

REPORT OF THE STATE INSPECTOR OF MINES
FOR INDIANA, 1898.

By ROBERT FISHER.

INDIANAPOLIS, IND., January 17, 1899.

PROF. W. S. BLATCHLEY, *State Geologist of Indiana*:

I transmit herewith my fourth annual report as Inspector of Mines. It is not so complete as I should have been pleased to make it, as other duties which are made imperative by the statutes have made large calls upon the time of myself and my assistant during the period which I had intended to devote to its preparation.

There were five fatal and several serious accidents during the month of December, 1898, which accounts for part of the delay, and several calls for special inspections were responded to during the same period. With your permission, I shall file a supplementary report previous to retiring from office, March 11, covering some points which I have been compelled to neglect at this time.

ROBERT FISHER,
Inspector of Mines.

REPORT
OF
INSPECTOR OF MINES

TO THE
STATE GEOLOGIST:

1898.

ROBERT FISHER, INSPECTOR.
JAMES EPPERSON, ASSISTANT.

In beginning the last annual report which I shall have the honor to file, I think it is a fitting time to review the history of the Mining Department in this State, and to some extent the legislation governing the industry, and I do this, though it to some extent repeats what was said in the introduction to my report for 1897.

The first legislation enacted in the State of Indiana for the regulation of mines was approved March 8, 1879. It provided for one Mine Inspector, who was allowed a fee of five dollars for each inspection made, and his jurisdiction extended over all mines in the State, without reference to the number of men employed, the territory excavated or the amount of coal produced. Not more than two inspections of any mine were to be made during any year. The law was modeled after that in force in the State of Illinois at that time, and provided for second outlets in certain cases, maps of mines to be made by operators and copies of the same to be filed with the Inspector, ventilation affording at least 100 cu. ft. of fresh air for each person and 300 cu. ft. for each mule used in the mine, precautions to be taken in working toward abandoned works, covers on cages and gates on shafts,

daily examinations of ropes and places known to contain dangerous gases, and preventing the employment of boys under fourteen years of age. The Inspector was appointed by the Governor, to serve four years. Penalties were provided for a violation of the provisions of the act. The report of Herbert H. Richard, the first Inspector, shows that during the year 1879-1880 there were in the State 177 mines of all classes, but a great many were small mines that worked only in the fall of the year. The mines were generally deficient in ventilation and in other respects. A great improvement was noted on the second visit. The only fan reported in the State had just been erected by the Brazil Block Coal Company at its mine in the town of Brazil.

In the codification of the laws of Indiana in 1881, several changes in the mining laws were made. The section requiring mine maps to be made was dropped, and a provision inserted that maps should be made on request of the owner of the land, the miners employed or the owners of the mine, and that the expense be borne by the party causing the survey to be made. The appointment of an Inspector was made subject to the consent of the Senate, the term reduced to two years, and a salary provided instead of fees, which were discontinued. Mines employing less than ten men were exempted from the provisions of the act, and the inspection of scales by the Inspector was provided for. The report for 1881-1882 shows a marked improvement in the condition of the mines. Though ventilation was still defective, the work of improvement had been rapidly moving on, and fourteen fans were reported as being in operation in Clay county alone, with others scattered over the State.

The General Assembly of 1883 amended the law so as to provide "that the rope used for hoisting and lowering in every coal mine shall be a wire rope," and providing for the employment of a check weighman by the miners employed at any mine.

March 5, 1885, an act was approved providing for driven air courses parallel with all entries, providing for breakthroughs every 75 ft., requiring owners and operators of mines to keep a sufficient supply of timbers at the mine and deliver them to the working places, maps of abandoned mines to be filed with the county recorder, safety catches on cages, and requiring foremen to visit working places every alternate day. In 1889 a difference in politics between the Governor and the Legislature led to the enactment of a law placing the power of appointment in the General Assembly. This led to litigation between the two appointees, to the detriment of the mining interests. The Supreme Court finally sustained the Governor, and in 1891 an act was

passed creating the Bureau of Geology and Natural Resources, and making the Mining Department a branch of that bureau, and placing the appointment of the Inspector in the hands of the State Geologist, to whom he reports. The law also gives the Inspector an assistant, appointed by himself and removable by him for cause. The Inspector and his assistant are required to be residents of the State of Indiana for five years immediately preceding their appointment and practical miners of at least ten years' experience, and no person is eligible to either place who is or may be pecuniarily interested in any coal mine in the State. Another act of the same Legislature requires the use of accurate scales of standard manufacture for weighing coal, the testing of scales each morning by weighmen, providing for lights and gates at the top vein where two veins are being worked, a code of signals for hoisting shafts, requiring the Inspector to investigate, with a coroner, all fatal accidents occurring in and about mines, splits in ventilating currents, breakthroughs every 45 ft., reports of air circulating in the mine to be recorded to the Inspector monthly, and prohibiting the employment of females. In 1897 a law was enacted providing for the examination of mine bosses, fire bosses and hoisting engineers by the Inspector of Mines, providing for notice to the Inspector of all serious accidents occurring in mines, requiring mine bosses to give a written acknowledgment when notice is given of an unsafe place, providing that when an escape-way is over 150 ft. deep a hoisting apparatus may take the place of a stairway in such shaft, requiring operators to make and file with the Inspector maps of mines and to make monthly reports of tonnage and wages, and providing an office in the State House for the Inspector.

From the above it will be seen that the Mining Department of this State has no official relation to any other of the State authorities than the State Geologist, and that the only relation between them is that the Geologist appoints the Inspector of Mines and receives his annual report. The powers of the Inspector may be briefly summarized as follows:

1. To enter and inspect mines and to order such improvements as he considers necessary for the health and comfort of the employes.
2. After giving a reasonable time for such improvements, to order the removal of workmen from the mine or part of the mine which is unsafe or not sufficiently ventilated.
3. To examine and grant certificates to applicants for the positions of mine boss, fire boss and hoisting engineer.

4. To appoint a competent mining engineer to make a survey and map of any mine in the State when the owner or operator has failed to furnish a satisfactory map.

5. To forbid the use of scales which are found to be inaccurate.

And his duties are:

1. To make at least two inspections annually of each mine and the machinery and appliances connected therewith.

2. To collect and tabulate the statistics of the coal industry of the State.

3. To see that the mining laws of the State are enforced, and prosecute wilful violations of the same.

4. To make an annual report to the State Geologist of the work of his department.

The number of mines coming within the jurisdiction of the department in 1897 was 126; men employed, 7,999, and tons of coal produced, 5,146,920. Fatal accidents, 16, or one to each 254,880 tons of coal produced. The ventilation of most of the mines is good, fans being used at all but six, and two of those having natural ventilation to supply the men employed at nearly all seasons of the year, and furnaces being used in all of them when necessary.

The following have been the Inspectors under the different laws noted above:

Herbert H. Richards.....	1879-1881
Thomas Wilson, Jr.....	1881-1885
Thomas McQuade.....	1885-1889
Thos. R. Tislow.....	1889-1891
Thomas McQuade.....	1891-1895
Robert Fisher.....	1895-1899

And the following have been assistants:

Welman A. Lackey.....	1891-1892
Michael Comiskey.....	1892-1894
Barney Martin.....	Jan. 1 to Mar. 15, 1895
Wm. McCloud.....	Mar. 15 to Dec. 1, 1895
James Epperson.....	Dec. 1, 1895

Since the creation of the office its incumbents have been handicapped by reason of the amount of territory to be covered with the force of Inspectors, and inadequate provision for the necessary traveling and other expenses incident to the proper performance of the work to be done.

LEGISLATION.

In the work of my office during the two years since the Legislature was in session, several places in the law have been found to be weak in the means provided for enforcing its provisions. The following amendments should be made to make the work of the Inspector effective:

1. In all cases where the Inspector is authorized to order the men out of a mine, he should be permitted to bring an injunction suit in the name of the State and to prosecute it without filing a bond, and have the services of the law officers of the State, as he now has in criminal cases.

2. Whenever the Mine Inspector shall find men working without sufficient air or under any unsafe condition, he should be authorized to bring suit immediately without giving the notice now required. As the law now stands, it permits mine operators to allow their mines to get into a bad condition between the visits of the Inspector, knowing that a reasonable time must be given to make repairs before they are subject to a fine. With the best work that can be done by the Mine Inspector and the law officers of the State, a mine *may* run in an unfit condition for ten months of the year.

3. When a new mine is opened, or one resumes work after a shutdown, notice should be given to the Inspector so that he may know of the fact. In several instances mines have been reopened after a long stoppage, and operated, usually under very bad conditions, for six weeks before knowledge of the fact comes to this office by the reports now required by law.

4. The Inspector should be given some supervision over small mines. There are numerous mines in the State which, during some part of the year, employ a sufficient number of men to bring them within the operation of the law, and for the rest of the year employ but a few men. If the Inspector visits them at a time when less than ten men are employed, he has no power to order improvements made, and the visit is wasted. When the number of men is increased, the mine is run without complying with the law, and as this is usually at the busy season of the year, visits of inspection can not be made without neglecting more important work. In addition to this, employes of small mines are denied the protection and benefits of the law at all times.

5. The increase of machine mining and the fact that all coal mined in this way is blasted as soon as cut, or at least during working hours, filling the working places with powder smoke, call for some regulation as to the use of blasting powder in mines.

If these changes are proposed in the Legislature, I shall render all assistance in my power to secure their passage. In this connection I will say that though in the compilation of the laws published in 1897 I invited suggestions as to changes required in them, no such suggestions have been received in such form that I can embody them in this report or present them to the Legislature. The above have been brought to my mind by the experience of the last four years in the work of the office.

In this connection I desire to say that in nearly all cases where it has been necessary to bring suits for the violation of the mining laws I have had the hearty co-operation of the prosecuting attorneys in bringing the cases to as speedy a trial as the law will permit. The delays allowed by the practice in our courts, however, make it a tedious and expensive matter to secure conviction, even where the violation is a plain one. I am also sorry to say that I have not had the desired co-operation of the miners in reporting violations of the law or in giving evidence on prosecution.

REVIEW OF TRADE FOR THE YEAR.

As a whole, the coal business in the State of Indiana during the year 1898 has been fairly satisfactory. The question of wages as settled by the Chicago conference of January has been generally complied with in all of the district north of the B. & O. S. W. railroad, and there has been no general stoppage of work at any number of mines in this territory. The total production of coal in the State will reach more than five millions of tons, an increase of nearly one million tons over last year. The increase is partly accounted for by the fact that during the months of July, August and September, 1897, nearly all of the mines in the State were idle on account of the national strike begun on July 4, but aside from this there is a large increase in the amount of coal mined in the counties of Sullivan, Vigo, Vermillion and the bituminous mines in Parke county. This is partly offset by very slack work in the block coal district during the summer. The claim is made by the operators in this region that by the Chi-

cago agreement they were placed at a disadvantage with respect to the Pittsburg district in Pennsylvania, and lost a large part of the trade that rightfully belongs to this field. An attempt will therefore be made in the next conference to have the differential between these districts restored to the point existing before last year. The miners of this district have instructed their delegates to oppose any reduction in the differential between the block and bituminous districts of this State, which is at present, as for several years past, ten cents per ton for pick mining. This is very likely to cause a serious disagreement in the conference to be held at Pittsburg, and may have serious results on the business here for the next year, as it will be very difficult to increase the price in the East without a corresponding increase in the bituminous fields of the West. The last three months of the year have been very brisk in all parts of the State, and the production is nearly as large in the block coal district as it has ever been, and there is a great increase in the production of the bituminous mines over everything that has ever been known in the State. The only place where any complaint of slack work exists is on the line of the Pennsylvania railroad in Greene county, where there is a shortage of cars to move the product, and two-thirds time is about all that they have done.

South of the B. & O. S. W. railroad the United Mine Workers have made but small progress with their organization, and the Chicago agreement has not been in effect. Several attempts have been made to bring the miners there into the organization, but the operators seem to be unalterably opposed to working in harmony with the miners of the competitive district, as they claim that their principal competition comes from Kentucky and the Ohio river mines, and very little of their coal seeks an outlet north. There have been several small strikes in that district as a result of attempts to have the Chicago scale of prices adopted at different mines, but the year ends with all at work full time and with prospects of a continuance of the demand for some time to come. As the demand is mostly local, the continuance of cold weather will have a good effect on the prospects.

A strike has been in progress at the mines of Cabel & Co., at Washington, during the whole of the year, but the mines have been operated to some extent by miners brought from Kentucky, and mining machines have been introduced there, so that the company have kept up a fairly good production, though not nearly as good as they would have been had the business gone on without that interruption. The operators claim to be paying scale rates, so that the only question seems to be one of the recognition of the miners' organization. Within the

last months the mines operated by the same parties at Hartwell, in Pike county, have been drawn into the fight, and an attempt is now being made to operate them with non-union labor, but with what success I am not able to say at present. The struggle seems to be no nearer an end than at this time last year. This is one of the few difficulties that the Labor Commissioners of the State have been unable to adjust during the year. The men who are on strike have the sympathy and support of organized labor in their contention, and are being generously supported.

More has been done in the way of new developments this year than for a long time previously. New mines have been opened in the different counties as follows: Clay, 8; Daviess, 1; Greene, 1; Parke, 1; Vermillion, 2; Vigo, 1. Total, 14. In addition, shafts that had been previously in operation have been sunk to lower veins as follows: In Clay, 1; Vermillion, 2, and two new shafts are in process of sinking.

Mining machine plants have been installed in three mines, and the use of machines has been temporarily abandoned at two. Electric haulage has been installed at two mines during the year, and is in process of installation at another.

On the basis of the November output, the present capacity of the mines of the State is 6,100,000 tons at mines employing over ten men, and it is really greater than this, as many more men could have been employed during that month at the mines which were in full operation, and shortage of railroad transportation curtailed production in other localities, as noted above.

The new year will open with most flattering prospects for the coal trade of the State, and the only thing that can prevent it from being the banner year in our history in the amount of production and wages paid will be an inequitable placing in the scale to be paid in this State by the joint conference of miners and operators to be held during the next month. Business has been done during the last year in this State, as in fact by the trade all over the country, at a very small margin of profit. The indications are fair at present for an improvement in this respect for the next year, and it is to be hoped that capital will be fairly well recompensed during the year.

Table Showing the Production of Coal in Tons of 2,000 Pounds in Indiana, During the Year 1898,
at Mines Employing More than Ten Men.

COUNTY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Clay.....	102,196	109,226	86,543	69,438	57,941	52,585	62,378	66,768	80,286	97,150	100,402	127,654	1,018,497
Davi ss.....	13,141	15,956	18,812	16,218	11,201	11,108	11,960	13,230	13,057	15,301	18,650	22,606	181,060
Dubois.....	629	692	389	576	363								2,649
Fountain.....	12,805	12,235	7,868	4,059	10,159	10,498	7,148	8,668	8,115	10,710	8,716	10,920	111,901
Gibson.....	1,774	4,746	2,471	2,810	1,991	2,435	2,269	2,307	3,224	7,082	8,400	7,777	47,286
Greene.....	69,519	49,752	35,321	38,528	27,971	27,540	25,069	40,319	58,371	45,785	55,564	44,983	518,722
Knox.....	5,133	3,992	3,502	2,984	1,949	3,104	2,919	3,513	3,751	5,706	6,249	7,655	50,457
Martin.....	1,144				460	510	558	409	502	482	367	620	5,052
Owen.....	1,293	1,231	987	941	772	205	682	469	691	666	421	455	8,515
Owen.....	59,757	47,010	63,747	43,169	33,683	35,456	29,576	42,044	43,293	50,417	72,823	81,169	612,144
Parke.....	2,453	2,058	2,495	2,208	2,496	2,113	1,727	2,517	1,993	1,007	2,910	2,310	27,087
Perry.....	19,188	17,542	15,890	16,295	16,495	13,591	14,325	14,228	12,662	10,003	27,136	54,466	240,821
Pike.....	62,362	48,164	53,878	60,190	63,830	50,909	45,178	43,821	53,934	62,520	75,754	56,902	677,442
Sullivan.....	19,315	17,386	16,831	13,302	11,472	10,034	11,339	11,555	15,928	23,224	22,825	19,401	193,802
Vanderburgh.....	33,000	32,046	40,660	35,373	20,246	18,614	19,908	27,131	49,014	46,340	36,410	41,205	399,947
Vermillion.....	61,796	51,005	76,487	49,942	78,318	59,280	59,416	65,359	73,173	75,989	82,825	85,859	819,440
Vigo.....	11,636	10,525	8,385	8,754	4,269	5,945	6,660	7,557	5,785	10,062	11,631	20,715	111,924
Warrick.....													
Total.....	477,641	424,166	434,269	364,974	343,466	303,927	317,012	349,886	423,779	472,224	531,083	584,697	5,027,044
Estimated production of small mines.....													150,000
Grand total.....													5,177,044

REPORT OF STATE INSPECTOR OF MINES.

INDIANA MINING INSTITUTE.

In July, 1897, the Indiana Mining Institute was organized for the purpose of social and educational improvement of the members by interchange of views and experiences in line with the work of mine management. The constitution prohibits anything tending to affect the question of wages, and the co-operation of all, whether employers or employes, along the line of improvement in mining methods, has been solicited. While it has not been so successful as could have been wished, the quarterly meetings of the institute have been interesting and instructive.

I give herewith a paper by Mr. D. J. Lloyd on the "Benefits of the Institute," as embodying the ideas of its organizers, and one by T. J. Mooney, M. E., as illustrating the subjects treated in the discussions held by the members.

While space does not permit their publication, papers by W. F. Brown, on "Mechanical Haulage," and by William Spears, on "A New Mine Pump Designed to Resist the Corrosive Action of Mine Water," are especially worthy of mention. Other papers published by the institute are on "Gases Met With in Mines," by J. T. Fogg; "Safety Lamps," by William Devonald; "Different Methods of Working Coal," by Gust. Stievenart, M. E., and "Long Wall Mining," by Roland Elston. Papers were also contributed by Dr. George H. Ashley, on "The Indiana Coal Survey," and by Robert Fisher, on "Mining Legislation." Copies of any of these may be obtained from the secretary, G. S. Patterson, Terre Haute, Indiana:

Benefits of the Institute.

BY DAVID J. LLOYD, TERRE HAUTE, IND.

[Terre Haute Meeting, April 22, 1898.]

When I was informed by our secretary that I was on the program for a paper to be read before this institute, I must say that I was surprised, being a stranger to most of you, and much more so particularly when the subject "Benefits of the Institute" was assigned to me. I felt then, and do yet, incompetent to do justice to so important an article.

However, feeling it my duty, I will attempt the task in order to be obedient to the committee on program. I trust, though, gentlemen,

that you will pardon me should I fail to express myself in the language of a collegian of the true meaning of what this institute should and ought to be, as my school days were cut off when twelve years old and taken into the bowels of the earth to be made a collier, by which name we are better known across the water.

This institute should be, and is, I believe, a step in the right direction. It is the dawn of a brighter future; it should awaken general interest in each other, in study, and create a desire for higher proficiency. We should, therefore, contribute all in our power to make it a grand success.

This can only be done by attending as often as is possible and consecutively perform the duties assigned to us at all times by the committee on program, such as reading papers on various topics, to be genial and frank in open discussion.

This, then, gentlemen, is my idea of an ideal school of practical training, and by close application to the foregoing we can acquire a knowledge of technicalities, or a technical education, which many of us were deprived of in our early lives, which has with the constant change of conditions become a necessity. Methods that we now use in mining were not heard of fifty years ago.

So late as the year 1852 a committee of the House of Commons of England reported as follows:

“Your committee are of opinion that any system of ventilation depending upon complicated machinery is inadvisable, since under any disarrangement or fracture of its parts the ventilation is stopped or becomes inefficient.

“That the two systems which alone can be considered as rival powers are the furnace and steam jet.”

You will find to-day, gentlemen, on the statutes of England, where said report has been completely reversed.

In 1861 the centrifugal fan at Elsecar was described to the North of England Institute of Mining Engineers by the late J. J. Atkinson, and to him must be given the credit of having in several papers on the subject first shown clearly the superiority of mechanical ventilators over every other system.

So that we are not only going to be benefited in the future by this institute, but are benefited by institutes of nearly forty years back.

Then, with the privileges that we now enjoy, shall I say that ignorance is crime, and that knowledge gained merely from self-experience is not sufficient in our daily vocation?

Inventions and discoveries have worked miracles. The possibilities of steam and compressed air have not yet been fathomed. “Elec-

tricity, with its wonderful achievements accomplished in the past ten years, is as yet, I believe, in its infancy."

As I said in my paper, "Electricity," read before the Illinois Mining Institute in the year 1892:

"No one has been able to tell us what electricity is, except that it is a property which resides in all matter, and which constantly seeks to establish an equilibrium. But of the nature of electricity, except through its observed effects, nothing is known; therefore it is only known to us by what it does, which, after all, perhaps, is the best way to know anything."

However, we must adapt ourselves to our changed surroundings and keep abreast of the times if we expect to hold our own in the struggle for existence.

Competition in all branches of industry is stronger, sharper and more active than ever before.

Especially is this the case in the industry in which we are interested; only that man to-day who has the ability, tact and education required to recognize, appropriate and employ the best and most advanced methods of mining will prove successful.

The legislatures of the various States have now appreciated this fact, hence the law requiring a higher standard of efficiency on the part of the mine foremen, managers and bosses.

The gentlemen who were instrumental in organizing this Mining Institute, which gives us an opportunity for the calm and intelligent interchange of opinions, also recognized this necessity.

Have I been too radical in intimating that it is not necessary to take a collegiate course in order to acquire a technical education?

The world is full of self-educated men, prominent in all the affairs of life, who are abundantly able to cope with the brightest graduates of Yale and Harvard colleges. We must take advantage of our present opportunities which surround us, employ spare moments in study and mental improvement.

Abraham Lincoln, I am told, never attended college; the elder Atkinson rose from the humbler walks of life; Sir George Elliott, the coal king of Great Britain, was a poor eight-year-old collier boy; William Hopton, author of the "Conversation on Mines, Between Father and Son," entered the mines when only seven years old.

Some of the distinguished gentlemen whom I have the honor of addressing, and who are recognized throughout the State as among the ablest mining men, were never matriculated at college.

Industry, energy and perseverance remove all obstacles and overcome all difficulties.

Is this institute, then, not, as I said, a step in the right direction?

Experience taught our forefathers that the inhalation of black-damp (carbonic acid gas, CO_2) was injurious to life, but they knew practically nothing of the gases that enter into its composition. They knew that fire-damp (marsh gas, CH_4) was explosive, but they did not consider it worth the trouble to ascertain under what circumstances nor when it attained its greatest explosive force, excepting the few who pushed and pried into the science and theory of mining, as we expect to do in this Mining Institute of Indiana, using as our motto, "Let us live and learn to-day, that we may know more to-morrow than we did yesterday."

We who come so frequently in contact with gases breathe atmospheric air in blissful ignorance of the fact that it is composed principally of oxygen and nitrogen.

Our knowledge of this most interesting branch of the science is confined to our ability to detect the gas when present and then to remove it.

Even this we are unable to do unless we have witnessed the same thing done repeatedly by some one else.

Practice enables us to drive entries, lay off rooms at certain angles and at given distances, with fair exactness and without so much as speaking acquaintance with trigonometry, geometry, sines and cosines, but, if asked why we do this or that, we are lost. Through ignorance we can not explain ourselves.

To what, then, is our ignorance attributable, and how can we overcome it? Our lack of technical education is directly responsible for our condition, and this can only be overcome by, as I said, applying ourselves diligently to the welfare of this institute, and taking as our motto the words given.

By securing the works of the ablest men, who have made the consideration of the problems which confront us in mines their life work. They can now be purchased for paltry sums.

By reading monthly and weekly periodicals, ably edited by men of high scientific attainments, devoted exclusively to the discussions of mining questions, which can be had for from \$1 to \$2 per year, and by all means would I advise a young man to take a course in a correspondence school, such as was instituted a few years ago, in connection with an institute organized for such purposes as this one is, can not fail to widen a member's mental faculty.

The institute carries with it innumerable advantages. A member comes in contact with the masterly minds of the State. He listens and comprehends. They are a source of instruction to him. He can ap-

appropriate their ideas and employ their knowledge they have gained in years of study and experience for his own purposes.

His acquired judgment enables him to discriminate between good and bad methods and to make a proper application of the former. He educates himself for every emergency, and adapts himself quickly to changes in the system of mining. He deals directly in science and theory of mining, as well as practical.

He is thoroughly familiar with all new systems of mining long before the change is made. His scientific and theoretical knowledge enables him to apply his practical knowledge with less difficulty and more advantageously.

He will not indulge in costly experiments, that have been tried years before, when failures of such are fully discussed in the meetings of the institute.

These meetings will broaden our views, remove prejudice and cause us to entertain the views of others. It will make us more tolerant of the opinion of others.

We will no longer consider our own methods the only ones worthy of adoption. It will keep us out of the ruts and make us desirous of being benefited by the experience and teachings of others.

It will afford better protection to life and limb, reduce the number of accidents of all kinds in the State, and render property more secure.

It will produce greater skill, and skill leads to economy. It will stimulate to greater mental activity and will bring about a constant improvement. It will lead to investigation and discovery. It will revolutionize man and methods.

Let us then, indeed, gentlemen, put forth our very best efforts, throw wide open our doors and our arms, and make this institution a blessing to the Commonwealth of the State of Indiana.

**The Profitable Amount of Coal to Mine from the "L" Seam of Coal—
How to Mine It and How to Prevent Creeps and Squeezes.**

BY P. J. MOONEY, MINING ENGINEER.

[Terre Haute Meeting, September 29, 1897.]

Indiana is destined to attain a higher rank in the list of coal-producing States than it has yet reached, and to gain that end it is essential for those engaged in mining to observe the strict rules of economy and to be certain that all operations come within the lines of true practicability.

One of the most vital points in the successful production of coal is to extract the most profitable amount of coal from the territory being worked with the least amount of local diversities from the original plan, allowing that practical changes could be a part of the plan.

Inasmuch as the loss from mining in the block coal seams of the State has been reduced to a minimum, being less than 10 per cent. in several mines that have been finished, this paper will be confined to a discussion of the "L" seam, one of the leading bituminous seams of Indiana, and which is extensively worked at Lyford, Coxville, Rosedale, Fontanet, Star City, Shelburn, Hymera, Vincennes and several other places in the State, and is a vein of coal which runs from six to seven feet thick, with a band of slate or fire-clay about six inches thick in the middle of it. A section of the strata at the place in mind where this seam is being worked is as follows:

SECTION OF STRATA.

	<i>Ft.</i>	<i>In.</i>
Surface sand, gravel, and hard pan.....	72	..
Blue slate	15	..
Black slate	4	..
Coal	1	..
Clay	2	..
Blue shale	29	..
Clay	1	..
Blue shale	26	..
Black slate	8	..
Coal and slate.....	1	..
Clay	3	..
Blue shale	8	..
Sand rock	6	..
Gray slate	3	..
Coal with 6 in. band in middle.....	7	9
Fire-clay	5	..
	191	9

The sandstone overlying the draw slate over the coal is a hard silicious rock with great transverse strength, and is very hard to break, requiring in some instances an excavated area of 150 by 200 ft. to gain that result. In the entries the draw slate breaks and falls in layers at intervals.

The fire-clay under the coal is of medium hardness, but disintegrates very rapidly when the pillars, on account of the overlying weight, exert an abnormal pressure on it. If, after the bottom begins

to crack on account of this pressure coming on, water is allowed to run over the clay and percolate it, the disintegration is hastened. Simultaneous with this disintegration of the bottom, the pillars begin to crack and spall off, and frequently the pushing out of the fire-clay band in the coal is the first indication of unusual weight.

If this process continues, and it is very hard to stop after reaching this stage, and timber is then of little value, the pillars keep cracking and spalling off and are forced farther down in search of a solid footing as the bottom crumbles and recedes. The fire-clay is pushed out into the roadways and breakthroughs and piles up with the coal that has spalled off; the draw slate now usually adds to the disaster by breaking and falling, and there is a well-defined squeeze. The money spent to develop that part of the mine is usually lost. The probabilities are that the coal that was to be mined with those entries can never be profitably reached from any other direction, and the output of the mine is likely to decline at this time.

When this state of affairs comes to exist, it is apparent that the pillars were either too small or were wrongly proportioned, and, to arrive at a conclusion of how large the proper sized pillars should be, three illustrated plans will be described and shown, with their deductions. Before going into the explanation of these plans, it would be well to state that the best general way to work this seam is in panels from two hundred to three hundred yards wide, so as to protect all divisions of the territory from emergencies. These panels should be laid out to suit the most favorable haulage gradient, and cross-entries with 30-ft. center pillars should be turned off about 100 yds. apart to go across the short way of the panel. When the roof is normal, the rooms should be worked wide, with two roads in each, and should be driven half way to the next cross-entry. The pillars should be properly proportioned on a plan that would prevent creeps or squeezes, not only while the rooms are being driven up, but in such a way that the entries will remain uninjured after the room pillars have been drawn, so that advancing work will not be impeded. The pillars can best be made uniform by driving all work, including rooms on sights. Breakthroughs should be made at suitable places for air.

The dimensions of the places in all the plans are shown on the figures.

The first of the plans referred to, which is used extensively, is shown by Fig. 1,* and consists of turning a double room off the entry with

*By mistake the wrong plate was sent for Fig. 1. The rooms described and figured in Fig. 1 are of the general form indicated in D, Plate LXXXV, p. 1445, or of the rooms at the No. 8 mine, figured in Plate LXXXVIII, p. 1473, though in pillar dimensions, etc., resembling Plates XCII and XCIII.

two necks; these necks are driven in off the entry 12 ft., and are then connected square across, which leaves a pillar between the necks 12 ft. by 24. With this kind of rooms, pillars are usually left 12 ft. thick between the rooms, which makes in the room and entry pillars 28 per cent. of the coal when the rooms are driven up, but squeezes frequently develop in this class of work before the room pillars are drawn and often before the rooms are driven up.

Calculating the weight of the overlying strata at an average of 125 lbs. to the cubic foot, this makes a weight of 38 tons per square foot on all the pillars, but when the room pillars are drawn and the rooms caved, leaving 15 per cent. of the coal in the entry pillars, the strata remaining above the entry pillars form a wedge-shaped burden, widest at the surface, which makes the pressure on the entry pillars 28 tons per square foot, but the adhesive strength of the overlying strata to the surrounding strata is now almost lost, and this largely explains why the entries sometimes squeeze in later on, when they appeared to be all right at the time the room pillars were finished, and rooms caved to points shown by the dotted lines.

The pillars in this method of working can be changed by increasing the thickness of the pillars between the entries to more than 30 ft., but the objections to doing so are obvious; or, the pillars between the rooms could be made thicker; but unless increased enormously, the danger that is wished to be avoided is only intensified, because the weight is then thrown back from the face of the rooms on to the entry pillars, which were made but slightly larger by the change, while it would be best for the weight to incline towards the faces of the rooms.

Another plan used to some extent is shown by Fig. 2, and is a modification of the first. By this plan, the room is turned off the entry with one neck, which is driven in 12 ft.; then the room is widened parallel to the entry to the width of a double room. By this method the pillars are not materially strengthened, for when the stress comes on, the entry pillar is likely to crack at the point where it makes the conjunction with the room pillar, shown by the dotted line on Fig. 2.

After the room pillars are drawn, there is 17 per cent. of the total coal left in the entry pillars, and the pressure is 27 tons per square foot; hence, it will be seen that the entries are still liable to squeeze.

Fig. 3 illustrates the third plan, and is the only plan we use at Coxville, where, after a long test, workings developed on this principle have never squeezed. By this method the rooms are turned off the entries with a single neck. The neck, 7 ft. wide, is driven in 12 ft., and from there the room is widened on a 45° angle from the line of

the entry until it is double room width, 36 or 38 ft. wide, and at this width is continued until it is half way to the next cross-entry; the pillars between the rooms are left 16 to 18 ft. thick.

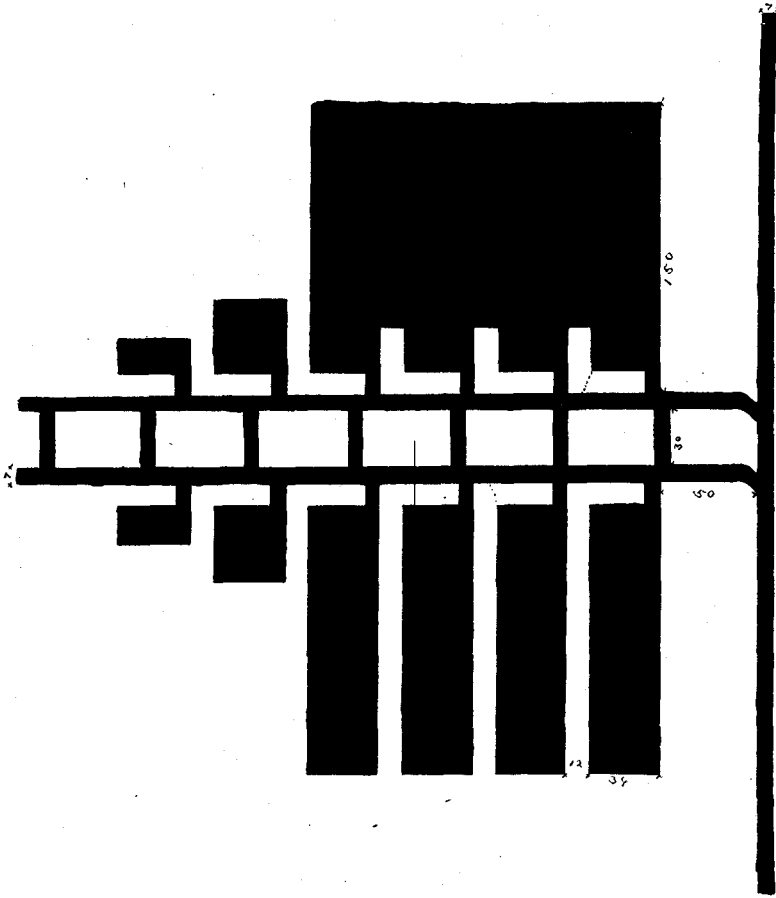


PLATE XCII (Fig. 2). Plan of double room with one neck widened parallel with entry.

This plan makes the entry pillar thickest and strongest at the center, with strong resisting sides, and the coal in the pillars, when the rooms are driven up, is 37 per cent. of the whole, with a weight on them of 28 tons per square foot. When the room pillars are drawn and the rooms caved, the coal in the entry pillars is 24 per cent., with a pressure on them of 22 tons per square foot, which is a favorable decrease of pressure compared with the other two plans described. Some

objection is made to this shape of room, because at the first thought it looks as though it would take too long to get a breakthrough made for air, but upon investigation it will be seen that as the room widens

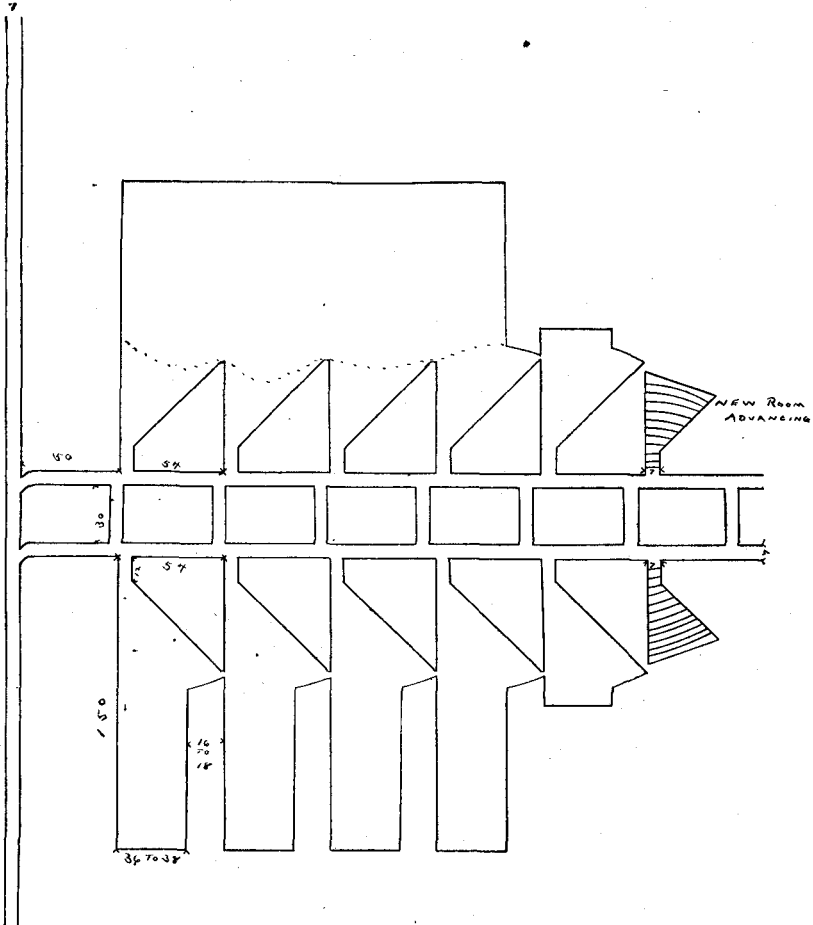


PLATE XCIII (Fig. 3). Plan of double room with one neck widened at 45° angle.

on the 45° angle it improves in foot face each foot advanced, and the angular widening can proceed until the room is 54 ft. wide, when the widening side will be over to the straight side line of the next room; the room can then be marked down to the proper width, 36 ft., leaving a pointed opening in the rib, which will be cut into by the next room when it reaches that point; and this second room will in

turn make the breakthrough for the third; thus, each room makes the breakthrough in advance for the next. The draw slate does not break much in the rooms worked on this plan, and where it is suitable, some of the top coal is left up in the entries to keep the draw slate from breaking there. To prevent a large accumulation of superincumbent weight, which condition invites squeezes, the room pillars should be drawn back to these angular pillars as soon as the rooms reach the maximum point to where they stay practically intact.

This leaves a line of caved finished work denoted by the dotted lines on Fig. 3, and is the only sure way to get the coal in the room pillars; for the rock is soft in places, which causes some of the rooms to cave, if allowed to stand indefinitely, and the leading object in view is to have absolute control of the pressure and the places until all are finished.

When a set of entries are finished, the entry pillars are usually surrounded by goaf, disintegrated draw slate and half-rotten timber, to such an extent that about one-half of the coal in them is all that it pays to mine, leaving 12 per cent. of the total territory in them, to which 5 per cent. for general emergency loss should be added, making the total loss 17 per cent.; hence, the amount of coal that can be profitably mined from this seam is 83 per cent. of the whole.

MAPS.

Mine maps have been filed by nearly all operators at the time required by law this year, and it has been necessary to appoint an engineer in but two cases. In one of those the mine had recently changed hands, and in the other the delay arose from the fact that the mine was under lease, and the owners and lessees had each been depending on the other to have the work done.

EXAMINATIONS.

Examinations of applicants for certificates of competence and service to act as mine boss, fire boss and hoisting engineer at coal mines have been held at the following times and places during the year, with the results given below:

PLACE.	APPLICANTS.			PASSED.			FAILED.		
	M. B.	F. B.	Eng.	M. B.	F. B.	Eng.	M. B.	F. B.	Eng.
Brazil, January 15.....	15	3	8	7	3	4	8	0	4
Washington, April 14.....	8	0	5	6	0	5	2	0	0
Terre Haute, July 15.....	20	0	11	9	0	4	11	0	7
Brazil, October 15.....	23	0	10	12	0	6	11	0	4
Evansville, December 15.....	4	0	13	2	0	11	2	0	2
Totals.....	70	3	47	36	3	30	34	0	17

From the number of applicants that attend the examinations, and from the inquiries that have been received as to the time and place of holding them in the future, I am of the opinion that it has had the effect of arousing an interest in education among the workers in the mines of the State which will raise the members of the craft in the estimation of the public, and eventually result in this great natural resource of our State being mined in a manner in the future that will save from waste and loss a much larger proportion of our coal seams than has been the case in the past. I give below a list of the certificates issued during the year, a sample list of questions given to each class of applicants, and the answers which were considered best to those given by the applicants for mine boss and hoisting engineers' certificates. The answers given are not by any one applicant, but what were considered the best were taken from the whole of the papers handed in:

Certificates of Competency Issued 1898.

MINE BOSSES.

- George H. Doidge, Cardonia.
- John E. Griffiths, Dugger.
- Wm. McElrath, Perth.
- Joseph C. Winn, Perth.
- Wilson McIntyre, Carbon.
- Gust. Stievenart, Brazil.
- John Baird, Jr., Cardonia.
- Henry Kocher, Washington.
- David J. Lloyd, Terre Haute.
- Rafe Cauldwell, Terre Haute.
- Alex. Maule, Princeton.
- Wm. A. Murry, Montgomery.
- Wm. H. Lynn, Bicknell.
- Peter May, Linton.
- Silas Jones, Seeleyville.
- F. Freeman, Bicknell.
- J. C. Carrol, Clay City.
- F. S. Carrol, Clay City.

- J. T. Speirs, Diamond.
- James Anderson, Winslow.
- Archie Dinsmore, Cardonia.
- F. S. Kelley, Danville, Ill.
- John Mooney, Brazil.
- John Barker, Cardonia.
- Thomas Teal, Cardonia.
- Edgar Karral, Voorhees.
- F. S. Whippo, Ehrmandale.
- W. G. Hodge, Brazil.
- John P. Acree, Brazil.
- Samuel Holden, Brazil.
- John D. King, Brazil.
- Jonathan Thomas, Carbon.
- Wm. Dalrymple, Silverwood.
- W. G. Spears, Brazil.
- Ben Schrepferman, Brazil.
- H. L. Katenhusen, Newburgh.

HOISTING ENGINEERS.

L. V. Simpson, Terre Haute.	E. E. Bledsoe, Dugger.
Eli P. Berry, Center Point.	Emmet Wehr, Carbon.
Hugh Kirkland, Diamond.	Clayton Bright, Silverwood.
James N. Smith, Macksville.	M. D. Martin, Clinton.
Ed. Smith, Edwardsport.	William Abshier, Newburgh.
F. Golliner, Macksville.	Frank S. Brenner, Newburgh.
Wm. Maule, Princeton.	Dan Briedenbach, Evansville.
David J. Lloyd, Terre Haute.	William S. Cameron, Evansville.
M. W. Smith, Macksville.	Clarence Robertson, Newburgh.
Jeff. Walters, Cardonia.	Wm. Robertson, Newburgh.
William Barnes, Ayrshire.	Albert Langer, New Harmony.
G. D. Smith, Freelandville.	Wm. A. Cecil, Evansville.
Chas. Mock, Clinton.	Geo. Bonenberger, Evansville.
F. Gerner, Clinton.	Herman Koenig, Evansville.
Clifford Hardin, Carbon.	

FIRE BOSSES.

James Skene, Mecca.	James E. Griffiths, Dugger.
Thomas Orr, Harmony.	

Certificates of Service.

MINE BOSSES.

Thomas B. Hall, Chandler.	John P. Gilmour, Alum Cave.
Andrew Butterman, Turner.	Fred Whitmarsh, Cardonia.
Peter Ehrlich, Turner.	Wm. N. Stevenson, Eagle.
W. H. Bailey, Chicago, Ill.	Wm. L. Dalton, Clinton.
James Teverbaugh, Washington.	Thomas Williams, Cayuga.
Claude S. Peck, Brazil.	William Byers, Brazil.
A. L. Tribble, Brazil.	F. M. Wampler, Indian Springs.
F. P. Cristy, Clinton.	John Young, Ragsville.
John Mushet, Sr., Lyford.	Thomas E. Sutton, Hymera.
A. M. Roberts, Hymera.	Matthew Barr, Perth.
Walter Irvine, Cass.	N. Schrepferman, Brazil.
Wm. McCloud, Sullivan.	Jacob Robbins, Silverwood.
J. H. Irwin, Macksville.	Julius M. Archer, Harmony.
Wm. Harris, Washington.	

HOISTING ENGINEERS.

George D. Partington, Evansville.	Fred Schrepferman, Brazil.
James H. Eller, Voorhees.	Charles Solomon, Washington.
Wm. Baum, Chandler.	James Chaney, Linton.
John T. Shanks, Sullivan.	Nathan Williams, Ehrmandale.
John R. Ogden, Rosedale.	Wm. H. Conkel, Farnsworth.
Mate Gibson, Ehrmandale.	Joseph Dickinson, Clinton.
John H. Wilkinson, Alum Cave.	Claude Peck, Knightsville.
William Cummings, Carbon.	Benj. James, Diamond.

A. Podesta, Evansville.
John Sweeny, Evansville.
John A. Cummins, Alum Cave.
Henry Cash, Chandler.

W. D. Gummere, Del Carbo.
E. H. Adamson, Clinton.
A. W. McGranahan, Ehrmandale.

FIRE BOSS.

Simeon Woolley, Shelburn.

Questions for the Examination of Mine Bosses for State of Indiana.

[At Brazil, October 15, 1898.]

1. What are the duties of a mine boss as provided by the law of Indiana?
2. What duties imposed by law on "the owner, operator, agent, or lessee" are usually performed by the mine boss?
(Give the principal heads under which these duties fall, but it is not necessary to quote the law word for word.)
3. What duties other than those set out in the law are mine bosses usually required to perform at the mines of Indiana?
4. What, in your opinion, are the necessary qualifications of a mine boss, as to character, habits, education and experience?
5. Give the precautions required by law to be taken to prevent accidents in hoisting shafts in this State. (In substance, not necessary that it be the law word for word.)
6. Give in substance the law of Indiana in regard to (a) the amount of air to be forced into a mine, (b) how it shall be circulated, (c) what examination shall be made of working places with respect to their ventilation, (d) how the ventilation shall be provided, (e) in regard to splitting the air, (f) in regard to breakthroughs, (g) in regard to doors.
7. A five-foot vein of coal has a roof of three feet of hard black slate, overlain with four feet of limestone and has a fire-clay bottom three feet thick. The total cover over the coal is fifty feet. Give (a) width of entries and thickness of entry pillars, (b) width of rooms and thickness of room pillars, (c) what amount of coal should be left to protect the shaft.
8. Under what conditions would you consider the use of mining machines inadvisable? (b) What conditions are most advantageous to the use of punching machines for mining? (c) What condition would make the use of chain machines most desirable?
9. What are the different noxious gases found in mines? Give as fully as possible what you know of the properties and dangerous character of each gas.
10. A cross entry is driven at right angles to the main entry and reaches the bottom of a dip after going 175 yds. From the shaft to the point where the cross entry is turned is 700 ft. It is required to drive a water level in a straight line from the shaft to the dip in the cross entry. What is the distance?
11. In a certain mine the main air course and return are each 2,000 ft. long. The air course is badly fallen and the air is poor in all entries

and working places. The fan is being run to its full capacity. Name three ways in which the amount of air may be increased without putting in a larger fan.

12. In a mine the air splits at the bottom of the downcast. The air course on one side of the mine is 1,200 ft. long and on the other 2,700 ft. long; 25,000 cubic feet of air per minute is being sent into the mine. How much of it goes to each side of the mine, all other conditions being the same on both sides? (b) In the above case it is desired to have the same amount of air going to each side. How would you arrange to bring this about? (c) After arranging for this, would there be any change in the amount of air entering the mine, the power producing the current remaining the same?

13. At the face of the entry (E) shown in the sketch on the blackboard the coal has caught fire from a shot in the coal. At the point (b) on the air course there is a feeder giving off a large amount of marsh gas. How would you proceed to extinguish the fire or prevent it from spreading?

14. A vein of coal 7 ft. thick is opened by a shaft having two hoisting compartments each 6 ft. 6 in. by 7 ft. The roof is good and the bottom inclined to be soft. (a) What gauge of track would you use? (b) How would you build your main haulage road? (c) Give the dimensions of the cars you would use. (d) How much coal, mine run, should each car carry, broken coal weighing 70 lbs. per cubic foot?

15. In a given mine the main north entry runs 700 ft., the first east and the first west each run 200 ft., the second east and the second west each run 125 ft., all being double entries. The main south entry runs 300 ft., with a pair of entries on each side each 150 ft. in length. Allowing 33 ft. for each room and pillar, and one man to a working place—entry and rooms—(a) how many men would be employed? (b) How many mules would be needed? (c) The air measurements that should be shown at the face of each entry?

(Notice that the amount of air course on each side of the mine is the same as in question 12, and take your answer to that as the amount of air going to each side of the mine.)

16. How do you measure air in mines? (b) What instruments are necessary? (c) Assuming the dimensions of the air course in question 12 to be 4 ft. 6 in. by 7 ft., what is the velocity of the north current? Of the south current?

Answers to the Questions for the Examination of Mine Bosses.

[At Brazil, Ind., October 15, 1898.]

1. He shall (1) watch ventilation apparatus and air ways; (2) see that loose coal and rock on the traveling and air ways are secured against falling; (3) measure the air at the inlet and outlet and at the face of the entries once a week; (4) keep a record of such measurements and report monthly to the Inspector of Mines; (5) visit and examine working places each alternate day when men are or should be at work; (6) see that sufficient timbers are kept at working places; (7) order and direct that unsafe

places be made safe when notified of them, and give written acknowledgment when he receives such notice; (8) give immediate notice to the Inspector of Mines when a serious or fatal accident occurs at his mine.

2. To see that escape ways are constructed and maintained as required by law; (b) that safety appliances are provided; (c) that the proper hoisting signals are used; (d) to split the ventilating current so that not more than fifty men work on any one current; (e) to have breakthroughs made every forty-five feet and all except that nearest the face closed and made air-tight; (f) to see that a sufficient supply of timber be kept at the mine; (g) to see that proper precautions are taken when approaching old works; (h) to see that no female or boy under fourteen years of age is employed in the mine.

3. To employ and discharge workmen; (b) to keep the time of the day men; (c) to lay off and direct the underground workings of the mine; (d) to make measurements of narrow work and report the same to the book-keeper; (e) to make allowances for dead and deficient work; (f) to direct the employment of day men in and about the mine; (g) to take all possible steps to produce coal with the greatest economy consistent with the safety and comfort of the employes of the mine.

4. He should be honest and fair in his dealings with his employes and employers, deliberate in forming his opinions, and firm in his decisions, without being stubborn or obstinate; (b) he should be temperate and steady in his habits, giving close attention to his duties and be regular in performing them; (c) he should be able to read and write the English language clearly and legibly, and have sufficient knowledge to perform the duties specified in the answers to questions 1, 2 and 3 above; (d) he should have had sufficient experience to understand the best methods of mining applicable to different conditions, to detect dangerous conditions in the mine and take proper steps to remedy them, and be able to direct the drainage, timbering, ventilation and haulage; he should also have had some experience in dealing with men and directing their work.

5. None but sober and competent engineers shall be placed in charge of any engine where men are hoisted or lowered. (b) An adequate brake shall be attached to every drum or machine used for hoisting. (c) Also an indicator to show the position of the cage in the shaft. (d) The signal law shall be posted at the top and bottom of the shaft and in the engine room. (e) A wire rope shall be used for hoisting, and it shall be examined every morning by a competent person. (f) Cages must be covered, and have approved safety catches attached to them. (g) Safety gates must be placed at all landings. (h) Signal bells must be placed at the bottom of each shaft connecting with the engine room. (i) Reflecting lights must be placed within ten feet of the shaft at any vein worked above the bottom of the shaft. (j) A travelling way must be cut in the side of the shaft.

6. (a) One hundred cubic feet per minute for each person and three hundred cubic feet for each animal employed in the mine. (b) It must be circulated around main entries, cross entries and working places so that they shall be free from standing gas of all kinds. (c) Where fire damp is known or supposed to exist the working places shall be examined by a

competent person immediately before each shift. (d) By any suitable appliance, as furnace, fan, steam jet, or by natural draft. (e) Split so as to give a separate current to at least each fifty men. (f) Shall be made in every room forty-five feet apart, and all except the last shall be closed and made air-tight. (g) They shall be opened and closed by persons designated for that purpose.

7. (a) Eight ft. entry, 21 ft. pillar. (b) 21 ft. room and 9 ft. pillar. (c) A block of coal 160 ft. square. (Correct answers to this question may vary within reasonable limits.)

8. (a) A low vein, one with a bad roof, or one where a great deal of sulphur or other hard material is found in the mining bench. (b) A good roof, hard bottom, thick vein, with mining bench reasonably free from sulphur or boulders. (c) Less coal being taken for the cutting, a thin vein may be worked to advantage with chain machines; a stronger roof is required for chain than punching machines, and the mining bench should be entirely free from boulders and sulphur.

9. Black damp (CO_2) is heavy, will not support light, and kills by suffocation. Is easily detected by its effect on a light. (b) White damp (CO) is poisonous, being nearly the weight of the air, is diffused through it, is not easily detected and a very small percentage of it is very injurious. (c) Marsh gas (CH_4) is very light, may be detected with a safety lamp, when mixed with 9.5 times its volume of air, is very explosive and less so in proportions varying within certain limits both ways from this. (d) Choke damp is the product of an explosion of fire damp, is composed of various gases in varying proportion and is extremely fatal.

$$10. \sqrt{(175 \times 3) \times 700} = 875 \text{ ft.}$$

11. (a) Split the air. (b) Enlarge the air course. (c) Sink an air shaft at the end of the air course farthest from the intake.

12. The quantity varies inversely as the square root of the lengths of the air ways, or as $\sqrt{1200}:\sqrt{2700}$. By extracting the root and reducing we get 2:3, or two-fifths of the air goes one way and three-fifths the other: $\frac{1}{5} \times 25,000 = 5,000$.

$5,000 \times 2 = 10,000$ cu. ft., amount going to the long side.

$5,000 \times 3 = 15,000$ cu. ft., amount going to the short side.

(b) Split the air on the long side or 2; put in a regulator on the short side.

(c) By the first plan there would be more air forced into the mine; by the second there would be less.

13. This can be answered in several ways. The plan that was finally successful in the case I had in mind was to close the mouth of the shaft for four days, when the fire had stopped burning so briskly as at first. A brattice was then carried in on the air course side to carry air enough to keep the gas from the fire. The entry was then closed by an air-tight stopping and the fire allowed to smother itself. The other part of the mine is now working and feeling no bad effects from the fire. An explosion occurred from bratticing off the entry while the fire was still burning brightly.

14. (a) Three ft. 2 in. (b) Lay ties 5 in. by 3 in., 4 ft. 6 in. long on the bottom, 2 ft. apart from center to center; use 16-lb. iron, well spiked to each tie, the rails joined with fish plates; if possible drain all water off the road and ballast with rock or ashes. If the bottom is too soft for this use corduroy. (c) Cars 5 ft. 6 in. long, 2 ft. 6 in. wide at the bottom; sides, 10 in. high, straight up, then a 10-in. board set at such an angle that the car would be 3 ft. 6 in. wide at the top, and above that a 12-in. board. Use wheels 18 in. in diameter and have the frame work and running gear strongly built. (d) This car would contain 37 cu. ft., and would hold level full 2,600 lbs. or, with a foot of building on the top, about 4,000 lbs.

15. (a)—	<i>Men.</i>
Each 200-ft. entry gives 6 rooms, 6x4.....	24
Each 125-ft. entry gives 3 rooms, 4x3.....	12
Each 150-ft. entry gives 4 rooms, 4x4.....	16
16 entries, 1 man in each.....	16
<hr/>	
Total men at work mining.....	68
3 drivers, 2 tracklayers, 1 timber man, 1 cager.....	7
3 mules.	7
	<hr/> 75

Without allowing anything for leakage, there would be 10,000 cu. ft. per minute at the face of each entry on the north side and 15,000 at the face of each entry on the south side, and 25,000 cu. ft. at the inlet and outlet. If one-half these quantities were found I would consider the mine in fair condition, i. e., at the faces of the entries. The inlet and outlet would show the full amount.

[In grading answers to this question full credit was given to those showing 5,000 cu. ft. going to the north side and 2,300 to the south side, as some understood the question to ask what amount of air would be needed for the men employed.]

16. (a) Take the velocity by holding the anemometer for one minute in the air current, measure the height and width of the air way, multiply the three measurements together gives the cubic feet per minute. (b) Anemometer, tape line and timepiece.

$$(c) \text{ North, } \frac{10,000}{4.5 \times 7} = 317 \text{ ft. South, } \frac{15,000}{4.5 \times 7} = 476.$$

[In grading answers to (c) above if the wrong quantity was taken as the amount of air circulating, but the process was correct, full credit was given to the answer.]

**Questions for the Examination of Hoisting Engineers for State of
Indiana.**

[At Brazil, October 15, 1898.]

1. Name the essential qualifications of a hoisting engineer as to (a) character, (b) habits, (c) education and (d) experience.
2. What is the result if the proper allowance is not made for the contraction and expansion of a steam boiler in setting?
3. What do you mean by expansion? (b) What causes it? (c) In which direction is it greatest—through length or the diameter of boiler? Give reason for your answer.
4. What pipe fittings, valves and other attachments are used in setting up and connecting a boiler and engine?
5. What in your opinion is the best kind of boiler for use in a coal mine? (b) Why do you prefer it over each of two other kinds?
6. What are the advantages of a double over a single hoisting engine?
7. (a) What is the use of a flywheel on an engine? (b) What is the effect if the flywheel is too light for its work? (c) If it is too heavy?
8. Why is a geared engine preferred to one coupled direct, at the mines of Indiana?
9. What should be the size of the cylinder of a single engine, with gear wheels in the ratio of one to six, connected to a drum 5 ft. in diameter, to hoist a weight of 4,000 lbs. from a shaft 85 ft. deep in 45 seconds? (b) What would be the speed of the engine—strokes per minute? (c) What would be the piston speed?
10. Describe the action of the reversing gear of a hoisting engine.
11. Give in substance the law relating to the qualifications of hoisting engineers at coal mines in Indiana.
12. Give in substance the laws intended for the prevention of accidents in hoisting shafts.
13. Give the signal law which is required to be posted in the engine room at mines in Indiana.
14. How can you learn, by comparing your steam and safety valve with each other, whether they are correct?
15. (a) What is the back pressure per square inch on the plunger of a pump which is raising water 175 ft.? (b) What mean effective steam pressure would be necessary to do this work if the steam cylinder is 6 in. in diameter, and the water cylinder is 4 in. in diameter, making no allowance for friction, or of the power required for suction?
16. (a) What kind and size of rope would you order to hoist a load of 5,000 lbs? (b) How would you examine a hoisting rope? (c) What indications would lead you to think that your rope was becoming defective?

Answers to the Questions Given for the Examination of Hoisting Engineers.

[At Brazil, Ind., October 15, 1898.]

1. (a) He should be upright and honest, so that he can be depended upon always to be at his post and do his whole duty. (b) He should always be sober and attentive when on duty and avoid all habits that will tend to affect his nerves. (c) He should be able to read and write the English language legibly, and know enough arithmetic to be able to calculate the proper set of valves and the power of an engine, and should have a good knowledge of the mechanical powers. (d) He should have sufficient experience to understand the care of boilers, proper methods of firing, and to quickly detect anything wrong in the steaming of his boilers or the running of his engine, and to be able to make all the small repairs necessary to keep his machinery in running order and to be well acquainted with the work of running the engine practically.

2. The boiler walls will be injured and cracked. This will interfere with the draft and will make the setting of boiler unsafe, and throw all the connections out of line.

3. (a) Increase of size. (b) Heat and the pressure of the steam in the boiler. (c) Lengthwise, as there is a greater body of metal to expand in that direction.

4. Steam, blow-off and feed pipes, water gauges, safety valve, steam gauge, manhead, globe valve, throttle valve, with the necessary sleeve, elbow, tee and reducing fittings.

5. (a) A two-flue boiler. (b) Because it has more heating surface than a cylinder boiler, and is more easily cleaned and taken care of than a tubular boiler. (The answers to this question will be given credit according to the answers to (b), as each kind of boiler has some advantages over the others.)

6. It can be run more steadily, and as the cranks are set at right angles there is no danger of its stopping on the dead center.

7. (a) To carry the engine over the center and to steady it in running, by taking up power in the middle of the stroke and giving it out at the end of the stroke. (b) The engine will run "jerky" and would not be carried over the center with a heavy load. (c) It would require too much power to start the engine, and after it had got under headway it would be difficult to stop.

8. It allows the engine to run faster with the same speed in the drum, gives better control of the engine in a shallow shaft and at the same time allows the use of a larger drum, which is easier on the ropes.

(a) Assume an average steam pressure in the cylinder of 45 lbs. per square inch, then:

$$\frac{5000 \times 85 \times 60}{45 \times 45 \times .7584 \times 86.56} = 11.1.$$

Diameter of piston, and the size of the engine is 18 in. by 11.1 in.

$$9. \quad (b) \quad \frac{85 \times 6 \times 60 \times 2}{5 \times 3.1416 \times 45} = 86.56 \text{ strokes per minute.}$$

(c) Assuming the cylinder to be 18 in. long then:

$$\frac{86.56 \times 18}{12} = 129.84 \text{ per minute.}$$

10. Throwing the reverse lever raises the block in the link and brings the opposite into action on the valve rod, causing it to travel in the opposite direction from that in which it was traveling when the block was at the bottom of the link, and steam is admitted to the opposite end of the cylinder at the corresponding point of the stroke of the engine, causing it to run in the opposite direction.

11. "No owner or agent of any coal mine in this State shall place in charge of any engine used for conveying into or hoisting out of any coal mine in this State any but experienced, competent and sober engineers." It shall be unlawful for any person to serve in the capacity of hoisting engineer of any coal mine in this State, without having first received from the Inspector of Mines a certificate of service or of competency.

12. None but sober and competent engineers shall be placed in charge of any engine where men are hoisted or lowered. (b) An adequate brake shall be attached to every drum or machine used for hoisting. (c) Also an indicator to show the position of the cage in the shaft. (d) The signals shall be posted at the top and bottom of the shaft and in the engine room. (e) A wire rope shall be used for hoisting, and it shall be examined every morning by a competent person. (f) Cages must be covered and have approved safety catches attached to them. (g) Safety gates must be placed at all landings. (h) Signal bells must be placed at the bottom of each shaft connecting with the engine room. (i) Reflecting lights must be placed within ten feet of the shaft at any vein worked above bottom of the shaft. (j) A traveling way must be cut in the side of the shaft.

13. There shall be a code of signals at all coal shafts in this State with a signal bell in the bottom of each shaft. One bell shall signify to hoist coal or empty cage, and also to stop either when in motion; two bells shall signify that men are coming up; when return signal is received from the engineer, men will get on the cage, and ring one bell to hoist; four bells shall signify to hoist slowly, implying danger. The engineer's signal for men to get on the cage shall be three bells.

14. Place the weight at different points on the lever of the safety valve, raise steam until it blows off, calculate the pressure on the safety valve and compare with that shown by the steam gauge.

$$15. \quad (a) \quad \frac{175 \times 14.7}{34} = 75.558 \text{ pounds pressure.}$$

$$(b) \quad \frac{4 \times 4 \times .7854 \times 75.558}{6 \times 6 \times .7854} = 33.581 \text{ pounds per square inch.}$$

16. (a) Iron wire, 1 in. in diameter. (b) Have some other person to run the engine slowly, and I would stand at a point where I could get a good view of the rope, and watch for indications of broken wires or strands. (c) If the rope began to show broken wires, or if it had materially lengthened by use I should think that it was becoming defective. There are other signs that can only be noticed by constant practice.

Questions for Examination of Fire Bosses.

[At Frazil, Ind., January 15, 1898.]

1. What are the duties of a fire boss?
2. What would determine whether or not any particular part of a mine should be examined for gas?
3. What are the essential features of a safety lamp?
4. What indications does a safety lamp give of the presence of fire damp, when a small amount only is present?
5. What, when it is present as an explosive mixture?
6. What kinds of safety lamps have you used in places where fire damp was known to exist?
7. Which do you prefer? and why?
8. How would you remove fire damp from a working place, or render it harmless?
9. From where does the fire damp come that is found in mines?
10. What velocity of air is necessary to carry marsh gas out of a working place without allowing it to mix with the air?
11. In what parts of a mine is fire damp, or pure gas, most likely to be found?
12. In case the workings of a mine were being driven toward old works where there was reason to suspect the presence of gas, what precautions would you advise to prevent an accident from its being suddenly admitted to the working places?
13. Should a fall occur on your intake airway and a large amount of marsh gas be given off from the roof, what steps would you take to prevent an explosion and rescue the men at work inside?
14. What gases enter into the composition of fire damp, and in what proportions?
15. What is the effect of coal dust on an explosion of fire damp?
16. Give an outline of what you would do to rescue workmen after a heavy explosion.

INDIANA MINES.

I give below a list of mines which are in active operation on January 1, 1899, the person in charge of each mine and the number of men and animals employed in each, as shown by the December (1898) reports of mine bosses:

CLAY COUNTY.

MINE.	MINE BOSS.	ADDRESS.	EMPLOYEES.		Animals used
			Inside.	Outside.	
Brazil Block No. 1	John Belin	Brazil	111	12	10
Monarch	James King	Brazil	15	1	2
Fairview	W. J. Price	Cardonia	51	5	6
Diamond	Jas. Cuthbertson	Brazil	131	9	11
Gladstone	W. P. McQuade	Brazil	96	9	11
Brazil Block No. 11	Mart'n Navin	Diamond	56	7	7
Brazil Block No. 8	Henry Payne	Brazil	156	17	13
Pratt	H. W. Jenkins	Perth	67	8	7
Eureka No. 2	W. T. Hopkins	Carbon	123	7	13
Eureka No. 3	John Quigley	Carbon	91	6	3
World's Fair	R. F. Jenkins	Knightsville	64	3	3
Rob Roy	Jas. Dunlop	Brazil	40	3	3
Brazil	Moses Marks	Cardonia	68	7	3
Dewey	John Cox, Sr.	Brazil	102	2	1
Gart No. 5	A. Gilmour	Cardonia	164	10	10
Gart No. 3	Wm. Conroy	Brazil	99	2	10
Crawford No. 4	Sam'l Lindsay	Hoosiersville	106	9	7
Lucinda or Columbia No. 5	M. Hoffman	Asherville	170	9	3
Columbia No. 4	T. Thompson	Hoosiersville	51	4	3
Louise	Grif Howell	Center Point	25	4	3
Crawford No. 5 and 2	Walter Knox	Asherville	31	9	2
Pyrath No. 3	F. Eberwine	Knightsville	38	3	3
Briar Hill	F. S. Carrol	Clay City	28	5	3
Markland	Peter Andrew	Clay City	28	5	3
Harrison No. 2	Chas. Nash	Clay City	46	6	4
Harrison		Clay City			
Klondike	J. Ehrlich, Sr.	Staunton	134	8	7
Superior	A. Butterman	Turner	30	5	3
San Pedro	Ed. Somers	Staunton	74	6	6
Crawford No. 3	Abandoned		35	4	1

DAVISS COUNTY.

Cabel No. 4	A. Kocher	Washington			
Cabel No. 9		Washington			
Wilson's No. 4	J. Teverbaugh	Washington	23	3	2
Montgomery No. 1	Jas. B. Brown	Montgomery	11	3	1
Montgomery No. 2	Jas. B. Brown	Montgomery	58	7	9
Montgomery No. 3	Geo. B. Brown	Montgomery	30	7	2
Mutual	D. W. Davis	Cannelburg	40	6	4
Hoosier	Grant Stov	Raglesville			
Union	A. W. Stickey	Raglesville	20	4	+
Stuffles No. 3	W. A. Jacobs	Raglesville	11	2	+
Hawkins	Thomas Harris	Washington	27	5	3

FOUNTAIN COUNTY.

Indiana Bituminous	Wm. Dalrymple	Silverwood	70	7	9
Sturm	J. S. Tiley	Silverwood	17	2	3

GIBSON COUNTY.

MINE.	MINE BOSS.	ADDRESS.	EMPLOYES.		Animals used
			Inside.	Outside.	
Oswald	J. C. Anderson	Princeton			

GREENE COUNTY.

Island No. 1	S. C. Risher	Linton	108	14	8
Island No. 2	J. S. Newport	Linton	125	23	19
Island Valley	Joseph Fennell	Linton	44	3	6
Fluhart	Thomas McQuade	Linton			
South Linton	Joseph Perry	Linton	89	6	8
Summit	Frank Lockhart	Linton	110	10	11
Summit No. 2	H. W. Sexton	Linton			
Templeton	James Dunn	Linton	133	12	7

KNOX COUNTY.

Prospect Hill	W. R. Scott	Vincennes	25	6	3
Bicknell	R. M. Freeman	Bicknell	35	4	2
Edwardsport	F. S. Kelly	Edwardsport			

MARTIN COUNTY.

Tunnel	F. M. Wampler	Indian Springs			
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PARKE COUNTY.

Parke No. 8	George Mitch	Rosedale	70	11	8
Cox No. 3	George A. Davis	Coxville	133	22	20
Mecca No. 1	James Skene	Mecca	37	7	5
Lucia	F. J. Urbain	Mecca			
Lyford No. 2	John Mushett, Sr.	Lyford			
Brazil Block No. 12	Robert J. Wallace	Diamond	85	11	5
Standard	John J. Scott	Brazil	101	6	6
Columbia No. 2	Jno. Chesterfield, Sr.	Brazil	116	6	5
Columbia No. 1	Geo. Meyers	Brazil	70	5	7
McIntosh No. 1	Samuel Holden	Brazil	45	3	3
McIntosh No. 3	Jno. Chesterfield, Jr.	Brazil	44	5	2
Otter Creek	John A. Bolin	Carbon	56	4	5
Crawford No. 1	Henry Schlatter	Carbon	67	6	4
Hardscrabble	John Paton	Lyford	8	0	1

PERRY COUNTY.

Cannelton	George W. Briggs	Cannelton			
Troy	H. L. Williams	Troy	22	2	2

PIKE COUNTY.

Woolley	H. T. Brewis	Petersburg	60	5	7
Blackburn	John R. Willey	Petersburg	34	7	6
Little's	Andrew Dodds	Littles	121	12	13
Carbon	Bartley Stinson	Sopha			
Ayrshire	John Jennings	Ayrshire			
Hartwell		Cabel			

SULLIVAN COUNTY.

MINE.	MINE BOSS.	ADDRESS.	EMPLOYES.		Animals used
			Inside.	Outside.	
Jackson Hill.....	G. H. Sargent.....	Eagle.....	113	13	24
Harrison.....	T. C. Sutton.....	Hymera.....	92	10	8
Phenix.....	Joseph Peters.....	Alum Cave.....	165	19	13
Star.....	Samuel Campbell.....	Del Carbo.....	83	19	13
Shelburn.....	Thos. Thomas.....	Shelburn.....	60	13	7
Sullivan.....	David Harrison.....	Sullivan.....	12	1	0
Bush Creek.....	John T. Fogg.....	Farnsworth.....	.....	.....	.....
Bunker Hill.....	Frank Smith.....	Farnsworth.....	20	2	2
Briar Hill.....	.....	Dugger.....	.....	.....	.....
Dugger.....	H. A. Butler.....	Dugger.....	103	16	17

VANDERBURGH COUNTY.

Union.....	P. Schultheis.....	Evansville.....	29	6	3
Diamond.....	G. Bonenberger.....	Evansville.....	24	4	2
First Avenue.....	Frank Guenther.....	Evansville.....	.....	.....	.....
Sunnyside.....	C. H. Baetz.....	Evansville.....	61	10	13
Ingleside.....	John Odell.....	Evansville.....	100	10	14

VERMILLION COUNTY.

Buckeye.....	William Chesterfield.....	Clinton.....	110	9	10
Brouillet's Creek No. 3.....	D. W. James.....	Clinton.....	.....	.....	.....
Brouillet's Creek No. 4.....	Steward Shirkie.....	Clinton.....	105	6	5
Prince.....	John Mushett, Jr.....	Clinton.....	125	11	7
Torrey No. 4.....	Edgar Karral.....	Voorhees.....	113	15	7
Cayuga.....	R. M. Irving.....	Cayuga.....	13	3	2

VIGO COUNTY.

Peerless.....	G. R. Anthony.....	Fontanet.....	127	9	10
Union.....	James Johnson.....	Fontanet.....	166	13	15
Diamond No. 2.....	Thomas Gregory.....	Fontanet.....	165	9	12
Grant.....	James Devonald.....	Burnett.....	70	10	10
Nickel Plate.....	D. J. Evans.....	Ehrmandale.....	23	7	3
Eureka.....	John W. Alvis.....	Ehrmandale.....	40	5	2
Ray.....	George West.....	Seeleyville.....	68	8	6
Ehrlich.....	H. B. Ehrlich.....	Seeleyville.....	40	7	4
Hector.....	William Grey.....	Seeleyville.....	64	7	5
Parke No. 10.....	Jeff Ladson.....	Heckland.....	99	12	10
Brick Works.....	Robert F. Bieler.....	Macksville.....	12	1	1
Miller.....	John Crosby.....	Terre Haute.....	.....	.....	.....
Murray.....	Thomas G. Marshall.....	Macksville.....	12	.....	.....
Broadhurst.....	John F. Erwin.....	Macksville.....	20	2	0
Larimer.....	W. L. Erwin.....	Macksville.....	21	3	0

WARRICK COUNTY.

Star.....	Geo. F. Archbold.....	Newburg.....	32	5	4
Britzius.....	H. J. Katzenhusen.....	Newburg.....	.....	.....	.....
Air Line.....	T. B. Hall.....	Chandler.....	.....	.....	.....
Chandler.....	Patrick Bartley.....	Chandler.....	.....	.....	.....
Big Vein.....	William Woolley.....	Boonville.....	38	6	7
Caledonia.....	E. P. Hargroves.....	Boonville.....	23	3	2
Gough.....	Wm. Kelley.....	Boonville.....	.....	.....	.....

DESCRIPTIONS OF MINES.

During the year 1898 mines employing more than ten men have been operated in the counties of Clay, Daviess, Dubois, Fountain, Gibson, Greene, Knox, Martin, Owen, Parke, Perry, Pike, Sullivan, Vanderburgh, Vermillion, Vigo and Warrick. I give below a brief description of each mine, arranged in the alphabetical order of the counties:

Clay County.**BRAZIL BLOCK COAL COMPANY'S No. 1.**

This mine is located in the northern part of the city of Brazil, on the main line of the Chicago & Indiana Coal railroad. The coal is mined by electric machines, and an electric motor has been installed during the year. It is of a new pattern, the invention of Mr. E. Morgan, of Chicago. A description of the motor and an account of its work will be found in another part of this report. The shaft bottom is lighted with incandescent lamps. In securing the roof at the bottom of the shaft, instead of the timbers usually employed for that purpose, legs of 4½ in. gas pipe and cross-bars of railroad iron are used. These are lagged overhead with 2 in. oak timber. The result to date has been highly satisfactory, as there has been no necessity for repairs to this work since the mine was opened, though the roof is one that is very sensitive to the action of the air, and timber in this vein requires frequent renewal. The double partings at the bottom of the shaft are floored, and the tracks are laid with heavy T iron. A great deal of water is found in this mine, as it is being operated in territory that is surrounded by abandoned mines. This, together with the fact that the under-clay is very soft, makes it necessary to corduroy all the haulage roads in the mine. On the last inspection of the mine a good deal of powder smoke was found in many places, but reports since then indicate a greatly improved condition in this respect, though I am convinced that the proper purity of the air in machine mines will not be secured in the absence of a statute on the subject. There is usually a thick fog of smoke or dust in the places where the machines are at work, which it has been impossible for us to have properly removed.

MONARCH.

This mine is located northwest of the city of Brazil, at the Monarch sewer pipe works, and all the product is used at the factory. Shale from the roof and fire-clay from the bottom are taken out for this

purpose, as well as the coal from the vein, and the workings are from 8 to 10 ft. high. A second outlet has been opened at this mine during the year, and it now complies with the law in all respects. It has always been found in good condition when inspected. Fifteen men are employed.

The Brazil Brick and Pipe Company have sunk a shaft during the year at their plant just north of the above for the purpose of securing clay and shale for use in their factory. It is well equipped and the owners are endeavoring to comply with the mining law, though, as they mine no coal, the mine does not come under the provisions of the law, it being applicable to coal mines exclusively. As the clay industry is being rapidly developed in this State, I would recommend that the law be amended to include clay mines where it is necessary to go under overlying surface and take clay out of a vein, as in this case.

FAIRVIEW.

This mine is located on the C. & I. C. railroad, four miles northwest of the city of Brazil. The main and lower veins of block coal are mined here. Very little work has been done here during the year, but on each of my inspections I found the mine in good condition. On the last visit the scales were not working satisfactorily, and repairs were ordered. The mine boss reported that he had discovered the difficulty and remedied it, and no complaints have been received from there since, so I suppose that they have been giving correct weights since then.

DIAMOND No. 3.

This mine lies one mile west of the above and is reached by a switch from the C. & I. C. railroad. The same veins are worked here as at the Fairview, the lower vein having been opened during the year 1897. This mine has worked more regularly than the average of the block coal mines during the year, and has been found in good condition on all the inspections made during the year. James Cuthbertson, Sr., is still in charge, which insures a careful watch to keep the mine in the best possible condition. This company keeps a locomotive at the mine to do its switching.

Other mines on the main line of the C. & I. C. railroad are the Peerless, Cox No. 3, Mecca No. 1 and Lucia, all in Parke county, and descriptions of them will be found under the head of that county.

GLADSTONE.

This mine is located on the Coal Bluff branch of the C. & I. C. railroad, one mile east of the town of Coal Bluff, near the Vigo county line. In fact, coal is mined in both counties from the shaft at this mine. The lower vein of block coal is mined here, but it is not of as pure a quality as that mined further east, being to some extent of the same nature as the semi-block found in the vicinity of Clay City, in the southern end of the county. Bad roof has been found in the mine during the year, and several narrow escapes from serious accidents have occurred. But one man has been severely injured during the year. This was a miner who was injured by a piece of falling slate on the entry as he was going to work in the morning, and will probably result in a damage suit. The mine has been found in fair condition on each inspection made of it. Considerable trouble is experienced in keeping the air courses open, so the ventilation is not as good as could be desired, but with the attention given to it, we usually find it above the average of the mines of the State. A great improvement could be made if the quality of oil used were better, but many of the miners here, as elsewhere, seem to think that they should give no attention to their own comfort unless forced to do so by the State law or by those in authority at the mine, and for the sake of saving 1 cent per day in the cost of oil, will work in a continuous cloud of poisonous smoke of the most hurtful character of any gas found in the mines of the State. This is not the only mine in the State where this state of affairs exists, and I refer to it at greater length in another part of this report. Some fire-damp is generated in this mine, but with a careful daily examination by a competent fire boss, accidents from this cause have been prevented during the year.

BRAZIL BLOCK COAL COMPANY'S No. 11.

This mine is located on the same railroad, two miles northeast of the above. No coal was mined here during the months from March to July, inclusive. The mine was in only passable condition when inspected in September, but every indication was that it was being rapidly improved. During the year electric mining machines were introduced. The power is supplied from the plant located at the No. 8 mine of the same company. The main and lower block coals are mined here, and machines are used in both veins. The roof in the lower vein is good, and there should be very little difficulty in keep-

ing the working places in good condition with respect both to ventilation and safety. The main block seam, on the other hand, has a very treacherous roof, and requires constant care to prevent accidents from falling slate; also, the air courses are likely to be badly choked by falling slate unless constant care is taken to secure the roof and clean up all that falls from time to time. This company has, however, usually kept all its mines in excellent condition when they are in operation, and I feel confident that this will be no exception to the rule.

BRAZIL BLOCK COAL COMPANY'S No. 8.

This mine is located on the same road, near the Parke county line. The coal is the lower vein of block, and is mined by electric machinery. The same difficulty exists in securing loaders that was noted in my report last year. This is partly caused by the fact that the working places are usually fouled by powder smoke from shots fired in the coal and in the bottom, nearly all the blasting being done during working hours. The roof over this coal is excellent, and the mining machines have every advantage that can possibly be secured in the vein in question. The only drawback is that the vein is thin. This seems to have been overcome sufficiently to make machine mining in this field a decided success, as is evidenced by the introduction of machines at the mines Nos. 11 and 12, owned by the same company. A description of the plan of the workings of this mine was given in my last report, and I will only add now that it has been carried on successfully during the present year. The circulation of air in the mine is all that could be asked; in fact, it is so strong in some places that drivers have difficulty in keeping lights on the entries. Still, it is not sufficient to carry out the smoke as it is generated in the mine.

Other mines on this branch road are McIntosh's Nos. 1 and 2, Standard, Columbia Nos. 1 and 2 and the Brazil Block Coal Company's No. 12, which are in Parke county, and descriptions of which will be found in the proper place in this report.

PRATT.

This mine is located on the main line of the I. & St. Louis division of the Big Four railroad. It has been operated since 1888, and has been described so frequently in former reports that no extended notice will be given here. But little work has been done here during

the year, and it has been inspected but once, when it was in fair condition for so old a mine. Most of its territory has been opened up, and though there may be several years' work in the mine yet, it will be mostly in removing pillars, and it is likely to be kept in good condition, as the mine boss, H. W. Jenkins, is a very careful manager. The mine lies one and one-half miles west of Coal Bluff.

EUREKA No. 2.

This mine is located on the same railroad, at the eastern limits of the town of Carbon. The main and lower block coals are mined here, the latter being reached by a tunnel, and all the coal is hoisted from the bottom of the shaft. A great deal of territory has been excavated in the lower vein, and it is a very difficult matter to keep the works there properly ventilated, and usually a great many smoky places are found on inspection. These have always been remedied within the time allowed, and on a second inspection the mine has been found in fair condition, only to be neglected when a visit from the Inspector is not expected. The law should be amended to dispense with the notice to repair now required, so that mine managers would feel that it was necessary to keep their mines in repair at all times, as they would be liable to prosecution if the mine was found in bad condition on any visit of the Inspector. The history of the office shows that the power to prosecute has never been abused by any incumbent, while the checks upon this power are very often taken advantage of by the managers of mines. This is by no means the rule, but enough of it is done to cause a great deal of discomfort and danger to miners employed in the State.

The upper vein at this mine has not been so largely developed, and the ventilation of that was found to be in fairly good condition. The roof is bad and the roads wet and muddy, making the work there both dangerous and disagreeable. Good care by the management and employes has prevented an unusual number of accidents during the year. The scales at this mine were examined at the request of the miners, on a showing that the weighman and check-weighman differed as to their correctness. It was found that the weights given on the different parts of the scales did not agree, and they were condemned as incorrect. After several unsuccessful attempts to adjust them at the mine, they were sent to the scale works for repairs, and are now working well and satisfactorily to all parties. This is the only case during my term of office where a test has been made under the provisions of

section 2 of the act of 1891. In all other cases where a disagreement existed in regard to scales, the parties have succeeded in having them properly adjusted without calling on myself or my assistant to settle the dispute. We have on each inspection of a mine given the scales a cursory examination, and have frequently ordered repairs to be made on them, which has usually been promptly done. The law requiring test weights to be kept at each mine gives the parties interested an opportunity to discover promptly when anything is wrong and to remedy it before it becomes serious.

EUREKA No. 3.

This mine was opened during the latter part of last year, and has been idle for several months this year. It has been inspected but once, when it was found in good condition. It is located on the south side of the Big Four railroad, one mile west of Lena, and is near the eastern edge of the coal field, and the coal is harder to mine than it is nearer the center of the field. It is of good quality, however, and the mine is likely to prove a success. There is a large unworked territory surrounding the mine, but I am not in a position to know whether the vein runs regularly under it.

WORLD'S FAIR.

This mine is located one mile northeast of the city of Brazil, and is reached by a switch from the main line of the Vandalia railroad. It has been operated very irregularly during the year, and all the work now being done is in removing pillars. With regular work it would be worked out and abandoned during the year 1899, but as it has been worked for several years it may last for a considerable time yet. The test entries mentioned in my report of last year failed to develop any coal that could be worked profitably, and that part of the work has been abandoned. Several accidents have occurred at this mine during the year, some of a serious character, from falling slate. From reports received, all seem to have been the result of the ordinary risks of the miner's occupation, and no special investigation has been made by this office as to the cause of any of them. When last inspected the mine was found in good condition, and it will probably be kept so until it is finally abandoned.

ROB ROY.

This mine has been developed during the year by the Lancaster Coal Company. It is located on an extension of the switch which serves the World's Fair mine and is located on the adjoining property, about one-fourth of a mile north of that mine. Mr. John Andrews, one of the oldest operators in this field, is the superintendent. Three veins of block coal are found on the territory, but the shaft has been sunk only to the second or main block coal, and no development has been made in the upper, or "rider" vein. Many faults have been found in the mine which has delayed the work of opening the mine, and a very small business has been done there up to the present time, though the probabilities are that it will prove a valuable property. As the coal has been worked out of all the surrounding territory, there will probably be a great deal of water to contend with, and there will be some danger of breaking into old works, and great care will be needed to prevent accidents from this cause. However, as good maps of the surrounding mines will be found on file in the county recorder's office, it is probable that no difficulty will be found in working the mine safely, but the Inspector of Mines should give special attention to this point.

BRAZIL.

This mine is located immediately west of the above, but is reached by a switch from the Knightsville north branch of the Vandalia railroad. It is nearing abandonment and will probably be finished during the year 1899. Three veins of coal have been mined here, and all have been fairly well cleaned out, a very small percentage of the coal having been lost. This is especially true of the lower and rider veins. There has been considerable bad roof in the middle vein, which has caused the loss of more coal in this than in either of the other veins. A great deal of water has been handled at this mine, as the surrounding territory had been worked out and abandoned before this was opened, and had been allowed to fill up with water. Proper precautions have been taken in approaching the workings of the old mines, and the water was drained off without accident and with but slight delay to the operation of the mine. The lower vein is now entirely abandoned, and very little new work is being done in either of the other veins, most of the men being engaged in drawing pillars. The mine has been found in excellent condition on each inspection during the year.

DEWEY.

This is a new mine, which has been opened during the year. It is also reached by a switch from the north branch of the Vandalia, and is located north of the town of Cardonia. The lower vein of block coal is being mined. It has been operated steadily ever since the coal has been struck. The main block vein is found here also, but at the shaft it was not found workable, and has not been opened up. The development of this mine has been rapid, over one hundred men being now employed in the mine, the first coal having been taken out in the month of August. The coal is of good height and the shaft is well located for haulage and drainage, the vein rising in nearly all directions from the shaft. When inspected, the mine was found in excellent condition, both as to equipment and underground work. No escape way had been provided, but the management assured me that it would be provided with all possible dispatch. When this is done the mine will be in excellent condition, and with a good roof and bottom, is likely to be kept so.

GART No. 5.

This mine is located a short distance east of the above, and has the largest output of any pick mine in the block coal field. During the year the upper vein has been opened by a tunnel, and the output is now larger than when my report was made last year. On the last inspection many of the places in the lower vein were found to be smoky, though a good current of air was passing on the entries. This is to be attributed principally to the quality of the oil used in the mine, as is the case in a great many other places in the State, and it appears that statutory compulsion is the only possible remedy. The roof is generally good in the lower vein, but a great deal of roof has to be taken down to give the necessary height for the haulage roads in the mine, and as this is "gobbed" in the rooms, it interferes with the circulation of the air and has something to do with the condition of the air in the rooms. In the upper vein the ventilation was found in better condition than in the lower vein, but as is usual in this vein, the roof is not so good, and only careful timbering prevents frequent accidents. On the whole, the mine is in better condition than at the close of the last year, but is far short of the standard I should like to see reached. (See Plate L and Fig. 954 of Coal Report.)

GART No. 3.

This mine is located on the Harmony north branch of the Vandalia railroad, one and one-fourth miles north of the main line. It is in territory nearly surrounded by abandoned works and makes a great deal of water, six pumps being in use at the mine. Very little work has been done at the mine during the year, and it was not in very good condition when inspected last. The mine was idle at the time of the inspection, and but two men were at work. The main and lower block coals are worked in this mine, the coal from both being hoisted from the bottom of the shaft, the upper vein being reached by a tunnel. The works on the southeast of the shaft have been worked out and abandoned some time since and a good deal of black damp given off from the old works finds its way to the bottom of the shaft. None of it, however, reaches the side of the shaft where work is being done. The coal in the bottom vein is good and has an excellent roof in most places, but the dips are irregular, making the haulage bad and interfering with the drainage of the mine. As is usual in the main block vein, the roof in the upper vein at this mine requires a careful watch and a great deal of timber to keep it safe. The water is drained from it to the bottom vein through drill holes and is then pumped to the surface. Some of the pumps are located a considerable distance from the shaft and operate through drill holes to the surface, steam being carried to them above ground. This prevents the heat from being communicated to the air of the mine and is a great assistance to the ventilation.

The above are all the mines employing more than ten men that are in operation north of the Vandalia railroad and east of the Chicago and Eastern Illinois railroad in Clay county at present.

COLUMBIA No. 5, OR "LUCINDA."

This mine is located on the Center Point Division of the Vandalia railroad two miles northeast of Ashersville. It is a new mine, having been opened during the present year, and began shipping coal in July. It has been very rapidly developed and is now one of the largest producers of block coal in the State. When inspected it was found in excellent condition, except for the fact, which is entirely too common in our mines, that a very poor quality of oil was being used. The equipment of this mine is the same that was used at the Briar Hill

mine of the same company. Only one vein is being developed yet, but I understand that there is another on the property which will be opened up later, and the mine is likely to be long-lived as well as a large producer.

COLUMBIA No. 4.

This mine is located one and one-fourth miles southwest of Ashersville, on the same branch. The upper vein, which had been worked at this mine since 1896, was abandoned during this year, and the shaft has been sunk to the lower vein. It is a very hard and irregular piece of coal, and the development has been very slow, only thirty-five men being employed inside at the last report received from the mine. There is quite an extensive territory of undeveloped coal surrounding this shaft, and it is to be hoped that better coal will be reached in the development of the mine. All the strata in the vicinity of the shaft seem to have been disturbed by volcanic action, and they are badly displaced. Several faults have been found in the mine and the roof is not regular. I presume that Mr. Ashley will discuss this matter at length in his report, as it refers to the upper vein, and I will only say that the same conditions in a less degree apply to the vein now being worked. In spite of the most careful management, several accidents have been reported from this mine during the year.

LOUISE.

One and one-half miles west of Center Point on a switch from the same branch. This mine has not been operated with any regularity since I have been in the office of Inspector. In fact it has not run long enough at a time to enable the managers to put it in workable condition before it has been shut down again. At the time of the last inspection only seventeen men were employed, and the ventilation was fairly good, but a great amount of dangerous roof was found. This the mine boss was ordered to repair at once, and he began the work before Mr. Epperson left the mine. I have no report as to how well the work has been carried out. He was also ordered to employ no more men until more ventilation was provided. A very few months' steady work would finish the mine, and I have been hoping each time that it has been started that it would be worked out before being closed down again. I still have the hope that this will prove to be the final "run."

CRAWFORD No. 5.

Located one-half mile beyond the above; has been opened during the year. It equipped and opened in excellent shape, and, being under the superintendence of William Spears, we have every assurance that it will be kept so. Mr. Spears is one of the most successful mine superintendents in this district, and in my four years' experience as Inspector I do not remember that I have had occasion to order any changes at any mine under his charge, though he has had from three to five during that time. While the coal found in this mine is not as profitable to work as that at No. 2 of the same company, which has just been abandoned, it gives promise of producing a large amount of coal.

CRAWFORD No. 4.

Situated immediately southeast of Hoosierville, on a switch from the main line of the Vandalia railroad; has been opened during the year to the bottom vein of block coal. When last inspected it was found in excellent condition. Though but recently sunk, there was a good current of air in all working places, and a second outlet was in course of construction which was finished a few days after my visit. The upper vein has been worked out of the territory in which this mine is opened, and there was considerable water being drawn from it, but it will probably soon be drained off and no danger is to be apprehended from it. This mine is also under the supervision of Mr. Spears.

BRIAR HILL.

This mine is located near the main line of the Evansville & Indianapolis railroad one mile northwest of Clay City. Very few men have been employed at this mine during the year, and the development of new work mentioned in my last report has not proceeded as rapidly as was anticipated, there being only twenty men employed inside at the date of the last report to this office. The ventilation of the mine when last inspected by Mr. Epperson was not in good condition, and several improvements were ordered and were immediately begun. No complaints have since then reached this office, and I presume that the repairs were carried out according to instructions. Less trouble has been experienced at this mine this year than usual on account of a great deal of the old work having been abandoned last year.

MARKLAND.

This mine is located at the north limits of Clay City and had been run on a very small scale until near the end of last year. It was idle for several months during the summer this year, but at the time of the last report to this office thirty-five men were employed inside. A tram road has been built from the mine to the main line of the E. & I. R. R., and coal is shipped by this road to the Terre Haute market. There is a small territory under lease here and the mine is not likely to last long.

HARRISON No. 2.

This mine is located on a branch of the E. & I. R. R., three miles east of Clay City. The dip of the coal in this mine is very irregular, which makes drainage difficult and the haulage bad. When last inspected the mine was found in fair condition, with a force of sixty-five men employed underground. The coal is of the character known as semi-block, the roof of gray slate and the bottom of fire-clay. The timbering and ventilation are well cared for when the mine is in operation, which it has been very regularly during the year, compared with others in Clay county, as will be seen by reference to the table giving the number of days each mine was in operation during the year, and but few accidents have occurred, which, with the difficulties to be met, speaks well for the management.

HARRISON No. 3.

This mine is on the same branch as the above and is operated under the same management. It is a new mine, having been opened during the year. Considerable trouble is found in the coal in this mine and its development has been very slow, only twenty-five men being employed on November 1st. Since that time the force has been increased to some extent, as the trade has demanded an increased output. When last visited by Mr. Epperson the mine was not in operation, but seemed to be in good condition under the circumstances. It is probable that it will be more largely developed during the coming year.

The Lancaster No. 4 mine is situated further east on this branch, in Owen county. As it will probably be worked out and abandoned within the next two months, no further reference will be made to it

in this report. There is quite a good deal of undeveloped territory in this vicinity, and the probabilities are that several mines will be opened in the neighborhood during the next few years.

SUPERIOR.

This is a bituminous mine located on the main line of the Vandalia railroad, one-fourth mile west of Turner. The southwestern part of this mine was worked out and abandoned during the year. On account of financial embarrassments, the mine did not run steadily during the fall months, and Mr. Ehrlich sold it to the Indiana Bituminous Coal Company about the middle of November. The latter company is developing the work to the northwest and is likely to make a more extensive mine of it than it has been heretofore, though very little progress has been made in that direction up to the present time. The probability is that a new shaft will be sunk here during the year 1899.

KLONDYKE.

This mine is reached by a switch from the main line of the Vandalia, and is located about a mile southeast of the town of Staunton. It is well equipped and is capable of handling a large production. It has been worked fairly steadily during the year. The coal is bituminous, about 7 ft. thick, and with a fairly good roof in some parts, but very bad in others. On each inspection made during the year this mine has been found in good condition, though on the last visit it was found necessary to order that an additional split should be made in the air current. This was to meet the requirement of the law that not more than fifty men shall be employed on any one current of air. In all other respects the mine was fully up to the standard. I might remark here that while it is absolutely necessary in thin veins that the air be divided strictly according to this rule, in thicker veins a larger current of air can circulate with a less velocity, and I have often found twice the statutory number of men on one current without suffering any discomfort. This, however, is not true in all cases, as many of the mines in thick veins are usually found in very bad condition on our regular visits.

SAN PEDRO.

This mine is located north of Staunton on a switch from the main line of the Vandalia railroad. It has been found in good condition on each inspection made. The coal is bituminous, 7 ft. thick and of

good quality. The coal lies near the surface and the roof is soft in many places, making it difficult to work with safety. Though several places have fallen in during the year, no serious accidents have occurred from this cause in the way of personal injuries, which speaks well for the management.

In addition to the mines described above, the following have been abandoned during the year, viz.: Brazil Block Coal Company's No. 7 and 10, Crawford Coal Company's No. 2 and 3, Excelsior, Nickel Plate, Briar Hill, or Columbia No. 3, and the Victoria mine. All of the above, except the Excelsior, were worked out and abandoned in the regular way, all coal which could be mined profitably having been taken out. The Excelsior was flooded by water breaking into the mine from a creek near by. This had occurred on two previous occasions, but the water had been pumped out and reopened each time before. When the last accident occurred, however, the management decided that it was too expensive and dangerous to work longer. The superintendent, H. B. Ehrlich, is entitled to great credit for having had the foresight to prevent loss of life, though I had advised against the reopening of the mine after the second time it was flooded. I hope that the history of this mine may prove a warning against attempting to work other mines in a like condition. The difficulty here was originally brought about by working the coal from under the watercourse without leaving sufficient support for the roof, and it was found impossible to secure it by timber after the water broke in the first time.

Daviess County.

CABEL No. 4.

This mine is located on a branch of the B. & O. S. W. R. R. some distance south of the city of Washington. The dip of the coal is irregular, giving heavy grades for haulage roads. In addition to this the bottom is a soft fire-clay, and where water is allowed to stand upon it the roads become very muddy, making the bringing of the coal to the bottom of the shaft a difficult and disagreeable piece of work. The coal is overlain by a fairly good shale roof, and where timbering is necessary it is well taken care of, so that the mine is worked on a regular plan and the coal is nearly all removed before any part of the mine is abandoned. The coal is bituminous, of a good quality, but the vein is very thin—less than 3 ft. in most places. The mine was idle from June to October of this year, but was found in good condition when last inspected.

CABEL No. 9.

This mine is on the same branch road as No. 4. Electric machines are used here for mining the coal. The conditions are about the same as at No. 4, but a band of draw slate from 2 to 20 in. in thickness is found at this mine above the coal. Owing to a dispute as to the payment which should be made for handling this slate by the miners, a strike has been carried on by the union at the two Cabel mines since April 1, 1897. A number of miners have been imported from the State of Kentucky, and some non-union men have joined them from among the old miners, permitting the mines to run to some extent. Some violence has occurred, owing to friction between the union and non-union miners, and some men have been seriously injured in the quarrels arising from this trouble. The dispute seems to be no nearer settlement now than a year ago, and the Hartwell mine in Pike county has recently been drawn into it by the miners joining the organization. Quite a large amount has been contributed by labor organizations in different parts of the country.

HAWKINS.

This mine is located on the E. & I. R. R. a short distance north of the city of Washington. The coal is 6 ft. thick and is of a good quality. It has a bad roof and all entries are closely timbered. It is being finished preparatory to abandonment and only pillars being drawn. It will probably be finished this spring.

DUNCAN OR WILSON'S No. 4.

This mine is near the city of Washington and is operated to supply local trade. It is one of the few mines in the State coming under the mining law, where a gin is used for hoisting coal. Everything about the mine was in good condition when last examined.

MONTGOMERY No. 1.

This mine is located on the main line of the B. & O. S. W. R. R. a short distance west of the town of Montgomery. The coal is a good quality of steam coal and is about 4 ft. thick, with a thin dirt band in the middle. The dip of the mine is very irregular and the bottom is soft, making it difficult to keep haulage roads in good condition. It is nearly worked out, but will probably run a few months of the year, though everything is working on pillars.

MONTGOMERY No. 2.

Is located near the above and is brought to the same dump, most of it being taken by the railroad for locomotive use. The mine is in good condition. Both of the above mines have worked fairly well during the year, and there has been very little complaint of the condition of either of them at any time.

MONTGOMERY No. 3.

Work on the opening of this mine was begun last year but proceeded very slowly, and no report was received from it at this office until that for the month of October, when fifteen men were employed. The mine is in the same vein as the two described last above, and is fairly well started away. On the last inspection made by Mr. Epperson it was found in good shape in most respects.

MUTUAL.

This is located at Clark's Station on the B. & O. S. W. R. R. The coal is hauled by mules over a tram road three-quarters of a mile in length from the mine to the tipple, which is near the main line of the railroad—is in fact a siding of the main line. This is the only mine now operating in the State where there is any cannel coal produced. The vein of this coal is about 3 ft. thick. One and one-half feet of bituminous coal underlies it, and the undermining is done in this stratum. This mine has most of the natural advantages that can be found in a vein of coal—good roof, regular dip, and very little water. The mine has always been found in good condition when inspected during my term of office. I have no separate report of the amount of cannel coal produced here, but should think that it would be more than three-quarters of the whole output of the mine, as a part of the bituminous coal is wasted in the process of mining, while the cannel coal is of such a nature that it makes nearly solid lump coal.

The above embrace all the mines that lie along the line of the B. & O. S. W. in Daviess county. In the vicinity of Shoals, in Martin county, there are quite a number of small mines, but none as far as I have been able to learn that employ more than ten men at any time, and they are operated only to supply local trade. In the northern part of Daviess county there are several small mines which employ from three to twenty men. The following are all of them that have come within the statute during the year.

HOOSIER.

This mine was reported last year as the "Stoy" mine, and is located one mile east of the town of Rablesville. The coal is hoisted with a gin operated by horse power, and is hauled from the mine by wagons, the principal market being found in the immediate vicinity of the mine, though some is hauled to the line of the Indiana Southern railroad, a distance of three miles, and shipped from there. No animals are used in this mine or the others in this vicinity, all the coal being pushed to the shaft bottom by the miners. The mine has been found in good condition usually, when inspected during the last two years.

UNION.

This mine was sold during the year to the Rablesville Coal Company, and has done very little work, not more than twelve men having been reported at any time since the first of March. It is probable that more than this number will be employed during the later months of the year, but I have no report at hand at this writing showing such to be the fact. Local trade, however, usually demands a larger force at this season.

STUFFLE'S No. 3.

This mine has been in operation on a small scale until very recently. It is one of the group referred to above as being in the vicinity of Rablesville, and there is nothing in the way of description to add to what has been said in regard to them. The mine has never been inspected, as on the last trip of my assistant to that district but few men were working in it and it did not come within the operation of the law.

In my last report the mine of the Rablesville Co-Operative Coal Company was described. This was operated by a company of miners during the fall of 1897, but the venture did not prove a financial success and the company disbanded. But few men are being employed there, if it is in operation at all, and it has not been inspected during the year.

The mines in Daviess county, as will be seen from the above, are small compared with those in other parts of the State. This is partly to be accounted for by the fact that the market is confined to the towns in the immediate neighborhood of the mines, with the exception of those on the line of the B. & O. S. W. R. R., which ship some east and west along that road.

Dubois County.

The only mine in this county, that at Huntingburg, was operated with a small force of men until July of the present year, when it was finally abandoned. As there were at no time more than seven men employed, no inspection was made during the year.

Fountain County.**INDIANA BITUMINOUS MINE.**

This mine is located on the T., St. L & K. C. or "Clover Leaf" railroad, one mile northwest of the town of Silverwood. By reason of its location a ready market has usually been found for the coal produced, and it has operated more steadily than most of the mines of the State since it was opened. The coal is a good quality of bituminous and seems to give good satisfaction wherever it is used. The vein is very irregular in thickness, varying from $4\frac{1}{2}$ to 7 ft., and has great changes of level, requiring considerable grading to make haulage roads of the proper grade to handle the coal economically, several cuts of 8 ft. in depth having been made in the mine. A fire has been burning in the eastern part of the mine for some time, but it has been kept under control and has not interfered with the operation of other parts of the mine. It has not, however, been extinguished. The present opening will probably soon be abandoned, as I am informed that a contract has been let to sink a new shaft north of the present one. This mine was found in good condition when last examined, and as it is under the care of William Dalrymple, formerly district mine inspector for the State of Ohio, I have no doubt that it will be kept so.

STURM.

This mine is located near the main line of the "Clover Leaf" railroad about one mile east of Silverwood. About twenty men are employed here and the coal is principally sold to the railroad for use on their locomotives. The mine has always been found in fair condition when inspected. The passage way to the second outlet required some attention in the way of timbering and cleaning when the mine was last visited, which was immediately attended to, according to the report sent me by the mine boss. In all other respects the mine was found to be operated in compliance with the mining law of the State.

Gibson County.

There is but one mine in this county which employs enough men to bring it under the provisions of the law. Several small mines are operated in different parts of the county, but no information has come to this office which would indicate that any of them have employed more than ten men at any time during the past year.

OSWALD.

This mine is located at the crossing of the Evansville & Terre Haute and the L., E. & St. L. or "Air Line" railroads. This property changed hands during the month of October last and is now owned and operated by the Princeton Coal Company, of which A. M. Ogle and W. W. Hubbard, of Indianapolis, both well known to the coal trade through their connection with the Island Coal Company, are large stockholders, and Louis J. Oswald, of Princeton, is the president. This mine is the deepest in the State—440 ft. The coal is an excellent quality of bituminous and should command a good trade if properly placed upon the market, as it undoubtedly will be under the present management. When last inspected, on December 17, it was found in excellent condition, though some accidents had recently occurred from falling slate. Fire damp is found in dangerous quantities in several parts of the mine, but for two years past no accidents have occurred from this source. While the extension of the works will increase the danger from this source, I think that with the means provided for the ventilation of the mine no accidents need occur in the absence of criminal negligence on the part of the employes and managers.

Greene County.**ISLAND No. 1.**

This mine is located one and one-half miles south of Linton on the I. & V. coal branch railroad. It is the pioneer mine of Greene county, having been the first of any consequence opened in this coal field. On each inspection of this mine made during the year it has been found necessary to order quite a number of improvements made in the ventilation, and it has been very difficult to have the orders complied with. Five inspections were made during the year, and if time had permitted several more would have been made. When last inspected,

October 9, there was considerable loose slate on the haulage ways, and the air was not split as required by law. In other respects the mine was in fair condition. The report of the mine boss for December indicates that the necessary change has since been made, so that no more than fifty men are employed on any one current of air, and as no accidents have occurred from falling slate on the entries I presume that the defective places pointed out by Mr. Epperson have been properly timbered or the loose slate taken down since the last inspection.

ISLAND No. 2.

This mine is located one-half mile west of the town of Linton. It has a double tipple, coal from one side being loaded into railroad cars on the I. & I. S. R. R., and that from the other on the I. & V. coal branch. The coal here, as in fact in all the mines of this county, is 5 ft. in thickness and of excellent quality for steam and domestic use. The mine was inspected twice during the year, and found in excellent condition on both occasions.

ISLAND VALLEY.

This mine is two miles southwest of Linton, on the I. & V. R. R. It is operated by a joint stock company, composed mostly of miners, and has been the most successful effort at co-operation that has been tried in the coal business in this State. The company are now engaged in sinking another shaft which will probably be in operation early in the year 1899. The old mine has usually been found in fair condition when inspected, though early this year some defects were noted and ordered remedied. The ventilation was poor in some parts of the mine and some bad slate was found on the main entry. Later reports show an improved condition in all respects.

FLUHART.

This mine is one and one-half miles southwest of Linton, and one of the largest mines in the State. It was found in good condition on both inspections made during the year. It is now in charge of Thomas McQuade, former Inspector of Mines for this State.

SOUTH LINTON.

This mine is one mile south of the town of Linton. It was inspected twice during the year, and found in excellent condition on both occasions. While not fitted with such costly equipments as some others, it is one of the best regulated mines in the State. The coal is of the same character as is found in the other mines in this county.

SUMMIT.

One mile west of Linton, has switches from the main line of the I. & I. S. and I. & V. branch railroads, giving it excellent shipping facilities, and it has a large capacity, which has been limited this year on account of the difficulty of getting railroad cars. This has been a common complaint at all the mines located on the two roads mentioned, however, so that the output for this year is not a fair indication of their productive capacity. The company operating this mine has a new shaft down to coal and it will be in the market with a large output for the 1899 trade. Several defects were found in the ventilation and timbering of this mine on the first inspection this year, but they were remedied at once when attention was called to them, and the mine has been found in good condition on each inspection since then.

TEMPLETON.

This mine is in the corporate limits of the town of Linton and about three-quarters of a mile from the central part of the town, on the I. & I. S. railroad. It has usually been found in good condition when inspected, but on August 20 it was found necessary to order some improvements to make the mine comply with the requirements of the law, the air being weak in some places and there being sixty-one men on one of the currents of air, while the law permits but fifty at the most; also, some gates at the surface were needed. Four days were given to make the necessary changes, and they were completed within the time given.

Knox County.

PROSPECT HILL.

This mine is located near the city of Vincennes, and is operated entirely to supply local trade, having no railroad connections. For a great part of the year less than ten men were employed, and the

escape shaft, sunk in 1897, was not kept in proper condition. Complaint reached this office in the month of October that more than the statutory number of men were working in the mine, without any means of egress except the main shaft. On inspection the complaint was found to be true, and the operators were ordered to clean up the roadway leading from the working part of the mine to the escapeway. This was done and no complaint has been received since. The mine is now leased to a co-operative company of miners. By the order of Mr. Epperson, the fan was moved from the main shaft to the second outlet early in the year, which has a good effect on the ventilation of the mine.

BICKNELL.

This mine is at the town of Bicknell, on the main line of the I. & V. railroad. It is a small mine and runs very irregularly, but has always been found in good condition when inspected. For a part of this year it was operated by a co-operative company, but later the owners—the Bicknell Coal Company—took charge of and are now operating the mine.

EDWARDSPORT.

This mine is one mile northeast of the town of Edwardsport, on the main line of the I. & V. railroad. It was visited twice during the year, but being idle at the time of the first visit, it was inspected but once while it was in operation. The second visit was made on account of a complaint having reached this office by an anonymous letter, and resulted, as such visits generally do, in finding that the mine was in good condition and that the letter had been written by a party who had some grudge at the mine boss. No recommendations were made, as no defects were found in the condition of the mine. It has been the rule of this office to pay no attention to letters of complaint unless signed by some person representing that he knew what he was writing about, and this rule would have been followed in this case but for the fact that an inspection was nearly due at the time the letter was received. While this is true, all letters giving true information as to the conditions existing at the mines of the State have been thankfully received and given prompt attention.

Martin County.**TUNNEL.**

This is a small mine at Tunnel Switch, on the Indiana Southern railroad, and is the only mine in the county employing more than ten men. It is opened by a drift and has natural drainage. The vein is from 30 to 36 in. thick and has good top and bottom, very little timber being necessary. When inspected, March 21, it was found necessary to order quite a number of improvements to secure the proper ventilation of the mine. They were promptly attended to by Mr. Dickie, who was then in charge of the mine. The mine is now being operated by F. M. Wampler under a lease from the company owning it. The output is small, and it is very difficult to keep miners there, as the vein is thin and hard to mine. Most of the coal is shipped to Bedford and east of there.

The only mine being operated in Owen county is Lancaster No. 4, which is nearly worked out, and will be abandoned within two months. There were but eight men employed on January 1, 1899.

Parke County.**PARKE No. 8.**

This mine is located one mile northwest of the town of Rosedale, on a switch from the Terre Haute & Logansport railroad, and has also a switch from the Chicago & Indiana Coal railroad. The coal averages 6 ft. in thickness, separated into two benches by a band of slate from 2 to 4 in. in thickness. The roof is a gray shale, which is hard when the coal is removed, but falls in large slabs when acted upon by the current of air used to ventilate the mine, making it very difficult to keep haulage and airways clean, and requiring a great deal of timber. I have had considerable trouble with this mine during the year. The ventilation is nearly always in bad condition, brought about partly by falls of slate in the airways and partly by the fact that coal is mined by machinery, and shots are fired at all times during the day, filling the air current with smoke at all times. The latter could probably be overcome if the air courses were kept clean and the current were properly divided, and, in fact, usually is, after they have been cleaned up by order of the Inspector, which has been necessary at the time of each regular inspection made since I have been in the office. In addition to the poor ventilation of the mine, the second outlet,

which is through the abandoned No. 6 mine of the same company, has not been available since early in September, when the buildings at that mine were destroyed by fire, disabling the pumping machinery there. Water was allowed to rise in the passage-way between the two mines. Foul air also accumulated to such an extent that a light could not be carried through it. Complaint was made to me of the condition of the mine by miners employed in it, and on an inspection made on September 14, I found it necessary to give the following notice to the mine boss:

BRAZIL, IND., September 14, 1898.

GEORGE MITCH, Mine Boss, Parke No. 8 Mine:

As required by section 2, page 169, Acts of the General Assembly of Indiana for 1897, I hereby notify you that on my inspection of the above mine this day I find that the air does not go to the faces of any of your entries as it should. 2.—That the breakthroughs are not made regularly in rooms, which consequently are smoky. 3.—Your escape way is in bad shape on account of falls, water and bad air. 4.—On the pit top there is nothing to prevent a man from walking into the screen.

These matters must be remedied at once, or at least in a reasonable time, and I hereby give you ten days to rectify the defects noted above and report to me.

ROBERT FISHER,
Inspector of Mines.

On the 27th I made a return visit, and was informed by the mine boss that the escape-way was not passable, but that he expected to have it so on the next day, and that the ventilation was considerably improved. I requested the miners' committee to go with the boss through the escape-way and to report to me the condition in which they found it, which they did on the 29th, saying that they found it still impassable. I then notified the company that any work done in the mine after October 4, before the escape-way was available, would be at the risk of prosecution. Mr. Epperson made a visit to the mine a few days later and found the same condition existing, and the mine at work. I then filed an affidavit in the Parke Circuit Court against the company, which has not yet come to trial, the defendant having taken advantage of delay allowed by the practice in our courts, and the mine continues to operate in violation of the law in this respect. In cases of this kind I recommend that the Inspector should be authorized to bring an injunction suit in the name of the State without bond, and to immediately prevent the working of a mine under unsafe conditions. While I have had some cases similar in some respects to this, none have arisen where such a total disregard of the law was shown.

Cox No. 3.

Located on a switch from the C. & I. C. R. R., one mile north of the above; is working the same vein of coal under nearly the same natural conditions, but by taking proper care of the air courses, it is usually found well ventilated. The escape-way here is through the No. 1 shaft, and was in fair condition when the mine was inspected on September 27. Some recommendations for the improvement of the ventilation were necessary. On a special visit by Mr. Epperson, October 11, some improvement was noted, but further repairs were necessary. The mine boss notified me later that he had done all that was ordered, but I have not found time to make another visit to learn if this is the fact.

MECCA No. 1.

This mine is located at Mecca, about one mile south of the main line of the C. & I. C. R. R. The attempt mentioned in my last report to so arrange the haulage road that the electric motor could bring the coal from the principal workings of the mine, as originally intended, was not a success, and it is still being used for but a part of the distance, several mules still being used on the other part of the road to bring the coal to the point where the motor takes it. Two veins of coal are found here, but the upper lies very irregularly, and is reached by tunnels at different parts of the mine. Where the bottom vein is mined first, the strata between the two veins falls away, leaving the upper vein practically undermined, and there is nothing for the miner to do but to take the coal down. This work is somewhat dangerous, owing to the insecure bottom which is left to timber the roof of the upper vein upon; but as far as I am informed it has been carried out successfully to date. But very little new work is being opened, and the output has fallen off during the year. All working places were found in good condition on my last inspection, with the exception of the places in the upper vein mentioned above, which seem to be dangerous, but not so much so as to justify their being stopped.

LUCIA.

This is a mine at Perry's station, two miles north of Mecca, on the main line of the C. & I. C. R. R. When inspected, November 23, it was found in good condition, though all of the provisions of the law were not being strictly complied with. There was no speaking tube

in the shaft nor any bell in the bottom of the shaft by which the engineer could give the return signals required by the law. Material was on the ground, however, to put them in. No escape-way had been provided, but probably will be before 5,000 sq. yds. have been excavated, as the contract has been let for the sinking of a second shaft. The vein is about 4 ft. thick, of a good quality of bituminous coal, and has a splendid roof and bottom. The coal is got by blasting off the solid, without undermining, and the only danger that will attend the work will be from the excessive use of powder. A reference to the list of accidents will show that those from that cause are increasing at a rapid rate. In view of this fact, I recommend that a law be enacted to regulate the use of powder in the mines of the State.

LYFORD No. 2.

This mine is located near Lyford, on the main line of the Chicago & Eastern Illinois railroad. The conditions here are the same practically as at Cox No. 3 and Rosedale, and the mine having been idle so much since it was opened, the air courses are in very bad condition, being filled with fallen slate, and the breakthroughs are very poorly closed in the old parts of the mine, allowing a large leakage on the first of the air, making the ventilation deficient in a great many places. The mine has changed hands twice during the year. On March 1 it was sold to the "Scott Mines" Company, of Chicago, who operated the mine until the first of September, when they got into financial difficulties, and the mine was idle for two months, when the Wabash Coal Company, also of Chicago, took charge of it, and have since been operating the mine. During the two months of idleness no work in the way of keeping up the repairs in the mine was done, as no person seemed to know when the mine would be reopened or by whom, so that when it was reopened it was in very bad condition, both as to ventilation and timbering. I was requested by the mine committee to make an inspection shortly after operations were resumed, and did so on November 17. I gave the result of the inspection in the following letter to the mine boss:

BRAZIL, IND., November 17, 1898.

JOHN MUSHETT, Mine Boss,
Lyford No. 2 Mine:

As required by section 2, page 169, Acts of the General Assembly of Indiana for 1897, I hereby notify you that on my inspection of the above mine this day I find that the air is very bad in all places but one—on the "blind" or "stub" entry. All of these should be stopped until the air is

carried into them by some means. They are in about the same condition as at the time of my last visit on August 23, when I ordered them to be stopped.

2. A door should be placed on the main air course between the seventh and eighth north entries, as there is nothing now to force the air into those entries.

3. After coming out of the sixth north the air leaks badly, and, when I was there, there was not sufficient air in either the seventh or eighth north, the main entry, or the ninth or tenth south, and the circulation was very weak in the seventh and eighth south entries.

4. While there appears to be a very good current of air starting into the third south, no part of it reaches the faces of the third and fourth south entries, and, as the first and second depend on this current for their supply, the air is bad near the faces of those entries.

5. The air is badly checked at the bottom of the shaft, by the fact that the air course is so much lower a few feet away from the shaft than it is where the air leaves the downcast. By enlarging this a better current of air could be got into the mine.

6. In the crosscut from the fourth to the fifth north entry there are several places that look dangerous. I marked one stone that should be taken down.

7. The entrance to the escape shaft is very low. It should be at least 5 ft. high, and is but little more than three.

The rooms mentioned in the blind entry must be stopped as soon as you can give the men other places. The air passing over the overcast should be carried to the face of the fourth north within a week, and the other points noted should be attended to within two weeks, and I hereby give you fifteen days to rectify the defects noted above and report to me.

ROBERT FISHER,
Inspector of Mines.

While my time has been so taken up with other duties since that time that I have not made another visit, I have been informed that the most of my instructions have been carried out and that the mine is now in fair condition.

The above are all bituminous mines, and, with the exception of the Mecca and the Lucia mines, are all working the same seam—that designated as "L" in Prof. Cox's reports. This vein is also extensively worked in Sullivan, Vermillion and Vigo counties, and furnishes a large proportion of the bituminous coal mined in the State. In another part of this report will be found a paper by P. J. Mooney, M. E., on the profitable working of this seam. The paper was read before the Mining Institute of Indiana, and aroused considerable interest among those present, and I think can be profitably reproduced here.

BRAZIL BLOCK COAL COMPANY'S No. 12.

This mine is located on the Coal Bluff branch of the C. & I. C. R. R., just north of the Clay county line and west of the town of Caseyville. The shaft was sunk in 1897, but did not begin producing coal until January, 1898, and then but a small amount. It was shut down from the first of March until the month of August, when it was started with an equipment of electric machines. The main and rider veins of block coal are mined, the latter being reached by a tunnel from the other, and all the coal being hoisted from the same landing in the shaft. When inspected, on November 28, it was found in fair condition, except for the powder smoke from shots being carried in the air current. This is a complaint common to all mines using mining machines, and it seems to need additional legislation to provide a remedy. In this mine I found the most of this trouble in the work reached by the tunnel, but this probably arose from the fact that more firing had been done there at that time than in other parts of the mine. A split of the air current has been made in this part of the mine since my visit, and the conditions are reported as being considerably improved, the smoke being carried out of the mine more quickly by reason of having a shorter distance to travel.

STANDARD.

On the same branch railroad, one-half mile north of the Clay county line. It is arranged to load coal on a switch from the Chicago & Southeastern railroad also, having a dump on each side of the shaft. Both of the regular veins of block coal are mined. The coal from the upper or "main" block vein is lowered through a "drop shaft" to the level of the bottom vein and hoisted from the same landing at the bottom of the shaft. At the drop shaft no machinery is needed to handle the coal except a drum and brake, as the weight of the loaded car brings up the empty. Most of the men from the upper level are hoisted at the main shaft from a landing at the level of the upper vein. The mine boss at this mine seems to have been very neglectful, and on my regular inspection, on September 28, I found that many of the minor provisions of the law were not being complied with, though I had ordered the necessary work done on several previous occasions. In addition to this, the air was very bad in nearly all the upper vein workings. On a visit made October 25 I found that though some work had been done along the lines indicated in my notice given on the previous visit, the mine was not yet in approved

condition. Since then all of my recommendations have been followed and the mine is reported by the mine boss and miners working there to be in good shape.

COLUMBIA No. 2.

This mine lies just southwest of the above, and is opened out in both veins, but on my last inspection there was no work being done in the upper vein. The mine has always been in good condition when I have inspected it, except that a very poor quality of oil is usually burned, making the mine smoky at all times. One complaint was received from this mine during the year, and the passage-way to the escape shaft having been allowed to fall and become unsafe, I called the attention of Mr. Chesterfield to the matter, and the road was cleaned up and put in good condition, and a satisfactory report of the matter made to me without the necessity of a visit from me.

COLUMBIA No. 1.

This mine lies one-fourth of a mile north of the Standard, and is working the upper or main block seam. It was idle for quite a long time during the summer of this year, and, contrary to the usual rule in such cases, was found in good condition when inspected. On previous occasions there had usually been a good many workmen in this mine where the air was bad and others in places where there was bad roof, but on this inspection I found a good current of air in all the working places and the entries and air courses well timbered. In fact, the mine was in excellent condition in all respects.

McINTOSH No. 1.

This mine is situated west of the Standard, and is now operating principally in the lower vein, only a few places being worked in the upper vein to remove a block of coal that was left in to support the shaft when that vein was abandoned some years since. When last inspected, November 26, there was very little new work being done, nearly all of the coal being taken out of the pillars. Everything was in good condition, as far as I could see, and, with the exception of one short piece of entry that needed timbering, no places were found that were not in excellent shape. This mine will probably be abandoned early in the year 1899.

McINTOSH No. 3.

This mine has been opened during the present year, and was inspected but once. It was not fully equipped at that time, and a few of the minor provisions of the law had not been complied with. The underground work of the mine was in good shape, though the bottom is very soft, which will cause a good deal of trouble in keeping haulage roads in order. Reports received since my visit show that all recommendations have been complied with and that the mine is now in first-class condition in all respects.

OTTER CREEK.

This mine is located on a coal switch of the Big Four railroad, two miles northeast of the town of Carbon. It was idle nearly all summer, and work in the upper vein has not been resumed. The shaft is now being operated in the lower vein of block coal. Some pillars still remain in the upper vein, which is now being cleaned up preparatory to removing them, and this vein will probably be worked out and abandoned early in the year 1899. The working parts of the mine were found in excellent condition when last inspected, on December 29, 1898.

CRAWFORD No. 1.

This mine is located immediately east of that last described. The upper vein is worked out, and about half of the men in the lower vein are at work on pillars. When inspected by Mr. Epperson, December 29, it was reported in extra good condition, as it always has been when inspected during the last three years. It will probably be finished during the year 1899. It has run very irregularly during the current year, and if this should occur again it may be found on the list of active mines at the end of the next. There seems to be a great deal of trouble in getting railroad cars at all of the mines on this railroad which mine block coal. (See Plate LXXX of Coal Report.)

Perry County.

CANNELTON.

This mine is located three miles northeast of the town of Cannelton. The coal lies in the hills above water level. The coal from two of these hills nearest the river has been worked out, and a haulage-way

is maintained through them, all coal mined in the present workings being hauled through them by mules for a distance of more than a mile. The works are quite extensive, but very little is now being done except to remove pillars. Ventilation is produced by a furnace, and this is the only extensive mine in which I have seen this method successfully employed. The market for the coal is found on the Ohio river, the company keeping a small locomotive to haul the coal from the dump to the river, where it is loaded into coal boats and sold to the steamboat trade.

TROY.

This mine is located one-half mile above the town of Troy. The coal is sold on the river. This mine is not worked very extensively, and as it has a good roof and a hard bottom, there is very little danger attending its operation. It has always been found in good condition, and there is very little to say in regard to it that will not be found in the tables which form a part of this report.

Pike County.

WOOLLEY.

This mine is located near the south limits of the city of Petersburg, on the Evansville & Indianapolis railroad. It is worked on a very irregular plan, and without reference to the final saving of the room pillars. The mine has been reported in good condition on each inspection made during the year. A second outlet has been provided at the mine since my last report, and it now complies in all respects with the law.

BLACKBURN.

This mine is located at Blackburn station, on the E. & I. R. R., and is fitted up with one of the most complete screening arrangements to be found in the State. The screens are of the shaker pattern, making lump and nut coal. The motion of the screens is so adjusted that no jar to the tipple results from their operation. The device by which this is brought about is the invention of Mr. S. W. Little, president of the company operating the mine. Space will not permit a full description of the screens here. The mine is opened by a slope 450 ft. in length. The grades in the mine are light, and a good fire-clay bottom makes the maintenance of good haulage roads an easy

matter. The coal is a hard bituminous, $7\frac{1}{2}$ ft. thick, overlain with a good black slate roof, requiring very little timber. Air courses are easily kept clean and the ventilation is good at all times. But little work has been done at the mine during the year, and it was inspected only once, when it was found in good condition.

LITTLE'S.

This mine is situated at Little's station, on the E. & I. R. R. It is comparatively dry and has a hard bottom. The dip of the vein, while not heavy, is very irregular in direction, which constitutes the only drawback to an easy haulage of the coal. The vein is from 5 to 6 ft. thick and is a good quality of bituminous coal. In the main part of the work no timber is required in the entries. Rooms are well timbered where it is necessary, and the ventilation is all that could be desired. An excellent manway serves as a second outlet to the mine, and as it is available at all times, but few men enter or leave the mine on the cages. This is in all respects a model mine, partly by reason of its natural advantages and partly by the good management used in laying out and conducting the work.

CARBON.

This mine is on the main line of the Louisville, Evansville & St. Louis Consolidated or "Air Line" railroad. It is opened by a slope 150 ft. in length. The coal is 4 ft. 4 in. thick, and is an excellent quality of bituminous. It has a good roof, requiring but little timber in the entries; air courses are kept clean, and the ventilation, which is produced by a furnace, is fairly good. The mine was idle when visited, June 8, but on a later inspection was found in good condition.

AYRSHIRE.

One mile east of the above is the largest mine in the county. It has a good roof and the entries require very little timber to keep them safe. The coal here has the reputation of being the best bituminous in the State, and enjoys a fairly good demand at all times. The only coke plant now in operation in the State is owned by the operator of this mine and is located near it. I have no report of the amount of coke made here this year, but the plant has been in operation most of the time. The coal is of a soft nature and makes a large proportion

of nut and slack. The slack is mostly utilized in the manufacture of coke. The ventilation of the mine is usually good, but on the last inspection it was found deficient in some parts of the mine. This has since been remedied, and the latest report shows the mine in fair condition in all respects.

HARTWELL.

This mine is about five miles from the main line of the "Air Line" railroad, and is reached by a switch from that road. It is opened by a drift, and the coal is mined by machines of the Morgan Gardner type. On each of the two inspections made during the year the mine was found in good condition. At last reports the mine was idle on account of a strike against the organization of the men into the United Mine Workers' organization. Some of the men who have been working at the mines of Cabel & Co., at Washington, were sent to this place, and I presume that at the end of the year the mine is at work, with a small capacity. When the last visit was made to this territory by Mr. Epperson the strike had just begun, and the mine was not inspected.

Sullivan County.

HARRISON.

This mine is located at the town of Hymera, on the Farmersburgh branch of the Evansville & Terre Haute R. R. The coal is a vein of good bituminous, 5 ft. 6 in. in thickness. It is one of the most costly equipped mines in the State, having the latest hoisting machinery and a very complete screening plant, also an electric plant operating haulage and mining machinery. At the last inspection the mine was found in bad condition, and several changes were ordered to improve the ventilation. The air shaft had been allowed to freeze up nearly solid, entirely shutting off the air from one side of the mine. When it was cleared out the ventilation was fairly good in all parts of the mine. A new fan, driven by electric power, has been placed at the air shaft this year, and each side of the mine now has a separate system of ventilation. Only gross neglect on the part of the underground management can prevent the mine from being kept in good condition. (See Plate XCI, p. 1483.)

PHENIX.

At Alum Cave, on the same branch as the above, is one among the largest mines in the State. The coal is mined by the Harrison machine, driven by compressed air. It is well equipped in screening machinery, having roller screens for cleaning the small coal, and a large washer, which enables the company to put all of its small coal into marketable shape. A coke plant of several ovens is located at this mine, but it has not been in operation for several years. The No. 2 mine was flooded early in the year, and has only recently been reopened. The coal has an average thickness of 6 ft. The mine has been found in bad condition with respect to ventilation on every visit made this year, of which there have been five, and another is due early in January to see if the improvements ordered at the last inspection have been carried out. The works are extensive, and the principal trouble seems to be that the stoppings and doors are not kept in good order. (See frontispiece; Plate LXXXIII, p. 1441, Fig. 986.)

STAR.

This is located at Gramercy Park, on the same branch road. It has an excellent equipment, including roller screens and an electric plant to operate mining machines. The ventilation of the mine is well carried out, each pair of entries having a separate current of air, thereby dispensing with the use of doors on the entries and making a large saving in the daily expenses of the mine. The mine has been found in good condition on every inspection made during the year.

JUMBO.

At Jackson Hill, on the same branch railroad. The coal here is 5 ft. 8 in. in thickness, and of good quality. Harrison mining machines, driven by compressed air, are used in this mine. The ventilation is provided for by two fans, one for each side of the mine. On each inspection made during the year this was found in a satisfactory condition, but the roof is bad and there is usually a good deal of timbering needed to make the entries and traveling ways safe. Several changes have been made in the position of mine superintendent at this mine during the year, and one mine boss was killed while at work timbering one of the entries.

SHELburn.

At Shelburn, on the main line of the E. & T. H. R. R., is a machine mine, in which the Lechner and Harrison machines, driven by compressed air, are used. There are two shafts here, but the one known as No. 1 is now being used entirely as an air shaft. The mine has been in operation for a long time, and the air courses are in bad condition, making the ventilation of the mine a difficult matter. This is one of the few mines in the State which generate fire-damp in dangerous quantities, and this makes close attention to the ventilation necessary. An explosion of fire-damp occurred at this mine on August 2, by which three men were seriously burned. A shot had been fired in one of the entries at noon on that day which set fire to the coal. It was found impossible to extinguish the fire by ordinary means, and four men had gone into the mine in the evening to build stoppings across the entries to shut the air from the fire, in hopes of smothering it out by that method. One of the stoppings had been put in place, and while the men were at work on the other, the explosion occurred. It was supposed that gas from a blower had accumulated in the part of the entry inside of the point where the stoppings were being built and filled the entries to the point where the fire was burning, and had caught fire from the burning coal. The mine was closed down for several days and no air allowed to enter, during which time the fire was smothered to such an extent that the work of placing the stoppings as at first intended was successfully accomplished and that part of the mine shut off. Work has since been resumed in the other parts of the mine and successfully carried on.

SULLIVAN.

A short distance north of the depot, at the city of Sullivan, on the main line of the E. & T. H. R. R. It is an old mine that had been shut down for several years and was reopened during the summer of 1898. It is operated for local trade exclusively. It was only within the last two months of the year that there have been more than ten men employed at the mine. When first inspected it was found to lack a great many of the safety appliances required by law, and not all of them had been complied with when a later visit was made. Time was given to complete the work, which carried it over into the year 1899, and we hope that on another visit to the mine it will be found to meet the requirements of the statute.

BUSH CREEK.

Three miles east of Sullivan, on the Indiana & Illinois Southern railroad; has been idle a great part of the year, and but one inspection was made. The mine was then being opened up after a long period of idleness, and was not in good condition. There were but few men working in it, and all possible diligence was being used to get it into good order, which I think has been accomplished by this time. The mine has changed hands during the year and is now owned by McGregor & Campbell, of Brazil, Ind., and operated by Donald & Fogg, Farnsworth, Ind.

BUNKER HILL.

One mile east of the above, on the same railroad. This mine has always been found in excellent condition, every precaution having been taken for the safety and comfort of the miners. It has changed hands during the year, Messrs. Hancock & Conkel, who opened and operated it for a number of years, retiring and being succeeded by Mr. Crowder, of Sullivan, Ind. It is now leased and operated by a company of miners, and is being run at about half its normal capacity. No complaint was found with the condition of the mine on the last inspection.

FREEMAN OR BRIAR HILL.

One-half mile southwest of the town of Dugger. This mine has done very little work during the year. For the first three months of the year about thirty men were employed by the lessees, the Lyonton Coal Mining Company, but for a few months after that it was practically idle. It has since resumed operations, but I have had no report from it, and do not know what has been done. It was in good condition when inspected, June 5, and no inspection has since been made.

DUGGER.

This mine is at the town of Dugger, on the same railroad. It has been improved a great deal during the present year. An electric mining machine plant has been put in and a new air shaft has been sunk near the head of the works. This has had the effect of improving the ventilation of the mine by giving the air a shorter course to travel. There is a good deal of bad roof in this mine, and constant care is necessary to prevent accidents from falls of slate. This has

been very successfully done this year. The coal is 5 ft. in thickness, of a splendid quality, showing in some parts of the vein beautiful peacock colors. It usually commands a good trade, which has not been fully supplied this year, on account of a scarcity of railroad cars. The mine has facilities for loading coal on both the I. & I. S. and the I. & V. branch railroad, but both have been short of cars. The electric plant consists of a 150 H. P. engine, 100 K. W. dynamo and four Morgan-Gardner mining machines. The power is stated to be sufficient to run twelve machines of the type used here. A new head frame has been put up at the mine during the year, and the shaft has been enlarged to the size of 9 by 12 ft., and two new pumps have been added to the equipment.

There are a number of small mines operating in this county, some of which may at some time during the year have employed more than ten men; but if so, the fact did not come to the knowledge of this office, and no inspections have been made of any of them during the year.

Vanderburgh County.

UNION.

Located just north of the city limits of Evansville, on the Stringtown road. It is operated by the Evansville Union Coal Mining Company, composed of about twelve miners. This, as are all other mines in this county, is opened by a shaft to a vein of bituminous coal that runs about 4 ft. in thickness. It is run exclusively for local trade and employs but few men. Considerable difficulty has been found in keeping the roof up, and the airways have usually been found in bad condition. The road to the escape-way was in bad shape on the last inspection of the mine, and it was ordered cleaned up. I have very little faith in this mine ever being got into a shape to work with either safety or profit, and but for the fact that most of the employes are members of the company, I should have attempted to close the mine. A good deal of work has been done in trying to get the mine in good condition, and I hope that it may be found in better shape on the next inspection.

DIAMOND.

This mine is one-half mile west of the above and is operated in the same vein, which is a fair quality of steam and domestic coal. As the trade is entirely local, few men were employed here at any time,

and the mine is not largely developed. On the last inspection, September 10, the air was weak in all parts of the mine, and in some places a great deal of black damp was mixed with the air. A good deal of loose slate was also found, which was ordered taken down or timbered. The catches and covers on the cages and gates at the shaft were ordered repaired in six days, which I am informed was done.

FIRST AVENUE.

This mine is on the banks of Pigeon creek, near First avenue, in the city of Evansville; does a local trade and has also a switch from the Belt railroad, on which some coal is shipped. All of the old part of this mine was lost during the year by a squeeze, and it has been reopened in another body of coal. When inspected, September 9, it was in bad condition, but fifteen men were at work on repairs, which it was estimated would be completed in four weeks. It has since been reported by the mine boss that the repairs were completed and that the mine was in excellent condition on December 14.

SUNNYSIDE.

This is the only mine in Vanderburgh county where mining machines are used; those of both Harrison and Ingersoll-Sargeant type are used, being driven by compressed air. The output has been increased some during the year, and the mine has been found in excellent condition on each inspection made, both with respect to ventilation and the means taken to insure the safety of the employes.

INGLESIDE.

This mine was located near the Ohio river, just below the city limits of Evansville, and is the oldest mine in the State, having been opened in 1858. It is convenient to the river and has a siding from the Louisville & Nashville railroad, on both of which shipments are made. Tail-rope haulage is in operation in the mine for a distance of 3,000 ft. It has always been found in good condition, except with respect to the escape-way, and this has been put in order during this year, so that now there is no complaint to be made of the mine in any respect, except that occasionally black-damp finds its way from the old works into the return air current, which might interfere with the use of the escape-way. This, however, is very seldom used, and by reversing the air in case of an accident, the difficulty could be removed and men could be taken from the mine in safety.

Vermillion County.**BUCKEYE.**

This mine is about one and one-half miles northwest of the city of Clinton, on a branch of the Chicago & Eastern Illinois railroad. It is operated in the lower vein found in this locality, or the "L" seam, mentioned elsewhere in this report. The vein is from 5 ft. 10 in. to 6 ft. 6 in. thick, with a hard clay bottom. The experiment has been made, of which mention was made in my last report, of leaving a coal roof in the entries, and seems to have proven a success here, as no breaks have occurred where this has been done. This mine has always been found in good condition when inspected, except for the ever-present nuisance of bad oil, which fills the working places with smoke. If this could be done away with, the air would be fresh and pure in the mine at all times.

BROUILLET'S CREEK No. 3.

This mine is one and one-half miles south of the above, on the same branch of the railroad. It has been operating in the upper seam of coal found in this territory, and the works in that vein are very extensive. The distance which coal had to be hauled, however, became so great that about November 1, this year, they were abandoned, and the shaft is now being sunk to the vein worked at the Buckeye. It will probably be ready to take out coal from this seam early in 1899.

BROUILLET'S CREEK No. 4.

One mile south of the above; has been opened this year and began shipping coal in October. It has been one of the most rapidly developed mines that has ever been opened in this State. It is being worked in the upper vein and is now producing over 500 tons of coal per day. All the natural conditions here are favorable to the safe and profitable working of a mine, it having a good roof and dry, hard bottom. Several accidents have occurred at this mine since it began operation, from the use of powder, the coal being blasted from the solid without undermining and large charges of powder being used. Some of the shots fired seem to have all the force of an explosion of fire-damp, though none of this gas has ever been found in the mine. It may be that coal dust has played a part in some of the most violent explosions, but in the only one which I have investigated—that in

which two men lost their lives—after a careful investigation, I failed to find any of the conditions or results usually given as causing or accompanying explosions of coal dust. After my investigation of that accident, I gave the company the following notings, which seemed to me to cover the precautions necessary to prevent such accidents in the future:

BROUILLET'S CREEK COAL COMPANY,
Clinton, Ind.:

GENTLEMEN—In order to prevent, if possible, a repetition of the accident of December 10 you will observe the following instructions at your No. 4 mine.

1. Do not allow any rooms to be worked on any entry inside of the last open breakthrough.
2. Require entries to be cut clear to the end of every hole before it is fired.
3. Do not allow more than one shot to be lighted at any one time.
4. Complete your escape-way and make it available for the use of the men employed in the mine as quickly as possible.
5. Drive a connection from your escape-way to the main air course, so that men may pass out of the mine without going under the shaft.
6. Post two or more copies of this notice conspicuously about the mine.
7. Report to me within ten days what progress you have made in carrying out these instructions.

Very truly,

ROBERT FISHER,
Inspector of Mines.

No reports from this mine have reached me since then of any damage having been caused as a result of heavy shot firing, and I presume the proper precautions are being taken to prevent such damage, whether as a result of my instructions or as a result of greater care on the part of miners and employers in the mine.

PRINCE.

This is a new mine which has been opened during this year and began shipping coal in July. It is equipped with steel head-frame, self-dumping cages, shaking screens, powerful hoisting engines, with Crawford & McCrimmon's improved conical drum, and is capable of handling a large output of coal. It is opened in the upper vein coal, same as is mined at Brouillet's Creek No. 4. The mine makes a good deal of water, the bottom is soft and haulage roads are likely to be very hard to keep in good condition.

A trial of electric mining machines was made here, but it was found that the under-clay was so damp that when mining was done in that the machine became clogged and would not work properly. In the lower strata of the coal there were some small balls of sulphur, which prevented the machines doing good work in that, and the contemplated machine plant was not installed, but the mine is now being worked entirely by pick miners. The output now reaches nearly 400 tons per day, and the mine was found in excellent condition in all respects on the last inspection.

TORREY No. 4.

This mine is located near the town of Geneva, three and one-half miles northwest of Clinton. The works in the upper vein have been abandoned during the summer. The mine is being reopened in the bottom vein, which presents the same condition here as at the other places where the same seam is worked. The development was carried on for a while with the machines that had been used in the upper vein, but, owing to a disagreement between the company and the miners as to the price that should be paid for machine work, the use of machines has been discontinued and the mine is now being worked by pick miners with fairly good success. The plan of the mine contemplates extensive operation when it is fully developed, and there is no doubt a large amount of coal will be produced here. The mine was in fair condition when last inspected. Each of the last two mines described has switches from the C. & E. I. road, which handles all the coal produced in this field.

CAYUGA.

This mine is at the plant of the Cayuga Pressed Brick Company, about one mile north of the town of Cayuga. It is operated exclusively by the works of the company. The coal is found to a depth of about 100 ft., and 50 ft. above this is found a vein of clay which is used by the company in the manufacture of a buff building brick. It is a question whether this mine comes under the operation of the mining law, as less than ten men are employed in the vein where coal is mined, and the law makes no provision for the control of clay mines.

In addition to the mines mentioned above, where the works in the upper vein have been abandoned during the year, the Fern Hill mine of the Hazel Creek Coal Company has been entirely abandoned. There are reported to be some small mines in the vicinity of Newport

which at times employ more than ten men, but it was too late in the year when the information reached me to permit an investigation of the report.

Vigo County.

PEERLESS.

This mine is located on the main line of the C. & E. I. R. R., one-half mile north of the crossing of the Big Four railroad at Coal Bluff. The coal mined in this and the next ten mines described is the same vein as is mined at Rosedale and other points in the State. The bottom is soft, but the entries are well drained and the haulage roads are kept in good order. The coal is of a softer character than at most of the other places where this seam is found, and does not bear handling well. It is worked on a plan which provides for the recovery of most of the pillars from the rooms as well as from the entries before the mine is finally abandoned. In opening the mine, sufficient pillars were not left near the bottom of the shaft, and a squeeze closed the main air course. This makes it necessary to carry the intake air current along the main haulage-way, and a door on this road near the bottom of the shaft permits a large leakage. In spite of this fact, a good current of air is carried to the faces of the entries and the rooms are fairly well ventilated. All the entries and airways are well timbered, and the mine is always found in fair condition when inspected. The shaking screen which has been in use at this mine did not work entirely satisfactorily, and I understand that a part of it is being taken out. I have not learned the reasons for this action. Shaker screens used at the mines of this State have usually given satisfaction.

UNION.

One and one-half miles northeast of Fontanet. The coal here is mined by Harrison machines, driven by compressed air. It is worked on the same plan as the Peerless, and nearly all the coal is finally saved. Haulage roads are good, being underlain with plank where the bottom is soft. The mine has always been found in excellent condition when inspected, and no improvements have ever been recommended by the Inspectors. It is one of the largest producers in the State, as will be seen by reference to the table of production, found in another part of this report.

DIAMOND No. 2.

Two and one-half miles southwest of Fontanet, on the Big Four railroad; has been developed greatly during the year, and has now nearly as large an output as the Union. The air compressor which has been at this mine for over a year has not been put into use yet. A shaking screen has been put into operation at this mine during the year, but it jars the head-frame of the shaft to such an extent that it can hardly be said to be a success. A great deal of trouble has been experienced in the western and southwestern parts of the mine from bad roof. In many places sand has run into the mine from falls, and also a great deal of water. When last inspected, all the places where the roof seemed weak were well timbered, and a good current of air was circulating in all parts of the mine. Some places were smoky, the result of the use of bad oil.

GRANT.

This mine has nearly always been found in bad condition when inspected during my term of office. There is a good deal of bad roof in the mine, which is not always well timbered, and the mine is old and has been opened up over a large extent of territory. The older parts of the air courses have fallen badly and are blocked with slate in many places. It has been necessary to order them cleaned up at every inspection made, and after this is done they seem to be neglected till the Inspector calls again. The coal is mined by machinery, and as this requires firing of shots at all times of the day, powder smoke adds to the difficulty of keeping the mine well ventilated. Considerable improvements have been made in the surface plant this year, but practically nothing has been done to permanently improve the conditions underground. On the last visit made by Mr. Epperson he found the same conditions as usual, and was informed that the mine would probably be abandoned within four months. If this is done, this company will probably open a new mine during the year 1899, as they have a large territory available in which the coal has not been mined. It is to be hoped that the change will be made; otherwise it may be necessary to condemn the present mine and let it work under protest, as the law as it stands at present does not give the Inspector the necessary power to prevent it from going on as it has in the past.

NICKEL PLATE.

One mile east of the above, on the Brazil division of the C. & E. I. R. R. The vein here is 7 ft. thick, and lies in the hills on each side of the valley up which the railroad switch runs to the mine. Two fans are used to ventilate the mine, one for each side, and the mine has usually been found in good condition when inspected. It was shut down on October 28 and has worked but very little since, the Ehrmann Coal Company, owners of the mine, having gone out of the business. In December the mine and all the property connected with it were leased to Francis S. Peabody, of Chicago, who is now operating them. No inspection has been made since he took charge, but as Mr. D. J. Evans is continued in charge of the mine, I am sure it will be placed in good shape as quickly as possible and kept so.

EUREKA.

One mile southwest of the above, on the same railroad, is a slope opened this year. But few men are employed in the mine, and it has not been developed very much. But one inspection was made during the year, and the mine was then found in good condition in all respects.

VIGO.

This mine lies one mile east of the Nickel Plate. It has been operated this year by Edward Davis under a lease, and has run very irregularly. Most of the available coal has been worked out of the territory, and the only coal that is left is in pillars. It will probably be abandoned during the year 1899. There have not been ten men employed at any time during the last two months, but the mine was found in excellent condition when examined late in December.

RAY.

This mine is located one-half mile east of the town of Seeleyville, on the main line of the T. H. & I. R. R. It has a very good equipment, everything about it being in first-rate shape. During the present year a mining machine plant has been installed here. Compressed air is the power used, and the machines are of the Harrison and Sullivan types. Nearly all conditions in the mine are favorable to the use of machines, and there can be but little doubt as to the success of the

new plan of working. This mine has always been found splendidly ventilated, and while there is some bad roof, the entries and air courses are always well timbered. There has been nothing to complain of at this mine during the year under review.

EHRlich.

Immediately south of the town of Seeleyville. Considerable work was done in the improvement of this mine during the year. The water box which had taken up one of the hoisting compartments of the shaft was taken off and a pump placed in the mine to raise the water. This, however, did not last long, as the water coming out of the mine is filtered through the gob left in the old works and is impregnated with materials that have a very bad effect on iron, and the pump was soon eaten out by them. It was relined with brass and again put into service, and was doing satisfactory work when the mine was last inspected, but I have since been informed that it was again disabled and that the water boxes have again been put into use. This is a great drawback to the output of the mine. Quite a large part of the older works of the mine was finally abandoned during the year, all the pillars being drawn out, which has permitted the abandonment of some very bad roadways and air courses. On my last inspection I found that the parts of the mine that are still working are well ventilated and the roof fairly well timbered. This work was being pushed with all possible rapidity and the promise was that all parts of the mine would soon be in excellent condition. The road to the escape-way had been cleaned up to some extent, but as this is through a shaft that was opened over twenty years ago it cannot be put into satisfactory condition. In case of an accident, however, there would be an available means of escape from the mine.

HECTOR.

This mine is situated one-fourth of a mile west of Seeleyville. The roof is the best in this mine of any that I have seen working in this vein. The coal that is being worked is from 6 to 7 ft. thick, but on the east side of the mine there is some that is a great deal lower. This is not being worked at present, but probably will be later. The entries are well drained and the haulage roads are good, being high and having no timbers to interfere with the movements of the drivers. There is practically no bad roof in the mine, and the principal fault to be

found with it is that the rooms are not sufficiently well timbered at all times. Though there is not much danger of accidents to workmen, lack of the proper amount of timber might cause damage in the future to the mine as a whole, if thin pillars should allow the roof to begin settling.

PARKE No. 10.

Owned by the Parke County Coal Company; is situated near Heckland station on the T. H. & L. R. R. This mine was laid off on what is known as the three-entry system, the air being carried across the main entry near the bottom of the shaft, and an air course carried along each side of it. This divides the mine from the start into four ventilation districts, and if the proper attention were given to doors and stoppings there should never be any difficulty with the ventilation. The roof in this mine is good—sandstone in most places—and the bottom is a hard fire-clay, making a good haulage road where water is not allowed to stand upon it. It was inspected twice during the year. On the first visit it was found in excellent condition. Later in the year it was found that the doors and stoppings were being neglected and the air current was weak in some places in the mine. Several changes were suggested that would improve the conditions, and the mine boss reported later that they had been made. We have not found time to make another visit to the mine to learn the truth of the report. This should be one of the easiest mines in the State to keep in repair, and only gross neglect on the part of the managers will allow it to be in a condition that would call for complaints from any source.

BRICK WORKS.

This mine is located at the works of the Terre Haute Brick and Pipe Company, on the west side of the Wabash river. All the coal produced now is used at the factory of the company, and but very few more than ten men have been employed at any time during the year. The vein mined here seems to be found of workable thickness only in this vicinity. It has a very soft fire-clay bottom and lies so near the surface that a great deal of water is found coming out of the coal and the roof, making it very difficult to keep roads in good condition. The roof is generally a soft shale which requires a great deal of timber, and in some places it is a "white top" that is impossible to hold with

timber. At my last visit I found but eight men at work in the mine, most of them taking out pillars, and nearly all of the new work that was being opened seemed to be going into this white top and did not promise to last long.

MURRAY-LLOYD.

This mine, located one-fourth mile south of the above was opened in 1897, but at the close of the year was in the hands of a receiver, and was not working, so that it did not appear in my report for that year. After several attempts to dispose of it at receiver's sale it was finally purchased by R. J. Smith, of Terre Haute, Indiana, and is now being operated by him. This is the only mine on the west side of the river that has railroad connection, it having a switch from the main line of the Vandalia. It was inspected twice after Mr. Smith began operating it and was found in bad condition on both occasions. At the time of the first inspection very few of the safeguards required by law had been provided at the mine, and the ventilation was very poor in nearly all the working places. On the second visit there were no covers on the cages, the traveling way around the shaft did not comply with the law, and in some parts of the mine the ventilation had not been improved. In those places but few men were employed, and an effort was being made to carry air into them. The men working there asked that they be allowed to continue under a promise that no more men be put into that part of the mine till more air should be provided, and I gave thirty days to do this. I have not found time to make a visit to learn whether this has been done, but I have heard no complaints and I presume that Mr. Marshall has carried out the instructions given.

Other mines in this territory are the Miller Bros., Broadhurst, Larimer, and Krackenberger. Of these the first and last were not found during the year at any time to be employing the number of men that are required for the law to take effect. One inspection was made of the Miller mine, and I found that the owners were trying to get it into condition to comply with the law, so that they could increase their force for the fall trade. The Krackenberger mine was reported in very bad condition, but as only seven men were employed I did not make an inspection.

The other two mines did not employ more than ten men during the summer, but when last inspected were found to be in full compliance with the mining law, as they usually have been since they began to employ more than nine men. They each do a large local trade during the fall and winter months.

Warrick County.**STAR.**

This mine is located one mile east of Newburgh on the Ohio river. This is one of the best regulated mines in the State, natural conditions helping greatly to produce this result, the vein lying nearly level and having a good roof and a hard bottom, and there being but little water to contend with. During the year the railroad from Newburgh to the mine was washed out, so that dependence for shipping facilities has been on the river entirely during the fall. No timber is used in the entries and but very little in the rooms. A good current of air is always maintained through the mine.

BRITZIUS.

This mine was flooded during the spring, and Mr. Robertson abandoned it. It has been reopened and working with a few men. Up to December 15 there had not been ten men employed at any one time during the year and no inspections have been made.

AIR LINE.

This mine is located at Chandler on the Evansville division of the Air Line railroad. A fire destroyed the head frame at this mine early in the year, and the mine was inspected but once, when only seven men were employed. It was found to comply with the law except in a few minor particulars which could be easily remedied before the force of men was increased sufficiently to bring the mine within the operation of the law.

CHANDLER.

Located a short distance east of the above, near the depot at Chandler. On the first inspection during the year it was found necessary to order considerable retimbering in the mine and some improvement in the ventilation. A second outlet has been completed since my last report. There are seldom more than fifteen men employed at this mine, and the output is small. On the last inspection made the mine was found in good condition.

BIG VEIN.

This mine is located one mile east of Boonville, on the Air Line railroad. It is opened by a slope and the coal lies near the surface. The coal is mined by machinery, three mining machines and two Jeffrey air drills being in use. The roof is very soft, but no difficulty is experienced in holding the roof in the narrow work with timber. Where falls occur in rooms an opening is usually made to the surface. This assists materially in the ventilation of the mine. The coal is an excellent quality of bituminous, from 6 to 8 ft. thick. This mine is always found in splendid condition. (See Plate LXXXII, p. 1439.)

CALEDONIA.

Is situated east of the Big vein mine. During the summer there are but few men employed, and it was idle when visited. An inspection, however, showed that the mining law was being fairly well complied with, and as far as could be learned under the circumstances the mine was in good condition. (See Plate LXXXII, p. 1439.)

GOUGH.

This mine has always been found in excellent condition when inspected. It is in the same vein of coal as the two mines last described. The main opening is by a shaft and the second outlet by a slope 150 ft. away from it. From eighteen to twenty-five men are usually employed.

ACCIDENTS.

The year shows the usual proportion of accidents to the amount of coal produced. The following table will give a basis of comparison of the fatal accidents year by year since 1892. Previous to that time no reports of accidents were required to be made to the Inspector, and from 1892 to 1896 only fatal accidents were required to be reported. With the exception of those occurring in Vermillion county, there is but little to be said in addition to the trite statement that the ordinary precautions used by careful miners would have prevented the fatalities which have occurred during the year. The exceptions noted occurred from the excessive use of powder, and the remarks

found in the notice of the Brouillet's Creek No. 4 mine cover all that need be said of them, as all occurred either directly or indirectly from the same cause. Either my assistant or myself investigated each fatal accident in conjunction with the coroner of the county in which it occurred, and records of such investigations are on file in this office for the guidance of my successor. It will be noticed that one of the fatalities reported was the result of a pick wound in the head. The evidence adduced on the investigation pointed very strongly to its having been a murder, and not properly to be classed as one resulting from the casualties of mining, but, as we could discover no clew to the perpetrator, I have included it in the list.

Minor Accidents Reported from Indiana Mines, 1898.

DATE.	NAME.	CAUSE.	INJURY.	MINES.	COUNTY.
Jan. 11.	John Burnett.	Falling slate	Slight bruises	Brazil B. C. Co. No. 1.	Clay.
Jan. 12.	John Whitson	Mine car	Broken leg, one bone	Grant	Vigo.
Jan. 13.	William Porter	Mine car	Sprained ankle	Gart No. 5	Clay.
Jan. 26.	John D. Berry	Falling coal	Leg broken, small bone	Hawkins	Daviess.
Jan. 29.	Frank Purcell	Not given	Bruised ankle	Cabel No. 4	Daviess.
Jan. 29.	Patrick Bartley	Coal from car	Foot mashed	Chandler	Warriek.
Jan. 29.	Not reported.			Buckeye	Vermillion.
Jan. 29.	James Montague	Steel from anvil	Eye hurt	Star	Sullivan.
Feb. 2.	W. C. Conners	Mine car	Foot bruised	Brazil B. C. Co. No. 8.	Clay.
Feb. 24.	Jas. C. Smith	Caught by cage	Bruised, not seriously	Grant	Vigo.
Feb. 24.	Harvey Raabe	Coal on railroad car	Hand hurt slightly	Crawford C. Co. No. 3.	Clay.
Feb. 24.	Henry Woolridge	Coal fell down shaft.	Shoulder bruised	Nickel Plate	Clay.
Feb. 24.	George Gruse	Falling slate	Leg bruised	Fairview	Clay.
Feb. 24.	H. B. Ehrlich*	Falling roof	Slight bruises	Klondyke	Clay.
Feb. 24.	G. Hoffmann*	Falling roof	Slight bruises	Klondyke	Clay.
Mar. 19.	Perry Bruster	Falling coal	Ankle sprained	Hartwell	Pike.
Mar. 22.	George Kinkade	Fell in manway	Side bruised	Island City	Greene.
Mar. 8.	Mike Heveren	Mine cars	Hand hurt	Brazil B. C. Co. No. 8.	Clay.
Mar. 26.	D. Guimanni	Falling roof	Back hurt	Brazil B. C. Co. No. 8.	Clay.
Mar. 24.	Daniel Thomas	Mine cars	Foot and leg bruised	Gladstone	Clay.
Mar. 24.	James Lawhorn	Mine cars	Leg hurt	Eureka No. 2	Clay.
Mar. 24.	Fred Shepperd	Falling slate	Head bruised	Diamond No. 2	Vigo.
Mar. 24.	Frank Salters	Mine cars	Ankle bruised	Peerless	Vigo.
Mar. 24.	Luther Lake	Falling coal	Hips bruised	Union	Vigo.
Mar. 24.	John Richards	Mine car	Leg bruised	Union	Vigo.
April 21.	Henry Gordon	Falling slate	Side bruised	Brazil	Clay.
April 21.	Jesse Hess	Falling slate	Hips bruised	Cox No. 3	Parke.
April 21.	James Malloy	Falling coal	Not reported	Mecca No. 1	Parke.
April 27.	George Frost	Falling coal	Collar bone broken	Crawford No. 1	Parke.
April 27.	Ben Willoughby	Falling slate	Back hurt slightly	Diamond No. 2	Vigo.
April 27.	James Rouke	Falling slate	Foot hurt	Union	Vigo.
May 3.	James Faulds	Mine car and roof	Hand mashed slightly	Phenix	Sullivan.
May 12.	Harvey Buck	Falling slate	Head bruised	Grant	Vigo.
May 14.	Scott Mason	Falling slate	Slight	Hymers	Sullivan.
May 19.	Martin Luther	Mine car	Back and side bruised	Briar Hill	Clay.
May 19.	T. J. Russel	Mine car	Leg bruised badly	Superior	Clay.
May 21.	Elmer Critchlow	Falling slate	Slight	Harrison No. 2	Clay.

* Both in one accident.

Minor Accidents Reported from Indiana Mines, 1898—Continued.

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REPORT OF STATE GEOLOGIST.

DATE.	NAME.	CAUSE.	INJURY.	MINE.	COUNTY.
May 21	Joseph Stamps	Not reported	Not serious	Ingleside	Vanderburgh.
June 2	James Liddell	Falling slate	Slight	Phenix	Sullivan.
June 9	Joseph Wright	Mining machine	Finger joint lost	Phenix	Sullivan.
June 10	Frank Fulford	Mine car	Ankle strained	Edwardsport	Knox.
June 16	Charles Miller	Mine car	Foot bruised	Briar Hill	Clay.
June 16	Edward Van Fossen	Falling slate	Knee and hip hurt slightly	Phenix	Sullivan.
June 16	John Holden	Mine cars	Leg hurt	Brazil B. C. Co. No. 8	Clay.
June 16	Allen Meode	Falling slate	Not reported	Star	Sullivan.
June 16	John W. Alvis	Falling slate	Foot hurt slightly	Nickel Plate	Vigo.
June 30	Edward Cutty	Mine car	Slight bruises	Brazil B. C. Co. No. 8	Clay.
July 11	H. Vonderschmidt	Falling coal	Foot hurt	Brazil B. C. Co. No. 8	Clay.
July 14	Samuel Darby	By a bar slipping	Foot hurt	Briar Hill	Clay.
July 14	William Daugherty	Not reported		Klondyke	Clay.
July 25	William Krack	Railroad cars	Slight	Brazil B. C. Co. No. 12	Parke.
July 20	Richard Spur	Mine car	Foot hurt	Star	Sullivan.
July 20	D. Montague	Explosion of powder	Burns, not serious	Dewey	Clay.
Aug. 8	Leonard Bardin	Fell from scaffold	Nose broken	Phenix	Sullivan.
Aug. 29	George Cochran	Trolley wire	Head slightly cut	Phenix	Sullivan.
Aug. 4	John Remage	Mine car	Hand mashed	Brazil B. C. Co. No. 1	Clay.
Aug. 4	Andrew Matzura	Falling slate	Fingers cut	Brazil B. C. Co. No. 11	Clay.
Aug. 3	Thomas Skene	Mining machine	Hand hurt	Brazil B. C. Co. No. 8	Clay.
Aug. 8	John McCann	Mine cars	Thumb hurt	Brazil B. C. Co. No. 8	Clay.
Aug. 25	Roland Elstone	Falling slate	Slight	Brazil B. C. Co. No. 8	Clay.
Aug. 25	David Brenton	Went back on a shot	Slight bruises	Templeton	Greene.
Aug. 2	Thomas Thomas	Gas explosion	Not serious	Shelburn	Sullivan.
Aug. 2	Mark Headley	After damp of an explosion	Fainted	Shelburn	Sullivan.
Aug. 2	John Vasco	Blast in coal	Burns	Torrey No. 4	Vermillion.
Sept. 9	James Faulds	Mine car	Bruises, head and neck	Phenix	Sullivan.
Sept. 5	John Waller	Falling slate	Slight	Little's	Pike.
Sept. 21	Andrew Farmer	Falling slate	Head cut, jaw broken	Templeton	Greene.
Sept. 30	Martin Murdoch	Falling slate	Body and limbs bruised	Lyford No. 2	Vermillion.
Sept. 30	Samuel Hice	Falling coal	Leg hurt	Crawford No. 3	Clay.
Sept. 30	William Heacox	Mine car	Finger caught and bruised	Crawford No. 3	Clay.
Sept. 30	Uri Heacox	Falling coal	Hip bruised	Crawford No. 3	Clay.
Sept. 27	Doc Young	Mine car	Back strained	Silverwood No. 2	Fountain.
Sept. 12	C. Chesterfield	Falling slate	Back hurt	Columbia No. 2	Parke.
Sept. 12	John Milburn	Mining pick	Hand hurt	Hartwell	Pike.
Sept. 12	David Walters	Mine car	Back hurt slightly	Peerless	Vigo.
Sept. 12	James Brown	Falling slate	Head cut	Union	Vigo.

Sept. 12	C. McClintock	Falling slate.	Bruises	Nickel Plate.	Vigo.
Sept. 27	William Rees	Mine car.	Foot hurt	Eureka No. 2	Clay.
Oct. 27	James O'Herron	Falling slate.	Back injured slightly	Eureka No. 2	Clay.
Oct. 27	Samuel Buck	Falling coal	Arm hurt slightly	Fairview	Clay.
Oct. 28	Charles Johnson	Falling slate.	Leg hurt slightly	Cabel No. 4	Daviess.
Oct. 28	Andrew Gasper	Mine car.	Ankle strained	Mecca No. 1	Parke.
Oct. 4	Edward Don	Mine car.	Finger mashed	Standard	Parke.
Oct. 4	Jerry Coakley	Falling slate.	Hand cut	Hartwell	Pike.
Oct. 4	Joe Bush	Not reported	Wrist dislocated	Sunnyside	Vanderburgh.
Oct. 4	J. Rees	Falling slate.	Bruised slightly	Sunnyside	Vanderburgh.
Oct. 4	J. Lehman	Same accident.	Bruises	Sunnyside	Vanderburgh.
Nov. 22	Perry Wilson	Caught by cage	Hand bruised.	Phenix	Sullivan.
Nov. 25	H. C. Alford	Falling slate.	Internal injuries	Mutual	Daviess.
Nov. 25	Thomas Robbins	Blast in coal	Body bruised	Eureka No. 2	Clay.
Nov. 25	William Dalton	Mine car.	Heel bruised	Fairview	Clay.
Nov. 11	Charles Morens	Falling roof.	Back, face and leg hurt	Klondyke	Clay.
Nov. 11	H. McClintock	Mine cars	Slight	Brazil B. C. Co. No. 11	Clay.
Nov. 11	Charles Witty	Hit with prop	Head cut slightly	Fluhart	Greene.
Nov. 2	James Clark	Falling slate.	Back hurt slightly	Fluhart	Greene.
Nov. 12	William Lewis	Falling slate.	Slight	Summit	Greene.
Nov. 9	William Lynn	Mine car.	Slight injuries	Brazil B. C. Co. No. 12	Parke.
Nov. 21	Michael Kolibe	Mine car.	Foot hurt slightly	Brazil B. C. Co. No. 12	Parke.
Nov. 26	Gus Mullet	Falling slate.	Thumb bruised	Brazil B. C. Co. No. 12	Parke.
Nov. 26	William Reece.	Mining machine.	Thumb cut	Parke Co. C. Co. No. 10	Vigo.
Nov. 26	No name reported	Falling coal	Slight	Island Valley	Greene.
Nov. 26	James Pellow	Falling coal	Collar bone broken	Crawford No. 3	Clay.
Nov. 26	Clarence Reberger	Falling coal	Foot hurt	Crawford No. 2	Clay.
Dec. 23	Robert Turner	Falling roof	Face cut	Brazil B. C. Co. No. 1	Clay.
Dec. 30	Richard Reybould	Falling coal	Ear split	Gart No. 5	Clay.
Dec. 20	Alex. McCollum	Falling coal	Leg and arm hurt slightly	Crawford No. 5	Clay.
Dec. 9	Mort Reynolds	Mine car.	Hand hurt	Pratt	Clay.
Dec. 9	James Wilson	Falling slate.	Not reported.	Columbia No. 1	Parke.
Dec. 9	L. Knox	Not reported.	Not reported.	Crawford No. 1	Parke.
Dec. 9	Jacob Bell	Falling slate.	Not reported.	Woolley	Pike.
Dec. 9	Edward Cook	Not reported.	Not reported.	Woolley	Pike.

Serious Accidents in Indiana, 1898.

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REPORT OF STATE GEOLOGIST.

DATE.	NAME.	CAUSE.	INJURY.	MINE.	COUNTY.
Jan. 2.	Nelson Hensley	Explosion, powder	Burns, left side	Island No. 2	Greene.
Jan. 10	Grif Owens	Falling slate	Broken leg	Otter Creek	Parke.
Jan. 15	John Stiles	Falling roof	Sprained back	Cabel	Daviess.
Jan. 21	J. Gulumetti	Explosion, loose powder	Bad burns	Brazil B. C. Co. No. 11	Clay.
Jan. 26	David Aiken	Falling slate	Back strained	Columbia No. 3	Clay.
Jan. 24	J. Schrefferman	Mine cars	Broken leg	Brazil B. C. Co. No. 1	Clay.
Jan. 9.	Thomas Burkman	Falling timber	Injured in back	Templeton	Greene.
Feb. 14	Andrew Bramlet.	Coal on railroad car	Finger cut off	Brazil B. C. Co. No. 8	Clay.
Feb. 7	Albert Southard	Explosion of gas	Face, arms and body burned	Star	Sullivan.
Feb. 12	Louie Maher	Mine car in slope	Knee crushed	Duncan or No. 4	Daviess.
Feb. 10	Morgan Rosser	Falling slate	Back and kidneys badly hurt	Cox No. 3	Parke.
Feb. 18	James Boskell	Coal fell in shaft	Finger cut off	Brazil B. C. Co. No. 8	Clay.
Feb. 22	Grant Goff	Falling slate	Back strained	Columbia No. 4	Clay.
March —	George Thompson	Falling slate	Finger cut off	Troy	Perry.
March 18	Name not reported	Mine car	Shoulder badly bruised	Island No. 2	Greene.
April 7	Charles Whorter	Falling slate	Toe broken	Dugger	Sullivan.
April 7	W. M. Robinson	Falling slate	Back strained	Dugger	Sullivan.
May 21	Daniel Winters	Falling slate	Head and chest bruised badly	Columbia No. 5	Clay.
June 21	Clarence Ridgely	Falling slate	Head and chest bruised badly	Oswald	Gibson.
June 21	Moses Yemm	Slate fell in shaft	Collar bone broken	Crawford No. 5	Clay.
June 18	Roland Estone	Mining machine	Finger cut off	Brouillet's No. 3	Vermillion.
June 23	John Holden	Falling slate	Hand broken	Brazil B. C. Co. No. 8	Clay.
June 23	J. W. Alvis	Falling slate	Foot hurt	Brazil B. C. Co. No. 12	Clay.
June 2	C. R. Rogers	Falling coal	Leg broken	Nickel Plate	Vigo.
July 27	W. Straker	Mine cars	Three ribs broken	Woolley	Pike.
July 27	August Lucarena	Went back on shot	Not reported	Sunnyside	Vanderburgh.
July 8	Edward Geiser	Falling slate	Flesh wounds	Brouillet's No. 3	Vermillion.
July 8	Fin Brand	Rope slipped off drum	Shoulder bruised	Oswald	Gibson.
July 3	Ed Mitchell	Falling slate	Bad bruises	Crawford No. 4	Clay.
July 28	Daniel Martin	Falling slate	Back bruised seriously	Brazil B. C. Co. No. 1	Clay.
July 28	John Wells	Shot through pillar	Arm and leg broken, int. inj's.	Gladstone	Clay.
Aug. 18	Rufus Harmon	Caught by cage	Head bruised	Eureka No. 2	Clay.
Aug. 2	Charles Meyers	Mine cars	Seriously bruised	Shelburn	Sullivan.
Aug. 2	James McCombs	Explosion of gas	Seriously burned	Shelburn	Sullivan.
Aug. 2	David John	Explosion of gas	Seriously burned	Shelburn	Sullivan.
Aug. 2	John Thomas	Explosion of gas	Seriously burned	Shelburn	Sullivan.
Sept. 17	August Johnson	Falling slate	Leg broken	Silverwood No. 2	Pountain.
Oct. 5	J. Pursinger	Falling slate	Foot mashed, ankle broken	Troy	Perry.
Oct. 5	B. Crawford	Mine car	Leg broken	First Avenue	Vanderburgh.

Oct. 5	Jacob Bell	Falling slate	Two ribs broken	Crawford No. 1	Parke.	
Oct. 10	John McCloney	Slipped on screen	Hand bruised	Phenix	Sullivan.	
Oct. 10	James Leonard	Falling coal	Hand mashed	Phenix	Sullivan.	
Oct. 10	William Leonard	Falling coal	Internal inj's, breast and back	Phenix	Sullivan.	
Oct. 10	James Anderson	Falling slate	Arm hurt	Grant	Vigo.	
Oct. 10	Henry Schepper	Falling slate	Head hurt	Grant	Vigo.	
Oct. 12	Charles Withers	Falling roof	Back hurt	World's Fair	Clay.	
Oct. 24	J. Albersen	Falling slate	Head and shoulders bruised	Prospect Hill	Knox.	
Oct. 24	Sol Ward	Falling slate	Eye cut, hip bruised	Phenix	Sullivan.	
Oct. 30	Prosper Julebert	Falling slate	Neck and ankle sprained	Brazil B. C. Co. No. 1	Clay.	
Oct. 30	Joseph Summers	Cage in shaft	Two toes cut off	Island City	Greene.	
Oct. 30	Joseph McBright	Falling coal	Bruised badly	South Linton	Greene.	
Oct. 22	William Spillman	Blast in coal	Badly bruised	Ingleside	Vanderburgh.	
Oct. 24	G. Chesterfield	Heavy shot in coal	Three ribs broken, int. hurts	Buckeye	Vermillion.	
Nov. 30	John McGloire	Falling slate	Thigh broken	Templeton	Greene.	
Dec. 5	David Carico	Falling slate	Leg broken	Oswald	Gibson.	
Dec. 14	William Rhyan	Kicked by a mule	Three ribs and should'r broken	Buckeye	Vermillion.	
Dec. 13	O. Jeremerick	Falling coal	Two ribs and shoulder broken.	Cox No. 3	Parke.	
Dec. 13	Herman Ham	Falling coal	Arm and ankle broken	Cox No. 3	Parke.	
Dec. 17	Charles Eberwine	Falling slate	Arm and two ribs broken	Columbia No. 5	Clay.	
Dec. 21	Harvey Patterson	Mine car	Head and shoulders bruised	Columbia No. 4	Clay.	
Dec. 26	Thoms Berrisford	Falling slate	Hand dislocated	World's Fair	Clay.	
Dec. 26	William Spriggs	Mine car	Hand dislocated	Diamond No. 3	Clay.	
Dec. 28	Elmer Drake	Fell down shaft	Legs badly hurt	Superior	Clay.	
Dec. 7	William Davis	Engineer lost control of his engine and cage fell	Severe concussions in all cases	Torrey No. 4	Vermillion.	
Dec. 7	Henry Larimer					
Dec. 7	Fletcher Hamby					
Dec. 7	Owen Graham					
Dec. 3	John D. King	Falling slate	Leg broken and severe bruises	Monarch	Clay.	
Dec. 3	David Carmichael	Falling coal	Thigh broken	San Pedro	Clay.	
Dec. 21	David Hopkins	Falling slate	Leg broken	Peerless	Vigo.	
Dec. 29	Fred Whippo	Mine car	Badly bruised	Nickel Plate	Vigo.	

Fatal Accidents in Indiana Mines, 1898.

DATE.	NAME.	CAUSE.	OCCUPATION.	MINE.	COUNTY.
Jan. 4.	C. G. Smith	Cage caught him while looking down the shaft.	Roustabout	Montgomery No. 1	Daviess.
Jan. 27.	George Markle	Explosion of boiler	Fireman	Union	Vigo.
Feb. 10.	Nat. McGill	Falling roof, January 14	Miner	World's Fair	Clay.
Feb. 10.	Louis Deis	Falling slate, January 13	Miner	Sunnyside	Vanderburgh.
Feb. 12.	John Pesete	Pick in skull. No clew	Miner	Pratt	Clay.
Feb. 27.	Herman Bounes	Falling slate, February 24	Miner	Fuhart	Greene.
Mar. 5.	Thomas O'Harris	Premature blast.	Miner	Wooley	Pike.
Mar. 19.	Frank Murphy	Falling slate.	Miner	Island No. 2	Greene.
April 16.	Alex. Ferguson	Falling slate.	Miner	Nickel Plate	Vigo.
April 23.	Joe Rafatto	Falling slate.	Miner	Standard	Parke.
June 25.	Frank Reni	Door blown open by a heavy shot	Miner	Brouillet's No. 3	Vermillion.
July 8.	John Flatley	Both killed instantly by the same fall of slate.	Miners	Cox No. 3	Parke.
July 8.	Andrew Brumick				
Aug. 30.	Sheridan Osborn	Falling slate.	Miner	Hartwell	Pike.
Aug. 30.	James Oswald	Both instantly killed by falling roof in working place.	Miners	Superior	Clay.
Aug. 30.	Charles Howalt				
Oct. 19.	James M. Molar	Coal falling down shaft	Cager	Jumbo	Sullivan.
Dec. 8.	Alonzo Colbert	Falling slate.	Miner	Duncan or No. 4	Daviess.
Dec. 11.	James Henry	Both died from injuries received from heavy shot firing on December 10.	Miners	Brouillet's Creek No. 4	Vermillion.
Dec. 19.	Newton Muncie				
Dec. 23.	Albert Haag	Falling slate	Miner	Mutual	Daviess.
Dec. 25.	George Dalton	Went back on a shot too soon	Miner	Buckeye	Vermillion.

Fatalities by Years.

YEAR.	EM- PLOYES.	TONS OF COAL.	Fatalities.
1879.....	3,459	1,196,490	.....
1880.....		1,550,375	.....
1881.....	4,567	1,771,536	10
1882.....		1,990,000	.....
1883.....	5,403	2,560,000	11
1884.....	5,716	2,260,000	9
1885.....	6,502	2,375,000	7
1886.....	6,406	3,000,000	7
1887.....		3,217,711	.....
1888.....	6,685	3,140,979	17
1889.....			.....
1890.....	6,550	3,791,211	5
1891.....	6,975	3,819,600	5
1892.....	7,600	4,408,471	19
1893.....	7,431	4,358,897	22
1894.....			.....
1895.....	7,885	4,202,084	23
1896.....	7,112	4,068,124	23
1897.....	7,984	4,088,100	16
1898.....		5,146,920	19

NOTE.—Where blanks occur there was no report.

LIST OF MINES.

Table Showing the Names and Addresses of Persons and Corporations Operating Coal Mines in the State of Indiana During the Year 1898, With the Names of Mines in Each County.

CLAY COUNTY.

NAMES.	ADDRESSES.	MINES.	REMARKS.
Allais & Urbain	Brazil	Victoria	Abandoned.
Brazil Block Coal Co.	Brazil	No. 1 Mine	
Brazil Block Coal Co.	Brazil	Gart No. 3	
Brazil Block Coal Co.	Brazil	Gart No. 5	
Brazil Block Coal Co.	Brazil	Mine No. 7	Suspended.
Brazil Block Coal Co.	Brazil	Mine No. 8	
Brazil Block Coal Co.	Brazil	Mine No. 10	Abandoned.
Brazil Block Coal Co.	Brazil	Mine No. 11	
Briar Block Coal Co.	Clay City	Briar Hill	
Chicago and Indiana Coal Co.	Terre Haute	Harrison No. 2	
Chicago and Indiana Coal Co.	Terre Haute	Harrison No. 3	New mine.
Coal Bluff Mining Co.	Terre Haute	Pratt	
Crawford Coal Co.	Brazil	Mine No. 2	Abandoned.
Crawford Coal Co.	Brazil	Mine No. 3	Abandoned.
Crawford Coal Co.	Brazil	Mine No. 4	New mine.
Crawford Coal Co.	Brazil	Mine No. 5	New mine.
C. Ehrlich & Co.	Turner	Kiondyke	
C. Ehrlich & Co.	Turner	Excelsior	Abandoned.
D. H. Davis Coal Co.	Knightsville	World's Fair	
Ehrlich, Peter	Turner	Superior	Sold to I. B.
Eureka Block Coal Co.	Terre Haute	Eureka No. 2	
Eureka Block Coal Co.	Terre Haute	Eureka No. 3	New mine.
Diamond Block Coal Co.	Chicago, Ill.	Diamond No. 3	
Goucher, McAdoo & Co.	Brazil	Monarch	
Jackson Coal and Mining Co.	Brazil	Brazil	
Jackson Coal and Mining Co.	Brazil	Nickel Plate	Abandoned.
Jackson Coal and Mining Co.	Brazil	Dowey	New mine.
Peter Andrew	Clay City	Markland	
Otter Creek Coal Co.	Brazil	Fairview	
Somers, Joseph	Staunton	San Pedro	
Weaver Coal Co.	Center Point	Louise	
Zeller, McClellan & Co.	Brazil	Columbia No. 3	Abandoned.
Zeller, McClellan & Co.	Brazil	Columbia No. 4	
Zeller, McClellan & Co.	Brazil	Columbia No. 5	New mine.
Lancaster Block Coal Co.	Terre Haute	Rob Roy	

DAVISS COUNTY.

Cabel & Co.	Washington	Mine No. 4	
Cabel & Co.	Washington	Mine No. 9	
Daviss County Coal Co.	Montgomery	Mine No. 1	
Daviss County Coal Co.	Montgomery	Mine No. 2	
Daviss County Coal Co.	Montgomery	Mine No. 3	New mine.
Mutual Mining Co.	Montgomery	Mutual	
Raglesville Coal Co.	Raglesville	Hoosier	
Stuffle, James	Raglesville	Mine No. 3	Small mine.
Washington Coal Co.	Washington	Hawkins	
Washington Coal Co.	Washington	Duncan	
Winkelpleck, Jonas	Raglesville	Union	Small mine.

DUBOIS COUNTY.

L. A. Southard	Huntingburg	Huntingburg	Abandoned.
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LIST OF MINES—Continued.

FOUNTAIN COUNTY.

NAMES.	ADDRESSES.	MINES.	REMARKS.
Indiana Bit. Coal Co	Terre Haute	Silverwood No. 2	
Silverwood Coal Co	Silverwood	Sturm	

GIBSON COUNTY.

Maule Coal Co	Princeton	Oswald	See Note 2.
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GREENE COUNTY.

Island Coal Co	Indianapolis	Island City	
Island Coal Co	Indianapolis	Island No. 2	
Island Valley C. and M. Co.	Linton	Island Valley	
Linton C. and M. Co	Linton	Fluhart	
So. Linton Coal Co	Linton	South Linton	
Summit Coal Co	Bloomfield	Summit	
Western Ind. Coal Co	Terre Haute	Templeton	

KNOX COUNTY.

Bicknell Co-op. Coal Co	Bicknell	Bicknell	See Note 3.
Edwardsport Coal Co	Indianapolis	Edwardsport	
Prospect Hill Coal Co	Vincennes	Prospect Hill	See Note 4.

MARTIN COUNTY.

Bedford C. and M. Co	Bedford	Bedford	See Note 5.
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OWEN COUNTY.

Lancaster Block C. Co	Terre Haute	Lancaster No. 4	
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PARKE COUNTY.

Brazil Block Coal Co	Brazil	Cox No. 3	
Brazil Block Coal Co	Brazil	Brazil Block No. 12	
Brazil Block Coal Co	Brazil	Otter Creek	
Crawford Coal Co	Brazil	Mine No. 1	
McIntosh, I. & Co	Brazil	Mine No. 1	
McIntosh, I. & Co	Brazil	Mine No. 3	New mine.
Otter Creek Coal Co	Brazil	Mecca No. 1	
Parke County C. Co	Rosedale	Mine No. 8	
Rock Run Coal Co	Brazil	Lucia	New mine.
Standard Coal Co	Terre Haute	Standard	
Wabash Valley C. Co	Clinton	Lyford No. 2	See Note 6.
Zeller, McClellan & Co	Brazil	Columbia No. 1	
Zeller, McClellan & Co	Brazil	Columbia No. 2	

LIST OF MINES—Continued.

PERRY COUNTY.

NAMES.	ADDRESSES.	MINES.	REMARKS.
Amer. Cannel Coal Co	Cannelton	Cannelton	
Bergenroth Bros.....	Troy	Troy	

PIKE COUNTY.

Cabel-Kaufman Coal Co.....	Cabel	Hartwell	
Ingle, D.....	Oakland City	Ayrshire	
Jackson, W. A.....	Oakland City	Carbon	
The S. W. Little Coal Co.....	Evansville.....	Blackburn	
The S. W. Little Coal Co.....	Evansville.....	Little's	
The J. Woolley, Jr., Coal Co.....	Evansville.....	Woolley.....	

SULLIVAN COUNTY.

Hancock & Conkel	Farnsworth	Bunker Hill	See Note 7.
Harder-Hafer Coal Co	Del Carbo	Star	
Hymera Coal Co	Hymera	Harrison	
Ind. and Chicago Coal Co.....	Dugger	Dugger	
Jackson Hill Coal and Coke Co.....	Ragle	Jumbo	
Lyonton Coal Mining Co.....	Dugger	Briar Hill	Abandoned.
North Currysville Coal Co.....	Shelburn	Currysville	
New Pittsburgh Coal and C. Co.....	Alum Cave	Phenix	
Shelburn Mining Co	Shelburn	Shelburn No. 2	
Watson-Little Coal Co.....	Farnsworth	Bush Creek	See Note 8.
Sullivan Coal Co	Sullivan	Sullivan	Small.

VANDERBURGH COUNTY.

Diamond Coal Mining Co.....	Evansville	Diamond	
Ev. Union Coal Mining Co.....	Evansville	Union	
John Ingle Coal Co	Evansville	Ingleside	
Lozier, H. A.....	Evansville	First Avenue	
Sunnyside Coal and Coke Co	Evansville	Sunnyside	

VERMILLION COUNTY.

Brouillet's Creek Coal Co.....	Clinton	Mine No. 3.....	
Brouillet's Creek Coal Co.....	Clinton	Mine No. 4.....	New mine.
Hazel Creek Coal Co	Clinton	Fern Hill	Abandoned.
Keller Coal Co.....	Clinton	Prince	New mine.
McClellan, Estman & Co.....	Clinton	Buckeye	
Torrey Coal Co	Voorhees	Torrey No. 4	
Cayuga Press Brick Co.....	Cayuga	Eureka	

LIST OF MINES—Continued.

VIGO COUNTY.

NAMES.	ADDRESSES.	MINES.	REMARKS.
Broadhurst, J. N. & G.	Macksville	Broadhurst	
Coal Bluff Mining Co.	Terre Haute	Diamond No. 2	
Coal Bluff Mining Co.	Terre Haute	Peerless	
Coal Bluff Mining Co.	Terre Haute	Union	
Davis, Edward	Ehrmandale	Vigo	Small now.
Ehrlich, Julius	Seeleyville	Ehrlich	
Ehrman Coal Co.	Terre Haute	Nickel Plate	See Note 9.
Grant Coal Mining Co.	Burnett	Grant	
Lankford, William	Macksville	Larimer	
Loughner Coal Co.	Seeleyville	Hector	
Murray & Lloyd	Macksville	Murray	See Note 10.
Nevins Coal Co.	Fontanet	Bureka	New mine.
Parke County Coal Co.	Rosedale	Mine No. 10	
Terre Haute Brick and Pipe Co.	Terre Haute	Brick Works	Small now.
Vigo County Coal Co.	Seeleyville	Ray	

WARRICK COUNTY.

Archbold, John	Evansville	Star	
Bartley, Patrick	Evansville	Chandler	
Caledonia Coal Co.	Boonville	Caledonia	Small now.
DeForest Coal Co.	Evansville	DeForest	Irregular.
Hall and Lawrance	Chandler	Air Line	
Kelley & Nester	Boonville	Gough	
J. Woolley, Jr., Coal Co.	Evansville	Big Vein	

Notes.

1. The Superior mine in Clay county was sold by Peter Ehrlich to the Indiana Bituminous Coal Company, of Terre Haute, Ind., in the month of November, and has since been operated by that company.

2. The Oswald mine was sold in the month of October to the Princeton Coal Company, Princeton, Ind.

3. The Bicknell Co-operative Coal Company gave up their lease on the Bicknell mine and it has been operated by the Bicknell Coal Company since the month of September.

4. The Prospect Hill mine has been worked by the Prospect Hill Co-operative Coal Company since October.

5. The Tunnel mine has changed hands twice during the year and is now being operated under a lease by F. M. Wampler, Indian Springs, Ind.

6. The Lyford mine was operated from January to June by The Calumet Coal Company, from June to October by the "Scott Mines" Company, and since then by the present operators, as given in the table.

7. Hancock & Conkel sold the Bunker Hill mine to — Crowder, Sullivan, Ind., and it is at present leased to a company who are operating it under the firm name of Smith, Lawson & Co., Farnsworth, Ind.

8. The Watson-Little Coal Company retired from business early in the year, and this mine has done very little work. At the close of the year it is being operated under a lease by Donald, Fogg & Co.

9. The Ehrman Coal Company ceased operating their Nickel Plate mine in October, and have leased it to F. S. Peabody, of Chicago, Ill., who began operations in the latter part of December.

10. The firm of Murray & Lloyd failed near the close of 1897. The mine did very little work until it was sold to R. J. Smith in September. It is at present operated by the purchaser, whose address is Terre Haute, Ind.

This year has been the most prolific of changes in the coal business in this State of any year since I have been in the office of Inspector. In addition to the changes noted above, several mines that were on the list in my report for 1897 have not employed more than ten men during this year, hence I have no report from them.

It will be seen from the above table that there have been ten mines abandoned during the year; five that are now working less than ten men, most of them having reduced their force preparatory to abandonment; one is suspended at present, which may be reopened during the year 1899, and twelve new mines have been opened during the year, which are now producing coal. In addition to these there are two new mines in Greene county which have not yet reported, though I understand at the close of the year that the vein has been reached in each of them. The probabilities are that there will be several new openings made early in the coming year.

TABLE

Showing the Number of Men and Mules Employed, Days Worked, Accidents Occurring, Kegs of Powder Used, and Total Coal Produced at Each Mine Reporting to this Office in 1898.

CLAY COUNTY.

NAME OF MINE.	EMPLOYED.			Days Worked.	ACCIDENTS.		Kegs of Powder Used.	COAL PRODUCED.
	Men Inside.	Mules.	Men Outside.		Fatal.	Non-Fatal.		
Brazil Block No. 1	112	12	13	246		6	1,286	79,836
Gart No. 3	117	10	10	56			375	14,695
Gart No. 5	182	11	10	155		2	2,070	72,672
Brazil Block No. 7	38	2	1	12			33	1,026
Brazil Block No. 8	181	15	18	263		12	2,961	120,370
Brazil Block No. 11	39	3	4	206		3	846	15,094
Gladstone	89	8	9	230		2	3,635	71,719
Briar Hill	25	3	5	167		3	148	13,532
Harrison No. 2	48	4	6	135		1	672	20,511
Harrison No. 3	20	1	3	70			114	3,839
Pratt	70	6	6	134	1			27,610
Crawford No. 2	39	2	8	150		1	586	27,886
Crawford No. 3	75	5	6	156		5		29,824
Crawford No. 4	28	1	2	114		1	798	12,054
World's Fair	45	2	3	140	1	2	787	14,875
Diamond	82	5	8	158		1	3,425	63,538
Excelsior	27	4	4	8			40	599
Eureka No. 2	145	14	7	144		4	2,165	55,023
Eureka No. 3	49	2	3	124			286	18,237
Monarch	15	2	3	297				6,943
Brazil	113	6	7	188		1	956	43,543
Nickel Plate	36	2	3	95		1	250	7,067
Markland	22	3	4	161			554	9,811
Fairview	58	5	5	149		3	687	19,337
Louise	71	6	5	120			1,023	22,662
Columbia No. 3	14	2	2	40		1	82	2,175
Columbia No. 4	42	2	4	168			1,045	17,776
Klondyke	136	5	8	209		5	2,239	110,902
Superior	37	3	3	162	2	2		5,994
San Pedro	61	4	7	156			824	38,463
Victoria	27	4	2	100			243	7,947
Rob Roy	23	2	3	88			63	2,158
Columbia No. 5	151	4	7	100		1	481	30,675
Dewey	81	2	7	111		1		12,764
Crawford No. 5	46	1	6	72		3	465	12,262
Pyrah No. 3	36	2	3	75			115	4,888

DAVISS COUNTY.

Cabel No. 4	38	4	6	174		2	662	14,199
Cabel No. 9	59	7	7	151		1	631	25,460
Montgomery No. 1	37	7	7	250	1		1,693	44,440
Montgomery No. 2	52	7	6	240			1,542	47,094
Montgomery No. 3	25	2	1	70			1,286	7,191
Mutual	38	4	7	154	1	2	546	6,550
Hooster	10		2	183				4,693
Union	10	1	2	183				1,835
Hawkins	27	3	5	73		1	79	14,485
Duncan	15	1	3	173	1	1	46	7,223

TABLE—Continued.

DUBOIS COUNTY.

NAME OF MINE.	EMPLOYED.			Days Worked.	ACCIDENTS.		Kegs of Powder Used.	COAL PRODUCED.
	Men Inside.	Mules.	Men Outside.		Fatal.	Non-Fatal.		
Huntingburg.....	7	1	2	166	.....	.....	.....	2,649

FOUNTAIN COUNTY.

Silverwood No. 2.....	87	10	7	261	2	4,275	94,819
Sturm No. 2.....	21	2	3	290	869	17,082

GIBSON COUNTY.

Oswald.....	63	4	12	170	3	1,553	47,286
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GREENE COUNTY.

Island City.....	85	7	12	140	1	67,768
Island No. 2.....	142	17	16	139	1	2	117,789
Island Valley.....	50	4	7	152	.....	2	751	37,356
Fluhart.....	167	11	9	125	1	2	1,509	61,332
South Linton.....	74	5	6	133	.....	1	1,175	51,566
Summit.....	119	15	13	143	.....	1	2,462	103,080
Templeton.....	97	5	8	157	.....	4	.....	82,831

KNOX COUNTY.

Bicknell.....	29	2	4	155	.....	.....	546	18,616
Edwardsport.....	39	4	8	138	1	542	29,888
Prospect Hill.....	18	3	5	217	1	382	10,853

MARTIN COUNTY.

Tunnel.....	17	2	2	135	3	5,052
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OWEN COUNTY.

Lancaster No. 4.....	17	2	3	197	1	8,813
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TABLE—Continued.

PARKE COUNTY.

NAME OF MINE.	EMPLOYED.			Days Worked.	ACCIDENTS.		Kegs of Powder Used.	COAL PRODUCED.
	Men Inside.	Mules.	Men Outside.		Fatal.	Non-Fatal.		
Brazil Block No. 12	37	2	7	238	.....	5	635	17,646
Cox No. 3	130	19	22	240	.....	2	1,344	153,612
Lyford No. 2	132	9	15	202	.....	1	2,220	79,842
Mecca No. 1	43	3	7	196	.....	2	1,653	30,689
Parke No. 8	59	7	10	196	.....	.....	888	93,620
Otter Creek	46	3	4	140	.....	1	467	18,484
Standard	36	4	5	223	.....	1	.....	55,825
Columbia or Superior No. 1	53	4	5	96	.....	.....	779	26,173
Columbia or Superior No. 2	110	4	6	200	.....	1	3,561	56,745
Crawford No. 1	91	5	5	131	.....	3	167	34,627
McIntosh No. 1	67	4	5	210	.....	.....	921	32,463
McIntosh No. 2	35	2	3	106	.....	.....	445	7,115
McIntosh No. 3	53	3	4	42	.....	.....	503	5,900

PERRY COUNTY.

Cannelton	31	4	6	140	.....	.....	36	16,703
Troy	17	2	2	250	.....	2	309	10,384

PIKE COUNTY.

Hartwell	41	6	5	118	.....	1	477	16,458
Ayrshire	129	21	15	111	.....	3	2,890	83,511
Blackburn	27	5	7	84	.....	.....	608	19,080
Littles	102	11	10	174	.....	1	2,966	71,105
Carbon	23	2	4	185	.....	.....	433	18,335
Woolley	36	5	5	205	.....	2	1,437	32,332

SULLIVAN COUNTY.

Briar Hill	19	1	3	147	.....	.....	401	11,528
Bunker Hill	28	3	4	47	.....	.....	427	14,244
Dugger	79	13	12	149	.....	2	.....	69,364
Star	85	13	18	221	.....	4	1,492	142,916
Jumbo	111	23	15	230	.....	1	1,143	145,468
Curryville	25	2	6	17	.....	.....	19	1,124
Phenix No. 1	130	16	17	234	.....	14	1,505	148,593
Hynera	75	9	12	202	.....	1	582	105,772
Shelburn	43	6	11	151	.....	5	707	33,735
Bush Creek	12	1	2	96	.....	.....	133	3,963
Sullivan	12	1	1	52	.....	.....	.....	775

VANDERBURGH COUNTY.

Diamond	21	3	4	218	.....	.....	678	15,697
Union	21	2	5	214	.....	.....	610	11,870
Ingleside	96	11	9	209	.....	2	215	63,606
First Avenue	23	5	7	259	.....	1	1,128	24,792
Sunnyside	62	12	9	214	.....	2	1,725	77,327

TABLE—Continued.

VERMILLION COUNTY.

NAME OF MINE.	EMPLOYED.			Days Worked.	ACCIDENTS.		Kegs of Powder Used.	COAL PRODUCED.
	Men Inside.	Mules.	Men Outside.		Fatal.	Non-Fatal.		
Brouillet's No. 4	103	5	6	128	2	.....	2,558	44,041
Cayuga	15	2	.....	78	.....	.....	.....	2,630
Fern Hill	100	18	15	56	.....	.....	1,240	19,978
Prince	72	4	.....	132	.....	.....	2,919	46,324
Brouillet's No. 3	122	14	8	160	1	2	6,194	107,924
Torrey No. 4	54	6	11	219	.....	5	2,649	58,584
Buckeye	123	8	9	229	1	3	4,382	120,466

VIGO COUNTY.

Klondyke	19	1	4	97	.....	.....	285	5,337
Diamond No. 2	149	10	9	257	.....	2	.....	145,267
Peerless	108	7	9	210	.....	3	.....	87,585
Union	172	14	12	265	1	5	.....	182,785
Broadhurst	13	2	1	294	.....	.....	.....	10,478
Ehrlich	49	4	6	231	.....	.....	1,552	43,692
Nickel Plate	71	9	8	177	1	4	1,668	50,971
Hector	62	4	7	226	.....	.....	1,884	54,907
Grant	92	10	10	181	.....	5	2,380	77,313
Parke No. 10	72	7	9	186	.....	1	745	81,222
Brick Works	11	2	1	259	.....	.....	335	9,916
Vigo	20	1	4	113	.....	.....	287	9,800
Ray	48	4	6	178	.....	.....	930	48,322
St. Mary's	30	1	4	23	.....	.....	68	1,765
Murray	21	2	3	172	.....	.....	.....	10,000

WARRICK COUNTY.

Star	29	4	4	154	.....	.....	1,150	23,279
Chandler	11	3	3	147	.....	1	.....	6,061
Gough	22	3	4	150	.....	.....	516	18,219
Air Line	10	1	3	168	.....	.....	197	4,732
Big Vein	30	6	6	185	.....	.....	609	38,261
Caledonia	14	2	2	208	.....	.....	211	11,148
Brizius	16	2	3	60	.....	.....	65	2,444
DeForest	16	2	3	113	.....	.....	424	7,780