INDIANA.

DEPARTMENT

OF

Geology and Natural Resources.

EIGHTEENTH ANNUAL REPORT.

S. S. GORBY,
STATE GEOLOGIST.

1893.

TO THE GOVERNOR.

INDIANAPOLIS:
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1894.

STATE OF INDIANA,
EXECUTIVE COMMITTEE,
OCTOBER 12, 1893.

Received by the Governor, examined and transmitted to Secretary of State for publication, upon the order of the Board of Commissioners of Public Printing and Binding.

MYRON D. KING,
Private Secretary.

Filed in the office of the Secretary of State of the State of Indiana, October 12, 1893.

W. H. MYERS,
Secretary of State.

Received the within report and delivered to the printer.

CHRISTIAN H. STEIN,
Clerk Printing Bureau.

State of Indiana,

Department of Geology and Natural Resources,

INDIANAPOLIS, IND., October 9, 1893.

TO HON. CLAUDE MATTHEWS,
Governor of Indiana:

SIR: Herewith is submitted the 18th Report of the Department of Geology and Natural Resources. The report embraces papers by Prof. Charles R. Dryer, upon the Geologies of Lagrange and Noble counties; the Botany of Noble County, by Prof. W. B. Van Gorder; reports by State Inspector and Assistant Inspector of Mines; reports by the State Supervisor of Oils and his assistants; report by the State Supervisor of Natural Gas; a paper on the structural features of the State with diagrams by Prof. E. P. Cubberly, and a Paleontological Report by Prof. S. A. Miller, describing and figuring eighty species of fossils hitherto unknown to science.

It is hoped the report will be a valuable aid to those interested in the geology or natural history of the State, whether in an economic or purely scientific sense.

Respectfully submitted,

S. S. GORBY,
State Geologist.

ASSISTANTS TO THE STATE GEOLOGIST.

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INTRODUCTORY.

The attention of capitalists has been closely directed to the State of Indiana for several years, and, as a result of careful investigation, investments of capital have been large, varied and continuous. Notwithstanding the business depression of the last year, the affairs of a large proportion of the industries of the State have been fairly prosperous. While a few industries have temporarily suspended operations on account of a depressed state of trade, a large proportion of them continued to operate, some with a reduced force and others with a full complement of employes and with reasonable profit.

THE COAL INDUSTRY.

The coal industry of the State shows a large increase of production during the year just passed, and there has been a corresponding increase in mines and facilities for handling coal, and of employes also. There was more coal mined in Indiana the last year than was ever produced within the same period in the history of the State. With a profitable coal area of more than 7,000 square miles, extending over twenty-two counties of the State, and with fair shipping facilities to a profitable and increasing market, the output of the Indiana fields should be several times greater than the present production. The block and bituminous coals of Indiana compare favorably with those of any other State. Following is an analysis of Hocking Valley, Ohio, coal—the average of the field:

ANALYSIS OF HOCKING VALLEY, OHIO, COAL.

Fixed carbon	54.17
Gas	36.40
Ash	2.81
Moisture	6.61
Total	99.99

ANALYSIS OF INDIANA BLOCK COAL.

Fixed carbon	56.50
Gas	32.50
Ash	2.50
Water	8.50
Total	100.00

The sample of Indiana coal from which the above analysis was made was taken from Clay County. The analysis of a sample of bituminous coal from Vanderburgh County resulted as follows:

Fixed carbon	53.50
Gas	39.00
Ash, red	4.00
Water	3.50
Total	100.00

From a specimen of Fayette County, Pennsylvania, coal, above Pittsburgh, was obtained the following:

Fixed carbon	58.00
Gas	34.00
Ash	5.00
Water	3.00
Total	100.00

A specimen of Mecklenburg County, Kentucky, coal showed as follows:

Fixed carbon	51.00
Gas	42.50
Ash	4.50
Water	2.00
Total	100.00

Coal from Grundy County, Illinois:

Fixed carbon	50.35
Gas	39.85
Ash	4.15
Water	5.65
Total	100.00

The weight of Indiana coal varies from 71 pounds to 85 pounds per cubic foot, with an average of 79 pounds. It contains fixed carbon varying from 40 per cent. to 65 per cent., averaging 55 per cent. Gas, from 33 to 53, averaging 41. Ash, from 1.50 per cent. to 19.50 per. cent., averaging 5.00 per cent. Water, from 2.00 to 6.00, averaging 3.00 per cent. It produces from 42.00 to 65.00 per cent. of coke, averaging 58.00 per cent. It is as generally free from sulphur as that produced in other States. The large, undeveloped coal areas of the State should receive the attention of capitalists, and become a source of large revenue to our people. This department has never had means to make a thorough survey of the coal fields. A special appropriation of at least

$10,000 ought to be made for this work, and the reports thereon published in special volumes, so that the information could be given to those who are directly interested in these industries. The office of the State Geologist is constantly receiving letters from capitalists, making special inquiries concerning portions of our coal area to which no definite answer can be given, for the reason that we have not the facts upon which to base replies. Were a thorough survey of the coal fields made, the facts would always be at hand; and it is certainly true that if the complete facts concerning this great mass of undeveloped wealth were known, the increase of capital in the coal industry, as well as the production of fuel, would soon be doubled.

BUILDING STONE.

It is generally conceded among architects that for general purposes no stone in America surpasses the Indiana Oolitic Limestone as a building material. It is strong, durable, cheap, and of uniform texture and color. No other stone in the market can be so readily and easily dressed, or prepared for the builder's use. In the middle and southern States a larger proportion of this stone is used in the large Government structures, and other large public structures, than all other stones combined. It is so well known now, and its value is so generally recognized that its use in public buildings has become almost universal. As a result of this popularity, the Oolitic limestone quarries of Indiana suffered less on account of the general business depression during the year 1893 than did any other industries of the State. The orders for stone that were booked previous to the beginning of a general feeling of distrust were sufficient to keep all the quarries running to their full capacity during the entire year, while many of them have contracts for all they can produce during the year 1894.

The limestone quarries, other than the Oolitic, have also been very successful, despite unfortunate conditions that have so universally prevailed.

Too little attention has been given to the valuable sandstones that are found in several counties of the State, notably in Fountain, Warren, Vermillion, Parke, Dubois, and a number of others. As a rule, this sandstone is very strong, capable of sustaining a pressure of 6,000 lbs. to 7,000 lbs. per square inch. It is easily worked, and can be obtained in blocks of any dimensions required. It is fine grained, even in texture, and its fire-proof qualities make it very desirable as a building stone. It is found in a variety of colors, but gray and a chocolate color predominate. Several quarries have been opened in the counties named, and it is expected that the beauty and durability of the stone will soon make a demand for it that will put it into close competition with the well known Oolitic limestone.

INDIANA CLAYS.

No other mineral substance is used so extensively by man as clay. Our cities are built of it in the form of bricks; our streets are paved with it, our houses decorated with it in the form of tiles, vases and other objects. In the dining room the ware of the matron is her especial pride. For domestic purposes, hundreds of different articles are made of clay, and on account of the non-corrosive properties of the articles they are far superior to articles manufactured of any other minerals.

Indiana has a great diversity of clay, some of them being of great value. The clay products of the State already amount to many millions of dollars annually. These products, however, consist principally of building, paving and fire-proof bricks, decorative, flooring and roofing tiles, sewerage and drainage tiles, terra cotta, brown stone ware and similar products. The State Geologist is preparing an exhaustive report on the clays of the State, which will appear in the nineteenth report of this department. In preparing for this report he has collected and made analysis of about one hundred and seventy samples of clay from all parts of the State. In this work only such clays have been used as are found in commercial quantities, and at available points. Some of these clays are of extraordinary value on account of their whiteness, and the large proportion of alumina they contain. It is hoped that the publication of the report will result in a widening of the market for these valuable products.

SAND.

In the vicinity of Pendleton and Montpelier valuable white sand has been found for the manufacture of glass. In Washington County, near Salem, occur vast quantities of a good quality of moulder's sand, suitable for foundry use. For building purposes sand of suitable quality occurs in nearly every neighborhood.

NATURAL GAS.

The natural gas fields of the State are still producing enormously. While a number of localities, where the draught has been heavy and continuous, show a marked diminution of pressure and volume, the larger part of the field is found to be reduced but little below the original pressure. If used with economy, natural gas will be a source of revenue to the State for many years yet. It is a humiliating fact, however, that it is viciously and continuously wasted. This waste is not confined to any single class of individuals. In private houses almost twice as much is consumed as is necessary for the comfort of the inhabitants. In most houses it is allowed to burn in each stove, grate or furnace twenty-four

hours in the day, regardless of the conditions of temperature. It is still allowed to burn in immense flambeaus in hundreds of places throughout the field, and in some localities it is burned day and night.

In the development of oil wells more or less gas is found. Some of these wells yield two to four millions cublic feet of gas per day. These oil wells, as a rule, are some distance from any gas pipe line, and, of necessity, the gas is wasted. It has been impossible so far to regulate the use of gas in such a way as to prevent this extravagant waste. When it is piped to the premises of an individual he considers all that is admitted through the pipes his, and seems to act upon the assumption that he must consume it all or it will be a loss to him.

The daily loss to the people in the gas area at this time on account of this extravagance is not less than $5,000. The various companies that pipe gas to the various cities and towns have made a few feeble efforts to regulate the use of gas to the actual needs of consumers, but their efforts so far have been almost wholly futile.

PETROLEUM.

Indiana is rapidly attaining importance as a producer of petroleum. During the year 1893 the yield was 2,335,000 barrels of 42 gallons each. The consumption of refined petroleum in the State was about 260,000 barrels, and of crude oil about 150,000 barrels, so the fact is plain that the production of petroleum has become a most important industry. At the beginning of the year there were almost 250 producing wells in the State; at the present time there are more than 1,000. The yield of 1893 will be more than doubled, and it is likely, judging from the increase in developments, that the yield will be three if not four times as much as the last year's product.

The counties producing the largest quantities of petroleum are Jay, Wells, Adams, Blackford and Grant, though many other counties produce it in small quantities. At the present time wells are being brought in, in the counties named above, at the rate of 100 per month. At the present rate of increase the number of producing oil wells in the Indiana field will be near 2,000 by the close of the year 1894.

The following tables by Mr. George A. Whitney, Jr., of Toledo, Ohio, show the new wells drilled during each month of 1893 and the rate of production.

TABLE No. I.

The Indiana Oil Field in 1893.

Showing the number of wells completed for oil during the year by months:

MONTH.	Wells Completed.	New Production, Barrels.	Dry.	Drilling.	Rigs Up.	Abandoned Wells.
January	20	1,206	7	23	13	4
February	30	911	10	19	15	. .
March	28	2,805	7	24	15	9
April	40	5,600	9	17	14	4
May	52	2,925	17	34	22	4
June	53	5,060	7	44	28	. .
July	52	3,550	11	39	38	6
August	62	3,790	12	50	42	. .
September	77	3,620	17	54	35	3
October	81	3,000	14	67	41	4
November	83	2,395	19	62	47	11
December	83	2,318	12	67	51	6
	661		142			51
In Grant County	4		4			
Total for year	665		146			51

TABLE II.

Jay County, Indiana, in 1893.

Showing the number of wells completed for oil during the year by months.

MONTH.	Completed Wells.	New Production, Barrels.	Dry.	Drilling Wells.	Rigs Up.
January	5	525	2	14	12
February	14	620	2	7	9
March	14	1,770	3	15	9
April	23	4,600	5	10	9
May	31	1,750	10	11	10
June	24	2,960	5	44	28
July	22	2,150	3	26	20
August	30	2,250	5	31	23
September	45	2,390	11	30	10
October	28	850	8	12	10
November	13	320	4	10	5
December	8	95	5	11	11
Total for year	257		63		

TABLE No. III.

Wells County, Indiana, in 1893.

Showing the number of wells completed for oil during the year, by months:

MONTH.	Completed Wells.	New Production, Barrels.	Dry.	Drilling Wells.	Rigs Up.
January	8	605		5	2
February	7	176	2	8	1
March	10	1,000	2	6	4
April	9	680		4	4
May	13	965	3	18	10
June	19	1,490		16	8
July	17	1,010	2	6	8
August	18	830	3	8	12
September	15	320	2	12	10
October	32	1,235	4	28	24
November	52	1,500	10	34	34
December	54	1,583	5	41	29
Total for year	254		33		

TABLE No. IV.

Adams County, Indiana, in 1893.

Showing the number of wells completed for oil during the year by months.

MONTH.	Completed Wells.	New Production, Barrels.	Dry.	Drilling Wells.	Rigs Up.
January	7	70	5	5	5
February	7	115	4	4	5
March	3	30	2	3	2
April	5	320	1	3	1
May	8	310	4	5	2
June	10	610	2	6	5
July	12	390	5	3	2
August	7	390	1	5	4
September	9	300	2	5	6
October	9	465	1	9	4
November	7	240	2	6	3
December	11	395	1	8	7
Total for year	65		30		

TABLE No. V.

Blackford County, Indiana, in 1893.

Showing the number of wells completed for oil during the year by months:

MONTH.	Completed Wells.	New Production, Barrels.	Dry.	Drilling Wells.	Rigs Up.
January	...	...	...	2	...
February	2	...	2	...	...
March	1	5	...	...	...
April	3	...	3	...	...
May	...	...	...	...	...
June	...	...	...	2	4
July	1	...	1	4	8
August	7	320	1	6	3
September	8	320	2	7	9
October	12	450	1	8	6
November	11	335	2	12	5
December	10	245	1	7	4
Total for year	55		13		

At the present time more extensive developments are being made in Grant County, and are likely to follow around the rim of the gas area into Howard and Tipton counties. Valuable deposits of petroleum occur in the vicinity of Royal Center, Cass County, and near Francisville, Pulaski County.