

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 125,800; 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 16,000 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 toping, 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—8=714 cubic feet. The Biram instrument indicated  $v = 598.33 \times .97 + 47 = 627$  cubic feet.

Area  $57.375 \times \sqrt{627} = 35,954$  cubic feet per minute.

Area  $57.375 \times \sqrt{714} = 41,054$  cubic feet per minute.

The water gauge on main gangway door, about 300 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=88,504 cubic feet of air per minute  $\times$  by the water gauge,  $.25 \times 5.2 + 83,000 = 1.516$  P.

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

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

Lbs. per horse power per hour.

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

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

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

EFFECTIVE POWER.

	Coal consumed per fortnight.....	Coal consumed per 24 hours.....	Coal consumed per hour, average.....	Coal consumed per horse power per hour.....	Horse power in shaft at bottom of shaft.....	Cubic ft. of air per minute,	Water gauge at bottom of shaft.....
	Tons.	T. cwt. qr. lbs	Lbs.	Lbs.	H. P.	Cubic feet.	Inches.
Furnace.....	98	6 17 0 16	640	101.75	6.29	36,350	1.1
Fan.....	62	4 8 2 8	413	19.82	20.63	64,700	2.05

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

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

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

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

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

## 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,  $1\frac{1}{4}$  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, 3 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.

six hundred feet. The sectional area is  $8 \times 12$  feet; gradient, fourteen degrees. These slopes are intended to maintain the present production of the colliery.

**Butler Coal Company.**

At the **Boston Colliery**, two tunnels were driven from the Red Ash vein to Red Ash, a distance of four hundred feet; one tunnel to transport coal, the other for ventilation. They have, likewise, sunk two slopes on same vein, one six hundred and fifty feet, the other one hundred and fifty feet, which open up some good coal for this company, as some time ago this colliery was considered to be worked out.

**Butler Coal Company.**

At the Butler Colliery a new slope was sunk on the Pittston vein, a depth of one hundred and fifty feet, for the purpose of robbing or taking the pillars out.

**Haddock & Steel.**

A new air-shaft was sunk by this company from the surface to copper vein, a distance of one hundred and sixty feet. Size of shaft,  $16 \times 16$  feet. A new twenty-foot Guibal fan was erected thereon; face of fan, eight and one half feet. Two side inlets, diameter eight and one half feet, working speed sixty revolutions per minute, giving ninety thousand cubic feet of air exhausted per minute, with one and a half inches of water gauge. The gearing is direct. This fan was started July 26, 1885, taking the place of the old fan.

**W. G. Payne & Co.**

A new twenty-five-foot fan, of the Guibal pattern, was placed in position at the East Boston Colliery, in place of the fifteen-foot fan which was done away with. The new fan is placed over the same shaft as the old one was, giving a result of one hundred and twenty-three thousand three hundred and eighty-six cubic feet of air exhausted per minute, with a water-gauge of eight tenths of an inch, with a working speed of forty revolutions per minute. It was started December 2, 1885. It is direct in gearing. This colliery has the means now to give their men all the fresh air they will want.

**Waddel & Walters.**

A new shaft was sunk in the Bennett shaft, from the upper to the lower split of the Baltimore vein, to a depth of two hundred feet. Size of slope,  $6 \times 18$ . Gradient of fifteen degrees. Likewise, a new gravity plane was driven in the lower split, three hundred feet, with a sectional area of  $6 \times 18$ , and a gradient of twelve degrees, which will open up some good coal, and enlarge the company's shipment from this colliery.

4 MINES.

seventy-five. This is low enough to ensure a healthy condition of the air which the said number would have to respire, and at the same time the volume required by law would have sufficient speed or velocity to sweep the smoke away in a short time after it is produced.

The volume of air in the **Boston** mine became insufficient, and the company erected a new fan at the No. 3 shaft to remedy this. This change was effective and produced satisfactory results.

In the Nos. 2 and 3 shafts of the Delaware and Hudson Canal Company, at Plymouth, the air currents were divided into a larger number of splits, and the change has proved very beneficial. Both mines are now in conformity with the requirements of the law, having limited the number of persons employed in each split below seventy-five.

At the Nottingham mine of the Lehigh and Wilkes-Barre Coal Company, at Plymouth, the quantity of air was approaching the minimum allowed by law, and too many persons were placed to work in some of the splits. On December 13, the inspector requested the foreman to make preparations to increase the quantity of air and reduce the number of persons employed in each split to the lawful number. The company at once concluded to sink a new air-shaft, to provide an additional intake and upcast, upon which a fan will be placed as soon as the shaft can be completed.

The foremen of the Lance and Reynolds collieries were also notified that too many persons were employed in some of the air-currents, and they were distributed properly in a few days thereafter.

In the No. 1 shaft, Nanticoke, there were more than the lawful number of persons employed in the "main west gangway split," and after receiving a letter from the inspector, requesting compliance with the law, it was immediately complied with by adding another split of air.

In many instances, the provisions of the law are overlooked, until the inspector requests compliance. In underground slopes, and particularly where the pitch is small, the second openings are frequently not effected or driven until the inspector pushes the matter. There were several instances during the year under consideration where the inspector had to request such work to be done; but generally, upon requesting, the work is promptly started and pushed to completion.

I find that the operators are generally disposed to have their collieries worked in such a manner that the inspector will have nothing to say, but the foremen have a tendency to delay costly preparations in cases where no imminent danger is threatened, and where the law is not strictly complied with I find that the fault generally lies with the foreman. Naturally, he desires to make the business of his employer as profitable as he can, and sometimes he is tempted to economize unwisely by aiming to do that.

Automatic speed recorders have been attached to a number of the fans on the gaseous mines, and they are working very satisfactorily.

*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

reported to exhaust 30,000 cubic feet of air per minute while running thirty revolutions.

*Parrish Coal Company.*—This company erected a new fan on their slope. It is twenty feet diameter, running forty-five revolutions per minute and exhausting 68,000 cubic feet of air per minute.

*A. J. Davis.*—At the Warrior Run colliery a new air-shaft was sunk, effecting a second opening to the new tunnel. It is 9x9 feet and 206 feet deep, and connects with the Baltimore seam. The main slope is being extended also to a further depth of from two to three hundred feet.

*Hanover Coal Company.*—The Maffet shaft of this company is being extended from the Ross to the Red Ash seam. It was down a distance of 185 feet below the Ross at the close of the year, and when completed it will open an extensive lift of good coal. A number of other improvements were made during the year.

#### Coal Breakers Consumed by Fire.

On Sunday, January 16, 1887, between one and two o'clock A. M., the **Boston** breaker of the Delaware and Hudson Canal Company, at the upper end of Plymouth, took fire and was totally consumed. It is not known how it originated, but everything in and about the breaker was destroyed. By November 3rd, a new breaker was erected near the Boston shaft, about a mile and a quarter north-east of the site of the old one. This is a great improvement on the old one. They began to pass coal through it on the date mentioned. They worked eight and one-fourth days before the old breaker took fire and forty-one and three-fourths days with the new one before the close of the year.

#### Burning of the Parrish Coal Company Breaker.

At about ten o'clock P. M., January 25, 1887, the breaker of the Parrish Coal Company, at Plymouth, was discovered to be on fire, and although strenuous efforts were made to prevent its destruction, it was completely destroyed in a short time. It was comparatively a new breaker, having been in operation only since December, 1884, about a month more than three years. Preparations were immediately made to erect a new one, and on July 7 it was completed and started to prepare coal for shipment to market. The new one is a fine structure, larger than the old one, and has the best appliances for preparing and separating coal.

#### Burning of the No. 10 Breaker.

The No. 10 breaker of the Lehigh and Wilkes-Barre Coal Company, at Sugar Notch, took fire from a passing locomotive early Monday morning, May 2, 1887, and it, with every building within a radius of two hundred feet was completely destroyed. The engine-house and slope head house on the old No. 10 slope was burned, and the cage

which has been idle since 1878. The gangways were retimbered and the tracks relaid, so that the mine is now in shape to produce coal. It is to be hauled to, and shipped through, the No. 18 breaker.

At the Nottingham colliery, in Plymouth, the new air shaft was completed to the Ross seam, and a twenty-four foot Guibal fan was erected thereon to ventilate the workings. A cage and an engine adapted to hoist the workmen was also placed thereon, which proved a relief to both employes and company.

#### Delaware and Hudson Canal Company.

The new Baltimore shaft of this company was completed to the Red Ash seam, which was cut at a depth of 655 feet. It opens an extensive field of this seam, and the other shaft (No. 2), already working that seam, will be connected to effect a second opening.

At the **Boston** mine a new seventeen and a-half-foot fan was erected, which improved the ventilation of the mine to some extent. It was located at the No. 3 shaft—too far away to be of much effect as a ventilator of the Boston workings; hence, the result is not quite satisfactory.

The No. 2 shaft of this company, at Plymouth, was sunk from the Cooper to the Bennett seam, and opened an extensive field of that seam.

At No. 3 colliery a slope is being sunk underground in the Cooper seam. The hoisting engine is located on the surface, and the rope passes into the mine through a bore-hole made for the purpose.

#### Susquehanna Coal Company.

A number of minor improvements were effected at the mines of this company, but I shall note only a few. At No. 1 shaft, in both the Forge and Red Ash seams, underground slopes were sunk, extending to lower levels. The hoisting engines of both were located on the surface, and the ropes pass down through bore-holes.

The No. 4 slope was graded and thereby made to work much more satisfactorily. It is now being extended through the rock into the Hillman seam.

#### Red Ash Coal Company.

The No. 1 slope of this company was extended and a new pair of direct-acting hoisting engines were placed to hoist therefrom. The cylinders are 28x48 inches, and they work admirably.

At the No. 2 colliery a new slope was made to a length of 750 feet, and a pair of direct-acting hoisting engines were furnished, having cylinders 28x48 inches.

A new sixteen-foot fan was also erected on this mine, which has improved the ventilation to an appreciable degree. The collieries of this company are now in good shape for producing coal for a number of years.



D + H Co.

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°.

100,000 cubic feet per minute, the quantity of gas issuing was sufficient to make the whole current explosive, and it was maintained in that condition during a period of from three to four weeks. During this time the mine was kept idle, and no one was permitted to enter with any light but that of a safety lamp.

*Cave at the Hillman Vein Colliery.*

In this mine the Hillman seam is worked right over the section which caved in the Hollenback mine. The distance between the Baltimore and Hillman seam is about 300'. At about 8 o'clock A. M., June 12, the officials of the colliery having already been apprised of the existence of a "squeeze" in Hollenback mine beneath them, were on the alert, watching for its effects, they noticed the pillars suddenly beginning to crack and crumble and at once sent the workmen out. At about 12 o'clock it fell in, closing the most of their workings. A large quantity of explosive gas simultaneously appeared, and mixed with the air, charging it so that the whole became explosive and continued so for several days. Explosive gases escaped from crevices on the surface at several points and caused some alarm among the inhabitants lest accumulations would take place in the cellars of their houses, but care was taken to caution them against taking lights into the cellars until it was ascertained that no danger existed.

No naked lights were used in this mine until the workings and airways were re-opened and the ventilation restored so that no dangerous bodies of fire-damp existed therein.

*Cave at the Boston Mine.*

In the month of April a small section of the workings of this mine in both the Bennett and Cooper seams caved very suddenly at a point where the pillars were large and regular in thickness. It did not damage the mine-workings much except that it permitted a large volume of water to flow in and flood a large portion of the workings. The surface over this point consisted of a depth of coarse, sandy gravel, but no body of water was known to exist there. However, the large volume which found its way into the mine through this cave, proved that an accumulation existed somewhere beneath the gravel, and it is supposed that the hydrostatic pressure developed by this water was the originator of the squeeze and the cave-in. No fire-damp appeared in this case.

*Cave at Nos. 2, 3 and 5 Collieries at Plymouth.*

These three mines worked different seams, over or above each other. In No. 5 colliery, the Bennett and Cooper seams were mined. In No. 2, the Five-foot and Hillman were mined, and in the No. 3 the Five-foot and Cooper seams were mined. The three were old collieries having very extensive workings, all nearly exhausted of coal. For a few days

the year. The hoisting engines for both these slopes are located on the surface, the ropes passing down through bore holes.

At the **Boston colliery**, several hundred feet east of the old shaft, a new shaft has been started. It is intended to sink it from the surface to the red ash seam. Its size is  $12 \times 33\frac{1}{2}$  feet and it was sunk to a depth of 110 feet by the end of the year 1893.

The sinking of another shaft is in progress by this company about a quarter of a mile east of the No. 5 shaft. It was sunk at the close of the year to a depth of 115 feet. Its size is  $10\frac{1}{2} \times 33\frac{1}{2}$  feet.

#### Improvements by the Susquehanna Coal Company.

At the No. 1 shaft a slope was made through old workings a length of 1,400 feet on a dip of  $8\frac{1}{2}$  degrees; size  $8 \times 16$  feet.

Another slope is being sunk in the George seam. Its size is  $8 \times 16$  feet and it was at a length of 1,000 on an average dip of  $8\frac{1}{2}$  degrees at the end of the year.

A new tunnel was driven from the Forge to the Mills seam a length of 800 feet, and a size of  $8 \times 14$  feet.

At the No. 4 slope, a tunnel 300 feet long was driven from the Mills seam and a rock plane was driven from the Mills to the George seam. Its length is 300 feet; grade, 20 degrees, and size,  $8 \times 14$  feet.

#### Improvements by the Delaware, Lackawanna and Western Railroad Company.

At the Avondale colliery a horizontal tunnel was driven through the rock from the red ash to the Ross seam. Its size is  $7 \times 10$  feet and its length 300 feet. This opens a large area of the Ross seam.

At the Woodward colliery both underground slopes were extended, the one in the red ash seam a length of 306 feet to a total length of 2,019 feet and the slope on the Baltimore seam was extended a length of 372 feet, thus opening in each a new lift. The tunnel mentioned in last year's report, which is being driven from the red ash to cut the Baltimore seam was driven a distance of 486 feet. Its total length now is 1,686 feet. When this tunnel is completed it is intended to haul the coal of the Baltimore seam below a certain line in the slope out through it to the foot of the red ash shaft, where it will be hoisted to the surface.

The three new shafts in progress of sinking by this company in Hanover township are not yet completed. The Bliss shaft was at a depth of 669 feet. The Auchincloss No. 1 at a depth of 661 feet, and the Auchincloss No. 2 at a depth of 659 feet. The size of each shaft is  $12 \times 43$  feet 3 inches.

#### Improvements by the Parrish Coal Company.

At the Parrish colliery a new air shaft was sunk to a depth of 60 feet, having a sectional area of 216 square feet. For the purpose of

## Delaware and Hudson Canal Company.

## No. 2 Baltimore—

A new double fan was erected, 17½ feet diameter, enclosed in brickwork, and an underground slope was driven to a depth of 700 feet, which is still being extended.

## Boston—

The new shaft was sunk to a depth of 475 feet, and its sinking is continued. It is 12x33.5 feet, and has passed through three coal seams.

## No. 5 Colliery—

The new shaft was sunk to a depth of 725 feet during 1894, and its sinking was continued. Its size is 10½x33 feet.

## Susquehanna Coal Company.

Five new tunnels were driven in the mines of this company:

One 8x14 feet and 800 feet in length from the Ross to the Twin seam.

One 8x14 feet and 400 feet in length from the Hillman to the Hillman seam.

One 8x12 feet and 200 feet in length from the Forge to the Forge seam.

One 8x14 feet and 800 feet in length, from the Forge and was unfinished at end of year.

One 8x14 feet and 500 feet in length, from the Mills to the Mills seam.

Three of the underground slopes were extended. The No. 10 slope was extended a length of 2,000 feet. No. 12 was extended 500 feet, and No. 13 1,500 feet.

Five new gravity planes were made, varying in length from 200 to 1,500 feet. These improvements open new areas of coal property in each of the seams.

## Improvements by the Parrish Coal Company.

The underground slope on the Baltimore seam in the Parrish colliery was extended a distance of 900 feet, making the total length of this slope 2,316 feet.

## Improvements by the Alden Coal Company.

A new air shaft was sunk for the Alden colliery from the surface to the Cooper seam, a depth of 612 feet. Its sectional area is 416 square feet. A new fan, 24 feet diameter, is in progress of construction. The engine is 20x36 inches, directly connected. This will be applied to ventilate the north basin workings of the property.

different manner than that heretofore employed. There is no back pressure on the piston caused by forcing the steam through the breaker, the pipes from the exhaust being very large and the steam conducted at once to the highest point required. From this point the steam travels downward through the system of pipes, with the condensed water, thus utilizing the heat in the latter, as well as the latent heat in the steam. The water which collects in the pipes is let off by traps which adjust themselves to any pressure, the heating pipes in the breaker by this arrangement taking the place of surface condensers and assisting, instead of retarding the breaker engine in its work. The pipes are also connected to a pipe direct from the boilers by means of an automatic reducing valve, which is set to supply steam from the boilers when the pressure in the pipes has fallen 8 pounds below atmospheric pressure. This arrangement provides for the heating of the breaker when the breaker engine is not in service.

Operations at the new colliery were commenced on the 16th day of December, 1895, and up to the present time no changes throughout the entire breaker have been required. The daily output is not yet up to the maximum, but before a great while it is expected that the colliery will be able to ship 4,000 tons daily.

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No. 9 Sugar Notch.—One tunnel through rock from Twin to Ross seam 351 feet long, 7x12 feet area.

Lance No. 11.—Two new Sterling boilers, 125 horse power each. A thirty-five foot fan is in course of erection on the new aid shaft which was sunk in 1894.

#### Improvements by the Delaware and Hudson Canal Company.

Baltimore Tunnel Colliery.—A new gravity plane was made extending towards the outcrop 600 feet.

No. 2 Baltimore Colliery.—The inside slope was extended to a length of 1,000 feet and is being continued.

**Boston Colliery.**—The new shaft was completed to the Red Ash seam which was cut at a depth of 475 feet. Its size is 12x33½ feet.

No. 3 Plymouth.—A new breaker to replace the structure which was burned on November 15, 1894, was finished by July, 1895, in which month it started to prepare coal, and worked seven and three-fourths days. It was erected about 300 feet west of the location of the old one which is a very desirable improvement. A pair of first motion hoisting engines with a brick engine house has been erected at the shaft, and the whole plant and outside arrangement is now in a satisfactory condition.

A new breaker is in course of erection at the new No. 5 shaft which was sunk and completed last year. The shaft is equipped with machinery and they are now commencing to drive gangways in the Red Ash seam.

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.

the coal from the shaft to the breaker. Another conveyer line was constructed to convey the coal of the Baltimore No. 4 shaft to this breaker.

At the **Boston colliery** the breaker hoisting tower was torn down and a conveyer was constructed to scrape the coal from the dump at the shaft to the head of the breaker, and in the mine a tunnel has been driven from the bottom to the top split of the Red Ash seam. It is 400 feet in length and 7x12 feet area.

The No. 2 shaft at Plymouth was extended from the Bennett to the Red Ash seam 312 feet, making the total depth of the shaft 898 feet.

A new fan was erected to take the place of the old one. It is 22 feet in diameter, encased by a brick wall. It runs 70 revolutions and is exhausting 97,800 cubic feet of air. The engine is horizontal direct acting, 16x30 inch cylinder.

At the No. 3 colliery, Plymouth, the Hillman seam was opened and a slope was sunk to a length of 620 feet; average grade 12 degrees; 7x12 feet area.

At the No. 4 colliery a new slope has been sunk in the Red Ash seam to a length of 800 and it is still being driven. It is 7x14 feet area and has an average grade of 7 degrees. It opens a large area of excellent coal.

#### Improvements by the Susquehanna Coal Company.

In the No. 1 shaft, Nanticoke, an extension of tunnel has been driven from the Lee to the Ross seam a length of 960 feet, and 7x14 feet sectional area. A tunnel has been driven from the Forge through troubled ground a length of 1,570 feet, 7x14 feet area and is still being driven. An extension has been made by a tunnel from the Hillman to the Forge seam 650 feet in length, 7x14 feet area. A tunnel has been driven for ventilation purposes from the Hillman to the Hillman 240 feet in length and 7x14 feet area.

In the No. 4 slope, Nanticoke, the main slope has been extended through the rock from the Hillman towards the Forge seam a length of 350 feet and it is still being driven. The No. 21 tunnel was extended a length of 700 feet from the Mills to the Mills and Tunnel No. 23 driven on from the Hillman to the Mills a length of 500 feet. The area of all is 7x12 feet.

In the No. 2 shaft, Nanticoke, No. 5 slope was extended through an anticlinal from the Lee to the Lee a length of 420 feet and the No. 11 slope was driven through the rock from the Ross to the Lee seam an extended length of 850 feet. A new gravity plane 850 feet in length was made in the Ross seam.

At the No. 6 shaft, Glen Lyon, No. 5 tunnel was driven to a length

Plymouth No. 1.—Foot of shaft in Hillman vein, has been cleared up and very heavily timbered. Large sump driven below shaft in vein, and a duplex Janesville pump, 22x10x36 feet, has been installed. Began pumping October 1. Capacity, 1,000 gallons. This work has all been done preparatory to sinking the shaft down to the Bennet vein.

The Plymouth Pumping Plant.—A pump room, 17x59 feet, with offset 10x15 feet 6 inches. Stone side walls and brick arch. A Janesville compound duplex, 26x50x16x48 inches, with a capacity of 3,000 gallons, has been put in place. This pump is provided with a pump condenser. In connection with it there has been completed a 20-inch more hole for pumping water, which is 585 feet in depth.

Plymouth No. 2.—Car haul at foot of shaft, Red Ash vein, 70 feet long. Elevates empty cars to run back to slope, 400 feet away. No. 2 slope, in 5-foot vein, extended 300 feet. Ten-inch bore hole for flushing culm. High pressure boiler plant, four locomotive type of boilers in use; 78x28 feet 2 inches; brick boiler house, 54x81 feet. Boiler house is large enough for six boilers. Three cylinder boilers added to boiler plant.

Plymouth No. 3.—Completion of sinking shaft to bottom Red Ash vein, making total depth of shaft about 750 feet. Foot opened out about 50 feet on each side of shaft.

No. 7 tunnel through fault in Hillman vein, on shaft E gangway; 207 feet in length.

No. 9 tunnel from Five Foot to Stanton vein, about 400 feet.

No. 10 tunnel from Hillman to Lance vein, 259 feet long. Are driving plane airway in Lance to connect with airshaft. Now up 300 feet.

Abbott slope from outcrop to D. Low line, 450 feet long. Are driving gangways and airways east and west.

Six-inch bore hole for drawing Abbott, Lance, Five Foot and Cooper veins to Bennet vein and Plymouth pump plant at No. 1. Extension No. 1 air shaft to Five Foot vein, about 40 feet.

Plymouth No. 4.—No. 2 slope, in Ross vein, down 300 feet, going. No. 1 slope, in Red Ash vein, extension 200 feet, going. Rope hole for Ross slope. Pair engines, 18x36 inches, first motion. Frame engine house, 20x32 feet. Rope haulage, 900 feet long. Endless rope transporting cars from No. 4 to No. 5. Engines, pair 10x12 inch.

Plymouth No. 5.—Completion of No. 3 plane, in Red Ash vein, to connect No. 4 colliery. Plane, 2,200 feet long, operated by pair engines, size 22x48 inches, at No. 4 colliery. Rope is taken down No. 4 air shaft. No. 4 plane in No. 4 tunnel, Five Foot vein, 400 feet long. Connection of top split working with air shaft and hoisting shaft for second opening.

**Boston.**—Extension of No. 4 plane in top split of Red Ash through.

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Plane is now up 1,400 feet. At present is driving through fault or upthrow to bottom split in which vein the plane will be continued. Sinking slope and airway in Red Ash bottom split. Now down 1,400 feet. This slope will be an engine plane and second opening for No. 3 colliery. Pair hoisting engines, size 18x36 inches, at outlet shaft. Brick engine house, 22x43 feet.

#### Improvements by the Susquehanna Coal Company, 1899.

The principal improvements made by this company during 1899 have been in opening a tract of coal land situate at Stearns Station, Newport township, Luzerne county, about half way between their Nanticoke and Glen Lyon lands; these consist of three shafts in process of sinking, viz:

No. 4 shaft, four compartments, 15 feet 6 inches by 33 feet 10 inches inside, concrete coping; this has been sunk 430 feet and provided with a steel head frame 48 feet high to carry four 14-foot sheaves, one of which is in place; temporary hoisting engines, 18x36 inches, geared  $3\frac{1}{2}$  to 1, to 12 foot drum; 6-foot Sturtevant ventilating fan and compressor, 20x20x30 inches, with the necessary engine, fan and compressor houses.

No. 4 air shaft, being sunk as a second opening for No. 4 shaft, is located about 330 feet northerly from it, size 14x16 feet, inside concrete coping; this has been sunk about 100 feet and provided with wooden head frame 35 feet high, and permanent 15x48-inch direct acting hoisting engines, with 6 foot drum, the intention being to use a small carriage about 5x8 feet in one corner for hoisting men and materials, for repairs and in emergencies; there is also a ladderway partitioned off, the shaft being used as an airway to the permanent fan.

No. 5 shaft, located about 730 feet northerly from No. 4, is being sunk to develop the upper seams in the north basin, independent of the main No. 4 shaft; about 40 feet has been sunk. It is 22x15 feet 2 inches inside the concrete coping, providing for two hoistways and a pump and manway; a wooden head frame 42 feet 2 inches high has been erected, with two 14-foot sheaves and permanent hoisting engines, 20x36 inches, geared  $3\frac{1}{2}$  to 1, to 12 foot drum, with engine house.

The steam for this plant is furnished at present by two 250 horsepower Babcock & Wilcox boilers, the boiler house being located about 190 feet northeasterly from No. 4 shaft. There have also been ~~built two blocks of miners' dwellings and a foreman's house,~~ with sewerage, and water pipes have been extended from the Nanticoke Water Company's main, throughout the plant.

The improvements made at Nanticoke consist of four additional pumps put in No. 4 slope to control the water from the cave of April 13, and a new Peanesville pump 30x12x36 put in the Forge seam,

Plymouth No. 3.—Foot in Red Ash vein has been opened out, and is now connected with slope sunk from Boston vein. This slope is now an engine plane for No. 3.

No. 9 tunnel to Stanton vein completed 563 feet.

New fan, 10x28 feet, in brick engine house 48x48 feet, ventilating Red Ash vein, running since July.

Plymouth No. 4.—No. 2 Ross slope down 2,200 feet; still driving.

No. 1 Red Ash slope down 2,250 feet, still driving.

No. 7 plane, in Red Ash up 600 feet; still driving.

Plymouth No. 5.—No. 5 plane, in Red Ash, top split, up 500 feet; still driving.

**Boston.**—No. 4 plane, top split, Red Ash, completed up 1,400 feet.

#### Improvements by the Susquehanna Coal Company During the Year 1900.

Stearns.—No. 4 shaft, sunk 205 feet to 651 feet total depth.

No. 4 air shaft sunk 553 feet to 663 feet, total depth.

No. 5 shaft, sunk 172 feet to 220 feet, total depth. The sinking of these three shafts is now completed.

Rock foot No. 4 shaft driven 80 feet.

Nanticoke.—No. 14 slope, Lee seam, Nanticoke, rock work for head completed.

No. 12 rock plane, from Lee toward Ross, driven on 20-degree pitch 100 feet.

No. 13 rock plane, 7x14 feet, 20-degree pitch, driven up 100 feet from No. 21 tunnel, completed.

Outside Improvement—New narrow gauge railroad, three miles, from Nanticoke to Stearns.

New compressor plant for No. 14. Slope engines, Nanticoke, Pa. Engines to be inside at head of slope, and compressed air to pass through bore hole.

One thousand horse power new Babcock & Wilcox boilers, No. 5 breaker, Nanticoke.

One thousand horse power new Babcock & Wilcox boilers, No. 1 shaft, Nanticoke.

#### Improvements by Delaware, Lackawanna and Western Company During the Year 1900.

Woodward.—One 500-horse power engine directly connected with one G. E. 330 K. W. Multipolar Electric Generator.

One 80-horse power electric hoist in the Cooper seam.

One 120-horse power electric hoist in the Red Ash seam.

One 7x8-inch Triplex electric pump, 20-horse power motor.

*C. J. ...*

Inside: New openings in Cooper seam, Shaft No. 1, in two places in No. 13 tunnel.

Enlarged main gangway from foot of No. 1 North Shaft to head of No. 9 Slope, and to No. 13 tunnel.

New bore hole, 960 feet deep, from surface to Lee seam, for No. 10 Slope hoisting rope.

#### Improvements at the Delaware and Hudson Collieries During 1902.

Plymouth No. 2.—Tunnel in G vein through fault 200 feet long, 7'x12'. Tunnel from Red Ash to top split, 275' long, 7'x16'.

Outside: A Norwalk compressor, 24"x14½"x22"x24", was installed for furnishing air for pumping.

Shaft No. 1.—A Dickson compound triple expansion pump, with a capacity of 3,000 gallons per minute, size of pump 15"x26"x16"x48".

Shaft No. 3.—Tunnel from Red Ash seam to top split, 275' long, 7'x16'. A 10"x48"x24" Jeanesville pump was installed at the foot of shaft.

Outside: A new breaker engine, 16"x30", was attached to the old one, changing it into a double engine.

**Boston:** Reopened tunnel and sank slope in the Bennett seam, and put in a pair of 24"x48" haulage engines to take coal from the slope to the breaker.

Outside: Installed nine new cylinder boilers, 34"x36' in length.

Placed one pair of engines, 26"x48", at the bore hole to hoist out of plane from top split of Red Ash.

#### Improvements at the Alden.

A slope in the Cooper seam 550' long to reach the basin.

Tunnel 100' long from the Cooper to Hillman seams, 14'x7' through the rock.

There has also been provided for cases of emergency two "Vajen's" improved head protectors.

#### Improvements at the Delaware, Lackawanna and Western Collieries During 1902.

Woodward.—A new steel trestle connecting the breaker with the shaft, and four batteries of Sterling boilers have been installed. One electric hoist and one electric motor have also been installed at this colliery.

Avondale.—One electric motor has been placed inside.

Auchincloss.—An electric breaker of 500 tons daily capacity has been placed in operation and is giving perfect satisfaction.

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

#### Woodward Colliery

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

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

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

#### DELAWARE AND HUDSON COMPANY

##### Plymouth No. 2 Colliery

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

##### Plymouth No. 3 Colliery

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

##### Plymouth No. 4 Colliery

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

##### Plymouth No. 5

Fifty new mine cars; coal conveyor.

##### Boston Colliery

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

New barn built in Cooper vein to take place of barn destroyed by squeeze of 1903 in 5 foot vein.

Flushing hole and crushers to crush refuse from breaker for flushing purposes installed.

Plymouth No. 4.—No. 10 plane Ross vein driven 150 feet.

Plymouth No. 5.—Rope hole drilled and 12½x15 inch engines installed for No. 5 plane, top Red Ash vein, which has been extended 370 feet.

**Boston.**—No. 4 rock plane from bottom to top Red Ash completed 400 feet and extended in coal 200 feet; No. 4 tunnel Ross vein driven 132 feet; No. 10 plane, top Red Ash, extended 600 feet; No. 9 plane, top Red Ash, extended 400 feet; No. 11 plane, Bennett vein, has been opened from the old No. 1 tunnel level, 900 feet; foot of shaft Red Ash vein retimbered and equipped with light car haul.

Inside.—Two bore holes from surface for steam pipes, two car hoists at foot of shaft, two compressed air motors for haulage.

#### Wanimie No. 18 Colliery

Inside.—No. 7 rock slope Baltimore to Ross, No. 12 tunnel extended, Baltimore to Cooper.

#### DELAWARE AND HUDSON COMPANY

##### Plymouth No. 2

No. 10 plane, Top split Red Ash, extended 800 feet.  
 No. 6 slope, Stanton, extended 300 feet.  
 No. 8 slope, Hillman vein, extended 150 feet.  
 No. 12 Rock plane, Stanton to Kidney vein, driven 330 feet.  
 Eight inch rope hole for No. 7 Stanton vein plane, 246 feet deep, and 12 $\frac{1}{4}$  inch x 15 inch engines installed.  
 Eight inch culm hole and crusher plant for flushing refuse into the mines.

##### Plymouth No. 3

Crusher plant installed, to break up refuse from breaker to be flushed into the mines.

##### Plymouth No. 4

No. 10 plane, Ross vein, extended 150 feet, and 10 inch x 12 inch engines installed for operation of same.  
 No. 9 plane, Bennett vein, driven through old workings 600 feet, and pair of 10 inch x 13 inch engines installed for operation of same.  
 Crusher plant installed for flushing purposes.

#### Boston

No. 12 Rock plane, from Upper to Lower Ross, 250 feet.  
 No. 9 plane, Top split extended 315 feet.  
 No. 10 plane, Top split extended 100 feet.

#### DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

##### Avondale

Extensive breaker improvements made at this colliery. When repair work was begun on this structure it almost became necessary to rebuild the entire building, costing a large amount of money, with the result that the company has what might be considered a modern breaker on a small scale.

The work of changing the location of steam boilers from the Ross shaft to the main shaft will be completed early during the year 1906.

Connection is being made with the colliery to the Nanticoke Power Station, which will generate electric current for operating locomotives and hoists in this mine.

A 7x12 rock tunnel connecting Red Ash and Ross vein, 743 feet long on a 5 per cent. grade has been completed.

**Boston**

No. 9 Plane, Top Split, Red Ash vein, extended 600 feet.

No. 13 Plane, Bottom Split, Red Ash vein, graded and driven 1000 feet, 600 feet of which was driven through fault cutting the Top and Bottom Splits of the Red Ash vein.

8 inch rope hole for No. 13 Plane drilled 225 feet and pair of 14x20 engines installed.

Air return in rock driven from Ross vein to Top Split of Red Ash.

Steel tower erected to take the place of frame structure over main shaft.

Condition of colliery is good.

## LEHIGH AND WILKES-BARRE COAL COMPANY

## Lance No. 11

Outside.—Fuel conveyor.

Inside.—Compound condensing pump and rooms.

Condition of colliery is good.

## Nottingham No. 15

Outside.—Colliery office.

Inside.—Duplex pump, 9th East.

Condition of colliery is good.

## DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

## Avondale

The appearance outside at this colliery has been considerably improved by the erection of a concrete retaining wall extending along the hillside from the breaker to the fan house.

The installation of feed water regulators, etc., in boiler room is a decided improvement over the old method of feeding the boilers.

Inside.—Two 7x12 short rock tunnels were driven on No. 4 East Gangway Ross vein, through fault.

The installation of a double motor electric hoist on No. 7 Slope, Ross vein, is a decided improvement over the old steam engine.

The erection of concrete piers, or props, in several places in this colliery might be worthy of mention.

Condition of colliery is good.

## Woodward

Outside.—New steam lines from the boiler plant to ventilating fan, hoisting engines and power station have made a decided improvement in the outside appearance and efficiency of this colliery.

The breaker has been improved by the installation of mechanical pickers, rock crushers, etc., together with two Phillips steam dumps.

The brick partition separating hoist way and air way No. 2 Shaft was partly completed during the year; it is now completed. It has been a source of improvement to the ventilation of this colliery.

The erection of a steel bridge under this breaker over railroad tracks adds strength to the building and will prevent the building from getting on fire from sparks from locomotives passing under it.

Inside.—Two rock tunnels were driven connecting Cooper vein with 5 Foot vein and Red Ash with Ross vein.

A rock slope is being sunk from the surface to the Abbott vein. This work will be completed in 1907.

The erection of a concrete and iron air bridge, No. 2 Slope, Red Ash vein, has made a decided improvement in the ventilation of this section.

No. 2 shaft.—Concrete for 79 feet from surface to rock, also re-timbered from concrete to bottom, and head frame replaced.

New brick oil house erected 18'x28'.

No. 6 slope in Stanton vein extended 90 feet and stopped in fault.

No. 14 rock plane driven from Stanton vein 550 feet, cutting Hillman, Lance and Abbott veins, and intersecting a 8 by 6" bore hole from surface to rock a distance of 203 feet, for use of rope to operate place.

Plymouth No. 3 Colliery.—Red Ash sump lengthened 450 feet.

No. 6 slope in Red Ash vein opened and driven 260 feet.

No. 15 rock tunnel driven 460 feet from bottom to top Red Ash vein.

Rock tunnel driven 100 feet from Stanton vein to tap shaft for ventilation.

Plymouth No. 4 Colliery.—No. 11 plane, Top Red Ash vein, extended 170 feet.

Plymouth No. 5. Colliery.—Boiler house erected 50'x60' and two Sterling 300 H. P. water type boilers installed.

**Boston Colliery.**—No. 13 plane, in Bottom Red Ash vein, extended 300 feet.

#### PARRISH COAL COMPANY

Parrish Colliery.—A rock plane driven from Baltimore vein to the Five Foot vein for ventilation, a distance of 279 feet, size 7' by 18' on a grade of fifteen degrees.

Sank No. 6 slope Baltimore vein a distance of 200 feet.

Buttonwood Colliery.—Sunk No. 4 slope, Stanton vein, a distance of 300 feet, to the boundary line.

Installed a new engine on top of Stanton plane, for plane and slope, geared 18" by 30" (double engine) 460 H. P.

Sank a slant slope from top of No. 2 slope Hillman vein 600 feet, to mine coal in a synclinal between two rolls.

A new plane driven on the Abbott vein 900 feet long, and a pair of geared engines 12" by 16", 124 H. P., installed.

A tunnel driven from the Kidney vein to the Abbott vein, to strike the vein at the southern boundary line, a distance of 470 feet size 7' by 12.

#### KINGSTON COAL COMPANY

Gaylord Colliery.—The old cylinder boiler plant has been dispensed with and 900 H. P. B. and W. boilers have been erected and installed in brick house. Said plant has been completed with duplicate feed pumps, Cochran water heater, etc.

A new brick house has been erected for electric generator and air compressor.

Two new  $7\frac{1}{2}$  ton electric locomotives have been purchased and electric haulage is in course of construction between the foot of the Bennett slope and the Red Ash.

A new washery or wet side addition to the breaker is in course of construction and almost completed, with three banks of shakers, duplicate rolls, duplicate elevator.

A Compound Duplex 28"x36" pump is being installed.



New brick blacksmith and carpenter shop completed; new brick oil house and hospital and new brick warehouse completed.

Fifty foot addition to stable.

Addition of 300 H. P ; B. and W. boilers completed for washery.

Electric haulage is now in service between the Red Ash vein and foot of slope.

#### DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY

Woodward Colliery.—The work of sinking Woodward No. 3 Shaft on the Kingston flats has progressed to a depth of 450 feet. The shaft will be completed during this year to the Baltimore vein.

The rock tunnels have been driven from the Cooper to Five Foot vein for development.

The work of installing the sub-station mentioned in last year's report has been completed, but it is not yet in operation.

The No. 2 Shaft hoisting engines have been equipped with new drums and clutch arrangement; also steam brake and reverse.

The three slide valve breaker engines have been replaced with three compound Corliss valve engines, in order to economize in the consumption of steam with very good results.

Four new concrete and steel air bridges have been built during the year.

Avondale.—The work of installing an inside sub-station mentioned in last year's report is now completed and is in operation and running order.

The Ross shaft has been abandoned as a hoistway and will be used hereafter as an air shaft only.

One concrete and steel air bridge has been erected on 4½ East lift, No. 2 Slope, Red Ash vein.

A rock tunnel was driven from Ross vein to surface for second opening to Ross and Red Ash veins.

#### DELAWARE AND HUDSON COMPANY

Plymouth No. 2 Colliery.—Rope hole, 93 feet deep, drilled for No. 7 plane.

Air shaft to Lance vein sunk 40 feet.

No. 9 slope, Top Ash vein, driven 340 feet.

Plymouth No. 3 Colliery.—Air shaft to Lance vein sunk 40 feet deep.

No. 9 plane, Station vein, extended 450 feet.

Plymouth No. 5 Colliery.—Slush hole for ashes drilled 448 feet deep.

No. 2 slope Cooper vein, rope hole drilled 177 feet deep.

Rock slope from Bennett to Cooper vein completed 350 feet long.

Four Emery slate pickers installed in breaker.

**Boston Colliery.**—New plane No. 6 driven from Boston to Plymouth No. 5 in Bottom Red Ash 4,200 feet long, to take Boston coal to Plymouth No. 5 breaker. Rope hole 446 feet deep drilled, and pair of 22 x 48 inch Dickson engines installed. Boston breaker has been abandoned.

R.

"An era in the history of mining anthracite in the Wyoming coal field has been inaugurated by the success of the Dundee Coal Company in reaching a superior vein of eleven feet in thickness at a depth of nearly 800 feet below the surface.

From a distance we have watched the progress of this shaft with anxious eyes, and we are sure that the pleasure to us of their success can very little be less than to the members of the company. Much credit has been thrown on our coal field by the partial and unsuccessful exploration for coal in Hanover and Newport. Borings have been abandoned at a depth of three or four hundred feet, leaving doubt about the existence of coal, in the minds of strangers, and, indeed, in the minds of some of the less sanguine of our own citizens.

The Dundee Coal Company, composed principally of our own citizens, resolved to sink its shaft to a depth of 1,000 feet if coal could not sooner be obtained. The largest vein cut had been but four feet, with many smaller ones. Still, without hesitation, yard after yard was cut. Mr. F. Koerner, an intelligent and energetic man, had charge of the work, which progressed as rapidly as the hard rock would permit, until 780 feet had been passed. Then indications of coal appeared and an auger was put down three feet to a small eight-inch seam of slate below which was a vein of fully eight feet of beautiful coal. To the bottom of the vein is 792 feet, and to provide for the dropping of the water from above the shaft was sunk a few feet deeper, probably 800 feet in all."

The story is continued with a narrative of the personal experiences of the editor in a descent of the shaft. A large stream of water entered at a depth of 250 feet, but was cared for by pumps. The editor mined a few specimens of coal at the bottom with illumination furnished by a few gas jets pouring forth from the vein itself. He says, in his story, that the vein was supposed to be the Mills vein, found at Nanticoke, and that other veins of greater thickness were believed to be underlying it. This belief was well founded, for the territory in which this vein was located is now considered the richest in the Wyoming coal field, and the lower veins are found at a depth of from 1,800 to 2,000 feet. The ancient chronicler also tells of the gas found in the vein, for it was the presence of this gas in large quantities and the lack of knowledge of proper ventilating methods in those days that caused the subsequent abandonment of the mine.

#### LEHIGH AND WILKES-BARRE COAL COMPANY

Lance No. 11 Colliery, Inside.—Tunnel, Cooper to Five Foot, No. 1 Slope, 5th West.

Nottingham No. 15 Colliery, Outside.—Corliss breaker engine.

Reynolds No. 16 Colliery, Inside.—Rock plane, Ross to Ross, No. 4 tunnel East.

#### DELAWARE AND HUDSON COMPANY

Plymouth Nos. 1 and 2 Colliery.—A return airway was driven from No. 14 plane, Abbott vein to No. 1 shaft.

An air shaft was sunk 55 feet from surface to Lance vein workings and 300 feet of return airway was driven in vein.

A 50,000 gallon water tank was erected and pipe connections made for boiler supply.

Plymouth No. 3 Colliery.—Extensive repairs were made to breaker and the timbering in main shaft was replaced by concrete from top to bottom. A new 8-inch rope hole was drilled 425 feet from surface for No. 6 plane, Red Ash vein.

Plymouth No. 5 Colliery.—No. 7 plane, Bennett vein, was driven 1,200 feet and an inch rope bore hole was sunk 290 feet from surface.

No. 3 plane, Bennett vein, was driven 250 feet.

**Boston.**—No. 14 plane was driven from the Boston Split Red Ash 250 feet through rock to the Top Red Ash and 600 feet in the latter vein.

No. 15 plane, Bottom Red Ash vein, was driven 1,100 feet.

The **Boston** breaker was torn down and the coal is now being prepared at No. 5 breaker.