INDIANA

DEPARTMENT

—OF—

Geology and Natural Resources.

SEVENTEENTH ANNUAL REPORT.

S. S. GORBY,

STATE GEOLOGIST.

1891.

TO THE GOVERNOR.

INDIANAPOLIS:
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THE STATE OF INDIANA,
EXECUTIVE DEPARTMENT,
INDIANAPOLIS, Sept. 7, 1892.

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

WILLIAM B. ROBERTS,
Private Secretary.

Filed in the office of the Secretary of State of the State of Indiana, September 7, 1892.

CLAUDE MATTHEWS,
Secretary of State.

DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES.

INDIANAPOLIS, IND., September 6.

To HON. IRA J. CHASE, *Governor of Indiana:*

Herewith I submit the Seventeenth Report of the Department of Geology and Natural Resources. In the preparation of this volume I have been fortunate in securing the assistance of men who are known throughout the nation as experts in their various lines of work. The results of their labors, which appear in the body of this volume, will be fully appreciated by all those who are interested in the economic and scientific interests of our State.

By act of the General Assembly, in force in March, 1891, it became the duty of the State Geologist to appoint a State Inspector of Mines, a State Supervisor of Oils, and a State Supervisor of Natural Gas. In compliance with that act I appointed Thomas McQuade, of Clay County, Indiana, State Inspector of Mines; Nelson J. Hyde, of Marion County, Indiana, State Supervisor of Oils, and E. T. J. Jordan, of Shelby County, Indiana, State Supervisor of Natural Gas. These officers qualified according to law at once, and have since continued to discharge their duties in a wholly satisfactory manner. The report of each of these officers will be found included in this report to you, as provided by law.

While it has been the aim to make this report chiefly economic, there will be found in it, nevertheless, much matter of a purely scientific nature that will be of great value to the thousands of teachers and students of the State. The valuable article by Mr. S. A. Miller, with its accompanying twenty plates, describes and illustrates more than 150 species of fossils, found mainly in Indiana, that are wholly new to science.

The report is respectfully submitted.

S. S. GORBY,
State Geologist.

ASSISTANTS TO THE STATE GEOLOGIST.

MAURICE THOMPSON,
Geologist.

A. C. BENEDICT,
Geologist.

CHAS. R. DRYER,
Geologist and Chemist.

MOSES N. ELROD,
Geologist.

S. A. MILLER,
Palæontologist.

O. P. HAY,
Herpetologist.

W. S. BLATCHLEY,
Entomologist.

E. BRADNER,
Botanist.

J. E. BEASLEY,
Taxidermist.

THOMAS McQUADE,
Inspector of Mines.

NELSON J. HYDE,
Supervisor of Oils.

E. T. J. JORDAN,
Supervisor of Natural Gas.

LILLIAN B. GORBY,
Stenographer.

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INTRODUCTORY.

In preparing the Seventeenth Report of the Geology of Indiana for the press, the State Geologist has fortunately been able to secure the assistance of well-known specialists, who have aided in making this one of the most valuable reports, both for economic and scientific purposes, ever issued in the State. This volume exceeds the size originally intended, but circumstances that delayed the publication of the Sixteenth Report rendered it necessary to add somewhat to the size of this in order to secure the publication of material already prepared at considerable labor and expense, which, if publication was longer delayed, would lose much of its value.

The material for the Eighteenth Report is now nearly ready for the printer, and it will follow as soon as the funds become available for its publication. Like the present volume, it will be devoted mainly to matters of economic importance, but will contain many plates illustrating new species of fossils, with descriptions by Mr. S. A. Miller; besides valuable scientific papers by Prof. O. P. Hay and others.

BUILDING STONE.

The report of ex-State Geologist Maurice Thompson and Mr. A. C. Benedict, upon the building stones of Indiana, has been prepared with great care. Mr. Thompson shows in his discussion of the value of the oolitic limestones of Indiana for building purposes, that, taking all things into consideration—durability, strength, texture, color, tractability in the hands of the artisan and cost of production, or cheapness—this stone is the equal of any, if not superior, to all others on the market. Its strength is sufficient to safely sustain a structure, properly designed and systematically constructed, one-half mile or more in height. Its texture is so unvarying that the strength of each block is evenly distributed through it. There are no alternating hard or soft spots in it. Its color, after weathering, is a uniform gray, pleasing and grateful to the eye, which gives to the more imposing structures a stately appearance that implies durability and strength. The facts referred to here are fully discussed in Mr. Thompson's paper.

In speaking of the merits of Indiana Stone it is not the design of the State Geologist nor any of his assistants to detract in the least from the value of the stone from any other section. It is intended solely to make public the value of the material afforded in Indiana. In this respect the State Geologist deplores the fact that in certain government publications, written in ignorance or through prejudice, statements are made concerning the oolitic limestones of this State, both of a scientific and statistical character, that are at absolute variance with the facts. Not only this, but the same publications have, through prejudice or ignorance, discriminated as unjustly against our valuable sandstones. It is to be regretted that it is necessary that public attention should be called to a matter of this kind in this way, and it is a matter of still farther regret that men employed to collect facts and make impartial statements of them should be led to undervalue the product of one locality or overestimate the product of another. The limestones and sandstones are all that the various chiefs of this department have ever claimed for them—durable, strong, even textured and tractable. The quarrymen of the State will be glad to submit samples for impartial and thorough tests at any time, knowing well the merits of the material they supply.

The statistical part of the report on building stone, etc., was prepared by Mr. A. C. Benedict, who, at the suggestion of the State Geologist, visited every quarry in the State and obtained all his data from the officers and proprietors direct. His statements, therefore, may be relied upon as being the most accurate that can be obtained, and they serve to show that the quarrying industry of the State has grown to gigantic proportions. More than 20,000,000 cubic feet of stone, for all purposes, were taken from the quarries of the State in 1890, and sold upon the market. Several millions of dollars are invested in this industry, giving employment to thousands of hands, who receive wages amounting to more than four millions of dollars annually. In addition to this, the employers derive reasonable profits upon their investments.

In this connection it is worthy of note that such a thing as a strike among the quarrymen of the State is unknown. The laborers get fair wages, they seem satisfied, and there is harmony and good feeling generally between employer and employe.

The valuable stones of Indiana consist of limestones and sandstones wholly. There are no granites, slates nor marbles in Indiana. There are, however, in some sections of the State crystalline limestones that are susceptible of a fine polish, and these rocks are sometimes called marble. Rocks of this character occur in the Devonian outcrops on Pipe Creek, in Miami County, at several points in Jefferson County, and also in the southern part of Fayette County, where Hon. J. N. Huston has recently opened an extensive quarry. The rock in Mr. Huston's quarry is a very dark limestone, which takes a good polish and makes a fine appearance

when used for interior decorations. It is a strong, close-grained and durable stone, and well adapted to masonry.

The map accompanying this report shows the location of the principal quarrying industries of the State, and it is colored to indicate the kind of stone taken out and the geological formation where it occurs.

THE DRIFT.

This vast mass of matter, sand, gravel, bowlders and clay, covers nearly the whole of the northern two-thirds of the State. The soils afforded by this great deposit are among the most fertile in the Union. For manufacturing purposes its clays are receiving much attention. For drain tiles and the manufacture of brick it is very valuable. In some localities excellent clay has been found for the manufacture of crockery-ware. Careful examinations will doubtless disclose vast deposits of clay in this region well adapted to the production of a variety of wares as yet not manufactured in the State.

In this connection it is proper to state that the State Geologist designs an exhaustive study of the clays of Indiana. In addition to the clays of the Drift area, the southern part of the State affords an abundance of clay of a finer grade. Citizens of all parts of the State are invited to send samples of clay to this office, with location of deposit and full description of the same. The clay should be sent in a four-ounce package, by mail, and it will be examined and analyzed and a full report concerning it will appear in the succeeding Geological Report of the State. Manufacturers of clay products everywhere are making inquiries for material suitable to the manufacture of their wares, and in this report it is hoped that the full resources of the State and in this particular may be made known.

COUNTY REPORTS.

This volume contains reports on the Geology of Carroll, Steuben, Wabash and Whitley Counties. In his report on Steuben County, Professor Dryer has detailed the results of his studies of the drift deposits in that region clearly and minutely. The phenomena connected with the deposition of this great mass of material are the most complicated with which the Geologist has to contend. Dr. Dryer has studied this subject with great care, both stratigraphically and dynamically, and his excellent report upon Steuben County details with clearness many interesting facts connected with the morainic masses of Northern Indiana. There being no rock exposures in either of the two counties alloted to him, his work is necessarily confined to the study of morainic deposits.

The report on Carroll County, by Maurice Thompson, and that on Wabash County, by M. N. Elrod, M. D., and A. C. Benedict, deal

largely with the phenomena connected with the disturbed strata along the Wabash River. To the student of Dynamic Geology these reports will be of peculiar interest, as phenomena are exhibited in both these counties at marked variance with the conditions disclosed throughout the southern part of the State. As the exposures of stone in this region are limited to the inconsiderable areas uncovered by the erosions of the streams, it is a difficult matter to make satisfactory observations, and the rocks exposed have to be examined with critical minuteness to enable one to arrive at satisfactory conclusions. Though the counties named are forty miles or more apart, both afford exposures of the Niagara limestones, and these are the rocks that exhibit such marked peculiarities of structure. Folds of the strata and cone-like projections are common in both counties, and all the facts connected with these peculiar structural features are presented in these reports with careful minuteness of detail. When the counties of Huntington, Blackford, and some others in that part of the State, in which limited exposures of stone occur, are surveyed, it is probable that additional facts will be obtained that will, in a measure, relieve the conclusions presented in these reports of some of their elements of uncertainty.

STATE INSPECTOR OF MINES.

This officer was appointed by the State Geologist in March, 1891, and at once entered upon the discharge of his duties. His report shows a fairly prosperous condition of the coal mines of the State, and that adequate means are employed to protect the lives and sustain the health of the employes. Accompanying the report is a carefully prepared list of the mines operated in the State.

The law directing the State Geologist to appoint an Inspector of Mines also provided for an Assistant Inspector of Mines. For convenience, the State, as pertains to mines, was divided into two areas, called the Northern District and the Southern District respectively. The Southern District was assigned to the Assistant and the Northern District to the State Inspector. The report of the Southern District by the Assistant Inspector of Mines appears in connection with that of his Chief.

STATE SUPERVISOR OF OILS.

This officer, in pursuance of law, was appointed by the State Geologist in March, 1891. His report for the year 1891 appears in this volume. The law provides for at least one Assistant Supervisor in each Congressional district, and these were all duly appointed and entered upon the discharge of their duties. But few complaints have reached this office concerning the evasion of law by manufacturers and dealers in petroleum, and these have been of a trivial character. The general inclination has

been to comply with the laws concerning the inspection of oils, and, though a comparatively few packages have been rejected, they have been removed from the State without complaint. The officers charged with the inspection of oils have, without distinction, discharged all their duties faithfully and impartially.

Incidental to this there will be found in the volume a full report on the Oil Production of Indiana, by A. C. Benedict. Every portion of the field was visited in the spring of 1892, and he states fully all the facts attainable concerning the production of petroleum in Indiana at that time. While the field at this time is not as productive as the Ohio and Pennsylvania fields, it may yet be considered promising, inasmuch as quite a number of old operators in the more productive fields of the East are still prosecuting their work in this State, after having made sufficient tests of the Indiana field to determine its value.

The quality of oil yielded by the Indiana wells compares favorably with that produced in Ohio, and this industry may be considered one likely to prove of vast importance in a considerable portion of the State, and at least fairly profitable.

STATE SUPERVISOR OF NATURAL GAS.

This officer was also appointed by the State Geologist in March, 1891, in pursuance to enactment by the General Assembly. He began the discharge of the duties of his office immediately after his appointment. His report for 1891 appears in this volume and is replete with important facts, valuable suggestions and wholesome recommendations. Aside from the cleanliness connected with its use and its convenience as a fuel, its intrinsic value for heat-producing should make gas an article to be used economically. It is now clearly understood that the immense area of gas-producing territory in Indiana is practically one reservoir, and, this being true, natural gas is the joint property of all the real estate owners in the gas area. It is the common property of all, from which any one may secure a supply who secures a right to drill a well. What right, then, has any one who perchance may own a well, or can get the right to use it, to recklessly waste, by needless consumption or otherwise, this substance of which he is only a joint owner? For a long period of time after the discovery of gas in Indiana the amount of gas daily consumed at the wells and absolutely wasted was in excess of 100,000,000 cubic feet; and it is not exaggerating to state that the amount of gas needlessly wasted in Indiana for the past six years was worth in cash $10,000 daily. The value of the gas thus wasted would amount at the present time to the enormous sum of $22,000,000, and if distributed pro rata among the inhabitants of the gas area would amount to $100 for each man, woman

and child in that region. Who can apologize for this reckless extravagance? It is a matter of regret that, although it is not so great as formerly, there is still much extravagance connected with the consumption of gas over a large proportion of the field. Stringent laws should be enacted and rigidly enforced for the preservation of this valuable fuel, and to protect the individual rights of the joint owners.

ENTOMOLOGIST'S REPORT.

The report of Prof. W. S. Blatchley on the Butterflies or Diurnal Lepidoptera of the State is the only complete work of this kind ever published concerning this class of insects in Indiana. Prof. Blatchley has prepared this paper after many years of collecting and study, and it will be found invaluable to the college student of Indiana. This subject has an economic side as well as purely scientific, for it is the larvæ of this class of insects that are so destructive of plants in the conservatory, the garden and the field. The author has fully described the habits of each species of this order occurring in Indiana.

HERPETOLOGIST'S REPORT.

This valuable report by Prof. O. P Hay is complete, touching the reptiles and batrachians of Indiana. It is well that this subject was taken up in season, for individuals of some of the species are now very rare in this State, and it will be but a few years at most until some of these species will become wholly extinct. Prof. Hay has been a painstaking student in this field of science for many years, and he is credited with many new discoveries touching the habits and vagaries of structure of many of the species enumerated in his paper. This work by Prof. Hay completely exhausts the field so far as pertains to this department of natural history in Indiana. The illustrations accompanying his report were made especially for this volume under the immediate supervision of the author.

PALEONTOLOGIST'S REPORT.

This volume, in Mr S. A. Miller's report, contains the largest original contribution to science in the way of new discoveries and descriptions of fossils ever published in the State. More than 150 new species of fossils are described and aptly illustrated in twenty finely executed plates. The specimens described are mainly from the collections of Mr. J. F. Hammell, of Madison; Mr. A. C. Benedict, of Indianapolis; that of the State Geologist's private collection, and from the Indiana State Museum. The rock formations of Indiana are very rich in organic remains, and it is by

an accurate knowledge of these remains that the practical Geologist is able to identify the various divisions of rock formations, hence the importance of a thorough knowledge of all fossil forms existing in the rocks.

THE MUSEUM.

The collection of specimens for the State Museum has been materially increased by the addition of the splendid collection secured from Drs. Frank and Warren Howard, of St. Paul, Ind., and by additions to the Natural History department made by Mr. J. E. Beasley, of Lebanon, Ind., besides minor collections. As soon as suitable cases can be secured for the Museum the process of further classification and arrangement of the specimens will proceed. As yet the new additions to the State collection have not been placed on exhibition for the lack of proper cases.

THE OFFICE.

The work of the office, especially that pertaining to the correspondence, has materially increased within the last few years. The number of letters daily received at the office ranges from thirty to fifty. These all receive attention at the very earliest moment practicable, and all answers are dictated by the State Geologist, which entails a vast amount of work.