FIRST BIENNIAL REPORT

OF THE

STATE MINE INSPECTOR

TO THE

GOVERNOR

OF THE

STATE OF IOWA,

FOR THE YEARS 1880 AND 1881.

DES MOINES:
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FIRST ANNUAL REPORT

OF

PARK C. WILSON,

STATE MINE INSPECTOR,

FROM AUG. 18, 1880, TO JAN. 1, 1881.

REPORT.

INTRODUCTION.

DES MOINES, IOWA, December 26, 1880.

To HIS EXCELLENCY, JOHN H. GEAR, *Governor of Iowa:*

IN accordance with chapter two hundred and two, of the laws of the Eighteenth General Assembly, I herewith submit to you my first annual report as State Mine Inspector.

Pursuant to your appointment, I repaired to the capital on the 27th day of July, 1880, and entered immediately upon the duties of my office.

As you are well aware this was the first introduction of the State mining law. It was necessary to have a scientific test for the air and some little time was consumed in getting the instruments necessary for the discharge of my duties, and it was not until the 18th of August that I commenced the actual work of

INSPECTION.

At that time of the year there were a great many mines not working, and some that were, employing only a few men, that usually have a large number at work.

On account of the scarcity of miners in the State in the fall and the early part of the winter, some of the counties will not be reported very extensively in the report, because after I have once visited a county I have not had time to make a second visit.

As the law does not apply to, or affect, any coal mine in which not more than fifteen persons are employed at one time, many mines which I have visited I have not recorded, because of less than such minimum number of men being at work at the time of my visit.

It is customary for mine inspectors to give suggestions in regard to the future development of our coal beds, and also upon the coal strata of the State; but the limited time at my disposal has not permitted me to make many observations on anything besides the condition and inside workings of the different mines I have visited.

MAHASKA COUNTY.

As before stated, I commenced my tour of inspection August 18. I began work in Mahaska county. There were six mines at that time in the county that were employing fifteen men each. The Consolidation Coal Company (three), the Excelsior Coal Company, the Iowa Coal Company and the Oskaloosa Coal Company. Mine Number Three, of the Consolidation Coal Company, was the first one visited. This mine is situated on the Central Iowa Railway, and is opened by a drift on the south side of the Little Muchakinock Creek. The opening (or pit mouth) is ten or fifeeen feet above the bed of the creek, gradually dipping, as it penetrates the hills, for a distance of seventy-five yards, where the level of the coal-bed is reached. This mine has been in operation about six years, and all the front part of the hill is wrought out, with the exception of one entry on the right, where the pump-shaft and man-way are situated. This mine is worked on the room-and-pillar plan, as almost all of the mines are, with slight variations, and a description of one mine will answer for all that are worked on the same plan. In the mine, double entries are driven, and at the time of my visit only two were being worked, those at the right hand. These two were driven eighteen feet apart, leaving eighteen feet of coal between them, and the rooms were turned off the entries in opposite directions, those on the first right turning to the right, and those on the second right turning to the left. The rooms are driven seven feet wide until they reach a distance of ten feet from the entry, when they widen out to twenty feet, the full width allowed, leaving ten feet of coal between the rooms to support the roof, while driving up the room. When the room is driven the distance of seventy-five yards, the pillar is attacked and brought back toward the room mouth, letting the roof fall. The company had just put in machinery for handling the coal using a single rope, the empty cars pulling the rope back into the mine and to the bottom of the slope. Thence a mule pulls the cars with the rope attached, back to the first station, a distance of four hundred yards. Just back of this station, there are four entries turned off the main entry, two to the right and two to the left. Mules haul the coal to the station where the trains are made up. Six cars only are allowed to be taken out at once by the engine.

The drag is fastened to the last car, and the man in charge of the train rides on the drag. The coal is taken by the mules from the face of the rooms where the miners are working, the coal being high enough to admit of the mules going anywhere throughout the mines where the men are at work. At the time ninety-five miners, eight drivers, and eight mules were employed inside the mine. The capacity of the mine is three hundred tons per day, the length of the main entry five hundred and sixty-three yards, with four cross entries; the length of the two right entries is two hundred and eighty yards each, and the left hand entries are one hundred and forty-five yards each, measuring from the main entry.

The air-ways are five and half feet in height and seven feet wide. The mine is ventilated by a furnace of forty-eight cubic feet capacity, and and an air-shaft one hundred and two feet in height. The air is carried in one continuous current around the mine. Its full volume was eleven thousand two hundred and seventy cubic feet per minute; there were thirty-eight working rooms in the mine. The gauge of track is three feet one inch, the capacity of the mine-cars one ton each, and the the distance of air-shaft from mouth of slope four hundred and twelve yards. The escape-shaft is three hundred yards from the mine opening, and is located on the west side of the main entry. The mine was in good condition in every respect and the outside workings were in good repair. T iron tracking is used in all of the entries. The east entries had run into a fault, and by drilling down from the surface fifty yards ahead of the entries, it was found that the coal had cropped out, and the entries were stopped. The main entry rises gradually from the station from which the engine pulls the coal until the coal was only about three and a half feet thick, and proved to be the same fault that had been met with in the east entries so the main entries were stopped and two entries were turned to the right and had been driven only a short distance when the workmen drove through the fault and found coal again. There is considerable gas in the mine on account of so much powder being used and they are troubled considerably with gob-fires, which require close attention. The waste, which the miners throw back sometimes heats, and often has to be loaded into cars and taken out of the mines. Mine Number One, belonging to the same company is situated on the same creek, about half a mile lower

down. It is also a drift opening and worked on the same plan, but it is a larger mine. It is been in operation about seven years, some of the time shipping as high as five hundred tons per day. The main entry is seven hundred and eighty-five yards in length, with six cross entries in operation. The first and second north are two hundred and sixty yards in length, the others are not driven so far. Rooms are turned and being worked on all the entries. The cross entries turn square off the main entries, and the rooms turn square off the cross entries, measuring thirty feet to the room. The rooms are turned as before described.

Steam power is employed in the mine for hauling the coal, a thirty-two horse-power double engine, with endless rope being used. The manner of ventilating this mine is by means of a furnace, the air passing into the mine at the mouth of the drift and traveling along the main entry until it reached a point just back of the wheel on which the rope works. There was a door hung on the main entry turning the air into an air course running parallel with the main entry until it reached the first north entry. There was a door to keep the air from returning on the main entry and another door further up the first north to turn the air into the rooms. From where the air left the main entry until it reached the first north was about one hundred and fifty yards, with a brattice every twenty yards that was leaking air so that by the time we reached the back of the first north there was no current of air, or at least it was so small that the air meter would not record any. Thence through the rest of the mine there was no current of air even on the entries except what was caused by the driver with his mule passing along the entry with the car.

After I had gone all through the mine, I told the foreman that I expected him to comply with the mining law; and that the law gave him twenty days to air the mine properly or he would have to cut the force down to ten men. I requested him to change the mode of carrying the air. Instead of turning the air off the main entry as before described, I requested him to take off the door on the main entry and let the air travel on it until it came to first entries, and turn it into them and conduct it around the mine in that way, putting in an overcast over the main entry. Thus the men would get pure air, and all the leakage of carbonic acid gas from

the old works would be carried away from the men; when as by the other mode the air traveling by the old works carried all the foul air from the old workings to the men.

The furnace is situated on the right side of the mine, some three hundred yards from the main entry, at the end of a cross entry. The coal is all worked out on this cross entry, except close to the furnace, but the entry is well timbered. The air-shaft is six feet four inches in diameter, and sixty feet high. The furnace has a capacity of twenty-two cubic feet, is situated thirty feet from the bottom of the air-shaft, and is seven hundred and eighty-three yards from the mouth of the mine. The man-way is also situated on this entry with good ladders for the men to escape by, in case of accident. The escape-shaft is four feet in diameter. Ninety-eight miners were employed but more men were being added to the force. The capacity of the mine at that time was three hundred and fifty tons per day. The air-ways are all driven seven feet wide, and the full height of the coal, which is six feet. All of the entries are timbered, the roof in the mine is good.

I again visited this mine in twenty-five days from the date of the former inspection, and found the changes recommended had been made. On testing, I found over six thousand cubic feet of air per minute in places where there was no current on the first inspection.

The outside workings of the mine are in good condition. The mine water is pumped out of the mines with an eight horse-power engine, using an elevator pump, lifting the water up a shaft one hundred and twenty-seven feet, with an endless rope running from the pumping engine half a mile to another water-shaft belonging to Number Three, and hoisting the water from the mine with the same kind of pump.

October 11th, I visited the Eureka Mine, belonging to the Consolidation Coal Company at Beacon. This mine is operated by a shaft using steam power, with wire rope for hoisting the coal. The mine is worked on the room-and-pillar, with single entries. The coal is weighed on railroad scales after being screened. At the time of my visit the mine was employing forty-eight miners, four mules, and four drivers. The capacity of the mine was two hundred and

sixty tons per day. The length of the main entry is one thousand feet with eight cross entries, driven one hundred yards apart, the air-ways passing through the rooms. The mine is ventilated by a furnace of twenty-five cubic feet capacity. The air-shaft was four and one-half feet in diameter, and ninety-five feet in height. There were sixty working rooms in the mines. The gauge of track is three feet, the capacity of the mine cars one ton, the distance of the air-shaft from hoisting-shaft one hundred and twenty feet, and the size of the escape-shaft four feet square. This mine was in poor condition. There were no covers on the cages, no brakes on the drum, and no air in circulation in the mine. There were very few rooms in the mine fit for a man to work in. The air-ways in places were almost full of slate and refuse from the mine, so that what air there was in the mine was loaded with gas until it was not fit to breathe. The bottom of the air-shaft, back of the furnace, was almost full of dirt and slate which had fallen down the air-shaft. The air-shaft is not timbered. Some of the rooms had fallen in, and there was no way for the air to circulate through the mines to the eastern part until an air-way was driven around those rooms that had fallen in, at which men were working when I was there. Men were driving both ways, and it was thought they would get it done in a short time. I notified the superintendent of the condition of his mine, requesting covers put on the cages, gates on the landings, and a brake on the drum, the air-shaft and the air-ways cleaned out, and ladders put in the escape-shaft. The miners have since reported to me that the air in the mine is good. Being called upon to visit other places so that my time has been occupied, I have not visited this mine a second time.

The Iowa Coal Company's Mine is also situated at Beacon, C. L. Williams, of Keokuk, president; Simon Phillips, of Beacon, superintendent. The company has a capital invested of one hundred thousand dollars. The mine is operated by a shaft, using steam power, with wire rope for hoisting purposes. The mine is worked with double entries. The coal is weighed on railroad scales after being screened. Fifty miners, five mules, and five drivers were employed in the mine. The capacity of the mine was one hundred and fifty tons per day, and the length of the main entry seventeen hundred and twenty-eight feet. I did not get the measurement of

the cross entries, for the maps were not made up. The height of air-courses was six feet; the width the same, and the full volume of air nineteen thousand two hundred and thirty-six cubic feet per minute. The mine is ventilated by a furnace of twenty-five cubic feet capacity, with an air-shaft five feet in diameter, and fifty-five feet in height. There were one hundred working rooms. The gauge of track was two feet nine inches, and the capacity of the mine cars, one ton each. The air-shaft is fifty feet from hoisting shaft. The escape is by an old slope where the men can walk out of the mine in case of an accident. This mine is in good condition with the exception of covers on the cages, and a brake on the drum. I notified the superintendent to put a brake on the drum and covers on cages, and to have the maps made up.

The Oskaloosa Coal Company's Mine is on the Chicago, Rock Island & Pacific Railroad, two miles west of Oskaloosa, John Burdess, president. The capital invested is twenty thousand dollars. The mine is operated by a slope using steam power, with single rope, the empty cars pulling the rope back into the mine to the first station. The mine is worked with single entries. The rooms are turned off both sides of the entry, and the air is carried through the rooms. The coal is weighed on railroad scales, after being screened. There were twenty-six miners employed, two mules and two drivers. The capacity of the mine was sixty-five tons per day. The length of the main entry three hundred and forty yards, with four cross entries driven one hundred yards apart. The entries are four feet six inches in height and six feet wide. The full volume of air is six thousand four hundred and twenty cubic feet per minute. Ventilation is by means of a furnace of nine cubic feet capacity, with an air-shaft four feet in diameter and sixty-six feet high. The mine had forty working rooms, with a gauge of track two feet ten inches. The capacity of the mine cars twelve hundred pounds each. The distance of air-shaft from mouth of slope was two hundred and ten yards. There is no way for the men to escape in case of accident except at the slope mouth. Sufficient air was traveling through the air-ways, but at some of the working places there was no circulation. I notified the superintendent of the condition of the mine, requesting him to provide an escape for the men, also to hang doors on the entries to force the air into the face of the rooms, and to

make maps of the mine. The outside workings were in good repair.

The Excelsior Mine is located two and one-half miles south of Oskaloosa on the Central Iowa Railway, S. S. Merrill, president, and W. A. Durfee (of Oskaloosa), superintendent. A capital of eighty thousand dollars is invested. The mine is operated by a shaft, using steam power to hoist the coal. There is also an engine to run the fan, one boiler furnishing the steam for both engines. The mine is worked with double entries. The coal is weighed on railroad scales after being screened. One hundred and thirty miners were employed. The capacity of the mine was five hundred tons per day. The length of the main entry was fifteen hundred and ninety feet with twelve cross entries. The full volume of air is seventy thousand cubic feet of air per minute; the air is divided at the bottom of the shaft and carried in different currents throughout the mines, giving each portion of the mine its proper amount of air. The mine is ventilated by means of a fan ten feet in diameter, run at ninety revolutions per minute. The air-shaft is eight feet in diameter and seventy-five feet high. The distance of the air-shaft from hoisting shaft is thirty-five feet. The escape shaft is eight feet in diameter, and situated fifty feet from the hoisting shaft. There were ninety working rooms in the mine, with a gauge of track of three feet. The mine was in good condition, with a strong current of air traveling all through the mine. The outside workings were in extra good condition, with the exception of covers on the cages, and these have since been put on.

MONROE COUNTY.

Coalfield Mine is situated in Monroe county on the Central Iowa Railway. It is owned by the Consolidation Coal Company. This mine is operated by a drift, and has been in operation three or four years; but the old works are all abandoned, and new ones are now being opened out with double entries, making the mine almost the same as a new one. Thirty miners were employed at the time of my visit, and the miners had good air within a reasonable distance of their working places. The coal is about four feet in height on an average. The miner mines the coal and then blasts it down with powder, firing only twice a day, and by the time the men get back

after dinner the smoke is all gone. The mine is ventilated by means of a furnace of twenty cubic feet capacity, with an air-shaft three feet in diameter and eighty-six feet high. The capacity of the mine was one hundred tons per day. The coal is weighed on railroad scales after being screened. In this mine a wooden track is used with flat car-wheel and wooden guide on inside of the track. The coal is hauled by mule power from the back of the mine to the top of the dump. There were no ladders in the escape-shaft when I was there, but I requested the foreman to have them put in as soon as possible.

Hickory Grove Mine is situated on the same railroad, four miles farther up the creek (both this and the last mentioned mine being situated on Miller's Creek). It is operated with a shaft. The officers are A. Hicks, president; Martin Hicks, superintendent, both of Hickory Grove; and H. W. Gleason, of Oskaloosa, vice-president. The shaft is eighty feet deep and there is a forty horse-power engine for hoisting the coal. This mine is worked with room-and-pillar. At the time of my visit twenty-six miners were employed. The length of the main entry was two hundred and fifty yards with six cross entries. The cross entries were driven, some, sixty yards apart, and some, one hundred. Two of the entries were one hundred and forty yards in length, two were eighty yards and the other two were just started. The entries were driven twelve feet wide, and the height of the coal, which is five feet. The mine is aired with a fan seven feet in diameter and three and one-half feet in width. The air is carried in one current around the mine. There was a good current passing but the miners fire the blasts at all times in the day. For this reason the air was loaded with powder smoke. The volume of air was equal to one hundred and twenty-five cubic feet per man per minute, but the first man in the air fared better than the last. I recommended the men to pass a law regulating their firing, but they said they could not make coal enough by firing twice a day and for that reason they would rather have the smoke, and be allowed to fire at will. The capacity of the mine was three hundred and seventy-five tons per day. The coal is weighed on railroad scales. The air-shaft is five feet in diameter and eighty feet high and is situated eighteen yards from the hoisting-shaft. This mine has an escape-shaft for the men, which the company has

a right to be proud of. It is eight feet in diameter inside the timbers, with winding stairs commencing at the bottom and making eleven circles in reaching the top. The men use this altogether for going into and coming out of the mine. No one is allowed to ride on the cages, hence covers on them are unnecessary.

POLK COUNTY.

The next mine visited was the Pioneer Coal Company's Mine, Wesley Redhead, president, James P. Clark, superintendent, both of Des Moines. There is a capital invested at this shaft of fifteen thousand dollars, using steam power for hoisting the coal. The mine is worked with room-and-pillar. The main entry is nine hundred and thirty-three yards in length, with two cross entries. Here were employed twenty-one miners. This mine has been in operation for several years and has considerable territory wrought out. The air-shaft is two hundred yards from the hoisting-shaft. The hoisting-shaft is the downcast for the air, which has to travel nine hundred and thirty-three yards before it gets to the cross entries where the men are working, and then travel the same distance back to the upcast. The coal being soft, the entry pillars were crushed from the weight of the roof settling on them, until there was a leakage of over four thousand cubic feet of air before it got to the men; but at the time of my visit there was sufficient air for the amount of men employed. The air-shaft is five feet in diameter, and one hundred and sixty-seven feet in height. The capacity of the furnace is twenty-five cubic feet. This mine at one time extended from the north from the shaft passing under 'Coon River, but the coal got too thin to work, and that part of the mine was abandoned. The present workings of the mine are in bad condition. The foreman gave as a reason that the mine was just recovering from the effects of a strike which had laid it idle for some time. The curtains and doors on the entries were in bad condition, and were of no benefit for what they were intended for. The air-ways in places had considerable slate and refuse in them, and the cross-cuts from one entry to another were too small to admit of the proper amount of air passing through them. I requested the boss to take the curtains off the entries, and hang doors in their places, to fix up the doors that he already had so they would not leak so much air, to clear up the refuse

from the air-ways, and to have the break-throughs made larger all through the mine.

The Polk County Mine belongs to the same company, Wesley Redhead, president; Daniel Rees, superintendent. There is a capital invested of six thousand dollars. The mine is operated by a shaft using steam power, with hemp rope for hoisting. The mine is worked with room-and-pillar. It was employing twenty miners. The capacity of the mine was forty tons per day. The length of the main entry is four hundred yards, with the cross entries driven five hundred feet apart and seven feet wide. This mine is in good condition at the present time, considering the way the mine had been opened. At the time this company took charge of it, it was all on fire, and it was impossible to get any distance from the bottom of the shaft; but Mr. Rees, the present foreman, went to work, and by erecting board brattices to carry the air, finally succeeded in building brick and sand stoppings, and thus subdued the fire. The man in charge of the mine when it was first opened did not understand that kind of work, and was opening the mine without any system, and when the fire broke out he could do nothing with it. Now the mine is in fair condition, with double entries driven seven feet wide and five feet high. The mine is ventilated by means of a furnace of thirty-six cubic feet capacity. The air-shaft is five feet in diameter and one hundred and five feet high. The current of air was over one hundred cubic feet per man per minute. The escape-shaft is two and one-half feet by five, with stairs, all complete.

The officers of the Eclipse Coal and Mining Company are S. S. Ethridge, Thomas Beck and J. L. Englebert, all of Des Moines. This company has a capital invested of fifty thousand dollars. The mine is opened with a shaft, using steam power for hoisting the coal. The mine is worked with room-and-pillar, with double entries seven feet wide and five and one-half feet high. The company was employing twenty miners, two drivers and two mules. The capacity of the mine was fifty tons per day. The length of the main entry is eleven hundred feet, with four cross entries one hundred and twenty yards apart. Three of the cross entries were driven three hundred yards from the main entries, and the fourth was driven one hundred yards; each entry driven double, with a velocity of air sufficient to give the men over one hundred and twenty cubic feet of air per man per

minute. The mine is ventilated by means of a furnace of forty-eight cubic feet capacity. The air-shaft is five feet in diameter and seventy-five feet in height. There were fifty working rooms, with a gauge of track of three feet. The capacity of the mining cars was twelve hundred pounds each. The air-shaft is situated fifty feet from the working-shaft. The size of the escape-shaft is five by ten feet. I found the doors in the mine considerably out of repair, and the brattices were leaking considerable air, but the same reason was given which the other foreman gave, that while the men were on the strike repairs had been neglected. Men were now employed at general repair work inside the mine, and if the improvements are made which the foreman told me were intended, the mine will be in good condition.

The Eureka Mine is situated on the south side of 'Coon River, just at the foot of the hill, Norman Haskins, president; James Cormac, superintendent, both of Des Moines. A capital of twenty-five thousand dollars is invested. The mine is opened with a shaft using steam power. The mine is worked with double entries. At the time of my visit was employing sixteen miners, one driver, and one mule. The coal is weighed on railroad scales after being screened. The capacity of the mine was fifteen tons per day. The length of the main entry is one thousand and eighty feet, driven eight feet wide and five feet high, with four cross entries. The length of the first and second east is four hundred and eighty feet, the first west is three hundred and sixty feet, and the second west is seven hundred and twenty, with air-ways driven parallel with entries. The full volume of air was five thousand five hundred and twenty cubic feet per minute. The mine is ventilated by means of a furnace of eighteen cubic feet capacity, with an air-shaft four feet by five, one hundred and twenty feet high. There were twenty-two working rooms, with a gauge of track of three feet. The capacity of mine cars was twelve hundred pounds each, and the distance of the air-shaft from hoisting-shaft three hundred and seventy-two feet. The escape-shaft is situated close to the furnace-shaft, and is of the same size. The mine was in good condition, but I suggested to the foreman to have his break-throughs made larger between the entries, which he gave orders to have done. On November 27th there were complaints made to me that the air in the Eureka Mine was not

good, and I was desired to come and look after it. I went to the mine and tested the full volume of air, which was ten thousand three hundred cubic feet, almost double what it was when I first visited the mine; but on examination, I found that in dividing or splitting the air there were nineteen hundred and twenty cubic feet of air per minute on one divide where eighteen men were employed, while on the other, where there were forty-six men employed, there were eight thousand four hundred cubic feet per minute. I also found rooms with break-throughs too small to admit the air to pass through, which the miners said was their fault, as the company had never restricted them in making the break-throughs. Some had been large enough, but had been almost filled up again. The main trouble, however, was on the first right entry, and where the complaints came from; there were two rooms on that entry that had no break-through between them, and both parties refused to make one. I told them that the air was there for them, and whenever they made a place for the air to get to them, it would go there, but it was not for me to decide who should make the break-through, as it was none of my business who made it, so that it was done. I requested the boss to hang some doors on the entries, and to have the break-throughs in dispute put through immediately. I have heard nothing of the complaint since.

MARION COUNTY.

The mine of J. T. James & Co. is situated on the Chicago, Rock Island & Pacific Railway at Knoxville, Marion county, where they are operating a shaft, with a capital invested of five thousand dollars, using a two-horse gin for hoisting the coal. This mine is worked with room-and-pillar. The cross entries are driven twenty feet wide, with two walls of slate built five feet from each rib. The space betwen these walls is filled with slate and refuse from the coal; in this way two entries are got, carrying the air up one side of this wall and down on the other. The coal is weighed on railroad scales after being screened. There were nineteen miners, one mule and one driver employed in the mine. The capacity of the mine is one hundred and fifty tons per day; the length of main entry one hundred and seventy-five yards, with four cross entries driven one hundred yards apart; the length of the first west entry is seventy-five yards, and of

second west thirty yards; the height of entry four feet, the width six feet, and the full volume of air is seventeen hundred and seventy-six cubic feet. At the back of first west entry the air traveled ninety feet per minute, but on the second west there was no current of air. The doors had let all the air escape. The mine was ventilated by a stove placed at the bottom of the air-shaft. The stove was red hot, and I should think was doing all any stove could do placed in similar circumstances. The air-shaft is joined to the hoisting-shaft, and is two and one-half feet wide, six feet long and seventy-five feet high; the gauge of track is two feet eight inches, and the capacity of mine-cars, one thousand pounds each. The downcast-shaft is seventy-five yards from the hoisting-shaft, and is also used for an escape shaft for the men. It is five by six feet. The hoisting-shaft was without gates on the landing, and there were no covers on the cages. I requested Mr. James to put in a furnace in place of the stove, to put covers on the cages, gates on the landing, and to have a map of the mine made. Work was begun the next day at the furnace and it was put in as soon as it could be done. I passed through there some time after when men were working on the gates, to make room for which, so that the gates would work, it was necessary to raise the roof of the dump.

The company has another shaft in operation a little west of the one before spoken of, but as it was working only eight men then, I did not go down into the mine. The company also has another mine close to Knoxville Junction, on the same railroad, but was working only a few men there, but it is in contemplation to work more as soon as the mine can be opened out enough to make room for miners. There is another mine in Knoxville known as the Gamble Mine, but as it was only working a few men it was not visited.

The Flagler Mine Number Five, belonging to the Union Coal and Mining Company, is situated on the Albia, Knoxville & Des Moines branch of the C., B. & Q. Railroad, about five miles south of Knoxville. The officers are J. C. Peasley, president, Burlington, and Samuel A. Flagler, superintendent, Ottumwa. It has a capital invested of twelve thousand dollars. The mine is opened by a drift, using mule power for hoisting the coal. The mules pull the coal direct from the mines, the coal being high enough for large mules to go anywhere in the mine. Some places are seven or eight feet high. The mine is all worked doubly entry. The coal is weighed on railroad scales after being screened. Forty miners, six drivers, and eight mules were employed. The capacity of the mine was one hundred and thirty tons per day. The length of the main entry is nine hundred and fifty, with seven cross entries, driven one hundred and twenty yards apart; the length of the first and second south entries was five hundred feet. First and second north entries are driven two hundred feet, and the first west entry three hundred and thirty feet, with air-ways driven parallel with entries; the width of air-ways is six feet, and the height five feet and a half. The full volume of air is eight thousand nine hundred and seventy-five cubic feet per minute. The mine is ventilated by a furnace of twenty-one cubic feet capacity, with an air-shaft six feet square, and one hundred and two feet high. There were twenty working rooms with a gauge of track of three feet. The capacity of the mine cars is one thousand pounds each. The air-shaft is three hundred and thirty yards from mouth of mine. The mine is without a man-way or escape-shaft, and was in rather bad condition. It had been lying idle for some time, and there were a great many falls in the air-ways; but the foreman, Harry Booth, had put on a force of men to clean out the air-ways, and they were working at it while I was there. There was a good current of air traveling on all of the entries, but nothing to force the air into the rooms. I requested the foreman to hang doors on the entries in order to force the air into the rooms where the men were at work, also to provide a way of escape for the men, and to have the maps made. He asked for some delay on the maps, as he had recently been put in charge of the mine, and his time was occupied inside constantly.

OAKHILL MINE.

I next inspected the Oakhill mine, George I. Butler, president, Mt. Pleasant; C. F. Stephens, superintendent, Knoxville. This mine is located on the same railroad about one half mile south of the Flagler Mine. A capital is here invested of twelve thousand dollars. The mine is opened by a drift using mule power. This, like the Flagler, has coal eight and nine feet thick. The mine is worked with double entries. The coal is weighed on small scales before being screened. Twenty-eight miners, two mules and two

drivers were employed in the mine. The capacity of the mine is one hundred and twenty-five tons per day. The length of main entry is seven hundred and seventy-one feet, with six cross entries, the length of first and second east three hundred and thirty-two feet, third and fourth east one hundred and eighty-one feet, third and fourth west two hundred and thirty feet. The first and second west were wrought out. The entries are driven six feet high and twelve feet wide. This width is necessitated in order to make room in which to stow away the refuse of which there is a large quantity in this coal. The full volume of air was seven thousand and sixty-four feet per minute. The mine was ventilated by a furnace of eleven cubic feet capacity with an air-shaft four by six feet, and seventy-one feet high. The capacity of the mine cars is one thousand pounds each. The air-shaft is situated seven hundred and thirty-four feet from mouth of mine. There were two inlets for the air, one an old air-shaft; the other the drift mouth. The air that passes in at the mouth of the mine ventilates the east and back part of the mine while that which comes down the old air-shaft ventilates the west part of the mine, both currents meeting at the furnance. Ladders have since been put in the old shaft referred to, to be used as an escape for the men in case of accident. This mine has all the air traveling on the entries. I requested the boss to put doors on the entries to turn the air into the rooms, and make the breakthroughs larger between the entries.

JEFFERSON COUNTY.

WASHINGTON COAL COMPANY'S MINE.

On request I visited the Washington Coal Company's mine, of Pertre. William Elliot, president; W. E. Thompson, superintendent, both of Fairfield. The mine is located on the railroad seven miles north of Fairfield. There is a capital invested of twelve thousand dollars. The mine is opened by a shaft using a two-horse gin to hoist the coal. The mine is worked with single entries. The coal is weighed on small scales before being screened. At the time of this visit, forty-eight miners, two drivers, two mules, and three pushers were employed in the mine. The coal is too thin to admit of a mule going to the face; accordingly men are required to push coal from the

miner to the entry, where the roof is blasted down to make height for a mule. The capacity of the mine is eighty-two tons per day. The length of the mine entry was one thousand three hundred and eighty feet and there are two cross entries four hundred feet in length, the height three feet and width of entries seven feet. The full volume of air was five thousand nine hundred and fifty-six cubic feet per minute. The mine was ventilated by means of a furnace of twenty-eight cubic feet capacity, with an air-shaft three feet nine inches in diameter and eighty-four feet high. There were twenty-eight working rooms. The gauge of track is two feet eight inches, and the capacity of the mine cars nine hundred pounds each. The air-shaft is sixty feet from hoisting-shaft. The mine was in poor condition on account of having no covers on the cages, no gates on the landing, no escape for the men aside from the hoisting-shaft and very poor ventilation. I notified the superintendent of the condition of his mine, but not hearing anything from the mine I again visited it October 29th and found it in about the same condition. The sinking of a shaft for the purposes of escape had been begun, but it was not finished. There were yet no covers on the cages, and the air in the back of the mine was not fit for men to work in. I gave the company its choice to reduce the number employed as the law directs, or I would have to reduce the force by law. The force was then voluntarily reduced and is in that condition at the present time. When the improvements are completed and the mine properly ventilated, the company is to advise me when I will again visit the mine and if the ventilation is good, their full force of men may again be set to work.

JEFFERSON COUNTY COAL COMPANY'S MINE.

The Jefferson County Coal Company's shaft is located about one mile east of Perlee, James F. Wilson, of Fairfield, president, and R. H. Herford, superintendent. Most of the coal from this mine is used by railroad engines. There is a capital of twenty thousand dollars invested. The mine is operated by a shaft, using steam for hoisting the coal. The mine is worked with double entries. The coal is weighed on small scales, before being screened. Seventeen miners, two mules and two drivers were employed. The capacity of the mine was forty tons per day. The length of main entry was

five hundred feet, with two cross entries, the height of entries three and a half feet, and the width six feet. The mine was ventilated by building a fire in a basket at the bottom of the air-shaft. There were five working rooms with a gauge of track of three feet, and the capacity of the mine cars was one ton each. The distance of air-shaft from hoisting-shaft was four hundred feet. There were no gates on the upper landing, and there was no brake on the drum, and in what was used for an air-shaft. I could not, standing at the bottom, see out at the top, while the air-course at the bottom of the shaft had fallen in. Neither were there any maps of the mine. I gave the superintendent notice of the condition of his mine, and the improvements required. When I visited the Washington shaft the second time I also visited this mine. The brake had then been put on the drum and the gates on the landings, but there were no covers on the cages. Another shaft had been commenced and was sunk about half way to the coal. When complete it will be large enough, being seven feet in diameter. The air-course, before spoken of, was timbered up until the point was reached where it had fallen in, whence the men drove through the coal until they made connection with the air-course on the opposite side of the fall. The company, however, voluntarily reduced its force to twenty men, under the provisions of section nine of the mining law, the mine not having been in operation one year. The present foreman had had charge of this mine only about ten days before my first visit.

KEOKUK COUNTY.

STARR COAL COMPANY'S MINE.

The Starr Coal Company's Mine is situated at What Cheer, on the Burlington, Cedar Rapids & Northern Railroad, A. N. Foster, superintendent. There is a capital invested of thirty-three thousand dollars. This mine is operated by a shaft, using steam for hoisting the coal, and is worked with double entries. The coal is weighed on railroad scales after being screened. One hundred and ten miners, four mules and four drivers were employed. The capacity of the mine was four hundred tons per day. The length of main entry was seven hundred yards with eight cross entries; the height of the entries, six feet, and the width, nine feet, and the full volume

of air, nine thousand five hundred and forty cubic feet per minute. The mine is ventilated by a steam jet at the bottom of the air-shaft. The air-shaft is three feet wide, four and a half feet long, and eighty-five feet high. There are eighty working rooms, with a gauge of track of three feet, and the capacity of the mine cars one ton each. The distance of air-shaft from hoisting-shaft is thirty-five feet. The mine is in good condition, with the exception of an escape-shaft and a brake on the drum. The air-ways are are driven large and of uniform size, and the doors and stoppings were in good condition. I tested the steam jet at its full capacity, and it gave eleven thousand one hundred and thirty cubic feet per minute. This mine requires a less amount of air per man any than other mine I have been in. There is very little waste in the coal, and consequently no gob in the rooms to accumulate gas. The coal is cut and mined on each rib, and very little powder is used. The outside workings were in good condition. The Starr Company is sinking another shaft one mile north of the one described, but had only a few men employed there. There were several other mines in this county which I went to see, but as none of these were working fifteen men, I did not go into them. Some of them are in bad condition.

APPANOOSE COUNTY.

CENTERVILLE COAL COMPANY'S MINES.

I next visited the Centerville Coal Company mines at Centerville, Appanoose county. William Bradley, John T. Henderson and D. A. Spooner constitute the company, and are its officers. It has two mines. The first visited was the Cobb Mine. A capital is here invested of twenty-five thousand dollars. The mine is operated by a shaft using a twelve horse-power steam engine for hoisting purposes. The coal is weighed on railroad scales after being screened. Twenty-eight miners, one driver, and two mules were employed in the mine. Its capacity was fifty tons per day. (I could not get the measurements as there were no maps of the mine.) The ventilation was by a steam jet at the bottom of the air-shaft, which is four feet wide, five long, and one hundred and seventy high. There were thirteen working rooms, with a gauge of track two feet six inches, and the capacity of the mine-cars of twelve hundred

pounds. The air-shaft is joined to hoisting-shaft. The escape shaft is situated at the extreme north part of the mine. It had once been a hoisting-shaft. This mine is in poor condition. There were no covers on the cages, no brake on the drum and no gates on the landings while the traveling-way leading to the escape-shaft was full of water. The mine was opened with single entries, and the air traveling through the old rooms became so loaded with gas that it was with difficulty I could carry a light in some of the working places. The air-way from the bottom of the air-shaft where the steam jet is has no connection with the works at the back of the mine, but comes out on the main entry about fifty yards from the hoisting-shaft. The hoisting-shaft is a downcast for the air, and so is the escape-shaft at the back of the mine, but the hoisting-shaft gives the steam jet its full capacity of air, and consequently there is no current from the back of the mine where the miners are at work. The main entry was in a dangerous condition on account of the way it was timbered. The shaft is sunk in a fault, and had to be driven about seventy-five yards before coal was reached.

The timbers in the entry through this fault were rotten, and some of them broken by the weight, and the entry was liable to close at any time. I gave the company notice of the condition of the mine and requested immediate attention. Next morning a force of men was set to work, putting in new timbers in the main entry; and the other changes were promised as soon as men could be gotten to do it.

The company's other mine is situated about one mile west of Centerville. There is a capital invested at the mine of ten thousand dollars. The mine is opened by a shaft, using a twenty-five horse-power engine for hoisting the coal. The mine is worked with single entries. The coal is weighed on small scales before being screened. Twenty-nine miners were employed. The capacity of the mine was seventy-five tons per day. The length of the main entry was six hundred feet, with cross-entries. This mine is ventilated with a steam jet. The air-shaft is two feet wide, five feet long and one hundred and forty feet high. There were fifteen working-rooms with a guage of track of three feet, and capacity of the mine cars fourteen hundred and forty pounds. This is a new mine, having been opened only one year. There were no covers on the cages, no brake on the drum, and no escape-shaft. The air in the workings of the mine was poor on account of the curtains being torn so as to allow the air to waste before it gets to the men. I requested the curtains taken off and doors put in place of them. An entry was being driven night and day to get to another shaft, which it is contemplated to use as an escape-shaft for the men. I recommended that double entries be opened and the abandonment of the single entry plan, as it was a new mine; and in the way it was being worked the company would soon be compelled to go to a big expense to ventilate the mine as it should be done.

WATSON SHAFT NUMBER FOUR.

The Watson Shaft Number Four is situated south of Centerville about one mile and is owned by Rufus Ford, of Des Moines. There is a capital invested of forty-five thousand dollars. A twenty-five horse-power engine is used for hoisting the coal. The mine is worked with double entries. The rooms are driven forty feet wide with two roads in each room. The coal is weighed on small scales before being screened. Forty-seven miners, three mules, and three drivers were employed. The capacity of the mine was one hundred and fifty tons per day. The length of the main entry is four hundred yards, with three cross-entries driven one hundred and twenty yards apart. The height of air-ways was two feet, nine inches, width seven feet; ventilated with steam. The air-shaft is four feet wide, six long, and one hundred and ninety high. There were fifty working rooms, a gauge of track of three feet two inches, and capacity of mine cars fourteen hundred and forty pounds. The escape-shaft is four hundred feet from hoisting-shaft. The air in this mine was good, although the curtains and doors were somewhat out of repair. There were no covers on the cages, no brake on the drum, and no ladders in the escape-shaft. I gave the company notice of the condition of the mine, and the repairs necessary to be made.

POLK COUNTY.

WATSON MINE, DES MOINES.

I next visited the Watson Mine situated at Des Moines, and belonging to the same company, Rufus Ford, president. The reason I did not visit this mine at the time I visited the other mines in the neighborhood, was that the mine at that time was lying idle, the men being on a strike; so I passed it by until now. This mine is operated by a shaft, using a forty horse-power engine for hoisting the coal. A capital is invested of sixty thousand dollars. The mine is worked with double entries on the east side of the mine, but the entry running west from the main entry is worked single. The coal is weighed on small scales before being screened. Forty-four miners, six drivers, and eight mules were employed. The capacity was fifty tons per day. The full volume of air at the first of the workings was thirty-six hundred cubic feet, but the leakage reduced it until on the west entry there was no current. The mine is ventilated with a fan eight feet in diameter, with an air-shaft six feet square and seventy feet in height. The air-shaft is one hundred and fifty yards from hoisting-shaft, and is used for an escape-shaft. The air-ways are driven three and one-half feet high and six feet wide. There was no brake on the drum, and one of the gates on the lower landing was off. The company had no maps of the mine. This mine has every advantage for good ventilation, but the air is allowed to escape before it gets to the men. The air-course running parallel with the main entry was almost full of refuse in one place where the men had been blasting up bottom; they had put all the lumps which they could handle with their hand into the air-course until it was almost full. I gave the company notice of the condition of the mine, requesting a brake put on the drum, the stoppings repaired, the air-courses cleaned out, and maps made of the underground workings of the mine. I recommended that another door be hung on the traveling way leading to the escape-shaft, for the reason, that whenever the door was opened, the full volume of air passed direct to the upcast. By hanging another door, as both would not be open at once, the current of air would continue to pass around the mine.

JASPER COUNTY.

JASPER COAL AND RAILROAD MINE.

The Jasper Coal and Railroad Mine is situated five miles south of Newton, Jasper county. F. H. Griggs, of Davenport, is president, and D. S. Couch, of Newton, superintendent. A capital is here invested of fifty thousand dollars. The mine is operated by a slope using steam power for hauling the coal, and is worked with double entries. The coal is weighed on railroad scales after being screened. Thirty-four miners, three drivers, and three mules were employed. The capacity of the mine was seventy tons per day. The length of main entry was two thousand feet, with two cross entries driven eighty yards apart. The entries are four and a half feet high and ten feet wide. The full volume of air was six thousand and nine hundred and eighty cubic feet. Ventilation is by means of a furnace of twenty cubic feet capacity, with an air-shaft four by six feet, and eighty-two feet in height. There were twenty-five working rooms, with a gauge of track of two feet eight inches. The air-shaft is situated four hundred yards from mouth of slope. The escape shaft is at the air-shaft. It was once a hoisting-shaft, and one side is now used for an air-shaft, and the other for an escape. The machinery belonging to this mine is in good repair. There are two drags for the train on the slope, in case of one breaking; but the interior of the mine is not in very good repair. The stoppings are leaking considerable air, and there was nothing on the entries to force the air into the rooms. I gave the superintendent notice of the condition of the mine, requesting the stoppings be made tight, doors hung on the entries, and maps of the mine made.

MONROE COUNTY.

ALBIA COAL COMPANY.

The Albia Coal Company's mine is situated three miles west of Albia, on the main line of the Chicago, Burlington & Quincy Railroad. The company is composed of Henry Miller, S. W. Bone and Y. B. Lloyd, and has a capital invested of forty-five thousand dollars. The mine is operated by a shaft using a forty horse power engine for hoisting the coal. The mine is worked with double entries. The coal is weighed on railroad scales after being screened. One hundred and sixty miners, twelve drivers, and twelve mules are employed in the mine. The capacity of the mine was four hundred tons of screened coal per day. I did not get the measurement of the mine, the company having no maps, but they have since been made. The air-ways are five feet high and six feet wide. The full volume of air is thirty-eight thousand two hundred and twenty cubic feet per minute. The mine is ventilated by means of a furnace of thirty cubic feet capacity. The air-shaft is seven feet long, five feet wide and one hundred and thirty-eight feet in height. There were eighty working rooms, with a gauge of track of three feet, and the capacity of mine cars sixteen hundred pounds. The company has made a blacksmith shop in the mine, where all of the work is done for the interior of the mine, and it saves the trouble of hoisting miners in the shaft, and the air is divided so the air from the mule stable and the blacksmith shop goes direct to the furnace, and does not affect the air of the mine. The volume of air before alluded to does not include the amount that passes through the mule stable and blacksmith shop. There were no covers on the cages, and the gates on the upper landing needed some repairing, which I requested the company to have done.

There were other mines in operation close to this mine, but they were neither of them working fifteen men, and were accordingly not visited. The Cedar Coal Company is operating two shafts only a short distance from the Albia Coal Company's Mine. There are a great many mines along Cedar Creek, but none of them are employing fifteen men.

MONROE COUNTY.

EUREKA MINE.

The Eureka Mine, of Monroe county, is situated about one mile from Fredric, a station on the C., B. & Q. Railroad. The company is composed of A. P. Minotonye, C. O. Monroe, D. S. Starr and R. A. Furguson. There is a capital invested of eight thousand dollars. The mine is opened by a shaft, using a twenty-five horse engine for hoisting the coal. The coal is weighed on wagon scales, and twenty-seven miners were employed. The mine is worked with single entries. The length of the main entry is two hundred and forty-five yards. The entries are four feet four inches in height, and seven feet wide, ventilated with a furnace of twelve cubic feet capacity, with an air-shaft two feet wide, five feet long and one hundred and twenty feet in height. The air-shaft is joined to the hoisting-shaft. The air in this mine was good with the exception of two rooms. These rooms were driving break-throughs when I was there. There was no brake on the drum, no covers on the cages, and no gates on either landing, and no maps of the workings of the mine. I requested that the necessary improvements be made. The escape-shaft is through another mine, belonging to the Akers Brothers. By mutual consent their works are driven so as to connect the two mines, which are about one hundred yards apart, so that in case of accident at either shaft, the men can escape at the other. The Akers Bros. were working their mine longwall. This coal is suitable for that kind of work, as there is a seam of slate about one foot in thickness in the center of the coal, which can be used to good advantage, building walls along the roadways, and filling the space behind the workmen as they advance.

LUCAS COUNTY.

WHITEBREAST MINE.

The Whitebreast Mine is situated at Cleveland, Lucas county, on the main line of the C., B. & Q. Railroad. J. C. Osgood is president and Thomas J. Phillips, superintendent. The company has a capital invested of one hundred and fifty thousand dollars. The mine is operated by a shaft, with double entries, using a double engine with eighty horse-power for hoisting the coal. Three boilers furnish steam for the hoisting engines and for the engine which runs the fan. Four hundred and five men and forty-two mules were employed and working two shifts. Two hundred and twenty-seven miners, thirty-three mules and twenty-one drivers were working on the day-shift, and the balance were working nights. The capacity of the mine is six hundred and forty tons per day; the length of main entry two thousand feet; the size of air-ways five and one-half feet in height and eight feet wide; the full volume of air thirty-five thousand three hundred cubic feet per minute. Ventilation is with two seven foot downcast fans, making the hoisting-shaft an upcast. The air-shaft is six by eight feet, and two hundred and fifty feet deep. There were one hundred and thirty working rooms, with a gauge of track of three feet two inches. The capacity of the mine-cars is one ton. The downcast is used for an escape-shaft, and the company keeps a rope in the engine-room at the fan and a gin to hoist the men should an accident occur. The air in the mine was all traveling on the entries. I requested doors hung on the entries to force the air into the rooms, and I recommended that they put guides in the air-shaft and provide a cage for hoisting men in time of accident. The company has another shaft sunk just one-half mile east of the one they are now operating, and was just putting in the machinery. This shaft has three apartments, two for coal and the other intended for lowering timbers and lowering and hoisting men. The company is double-shifting two of the entries intending to connect with the new shaft by the time the machinery is in place, and thinks to be ready to hoist coal at the new shaft by spring.

POLK COUNTY.

GARVER & WALTER'S MINE.

Garver & Walter's mine is situated northeast of Des Moines City. This mine was opened in September last. There is a capital invested of ten thousand dollars. The mine is opened by a shaft ninety feet deep, using a two horse gin for hoisting the coal. Twenty miners were allowed, all that the law allowed until the escape-shaft is sunk. The capacity of the mine was sixty tons per day. There were no covers on the cages and no gates on the landings, but six men were employed outside on improvements. They have started to sink another shaft; but the cold weather came on and they cannot get men to work at it.

WAPELLO COUNTY.

FITZ & POSTLEWAIT'S MINE.

Fitz and Postlewait's mine at Happy Hollow, Wapello county, is situated a little over a mile from the Chicago, Burlington & Quincy Railroad. The dump stands on the side-track at Shock's Station, a tram-road being used to bring the coal from the mine to the dump. They have a capital invested of five thousand dollars. The mine is opened by a drift, mule power is used to haul the coal. The mine is worked with double entries five feet high and seven feet wide. The coal is weighed on railroad scales after being screened. Eighty miners, nine drivers, and twelve mules were employed. Three of the mules were used on the tram-road, hauling the coal to the dumps. The capacity of the mine was ten hundred and fifty tons per day. The length of main entry was one thousand two hundred and six feet, with four cross-entries, driven four hundred and eighty-six feet apart. The first and second west were driven eleven hundred feet, and came to a fault where they were stopped. The third and fourth west were driven fourteen hundred feet. They had been in the fault for about fifty yards, but they were still driving them to see if good coal could not be reached. The full volume of air was seven thousand cubic feet per minute. The mine is ventilated by a furnace of twenty cubic feet capacity, with an air-shaft six feet

square and seventy feet high. There were forty-five working rooms with a gauge of track of three feet. The capacity of the mine-cars was one ton each. The distance of the air-shaft from mouth was fourteen hundred feet. The size of the escape-shaft is five feet square, and it is five hundred and fifty feet from mouth of slope. I requested the boss to hang doors on the entries to force the air into the rooms, and to make the maps up to the first of last September, as the law directs.

BOONE COUNTY.

CLIMAX MINE.

The Climax Mine is located at Coaltown, Boone county, on the Des Moines & Fort Dodge Railroad. The company which now owns the mine bought it a short time before I visited the mine, and I did not learn who its members were. The capital invested is fifty thousand dollars. The mine is operated by a shaft, using a twenty-five horse-power engine to hoist the coal. The mine is worked with double entries. The coal is weighed on railroad scales after being screened. Fifty-two miners, two drivers, and two mules were employed. The capacity of the mine was three hundred tons per day. The air-ways were four feet high and six feet wide, and the full volume of air was seven thousand eight hundred and seventy-two cubic feet per minute. Ventilation is with steam, using the exhaust steam from the engine. The air-shaft is joined to the hoisting-shaft and is twenty-two inches wide, six feet long, and one hundred and twenty feet high. There were thirty working rooms, with a gauge of track of two feet, eight inches. The capacity of the mine-cars was one thousand pounds. The escape-shaft is four feet square, and is seventy-five yards from the hoisting-shaft. There were no covers on the cages, and there was no brake on the drum, and the doors and curtains inside the mine were in bad condition. There were places in the mine where the air was very bad. I requested the boss to have covers put on the cages and a brake on the drum, to rebuild some of the brattices, and to take off one curtain and put a door in its place. The maps had not been made up to the first of September; so I also requested that this be attended to. I next went to Greene county, but the mines were all closed on account of a strike.

DALLAS COUNTY.

CHICAGO AND VAN METER COAL COMPANY'S MINE.

I then went to Van Meter. The Van Meter shaft is situated on the Chicago, Rock Island & Pacific Railroad. It is two hundred and fifty-six feet deep; a gin is used to hoist the coal. The mine belongs to the Chicago and Van Meter Coal Company, J. L. Platt, president, and J. M. Thompson, superintendent. This mine's engine-house and dump were burned down last fall, and new machinery is now being put in and it is thought everything will soon be ready for hoisting with steam again. The mine is working only fourteen men and only about fourteen tons per day can be hoisted with the gin. There are no maps of the mine. There is only one shaft and no way of escape for the men should anything happen at the hoisting-shaft. I recommended that another shaft be sunk, as the mining law would not admit of more than ten men working until another shaft had been sunk so that a way of escape could be provided for the men in case of accident.

HARDIN COUNTY.

I next visited the mines of Hardin county: but there were none that were working fifteen men. I went into only one mine in the county. This was Chaffin's Mine at Eldora. It is one of the oldest mines in the State and is about wrought out. The back part of the mine came to a fault where the sandstone of the roof came down and cut the coal out. What coal is left along the fault is being worked out and then it is the intention to attack the entering pillars and take them out. The coal in places in this mine is six feet thick. There was a good circulation of air in the mine.

WEBSTER COUNTY.

December 21st I went to Fort Dodge to visit the mines in that locality. I found that two of the largest mines in the county, belonging to the Fort Dodge Coal Company, were still lying idle. This company's mines are situated seven miles down the river from Fort Dodge. One of them is working thirty-eight miners, and is operated by a drift, mule power being used to haul the coal out of the mines and across the creek to the foot of the hill. Thence there is an incline running up the hill to the dump, an engine being used for pulling the coal up this incline. This mine is where iron miners are being used. There is a stationary engine at the mouth of the mine, where the air is condensed and conveyed into the mine through pipes to a reservoir placed on the main entry. From this reservoir there are two pipes, one on each entry. There were two of these miners in operation when I was in the mine. They not only did good work, but the exhaust adds to the ventilation of the mine. This mine depends altogether on natural ventilation, like all others in this locality, except two shafts belonging to the Fort Dodge Coal Company, where fans are used. There were no maps of this mine. I requested the company to have a map made, and to put in a furnace so as to cause a circulation of air in the mine.

The Craig Coal Company is operating on the west side of the Des Moines River just opposite Coalville. All of this company's mines, seven in number, are operated by drifts, and in all of them reliance is had on natural ventilation. The mines on this side of the river have never been worked very extensively, most of them lying idle in the summer time, but now that the Minneapolis & St. Louis Railroad Company is building a road down on that side of the river, some of the mines are opening with the intention of doing considerable business. The Craig Coal Company had only one mine that was working fifteen men, and I requested that a furnace be put into it to ventilate the mine and that the maps be made as soon as possible.

Walter Irvin's mine is situated about a mile from the river. It is opened by a slope with single entries. The men push the coal from the place of their rooms to the outside of the mine. Thirty-

three men were employed. The capacity of the mine was fifty tons per day. The entries were driven five and one-half feet wide and of the height of the coal, which is from five to six feet. Natural ventilation is relied on. The full volume of air was fifteen hundred and eighty-six cubic feet. There was nothing on the entries to force the air into the rooms. It passed in at the mouth of the mine, going direct to the upcast, which was a shaft, about eight feet deep. I requested the operator to sink an air-shaft, to put in a furnace and to have maps of the mine made.

Johnson McDonnough has three mines in operation. All of them are slopes, with only one opening at each mine.

Smith & McGovern have a mine opened by a slope that dips ten inches to the yard. They are employing seven men.

J. Stemlra has slope with one opening.

John Paral has a shaft fifty feet deep. He employs ten men. There are no covers on the cages and no gates on the landing. Natural ventilation.

Thomas Collins is working two mines on the east side of the river. Both are opened by drifts. Nine men were employed in each.

The Minneapolis & St. Louis Railroad has bought a mine on the west side of the river. It has one opening, which is being made larger, so as to have a double entry with two tracks, and another opening is being made in order to connect the two. In this way it is thought natural ventilation will give air enough for what men can be worked. At the time of my visit, a drain was being put in, and had reached a point on the main entry where the door that was hung to turn the air could not be closed, and I could not get a satisfactory test of the air. None of the mines on the west side of the river have any maps. I have given orders to have such maps made.

FIRST ANNUAL REPORT

OF

PARK C. WILSON,

STATE MINE INSPECTOR,

FROM JANUARY, 1881, TO JULY, 1881.

REPORT FOR 1881.

After making out my partial report the first of January, I continued my tour of inspection in the northern part of the coal-field, visiting the mines of Lehigh, Webster county.

WEBSTER COUNTY.

CROOKED CREEK COAL AND RAILWAY COMPANY.

The Crooked Creek Coal and Railway Company has three openings at Lehigh, all drift openings, with a capital invested of one hundred and twenty-five thousand dollars, using mule power. The coal is dumped directly into the railroad flats. The mines are worked on the longwall system. The coal is weighed on railroad scales. They were employing, when I was there, forty-seven men. The capacity of the mine was claimed to be one hundred and eighty tons per day. They had no maps of the mine, and I could not get the measurements of the works. The height of the air-ways was three feet; width, seven; ventilation by a furnace of twenty cubic feet capacity, with an air-shaft fifty feet in height and three feet in diameter. The full volume of air was one thousand nine hundred and forty cubic feet per minute. The air-shaft is situated thirty yards from the mouth of the slope. The escape was by another slope. The different openings were connected, so that in case of accident at one slope, the men could get out at the other. The coal was hauled from the two slopes, which were about one hundred yards apart, on to the one dump. This mine is not in very good condition. One of the openings was at one time worked on the room and pillar plan, and at several places in the mine the men were working in very poorly aired places. The air-course connecting the two openings was too small to admit of the proper amount of air traveling through the mine. In some of the places extra prices were paid in order to get men to work them, as it would cost more to conduct the air to the working place than the coal would be worth after it was taken out of the mine. This company owns the railroad from Judd, on the Illinois Central Railroad, to Lehigh, a distance of eight miles; and they contemplate opening another mine, as soon as the weather will permit, in the spring.

BLACK DIAMOND MINE.

The Black Diamond Mine is situated about one mile from Lehigh on Crooked Creek. W. C. Beam is proprietor, with a capital invested of $10,000. The mine is opened with a drift. There are two openings about one hundred yards apart, and the works connect back in the mine. The mine is worked with double entries room-and-pillar, using mule power. The coal is weighed on wagon scales, hauled in wagons to the railroad track, and there loaded into the cars. Thirty-one men were employed. When I was there the capacity of the mine was forty tons per day; length of main entry 1:2 yards, with two cross entries driven 120 yards apart, with air-ways driven parallel with entries, four feet high and six feet wide; all relying on natural ventilation through an air- shaft thirty-four feet high and five feet square, situated fifty feet from the mouth of one of the slopes. This mine, at the time of my visit, had good ventilation. It being very cold and windy the entry was closed leading to the air-shaft, and the air was going in at one opening and coming out at the other. The full volume of air was 1800 cubic feet per minute and none of the working places was any distance from the entries. The mine has never been worked very extensively and the air in passing through the mine has no great distance to travel.

BOONE COUNTY.

L. D. Wilber's Mine is situated about two and one half miles west of Boonsboro. It is opened by a shaft with a two horse gin for hoisting purposes. There is a capital invested of $10,000. The mine is worked on the room-and-pillar plan, with what is termed crib entries. The workmen drive twenty feet wide and build what is termed cribs—that is, square pens which are filled with slate in the center. There is a row of these in the center of this room. One side of these cribs is used as a roadway. On the opposite side a space is left of three feet for an air-course. At the time of my visit thirty-one men were employed. The coal was weighed on wagon scales and hauled to the railroad, a distance of about one mile. There were no maps of the mine. It was ventilated by a

furnace of twelve cubic feet capacity, situated on top of the ground with a stack about eighteen feet high. The air-shaft was joined to the hoisting-shaft two and one half feet square and 120 feet high. There were fourteen working rooms with a gauge of track of two and one half feet. This mine is in poor condition. It has no escapement-shaft for the men in case of accident at the hoisting-shaft. No covers were on the cages, and no gate on the landings; and the air-courses in a great many places were closed almost entirely up, and there was no place in the mine large enough for a man to get through without crawling, and in some places I could not get through at all. The space was almost entirely closed. I gave the superintendent notice of the condition of the mine, requesting another shaft shunk, covers put on the cages, gates put on the landings, and the air-ways cleaned out so that the air may travel freely through the mine, as the full volume of air was only three hundred feet per minute. The superintendent told me he would have the improvements put in immediately, as he was intending to drive a slope, and would commence in a day or two. I again visited the mine in April and found nothing had been done towards making the improvements I had ordered, except to make the gates on the landings, and they were pushed up as high as one could reach and a wedge driven in behind to hold them up, so that they were of no benefit whatever. The inside of the mine was in no better condition than when I first visited it. I requested the superintendent to reduce his force to ten men; and as he was working only fifteen men and had not steady work for them, he made the reduction. Those ten men, in my opinion, are working in very foul air, and if anything should happen to the hoisting-shaft they would be shut off from any escape, and perhaps perish before they could be got out of the mine; but, as a mine employing only ten men does not come within the provisions of the law, the Inspector could do nothing further. Some of the mines want nothing better than this, because, not having in the summer-time work for more, they would as soon reduce their force as not.

February 9, Logan & Canfield Mine was visited. It is situated about two miles from Boonsboro, on the branch of the C. & N. W. Railway. This mine is opened by a shaft 243 feet deep, using steam

power for hoisting purposes of sixteen horse-power. There is a capital invested of $30,000. The mine is mostly worked on the room-and-pillar plan. The proprietors are working two seams of coal, the upper longwall, and the lower with room and pillar. The two seams are only eight feet apart in this section of country. On the west side of the shaft they are working the second seam of coal, and and on the east side the third vein. They were employing at the time of my visit eighty-two men. The capacity of the mine was one hundred tons per day. The mine was ventilated by a fan seven feet in diameter and two feet wide. The air-shaft is joined to hoisting-shaft, and is three feet wide by six feet long. There were thirty-one working-rooms in the mine, with a gauge of tracks of two and one-half feet. The escape-shaft is situated about 370 yards from the hoisting-shaft, is twelve feet long, six feet wide, and one hundred feet deep, and was formerly used as a gin-shaft.

This mine was in poor condition. The escape-shaft had part of a ladder in it, but it did not reach to the bottom of the shaft, and if it had done so it was too old and rotten to be safe for men to climb out on; the manway leading to the escape was almost full of water back from the bottom of the shaft, and the return air-course had fallen in, and air was conducted to the upcast-shaft by an overcast over the main entry, and the overcast was not made tight enough so that the air, as it came down the hoisting-shaft, passed up through the bridge of the overcast and direct to the upcast-shaft, and consequently was of no benefit. The full volume of air was 860 cubic feet per minute, which was not nearly enough for the men employed; besides the mine produces a great amount of gas. It is troubled to a great extent with gob-fires. There were places in the mine where the air was actually hot from the heat of the fire in some of the old works. I notified the superintendent of the condition of the mine, requesting the manway cleaned out, the water taken out, and as the escape-shaft was used for hoisting water by means of a gin with a barrel in each side of the shaft, I recommended that they put a cage in one side of the shaft, so that in case of accident at the hoisting-shaft the men could be hoisted out with the gin. I also requested the return air-course be cleaned out and timbered, so that the overcast before referred to could be dispensed with, and the air, instead of escaping, be conducted to the men.

I again visited the mine in April, and found the manway all cleaned out and a cage in one side of the escape-shaft. The return air-course was also cleaned out and considerable improvements had been made otherwise. On testing the current of air I found instead of 860 cubic feet per minute, a volume of 4,800 cubic feet per minute. Yet it was not conducted to where the men were working. The workmen in the longwall workings were better cared for than those in the other part of the mine. In some of the rooms the air was thick and heavy, and the miner's lamp burned with a dull flame. I called the company's attention to the law and asked that the force be reduced to ten men until the mine could be brought into the conformity with the law. The proprietors said they were law-abiding citizens, and would reduce their force with the understanding that as soon as they thought they had everything in good shape they would notify me, when I was to inspect the mine, and, if everything should be found satisfactory, I would let the men go to work. They accordingly called on me again in May, stating they would have everything in good shape by the next Monday, and asking me to come and inspect the mine. When I got to the mine I found they had hung another door and made considerble improvements, while the volume of air was increased to 10,255 cubic feet, and the sanitary condition very much improved. There was some narrow work, which they had failed to get driven on account of a fall, but they had the fall almost cleaned up, and had only about another yard of coal to take out, and the miners told me they could hear the car on the opposite side. So I let the men go to work with instructions to the company to timber some of the entries, and make some of the air-ways larger. The mine is not in first-class condition, but there has been a big improvement, and the proprietors say they intend to keep on until they have everything in good shape.

LOWER VEIN COAL COMPANY.

This mine is situated a short distance west of Logan & Canfield's Mine. It also has a railroad track to the mine. It is operated by a shaft 245 feet deep, using steam power, double engine of 25 horse power. Capital invested, $50,000. The mine is worked on the longwall system. The coal is weighed on railroad scales after being

screened. At the time of my visit 85 men were employed. The works have capacity of one hundred and twenty tons per day. The mine is ventilated by a fan, the full volume of air being 3,000 cubic feet per minute, with an air-shaft four by six feet, 245 feet high, and joined to hoisting-shaft. The escape was through an old slope four feet in height and five feet in width. At the time of my visit this was almost closed with ice. Men were engaged cleaning out the ice, which, when accomplished, would double the volume of air; but the weather being very cold the water freezes as fast as it accumulates. The air is carried in one continuous current around the face of the longwall, or working-places of the mine, and in that way the first man was compelled to work with his coat on whilst the last man had scarcely air enough. I recommended that the air be divided, so as to let only part of the volume on the first of the men, increasing it at the different roadways leading to the face. I found on visiting the mine again in April, the plan suggested had been adopted with satisfaction to the men.

MILFORD COAL COMPANY.

This mine is located on the west side of the Des Moines river, just west of the Boonesboro mines. The mine is operated by a shaft seventy feet deep, using a two-horse gin for hoisting purposes. The mine is worked with room-and-pillar, single entry. The coal is weighed on wagon-scales, after being screened, and is hauled across the river to be loaded into the cars. Twenty-four men were employed. The capacity of the mine, at the time I was there, was thirty tons per day. Natural ventilation was relied upon. There were two openings; the shafts were about seventy-five yards apart, and the shaft that had been the down cast was full of ice. A man-way was joined to the hoisting-shaft. At the time of my visit the air was traveling down the hoisting-shaft, and up the man-way. There were no covers on the cages, no gates on the landings, and no ladders in the escape-shaft; and if there had been, the men could not have got out, for the place was full of ice. I gave the superintendent notice of the condition of the mine, requesting that covers be put on the cages, gates on the landings and ladders in the extra shaft to be used as an escape-shaft. When I visited the mines in that section again in April, the mine was working only six men, and the ferry-boat was not running on the river. So I did not visit that mine on the second tour.

ROGERS & CROW MINE.

This mine is located on the east side of the Des Moines River, close to the river bank. The mine is operated by a shaft, using a two-horse gin for hoisting purposes. Part of the mine is worked with room-and-pillar, with single entry; and part is worked longwall. The coal is weighed on wagon-scales, and hauled to the railroad track, a distance of about a mile. Thirty men were employed at the time of my first visit. The capacity of the mine was thirty-five tons per day. There are no maps of the mine. It is ventilated by a furnace of ten cubic feet capacity. The air-shaft is joined to the hoisting-shaft. There is no escape-shaft for the men in case of accident at the hoisting-shaft. There were no covers on the cages, nor gates on the landing; and all of the underground workings were in bad condition. The air-ways are too small to give good satisfaction. I notified the superintendent of the condition of the mine, requesting covers put on the cages, gates on the landing, and an escapement-shaft sunk. When I visited the mine again in April operations had been extended too near the river, and the water had broken into the mine, and nothing was being done. The vein of coal at this place is about on a level with the bed of the river. I spoke to the foreman about the danger of driving the underground workings too close to the river, but he thought there was no danger of the river bothering them, but he now thinks differently.

MOINGONA COAL COMPANY.

Of this company, P. E. Hall, of Cedar Rapids, is president, and William Blyth, of Moingona, superintendent of the mine. The mine is located at Moingona, Boone county, on the Chicago & Northwestern Railway. The company has a capital invested of one hundred thousand dollars. The mine is operated by a shaft, using steam power of twenty-five horse-power for hoisting purposes. The mine is worked on the longwall plan with good results. The coal is weighed on small scales before being screened. At the time of my visit one hundred and forty-five men were employed, and the capacity of the mine was three hundred and fifty tons per day. The mine is ventilated

by a furnace of sixteen cubic feet capacity, situated on top of the ground with a brick stack about twenty-five feet high. The full volume of air was eight thousand eight hundred and forty cubic feet per minute with an air-shaft four by six feet and one hundred and fifty-five feet high. The air-shaft is joined to hoisting-shaft. The escape-shaft is six by ten feet, situated about four hundred yards from hoisting-shaft. It was once used as a hoisting-shaft, but the works at that shaft are abandoned. This mine is in good condition in regard to ventilation. The air is so divided, or split, as to give the first men on the air about one hundred and ten cubic feet per minute, and increased at every roadway leading to the face of the coal, so that the last man had over eight thousand cubic feet traveling by his working place. But the men were riding up and down the shaft against loaded cages, which was ordered stopped immediately, and the superintendent notified not to allow any man to ride against a loaded cage.

NORTHERN COAL COMPANY.

R. E. Montgomery, of Ft. Worth, Texas, is president, and W. D. Morgan, of Moingona, superintendent. This mine is situated about two miles west of Moingona, on the Chicago & Northwestern Railway. It has a capital of thirty thousand dollars invested. The mine is operated by a shaft, using a forty horse-power engine for hoisting purposes, and is worked on the longwall plan. The coal is weighed on small scales before being screened. At the time of my first visit sixty-three men were employed. The capacity of the mine was one hundred and ten tons per day; and it was ventilated with a fan. The full volume of air was one thousand seven hundred and fifty-two cubic feet per minute. The air-shaft is joined to the hoisting-shaft and is four by five feet, and one hundred and thirty feet high. The escape-shaft is three and one-half by four feet, situated sixty yards from the hoisting-shaft. This mine, at the time of my visit, was not in first-rate condition. The air-courses had been allowed to fill up in some places until they were too small for good results, as they were using a seven foot fan, with which if the air-ways had all been of good size, the mine would undoubtedly have had a volume of three times what they now have.

HUTCHINSON BROTHERS MINE.

James and John Hutchinson, Zenorsville, Boone county, proprietors. These mines and all the mines in the vicinity are known as the Squaw Creek Mines. This mine has a capital invested of $6,000. The mine is opened by a slope. A one-horse gin is used for hauling the coal to the surface. The mine is worked by room-and-pillar, with single entry. The coal is weighed on small scales. Forty-three men were employed when I was there. This mine has employment for very few men in the summer time. The coal is sold to the country trade, and is what is generally termed a country mine; but in the winter there is a very large trade. The capacity of the mine was about 100 tons per day. Reliance is had on natural ventilation. There is an air-shaft about 350 yards from the mouth of the slope that is four by four feet and 100 feet deep. The full volume of air was 5,400 cubic feet per minute. There were eighteen working-rooms with a gauge of track of two feet four inches. The capacity of the mine-cars was 800 pounds. The air-shaft was intended as an escape-shaft for the men; but there were no ladders or anything by which the men could escape in case of accident in the slope. There was no drag in use behind the cars on the slope. There was a small drag there which I caused to be used while I was there, and I requested that a larger one be made and used on every trip hauled out of the mine, because if anything should break while men were in the slope behind the loaded cars it would be a miracle if some were not injured.

SQUAW CREEK MINE.

John Clemmons, Zenorsville, Boone county, proprietor. This mine is situated on Squaw Creek, only a short distance from Hutchinson Brothers' Mine. The mine has two openings, one a slope and the other a shaft, using gin power. It is worked on the room-and-pillar plan, with single entries. The coal is weighed on small scales. Thirty-six men were employed at the time of my visit, and the capacity of the mine was seventy tons per day. The air-ways were driven three feet eight inches high and six feet wide. The mine was ventilated by a furnace, but at the time of my visit to the mine a great portion of it was full of water. The pump had given out

and the proprietor had neglected to send for a new one until about the time of the snow blockade. Consequently they had no way of getting the water out of the mine. The air-courses were almost entirely full of water in places and for that reason there was no current of air traveling through the mine. This mine, like all the others on this creek, depends mostly on the local demand. No coal is sold to the railroads. Consequently in the summer time only a few men are kept, and perhaps for eight months in the year less than ten men are worked. Hence, the mine is not subject to the requirements of the law.

WARREN COUNTY.

SUMMERSET MINE.

John and James Sumsdon, Summerset, proprietors. This mine is situated on the river bank just opposite Summerset. The proprietors have a capital invested of $4,000. The mine is operated by a shaft; using a one-horse gin for hoisting purposes. It is worked with room-and-pillar, double-entry. The coal is weighed on small scales before being screened. At the time of my visit nineteen men were employed; the capacity of the mine was sixty tons per day; the length of the main entry was 200 yards, and the air-ways were 3½ feet high and 6 feet wide. Ventilation is by a furnace of 7 cubic feet capacity. The air-shaft is 27 inches wide, 5 feet long, and 90 feet high. The full volume of air was 640 cubic feet per minute. There were 80 working rooms with a guage of track of 2½ feet. The capacity of the mine cars was 600 pounds. The air-shaft was joined to hoisting-shaft. This mine is in poor condition, having no covers on the cages, no gates on the landings, and no escape-shaft for the men in case of accident at the hoisting-shaft. I notified the superintendent of the condition of his mine, requesting covers put on the cages, gates put on the landings, and an escape-shaft sunk. I again visited the mine April 6th, and found that they had not yet complied with the law. The proprietors had come to the conclusion that it would be cheaper for them to abandon the shaft, and sink a new one, than to make the necessary improvements the law required. The force was already reduced to seven men with the intention of soon quiting operations altogether at this shaft and sinking a new one farther down the river.

There is a number of other mines in the vicinity of Summerset that were working only a few men at the time of my visit to the county, and consequently were not subject to the mining law at that time.

WATSON MINE.

This mine is situated at Ford's Station, on the A., K. & D. branch of the C. B. & Q. railroad, Rufus Ford is president; capital invested $9,000. The mine is opened by a slope; and at the time of my visit steam power was being put in for the purpose of hauling the coal up the slope; the mine is worked on the room-and-pillar plan, with double entries, the coal is weighed on small scales. Thirty-three men were employed, and the capacity of the mine is 50 tons per day. The air-ways are 3½ feet height and seven feet wide, ventilated by a basket. The air-shaft is 4½ by 5 feet, and 28 feet high, being built at the mouth of an old drift opening and situated at the foot of a very steep hill. It is about 40 yards from the mouth of the drift where the coal is brought from the workings of the mine. There are 20 working-rooms with a gauge of track of 2½ feet. The capacity of the mine-cars was 1,000 pounds. The escape is by another slope belonging to the same company, which is used to supply the country trade. This mine is in fair condition for the number of men employed. I notified the president as to condition of the mine, stating that in case he should want to emply more men, it would be necessary to make an improvement in the shape of a furnace, instead of the basket now in use; and as there was nothing but a single door, and it not very good to keep the air from the outside of the mine going directly to the furnace, I requested a tight stopping made inside where the door now hangs, so that what air passed over the furnace would have to travel through the mine instead of coming from the surface and going up the air-shaft, and thus being of no benefit to any one.

MARION COUNTY.

KNOXVILLE CITY COAL COMPANY.

W. A. Gamble, Knoxville. This mine is situated in the north-east edge of Knoxville, and has a capital invested of one thousand dollars. The mine is opened by a shaft using a one-horse gin for hoisting purposes. It is worked room-and-pillar, with single entry. The coal is weighed on wagon scales after being screened. At the time of my visit fourteen men were employed. The capacity of the mine was thirty tons per day; main entry was driven 115 yards from the shaft; the air-ways were driven through rooms, and were four feet high and seven wide. The mine at one time had been ventilated by a stove, situated at the bottom of the air-shaft; but there was no fire in it at the time of my visit, and I don't think there had been any for some time, as it was almost covered with mud which had fallen down the shaft; hence, at this time, natural ventilation was depended upon, which gave 900 cubic feet of air per minute. The air-shaft was four by four feet, and height of air-shaft forty feet. There were eight working rooms, with a gauge of track of two feet four inches; capacity of the mine-cars, 800 pounds. The air-shaft is situated about seventy-five yards from the hoisting-shaft. This mine is in poor condition. There were no covers on the cages, no gates on the landings, and no escape-shaft for the men in case of accident at the hoisting-shaft, while the ventilation was very poor. Although this mine, as it employed less than fifteen men, did not come under the law, yet, as I was called upon to inspect this mine, I notified the proprietor of its condition, requesting covers put on the cages, gates put on the landings, a furnace put in the mine for ventilating purposes, and the hoisting-shaft re-timbered, as it had been badly damaged in cutting ice out of the shaft, some of the timbers being almost cut in two, and that the mining law would not allow him to work more than ten miners until the mining law was complied with. He concluded he would rather sink a new shaft than to repair the old one; he will abandon the present shaft, and sink a new one nearer the railroad, so that he can get a side track for loading cars.

J. T. JAMES & CO.'S MINE.

Of this mine I gave a description in the first part of my report. I visited it again March 11, 1881, and found the proprietors had made the improvements I had requested. They had taken the stove out of the mine, and in its place had built a furnace of twelve cubic feet capacity, and the full volume of air was increased from 1,776 cubic feet per minute to 4,900. They had covers on the cages and gates on the landings, and the general safety of the mine was improved. At the time of my first visit, I advised the foreman to abandon the plan of driving the entries twenty feet wide, building a double wall, and in that way getting a double entry, and he concluded to take the advice for the mine had only a short distance driven in that way, and it gave them more trouble than all the balance of the mine, on account of the leakage of air. When I was there in March, they were driving cross-entries to carry the air so as to avoid this crib entry, as they could not get it so but it would leak the full volume of air before it reached the miners' working place. They had about thirty yards to drive the cross-entries until they connected, and then the mine would have good ventilation throughout.

SOUTH CEDAR MINE.

The South Cedar Mine is situated at Marysville, R. H. Lenor and John Yenzer, proprietors. They have a capital invested of $3,500. The mine is opened by a slope, and is worked on the room-and-pillar plan, with single entry. They weigh the coal on wagon-scales. The air-shaft is seventy-five yards from the mouth of the slope and there are three openings that will admit of men escaping in case of accident. I could not get into the mine for the reason that it was full of water. A ditch had been dug to run the water from the creek into the mine on account of a fire which had started in an old mine that belonged to another company, but the two mines are connected under the ground, and as the mines have little to do in the summer time, they became filled with water to keep down the fire; but the fire has got under such headway and there are so many openings to give it fresh air, that it will take some time to conquer it. This is a piece of carelessness by which one good mine is lost, and not only so, another is damaged, as the slate,

coal and all, are on fire; and, unless the fresh air is shut out, it will burn for years, perhaps, without stopping.

FLAGLER MINES.

I visited the mines of Flagler August 4th. Found the Flagler Mine in fair condition, with the exception of two places, and arrangements were being made to better the condition of those places. I found the improvements I had recommended on a former visit all made. There was considerable roof falling in places throughout the mine, caused by the action of the warm air from the outside of the mine; but a force of men were employed in timbering and looking after that kind of work.

The Oak Hill Mine was not running as the old dump had been torn down, and it was now being re-placed with a new one of larger size and better construction.

PAGE COUNTY.

CLARINDA MINE.

This mine is situated two and one-half miles southeast of Clarinda on the Nodaway River. It is worked by Thomas Proser, who has a capital invested of $1,000. The mine is operated by a shaft and two slopes, using mule-power at both slopes, and a one-horse gin at the shaft for hoisting purposes. The mine is worked on the room-and-pillar plan, with single entry. The coal is weighed on wagon-scales, and at the time of my visit they were working sixteen men; the capacity of the mine was twenty tons per day; the length of main entry was 270 feet; the cross-entries were driven 150 feet apart; the air-ways were driven sixteen inches (the height of the coal) and five feet wide. Natural ventilation was relied upon. There were fourteen working-rooms with a gauge of track of two and one-half feet; capacity of mine cars five bushels each. This mine is not in good condition. There were no covers on the cages and no gates on the landings, and there was no circulation of air through the mine. The air-ways were in good condition, with doors and stoppings all in good order; but the trouble was that the air was passing in at one of the slopes and out at the other slope, and not going to the men in the back part of the mine. The opening of one slope was over eight or ten feet higher than the opening of the other, hence the air failed to travel around the works and

pass out at the hoisting-shaft, as was intended, because an old hoisting-shaft with which the works were connected sometimes, acted as an up-cast. I requested the foreman to hang a door on one of the slopes, and to build brattices disconnecting the present works from the old shaft, thereby giving only one intake and one outlet for the air, thus causing the air to pass in at the slope left open and out at the hoisting-shaft; and in that way it would necessarily travel by the working place of the miners. But before the improvements were all made, the river overflowed and filled the mine with water and not much will be done toward fixing up the mine until the fall, because, as all of the coal is sold to the country trade, the demand in the summer months would not warrant much expense in repairing the mine.

There are four other mines in operation in this county: Pinkerton shaft, five miles from College Springs; William Aikin's and William McClane's; and all the coal in this county which is being worked is only about sixteen inches thick.

TAYLOR COUNTY.

There are four mines in Taylor county. Smith Patch has a mine operated by a slope. The Burnside Mine is also operated by a slope, and Nathan Wilcox and Samuel Moore have each a shaft thirty feet deep.

ADAMS COUNTY.

CARBON MINES.

John and Thomas Gabbie, of Quincy, have a mine operated by a shaft. A capital invested of four hundred dollars, using a one-horse gin for hoisting purposes. The mine is worked on the longwall plan. The coal is weighed on wagon scales, and about twenty men are employed. In the cold weather when there is a demand for coal, the capacity of the mine was two hundred and fifty bushels per day. The length of main entry is one hundred and seventy feet; the height of air-ways, eighteen inches, and width, four feet; ventilated by a stove. The air-shaft which is four by four feet, being joined to hoisting-shaft. The capacity of the mine-cars was four hundred pounds each; and gauge of track, two feet and three inches. This mine is in poor condition. It is operated by a single

shaft, with no covers on the cages, no gates on the landing, and no escape for the men in case of accident at the hoisting-shaft: neither is the ventilation good; but the shaft had been in operation but ten months, and the law allows one year for making the second outlet. This is about the limit to which one of these shafts is operated; by that time the coal is worked out so far from the shaft that the owners prefer to sink a new shaft, rather than to make the roadways in the mine of sufficient height so that they could handle the coal with any economy.

KIMBY'S MINE.

This mine is situated at Carbon, Adams county, and is operated by a shaft forty feet deep, using gin power for hoisting purposes, with a capital invested of one thousand dollars. The mine is worked on the longwall plan. The coal is weighed on wagon scales. At the time of my visit fifteen men were employed; the capacity of the mine was twenty tons per day, and the air-ways were driven three feet high and five feet wide. Natural ventilation was relied upon. The air-shaft was four by six feet, thirty feet deep, and situated forty yards from the hoisting-shaft. There were no covers on the cages, and no gate on the landing. It was only a single shaft. The miners descended by sliding down the rope. There was a ladder in the hoisting-shaft by which men could come out of the mine.

BELL'S MINE.

A. Bell, Carbon, Adams county, is proprietor. This mine is operated by two single shafts, forty-two feet apart, the gin standing between the two shafts. Mr. Bell has a capital invested of one thousand five hundred dollars. The mine, like all others in this county, is worked longwall. The coal is weighed on wagon scales. At the time of my visit, thirty men were employed, and the capacity of the mine was fifty tons per day. The length of main entry, forty yards; the air-ways were driven three feet high and seven feet wide, and the mine was ventilated by natural ventilation, one shaft being used as an air-shaft; the other as downcast for the air; and there was no telling which was going to be the upcast, as both of the shafts were on a level on the surface and of equal depth. Sometimes the air would force down one shaft and then down the other, and again down

neither, as the pressure of the atmosphere would be alike on both shafts, consequently, at times, there would be no circulation of air in the mine. There were no covers on the cages; and the men were riding against loaded cages. While I was there, some of the men would cage their car of coal at the bottom of the shaft, then get on top of the car on the cage, and ride to the surface. There were no gates on the landings, and nothing to protect the top of the shaft; and there was no escape-shaft. As the two hoisting-shafts were forty-two feet apart, they could not, under the law, be accepted, as the law says they must be, separated by fifty feet of natural strata.

There were ten other mines situated in the county, all of them operated about as those already described. The coal in all of them ranges from sixteen inches to two feet in thickness. Not many men are employed in the summer season. As the coal is all sold to the local trade, they ship none on the railroads. The mines are eight miles from Corning, a station on the Chicago, Burlington & Quincy railway. Starley's mine, however, is an exception, it being at the north edge of the county, close to the county line of Cass county.

CASS COUNTY.

Royal Hudspath has a shaft in Cass county, just close to the south line of the county.

WHITEBREAST MINE.

I visited this mine the second time, March 18, 1881, and found it in fair condition. On testing the full volume of air, I noticed a decrease of about eleven thousand cubic feet in a minute in the volume. I communicated the fact to the superintendent, Mr. Phillips, in the evening. He sent two men to look the matter up, and reported to me the next morning that on examination they found that ice had joined at the bottom of the downcast shaft, partly filling up the air-way, and thereby obstructing the passage of the air by increasing the friction; but that the men had removed the ice, and requested me to test the circuit of air again; which I did, and found that there was forty thousand eight hundred cubic feet per minute. At the date of this visit, four hundred and seventy-five men were employed, and the capacity of the mine was increased seven hundred tons of lump coal per day. Work had commenced in the B shafts, and

eighteen men working it down. They had sunk the bottom of the shaft deep enough so that they had taken up about five feet of fire-clay at the bottom of the shaft. Sloping gradually to the shaft, and making a down grade for the loaded cars to travel, a ditch about two feet deep on each side of the entry, and about eighteen inches wide, had also been dug, and, commenced in the bottom of this ditch, a stone wall laid in cement, had been built, from the bottom of this ditch to the bottom of the coal. Then the timbers for the entry were placed on top of this stone wall, placed close enough together to touch, as did also the cross-timbers over the entry, the whole thing making what would be considered a splendid job, not only as a protection to the entry, but as economizing the handling of the coal. The entries from the old shaft came within about three hundred feet of connecting with the new shaft. When the two shafts are connected under ground they will then split the air, and in that way improve the ventilation all through the mines.

The company operating the "old coöperation" shaft were experiencing some trouble with the water, as the pump had given out, and as the mine was not working men enough to come under the requirements of the mining law, I did not inspect it; but the foreman told me he intended ventilating the mine with a fan not less than eighteen feet in diameter, which will be the largest fan in the State; and with air-ways and an upcast of proportionate size, it will give good satisfaction to the miners employed.

MAHASKA COUNTY.

The Elida Mine is situated just west of Knoxville Junction, on the Knoxville branch of the C., R. I. & P. Railway. E. J. Evans and J. T. James are proprietors. The mine is opened by a slope with a steam engine of twenty-five horse-power. The capital invested is $20,000. The mine is worked by room-and-pillar, with double entries excepting the first south entry, which is single. The coal is weighed on railroad scales after being screened. At the time of my visit, fifty-one men were employed; the capacity of the mine was 156 tons per day; length of main entry was 700 feet, with two cross-entries driven 180 feet from main entry, air-ways driven through rooms on first south, but in the rest of the mine the air-ways were driven parallel with entry; height of air-ways five feet, width

seven. The mine was ventilated by building a fire on some bars of iron at the bottom of the air-shaft, which was four and one-half feet by four and one-half feet, and forty-six feet high. The full volume of air was 2,079 cubic feet per minute. There were twenty-two working rooms with a gauge of track of two feet nine inches; the capacity of the mine-cars was one ton each. The distance of the air-shaft from the mouth of the slope was 120 feet. The mine was not in very good condition. Some of the men were working almost sixty yards in advance of the air, because there were not break-throughs between the rooms, although they had been ordered by the mining boss to make break-throughs, yet for some reason they had neglected to have it done. There was no escape-shaft for the men, but as the mine had not been opened one year that could be put off a little longer. I notified the superintendent of the condition of this mine, requesting a furnace put in the mine, an escapement provided for the men and a larger drag made to fasten on behind the train of loaded cars in the slope, as the one in I considered too small to be of any service should the rope or any of the couplings of the cars break.

This company has another slope in operation about 100 yards from the one referred to, which it intends to open out in time for the winter trade to a considerable extent, but at this time it is working only a few men. It is intended to use steam power, and during the coming winter to be able to handle considerable coal.

BUCK CREEK MINE.

Robert Evans, New Sharon, Mahaska county, proprietor. This mine is located four miles east of New Sharon. It is operated by a slope, using mule-power. Capital invested, $3,000. The mine is worked with room-and-pillar with single entry. The coal is weighed on wagon scales and sold altogether to local trade. The summer demand furnishes work for only two or three men, but in the winter time eighteen or twenty men are employed. The capacity of the mine was 2,000 bushels per day. The main entry was driven a distance of 200 yards with two cross entries, each 200 yards in length. The air-ways were four and one-half feet in height and seven wide, ventilated by natural ventilation, the air-shaft four feet square and forty feet high, being situated fifty yards from mouth of slope. The

escape-shaft is situated 150 yards from mouth of slope. The mine was working only a few men. I recommended a furnace put in for ventilation; also ladders put in the escape-shaft to afford means of escape in case of accident in the slope.

EVANS' COAL BANK.

Williams E. Evans, New Sharon, Mahaska county, proprietor. This mine is located about four miles northeast of New Sharon and has a capital invested of $20,000. There are two openings, both slopes using mule-power. The mines are worked with room-and-pillar, with single entry. The coal is weighed on wagon-scales after being screened. About twenty-five men are employed. The air-ways are driven five feet high and seven feet wide, ventilated by a stove placed at the bottom of the air-shaft, which was four feet square and fifty-five feet high.

There were twelve working-rooms with a gauge track of three feet two inches; capacity of mine-cars fourteen bushels. The air-shaft is situated about 300 yards from mouth of slope. There were no ladders in the escape-shaft. I requested that they be put in, also a furnace put in place of the stove.

There are several other mines situated in the vicinity. Jacob Heightsman has a shaft. Hugh Smith has a slope. James Roberts has a slope. Guthrie has two shafts and one slope, but they are worked on the same plan as the two above described.

EXCELSIOR MINE.

Situated two and one half miles south of Oskaloosa. There had been some complaints made by some of the miners here stating that the air was not good in the rooms. I had notified the superintendent, Mr. Durfee, of the complaints, requesting him to have it attended to. When I visited the mine I found that some of the rooms were not very well ventilated, for the reason that while the mine was idle last winter during the snow blockade, several of the rooms had fallen in, and that in working around the rooms which had fallen in the men were compelled to work in air not altogether the best. But in the worst air where they were working there was over 400 cubic feet of air per man per minute traveling on the entry from which the rooms were turned off. The boss had stopped some of

the rooms the morning I got there, and given the men orders to square up their places, but the men told me they would rather work on where they were than to turn new rooms. After going all through the mine I came to the conclusion that the foreman was doing the best he could under the circumstances. There are times when the boss cannot have a current of air at the face of every room, especially when a mine stands idle for some time and some of the rooms have fallen in. There were places in the mine where there was poor air on account of not having break-throughs. I called the boss's attention to this, requesting it attended to as soon as possible.

The new shaft, No. 2, was not quite ready to work, although the dump building was up and the machinery was being put in with the intention of getting ready to commence work by the 15th of July.

CONSOLIDATION COAL COMPANY OF MUCHAKINOCK.

This company's stockholders have bought out the interest in the old Consolidation Company of J. K. Graves and H. W. McNeill. The company now consists of Marvin Hughitt, J. E. Buxton, J. B. Redfield and M. M. Kirkman, but still retains the name of the "Consolidation Coal Company." Mine No. 3 was visited June 16, and was in good condition with the full volume of air, 13,616 cubic feet per minute. No. 2 is a new mine just begun in the spring. It is opened by a slope, but the machinery was not in place nor the dump building up. They were hauling the coal with mules and shoveling it into the railroad cars. This mine is opened with three parallel entries, the air passing in on the main entry is divided or split at the back of the mine using an overcast for the air on the west side of the mine to return to the air-shaft, but at the time of my visit there were no doors to turn the air into any particular portion of the mine. Ventilation at present is had by means of a temporary furnace with the intention of using a fan when the machinery is in place. The air-shaft is nine feet in diameter and thirty-six feet deep. No rooms have been turned. All the work in the mine is narrow work, such as entry-driving and air-ways, which are driven seven feet wide and six feet high. If the entries are driven as they now are until winter, the mine will have the capacity

to work at least 500 m n. I requested the superintendent to furnish lumber and have doors and stoppings made so as to convey the air to the face of the working places. The full volume of air was 7,560 cubic feet per minute, with thirty-six men employed on the day-shift, and about twenty working on the night-shift.

Mine No. 1.—This mine was in poor condition in regard to ventilation. The full volume of air was 6,885 cubic feet per minute with sixty-one miners, ten mules, ten drivers and two roadmen. In making calculations, I allow one mule as much air as three men, which would make the force in this mine equivalent to ten men. There were two entries on the north side of the mine where the air was very poor, it being carried in one continuous current through the mine, gathering all the impurities of the mine as it passed down to the entries above referred to. There the current was only about fifty-four cubic feet per man per minute and the quality very poor. I notified the superintendent of the condition of this mine, requesting immediate attention.

I again visited the mine July 11. On testing the full volume of air I found it had decreased about 1,000 cubic feet per minute, but there was not so much leakage through the brattices and doors as on the former visit. The volume of air on the north entries, above referred to as being so bad was increased to 134 cubic feet per man per minute, yet the ventilation was not good, as there was too many impurities mixed with the air. I called the attention of the superintendent to the matter, requesting an overcast put in so as to let the air from the back part of the mine go directly to the furnace, and not down to the men on these north entries, and divide or split the air, giving the men on the north entries referred to fresh air instead of the impure article they now have. The more impurities there are mixed with the air, the greater the volume should be, in order that it will not be injurous to the men; but there seems to be an idea that if there is a good current of air passing through any portion of a mine there is no need of complaint, no matter how impure that current may be; the quantity and not the quality, of the volume of air that is traveling, being considered decisive.

BURDESS MINE.

John Burdess, Oskaloosa, proprietor. On my first visit to this mine, I found it deficient in ventilation, and in not having an escape-shaft. I gave the owner notice of the condition of the mine, and when I visited it again, I found that there had been an escape-shaft provided, but the ventilation was not so good as it was on a former visit. At some places in the mine there was no circulation of air, and in a great many places where the men were working their lights burned with a dull, heavy flame. The air had to travel over falls and through old rooms, gathering impurities as it went, until the men were compelled to work in an atmosphere very injurious to their health I ordered the force reduced to ten men, according to section fourteen of the mining law, which order Mr. Burdess complied with. I also requested some of the air-ways cleaned up, some of the break-throughs cleaned out, some new break-throughs made, and the brattices made tight so as to stop the leakage of air, with the understanding that when the improvements were made Mr. Burdess was to notify me and if everything was in good repair I would let the men resume work. Being called upon to be elsewhere at the proper time, I requested Mr. William Bowen, of Beacon, to inspect the Burdess Mine and report to me. I herewith submit his report in full:

BEACON, May 2, 1881.

MR. PARK WILSON—According to your request in regard to the Burdess Mine, I have complied with your wish, and report as follows:

Mr. Burdess and I started from the bottom of the slope, and went to the south entry or lead. There was a good volume of air going through the face of the rooms. I found that there was a good air course opened at the face where, when you were there, was the fall which obstructed the air. Mr. Burdess showed me the place where you tested the current of air, and found it deficient. This place had been enlarged since you left, and it is now about five feet square and the current of air in passing through would draw the flame of the lamp nearly horizontal from the lamp. I followed on and found the old break-throughs closed up and well clayed in good shape, a good current through the west and north portion of the mine, the doors well fixed and the escape-shaft in good order. I accordingly allowed the men to resume work Saturday.

WILLIAM BOWEN,
Beacon, Mahaska county, Iowa.

EUREKA MINE.

I visited this mine April 27, 1881, and found the ventilation very poor. As I had given the company notice, on a former visit, of the condition of the mine, I now required a reduction of the force to ten men, according to section fourteen, of the mining law, with instructions to drive some narrow work to be used as an air-way, thereby making a shorter distance for the air to travel, and consequently relieving the friction of the current of air. Not only so, but instead of carrying the air through several old rooms which were full of heated gobs, it would be allowed to travel through a clean air-way giving the men good, fresh air, instead of impure air loaded with carbonic acid gas until the miners' lamps would scarcely burn on the entry in the full volume of air that was traveling. As I could not visit this mine when they got the improvements finished, I got William Bowen, the same gentleman who inspected the Burdess mine, to inspect this mine. I herewith submit his report of the Eureka Mine.

PARK WILSON: *Dear Sir*—According to your request I inspected the Eureka Mine and allowed the company to go to work with the full force of men yesterday. The air-course was finished the day before yesterday. There is a very strong current of air passing through the mine now, much more than was expected by anybody here—quite a change to what it has been for a long time. The miners here are glad that there is a law at last to provide pure air which is indispensable to the health of miners. They say, Go on, and have the law carried out. WILLIAM BOWEN,

Beacon, Mahaska county, Iowa.

There are forty-seven mines in this county and about half of them employ, at times in the winter, from twelve to sixteen men each, but as both of my visits in the county have been in warm weather there are several of them that are not on the list as mines subject to the law statute. Some have kept just fourteen men, and in that way avoided inspection, claiming it to be cheaper to avoid being compelled to make improvements than to get the benefit of three or four men's work; taking advantage here of section nineteen of the mining law, which says that the provisions of the "act shall not apply to or affect any coal mines in which not more than fifteen persons are employed at the same time: *Provided*, That upon the application of the proprietors of, or miners in, any such mine the Inspector shall make, or cause to be made, an inspection of such mine and direct and enforce any regulations in accordance with the provisions of this act that he may deem necessary for the safety, or the health and lives, of the miners." There are several new mines being opened in the county with the intention of being able to do considerable business this coming winter, which will add no little to the coal out-put of the county.

SCOTT COUNTY.

There are two mines in this county. They are situated from two to four miles north from Buffalo, a small town on the Mississippi River. This is what is generally termed a pocket of coal as it has no connection with any other bed of coal in the State. The vein ranges from eighteen inches to two feet and a half in thickness, but does not extend over any extent of territory. Some of the mines are worked to a considerable extent in the winter season, and in fact most of them work fifteen men in the winter time. The coal is sold to farmers, who come to the mines after it, or it is hauled to the towns and sold in the market. The mines are worked on a cheap scale, no attention being paid to ventilation or general safety of the men. Some of the mines do not use cages; the coal being hoisted in a swinging box in the shaft, and men are hoisted and lowered by standing with their feet in the rope and holding fast with their hands. At none of the shafts is there any protection whatever at the top of the shaft.

Phelix Mactan has a shaft two and a half miles north of Buffalo, using a one-horse gin for hoisting coal, the mine is worked with room-and-pillar, single entry. The coal is weighed on wagon scales. He employs in the winter as many as twenty-two men, but at the time of my visit there were only three men at work in the mine. When a full force is employed, about thirty tons per day are hoisted. The air-ways were two feet eight inches in height, and five and a half feet wide; and the gauge of track was two feet. The air-shaft was situated about one hundred yards form the hoisting-shaft, ventilated by natural ventilation. The air-shaft was used as an es-

cape-shaft, and was four feet square with a perpendicular ladder nailed to the side of the shaft. The escape is only thirty feet deep The men were not allowed on the cages. There were no gates on the landing and no protection around the top of the shaft. I notified the superintendent of the condition of the mine, requesting gates put on the landings, and covers on the cages (if he hoisted men on them), and a sufficient amount of air made to circulate through the mine to give pure fresh air to all the men employed in the mine.

DODGE MINE.

S. James, of Davenport, and Daniel Dodge, of Buffalo, proprietors. This mine is situated about three miles north of Buffalo, and has a capital invested of $2,500. It has two openings, both shafts; one a gin shaft eighty-one feet deep, at the other steam power is used. The shaft is sixty-four feet deep. Both mines are worked with room-and-pillar, single entry. The coal is dug by measure, counting five bushels to the car. They had last winter fifty-two men employed, but at the time of my visit they were only employing four men in the mine, as the mines were almost full of water and some of the machinery at the steam-shaft where the water is hoisted was broken and the water could not be gotten out of the mine until the machinery was fixed. The capacity of the mine while employing a full force of men is about 2,500 bushels per day. The air-ways are driven two feet ten inches high and ten feet wide, ventilated by building a fire in an iron basket and hanging it down in the air-shaft. The air-shaft is five feet square and twenty-two feet deep. There were twenty-six working rooms, with a gauge of track of two feet six inches. The two shafts were connected underground by an entry, and the air-shaft was on this entry, being 110 yards from the gin-shaft and 175 yards from the steam-shaft. There are five different openings, two of them are used as hoisting-shafts, one as an air-shaft, and the other two were claimed to be escape-shafts, but I could see no way provided at either one for men to escape. Both of the hoisting-shafts were without covers on the cages, gates on the landings or any protection around the top of either. I notified the superintendent of the condition of his mine requesting covers on the cages, and gates on the landings, and also requested him to

apply some other method of ventilation, as the basket which was in use could not create heat enough to cause a circulation of air through the mine of sufficient volume to supply the number of men that would be employed when the water was gotten out of the mine. One great trouble with the present plan of ventilation is that the air-shaft is sunk down in the hollow while the hoisting-shaft stands on top of the hill, some forty or fifty feet higher than the top of the air-shaft or upcast, and the pressure of the atmosphere would be greater at the lowest opening, which would be the top of the upcast shaft. Consequently it would take considerable force to overcome the difference in the pressure of the atmosphere, as what difference there is against the force now employed, viz., fire in a basket in the shaft.

All of the other mines are operated about the same in this county. Samuel Moore has a shaft fifty feet deep. Charles G. Rowen has a shaft forty-nine feet deep; no covers on the cage, no gates on the landing and no ladders on the escape-shaft. Henrick Milky's shaft is thirty five feet deep. Robert Williams's shaft is seventy feet deep. John D. Morris's is thirty-five feet deep. John Murry's shaft is sixty-four feet deep. Frank Cooper and Mike Luddon have a slope. Anthony McGarney's shaft is sixty feet deep, etc.

JASPER COUNTY.

JASPER COUNTY MINE.

Robert Davidson, proprietor, Newton. This mine is situated three miles south of Newton; has a capital invested of $1,000, opened by a shaft, using a one-horse gin for hoisting the coal. The mine is worked with room-and-pillar, single entry. The coal is weighed on wagon scales. At the time of my visit twenty men were employed; the capacity of the mine was forty tons per day; the air-ways were driven five and a half feet in height and six feet wide. The air-shaft is three feet in diameter and thirty feet deep, ventilated by a furnace two and a half feet wide and twenty inches high. The full volume of air was 1,200 cubic feet per minute. There were twenty-five working rooms, with a gauge of track of twenty-three inches. The capacity of the mine-cars was 800 pounds each. The air-shaft is situated about 100 feet from hoisting-shaft. The escape

is through an old slope opening, which is four and a half feet square. This mine had no covers on the cages, and no gates on the landings, and the slope used as a man-way, or escape, was almost full, in places, of dirt which had washed in from the surface by the rains. The mine was poorly ventilated. One reason was that the furnace was too small, and another was that the air was passing in at the slope, and going directly to the furnace, and in building the furnace the builder had sunk into the bottom to make room for it, and the dirt taken out had been thrown into the air-way leading to the furnace until this air-way was almost full of dirt. Then there was a pumping-shaft, which was also a downcast for the air, and all the air that passed down it went directly to the furnace. Consequently there was not much air passing down the hoisting-shaft, and there was no way of using the air that passed into the mine from any other source than at the hoisting-shaft. I notified the proprietor of the condition of his mine, requesting covers put on the cages, gates put on the landings, the air-ways cleaned out, a double door hung on the man way or slope, and a new stack built on top of the air-shaft, not less than twenty-four feet in height. This mine has never before employed so many men in the summer time, but the railroad mine was abandoned this spring, so that this mine got a railroad contract for all the coal they could produce.

The county has twenty-three mines in operation, and most of them employ ten or fifteen men in the winter season. Henderson W. Johnson has a shaft seventy-five feet deep, situated five miles northwest of Colfax. He had no covers on the cages, no gates on the landings, and no escape for the men in case of accident at the hoisting-shaft, and the rope used in the north side of the shaft was condemned. I notified the proprietor of the condition of the mine, also stated that I did not consider the boiler safe, and would not consent to it being used until tested by a practical boiler-maker. If he pronounced it safe, I would withdraw my objections.

BLACK HEATH COAL COMPANY

Has a shaft situated about half a mile south of Johnson's mine. This mine is operated by a slope, using a steam engine of twenty-horse-power. There is no escapement for the men, and the drag in use behind the loaded cars in the slope, was not large enough to hold the cars from running back should anything break.

THE FITZHUGH MINE

Is only a short distance east of the mine above referred to, and is operated by a shaft fifty-five feet deep.

Gede Beiley and Scott Slaughter have each a mine situated three miles east of Colfax.

All of these mines above referred to work a large force of men in the winter season, farmers coming after coal for fifteen or twenty miles, and as the country is thickly settled, there is quite a large demand which the mines have to supply.

There are several mines south of Newton within five miles of the town. There are also a number of mines east and north of Monroe, all of them drift openings; but the majority of them have been sold to some organized company, whose name I have not learned. This company intend running a railroad track from the road running from Newton to Monroe to connect with the mines and ship their coal on the cars. This will in all probability develop quite a good vein of coal in this locality, better, perhaps, than has heretofore been thought of, as there has never been any very extensive mining done in the vicinity of Monroe.

APPANOOSE COUNTY.

I visited the mines of this county on my second tour for the year in June, 1881. The mine of the Centerville Coal Company, John T. Henderson, superintendent, I visited last fall and requested some improvements, such as covers on the cages, gates on the landings, and an escape-shaft for the men in case of accident at the hoisting-shaft. When I visited it on the 6th of June, I found the improvements all made except the escape-shaft, which they had commenced. I had the force reduced to ten men until the linking the escape-shaft was finished. I also found on examination that the partition dividing the hoisting-shaft from the air-shaft was not as tight as it should be, and requested a new partition put in. I again visited the mine in July and found the escape-shaft completed, with the exception of the ladders and the partition between the hoisting-shaft

and the air-shaft was made new; and things now begin to look in some shape. I requested that four doors be hung to force the air through the mine, and as the escape-shaft was the downcast for the air, the upcast being joined to the hoisting-shaft, there was no danger to the miner if fire should occur at the hoisting-shaft; so I let them resume work with the full force of men with instructions to provide a way for men to ascend at the escape-shaft as soon as possible. Twenty-three miners are at work. The mine is in better condition than when I first visited it, and now double entries are being driven, and if they are continued, the mine will soon be brought into good condition.

THE CO-OPERATIVE COAL COMPANY.

This company's mine is situated at Brazil, five miles west of Centerville. C. Carmin is president, and A. C. Andrews, secretary; post-office, Brazil. The mine is operated by a shaft sixteen feet deep using a one-horse gin, with a capital of $1,400 invested. The mine is worked with room-and-pillar with single entry. The coal is weighed on small scales before being screened. Fifteen men were employed at the time of my visit; the capacity of the mine was seventy-five tons per day; and the air-ways were driven four and one-half feet in height and eight feet wide. The air-shaft is three feet square and thirty-one feet in height. There were fifteen working-rooms with a gauge of track of two feet and seven inches. The capacity of mine-cars was eleven bushels. The air-shaft is situated 200 feet from hoisting-shaft. The escape-shaft is the furnace-shaft, with a ladder in it. There were no covers on the cages and no gates on the landing. I notified the president of the condition of the mine and the requirements of the law. I again visited the mine in July and found the improvements that I had recommended made, except the covers on the cages; and as the cages were not used for hoisting or lowering men, the law does not require covers. The shaft is only sixteen feet deep, and the men climb the partition coming out of the mine, and slide down the rope going in. This mine is operated by a company of miners. There were fifteen men when the company was organized, but there are now only seven. The president of the company is one of the number, also the secretary and pit-boss. They had to build their own side track and open up the mine under the usual disadvantages of workingmen without money, as well as to overcome the opposition of competing operators; but pluck and hard work has prevailed, and they now have a mine in condition to load considerable coal, and if properly managed it will compensate the men who, by their labor and perseverance, have merited the patronage they now have. They intend to make some more improvements outside the mine in the way of new dump-buildings, etc., which would add greatly to their ability for handling coal cheaply.

THE WALNUT COAL COMPANY'S MINE.

The Walnut Coal Company's Mine at Brazil is operated by a slope, using mule-power. It is worked with single entry, room-and-pillar. The mine is ventilated by a stove, and has a better current of air than any other mine in the county. The air-ways were clean all through the mine with uniformity of size, which always gives good results, and as there were only a few men at work, the volume of air was sufficient, for the men were working only a short distance from the main air-ways.

There is another mine, situated at Brazil, but as it was not working fifteen men at the time of my visit, I did not include it in the list as coming under the law. Both of my visits to Brazil have been in warm weather, and the mines have not been working full force, but in the winter season all three of the mines at this point employ more than fifteen men each. There is a new shaft being sunk just south of Brazil, but I did not learn who the operators were, as they were not working at the time of my visit.

COBB MINE.

I visited this mine June 10th and found it in bad condition. The manway leading to the escape-shaft was full of water, and the ventilation was not good in any place in the mine. The other improvements I had ordered on my first visit, such as covers on the cages, and gates on the landing, were complied with, and the timbering in the main entry was done, with the exception of one or two pair of cross timbers. The condition of the mine at this date was not such as to permit the mine to be operated with by more than ten men,

but the superintendent in charge of the mine at the present time had never had any notice thereof as he was not superintendent at the time of my first visit. I requested him to reduce his force to ten men, as required by section fourteen of the mining law. He refused to reduce his force until compelled to, and I concluded I had better give him legal notice of the condition of his mine than to bring suit and have the State thrown into the cost. I gave him notice of the condition of his mine June 10, 1881, and on July 6th I again visited the mine and found it still in poor condition. The water was yet in the manway, I undertook to go through but could not. A boiler and steam-pump were at work at the escape-shaft to take the water out of the mine so that the escape-shaft could be reached, but how much was still in the mine I could not tell, except that there was too much for men to get to the escape-shaft. The ventilation was no better than at my first visit. I gave the superintendent his choice to reduce his force voluntarily or I would commence legal proceedings against him. He accordingly reduced his force to ten men and is now working under the reduced force and will remain so until the mine is properly ventilated.

DIAMOND MINE.

This mine is operated by W. W. Oliver, president, and Alex. Dargavell, superintendent, both of Centerville. It is situated about one half mile east of the town of Centerville. Operated by a shaft. Capital invested $15,000. Gin power is used for hoisting purposes. The coal is weighed on wagon scales. Fifteen men were employed at the time of my visit. The capacity of the mine was forty tons per day. The air-ways are four and one-half feet in height and eight feet wide. The air-shaft is joined to the hoisting-shaft, is sixteen inches wide, four feet eight inches long, and 100 feet in height. Ventilation by a furnace eighteen inches wide and twenty inches high. There were seven working rooms with a gauge of track of two feet seven inches. The capacity of the mine cars is 800 pounds. There was no escape-shaft and only the one opening. There were no covers on the cages and no gates on the landings. I notified the superintendent of the condition of his mine and the requirements of the mining law, and requested the improvements made as soon as possible. This company is sinking another shaft about a

mile and a half from town on the line of the southwestern branch of the C., R. I. & P. R'y, which it is hoped to have in operation by the beginning of cold weather. The shaft was sunk about eighty feet when I was there, and it was thought it would be necessary to go about 130 feet from the surface before getting to the coal.

KELLER MINE.

This mine is situated about one mile southeast of Numa, J. H. Packard, proprietor. It was working only a few men, as the demand would not justify it, and it was without covers on the cages had no gates on the landings, and was without an escape-shaft.

There are three other mines in the vicinity of Numa, all about in the same condition, worked on as cheap a plan as possible without any regard to safety, but in the summer time they only work a few men, consequently are not subject to the mining law. This was the case when I first visited the mines in the county. In the winter time, however, some of them worked as many as twenty-five or thirty men. But as a State Mine Inspector cannot visit all the mines in the State, some of them are very likely to evade the law for some time. This county has about forty-four mines and during the summer months there are only about six or seven of them that work over ten men, but in the winter the majority of them work over fifteen and some of them that do not employ over five or six men in the summer work over fifty in the winter. I have notified the superintendents of all the mines of the requirements of the law and requested the improvements made as soon as possible, and further notified them not to employ more than ten men at one time until the improvements were made.

MONROE COUNTY.

THE AVERY COAL COMPANY'S MINE

Is situated about one mile and a quarter east of Avery, Daniel Watson and David Hammond, proprietors, with a capital invested of $12,000. The mine is opened by a shaft ninety-four feet deep, using a steam engine of twenty-five horse-power. It is worked with room-and-pillar, double entry. The coal is weighed on wagon scales. At the time of my visit eighteen men were employed. The capacity of

the mine was seventy tons per day. The air-ways were four and a half feet in height and twelve feet wide. The air-shaft is joined to the hoisting-shaft, and is twenty-nine inches wide, six feet long and 115 feet high, from the bottom of the coal to the top of the stack, ventilated by a furnace of eight cubic feet capacity. The full volume of air was 5,000 cubic feet per minute. There were eleven working rooms with a gauge of track of three feet. The mine was deficient in not having covers on the cages, or gates on the landings, and the furnace is too close to the shaft, as the upcast is not protected by being lined with incombustible material. I notified the superintendent of the condition of the mine, calling his attention to these defects, and requesting an escape-shaft sunk as soon as possible, but as the law allows one year in which to make the second opening, the company has until next June in which to comply with my last request, but the superintendent agreed to put one down immediately.

This company has extended the tram-road that formerly belonged to the Union Coal Company down to its mine, and has a small engine for the purpose of hauling the coal from the mines to the railroad. The coal is hoisted out of the mine in thousand-pound cars, then dumped into cars on the tram-road, which hold one hundred bushels, and the engine pushes two of these cars up to the dump at the railroad. The engine handles the coal on the tram-road much more cheaply than was the case formerly when mules were used.

SMOKY HOLLOW MINE.

This mine is situated about two miles and a half from Avery, in what is known as Smoky Hollow. Harry Fisher and William Jamison are the proprietors, and have a capital of $2,000 invested. The mine is opened by a slope, using mule-power. It is worked with room-and-pillar, with single entry. The coal is weighed on wagon scales, hauled in wagons to Avery, and there loaded into the railroad cars. At the time of my visit there were only twelve men employed. The capacity was considered sixty-five tons per day. The air-ways were driven five and a half feet high and eight feet wide, with an air-shaft four feet in diameter, ventilated by a furnace of twenty cubic feet capacity. There were eight working rooms, with a gauge of track of two feet five inches. The capacity of the

mine-cars is 1,000 pounds. The air-shaft is 150 yards from mouth of slope, and is also the escape if anything should happen to the slope. The mine is in good condition, and the work is all in good shape; but like a great many other mines, there was no fire of any consequence in the furnace, and the volume of air was very small. If a good fire was kept in the furnace there would be air sufficient for all the men it would be desirable to employ.

There are several other mines in operation in this hollow, but as the coal must be hauled a distance of two and a half miles, they do not run a very extensive business; yet, if some one should run a railroad switch down the hollow, there could, in my opinion, be opened as extensive coal works as we now have in the State. The coal is of good height and splendid quality, and is known to extend four miles south of the hollow where the miners are now working. The coal on the south side of the hollow is not so full of rock as it is on the north side, judging from what observations I could take in the mine.

THE EUREKA MINE OF MONROE COUNTY.

I visited this mine August 17th, and found it in fair condition, with the exception of the west entry, where it was deficient in ventilation. I requested the operators to attend to it at once. The manway connecting the two shafts was not in very good condition, and is about to be made a new one, so it will stand. One of the parties was working longwall, and when the slack work came the longwall workings caved in and damaged the manway connecting the shafts. The companies are building a tram-road from the mines to the railroad track, intending to use a drum on top of the hill and have the loaded cars pull the empties back up the hill, with a switch in the center where the full cars and the empty ones will pass. The grading was nearly all done and most of the ties in place. The owners intended getting their iron and cars for the tram-road of Fix & Postlewait, of Happy Hollow, as the old Happy Hollow Mine is wrought out, the track taken up and the whole thing abandoned on account of coming into a very large fault.

KEOKUK COUNTY.

This county has some splendid coal, but has never been very extensively developed, for the reason that until lately there has been only one railroad and that an east and west road. Now since the B., C. R. & N. has come into the county, the county has a northern market, and some splendid coal is being developed. Although coal has been produced in the county for years, there never were any very extensive works until the Starr Coal Company commenced operating at What Cheer. This company have two mines in operation. The Starr shaft, before referred to in my report, is now working 180 men. Their full volume of air is 13,440 cubic feet per minute. When I first visited this mine I requested the company to put covers on the cages and sink another shaft for an escape-shaft, as the one it had was only thirty-seven feet from the hoisting-shaft instead of fifty feet of natural strata, as required by law. As the company had no suitable place for an escape unless another was sunk close to the one already there, by agreement the company was to work its first south entries day and night until they connected with an old shaft, which was to be timbered and used for an escape. On examination I found by opening the doors at the bottom of the shaft, the air could be reversed and made to travel up the hoisting-shaft, and, as a steam jet was being used, if the steam were shut off the underground workmen would be in no danger of suffocating in case of fire. Sometime during the winter the stove in the dump was thrown over, setting the building on fire, and the whole thing—engine room, dump and all—burned while the men were in the mine, and nobody was hurt. The men could not get out, as the heat from the burning building was so great they could not stand at the top of the escape-shaft, which was thirty-seven feet from the hoisting-shaft, flanked on the east by the engine house; but if the distance had been fifty feet, as the law provides, it would have been no better for the men, as the thirteen additional feet would not have made it enough to permit the men to escape. The buildings are all rebuilt now, and a new escape is almost completed, situated about 250 yards from the hoisting-shaft.

The B shaft, belonging to the same company, has the mine opened in good shape with double entries. This mine is situated about one mile north of What Cheer. At the time of my visit it was using gin-power for hoisting the coal. The dump-building and machinery at this shaft would have been all up before now, but when the fire occurred at the other mine the company moved the dump building and machinery from the new shaft and put them at the old shaft. The new one has twenty-four men, all of them employed driving narrow work, so that when the machinery is in place there will be ability to give employment to about 125 miners. The present capacity of the mine is seventy tons per day. There are seven cross entries driven six feet high and eight feet wide, with an air-shaft six by eight feet, ventilated by steam. The full volume of air is 2,016 cubic feet per minute. The air-shaft is situated 118 yards from the hoisting-shaft and is also used as an escape-shaft.

ROSETTA MINE.

President, E. N. Cook, of Muscatine; superintendent, W. W. Creeg, of What Cheer. There is a capital of $50,000. The mine is situated about one mile northwest of What Cheer. It is opened by a shaft. It is intended to make use of a double engine of sixty horse-power for hoisting the coal. At the time of my visit they were just raising the new dump and had only four men in the mine. The air-ways are five and one-half feet high and eight feet wide. The air-shaft is six by twelve feet, and situated 150 yards from the hoisting-shaft. The escape-shaft is six feet square, fifty-two feet deep, and is joined to the air-shaft. The mine was ventilated by a furnace of ten and one-half cubic feet capacity.

MUSCATINE MINING AND COAL COMPANY.

President, P. M. Musser, Muscatine; superintendent, F. M. Witter, What Cheer. This mine is situated two miles northwest of What Cheer, and is opened by a shaft. It has a capital of $50,000. The mine is worked with room-and-pillar with double entry, using a one-horse gin for hoisting the coal. There were twenty-one men employed. The capacity of the mine was thirty-five tons per day, the air-ways are driven five and a half by eight feet, the air-shaft is five feet by ten, and seventy feet deep, ventilated by a basket; full volume of air 2,988 cubic feet per minute. The air-shaft is situated 200 yards from the hoisting-shaft, and is also used as an escape-

shaft. This company is making arrangements, too, for using steam-power as soon as their dump-buildings and outside improvements can be completed. The side track from the railroad is partly graded, and their calculation is to be prepared to hoist coal by steam and load it into the railroad cars at the dump by the middle of October. The company is driving its narrow work under ground as fast as possible so as to be able to employ as many as the demand for coal will warrant, as soon as the improvements are completed. There are other mines in this county that employed over fifteen men last winter; but, as both of my visits have been in warm weather they, at that time, were employing only a few men.

POLK COUNTY.

PIONEER COAL MINE.

May 10th I visited the Pioneer Coal Mine. Wesley Redhead is president, and James P. Clark, superintendent. Thirty-two men were employed, twenty men working day-shift, and twelve at night. The full volume of air was 8,400 cubic feet per minute. It was properly conducted to the men at their different working places. Most of the men were working in the entries and air-ways. The company gave, as a reason for this that it intends to have plenty of work opened out so that when the rush of work comes in the fall it will have room for all the men it wants. There were only a few rooms working, and some of them would soon be wrought out.

EUREKA MINE.

May 12th I visited the Eureka Mine, Norman Haskins, president; and James Cormack, superintendent. There were twenty-one men employed, with a full volume of air of 7,755 cubic feet per minute. The air was well conducted to the different working places of the mines, with the exception of the southeast part of the mine, where the leakage of the air through the doors made the ventilation deficient at the working places. There were some old works in which considerable carbonic acid gas had accumulated which was being carried to the men. I requested the superintendent to have the leakage of air through the doors stopped, and to build stoppings to prevent the escape of the carbonic acid gas from the old workings.

ECLIPSE MINE.

This mine had twenty-eight men employed, with a full volume of air of six thousand three hundred and seventy cubic feet per minute. It was well distributed through the works. The mine was not working while I was there, and the foreman said that when the mine was not working not much attention was paid to the furnace.

THE POLK COUNTY MINE

Had twenty-two men employed. The full volume of air was seven thousand six hundred and eighty-eight cubic feet per minute. The doors and brattices were not in good repair, as there was a leakage of four thousand nine hundred and eighty-six cubic feet of air per minute. One of the covers was off the cage. I notified the superintendent of the deficiencies, requesting that they be attended to immediately.

WALTERS AND GARVER'S MINE

Had eighteen men employed, with a full volume of air of two thousand eight hundred and eighty cubic feet per minute; but there was nothing on the entries to turn the current of air into the working places of the men, and no rooms where the second cross-cut had been made; the old one had not been stopped up. I requested the boss in charge of the mine to have the improvements made as soon as possible. On my first visit to this mine there was only one opening, but now the proprietors have the second shaft, just fifty feet from the hoisting-shaft. They worked only twenty men at a shaft, according to the mining law, until they had the second opening. This was quite a hinderance when the demand was so heavy as it was last winter.

WATSON MINE.

This mine had twenty-eight men employed, with a full volume of air of three thousand one hundred and fifty cubic feet per minute, but the air was poorly conducted. At several of the working places the men were compelled to work in very impure atmosphere. I requested a door hung on the mouth of the first room on the north entry, a break-through between the first and second room, and a door

hung on the mouth of the second room, also a break-through made from the second north entry on the right side into the second room, in order to conduct the air to the men who were driving the entry. I notified Mr. Ford of what I wanted done, and that it was strictly necessary that it should be done immediately.

JEFFERSON COUNTY.

I visited the mine of the Jefferson County Coal Company, at Perlee, May 20. Their escape-shaft was completed, and the basket for ventilating the mine had been done away with, and a steam jet was being used. The full volume of air was seven thousand three hundred and eighty-seven cubic feet per minute, but the door on the main entry, to turn the air into the workings of the mine, was not in good repair, and was leaking five thousand eight hundred and forty-two cubic feet of air per minute, and not only so, but when the door was opened the full volume of air rushed down the main entry to the return air-course, and thence direct to the upcast, and thus was no benefit to the men. I requested another door hung on the main entry far enough from the one already there so that the train of loaded cars could stand between the two, and one of the doors be shut against the volume of air, and I requested a door hung on the east entry, to turn the current of air into the rooms where the men were working the coal. After it is brought on the main entry the coal is pulled by steam to the bottom of the shaft by a rope attached to the engine. Four cars can now be hauled to the bottom of the shaft, but when mules were used on the main entry they could take only one car at a time, and this was very hard on the mules, as the grade was so steep.

May 21st, I visited the mine of the Washington Coal Company, at Perlee. This company had got its escape-shaft completed, and had the ladders in good shape. The full volume of air was six thousand one hundred and twenty cubic feet per minute, but the leakage of the doors and brattices allowed the current to escape so that by the time it reached where the men were working, the volume was reduced to two thousand seven hundred and thirty cubic feet per minute. I requested a door hung on the entry to turn the air into the rooms. There was sufficient air for the men employed, some-

thing I had never found before on visiting the mine. On going to the furnace I found a pit-car full of props and fine wood had been taken in, I suppose for my benefit in giving the superintendent notice of the condition of his mine. I called his attention to the matter of fuel for his furnace, stating that I considered bank-timbers were very expensive to be used as fuel in a furnace in a coal mine, but in my opinion, could I have slipped into the mine the next morning, I would have found a fire made of lump coal, and very likely a poor fire at that, with the volume of air reduced accordingly.

DALLAS COUNTY.

The miners of this county have not been visited since last winter, as there is only one mine that works any quantity of men; that is the mine at Van Meter, and it is being worked with a reduced force on account of having only one shaft or opening. The mine is working day and night with ten men employed on each shift. The company has the Iron-miner in this mine, which enables them to produce considerable coal with the men they have employed; but considering the machinery the company has at this mine, it hardly pays to run it with ten miners. After the engine house and dump-building burned last fall, the company put in all new machinery and an extra engine for running the air compresser; and Mr. Platt, the president of the company, told me some time since he thought the escape-shaft would be completed by the first of October. As soon as this was done he would want about 125 more miners. A portion of the mines he intends opening out longwall enough to give employment to about eighty men; the balance of the mine will be worked with room-and pillar.

STATISTICS.

It will be noticed that there are twenty-one counties included in my report, and there are nine others producing coal, but without mines, coming under the mining law. In the thirty coal producing counties of the State there are over 400 mines in operation. The larger number of them I have visited, not knowing their capacity until I found out by going to them. Some of the mines which employ only three or four men in the summer time, in the winter employ as many as sixty men in the rush for coal. Then

while the large mines fail to furnish coal to supply the demand, all the small mines along the line furnish coal by hauling with wagons and shoveling into the railroad cars at the different stations. Marion, Mahaska, Monroe, Appanoose, Boone and Webster counties have a great many mines that haul their coal to the railroad in wagons, and in fact all the coal producing counties have mines that keep no account of the coal mined nor the amount shipped after they get the money for it; consequently in gathering the facts in regard to the total annual out-put of coal for the State, the true amount cannot be ascertained, and some of the large companies refuse to report the amount of coal mined at the mines; but from what I can find out while visiting the different mines, I believe I have made a pretty correct estimate by putting the total annual out-put of coal for the State at 3,500,000 tons.

I will here state a proposition which seems to me to be one of great importance, not only to the mining community, but to the whole State. Our coal-fields are a monopoly to the State and of immense value to her prosperity; they constitute a source of wealth of more value to Iowa as a State, than the ability to draw at pleasure from some foreign source (if such were possible) an amount of gold equal to the total annual value of her coal trade. Therefore anything that depreciates this source of wealth depreciates to the same extent our source of income. A keeper of records of our mineral wealth is consequently as necessary as her secretaries. The mining and manufacturing interests of our State in the near future are going to become the paramount sources of her industrial and progressive wealth, and in order to render them available and lasting they should be economized. This cannot be done without some system of encouragement to their development and of protection against waste and ignorance. A faithful record of the progress of the trade and the development of our mineral wealth and the statistical returns of the same, would not only be useful and instructive to the miner and the manufacturer, but would display to the capital of the world inviting fields of enterprise. A bureau of reference should be established where the plans of all our mines would be filed yearly and the ventilation of our mines should be exhibited and compared in such a manner that errors could be detected and corrected. The experience of the whole State might

be gathered together by the keeper of mining records, and all that practical skill, invention, and science have done for one may be made available for all. The State is very careful in gathering the agricultural statistics; then why not look as well to the mineral product and ascertain the amount of wealth that is brought to the State therefrom?

REVIEW.

In Iowa that group or series of strata known as the coal-measures, is probably from 300 to 500 feet in thickness. Although the coal-measures are generally spoken of as lying horizontal, there is a general inclination or dip to the south and west, or more properly towards the southwest. There are many places where, in limited districts, the strata may seem to be horizontal, or may even show an inclination or dip to the east, but the general tendency of all the coal bearing, as well as other formations, is to dip to southwest. Geologists have divided the coal-measures of Iowa into three groups, viz., the upper, middle and lower coal-measures. Each of these coal-measures embrace a great many strata of various formations of rocks that are usually associated with the seams of coal of the particular measure to which they belong. The strata belonging to our coal-measures are a succession of sandstone, limestone, sandy shale, carbonaceous shale, marl and coal. In some places the coal-measures are barren of any seam of coal of sufficient thickness to be worked with profit, and in some places the coal is wanting altogether; but as a general rule each of these measures carries a seam of coal that is one of the chief characteristics of that measure wherever it may exist. The upper coal-measure lies wholly to the southward and westward of the Des Moines River. The eastern or outcropping edge of this upper-coal measure may be approximately traced by a line drawn from about the center of the county of Appanoose, in the southwestern part of the State, northwestwardly through Chariton, Guthrie Center and Audubon. Therefore its position is wholly in the southwest part of the State. This measure consists principally of limestone, with some fine-grained sandstone, marly shale, and coal. This coal-measure carries only one seam of coal, which averages about eighteen inches in thickness.

The middle coal-measure projects northwestwardly an average of say twenty-five miles beyond the edge of the upper one, and the lower coal-measure, occupying the region of the Des Moines River, some fifty miles in width, and following the river through the counties of Webster, Boone, Dallas, Polk, Warren, Marion, Mahaska, Wapello, and Van Buren. This coal-measure contains all the larger beds of coal, and in fact about all the coal of any consequence there is in the State. The eastern edge of the lower coal-measure, and also of the coal field of the State, extends from the southeast corner of Van Buren county north, lapping over into Lee county, in places a distance of four or five miles, running north through Jefferson and Henry counties in the same manner, extending into Washington county to a point on Crooked Creek, close to the southwest corner of Franklin township, following the creek northwestwardly some fifteen or twenty miles and about three miles west of the city of Washington, thence west to the east line of Keokuk county, thence following almost a direct course to the Iowa River at the point where the river crosses the east line of Marshall county, thence up the river to a point about two miles below Iowa Falls, then west to the north line of Webster county, following the line as above described, and the northern and eastern boundaries of the coal-measures will be found. North and east of the line it is useless to look for coal in Iowa, with the exception of the small deposit in Scott county, eight miles west from Davenport, and from two to three and a half miles north of Buffalo, where there is a small district of almost one township which bears a seam of coal averaging about three feet in thickness. In this district are located ten mines, one slope, and mine-shafts. The deepest one is sixty-four feet. The mines in this locality give employment in the winter season to about one hundred and twenty-five men. This pocket of coal is not connected with any other portion of the coal field of the State, as the subcarboniferous rocks come to the surface between this body of coal and the Iowa coal field, as above described; showing that there can be no connection between the two.

LEE COUNTY,

Although spoken of as being in the coal field, must not be considered a coal-producing county. Although the coal-measures extend a short distance into the west edge of the county, there has never been any coal mined in the county, and it would be useless to look for coal, except in the extreme northwest corner.

HENRY COUNTY

Is situated, in regard to the coal field, about the same as Lee, although there are some mines operated by drifts in the winter season at Hillsborough, in Salem township, but they are operated only to a very limited extent for local trade.

WASHINGTON COUNTY

Has the coal-measure extending over more territory than either Lee or Henry county, but the measure is considered barren of coal, there never having been but one mine in operation in the county. That was one in Franklin township, about six miles southwest of Washington, and was a small pocket of coal about two feet in thickness.

VAN BUREN COUNTY

Is almost entirely underlaid by one or more seams of coal, ranging from two to four feet in thickness, but owing to the position of the county in relation to the general coal field it does not find any considerable market outside the local trade, as coal can be got as cheap further north or west, without the expense of transportation. For this reason the resources of the county have never been developed. The county has some mines in operation, the most important being near Farmington. They range in depth from thirty to seventy feet. Some are opened by drifts, but none are worked extensively. They are eight in number, and give employment to about forty-three men.

JEFFERSON COUNTY.

The most important mining locality is at Perlee, where there are two shafts in operation that produce over half the entire product of the county. This county is situated similarly to Van Buren county and for that reason its coal is not mined extensively at the several places where mines have been opened. The coal of this county on an average is about three feet in thickness, but in some few places it reaches a thickness of five feet. There are mines in operation in several places in the county, but none worked so extensively as those at Perlee. There are twenty-two mines in operation, giving employment to 218 men.

DAVIS COUNTY

Is known to contain large quantities of coal, but the demand is very light. Wood is very plentiful and is used by a large majority of the citizens for fuel. Consequently the coal has never been fully developed. There are eleven mines in the county which give employment to eighty-five men.

WAPELLO COUNTY

Is well supplied with coal. There are three seams of coal in this county the first seam or number one is very thin, averaging about eighteen inches in thickness. The second seam is the one mostly worked, and is the best seam of coal the county has. This seam varies in thickness in different localities. There are twenty-seven mines in operation, most of them located around Ottumwa and Kirkville and along the river from Eddyville to Ottumwa. Near Eldon the seam is three and one half feet thick. At Kirkville it reaches a thickness of six feet. Although abundantly supplied with coal the resources of the county have never been developed. The mines at the present time are operated almost exclusively to meet the local demand. Of the twenty-seven mines in the county the majority of them work only three or four months in the winter, and the rest of the year they are idle. The mines now in operation give employment to 337 men, but if the county had a railroad in the proper place to suit the coal it would soon have mines that would compare favorably with any in the State.

KEOKUK COUNTY

Is on the extreme eastern edge of the productive coal fields in central Iowa. The seam, which is from five to seven feet in thickness at What Cheer and extensively worked there by several mines, crops out on German Creek, some four or five miles east. The discovery of coal at What Cheer, in any considerable deposits was quite a surprise, as geologists discouraged the hope of any such discovery. There is one peculiarity in the deposits of coal in the different counties in the coal field east of the Des Moines River. Coal is more liable to be found bordering on streams emptying into either the Des Moines, Skunk or Iowa River. Those prospecting meet with better success close to the stream than back on the high lands two or three miles, even though the stream be nothing but a very small creek. The same seam of coal that is being worked at What Cheer is also being worked eight miles south, and about one mile south of Delta; and it undoubtedly extends westward and southward until it connects with the Mahaska and Wapello coal field, subject, however, to faults and thinouts, as I do not believe there is any seam of coal in the State that holds its thickness for a mile in any given direction. There are twenty-two mines in the county giving employment to 476 men.

MAHASKA COUNTY

Is the heaviest coal-producing county in the State. This is because the Central Railway of Iowa has given it a direct market north into a country entirely destitute of coal. The second seam of coal is being worked. This varies in thickness from three to seven feet, and is heaviest along the small streams, tributaries of the Des Moines and Skunk rivers. There are forty-eight mines in operation in the county, that give employment to 943 men. The largest mines are those of Excelsior and Muchakinock, which produce the greater part of the coal mined in the county, although the new mines opened on the Muchakinock Creek, west of Knoxville Junction, bid fair to rival those of the above named places. Here, the same seam of coal, which is over six feet in thickness and of good quality, is being worked. Most of the mines in this county are worked by drifts, as the seam

they are working lies considerably above the level of the Des Moines River, and the small streams have cut their channel through the coal-measure far enough to leave the coal exposed, or lightly covered by soil, in the sides of the hills bordering the streams, and is so easy of access that there has been very little effort made to test the lower seam, which crops out in the Des Moines River some four miles above Eddyville, and can be found along the banks of the Little Muchakinock Creek fourteen feet below the second seam of coal.

APPANOOSE COUNTY

Has a seam of coal which averages three feet in thickness, and extends with more uniformity over the county than the coal of any other county in the State. There are a great many small mines in the county that are operated for local trade. Centerville is the center of the mining industry in the county; there are seven or eight mines in operation within one and a half miles of the center of town. They are shafts from forty to one hundred and fifty feet deep. There are forty-four mines in operation in the county, giving employment to 387 men.

MONROE COUNTY,

Like Appanoose, has several small mines which are located along the creeks back from the railroads. The largest mines are located at Albia, Avery, and Fredric on the C., B. & Q. R. R., and at Coalfield and Hickory Grove on the Central R. R. of Iowa. There are thirty mines in operation in the county, giving employment to 638 men. The deepest shaft in operation is at Albia, and is 150 feet deep.

MARION COUNTY,

Although not the heaviest producer in the State, undoubtedly has the heaviest deposit of coal in the State. Flagler is the heaviest producing point in the county, although at Marysville, a small town on Cedar Creek, there are several mines in operation. One of them, a short distance west of the town, has a thickness of coal of almost twelve feet. All the mines on Cedar Creek are worked drifts. On Whitebreast Creek, in the north part of the county, the coal is

exposed along the bank, and at a point about two miles north of Knoxville a four-foot seam of coal is exposed for a distance of half a mile; and at Coalport, about four miles further north, there are two seams of coal, the first and second seam being both exposed in the river bank above the level of the river. There are mines in almost every township in the county, and there is every indication that the entire county is underlaid with coal. But the resources of the county have never been developed owing to the fact that it is surrounded on every side by other coal-producing counties; and as it has no east and west road extending through the State the counties north and south intercept the coal trade in supplying the northern and western portions of the State that are destitute of coal. The demand on the Marion county mines is therefore almost wholly confined to the county. Some of the mines along Cedar Creek and at Marysville haul coal in wagons to the railroad in the winter season. There are forty-six mines in the county which give employment to 295 men.

JASPER COUNTY

Produces considerable coal. The most important mines are distributed along the valley of the Skunk River, from a point about four miles northwest of Colfax, to Reasnor Station, on the Monroe Branch of the C., R. I. & P. Railway. There are also some mines about three miles east of the town of Monroe, to which a tram-road is in process of construction, with the intention of increasing the capacity of the mines, which heretofore have been operated only for local trade. The mines throughout the county are equally divided, half shafts an half slopes. The locality having the heaviest production is along the railroad about four miles south of Newton, where there are several mines in operation. The twenty-two mines in the county give employment to 170 men.

MARSHALL COUNTY

Has one mine located about four miles northwest of Albion, on the west side of the Iowa River. The discovery of coal in this county is of recent date, and the mine has never been worked to any extent, it giving employment to only fourteen men. The coal at this mine is about three feet in thickness.

HARDIN COUNTY

Is on the extreme northeastern border of the coal-field on the Iowa River, a few miles north of Eldora. The three seams of coal belonging to the lower coal-measures are found here, but they are very much thinned out, and lie in basins, or pockets, so that their thickness is very irregular. The thickest coal to be found is in Chaffin's Mine, where in places it reaches a thickness of six feet; but that is an exceptional case, most of the coal averaging about two feet in thickness. Coal commands a higher price at the mines here than at any locality in the State; but the irregularity of seams, and the trouble from water, cause the operations of mines in this locality to be very expensive. There are four mines in operation in the county, giving employment to thirty eight men.

HAMILTON COUNTY

Has some mines in operation at Homer and a few other points in the county. The coal so near the northern edge of the coal field is always found in basins, or pockets, and in this county the basins are small, except, perhaps, in the southwest corner, where some good marketable coal may be found. There are four mines in operation in the county, giving employment to thirty-five men.

BOONE COUNTY

Has two seams of coal that are being worked extensively at Boonsboro by shafts. Here the coal-seam is about on a level with the Des Moines River, but in order that the coal may be brought to the surface where it could be loaded into the railroad cars without hauling in wagons, shafts have been sunk from the top of the bluff a distance of 243 and 345 feet, respectively, the deepest shafts in the county. There are extensive mines in Moingona, on the river, at Coaltown in the southwest corner of the county, and at Zenorsville, in the northeast corner. There are twenty-seven mines in operation, giving employment to 395 men.

WEBSTER COUNTY

Has the most northern mines in the State. The principal seam of coal varies from three feet to five in thickness, at the different mines, although in some places the coal reaches the thickness of nine feet; but the average is about four feet and a half. The most important mines are at Coalville, seven miles south of Ft. Dodge, where the Ft. Dodge Coal Company is operating on a large scale; besides other companies that have recently opened up mines on the west side of the river, since the building of the Minneapolis & St. Louis Railroad, which gives them a direct northern market by rail. The next important mining locality is at Lehigh (also on the Des Moines River), which is exclusively a coal mining town. A railroad is built from Judd Station, on the Illinois Central, to Lehigh, for the purpose of bringing out the coal. This railroad is owned and operated by the Crooked Creek Coal and Railway Company. There are twenty-eight mines in the county, giving employment to 390 men.

WAYNE COUNTY

Has the same seams of coal that are worked in Appanoose county. Mines are in operation on the southwestern branch of the C., R. I. & P. Railway, at Knifflin and other points in the county; but they are all worked in a small way, and some not operated at all in the summer. There are seven mines in operation in the county, giving employment to forty-three men.

LUCAS COUNTY

Has the largest mine in the State, one employing more men than any other one opening. This is the mine of the Whitebreast Coal Company, at Cleveland. This company uses the electric light for lighting the works, the only one in use in the State at any mine. There is another shaft at Cleveland known as the Co-operative shaft. It is the deepest in the State, being 285 feet deep, but it has never been operated to any extent. The Farmer's Co-operative Coal Company, at Russell, has a shaft of considerable capacity; but the mine has never been worked to any extent. There are thirteen mines in the county, giving employment to 576 men.

WARREN COUNTY.

The seams of coal worked in Warren county are much thinner than in Marion county. The surface seam, which is worked by drifts in the vicinity of Lacona and Indianola, is only about twenty inches thick; but it is worked to considerable extent in order to supply the local demand. The second seam, worked by a shaft fifty feet deep at Summerset, and by a slope at Ford's Station, on the A., K. & D. Branch of the C., B. & Q. R. R., near the Des Moines River, and in other places in the county, is three feet six inches to four feet in thickness, while in Marion county the same seam of coal is from five to seven feet in thickness. There are sixteen mines in the county, giving employment to 109 men.

POLK COUNTY.

The coal product of Polk county is increasing rapidly, although it is not so large as the coal traffic in the city of Des Moines would indicate, as much of the coal consumed is brought from other places. Some of the coal mined in Warren county is consumed in the city. All the mines of any note in Polk county are concentrated immediately around the city, and some are within the corporation limits. The three seams of coal belonging to the lower coal-measures are all worked in the mines around the city; but the majority of them are working the second seam, although at a greater depth than the third seam, or what is generally called the lower vein coal, is found, which is being worked extensively by the Pioneer Coal Company at its mine, south of the Raccoon River. The coal in the mines around the city of Des Moines averages a thickness of about four feet, although Walters & Garver, in their new mine, operating the second seam of coal, directly east of the new capitol, have coal a thickness of six feet. There are twenty-two mines in the county, giving employment to 385 men.

DALLAS COUNTY.

The only important mine in this county is at Van Meter, on the C., R. I. & P. Railway, where the Chicago & Van Meter Coal Company is working a three-foot seam of coal 256 feet below the surface. There are nine mines in the county, giving employment to

120 men. The small amount of men reported is caused by the mine at Van Meter having to work under a reduced force the past year. This mine alone at times employs over 100 men, but as it had only one opening the company was compelled under the law to reduce its force to ten men.

GREENE COUNTY.

The mines of Greene county, like those of the southwest corner of Boone, are operated by shafts from forty to seventy feet deep, working the same seam of coal. Some of the mines in Greene county have been worked extensively in order to supply the local demand. There is a fine deposit of coal, but it has only lately been discovered. It is now, however, being rapidly developed. There are nine mines in the county, giving employment to eighty-five men.

GUTHRIE COUNTY

Has some small mines operating in a seam of coal belonging to the middle coal-measure. The coal varies from sixteen inches to two feet in thickness. It is of an entirely different quality and is of a different seam of coal from any worked east or north of it. Several mines have been opened in different places in the county. Some have been worked for several years to supply the local demand. There are seven mines in the county, giving employment to forty men.

TAYLOR COUNTY

Has four mines in operation at Hawleyville, on the west fork of the One-hundred-and-two River. The coal is about eighteen inches in thickness. This seam belongs to the upper coal-measures. The mines are not worked very extensively, all the coal going to the local trade. The four mines give employment to thirty-five men.

PAGE COUNTY

Has several mines. Two miles south of Clarinda there are some mines operated by shafts from fifty to sixty feet deep, reaching the same seam of coal worked in Taylor county; and farther down the Nodaway River there is a shaft 120 feet deep. All the mines

in Page county are operating the same seam of coal. There are seven mines in operation, giving employment to seventy-four men.

ADAMS COUNTY

Has several mines in operation close to Carbon and Quincy, and one at the northern edge of the county, all operating in the seam of coal belonging to the upper coal-measure. There are thirteen mines in the county, giving employment to 176 men.

It will be noticed from the above review, that the State of Iowa will in the near future become a mining State of no small magnitude. A few years since the State was considered to have no coal to amount to anything. At the present time there are in the State 457 mines in operation, giving employment to 6,174 men, and producing annually over 3,000,000 tons of coal. Within the limits of the Iowa coal fields there are thirty-eight counties, of which twenty are producing coal to a greater or less extent. The mining industry of the State has become one of considerable magnitude, and also a great source of wealth. The coal seams are being developed as rapidly as railroad transportation can be obtained; a great many new mines are being opened, and yet the prospecting goes on, and every indication leads to the belief that the State will double her present number of *mines, as well as her mining population, in a few years. It therefore* becomes necessary for our lawmakers to become acquainted with the miner, and ascertain his wants and necessities, for with the development of our coal mines comes the necessity for legislative supervision in the interests of the underground workmen. A step in the direction suggested was taken in the passage of the act to regulate mines and mining—chapter 202, acts of Eighteenth General Assembly, which I find deficient in some respects; although the law contains some useful and necessary provisions for the protection of the health and safety of the underground workman; and in some respects these fall short of what they were intended to do.

Generally speaking the public has no patience, and seldom any sympathy, with miners in their numerous strikes and disputes with their employers about wages, and regard as the height of foolishness the policy which seeks redress for grievances through strikers; but it must be taken into consideration that the miner is differently situated from any other class of men. His operations are far removed from public knowledge and investigation. When the peculiar perils and privations of the mine are better understood by the general public the miner will be honored where he is now despised. My experience the last year in visiting the mines throughout the State, more than ever convinces me that the discontent among miners comes not so much from the evil nature of the men, as the evil condition of the mines. Therefore, laws should be enacted giving the miner protection of life and health. In the following recommendations I have endeavored to suggest only what is just and right between the operator and miner. If the recommendations should become part of the mining laws of our State, they would undoubtedly be a great benefit to the underground workman, without oppressing the operator, and nothing more than some of the operators in the State have done before they considered their mines secure, and nothing but what all should be compelled to comply with, in order to secure to the miner greater chance for his life in case of accident from his daily avocation in the mine.

RECOMMENDATIONS.

The requirements of the mining law in regard to the Inspector enumerating all accidents in and about the mines (section 3) demands an impossibility of the Inspector, for this reason: The law does not require the operators of mines to report any but fatal accidents, so that those are all the Inspector can enumerate in his report, as the serious accidents are not reported to him, and he has no way of finding out about them, unless they happen while he is at the mines. The law should require the operators to report all accidents, or the Inspector should not be required to enumerate them.

Fifteen hundred dollars, the present salary of the Inspector (section 4), is too small, as the law does not make any provision for traveling expenses. Section two of the law says: "The Inspector shall give his whole time and attention to the duties of his office, and shall examine all the mines in this State as often as his duties will permit," etc. Now, in order to do this, the Inspector is compelled to travel most of his time, as there are twenty-six coal-producing counties in the State. The expenses of travel are therefore large, and if it had not been for passes on the different railroads the mines

could not have been visited as often as they were. When the magnitude of the work is taken into consideration, the salary should be $2,000 a year, and a Mine Inspector should not be compelled to rely on passes on the railroads in order to enable him to carry out a law of the State. Furthermore, the possession by the Inspector of passes on the different railroads, under existing circumstances, gives a chance for dissatisfaction on the part of some of the operators; for the reason that some of the railroads are largely interested in coal, and passes over such roads are a money consideration to the Inspector under the present law, to the apparent prejudice of the coal companies that are not interested in railroads. (See Penn. law, section 8.) When a mine is wrought out and abandoned, the maps or plan of that mine (Sec. 7) should be filed in the office of the Inspector. The provision of the law in regard to the second opening (Sec. 8) will apply to slope or drift openings where the openings are never covered with buildings, and the only danger arises from caving or falling in of the openings; but where a mine is opened by a shaft, fifty feet therefrom is too close for an escape-shaft, because in case of fire at the hoisting-shaft, if the wind should be in the direction of the escape-shaft, situated fifty feet from the hoisting-shaft, the heat from the burning building would not admit of anyone coming up the escape-shaft. In regard to the time given by law for the second opening to be made, I should recommend that it should not be lawful for the operator of any mine opened by a shaft, after the expiration of the time given by law within which to make the second opening, to employ any person in said mine until the said second opening is made, and that the second opening at all mines opened by a shaft, should not be less than one hundred feet from the hoisting-shaft. (See sections 2 and 3, Pennsylvania Mining Law, and section 297 of Ohio Law.)

Of the mining law, I have had considerable trouble with section 10, for the reason that the law does not state the amount of air per minute that should be furnished each person employed in the mine. There is an impression that because there is no fire-damp in any of the mines in this State, a current of air, however small, is sufficient to ventilate a mine. Another trouble is that some of the mines are worked extensively some portions of the year, and therefore require quite a strong current of air in order to free the mine from impurities, and when the force becomes reduced, the volume of air is reduced in proportion to the number of men drawn out, not realizing that most of the trouble we have to contend with originates from the decomposition of the different substances in the mine; and the mines in this State are more subject to spontaneous combustion than the mines of any other State. They therefore require a large amount of fresh air. Sometimes when there are only a few men employed I have noticed, in testing and measuring the current of air in the different mines, that in room-and-pillar work, where a mine had a volume of air of less than one hundred cubic feet per minute for each person employed in the mine, the ventilation was always deficient; in some mines, where the volume of air was equal to one hundred cubic feet per minute for each person employed, the ventilation was poor, but would be made good by having the doors and brattices made tight, so as to avoid the leakage of air. I would, therefore, recommend that the operator of every coal mine shall provide and maintain for every such mine an amount of ventilation of not less than one hundred cubic feet per minute for each person employed in such mine; and that all mines governed by the provisions of this act shall be provided with artificial means of producing ventilation, such as fans, exhaust steam, furnaces, or other contrivances of such capacity and power as to produce and maintain an abundant supply of air for all the requirements of the mine. (See Ohio Law, Sec. 298.)

I desire to call attention to the provision of the law with respect to the ages of boys before they are allowed to work in the mines. Section 13 says: "No boy under twelve years of age shall be allowed to work in any mine, and it shall be the duty of the agent of such mine to see that the provision of this section is not violated"; but there is no penalty attached for refusal or neglect to do so. Boys under twelve years of age are working in the mines at the present time. Fathers of boys should be required to furnish an affidavit as to the age of their boys when there is any doubt, and there should be some penalty attached for refusing or neglecting to do so. I would recommend that the law prohibit any person under fifteen years of age from working in any mine unless he can read and write, and that the mining boss be required to examine and test a boy's requirements in that respect before employing him, and that

fines and penalties be provided for neglect or refusal to do so. (See Ohio Mining Law, section 302.)

LIST OF FATAL ACCIDENTS

IN THE MINES OF THE STATE, FROM JULY 4, 1880, UNTIL JULY 1, 1881.

July 22, 1880, William Jukes was killed by a fall of slate in the mine of the Whitebreast Coal Company.

October 22, Thomas Scott was killed by a fall of slate in the Happy Hollow Mine, operated by Fix & Postlewait.

December 14, Milton E. Conady was killed by a fall of slate in Hutchison Brothers' Mine.

February 28, 1881, J. W. Lawson was killed by a fall of false roof in the Iowa Coal Company's Mine.

February 21, 1881, James Blackburn was killed by falling down the shaft he was operating. The mine had no gates on the landings, and the cage caught in the shaft and the horse walked some distance allowing considerable slack rope to collect between the shaft and drum of the gin. When he caught hold of the rope and gave it a jerk, the cage came loose, dropped, and jerked him headforemost into the shaft.

May 30, John R. Griffiths was killed by a fall of rock in the Whitebreast Coal Company's mine.

Total number of fatal accidents in the year, six.

The accidents above reported resulting from falls of roof in the working places of the miners exceed in number those which result from all other causes combined. Accidents caused by falls of roof and coal are mainly under the control of the miners themselves, and the number of fatal accidents can only be lessened by increased care on their part, as in almost every case the coal companies are exonerated by the coroner's jury from all blame connected with the loss of life by falls of slate in the working places of the miners.

The mining law contains a provision (Section 15) subjecting to fine and imprisonment any miner who refuses to obey any order given by the mine superintendent in relation to the security of the part of the mine under said miner's immediate control; but accidents resulting from refusal to comply with this provision of the law are little under the control of the mining-boss, who cannot be

more than a few minutes each day in the working-place of any miner. The responsibility, therefore, rests to a great extent with the working miner.

MINE VENTILATION.

The subject of mine ventilation has never received any special attention in this State, as the mines do not produce any explosive gas. The general impression is that anything that will cause a current of air, however small it may be, is sufficient to ventilate a mine. It will be seen from the description of the mines that there are four kinds of ventilation used in the State; viz., fan, furnace, steam and natural. Natural ventilation is the simplest mode, and one which is suggested by the ordinary currents of air. In natural ventilation, the air passes into the mine at the lowest level and returns to the atmosphere at a higher level, where the air is more rarefied and where the atmospheric pressure is the least. This system of ventilation cannot, however, give good satisfaction in this State, for the reason that our coal seems to lie in almost a horizontal position, and we very seldom find any material difference in the height of the different openings in the same seam of coal, while the temperature is nearly the same, and the pressure of the atmosphere is exerted on both openings almost equally; consequently some force should be employed to create a movement and propel a current of air through the mine in a given direction. The question is often asked by those who are relying on natural ventilation: "Why it is that the natural heat in the mines will not always produce a current of air?" The answer is that it must be remembered that the temperature of the mine and of the underground workings is sometimes several degrees higher than that of the air at the surface; and when this is the case, other circumstances being favorable, there will be a natural draught in the mine. In winter, when it is extremely cold, there will be a large current, as sometimes there will be a difference of several degrees between the two temperatures. That in the mine being warmer, there would be a natural current, as heat expands the air so that a cubic foot of warm air is not as heavy as one of cold air, hence the warm air rushes up the upcast, and the cold air passing into the mine, it is raised in the temperature and thus a nat-

ural current is produced. But where two shafts or openings are made into a mine of the same depth, and the top and the bottom of both are in the same level, as is often the case in this State, there can be no movement of air in the mine, even if the air in the mine and that of the surface is of different density, because the pressure of the atmosphere on both openings is equal. If one of the openings is made in higher ground, then that opening has a less atmospheric pressure on top, and there would be a natural current, provided, however, that the temperature of the mine and that of the surface are of different densities. When the atmosphere above ground and that of the mine approach each other in density, there is no motion of air in the mine except what is produced by the movement of the cars along the roadways of the mine. Therefore, the conclusion must be that there is little or no natural current of air in a mine in warm weather; that natural ventilation is generally very small in amount and should never be depended upon, no matter how small the requirements of the mine may be; and that some force should be brought to bear to create a movement of air in the mine.

This force is generally furnished throughout this State, by a furnace. This, in most mines, is situated at the bottom of the upcast; the heat from the furnace, rarefying the air in the upcast shaft, creates a rapid upward movement of the mine vapor; and the cold air from the surface, rushing in to take its place, causes a current of air, if properly conducted, to travel through all the avenues of the mine.

The steam jet acts on the same principle. When the steam is let loose in the upcast, it suddenly springs upward and moves the air quickly in its vicinity; but its force is soon exhausted. So that it does not exert its propelling power any distance up the shaft, and if the shaft is deep the steam cools and not only loses its force, but, condensing, falls back and retards the column. In deep shafts the steam pipe should extend a sufficient distance up the shaft so that the steam would reach the surface before condensation commences.

Next we have the fan ventilation. There are two kinds of fans used for ventilation in this State. One is the blow or force fan; the other the suction fan. The suction fan, by its revolving force partially counteracting the pressure of the atmosphere by reducing the weight of the air on the top of the upcast, allows the air in the upcast to swell and expand, whereby its weight is diminished, and the atmospheric pressure, remaining the same on the top of the downcast, overbalances the column of air in the upcast, thereby causing a current of air to travel through the mine.

The question is often asked which is the best mode of fan ventilation. If those who contemplate using fans will study the science of ventilation they will find that air is an elastic fluid, which increases in tension by the pressure exerted; that air, occupying a certain space under the ordinary atmospheric pressure, can be reduced to half the space by double the pressure, and to one-third the space under a treble pressure, and so on; and that, consequently, the density of a given column of air varies directly as the pressure on each unit of surface under which it exists, the temperature remaining unchanged. The effect, therefore, of forcing air into a mine through a long series of intricate passages is to increase its density in proportion to the pressure applied and the length of the column. The object of the ventilation should be to remove the cause that distresses the underground workmen, and that cause should be removed as soon as possible. To do this I consider the suction fan the best, or the fan placed at the top of the upcast, especially in mines which produce the amount of carbonic acid gas that the mines of this State produce. The ventilating fan employed at the upcast, by reducing the weight of the air in the upcast, allows the air to expand, whereby its weight is also diminished in the space occupied. The air being elastic, a reduction in weight allows the air to swell and expand on the same principle as it is swelled out by heat; and, the pressure of the atmosphere at the top of the downcast furnishing the supply of fresh air, the propelling power is increased every yard along the whole length of the underground passages of the mine from upcast to downcast the same as a furnace. But suppose the ventilating fan be placed at the top of the downcast. By its revolving force it must exert a pressure on the air in the downcast, whereby its density is increased so that the greatest moving propelling weight or density is at the downcast, as before, in order to overcome the pressure of the atmosphere on the upcast. But by increasing the density the velocity of the moving column of air is necessarily decreased and caused to travel slower, and as the work in the current's motion is in proportion to the increased or diminished velocity,

and as carbonic acid gas is the heaviest of all the gases, and the principal gas with which we have to contend, occupying the lowest strata in all of the mines, like sand in the bottom of a river, the same law for removing one holds good for the other; and that is this, that the greatest velocity in the moving current of water is necessary to remove sand in the bottom of a stream; so, also, the greatest velocity in the moving current of air is necessary to remove carbonic acid gas from the workings of our coal mines, or, in other words, whenever you increase the density of a column of air above that produced by the ordinary atmospheric pressure you decrease the velocity, and in the same proportion as you decrease the velocity you decrease the ventilating power, as applied to the mines of this State. The ventilating fan should therefore be applied where it would give the greatest velocity to the current of air, removing the noxous gases as soon as possible, and conducting them with the greatest possible speed out of the mine, and giving nature's laws a chance, by the pressure of the atmosphere on the top of the downcast shaft, to supply fresh air to the men employed. The atmosphere is a vast ærial ocean, of which the earth is the bottom. It is estimated that this ocean extends upward to a height of about forty-five miles, growing gradually lighter in the ascending column. In sustaining the column from the top downwards the bottom is squeezed and contracted into a smaller bulk, and consequently greater density. At the height of three and a half miles, air is twice as light and elastic as at the level of the sea, and at seven miles of height it has been considered to be four times as light, and so on until it gradually thins out to nothing. A column of air, the whole height of the atmosphere, weighs about one ton to the foot square, and a column one inch square weighs about fifteen pounds. An ordinary sized man sustains the immense weight of about fourteen tons. The atmospheric pressure on a shaft sixteen feet square, in this latitude, would be something over twenty-seven tons; and on top of a circular shaft, nine feet in diameter, the atmospheric pressure is something over eighty-one tons. I, therefore, fail to see the philosophy of placing a ventilating fan at the top of the downcast to increase the pressure or weight of the atmosphere in the shaft in order to ventilate a mine. The atmosphere consists chiefly of oxygen and nitrogen gases in the proportion of about twenty-one volumes of oxygen, to seventy-nine of nitrogen. It, also, contains a minute but essential quantity of carbonic acid gas, which, however, varies at different times. Besides, there are found in it variable quantities of the vapor of water, and traces of ammonia, sulphureted hydrogen, and carbureted hydrogen. Of the constituents of the air the oxygen and nitrogen are usually spoken of as fixed, the carbonic acid, ammonia, and water as variable. There are causes in constant operation that tend continually to impress changes in the amount of all these bodies. Every process of combustion, and the respiration of every animal, removes oxygen and replaces it by carbonic acid; but the growth of plants has the reverse action, removing carbonic acid and replacing it with oxygen; that for many centuries in succession the constitution of the atmosphere is unchanged. The earth's atmosphere, in its relation to the world's organization, is full of interest. All plants come from it, and all animals return to it; so that it stands as a bond of connection between these orders of life; hence, in the mines, the workmen are removed from all vegetation, so that there is nothing to consume the carbonic acid gas as it accumulates from the several causes constantly operating in mines. It, therefore, becomes necessary to bring some force to bear to remove the gases from the mines as soon as they accumulate, in order that men can work therein without injury to themselves. At a great many mines in the State the true object of ventilation is lost sight of. No attention is paid to the upcasts, it being apparently thought that a large intake is all that is necessary, and if there is a fan to ventilate the mines anything will do, so that it is a fan; and if a furnace is used, anything will do that will hold fire. But there are other things necessary besides good fans or furnaces to properly ventilate a mine. It is, also, necessary to have large and roomy air-ways, uniform in size; and they should never be contracted at any point to a less general diameter than the volume of air requires moving at a uniform speed. After an air-course has been driven, it is just as necessary to keep it free from falls and all foreign matter as it was to drive it large in the first place; because air, moving in a compact body, drags on all rough and uneven surfaces, and the smoother the passage the less the friction the current of air meets with while passing through the mine.

Many of the furnaces in the State are too small for good results;

the air is too confined in passing through. Roomy air-ways are of little avail with a small furnace. So are roomy air-ways with a small upcast. There are instances of this kind in the State where the intake is large and roomy, and the air-ways are of good size, and yet the upcast in some cases is not over one-tenth the size of the air-ways. At other mines, where there is a large intake and a large upcast, the furnace has, perhaps, not more than three or four cubic feet capacity, some in the State falling as low as three cubic feet or less. It makes no particular difference where the air-shaft may be located, so that it has depth and the air-courses have width. A good furnace or fan will then give motion to the necessary quantity of air. Good furnaces are something seldom met with in the mines of this State. It is a matter of great importance that care should be taken in building a ventilating furnace, for several reasons. Setting the coal on fire must be guarded against, and the furnace should be situated far enough from the upcast shaft to obviate danger of setting the woodwork on fire. For this reason some place the furnace on top. This should never be done. The proper place for a furnace is at the bottom of the upcast, because the power of a furnace depends upon the amount of heat produced, and the longer column of heated air there is in a shaft, the greater the velocity of the ventilating current. This fact should be thoroughly understood among mine foremen, as many a shallow mine is poorly ventilated because, in addition to the imperfection of a shallow shaft, there is added that of a small furnace. A furnace should be built with a view of making as hot as possible the column of air while passing over it, and in order to do this the furnace should be built so as to allow as much grate-bar surface as can be had. The fire should be scattered over the entire surface of the grate-bars. In that way more heat is exposed to the column of air while passing over the fire. Another mistake is made by some in the manner in which they make the fire in the furnace. Their object is to build a fire that will last as nearly all day as possible, consequently they use the largest coal they can get, which not only makes a dull fire, but blocks up the passage of the air at the furnace. Fine coal is better for building a fire at the furnace, as it will cause a flame which is better for ventilating purposes than a smoldering fire. Some make a mistake in building their furnaces by blasting up the bottom to

get room, thereby causing the air to have to dip, in order to pass through the furnace. It should, on the contrary, be made to slant upward if possible in going to the furnace. The air must be carried to the working places where the miners are at work. To do this it is not only necessary to have roomy air-ways and good furnaces or fans, but doors and stoppings should be promptly provided. If not, the air will take the nearest route from the intake to the upcast, and be of no benefit whatever to the miner. Most of the underground bosses admit that twenty yards is far enough for men to work ahead of air, and they say that they always have the entry drivers make a cross-cut every sixty feet, but they will have men turn rooms off an entry and drive them seventy-five and sometimes one hundred yards without any current of air nearer than the entry. When requested to hang doors on the entries they think it is all foolishness, but the miner who is working at the face of his room, perhaps seventy yards from the entry, where his lamp burns with a black and cold flame caused by the accumulation of gas, would hail a current of fresh air at his working place with delight.

It is not only necessary to have a strong current of air passing through the workings of a mine, but it is necessary to divide or split the current of air so that all the different portions of the mine can receive fresh air from the intake, and as soon as one division of air has passed through all the workings of that division conduct it direct to the upcast. There are two benefits to be derived from dividing or splitting the current of air: The first is, you give the men fresh air; and the other you increase the volume of air by diminishing the friction. For instance, if we have thirty thousand cubic feet of air traveling per minute through an air-way in the mine of thirty cubic feet capacity, there would be more friction in the current than if the same current of air was split and conducted through three different air-ways of the same capacity; and for every additional split or divide of the air an additional quantity of air on the whole is obtained; but, owing to the size of the shafts, it is not best to have too many divides, for in each divide the quantity becomes less and less, and if too many are made the current becomes too slow and feeble to sweep the impurities from the mine, as it requires a strong current of air to remove carbonic acid gas from the working places of the miner; and a great many of the

mines in this State use so much powder it is necessary to have a strong current of air passing through all of the working places. It is not only necessary to have a strong current of air traveling along the air-ways, but there should be doors placed on the entries in order to force the current of air to sweep the face of the working places; although some contend it is not necessary, and claim that a strong current of air passing on an entry forms a suction which causes the powder smoke and other impurities to leave the face of the rooms and travel on to the air-ways. If those who thus argue give the proper attention, they will find the effect quite the opposite. In almost every instance the rooms are turned narrow off the entry and the current of air passing on the entry has a tendency to back the powder smoke into the rooms instead of drawing it out. There should be doors placed on all of the entries, no matter how large a current of air is passing, and if shut at no other time than during the noon hour and night, it would be a great benefit to the miner by having the face of the rooms clear of smoke when they return to work after the noon hour. The most of the mines in the State are better adapted for fan ventilation than furnace on account of the moderate depth of the coal from the furnace. The deeper the shaft the better the draft and the longer the column of heated air from a furnace, and the shallower the shaft the better the ventilation from a fan, although some of the furnaces give better currents of air than some of the fans. But if those same fans had larger air-ways and a larger upcast they would give better satisfaction. A furnace is more liable to be neglected than a fan which can be kept in motion by the hoisting engineer without interfering in any way with his other duties, but the furnace is different. Of all the mines I have visited where a furnace is used, I have found only one where it was made the business of any one man to keep up a fire in the furnace so that if the fire was neglected he alone was responsible.

The fault of poorly ventilated mines is not altogether the furnace. In some of the mines the pit-boss is in a hurry to do something else, and he thinks the roadman will build the fire, and the roadman has some track to fix and he thinks the boss mule-driver will fix the fire, and the boss mule-driver is busy and he thinks somebody else will build the fire, and somebody else supposes that the fire has been built, and so on; consequently the fire is not built,

and if a miner complains about the air he is given to understand that if he doesn't like the air in that mine he can go where he can get better air, and in a day or two you see a coal miner hunting a job of work. Some may think this a little overdrawn, but it is not; circumstances of this kind happen very often.

GASES.

Carbonic acid gas, or black-damp of coal mines, is composed of carbon and oxygen. Its specific gravity is to that of common air as 1.524 to 1, or a little more than one-half heavier. This gas is always found occupying the floor of the mine, as it is heavier not only than common air but also than any of the other gases. It is often found in the mine for two or three feet in thickness, while the air above is comparatively pure, although it will diffuse with common air. Being thus heavier than any other gas, force is required to remove it. This gas is accumulated from several causes: The respiration of men and animals, the combustion of the workmen's lights, the decomposition of timber and small coal in the gobs, the explosion of powder used for blasting down the coal and for whatever purpose it may be used in the mine, and from the excrementitious deposits of men and animals; and it also exudes from the roof and floor of the mine. Carbonic acid gas in its pure state is a deadly poison, as it will support neither life nor light. This is proven by the fatal accidents that have happened to persons going into wells and old prospect holes, and down the shafts of abandoned mines. This gas, when mixed with a certain portion of pure air, can be breathed for some time where the miner's lamp cannot be kept burning; but its effect on the miner is such as to produce headache, languor, weakness in the legs, loss of appetite, and general depression; and to this may be attributed the fact that so many miners are addicted to drinking. On coming out of a mine when the air is heavily loaded with black-damp, the miner often feels so depressed that the first thing he does is to go to a saloon for something to revive his spirits, stimulate him and give him an appetite; and when once there he often remains, without washing or supper, until late in the night. In mines where the workmen use a great number of powder an increased amount of carbonic acid gas is accumulated

over mines where no powder is used. Gunpowder contains 78.8 per cent of niter, 13.3 per cent of sulphur, and 11.9 per cent of charcoal; or, in equivalent parts, 101 of niter, sixteen of sulphur, and eighteen of carbon; when exploded, it is converted into sixty-six parts of carbonic acid gas, fourteen of niter, and fifty-five of the sulphide of potassium. Blasting powder consists of nearly equal molecules of nitrate of potassa and sulphur, with six molecules of charcoal; accordingly 100 parts contain of saltpeter 66.03, sulphur 10.45, and charcoal 23.52. One hundred parts by volume of the gaseous product of the combustion consists of carbonic acid gas 52.67, nitrogen 41.12, oxide of carbon 3.88, hydrogen 1.21, sulphureted hydrogen 0.60, oxygen 0.52. Consequently, after the miner fires his blast, he can neither work nor live in the smoke, and to use his language, he waits until the smoke from the blast cools, when in reality he is waiting for the gases to be diffused through the air. The time for this varies according to the ventilation. Where a strong and rapid current of air is made to sweep the working places the smoke is soon carried away; but where the current of air is weak the smoke hangs longer, and is often found in the working places all day in blinding and suffocating volumes, sometimes forming into layers of thick and thin smoke resembling solid substances, and frequently the miner stops suddenly on entering it thinking he is coming into contact with a loaded car or pillar of coal.

The health of a man working in the mine under the condition above described, is slowly but surely undermined, and not only that, but his temper is very liable to be considerably soured. Carbonic oxide gas, or white-damp, is also heavier than common air. It contains 56.69 per cent of oxygen and 43.31 per cent of carbon. This gas affects the miner more than carbonic acid gas and is different in its nature. Black-damp will not support light, while white-damp will admit of the miner's lamp burning with increased brilliancy. It is considered by some that a very small amount of this gas is found in mines. This may be the case from natural causes, but when we consider that white-damp is produced by the explosion of blasting-powder and from fires in the mines, we realize that this gas is, to a considerable extent, the product of the ordinary combustion of what is termed in this State "gob-fires." It can be recognized by its flickering blue flame seen playing over the glowing embers.

Sulphureted hydrogen gas is a transparent colorless gas of a disgusting odor. It is highly poisonous when respired, and even when diluted with 600 times its bulk of air, is rapidly fatal to the lower animals. Its density a little exceeds that of atmospheric air, 100 cubic inches weighing a little more than thirty-eight grains. In sulphureted hydrogen, one volume of sulphur vapor and two volumes of hydrogen are condensed into the space of two volumes, and the composition of the gas may be represented as: sulphur, 94.12; hydrogen, 5.88. This gas is also sometimes found in coal mines. It is generated in the wastes from the decomposition of iron pyrites.

Light carbureted hydrogen gas, commonly called fire-damp, is one of the principal constituents of coal gas. It occurs in many coal mines. It is seen bursting forth from the seams of coal, and blowing out from the fissures as though escaping from under high pressure. When mixed with five times its volume of air an explosive mixture is found, which takes fire on approach of a light. When the mixture has been brought to about nine volumes of air to one of fire-damp the most dangerous mixture has been attained. The fatal results of an explosion of fire-damp in the mine are not, however, limited to the mechanical violence which it occasions to the sufferers. The vitiated atmosphere the explosion produces is often fatal to those employed in other parts of the mine, or to the generous but ignorant and rash survivor who attempts to descend into the pit before it has been properly ventilated in order to rescue his comrades or to ascertain their fate. From the composition of fire-damp it is obvious that this gas in exploding renders ten times its bulk of atmospheric air unfit for respiration, the two volumes of oxygen which ten volumes of air contain, producing one volume of carbonic acid and two of steam, which becoming condensed is also converted into the same gas, leaving eight volumes of nitrogen at liberty. The mines of this State are not troubled any with fire-damp, and for that reason in the majority of the mines very little attention was paid to ventilation. If the air was too poor to permit the men to work, they were allowed to go home until a change in the atmosphere renewed the ventilation.

I will now take the liberty to quote the following, being from the pen of one of the best authorities on mining:

THE GASES OF COAL MINES.

BY JOHN J. ATKINSON.

A variety of gases is given off by the coal and other minerals met with in coal mines. A further supply of gases arises from the breathing of men and animals, and from the burning of candles and lamps, as well as from the explosion of the powder used for blasting the coal and stone in the mines. The whole of these gases are capable of causing the death of men and animals, breathing them in their pure and undiluted state, and some of them require to be mixed with many times their own volume of air before the mixture they form with it can be breathed for any great length of time with safety.

Some of the gases given off in coal mines, when mixed with certain proportions of air, form violently explosive mixtures. Such a mixture of air and gas on being ignited by a naked candle or other flame, suddenly explodes and becomes one mass of living flame, scorching and burning everything that may happen to be in contact with it. Such an explosion, in general, also creates a complete hurricane or tornado of immense force and violence, tearing and driving all before it, knocking down the masonry erected for the guidance of the ventilation as well as the props and timbers erected to support the roof of the mine, which falls in great masses, causing bodily injury or death to those it may fall upon, and often inclosing and imprisoning those who, being unhurt by its fall, are left stunned by the concussion, more or less scorched by the flames, and, without lights, shut up to breathe the deleterious atmosphere produced by the explosion. The flames of such an explosion being extinguished, and its violence exhausted, there remains an atmosphere so hot and so charged with noxious gases and steam, as to cause the death of all who are left alive to inhale or breathe it. This resulting atmosphere is generally termed *after-damp*. The grand object of the ventilation of mines is to cause such a current of air constantly to circulate through them as shall, by mixing with and diluting the gases, render them harmless, and, in that state, carry them off as quickly as they are produced in the mines. It is here proposed, in the first instance, to remark upon the chemical composition of the air we breathe; then upon that of a few of the important gases met with in coal mines; and afterwards to notice some of the leading principles of ventilation, by taking advantage of which we get rid of the gases as fast as they are given off in mines.

ATMOSPHERIC AIR.

Air is, almost entirely, a mixture of two gases—oxygen and nitrogen; carbonic acid is also present in limited but variable proportions, forming, on an average, about one part to 2,500 parts of our atmosphere. Besides oxygen, nitrogen and a trace of carbonic acid gas in the atmosphere, there is always more or less of watery vapor, diffused through the gases of which it is composed; but this vapor is variable in amount, is not considered as forming a constituent part of the atmosphere, and is, therefore, not embraced in statements as to the chemical composition of air; yet its effects are of the highest importance, both in the general economy of nature, and also in considerations relative to the ventilation of mines. Dry air is chemically composed of

	BY WEIGHT.	BY VOLUME.
Nitrogen gas	77 per cent	79
Oxygen gas	23 " "	21
	100	100

A cubic foot of air at the temperature of melting ice (32°), and under pressure of 14.7 pounds per square inch, or 2,116.8 pounds per square foot, weighs 0.080728 pounds; that under the same conditions 1,000 cubic feet weigh 80,728 pounds avoirdupois.

NITROGEN GAS.

Nitrogen gas is rather lighter than air taken in equal volumes at the same temperature and under the same pressure. The specific gravity of air being taken as 1,000, that of nitrogen gas is only 971.37, so that the weight of 1,000 cubic feet of air being 80,728 pounds, that of 1,000 cubic feet of nitrogen is only 78,416 pounds, at the temperature (32°) of melting ice and under the pressure of the atmosphere, taken at 14.7 pounds per square inch, or 2,116.8 pounds per square foot. A cubic foot of nitrogen, under the same conditions of temperature and pressure, weighs 0.0784167 pounds and a cubic foot of air 0.080728 pounds as heretofore stated.

Nitrogen gas has neither color, taste, nor smell, and so far it is like air itself. It will not support life, but causes death when breathed. It will not support combustion, but extinguishes lights. This gas has very little chemical affinity or attraction for other bodies; its chemical properties are rather those of indifference than of activity; its position amongst gases, in general, being almost like that of water amongst liquids as it serves to render their properties less active. It dilutes the oxygen of the atmosphere, which could not long be breathed without being diluted with nitrogen. Nitrogen is, however, probably the best part of manures for lands; and it is a component part of nitrous oxide or laughing gas, of ammonia, and of nitric acid, or aquafortis, as well as of many other compounds.

OXYGEN GAS.

Oxygen gas, as has been stated, forms about twenty-one parts by volume, or twenty-three parts by weight, out of every 100 parts of air, being rather more than one-fifth part. The specific gravity of air being taken as 1,000, that of oxygen gas is 1,105.63; 1,000 cubic feet of air, at 32°, and under a pressure of 14.7 pounds per square inch weigh 80,728 pounds; 1,800 cubic feet of oxygen gas, under the same conditions, weigh 89,255 pounds; so that this gas is rather heavier than an equal volume of air. Oxygen gas has neither color, taste, nor smell. This gas, in a free and uncombined state, is essential to life, we must breathe it in this state or die; in its undiluted state it is not fit to breathe beyond a very short time. In our atmosphere it is fitted to sustain life by dilution or mixture with nitrogen gas. Chemical compounds in the gaseous form may contain large proportions of oxygen and yet be unfit for respiration or breathing; to be suited for this purpose, the oxygen must be free and uncombined, and at the same time diluted.

Oxygen is the most abundant substance in nature, and constitutes at least one-third of the solid mass of the earth—twenty-three per cent of the air, and eighty-nine per cent of water. Oxygen has strong affinities and combines with all known substances, except *fluorine*. It forms, with other substances, no less than 136 inorganic compounds, and it would be difficult to say how many organic ones. This gas is the great supporter of combustion. Substances that burn in air burn much more vividly in pure oxygen, showing that the oxygen in the air is the supporter of combustion. Iron wire will burn in oxygen, but not in air; and this is also the case with other metals in a finely divided state. When, by breathing we inhale air into our lungs a part of oxygen it contains combines with carbon, and we exhale or breathe out, as the result, an equal quantity, by volume, of carbonic acid gas, and consequently liberate about $3\frac{1}{2}\frac{1}{2}$ times as great a volume of free nitrogen gas. Having glanced at the chemical constitution of the atmosphere, let us next consider that of the principal gases met with in coal mining.

CARBONIC ACID GAS.

When this gas is met with in coal mines it is often called *stythe, choke-damp or black-damp*. It is composed of oxygen and carbon. We have already considered the nature of oxygen as a component part of the atmosphere, but we must not expect to find it show the same properties when chemically combined either with carbon or any other substance whatever. Carbon, the other part of the choke-damp, forms the chief ingredient in coal; and coke contains a still larger proportion of this substance; but the diamond is pure carbon, in a crystaline state. The chemical composition of carbonic acid gas is:

	BY ATOMS.	BY WEIGHT.	BY VOLUME.
Oxygen	2	72.73 per cent	1
Carbon	1	27.27 "	1
	1	100.00	1 condensed

Now, although this gas contains nearly three parts out of four, by weight, of oxygen (the life-supporting element), yet because it is combined with another substance (carbon) the result is in this case a poisonous gas. It is dangerous to life to breathe air containing eight per cent, or one-twelfth, of this gas. Lights are extinguished in air containing ten per cent or one-tenth of it. At thirty-two degrees, under a pressure of 14.7 pounds per square inch, 1,000 cubic feet of air weigh 80,728 pounds and one thousand cubic feet of carbonic acid gas weigh 123,353 pounds. So that it is rather more than one and one-half times as heavy as an equal volume of air. The specific gravity of air being 1,000, and that of carbonic acid gas is 1,528.01. Before being mixed with air it rests next to the "thill" or floor of mines, owing to its great heaviness or density when compared with air. This gas besides being given off naturally into many mines, is always found to result from the breathing of men and animals, and the burning of candles and lamps, and mixed with other gases from the explosion of the powder used in blasting. Near the mouth of an adit, or drift, at Butterknowle Colliery, in the county of Durham, the writer has seen several small birds lying dead from the effects of this gas. They had come to feed upon the crumbs where the workmen ate their meals, and close to the mouth of this was an abandoned drift, and the gas coming out of the drift at the level of the ground had overcome them. At the same colliery, in several places where the coal has been worked away, the ground has been rent up to the surface, and it is said that birds flying across these rents or pitfalls, in some instances, are so quickly affected by the escaping gas as to drop into the holes and die there. Without disputing the fact of dead birds being found in the holes, the reason assigned as the cause of their coming there appears to be rather doubtful. The effect of the gas is not, perhaps, so instantaneous as to account for it. Unfortunately, birds are not the only sufferers from this gas, for many human beings have met their deaths through breathing it; and in many other cases injurious effects are produced on the health of workmen through the mixture of this gas, in small proportions, with the air of mines. Limestone consists of carbonic acid and lime, and chalk is of a similar composition; these ingredients, however, being generally mixed with oxide of iron, magnesia, and other substances in less but variable proportions.

PHOTO-CARBURETED HYDROGEN GAS.

Light carbureted hydrogen gas, or, as it is sometimes called, marsh gas.

This gas is the fire-damp of the mines. It contains one atom of carbon, combined with two atoms of hydrogen, or some multiple of these. Taking the atomic volumes of carbon and hydrogen to be the same, it contains one volume of carbon, combined with two volumes of hydrogen—in all three volumes—but the three volumes are condensed into one volume of fire-damp. The weight of air, at the temperature of melting ice (32°), and 14.7 pounds per square inch pressure, is, for 1,000 cubic feet, 80.728 pounds; that of 1,000 cubic feet of gas under the same conditions, is 45.368 pounds; so that the specific gravity of this gas is 562, that of air being 1,000, it being rather more than half as heavy as an equal volume of air under the same conditions. Owing to the fire-damp of mines being lighter than air, it lodges next to the top or roof in mines until, by diffusion, it gets quite mixed with air. This gas would soon cause death if breathed in a pure and undiluted state; but, when mixed with twice its own volume of air, it may be breathed for some time without serious effects. It quickly extinguishes lamps or candles when unmixed with air. Fire-damp or light carbureted hydrogen contains nearly 25 per cent by weight of hydrogen. Hydrogen is the lightest known gas, being only one-fourteenth part of the weight of air. The hydrogen in fire-damp is, however, condensed into a smaller volume than it occupies in a free state. Light carbureted hydrogen gas is chemically composed of

	BY ATOMS.	BY WEIGHT.	BY VOLUME.
Hydrogen	2	24.6 per cent	2
Carbon	1	75.4 " "	1
	1	100.00	1 condensed

In the fire-damp of mines, however, we find a small proportion of other gases mixed with it. When one part of fire-damp is mixed with thirty parts of air, by volume, its presence can be detected by the appearance of a flame of a candle; and as the quantity of fire-damp is gradually increased from one part to two parts in thirty of the air, the appearance of the flame is more and more affected by it; but even in the latter proportion the mixture will not explode. The flame of the candle is surmounted by a pale blue halo, called in mining language a "top" or "cap," which partakes more or less of a brown color according to the quality of *stythe*, or carbonic acid gas, that may be present along with the fire-damp. The examination of the flame, for the purpose of forming a judgment as to the quantity of fire-damp mixed with the air in mines, is, in mining dialect, called "trying the candle," or "trying the lamp." When the fire-damp forms as much as one part out of thirteen of the air, the mixture

becomes explosive, so that, if ignited by an exposed flame, the whole of the mixture is converted into a mass of flame; in this state of the mixture, however, the force of the explosion is comparatively feeble. When there is only nine to ten times as much air as fire-damp, the explosive force is greatest. If the proportion of gas be greater than one part out of nine to ten of air, by volume, the force of the explosion gradually becomes less and less, until there is only five times as much air as gas when the mixture will no longer explode, but on the contrary, will extinguish the flame of candles or lamps that may be brought into it.

The presence of carbonic acid gas, or of free nitrogen gas in mixtures of fire-damp and air, is found to lessen their explosive force so that if we add to the most explosive mixture one-seventh part of its volume of carbonic acid gas it will not explode at all. Air containing one-fourth part of fire-damp, by volume, may be breathed for some time without very serious effects being produced on the animal frame. Common coal gas, as used for lighting, contains a large proportion of light carbureted hydrogen gas—the fire-damp of mines. Besides this, however, it contains a considerable proportion of pure hydrogen, some carbonic oxide, and olefiant gas. When a mixture of air and fire-damp is exploded, the chemical changes that take place, and the nature of the resulting mixture or after-damp are as follows:

MIXTURE BEFORE EXPLOSION.

		BY ATOMS. RELATIVE NO. OF VOLUME ATOMS PER ATOM.	BY MEASURE. UNCOMBINED VOLUME.	COMBINED VOLUME.	VOLUME PER CENT.
AIR	Oxygen	4	4 x 1 = 4	18.8	90.385
	Nitrogen	7.4	7.4 x 2 = 14.8		
FIRE-DAMP	Carbon	1	1 x 2 = 2	2	9.615
	Hydrogen	2	2 x 2 = 4		
			24.8	20.8	100.000

MIXTURE AFTER EXPLOSION.

		BY ATOMS. RELATIVE NO. OF VOLUME ATOMS PER ATOM.	BY MEASURE. UNCOMBINED VOLUME.	COMBINED VOLUME.	VOLUME PER CENT.
FREE NITROGEN		7.4	7.4 x 2 = 14.8	14.8	71.2
CARBONIC ACID GAS	Carbon	1	1 x 2 = 2	2	9.6
	Oxygen	2	2 x 1 = 2		
STEAM	Hydrogen	2	2 x 2 = 4	4	19.2
	Oxygen	1	2 x 1 = 2		
			24.8	20.8	100.00

Before explosion, there may happen to be present either an excess of air or of fire-damp, beyond what is necessary to cause the explosion; and if so they will remain mixed with the after-damp in an unchanged state after the explosion has taken place. There never can, however, be such an excess of air present as to render the after-damp fit to breathe, or the explosion could not take place; the limits are such that this is impossible. The above proportions of 1 of fire-damp to 9.4 of air form the most explosive mixture, a other proportions forming a less explosive mixture.

From the second table we perceive that the after-damp contains between seven and eight times as much free nitrogen as carbonic acid gas or choke-damp. It was at one time a popular mistake to suppose that the injurious part of the after-damp consisted only of carbonic acid gas or choke-damp—not among scientific chemists, but amongst respectable mining authorities – and that not very long ago. After-damp, it may be seen by the second table, contains about 71 parts of free nitrogen, 9½ parts of carbonic acid gas, and, at the moment of explosion, 19 parts of steam; so that it might be said, at this stage, that after-damp contains, in round numbers, seven parts of nitrogen, one part of carbonic acid gas, and two parts of steam, out of a total of ten parts. Directly after the explosion a large part of the steam condenses, and leaves, as a residuum, about 7½ of nitrogen, and 1 part of carbonic acid gas, out of 8½ parts; the whole unfit to breathe, and incapable of supporting either life or combustion. A small excess of air or of fire-damp might be left mixed with the after-damp of an explosion beyond what is noticed in the tables as being chemically changed; but in no case could the air of the after-damp contain less than twice its own volume of deleterious gases or the explosion could not have taken place; such a mixture breathed would soon cause death. Since explosions can not always be prevented, how important it is then to be prepared to mix and dilute the after-damp with fresh air in as speedy a manner as possible after this occurrence. If there is more fire-damp present than is chemically changed by an explosion the force of the explosion itself is lessened, but the after-damp resulting is more deadly than if an excess of air had been present at the time of the explosion.

CARBONIC OXIDE.

This gas is sometimes called white-damp, when met with in the mines. Assuming as before that the atomic volume of carbon is twice as great as that of oxygen, its composition is as follows:

	BY ATOMS.	BY WEIGHT.	BY VOLUME.
Oxygen	1	56.69	½
Carbon	1	43.31	1
	1	100.00	1 condensed

Its specific gravity is 875.195, that of air being assumed at 1,000; so that 1,000 cubic feet of air at 32°, and under a pressure of 14.7 per square inch, weighing 80.728 pounds, an equal volume of this gas under the same conditions will weigh 79,426 pounds, and one cubic foot under the same conditions will, therefore, have a weight of 79,426 pounds.

Carbonic oxide has a much more deleterious effect on the animal economy than carbonic acid; air which contains only one per cent of carbonic oxide almost immediately causes the death of warm blooded animals, as has been shown by the decisive experiments of M. Felix Leblanc. Carbonic oxide is itself an inflammable gas, but does not support the combustion of other bodies. It has no taste, but has a peculiar odor. Small animals immersed in it die instantly. When inhaled, it produces giddiness and fainting fits even when mixed with a fourth of its bulk of air. It is easily kindled, and burns with a blue flame, being transformed into carbonic acid by the process. The carbonic acid formed by combustion at the bottom of a coal, coke, or charcoal fire is sometimes converted into carbonic oxide, by being deprived of a part of its oxygen, as it passes upward through the red-hot embers; and on coming into contact with the air at the top of the fire, burns there with a blue flame, and is again converted into carbonic acid gas. This gas is perhaps never found in coal mines except as the result of the explosion of gunpowder or the combustion of coal or wood. Carbonic oxide is obtainable in a state of purity by heating yellow ferro-cyanide of potassium with eight or ten times its weight of oil of vitriol. Bunsen obtained it by slightly heating a mixture of formic and sulphuric acids; and, to insure the perfect purity of the gas, he passed it through a concentrated solution of caustic potash. Such a proportion of this gas might be mixed with air as to form a mixture in which candles or lamps would burn, while life would become extinct, and it is probable that many deaths in mines have resulted from this gas, in situations where the lights have continued to burn.

It appears to be very probable that the death of the men and boys in the late accident at Hartley Colliery arose in a great measure from this gas given off by the furnace, after the stoppage of the air current by the closing of the shaft; inasmuch as the lights used by the workmen engaged in clearing the shaft appeared to be rather increased in brilliancy than otherwise at the time when the most effects were felt from the escaping gas, and the mine gave off no fire-damp and very little choke-damp.

At page 120 in the minutes of evidence taken before a select committee of the House of Commons on accidents in mines, in 1835, the late George Stephenson, in reply to question 1,853, gives an account of an accident at Newbottle Colliery, by which several persons lost their lives by a gas in which the lights burnt well, and which the witness supposed to have been sulphureted hydrogen gas; but it appears to be more probable that it was a mixture of carbonic oxide, sulphurous acid, and a small quantity of carbonic acid gases

generated by the explosion of gunpowder in the drift where it was found to prevail; because sulphureted hydrogen gas has a particularly offensive smell, of which no mention is made in the account of the accident.

The writer is acquainted with several instances where gases have caused deaths, and with others where they have caused severe indisposition, in places where candles continued to burn brightly; in some of these cases the gases were apparently produced by the explosion of gunpowder, and in others by the combustion of coals; and hence it appears to be probable that carbonic oxide was a prominent ingredient in them. In an experiment by M. Leblanc, a large-sized dog was asphyxiated in an atmosphere which contained 4 per cent of carbonic acid, and only ½ per cent of carbonic oxide.

HYDRO-SULPHURIC ACID, OR SULPHURETED HYDROGEN.

This gas is sometimes met with in coal mines. It is colorless but distinguishable by its unpleasant smell, which resembles that of rotten eggs. It produces fainting fits and asphyxia, if inhaled, even when present only in very small proportions, with atmospheric air. When inhaled in its pure state it acts as a powerful narcotic poison. It does not support combustion but is itself inflammable, and burns when exposed to a supply of air and ignited; and when mixed with oxygen gas the mixture is explosive. It reddens tincture of litmus, but the reddening disappears on exposure to the air. The composition of sulphureted hydrogen is as follows:

	BY ATOMS.	BY WEIGHT.	BY VOLUME.
Sulphur.	1	94.15	½
Hydrogen	1	5.85	1
	1	100.00	1

According to Bunsen the specific gravity of this gas is 1,174.88, that of air being assumed at 1,000, under the same conditions as to temperature and pressure. Sulphur heated strongly, and repeatedly sublimed in fire-damp freed from oxygen by phosphorus, produced a considerable enlargement of its volume, sulphureted hydrogen was formed, and charcoal precipitated; the volume of sulphureted hydrogen produced (ascertained by absorbing it by solution of potassa) was exactly double that of the fire-damp decomposed.

Sulphureted hydrogen gas may be inflamed by charcoal or iron, even at a low red heat. In air it burns with a blue flame, forming water and sulphurous acid, and depositing sulphur. According to some authorities one fifteen-hundredth part of this gas in air is instantly fatal to small birds, one one-thousandth killed a middle-sized dog, and a horse died in an atmosphere that contained one two-hundred-and-fiftieth part of its volume. The presence of sulphureted hydrogen gas in the atmosphere, even in small proportions, can be detected by its action upon moist carbonate of lead, spread upon white paper, which it blackens. M. Parent Duchatelet observed that workmen breathed with impunity in an atmosphere containing 1 per cent of sulphureted hydrogen, and he states that he himself respired air containing as much as 3 per cent of the gas without experiencing any serious results. This gas is formed whenever sulphur in a very comminuted form is brought into contact with hydrogen in the act of being given off, and is probably formed to some extent where pyrites is undergoing decomposition in mines. When this gas is present with the air, in mines, candles will burn in the mixture so that if it is not detected by its odor it may prove fatal to life before its presence is detected.

It appears to be probable that this gas is frequently formed in old unventilated workings, partly filled with water. There are two instances mentioned by Mr. Nicholas Wood in his evidence before the committee of the House of Commons on accidents in mines in 1853—one at Hartley Colliery, which proved fatal to one person, and another at Tyne Main Colliery, where ill effects were felt, notwithstanding that lights burnt well, both of which, in all likelihood, were due to the generation of this gas from the action of the water upon pyrites in old workings.

A man breathes into his lungs about one-fifth of a cubic foot of air per minute, and converts about seven per cent (by volume) of this into carbonic acid gas, which, with about three and three-quarter times as much free nitrogen, he exhales, along with about sixty-six and two-thirds per cent of the air he breathes in an unchanged state. The largest lamp used in mining converts less oxygen into carbonic acid gas than a workman. Both give off water vapor as well as carbonic acid gas. When coal is on fire it gives off, in burning carbonic acid, carbonic oxide, and sulphurous acid gases. The explosion of gunpowder gives rise to carbonic acid, nitrogen, carbonic oxide, and steam, besides carbureted and sulphureted hydrogen in small proportions. In the ordinary course of mining these causes give rise to so small a quantity of gas in proportion to the air that they hardly belong to the subject in hand unless in reference to the state of a confined and unventilated part of a mine where a shot has been fired, or in the more rare case of coal being on fire in a mine.

Sir Humphrey Davy discovered that the flame of ignited gas would not pass through fine wire gauze, containing twenty-eight holes for each inch in length, or 784 holes per square inch, unless the gas is moved with great velocity against the gauze or the gauze against the gas, and by inclosing the flame of an oil lamp in a cage made of this gauze we are able to carry a light into an explosive mixture of air and gas without setting the gas on fire on the outside of the gauze; by this means an explosion is avoided. If we find ourselves with a safety lamp in an explosive atmosphere we should only try to put out the flame by carefully drawing down the wick and by no means try to blow it out or we might blow the flame

through the gauze and cause an explosion. An explosion might result from drawing the flame of the lamp through the gauze by means of a tobacco pipe, yet workmen are not unfrequently detected in this very daring and dangerous practice in mines. Outside feeding, or oil tubes, used to be attached to safety lamps, but these are dangerous, as the flame might pass down the wick tube and up the oil tube and so fire the gas on the outside of the lamp, if the oil plug was out or fitted badly and the wick was small compared with the tube; but feeding tubes are not used now, at least in many districts. There are several sorts of safety lamps now more or less used, which give more light than the Davy lamp; glass being used in lieu of gauze opposite the flame. Glass is brittle and liable to crack from unequal expansion, and many persons do not think glass lamps so safe as the Davy, in consequence. The late George Stephenson contrived a safety-lamp having both glass and gauze around the flame, known as the Geordy or Stephenson lamp. The Davy lamp is perhaps the best known lamp for detecting the presence of a small mixture of fire-damps in the air of the mine.

Now, since fire-damps, choke-damp, and other gases are met with in more or less abundance in all coal mines it becomes an important question as to how the bad and often fatal effects they are likely to produce, if not properly dealt with, may best be avoided. To this end it has sometimes been proposed to get them to combine chemically with some substance to be presented to them as they are given off; and only a short time ago a Mr. Wall had a proposition of this kind before the public. So far, however, the best mode of dealing with them appears to be to dilute them with very large quantities of fresh air, and to sweep them out of the mine with an energetic ventilation as fast as they are given off or generated. After all, however, the natural laws and principles operating in the production of ventilation in mines have been less generally studied in England than on the continent; and from this cause many mistakes have been made in the practice of ventilation in this country, (England). New arrangements for the ventilation of mines have sometimes been made at a great cost, and have not been found to answer when completed. In a few cases lives have been lost from this cause; in others, an inferior arrangement and ventilation have been produced whereby the application of these natural principles, a superior one might have been obtained at the same or even at a smaller cost.

STRIKES AND LABOR TROUBLES.

Numerous strikes occurred last winter and spring in different parts of the State. The miners at Coalville, in Webster county, held a meeting and passed resolutions, demanding of the operators, as everything was on the advance, and the increasing demand for coal at an enhanced price entitled them to more pay for mining than they were receiving, for an advance of fifeeen cents per ton; the former price being one dollar. All the operators acceded to the demand with the exception of the operators of the Ft. Dodge Mines. They replied to the miners that they could not pay any more than they were then paying; that, while some of the coal had advanced in the market, their coal had not, as they had a contract on the railroad; and the railroad company would not advance the price above their contract; therefore they could not pay the miner any more. Miners never went into a strike under more favorable circumstances, as while on a strike they were working all the time in other mines. When they stopped work for the Ft. Dodge Coal Company, they went to work elsewhere, and when I was there in January, the mines of the Fort Dodge Company were lying idle on account of the strike, while all the men that wanted work, I was told, had got it, and were getting all they could do. The operators of the Ft. Dodge Mines saw that men with steady work could stand a strike for an indefinite time, and concluded to employ others to take the place of the men who had quit them. So they went to Tennessee, and brought about seventy-five colored men to work in the mines, offering them seventy-five cents per ton, while they had offered to pay the white men one dollar, but by this time the price of mining had advanced to $1.50 per ton, and the white miners told the colored men that if they would refuse to work they (the white men) would furnish them with everything they wanted to live on, which was agreed to by the colored men. So the strike continued. Subscriptions were raised at adjoining mines to help keep up the arrangements made, and Sambo gave concerts every night, and said this was a boss country, only a little bit cold. But all things have an end, and so had the good times for the colored men. When the warm weather came the small mines, rely-

ing on the local demand, (where the white men had been getting work,) had no sale for their coal, and work began to slacken; the men had idle days; and then the question arose, What are we going to do with the colored men? we have no money to send him back home; we can't keep him any longer, for we now have all we can do to keep our own families; and if we don't keep him he will go to work; so they concluded to let Sambo go to work, and all would go to work along with him. All through the three months' strike there was no attempt at violence, although reports to the contrary were frequently circulated.

When the news was circulated that Coalville had made a demand for an advance of wages, it went like an ocean wave all over the State, and when I was in Greene county the miners at the Keystone Mine struck twice in half a day. Through a mistake at a meeting the night previous, they had agreed to make a demand of 15 cents per ton advance; but the miners at this mine demanded only 12½ cents in the morning, which was acceded to, and the men went down to work: but the miners at the Armstrong Bro.'s Mine made a demand of 15 cents per ton, and their demand was rejected. So they sent a committee to the Keystone Mine, and when they made their statement to the men they came out again for the other 2½ cents per ton, which the operators paid, after stopping the mines some three or four days.

At Zenorsville, in the eastern part of Boone county, the miners made some four or five demands, at different times, until they brought the price of mining up from 4 to 6 cents per bushel; but none of the strikes were of any duration with the exception of the one at Coalville; as the operators either advanced the price of mining as soon as asked, or like the operators around Des Moines, paid it as soon as they became convinced that the miner was going to ask it. There was a strike at the Climax Mine in Boone county in the spring, of about five weeks duration, caused by the operators of the mine wanting to reduce the price of mining from $1.15 to $1.00 per ton. The miners refused to accept the reduction, and at the close of the strike they compromised by taking $1.00 per ton in summer, and $1.12½ in the winter.

A strike occurred at the Whitebreast Mines in the spring, in regard to a contract the coal company wanted the men to sign, which

lasted considerable time. The mine-owners brought colored men to the mine to work in the place of the men on strike, when the white men concluded to sign the contract and resume work; and the colored men were returned home.

A strike was supposed to be under headway at the Albia Mine this summer, and the mine-owners in order to put a stop to it, discharged six men, and the miners were talking of demanding their reinstatement, when the company then discharged some twenty-five or thirty more men, and all has been quiet since.

Workmen have a right, either individually or in mass, to demand an advance in wages, and to refuse to work if the demand is not complied with; and they also have a right to refuse to accept a reduction in wages, and to call meetings and discuss questions affecting their interests, and to stop work if they think proper; but the operators also have rights. They have a right to discharge any man or company of men who do not suit them, and to employ men in their places, and where men are on strike the operators have a right to employ new men, on any conditions they choose, to take the place of the workmen on strike. And the rights of the one are as sacred as the rights of the other. But the system of strikes in settling disputes is all wrong. Not a year passes but we witness some conflict in which labor is arrayed against capital over the adjustment of wages, and it will continue to be so as long as the system of strikes prevails. Many a long strike, disastrous to both parties, could be avoided if men would allow their better judgment to have control. All the strikes of the last year in this State could have been settled before the suspension of work if the men had met the operators and talked over the situation in a friendly manner, like they did at What Cheer this summer, where the miners called a meeting to consult together on the subject of wages, and invited the operators to meet with them. The invitation was accepted by the mine-owners. They exchanged views on the subject of wages, and adopted the price of four cents per bushel from October 1, 1881, to April 1, 1882. Now this agreement was made in a few minutes, whereas by a strike it would have taken, perhaps, months to accomplish the same thing; and the circumstances are entirely different now than they would have been had there been a strike: the best of feeling

prevails; the men have plenty of work, and all are prospering. If they had resorted to a strike, the men would have been out of work, and more or less suffering would have prevailed, and the operators would in all probability have lost their contracts in the market. Now all are prospering. This is the proper way to do, but if it is not practicable to meet in a body, let each side choose representative men, not rash and quick tempered, but men who could meet and discuss the situation and show figures if necessary to back up their arguments, and in that manner establish a board of arbitration, to which all disputes should be referred before talking of coming out on strike. Boards of arbitration have given good satisfaction in other States where they have been adopted, and could be made to work well in Iowa. Men are the same in this respect the world over. More can be done with them by reasoning than by threatening or trying to force them. Go to them before they become excited, and they can be persuaded to do things they would not do after their blood is hot.

MINERS' CONTRACTS.

The following are all the written contracts there are in the State under which the men are working. The other mines all work under a verbal contract.

This agreement, made and entered into this....day of....188–, by and between the .. Company as first party, and.....as second party, witnesseth: That both parties hereto do hereby mutually covenant and agree to be governed in their relations with and to each other as employer and employe by the following

CONTRACT RULES.

1. The said first party shall employ the said second party in the coal mine of the said first party, in the capacity of a.....and shall as near as practicable furnish him the opportunity to work as many days per month as the average of other employes working at similar work and under similar conditions in said mine.

2. The second party shall at such times as his services are required in the regular established working hours of said mine, report promptly on time and shall do and perform faithful and efficient work in said mine in the capacity of a.... and when required by the pit-boss shall do any other service or work incidental and necessary to the working or safety of the mine, or produce to the pit-boss a good and sufficient reason for not doing so.

3. The said second party shall from the time he begins work under this agreement to the end of his term of service, whether at the time actually at work or not, use the utmost degree of care and caution to prevent and guard against any accident or injury to himself or any other person, or to any of the property of the said first party, in or about said mine, and shall report at once to the pit-boss or superintendent anything about the machinery, the mine or the operations thereof, that appears to him dangerous, in order that accidents may as far as possible be prevented in the perilous business in which the parties hereto are engaged.

4. The said second party hereby agrees that he will not take part in, or attend any general meeting of miners or employes held in the mine or on the premises of the said first party, unless such meeting shall have the sanction of the superintendent of the mine. And he further agrees that he will not stop work or join any strike or combination for the purpose of obtaining for himself or others, or causing the said first party to pay him or any of its employes, an advance of wages, nor will said second party in any way aid, abet, join with or countenance any strike, combination or scheme that shall in purpose or effect injure or impede the business of the said first party, nor will the said second party interfere in any manner, by threats, menaces or otherwise with the right of any person to work in any way and upon any terms and with whom said person may deem proper, nor will the said second party interfere in any way with the just right of the said first party to employ, retain or discharge any person or persons whom the said first party may choose to employ.

5. The wages of said second party shall be at the rate of ... cents per bushel from the date hereof until October first 188 , and ....cents per bushel from October first 188 until May first, 188 . A "bushel" under this contract meaning eighty pounds of screened coal, weighed after passing over the main or upper screens now in use at said coal mine, the coal to be cleaned by the miner (before loading it in pit-cars) of all impurities such as slate, sulphur, clay, stone and blackjack. And the said first party shall pay the second party monthly at this rate, on the Saturday nearest to the fifteenth day of each month, for the preceding month's earnings, unless sooner paid, or unless the said second party shall have forfeited his pay or any part thereof by breaking or violating his agreements as set forth in rule 4 of this agreement.

6. All tools, implements or machinery belonging to said first party that shall be used by said second party in the mine shall be properly and carefully handled and used by him, and when not in use shall be placed by him in a safe part of the works, and any loss or breakage occurring to such tools or implements shall be paid for by said second party out of his wages, unless such loss or breakage shall be proven to have been unavoidable on the part of said second party.

7. It is distinctly agreed by both parties hereto and this agreement is made with the express understanding that in case the said second party breaks, violates or infringes any of the agreements and

stipulations set forth in rule 4 hereof, that he shall forfeit to the said first party a sum of money equal to fifteen days full wages at the rate specified in rule 5, and said first party shall retain said amount from the wages of said second party, for the use and benefit of the said first party forever.

8. Nothing in this agreement shall be construed to prevent the said first party from discharging the said second party at any time and thus terminating this agreement, or to prevent the said second party from quitting the employ of said first party at any time except when a strike or general stoppage of work is impending or in progress.

It is mutually agreed that this agreement shall be and remain in force from the date hereof until May 1st, 188-.

In testimony whereof, we have hereto set our hands at Des Moines, Iowa, on the day and date first above written.

MINERS' CONTRACT.

This agreement, made this .... day of ... , A. D. 1881, between the Whitebreast Coal and Mining Company, party of the first part, and ....., party of the second part.

Witnesseth, That the party of the second part agrees to enter into the employment of the party of the first part as a miner of coal. The party of the first part agrees to pay the party of the second part for each ton of coal mined by him and delivered on pit-cars at the face of the room where the same is mined, eighty-seven and one-half (87½) cents per ton for lump coal, from the first day of April, 1881, to the first day of April, 1882. All coal to be weighed after passing over the screens in use for time being, such screens not to be different from those now in use, as regards length or space between the bars. The party of the first part reserves the right of closing the mines at any time, or of discharging such miners as it may think proper, including said second party.

And the party of the second part agrees that he will not stop work, or join any "strike" or combination against the party of the first part; for any purpose whatever, during the term of the contract, which is from April 1st, 1881, to April 1st, 1882.

In witness whereof, the parties have hereunto set their hands, this .... day of ...., 188-.

WHITEBREAST COAL AND MINING CO.

CHICAGO AND VAN METER COAL COMPANY—LABOR CONTRACT.

I,...., hereby agree with the Chicago and Van Meter Coal Co., to work for said coal company, as a miner, in its coal mine at Van Meter, Iowa, in the capacity of operator of a machine for under-cutting coal, said machine to be propelled by compressed air power, and is known as the "Harrison Mining Machine," and to be operated in the mines of the said Chicago and Van Meter Coal Co., at

Van Meter, Iowa, terms and conditions to be as follows; to-wit, For the first fifteen (15) square yards under-cut in any one day, fifteen cents per yard, and for all in excess of fifteen square yards under-cut in any one day, twelve and one-half (12½) cents per square yard. The said coal company to guarantee for the first fifteen days an earning of two dollars ($2.00) per day, and at the expiration of the fifteen days I am to be privileged to accept the above schedule of rates (waiving the guarantee of said company) for a term of not less than .... months or abandon the job, as I may elect. The said coal company, on its part agrees to pay the above rate of compensation so long as the said.....shall well and faithfully perform the duties of said position, and to the satisfaction of the superintendent in charge of said mines. Payment to be made according to usage now and heretofore practiced by said coal company; to-wit, On the fifteenth day of each month for all labor performed in and during the preceding calendar month. And in consideration of above named compensation I further agree that I will, in every way consistent, work to the best of my ability in the interests of said coal company, acting under the general direction of the superintendent in charge. That I will in no manner, directly or indirectly, join with or encourage any miners' strike, or join any miners' union or do any acts whatever calculated to interrupt, hinder, or in any way interfere with the continuous working of said mine. That I will not, while in the employ of said company, as an operator of one of said mining machines be governed by any strike, or effort of any kind to interrupt, delay or hinder work in said mine by men employed in other capacities in and about said mine. But in case of a strike on the part of any or all the men employed in other capacities in and about said mine, I agree to continue the work of mining individually, or with others occupying similar positions as myself, to the best of my ability, same as though no strike had occurred. I further agree that I will serve said coal company as above for the term of . unless sooner discharged, reserving to myself the right to end this contract at any time by giving fifteen days' notice in writing to the superintendent in charge.

CHICAGO AND VAN METER COAL COMPANY.

CHICAGO AND VAN METER COAL COMPANY—LABOR CONTRACT.

I,....., hereby agree with the Chicago and Van Meter Coal Co., to work for said coal company in its coal mine at Van Meter, Iowa, in the capacity of....for which I am to receive compensation as follows:....which rate of compensation the said coal company hereby agrees to pay so long as the said ...shall well and faithfully perform the duties of said position, and to the satisfaction of the superintendent in charge of said mines. Payment to be made according to usage now and heretofore practiced by said coal company; to-wit, On the fifteenth day of each month for all labor performed

in and during the preceding calendar month. And in consideration of above named compensation I further agree that I will, in every way consistent, work to the best of my ability in the interests of said coal company, acting under the general direction of the superintendent in charge. That I will in no manner, directly or indirectly, join with or encourage any miners' strike, or join any miners' union, or do any act whatever calculated to interrupt, hinder, or in any way interfere with the continuous working of said mine. That I will not while in the employ of said company be governed by any strike, or effort of any kind to interrupt, delay or hinder work in said mine by men employed in other capacities in and about said mine. But in case of a strike on the part of any or all the men employed in other capacities in and about said mine, I agree to continue my work individually, or with others occupying similar positions as myself, to the best of my ability, same as though no strike had occurred. I further agree that I will serve said coal company as above for the term of.... unless sooner discharged, reserving to myself the right to end this contract at any time by giving fifteen days, notice in writing to the superintendent in charge.

CHICAGO AND VAN METER COAL CO.

MINERS' UNIONS.

Miners' unions are looked upon by some with distrust; but a miners' union conducted properly is a blessing to all who have anything to do with it. I do not have reference to unions whose sole object is to keep the price of wages to the highest possible point the market will afford; which is proper in its place, but should not be the sole object in life. I speak of those which have a tendency to improve the miners' condition in life. There are many men working in the mines who dislike mining and would not follow it if they were qualified to follow anything else, but they were taken to labor in the mines as soon as they were large enough to be of any benefit to their fathers, and in that way deprived of the privilege of school. There are plenty of young men who would gladly avail themselves of the chance of attending school if it were possible for them to do so and continue their work. Therefore the operators should encourage night schools, and help to furnish a room for a reading-room, and assist in procuring a library. It would repay them tenfold. The men would soon become interested, and instead of spending their time and money in worse than foolishness, around the saloons, they would be studying some useful and instructive books. This could be done in such a manner that no one would feel the

loss of the amount contributed. Let the miners and the operators each give a percentage of their earnings, to be paid every month, the whole amount to be a general fund, and each person contributing to be a member, no matter where he is, so long as he keeps his monthly dues paid; the general fund to be used in cases of distress among members of the union; for instance, if a member gets sick or disabled, pay him a certain amount per week, and his doctor bill, until he is able to go to work again, or if one of the members die pay his funeral expenses.

A union of this kind would not only be a blessing in relieving distress, but would soon accumulate libraries that would be an honor to the State in which it existed. Unions of this or similar kinds are operating with good results in other places. Andrew Ray, Mine Inspector of Ohio, gives an instance of one in successful operation, in his report for the year 1880, which I will copy. In that report, under the head of "Miners' Unions," he says :

"The miners of the State do not improve their opportunities for the amelioration of their condition in life. There are miners in every district of the State of philanthropic views, fine intelligence, and sound judgment, who, with properly directed effort, might become real benefactors of their fellows, and leave the world better than they found it. All their energies seem directed to organizations for maintaining the price of mining at the highest point the coal market will afford the operators to pay. This is all right and proper in itself, but is by no means the sole duty of life. The establishment of night schools, of libraries and reading rooms, of Sunday-schools and churches, open a wide field of usefulness. In those districts of the State, and of every State where there are intelligence and sobriety; where there are reading rooms and libraries; and where saloons are few and far between, there are greater contentment, better wages paid, and fewer strikes, than where ignorance and saloons prevail.

"The miners of Germany have superb organizations, which deserve to be studied by the miners of Ohio and other States. These unions have brought contentment to the German miner, and might be adopted by the miners of the United States with advantage, and in their formation the operators of the mines ought to lend a helping hand.

"The miners' unions of Germany are the oldest associations of the kind in the world, having originated in the silver mines of the Hartz Mountains more than six hundred years ago, and they now extend over every mining country of continental Europe, receiving corporate rights from government. The system has been perfected in Prussia, and is simply admirable. Every miner or member of

the union, is required by law to contribute three and one-half per cent of his earnings, and the owner or operator one per cent of the yield of the mine, into the benefit fund of the association, and the money thus collected is applied in payment to members during periods of sickness or disability resulting from accident in the mines.

"The members of the union are divided into two classes—permanent members and temporary members. Temporary members only possess personal rights, while permanent members, who become such after having belonged to the union for five years, have their rights in the association extended to all their family. Members forfeit their rights to any benefit fund, and in fact cease to be longer members, when they refuse to pay their regular monthly contribution. All the funds of the union are under the control of the inspector of mines, who is responsible for all defalcations and who is also obliged by law to see that all members are fairly treated. Any miner who belongs to the union, who may be hurt in the mines in the pursuit of his calling, or who may become sick and unable to work from any natural cause, draws pay from the funds of the association during the whole time he is off work, and he also receives medical assistance free of charge. Should accident or disease prevent a member from working in the mines, or when a member is no longer able to work, through old age, he draws a life pension in consequence, and after his death his widow receives a monthly pension till she marries again, and all his children draw pensions until each arrives at the age of fourteen years. When a member is killed in the mines, or dies from any cause, the association pays all funeral expenses. There is no compulsion exercised to get members to join; the union is simply and only a benevolent association like the Free Masons or Odd Fellows, except that there is no secrecy about its operations. It partakes in no sense of a trades' union organization, associations of this character being contrary to law until the year 1869, when the ban was removed forever.

"The result of such legislation has made the miner of Germany proud of his occupation. He is as proud as a miner, is a common proverb. Very few German miners ever emigrate to this country, being secured by their superb organization against want in their old age. Thousands of Germans work in the coal mines of the United States; but question them, and you will find that they, with rare exceptions, never saw a coal mine in Fatherland. Were organizations of a character similar to these established in the mining regions of this State, and facilities provided for the education of the boys and young men of the mines, strikes would soon become as scarce as they are now common; and instead of the sheriff of the county being required to call upon the Governor of the State every few months for aid to quell some threatened disturbance against persons and property, the miners through the vast influence which their intelligence and numbers would give them, would be sending

representatives to the State legislature to make laws which we are all—sheriff and governor included—bound to obey. The proper adjustment of the relations of labor and capital can only come through increased intelligence, sobriety, firm union, and moderation on the part of employes. The workingman, if left to his own resources, will not, as a general rule, seek to improve his condition in this country, for the tendency in all countries where wage-laborers are paid good wages is to produce thoughtlessness as to the future. The labor question, to which little or no attention is paid by our philanthropists and statesmen, is one of the gravest questions of the future. The growth of intelligence among our workmen must keep pace with the increased demands of individual restraint. Reason, not bayonets, is demanded by our age and nation. Workingmen must govern themselves and respect the laws and rights of others. Only in this way can civil liberty continue.

"As illustrating the influence upon the habits of miners in the maintenance of reading rooms and libraries in their midst, I need only refer to the condition of the mines in Washingtonville, in Columbiana county. Twelve years ago the Cherry Valley Iron and Coke Company joined their workmen in the erection of a mining institute. Since that time a mule-driver and a coal-digger have studied law, and been admitted to the bar, and are building up a lucrative practice; another coal digger has graduated at the Cleveland Medical College and is rapidly acquiring practice in his new profession, while a number of others are school teachers, all of whom owed the inspiration of bettering their condition in life to their educational surroundings. The miners of this place are among the most sober, intelligent, and industrious citizens to be found in any calling. There are few strikes there, because reason is used in the adjustment of wages disputes. The mines are well ventilated, and the miners and operators regard each other as common friends, mutually dependent upon each other. This state of affairs ought to exist everywhere. There should be no strikes or lockouts. They belong to the old world, and should be frowned down in a free country."

APPENDIX.

APPENDIX.

IOWA STATE MINING LAW.

Be it enacted by the General Assembly of the State of Iowa:

SECTION 1. That there shall be appointed by the Governor, with the advice and consent of the Senate, one State Mine Inspector, who shall hold his office for two years; subject, however, to be removed by the Governor for neglect of duty or malfeasance in office. Said inspector shall have a theoretical and practical knowledge of the different systems of working and ventilating coal mines, and of the nature and properties of the noxious and poisonous gases of mines, and of mining engineering; and said inspector, before entering upon the discharge of his duties, shall take an oath or affirmation to discharge the same faithfully and impartially, which oath or affirmation shall be indorsed upon his commission, and his commission so indorsed shall be forthwith recorded in the office of the Secretary of State; and such inspector shall give bonds in the sum of two thousand dollars ($2,000), with sureties to the approval of the Governor, conditioned for the faithful discharge of his duty.

SEC. 2. Said inspector shall give his whole time and attention to the duties of his office, and shall examine all the mines in this State as often as his duties will permit, to see that the provisions of this act are obeyed; and it shall be lawful for such inspector to enter, inspect and examine any mine in this State, and the works and machinery belonging thereto, at all reasonable times, by night or by day, but so as not to unnecessarily obstruct or impede the working of the mines; and to make inquiry and examination into the state and condition of the mine as to ventilation and general security as required by the provisions of this act. And the owners and agents of such mines are hereby required to furnish the means necessary for such duty and inspection, of which inspection the inspector shall make a record, noting the time and all the material circumstances; and it shall be the duty of the person having charge of any mine whenever any loss of life shall occur by accident connected with the workings of such mine, or by explosion, to give notice forthwith by mail or otherwise to the inspector of mines, and to the coroner of the county in which such mine is situated, and the coroner shall hold an inquest on the body of the person or persons whose death has been caused and inquire carefully into the cause thereof, and shall return a copy of the verdict and all testimony to said inspector. No person having a personal interest in, or employed in the management of, or employed in the mine where a

fatal accident occurs, shall be qualified to serve on the jury impaneled on the inquest.

SEC. 3. Said inspector while in office shall not act as an agent or as a manager or mining engineer, or be interested in operating any mine, and he shall annually, on or before the first day of January, make a report to the Governor of his proceedings, and the condition and operations of the mines in this State, enumerating all accidents in or about the same, and giving all such information as he may think useful and proper, and making such suggestions as he may deem important as to further legislation on the subject of mining.

SEC. 4. Said inspector shall receive a salary of fifteen hundred dollars per annum, to be paid in quarterly installments, and he shall have and keep an office in the State House at Des Moines in which shall be kept all records and correspondence, papers, and apparatus and property pertaining to his duties, belonging to the State, and which shall be handed over to his successor in office.

SEC. 5. Any vacancy occurring when the Senate is not in session, either by death or resignation, removal by the Governor or otherwise, shall be filled by appointment by the Governor which appointment shall be good until the close of the next session of the Senate, unless the vacancy is sooner filled as in the first section provided.

SEC. 6. There shall be provided for said inspector all instruments necessary for the discharge of his duties under this act, which shall be paid for by the State, on the certificate of the inspector, and shall be the property of the State.

SEC. 7. The owner or agent of every coal mine shall make or cause to be made, an accurate map or plan of the working of such mine on a scale of not less than one hundred feet to the inch showing the area mined or excavated. Said map or plan shall be kept at the office of such mine. The owner or agent shall on or before the first day of September, 1880, and annually thereafter, cause to be made a statement and plan of the progress of the workings of such mine up to said date which statement and plan shall be marked on the map or plan herein required to be made. In case of refusal on the part of said owner or agent for two months after the time designated to make the map or plan or the addition thereto the inspector is authorized to cause an accurate map or plan of the whole of said mine to be made at the expense of the owner thereof, the cost of which shall be recoverable against the owner in the name of the person or persons making said map or plan.

SEC. 8. After six months from the passage of this act it shall not be lawful for the owner or agent of any coal mine operated by shaft or slope to employ more than fifteen persons at one time to work therein or permit more than fifteen persons at one time to work in such mine, unless there are to every seam of coal worked in such mine two separate outlets separated by natural strata of not less than fifty feet in breadth by which shafts or outlets distinct means of egress must be always available to afford easy escape from

such mine in case of explosion, cavings or falling in of either shaft. But, in case of mines operated as in this section first provided, if in the judgment of the inspector an additional shaft is deemed necessary then the same shall be provided subject, however, to the decision of the circuit court of the county in which the mine is situated.

SEC. 9. All mines hereafter opened shall be allowed one year to make outlets as provided in section 8 when such mine is under two hundred feet in depth, and two years when such mine is over two hundred feet, but not more than twenty men shall be employed in such mines at one time until the provisions of section 8 are complied with, and after the expiration of the periods above mentioned should said mines not have the outlets aforesaid they must reduce their number to fifteen persons.

SEC. 10. It shall be the duty of said inspector to see that all coal mines are well and properly ventilated and that such quantities of air are supplied to the miners at their several places of working in each mine as is requisite for their health and safety.

The ventilation required by this section may be produced by any suitable appliances, but in case a furnace is used for ventilating purposes, it shall be built in such a manner as to prevent the communication of fire to any part of the works by lining the upcast with incombustible material for a sufficient distance up from said furnace.

SEC. 11. The owner or agent of every coal mine operated by a shaft or slope, in all cases where the human voice cannot be distinctly heard, shall forthwith provide and maintain a metal tube or other suitable means for communication from the top to the bottom of said shaft or slope, suitably calculated for the free passage of sound therein, so that communication can be held between persons at the bottom and top of the shaft or slope, and there shall be provided a sufficient cover overhead on all carriages used for lowering and hoisting persons, and on the top of every shaft an approved safety-gate and also approved safety-spring on the top of every slope, and an adequate brake shall be attached to every drum or machine used for raising or lowering persons in all shafts or slopes, and a trail shall be attached to every car used on a slope, all of said appliances to be subject to the approval of the inspector.

SEC. 12. No owner or agent of any coal mine operated by shaft or slope shall knowingly place in charge of any engine used for lowering into or hoisting out of such mine persons employed therein, any but experienced, competent and sober engineers, and no engineer in charge of such engine shall allow any person except such as may be deputed for that purpose by the owner or agent, to interfere with it or any part of the machinery, and no person shall interfere or in any way intimidate the engineer in the discharge of his duties, and the maximum number of persons to ascend out of or descend into any coal mine on one cage shall be determined by the inspector, but in no case shall such number exceed ten, and no person shall ride upon or against any loaded cage or car in any shaft or slope.

SEC. 13. No boy under twelve years of age shall be allowed to

work in any mine, and it shall be the duty of the agent of such mine to see that the provisions of this section are not violated.

SEC. 14. In case any coal mine does not in its appliances for the safety of the persons working therein, conform to the provisions of this act, or the owner or agent disregards the requirements of this act for twenty days after being notified by the inspector and court of competent jurisdiction in session or vacation, may, on application of the inspector, by civil action in the name of the State, enjoin or restrain the said owner or agent from working or operating such mine with more than ten miners at once until it is made to conform to the provisions of this act, and such remedy shall be cumulative and shall not take the place of, or affect any other proceedings against such owner or agent authorized by law for the matter complained of in such action.

SEC. 15. Any miner, workman, or other person who shall knowingly injure or interfere with any air-course or brattice, or obstruct, or throw open doors or disturb any part of the machinery, or disobey any order given in carrying out the provisions of this act, or ride upon a loaded car or wagon in a shaft or slope, or do any act whereby the lives and health of the persons or the security of the mines and machinery is endangered, or if any miner or person employed in any mine governed by the provisions of this act shall neglect or refuse to securely prop or support the roof and entries under his control or neglect or refuse to obey any order given by the superintendent in relation to the security of the mine in the part of the mine under his charge or control, every such person shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not exceeding one hundred dollars or imprisonment in the county jail not exceeding thirty days.

SEC. 16. Whenever written charges of gross neglect of duty or malfeasance in office against any inspector shall be made and filed with the Governor signed by not less than fifteen miners or one or more operators of mines together with a bond in the sum of five hundred dollars payable to the State and signed by two or more responsible freeholders and conditioned for the payment of all costs and expenses arising from the investigation of such charges it shall be the duty of the Governor to convene a board of examiners to consist of two practical miners, one mining engineer and two operators at such time and place as he may deem best, giving ten days' notice to the inspector against whom charges may be made and also the person whose name appears first in the charges, and said board when so convened and having first been duly sworn or affirmed truly to try and decide the charges made shall summon any witness desired by either party and examine them on oath or affirmation which may be administered by any member of the board and depositions may be read on such examination as in other cases, and report the result of their investigations to the Governor and if their report shows that said inspector has grossly neglected his duties or is incompetent or has been guilty of malfeasance in office it shall be the duty of the Governor forthwith to remove said inspector and appoint a successor, and said board shall award the costs and expenses of such investigation against the inspector or the person signing said bond.

SEC. 17. In all coal mines in this State the miners employed and working therein shall at all proper times have right of access and examination of all scales, machinery or apparatus used in or about said mine to determine the quantity of coal mined for the purpose of testing the accuracy and correctness of all such scales, machinery or apparatus, and such miners may designate or appoint a competent person to act for them, who shall at all proper times have full right of access and examination of such scales, machinery or apparatus and seeing all weights and measures of coal mined and the accounts kept of the same provided not more than one person on behalf of the miners collectively shall have such right of access, examination and inspection of scales, weights, measures and accounts at the same time, and that such person shall make no unnecessary interference with the use of such scales, machinery or apparatus.

SEC. 18. The owner, agent, or operator of any coal mine shall keep a sufficient supply of timber where required to be used as props so that the workmen may at all times be able to properly secure the workings from caving in, and it shall be the duty of the owner, agent or operator to send down all such props when required.

SEC. 19. The provisions of this act shall not apply to or affect any coal mines in which not more than fifteen persons are employed at the same time. *Provided*, that upon the application of the proprietors of or miners in any such mine the inspector shall make or cause to be made an inspection of such mine and direct and enforce any regulations in accordance with the provisions of this act that he may deem necessary for the safety or the health and lives of the miners.

SEC. 20. Chapter 31, acts of the Fifteenth General Assembly is hereby repealed.

Approved, March 30, 1880.

OHIO MINING LAW AS AMENDED.

SEC. 290. The inspector of mines shall be appointed by the Governor by and with the advice and consent of the Senate, and shall hold his office for four years, and no person shall be appointed unless he is possessed of a competent knowledge of chemistry, geology and minerology and has a practical knowledge of mining, engineering and of the different systems of working and ventilating coal mines, and of the nature and properties of the noxious and poisonous gases of mines, particularly fire-damp.

SEC. 291. Before entering upon the discharge of the duties of the office the inspector shall give bonds to the State in the sum of five thousand dollars with sureties to be approved by the Governor conditioned for the faithful performance of his duties. The bonds

with his oath of office and approval of the Governor indorsed thereon shall be forthwith deposited with the Secretary of State.

SEC. 292. The inspector shall give his whole time and attention to the duties of his office and shall examine all the mines in the State as often as his other duties will permit, to see that the provisions of this chapter are obeyed; and the inspector may enter, inspect and examine any mine in the State and the works and machinery belonging thereto at all reasonable times by night or by day but so as not to unnecessarily obstruct or impede the working of the mine and to make inquiry into the state and condition of the mine as to ventilation and general security, and the owner and agent of such mine are hereby required to furnish the means necessary for such entry and inspection, of which inspection the inspector shall make a record, noting the time and all the material circumstances; and the person having charge of any mine whenever loss of life occurs by accident connected with the working of such mine or by explosion shall give notice forthwith by mail or otherwise to the inspector of mines and to the coroner of the county in which the mine is situated who shall hold an inquest upon the body of the person or persons whose death has been caused and inquire carefully into the cause thereof and shall return a copy of the finding and all the testimony to the inspector.

SEC. 293. The inspector while in office shall not act as an agent or as a manager or mining engineer or be interested in operating any mine, and he shall annually make a report to the Governor of his proceedings and the condition and operation of the mines of the State, enumerating all accidents in or about the same and giving all such other information as he thinks useful and proper, and making such suggestions as he deems important as to further legislation on the subject of mining.

SEC. 294. The inspector shall have an office in the State House in which shall be carefully kept the maps and plans of all mines in the State and all records and correspondence, papers and apparatus and property pertaining to his duties belonging to the State and which shall be handed over to his successor in office.

SEC. 295. There shall be provided for the inspector all instruments and chemical tests necessary for the discharge of his duties under this chapter which shall be paid for on the certificate of the inspector and which shall belong to the State.

SEC. 296. The owner or agent of every coal mine shall make or cause to be made an accurate map or plan of the workings of such mine on a scale of not less than one hundred feet to the inch showing the area mined or excavated and the location and connection with such excavation of the mine of the lines of all adjoining lands and the name or names of each owner or owners so far as known marked on each tract, a true copy of which map the owner or agent shall deposit with the inspector, and another copy of which shall be kept at the office of such mine, and the owner or agent shall every four months thereafter file with the inspector a statement and plan

of the workings of such mine up to that date which statement and plan shall be so prepared as to enable the inspector to mark the same on the original map or plan herein required to be made, and in case of refusal on the part of the owner or agent to make and file the map or plan, or the addition thereto, the inspector is authorized to cause an accurate map or plan of the whole of said mine to be made at the expense of the owner thereof, the cost of which shall be recoverable against the owner in the name of the person or persons making the map or plan which shall be made in duplicate, one copy being delivered to the inspector and the other left in the office of the mine; and he shall, on being paid the proper costs thereof on demand of any person interested in the working of such mine or owner of adjoining lands, furnish an accurate copy of any map or plan of the working of such mine.

SEC. 297. It is unlawful for the agent or owner of any coal mine worked by a shaft wherein over 15,000 square yards have been excavated, to employ or permit any person to work therein, unless there are to every seam of coal worked in each mine at least two separate outlets separated by natural strata of not less than one hundred feet in breadth, by which shafts or outlets distinct means of ingress and egress are always available to the persons employed in the mine, but it is not necessary for the two outlets to belong to the same mine; the second outlet need not be made until 15,000 yards have been excavated in such mines, and to all other coal mines, whether slopes or drifts, two such openings or outlets must be provided within twelve months after fifteen thousand yards have been excavated therein; and in case such outlets are not provided as herein stipulated, it shall not be lawful for the agent or owner of such mine to permit more than ten persons to work therein at any one time. In case a coal mine has but one shaft, slope or drift for the ingress or egress of the men working therein and the owner thereof does not own suitable surface-ground for another opening, he may select and appropriate any adjoining land for that purpose, and for approach thereto, and shall be governed in his proceedings in appropriating such land by the provisions of law in force providing for the appropriating of private property by corporations, and such appropriations may be made whether he is a corporator or not; but no land shall be appropriated under the provisions of this chapter until the court is satisfied that suitable premises cannot be obtained by contract upon reasonable terms.

SEC. 298. The owner or agent of every coal mine, whether shaft, slope or drift, shall provide and maintain for any such mine an amount of ventilation not less than 100 cubic feet per minute per person employed in such mines, which shall be circulated and distributed throughout the mine in such a manner as to dilute, render harmless, and expel the poisonous and noxious gases from each and every working place in the mine, and no working place shall be driven more than 120 feet in advance of a break-through or air-way; and all break-throughs or air-ways, except those last made near the

working places of the mine, shall be closed up and made air-tight by brattice, trap-doors, or otherwise, so that the currents of air in circulation in the mine may sweep to the interior of the mine where the persons employed in such mine are at work, and all mines governed by the statutes shall be provided with artificial means of producing ventilation, such as forcing or suction fans, exhaust steam, furnaces, or other contrivances of such capacity and power as to produce and maintain an abundant supply of air, and all mines generating fire-damp shall be kept free of standing gas, and every working place shall be carefully examined every morning with a safety lamp by a person or persons before any of the workmen are allowed to enter the mine.

SEC. 299. The owner or agent of every coal mine operated by shaft, in all cases where human voice cannot be distinctly heard, shall forthwith provide and maintain a metal tube from the top to the bottom of such shaft suitably calculated for the free passage of sound therein so that conversation may be held between persons at the bottom and top of the shaft, and there shall also be provided an approved safety-catch and a sufficient cover overhead on all carriages used for lowering or hoisting persons, and in the top of every shaft an approved safety gate, and an adequate brake shall be attached to every drum or machine used for lowering or raising persons in all shafts or slopes.

SEC. 300. No owner or agent of any coal mine operated by a shaft or slope shall place in charge of any engine used for lowering into or hoisting out of such mine persons employed therein any but experienced, competent and sober engineers, and no engineer in charge of such engine shall allow any person except such as may be deputed for that purpose by the owner or agent to interfere with it or any part of the machinery, and no person shall interfere or in any way intimidate the engineer in the discharge of his duties, and in no case shall more than ten men ride on any cage or car at one time, and no person shall ride upon a loaded cage or car in any shaft or slope.

SEC. 301. All safety-lamps used for examining coal mines or which are used in any coal mine shall be the property of the owner of the mine and shall be under the charge of the agent thereof, and in all mines whether they generate fire-damp or not the doors used in assisting or directing the ventilation of the mine shall be so hung and adjusted that they will shut of their own accord and cannot stand open, and the mining boss shall keep a careful watch over the ventilating apparatus and the air-ways, and he shall measure the ventilation at least once a week at the inlet and outlet, and also at or near the face of all the entries, and the measurements of air so made shall be noted on blanks furnished by the mine inspector; and on the first day of each month the mining boss of each mine shall sign one of such blanks properly filled with the actual measurements and forward the same to the mine inspector.

SEC. 302. No boy under twelve years of age shall be allowed to work in any mine, nor any minor between the ages of twelve and sixteen years unless he can read and write and in all cases of minors applying for work the agent of such mine shall see that the provisions of this section are not violated.

SEC. 303. In case any coal mine does not, in appliances for the safety of the persons working therein, conform to the provisions of this chapter or the owner or agent disregards the requirements of this chapter, any court of competent jurisdiction may on application of the inspector by civil action in the name of the State enjoin or restrain the owner or agent from working or operating such mine with more than ten miners at once until it is made to conform to the provisions of this chapter; and such remedy shall be cumulative and shall not take the place of or affect any other proceedings against such owner or agent authorized by law for the matter complained of in such action.

SEC. 304. Whenever written charges of gross neglect of duty or malfeasance in office against any inspector is made and filed with the Governor signed by not less than fifteen coal miners or one or more operators of mines together with a bond in the sum of five hundred dollars, payable to the State and signed by two or more responsible freeholders and conditioned for the payment of all costs and expenses arising from the investigation of such charges the Governor shall convene a board of examiners to consist of two practical coal miners, one chemist, one mining engineer and one operator at such time and place as he deems best, giving ten days' notice to the inspector or against whom the charges are made and also to the person whose name appears first in the charges, and the board when so convened and having been first duly sworn truly to try and decide the charges made shall summon any witnesses so desired by either party and examine them on oath which may be administered by any member of the board and depositions may be read on such examination as in other cases and the board shall examine fully into the truth of such charges and report the result of their investigation to the Governor, and the board shall award the costs and expenses of such investigation against said inspector or the persons signing the bond according to their finding against said inspector or in his favor which costs and expenses shall include the compensation of such board of five dollars per day for each member for the time occupied in the trial and in traveling from and to their homes, and the Attorney-general shall forthwith proceed to collect such costs and expenses and pay the same into the State treasury, being in the first instance paid out of the State treasury, on the certificate of the president of such board.

SEC. 305. In all coal mines in the State the miners employed and working therein, the owners of the land, or other persons interested in the rental or royalty of any such mine, shall at all proper times have full right of access and examination of all scales, machinery, or apparatus used in or about such mine to determine the amount of coal mined for the purpose of telling the accuracy and correctness of

all such scales, machinery, or apparatus; and such miners, land-owners, or other persons may designate or appoint a competent person to act for them who shall at all proper times have full right of access and examination of such scales, machinery, or apparatus, and seeing all weights and measures of coal mined and the accounts kept of the same; but not more than one person on behalf of the miners collectively, or one person on behalf of the land-owners or other persons interested in the rental or royalty jointly shall have such right of access, examination and inspection of scales, weights, measures and accounts at the same time, and that such persons will make no unnecessary interference with the use of such scales, machinery, or apparatus; and the miners employed in any mine may from time to time appoint two of their number to act as a committee to inspect, not oftener than once in every month, the mine and the machinery connected therewith, and to measure the ventilation current, and if the owner, agent, or manager so desires he may accompany said committee by himself or two or more persons which he may appoint for that purpose; the owner, agent or manager shall afford every necessary facility for making such inspection and measurements, but the committee shall not in any way interrupt or impede the work going on in the mine at the time of such inspection and measurement, and said committee shall within ten days after such inspection and measurements, make a correct report thereof to the inspector of mines, on blanks, to be furnished by said inspector for that purpose, and if such committee make to the inspector a false or untrue report of the mines, such act will constitute a violation of this section.

SEC. 306. The provisions of this chapter shall not apply to or effect any coal mine in which not more than ten men are employed at the same time, but on the application of the proprietor of or miners in any such mine, the inspector shall make, or cause to be made, an inspection of such mine, and shall direct and enforce any regulations in accordance with the provisions of this chapter, that he deems necessary for the safety of the health and lives of miners.

SEC. 306. (*a*). The inspector of mines, may, with the approval of the Governor, appoint an assistant, who shall be a practical miner of not less than five years' experience, and who shall perform such duties as may be required by the inspector, and receive a salary at the rate of twelve hundred dollars ($1,200) per annum, and the inspector may, with the consent of the Governor, remove such assistant at pleasure and appoint a successor, and may allow the assistant traveling expenses out of his contingent fund.

SEC. 6,871. Whoever knowingly violates any of the provisions of sections 298, 299, 300, 301, 302 and 305 of the revised statutes, or does any act whereby the lives or health of the persons or the security of any mine and machinery are endangered, or any miner or other person employed in any mine governed by the statute, who intentionally and willfully neglects or refuses to securely prop the roof of any working place under his control, or neglects or refuses

to obey any order given by the superintendent of a mine in relation to the security of the mine in the part thereof where he is at work, and for fifteen feet back from the face of his working place, shall be fined not less than fifty dollars, or imprisoned in the county jail not less than thirty days, or both.

PENNSYLVANIA MINING LAW.

AN ACT providing the means for securing the health and safety of persons employed in the bituminous coal mines of Pennsylvania.

SECTION 1. *Be it enacted*: That the owner or agent of every bituminous coal mine or colliery, shall make, or cause to be made, within six months after the passage of this act, an accurate map or plan of the working of such coal mine or colliery on a scale not exceeding one hundred feet to the square inch, and showing the bearing and distances, which shall be kept for use of the inspector in the office at the mine of said coal mine or colliery; and said owner or agent shall cause on or before the 10th of January in every year a plan of the progress of the working of such coal mine during the year past, to be marked on original map or plan of the said coal mine or colliery, and the inspector shall have the right at all times to have possession of any such map or plan at the mines to draw a copy therefrom for his own convenience: *Provided*, If the owner or agent of any coal mine shall neglect or refuse or from any cause fail for the period of two months after the time prescribed, to furnish the map or plan as hereby required, or if the inspector shall find or have reason to believe that any map or plan of any coal mine furnished in pursuance of the provisions of this act is materially inaccurate or imperfect, he is hereby authorized to cause a correct map or plan of the actual workings of said coal mine to be made at the expense of the owner thereof, the cost of which shall be recoverable from said owner as other debts are recoverable by law: *Provided*, That if the map or plan which he claimed to be incorrect shall prove to have been correct then aforesaid expenses shall be paid by the said inspector and may be recovered from him in like manner.

SEC. 2. It shall not be lawful after six months from the passage of this act for the owner or agent of any bituminous coal mine to employ any person at work within said coal mine or permit any person to be in said coal mine for the purpose of working therein unless they are in communication with at least two openings separated by natural strata of not less than one hundred and fifty feet in breadth, if the mine be worked by shaft or slope, and of not less than twenty-four feet, if the mine be worked by drift: *Provided*, If the mine be worked by drift, two openings inclusive of air-shaft, shall only be required, if the air-shaft can be used for ingress and egress in case of emergency; that not more than twenty persons shall employed in the mine at any one time after the expiration of the six months until the second opening shall be reached and made

available; and in case of furnace ventilation being used before the second opening is reached, the furnace shall not be placed within forty feet of the foot of the shaft and shall be well secured from danger from fire by brick or stone walls of sufficient thickness and the mine while being driven for making and perfecting a second opening; the owner or agent shall provide and maintain a metal tube from the top to the bottom of the slope or shaft suitably adapted to the free passage of sound through which conversation may be held between persons at the bottom and at the top of the shaft or slope; also the ordinary means of signaling to and from the top and bottom of the shaft or slope, and an approved safety-catch, and sufficient cover overhead on every carriage used for lowering and hoisting persons; and the said owner or agent shall see that sufficient flanges or horns are attached to the sides of the drum of every machine that is used for lowering and hoisting persons in and out of the mine, and also that adequate brakes are attached thereto; the main link attached to the swivel of the wire rope shall be made of the best quality of iron, and shall be tested by weights or otherwise satisfactory to the inspector of mines of the district, and bridle chains shall be attached to the main link from the cross pieces of the carriage and no single link chain shall be used for lowering or raising persons into or out of said mine, and not more than six persons shall be lowered or hoisted by the machinery at any one time and only sober, competent and experienced engineers shall be employed.

SEC. 3. When a second opening is made one opening shall be set apart exclusively for purposes of ingress and egress and shall not be clogged or obstructed with machinery, pumps or currents of heated air or steam; if the opening is a shaft it shall be fitted with safe and convenient stairs at an angle of not more than sixty degrees descent and with landings at easy and convenient distances; all water coming from the surface or out of the strata in the shaft shall be conducted by rings or otherwise to be prevented from falling down the shaft so as to wet persons who are ascending and descending the stairway of the shaft; if the opening in a slope, it shall be provided with safe and available traveling-ways.

SEC. 4. The owner or agent of every bituminous coal mine, whether shaft, slope or drift, shall within six months after the passage of this act provide and thereafter maintain for every such mine ample means of ventilation, affording one hundred cubic feet per minute for each and every person employed in said mine, which shall be circulated around the main headings and cross headings to an extent that will dilute, carry off and render harmless the noxious gases generated therein; and all mines generating fire-damp shall be kept free of standing gas, and every working place shall be carefully examined every morning with a safety-lamp by a competent person before any workmen are allowed to enter.

SEC. 5. In order to better secure the proper ventilation of every coal mine and promote the health and safety ot the persons employed therein, the owner or agent shall employ a competent and practical inside overseer, to be called mining boss, who shall keep a careful watch over the ventilating apparatus, the air-ways, traveling-ways, pumps and pump-timbers, and drainage; and shall see that as the miners advance their excavations all loose coal, slate and rock overhead are carefully secured against falling in or upon the traveling-ways, and that sufficient timber is furnished, of suitable lengths and sizes for the places where they are to be used, and placed in the working places of the miners; and it shall also be the duty of the mining boss to measure the current of air at least once a week, at the inlet and outlet, and at or near the face of the headings, and keep a record of such measurement, and report the same to the inspector of his district once in every month; the safety-lamps used for examining mines, or which may be used in working therein, shall be furnished by and be the property of the owner of said mines, and shall be in the charge of the agent of such mine, and in all mines generating explosive gases the doors used in assisting or directing the ventilation of the mines shall be so hung and adjusted that they will close themselves, or be supplied with springs or pulleys so that they cannot be left standing open; and bore-holes shall be kept not less than twelve feet in advance of the face of every working place, and when necessary, on the sides, if the same is driven towards and in dangerous proximity to an abandoned mine or part of a mine suspected of containing inflammable gases, or which is inundated with water.

SEC. 6. Any miners, workmen or other persons who shall intentionally injure any shaft, lamp, instrument, air-course or brattice, or obstruct or throw open air-ways, or carry lighted pipes or matches into places that are worked by safety-lamps; or handle or disturb any part of the machinery; or open a door and not close it again; or enter any place of a mine against caution; or disobey any order given in carrying out the provisions of this act; or do any other act whereby the lives or the health of persons, or the security of the mines or the machinery are endangered, shall be deemed guilty of a misdemeanor, and may be punished in the manner provided in the sixteenth section of this act. All machinery about the mines shall be properly fenced off, and the top of each shaft and the entrance of every abandoned slope and air or other shaft shall be securely fenced off; and there shall be cut in the side of every hoisting shaft at the bottom thereof a traveling-way sufficiently high and wide to enable persons to pass the shaft in going from one side of the mine to the other without passing over or under the cage or other hoisting apparatus.

SEC. 7. If any person, firm or corporation is, or hereafter shall be seized in his or their own right of coal lands, and it shall not be practicable to comply with the requirements of this act in regard to drainage and ventilation by means of openings on his or their own land, and the same can be done by means of openings on adjacent

lands, he or they may apply by petition to the court of quarter sessions of the proper county, after ten days' notice to the owners, their agent or attorney, setting forth the facts under oath or affirmation particularly describing the place or places where such opening or openings can be made, and that he or they cannot agree with the owner or owners of the land as to the amount to be paid for the privilege of making such opening or openings; hereupon the said court shall appoint three disinterested and competent citizens of the county to view the grounds designated, and lay out from the point or points mentioned in such petition a passage or passages for air and water not more than sixteen feet in diameter by the shortest and most convenient route to the coal of such person, firm or corporation, preferring in all cases an opening through the coal strata where the seam is practicable; the said viewers shall at the same time assess the damages to be paid by the petitioner or petitioners to the owner or owners of such land for the privilege of making said openings, which damages shall be fully paid before such opening is made; it shall be the duty of said viewers to give notice by at least three written or printed handbills posted on the premises at least five days prior to the time of meeting to attend to the duties of their appointment, setting forth distinctly the time, place and object of their meeting, and also to give personal notice to the parties, their agents and attorneys, where it can be done, and shall, within thirty days after their appointment make report of their proceedings to said court, stating the amount of damages awarded, accompanied by a map or plan of said openings; and if no appeal be taken to said court within ten days after notice to the opposite party in interest of the filing thereof, it shall be marked confirmed by the clerk and the petitioner or petitioners may proceed to make said opening or openings; the pay of the viewers and other costs shall be the same as in road cases, and shall be paid by the petioner or petitioners.

SEC. 8. As soon as practicable after the passage of this act the persons exercising the office of presiding judge of each of the several courts of common pleas in the fifth, tenth, and fourth judicial districts shall appoint one reputable miner of known experience and in practice at the time (in the fifth district the president, judge of the court of common pleas, number one shall make said appointment), and the Governor shall appoint two mining engineers of like repute and experience and practice at the time who shall constitute a board of five examiners, whose duty it shall be to inquire into the character and qualifications of candidates for the office of inspector of mines under the provisions of this act. The examiners first appointed in pursuance of this section, shall meet in the city of Pittsburgh on the fifteenth day of May next, and after being duly organized, having taken and subscribed before any officer authorized to administer the same, the following oath namely: "We, the undersigned, do solemnly swear (or affirm) that we will perform the duties of examiners of applicants for appointment as inspector of bituminous coal mines to the best of our abilities and that in recommending or rejecting said applicants we will be governed by the evidence of qualification to fill the position, under the law creating the same and not by any consideration of political or other personal favor; that we will certify all whom we may find qualified, according to the true intent and meaning of the act and none others to the best of our judgment; shall proceed to the examination of those who may present themselves as candidates for said office; and they shall certify to the Governor the names of all such applicants as they shall find competent to fill the office under the provisions of this act which names, with the certificate and the oath of the examiners shall be mailed to the Secretary of the Commonwealth to be filed in his office, and shall be valid when recommended by four of the examining board." The qualifications of candidates for said office of inspector of mines to be inquired into and certified by said examiners, shall be as follows; namely, They shall be citizens of the United States, of temperate habits, of good repute as men of personal integrity, shall have obtained the age of thirty years and shall have had at least five years experience in the workings of the bituminous coal mines of Pennsylvania and upon the examination they shall give evidence of such theoretical as well as practical knowledge of the working of coal mines and noxious gases as will satisfy the examiners of their capability and fitness for the performance of the duties imposed upon inspectors of mines by the provisions of this act. The board of examiners shall, also, at their said meeting, divide the bituminous coal counties of the State into three inspection districts as nearly equal in regard to the labor to be performed as is possible, taking into consideration the number of mines and the extent of territory; at every subsequent calling of the board of examiners this division may be revised as experience may prove to be advisable. The board of examiners shall each receive five dollars per day and all necessary expenses to be paid out of the State treasury upon the filing of the certificates of the examining board in the office of the Secretary of the Commonwealth, as herein before provided.

The Governor shall from the names so certified appoint one person to be inspector of mines for each district, as fixed by the examiners in pursuance of this act, whose commission shall be for four years to be computed from the fifteenth day of May next. As often as vacancies occur by death, resignation or otherwise in said offices of inspectors of mines, the Governor shall fill the same, by appointment for the unexpired term, from the names on file in the office of the Secretary of the Commonwealth, until the number shall be exhausted; and whenever this shall occur the Governor shall cause the aforesaid board of examiners to meet, who shall examine persons that may present themselves for the vacant office of inspector, in the same manner as herein provided and the board of examiners shall certify to the Governor one person to be commissioned by him for the office of inspector for the unexpired term and any vacancies that may occur in the examining board shall be filled in the dis-

trict where the vacancy occurred. And every four years the Governor shall appoint two mining engineers as before and shall notify the persons exercising the office of president judge of the courts of common pleas of three of the judicial districts of the State, containing bituminous coal mines selecting them in such order as to allow each district an equal share of such appointments, each to appoint one miner and the five so appointed shall constitute a new board of examiners whose duties, term of service, and compensation, and vacancies that may happen, shall be the same as those first provided for by this section and from the names that may be certified by them, the Governor shall appoint the inspectors provided for in this act. Nothing in this act shall be construed to prevent the reappointment of any inspector of bituminous mines. The inspectors of mines shall each receive for their services an annual salary of two thousand dollars to be paid quarterly by the State treasurer, and they shall each reside in the district for which they shall be appointed. Each inspector is hereby authorized to procure such instruments and chemical tests and stationery, from time to time as may be necessary to the proper discharge of his duties, under this act, at the expense of the State, which shall be paid by the State treasurer, upon accounts duly certified by him and audited by the proper department of the State. All instruments, plans, book memoranda, notes, etcetera, pertaining to the office shall be the property of the State and shall be delivered to their successors in office.

SEC. 9. Each inspector of bituminous coal mines shall, before entering upon the discharge of his duties give bond in the sum of five thousand dollars with sureties to be approved by the president judge of the district in which he resides, conditioned for the faithful discharge of his duty, and take an oath (or affirmation) to discharge his duties impartially and with fidelity to the best of his knowledge and ability.

SEC. 10. No person who shall act as a manager or agent of any coal mine or as a mining engineer or to be interested in operating any coal mine shall at the same time act as an inspector of coal mines under this act.

SEC. 11. For any injury to person or property occasioned by any violation of this act or any willful failure to comply with its provisions by any owner, lessee, or operator of any coal mine or opening, a right of action against the party at fault shall accrue to the party injured for the direct damages sustained thereby; and in any case of loss of life by reason of such violation or willful failure a right of action against the party at fault shall accrue to the widow and lineal heirs of the person whose life shall be lost, for like recovery of damages for the injury they shall have sustained.

SEC. 12. The inspectors of bituminous coal mines shall each devote the whole of his time to the duties of his office; it shall be his duty to examine the mines in his district as often as possible to see that all the provisions of this act are observed and strictly carried out, and he shall make a record of all examinations of mines showing the condition in which he finds them, the number of mines in his district, the number of persons employed in and about each mine, the extent to which the law is obeyed, the progress made in the improvement sought to be secured by the passage of this act, the number of accidents and deaths resulting from injuries received in the mines and all other facts of public interest concerning the condition and progress of mining in his district, which record shall on or before the first Monday of each month together with all matters and things furnished him in accordance with the provisions of this act be filed in the office of the Secretary of Internal Affairs to be by him recorded and included in the annual report of his department; he shall also from the time of his commission make strict and careful inquiry and examination into the condition of the ventilation and drainage of the mines.

SEC. 13. That the inspectors may be enabled to perform the duties herein imposed upon them, they shall have the right at all times to enter any bituminous coal mine to make examination or obtain information; they shall notify the owners, lessee or agents immediately of the discovery of any violations of this act and of the penalty imposed thereby for such violations, and in case of such notice being disregarded for the space of ten days they shall institute a prosecution against the owner, owners, agent or lessee of the mine under the provisions of section sixteen of this act, in any case, however where in the judgment of the inspector of either district delay may jeopordize life or limb he shall at once notify the inspectors of the other districts whereupon they shall at once proceed to the mine or colliery where the danger exists; and examine into the matter and if after full investigation thereof they shall be agreed in the opinion that there is immediate danger they shall apply in the name of the Commonwealth to the court of common pleas of the county in which the mine may be located for an injunction to suspend all work in and about such mine or colliery; whereupon said court if the cause appear to be sufficient after hearing the parties and their evidence as in like cases shall issue their writ to restrain the working of said mine or colliery until all cause of danger is removed; and the costs of said proceedings including the charges of attorney prosecuting said application shall be borne by the owner of the mine or colliery: *Provided*, That no fee exceeding the sum of twenty-five dollars shall be taxed in any one case for the attorney prosecuting such case: *Provided*, Further, that if said court shall find the cause not sufficient then the case shall be dismissed and the costs shall be borne by the inspector instituting the proceeding or the county, in the discretion of the court.

SEC. 14. Whenever by reason of any explosion or other accident in any bituminous coal mine or the machinery connected therewith, loss of life or serious personal injury shall occur it shall be the duty of the person having charge of such mine or colliery to give notice thereof forthwith to the inspector of the district, and if any person is killed, thereby to the coronor of the county, who shall give due

notice of the inquest to be held; it shall be the duty of the inspector upon being notified as herein provided, to immediately repair to the scene of the accident and make such suggestions as may appear necessary to secure the future safety of the men; and if the results of the explosion do not require an investigation by the coroner, he shall proceed to investigate and ascertain the cause of the explosion or accident and make a record thereof which he shall file as provided for; and to enable him to make the investigation he shall have power to compel the attendance of persons to testify, and administer oaths or affirmations; the costs of such investigation shall be paid by the county in which the accident occurred, in the same manner as costs of inquests held by the coroners or justices of the peace are paid.

SEC. 15. The court of common pleas of any county in the proper district upon a petition signed by not less than fifteen reputable citizens, not less than five of whom shall be miners, owners, or lessees of mines ,and with the affidavit of one or more of said petitioners attached setting forth that any inspector of mines neglects his duties or is incompetent or that he is guilty of malfeasance in office, shall issue a citation in the name of the Commonwealth to the said inspector to appear on not less than fifteen days' notice upon a day fixed before said court at which time the court shall proceed to inquire into and investigate the allegations of the petitioners; if the court find that the said inspector is neglectful of his duties or is incompetent to perform the duties of his office or that he is guilty of malfeasance in office the court shall certify the same to the Governor who shall declare the office of said inspector vacant and proceed in compliance with the provisions of this act to supply the vacancy; the cost of said investigation shall if the charges are sustained be imposed upon the inspector, but if the charges are not sustained they shall be imposed upon the petitioners.

SEC. 16. The neglect or refusal to perform the duties required to be performed by any section of this act by the parties therein required to perform them or the violation of any of the provisions or requirements hereof shall be deemed a misdemeanor and shall upon conviction be punished by fine of not less than two hundred dollars nor not exceeding five hundred dollars at the discretion of the court; and all penalties recovered under this act shall be paid into the treasury of the State.

SEC. 17. The inspector shall exercise a sound discretion in the enforcement of the provisions of this act and should the operator or owner be dissatisfied with any decision at which the inspector may arrive, it shall and may be lawful for such operator or owner to apply by petition to the court of quarter sessions of the county wherein such mine is located and said court shall thereupon appoint three reputable, competent and disinterested persons whose duty it shall be to forthwith examine such mines and hear the proofs and allegations of the inspectors and operators or owner, and make such report under oath, to court, of the facts as they exist together with their opinion thereon; and if said report sustains the decisions of

the inspector then the party making application to court shall pay the cost of such proceedings, and if the report is against such decision then the inspector shall pay the costs unless the court order otherwise. The report of said board shall become absolute, unless exceptions thereto shall be filed within ten days after notice of the filing thereof to the owner, operator or inspector, and if exceptions are filed the court shall hear and determine the same and the decision shall be final and conclusive.

SEC. 18. The provisions of this act shall not apply to any mine where ten men or a less number are employed or to any mine which does not generate fire-damp, black-damp, or other dangerous or noxious gases.

SEC. 19. All laws or parts of laws, inconsistent with any of the provisions of this act, are hereby repealed.

AN ACT to amend an act, entitled, "an act to provide the means for securing the health and safety of persons employed in the bituminous coal mines of Pennsylvania."

SECTION 1. *Be it enacted, etc*: That the last clause of the eighteenth section of the act of the General Assembly, entitled: "An act to provide the means for securing the health and safety of persons employed in the bituminous coal mines of Pennsylvania," approved the eighteenth day of April, Anno Domini one thousand eight hundred and seventy-seven. After the word "employed," in the second line of said section, which is as follows: "Or to any mine which does not generate fire-damp, black-damp, or other dangerous or noxious gases," is hereby repealed.

ABSTRACT OF BRITISH MINING LAW.

The following is copied from the last annual report of the State Mine Inspector of Ohio.

Application of Act—Inspectors—Managers—Restrictions as to Employment Under Ground—Restrictions as to Employment Above Ground—Who may be Employed about an Engine—Penalty for Misrepresentation of Age—Wages not to be paid in Public Houses—Weighing—Prohibition of Single Shafts—Fencing Abandoned Mines—General Rules—Special Rules—Dangerous Practices not Expressly Prohibited—Penalties—Misscellaneous—Register, Returns, Plans, Abandonment of Mines, Notices, Coroners' Inquests—Exemptions—Thin-Seam Mine, Saturday Half-Holiday, Ireland, Weighing Provisions, Single Shafts—General Rules.

1. The act applies to coal mines, mines of stratafied ironstone, mines of shale, mines of fire-clay.

Definition of mine.—The term "mine" includes every shaft in the course of being sunk, and every level and inclined plane in the course of being driven, for commencing or opening any mine, or for searching for, or proving minerals, and all the shafts, levels, planes, machinery, tramways, and sidings, both below ground and above ground, in and adjacent to a mine, and any such shaft, level, and inclined plane, and belonging to the mine. The term "shaft"

includes pit. Where two or more parts of a mine are worked separately, each of such parts may, after notice, be constituted a separate mine for the purpose of the act. A secretary of State, however, may object thereto, and the owner or agent must acquiesce in such objection, or refer the matter to arbitration.

3. The commencement of the act is, for England and Scotland, 1st January, 1873; for Ireland, 1st January, 1874.

4. Inspectors of mines are to be appointed by a secretary of State, and a district to be assigned to each. The existing inspectors are to continue to act.

5. An inspector may not himself be, or practice, or be the partner of one who is or who practices, as land agent or mining engineer, or as a manager, viewer, agent or valuer of mines, or as arbitrator, in mining cases, and may not be otherwise employed in or about any mine, whether such mine is one to which the act applies or not.

6. In order to ascertain whether the provisions of the act are observed both above ground and below ground, the inspector is authorized to examine any mine by day or by night, so, however, as not to impede the working thereof; and owners, agents, and managers, and all employed in or about the mine, are bound to render him every assistance in conducting such examination.

7. He is to make to a secretary of State an annual report of his proceedings, to be laid before Parliament, and, when directed, is to make a special report as to any mine accident attended with loss of life or personal injury. Such special report will be made public in the mode, and at the time directed by a secretary of State.

8. *Rule.*—Subject to the exceptions mentioned below, every mine must be under the control and daily supervision of a certificated manager.

9. *Exception 1.*—The rule requiring a manager does not apply to any mine in which less than thirty persons are ordinarily employed below ground, unless the inspector of the district insists upon it.

10. *Exception 2.*—The rule requiring a manager does not apply to any mine, the average daily output of which does not exceed twenty-five tons, unless the inspector of the district insists upon it.

11. *Exception 3.*—In special circumstances, notified to the inspector of the district, a manager may be temporarily dispensed with.

12. The certificate, given by a secretary of State, is either a certificate of service, given only to persons who before the 10th of August, 1872, were acting, and have since then acted, in the capacity of manager of mine, or who since the 10th of August, 1867, have acted in a like capacity for more than twelve months; or a certificate of competency given after examination, and upon proof of sobriety, experience, ability and general good conduct. The examination is conducted by examiners appointed by a district board, and the members of such district board are appointed by the Secretary of

State, and consists of three owners, agents or managers of a mine within the district; three persons employed in or about a mine within the district, not being owners, agents, or managers; three mining engineers, agents, managers, or coal viewers within the district, and an inspector of mines. The area of the district is fixed by a secretary of State.

13. The owner or agent may nominate either himself or any other person as manager, but the manager must not be a contractor for getting the mineral, or in the employ of a contractor.

14. A secretary of State, on a representation made that a certificated manager is by reason of incompetency or gross negligence, unfit to discharge his duties, or has been convicted for an offense against the act, may order a court of inquiry to be held, and, on the report of the court, cancel or suspend the certificate. He may also restore a certificate canceled or suspended.

15. A register of certificated managers is kept under the directions of a secretary of State.

16. Women and girls of any age may not be employed at all.

17. Boys under 12 may not be employed at all, unless the mine is specially exempted by the Secretary of State by reason of the thinness of the seam; when subject to certain conditions, stated in the exemption, boys between 10 and 12 may be employed.

18. Boys of 12 and under 13, and male young persons of 13 and under 16 may be employed not more than 54 hours a week, or more than 10 hours a day, and are to be allowed an interval of 12 hours for rest between each two consecutive periods of employment except between Friday and Saturday, when an interval of 8 hours will suffice.

19. A week begins at 12 P. M. on Saturday and ends 12 P. M. the Saturday following.

20. A period of a person's employment begins at the time of his leaving the surface, and ends at the time of his returning to the surface.

21. The immediate employer of any boy of 12 and under 13, and of any male young person of 13 and under 16, is not to take him below ground until he has reported his intention so to do to the manager, or to some person appointed by the manager.

22. Children under 10, of either sex, may not be employed at all.

23. Children of 10 and under 13, of either sex, may be employed, but not for more than 6 days a week, and not for more than 6 hours a day if employed for more than 3 days in a week, and not for more than 10 hours a day if employed for only 3 days, or less than 3 days in a week.

24. For children so employed an interval of 12 hours for rest must be allowed between two consecutive periods of employment, except between Friday and Saturday, when an interval of 8 hours will suffice.

25. *Schooling.*—The parent or guardian of, or person having the custody or control of any child so employed, must see that the child attends school (except in the case of there being no school which the child can attend within two miles of his or her home, or of the mine). Such attendance must be for at least 20 hours in every 2 consecutive weeks of employment, and any attendance is not to count if it is in excess of 3 hours at a time, or 5 hours in a day, or of 12 hours in a week, or on Sundays, or before 8 A. M., or after 6 P. M.

26. It will be the duty of the immediate employer, after employing a child for a fortnight, to obtain from the teacher every Monday morning during the continuance of the employment a certificate of the child's attendance at the school during the preceding week, and to deliver the certificate to the owner, agent or manager, who must keep the same in the office at the mine for six months for production to the inspector.

27. Also the person who pays the child's wages must, after a single application of the teacher, pay regularly every week the cost of the child's schooling (not to exceed 2d. a week, or one-twelfth of the child's wages), and he may deduct from the child's wages any sum so paid.

28. A teacher who is unfit, or who misconducts himself, is liable to be disqualified by an inspector of mines, for granting certificates of attendance, subject to an appeal to the educational department.

29. Young persons of 13 and under 16, of either sex, and women above 13, may not be employed more than 54 hours a week, or more than 10 hours a day, and must be allowed an interval of 12 hours for rest between two consecutive periods of employment, except between Friday and Saturday, when an interval of 8 hours will suffice.

30. Children of 10 and under 13, of either sex; young persons of 13 and under 16, of either sex, and women above 13, may not be employed between 9 P. M. and 5 A. M., or on Sundays, or after 2 P. M. on Saturdays; also they are to be allowed intervals for meals; namely, half an hour during a period of employment which exceeds 5 hours; one and a half hours during a period of employment which exceeds 8 hours. A mine in Ireland may be exempted by the Secretary of State from the provisions as to the Saturday half-holiday. (See exemption set forth below, paragraph 72.)

31. The person who is in charge of any engine, windlass or gin, howsoever worked, which is used for the purpose of taking persons up or down or along any shaft, inclined plane or level, (being either an entrance to a mine or a communication from one part of a mine to another), or who is in charge of any part of the tackle of such engine, windlass or gin, must be a male at least 18 years of age. If the engine, windlass or gin is worked by an animal, then, not the driver, but the person under whose direction the driver acts, is to be deemed the person in charge, but in that case the driver must not be under 12 years of age.

32. Any parent or guardian misrepresenting the age of any person with a view to procuring him employment in contravention of the act will be liable to punishment.

33. *Not to be paid in Public House, etc.*—Wages are not to be paid on any premises used for the sale of intoxicating liquor, or in any place contiguous to such premises.

34. Payment by day on yardage is allowed, but in any mine, unless expressly exempted, (see below, paragraph No. 73), where the amount of wages depends on the amount of mineral gotten, wages are to be paid according to the standard weight in pounds avoirdupois of the mineral gotten.

35. The weighing machines and weights are subject to the inspection of the Inspector of Weights and Measures.

36. *Check-weigher.*—The persons employed in a mine may if they think proper, appoint a check weigher at their own cost. The check-weigher must be a person employed either in the same mine, or in another mine belonging to the same owner. He is entitled to have every facility afforded to him to take a correct account of the weighing, but he is not to impede the working of the mine, or interfere with the weighing; and in his absence, the weighing may be carried on without him. He is liable to be removed by the magistrate for misconduct, and in that case, another may be selected to fill his place.

37. The weighing provisions expressly sanction agreements to be made between the employers and employed for deductions on account of "dirt" or "shorts," the words of the act being, "Nothing herein contained shall preclude the owner, agent or manager of the mine from agreeing with persons employed in such mine that deductions shall be made in respect of stones or materials other than mineral contracted to be gotten, which shall be sent up from the mine with mineral contracted to be gotten; or in respect of any tubs, baskets, or hatches being improperly filled, in those cases which they are filled by the getter of the mineral, or his drawer, or by a person immediately employed by him." Such deductions are to be determined by the banks-man, or weigher and check-weigher, or, in the event of difference, by a third person, to be mutually agreed on between the owner, agent, or manager, on one hand, and the persons employed in the mine, on the other.

38. *Rule.*—Subject to the exceptions stated below, and to any exemptions specially granted, every mine must have two shafts or two outlets in communication with every seam in work, which are capable of affording distinct means of ingress and egress to the persons employed in the seam. These shafts need not belong to the same mine. They must be separated by natural strata of not less than 10 feet in breadth, though openings may be made through the strata for such purposes as ventilation and drainage. Such openings, however, must, in the case of mines where inflammable gas has been found within the preceding 12 months, be only temporary. Between the two shafts or outlets there must be a communication

not less than 4 feet wide and 3 feet high. At each of the shafts or outlets, or on the works belonging to the mine, there must be kept, for raising or lowering persons, proper apparatus in actual use, or available for use within a reasonable time.

39. *Exception No. 1.*—The rule does not apply in case of a new mine being opened for the purpose of searching for or proving minerals, so long as not more than 20 persons are employed below ground at any one time in the whole of the different seams in connection with the shaft.

40. *Exception No. 2.*—The rule does not apply to any working for the purpose of making communication between two or more shafts so long as not more than 20 persons are employed below ground at any one time in the whole of the different seams in connection with each shaft or outlet.

41. *Exception No. 3.*—The rule does not, in the case of mines which before the passing of the act were not required to have a double shaft, come into operation till the first of January, 1875.

42. In certain cases temporary or permanent exemptions are allowed. (See below, paragraph 74).

43. Where a mine is abandoned, or the working thereof discontinued (at whatever time such abandonment or discontinuance occurred), the top of the shaft and any side entrance from the surface must be kept securely fenced by the owner of the mine or the persons interested in the minerals thereof

44. The act prescribes general rules (set forth at length hereunder, paragraph 70), which are to be observed so far as is reasonably practicable, in every mine.

45. In addition to the general rules, but not at variance with them, each mine must have its own set of special rules, framed to meet the special circumstances of the mine.

46. *Object.*—The object of special rules is to prevent dangerous accidents, and to provide for the proper discipline of those employed in the mine.

47. *Force.*—Special rules have the same force as if they were contained in the act.

48. *How made.*—Special rules are prepared in the first instance on behalf of the owner, and are, together with a notice, to be posted up during a fortnight on the premises; such notice to be printed, and to be to the effect that at the end of the fortnight the rules will be submitted to the inspector of mines for the district, and that in the meantime any person employed in the mine is entitled to forward any objection to the inspector at his address, as stated in the notice. On the expiration of the fortnight they are to be signed by the owner, agent or manager, and transmitted to the inspector, together with a certificate that the rules and the notice have been posted up as aforesaid.

49. A secretary of state, may within 40 days, object to the special rules if they are insufficient or unreasonable, and require

them to be modified. These requisitions must be complied with or else referred to arbitration.

50. After 40 days, special rules, if not objected to, become established, and are to be signed by the inspector of the district.

51. *At what time to be made.*—In mines having special rules in operation on the 1st of January, 1873, proper steps must be taken before the 1st of April, 1873, to submit a new set of special rules to the inspector. Meantime the existing special rules will continue in force. In the case of a new mine being opened, or the working of an old mine being renewed, the act allows three months within which special rules may be submitted.

52 *Amendment.*—At any time special rules may be amended in like manner at the instance of the owner, agent or manager. Also the Secretary of State may at any time propose amendments, which must be complied with, or referred to arbitration.

53. *Publication.*—A copy at full length of the special rules when made, and also of this abstract, together with the name and address of the inspector of the district, and the name and address of the owner, or agent, or manager of the mine must be kept posted up on the premises, and a copy thereof supplied gratis on application.

54. Any person who pulls down documents so posted up is liable to punishment.

55. If in any respect a mine is carried on in a manner which, though not expressly forbidden by the terms of this act, or by special rules, is, nevertheless, dangerous, the inspector may require the matter to be remedied, and the owner, agent or manager is bound to comply with the requisition, or else submit to a reference to arbitration.

56. Breach of a general rule by any person, or a special rule by any person bound to observe the same, is an offense against the act. And in the event of such an offense being proved to have been committed, the owner, agent, and manager will also each of them be guilty of an offense against the act, unless he proves that he had taken all reasonable means to prevent the offense by publishing, and, to the best of his knowledge, enforcing rules. A like liability arises with respect to other provisions of the act, the breach of which is declared an offense against the act.

57. The penalty for an offense against the act (except when another penalty expressly specified) is if the offense be committed by a person employed in or about the mine not exceeding £2; if committed by the owner, agent or manager, not exceeding £20, and a further penalty not exceeding £1 per day for every day that such offense continues to be committed, after a written notice from the inspector.

58. Where, however, the court is of the opinion that the offense is one which is reasonably calculated to endanger the safety of those employed in or about the mine, or to cause serious personal injury or dangerous accident, and was committed willfully by the personal act, personal default, or personal negligence of the accused, and that

pecuniary penalty will not meet the circumstances of the case, the punishment may be imprisonment, with or without hard labor, for three months.

59. An appeal lies in case of imprisonment, or half the maximum penalty has been adjudged.

60. An offense can only be prosecuted within three months after the date when it is committed.

61. An offense by an owner, agent, or manager cannot be summarily prosecuted, except either by an inspector of mines or with the consent of the secretary of state.

62. The owner, agent, or manager may be sworn and examined as an ordinary witness, if charged in respect of any contravention or non-compliance by another person.

63. Penalties for neglecting to send notices of accident, or for any offense against the act which has occasioned loss of life or personal injury, may be directed by a secretary of state to be paid to the sufferers, or to relatives of deceased sufferers, but not to any person who has contributed to the neglect or offense.

64. A person who is the owner, agent, or manager of any mine in which the coal mines regulation act applies, or the father, son, or brother of such owner, agent, or manager, is disqualified from summarily adjudicating on any offense committed against the act.

65. *Register.*—The owner, agent, or manager, must keep in the office at the mine a register containing particulars prescribed by section thirteen as to all persons whose hours of employment are regulated by the act; and, also a memorandum of the certificates of school attendance. The register is to be produced to the inspector who may inspect or copy it.

66. Returns are to be sent annually by the owner, agent, or manager of each mine to the inspector of the district, namely: On January 1st, a return in the form of schedule four to the act, and on or before February 1st, a return, in form to be prescribed by a secretary of State, specifying the particulars mentioned in section thirty-eight of the act.

67. *Plans.*—The owner, agent, or manager is to keep in the office, at the mine, an accurate plan and section, or tracing thereof, showing the workings up to at least six months previously, and is to produce it to the inspector of mines to examine, but not to copy; and, if requested, is to mark on the plan the workings up to production.

68. *Plans and Abandonment.*—Within three months of the abandonment of a mine, a plan and section, or tracing thereof, showing the boundaries of the workings, are to be sent by the owner to the Secretary of State, as a mining record, not, however, to be seen, until after the lapse of ten years, except by an inspector, or by consent.

69. Notices must be sent by the owner, agent, or manager of a mine to the inspector of mines for the district, as follows: Of the appointment of a manager, together with his name and address,

immediately after his appointment; and in case of the temporary appointment of an uncertificated manager, the notice shall state the reason for such appointment; of any accident causing loss of life, or serious personal injury, within 24 hours after such accident; of any accident from explosion of gas, powder, or steam boiler, causing any personal injury, within 24 hours after such accident; of any death resulting from personal injury, caused by an accident previously reported, within 24 hours after the death comes to the knowledge of the owner, agent, or manager. The following is to be made within two months after the event to be notified: Of the commencement of any working for the opening of a new shaft; of the abandonment of a shaft; of the recommencement of the working of a shaft after an abandonment of more than two months; of any change in the name of the mine, or in the name of the owner, agent, or manager; of any change in the officers of any incorporated company owning a mine. Notice must also be given by the owner or agent (not by the manager), of the fact that two or more parts of a mine are worked separately, with a view that each may be deemed to constitute a separate mine for the purposes of the act.

70. *Coroner's Inquests.*—In the case of an inquest being held concerning a death being caused by a mine accident, unless the inspector or some other person on behalf of a secretary of State is present, the coroner is to adjourn the inquest, and to send to the inspector four days' notice of the time and place of the adjourned inquest. If, however, only one life has been lost, by the accident; and forty-eight hours' notice of time and place of holding the inquest has been sent to the inspector, the inquest need not be adjourned if a majority of the jury think it unnecessary. At the inquest the inspector of mines may examine any witness subject to the order of the coroner. If the inspector is not present, and evidence is given of any neglect having caused or contributed to the accident, or of any defect in or about the mine appearing to require a remedy, the coroner is to send to the inspector notice thereof in writing. In the event of a fatal accident occurring in a mine and an inquest being held, no person who is employed in that mine, or is concerned in its management or has a personal interest in that mine, is qualified to serve on the jury.

71. *Employment of Boys in Thin Seam Mines.*—A secretary of State may exempt a thin seam mine from the provisions (see above paragraph No. 17) prohibiting employment, below ground, of boys under twelve. In a mine so exempted, boys of ten and under twelve may be employed under ground, but not for more than six days a week; not for more than six hours a day, if employed for more than three days in a week; not for more than ten hours a day, if employed for only three days or for less than three days in a week. An interval of twelve hours rest shall be allowed between each two consecutive periods of employment, except between Friday and Saturday, when an interval of eight hours will suffice. The period of such employment of a boy is deemed to begin at the time of his

leaving the surface and to end at the time of his return to the surface. The week is deemed to begin at 12 p. m., Saturday, and to end at 12 p. m. on the Saturday following. The immediate employer of any boy of ten and under twelve is not to take him below ground until he has reported his intention so to do to the manager or to some person appointed by the manager; boys of ten and under twelve are subject to the same provisions with regard to schooling as are prescribed (see above paragraphs 25, 26, 27, 28,) for children under thirteen employed above ground.

72. *Saturday Half-holiday—Ireland.*—A secretary of State may exempt any mine in Ireland from the provisions (see above paragraph 30) prohibiting the employment below ground of women, young persons or children, after 2 o'clock on Saturday afternoon.

73. *Weighing Provisions.*—A secretary of State may grant exemption from the weighing provisions (see above paragraph 34) or postpone their operation with respect to any mine or class of mines, as to which he is satisfied that such exemption or postponement is requisite or expedient by reason of the exigencies of the case. In any mine so exempted, wages may be paid according to measure or gauge, and local measures and gauges may be adopted, subject, however, to inspection by the inspectors of weights and measures. A check-measurer may be appointed in like manner as a check-weigher.

74. *Single Shafts.*—A Secretary of State may exempt a proved mine from the provisions (see above paragraph 42) prohibiting single shafts if satisfied that the quantity of mineral proved is insufficient to repay the outlay of the sinking or making of a second shaft or outlet. In a mine so exempted, there must not be employed below ground at any one time in the whole of the different seams in connection with the shaft or outlet, more than twenty persons; or, if the mine is not a coal mine or mine with inflammable gas, more than such other large number as a secretary of State may allow. If the mine is not a coal mine or mine with inflammable gas and the Secretary of State is satisfied that sufficient provision has been made against danger from other causes than explosion of gas by using stone, brick or iron, in the place of wood in the lining of the shaft and construction of the side-wall; in a mine so exempted there must not be employed below ground at any one time, in the whole of the different seams in connection with the shaft or outlet, more than the number of persons the Secretary of State may allow. If satisfied that the workings of a seam have reached the boundary of the property, or the extremity of the mineral field, and that it is expedient to work away the pillars already formed in the course of the ordinary workings, notwithstanding that by so working away the pillars one of the shafts or outlets may be cut off. In a mine so exempted there must not be employed below ground at any one time, in the whole of the different seams in connection with the shaft or outlet, more than twenty persons; or if the mine is not a coal mine or a mine with inflammable gas, more than such larger number as

the Secretary of State may allow, if satisfied by reason of an accident one of the shafts or outlets has become unavailable for the use of the persons employed in the mine; a mine so exempted may only be worked subject to the conditions specified in the exemption. In the case of a mine not at the time of passing the act required to have two outlets provided that an application is made in England or Scotland within six months after the first of January, 1873, or in Ireland within six months after the first of January, 1874, and the Secretary of State is satisfied that the mine is nearly exhausted; if the Secretary of State refuse to grant such exemption the matter may be referred to arbitration.

75. Also in the case of a mine not at the time of the passing of the act required to have two outlets, a secretary of State may grant an extention of time (see above paragraph 41) for providing an additional shaft or outlet if an application is made to him within six months preceding the first of January, 1875. In the event of the Secretary of State refusing such extension of time, the matter may be referred to arbitration.

76. The following are the general rules: An adequate amount of ventilation shall be constantly produced in every mine to dilute and render harmless noxious gases to such an extent that the working places of the shafts, levels, stables and workings of such mine, and the traveling roads to and from such working places, shall be in a fit state for working and passing therein. In every mine in which inflammablegas has been found within the preceding twelve months, then once in every twenty-four hours if one shift of workmen is employed, and once in every twelve hours if two shifts are employed; during any twenty-four hours, a competent person or competent persons who shall be appointed for the purpose, shall, before the time for commencing work in any part of the mine, inspect with a safety-lamp that part of the mine, and the roadways leading thereto, and shall make a true report of the condition thereof so far as ventilation is concerned, and a workman shall not go to work in such part until the same and the roadways leading thereto are stated to be safe. Every such report shall be recorded without delay in a book which shall be kept at the mine for the purpose, and shall be signed by the person making the same. In every mine in which inflammable gas has not been found within the preceding twelve months, then once in twenty-four hours a competent person or competent persons who shall be appointed for the purpose, shall, so far as is reasonably practicable, immediately before the time for commencing work in any part of the mine, inspect that part of the mine, and the roadways leading thereto, and shall make a true report of the condition thereof so far as ventilation is concerned, and a workman shall not go to work in such part until the same and the roadways leading thereto are stated to be safe. Every such report shall be recorded without delay in a book which shall be kept at the mine for the purpose, and shall be signed by the person making the same.

All entrances to any place not in actual course of working and extension shall be properly fenced across the whole width of such entrance, so as to prevent persons inadvertently entering the same. A station or stations shall be appointed at the entrance to the mine, or to different parts of the mine as the case may require, and a workman shall not pass beyond any such station until the mine or part of the mine beyond the same has been inspected and stated to be safe.

If, at any time, it is found by the person for the time being in charge of the mine or any part thereof, that by reason of noxious gases prevailing in such mine or such part thereof, or of any cause whatever, the mine or the said part is dangerous, every workman shall be withdrawn from the mine or such part thereof as is so found dangerous, and a competent person, who shall be appointed for the purpose, shall inspect the mine or such part thereof as is so found dangerous, and if the danger arises from inflammable gas shall inspect the same with a locked safety-lamp, and in every case shall make a true report of the condition of such mine or part thereof, and a workman shall not, except in so far as is necessary for inquiring into the cause of danger, or for the removal thereof, or for exploration, be readmitted into the mine, or such part thereof as was found dangerous, until the same is stated by such report not to be dangerous. Every such report shall be recorded in a book which shall be kept at the mine for the purpose, and shall be signed by the person making the same. In every working, approaching any place where there is likely to be an accumulation of explosive gas, no lamp or light other than a locked safety-lamp shall be allowed or used; and whenever safety-lamps are required by the act, or by the special rules made in pursuance of the act, to be used, a competent person, who shall be appointed for the purpose, shall examine every safety-lamp immediately before it is taken into the workings for use, and ascertain it to be secure and securely locked, and in any part of a mine in which safety-lamps are so required to be used, they shall not be used until they have been so examined and found secure and securely locked and shall not, without due authority, be unlocked, and in the said part of a mine a person shall not, unless he is appointed for the purpose, have in his possession any key or contrivance for opening the lock of any such safety-lamp, or any lucifer-match or apparatus of any kind for striking a light.

Gunpowder, or other explosives or inflammable substance, shall only be used in the mine under ground, as follows: It shall not be stored in the mine; it shall not be taken into the mine, except in a case or canister, containing not more than four pounds; a workman shall not have in use, at one time in any one place, more than one of such cases or canisters; in charging holes for blasting, an iron or steel picker shall not be used, and a person shall not have in his possession, in the mine under ground, any iron or steel picker; and an iron or steel tamping rod or stemmer shall not be used for ramming either the wadding or the first part of the tamping or

stemming on the powder; a charge of powder which has missed fire shall not be unrammed; it shall not be taken into or be in possession of any person in any mine, except in cartridges, and shall not be used, except in accordance with the following regulations, during three months after any inflammable gas has been found in any such mine, namely: A competent person who shall be appointed for the purpose, shall immediately before firing a shot, examine the place where it is to be used, and the places contiguous thereto, and shall not allow the shot to be fired unless he finds it safe to do so; and a shot shall not be fired except by or under the direction of a competent person, who shall be appointed for the purpose. If the said inflammable gas issues so freely that it shows a blue cap on the flame of the safety-lamp, it shall only be used either in those cases of stone-drifts, stone-work and sinking of shafts, in which the ventilation is so managed that the return air from the place where the powder is used passes into the main air-course without passing any place in actual course of working, or when the persons ordinarily employed in the mine are out of the mine or out of the part of the mine where it is used.

Where a mine is divided into separate panels, in such manner that each panel has independent intake and return air-way from the main air-course and the main return air-course, the provisions of this rule, with respect to gunpowder or other explosive, inflammable substance, shall apply to each such panel in like manner as if it were a separate mine. Where a place is likely to contain a dangerous accumulation of water, the working approaching such place shall not exceed eight feet in width, and there shall be constantly kept, at a sufficient distance, not being less than five yards in advance, at least one bore-hole near the center of the working, and sufficient flank bore-holes on each side. Every underground plane on which persons travel, which is self-acting or worked by an engine, windlass or gin, shall be provided (if exceeding thirty yards in length) with some proper means of signaling between the stopping-places and the ends of the plane and shall be provided in every case at intervals of not more than twenty yards, with sufficient man-holes for places of refuge.

Every road on which persons travel under ground where the load is drawn by a horse or other animal shall be provided, at intervals of not more than fifty yards, with sufficient man-holes, or with a space for a place of refuge, which space shall be of sufficient length and at least three feet in width, between the wagons running on the train-road and the side of such road.

Every man-hole and a space for a place of refuge, shall be constantly kept clear, and no person shall place anything in a man-hole or such space to prevent access thereto.

The top of every shaft which for the time being is out of use, or used only as an air-shaft, shall be securely fenced.

The top and all entrances between the top and bottom of every working or pumping-shaft shall be properly fenced, but this shall

not be taken to forbid the temporary removal of the fence for the purpose of repairs or other operations if proper precautions are used. Where the natural strata are not safe every working or pumping-shaft shall be securely cased, lined or otherwise made secure.

The roof and side of every traveling-road and working place shall be made secure, and a person shall not, unless appointed for the purpose of exploring or repairing, travel, or work in any such traveling-road or working place which is not so made secure.

Where there is a downcast and furnace-shaft and both such shafts are provided with apparatus in use for raising and lowering persons every person employed in the mine shall upon giving reasonable notice have the option of using the downcast-shaft.

In any mine which is usually entered by means of machinery, a competent person of such age as prescribed by the act, shall be appointed for the purpose of working the machinery which is employed in lowering and raising persons therein, and shall attend for the said purpose during the whole time that any person is below ground in the mine.

Every working-shaft used for the purpose of drawing minerals or for lowering or raising of persons, shall, if exceeding fifty yards in depth and not exempted in writing by the inspector of the district, be provided with guides and some proper means of communicating distinct and definite signals from the bottom of a shaft and from every entrance for the time being in work, between the surface and the bottom of the shaft, to the surface, and from the surface to the bottom of the shaft and to every entrance for the time being in work between the surface and the bottom of the shaft.

A sufficient cover overhead shall be used when lowering or raising persons, in every working-shaft, except where it is worked by a windlass, or where the person is employed about the pump or some work of repair in the shaft, or where a written exemption is given by the inspector of the district.

A single-linked chain shall not be used for lowering or raising persons in any working-shaft or plane, except for the short coupling chain attached to the cage or load.

There shall be on the drum of every machine used for lowering or raising persons, such flanges or horns, and also, if the drum is conical, such other appliances, as may be sufficient to prevent the rope from slipping.

There shall be attached to every machine worked by steam, water, or mechanical power, and used for lowering or raising persons, an adequate brake, and also a proper indicator (in addition to any mark on the rope) which shows to the person who works the machine the position of the cage or load in the shaft.

Every fly-wheel and all exposed and dangerous parts of the machinery used in or about the mine, shall be, and be kept, securely fenced.

Every steam boiler shall be provided with a proper steam-gauge

and water-gauge, to show respectively the pressure of steam and the height of water in the boiler, and with a proper safety-valve.

After dangerous gas has been found in any mine, a barometer and thermometer shall be placed above ground in a conspicuous position near the entrance of the mine.

No person shall willfully damage, or without proper authority remove or render useless any fence, fencing, casing, lining, guide, means of signaling, signal, cover, chain, flange, horn, break, indicator, steam-gauge, water-gauge, safety-valve, or other appliances or thing provided in any mine in compliance with the act.

Every person shall observe such directions with respect to working as may be given to him with a view to comply with the act or the special rules. A competent person or competent persons, who shall be appointed for the purpose, shall once at least in every twenty-four hours examine the state of the external parts of the machinery, and the state of the head-gear, working places, levels, planes, ropes, chains, and other works of the mine which are in actual use, and once at least in every week shall examine into the state of the shafts by which persons ascend or descend, and the guides or conductors therein, and shall make a true report of the result of such examination, and such report shall be recorded in a book to be kept at the mines for the purpose, and shall be signed by the person who made the same.

The persons employed in a mine may from time to time appoint two of their number to inspect the mine at their own cost, and the persons so appointed shall be allowed, once at least in every month, accompanied, if the owner, agent or manager of the mine thinks fit, by himself or one or more officers of the mine, to go to every part of the mine, and to inspect the shafts, levels, planes, working places, return airways, ventilating apparatus, old workings and machinery, and shall be afforded by the owner, agent and manager, and all persons in the mine, every facility for the purpose of such inspection, and shall make a true report of the result of such inspection, and such reports shall be recorded in a book to be kept at the mine for the purpose, and shall be signed by the person who made the same.

The books mentioned in the General Rules, or a copy thereof shall be kept at the office of the mine, and any inspector, under the act, and any person employed in the mine, may at all reasonable times inspect and take copies of, and extracts from any such books.

Respectfully submitted,

PARK C. WILSON,

October 15th, 1881. *State Mine Inspector.*