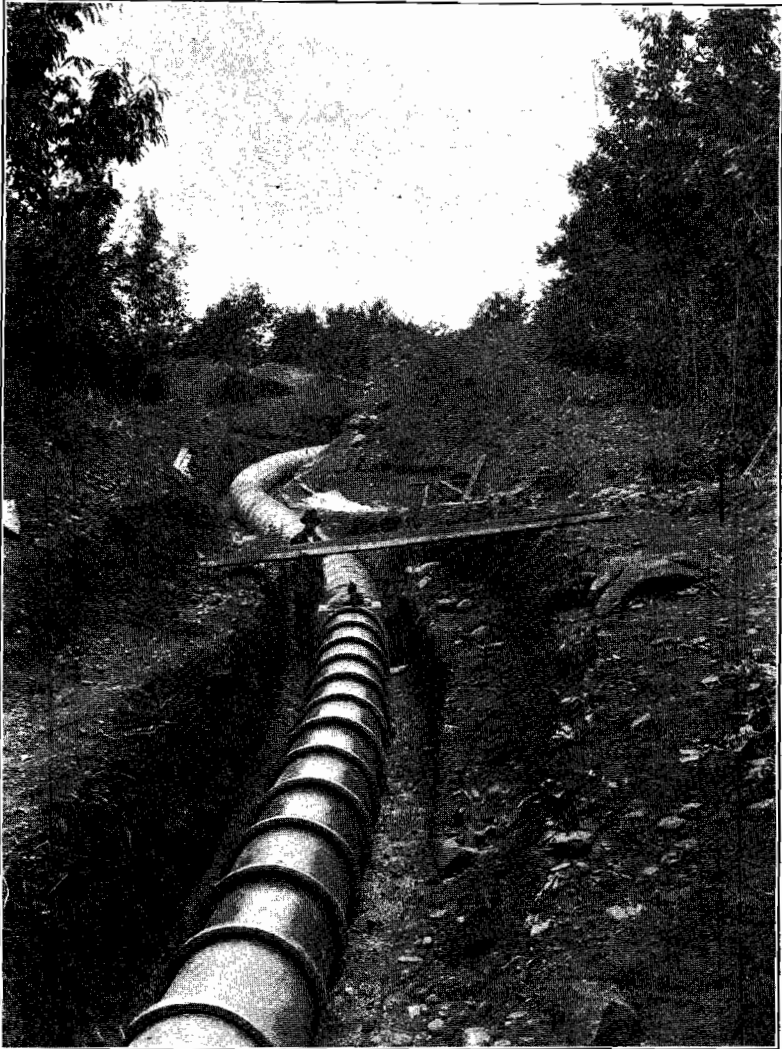


Pl. I.



Illustrating the use of Sewer Pipe in the Construction of Water Conduits.
(Plate loaned by the American Sewer Pipe Co.)

INDIANA.

DEPARTMENT

OF

Geology and

Natural Resources.

TWENTY-NINTH ANNUAL REPORT.

W. S. BLATCHLEY,

STATE GEOLOGIST.

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STATE OF INDIANA,
EXECUTIVE DEPARTMENT,
INDIANAPOLIS, March 7, 1905. }

Received by the Governor, examined and referred to the Auditor of State for verification of the financial statement.

OFFICE OF AUDITOR OF STATE,
INDIANAPOLIS, March 7, 1905. }

The within report has been examined and found to contain no financial statement.

D. E. SHERRICK,
Auditor of State.

March 28, 1905.

Returned by the Auditor of State, with above certificate, and transmitted to Secretary of State for publication, upon the order of the Board of Commissioners of Public Printing and Binding.

FRED L. GEMMER,
Private Secretary.

Filed in the office of the Secretary of State of the State of Indiana, March 28, 1905.

DANIEL E. STORMS,
Secretary of State.

Received the within report and delivered to the printer March 28, 1905.

THOS. J. CARTER,
Clerk Printing Bureau.

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*State of Indiana,
Department of Geology and Natural Resources.*

INDIANAPOLIS, IND., March 7, 1905.

HON. J. FRANK HANLY, *Governor of Indiana:*

DEAR SIR—I have the honor to submit to you herewith the manuscript of the Twenty-ninth Annual Report of the Department of Geology and Natural Resources. The contents of the report pertain very largely to the economic resources of the State, and embody the results of the work accomplished by the different divisions of the Department during the calendar year 1904.

Yours, very truly,

W. S. BLATCHLEY,
State Geologist.

Frank. 31 vols. 2d/

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B. A. KINNEY, Marion.....Supervisor of Natural Gas.
ALBERT STEVENS, Muncie.....Assistant Supervisor of Natural Gas.
ISADORE KESSLER, Indianapolis.....Stenographer.

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**DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES.
INDIANAPOLIS, IND.**

W. S. BLATCHLEY, State Geologist.

PLEASE ACKNOWLEDGE RECEIPT OF THIS VOLUME.

**In return, Scientific Books, Fossils, etc., and Implements of the Stone Age
are acceptable.**

**State Museum, Room 126, Third Floor, State House.
Open to the public from 8 A. M. to 5 P. M., except on Sundays and legal
holidays. Admission free.**

Office of State Geologist, Room 89, Third Floor, State House.

INTRODUCTORY.

The present volume is the twenty-ninth in the series of annual reports issued by the Department of Geology of the State of Indiana, and the tenth issued under the auspices of the writer. During the last decade the value of the natural resources produced in the State has gradually and steadily increased. While not including among their number any of the precious or even useful metals, they are, nevertheless, as varied in character and as valuable as those possessed by any State in the Union.

The following table will make plainer than any words the great increase in value of the six leading resources of the State during the ten years—1895 to 1904, inclusive—in which the writer has had the honor of being Director of the Department of Geology and Natural Resources:

	1895.		1904.	
	Output.	Value.	Output.	Value.
Coal.....	4,312,084 tons.	\$3,923,996	9,872,404 tons.	\$10,366,024
Petroleum.....	4,386,132 barrels.	2,807,124	11,331,340 barrels.	12,176,880
Natural gas.....	.....	5,203,200	.....	3,027,106
Building stone.....	.....	1,718,976	.....	3,031,925
Clay products.....	.....	3,117,520	.....	6,065,424
Portland cement.....	.....	.....	1,354,906 barrels.	1,341,396
Totals.....	.....	\$16,770,816	.....	\$36,028,755

The increase in value of the six resources for the ten years was \$19,257,939, or 115 per cent. When to the value of those mentioned there be added that of the hydraulic cement, lime, whetstones and grindstones, sand and lime brick, artificial stone, molding and glass sands, and other minor natural resources, the total will easily foot up forty or more millions of dollars. In a State which, a quarter of a century ago, was noted mainly for her crops of corn and wheat, her droves of fine cattle and hogs, her bluegrass pastures and her native timber lands, these figures

show a development of natural resources which is little short of marvelous.

The greater part of the present report is devoted to the "Clays and Clay Industries of Indiana." A dozen years ago the term "shale" was unknown among the natural resources of the State. Those great beds of soft, blue-gray, thin-layered rock, which occur over vast areas in the coal-bearing counties, were looked upon as a wholly valueless nuisance, which had to be removed or tunneled through before the underlying veins of coal could be reached. Today the smoke is pouring forth from hundreds of kilns where these shales are being burned into sewer pipe, hollow block, conduits, paving brick, pressed front and ordinary brick, drain tile, etc.

Not only have the Carboniferous shales been proven in the highest degree suitable for the best of such wares, but the Knobstone shales, which were accounted even more valueless than those of the Carboniferous Age, are in several places now being utilized for vitrified, pressed front and ordinary brick, and, in two of the largest factories of the State, as the clay ingredient of Portland cement. These Knobstone shales lie on or close to the surface over an area three to thirty-eight miles in width, extending in a southeasterly direction from Jasper County to the Ohio River. The factories now utilizing them are but the pioneers or fore-runners of many yet to be; for these hitherto ignored Knob shales possess almost unlimited possibilities of service for practical use.

In the first part of the paper here presented, the location, thickness and area of the more available and valuable clay deposits of the State are given in detail and their possible use or fitness for certain wares indicated. In the second part a brief description is given of the methods of manufacture of the more important classes of clay products now made in the State, followed by a short mention of the larger factories making such products. Full tables of statistics have also been compiled which show the relative importance of the different classes of clay products manufactured. From these tables the following general table has been condensed, which gives the more important figures relating to the seven great general groups of clay wares produced in Indiana.

Statistics of the Clay Industry in Indiana for the Year 1904.

	Capital Invested.	Value of Output.	No. of Hands Em- ployed.
Ordinary brick and drain tile industry.....	\$2,923,653	\$2,748,733	4,171
Paving brick industry.....	504,000	545,721	465
Dry pressed brick industry.....	546,000	240,670	222
Refractory clay industries.....	306,750	271,760	228
Sewer pipe and hollowware industries.....	1,028,000	959,780	917
Pottery and allied industries.....	811,000	833,780	784
Encaustic tile and terra cotta industry.....	400,000	485,000	587
Totals.....	\$6,519,403	\$6,085,424	7,374

The second paper in the volume is the report of the State Mine Inspector James Epperson, of Linton, for the year 1904. Mr. Epperson and his two deputies have given careful attention to the duties which they are empowered to perform, and have tried to enforce impartially all laws relating to the mining industry. In his report the statistics of the Coal Industry for the year are given, the tables being very full and complete in detail.

The law gives the State Inspector power to examine only those mines which work ten or more men. It is my opinion that the law should be so changed as to require the examination, at least once each year, of every mine operating in the State, regardless of the number of men employed. Many mines employ from six to eight men, and the aggregate amounts to a large number. The life of any one of these men is as valuable as that of a man working in a larger mine, yet under the present law they receive no protection whatever. The air where they work is often extremely foul, man-shafts are more often lacking than present, and too little attention is given to the condition of the roof. Some of these abuses could at least be ameliorated by the occasional visit of an Inspector invested with power to better the conditions where possible.

From the report of Mr. Epperson the following table, showing the relative rank of the fourteen coal producing counties of the State, with the output of each in tons, has been prepared:

*Tons of Coal Produced and Wages Paid to Miners in Indiana in 1904,
by Counties.*

<i>County.</i>	<i>Tons Produced.</i>	<i>Wages Paid.</i>
Greene	2,307,964	\$1,984,305
Vigo	1,719,021	1,491,498
Sullivan	1,589,974	1,437,747
Vermillion	1,131,750	931,049
Clay	532,736	1,144,986
Parke	502,612	993,317
Pike	349,133	298,108
Warrick	341,900	212,419
Vanderburgh	237,625	234,911
Knox	150,567	132,133
Daviess	133,270	146,498
Gibson	85,595	90,082
Fountain	55,910	60,392
Perry	7,275	7,959
Total	9,872,404	\$9,165,404

Of the coal produced, 727,072 tons were block coal and the remainder bituminous. The total production for the year fell off slightly, that for 1903 having been 9,992,553 tons. The loss was due to over-production in 1903, when a large number of new bituminous mines were opened, and to a decrease in the output of block coal, a number of mines of which have been worked out. This coal is produced only in Clay and Parke counties, the former producing 387,307 tons, and Parke County the remainder, or 339,765 tons. The output of block coal in the two counties in 1903 was, respectively, 586,381 and 439,559 tons.

The report of the State Gas Supervisor, B. A. Kinney, of Marion, follows that of the Mine Inspector. On account of the numerous bores put down in gas territory in search of oil, Mr. Kinney and his assistant were kept busy in enforcing the law against the waste of gas, and the number of prosecutions against oil operators was greater than in 1903. His report shows that new-wells of small capacity which, five years ago would have been considered worthless and been plugged, are now regarded as good, and every precaution is taken to preserve and prolong their life. The most of the bores sunk for gas had an output of less than 500,000 cubic feet daily, whereas a well producing less than 5,000,000 cubic feet was formerly regarded as of small size. The only new gas territory opened up in the main field during the

year was a small area in Grant County. Several wells sunk for oil in the vicinity of Princeton, Gibson County, developed a flow of gas varying from 400,000 to 800,000 cubic feet. The gas comes from the Huron sandstone, and it is very doubtful whether the supply will ever show much of an increase.

Almost all the gas produced in the State is now sold by meter measurement. Under this system the producer receives about five times as much per thousand for his gas as under the old flat rate system everywhere in vogue during the palmy days from 1887 to 1900. As a consequence, while the production has fallen off very greatly, the total value still represents a considerable amount.

Many inquiries having been received at this office relative to the plan outlined by the writer for the "Utilization of Convict Labor for Making Road Material," a paper has been prepared under that title, which embodies briefly the chief features of the plan. This paper, together with the copy of a bill bearing on the subject, which was introduced in the Sixty-third (1903) General Assembly, are submitted as a part of this report.

The production of petroleum in Indiana still continues to increase, the output for 1904 having been 11,331,340 barrels, valued at \$12,176,880. Petroleum, therefore, easily ranks as the leading natural resource of the State. The finding of oil in a deeper layer of the Trenton limestone was the principal feature of the industry for the year. This discovery alone kept up the production to that of 1903, as the initial output of new wells in the older portions of the field was nearly everywhere less than in that year. The price gradually fell during the year 1904 from \$1.31 to 95 cents, whereas the year before it had gradually risen. Several thousand new bores are necessary each year to keep the total output from falling off, and these are possible only when the market price is such as to stimulate the producer and guarantee him a fair profit on his capital invested. That the yearly output depends upon the price, and not upon the capacity of the field, is shown by the fact that the years 1897 and 1898 were the only ones since the striking of oil in the State, in which the production fell off, and during those years the price was low, ranging only between forty and sixty cents per barrel.

Natural gas is but the volatile part of crude petroleum which,

during ages past has risen into the higher porous portions of the Trenton rock. The presence of such a vast volume of gas as was extracted from the Trenton limestone of Indiana, between the years 1887 and 1900, is sufficient to denote the presence of an enormous body of the heavier petroleum or mother liquid. If the price is maintained at a fair figure, there is little doubt, therefore, but that the output of petroleum will hold its own, if not increase, for several years. It must ever be remembered, however, that with petroleum, as formerly with natural gas, we are drawing upon a stored product which is not being increased a single barrel, and that, therefore, the end of the supply is sure to come. In a paper entitled "The Petroleum Industry in Indiana in 1904" will be found the principal facts and statistics relating to the industry for the year.

In accordance with the usual custom, the report is ended with a paper on natural history, the one for the present volume, entitled "Insect Galls of Indiana," having been prepared by Dr. Mel. T. Cook, for a number of years Professor of Biology in DePauw University. In it Professor Cook describes and illustrates the more important excrescences or galls which occur so numerously upon the various wild and cultivated plants of the State. The paper is, therefore, of both economic and scientific value, and will doubtless prove of interest to many young observers in the State.

In addition to the field work, the results of which have been incorporated in the reports for 1903 and 1904, much progress has been made during the summer seasons of those two years in gathering data for a report on the "Road-making Materials of Indiana." Prof. J. A. Price spent one season and Prof. L. C. Ward two in this work and the results have been put in form for publication. It is the intention, if possible, to complete the field work in 1905 and to make the paper on road materials the principal feature of the report of the Department for that year.