An 18 degree rock plane, 375 feet in length, for haulage, has been driven from the Baltimore to the Five Foot seam. Also, a 30 degree rock plane, 225 feet long, for a second opening.

A slope has been extended in the Hillman 300 feet from the crown of the Cemetery anticlinal into the North basin.

A battery of six return tubular boilers of 150 horse power each. The boiler house has been equipped with duplicate feed pumps and forced draught fans.

The tower over the main hoisting shaft was rebuilt.

Franklin Colliery.—No. 8 Slope in top split of Red Ash seam was extended 310 feet, and a rope bore hole, 340 feet in length, completed from the surface to the head of the slope.

The bottom lift, Red Ash gangway, has been reopened for the extension of the unfinished tunnel to the Ross seam.

The head frame and fan at Red Ash second opening have been rebuilt.

A washery is under construction for the preparation of coal from the culm banks.

Conyngham.—No. 4 tunnel, 348 feet long, driven from Abbott to Snake Island seam.

No. 5 tunnel, 108 feet long, driven from Abbott to Snake Island seam.

Three-inch drainage bore hole, 314 feet deep, from Hillman sump to Baltimore seam, to drain water to shaft sump.

Baltimore No. 5.—An entirely new colliery plant, known as Baltimore No. 5, including a 2,000-ton breaker, was built during 1901, and began operations January 1, 1902. This plant prepares the coal from Baltimore tunnel and Baltimore No. 2 workings, which latter breaker was burned on January 26, 1901. The coal is transported overland to the breaker, on a surface railroad, also built

New slope in Ross tunnel No. 6 unfinished. New tunnel slope No. 6, Ross to Ross, unfinished. Shaft No. 7 sunk 40 feet, concreting to rock and permanent engine and head frame foundations completed.

DELAWARE AND HUDSON COMPANY

Conyngham

No. 4 tunnel driven from the Abbot to Snake Island vein, 325 feet.

No. 5 tunnel driven from the Abbot to Snake Island vein, 100 feet.

No. 6 tunnel driven from the Abbot to Snake Island vein, 150 feet. The Abbot vein slope No. 4 was sunk a distance of 900 feet. Hillman shaft recribbed from rock to surface, and new head frame and house built.

DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

Auchincloss No. 2 Shaft

A tunnel 7x12 has been driven from the Baltimore vein for the purpose of the development of the Hillman vein. Auchincloss No. 2 shaft.—The Baltimore vein has also been connected by a short tunnel to the Hillman vein for ventilating purposes.

Bliss Mines

The southwesterly side of this breaker was entirely reconstructed and improved upon by the installation of new shakers, belt conveyors and spiral slate pickers. A tunnel 7x12, 396 feet long, was driven from the Red Ash vein to the Ross vein for ventilation and haulage. One 10 ton electric locomotive was installed in the Ross slope, Espy tunnel, doing away with mules on this lift. A small 10 foot fan was located on the Forge vein for ventilation.

Truesdale

This is a new opening or operation. They are putting down at this location two shafts to be known as No. 1 and No. 2 Truesdale shafts. No. 1 will be a four compartment shaft, one pump way, two hoist ways and one airway, 45 feet 2 inches by 14 feet in the clear. No. 2 shaft will have two hoist ways and one air and will be 37 feet 2 inches by 14 feet in the clear. Operations have also been started to sink a slope to the Mills vein, a distance of 1,500 feet to the basin. They have also opened an old tunnel, known on geological survey maps as the Holland tunnel, and already gangways are being driven east and west to what is known as the Forge vein in this locality. The outside appearances of the collieries have been improved by the use of mineral paint and whitewash.

RED ASH COAL COMPANY.

Colliery No. 1

One 12 and 18x8x18 compound noncondensing duplex plunger Jeanesville pump.

DELAWARE AND HUDSON COMPANY

Conyngham Colliery.—A crusher plant has been installed at a flush hole at this colliery to crush the refuse from the breaker for flushing into the old workings.

Mine Foremen's Examinations

The examination of applicants for certificates as mine foremen and assistant mine foremen was held at Wilkes-Barre June 15 and 16.

The members of the board of examiners were: James Martin, Mine Inspector, Francis H. Kohlbraker, Superintendent, Patrick Fisher, miner, and Benjamin Williams, miner.

The successful applicants were:

Mine Foremen

Sidney Buckingham, Plymouth; Neil Sweeney, Plymouth; John W. Pritchard, Edwardsville; John P. Martin, Pittston; Arthur D. Evans, Nanticoke; Henry E. Miller, Maltby; John Johnstone, Christopher; Josiah H. Rogers, Plymouth; Collins Rundle, Forty Fort; Hugh E. Hughes, Peely; Jonah Roberts, Plymouth; Evan S. Morgan, Nanticoke; William Davis, Nanticoke; Rosser Mainwaring, Plains; Shadrach Dodd, Edwardsville; William S. Davis, Nanticoke; Thomas Davis, Sugar Notch; Reese Hammonds, West Pittston; Elmer E. Jones, Parsons; Frank Jones, Wyoming; John H. Corbitt, Edwardsdale; James Waters, Wyoming; John J. Morris, Forty-Fort; Thomas L. James, Wilkes-Barre; David Howells, Parsons; A. G. Hilbert, Plains; James F. Moran, Parsons; John D. Evans, Nanticoke; P. A. Grady, Ashley; William J. Walters, Nanticoke; Albert Buchman, Wyoming; William X. Jones, Nanticoke; George F. Miller, Maltby.

Assistant Mine Foremen

Elmer E. McQuown, Pond Hill; George Hopper, Glen Lyon; John A. Pritchard, Edwardsdale; Alonzo Russell, Shickshinny; Charles L. Kline, Pond Hill; Peter Gorham Ashley; Joseph Morris, Wanamie; Michael Needham, Miners Mills; Griffith Griffiths, Wilkes-Barre; David J. Thomas, Wilkes-Barre township; John J. Bridle, Pond Hill; John W. Tilley, Lee Park; Thomas I. Evans, Wilkes-Barre; Richard M. Evans, Lee Park; William H. Jenkins, Edwardsdale.

CONYNGHAM DISASTER

Shortly after 6 o'clock A. M. April 26, ten men were killed at the Conyngham colliery of the Delaware and Hudson Company, by the breaking of the rope in the shaft in which the men are lowered to and hoisted from their work. Several cage loads of workmen had already descended to their work. These ten men in their turn stepped upon the cage. The cage had just about reached the Hillman landing where most of them intended to get off. The engineer had slackened the speed and was about to stop when the rope parted. The safety catches failed to work and the cage dropped to the bottom of the shaft, a distance of about 400 feet.

The engineer in charge of the engine at the time was William Cunningham, a man of many year's experience as an engineer. He said that all went well until he was about to stop the engine, when he felt a jerk on the engine, and the rope, which is usually drawn taut by the weight of the cage, hung slack. He knew instantly that something was wrong. A few moments later word came up through the speaking tube from the footman that the cage with its load of human freight had struck the bottom with a terrific crash. A rescuing party of officials and workmen labored for several hours before they finally succeeded in extricating all of the bodies from the tangled mass of wreckage.

The question arises, why did the safety catches on the cage fail to work? I must say that I was greatly deceived in them. At the Delaware shaft of the Delaware and Hudson Company, where I was foreman for a number of years, the same kind of safety catches was used upon the cage. I had often seen them tested and they never failed to work satisfactorily.

These safety catches were what are called the quadrants. They are made of brass, with a row of teeth around the outer rim. They are adjusted by means of rubber springs through which the draw-bolt on the cage passes. If the rope breaks or becomes detached from the cage, they are supposed to wedge and grip tight upon the guides in an instant. There are four of these quadrants on each cage, or two to each guide, opposite each other.

Why they did not grip the guides and hold the cage on the morning in question is in my opinion due to one of two causes:

1st. That the safety catches on that cage were out of order at the time of the accident; or,

2nd. If they were not out of order, they were not safety catches such as the law requires that will be effective under any condition that may arise in hoisting shafts.

As to the first condition, we have the sworn testimony of John Moore, carpenter, and Thomas Ruddy and Harry Mills, engineers, whose duty it was to examine and keep in good order these safety catches, that they had examined them and that they were in good working condition.

As to the second condition, it was shown by the testimony of Mr. Thomas, who was looking at the cage as it was coming to the Hillman landing, that when the rope broke, the cage disappeared in an instant, showing conclusively that the safety catches failed absolutely to act. The guides at the point where the cage was when

the rope broke were in good condition, but they showed no signs of the safety catches having taken hold of them. This was a surprise to us all.

After the accident a great many opinions were expressed by different persons as to why the catches failed to work. The opinion most expressed was that the piece of rope hanging to the cage had held the catches taut and therefore they could not grip the guides as their inventor intended they should. If this theory be true then it must be acknowledged that the safety catches are not equal to all emergencies that may arise in our shafts.

I had intended, after being notified by the Chief of the Department of Mines, to test all the cages in the shafts in my district, and to test some of them under about the same conditions as prevailed at the Conyngham shaft at the time of this accident, namely, to drop a cage when several hundred feet of rope were attached to it. But when I spoke to some of the superintendents about doing this they were loath to do it. They felt that it would not be right for me as a Mine Inspector to cause them any more trouble or expense than operators were subjected to in other inspection districts. I had to acknowledge that their point was well taken, and as I had no authority to compel them to furnish pieces of rope of different lengths, I was compelled to abandon my idea of making such tests. The problem whether a piece of rope attached to the cage and falling with the cage will hold the safety catches taut and prevent them from taking hold is so far as I know at the present time unsolved.

Since this disaster, I doubt whether superintendents, foremen and intelligent mining men generally believe that if a cage loaded with men were descending a shaft and the rope were to break, or the cage become detached, the cage would stop in its descent.

In my experience in testing safety catches, I have found that if the cage does not stop the very instant it is cut loose it generally goes to the bottom. There seems always to be a reason for this. Sometimes something about the catches breaks, or the catches having small teeth get filled up with wood from the guides, or pieces break out of the guides, and when this happens the cage gets a start and generally lands upon the bottom.

After the above explanation of my experience in testing the safety catches, it will be seen how unlikely it would be for a heavy cage loaded with men going down some of our shafts as fast as they do sometimes, to be caught by the safety catches. In my opinion it seems nearly impossible for the reason that the heavy weight and the momentum of the cage going down would cause something to break or give way.

Even if the catches did hold fast and the cage stop suddenly, the result to the men would be the same as if the cage had struck the bottom hard. The chances are that they would all be injured or possibly killed by being thrown off the cage into the shaft. It is evident that all the dangers to which we are subjected in going up and down our hoisting shafts are not eliminated by the safety catches.

I have no wish to create any unnecessary alarm among mining people. Some of the safety devices now in use are the best that the market affords, but the question arises: Are they given proper attention? Every person whose duty it is to look after them should

do so without fear or favor, and according to law. If he does this he should have nothing to fear, but on the contrary he should have the thanks of his employers and of the men who must ride upon the cages.

The two best safety devices are:

1st. To always keep good ropes in shafts where men are hoisted or lowered. 2nd. To employ good and careful engineers, and not allow them to be overworked, men, who when hoisting or lowering men will run their engines as the law requires. If these two safety devices were adopted, there would scarcely be an accident of this kind.

The officials in charge of the mine always sincerely deplore any serious accident. The Mine Inspectors also regret them exceedingly and sympathize with the victims and their friends. But regret and sympathy amount to nothing to the victims, or to widows and orphans. What is needed is more strict oversight. If the provisions of the mine law were carefully followed, as the law intended they should be, there would be fewer accidents.

Take for instance the accident at the **Conyngham**. It shows plainly that the law had not been fully complied with, for what reason I am unable to explain. There were four men, three engineers and one carpenter, delegated by the foreman to look after the ropes and cages in this shaft. At the inquest, three of these men swore that they had examined this particular rope on the day before the accident, and that they could not see any broken strands in it. Yet when the rope broke the next day, there were numerous broken strands to be plainly seen on both ends back along from where the rope parted. I do not think that all of these broken strands had been broken between the time of their examination and the accident. It seems to me that these broken strands must have been visible to any one examining the rope for several days before the accident, and if they were, then all of those men whose duty it was to examine the rope and report its condition to the foreman, failed to do their duty, both to themselves and the company employing them, and also to the unfortunate victims and others who were compelled to ride upon this cage.

The only explanation that I can give as to why these men did not see those broken strands was, that they did not examine it as carefully as they should, and the reason they reported it in good condition, was that they took it for granted that as it was used only to lower and hoist men there would be no danger of it breaking. Of course this is only my supposition and I may be wrong.

I was sick at the time of the accident, and told them to notify Mine Inspector P. M. Boyle, who would assume my duties in the case. Mr. Boyle arrived at the colliery a short time after the accident and assisted in getting the bodies out. He notified Coroner Dodson to hold an inquest. There were several sessions before all the testimony was secured.

The verdict was as follows:

Verdict of Coroner's Jury

We, the jury, do say, that from the circumstances connected with this case and the evidence, that Frank Royal came to his death from being hurled down the shaft of the Conyngham mine, in North Wil-

kes-Barre, of the Delaware and Hudson Coal Company, on April 26, 1905, owing to the breaking of the rope and the dogs not working while the cage was descending. We are unable to determine from the evidence the cause of the breaking of the rope. We further find from the evidence given at the various hearings that the company had incompetent men to inspect this rope. We, the undersigned jurors, recommend that the company adopt some other method than the one now in use for testing the dogs, as the present method has proved inadequate. We further recommend that engineers, where men are to be lowered or hoisted, be required to be on duty but eight hours at one time, and we heartily approve of the method of employing engineers as recommended by Mine Inspector Martin in the Wilkes-Barre Record of February 28, 1905.

D. W. DODSON, Coroner.
 JACOB EVANS,
 JOHN CRAWFORD,
 FRANK CASTERLINE,
 THOMAS P. WILLIAMS,
 CHARLES CUNNINGHAM,
 JAMES HALL,

Jurors.

CONDITION OF COLLIERIES

The condition of the collieries in this district is good in regard to ventilation, except in a few instances.

It seems as if some foremen do not consider that it is necessary that all parts of a mine should be kept in good condition, especially as to ventilation. I have often found fault with the ventilation, but of course the foremen always have some excuse to offer, such as: "We expect to get a certain heading through so that the air will be better;" or, "The doors have been left standing open somewhere, which affects the ventilation badly. They know, however, that they have no one to attend to the doors properly. Numerous other excuses are also offered.

In my opinion it should not be necessary for any foreman to make excuses for the proper ventilation of any part of a mine, as required in Article 12, Rule 3, of the Anthracite mine law.

The mine foreman under this rule has charge of all matters pertaining to ventilation, and the speed of the ventilator is particularly under his charge and direction; and any superintendent who shall cause him to disregard the provision of the law shall be amenable in the same manner as the mine foreman.

IMPROVEMENTS

LEHIGH AND WILKES-BARRE COAL COMPANY

Hollenback No. 2 Colliery

Outside—Brick oil house; brick power house.

Inside—No. 18 Tunnel Red Ash to Top Red Ash; No. 19 Tunnel Red Ash to Top Red Ash.

DELAWARE AND HUDSON COMPANY

Baltimore Slope.—A washery is being erected to clean the old Baltimore slope bank.

Baltimore No. 2.—Number 7 Slope extended 475 feet and completed in Red Ash vein.

Number 9 Slope extended 1,500 feet in Red Ash vein.

Baltimore Tunnel.—Number 6 Slope in Red Ash vein extended 200 feet.

Baltimore No. 5.—Number 1 Slope Red Ash vein extended 900 feet and finished.

Conyngham.—Number 7 Tunnel from Hillman vein to Main shaft was finished 496 feet long. This is a new landing in shaft. All coal from upper veins will be handled here and the Hillman shaft abandoned.

Number 9 Plane Baltimore vein extended 350 feet.

Number 10 Plane Kidney vein extended 275 feet.

Number 11 Plane Abbott vein extended 250 feet.

Number 12 Plane Abbott vein extended 375 feet and 6 inches.

Rope hole put down a depth of 92 feet for operation of these veins.

New head frame over Main shaft and pair of 26x48 inch first motion engines installed in new brick engine house.

Old frame fan house partially rebuilt of brick.

A rock tunnel has been finished from the foot of shaft to Stanton vein 475 feet total distance, and 423 feet of this was driven in 1906. Size 7x16 inch.

Slope was driven down on Stanton Vein a distance of 600 feet in 1906, 7x12 inch.

Mine Foremen's Examinations

The examination of applicants for certificates of qualification as Mine Foremen and Assistant Mine Foremen was held June 19 and 20.

The board was composed of James Martin, Mine Inspector, Francis H. Kohlbraker, Superintendent, and Thomas Finn and Felix Wisniewski, Miners.

The following applicants were granted certificates:

Mine Foremen

Peter J. McDavitt, Howard F. Reilly, Bernard F. McGrane, Peter McGovern, Thomas R. Gambold, Osborne Morgan, Thomas Holton, Anthony Jones, John J. McAndrew, John B. Corgan, David M. Stanton, George Hopper, Elmer E. McQuown, Jenkin Thomas, Evan W. Bryant, John D. Davis and Jenkin Evans.

Assistant Mine Foremen

Jesse Henson, John J. Cassidy, William Connell, Joseph Dzialowski, Mortimer H. Watson, Henry Smith, Patrick H. Duffy, James Lindsay, Walter A. McGuire, John Donnelly, Lewis Morgan, John H. Williams, Edward Sterling, William H. Evans, John F. McTague, Daniel Howells, Edward Tredinnick, Richard Richards, Stephen Zapka, Caspar Urbanak, William V. Roberts, Harry Adams, William Llwellyn, Thomas George, John F. George, Charles Balcock, William H. Evans and Ambros Griffiths.

Inside.—Rock Plane airway Kidney to Abbott.
 No. 19 Tunnel extended to Abbott.
 Inman No. 21 Colliery.—Sinking Baltimore and Red Ash shafts.

DELAWARE AND HUDSON COMPANY

Baltimore Slope.—Washery completed and in operation.
 Baltimore No. 5.—New breaker erected to take place of one destroyed by fire, February 7, 1907, breaker now in operation.
 An 8x6 bore hole driven from surface to Red Ash vein, 950 feet for the conveyance of electric wires.
 Baltimore No. 2.—No. 9 Slope Red Ash vein, driven 200 feet and completed.
 No. 10 Slope Ross vein opened and driven 600 feet.
 No. 11 Slope Ross vein opened and driven 600 feet.
 Baltimore Tunnel.—No. 6 Slope, Red Ash vein extended 600 feet.
 Top split Red Ash vein opened on 5th and 6th.
 East.—No. 6 Slope, Bottom Red Ash vein.
 Conyngham.—No. 11 plane, Abbott vein, driven 50 feet and completed a 10" bore hole from Baltimore to Red Ash vein, driven 348 feet for water.

WILKES-BARRE AND SCRANTON COAL AND IRON COMPANY

Hillman Mine.—The slope in Stanton vein was extended 579 feet. The Slope airway Stanton was extended 579 feet.

Mine Foremen's Examinations

The examination of applicants for certificates of qualification as Mine Foremen and Assistant Mine Foremen was held on the 14th and 15th of May, at the Y. M. C. A. Building, Wilkes-Barre.

The Board of Examiners was Thomas H. Price, Inspector of Mines; F. H. Kohlbraker, superintendent; Thomas D. Lloyd and Patrick McGrane, miners. The following applicants were recommended for certificates:

Mine Foremen

Andrew Peterson, William Owens, Wilkes-Barre; Alfred B. Taylor, John C. Hermansen, Alden Station; Patrick Shovlin, Plymouth.

Assistant Mine Foremen

Henry Lewis, Morgan P. Harrison, Lewis R. Thomas, William D. Thomas, Plymouth; John R. Owens, Westmoor; Edward W. Davis, Wilkes-Barre; David Lloyd, Plymouth; Benjamin G. Griffiths, Sugar Notch; David H. Walters, James B. Flammery, Nanticoke; William L. Richards, D. J. Edwards, Edwardsville; Daniel Davis, Kingston; James Bryan, Alden Station; Thomas Price, Peely.

New return air course in Baltimore between Hillman and No. 1 levels completed.

Diamond drill provings in Drift level. Silting operations in Rock Slope and Baltimore vein district.

Warrior Run, Outside.—Back switch head on No. 1 or Buck Mountain slope; engine plane and tippie to dump mine cars into railroad cars for transportation to Seneca colliery for preparation.

Boiler fuel conveyor line for washery.

Crusher and conveyor line to reclaim culm bank south of breaker.

Ash and rock bank fire confined to harmless territory. Two shafts and two churn drill bore holes and 2 crushing outfits were necessary to accomplish this. Diamond drill proving for overlying veins.

Inside.—Reopened "D" vein on outcrop.

Reopened "C" No. 1 Lift, east.

Reopened "F" No. 3 Lift, east.

New slope in "C" No. 2 west to north dip.

Telephone communication throughout.

Silting operations in South and North basins.

DELAWARE AND HUDSON COMPANY

Conyngham.—Shaft retimbered and relined.

Baltimore No. 2.—No. 10 Slope, Ross Vein, extended 825 feet to limit and completed.

No. 11 Slope extended to limit of property, a distance of 200 feet.

No. 8 Plane graded and driven 410 feet.

Baltimore No. 5.—Hole for slushing refuse into mines drilled to depth of 739 feet.

MINE FOREMEN'S EXAMINATIONS

The examination of applicants for certificates of qualification as mine foremen and assistant mine foremen was held May 19 and 20, at the Y. M. C. A. Building, Wilkes-Barre.

The Board of Examiners was composed of Thomas H. Price, Inspector, F. H. Kohlbraker, Superintendent, Thomas D. Lloyd and Patrick McGrane, Miners.

The following persons passed a satisfactory examination and were granted certificates:

Mine Foremen

Edward W. Davis, Charles Enzian, James Stevens, Wilkes-Barre; James Gallagher, Pittston; Lewis R. Thomas, John B. Magee, Henry R. Kettle, David R. Jones, Plymouth; Henry H. Hughes, Wyoming; James C. Wallace, Dorranceton.

Assistant Mine Foremen

Thomas Beynon, Bernard Conyngham, William R. Davis, Charles Hammonds, William R. Humpleby, Peter Johnson, John N. Jones, David Werner, Wilkes-Barre; Henry Carver, David S. Jones, David

DELAWARE AND HUDSON COMPANY

Baltimore No. 5 Colliery

Baltimore No. 2.—No. 8 Plane Ross vein was extended 400 feet.

Baltimore No. 5.—A 16-inch bore hole 750 feet in depth was drilled to the Red Ash vein for pumping.

Two boilers of 250 horse power were added to the steam plant.

Baltimore Tunnel Colliery

A new boiler plant containing 3 boilers of 375 horse power was built to replace the old cylinder boilers near No. 4 shaft.

Conyngham Colliery

An air shaft 25 feet was sunk from the surface to Abbott vein. The Baltimore hoisting shaft was retimbered.

The Baltimore vein sump was enlarged 600 feet in length and a concrete dam built between it and shaft.

The two shafts being sunk by the Delaware, Lackawanna and Western Railroad Company, at Parsons are progressing very successfully, and Pettebone No. 3 has reached a depth of 515 feet and No. 4 shaft 393 feet.

The trestle work connecting these shafts with the Pettebone breaker, on the west side of the Susquehanna river, at Dorranceton in the 8th District, is about completed.

It is the intention to stop sinking operations in the main shaft when the Cooper vein is reached. The work of development will then be proceeded with in this seam and the upper seams, and the shaft sunk later from the Bennett vein to the Red Ash vein by a bore hole connection from the Cooper to the Bennett vein.

DELAWARE AND HUDSON COMPANY

Baltimore No. 5 Colliery.—Placed 68 I beams 15 by 24 inches at head of No. 1 slope in the Red Ash vein for roof support.

Installed a triplex 12 by 12 inch single-acting electric pump in the Red Ash vein.

Conyngham.—Completed 6 by 8 inch bore hole 607 feet, from surface to Hillman 8 inch and Hillman to Baltimore 6 inch, to slush culm from Baltimore No. 5 breaker to the Conyngham workings.

Completed 8-inch cast iron pipe slush line 1,375 feet long, Baltimore No. 5 breaker to bore hole; 6-inch bore hole 274 feet long for drainage from Hillman to Baltimore vein, and concrete pump room 15 by 22 feet at foot of Conyngham shaft in Red Ash vein.

Installed electric triplex 12 by 12 inch single acting electric pump in Red Ash vein.

Installed 7 by 20 foot Jeffrey fan in Conyngham main shaft.

Baltimore No. 2.—Completed concrete pump room 20 by 24 feet at foot of Baltimore No. 2 shaft in Red Ash vein.

Installed electric triplex 12 by 12 inch single acting pump in Red Ash vein.

Completed 540 feet partition wall in shaft, 12 inches by 14 feet, from Red Ash to surface cribbing.

WILKES-BARRE ANTHRACITE COAL COMPANY

Hillman Vein Colliery.—Completed tunnel from Kidney to Abbott, and started second opening. Slope driven in Kidney to open coal in upper lifts.

In the Stanton vein a slant slope was driven across pitch from 3-W to 4-W and now is being driven down to Basin.

3-½ West gangway driven to connect Baltimore tunnel to Stanton slope.

In the Baltimore vein a second opening from Baltimore to Stanton vein was completed. Drove straight slope 700 feet to north line of the property.

Commenced driving slant slope east from Straight slope. Installed 100 H. P. 4 stage centrifugal pump in pump lift and 35 H. P. triplex pump at No. 4 west.

Outside: Installed 3 batteries of boilers, 400 H. P. each, on old foundations of boiler house and emergency pump in boiler house.

Sank two bore holes from surface to Hillman vein about 60 feet each, to be used for slushing to bottom of shaft.