

SECOND BIENNIAL REPORT
OF THE
STATE MINE INSPECTOR,

TO THE
GOVERNOR OF THE STATE OF IOWA.

FOR THE YEARS 1884 AND 1885.

PRINTED BY ORDER OF THE GENERAL ASSEMBLY.

DES MOINES:
GEO. E. ROBERTS, STATE PRINTER.
1885.

BIENNIAL REPORT.

DES MOINES, IOWA, August 13, 1885.

To his Excellency, BUREN R. SHERMAN, Governor of Iowa:

SIR—In compliance with chapter twenty-one of the laws of the Twentieth General Assembly, I herewith submit my second biennial report of the Department of Mines for the two years ending June 30, 1885.

In this report I will give an approximate estimate of the coal output of the State, a list of fatal accidents, together with the decision of the coroner's jury of the county in which the accident occurred for the two years, a brief statement of the labors of the Inspector, and recommendations for the perfecting of the present mining law, with such other matters as I have deemed of importance to the mining industry of the State.

COAL OUT-PUT OF IOWA FOR FIVE YEARS.

COUNTIES.	1881.	1882.	1883.	1884.	1885.
Mahaska.....	917,495	701,397	927,387	932,714	762,785
Keokuk.....	463,010	511,849	500,040	430,940	372,816
Lucas.....	458,274	413,217	487,821	410,729	439,956
Polk.....	473,893	327,819	558,821	619,921	462,895
Boone.....	337,724	286,891	466,981	473,073	458,191
Webster.....	184,300	218,478	248,560	214,014	145,296
Wapello.....	181,815	207,721	237,821	240,720	187,911
Appanoose.....	107,348	97,976	128,896	158,986	245,896
Monroe.....	98,143	90,325	93,435	98,427	101,517
Marion.....	93,997	90,927	90,985	97,085	100,011
Greene.....	81,530	62,531	88,851	96,327	89,587
Jasper.....	42,435	40,189	45,883	46,321	90,425
Dallas.....	47,884	36,201	38,208	37,185	32,986
Jefferson.....	39,124	22,121	38,887	8,172	1,116
Warren.....	12,987	11,081	12,828	13,727	12,825
Scott.....	3,804	3,711	3,714	3,821	5,937
Hardin.....	1,317	1,125	1,203	1,075	885
Adams.....	3,708	1,691	3,891	3,981	3,896
Hamilton.....	1,787	874	1,998	1,878	918
Wayne.....	77	51	1,892	4,947	25,812
Van Buren.....	98	216	1,678	1,778	1,193
Davis.....	489	301	527	1,207	33,655
Page.....	685	118	748	1,009	1,819
Taylor.....	78	84	94	127	617
Henry.....	67	65	65	87	196
Cass.....	36	41	43	.....	.....
Guthrie.....	.....	.....	.....	5,137	4,596
Total.....	3,500,000	3,127,700	3,881,300	3,903,438	3,585,737

The foregoing table giving the out-put of coal for the years represented, is only an approximate estimate, as all the mines have not made reports to this office of their total out-put.

For the year 1885 there were returns sent to this office from four hundred and seventeen mines, leaving seventy-two mines not reported.

It will be noticed that the out-put for 1885 is 317,701 tons less than for the year 1884. This deficiency or falling off is attributed to several causes, one of which was the protracted strike at What Cheer, in Keokuk county, and at Angus, in Boone county, as either mining camp had a large daily out-put and when they went on a strike it gave the operators of Illinois a fine chance for taking contracts in a territory that geographically belongs to Iowa.

Another cause is that the competition from Illinois is growing stronger each year as they have in some localities reduced the price of mining to forty cents per ton, whilst Iowa is paying from seventy-five cents to \$1.00 per ton, and there are other causes that I will not take the

time or space to enumerate, that have a tendency to handicap both operator and miner in this State in their efforts to keep up the out-put of their mines and at the same time to maintain the present price both of coal in the market and of the price paid for mining. There are certain localities that geographically belong to Iowa but by a system of discrimination in freight rates and by rebate of freights other States have been enabled to come into successful competition with Iowa mines and in some instances have been enabled to undersell our Iowa coal in the markets, but these causes involve the question of transportation, and as the State only has power to deal with State commerce we cannot reach the difficulty through our State Legislature as the regulation of inter-state commerce is a matter within the jurisdiction of Congress.

LIST OF FATAL ACCIDENTS.

THOMAS FOX—KILLED AUGUST 1, 1883.

The jurors, upon their oaths, do say that the said Thomas Fox came to his death at or about 10:30 o'clock A. M., August 1st, 1883, at a prospecting hole N. E. and near the Miller coal shaft. From the testimony given before us it appears that he came to his death by a blow from the windlass crank, being purely accidental and not otherwise.

L. J. WELLS,
JOSEPH WILLIAMS, } JURORS.
L. D. SIMMS,

I. W. GRIFFITH, Coroner, Polk county, Iowa.

JAMES SPEAR—KILLED AUGUST 8, 1883.

The said jurors do say that he came to his death on the 8th day of August, 1883, in the coal mine belonging to the White Breast Coal and Mining Company, situated in White Breast township, Lucas county, Iowa, by the falling of a rock upon him. That it was entirely accidental, and that no blame attaches to anyone.

HENRY SCHEELY,
ALFRED STUART, } JURORS.
ALEXANDER SPENCER,

H. S. MILLAN, Coroner, Lucas county, Iowa.

PETER CLARK—KILLED AUGUST 31, 1883.

The said jurors, upon their oaths, do say that the said Peter Clark came to his death by a fall of slate while engaged in his daily avocation as a miner in Climax Mine No. 2, located at Angus, Boone county, Iowa, and according to weight of evidence adduced said Peter Clark, deceased, had timber sent into his place in said mine previous to his being killed, and had placed several timbers to keep the top secure for his own safety and while in the act of wedging coal a piece of slate, whose edge was resting on the coal, gave way without any warning, causing his death; but had timbers been sent to him when required said accident might have been avoided.

W. A. SWILER,
B. G. WOOD,
WILLIAM H. THOMAS, } Jurors.

GEORGE DORAN, Coroner, Boone county, Iowa.

WILLIAM GROYNNE—KILLED SEPTEMBER 21, 1883.

The said jurors upon their oaths do say that the said William Groyne came to his death by the falling of slate from the roof of a break through in the mines of the Jefferson County Coal Co., in which the men were working at the time of the accident, and that no blame attaches to the managers or employes of said company.

WILLIAM SPERRY,
ALBERT SPENCER,
RICHARD GREEN, } Jurors.

THOMAS D. EVANS, Coroner of Jefferson county, Iowa.

JOSEPH BECK—KILLED SEPTEMBER 29, 1883.

The said jurors do say upon their oaths that the said Joseph Beck came to his death at or about 9 o'clock A. M., September 29, 1883, in the Standard coal mines, in Saylor township, Polk county, Iowa, by means of the caving of the roof, being accidental, and, under the circumstances, unavoidable.

J. F. ANKENY,
L. J. WELLS,
GEO. PETEFISH, } Jurors.

I. W. GRIFFITH, Coroner of Polk county, Iowa.

RICHARD WATERS—KILLED OCTOBER 16, 1883.

The jurors upon their oaths do say that the late Richard Waters came to his death by accidentally stepping under the cage while it was being lowered, and caught on the landing by the cage.

J. H. WEBSTER,
BENJ. AYLOTT,
WILLIAM BLAIR, } Jurors.

GEO. DORAN, Coroner of Boone county, Iowa.

JAMES McDERMOT—KILLED NOVEMBER 22, 1883.

The said jurors upon their oaths do say, after having heard all the evidence, and having examined the body of said deceased James McDermot, do find that the deceased came to his death by accidentally being brushed between the edges of the cage and the roof as said cage was passing up the north shaft of Starr A mine, at What Cheer, Iowa, between the hours of 11 and 12 o'clock A. M., on the 22d day of November, 1883; said mine being operated by and under the control of the Starr Coal Company.

ROBERT FORSYTH,
THOMAS LINSLEY,
H. C. ADAMS, } Jurors.

JAMES M. CONNELL, Coroner of Keokuk county, Iowa.

CARL BECKSTROM—KILLED NOVEMBER 24, 1883.

We, the jury, now sitting and holding an inquisition on the dead body of Carl Beckstrom, now lying dead in Polk county, Iowa, find that the said Carl Beckstrom came to his death while working and mining coal in the Standard coal mine, by reason of the roof falling accidentally; and we find that the said Carl Beckstrom came to his death accidentally, by reason of said roof falling down, and not otherwise; no negligence being attached to said company or its employes.

L. STOHLGREEN,
A. W. PETERSON,
ED. LEWIS, } Jurors.

A. H. BOTKIN, J. P., Acting Coroner for Polk county, Iowa.

JAMES CURRY—KILLED NOVEMBER 30, 1883.

The jurors upon their oaths do say, after hearing the evidence, and having examined the case of said deceased, James Curry, we do find that the deceased came to his death by the accidental explosion of a keg of powder, caused by a spark falling from the lamp which was attached to the cap of Alex. McBride, a miner, and no blame attaches to any one.

J. W. D. SWISHER,
THOMAS CURTAIN,
A. M. CLARY, } JURORS.

JAMES M. CONNELL, Coroner of Keokuk county, Iowa.

GEO. HOLMES—KILLED DECEMBER 5, 1883.

The said jurors upon their oaths do say that the said Geo. Holmes came to his death by an unavoidable accident, over which he nor any other person had any control, while at work in the Climax coal mine.

ROBERT LONG,
FRANK SLEE,
CLARENCE LUDDEN, } JURORS.

GEO. DORAN, Coroner of Boone county, Iowa.

DANIEL ALLEN—KILLED DECEMBER 5, 1883.

The said jurors upon their oaths do say that the said Daniel Allen came to his death in room No. 3, fourth south entry of mine No. 1 of the Wapello Coal Company's mine, situated in Richland township, Wapello county, Iowa, on the 5th day of December, 1883, between the hours of 6 and 8 o'clock p. m., from an accidental fall of slate; and we further find that the said Allen did not exercise proper caution, in returning in too soon after the firing of a shot.

L. D. MCGLOSSON,
A. ROOP,
J. C. KURTZ, } JURORS.

S. A. SPILLMAN, Coroner of Wapello county, Iowa.

PAT. QUIGLEY—KILLED JANUARY —, 1884.

In the case of Pat. Quigley, who was injured in what is known as Logan and Canfield coal mine, who died from injuries received while at work in said mine, I investigated said case without a jury, and find the facts as follows: He was driving a three-foot entry, more par-

ticularly for his own convenience, and a piece of roof fell on him. It was a matter over which he nor no one else had any control, and the relations of the deceased lay no blame on the company.

The reason for not holding an inquest was that the body was buried before I arrived—they not getting the notice that I was coming. These are substantially the facts.

GEO. DORAN,
Coroner of Boone county, Iowa.

JOHN F. TURNING—KILLED JANUARY 6, 1884.

The said jurors upon their oaths do say that the deceased came to his death by recklessly passing under a stone that he knew was about to fall, and that no blame can be attached to any party or parties but himself.

JOHN CANTEBERRY,
ALECK. MITCHELL,
HENRY BOLDEN, } JURORS.

H. S. MILLAN, Coroner of Lucas county, Iowa.

DAVID SHEARER—KILLED JANUARY 15, 1884.

The said jurors upon their oaths do say that David Shearer came to his death by the accidental falling of a trap door, at the Indianola Mining Company's coal shaft, of January 15, 1884, and that said accident was not owing to the criminal negligence of any one, so far as we can determine.

W. W. CARPENTER,
W. T. HAMILTON,
M. W. SHEPHERD, } JURORS.

CHAS. G. SHAW, Coroner of Warren county, Iowa.

FREDRIC LIEF—KILLED JANUARY 16, 1884.

The said jurors upon their oaths do say that Fredric Lief came to his death by unavoidable fall of slate in mine No. 1, A entry, Boone No. 40, Muchakinock mines, Mahaska county, Iowa. We find that said fatal accident happened on January 16, 1884.

THOMAS NEWELL,
T. J. HENDERSON,
W. B. KILNER, } JURORS.

J. C. BARRINGER, Coroner of Mahaska county, Iowa.

JOHN COURTNEY--KILLED JANUARY 16, 1884.

The said jurors upon their oaths do say that said John Courtney was driving a team attached to a loaded car of coal, on the Central Iowa Railroad switch, to the Acme Coal Company's mines; that he was driving with the lines over one shoulder and under his arm, the ends dragging behind. The lines probably became caught under the car wheel, stopping the horses and throwing him under the car, killing him instantly. We find no one to blame for the accident. We find that the above accident happened on Wednesday, January 16, 1884.

T. J. HENDERSON, }
W. B. KITNER, } Jurors.
THOMAS NEWELL, }

J. C. BARRINGER, Coroner of Mahaska county, Iowa.

JOHN McLEAN--KILLED JANUARY 24, 1884.

The said jurors upon their oaths do say that said John McLean came to his death by an accidental fall of slate in room No. 3, Acme Coal Company's mine, on Thursday, January 24, 1884. We cannot find that any one is to blame for the accident.

C. W. JORDAN, }
JOHN H. PERRY, } Jurors.
W. B. KITNER, }

J. C. BARRINGER, Coroner of Mahaska county, Iowa.

DAVID DAVENPORT--KILLED JANUARY 27, 1884.

The said jurors upon their oaths do say said David Davenport came to his death by accident, by excitement and smoke, caused by fire in stable in B shaft of White Breast Coal and Mining Company.

L. L. MARKAMAN, }
JOHN HEIMANS, } Jurors.
JAMES FLOOD, }

H. S. MILLAN, Coroner of Lucas county, Iowa.

HENRY JONES--KILLED FEBRUARY 4, 1884.

The said jurors upon their oaths do say, after having heard the evidence and examined said body, we do find that the deceased came to his death by being accidentally crushed in the machinery attached to

an engine of the Central Iowa Coal Company, located at Swan, Marion county, Iowa.

A. W. ROUSE, }
R. S. BOWERS, } Jurors.
L. L. HUNTER, }

M. G. SHOOK, Coroner of Marion county, Iowa.

HENRY HOLDERMAN--KILLED FEBRUARY 16, 1884.

The said jurors upon their oaths do say that said Henry Holderman came to his death by the falling of slate while working in a room in the mine operated by J. A. Smith, on Saturday, February 16, 1884; and that said accident was caused by his own carelessness.

JAMES CARROLL, }
ALBERT W. SWALM, } Jurors.
W. R. LACY, }

J. C. BARRINGER, Coroner of Mahaska county, Iowa.

JAMES WATTS--KILLED MARCH 9, 1884.

The said jurors upon their oaths do say the deceased came to his death by the fall of a quantity of slate upon him while in the mine of the White Breast Coal and Mining Company, by his own carelessness, and that no blame attaches to any one.

F. E. KELLY, }
L. L. MARKAMAN, } Jurors.
JOHN BRETWAY, }

H. S. MILLAN, Coroner of Lucas county, Iowa.

NELSON HALL--KILLED MARCH 27, 1884.

The said jurors upon their oaths do say that he came to his death by being run over by the coal cars in shaft No. 1, West Cleveland, Lucas county, Iowa, and no fault attaches to the White Breast Coal Company, or anybody else.

GEORGE W. KAYS, }
JAMES WELCH, } Jurors.
WM. SNEDAKER, }

H. S. MILLAN, Coroner of Lucas county, Iowa.

JOSEPH EDWARDS—KILLED APRIL 3, 1884.

The said jurors upon their oaths do say that the deceased came to his death by his own neglect, and no blame attaches to any one else.

G. H. CHASE,
ELI McCracken, } Jurors.
A. M. REID,

H. S. MILLAN, Coroner, Lucas county, Iowa.

DAVID EDWARDS—KILLED APRIL 29, 1884.

The said jurors upon their oaths do say that the said David Edwards came to his death by being crushed by a fall of slate, being perfectly accidental.

J. C. BROOKS,
T. M. WILCOXSON, } Jurors.
JOHN STRIBLEY,

E. H. SAGE, Coroner, Wapello county, Iowa.

THOMAS HIRST, JR.—KILLED MAY 1, 1884.

The said jurors upon their oaths do say that on the 1st day of May, at about the hour of 4 o'clock P. M., said Thos. Hirst, Jr., came to his death by being crushed by the falling of slate in mine No. 2, Carver Coal Mines. Purely accidental; no blame attached to any person or persons.

A. T. FAILYER,
H. K. KIRKPATRICK, } Jurors.
ALVIN ROOF,

E. H. SAGE, Coroner, Wapello county, Iowa.

JOHN JEFFRIES—KILLED MAY 20, 1884.

The said jurors upon their oaths do say John Jeffries came to his death by an accidental and unavoidable fall of slate, while driving temporarily in third west entry on north side in No. 3 mine, Excelsior Coal Company's mines, at Excelsior, on the 20th day of May, 1884, about 2 o'clock P. M. We do not find any blame for the accident.

W. F. MASK,
T. J. HENDERSON, } Jurors.
F. D. BOYER,

J. C. BARRINGER, Coroner, Mahaska county, Iowa.

LEE HARGRAVE—KILLED JUNE 4, 1884.

The said jurors do say he came to his death in mine No. 2, of the White Breast Coal and Mining Company, by the falling of slate upon him while at work in said mines, it being altogether accidental and without felony.

J. P. VORHIES,
JOHN RYAN, } Jurors.
W. MOSENA,

H. S. MILLAN, Coroner, Lucas county, Iowa.

ARTHUR BURTON—KILLED JULY 17, 1884.

We, the jurors, find that Arthur Burton came to his death by the cage descending in the shaft and striking him upon the head, and that it was wholly accidental and caused by the carelessness of said deceased, and that no blame is attached to the Star Coal Mining Company or any of the employees.

H. G. PALMER,
J. H. LEATHERS, } Jurors.
OLIVER SEATON,

JAMES McCONNELL, Coroner, Keokuk county, Iowa.

P. P. McMULLEN—KILLED AUGUST 1, 1884.

The said jurors upon their oaths do say, that the said P. P. McMullen came to his death on the 1st day of August, 1884, caused by and the result of an injury received on the 3d day of July, 1884, in the main entry of the coal mine of the Standard Fuel Company, in Poweshiek township, Jasper county, Iowa, from and by slate from the roof falling on him while helping the pit boss, George Emery, and others, in the removal of slate that had fallen from the said entry on the night before the said injury. And that the said injury and death of the deceased was a result of the negligence failure to remove the loose slate of the roof before attempting to remove the slate that had fallen the night before.

J. A. MATTEEN,
J. R. RODGERS, } Jurors.
J. L. COOK,

HUGH NEWELL, Coroner, Jasper county, Iowa.

GEORGE CLARK—KILLED AUGUST 7, 1884.

The said jurors upon their oaths do say that said George Clark came to his death August 7, 1884, by burns and scalds, caused by the explosion of the steam boiler of the Warren County Coal and Tile Company's works, at Indianola, Iowa, which explosion occurred August 6, 1884.

DAN G. PECK,
AMOS EMBREE,
W. W. CARPENTER, } Jurors.

CHARLES SHAW, Coroner, Warren county, Iowa.

A. R. McCUNE—KILLED AUGUST 11, 1884.

The said jurors upon their oaths do say, that after hearing the evidence, and examining the body, we do find that deceased came to his death by a heavy body of slate falling from the roof of the Central Iowa Coal Mine. His head was caught between the slate and a large piece of coal, smashing the skull; the right eye was entirely out, and nose cut into, causing instant death. This accident cannot be attributed to any cause of negligence on part of Central Iowa Coal Company.

J. T. BLACK,
C. W. SCOLES,
R. ROLLER, } Jurors.

M. J. SHOOK, Acting Coroner, Marion county, Iowa.

MILES HOLCOMB—KILLED OCTOBER 24, 1884.

The said jurors upon their oaths do say, that said person came to his death by being thrown between or on the coal car while working in the coal mine of W. D. Johnson, on the 24th day of October, 1884, by becoming careless, and not locking the wheels the proper time, causing dislocation of the neck.

W. D. TENYRLIN,
SAMUEL ANDERSON,
SAMUEL BLUNK, } Jurors.

GEORGE DORAN, Coroner, Boone county, Iowa.

JOHN MORGAN—KILLED OCTOBER 30, 1884.

The said jurors upon their oaths do say, that John Morgan's death resulted from the falling of slate in his own room, carelessly left

without prop. No blame is attached to the superintendent of the mine, or anyone of the workmen therein.

ALEXANDER FINDLAY,
STANFORD DOUD,
IRA C. MCCRARY, } Jurors.

GEORGE P. WALKER, J. P., Acting Coroner for Van Buren county, Iowa.

MANFORD OGDEN—KILLED JANUARY 3, 1885.

The said jurors upon their oaths do say, that the said Manford Ogden came to his death by an accident which occurred at the Corey Coal Mine, on the 3d day of January, 1885, in Prairie township Keokuk county Iowa, which accident occurred by neglect of duty by deceased.

F. M. WALKER.
M. H. McFARLAN.
His
J. + HALL.
Mark.

ED JACKSON, J. P., Acting Coroner for Keokuk county, Iowa.

EDWARD MARTIN—KILLED AUGUST 8, 1885.

The said Edward Martin was injured in the Eureka Coal Mines, Des Moines, Iowa, by falling roof, and died in about ten hours afterward. No inquest.

Signed

EUREKA COAL COMPANY.
August 8, 1885.

JAMES TOWER—KILLED MARCH 6, 1885.

The said jurors, on their oaths, do say that the said James Tower came to his death on or about 7 o'clock A. M., March 6, 1885, at the Standard Coal Mine No. 3, situated in Delaware township, Polk county, Iowa, by means of falling state on or in the main entrance in said mine, and that it was the result of unavoidable accident, and that the entry for a distance of about nine feet, where the accident occurred, was insufficiently timbered.

J. D. BENNETT,
S. RIGGS,
J. A. CULSON, } Jurors.

I. W. GRIFFITH, Coroner, Polk county, Iowa.

WM. HOUGE—KILLED MARCH 23, 1885.

The said jurors, upon their oath, do say, after having heard the evidence and examined the body, we find that the deceased came to his death while working in the coal bank; he was crushed to death instantly.

JOHN J. KERR, }
HUGH H. MYERS, } JURORS.
HIRAM STEBBINS, }

W. W. ENTLER, a Justice of the Peace and Acting Coroner for Van Buren county, Iowa.

WILLIAM DORSEY—KILLED MARCH 27, 1885.

The said jurors, upon their oaths, do say that the said William Dorsey came to his death by an accidental and unavoidable fall of slate in room No. 1, entry F, mine No. 5, Consolidated Coal Company's mines at Muchakinoock, Iowa, on Friday, March 27, 1885, about 9 o'clock A. M., and further, jury find no one to blame for accident.

W. S. KENWORTHY, }
G. W. SHOCKLEY, } JURORS.
M. E. BENNETT, }

J. C. BARRINGER, Coroner, Mahaska county, Iowa.

ROBERT D. B. SHAW—KILLED MARCH 30, 1885.

The said jurors, upon their oaths, do say that deceased came to his death by an accidental fall of slate in straight entry Excelsior Coal Company's mines, Excelsior, Mahaska county, Iowa, on March 30, 1885.

D. H. LISNER, }
J. W. HINESLY, } JURORS.
JAMES CARROLL, }

J. C. BARRINGER, Coroner, Mahaska county, Iowa.

SAMUEL F. BEAUER—KILLED APRIL 17, 1885.

The said jurors, upon their oaths, do say that he came to his death by the accidental falling of rock in the mine of Albia Coal Company, in Monroe county, Iowa, and that said accident was unavoidable, and that no blame can be attached to any one.

ELIAS LOVE, }
DAVID ROWE, } JURORS.
J. P. WATSON, }

WM. WEBB, Coroner, Monroe county, Iowa.

There are forty fatal accidents reported for the two years ending June 30, 1885. Of that number twenty-eight were from falls of roof; three by being caught by the cage; two killed by coal cars in the mines; one by boiler explosion; one was run over by railroad car on the coal track; one by suffocation caused by smoke from a burning mule stable in the mine; one killed in the shaft; one killed by the explosion of a keg of powder; one by being caught by his engine; one by being struck by the crank of a windlass while prospecting. In the accidents reported above those that occur from falls of roof are in excess of those from all other causes combined, but as I have given the decision of the coroner's jury in each case, comments here will not be necessary.

LABORS OF THE INSPECTOR.

The work of the last two years has not been very satisfactory to me, as there has been more work than one inspector could possibly do, as the mines are scattered over so much territory extending from about three miles north of Fort Dodge in Webster county south to the State line, and from Buffalo nine miles west of Davenport in Scott county west to the Nodaway River in Adams and Page counties, embracing a territory of about one hundred and twenty-five miles north and south by about two hundred miles east and west. The old mining law took no notice of mines working less than fifteen men. But the Twentieth General Assembly repealed all the laws on mining and enacted the present law, which controls every shaft mine in the State, and every slope or drift mine working five men and upward, and when the number of mines working less than fifteen men and their location is understood, it will be readily seen that the work of the Inspector has been about doubled to what it was under the old law.

In the latter part of March, 1884, immediately after the present law went into effect I procured one thousand copies of the mining law, printed in pamphlet form and started on my tour of inspection.

I had a fair idea of the work before me and knew that if I undertook to make a thorough inspection of the underground works of every mine visited I could not possibly get around to all the mines

by the first of July, 1885, and for that reason I did not visit the underground works but confined myself to the work of outside improvements, such as safety catches for the cages and to see that all the mines furnished the proper means of escape in case of fire or an overflow of water.

It will be noticed by reference to the present law that there is a great change from the old law in regard to escapes, which I consider to be about as essential as any portion of the law, as a great deal of the coal of this State is overlaid with water and sand, and if a fall of roof should occur the underground works would soon be filled with water, and if the mine was not provided with the proper escapes there would be a liability of fearful loss of life; for this reason I confined myself to the work of visiting the mines, giving them a copy of the mining law and a written notice to comply with the same.

As before stated, I commenced this work in the latter part of March, 1884, and in the latter part of January, 1885, I had finished the tour of the State, visiting over four hundred and fifty mines; had located over one hundred escape shafts, and at nearly every shaft in the State safety catches had been provided.

Since the present law went into effect there has been seven mines flooded with water, but in every instance the escapes had been provided, and while some of the mines filled with water very rapidly, there has been no loss of life from that cause, all of the underground force escaped, but in some instances everything else was left in the mines and still remain, as the flow of water is so great that the companies could not get pumps enough to overcome the water sufficient to get into the mines, and they have been entirely abandoned.

I am glad to say that nearly all of the mines in the State at the present time comply with the present mining law in every respect except in ventilation, as there are some mines that are poorly ventilated and there always will be some poorly ventilated, unless there is a larger inspection force employed by the State to do the work, as one man cannot visit the inside workings of all the mines of this State and attend to the office work, and do the work as it should be done; for if he should visit one mine a day for every working day in the year, he would then lack about one hundred and seventy-five mines of visiting all the mines in the State.

SUMMARY OF WORK DONE.

POLK COUNTY.

In the early part of January, before I had finished visiting all the mines of the State, and while the railroads were snow blockaded in several places, I thought to improve the time by visiting the underground works of the mines of Polk county, especially those in the immediate vicinity of the city of Des Moines.

The first mine visited was the Giant Mine No. 2. I was very much surprised when I found the mine in the condition it was in, as everything all through the mine had an abandoned appearance; they were working forty-one men and two mules, while the volume of air was only 1,800 cubic feet per minute; the doors and stoppings were out of repair all through the mine, and the air was allowed to take its own course.

The mine was ventilated by a ten-foot fan that had a record of 26,000 cubic feet per minute when there was over one hundred men employed, but at the time of this visit the air was allowed to pass almost direct from one shaft to the other without hindrance. I asked the mine foreman to explain why he had let the mine run down so badly; he said his instructions from the superintendent were not to put any more expense on the mine, as it was pretty nearly wrought out and the company intended soon to abandon it, but on talking with the superintendent afterward I think the mine boss had misunderstood his instructions. I applied for an injunction to the District Court, which granted my petition, and on January 19th the notice was served. The superintendent came to see me and asked what was the matter; I explained to him the situation underground in his mine and told him as soon as he got everything in good shape I would lift the injunction and let him go to work again with his full force; he immediately ordered all the men to be put to work making the necessary improvements that the law would allow him to work underground (which was ten men), and it was only a few days until I was requested to go and inspect the mine, which I did and found the ventilation restored so that at a point on the first visit where there

was no ventilation they now had over 7,600 cubic feet, and the full volume was 14,831 cubic feet per minute. I canceled the injunction, the company paying the costs.

Giant Mine, No. 1.—I found this mine in fair condition. The east side of the mine was working forty-five miners, four drivers and one roadman; the volume of air for that side of the mine was 6,457 cubic feet per minute, and was well-conducted to the working-place of the men. The west side of the mine had only lately been opened out, and as there was only a small amount of coal to be recovered the mine foreman thought it would be economy to open the works out with singly entry; there were only seventeen miners employed on that side of the mine; the rooms were only in a short distance from the entry; the ventilation was good; but I fear when the rooms are driven back well to the boundary the boss will find that he made a mistake in opening out that side of the mine with single entry. This mine is being operated in the lower vein and their territory runs out east from the shaft under the underground stream that has caused so much trouble at four other mines in the same neighborhood by flooding with water, but the boss concluded that a half loaf was better than no bread, so he only takes out part of the coal, leaving a portion of the vein up to support the roof, which is a great advantage, as the air has no effect on the coal that is left, while if all the coal was removed the action of the air passing along the entries and through the rooms would cause the roof to slack or crumble, and would soon give them trouble, as the slate is not very thick between the coal and sand and water over it; if one fall should occur in a room in a place where they could not timber it, the fall would soon extend up far enough to let down the water, which would give them a great deal of trouble if it did not flood the mine entirely.

Garver Mine.—The Garver Coal and Mining Company were working eighty-nine miners and seven mules, with a full volume of air of 5,568 cubic feet per minute; the doors and stoppings were in very poor condition all through the mine. They were working the second and third veins of coal and when 5,568 feet of air was distributed so as to give each seam its proper proportion of the volume of air, I found it was entirely too small.

I applied for an injunction on the mine which was granted by Judge McHenry of the District Court, but the coal company with their attorney went to the Judge and made such a fuss about how they were oppressed, and the great injustice they were made to suffer

at the hands of the Mine Inspector, that the Judge canceled the injunction and set a date for trial, giving the company two week's time and at the end of the two weeks the mine was still in poor condition and the company asked still further time which was granted, giving the company ten days more time; at the expiration of the ten days I visited the mine and found the volume of air increased from 5,568 cubic feet per minute to 20,265 feet. The volume of air for the lower vein was 7,750 cubic feet per minute, while the volume of air for the upper seam was 12,515 feet; while there was a large increase in the volume of air there were portions of the mine that were very poorly ventilated, but I had become convinced that it was no use trying to enforce the law in the District Court, so I relieved the company by them paying the costs and served another notice on them, intending if they had not complied with the law at the end of the twenty days to apply for an injunction through the Circuit Court and see if I could find a judge that would enjoin a corporation for not complying with the mining law. The company went to work, put in a new fan, took the obstructions out of the air ways, and before the end of the twenty days had the mine in good condition.

Standard Fuel Company.—This company were employing one hundred and thirty-one men and six mules. The full volume of air was 9,036 cubic feet per minute. The sanitary condition of the mine was very poor. The airways were too small to allow the volume of air to pass, to properly ventilate a mine working as many men as they were, other circumstances being taken into consideration, although they had provided overcasts and stopping where they thought they were needed; but in some instances they had done just the opposite to what should have been done, and from the above and other causes the sanitary condition of the mine was very poor, and in some places not fit for men to work. I applied for an injunction on the mine, restraining them from operating with more than ten men until made to conform to the provisions of the mining laws, which was granted by the judge of the district court, but the company asked the judge to release them, which he did, giving them the same time that he did the Garver Coal Company. The officers of the company then called on me, and were very much exercised at what they seemed to think was oppression, but the superintendent is a good underground man, and I made a special request of him to visit the underground works of his mine, which he said he had not done for a long time. He consented to go and make a thorough examination, and after he had made

the inspection he came to the conclusion that he was not being oppressed any more than his company were oppressing their workmen, by failing to furnish them with proper ventilation at their working places in the mine. He ordered the airways made larger, and followed out other suggestions that I had made to him, and on January 29 I visited the mine again, and found the full volume of air had been increased from 9,036 cubic feet per minute to 37,973 feet. This volume of air was divided into five different currents, and the only trouble then existing was the divisions had not been properly made. For instance: one divide, where there were only eighteen men working, had 24,552 feet of air per minute. But all of those defects were remedied as we went through the mine, with the exception of the last east entry, running south on the east side of the mine. This entry was running up hill, and the boss thought it was necessary for him to put some obstruction on this entry, as it was running up hill, so as to force the air into an entry on the opposite side of the main entry, that was running to the dip, or down hill. He thought that cold air would naturally force itself into an entry running up hill, and as the weather was extremely cold, he thought the entry going to the dip would not get its proper amount of air unless aided in some way; but the reverse is the case, as cold air will naturally seek the lowest place in a mine, and unless the air is forced to travel in entries that are elevating they will not get their proper amount of air. I explained this to the boss, and demonstrated the fact by measuring the amount of air then traveling on the two entries. At the end of the entries going up the hill the current of air would not turn the wheel of the anemometer, while on the entry running to the dip there was almost two hundred feet of air to the man per minute. The boss readily saw his mistake, and promised to remedy it. The next day I therefore withdrew the suit pending, by the company paying the costs.

Pioneer Coal Company.—This mine is in good condition. The full volume of air was 20,125 cubic feet per minute. The company had forty-five miners employed. There were several new doors in the mine, showing that the mine had lately been overhauled. This is the oldest mine now in operation in the county, and as the territory does

extend very far east or west from the shaft, they are confined to a narrow strip. They have taken all the coal out as they advanced, going south from the shaft, until at the present time it is about a mile from the shaft to where they mine their coal; and as the air shaft is situated about one hundred yards from the hoisting shaft, when it is

taken into consideration that both the entry and airway are closely timbered, it will be seen that the friction of the air in passing along these airways is very great. The mine is ventilated by a force fan, run at about two hundred and fifty revolutions per minute, and taking all the disadvantages that have to be overcome in this mine, into consideration, I consider its sanitary condition very good. The boss has an anemometer of his own, and that enables him to make all divides in his air that are necessary, and make them accurate. An air meter is something that every mining boss should have furnished him. If this was done it would enable the mine bosses to make the proper divides in the air currents passing through their mines.

Eclipse Mine.—This mine had met with a small accident the morning I visited it, by having a fall in the air-way from the top of the air-shaft to the fan. They had covered it temporarily with hay and boards, but the air-way doors and stoppings were in good repair, the entries were all driven to the boundaries and the rooms were about all wrought out so there was not work left but bringing back the pillars; at the present time the mine is about ready to be abandoned.

Des Moines Coal Company.—This mine was in good condition in every respect. They were working twenty men and two mules. The volume of air was 7,520 cubic feet per minute. At the time of this visit the mine had not been in operation one year and had no escape shaft, but the law allowed them one year to furnish the second opening, and while they did not have the escape they had complied with the law by not employing over twenty men under ground. I called the attention of the manager to the fact that the time given by law for him to furnish the second opening had about expired; he made arrangements with the Union Coal Company and connected with their mine under ground, and in that way furnished an escape for both mines.

Union Coal Company.—This mine was not in very good condition. They were working thirteen men and one mule. The full volume of air was 3,512 feet per minute. The mine was without the second opening, but their underground works were driven up to those of the Des Moines Coal Company. It was only the work of a day or two until they were all right in this respect, and also in regard to ventilation as the hanging of one door and the repairing of one or two stoppings would force the air to where it was needed.

Pleasant Hill Coal Company.—This mine had a volume of air of 4,450 feet per minute, with fourteen men employed. There was some

little repair needed, one door had been broken down, but all the repair needed could soon be made and then the ventilation would be restored. The mine was without the proper escape shaft, but they made arrangements with the Van Ginkle Mine to connect their underground works and in that way comply with the law.

Van Ginkle Coal and Mining Company were working fourteen men and two mules. The full volume of air was 3,420 cubic feet per minute, and was well conducted to the working place of the men. The underground works were well taken care of. They were without an escape for the men that could be considered practical, as they had blown through into the adjoining mine, but had never made any arrangements for a permanent traveling way from one shaft to the other; they completed the arrangements in a few days after my visit.

I visited all the mines of any importance in the county except the Polk County Mine and the Eureka Mine, my reasons for not visiting them at this time, I found that my commencing suit against the mines on the east side had made the companies operating on the south side look after their mines and had put them in good repair, and I was not looking for mines that were complying with the law, but the opposite, and for this reason they were not visited. I have not the room in this report to give a minute detail of all the mines and will only refer to the majority of them, in a general way.

Since my last report this county has about held its own as regards the out-put of coal. There are twenty-three mines in the county, some have been wrought out and abandoned, some have been flooded with water, but other mines have been opened, so that the capacity of the mines in this county remains about the same. Since making my last report there has been four mines flooded with water: The Miller Mine was flooded in the fall of 1883. The Extra, Diamond and Standard No. 1 were flooded early in the winter of 1884. These four mines are located east of the city, just outside the corporation line, but there is an underground stream of water just east of them and the coal dips to the east from the shafts, and as it turns east the coal gets gradually thicker and for this reason they drove their underground works east in order to get the advantage of working the thick coal, and the farther they went east from the bottom of the shaft the less solid material they had over the coal; finally they got to a point where the roof was not strong enough to support the

heavy weight of land and water over the works, and when the fall came the mine soon filled with water.

The Pittsburg Coal Company have abandoned their shaft, located on the south side of the river and removed the machinery, but their reasons for abandoning the mine I am at present unable to say.

The Walnut Creek Coal and Mining Company have opened a mine about four miles west of the city of Des Moines, and are making extensive outside improvements. The mine is situated on the narrow gauge railroad running north from Des Moines.

The Altoona Coal and Mining Company have opened a shaft mine at Altoona, on the main line of the Chicago, Rock Island & Pacific Railroad, and are doing quite an extensive business.

The Wabash Coal Company and the Runnells Coal Company have opened slope mines on the line of the Wabash Railroad, and both mines are handling considerable coal.

There are three seams of coal being mined in this county, but a large majority of the mines of the county are operated by shaft. There appears to be a large dip in the coal measures, passing from northeast to southwest, and in this county the city of Des Moines seems to be about the center, as the concretionary limestone is exposed in the bed of the Des Moines river every few miles, from the southern portion of the State to a point just below Red Rock, in Marion county, showing a gradual elevation up the river to that point, but above Red Rock the concretionary limestone appears to take a horizontal position, or perhaps dips a little, as we advance up the river, and is hid from view until we reach a point a short distance below Fort Dodge, and in this swail or dip the lower coal seam is of sufficient thickness to work, and in fact it attains a thickness in places of seven feet; but below Red Rock I do not believe it will ever be found with sufficient thickness to be worked with profit. In places here in the city the second and third veins are sixty feet apart, while above and below the city they are close together, and in Boone county they are only about eight feet apart.

WEBSTER COUNTY.

This county at the time of making out my last report was quite a large coal-producing county, but the pockets of coal were so small and the coal so easily developed, that as soon as railroad transportation was furnished a great many mines were opened, and at the pres-

ent time most of the coal in the vicinity of Kalo has been recovered. The county has thirty-seven mines in operation, but a great many of them are small mines, working only eight or ten men in the winter season and doing nothing in the summer time.

The Ft. Dodge Coal Company are the largest coal producers of any company in the county. Their slope mine was lying idle at the time of my visit, as the demand that the company had for coal could be supplied from the other mine, which is a shaft, and was employing fifty-one miners, six mules and six drivers, with a full volume of air of 11,832 feet per minute. This volume was produced by natural ventilation. The pit boss had the fan started as soon as I arrived at the mine, but I had it stopped, as I wanted to know just how the ventilation had been. The air was divided at the bottom of the slope or manway into two currents, one current for the north and the other for the south side of the mine. The north side of the mine was working eight miners, one mule and one driver, with a volume of air of 2,700 cubic feet per minute. On the south side of the mine they were working thirty-five miners, four mules and four drivers. The volume of air was 2,200 cubic feet per minute. I requested the pit boss to put an obstruction in the air-way on the north side of the mine, and shut off some of the air from that side of the mine, and that would force more air into the other side of the mine; and I requested the boss to start the fan. I also called the attention of the superintendent to the fact that it was necessary to keep the fan running, which he said he would do until cold weather come again next winter. This company ship their coal on the Illinois Central Railroad west, into western Iowa. This company owns an interest in what is known as the Parle Shaft, on the west side of the river, but they were not operating the mine at the time of my visit. The coal from this mine is shipped on the Minneapolis & St. Louis Railway. They have had considerable trouble with the roof of the Parle shaft, and when they commence operating the shaft again it will be under a different system.

Craig Coal Company.—This company is operating two mines, Drift No. 2, and No. 4. The No. 4 mine at the time of my visit was working fifty miners, two mules and two drivers, and three day men underground. The full volume of air was 2,956 cubic feet per minute. There was no air shaft, but they had placed the smoke-stack of a boiler at the mouth of an old drift, and a basket hanging under it full of fire, was what they were relying on to ventilate the mine.

There was a very poor door hung on the mouth of the drift, but the door was not sufficient to exclude the air from the surface, and if it had been a tight door the air from the mine would have put out the fire that was in the basket.

Carlson Coal Company.—This company were working thirty miners and four pushers, with a full volume of air of 1,800 cubic feet per minute. The mine was worked long-wall, and was in very poor condition. I applied for an injunction restraining both of the above named mines from operating with more than ten men, until made to conform to the provisions of the mining law. But from some cause the papers praying for an injunction were delayed in some way, and the judge did not get them for some time. (The above mines are the ones referred to in my communication to the Governor, which will be found in the report of the mines at Boonesboro, Boone county). When the papers were placed in the hands of the judge he granted the injunctions, and about the same time I received the following communication.

CRAIG COAL COMPANY, }
FORT DODGE, IOWA, April 25, 1885. }

Park Wilson, Esq., Inspector of Mines:

DEAR SIR—We have now completed the air shaft and furnace in our new drift opening, and if you deem it necessary shall be pleased to have you come and test the same.

We think we have now a sufficiency of ventilation.

Yours very truly,

CRAIG COAL Co.

On receipt of the above communication I went immediately to Fort Dodge and found that the injunction papers had not been served, but were in the hands of the sheriff. I requested him to hold them until I could have time to inspect the mine, as I did not think it necessary to put extra cost on the company if they had made their mine to comply with the law. The sheriff consented to hold the papers until he heard from me. I then went to Kalo and the next morning I inspected the mine. I found they had sunk an air shaft, had built a furnace, and the volume of air had been increased from 2,956 feet to 11,960 feet per minute, and the ventilation of the mine was good. I then told the company that I would cancel the injunction if they would pay all costs, which they did.

I then requested the sheriff to serve the papers on the Carlson Coal Company. I got on the train and started to Angus, and

when we stopped at Kalo Mr. John Honaker, superintendent of the Carlson Coal Company, got on the train and wanted to know why I did not inspect his mine. I told him it was not necessary as he had not made any improvements in or around his mine since my last visit, and I knew the condition of his mine without taking the time to inspect it. He said he was confident his mine was the best ventilated mine in the county. After we had got to the second station below Kalo he said he demanded his mine inspected before any injunction papers were served on his company. I told him I would go back and inspect his mine, which I did, and found that there was fifty-four cubic feet of air per man per minute. I told him he would be compelled to submit to the injunction, but that at any time he would ventilate his mine I would gladly cancel the injunction by his company paying all costs.

Craig Coal Company.—Mine No. 2 of this company were working eighteen miners, one mule and one driver. This is a new mine and the works were only in a short distance. They do not use any powder and the sanitary condition of the mine at the time of my visit was good.

Standard Coal Company.—The mines of this company three years ago were the largest producers of any mines in Kalo, but at the present time they are leased to private parties and only produce a very small amount of coal, and what coal is produced is by robbing entry pillars.

Walter Ervine operates a drift mine in what is called Craig Hollow, about one mile from the railroad, but he relies mostly on local trade, employing fifteen or twenty men in the winter season, but does not do much in the summer time.

Thomas Collins operates a drift mine and hauls his coal to the railroad in wagons. Frank Collins is a partner with his father in the slope at Coalville, and also owns a shaft on Lizzard Creek, about three miles west of Fort Dodge.

There are twenty-seven mines in the vicinity of Fort Dodge, Coalville and Kalo, but aside from those mines that I have mentioned they are all relying on local trade or haul their coal to the railroads in wagons.

Lehigh—I have not been able to visit the inside works of the mines at this place. I went there for that purpose the same time I visited the other mines of the county, but at the time of my visit the mines were lying idle. The suspension was caused by the railroad

bridge over the Des Moines river not being safe to cross with the railroad engine. The mines had not been working for three or four days, and would not for the same length of time. I could not wait and did not want to inspect mines that had been lying idle for that length of time. I intended visiting the mines the last time I visited the Craig and Carlson mines, but when I got to Judd the train men on the Crooked Creek Railroad told me that the miners of Lehigh were on a strike. So I got back onto the train and went some other place. Therefore the underground works of the mines of Lehigh have not been inspected since the new law went into effect. There has been considerable prospecting done in this county in the last two years, but no new mines of any importance have been opened.

In passing down the river from Fort Dodge, the coal measures present a good view, and will lead to the impression that Webster is one of the best coal counties in the State, but upon careful examination that idea will be abandoned.

The outcropping of the coal in the bluffs of the river and its tributaries on both sides of the river show a remarkable uniformity in the thickness of the coal at the outcropping, and these surface indications can be found at a considerable distance from each other, so that from a surface view it would seem almost certain that this is but the outcropping of an extensive coal field, but upon close examination it will be found that the whole field in this county is confined to the immediate vicinity of the river and is made up of small pockets of coal that do not extend any distance with uniformity.

In a great many places where the coal outcrop is four feet in thickness on opening a mine the coal will dip as they advance into the hill and increase in thickness until, perhaps, a thickness of six or seven feet is reached in a distance of perhaps seventy-five yards, when the floor of the coal will begin to elevate and the coal getting gradually thinner until it becomes too thin to work with profit or is wanting altogether; as the coal loses its thickness back in the hill the roof gets poorer until the clay and sometimes sand comes down onto the coal, and every indication about the mines goes to prove that the coal does not extend any distance back from the river or creeks in this county, and should a pocket of coal be found any distance back from the river the indications are that the roof would be poor or that such a thin strata of slate would be found between the coal and sand and water that the coal could not be recovered.

BOONE COUNTY.

On December 15th by request I visited the mines of Boonsboro. The first mine visited was the one operated by W. D. Johnson & Co. Coal Company; they were working fifty-two miners, five mules, five drivers, and five draymen underground, while the full volume of air was only 5,735 cubic feet per minute; the air ways were very small, and the air was not conducted to the working-place of the miner. The traveling way to the escape shaft was obstructed by falls of roof, the ladder in the escape shaft was perpendicular, and did not reach the bottom of the shaft by about fifteen feet. I asked the pit boss why the mine was allowed to be in that condition. He said the superintendent would not allow any improvements to be made.

I next visited the mines of the W. C. Shepard & Company. I found No. 2 deficient in ventilation and the timbering on the entries was very poorly done, and in places the entries were dangerous for men to pass under.

Mine No. 1 was without covering on the cages. They were working thirty-eight miners, three mules, three drivers, and three day men underground. The full volume of air was 1,680 cubic feet per minute; the traveling way to the escape shaft was obstructed by falls of roof, and the mine all through was in poor condition. I applied for an injunction restraining the two companies above named from operating their mines with more than ten men until made to conform to the requirements of the mining law. The judge granted the injunctions and I went on with my work of inspection until in April I found that the companies were disregarding the injunctions by working a full force of men. I was at Kalo, in Webster county, when I heard that the companies had not complied with the law by reducing their force. But I went immediately to Webster City where the District Court was in session and notified the judge what the coal companies were doing, and in a day or two I received a notice to appear at Ames before a justice court to have my deposition taken, which notice I complied with. There I got an order from the court to go and inspect the mines again and report their condition to the court at that time, which order I tried to carry out. I inspected the mine of W. D. Johnson & Son Coal Company and found it in worse condition than when I inspected it before. The volume of air was not as large as on the former visit; the traveling way to the escape

was still obstructed by falls of roof, and they still had the perpendicular ladders in the escape shaft.

One mine of W. C. Shepard's was not being operated; the other mine the company refused to furnish me the means necessary for its inspection. I notified the superintendent in the evening that I wished to inspect the mine early the next morning. He promised he would have steam already to let me down, but the next morning there was no steam; the mine was not going to run that day. I asked him for some way of getting into the mine; he answered that he had all he could do that day and did not have time to go down to the mine. I went to see if I could get down, but there was no way of going down only to climb down a perpendicular ladder, and as that was not the kind of ingress or egress contemplated in the law, I did not go down into the mine. The next day the court finished taking my deposition.

The coal companies were represented by an attorney and the underground foremen at each of the mines. The attorney for the companies said he was not ready to take depositions on his side of the case, and the court adjourned; but there was an understanding between the district attorney and the attorney for the coal companies that they should give ten days' notice of the taking of the depositions on their side of the case. But, instead of getting the ten days' notice, I got the notice the next morning after they had finished taking them. The next day, after the court finished taking my deposition, at Ames, I addressed the following communication to the Governor:

DES MOINES, IOWA, April 20, 1885.

To his Excellency, BUREN R. SHERMAN, Governor of Iowa:

DEAR SIR—I write you this A. M. in regard to the difficulty I am meeting with in the enforcement of the mining law. In the latter part of December, 1884, I applied to Judge Henderson, of the Eleventh Judicial District, for an injunction on three mines at Boonesboro, Boone county; which was granted by the judge; but the companies disregarded the injunctions and continued to operate their mines with a full force of men, and all the time the sanitary condition of the mines was very poor. The mines are deficient in ventilation and without the proper means of escape. The traveling ways of the escape shafts are obstructed by falls of roof, and the ladders in the escape shafts are perpendicular ladders and do not comply with the law.

I notified the judge by verbal notice that the companies were disregarding the injunction. I received notice, April 4th, to appear at Ames, to have my deposition taken; and there I received orders from the court to go and in-

spect the mines and report their condition; which orders I tried to carry out.

One of the mines I inspected, and found it in worse condition than when I applied for the injunction, and the other company refused to furnish the means necessary for inspection, and I so stated under oath, on Wednesday, April 8th, the day the court finished taking my deposition. I urged on the district attorney the necessity of immediate action on the part of the court in the matter, as the men working underground at these mines are compelled to work in an atmosphere wholly unfit for respiration, endangering their health and lives.

It is now over four months since I caused an injunction to be placed on these mines. I have done all I can in this matter, and I consider it an outrage on the working miners of Iowa that the courts fail to enforce the mining law when cases are put into their hands.

On April 6, 1885, I applied for an injunction on two mines at Kalo, in Webster county, and on Saturday, April 18th, I received the following communication from one of the working miners at one of the mines above referred to:

"KALO, IOWA, April 16, 1885.

"Mr. Park C. Wilson:

DEAR SIR—I write you according to promise with regard to the ventilation of this mine. This company has done nothing to improve the ventilation, and it will be a great deal worse as the weather gets warmer. The men are dissatisfied because you did not give us the benefit of the law, and all the old miners desire you to come here as soon as possible. One man had to quit work on account of the ventilation. He had suffered so long from bad air, with no prospect of it being any better, that he had to give it up.

"Please come as soon as possible.

"Yours respectfully,

H."

Your Excellency can see that I have done all I can in this case. It is now two weeks since I applied for an injunction on the mines above referred to. I can do no more, and if the courts fail to grant an injunction or enforce their injunctions when granted, I certainly am not responsible. I do not wonder sometimes that Your Excellency is called upon to send troops to keep down riots around some of the mines, for I begin to think that the wants of the miners are ignored alike by operators and courts.

Awaiting your orders, I am, respectfully yours,

PARK C. WILSON,

State Mine Inspector.

December 16th I visited the mines of George Rogers & Co. They have two mines, one slope and one shaft. The shaft is situated on the second bottom, about one half mile from the Des Moines river, and is 42 feet deep; but since my visit they had a fall of roof, and

the mine filled with water, but not so but what the water can be overcome. The slope they are operating is on the opposite side of the river from the shaft, and was sunk to operate the upper vein of a mine that had flooded about three years ago on account of driving too close to the river with the works of the lower vein. After the works of the lower vein had flooded, he abandoned the shaft and sunk this slope to enable him to operate the upper vein. They have an incline several hundred feet in length, extending from the bottom of the slope to the top of the hill; using steam power for hauling the coal, which is landed on top of the dump, where they can load it into the railroad cars.

Millford Coal Co.—This company was operating a shaft 105 feet deep. They had no escape shaft, but the mine had not been in operation one year. They were working thirty-two miners, but reduced the underground force to twenty men, and in that way complied with the law. The shaft is situated on the west side of the river. They haul their coal in wagons and load it into cars; part of the time they have a temporary bridge across the river, and at other times they rely on a boat.

Chas. A. Sherman & Co. are operating a shaft situated about one mile west of Boonesboro. The coal is hauled from the shaft up an incline to the top of the bluff by a stationary engine placed on the bluff, and from there they have a tram road running to the railroad track, where the coal is loaded into the railroad cars.

James Bulkley, Samuel McBirnie, McBirnie & Waddell, and Fluckard & Nelson, are all operating mines just west of Boonesboro; their coal is either sold to the local trade or hauled in wagons to the railroad and landed on the cars.

James C. Wilson is operating a mine at Pilot Mound. His output is sold exclusively for local consumption.

Hutchinson Brothers, John Clemons and Joseph York, of Zenorsville, are operating mines for the local trade. About four years ago all the miners at Zenorsville had a splendid winter trade, but since the Chicago and Northwestern Railroad extended their road north of Ames it cut off a large country trade; but they still sell considerable coal in the winter season, but in the summer-time they are almost entirely idle.

The Moingona Coal Company are still operating their No. 4 mine at Moingona. This mine is worked long-wall. They are taking out

considerable coal, but not so much as in former years. The company are developing a mine at Angus in the same county.

The Northwestern Coal Company are operating their mine west of Moingona, on the main line of the Chicago and Northwestern Railroad.

The Clyde Coal Company have opened a mine up the river from the Northwestern Coal Company; but the mine got flooded with water, and the trouble they had overcoming the water delayed them considerable in developing the mine.

Climax Coal Company.—This company have taken the machinery away from their No. 1 mine, and are now using the old hoisting shaft as an escape and furnace shaft.

No. 2 shaft of this company were working seventy-five miners, thirteen mules, eleven drivers, three draymen and two cagers. The full volume of air was 6,160 cubic feet per minute; but was very poorly distributed, and the sanitary condition of the mine was very poor. The traveling way to the escape shaft was obstructed by falls of roof, and there was so much carbonic acid gas traveling with the air that we could not keep our lamps burning. The assistant superintendent, pit boss and myself, in trying to go from the hoisting shaft to the escape shaft, got in the dark, and the pit boss went back to the hoisting shaft and got lamps filled with coal oil before we could proceed, and before we could get through we got in the dark a second time, and had to send for larger lamps filled with coal oil, so as to get light sufficient to light us through the traveling-way from one shaft to the other. We were in this traveling way over two hours. This mine is now ventilated by a furnace, and they were compelled to make an opening through the door between the furnace and the escape shaft to let some fresh air into the furnace, or the black damp would put out the fire in the furnace. I consider that it was a great mistake taking the fan away from this mine, as they could have ventilated the mine if they had kept the fan, but with the furnace they never can ventilate that mine as it should be done. I consider the mine in a very dangerous condition for this reason: If a fire should occur at the hoisting shaft the air in the mine would be reversed, and then the carbonic acid gas from the old works in the mine, and the gas and smoke from the furnace, would all be drawn on to the traveling-way, and men could not pass through to the escape shaft, and all would perish. I applied for an injunction restraining the company

from operating this mine with more than ten men at once until made to conform to the provisions of the mining law.

Climax mine No. 3 was not in operation at the time of my visit, as they could supply their demand for coal from No. 2 mine.

Eagle Coal Company.—I found this company's mine in good condition in regard to ventilation and general security. They were employing under ground seventy miners, six day men, six drivers and six mules, with a full volume of air of 14,650 cubic feet per minute, which was well distributed to the working place of the miners. The mine was ventilated by a fan, run at about one hundred and fifty revolutions per minute, and the volume of air could be increased if necessary by increasing the speed of the fan.

There has not been any extensive developments of coal in this county in the last two years. Angus, Moingona and Boonsboro are the principal points of production. The two last named are old mining camps, and some of the mines are about exhausted. There are two seams of coal being mined in this county. The seams are separated by about eight feet of soap-stone, with a thin strata of shale immediately overlaying the lower seam. Most of the coal of the county is confined to the immediate locality of the streams, and all the prospecting on the highlands shows that the coal found any distance back from the streams is in small pockets, and in most cases overlaid with water and sand, and with poor roof.

JEFFERSON COUNTY.

About three-fourths of the superficial area of this county is underlaid with the coal measures, but at the present time there is not much coal being mined in this county. The town of Perlee, seven miles north of Fairfield, has been quite a mining town for several years, but at the present time there is only two small mines in operation.

The Jefferson County Coal Company abandoned their mine about one year ago. There was plenty of coal left where they were operating, but the company claimed they could not operate their coal and compete with other mines on the same line of railroad, and for that reason they abandoned their works. There are twelve mines in operation in the county, but they are all depending on the local trade. There are no mines in operation in the county that sell any coal to the railroads, therefore the out-put of coal this last year, and for some time to come, will be very small, as the large coal beds farther

west will have a tendency to keep the Jefferson county mines out of the market.

VAN BUREN COUNTY.

This county lies in the southeast corner of the Iowa coal field; although the coal measures extend east into Lee county some distance, the measures are almost entirely barren of coal, while Van Buren county has at least three-fourths of the superficial area underlain by deposits belonging to the coal formation, but a workable coal seam will not be found to extend over more than one-half of the territory so underlain. There are two seams of coal, ranging from two to four feet in thickness. The Des Moines river runs diagonally through the county, from northwest to southwest, and has cut its channel through the coal measures, leaving them exposed in the bluffs on either side, with the exception of one or two places, where a small depression in the lime rock in which a basin of coal is formed, and is still remaining exposed in the river bed. There are several large creeks emptying into the river on either side, that have also cut their channels through the coal measures, and leave the concretionary limestone exposed in their beds, and in fact, the concretionary limestone is exposed in almost every water course in the county, and outcrops in the bluffs of the Des Moines river, on one or both sides, almost throughout the entire county. The drift formation of this county presents about the same features as those of other counties, with an average thickness of about sixty feet, while the coal measures will not exceed a thickness of one hundred and thirty feet, and a drill hole two hundred feet in depth will test the coal in any portion of the county, as the lower seam of coal rests directly upon the concretionary limestone, with only from three to six feet of clay and shale between. But owing to the fact that all the water-courses in the county are well supplied with timber, there has never been much development of coal, even for local consumption; and the position of the county in the coal field is such that coal can be mined further north and west cheaper, and have the advantage in transportation; for this reason the coal of the county has never been extensively developed.

There are nineteen mines in operation in the county, but they are only operated to supply the local demand. Some of them do a considerable business in the winter season, but a majority of them are entirely idle in the summer.

KEOKUK COUNTY.

The mines in this county have only been visited once since making my last report, and at that time the underground works were not inspected. This county has considerable coal, but, like other counties, the coal lays in basins or pockets. A majority of the superficial area is underlain with the coal formation, but not more than one fourth of the territory so underlain bears a seam of coal thick enough to work with profit. Skunk river runs through the county from west to east, and the concretionary limestone is exposed in several places in the county, and for this reason some supposed that the county had very little coal; but, like the counties west and south, the lower seam is very thin or entirely wanting, while the second seam attains a thickness in places of seven and eight feet. One of the best basins of coal as yet developed in this State, is the deposit at What Cheer. There are twenty mines in operation in this county, and eleven are situated at What Cheer; a very large majority of the coal output of the county is produced at this point.

There have been no new developments in the last two years, but all the mines are being operated about as reported in my last report. The railroad transportation for the mines of What Cheer has been increased, since making my last report, by the Chicago & Northwestern Railroad building a branch road from their main line, starting at Belle Plaine, running south through What Cheer, and on to Muchakinock, in Mahaska county, where the railroad company own a large coal property.

All of the other mines in the county rely altogether on the local trade, and do but very little in the summer season.

WAPELLO COUNTY.

This county has twenty-two mines in operation, a large majority of which are in the vicinity of Ottumwa. The largest mines in the county are those of the Carver Coal Company. Their mines are located at Kirkville, where they employ a large force of men. Since making my last report they have opened a shaft mine, which takes the place of one of the slopes that they formerly operated. The mines around Ottumwa do not ship any coal on the railroad, but are operated exclusively for the local and city trade.

The Des Moines river runs diagonally through the county and has cut its channel through the coal measures, leaving them exposed in

the bluffs at either side of the stream. And the same can be said of the creeks emptying into the Des Moines river. In following the creeks from where they empty into the river, the coal measures are exposed for a distance of from six to ten miles from the river before the coal is hidden from view by the overlying stratas and the drift deposits. The county is considered, by some, to be well supplied with coal, but while there are three seams of coal ranging from a few inches to six feet in thickness, like Jefferson county, there is not much uniformity in the thickness, although some very fine deposits of coal, belonging to the second seam, have been developed. The upper seam is sometimes found at a thickness of two and a half feet, and the second seam, the only one of any importance in the county, reaches a thickness, in some localities, of seven feet; while the lower seam, in my opinion, is of no importance, as it is too thin to work with profit in any locality in the county, and, from a careful estimate, I am forced to the conclusion that fully three fourths of Wapello county is barren of coal thick enough to work with profit.

MAHASKA COUNTY.

This county is the largest coal-producing county in the State. The reason is because the railroads have given it a direct market north into a country entirely destitute of coal. There are thirty-nine mines in operation in this county, and quite a number of them ship their entire out-put by railroad into the northern market. Muchakinock, with four mines producing about one hundred flats of coal per day; Excelsior, with three mines producing about the same amount, ship their entire out-put, while the American Coal Company, Acme Coal Company, Standard Coal Company, and the Western Union Fuel Company ship almost their entire out-put into the northern market. The pay roll of the companies above referred to, when working a full force of miners in the winter, amount to over five thousand dollars per day.

There have been no extensive developments of coal territory in this county in the last two years. The Consolidation Coal Company have opened a shaft mine a short distance north of Muchakinock, which they named No. 5. The Knoxville Junction Coal Company sold their mines, located at Knoxville Junction, to the American Coal Company. The sale was made in the spring of 1884, J. K. Graves of Dubuque, and W. A. and H. W. McNeill of Oskaloosa, being the purchasers. They also leased the old Iowa Coal Works at Beacon,

but never operated the mine, and the Iowa Coal Company requested them to give up the lease, which they did, and then Mr. Phillips, the old Superintendent for the Iowa Coal Company, leased the mine; but as the mine had been idle all summer, there was considerable expense in getting the mine in good shape. He had hardly got it in good working order when the dump building burned down. He then abandoned the shaft, and is now opening a slope so as to connect with the old works on the north side of the shaft, which will furnish some work for the Beacon miners. About ten years ago Beacon was the largest mining town in Iowa, but for some cause it has been gradually going down, until at the present time there is only work for very few men, while there is plenty of coal in close proximity to the town. All of the other mines in the county are operated for the local trade. A majority of the mines are on the east side of the Des Moines river, although there is considerable coal on the west side; but as yet there have been no extensive developments on the west side.

The coal of this county is about as easily developed as any in the State, as both of the Skunk rivers and also the Des Moines river traverse the county from northwest to southeast, and all three of these rivers, as well as their tributaries, have cut their channels through the coal measures, leaving the measures exposed or thinly covered along their banks.

MARION COUNTY.

This county has not made any great improvement in the last two years in the development of her coal. In my last report I referred to the Red Rock Coal and Mining Company as preparing to make one of the largest mining plants in the State, as they had bought a large tract of land supposed to be coal lands, but the land was located and bought by men that still cling to the old theory "that if coal was exposed in the banks of a creek that of course it extended clear through the hill, and the further they got into the hill the thicker the coal would get," but their theory did not hold good in this case. The company invested a large capital without ever prospecting only what little surface prospecting could be done along the creeks, and the investment was made altogether on theory without any actual knowledge of what the land contained. It may seem out of place to refer to this matter in a report, as some may consider it a private matter, but I deem it advisable, as it may keep others from

making a like mistake, and as most all of our extensive mining developments are made with eastern capital such mistakes will have a tendency to keep eastern capitalists from investing their money in an enterprise of this kind in Iowa, while there is plenty of undeveloped coal in this State, and I consider Iowa coal lands the best investment there is in the State. This county has more mines than any other county in the State—there are forty-four mines in operation, but a majority of them are what is called country banks. Flagler is the largest coal producing point in the county; the No. 5 slope of the Union Coal Company and the Oak Hill mines are located here; the mines of South Cedar creek in the southeast corner of the county are still hauling their coal to the railroad in wagons; the Swan Coal Company have opened a shaft mine at Swan and are doing considerable business; there are mines in operation in almost every township in the county, but as before stated they are country banks and are not operated very extensively in the summer time.

MONROE COUNTY.

This county has twenty-three mines in operation, and a majority of them ship a considerable portion of their out-put on the railroad. All the mines of Smoky Hollow haul their coal either to Fredric or Avery in wagons and load it onto the cars, and considerable coal is brought from north of Fredric and loaded onto the C., B. & Q. railroad. None of the mines in these two localities are operated very extensively, as the coal is easy of access, and any one owning land on either of the creeks can open a mine with very little expense.

The Union Coal Company have bought the mine formerly owned by the Eureka Coal Company, and have made some good improvements.

The Iowa and Wisconsin Coal Company are operating a shaft about two miles west of Albia, and the Enterprise Coal Company are also operating a shaft mine in the same locality. Both mines are located on the main line of the C., B. & Q. railroad, and are doing considerable business. The Great Western Coal Company are not operating their mine at present—perhaps never will again, as they have not the coal in shape to work with profit; the shaft is located on the west edge of their leased land, the Albia Coal Company join them on the west, and the old works of an abandoned mine join them on the north and comes within about one hundred yards of the shaft; a large fault lays a short distance east of the

shaft, and they have no way left only to abandon the mine or drive through this fault which will never pay expenses. The Albia Coal Company calculated at one time on connecting underground works with the Great Western mine so as to provide an escape, but abandoned that idea and sunk an escape shaft at the south side of their mine.

The coal measures of this county are not so much exposed as they are in Marion and Mahaska counties, for the reason that this county lays farther away from the Des Moines river, and a great many creeks head in this county that before they empty into the river, and after they have passed out of the county, they have cut their channels through the coal measures, while in this county on some of the creeks there are no exposures except the drift material.

APPANOOSE COUNTY.

The coal in this county will average about two feet and ten inches in thickness, and extends with more uniformity of thickness than the coal of any other county in the state. It belongs to the middle coal measures and is of good quality for domestic purposes. Centerville, the county seat, is the center of the mining industry of the county, as there are eleven mines within a radius of two miles. A majority of the mines are operated by room and pillar, but a few have adopted the long-wall system. There are forty-one mines in operation in the county, but a majority of them are operated exclusively for the local trade. There are five mines at Centerville that ship their coal on the cars, having railroad facilities, and several other mines whose operators haul their coal in wagons and load it onto the cars. The mines of the Centerville Coal Company and the Scandinavian Coal Company are located on the Wabash railroad, and the Watson, the Diamond mine No. 2 and the Standard Coal Companies are located on the southwestern branch of the C., R. I. & P. Railroad.

The Co-operative Coal Company, of Centerville, sunk a shaft over a year ago, but for some cause they could not get the railroad company to build a track to their mine, and as the shaft is too deep to be operated successfully with horse power, they have done nothing with it since.

Neither of the mines at Numa is being operated at present. The engine house and dump building burned down last winter, and have not been rebuilt.

The Cincinnati Coal Company are operating a shaft at Cincinnati, on the line of the Burlington & Southwestern Railroad; and at Caldwell, on the same line of railroad, there is a slope mine, owned by the White Breast Coal Company.

The mines at Brazil are located on the Wabash Railroad, and all ship their coal by rail. The Co-operative Coal Company are not operating their mines at this place.

The mines of Walnut City are all country banks, but coal is hauled from some of them to Centerville, a distance of ten miles, and sold in competition with coal from mines that are being operated just outside the city limits. The mines of Walnut City are scattered over a radius of about five miles, but none of them are nearer than three miles of the town.

The mines of Griffinsville and Confidence are operated by shallow shafts. These mines are in the western edge of the county, and are between the Chariton rivers.

In this locality the coal measures are considerably exposed, and every indication shows a large deposit of the second coal-measure coal, and should railroad transportation ever be furnished this locality, there undoubtedly will be splendid coal easily developed.

There has never been any general prospecting done in this county, for the coal of the lower coal-measures; there has been one or two holes put down in different localities, but without success; the depth, or any reliable record of the holes, I am unable to give.

WAYNE COUNTY.

There are seven mines in this county, all country banks except three—two at Seymour and one at Plano.

On May 27, 1885, I visited the mines at Seymour. I found the Thatcher mine in very poor condition. The cages were out of repair, and without covers. The entries at the bottom of the shaft were in a dangerous condition. The airways all over the mine were in poor shape, and in places they were entirely closed. The escape shaft did not comply with the law, as the partition separating the escape shaft from the furnace shaft did not exclude the heated air and smoke from that side of the shaft used as an escape shaft, and they were deficient in ventilation. There were thirty-four men employed underground, and the volume of air was 534 cubic feet per minute. I would have applied for an injunction on this mine, as I had

notified Mr. Thatcher, but he had sold the mine, and the parties that then owned it had never received any notice. It was owned and operated by H. W. McNeill, of Oskaloosa. The mine had been opened on the long wall system, but had been very poorly managed; when the present owner took charge of the mine he got a man from Illinois that was accustomed to the system of long wall work. He had only been at the mine a short time, but had made considerable improvement—so I was told by the miners. I served a notice on the company, as contemplated by law, but have not had time to visit the mine since.

The mine of the Occidental Coal Company of Seymour was in good condition in regard to ventilation and general security underground, but there were no covers on the cages; they were without signals in the shaft; there was no escape shaft, but the mine had not been in operation one year. The escape shaft was located while I was there. They were employing more men underground than the law allowed, but they voluntarily reduced the force to twenty men. The full volume of air was 4,560 cubic feet per minute, with twenty-one men employed in the mine. On the north side of the mine, where there were fourteen men working, the volume of air was 2,800 cubic feet per minute. On the south side of the mine, working seven men, the volume was 1,760 feet per minute. The company made arrangements while I was there to have the cages covered and signals provided, and when that was done the mine would comply with the law. The company claimed they would have the escape shaft provided before the expiration of the time given by law, which in this case would be two years from the time they commenced operating the mine, as the shaft is over two hundred feet in depth. The two mines at Seymour are on the southwestern branch of the C., R. I. & P. R. R.

The Plano Coal Company, at the time of this visit, was in the hands of a receiver, and they had failed to provide an escape shaft, and as the mine had been in operation more than one year, it was unlawful for them to operate the mine until they complied with that provision of the law. I notified B. F. Silknetter, the man appointed as receiver for the company, calling his attention to the law, and he immediately closed the mine; under the circumstances it is hard to tell when they will be able to start the mine again; but one thing is certain: they will not start to operate the mine again until they have provided an escape shaft, so that the underground force can escape should an accident occur at the hoisting shaft. This mine is

located on the Humeston and Shenandoah branch of the Wabash Railroad.

Of the four other mines in the county, the one at Kniffin is the largest, employing from twenty to thirty men in the winter season; all are operated for the country trade.

There was some prospecting done at Corydon, the county seat, over two years ago. In this hole they passed through three seams of coal. The upper seam was sixteen inches in thickness, the second seam thirty-two inches, and the third seam six inches. The last seam was at a depth of 371 feet from the surface, the second seam was 327 feet from the surface, and the first seam was 326 feet from the surface, but there has been nothing done in the way of developing the coal at this point.

LUCAS COUNTY.

This county has twelve mines; but the principle mines of the county are at Cleveland and Lucas, seven miles west of Chariton. The White Breast Coal Company have two mines located at Cleveland that are operated very extensively, as they are able to hoist over one thousand tons per day at each one of the shafts. The mines are worked on the room and pillar plan, with double entry, using steam power for hauling the coal to the bottom of the shaft.

The Chariton Coal Company's shaft is located about one mile north-west of the White Breast mines, and is the deepest shaft in the State being 342 feet deep.

The Zero Coal Company are operating a shaft at Zero, on the line of the Chicago, Burlington & Quincy Railroad, and ships their coal on the cars. The three mines at Lucas and Cleveland ship their entire out-put on the cars west into Western Iowa and Nebraska, and are operated about as steady as any mines in the State. The four mines above referred to are operating the coal of the lower coal measures and the second vein of that coal measure; the other mines in the county are only operated for the country trade, and some of them do nothing in the summer.

WARREN COUNTY.

This county does not produce much coal for the number of mines it has, for the reason that the railroads do not run through the county in the right direction to furnish the coal companies transportation for their coal, as the railroads running north brings the mines of

this county in competition with Polk county coal, at Des Moines; going south they come in competition with Lucas county coal at Cleveland and Marion, and Monroe county coal that is shipped west on the Chicago, Burlington & Quincy Railroad; the only road in the county running west only runs to Winterset, the first county seat west, and as that road starts from Des Moines, it forces the mines of Warren county to come in competition with Polk county coal in the Winterset market. So that this county is compelled to come into competition with other mines north or south, where the coal is thicker and can be put on the market cheaper than Warren county coal. There are twenty-nine mines in the county, but they are all country banks except Lumsdon Bros. and Russell & Company, of Summerset; none of the mines of this county are operated very extensively at any time in the year.

HAMILTON COUNTY.

This county is not much of a coal producer; there are eighteen mines in operation, all located along the Boone river, but most of them are entirely idle in the summer time. There is considerable coal recovered along the bluffs of the Boone river by stripping off the surface; the position of the county in regard to the coal field gives the mines a good country trade in the winter as there are no mines north of them; all the coal consumed in the county, besides what they produce, has to be shipped in by the railroads. This county has perhaps more coal than both Hardin and Marshall counties, but coal so near the northern edge of the coal field is always found in small basins, and this county is not an exception to the rule in this respect; the township of Homer and the one immediately north of it has considerable coal.

HARDIN COUNTY.

This county has but two mines that come under the present law. There are some small mines, but they only employ three or four men. This county is on the extreme northeastern edge of the Iowa coal-field, and the mines are located 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, so that their thickness is very irregular. A few years ago they had coal in what was then known as the Chaffin mine, about six feet

in thickness; but that was an exceptional case, as most of the coal will only average about two feet in thickness. Coal commands a higher price at the mines here than at any other locality in the State, but the irregularity of the seam and the trouble from water causes mining operations in this locality to be very expensive.

MARSHALL COUNTY.

This county has only one mine and at the present time is not being operated. The land on which the mine is located belongs to D. M. Moninger, and I think it doubtful if it is ever operated again. This will never be much of a coal county. Although a considerable portion of the superficial area of the county is underlaid with the coal measures, a large portion of the area is barren of coal thick enough to work with profit; as the coal is all overlaid with sand and water, the cost of handling so much water added to the extra cost that will necessarily have to be paid for mining coal of thirty inches in thickness, will handicap the man who undertakes to operate a mine in this county.

JASPER COUNTY.

This county has twenty mines in operation, but those that have the largest capacity are located about three miles up the river from Colfax. There have been small mines in operation, supplying the country trade for several years in this locality. About four years ago, D. S. Couch, of the Jasper County Coal & Railway Company, bought some land and opened out a slope mine, built a railroad from Colfax out to his mine and was soon shipping considerable coal, but as soon as this company commenced operations it attracted considerable attention to that particular basin of coal, and now there are four other mines in operation, and the furthest of the five shafts are not over one mile apart. The Diagonal Railroad have built a switch down to the mine from their main line, starting at Valeria, which gives the Standard Fuel Company, the Vulcan Coal Company, the Black Heath Mining Company and the Pittsburgh Mining Company an outlet northeast with their coal. The coal in this locality will average about five feet in thickness, and is of good quality.

The Jasper County Mining and Railway Company are operating mines at Draper on the branch railroad from Newton to Monroe; their mines are operated by drifts and they handle considerable coal in the winter season. All the other mines in the county are operated

for the local trade, and the majority of them do a good business in the winter time.

DALLAS COUNTY.

This county has fourteen mines in operation, but there is only one mine in the county operated for the railroad trade, and that is the mine of the Chicago & Van Meter Coal Company located at Van Meter on the main line of the Chicago, Rock Island & Pacific Railroad. This company is working coal belonging to the lower coal measures. All of the other mines in the county are working the coal belonging to the middle coal measures and are operated exclusively for the local trade. The second coal measure coal of this county is not as thick as it is further south; there is more irregularity in the thickness, but the quality is about the same.

GUTHRIE COUNTY.

This county has twenty-three mines operating in a seam belonging to the middle coal measures. The coal varies from sixteen inches to two feet in thickness, and is a good quality for domestic purposes. The mines are located along the Middle and South fork of the Coon rivers and their tributaries, and are located in the eastern part of the county. The most western mines in the county are at the rapids of the Middle Coon river. Some of the mines have been in operation for several years, and all are operated for local trade.

SCOTT COUNTY.

The mines of this county are located about nine miles west from Davenport, and about two miles north of Buffalo. There are nine mines being operated in an area of about two miles. Some of these mines are worked quite extensively in the winter as the farmers come quite a distance after coal, while considerable coal is hauled in wagons to Davenport and sold in the city market, and coal is also wagoned to Buffalo and sold to the river trade. This basin of coal is not connected with any other portion of the Iowa coal field, as the subcarboniferous rocks come to the surface between this body of coal and the Iowa coal field proper, showing that there can be no connec-

tion between the two. The coal in this basin will average about thirty inches in thickness; is of good quality.

GREENE COUNTY.

The mines of this county are located in the south-east corner of the county, the Standard mine not being more than two hundred yards from the county line. There has been considerable improvement in the way of development of coal in this county in the last two years, caused by the Chicago, Milwaukee & St. Paul Railroad building a switch down to the mines, which enables the coal companies to load their coal on the cars direct from their dumps. There are eight mines in operation in the county, and the most of them have a railroad trade. A majority of the coal of this locality is shipped on the C., M. & St. P. Railroad, but some is shipped on the Minneapolis & St. Louis road. The mine at Grand Junction is only operated for town and country trade.

ADAMS COUNTY.

The miners of this county are working the cone of the upper coal measure, which varies in thickness from twelve to twenty-two inches in thickness. There are ten mines in operation in the county, all in the neighborhood of Carbon. The mines of this county do a good business in the winter season as there is no coal west, north nor east of them, and the farmers of the north part of the county all depend on the Carbon mines for fuel, as railroad coal sells at the railroad stations at from thirteen to seventeen cents per bushel, while the mines at Carbon pay seven cents per bushel for mining and sell the coal for ten cents. The mines are worked on the long wall plan.

PAGE COUNTY.

The mines of this county are all located along the Nodaway river. Those at Clarinda are worked on the room and pillar plan, while those at Shambaugh are worked on the long wall system. The coal belongs to the upper coal measures.

There has never been any prospecting done in this county for seams of coal below the one they are working only at one place. Mr. Sam-

uel Pinkerton of Shambaugh drilled a hole down from the bottom of his shaft (which is 110 feet deep) until he reached a depth of about 400 feet, but without any success.

TAYLOR COUNTY.

The mines of this county, like Page and Adams counties, are operating the coal of the upper coal measures. There are seven mines in the county all operated by shafts, and are all operated to supply a local trade. The coal of this coal measure is never found over twenty-two inches in thickness, and will not average more than sixteen inches.

NAMES OF MINES AND LOCATION.

APPANOOSE COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Cincinnati Coal Company.....	No. 1 Shaft ..	Cincinnati.	
William Scribfield.....	No. 1 Slope ..	Cincinnati.	
B. Van Manegan.....	No. 1 Slope ..	Cincinnati.	
John Young.....	No. 1 Shaft ..	Griffinville.	
Moses Lynch.....	No. 1 Shaft ..	Griffinville.	
Milton Smith.....	No. 1 Shaft ..	Melrose.	
William Roberts.....	No. 1 Shaft ..	Confidence.	
Edward Mosby.....	No. 1 Shaft ..	Confidence.	
Jacob Knapp.....	No. 1 Shaft ..	Iconium.	
B. B. Parker.....	No. 1 Shaft ..	Livingston.	
Diamond Coal Company.....	No. 1 Shaft ..	Centerville.	
Diamond Coal Company.....	No. 2 Shaft ..	Centerville.	
Centerville Coal Company.....	No. 1 Shaft ..	Centerville.	
Watson Coal Company.....	No. 4 Shaft ..	Centerville.	
James Wilson.....	No. 1 Shaft ..	Centerville.	
Thomas McClard.....	No. 1 Shaft ..	Centerville.	
Scandinavian Coal Company.....	No. 1 Shaft ..	Centerville.	
G. H. Talbert.....	No. 1 Shaft ..	Centerville.	
Samuel Norris.....	No. 1 Shaft ..	Centerville.	
John Gordon.....	No. 1 Shaft ..	Centerville.	
Co-Operative Coal Company.....	No. 1 Shaft ..	Centerville.	
Walnut Coal Company.....	No. 1 Drift ..	Brazill.	
Philby Coal Company.....	No. 1 Drift ..	Brazill.	
Tipton Coal Company.....	No. 1 Shaft ..	Brazill.	
Hawkeye Coal Company.....	No. 1 Shaft ..	Brazill.	
B. F. Silknetter.....	No. 1 Shaft ..	Brazill.	
William Bradley.....	No. 1 Shaft ..	Numa.	
James Johns.....	No. 1 Shaft ..	Numa.	
John Dickenson.....	No. 1 Drift ..	Dean.	
Ellis Moore.....	No. 1 Drift ..	Dean.	
A. M. Elgin.....	No. 1 Drift ..	Walnut City.	
A. M. Elgin.....	No. 2 Drift ..	Walnut City.	
George McCloud.....	No. 1 Drift ..	Walnut City.	
N. H. Nash.....	No. 1 Shaft ..	Walnut City.	
Jenison Huston.....	No. 1 Drift ..	Walnut City.	
E. Foster.....	No. 1 Drift ..	Walnut City.	
J. A. Lynch.....	No. 1 Drift ..	Walnut City.	
Mace Jackson.....	No. 1 Drift ..	Walnut City.	
John Remy.....	No. 1 Drift ..	Walnut City.	
A. F. Graham.....	No. 1 Shaft ..	Dennis.	
Thomas Frowse.....	No. 1 Shaft ..	Dennis.	

NAMES OF MINES—CONTINUED.

ADAMS COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Sypert & Jones.....	No. 1 Shaft ..	Carbon.	
Thomas Gabbie.....	No. 1 Shaft ..	Carbon.	
N. E. Nelson.....	No. 1 Shaft ..	Carbon.	
Samuel Drake.....	No. 1 Shaft ..	Carbon.	
William Pickard.....	No. 1 Shaft ..	Carbon.	
A. Bell.....	No. 1 Shaft ..	Carbon.	
P. Smith.....	No. 1 Shaft ..	Carbon.	
Geo. Harden.....	No. 1 Shaft ..	Carbon.	
A. Britton.....	No. 1 Shaft ..	Carbon.	
H. Hendricks.....	No. 1 Shaft ..	Carbon.	

BOONE COUNTY.

W. D. Johnson & Co. Coal Co.....	No. 1 Shaft ..	Boonesboro.	
W. C. Shepard Coal, Tile and Brick Co.....	No. 1 Shaft ..	Boonesboro.	
W. C. Shepard Coal, Tile and Brick Co.....	No. 2 Shaft ..	Boonesboro.	
W. C. Shepard Coal, Tile and Brick Co.....	No. 3 Shaft ..	Boonesboro.	
Charles A. Sherman.....	No. 1 Shaft ..	Boonesboro.	
George Rogers.....	No. 1 Shaft ..	Boonesboro.	
George Rogers.....	No. 2 Slope ..	Boonesboro.	
Millford Coal Co.....	No. 1 Shaft ..	Boonesboro.	
James Bulkley.....	No. 1 Shaft ..	Boonesboro.	
Samuel McBirnie.....	No. 1 Shaft ..	Boonesboro.	
McBirnie & Waddell.....	No. 1 Shaft ..	Boonesboro.	
Fluckard & Nelson.....	No. 1 Shaft ..	Boonesboro.	
John Botts.....	No. 1 Shaft ..	Boonesboro.	
William Knox.....	No. 1 Shaft ..	Boonesboro.	
William McBirnie.....	No. 1 Shaft ..	Boonesboro.	
James Wilson.....	No. 1 Shaft ..	Pilot Mound.	
William Zunkle.....	No. 1 Shaft ..	Pilot Mound.	
Dallas Smith.....	No. 1 Shaft ..	Pilot Mound.	
Moingona Coal Co.....	No. 4 Shaft ..	Moingona.	
Moingona Coal Co.....	No. 5 Shaft ..	Angus.	
Hutchinson Bros.....	No. 1 Slope ..	Zenorsville.	
Joseph York.....	No. 1 Slope ..	Zenorsville.	
John Clemons.....	No. 1 Slope ..	Zenorsville.	
John Clemons.....	No. 2 Shaft ..	Zenorsville.	
Northwestern Coal Co.....	No. 1 Shaft ..	Moingona.	
Clyde Coal Co.....	No. 1 Shaft ..	Moingona.	
Peter Scott.....	No. 1 Drift ..	Moingona.	
Patterson & Francis.....	No. 1 Drift ..	Moingona.	
John B. Dyer.....	No. 1 Drift ..	Luther.	
John W. Potter.....	No. 1 Drift ..	Woodward.	
Gilehis & Knox.....	No. 1 Drift ..	Woodward.	
Climax Coal Company.....	No. 1 Shaft ..	Angus.	
Climax Coal Company.....	No. 2 Shaft ..	Angus.	
Climax Coal Company.....	No. 3 Shaft ..	Angus.	
Eagle Coal Company.....	No. 1 Shaft ..	Angus.	
Union Coal Company.....	No. 1 Shaft ..	Ogden.	

NAMES OF MINES—CONTINUED.

DALLAS COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
J. W. Redfield.....	No. 1 Shaft	Redfield.	Redfield.
Alexander Leeper.....	No. 1 Shaft	Redfield.	Redfield.
Stephen Cloud.....	No. 1 Shaft	Redfield.	Redfield.
John Peppard.....	No. 1 Shaft	Redfield.	Redfield.
Thomas Botts.....	No. 1 Shaft	Redfield.	Redfield.
John Davis.....	No. 1 Shaft	Redfield.	Redfield.
Amos Thompson.....	No. 1 Shaft	Redfield.	Redfield.
Martin Fox.....	No. 1 Drift	Bayard.	Bayard.
Benjamin Petit.....	No. 1 Drift	Bayard.	Bayard.
Allen McPherson.....	No. 1 Shaft	Bayard.	Bayard.
J. W. Love.....	No. 1 Drift	Bayard.	Bayard.
Mrs. Mary Duck.....	No. 1 Shaft	Linden.	Linden.
Miss Flovilla Bailey.....	No. 1 Drift	Linden.	Linden.
Chicago & Van Meter Coal Co.....	No. 1 Shaft	Van Meter.	Van Meter.

GUTHRIE COUNTY.

Alexander Lamb.....	No. 1 Shaft	Stuart.	Stuart.
Andrew Muldoon.....	No. 1 Shaft	Stuart.	Stuart.
Daniel McNally.....	No. 1 Drift	Stuart.	Stuart.
George Cooper.....	No. 1 Drift	Stuart.	Stuart.
Benjamin Mills.....	No. 1 Shaft	Stuart.	Stuart.
Andrew Cove.....	No. 1 Shaft	Stuart.	Stuart.
Joseph Gleason.....	No. 1 Shaft	Dale City.	Dale City.
James Burnham.....	No. 1 Shaft	Dale City.	Dale City.
Isaac Ford.....	No. 1 Shaft	Dale City.	Dale City.
J. A. Frasier.....	No. 1 Shaft	Panora.	Panora.
J. A. Spring.....	No. 1 Shaft	Panora.	Panora.
William Butler.....	No. 1 Shaft	Panora.	Panora.
Nathan Mallow.....	No. 1 Shaft	Panora.	Panora.
Peter Digart.....	No. 1 Shaft	Panora.	Panora.
D. D. Reese.....	No. 1 Shaft	Panora.	Panora.
Galager & Sentney.....	No. 1 Shaft	Fansler's.	Fansler's.
Charles Christy.....	No. 1 Shaft	Fansler's.	Fansler's.
Edward Lewis.....	No. 1 Shaft	Fansler's.	Fansler's.
James Butler.....	No. 1 Shaft	Fansler's.	Fansler's.
Daniel Fillmore.....	No. 1 Shaft	Fansler's.	Fansler's.
Robert Chambers.....	No. 1 Shaft	Fansler's.	Fansler's.
John Davids.....	No. 1 Shaft	Fansler's.	Fansler's.
Merchant & Winters.....	No. 1 Shaft	Fansler's.	Fansler's.

NAMES OF MINES—CONTINUED.

GREENE COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Standard Coal Company.....	No. 1 Shaft	Angus.	Angus.
Keystone Coal Company.....	No. 1 Shaft	Angus.	Angus.
Keystone Coal Company.....	No. 2 Shaft	Angus.	Angus.
Climax Coal Company.....	No. 3 Shaft	Angus.	Angus.
Carpenter Bros.....	No. 1 Shaft	Angus.	Angus.
Armstrong Bros.....	No. 1 Shaft	Angus.	Angus.
Isaac Bussey.....	No. 1 Shaft	Angus.	Angus.
Grand Junction Coal Company.....	No. 1 Shaft	Grand Junction.	Grand Junction.

HAMILTON COUNTY.

David Wade.....	No. 1 Drift	Webster City.	Webster City.
S. C. Lester.....	No. 1 Drift	Webster City.	Webster City.
William Silvers.....	No. 1 Drift	Webster City.	Webster City.
John Walker.....	No. 1 Drift	Webster City.	Webster City.
Thomas House.....	No. 1 Drift	Webster City.	Webster City.
Isaac Morrow.....	No. 1 Drift	Webster City.	Webster City.
Benjamin Burton.....	No. 1 Drift	Webster City.	Webster City.
Robert Martin.....	No. 1 Drift	Webster City.	Webster City.
Nathan Claflin.....	No. 1 Drift	Webster City.	Webster City.
Arnold Claflin.....	No. 1 Drift	Webster City.	Webster City.
Joseph Clegg.....	No. 1 Drift	Webster City.	Webster City.
Mike Ward.....	No. 1 Drift	Webster City.	Webster City.
Richard Lane.....	No. 1 Drift	Webster City.	Webster City.
Jerry Robins.....	No. 1 Drift	Webster City.	Webster City.
A. L. Clegg.....	No. 1 Drift	Webster City.	Webster City.
Crouse Bros.....	No. 1 Drift	Kamrar.	Kamrar.
James Shea.....	No. 1 Drift	Kamrar.	Kamrar.
Joseph Bell.....	No. 1 Drift	Homer.	Homer.

HARDIN COUNTY.

John Hall.....	No. 1 Drift	Eldora.	Eldora.
John Madden.....	No. 1 Drift	Eldora.	Eldora.

MARSHALL COUNTY.

D. M. Moninger.....	No. 1 Shaft	Galvin.	Galvin.
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NAMES OF MINES—CONTINUED.

JASPER COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Standard Fuel Company.....	No. 1	Shaft..	Colfax.
Vulcan Coal Company.....	No. 1	Shaft..	Colfax.
Black Heath Mining Company.....	No. 1	Shaft..	Colfax.
Pittsburg Mining Company.....	No. 1	Shaft..	Colfax.
Jasper County Coal and Railway Comp'y	No. 1	Slope..	Colfax.
Gidde Bailey.....	No. 1	Drift..	Colfax.
Scott Slaughter.....	No. 1	Drift..	Colfax.
Jasper County Mining and Railway Co..	No. 1	Drift..	Draper.
Jasper County Mining and Railway Co..	No. 2	Drift..	Draper.
Jasper County Mining and Railway Co..	No. 3	Drift..	Draper.
Robert Davidson.....	No. 1	Shaft..	Newton.
William Snooks.....	No. 1	Shaft..	Newton.
Brown & Stewart.....	No. 1	Shaft..	Newton.
William Lister.....	No. 1	Shaft..	Newton.
William Kay.....	No. 1	Slope..	Newton.
McAllister & Tenent.....	No. 1	Shaft..	Newton.
Newton Coal Company.....	No. 1	Shaft..	Newton.
J. J. Pritchard.....	No. 1	Shaft..	Prairie City.
C. M. Norris.....	No. 1	Shaft..	Prairie City.

JEFFERSON COUNTY.

Russell & Crew.....	No. 1	Shaft..	Fairfield.
Calloway Stewart.....	No. 1	Drift..	Fairfield.
W. S. Sperry.....	No. 1	Slope..	Perlee.
Jacob Westenhouse.....	No. 1	Slope..	Perlee.
Amos Taylor.....	No. 1	Slope..	County Line.
Daniel Barr.....	No. 1	Slope..	County Line.
S. C. Fry.....	No. 1	Slope..	County Line.
John Beall.....	No. 1	Shaft..	Birmingham.
Jackson Zimmerman.....	No. 1	Slope..	Libertyville.
William Sullivan.....	No. 1	Drift..	Libertyville.
John McGregor.....	No. 1	Shaft..	Lockridge.
Andrew Schutz.....	No. 1	Shaft..	Salina.

KEOKUK COUNTY.

Starr Coal Company.....	A...	Shaft..	What Cheer.
Starr Coal Company.....	B...	Shaft..	What Cheer.
Starr Coal Company.....	C...	Shaft..	What Cheer.
Starr Coal Company.....	D...	Shaft..	What Cheer.
Granger Coal Company.....	F...	Shaft..	What Cheer.
Granger Coal Company.....	G...	Shaft..	What Cheer.
Granger Coal Company.....	H...	Shaft..	What Cheer.
Oory Coal Company.....	No. 1	Shaft..	What Cheer.
Vulcan Coal Company.....	No. 1	Shaft..	What Cheer.
John Blatt.....	No. 1	Shaft..	What Cheer.
Robert Moffet.....	No. 1	Shaft..	What Cheer.
Martin Fisher.....	No. 1	Shaft..	Delta.
Silas Brainard.....	No. 1	Shaft..	Delta.
Sigourney Coal Company.....	No. 1	Shaft..	Delta.
Crescent Coal Company.....	No. 1	Shaft..	Delta.
William Turnbull.....	No. 1	Shaft..	Richland.
William Bennett.....	No. 1	Shaft..	Richland.
William Lewman.....	No. 1	Shaft..	Richland.
Charles Cordes.....	No. 1	Shaft..	Richland.
F. M. Stephenson.....	No. 1	Shaft..	Packwood.

NAMES OF MINES—CONTINUED.

LUCAS COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
White Breast Coal Company.....	No. A	Shaft..	Cleveland.
White Breast Coal Company.....	No. B	Shaft..	Cleveland.
Chariton Coal Company.....	No. 1	Shaft..	Lucas.
A. D. Minshall.....	No. 1	Drift..	Chariton.
Paul Crile.....	No. 1	Drift..	Chariton.
Thompson Woodbury.....	No. 1	Drift..	Chariton.
William Griffin.....	No. 1	Drift..	Chariton.
George Willoughby.....	No. 1	Drift..	Chariton.
James Hall.....	No. 1	Drift..	Chariton.
J. F. Spiker.....	No. 1	Drift..	Chariton.
Henry Carney.....	No. 1	Drift..	Chariton.
Zero Coal Company.....	No. 1	Shaft..	Zero.

MARION COUNTY.

Union Coal and Mining Company.....	No. 5	Drift..	Flagler.
Oak Hill Coal Company.....	No. 1	Drift..	Flagler.
John A. Scott.....	No. 1	Drift..	Otley.
John A. Scott.....	No. 2	Drift..	Otley.
William Penfield.....	No. 1	Shaft..	Otley.
S. S. Roberts.....	No. 1	Shaft..	Otley.
Henry Bosquet.....	No. 1	Shaft..	Pella.
William Franklin.....	No. 1	Slope..	Pella.
William Thompson.....	No. 1	Slope..	Pella.
Girt Harnese.....	No. 1	Shaft..	Pella.
Lundest Van Steinbergen.....	No. 1	Drift..	Pella.
B. F. Wilson.....	No. 1	Drift..	Pella.
J. Bingham.....	No. 1	Drift..	Gosport.
R. Richards.....	No. 1	Drift..	Columbia.
Williams & Company.....	No. 1	Shaft..	Pleasantville.
J. M. Terry.....	No. 1	Slope..	Pleasantville.
Otho Clark.....	No. 1	Slope..	Pleasantville.
T. K. Mobley.....	No. 1	Slope..	Pleasantville.
M. A. Crookham.....	No. 1	Shaft..	Pleasantville.
Samuel Oxenreider.....	No. 1	Drift..	Lacona.
Rudolph Miller.....	No. 1	Drift..	Lacona.
Samuel Myers, Jr.....	No. 1	Drift..	Lacona.
Huston Fogle.....	No. 1	Drift..	Lacona.
Alphus Baner.....	No. 1	Shaft..	Lacona.
Ford Coal Company.....	No. 1	Drift..	Ford.
J. R. Taylor.....	No. 1	Drift..	Ford.
J. R. Taylor.....	No. 2	Drift..	Ford.
Martin & Ash.....	No. 1	Drift..	Ford.
David Reese.....	No. 1	Drift..	Ford.
Stephen Jones.....	No. 1	Drift..	Ford.
A. J. Williams.....	No. 1	Drift..	Ford.
Levi Patterson.....	No. 1	Shaft..	Des Moines.
Central Iowa Coal Company.....	No. 1	Shaft..	Des Moines.
Red Rock Coal and Mining Company.....	No. 1	Drift..	Des Moines.
Red Rock Coal and Mining Company.....	No. 2	Drift..	Des Moines.
Red Rock Coal and Mining Company.....	No. 3	Drift..	Des Moines.
Hamilton Coal Company.....	No. 1	Shaft..	Des Moines.

NAMES OF MINES—CONTINUED.

MARION COUNTY—CONTINUED.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Samuel Buckman.....	No. 1	Slope ..	Knoxville.
J. T. James.....	No. 1	Shaft ..	Knoxville.
Swan Coal and Mining Company.....	No. 1	Shaft ..	Knoxville.
James Boutin	No. 1	Drift ..	Marysville.
John Yenzer.....	No. 1	Shaft ..	Marysville.
Clark & Lever.....	No. 1	Drift ..	Marysville.
James Blackburn.....	No. 1	Drift ..	Bussey.
David Rice	No. 1	Drift ..	Attica.

MONROE COUNTY.

Avery Coal Company.....	No. 1	Slope ..	Avery.
Samuel Wignal.....	No. 1	Slope ..	Avery.
Charles Carlo.....	No. 1	Drift ..	Avery.
James Sidden.....	No. 1	Drift ..	Avery.
James Riddlebaugh.....	No. 1	Slope ..	Avery.
Eureka Coal Company.....	No. 1	Shaft ..	Avery.
R. H. Ingram.....	No. 1	Shaft ..	Albia.
Albia Coal Company.....	No. 1	Shaft ..	Albia.
Great Western Coal Company.....	No. 1	Shaft ..	Albia.
Iowa and Wisconsin Coal Company.....	No. 1	Shaft ..	Albia.
Enterprise Coal Company.....	No. 1	Shaft ..	Albia.
G. W. Hartzer.....	No. 1	Shaft ..	Albia.
John Memley.....	No. 1	Shaft ..	Albia.
Moses Hatch.....	No. 1	Shaft ..	Albia.
E. Newman.....	No. 1	Shaft ..	Albia.
Thomas Taylor.....	No. 1	Drift ..	Albia.
H. B. Teller.....	No. 1	Drift ..	Albia.
Hickory Grove Coal Company.....	No. 1	Shaft ..	Hickory Grove.
Allen Bauer.....	No. 1	Drift ..	Dallas.
W. R. Dinwiddie.....	No. 1	Shaft ..	Selection.
W. A. Gray.....	No. 1	Shaft ..	Selection.
George W. Cowles.....	No. 1	Shaft ..	Selection.
Jemima Wilson.....	No. 1	Shaft ..	Selection.
Union Coal Company.....	No. 1	Shaft ..	Fredrick.

NAMES OF MINES—CONTINUED.

MAHASKA COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Consolidation Coal Company.....	No. 1	Slope ..	Muchakinoek.
Consolidation Coal Company.....	No. 2	Slope ..	Muchakinoek.
Consolidation Coal Company.....	No. 3	Slope ..	Muchakinoek.
Consolidation Coal Company.....	No. 5	Shaft ..	Muchakinoek.
L. R. Thompson.....	No. 1	Drift ..	Muchakinoek.
Excelsior Coal Company.....	No. 1	Shaft ..	Excelsior.
Excelsior Coal Company.....	No. 2	Shaft ..	Excelsior.
Excelsior Coal Company.....	No. 3	Shaft ..	Excelsior.
Andrew Moore.....	No. 1	Slope ..	Eddyville.
O. H. Vance.....	No. 1	Shaft ..	Eddyville.
Marshall Underwood.....	No. 1	Shaft ..	Eddyville.
Henderson England.....	No. 1	Slope ..	Eddyville.
William Evans.....	No. 1	Slope ..	New Sharon.
Robert Evans.....	No. 1	Slope ..	New Sharon.
Samuel Ream.....	No. 1	Drift ..	Tracy, Marion Co.
William Hallowell.....	No. 1	Drift ..	Tracy, Marion Co.
Iowa Coal Company.....	No. 1	Shaft ..	Beacon.
Iowa Coal Company.....	No. 2	Slope ..	Beacon.
James Morrow.....	No. 1	Shaft ..	White Oak.
John Chilcoat.....	No. 1	Drift ..	Eddyville.
George L. Shumaker.....	No. 1	Slope ..	Leighton.
Leighton Coal & Mining Co.....	No. 1	Drift ..	Leighton.
O. O. Chapman.....	No. 1	Slope ..	Olivet.
Jacob Heightman.....	No. 1	Shaft ..	New Sharon.
Hugh Smith.....	No. 1	Slope ..	New Sharon.
American Coal Company.....	No. 1	Slope ..	Oskaloosa.
American Coal Company.....	No. 1	Slope ..	Oskaloosa.
Acme Coal Company.....	No. 2	Shaft ..	Oskaloosa.
Western Union Fuel Company.....	No. 1	Shaft ..	Oskaloosa.
Nathan Hussey.....	No. 1	Shaft ..	Oskaloosa.
Samuel Cable.....	No. 1	Shaft ..	Oskaloosa.
Samuel Smith.....	No. 1	Shaft ..	Oskaloosa.
Howard & Sons.....	No. 1	Shaft ..	Oskaloosa.
Standard Coal Company.....	No. 1	Shaft ..	Oskaloosa.
John Burgess.....	No. 1	Shaft ..	Oskaloosa.
Joseph Davenport.....	No. 1	Shaft ..	Oskaloosa.
W. N. Hoover.....	No. 1	Shaft ..	Oskaloosa.
William Barrowman.....	No. 1	Shaft ..	Oskaloosa.

PAGE COUNTY.

Marshall & Cooper.....	No. 1	Shaft ..	Clarinda.
Rhodes & Clowsier.....	No. 1	Shaft ..	Clarinda.
Robert Aikins.....	No. 1	Slope ..	Shambaugh.
W. McClain.....	No. 1	Shaft ..	Shambaugh.
J. M. Wilson.....	No. 1	Shaft ..	Shambaugh.
Samuel Pearson.....	No. 1	Shaft ..	Shambaugh.
Isaac Jones.....	No. 1	Shaft ..	Shambaugh.
Samuel Pinkerton.....	No. 1	Shaft ..	Shambaugh.

NAMES OF MINES—CONTINUED.

POLK COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine	Kind of mine	POST-OFFICE.
Coon Valley Coal and Mining Company..	No. 1	Shaft..	Des Moines.
Walnut Coal and Mining Company.....	No. 1	Shaft..	Des Moines.
Garver Coal Company.....	No. 1	Shaft..	Des Moines.
Giant Coal Company.....	No. 1	Shaft..	Des Moines.
Giant Coal Company.....	No. 2	Shaft..	Des Moines.
Giant Coal Company.....	No. 3	Shaft..	Des Moines.
Eureka Coal Company.....	No. 1	Shaft..	Des Moines.
Wabash Coal Company.....	No. 1	Slope..	Des Moines.
Pioneer Coal Company.....	No. 1	Shaft..	Des Moines.
Polk County Coal Company.....	No. 1	Shaft..	Des Moines.
Diamond Coal Company.....	No. 1	Shaft..	Des Moines.
Des Moines Coal Company.....	No. 1	Shaft..	Des Moines.
Aetna Coal Company.....	No. 1	Shaft..	Des Moines.
Runnells Coal Company.....	No. 1	Slope..	Des Moines.
Union Coal Company.....	No. 1	Shaft..	Des Moines.
Pleasant Hill Coal Company.....	No. 1	Shaft..	Des Moines.
Eclipse Coal Company.....	No. 1	Shaft..	Des Moines.
Two Rivers Coal and Mining Company.	No. 1	Shaft..	Des Moines.
G. Van Ginkle.....	No. 1	Shaft..	Des Moines.
Joshua Chambers.....	No. 1	Drift..	Avon.
L. D. Lang.....	No. 1	Drift..	Avon.
William Leid.....	No. 1	Shaft..	Avon.
William Dawson.....	No. 1	Drift..	Rising Sun.
Altoona Coal and Mining Company.....	No. 1	Shaft..	Altoona.

SCOTT COUNTY.

Phelix Mactin.....	No. 1	Shaft..	Buffalo.
Phelix Mactin.....	No. 2	Drift..	Buffalo.
Samuel James.....	No. 1	Shaft..	Buffalo.
Samuel James.....	No. 2	Shaft..	Buffalo.
Bennett & Flair.....	No. 2	Shaft..	Buffalo.
Charles G. Rowan.....	No. 2	Shaft..	Buffalo.
Charles G. Rowan.....	No. 2	Shaft..	Buffalo.
Robert Williams.....	No. 1	Shaft..	Buffalo.
Marion Murrey.....	No. 1	Shaft..	Buffalo.
Edward Winfield.....	No. 1	Shaft..	Buffalo.

NAMES OF MINES—CONTINUED.

TAYLOR COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine	Kind of mine	POST-OFFICE.
John Lindsay.....	No. 1	Shaft..	Newmarket.
W. H. Drewnell.....	No. 1	Shaft..	Newmarket.
Nathan Easter.....	No. 1	Shaft..	Newmarket.
Benjamin Anderson.....	No. 1	Shaft..	Newmarket.
Gomer Beyrion.....	No. 1	Shaft..	Villisca.
Nathan Wilcox.....	No. 1	Shaft..	Villisca.
Jack Monroe.....	No. 1	Shaft..	Villisca.

VAN BUREN COUNTY.

Templeton Harris.....	No. 1	Drift..	Bonaparte.
Meek Bros.....	No. 1	Drift..	Bonaparte.
Whitmore & Miller.....	No. 1	Drift..	Bonaparte.
Benjamin Wagner.....	No. 1	Drift..	Bonaparte.
Christy & Israel.....	No. 1	Drift..	Bonaparte.
Carson & Walker.....	No. 1	Shaft..	Doud's Station.
William Doud.....	No. 1	Shaft..	Doud's Station.
J. Avery.....	No. 1	Shaft..	Selma.
Allen Overturf.....	No. 1	Shaft..	Selma.
Hosmer & Murphy.....	No. 1	Shaft..	Farmington.
C. H. Scott.....	No. 1	Slope..	Farmington.
Ephraim Downard.....	No. 1	Drift..	Utica.
Ambrose Warner.....	No. 1	Drift..	Utica.
Thomas Teal.....	No. 1	Drift..	Utica.
David Cox.....	No. 1	Drift..	Hillsboro.
Thomas Rice.....	No. 1	Drift..	Hillsboro.
E. P. Brownfield.....	No. 1	Drift..	Hillsboro.
T. E. Taylor.....	No. 1	Drift..	Wilson.
Isaac Koonts.....	No. 1	Shaft..	Leando.

NAMES OF MINES—CONTINUED.

WEBSTER COUNTY.

NAME OF COMPANY OR FIRM	Name of mine	Kind of mine	POST-OFFICE.
Mills & Everett.....	No. 1	Drift ..	Kalo.
O. B. Tortlett.....	No. 1	Drift ..	Kalo.
S. Hilderbrand.....	No. 1	Drift ..	Kalo.
Craig Coal Company.....	No. 1	Drift ..	Kalo.
Craig Coal Company.....	No. 2	Drift ..	Kalo.
Craig Coal Company.....	No. 3	Drift ..	Kalo.
Parle Coal Company.....	No. 1	Shaft ..	Kalo.
Carlson Coal Company.....	No. 1	Drift ..	Kalo.
Standard Coal Company.....	No. 1	Drift ..	Kalo.
Standard Coal Company.....	No. 2	Drift ..	Kalo.
John Barnes.....	No. 1	Drift ..	Kalo.
William Stanbra.....	No. 1	Drift ..	Kalo.
Walter Ervin.....	No. 1	Drift ..	Kalo.
William Hydeman.....	No. 1	Drift ..	Kalo.
John Lloyd.....	No. 1	Drift ..	Kalo.
James Lynch.....	No. 1	Shaft ..	Fort Dodge.
Frank Collins.....	No. 1	Shaft ..	Fort Dodge.
David Strain.....	No. 1	Slope ..	Fort Dodge.
Thomas Collins.....	No. 1	Slope ..	Coalville.
Mumm & Keefe.....	No. 1	Slope ..	Coalville.
Mumm & Keefe.....	No. 2	Slope ..	Coalville.
L. Dupleas.....	No. 1	Slope ..	Coalville.
Alf. Davis.....	No. 1	Slope ..	Coalville.
Webster Rhodes & Company.....	No. 1	Slope ..	Coalville.
James Martin.....	No. 1	Slope ..	Coalville.
Fort Dodge Coal Company.....	No. 4	Slope ..	Coalville.
Fort Dodge Coal Company.....	No. 5	Shaft ..	Coalville.
Crooked Creek Coal Company.....	No. 1	Slope ..	Lehigh.
Crooked Creek Coal Company.....	No. 2	Slope ..	Lehigh.
Crooked Creek Coal Company.....	No. 3	Slope ..	Lehigh.
Cory Coal Company.....	No. 1	Slope ..	Lehigh.
John C. King.....	No. 1	Slope ..	Lehigh.
Thomas Parks.....	No. 1	Slope ..	Lehigh.
Vuton Peterson.....	No. 1	Slope ..	Lehigh.
W. Barrowman.....	No. 1	Slope ..	Lehigh.
George Williams.....	No. 1	Slope ..	Lehigh.
Burlin Smith.....	No. 1	Slope ..	Lehigh.
James Lewis.....	No. 1	Slope ..	Lehigh.
James Harper.....	No. 1	Shaft ..	Lehigh.

NAMES OF MINES—CONTINUED.

WAPELLO COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Carver Coal Company.....	No. 1	Slope ..	Ottumwa.
Carver Coal Company.....	No. 2	Slope ..	Ottumwa.
Carver Coal Company.....	No. 3	Shaft ..	Ottumwa.
Elias Kitterman.....	No. 1	Slope ..	Ottumwa.
W. E. Chambers.....	No. 1	Shaft ..	Ottumwa.
Ira Phillips.....	No. 1	Shaft ..	Ottumwa.
Jacob Mier.....	No. 1	Shaft ..	Ottumwa.
Michael Mier.....	No. 1	Shaft ..	Ottumwa.
Jacob Ream.....	No. 1	Shaft ..	Ottumwa.
Fred Metzgar.....	No. 1	Shaft ..	Ottumwa.
W. J. Baker.....	No. 1	Shaft ..	Ottumwa.
Jacob Schick & Co.....	No. 1	Shaft ..	Ottumwa.
M. Ochsclager.....	No. 1	Shaft ..	Ottumwa.
William Shepherd.....	No. 1	Shaft ..	Ottumwa.
William Carter.....	No. 1	Shaft ..	Ottumwa.
William Munley.....	No. 1	Drift ..	Ottumwa.
Kirkpatric & Son.....	No. 1	Shaft ..	Ottumwa.
M. H. Godley.....	No. 1	Slope ..	Eldon.
Phillip Datts.....	No. 1	Slope ..	Eldon.
Thomas McGlothlin.....	No. 1	Slope ..	Eldon.
Hugh Clark.....	No. 1	Slope ..	Eldon.
Eldon Coal and Mining Company.....	No. 1	Slope ..	Ottumwa.

WAYNE COUNTY.

L. F. Thatcher.....	No. 1	Shaft ..	Seymour.
Occidental Coal Company.....	No. 1	Shaft ..	Seymour.
Peter Ripper.....	No. 1	Shaft ..	Kniffln.
Martin Davis.....	No. 1	Shaft ..	Plano.
Plano Coal Company.....	No. 1	Shaft ..	Plano.
Thomas Burland.....	No. 1	Shaft ..	arvard.
David Munn.....	No. 1	Shaft ..	Ormanville.
Pleas Balin.....	No. 1	Shaft ..	Ormanville.

NAMES OF MINES—CONTINUED.

WARREN COUNTY.

NAME OF COMPANY OR FIRM.	Name of mine.	Kind of mine.	POST-OFFICE.
Joseph Edgerton.....	No. 1	Drift ..	Madora.
W. B. Jacobs.....	No. 1	Drift ..	Liberty Center.
Samuel T. Burgess.....	No. 1	Drift ..	Milo.
Nathan D. Bales.....	No. 1	Shaft ..	Milo.
John B. Williams.....	No. 1	Shaft ..	Milo.
W. A. Wright.....	No. 1	Shaft ..	Milo.
Aaron Beem.....	No. 1	Shaft ..	Sandyville.
Ephriam Conklin.....	No. 1	Shaft ..	Sandyville.
Allen Banner.....	No. 1	Drift ..	Baner.
Robert Nicholson.....	No. 1	Shaft ..	Carlisle.
Charles Voice.....	No. 1	Drift ..	Carlisle.
Henry Schuler.....	No. 1	Shaft ..	Carlisle.
H. Fogle.....	No. 1	Slope ..	Locona.
S. H. Needley.....	No. 1	Drift ..	Locona.
Samuel Myers, Jr.....	No. 1	Drift ..	Locona.
A. D. Sheepe.....	No. 1	Drift ..	Locona.
J. Gressbaum.....	No. 1	Drift ..	Locona.
Freeman & Penwell.....	No. 1	Drift ..	Locona.
J. B. Gardiner.....	No. 1	Slope ..	Locona.
A. B. Higbee.....	No. 1	Drift ..	Locona.
A. H. Swan & Co.....	No. 1	Shaft ..	Indianola.
Lumsden Bros.....	No. 1	Shaft ..	Summerset.
Russell & Co.....	No. 1	Shaft ..	Summerset.
D. K. Jones.....	No. 1	Shaft ..	Summerset.
Levi Simmons.....	No. 1	Shaft ..	Summerset.
Brown & Lord.....	No. 1	Shaft ..	Summerset.
William Crow.....	No. 1	Drift ..	Norwalk.
J. P. Cotman.....	No. 1	Shaft ..	Norwalk.
George Dillard.....	No. 1	Shaft ..	Springhill.

RECOMMENDATIONS.

I have very few amendments to urge to the mining law. Some may think strange that there should be a demand made for amendments to a law only passed the last session of the Legislature, but the present mining law has about doubled the work of the Inspector, and under the old law there was too much work for one man to do; so that since the passage of the present law it becomes an absolute necessity, as justice cannot be done to operator or miner unless something is done so that the inspection force can be increased. The most essential amendment would be to allow at least two more Inspectors. It will be seen by reference to the foregoing tables that there are 489 mines in operation in this State, and it is not necessary to enter into a lengthy argument to convince any one that there is too much work for one man to do. I would therefore recommend that the law be so amended that there could be three Inspectors—one chief Inspector and two assistants. I am convinced that that would be better than to divide the State into districts, as all reports could be embodied in one, and the work be done better, time could be economized, and better results would follow. I am confident that a law similar to the one now in operation in Ohio, in regard to the inspection force, would be what is needed in this State. I have had to work under disadvantages on the account of having to run all over a judicial district to find a district attorney, but as the law authorizing counties to elect county attorneys will go into effect in 1886, I deem it not necessary to make any changes in the mining law in that respect.

I am confident that with three inspectors to enforce the mining law, that much good can be accomplished, as all the operators could then be forced to comply with the law, and in that way both operators and miners would be satisfied.

TABLE OF THE PRESSURE OF AIR AT DIFFERENT HEIGHTS OF THE BAROMETER.

Height of Barometer.	Pressure per square inch.	Pressure per square foot.
27.0 inches.	13.25 pounds.	1908.23 pounds.
27.25 "	13.37 "	1925.89 "
27.5 "	13.49 "	1943.56 "
27.75 "	13.61 "	1961.23 "
28.0 "	13.74 "	1978.90 "
28.25 "	13.86 "	1996.56 "
28.5 "	13.98 "	2014.24 "
28.75 "	14.11 "	2031.91 "
29.0 "	14.23 "	2049.58 "
29.25 "	14.35 "	2067.24 "
29.5 "	14.47 "	2084.91 "
29.75 "	14.60 "	2102.58 "
30.0 "	14.72 "	2120.25 "
30.25 "	14.84 "	2137.92 "
30.5 "	14.96 "	2155.59 "
30.75 "	15.09 "	2173.26 "
31.0 "	15.21 "	2190.93 "

To find the pressure per square inch in pounds, multiply the reading of the barometer in inches by .4908. To find the pressure per square foot in pounds, multiply the reading of the barometer in inches by 70.6752.

GASES MET WITH IN MINES.

The gases generated in coal mines are fire-damp, after-damp, sometimes called choke-damp, black-damp, and white-damp.

Fire-damp is light carburetted hydrogen, and consists of one volume of the vapor of carbon, and two volumes of hydrogen condensed into one volume. This gas is never met with in the mines of this State.

Black-damp is the carbonic acid gas of chemistry, and is the principal gas met with in the mines of this State. It is composed of two atoms of oxygen and one atom of carbon, and by weight, oxygen 72.73, carbon 27.27, and by volume one each; and it is rather more than one and one half times as heavy as an equal volume of common air, the specific gravity of common air being 1,000, while that of carbonic acid gas is 1,524.01. 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, the excrementitious deposits of men and animals, and it also exudes from the roof and floor of the mine.

Black-damp in its pure state is a deadly poison, and will neither support life nor light. When ten per cent of black-damp is diffused through the air of a mine, a light cannot be maintained, but when mixed with a certain portion of pure air, a miner can remain for considerable time after his light has refused to burn. Its effect on the miner is such as to produce headache, languor, loss of appetite and general debility. This gas is mistaken for something else from the position it is sometimes found to occupy in the mines, as a great many miners think that if they are working in a place elevating from the entry that black-damp will not molest them, as the gas is heavier than common air it would force itself out into the air-way and would not remain in a room driven at an elevation off the stairway; but this is not the case.

Black-damp is sometimes held in suspension in a room elevating from an air-way; for instance, if a room is turned off the air-way, and the current of air is passing the mouth of the room and has no chance to exert any of its force at any other place in the room, then if black-damp should accumulate, and no car or anything else to cause a current in the room—under such circumstances, black-damp will accumulate and remain until a current of air is brought to bear upon it.

But some claim that as black-damp is one and one half times as heavy as common air, that it is not reasonable to suppose that it can be held in suspension at an elevation from the air-way by the passing current of air in the air-way. Let us see: Take, for instance, an air-way five feet wide and five feet high—the sum of its four sides would be twenty feet of resisting surface for each foot in length of the air-way. Now, suppose the room-mouth is five feet wide and five feet high, then the room-mouth would present the same resisting surface as the air-way; and as the room-mouth is five feet high and five feet wide, it would give an area of twenty-five feet exposed to the pressure of the moving column of air. The atmospheric pressure varies according to the density of the air. For instance, if the barometer reads thirty inches (see table of the pressure of air at different heights of the barometer), the pressure on all surfaces exposed to the air is 2,120.25 pounds per square foot; therefore, on the mouth of the room

above referred to, there would be a total pressure of 53,006.25 pounds. But there is another fact to be taken into consideration in connection with air pressure: that if we increase the speed of the air in the air-way, we also increase the pressure in the following proportion: If we double the quantity of air in an air-way, we have four times the pressure, and nine times the pressure will produce three times the quantity, and sixteen times the pressure will give four times the quantity, and so on in like proportion. And if the pressure of 2,120.25 pounds per square foot would give a volume of air of one thousand cubic feet per minute; and if the volume of air is increased to two thousand cubic feet, the pressure would then be 8,481 pounds per square foot, or a pressure on the room-mouth of 122,025.10 pounds; and if we increase the volume of air to three thousand feet per minute, then the pressure would be 19,082.25 pounds per square foot, and at the room-mouth it would be 477,056.25 pounds. And if the volume of air is increased to four thousand feet, we would have a pressure per square foot of 33,924 pounds, and on the room-mouth there would be a pressure of 848,100 pounds. In increasing the volume of air from one thousand cubic feet to four thousand, we have increased the pressure at the room-mouth from 53,006.25 pounds to 848,100 pounds; but as we have made no arrangement for this air pressure to exert its influence on any other portion of the room only at the mouth, and as this increased pressure is required to overcome the extra friction of the air current, let us look a little further; for instance, if the current of air, when the volume was one thousand cubic feet per minute, traveled one hundred feet per minute, when the volume was increased to four thousand cubic feet it would be compelled to travel four hundred feet per minute, and would meet with four times the friction, or rubbing surface, in the same length of time. But the air traveling at the speed of four hundred feet per minute, instead of coming in contact with the rubbing surface with a momentum gained from a velocity of one hundred feet, as in the first instance, strikes against the rubbing surface with a momentum gained from a velocity of four hundred feet, and the increased resistance from the greater momentum acquired four times greater than before, and would require the pressure to be increased to sixteen times the original pressure, as shown by the figures above. Therefore, the quantity of air obtained will vary as the square root of the pressure applied, and the pressure will vary as the square of the velocity of the air column, or quantity obtained. And, as before

stated, we have not made any arrangement whereby the air can circulate through this room, therefore, in increasing the volume of air from one thousand feet to four thousand feet, we have only increased the pressure in the room four times, while in the entry we have increased it sixteen times. If black-damp would force itself out of the room under the above circumstances, it would have to be four times as heavy as common air. This fact should be thoroughly understood by mine foremen, to enable them to more intelligently combat with this deadly enemy of the miner, and if this subject was more thoroughly understood, mine bosses would be more willing to provide ways for the air to circulate through the rooms, and would be more particular to see that cross-cuts were provided at the proper time and in the proper place.

I do not wish to convey the idea that I would have a pit boss decrease the current of air under the above circumstances, not by any means; but I have carried out the above figures so as to bring to the minds of those having charge of the distribution of the ventilating current the necessity of providing large and roomy airways, and of splitting or dividing the current of air so as to reach the miner with a fresh supply of air at his working place in the mine. I find in some localities that the pit boss has the rooms driven forty or fifty yards without holing from one room to another, and will then complain of the ventilation in the rooms, when there is a large volume of air passing along the entry from which the room is turned, when, if he would have the miners make a break through from one room to another, he would relieve the ventilating pressure, and by providing breakthroughs between the rooms he would increase the size of the space through which the air would have to pass, thereby reducing the velocity of the air current, and in that way reduce the friction of the air and the pressure necessary to produce a given amount of air. Some may take exception to this, and claim that the friction is not reduced on account of the rubbing surface being increased, but, as before stated, the quantity of air obtained will vary as the square root of the pressure applied, and the pressure will vary as the square of the velocity of the air column or quantity obtained. Now, it must be remembered that about nineteen-twentieths of the air pressure is required to overcome the friction (I am now speaking of Iowa mines), and if we double the velocity of the air in the same airway we in the first place cause twice the quantity of air to meet the resistance in a given time; and in addition to this, of this double quantity, meets

every resistance with a double velocity or momentum. The double quantity of air and the double velocity, taken together, is the reason why we have a four fold resistance. Again, if we treble the velocity of the air we thereby cause three times the number of particles to meet the resistance in each moment of time, and this alone would treble the resistance. But, in addition to this, the treble quantity meets the resistance with three times the momentum, which trebles the three-fold resistance that arises from the three-fold number of particles of air that meet the resistance each moment of time; and for this reason we have a nine-fold resistance for a three-fold quantity of air in a given time, and so on in like proportion. Therefore, from these laws we learn that the quantity of air that will pass through any mine is greater or less as the ventilating pressure is greater or less, but not in the same proportion; when the airways are the same the quantity of air only alters in the proportion of the square root of the pressure; so that a four fold pressure only gives a double quantity of air, and a nine-fold pressure only gives a treble quantity of air. But on the other hand, one-fourth of the pressure still gives one-half of the air, and one-ninth of the pressure gives one-third of the air. The changes in the quantity of air are sluggish as compared with the changes in the ventilating pressure, only varying as its square root. The quantity of air, however, is more sluggish still in reference to the power employed to cause it to circulate. The quantity of air only varies as the cube root of the power and of the quantity of coal burnt to produce it; so that eight times the coal only doubles and twenty-seven times the coal only trebles the quantity of air circulating in a mine, no matter what kind of mechanical ventilation is employed so long as the airways remain in the same condition. Therefore, we must not expect any great general improvement in the ventilation of mines from a mere increase of power, as any increase in the quantity of air in the same airways is slow, small, and costly, compared with the necessary increase of power required to produce it. Therefore, the quantity of air increases as we decrease or lessen the extent of the rubbing surface, but not in the same proportion, but only as the square root of the extent of the rubbing surface. If we could do away with three-fourths of the rubbing surface, other things being the same, we could only double the quantity of air in the mine; if the rubbing surface were reduced to one-ninth the quantity of air circulating per minute would only be increased to three times its previous amount. On the other hand, if the extent of workings and rub-

bing surface were increased four times, or nine times their previous amount, while the area of the airways and the ventilating pressure would remain unaltered; the air would only be lessened to one-half or one-third of its previous amounts respectively by such extensions, if we suppose the size of the airways and the number of splits of air to remain the same, as well as the ventilating pressure in each case.

From these laws then we learn that either to increase the ventilating pressure, or to lessen the extent of rubbing surface exposed to the air circulating in mines, is a very slow and very costly mode of proceeding to increase the amount of ventilation, as the quantity of air circulating in a given time alters so slowly with any alteration that may be made in the ventilating power or pressure in the mere extent of rubbing surface that may be presented to it.

For general improvements we must, therefore, look chiefly in some other direction, owing to these being slow and costly modes of increasing the ventilation of a mine. The same general laws of resistance shows us that if we could reduce the velocity of the air consistently with increasing the quantity circulating in a minute, we should greatly lessen the friction in comparison with the quantity of air circulating, and so obtain an increased quantity for the same amount of friction or by the same ventilating pressure. This object is accomplished by splitting the air, so that instead of allowing the whole of the air to traverse the whole of the workings in one continuous current, it should be divided into different districts of workings, and also brought out in separate channels to a point near the upcast shaft after it has done its work. In this way the extent of the rubbing surface is not lessened on the whole, but the area offered to the air is greatly multiplied; and although the velocity of each current will be reduced, still on the whole the quantity of air in all the splits or divides is very much greater than if they were only one single current in the mine, even when the ventilating pressure is the same.

Therefore, the conclusion that must be arrived at is this: that whenever by any process we can reduce the velocity of the ventilating current and maintain the same amount of air in circulation we have reduced the friction, and if the friction has been reduced the power necessary to overcome the friction has been dispensed with to the same extent; and if the volume of air remains the same after the velocity and friction have been reduced, then undoubtedly the pressure necessary to produce the given amount of air has been reduced also; and when a mining boss thoroughly understands the above facts, and

will divide separate splits or divides for his ventilating current, so that all his underground force can have a fresh supply of air from the intake, and after this current of air has done its work convey it as soon as possible to the upcast shaft, he has reduced the velocity, reduced the friction, reduced the pressure, and dispensed with the need of a certain amount of power to maintain the same amount of air.

White-damp, or carbonic oxide, is composed of one atom of oxygen and one atom of carbon. By weight, it contains 56.69 per cent of oxygen and 43.31 per cent of carbon. Its specific gravity is 975,195, being little less than common air. This gas is more deleterious to animal life than carbonic acid gas, as air containing a very small per cent of white-damp is unfit for respiration. Black-damp will not support combustion, while white-damp will admit the miner's lamp to burn amidst a deadly atmosphere. White damp is produced by imperfect combustion, and can be recognized when burning by its flickering blue flame, which may often be seen in the gob fires of this State. White-damp is frequently met with in the mines of this State, as the refuse of our coal seams are subject to spontaneous combustion; and in some of the mines the coal is blasted off the solid, and a very great amount of powder is consumed, and both, as before stated, produce white-damp.

STRIKES AND LABOR TROUBLES.

There have been several strikes in the last two years in different portions of the State. The strike referred to in my last report as not being settled, at the White Breast mines, in Lucas county, was finally settled by supplanting colored labor, and at the present time a majority of the miners at the White Breast mines are colored men. The strike was settled without any acts of violence being committed.

The only strike of importance, and the one that caused the most bitter feeling between operators and miners, was the strike at What Cheer and Angus. It may seem strange that I would class the strikes at these two places as one strike, but the circumstances are these: The miners at both places made a demand for an increase in wages at the same time, and the operators at Angus told their miners to go to work, and if What Cheer operators paid the price demanded, the

miners at Angus should have the same advance, as the coal from both places was going into the same market. The miners at Angus accepted this proposition, and went to work, while the miners at What Cheer stood out for the price demanded. This was the state of things under which the What Cheer miners were placed at the commencement of their strike. They were contending against the operators of What Cheer, who owned large mining interests in Illinois, and as soon as the mines of What Cheer were laid idle, the operators made a larger demand for coal from their Illinois mines, and what they failed to get from the Illinois mines they could get from Angus, as all the mines at Angus were running full time, so that it made very little difference to the What Cheer operators whether they operated their mines at What Cheer or not, as long as they could get all the coal they wanted to supply their demands. The operators at What Cheer at one time attempted to introduce colored miners, but there was a general uprising of the miners, and by upsetting a wagon loaded with household goods belonging to some of the colored folks, and throwing the wagon, household goods and all, into the creek, the idea of introducing colored labor was abandoned, and the colored people were withdrawn from the mines and sent back to Mahaska county. But all things have an end, and so did the strike at What Cheer. The miners became convinced that they were waging a useless warfare, and went to work. In a few days the miners at Angus made the demand of their operators, which was refused, and then they struck. After they had been on strike about ten days the operators made a proposition to pay an advance of the difference between the freight rates between What Cheer and Angus to Minneapolis. This proposition the miners refused, and both operators and miners settled down to see who could hold their breath the longest. The operators refused to confer with the miners' committee, and the miners would not confer with the operators only through their committee, and thus matters stood. The miners of Angus were in the same condition during their struggle as the miners of What Cheer had been during theirs, for the reason that the Illinois mines were still working, and the coal that was stopped from going into market from Angus was being supplied from Illinois and What Cheer; so that in both cases the demand for coal was being supplied, and could be as long as only one mining camp struck at a time. The operators at Angus, after the mines had been idle for some time, brought in men from Minneapolis and other places north, to take the places of the men on strike. The

miners sent out circulars and committees, asking for help. This call upon the part of the miners was liberally responded to by the mining camps in other portions of the State, and considerable aid was raised for them at a meeting held at the court house in Des Moines. But during this time the operators were increasing the working force in the mines, until the striking miners became boisterous in their demonstrations toward the men that were working, and a call was made on the Governor of the State to send troops to prevent a riot. The Governor responded by sending two companies of State troops, but one company was withdrawn the same day, and the other company, or a portion of it, remained for fourteen days, and was then withdrawn, as everything seemed perfectly peaceable, and in fact was peaceable. But about the time that the last of the troops were withdrawn was about the time that there was a large meeting held in the court house in Des Moines, at which some very inflammatory speeches were made by men that had more political aspirations than brains, or a care for the miners' interests, and the speeches made at this and other meetings by such men led a certain portion of the miners at Angus to believe that they would be sustained in any action they might take, and in a short time they made an assault on the men that were working. The result was that two or three of the men that had been working were unmercifully beaten, and one of their number killed. Immediately after the killing of this man the sheriff of Boone county took one company of State troops and went to Angus, and remained until the men resumed work.

This action on the part of the striking miners of course resulted in the withdrawal of public sentiment and the more rational of the miners saw the situation and accepted the terms offered by the operators in regard to the price paid for mining. By the operators conceding something to the miners in regard to the fuel of the miners, so that work was resumed after a strike of about four months duration, both parties claiming the victory. Thus ended the most bitter strike that has ever been in the State. I am convinced that there never would have been any acts of violence committed at Angus if men who were entirely outside of the coal interest had minded their own business; but if they felt a sympathy for the miner, had put their hands in their pockets and given some money to help support the women and children of the men on strike, instead of making speeches, thinking to tickle the ear of the striking miner and thereby secure his support at some future time.

In my humble opinion there never was a time when there was any need of troops at Angus until after the meeting that was held in the court house in the city of Des Moines. The trouble is that miners, like all other classes of men, have those among them who are very excitable, and during times of strikes, when excited, are what might be termed cranks, and sometimes commit depredations that are looked down on by a great majority of their fellow-miners, and the more conservative miners have enough to do to hold that element in check when there is nobody interfering but operators and miners. But as before stated, when men, with more aspirations than brains, interfere, men who have no sympathy with the striking miner, and cares nothing about him, unless it is to get a fee or to secure his influence politically. When such men interfere in times of strikes they excite the more excitable ones to a point beyond where the conservative ones can control them, and as consequence violence is committed; and when acts of violence are committed, the general public, not being acquainted with the facts, class all miners as law-breakers, when such is not the case by any means.

For this reason miners should be very careful in their meetings, (and this advice might be applied to those outside of the coal business holding meetings during times of strikes), as all parties should advocate moderation and respect for law, remembering that it takes years for miners to live down the prejudice caused by such acts of violence.

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 when men are on a strike the operators have a right to employ new men if they can, on any conditions they choose, to take the place of workmen on strike, and the rights of one are as sacred as the other. But the system of strikes in settling disputes is all wrong. Not a year passes but we are compelled to 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 acquaint themselves with all the circumstances and allow their better judgment to have control.

THE LABOR QUESTION.

The proper solution of the labor problem is very difficult, and the difficulties arising between capital and labor is one of great importance and one that has engrossed the leading minds of the last century all over the world. Great writers on political economy have given to us their ideas upon the great social problem with a diversity of opinion almost equal to their number. And to those might be added carefully prepared and well studied opinions of some of the eminent newspaper editors of the present time. But still the problem is not solved, as the conflict between labor and capital still continues. And yet every one realizes the fact that the world was never so rich in accumulated wealth, comforts of civilization, culture, intelligence and charity. The average condition of the people is better than in any former period.

Civilization through the agitation of the industrial question has reached a higher point and light is breaking all over the civilized world. The material progress made during the last fifty years surpasses that of all other periods of history. In Europe and the United States wealth has increased since 1850 three times faster than the population. Machinery multiplied until its productive power in the United States and England alone is equal to the power of a thousand million men. Prof. Huxley has well said "that the 7,500,000 workers in England can produce as much in six months as would have required one hundred years ago the entire working force of the world one year to equal." In the United States wealth has increased from 1850 to 1884 forty-two thousand, two hundred and forty millions of dollars. And according to Mulhall's estimate since 1830 Great Britain has almost trebled her wealth; France has quadrupled hers, and the United States has multiplied in wealth six fold. And at present we are growing nearly four millions richer at sunset than sunrise each day. The accumulations of Europe and the United States make up daily \$11,000,000 and the increase in population 11,000 daily. It is

estimated that it requires less than one-half of the manual labor that was required in 1865 to produce an equal amount of subsistence.

The domain of nature has been invaded by science until her secret forces have been made subservient to the will of man. During this period great progress has been made in political and intellectual development. The schools, colleges, asylums, hospitals, churches and benevolent institutions found everywhere are the monuments of increasing charity, and in this great march of progress the United States takes the lead. In this rich world this Nation of ours stands the richest. The valuation of property in 1884 was fifty-one thousand, six hundred and seventy millions in round numbers, while that of Great Britain—mother and rival—was more than six thousand millions less. This is a pleasant theme on which to dwell, but while we recount with pride and pleasure the progress made by the nations of Europe and more particularly by the United States, we cannot forget that an undertone of discontent comes up from the people which should make us pause. In the very nation where this advance has been so great there is wide spread depression in trade and commerce, and dissatisfaction among the working people. While all these splendid triumphs in material progress in works of charity and benevolence, the conditions necessary to the first social progress have been too much neglected. In Europe this discontent is due to two causes. One the unfinished struggle for political freedom on the part of the people which has been in progress since the eighteenth century, the protest against privileged classes, monarchy and imperialism. The people learning that they are the source of all political power want their will registered as the law that alone should govern them. This discontent has taken different forms in different nations. It has taken the form of Nihilism in Russia, Socialism in Germany, Communism in France, Radicalism in England and Manonegrism in Spain. These nations have also to deal with another cause, and the one on which the United States is called upon to deal is the industrial question, involving the relation between "capital and labor," employes and employed, the rate of wages and the proper distribution of wealth, which is the recurring question of all civilization and the problem of all ages. The nations of Europe are obliged to meet both problems at the same time, while the settlement of this first problem has made the United States the greatest nation of the world and its people the happiest. The youth of America should never cease to remember and reverence the devo-

tion and heroism of our forefathers who achieved independence and planted a free government in young America.

Honor to the wisdom and patriotism of the immortal Washington who successfully led the armies of America until they established and secured a government by the people and for the people which stood the test of foreign wars; and equal honor should be given to the immortal Lincoln and Grant, who by their wisdom and patriotism enabled the armies of the Northern States from 1861 to 1865 to establish the fact beyond a doubt that a free government could stand the test of civil war, which leaves the United States as she enters on the second century of her existence, still free from all the questions that are agitating the Old World, except the industrial problem.

This question is gaining in importance from several causes; the great increase in population, large immigration from Europe amounting in four years—from 1880 to 1884—to over twenty-four hundred thousand people, over crowding cities, rapid absorption of public lands, consolidation of wealth and the importation of contract labor are reproducing in the eastern and some of the western states many of the economic and social conditions of Europe. In this land of which we love to boast, in the midst of great wealth, with powers of production unsurpassed, with material success unparalleled, and in a land of plenty there is in places the beginning of want. It is estimated that 350,000 workers are without employment upon whose labor more than a million women and children are depending for food, shelter and clothing. And the number could not be estimated who are working on half time and in this way supporting their own existence and the existence of those dependent upon them. This great army of workers stands and waits in vain for the opportunity to earn by honest toil the necessities of life. Many of those who have employment are forced by competition to accept a rate of wages that yields a bare subsistence.

The gap that divides the rich and poor grows wider and deeper daily; with unmistakable signs in the cities of a tendency to classes. In cities the workers are forced into crowded tenement houses where foul air breeds disease and death. The tendency of the population of the United States is to large cities. One hundred years ago one-thirtieth of the population was in town—now more than one fifth is in cities and towns.

These evils have grown with our growth, and are largely the outcome here, as in Europe, of the existing industrial system.

They cause sudden outbursts of condemnation or indignation against wealth, capitalists or corporations.

It would be folly to condemn, as a whole, a system which, with all its faults, has merits, and which has brought us thus far on our onward march and placed us in advance of any other nation on the globe. But in a century the United States will have a population of 200,000,000. It is necessary, therefore, to seriously consider whether we should take the risk of going on under a system that permits such evils as now exist, and encourage industrial war between employer and employed, which, in other nations, has gathered more victims through want than all other wars that have cursed the world.

Whenever the people have not sufficient food, shelter, and clothing death always reaps a rich harvest.

The question is both industrial and social, and concerns not the capitalists nor the wage-receiver exclusively, nor one more than the other, but the whole body of society, and the State itself. It involves a great principle, in the presence of which individual interests become insignificant. No question more serious or of a graver moment ever came before the American people. And upon its right settlement may not only depend the future of society but ultimately the fate of the great republic. This nation is not without experience. A social and industrial question in the early history of our country took the form of slavery, and cast its shadow over our land, finally resting down in dense darkness over one half of it. It grew noiselessly at first, but soon reached such dimensions that it not only threatened our national existence, but brought on the greatest war of modern times. And to preserve the Union and to wipe out the blot of slavery the lives of nearly a million men were laid down, and five thousand million dollars expended, while woe, misery and desolation were brought to unnumbered households throughout the land. It was probably too much to expect that slavery could have been expelled from our social system without war. But we should profit by experience, as we can now see clearly how much better it would have been if the people, the real sufferers, who did not want it could have been spared war. If the great law which governs the evolutions of society and mankind, and always makes for right and justice, had not been forced by the ignorance and passions of men to employ war and destruction to accomplish its purpose. If the leaders and statesmen of those times charged with the welfare of the people and the safety of the Republic, had reasoned calmly and wisely together, and sought the ways

that make for peace, not only would the Union have been preserved, but slavery would have been abolished. Therefore, if only one branch of this industrial problem has recorded such bitter experience in its settlement, what may we not expect of, instead of peaceable methods, war should be invoked to settle other and larger industrial and social problems, in which the people everywhere would take part. The picture is too dark, everything that is good in man, all our wisdom, patriotism, prudence, goodness, charity, the teachings of our religion, the love for our children, and the hope for our posterity, should be invoked to keep us from this awful result. This great Republic, in its morning life, before wrong and injustice have had time to crystalize, with no inherited disposition to *caste*, with all power, in a people advancing in intelligence, and with the future clearly in view, and the question pressing for solution, this would seem the time to begin, and our country the place to solve the problem. To prevent industrial war, to bring about a better distribution of wealth, to regulate the force of competition, to secure to labor a larger share of the products it helps to create, shorter hours of work, thereby insuring longer hours for leisure and improvement, and to lessen the cares and distresses of poverty is an ambition worthy of American manhood. Struggling humanity awaits the action of this great Republic, to see if, after giving man a government on a Christian basis, it will give him industry on a Christian basis, and thus take the next great step in civilization. The question whether labor in America will, in the future, sustain, improve upon, or degrade from its once high condition, is one beside which every other national problem, social, religious, and political, is a matter of trifling moment; for, upon this depends the destiny of the greatest State, and the life of the most beneficent government which the world has ever seen. This Republic is in better condition at the present time to grapple with the industrial question than it ever will be again, and the longer it is put off the harder it will be to settle, for, with our present sparse population in most of the States, the general diffusion of property, both real and personal.

The accumulation of savings are guarantees of peace and order for the present, and permit us to hope that danger is far remote, and that no revolution threatens the form and substance of society and government. We should, therefore, calmly approach the consideration of the question now, and gather information, study causes, avoid the errors of other ages, and seriously consider in a spirit of fairness

what as individuals and as a nation we ought to do; not wait until our territory is densely populated—until New York, San Francisco and other seaboard cities shall give way to cities like London; nor until Chicago, St. Louis, Kansas City and other cities of like dimensions shall be supplanted with a population equal to New York; nor until hundreds of our inland towns have grown to the size of Chicago.

If the settlement of this industrial question is put off until such a time, then other evils will have crept in, and this republic will find itself confronted by many of the obstacles now met with in the Old World. Statistics tell us that to-day the tenement population of New York City, amounting to 500,000, live in 20,000 houses. Here is a population nearly as large as that of Chicago, and larger than that of Boston, St. Louis or Cincinnati. In the tenth ward of New York City there are about 1,000 tenement houses. In 200 of them, from fifteen to twenty families live in each. In the eleventh ward, the population is 68,799—29,043 native and 29,754 foreign-born—the most thickly populated district in the world.

As before stated the tendency of our population is to large cities, and as our territory becomes more densely populated, this tendency to large centers will increase. And should we procrastinate the settlement of the industrial question until such a time, we will find that we have been listening to the song of a siren. It is not the part of wisdom to sit still and hope that social and industrial questions will adjust themselves without giving man any concern. Remedies only follow effort and preparation. We have advanced sufficiently under the inspiration of liberty and knowledge to know that our industrial system should be on a better basis; that strikes, violence and friction between employer and employed should cease, and instead there should be unity of interests, peace and harmony, and with the object of bringing about a fair distribution of the wealth produced.

Labor has organized itself into societies all over the world, but its discussions are one-sided and conflicting. Some demand the ordinary way of remedying the evil, such as forcible division of property, nationalization of land, socialism and communism; but such remedies furnish no relief for existing evils, and have a tendency to widen the breach already existing between capital and labor. There is no natural antagonism between capital and labor. These two forces must act together or not at all. The antagonism is between employes and employed, and comes of error on both sides. The employer seeks to get

as much labor as he can for the smallest wages, while the employed aims to do the smallest amount of labor for the most wages he can get. This, through the law of competition, leads to a constant war of interests where there should be harmony.

This question has another phase besides the proper distribution of wealth, or the proper adjustment of wages. The social features add another difficulty to its solution. It is true that in the United States the wages have advanced in the last twenty-five years, but the wants to be satisfied in order to support life on the same relative plane as before have also increased. And this is right. As the world grows in power of production, man ought to grow in tastes and needs. His desire for a larger and higher state of existence does grow, and ought to grow as fast as the means of satisfying that desire increase. Therefore, the true question is not whether workers receive more than before, but whether they produce more and get a larger proportion of what is produced than before. In this country, where more intelligence and therefore more efficient labor is found than elsewhere, labor secures comparatively higher wages. Workers of the lower grades of intelligence or skill are denied their share of the benefits of a higher civilization if they have to compete, not only with the pauper labor of Europe, but with imported contract labor. Paupers, gathered largely from the almshouses of Europe, arrive almost daily in New York, and seek employment at lower wages than American labor and get it. The result is, they begin the process of becoming Americans by displacing American workers, who have families depending upon them for their daily bread; and with the knowledge that wealth brings social power, position, luxuries and influence, to which they, though born with passions, ambitions and hopes, must remain strangers, and that to all intents and purposes, both they and their children in whom they rejoice, must be forever shut out from associations with the rich, arousing a feeling often harder to subdue than the knowledge that they do not get a fair share of what their labor helps to produce.

The time for labor to get its fair share is not after wealth has been created and distributed, but at the time of its creation. If all property was equally divided among the people and there was no change in the industrial system those that have the most now would get a larger share soon after the division. The right to property legally acquired under the existing system ought never to be disturbed. The question is to secure better distribution in the future.

There is not and never can be too much wealth in the world. All the wealth is needed that the ability and power of individuals and corporations can legally produce. Wealth honestly acquired stands for frugality, thrift, self-denial, personal-effort and personal sacrifice. Labor stands for quite as much and is equally deserving. They are the greatest forces in civilization, without which it would perish. Both alike require and should have in an equal degree all the aid, encouragement and protection that the law of individuals can afford them. If capital is in distress, labor is in trouble; if it leaves a country labor leaves. Injury to capital through individual or state action is damaging to labor. Labor can never gain any advantage from the oppression of capital. Society has to a certain extent grown away from a true appreciation of the dignity and importance of labor. There was a time when there was no capital, but there never was a time since man's existence when there was no labor. In the beginning of societies labor, as it is the real creator, received all it produced and the worker was treated with respect. In our complex civilization man could not exist without the fruits of his labor. Everything that ministers to his wants, tastes, comfort and ease is the result of labor. Therefore, labor in all its departments should be justly remunerated and elevated, and the true dignity of labor recognized. Labor should not be degraded to the level of merchandise and treated as a commodity to be bought and sold and governed entirely by the laws of supply and demand, as that would have a tendency to do away with one redeeming feature of our industrial system, for degraded labor has lost its ambition to raise above its degraded condition; and if that state of affairs was brought about the poor man's son who has been raised in poverty would not have the ambition to raise above the condition under which he was raised. While under our present system the poor man's son of to day may be the man of easy circumstances, and his boy who may profit by his father's habits of economy and self-sacrifice, may be the millionaire of the next generation. Man comes into this world and is taught; property and wealth surround you and are essential to your existence. You need all you can get, and inside of certain limits, often not well defined you must get all you can and it will be yours. In accumulating property you may permit your neighbor to starve though you have more than you need or can use. Yet there is no binding law to oblige you to help him.

How little progress has been made in civilization in this regard over the beasts. What a short distance man has traveled from them;

without conscience they do nearly as well. Their law, the only one they know, is that the strongest takes. Man knows a different law, but too often follows the law of the brute. The restraints laid upon man by civilization in the acquisition of property are but few more than were imposed upon him in a state of nature. What he got then by his own exertions and by force was his. What he gets now, taking advantage of the weak by superior power or by cunning, is his also. Man must be lifted up from this lower level of his nature by education. The subject of education has never received the proper consideration in connection with our industrial system.

In the employment of labor there is no attention paid to education. The habit of employing boys in our mines and manufactories before they can read and write should be prohibited by law, as it has a tendency to bring to manhood a class of wage workers who are as ignorant and consequently as vicious in their habits as the pauper class that are brought over from Europe of which we have such need to fear. To the present industrial organization inherited from Europe there have been added by permission of law features largely of American origin, over-capitalization of corporations, watering of stocks, cornering of food products, reckless creation of bonded debts by States, cities and corporations, all of which are against good morals, tend to promote demoralization and depression in business and reduce the rate of wages, and should be prohibited by law. A large part of the work done in the world is by corporations. They constitute a great force in production and will increase, because man derives advantages and benefits from them which would not be had otherwise.

Corporations properly conducted are all right, if stock-watering and other evils are kept out, as incorporation is but a form of co-operation under the law. The evils that have grown out of corporations come from the abuse of their powers and privileges. The States have the power and should exert it in imposing conditions upon their creation. Heretofore corporations have been organizing mainly as the instruments of capital, but may we not hope that with national laws forbidding the importation of European paupers and contract labor, and with State laws prohibiting the employment of any one under sixteen years of age in any of our mines or manufacturing establishments, unless they have acquired a certain standard of education; that the wage worker would be educated in a few years so that he could combine in his own interests and become in-

corporated under the laws for peaceful and legal action to do their work in a way that will bring them the largest return. Wage workers have made progress through combination, and to some extent have bettered their condition, but never when they have resorted to violence or attempted coercion of their fellow workers, as that is but another form of slavery. Experience has proved that strikes and lock-outs which lead to violence and destruction of property, and sometimes lives, afford no satisfactory relief.

Wage-workers cannot afford to resist the law. By obeying the law, by defending their own interests with knowledge and foresight, and by wisdom and prudence in their conduct, they create a public sentiment which in the end brings justice. The wage worker must learn that the way to aid himself is not through violence or coercion, but through obedience to the law, and that he can, by proper effort, do more to elevate himself and better his condition than can be done for him; that thrift, frugality and economy are needed; that waste and intemperance are his worst enemies.

But there is also much for the capitalist to learn and do. He must learn that as a matter of policy it is safer and better to be just; that by agreeing to divide profits on an equitable basis with the wage-worker he will make more in the long run; and that competition, supply and demand are not the only laws that should govern the industrial world. He must learn that wealth is only a trust, and out of the abundance that has come to him he can afford to spare a portion of it on deeds of charity, in helping the deserving poor and unfortunate.

The methods which promise the best results in solving the industrial problem, after knowledge becomes more universal and society better prepared for their adoption, are boards of arbitration and co-operation; but both of these remedies require an education entirely different from what we now have, as both employer and employed should be educated so they could rise above their prejudices and recognize the great fact that all men are born equal. Arbitration, as a method of settling differences between nations and individuals, has already achieved great triumphs and secured the best results. Then why would it not work equally well between employer and employed? In France and England, arbitration and conciliation have made gratifying progress in adjusting differences between capitalist and worker. The State of Pennsylvania has passed a law providing regulations to govern arbitration of disputes between employer

and employed. Arbitration has been recommended by other States who are closely connected with both employer and employed, and whenever it has been adopted it has always prevented strikes and violence, and promises to do well in the future.

Whenever employer and employed become educated so that they can lay down their irritations and grievances sufficiently to meet as equals and discuss frankly and candidly the disputed issues before a board of arbitration selected by both parties, it will be a great step gained. Incorporated co-operation has made the greatest progress in the Old World. It has been tried to some extent in this country, but in this country, as wherever tried in the old country, co-operation has been retarded by lack of intelligence on the part of the wage-workers.

The wage worker, because of his surroundings, has been deprived of education sufficient to enable him to be intellectually equal with the employer, and for this reason they have been unable to combine, as the wage workers have lacked the ability, training and discipline to manage large or even moderate business enterprises. But educate the worker, furnish him the opportunities for training and discipline, and co-operation will be a success. It must not be presumed that the object sought will bring about an ideal state where all will be equal in power, wisdom, goodness, position, wealth and influence. This can never be. Absolute equality is an impossibility. The relief sought is not equality, but equity and justice. Some will always be wiser, better and stronger than others. Society, however, should be cast and formed on such lines that the good, wise and kind shall govern. This can be done in no other way than by education. Through the difficulties that environ the industrial question, it is plain that some adjustment must be reached by which the war now raging between employer and employed must come to an end, and be superseded by some system that will unite the interests of the employer and those employed. They must become and continue partners instead of enemies in the enterprises they operate. During the process of the creation of wealth there should be such a division between employer and employed that the latter shall secure at least the three essentials of existence: food, clothing and shelter; and in addition, means to subdue sickness, and by frugality and thrift something over for feebleness that grows as the years come on. The wage worker is entitled to this, and should have it. It is a modest, and who will say not a reasonable, demand? Nature has made provision for all her sons. This is an unanswerable reason why all who are worthy should have

enough. The industrial system which does not permit the worthy to get enough must be at fault, and public opinion all over this country is beginning to realize the fact. It is the power of public opinion which is reaching the conclusion that the laws of competition, supply and demand, as applied to the wage receiver, operate unjustly; that the worker does not now, in many cases, get a fair share of what he helps to produce; that he is, in effect, a partner with the capitalist, though not treated as such.

It must be further considered that the wage worker who heretofore has had little to say, is helping now through education to make this public opinion which in the end must stand as the sole judge and final arbitrator of what is just between him and the capitalist. If the capitalist should admit the principle of copartnership, would not he make, in the way of increased profits, nearly, if not all, that he would be called upon to concede? The worker, having a direct interest, would do more and better work. The saving, by better care of property, tools and machinery, and in diminution in the cost of superintendence, would in the aggregate afford a large return to increase the profits. With copartnership between employer and employed, the worker would feel he was more nearly the equal of the capitalist; his pride and ambition would be stimulated to better action, and the sense of inferiority he is made to feel by having no interest in the business would largely disappear. Unity of interests would prevent strikes, and the loss of time and wages and the destruction of property incident to them.

The civilization that has proved the best for man, and that has lifted him up to higher planes than any other, is that built upon and shaped by the teachings of Christ: "Love thy neighbor as thyself;" "Do unto others as you would have them do unto you."

All correct philosophy, all sound teaching and reasoning, conduct us unerringly to these simple truths, which combine in themselves every essential principle necessary to the solution of the industrial problem. A solution based upon these principles would abide, because it would be founded on simple justice between man and man.

THE HYGIENE OF MINES.

The following article on the hygiene of mines is by R. W. Raymond, P. H. D., of New York City, inserted in this report by request:

It is convenient to divide mines with reference to this subject into two classes, collieries and metal mines. Subterranean quarries, rock-salt mines, etc., present no conditions requiring them to be separated from the latter class.

With regard to the hygiene of American collieries (a branch of the subject which I shall not discuss at length), I take the liberty of quoting some excellent observations contained in a recent article by Mr. Henry C. Sheaffer, of Pottsville. Mr. Sheaffer says: "The working miner usually devotes his whole life to that occupation. He frequently, perhaps generally, begins at the age of from eight to twelve years, as a slate-picker in the breaker—the building in which the coal is prepared for market—where his business is to sit all day with twenty or thirty companions of about his own age and pick out fragments of slate from a thin stream of coal constantly flowing past him. The place in which he works is apt to be more or less open and exposed to draughts; his clothing consists of shirt and pantaloons, usually old and ragged; a battered cap and a pair of coarse shoes—the last often omitted in summer. His whole costume, whatever its original color, is soon stained a uniform black by the thick cloud of coal-dust which fills the breaker, filters through his clothing and begrimes his skin and which forms a large component part of the atmosphere he breathes. A boy and man has an invariable practice at the close of every working day, to wash himself thoroughly from head to foot, a custom to which his hardiness and generally rugged health in early life are to be largely attributed. His diet as boy and man is simple; pork, salt fish, potatoes and home-made bread are its staple constituents, but when work is good and money sufficient all the luxuries of the local market are to be found on the miner's table.

He learns to smoke and chew tobacco at an early age; has few or no scruples against the use of either malt or alcoholic liquors, and withal grows to be lusty, sinewy youth who seldom troubles the

doctors unless overtaken by one of the numerous accidents to which his own recklessness, not less than his somewhat dangerous occupation, exposes him. At the age of eighteen or twenty, if he has not previously entered the mine as a driver, or for some other description of boy's work, he goes in as a laborer, becoming in effect though not in name an apprentice to a practical miner, with duties so nearly the same as those of his boss that for the purpose of this article they may be considered identical.

The miner gets to his work shortly before seven o'clock in the morning, if on the day shift, or between five and six in the evening, if on the night shift. He is dressed in flannel shirt, woolen or heavy duck pantaloons, heavy shoes or boots, and usually with a coat thrown loosely over his shoulders. On his head he wears a cap or slouch hat or a helmet shaped like a fireman's, but of smaller dimensions. Whatever the head gear, the lamp, a small tin one, shaped like a miniature coffee-pot, swings by a hook over the visor, unless the place in which he works is fiery, when he carries a safety lamp in his hand. His dinner can and canteen of water or cold tea are swung from a strap passing over his shoulders. Thus equipped he rides down the shaft or the slope, and if he is lucky enough to catch a train of empty mine-wagons going to his working place, he rides in a distance, it may be two or three miles from the foot of the shaft. If no wagons are at hand, he walks most of the way through water and slush, taking small account of wet feet, or, indeed, of wet clothing at any time, though the roof over him may drip all day long. It is an exceptional case if he wears a rubber or oil-cloth suit, even in the wettest places.

Two miners, or two miners and a laborer, form a gang, and their work is an alteration of exhausting physical labor and intervals of rest. They work with drilling-bar, powder and pick, getting down the coal and breaking it to a size small enough to handle; with drills preparing and charging a hole for blasting, with shovels clearing away the coal and getting it into the mine-cars to be sent to the surface; and then when a particular job is done, or a blast is to be fired, they repair to the nearest place of safety, and in their overheated condition sit down in the cool, damp draught of the ventilating current to cool off as rapidly as possible. Is it any wonder that rheumatism, consumption miner's asthma are the common ailment among them? In walking to and from his work, along the mine gangway, the miner tries to step on the sills on which the track is laid, thus

avoiding the hollows worn by the mules' feet between the sills, and as these are laid from two and a half to three and a half feet apart, the effort gives him a long, slow, swinging gait, the head being thrown forward to counterbalance the body. The same posture is found best for traversing the manways and other smaller passages, the long stride being advantageous in picking the way over rough and uncertain ground, while the bent head escapes projections of the roof and permits the light of the lamp in the miner's cap to fall on the ground at his feet. The habit becomes fixed, and the old miner may always be known by his bent shoulders and swinging stride. That this natural compression of the chest cannot but be injurious is evident. Among the most laborious of the miner's duties is setting the timbers which support the roof. The gangway or general passageway of the mine is usually from seven to ten feet in height and about the same in width, seldom falling below these dimensions in American mines.

Where thick beds of coal are worked and the cars are drawn by mule or locomotive power (though in the thin beds of England and Wales they are often so small that a man cannot stand upright in them), the gangway timbers, unless the rock and coal are unusually solid, consist of a prop on each side, with a cross-piece uniting them. They are from ten to fifteen inches thick, of length adapted to the dimensions of the gangway, and being of green wood are correspondingly heavy, weighing from 300 to 500 pounds, according to size; yet three men are not only expected to set the side-pieces, but to lift the heavy cross-beam into position far above their heads and fix it there. The work is so hard, performed as it is beyond the brattice which supplies fresh air, in an atmosphere charged more or less with powder smoke and carbonic acid gas, that by the time it is done all three are thoroughly exhausted and over-heated, and in the most favorable condition for the reception of colds, lung disorders and rheumatism. If working in a steeply-pitching breast, though the timbers are not so large they are quite large enough to tax the strength of the two men who have to get them up a steep and difficult manway by sheer lifting and pulling. In this way, which is almost like working up through a chimney, timbers averaging perhaps eight feet long by six inches thick, are carried to the top of the breast, which may be from sixty to eighty yards above the gangway level.

Mention has been made of the brattice. This is a highly-important

aid to the ventilation of the mine. It is an air tight partition, generally carried along one side of the gangway, though sometimes over its top, and so arranged with reference to the ventilating current that the fresh air is carried along one side of it while the impure air, which is to be withdrawn, passes along the other side. Its object is to keep up a circulation of air in the recess formed by advancing operations at the face of the workings. As every passage or chamber is pushed forward into the solid coal or rock, it necessarily forms a bay in which the air is always stagnant unless moved by some such appliance as the brattice. Communicating passages, called headings, are made between the working chambers, about thirty yards apart, for the same purpose; but as the chamber is opened beyond the heading, a brattice becomes necessary here, also.

One great cause of impurity in the atmosphere in which the miner works, is that the brattice is frequently neglected, and the work pushed so far beyond it that it ceases almost entirely to affect the air at the face, which then becomes loaded with powder smoke and carbonic acid, or, in fiery mines, carburetted hydrogen. In either case, the effect on the miner's health is most injurious.

Of course the principal occupation of the coal miner is cutting and getting out coal; and here again his work is performed under disadvantageous circumstances as regards the preservation of health. Much of it consists in lying on the side, holing under the mass in a low cut, where every stroke of the pick dislodges a fresh shower of dust to be inhaled by the miner. Other portions consist of straining at arms' length to dislodge a mass hanging from the roof; of lifting and tugging at heavy weights; of shoveling continuously, hour after hour (where coal has to be shoveled into the mine-cars the filling of from eight to ten cars, holding three tons each, is considered a day's work for a laborer); and of swinging a heavy sledge in drilling by hand power. His footing is frequently unsteady, having to be maintained on a steep-pitching floor of smooth slate, so that, as a miner once expressed it to a friend of the writer, it is very much like asking a man to stand on the roof of a house while working. There are chasams under foot and loose rocks over head, equally to be avoided, and the whole shrouded in darkness which the miner's lamp reduces only to a semi-obscurity, and which hides without removing the danger.

The miner's life when not at work also has its effect on his general health, and, as with every other class of men, this varies according

to the tastes and temperament of the individual. His house is frame, plainly but conveniently built, and furnished with the necessary conveniences of life. Being situated in the country, and in a section where land is of little or no value for either building or agricultural purposes, there is plenty of space about the house, and fresh air in abundance. Even the close neighborhood of frequent hog-pens and occasional stables, and the universal practice of emptying slops from the house on the ground at the back door, have little or no deleterious effect, being neutralized by the abundance of pure air with which their odors and gases mingle.

The miner's first care on coming from work is to take a tub-bath, cleansing his skin thoroughly. He then dresses in a clean suit, eats his supper, and is ready for the duties and amusements of the evening, both of which are few and simple. Usually the male inhabitants of the patch gather in groups in the open air, in the village store, or in the omnipresent saloon, and smoke and talk until the coming of an early bed-time sends them home. Comparatively little drinking is indulged in except on pay-day, which comes once a month and is celebrated by the drinking classes with a spree. In this particular the miner's nationality makes itself seen. While men of all nations may be found drinking to intoxication, the practice as a race is confined to the Irish.

There are few of American descent among the miners, and these are generally found among the best and steadiest of their class.

The Irish are the most numerous, and they are fond of liquor, drink to excess, and are very quarrelsome when drunk. Terrible fights often accompany a pay-day spree among them. Next to the Irish in numbers are the Welch, a temperate, thrifty and intelligent race, who form a valuable element in the population. They are industrious and economical; generally succeed in securing homes of their own, which they delight in beautifying and keeping in order, and are apt to be found in positions of trust and authority in later life.

Germans and Poles, too, are industrious and economical, but less temperate than the Welch; more careless in their personal habits, and utterly regardless of the laws of health. They eat unwholesome food, sleep in ill ventilated rooms, and early acquire a sallow, unhealthy appearance. Nevertheless, their active occupation, and the enforced cleanliness of the shifting suit counteract many of the ill effects of their mode of living, and they will probably be found to average as long lives as the other races. Less numerous, though making up the

bulk of the population in certain localities are Scotch, English and Italian miners. The last are much like the Irish in habits, while the others hold an intermediate place between them and the Welch. It is, of course to be understood that these remarks apply in general to the nationalities. There are very good workmen and excellent citizens in all classes; and, similarly, there are worthless characters in all, but the general tendency will be found, as has been stated.

As in every other occupation, personal habits have their effect on the constitution, and predispose it to invite or to repel disease. Thus drunkenness causes gray tuberculosis, which the inhalation of dust and noxious gases predisposes to consumption, a very common disease in mining towns.

One of the most prominent conditions of a miner's working-life, certainly the first to be noticed by the casual visitor, is the absence of sunlight, a very deleterious condition, as many physicians and engineers of large practical experience consider it, while others, as positively deny that it has any injurious effect.

Dr. J. T. Carpenter of Pottsville, in a paper read before the Schuylkill County Medical Society, says: (*Transactions Medical Society of Pennsylvania, 1868-9, p. 488.*) The deprivation of sunlight must be a very strongly predisposing cause of disease.

It is to be expected that the results of this deprivation will become apparent in general anæmia in chronic, nervous irritations, in tendencies (easily to be developed by exciting causes) toward scrofula, tubercular, phthisic and allied maladies. Other practitioners however assert that the deprivation of sunlight is among the least of the miners' afflictions; that no injurious effects from it are perceptible, and that no acute disease can be traced either wholly or in part to this cause, while physicians will probably continue to differ for ever as to whether or not absence from sunlight during all the working hours predisposes to prolong any chronic complaint. In this connection it must be borne in mind that the miners work is carried on wholly by artificial light, and that usually of a very poor quality. Not the faintest ray of sunlight can penetrate to him, and about the first thing the unaccustomed visitor usually remarks is that it is so very dark. It needs but a slight exercise of imagination to persuade him that he has at last found a sample of that thick darkness that might be felt which once visited the land of Egypt.

In the winter season, especially when the mines are working full time, their inmates as a rule see but little of the sun during their

working days. They enter the mine before sunrise and quit it after sunset. It is however a very common practice among them to work week about, one week by day and the next week by night. In this case they have at least from four to six hours of every day's daylight during their night week, and in any case they usually spend Sunday above ground. They do not complain of want of sunshine, and it is difficult to trace any ill effects of its absence upon them. Their complexions are pale but not more so than those of persons who work at night or in shaded rooms above ground, and their eyesight as a general thing considering the miserable light they have to work by is remarkably good. Few miners are compelled to wear eye-glasses for either working or reading before reaching old age.

Too much care cannot be exercised to guard against carbonic acid gas in mines. It not only exists in large quantities in a natural state, but is constantly being formed by the exhalations from the lungs of men and animals, the products of combustion in the miner's lamps, the ventilating furnaces, and especially the small locomotive engines now so commonly employed. When mixed with common air it is only safe up to the proportion of five per cent, though it is said that some miners become so accustomed to it that they can breathe an atmosphere charged with twenty per cent of carbonic acid.

Mr. Andrew Roy, State Mine Inspector of Ohio (Third Annual Report, 1876), calls special attention to the insidious workings of this unseen but deadly foe of the miners. The air, he says in speaking of the comparatively shallow mines of Ohio where natural ventilation is depended on to a very great degree, is best in the morning, because the circulation is partially if not wholly renewed in the night during the absence of the miners, but in the afternoon and toward quitting-time it becomes very foul and miners frequently leave work because their lights will no longer burn or because they are so oppressed with languor and headache that they can no longer stay in the mine. The black-damp however is more insidious than direct in its operations, gradually undermining the constitution and killing men by inches. By reason of constant habit young and robust miners are able to stay several hours in a mine after a light goes out for want of fresh air, where a stranger unused to such scenes would fall insensible, and if not speedily removed would die.

Similarly Mr. J. K. Blackwell, appointed British Commissioner of Mines in 1849 with instructions to make an inspection of their sanitary condition reports. There is another class of injuries resulting

from defective ventilation to which miners are exposed. The circumstances producing these injuries are slow in operation and as their effects bring disease and not immediate and sudden death their existence has been little considered. These effects are the result of an inadequate supply of air which has become vitiated and unfit for breathing on account of its having lost its due proportion of oxygen, which is replaced by the formation of carbonic acid. This gas has its sources in respiration, the lights of the mine, the decomposition of small coal in the goaves (cavities of the roof), and of timber in the workings. Air in this state is also usually found to be loaded with carburetted hydrogen, yielded from the whole coal or in the goaves.

Sulphuretted hydrogen arising from the decomposition of pyrites is sometimes present, especially in coat seams, and liable to spontaneous ignition.

The gases formed by blasting are also allowed to load the air of the mines to a very injurious degree. Thomas E. Foster, Government Inspector in 1864, says: "In collieries that I alluded to as being badly ventilated they had no inflammable gas *and that was the reason why they were not well ventilated.* Although you sometimes kill a few men by an explosion, these collieries where they have no inflammable gas kill the men by inches. There are quite as many, in my opinion, killed where there is nothing but carbonic acid gas as where there is inflammable gas. The men's health is naturally destroyed and they kill them by inches. They do not go immediately but they go in for a few years and die."

Attention is especially called to Mr. Foster's remarks. Colliery managers are altogether too prone to think that fire-damp is the only damp that is to be feared and force their men to work year after year in an atmosphere loaded with carbonic acid because in this gas they die slowly and one by one dropping off without any of the dramatic circumstances attending death by explosion. It is cause for congratulation that the improved state of science and the requirements of the mining laws in all civilized countries have greatly improved the condition of the mines with regard to ventilation.

Another evil too commonly met with in coal mines is the cloud of dust with which the air is loaded. Where the coal is kept damp by the percolation of water little dust is made and the miner is comparatively free from injurious effect, but it is exceptional for the coal to be in this condition, and it has been found that the deeper the workings penetrate the less water is found and the drier and more dusty

the coal becomes. Anyone who has seen a load of coal shot from a cart or has watched the thick clouds of dust which sometimes envelop the huge coal-breakers of the anthracite region so completely as almost to hide them from sight, can form an idea of the injurious effect upon the health of constant working in such an atmosphere. The wonder is not that men die of clogged-up lungs, but that they manage so long to exist in an atmosphere which seems to contain at least fifty per cent of solid matter. Ventilation mitigates this evil, but does not obviate it, as a stream of pure water flowing into a muddy pool of which the bottom is being continually stirred up will thin the contents of the pool but will not make them clear. Every fresh stroke of the pick or hammer, every shovelful of coal moved, every fall of a dislodged mass, causes a fresh cloud of dust, until the ventilating current would need to flow with a force little short of a hurricane to keep the miners lungs supplied with unvitiated air. Inspector Roy, who has given much attention to the subject of mine ventilation, says (Report for 1876, p. 92): Constant labor in a badly aired mine breaks down the constitution and clouds the intellect.

The lungs become clogged up from inhaling coal-dust and from breathing noxious air, the body and limbs become stiff and sore and the mind loses the power of vigorous thought. After six years labor in a badly ventilated mine—that is a mine where a man with a good constitution may from habit be able to work every day for several years—the lungs begin to change to a bluish color. After twelve years they are black and after twenty years they are densely black, not a vestige of natural color remaining, and are little better than carbon itself.

The miner dies at thirty-five of coal-miner's consumption. Mr. Roy attributes the frequent strikes and other expressions of discontent among the miners primarily to defective ventilation, saying: "The sources of discontent among miners arise not in my judgment so much in the evil nature of men as in the evil genius of the mines, and no conspiracy laws are needed to compel miners to be law-abiding citizens, but better ventilation to expel the demons of the mines—those noxious gases which in remoter ages the priests of Germany were wont to combat with religious exorcisms."

The following cases reported by Dr. William Thomson show the condition of lungs above referred to: D. C., aged fifty-eight, miner for twelve years, lungs uniformly black and of a carbonaceous color. D. D., aged sixty-two, miner from boyhood, lungs uniformly black. G. H., aged forty-five years, lungs uniformly deep black through their

whole substance with a density equal to caoutchouc. L. A., aged fifty-four years, miner all his life, whole lungs dyed with black carbonaceous matter.

Dr. R. C. Rathburn, of Middleport, Ohio, testified before the Ohio Mining Commission on this subject as follows: "I have made two post-mortem examinations in which there was carbonaceous solidification in the air-cells. The Scotch people call it spurious melanosis, really a coal miner's consumption. I have no doubt the carbonaceous particles caused their death. I examined them after death because before their decease they spit up a black substance whose real character I wished to ascertain. Four cases came to my knowledge."

The black substance referred to is solid carbonaceous matter inhaled while at work. As noted above it is very slow to operate as a direct cause of death, but aggravates diseases of the lungs, acting principally as an irritant. Once in the lungs it remains there ever after manifesting itself in a peculiar black sputum in all cases of expectoration from lung troubles.

Dr. J. T. Carpenter, of Pottsville, in his treatise before quoted, says: "I saw, a short time since, a patient suffering from chronic bronchitis with coal-dust sputa, who had not entered a coal mine for nineteen years. A gentleman, of Pottsville, under my care is now recovering from pneumonia with softening and abscess of the lung, who in former years was engaged in mines, but has not habitually entered them for eight years past. During his recent illness the characteristic black sputum was constant. After what has been said it is evident that the greatest necessity for healthful mining is good ventilation. With air current sufficient to carry off noxious gases, powder-smoke and at least the most of the dust, mining becomes not merely a healthful but an agreeable occupation, notwithstanding all that has been said about its perils and drawbacks. The latter may seem a bold statement to those whose experience in mines is limited to a single visit, but it is the testimony of the great majority of miners and is confirmed by the well-known fact that men who go from farms and shops to work for a season in the mines rarely go back to the old work.

There is something about the comparatively free and easy life of the miner, who is to a great extent his own boss, the uniform temperature which in most mines varies little if any with the seasons and which ranges from 45° to 65° Fahrenheit, according to local circumstances, the year round—and perhaps the spice of danger which is

always present that makes the miner once initiated cling to that work for the rest of his life.

Nor is that life necessarily a short one, though the appalling frequency of easily avoidable accidents reduces its average length far below what it should be. So far as the writer is aware no comparative statistics of the average length of miners' lives or of their liability to disease have ever been published; but old men are common among them and men who have worked thirty, forty or fifty years in the mines and are still hale and hearty for their age are by no means rare. Their principal diseases, as before stated, are miners' asthma, consumption and rheumatism, and among those who have worked long in badly ventilated places dyspepsia, tremors, vertigo and other troubles arising from blood-poisoning. The two principal causes are dampness and bad air. Pumps and precaution obviate the one and proper ventilation the other.

In conclusion it is the opinion of the writer, formed from long and personal acquaintance with the subject and sustained by the almost unanimous testimony of practicing physicians, mining engineers, colliery owners and miners themselves, that were it not for accidental injuries and deaths the mining class would show as good average health, as fair a percentage of longevity and as low a death rate as any other class of manual laborers; that the hygienic conditions of American mines are receiving more attention and consequent improvement year by year; and that if the average miner could only be taught to exercise common sense about his work the list of fatal accidents would lose most or all of the terrors which now invest it in the mind of the general public.

Coming now to the second class of mines I wish to inquire whether the general conclusions expressed by Mr. Shafer with regard to collieries are equally applicable to metal mines?

The chief differences in this country between the sanitary conditions of coal mines and those of metal mines are the following:

1. The coal mines are, as a rule, neither very deep nor very high above the sea level, whereas a large proportion of the metal mines are situated at great altitudes (5,000 to 13,000 feet above tide). The comparative rarity of the atmosphere, though not perhaps injurious to health, *per se*, nevertheless intensifies the changes of temperature to which both the mountain climate and the underground work render the miner liable, and thus promotes certain febrile and rheumatic complaints.

2. Although it cannot be said of American metal mines in general that they are deeper than the coal mines, yet it must be admitted that they grow deep faster and that the deepest of them far exceed our coal mines in this respect. In some cases, notably that of the Comstock Lode, the increase of heat in depth is a very serious inconvenience and injury to the mining work.

3. With rare exceptions metal mines do generate poisonous or explosive gases in large quantities or brief periods. Slow decomposition in the rocks of minerals, such as pyrites, may give rise to sulphurous or sulphydric gases. Carbonic acid may be generated by decaying wood or by the burning candles, or the exhalations of the workmen, but there is no such imminent danger from these sources as threatens the coal miner who may be overwhelmed by a flood of black damp. On the other hand this immunity from sudden catastrophes, due to imperfect ventilation, leads in metal mines to a degree of carelessness in this department of mine engineering of which no one would dare to be guilty at a colliery.

As a rule, therefore, the air is much worse in metal mines than in coal mines. The former are usually left to ventilate themselves according to aerostatic laws, and when changes of wind or season cause a reversal or stagnation of the ordinary current the phenomenon is submitted to with a kind of fatalism.

Miners say that the air is bad in this or that level very much as one would speak in helpless resignation about the weather out of doors. When the heat or foulness of the air at any point actually prevents work remedies are applied, but so long as it is merely an inconvenience or a slight enhancement of the price per yard of contract work it is too often neglected, since neglect is not exposed to the death penalty.

4. The greater expense and completely unremunerative character of excavations in rock, such as usually inclose metalliferous deposits, leads to the making of much smaller and less regular passages than the gangways of collieries, while separately excavated airways may be said not to exist in metal mines at all, a brattice or an air-box, or a weather door now and then, being the most that is done for the artificial direction of the ventilating current. The smallness of the excavations in metal mines is therefore another cause of imperfect ventilation. On the other hand the old workings particularly, if well packed with deads or waste rock, do not need to be ventilated so

much, as often the case in coal mines, to prevent the accumulation of dangerous gases in them.

5. There is as a rule much more climbing in metal mines. The miners often descend and ascend through great vertical distances by means of ladders and stairs.

6. It is in a few localities only apart from the coal regions that a permanent class of miners exist. Moreover the hygienic conditions of most American metal mines are not extreme, and finally the effects often attributed to underground conditions in other countries may be largely due to other causes, and it may be that better diet, less prolonged and exhaustive labor, more comfortable homes and more rational habits have to some extent rescued the American miner from the evils which have been supposed to inhere in his avocation.

The points thus suggested will now be briefly reviewed under the heads of physical exertion, air, and temperature:

Physical exertion.—The yielding of sledge and pick, the pushing of cars, the wheeling of barrows, and the lifting of heavy rocks and timbers are forms of exertions which the miner undergoes, in common with laborers of many other classes, and which cannot be deemed apart from the peculiar conditions surrounding them specially injurious to health, though they are doubtless more or less competent to cause or to aggravate certain organic diseases. The ascent and descent upon ladders may be considered characteristic of this avocation, though it is involved also in the ordinary method of raising bricks and mortar to buildings in course of construction. Here the hod carrier not only climbs, but climbs frequently, and carries a heavy load—a practice once common in the mines of Mexico and South America, but unknown in this country, from which its cost, as well as its inhumanity, has excluded it. It is the custom now to use windlass or hoisting engines, even for buildings when they exceed one or two stories in height, and it must be remembered that the highest buildings come far short of the vertical extension of ordinary mines. The question, how much the health and efficiency of miners are affected by climbing up and down ladders? has been carefully examined. The loss of working-time involved in this method of transit is serious. But the exercise of climbing itself, if taken slowly and with due caution, and if the heated climber is not afterward exposed to a chill, is not generally held to be injurious to healthy and strong men. Added to other enfeebling conditions, it is said to hasten the period of declining strength, and it is an important objection to the use of

ladders in deep mines that they necessitate the employment of the younger men in the lower levels, and thus deprive the mine at the points where skilled labor is most desirable of the services of the oldest and most experienced workmen. Ladders placed at a proper angle are better than stairs, since they permit the arms to take part in raising the body.

The loss of time and the waste of strength involved in ladder-climbing are shown by the relative amount of work done per man in the upper and lower levels, this amount being, for instance, in lead mines of the north of England one-fifth greater in the upper levels. On the question of health it may here be added that sailors are not reported to suffer from climbing any more than brick-layers do, and the sum of the whole discussion appears to be that the economical view of the subject of climbing in mines is more important than the sanitary one.

This view has led to the introduction of the man-engine, and the practice of lowering and raising workmen in skips and cages. This is not the place for a criticism of comparative merits of these devices. It is sufficient to say that in most of those American mines which are deep enough to render the use of ladders a matter of hygienic importance, the workmen are lowered and raised by the machinery that hoist the ore, and the ladders being kept merely as a means of transit between neighboring levels, or as a resort in case of accident, do not enter into the hygienic problem.

Air.—The most thorough and satisfactory reports on the air of metal mines are those of Dr. R. Angus Smith, and Dr. A. J. Bernays, included in Appendix B to the Report of the Commissioners appointed to inquire into the condition of the metal mines of Great Britain, with reference to the health and safety of the persons employed in such mines. (London, 1864.)

Dr. Smith begins with an elaborate discussion of the normal amount of oxygen and carbonic acid in pure air; after citing many analyses of distinguished chemists, adopts 20.9* parts by volume of oxygen, and 0.04 of carbonic acid, as a fair out-door average, and shows that in confined spaces, and under various influences, the amount of carbonic acid may be increased indefinitely. At 11 p. m. in the pit of a London theatre it was 0.32. But many samples of bad air taken from mines have shown over two per cent of carbonic acid. By a

*The proportion given throughout this paper are parts in 100 by volume.

series of most interesting experiments, conducted in a hermetically closed lead chamber, containing 170 cubic feet of air, Dr. Smith established, among other important results, the following:

A person shut up in the chamber for five hours raised the amount of carbonic acid to 2.25 per cent. In this atmosphere the breathing was changed from 16 inspirations per minute to 22, and the pulse fell from seventy-six to fifty-five, becoming at the same time so weak that it was difficult to find. On another occasion, when the carbonic acid had risen to 3.9 per cent the number of inspirations advanced to twenty-six, and the pulse became so weak as to cause alarm. This is a symptom of poisoning by carbonic acid. An experiment tried by blowing carbonic acid into fresh air containing 20.1 oxygen without removing the oxygen, showed that the pulse of the subject was weakened, though the breathing was not difficult, and the candles burned moderately well. Four miners candles inclosed in the chamber ceased to burn at the end of five hours, having raised the temperature from 50° Fahrenheit to 65°, and vitiated the air until it contained 18.8 oxygen and 2.28 carbonic acid. It follows that men can live where candles will not burn, but that the poisonous effect of carbonic acid begins before its subject is conscious of serious inconvenience. However, it appears that the presence of carbonic acid is a more noxious agency than the mere diminution of oxygen in an otherwise pure air.

According to Dr. Smith's experiments respiration is not affected sensibly by a small or even a considerable diminution of oxygen when the place of that gas is not taken up by others of a harmful character.

But we do not usually have to deal in mines with simply rarified or deoxygenated air. The abstraction of oxygen is due to processes which load the air with such gaseous products as carbonic acid. The facility with which water absorbs certain percentages of its weight of carbonic acid and other gases explains the fact that the air is more tolerable in wet than in dry workings.

Trickling streams or spray perceptibly improve the ventilation, and this means is occasionally resorted to for enabling men to continue work where it would otherwise be difficult.

Dr. Bernays points out another most important fact, namely: that there is a great difference in the personal sensations of comfort or distress occasioned by breathing different atmospheres containing practically the same proportions of carbonic acid.

This is undoubtedly the effect of organic impurities which greatly aggravates that of the carbonic acid. A much larger proportion of the latter may be breathed with impunity when it is the result of inorganic processes and particularly of the slow oxidation of coal than when it proceeds from animal exhalations, and the quick, smoky combustion of candles.

Dr. Bernays says that he has often found the air of a crowded room intolerable, though it contained not more than 0.1 per cent of carbonic acid.

He mentions also, as a curious fact, that a man may continue to breathe without distress in a confined space so long as it is contaminated by his own breath, only though he could not, without great disgust, enter an atmosphere rendered equally foul by the respiration of others. But I suspect that the inference he suggests is not well founded. It is perhaps not the source of the contamination, but the entrance of the observer from purer air that makes it more repulsive in the latter case.

Carbonic acid and accumulations of organic impurities are most troublesome at the ends of galleries or in confined slopes, wings, etc., which are not swept by the general current of ventilation.

The operation of blasting in such places has the good effect of breaking up the stagnation of the air, but on the other hand, it contributes certain impurities of its own, partly volatile and partly in fine suspended floating particles. Carbonic acid, sulphuretted hydrogen, sulphide, and nitric of potassium, etc., are among the products of explosion from ordinary gunpowder. Gum-cotton is less harmful in this respect, and was recommended by the British Commission, but it has never found general application in mines, perhaps because its use in mines, as a quick and violent explosive has been superceded or rather forestalled by the various nitro-glycerine compounds.

It is well known that the gases from these produce most distressing headache, but this appears to be the effect on those persons only who are unaccustomed to them. I have seen miners return to a stupe almost immediately after a blast of dynamite apparently without inconvenience. This was, however, in a well-ventilated mine. With all explosives it is necessary and customary to allow the gases to clear away before resuming work. Sulphuretted and assemeretted hydrogen may be given off by rocks which contain such minerals as pyrites of iron or copper mispickel, etc., which undergo decomposition in the presence of air and moisture. To this cause in part may be due the

alleged unhealthiness of the copper mines of Cornwall as compared with the tin mines, in which the ore being already an oxide suffers upon exposure no chemical change. Besides the gaseous impurities of the air the dust produced by drilling has been considered a source of disease. This is probably not a serious evil. The almost invariable practice is to put water in the box holes to facilitate the work and there is from this source little or no dust to be inhaled. What has sometimes been mistaken for mineral dust in post-mortem examinations of the lungs of miners is finely divided carbon, and this is almost certainly attributable not so much to the occasional inhalation of gunpowder vapors as to the constant breathing of the products of the imperfect combustion of candles. Some reported cases of the lead-colic among lead miners may have been due to the inhalation of plumbiferous dust or to the drinking of poisoned water.

The effect of all these impurities of the air has been found on the continent of Europe and in Great Britain to be a peculiar form of asthma, consumption or anemia, known as the miners disease.

It is difficult to say how much the general low tone of vitality, due to insufficiency of animal food, lack of healthy dwellings, and reckless habits, contributes to the prevalence of this disease, but it is probably fair to conclude that these causes weaken the ability of the workmen to resist the effects of the impure air in which he works.

Temperature.—There is a gradual increase of temperature in the rocks of the earth's crust below the zone of uniform temperature which is found near the surface. The law of this increase in temperature is not clearly established. It is certainly much affected by the chemical reactions which may go on in the rock. Mr. Robert Hunt, in his testimony before the British Commission says, that whatever may be the temperature of the atmosphere on the surface of the earth, there is in the Cornish mines a constant temperature throughout the year at the depth of about 150 feet. Below that point he says the increase is one degree Fahrenheit for every 50 feet down to about 750 feet, then one degree in every 75 feet down to about 1350 feet, and below that about one degree to 85 feet. Mr. Henwood (quoted by Prof. J. A. Church, in his paper published in the previous volume of *Transactions* on the heat of the Comstock mines) gives for different kinds of rock the following distances in feet corresponding with each rise of one degree: granite, 51; slate, 37.2; cross veins, 40.8; lodes, 40.2; tin lodes, 40.8; tin and copper lodes, 39.6; copper lodes, 38.4. These figures show how great is the variation due to

local causes. Assuming the increase in granite to be at least affected in this way, and applying also Mr. Hunt's formula for the rate of increase, we may adopt as a probable standard of comparison a scale of depths and rock temperature as follows:

DEPTH— FEET.	TEMPERATURE OF ROCK.
150.....	60°
300.....	62°
800.....	66°
1,350.....	76°
2,000.....	84°

It will be generally admitted that most mines are hotter than this, the fact being that the heat given off by lights, explosives, animals and men is not immediately removed by the ventilation, and hence the rock is perceptibly cooler than the air. But chemical reactions and hot springs in the rock may very greatly raise its temperature, and when this is the case the miners finding that the rocks feel hot in comparison with the air, say that the lode or the wall makes heat. Even when the air is still somewhat, the warmer the rock may seem to be so when touched with the hand. One of the United mines in Wales is mentioned by Prof. Church, in the paper already cited, as possessing springs which discharge water at 116° Fahrenheit, the depth being 1320 feet. The heat of the air in the workings is given at 100° to 113° Fahrenheit.

The hottest mine in Cornwall is, or was in 1862, the Wheal Clifford, concerning which, the Superintendent, John Richards, testified that the temperature was 102° fifty-one feet below the 1,200 feet level, and a pretty deal hotter (120° he guessed) at the 1,380 feet level. At one time, in a confined working, the temperature was known to rise as high as 128°.

Mr. Robert Hunt, speaking apparently of the same mine, says that by his personal measurement the air showed 110° in the deep level, and that tests of the rock made by leaving a thermometer for two hours in a bore-hole, gave from 112° to 114°. He reports the maximum with which he was acquainted as 117°. Mr. Richards says the workmen can endure 120° perhaps half an hour, but cannot continue to work for an hour at 102°, while they can make a four-hour shift without interruption at 95°. Mr. Hunt gives the average time of working at twenty minutes, and says that on retreating the men were employed so that each set had one hour and forty minutes to recover

from the effects of twenty minutes exertion. Four turns of twenty minutes thus distributed through an eight-hour shift, constituted a day's work. It is not surprising that under these circumstances the labor account was heavy. It is said that three guineas per inch was paid for driving a cross-cut in this mine.

These remarkable statements are even surpassed by the recent experience of the deep mines of the Comstock lode, in Nevada. For many data on this subject, corroborating and completing my own hasty observations and recollections, I am indebted to the paper of Prof. John A. Church, already mentioned, and to the unpublished memoranda of that gentleman, generously placed at my disposal. In the lower levels of these mines (say about 2,000 feet below the crop-pings of the rock), the temperature is generally about 130°. In freshly opened ground the air usually varies from 108° to 116°, but higher temperatures are not unfrequently reported, as for instance 123° in the 1,900 feet level of the Gould and Curry. The water which enters the drift from the lode and the country rock, is, however, often much hotter. The vast body which filled the Savage and the Hale and Norcross mines for many months, had the temperature of 154°. But the water, like the rock and the air, varies in this respect, in different in this respect, in different portions of the mines.

The ordinary range of hot drift is 105° to 110°, air temperature. The ventilating current is delivered at a temperature of 90° to 95°, which seems to be most conducive to comfort. It is blown upon the men through zinc pipes, by means of powerful mechanical blowers. The question of present interest being the effect upon the health of the miners working under such conditions, further description of the peculiar phenomena of the case will be necessary.

Before considering the health of the Comstock miners, it should be noted that by no means all, or even a majority of them, are employed in the hot drifts; and moreover that these mines are provided with arrangements which enable every miner to bathe and change his clothing immediately upon emerging from underground.

The diseases of the Comstock miners are mainly typhoid and mountain fever, rheumatism and erysipelas. There is little or no consumption, bladder, kidney or liver disease.

The superior ventilation (apart from the question of temperature) in the mines, the hearty and abundant diet of the miners, the constant, enormous activity of their daily baths, seem to have abolished among them the disease supposed elsewhere to be characteristic of

their avocation. It is admitted by all observers that they are healthier than their wives and children. As to the immediate effect of the high temperature upon those who work in them, it must be confessed that while actually working, the men display apparently undiminished vigor, delivering with seven, eight, or even nine pound hammers, very rapid and effective blows. Perhaps a third of the time is lost in resting and cooling. In very hot drifts a relief gang is employed, and in extreme cases four and even six men to the pick have been found necessary. In the main, however, the rapid progress in the hot drifts is remarkable, and shows that the heat does not greatly lessen the power of work, except by necessitating longer or more frequent rest. At the usual temperature of 108°, three shifts of three men each, working in turns of eight hours, advance three to five feet daily, in hard rock. This is so much better than the efficiency reported from the hot lode in Cornwall, that we are led to infer that the method of delivering air to Comstock drifts affects the temperature and perspiration of the miners in such a manner as to protect them to a large extent from the otherwise distressing action of the heat. My own sensations, as I recall them in a deep and very hot level of the Crown Point (about 116° I believe), were not specially uncomfortable on the surface of the body, except when a drop of still hotter water fell upon me. The principal feeling of distress was internal, and was caused by the inhalation of the scorching air.

The question whether those who labor in such places are permanently injured is more difficult to decide. One of the physicians at Virginia City has declared that there is not a sound heart in any man on the lode who has worked in a hot drift for two years. This statement is, perhaps, too strong, though it is possibly true that many of the miners are organically affected, yet this appears not to interfere with ordinary and equable work, though it may perhaps develop into distinct disease under special strain or excitement. After long work in the hot drifts the men have a waxen color, and are known as tallow-faces. Prof. Church noticed some men, who, without being lazy, displayed unusual care in handling their work, and two or three of them told him that they were broken down in hot drifts. In the only instance in which the time required for breaking down was given, the workman had been employed underground six years.

The actual effect of the heat on the men is, first, excessive perspi-

ration, and if this is not removed by evaporation with sufficient rapidity, and great faintness. The pulse increases, as is shown by the following interesting data, obtained by Prof. J. O. Whitney and Prof. Church, in the 1,800 feet level of the Julia mine, the drift being about 1,200 feet long, and having an air temperature of 108° to 110°, while the air temperature at the station or junction of the drift with the (downcast) shaft was only 84°. The following observations were made:

	Pulse beats per minute.
Carman, after bringing out car, say 1,200 feet.....	140
Carman, after resting at station.....	64
Carman (another case) after partial rest.....	128
Prof. Whitney, normal rate	60
Prof. Church, after moving about without exertion	88

A case of death is reported as follows: A powerful man, accustomed to hot drifts, returned to work after a rest of three months, and entering the Imperial mine as carman, pushed his first car to the end of the drift in the 2,000 feet level—say, 1,000 to 1,200 feet—loaded it and brought it back to the station, where another man was waiting to relieve him; but, instead of taking his turn, he dumped the car and started back without cooling off. He loaded the car again at the end of the drift and proceeded to return, but was found a few minutes later hanging senseless to his car, and died. I believe he could be got to the surface. Another died in the Imperial incline while that was sinking. Three such deaths in all have been reported from this mine, which is an excessively hot one.

Sometimes accidental deaths may be the indirect result of the faintness caused by the effect of the heart on the circulation. Thus a man fell down the Imperial (upcast) shaft last year, who was probably overcome by the heat while putting in timbers. In these worst places strong and healthy men are employed. Fat men seem to stand the heat best, and among visitors, women endure it better than men. Some men wilt under the work, and are said to have no pluck. Drinking habits unfit the miner for this severe test. Unaccustomed men are often unable at first even to reach the end of the drift where they are to work. An intelligent miner told Prof. Church that the first month of such work after a long rest is hard, then comes three months of brisk feeling, and then follows a dragged-out sensation.

The underground use of machine drills operated by compressed air, is an important aid to ventilation and cooling, since the expulsion of

the escaping air absorbs much heat from the immediate neighborhood. But when, as in the Comstock, the heat radiated from the whole surface of the exposed rock is far in excess of that which men and lights supply, nothing can sensibly reduce it or mitigate its effect except abundant mechanical ventilation. This is carried to a large extent in the Comstock mines, and to the fact that in counteracting the high temperature the impurities of the air are thus removed, the remarkably good health of the Comstock miners may be partly ascribed. Other causes have been already mentioned, such as the healthy mountain climate, the good food, and the comfortable dwellings.

Finally, the fact must not be omitted from consideration that the miners of our western regions are immigrants, and presumably men of such bodily vigor and health as their adventurous spirits would imply.

Incidental to the question of temperature is the effect of sudden changes of temperature, such as are experienced on coming suddenly from the depths of a mine to the surface. The hygienic conditions here do not differ from those which any similar change of temperature produces, and since they may be easily counteracted by the prudent miner they need not be set down as sources of disease inherent in his occupation.

Another kindred question relates to the effect of barometric pressure, which varies in mines with the depth of the openings, and also with the changes of the outside weather. The general experience is, that high barometric pressure, though it permits a greater inhalation of oxygen with each breath, causes a feeling of distress, and affects the heart unfavorably.

Dr. Bernays says that undoubtedly the most injurious as well as the most unpleasant condition of mine air, is that in which a high temperature is accompanied with excessive barometric pressure and great humidity. The effect of the pressure alone can best be studied in the records of work in highly compressed air, as in the sinking of the caissons for the East River and other bridges. It may be affirmed as a general rule, that sound men are not permanently injured by it.

In ordinary mines, the chief sensible effect of the barometric pressure is the variation it may cause in the natural ventilating current. Where the ventilation is wholly or partly artificial, these changes may be controlled. The introduction of compressed and

cool air by machinery tends powerfully to reduce to a minimum the humidity of hot mines, and thus (as in the Comstock) to give an atmosphere in which free perspiration, rapidly evaporating, cools and refreshes the body. A comparison of the statements above made as to the Comstock miners and the miners in the hottest mine of Cornwall, shows how much more can be endured and accomplished by workmen when thus protected from vitiated or over-humid air.

The injurious effect of working under artificial light, instead of sunlight, has been often asserted, but there is no definite proof of it.

Where other conditions are wholesome, and the habits of the workmen are regular, this is not likely to have a traceable effect. At all events, it is subordinate to many other causes.

GENERAL CONCLUSIONS.

The British Commission to which reference has been made summed up its voluminous report in a few conclusions and recommendations, the substance of which I quote below in order to point out how far they are applicable to miners in the United States. The commission finds that a large proportion of the diseases affecting miners in the metal mines is to be ascribed to defective ventilation only. However various the opinions of physicians concerning the causes of the disease so well known under the name of miner's consumption or miner's asthma there is in one respect a remarkable unanimity among all the experts, namely, that the health of the miner is chiefly affected by the quality of the air in which he works. This conclusion is emphasized by the results of very wide inquiry on the part of the commission.

In the coal mines where special attention is paid to ventilation on account of explosive gases, the mortality of miners apart from accidents is lower than in the metal mines. Starting from this significant fact the Commission recommends that some of the methods of artificial ventilation employed in the former should be more generally introduced into the latter, and favors particularly the use of furnaces in upcast shafts to accelerate the natural current by heating the upward-moving column of vitiated air and to prevent the stagnation or reversal of the current by change of season or weather. With refer-

ence to other causes of disease the Commission recommends that every mine be provided with a conveniently situated separate house in which the workmen may change and dry their clothes; that boys under fourteen be not permitted to work under ground, and that mechanical means be adopted for transporting the miners into and out of the mines.

The man-engine is praised, but the system of hoisting the men in skips and cages is also pronounced satisfactory, provided the machinery be properly constructed and carefully tended.

These recommendations are as timely now as they were ten years ago, except that the increasing use of compressed air in mining has furnished an aid to ventilation not then considered. There is no proof that the metal miners of America are less healthy than other laborers, and there is no need that they should ever become so. In my judgment a wise regard for financial economy alone will cause capitalists to do all that philanthropic considerations would require in dealing with the problem of hygiene in mines—a problem which contains as the foregoing discussion shows no fatally insuperable difficulties and no insoluble mysteries.

RECORD OF STRATAS.

LOVILIA, IOWA, July 25, 1885.

To the HONORABLE PARK C. WILSON, *State Mine Inspector*:

Sir:—We have the honor of handing you a report embracing a part of the results of our last two years prospecting for coal in Iowa.

Statement of Stratas passed through for Chas. Blake, four miles south-west of Ottumwa.

	Feet.	Inches.
Drift deposit.....	21	6
Gray argillaceous shales.....	28	6
Blue bituminous shales.....	2	6
Coal.....	1	6
Blue argillaceous shales.....	31	...
Black sandstone.....	5	...
Hard ferruginous rock.....	1	9
Black carbonaceous shales.....	8	6
Sandstone.....	3	6
Argillaceous shales.....	7	6
Hard ferruginous rock.....	1	6
Black shales with sulphur.....	12	9
Gray clay shales.....	25	6
Brown ferruginous shales.....	8	3
Green variegated shales.....	23	...
Blue limestone.....	3	6
	195	6

MAY 8, 1885.

Strata passed through in drill hole No. 1, in Monroe county, for O. M. Ladd, of Ottumwa.

	Feet.	Inches.
Drift deposit.....	15	...
Blue sandstone.....	5	...
Gray arenaceous shales.....	6	...
Impure limestone.....	1	6
Light blue shales.....	32	...
Light blue sand shales.....	6	6
Dark blue sand shales.....	7	...
Rock, coal and sulphur.....	8	6
Dark clay shales.....	2	...
Fire clay.....	1	...
Total.....	79	6

Hole No. 7.

Drift deposit.....	30	...
Buff colored sand rock.....	3	...
Gray sand shales.....	7	...
Light blue shale.....	30	6
Dark blue argillaceous shales.....	6	...
Coal.....	5	6
Fire clay.....	...	6
Total.....	82	6

Hole No 8.

Drift deposit.....	7	...
Buff colored sand rock.....	49	...
Light blue shales.....	21	...
Dark bituminous shales.....	5	6
Coal.....	2	6
Fire clay.....	...	6
Total.....	85	6

Hole No. 10, one mile northwest of Lovilia, Monroe county.

	Feet.	Inches.
Drift deposit.....	18	..
Dark blue marley shales	17	..
Light blue sand shales.....	39	..
Impure limestone	7	9
Sand shales	29	..
Dark blue carbonaceous shales.....	2	3
Impure coal.....	4	..
Clay .....	..	6
Total.....	117	6

Hole No. 11, three miles northwest of Lovilia.

Drift deposit.....	9	..
Blue colored shales.....	5	..
Sandstone, light blue	47	..
Blue sand shales	32	..
Bituminous shales	4	..
Coal.....	4	9
Total.....	101	9

Hole No. 12, on same lands as No. 11.

Drift deposit.....	14	..
Impure lime rock	3	6
Sandstone, light blue	26	..
Light blue sand shales	17	..
Impure light rock	6	..
Light blue sand shales with sandstone partings	21	..
Dark marley shales	2	..
Impure limestone	3	6
Light blue clay shales	10	..
Light calcareous rock	3	..
Light blue shales.....	10	..
Dark blue shales.....	5	6
Coal.....	5	6
Clay.....	..	6
Total.....	127	6

Hole No. 24, one mile southwest of Hamilton, Marion County.

	Feet.	Inches.
Drift deposit.....	8	6
Gray sandstone	6	6
Light blue shale.....	19	..
Limestone	1	..
Blue shales.....	33	6
Blue limestone	1	..
Gray arenaceous shales.....	14	..
Limestone impure .....	..	6
Gray marley shales.....	16	..
Limestone blue	2	..
Light blue clay shales.....	15	..
Dark blue clay shales	4	6
Coal	3	9
Fire clay	1	..
Total	126	3

MAY 23, 1884.

Hole No. 1, for Kellogg Coal and Mining Co., one half mile south of Kellogg.

Drift deposit.....	87	..
Sand shales	22	..
Blue clay shales	13	..
Gray sand shales.....	5	6
Light marley shales.....	..	9
Coal.....	..	6
Light clay shales.....	..	6
Gray limestone.....	3	..
Blue clay shales.....	4	6
Gray shales with hard lime.....	..	..
Stone partings	19	..
Total	155	9

Hole No. 2, one mile southeast of Kellogg.

	Feet.	Inches.
Drift deposit	30	
Blue clay shales	21	6
Gray clay shales	2	9
Lime and sulphur	1	9
Dark blue shales	25	6
Gray sand shales	1	6
Blue limestone	10	9
Black carbonaceous shales	10	6
Sandstone with sand shales partings	18	
Blue limestone	3	6
Gray clay shales	2	3
Conglomerate rock with marley partings	24	4
Total	147	

OTTUMWA, October 16, 1885.

Hole No. 2, six miles northwest of Ottumwa, for O. M. Ladd.

Drift deposit	10	
Sandstone	2	
Blue clay shales	11	
Coal	1	2
Light blueish marlite	4	
Gray clay shales, laminated	20	
Black clay shales	8	
Black sand shales	2	
Gray clayey shales	14	
Coal	1	
Clay seam		9
Coal	2	
Clay	1	3
Total	87	2

Test three miles north of Mitchellville, Polk county.

	Feet.	Inches.
Drift deposit	64	
Yellow sandstone	4	
Blue shales	11	
Black bituminous shales	2	
Lime stone	1	8
Coal, impure	1	8
Gray clay shales	8	
Black carbonaceous shales	66	
Blue clay shales	21	
Sandstone and sulphur	3	
Gray clay shales	5	
Sand shales	4	
Gray shales	12	
Impure sandstone and sulphur	16	3
Gray clay shales	6	4
Calcareous laminated rock	23	6
Limestone with marley partings	16	
Total	263	9

Material passed through at Valeria, Jasper county, for J. Mickie & Co.

Drift deposit	26	
Black shale	18	
Hard ferruginous rock	2	6
Blue sand shale	3	
Impure coal and rock	1	6
Dark argillaceous shale	6	
Lime stone with crevis	5	
Sand rock with lime partings	4	
Total	66	

Material passed through in test No. 1 for the Peterson Coal and Mining Company, two miles west of Peterson, Clay County, on the C. & N. W. R. R. In this test there was a washout, as we did not get through the drift deposit, the drift consisting of

	Feet.	Inches.
Soil	4	...
Yellow clay and sand	30	...
Blue clay	40	...
Gray clay with sand pockets	10	...
Brown and blue clay with sand	7	...
Blue clay and sand of a buff cast, and with compact bands of sand-stone and shale partings	44	...
Total	135	...

Test No. 2 for same Company.

Clay and sand	11	...
Gray clay	9	...
Pink clay	10	...
Blue clay	21	...
Blue sand	44	...
Purple clay	14	...
Sulphur band	6	...
Light clay shale	4	...
Impure coal	2	...
Fire clay	4	...
Argillaceous shale	9	...
Impure coal	9	...
Carbonaceous shale	11	...
Sulphur band	6	...
Total	140	9

McELHANY BROS.

APPENDIX.

COAL SCREENS IN USE AT THE MINES IN OHIO.

The report of the Bureau of Labor Statistics has a table giving in detail and by counties the dimensions of the screens used in connection with the mines represented, and the proportion of the entire quantity of coal dug that passes over the screen and thus determines the miners' wages.

ATHENS COUNTY.

SCREENS—DIMENSIONS AND CONSTRUCTION			MATERIAL CON- STRUCTED OF	PROPORTION OF COAL MINED FOR WHICH THE MINER RECEIVES PAY
LENGTH (FEET)	WIDTH (FEET)	OPEN SPACES BETWEEN BARS (INCHES)		
12	6	1½	Round bars.	Four-fifths.
12	6	1½	Flat bars.	Four-fifths.

BELMONT COUNTY.

14	6	1½	Flat bars.....	Two thirds.
8	4	1½	Flat bars.....	Two thirds.
12	6	1½	Flat bars.....	Two thirds.
11	4½	1½	Flat bars.....	Two thirds.

CARROLL COUNTY.

10	5	1½	Flat bars.....	Two thirds.
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COLUMBIANA COUNTY.

10	5	1½	Flat bars.....	Two thirds.
12	6	1½	Flat bars.....	Three fourths.
8	6	1½	Round bars.....	Two thirds.
8	6	1½	Diamond bars....	Two thirds.
8	4½	½	Diamond bars....	Two thirds.

COSHOCOTON COUNTY.

9	4	1	Flat bars.....	Three fifths.
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GUERNSEY COUNTY.

10	6	1½	Flat bars.....	Two thirds.
10	6	1½	Round bars.....	Two thirds.
10½	6½	1½	Flat bars.....	One half.
10	5½	1½	Flat bars.....	Two thirds.

HOCKING COUNTY.

12	6	1½	Flat bars.....	Four fifths.
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COAL SCREENS IN USE AT THE MINES IN OHIO—CONTINUED.

JACKSON COUNTY.

SCREENS—DIMENSIONS AND CONSTRUCTION.			MATERIAL CON- STRUCTED OF.	PROPORTION OF COAL MINED FOR WHICH THE MINER RE- CEIVES PAY.
LENGTH (FEET).	WIDTH (FEET).	OPEN SPACES BETWEEN BARS (INCHES).		
12		8	1½ Flat bars.....	Three fourths.
10		5	1½ Flat bars.....	Three fourths.
12		6	1½ Flat bars.....	Three fourths.
10		5	1½ Flat bars.....	Three fourths.
12		6	1½ Flat bars.....	Three fifths.
15		6	1½ Round bars.....	Three fourths.

JEFFERSON COUNTY.

8	3	1½	Two thirds.
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MUSKINGUM COUNTY.

5	3	¾	Round bars.....	Two thirds.
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PERRY COUNTY.

12	6	¾	Flat bars.....	Nine tenths.
12	4½	1	Flat bars.....	Three fourths.
12	6	1½	Flat bars.....	Two thirds.
15	6½	1½	Square bars.....	.....
8	4	1	Flat bars.....	Three fifths.
12	4	1½	Flat bars.....	One half.
6	6	1½	.....	Four fifths.

STARK COUNTY.

12	4	1½	Flat bars.....	Two thirds.
12	4	1½	Flat bars.....	Two thirds.
14	6	1½	Flat bars.....	Three fifths.
9	6	1½	Round bars.....	Two thirds.
.....	.....	2	Flat prongs.....	.....
8	4	1½	Round bars.....	Three fourths.
12	6	1½	Flat bars.....	Seven twelfths.
12	6	1½	Flat bars.....	Seven twelfths.
11	6	1½	Flat bars.....	Two thirds.
11	6	1½	Flat bars.....	Five eighths.
7	.....	1½	Flat bars.....	Three fourths.
10½	6	1½	.....	Three fourths.
13	6	1½	Flat bars.....	Three fourths.
12	6	1½	Flat bars.....	Two thirds.
9	4½	1½	Flat bars.....	Two thirds.
10	4	1½	Flat bars.....	Two thirds.

SUMMIT COUNTY.

12	8	1½	Flat bars.....	Two thirds.
12	6	1½	Flat bars.....	Two thirds.

COAL SCREENS IN USE AT THE MINES IN OHIO—CONTINUED.

TRUMBULL COUNTY.

SCREENS—DIMENSIONS AND CONSTRUCTION.			MATERIAL CON- STRUCTED OF.	PROPORTION OF COAL MINED FOR WHICH THE MINER RE- CEIVES PAY.
LENGTH (FEET).	WIDTH (FEET).	OPEN SPACES BETWEEN BARS (INCHES).		
16	6	1½	Flat bars.....	.....
7	5½	1½	Flat bars.....	Two thirds.
8	6	1½	Flat bars.....	Two thirds.
9	4	1½	Flat bars.....	Three fourths.

TUSCARAWAS COUNTY.

20	8	2½	Triangular.....	.....
12	5	1½	Flat bars.....	One half.
12	5	1½	Flat bars.....	One half.
12	4½	1½	Flat bars.....	Two thirds.
10	5	1½	Flat bars.....	Two thirds.
12	4½	1½	Flat bars.....	Two thirds.
12	5	1½	Flat bars.....	Three fifths.
12	6	1½	Flat bars.....	Two thirds.

WAYNE COUNTY.

12	4	1½	Flat bars.....	Two thirds.
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IOWA MINING LAW.

CHAPTER 21, LAWS TWENTIETH GENERAL ASSEMBLY.

AN ACT to Regulate Mines and Mining, and to Repeal Chapter 202, of the Acts of the Eighteenth General Assembly.

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 term of office shall commence on the 1st day of April of each even numbered year. 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 the 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 pro-

visions 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 any coal mine shall be qualified to serve on the jury impaneled on the inquest. And the owner or agent of all coal mines shall report to the inspector all accidents to miners, in and around the mines, giving cause of the same; such report to be made in writing, and within ten days from the time any such accidents occur.

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 biennially, on or before the fifteenth day of August preceding the regular session of the general assembly 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 seventeen hundred \$1,700 dollars per annum, payable monthly, necessary stationery, and actual traveling expenses, not to exceed \$500 per annum; *provided*, that he shall file at the end of each quarter of his official year, with the auditor of state, a sworn statement of his actual traveling expenses incurred in the performance of his official duty for such quarter. He shall have and keep an office in the capitol at Des Moines in which shall be kept all records and correspondence, papers, 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 agent or owner 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 of each year, 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 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 recovered against the owner in the name of the person or persons making said map or plan. And the owner or agent of all coal mines hereafter wrought out and abandoned, shall deliver a correct map of said mine to the inspector, to be filed in his office.

SEC. 8. It shall be unlawful for the owner or agent of any coal mine worked by a shaft, to employ or permit any person to work therein unless there are to every seam of coal worked in such 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 in no case shall a furnace shaft be used as an escape shaft; and if the mine is a slope or drift opening, the escape shall be separated from the other openings by not less than fifty feet of natural strata; and shall be provided with safe and available traveling ways, and the traveling ways to the escapes in all coal mines shall be kept free from water and falls of roof; and all escape shafts 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, so as to furnish easy escape from such mine; and all air shafts used as escapes where fans are employed for ventilation, shall be provided with suitable appliances for hoisting the underground

workmen, said appliances to be always kept at the mine ready for immediate use; and in no case shall any combustible material be allowed between any escape shaft and hoisting shaft, except such as is absolutely necessary for operation of the mine; *provided*, that where a furnace shaft is large enough to admit of being divided into an escape shaft and a furnace shaft, there may be a partition placed in said shaft, properly constructed so as to exclude the heated air and smoke from the side of the shaft used as an escape shaft, such partition to be built of incombustible material for a distance of not less than fifteen feet up from the bottom thereof; and *provided*, that where two or more mines are connected underground, each owner may make joint provisions with the other owner for the use of the other's hoisting shaft or slope as an escape, and in that event the owners thereof shall be deemed to have complied with the requirements of this section. And *provided further*, that in any case where the escape shaft is now situated less than one hundred feet from the hoisting shaft there may be provided a properly constructed underground traveling way from the top of the escape shaft, so as to furnish the proper protection from fire, for a distance of one hundred feet from the hoisting shaft; and in that event the owner or agent of any such mine shall be deemed to have complied with the requirements of this section; and *provided further*, that this act shall not apply to mines operated by slopes or drift openings where not more than five persons are employed therein.

SEC. 9. In all mines there shall be allowed one year to make outlets as provided in section eight, when such mine is under two hundred feet in depth, and two years when such mine is over two hundred feet in depth; but not more than twenty men shall be employed in such mine at any one time until the provisions of section eight are complied with, and after the expiration of the period above mentioned should said mines not have the outlets aforesaid, they shall not be operated until made to conform to the provisions of section eight.

SEC. 10. The owner or agent of every coal mine, whether it be operated by shaft, slope, or drift, shall provide and maintain for every such mine an amount of ventilation of not less than one hundred cubic feet of air per minute for each person employed in such mine, and not less than five hundred cubic feet of air per minute for each mule or horse employed in the same, which shall be distributed and circulated throughout the mine in such manner as to dilute, render harmless, and expel the poisonous and noxious gases from each and

every working place in the mine. And all mines governed by the provisions of this act shall be provided with artificial means for producing ventilation, such as exhaust or forcing fans, furnaces, or exhaust steam, or other contrivances of such capacity and power as to produce and maintain an abundant supply of air for all the requirements of the persons employed in the mine; but in case a furnace is used for ventilating purposes it shall be built in such 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 to ensure safety.

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 safety catch of approved pattern and 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 train 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 except the conductor in charge of the train.

SEC. 13. No boy under twelve years of age shall be permitted to work in any mine; and parents or guardians of boys shall be required to furnish an affidavit as to the ages of their boys when there is any

doubt in regard to their age, and in all cases of minors applying for work the agent or owner of the mines shall see that the provisions of this section is [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, any court of competent jurisdiction, while in session, or the judges in vacation, may, on application of the inspector, by civil action in the name of the State, enjoin or restrain by writ of injunction, the said agent or owner from working or operating such mines with more than ten persons at once, except as provided in sections eight and nine, until it is made to conform with the provisions of this act, and such remedies 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; and for any willful failure or neglect to comply with the provisions of this law by any owner, lessee, or operator of any coal mine or opening whereby any one is injured, a right of action shall accrue to the party so injured for any damage he may have sustained thereby; and in case of loss of life by reason of such willful neglect or failure aforesaid, a right of action shall accrue to the widow, if living, and if not living, to the children of the person whose life shall be lost, for like recovery of damages for the injury they shall have sustained.

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 except as provided in section twelve, 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 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 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. Any person willfully neglecting or refusing to comply with the provisions of this act when notified by the mine inspector to comply with such provisions, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or imprisonment in the county jail not exceeding six months, except when different penalties are herein provided.

SEC. 20. Chapter 202 of the acts of the Eighteenth General Assembly is hereby repealed.

SEC. 21. This act being deemed of immediate importance shall be in force on and after its publication in the Iowa State Register and Iowa State Leader, newspapers published in Des Moines, Iowa.

Approved, March 18, 1884.

PENNSYLVANIA MINING LAW.

AN ACT Relating to Bituminous Coal mines and Providing For the Lives, Health, Safety and Welfare of Persons Employed Therein.

SECTION 1. Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same, That the owner, operator or superintendent of every bituminous coal mine, shall make, or cause to be made, an accurate map or plan of such coal mine on a scale not exceeding one hundred feet to the inch, which map or plan shall exhibit all the openings or excavations, the shaft, tunnels, slopes, planes, gang-ways, entries, cross-headings, rooms, et cetera, and shall show the direction of the air currents therein, and shall accurately delineate the boundary lines between said coal mine and adjoining mines operated by other parties, and show the relation and proximity of the workings thereto. The maps shall also show the changes of level of the lowest entry in use for drainage connecting with each independent opening. The said map or plan, or a true copy thereof, together with a record of all the sur-

veys of said boundary lines, and openings and excavations aforesaid, shall be kept at such mine by the said owner, operator or superintendent for the use of the mine inspector, and for the inspection of any miner working in said mine, whenever said miner shall have cause to fear that the working place where he is working is becoming dangerous by reason of its proximity to other workings, which may be supposed to contain water or dangerous gas. The said owner, operator or superintendent, shall as often as once in every six months, accurately place or cause to be placed on the map or plan of said coal mine, a plan of the excavations made of all the working places or other parts of such coal mine during the preceding six months, and whenever the workings or excavations of said coal mine or any part of the same have been driven to within ten feet of the boundary line, or when said coal mine or any part of the same is abandoned, the owner, operator or superintendent thereof, shall furnish the mine inspector within three months after the proximity to the boundary line as aforesaid, or after abandonment of the said mine or any part of the same, with a correct copy on tracing muslin of the map or plan of said mine, which shall accurately show all excavations and workings of such mine to date, exhibiting clearly the part or parts abandoned; and the part or parts in proximity to the boundary line aforesaid. The maps or plans of the several coal mines in each district, which are furnished to mine inspector as last aforesaid shall be the property of the Commonwealth, and shall remain in the care of the inspector of the district in which the said mines are situated to be transferred by him to his successor in office, and in no case shall any copy of the same be made without the consent of the owner, operator or his agent. If the mine inspector shall find or have good reason to believe, that any map or plan of any coal mine made or furnished in pursuance of the provision of this act is materially inaccurate or imperfect, he is hereby authorized to cause a correct map or plan of said coal mines, to be made at the expense of the owner or operator thereof, the cost of which shall be recoverable from said owner or operator as other debts are recoverable by law; *Provided, however,* That if the map or plan which is claimed to be inaccurate shall prove to have been correct then the Commonwealth shall be held liable for the expenses incurred in making said test and survey and the same shall be paid by the State Treasurer upon warrants of the Auditor General, who shall require proper vouchers and satisfactory proof of the same.

SEC. 2. It shall not be lawful for the owner, operator, contractor, lessee or agent of any bituminous coal mine, or for any firm, company, corporation or association, their clerks, servants, agents or employes to employ any person at work within said coal mine or permit any person to be in said coal mines for the purpose of working therein, unless they are in communication with at least two openings, if the mine be worked by shaft or slope, which two shafts or slopes shall be separated by natural strata at all points by a distance of not less than one hundred and fifty feet except in mines already opened, such distance may be less if in the judgment of the mine inspector one hundred and fifty feet is impracticable, and if the mine be worked by drift two openings exclusive of the air shaft and not less than twenty-four feet apart shall be required except in drift mines heretofore opened where the mine inspector of the district shall deem it impracticable: *Provided, however,* That an aggregate number not exceeding twenty persons may be employed in the mine at any one time until the second opening shall be reached and made available, which said second opening the mine inspector shall cause to be made without unnecessary delay, and in case of furnace ventilation being used before the second opening is reached, the furnaces shall not be placed within forty feet of the foot of the shaft, slope or drift, and shall be well secured from danger from fire, by brick or stone walls of sufficient thickness while being driven for making and perfecting the second opening.

SEC. 3. When the second opening or outlet is made which does not exceed sixty feet in vertical depth from the surface to the seam or stratum of coal that is being mined, it shall be set apart exclusively for the purpose of ingress or egress to or from the mine by any person or persons employed therein, and it shall not be clogged or obstructed with ice, machinery, pumps or currents of heated air or steam, and if the opening is a shaft it shall be fitted with safe and convenient stairs not less than two feet wide, and to not exceed an angle of sixty degrees descent, and landings of not less than eighteen inches wide and four feet long at easy and convenient distance, and all water coming from the surface or out of the strata in the shaft shall be conducted by rings, casing or otherwise, and be prevented from so falling down the shaft as to wet persons who are ascending or descending the stairway of the shaft; if the second opening is a slope it shall not have a greater angle of descent than twenty degrees and may be of any depth, but when the seam or stratum of coal at

main outlet or second opening, or escapement shaft, in connection with any mine exceeds sixty feet in vertical depth from the surface, the miners or other employees in the mine shall be lowered into or raised from said mine by machinery, and when the employees are lowered into or raised from said mine at the main outlet, the escapement shaft or second opening shall be fitted with safe and available machinery or other appliances by which persons employed in the mine may readily escape in case of accident. The hoisting machinery and other appliances used for lowering or raising the employees into or out of the mine shall be kept in safe condition and inspected once each twenty-four hours by a competent person employed in whole or in part for that purpose. And such machinery and the method of its inspection shall be approved by the mining inspector of the district where the mine is situated; *provided* that when miners are not at work in the mine the said second shaft or slope may be used for the purpose of lowering material; *provided further*, that the requirements of this section shall not be applicable to stairways now in use when in the judgment of the inspector they are sufficient. The owner, operator, lessee or agent shall provide and maintain a metal tube from the top to the bottom of the 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; also, the ordinary means of signaling to and from the top and bottom of the shaft and an approved safety catch and sufficient cover over head on every carriage, used for lowering and hoisting persons, and the said owner, operator, lessee or superintendent shall see that sufficient flanges 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 to the drum, 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 to the satisfaction of the inspector 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 the mine, and no greater number of persons shall be lowered or hoisted at any one time than may be permitted by the inspector of the district, and notice of the number so allowed to be lowered or hoisted at any one time shall be kept posted up by the owner, operator or superintendent in a conspicuous place at the opening of the shaft.

SEC. 4. The owner or agent of every bituminous coal mine, whether shaft or slope or drift, shall provide and hereafter maintain for every such mine ample means of ventilation, affording not less than one hundred cubic feet per minute for each and every person employed in said mine, and as much more as the circumstances may require, which shall be circulated around the main headings and cross headings and working places to an extent that will dilute, carry off and render harmless the noxious or dangerous gases generated therein, and all mines generating fire-damp shall be kept free of standing gas in the worked-out or abandoned parts of the same, and the entrance thereto shall be properly closed and cautionary notice shall be posted to warn persons of danger, and every working place and all other places where gas is known to exist or supposed to exist shall be carefully examined by the fire boss immediately before each shift with a safety lamp, and in making said examination it shall be the duty of the fire boss at each examination to leave at the face of every place so examined evidence of his presence, and it shall not be lawful for any miner to enter any mine or part of a mine generating fire-damp until it has been examined by the fire boss as aforesaid and reported by him to be safe.

SEC. 5. In order to better secure the proper ventilation of every coal mine and promote the health and safety of the persons employed therein, the owner or agent shall employ a competent and practical inside overseer to be called mining boss, who shall be a citizen of this Commonwealth and an experienced coal miner, and shall keep a careful watch over the ventilating apparatus and 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 therein or on the traveling-ways, and that sufficient props, caps and timbers are furnished, of suitable size and cut square at both ends, and as near as practicable to a proper length for the places where they are to be used, and such props, caps or timbers shall be delivered and placed in the working places of the miners; and shall see that all water be drained or hauled out of all working places before the miner enters, and as far as practicable kept dry while the miner is at work. And it shall be the duty of the mining boss to see that proper cut-throughs are made in the room-pillars of the miners' places at regular intervals of sixteen yards each for the purpose of ventilation. And in all traveling-ways and road-holes for shelter shall be made at least every thirty

yards and be kept whitewashed, when a space two feet six inches between the wagon and the rib, shall be deemed sufficient for shelter. And the mining boss shall measure the air-current at least once a week at the inlet and outlet, and at or near the face of the headings; he shall keep a record of such measurements, which shall be placed by him in a book kept for that purpose, the said book to be open for the examination of the inspector of the district. He shall also, on or about the 15th day of each month, mail to the inspector of his district a true copy of the air measurements given, stating also the number of persons employed in or about said mine, the number of mules and horses used and the number of days worked in each month. Blanks for such purpose shall be furnished him by the inspector of the district.

It shall be the further duty of the mine boss to immediately notify the agent or owner of the mine of his inability to comply with the provisions of this section. It shall then become the duty of said superintendent, operator, lessee or owner, at once to attend to the matter complained of by the mining boss to comply with the provisions hereof. 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 charge of the agent of such mine; and in all mines the doors used in assisting or directing the ventilation of the mine 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 of the same if such working-places are being driven toward and in dangerous proximity to an abandoned mine or part of a mine suspected of containing inflammable gases or which is inundated with water. The mining boss or his assistant shall visit and examine every working-place in the mine at least once every alternate day while the miners of such place are or should be at work, and shall direct that each and every working-place is properly secured by props or timber, and that safety in all respects is assured, and that no person shall be permitted to work in an unsafe place unless it be for the purpose of making it safe. All owners and operators of bituminous coal mines shall keep posted in a conspicuous place about their mines printed rules, submitted to and approved by the district mining inspector, defining the duties of all persons employed in or about said coal mines and collieries, which said notices

shall be printed in the language or languages used by the miners working therein.

SEC. 6. Any miners, workmen or other person 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 the 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 security of the mines or the machinery is endangered, shall be deemed guilty of a misdemeanor, and may be punished in a manner provided in the twenty-first section of this act. All machinery about mines shall be properly 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 shall hereafter 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 land, he or they may apply by petition to the court of common sessions of the proper county after ten days' notice to the owner or 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, whereupon 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 same is practicable.

The said viewers shall at the same time assess the damages to be paid by the petitioners to the owner or owners of such lands which damages shall be fully paid before such opening is made. It shall be the duty of the petitioner or the viewers to give notice by at least

three written or printed hand-bills posted on the premises at or near the place where such opening is proposed to be made 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 owners, their agent or attorney, if residing in the same county, and the said viewers shall within thirty days after their appointment make report of their proceedings to the said court stating the amount of damages awarded accompanied by a map or plan of the proposed openings, and if no exceptions be filed to the said report within ten days after notice to the opposite party, his agent or attorney, of the filing of said report it shall be marked, confirmed by the clerk, and the petitioner or petitioners may proceed to make said opening or openings and shall have the right to use the same for the purpose of ventilation and drainage as aforesaid and as a passage way. The proceedings shall be recorded in the road docket of the proper county and the pay of viewers shall be the same as in road cases. If exceptions be filed they shall be disposed of by the said court as speedily as possible and both parties to have the right to take depositions as in road cases. If, however, the petitioner desires to make such opening before the final disposition of such exceptions he shall have the right to do so by giving bonds to be approved by the court, securing the damages as provided by law in the case of lateral railroad.

SEC. 8. In the year one thousand eight hundred and eighty-nine and every four years thereafter the Governor shall as hereinafter provided during the month of February appoint two mining engineers of good repute and of known experience and practice at the time. He also shall as hereinafter provided during the same month and every four years thereafter notify three president judges of the courts of common pleas of the judicial districts of the State containing bituminous coal mines, whose duty it shall be, each of them, to appoint one reputable miner of at least five years' practical experience in the mining region of Pennsylvania, in practice at least three months prior to his appointment, and a citizen of the Commonwealth not less than five years; *Provided*, That any person having been employed five months prior to the meeting of the examining board as superintendent, State or county officer, shall not serve on examining board. The two engineers and the three miners so appointed shall constitute a board of 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 examining board so constituted shall meet in the city of Pittsburgh on the first Monday of April, and when called together by the Governor for extra occasions at such time and place as he may designate, and after being duly organized and 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 inspectors 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 the qualifications 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, shall proceed to the examination which shall be in writing, of those who may represent 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 certificates and their percentage and the oath of the examiner shall be mailed to the Secretary of the Commonwealth and be filed in his office; *provided*, that no person shall be returned as competent whose percentage shall be less than ninety per cent, and such certificate shall be valid only when recommended by four of the examining board, the qualification of candidates for said office of inspectors of mines to be inquired into and certified by said examiners shall be as follows, namely: That they shall be citizens of Pennsylvania, of temperate habits, of good repute, as men of personal integrity, shall have attained the age of thirty years, and have had at least five years practical experience in the workings of the coal mines of Pennsylvania, and upon the examination they shall give evidence of such theoretical as well as practical knowledge and general intelligence regarding mines and mining and the working thereof, and all noxious gases, as will satisfy the examiners of their capacity and fitness for the duties imposed upon inspectors of mines by the provisions of this act. The board of examiners shall also at their meeting or when at any time called by the Governor together for an extra meeting divide the bituminous coal counties of the State into eight inspection districts as nearly equal to the labor to be performed as is possible, and at any subsequent calling of the board of examiners, this division

may be revised as experience may prove to be advisable, and they shall immediately after the examination furnish each person who came before said examination board to be examined, all questions which were given at the examination, on printed slips of paper and to be marked solved right or wrong, as the case may be. 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, the Governor shall from the names so certified, commission one person to be inspector of mines for each district, as fixed by the examiners in pursuance of the act, whose commission shall be for a full term of four years, to be computed from the fifteenth day of May, one thousand eight hundred and eighty-five. Always provided, however, the highest candidate or candidates in percentage shall have priority to be commissioned for a full term or unexpired term, before those candidates of a lower percentage, and in case of a tie in percentage, the oldest candidate shall be commissioned, as often as vacancies occur in said offices of inspectors of mines, the Governor shall commission for the unexpired term from the names on file the highest in percentage above ninety per centum, in the office of the Secretary of the Commonwealth, until the number shall be exhausted, and whenever this may occur the Governor shall cause the aforesaid board of examiners to meet, who shall examine persons who 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 highest in percentage 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 by those or their successors in whose jurisdiction the vacancy occurred.

Each inspector of mines shall receive for his services an annual salary of two thousand dollars and actual traveling expenses, to be paid quarterly by the State Treasurer upon warrant of the Auditor General, and all nine inspectors hereafter appointed shall make their residence and keep an office in the district for which they are commissioned. Each inspector is hereby authorized to procure such instruments and chemical tests, stationery, and to incur such expense of communication from time to time as may be necessary to the discharge of his duties under this act at the cost 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, books, memoranda, notes, et cetera, pertaining to the office shall be the property of the State and shall be delivered to their successor in office; that in addition to the expense now allowed by law to the mine inspector in enforcing the several provisions of this act to which this is supplementary, they shall be allowed all necessary expenses by them incurred in enforcing the several provisions of said laws in the respective courts of the Commonwealth, the same to be paid by the State Treasurer on warrants drawn by the Auditor General after auditing the same. All such accounts presented by the mine inspector to the Auditor General shall be itemized and first approved by the court before which the proceedings were instituted.

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.

But 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. 10. The inspector 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, which shall not be less than once in three months, and report how often he has visited each mine in the year to see that all the provisions of this act are observed and strictly carried out, and he shall make record of all examinations of mines, showing the condition in which he finds them, especially in reference to ventilation and drainage, the number of mines in his district, the number of persons employed in 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 or about the mine, with cause of such accident or death, which record completed to the 31st day of December of each and every year, shall, on or before the first day of February following, 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.

SEC. 11. 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, operators, lessees, superintendent, or mining bosses immediately of the discovery of any violation of this act and of the penalty imposed thereby for such violation, and in case of such notice being disregarded for the space of five days they shall institute proceedings against the owner, owners' agent or lessee or mining boss of the mine, under the provisions of section twenty-one of this act. In case, however, where in the judgment of the inspector of any district, delay may jeopardize life or limb, he shall at once notify one of the inspectors of the other districts, whereupon they shall at once proceed to the mine where the danger exists and examine into the matter, and if after a 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, or in case the court should not be in session, to a judge of said court in chambers, in which the mine may be located, for an injunction to suspend all work in and about such mine; whereupon said court or judge shall at once proceed to hear and determine speedily the same, and if the cause appear to be sufficient after hearing the parties and their evidence as in like case shall issue their writ to restrain the working of said mine until all cause of danger be removed, and the cost of said proceedings, including the charges of the attorney prosecuting the same, shall be borne by the owner, lessee or agent of the mine; *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 be borne by the county.

SEC. 12. 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 coroner of the county, who shall give due notice of the inquest to be held. If the coroner shall determine to hold an inquest the mine inspector shall be allowed to testify and offer such testimony as he may deem necessary to thoroughly inform the said inquest of the causes of the death. And the said inspector shall

have authority at any time to appear before such coroner and jury and question or cross-question any witness, and in choosing a jury for the purpose of holding such inquest, it shall be the duty of the coroner to impanel at least three experienced miners upon such jury. 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 or accident do not require 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 to administer oaths or affirmations. The cost 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. 13. The court of common pleas of any county in the proper district, upon a petition signed by not less than fifteen reputable citizens, who 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 duty, 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 inspector is neglectful 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 costs 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. 14. The inspector shall exercise a sound discretion in the enforcement of the provisions of this act, and if the operator, owner or miners shall not be satisfied with any decision, the inspector may arrive at in the discharge of his duties under this act which said decision shall be in writing, signed by the mine inspector, the said owner, operator, miner or miners shall forthwith appeal from such decision to the court of quarter sessions of the county wherein the

mine is located, and said court shall speedily determine the question involved in said decision, and appeal which said decision shall be binding and conclusive. The court in its discretion may appoint three practical, reputable, competent and disinterested persons whose duty it shall be, under instructions of the said court, to forthwith examine such mine, and make report under oath of the facts as they exist, or may have been together with their opinions thereon. 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, miner or miners or inspector, and if exceptions are filed the court shall at once hear and determine the same, and the decision shall be final and conclusive. If the court shall finally sustain the decision of the inspector then the appellants shall pay all costs of such proceedings. And if the court shall not sustain the decision of the inspector, then such costs shall be paid by the county, or by the appellant and county in such proportion as the court shall determine. That no appeal from any decision made by any mine inspector shall work as a supercedeas to such decision during the pendency of such appeal but all such decisions shall be in full force until reversed or modified by the proper court.

SEC. 15. On the petition of the mine inspector of any district, the courts of common pleas in any county in said district, shall at the first term after the passage of this act, appoint an examining board consisting of a mine inspector, an operator and a miner, who are citizens of the United States, and shall have at least five years experience in the bituminous mines of the State, who shall examine any person applying thereto as to his competency and qualifications to discharge the duties of mining boss. The said board of examiners shall meet at the call of the inspector, and they shall grant certificates to all persons whose examination shall disclose their fitness for the duties of mining boss; and such certificates shall be sufficient evidence of the holder's competency and qualifications for the duties of the said office: *Provided*, That any person who shall have been employed as a miner at least five years in the bituminous mines of Pennsylvania, and as mining boss continuously by the same person or firm for the period of one year next preceeding the passage of this act, shall be entitled to a certificate without undergoing said examination, but he shall not be employed by any other person or firm without having undergone such examination. The examining board shall hold their office for the period of four years from the date of their appoint-

ment, and shall receive five dollars per day for each day necessarily employed, and mileage at the rate of three cents per mile for each mile necessarily traveled, to be paid by the Commonwealth. For each certificate granted the board shall receive the sum of one dollar, which shall be for the use of the Commonwealth.

No person shall act as fire boss in any bituminous mine unless granted a certificate of competency by any of the mine inspectors of the bituminous region of Pennsylvania, and it shall be unlawful for any owner, operator, contractor, superintendent or agent to employ any person as fire boss who has not obtained such certificate.

After January first, one thousand eight hundred and eighty six, no owner, operator, contractor, lessee, superintendent or agent shall employ any mining boss or fire boss who does not have the certificate of competency or service required by this section.

And if any accident shall occur in any mine in which a mining boss shall be employed who has no certificate of competency or service as required by this section by which any miner shall be killed or injured, he or his heirs shall have a right of action against such operator, owner, superintendent, contractor, lessee or agent, and shall recover the full value of the damages sustained.

SEC. 16. No boy under the age of twelve years, and no woman or girl of any age shall be employed or permitted to be in any bituminous coal mine for the purpose of employment therein, nor shall any boy under the age of ten years, or any woman or girl of any age be employed or permitted to be in or about the outside structure or workings of any bituminous mine or colliery for the purpose of employment: *Provided, however*, that this provision shall not effect the employment of a boy or female of suitable age in an office or in the performance of clerical work at such mine or colliery.

SEC. 17. For any injury to person or property occasioned by any violation of this act or any wilful failure to comply with its provisions a right of action against the party at fault shall accrue to the party injured for the direct damage sustained thereby and in any case of loss of life by reason of such violation or wilful 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. 18. It shall be the duty of owners, operators, contractors, superintendents, lessees or agents, to keep at the mouth of the drift, shaft or slope, or at such other place as shall be designed by the mine

inspector, stretchers, properly conducted, for the purpose of carrying away any miner or employe working in and about such mine who may in any way be injured in and about his employment.

SEC. 19. It shall be the duty of the mine inspector on each visit to any mine to make out a written or partly written and partly printed report of the condition in which he finds such mine and post the same in the office at the mine. The said report shall give the date of the visit, the number of visits during the year, the total number of mines in his district, the number of feet of air in circulation and where measured, and such other information as he shall deem necessary. And the said report shall remain posted in the office for one year and said report may be examined by any miner or person employed in and about such mine.

SEC. 20. On or before the fifteenth day of January in each year, the owner, operator, or superintendent of every mine or colliery shall send to the inspector of the district, a correct report specifying with respect to the year ending the thirty-first of December, preceding such report the name of the owner or operator and officers of the mine and the quantity of coal mined the report shall be in such form and give such information as may be from time to time required and prescribed by the mine inspector of the district. Blank forms for such reports shall be furnished by the Commonwealth.

SEC. 21. 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 a fine of not less than two hundred dollars and not exceeding five hundred dollars, at the discretion of the court. And in default of payment of such fine and costs for the space of ten days the defendant shall be sentenced to imprisonment in the county jail for a period not exceeding six months.

SEC. 22. The provisions of this act shall not apply to any mine employing less than ten persons in any one period of twenty-four hours.

SEC. 23. All acts or parts of acts supplied or inconsistent herewith are hereby repealed.

MINING LAWS OF OHIO.

INSPECTOR OF MINES.

SECTION 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 mineralogy, 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 bond 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 bond, 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 such 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 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 working 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, as 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 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 cost 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 owner or agent of any coal mine worked by a shaft, wherein over fifteen thousand 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 fifteen thousand yards have been excavated in such mine; 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 proceeding in appropriating such land by the provisions of law in force providing for the appropriation 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 every such mine, an amount of ventilation of not less than 100 cubic feet, per minute, per person employed in such mine, 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 one hundred and twenty feet in advance of a breakthrough, or air-way; and all breakthroughs, or air-ways, except those made near the working faces 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 statute 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 from standing gas, and every working place shall be carefully examined every morning with a safety-lamp, by a competent 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 conversations 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 and hoisting persons, and in the top of every shaft an improved 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 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 said 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 appliance 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. When 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 free-holders, 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 against whom the charges are made, and also to the person whose name first appears 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 a member of the board, and depositions may be read on such examinations, 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 the 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 loyalty 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 quantity of coal mined, for the purpose of testing 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 shall 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 a month, the mine and the machinery connected therewith, and to measure the ventilating current, and if the owner, agent, or manager so desires, he may accompany said committee by himself or two or more persons whom he may appoint for that purpose; the owner, agent or manager shall afford every necessary facility for making such inspection and measurement, 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 measurement, 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 shall constitute a violation of this section.

SEC. 306. The provisions of this chapter shall not apply to or affect 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. 6871. Whoever knowingly violates any of the provisions of sections two hundred and ninety-eight, two hundred and ninety-nine, three hundred, three hundred and one, three hundred and two, and three hundred and five, 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 more than fifty dollars, or imprisoned in the county jail not more than thirty days, or both.

MINES.

SEC. 4374. A person owning land adjoining a mine worked for the production of coal, ore, or other mineral substance, or a person having an interest in such mine, having reason to believe that the protection of his interest in the mine, or in like minerals on his adjoining land requires it, upon making affidavit to that effect before a justice of the peace or other proper officer, may enter such mine and have an examination or survey made thereof; but such examination or survey shall not be made until one day's notice thereof is given to the parties in interest, nor at unreasonable times, but in such time

and in such manner as will least interfere with the workings of the mine, if the same is being operated at the time.

SEC. 4375. When the affidavit has been made and notice given, the person in charge of such mine shall, on the application of the party giving the notice, transport by the ordinary method in use at such mine for entrance and exit, a surveying party of not more than five persons, furnish to such party a competent guide, and supply them with approved safety lamps; and for every person so transported, he shall be entitled to receive, from the person requesting such survey, the sum of fifty cents, unless the shaft exceeds two hundred and fifty feet in depth, when he shall be entitled to the sum of one dollar for each person, and five dollars per day for the guide.

SEC. 4376. If the parties working or occupying such mine sustain any damage, for which compensation should be made by reason of such examination or survey having been made at unreasonable times, or in an improper or unwarrantable manner, the person making the same, or causing the same to be made, shall be liable therefor.

SEC. 4377. The parties working or occupying or working such mine shall not hinder or obstruct the examination or survey, when made at a reasonable time and in a reasonable manner, under a penalty of not less than fifty nor more than five hundred dollars for each offense, to be recovered before a court of competent jurisdiction.

SEC. 4378. The party who makes the application for the survey, may, upon refusal of the owner or person in charge of the mine to comply with the foregoing provisions, recover judgment, as upon default, in a court of competent jurisdiction, against the owner of such mine, in such sum as such party may declare, under oath, he believes to be justly due him for coal or other mineral belonging to him, taken by the owner of such mine without his permission; and the statute of limitation shall not be operative as against such claim; but the demand and refusal to enter such mine, shall be first proven to the satisfaction of the court or jury, and the refusal of the party in charge of the mine, shall be held to be the refusal of the owner.

SEC. 4379. The provisions of this chapter shall be available to any person who, on his oath, states that he is the owner or authorized agent of any owner of land which he believes contains coal, or other valuable mineral substance, within one mile of such shaft; although it do not adjoin any mine of the owner of such shaft; the affidavit required shall be sufficient if it state that the lands in which the affiant is interested are in the vicinity of such shaft, and not

more than one mile distant therefrom; and service upon any owner or superintendent of such shaft shall be sufficient.

OFFENSES AGAINST PROPERTY.

SEC. 6881. Whoever, in mining for coal or other minerals, willfully and without lawful authority, trespasses upon the lands of another, shall be fined not more than one hundred nor less than five dollars, or imprisoned not more than ten days, or both; and any continuation of such trespass, for twenty-four hours after the commencement of any prosecution under this section, shall be deemed a separate offense, and all prosecutions hereunder shall be commenced within one year from the time the offense becomes known to any owner of the property injured.

OFFENSES AGAINST PUBLIC HEALTH.

SEC. 6925. Whoever throws or deposits, or permits to be thrown or deposited, any coal dirt, coal slack, coal screenings, or coal refuse from coal mines, or any refuse or filth from any coal-oil refinery or gas works, or any whey or filthy drainage from a cheese factory, upon or into any of the rivers, lakes, ponds, or streams of this State, or upon or into any place from which the same will wash into any such river, lake, pond, or stream, shall be fined in any sum not more than two hundred or less than fifty dollars.

FRAUD.

SEC. 7070. Whoever sells and delivers any stone coal, except at the weights and measures prescribed by law, shall be fined not more than fifty nor less than five dollars, or imprisoned not more than thirty nor less than five days.

WEIGHTS AND MEASURES.

SEC. 443. A bushel of the respective articles hereafter mentioned shall mean the amount of weight, avoirdupois, in this section specified, viz:

Of coke, forty pounds.

Of bituminous coal, eighty pounds.

Of cannel coal, seventy pounds.

SEC. 444. The standard bushel of stone coal, coke and unslacked lime, shall contain twenty-six hundred and eighty-eight cubic inches;

and the lawful measure for measuring such articles shall contain two bushels, and be of the following interior dimensions: Twenty-four inches diameter at the top, twenty inches at the bottom, and fourteen and one-tenth inches deep.

SEC. 445. When facilities can be had, all sale of coal shall be by weight, and two thousand pounds, avoidupois, shall constitute a ton thereof; but, where coal cannot be made, it may be sold by measurement.

SEC. 446. Whoever sells stone coal in violation of the provisions of this chapter shall be liable to the person to whom the coal is sold and delivered, in treble damages, to be collected in a civil action before any court of competent jurisdiction; if the defendant in such action does not reside in the county where the mine is located, service may be had upon him by copy of the summons left at his place of business; and any judgment recovered in such case shall be a lien upon all property of the defendant, in the county, from the day of service; but this section shall not apply to any person or corporation mining or selling less than fifteen thousand bushels of coal annually.

SCHOOL OF MINES.

SEC. 8435. That the trustees of the Ohio Agricultural and Mechanical College be, and they are hereby required to establish in said college a school of mines and mine engineering, in which shall be provided the means for studying scientifically and experimentally the survey, opening, ventilation, care, and working of mines, and said school shall be provided with complete mining laboratories for the analysis of ores, coals, and other minerals, with all the necessary apparatus for testing the various ores and coals, and also with the models of the most improved machinery for ventilating and operating all the various kinds of mines with safety to the life and health of those engaged.

(8436) SEC. 2. Said trustees may require one of the professors now authorized to be employed in said institution to give instruction in the most improved and successful methods of opening, and operating, and surveying, and inspecting mines, and in the methods of testing and analyzing coals and other minerals, especially those found in the State of Ohio. It shall also be the duty of such professor to register all experiments made in testing the properties of coals and other minerals, and such results shall be published in the annual reports of said trustees. It shall also be the duty of said

professor to preserve in a cabinet, suitably arranged for ready reference and examination, suitably connected with the school of mines, samples of the specimens from the various mines of the State, which may be sent for analysis, with the names of the mines and their localities in the counties from which they were sent, and the analysis and a statement of the properties attached. It shall also be his duty to furnish analysis of all minerals found in the State, and sent to him for that purpose by residents of this State.

(8437) SEC. 3. There is hereby appropriated out of the general revenue fund the sum of four thousand five hundred dollars, to be expended in providing apparatus, equipments, cabinets, etc., as mentioned in the first and second sections of this act.

SEC. 4. This act to take effect and be in force from and after its passage.

AMENDMENTS TO THE OHIO MINING LAW, PASSED MAY 1, 1885.

AN ACT to amend and supplement certain sections of the Revised Statutes therein named.

SECTION 1. Be it enacted by the General Assembly of the State of Ohio, That sections two hundred and ninety-three, two hundred and ninety-five, and two hundred and ninety-nine of the Revised Statutes of Ohio, as amended by an act entitled "an act to apportion the state of Ohio into mining districts, to provide for adequate and efficient inspection of mines, and to amend and repeal certain sections of the Revised Statutes therein named," passed April 12, 1884 (81 v. 153), be and the same are hereby amended so as to read as follows:

Section 293. The chief inspector shall issue such instructions, make such rules and regulations for the government of the district inspectors, not inconsistent with the powers and duties vested in them by law, as shall secure uniformity of action and proceedings throughout the different districts; and he may order one district inspector to the assistance of any other district inspector, or make temporary transfers of district inspectors, when in his judgment the efficiency or necessity of the service demands or permits; and he may, with the consent of the governor, remove any district inspector at pleasure; the district inspectors are hereby invested with all the powers and authority of county auditors, as sealers of weights and measures in the different counties of this state, and for any service performed as

such sealers they shall receive the same compensation as now provided by section ten hundred and sixty-two of the Revised Statutes; but said inspector shall exercise said authority in connection with weights and measures, only at mines in their respective districts; the chief inspector shall render such personal assistance to the district inspectors as they, from time to time may require, and shall make such personal inspection of mines as he may deem necessary and his other duties will permit; he shall keep in his office and carefully preserve all maps, surveys and other reports and papers required by law to be filed with him, and so arrange and preserve the same as shall make them a permanent record of ready, convenient and connected reference; he shall compile and consolidate the reports of district inspectors, and annually make report to the governor of all his proceedings, as well as those of the district inspectors, the condition and operation of the different mines of the state, the number of mines and the number of persons employed in or about such mines, the amount of coal, iron ore, limestone, fire-clay, or other minerals mined in this state; and for the purpose of enabling him to make such report, the owner, lessee or agent in charge of such mine, or who is engaged in mining, is hereby required to give accurate information as to the foregoing facts on blanks to be furnished by the chief inspector under penalty of one hundred dollars, to be recovered at the suit of the chief inspector in the name of the state of Ohio, for refusal to furnish such information on demand of the chief inspector; he shall also include in such report such facts relative to the mineral resources of the state, and the development of the same, as shall, in his judgment, be of public interest, he shall enumerate all accidents, and the manner in which they occurred, in or about mines, and give all such other information as he thinks useful and proper, and make such suggestions as he deems important relative to mines and mining, and any other legislation that may be necessary on the subject for the better preservation of the life and health of those engaged in such industry.

Section 295. There shall be provided for the inspectors, weights and measures and all instruments and chemical tests necessary for the discharge of their respective duties under this chapter, which shall be paid for on the certificate of the chief inspector, and shall belong to the state.

Section 299. The owner or agent of every coal mine operated by shaft, in all cases where the 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; there shall also be provided an approved safety-catch, and a sufficient cover overhead, on all carriages used for lowering and 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; and there shall also be provided in every shaft a traveling or passage way from one side of a shaft bottom to the other, so that persons working therein may not have to pass under descending cages; and all slopes or engine-planes, used as traveling ways by persons in any mine, shall be made of sufficient width to permit persons to pass moving cars with safety; but if found impracticable to make any slope or engine-plane of sufficient width, then safety holes of ample dimensions, and not more than sixty feet apart, shall be made on one side of said slope or engine-plane. The said safety-holes shall always be kept free from obstructions, and the roof and sides shall be made secure.

SEC. 2. That the following section shall supplement section two hundred and ninety-nine:

Section 299a. From and after May 1, 1885, no boiler used for generating steam, and no hopper, or other inflammable structure for the preparation or dumpage of coal, shall be erected nearer than one hundred feet to the mouth of any shaft or slope; but this section shall not be construed to prohibit the erection of a fan for the purpose of ventilation, or of a trestle for the transportation of cars from any shaft or slope to such hopper or structure; neither shall it apply to any shaft or slope, until the same be sunk to its proposed limit, or until the work of development and shipment of coal has commenced.

SEC. 3. That sections three hundred and one and six thousand eight hundred and seventy-one of the Revised Statutes be and the same are hereby amended so as to read as follows:

Section 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 ventilation of the mine, shall be so hung or adjusted that they will shut of their own accord and cannot stand open; and all main doors shall have an attendant, whose constant duty shall be to open them for transportation and travel, and prevent

them from standing open longer than is necessary for persons or cars to pass through; 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 said actual measurements, and forward the same to the mine inspector.

Section 6871. Whoever knowingly violates any of the provisions of sections two hundred and ninety-eight, two hundred and ninety-nine, three hundred, three hundred and one, three hundred and two, and three hundred and five 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 the mine governed by the statute, who intentionally and wilfully 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; or any person having charge of a mine, whenever loss of life occurs by accident connected with the working of such mine, or by explosion, who neglects or refuses to give notice thereof forthwith, by mail or otherwise, to the chief inspector of mines, and to the coroner of the county in which such mine is situate, or any such coroner who neglects or refuses to hold an inquest upon the body of the person whose death has been thus caused, and return a copy of his findings and all the testimony to the inspector, shall be fined not less than fifty dollars, or imprisoned in the county jail not more than thirty days, or both.

SEC. 4. That sections 293, 295 and 299, as amended April 12, 1884, and original sections 301 and 6871 be and the same are hereby repealed.

SEC. 5. This act shall take effect and be in force from and after its passage.