ADMINISTRATIVE REPORTS

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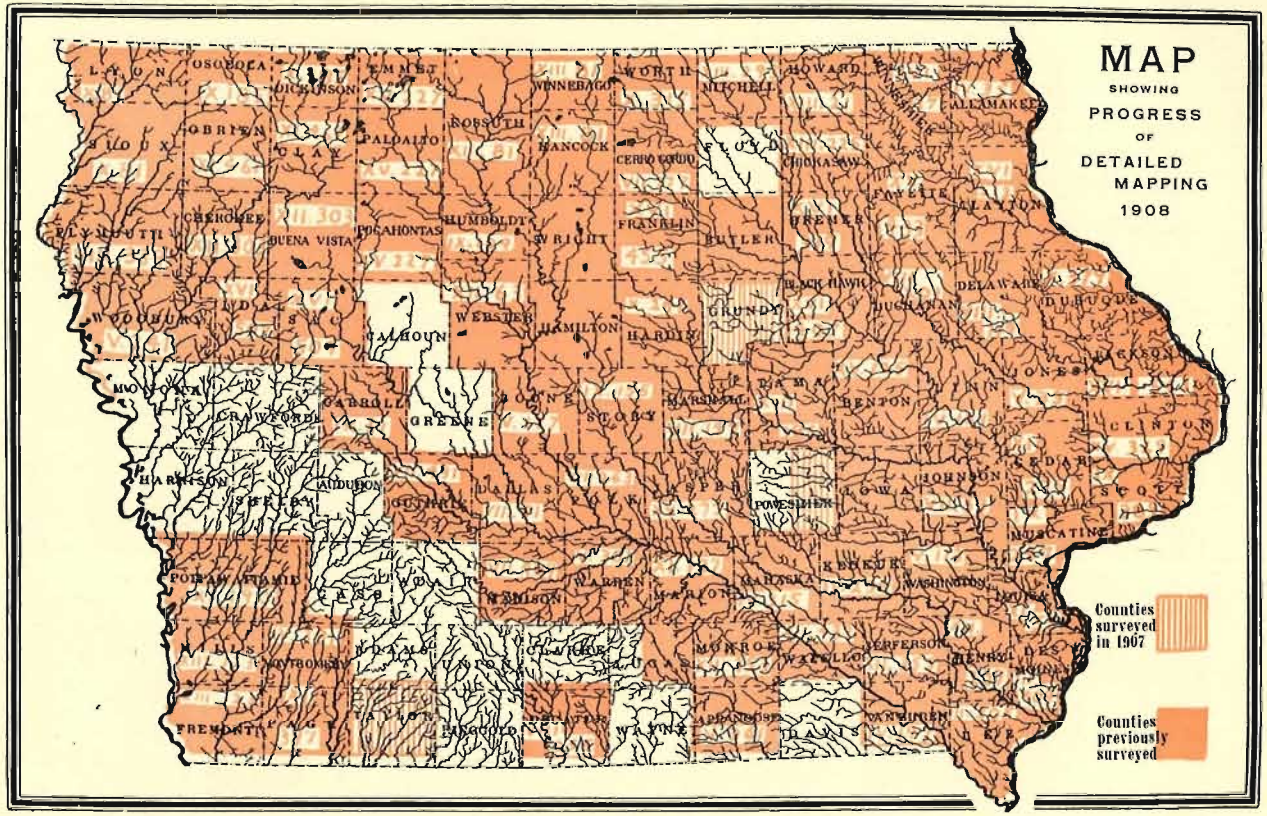
MAP
SHOWING
PROGRESS
OF
DETAILED
MAPPING
1908
Counties surveyed in 1907
Counties previously surveyed
LYON
OSCEOLA
DICKINSON
EMMET
KOSSUTH
WINNEBAGO
WORTH
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
O'BRIEN
PALO ALTO
HANCOCK
CERRO GORDO
FLOYD
CHICKASAW
FAYETTE
CLAYTON
CHEROKEE
BUENA VISTA
POCAHONTAS
HUMBOLDT
WRIGHT
FRANKLIN
BUTLER
BREMER
BUCHANAN
DELAWARE
DUBUQUE
WOODBURY
IDA
SAC
CALHOUN
WEBSTER
HAMILTON
HARDIN
GRUNDY
BLACK HAWK
MONONA
CRAWFORD
CARROLL
GREENE
BOONE
STORY
TAMA
MARSHALL
BENTON
JONES
JACKSON
CLINTON
HARRISON
SHELBY
AUDUBON
GUTHRIE
DALLAS
POLK
JASPER
POWESHIEK
IOWA
JOHNSON
CEDAR
SCOTT
MUSCATINE
POTTAWATTAMIE
MILLS
ADAIR
MADISON
WARREN
MARION
MAHASKA
KEOKUK
WASHINGTON
LOUISA
MONTGOMERY
ADAMS
UNION
CLARKE
LUCAS
MONROE
WAPELLO
JEFFERSON
HENRY
DES MOINES
FREMONT
PAGE
TAYLOR
RINGGOLD
DECATUR
WAYNE
APPANOOSE
DAVIS
VAN BUREN
LEE

SIXTEENTH ANNUAL

Report of the State Geologist

IOWA GEOLOGICAL SURVEY,
DES MOINES, DECEMBER 31, 1907.

To Governor Albert B. Cummins and Members of the Geological Board:

GENTLEMEN:—During the year 1907 the Iowa Geological Survey has been occupied with a number of problems of state-wide interest and importance. The fuel question is one which engages universal attention; and the investigation of the coal resources of the state, begun some years ago by Professor F. A. Wilder, was resumed at the point where he was obliged to leave it on account of large business interests which called him elsewhere. Under the direction of Professor Wilder Mr. Henry Hinds was placed in charge of field work in the coal area, to collect data relative to the distribution and extent of the coal seams and the output of the various coal fields. The work will be continued during the coming field season. Arrangements have been made with the Technological Branch of the United States Geological Survey to make careful tests of our coals with reference to their relative value and efficiency when burned under steam boilers, when used as a source of producer gas, or when employed in any other ways to serve domestic, commercial or manufacturing needs. The new tests will be supplementary to those made in 1905 and published in Bulletin No. 2. According to present plans, the Monograph on Iowa Coals will be submitted for your consideration in December, 1909.

For centuries peat has furnished a large percentage of the fuel used for domestic and other purposes in portions of the old world. There are extensive beds of peat in the western continent, but the abundance and cheapness of wood and coal have caused this source of fuel to be neglected on this side of the Atlantic. Practical men, however, are now turning their attention to American peat, recognizing here a possible source of fuel supply when forests and coal mines no longer yield as boun-

tifully as heretofore. Iowa has extensive peat beds, and during the past year Dr. S. W. Beyer, with a corps of assistants, was assigned the task of investigating the location and extent of these beds, together with the quality of the peat and the uses to which it may possibly be applied. Reconnoissance work on the location of peat beds was undertaken in 1905 under the direction of State Geologist Wilder, and the tests described in Bulletin No. 2, demonstrate the possible value of peat when used as ordinary fuel or as a source of producer gas. The investigations now in progress under the direction of Dr. Beyer are designed to carry the preliminary tests still farther and make an exhaustive examination of all the possibilities now lying unused in our Iowa peat beds.

Another source of fuel is natural gas, and Iowa continues to produce this in small quantities. The Letts gas field has been furnishing gas for fuel and lights, and even for the operation of gas engines, for quite a number of years without showing any material diminution either in the pressure or the supply. Natural gas has been found at Herndon and at a few other localities in Iowa. Our gas wells are all shallow. As intimated on page 24, volume XII, the gas reservoirs are lenticular bodies of sand or gravel in the drift clays covering the state. The source of the gaseous fuel is very probably the Pleistocene forests which are known to be buried in the drift, or the peat beds which accumulated during the interglacial stages and were covered with later sheets of till. There is reason to expect that similar small gas fields may exist in many localities where they have not yet been discovered, but nothing has thus far come to light which would hold out any hope of success in exploring the rock formations beneath the drift for gas or oil. From the best knowledge now at hand it may be said that the field most likely to reward the driller for gas and oil lies in southern and southwestern Iowa. It is quite possible, especially in the southwest, that the geological conditions underlying Iola and Neodesha, Kansas, may exist in some limited areas which have not yet been explored by the drill.

Some experiments conducted at Platteville, Wisconsin, indicate the possibility of utilizing the hydrocarbons included in

the so-called "oil rock" near the base of the formation generally called "Trenton limestone," now known as "Platteville limestone," in the upper Mississippi valley. This oil rock is quite extensively developed in northeastern Iowa. It has long been known to be rich in bitumen, but there have been no methods known whereby the fuel content could be economically utilized on a commercial scale. The subject is worthy of some attention on the part of the Survey.

In addition to making an investigation of our peat resources Professor Beyer was asked to examine into the occurrence and distribution of materials suitable for the improvement of our public roads. Throughout the northern half of Iowa there are beds of gravel of sufficient extent, and of the most desirable quality, to supply all the needed road material for many years to come. The distribution is such that practically every neighborhood may have its local gravel pits. These gravels belong to two distinct stages of the glacial series, which are separated one from the other by long intervals of time. The older gravels are related to the Kansan drift, the younger, to the Wisconsin. The possibilities in the way of road improvement, when these gravels are used in connection with intelligent construction of the road bed and thorough provision for drainage, are illustrated in many parts of the state, but as yet the illustrations are all too few. There are some good stretches of road between Ionia and Old Chickasaw, in Chickasaw county, showing the satisfactory results which may follow the use of local gravels. Between Walker and Troy Mills in Linn county, there is a piece of road, once one of the worst in that part of Iowa, which has been transformed by turnpiking, drainage, and the free use of local gravel, into one of the best. The cases cited illustrate what has been done in the way of road improvement in many parts of the state; they illustrate what may be done in almost every neighborhood north of a line running west from Clinton to the Missouri river. In the southern part of Iowa gravels are not so plentiful. Some beds occur, but crushed stone may be used in many localities at an expense not prohibitive. In Dubuque county, where gravels are not uncommon, there are many miles of country roads macadamized with crushed stone.

During the year areal work and geological mapping has been done in Taylor county by the Director of the Survey, in Grundy county by M. F. Arey of Cedar Falls, and in Poweshiek county by S. W. Stookey of Cedar Rapids. The investigation of the underground waters of the state has been continued under the direction of W. H. Norton; and B. Shimek has extended his work on the problems of the Loess, an important formation of the soil series, whose puzzling history and characteristics his studies are clearing up with gratifying success.

For the first time in its history the Iowa Geological Survey, during 1907, co-operated with the United States Geological Survey in extending the work of topographic mapping within the state. The basis of co-operation was an agreement that the two organizations should expend equal sums for field work, while all the cost of office work, together with the expenses connected with engraving and printing, should be borne by the National Survey. In many ways correct topographic maps are among the first requisites to the carrying out of detailed geological investigations. It would be impossible, for example, to represent the distribution of geological formations in such a region as the Driftless Area of northeastern Iowa, without a topographic base map. The topographic work of last season was done in the coal area near Des Moines, maps showing the elevation of the surface at practically every point being necessary to the determination of certain problems connected with the genesis and distribution of the somewhat erratic coal seams of the state. Topographic maps of the north-central parts of Iowa,—the area of the Wisconsin drift, with its numerous marshes, its shallow lakes, its imperfect drainage,—would show at once the lines along which reclamation ditches might be made to secure the highest efficiency with the least expense. The continuation of the plan for co-operative mapping, to the end that all portions of the state involving economic problems which require correct base maps for their solution may be covered as speedily as possible, is earnestly recommended.

Under authority granted by the Geological Board, Dr. Charles R. Eastman was employed to prepare an illustrated Monograph on the Devonian Fishes of Iowa. Dr. Eastman has executed his

commission with such thoroughness and self-sacrifice as to place the Survey, the State and the world of science under lasting obligations. The most important part of the material used in the preparation of this Monograph was derived from the State Quarry limestone at a point about two and one-half miles northeast of North Liberty, in Johnson county. Some notice of the very remarkable fish fauna found at this locality was given in the report on the Geology of Johnson County and in an appended paper by Dr. Eastman, published in volume VII of this series of reports. The State Quarry beds have furnished many strange forms, new to science, which broaden knowledge by throwing light on the history and development of the whole group of fishes; and some of the new forms are represented by a wealth of individual specimens almost unprecedented. Along with the new types are many previously known to students of Vertebrate Paleontology.

A full discussion of the Devonian fishes of our state is impossible without taking account of the geographic range of our species and of species in other states, to which ours are intimately related. The facts of Science are not circumscribed by state lines, for which reason Dr. Eastman was requested to broaden the scope of the discussion so as to include related forms from Devonian areas lying outside the boundaries of Iowa. The Monograph, as a matter of course, should contain a notice of all our local species, old and new, but its scientific value and educational usefulness can be greatly enhanced by adding information which will give the student a view broad enough to embrace the geographical and zoological relationships of the forms found in Iowa. To the request for the fuller discussion Dr. Eastman gave ready consent, though it involved much more labor and research than had been originally planned. The result is the manuscript and illustrations which I have the honor to transmit herewith. These make a notable contribution to the science of Geology, and I recommend their publication as volume XVIII of the reports of the Iowa Geological Survey.

I have the honor to remain, gentlemen,

Yours respectfully,

SAMUEL CALVIN.

REPORT OF THE ASSISTANT STATE GEOLOGIST

IOWA GEOLOGICAL SURVEY,
DES MOINES, December 31, 1907.

DEAR SIR:—The past year has been occupied largely by the publication of the Report on Quarry Products of the state and by the administrative duties of the office. A portion of May and June was spent in the northeastern counties of the state in a study of the Pleistocene gravels of that area. This study included not only the problem of the age of these deposits and their relations to the different drift sheets of that part of the state, but also that of their availability and suitability for road material and for use in concrete and similar purposes. Distributed over the area studied are numerous bodies of these gravels, many of which are eminently suitable for use on the roads. Wherever they have been put to such use an improvement in the condition of the roads is very noticeable. As a case in point some of the roads leading into Independence may be cited. These show a firm, well packed roadbed, free from the mud and dust which are constant accompaniments of the ordinary dirt roadway. A wide and systematic use of this abundant and cheap supply of road metal will go far to solve the universal and important problem of good roads by superseding the too common practice of heaping in the middle of the road a ridge of loose dirt which there becomes transformed by the next rain into so much soft mud, a hindrance rather than a help to traffic. If the local authorities can be educated to understand the superiority of the use of gravel in road making they will have learned a lesson, the application of which to the problem they have to face will serve to place Iowa's roads on a par with those of the eastern states and of western Europe.

In addition to their use for road improvement these gravels have found an extensive use in concrete making. Some of them possess excellent packing qualities and form good foundations for cement sidewalks. A deposit at Elkader is said to be unusually good in this respect. With the present rapid development in the use of cement these gravels will assume an increasingly important position among our economic resources.

About the middle of June the manuscript for the annual report came to the office and its preparation for publication was at once undertaken, together with the supervision of the making of the plates to illustrate the report. In addition to these it was deemed advisable to prepare a two-page geological map of Iowa to accompany the volume for the purpose of showing the locations of the commercial quarries, lime kilns and cement plants of the state. For this purpose a new black base was prepared showing in addition to the principal towns and streams the commercial centers of the quarry industry, and on this were indicated the greater geological divisions as outlined by the more recent studies. This map should serve a very useful purpose as a clear, convenient and, it is believed, reasonably accurate economic and geologic outline map of the state.

The report has been greatly delayed in publication, both because of the difficulty of getting final corrections made on the manuscript and because when it was at length given to the printer other documents already had precedence and work on our report necessarily proceeded more slowly than would have been the case had the printer received our manuscript a few weeks earlier. It is only fair to say that the mechanical execution of the report is much more creditable to the state and to the Survey than was that of the preceding volume.

The geological wall map of Iowa on the scale of eight miles to the inch, which was begun in 1906, was completed and an edition of five thousand issued; three thousand to be folded and two thousand mounted on rollers and taped. This map will be distributed with the report for 1907. As it is the first map of its kind issued in Iowa it should be a great aid to the students of Iowa geology in gaining a comprehensive view of the stratigraphy of the state.

Interest in the economic resources of the state continues with increased activity as is evidenced by the inquiries which have come to the office during the past year. These inquiries come from all sources and include all questions which pertain to the work of the Survey. It is the aim and desire of the Survey to aid in increasing this interest and in making it more and more intelligent. To this end considerable correspondence has been carried on and a large number of reports have been distributed. There is evident a very urgent need for a clear, concise discussion of Iowa geology which will be suitable in scope and treatment for use by the high school pupils of the state as well as by the general student of geology. Such a volume would do more toward creating an intelligent conception of and interest in the mineral possibilities and limitations of Iowa than any other single agency. Our knowledge of the stratigraphy and economic conditions of the state is now such as to warrant the publication of such a report and it is to be hoped that it may be possible to bring it to fulfilment within a very few years. It seems that only by educating the younger generation properly will it be possible to gradually eliminate the mistaken notions which are now so prevalent regarding the contents of the rocks and the possibilities of these latter being made to yield anything which may be sought in their depths. It is in just this educational work that the volume contemplated above would be of such good service and in which it would repay all its cost many fold.

The Survey library has received the usual accessions by exchange during the current year. A glance over the list as given in the report for 1906 will serve to show how extensive the exchange list of the Survey has become. This list is constantly being augmented and thus the value of the library is increasing yearly. It now consists of over one thousand bound volumes besides a large number of unbound pamphlets. These include the reports of the Federal, State and leading foreign Surveys, the publications of numerous scientific societies and institutions, both American and foreign, and the leading technical journals of the United States whose scope is pertinent to our work. We are thus gradually building up an admirable working library

and one whose value for research purposes will increase with each year. To the better attainment of this end an effort has been made to complete our files of various publications by obtaining missing numbers as well as to add new exchanges to our list. The following additions to the list given last year are for the most part new exchanges, although a few have been received during previous years: The publications of the Geological Surveys of Alabama, Connecticut, Michigan, Vermont, Virginia and Wisconsin; the publications of the California State Mining Bureau, of the Mining Department of Tennessee, of the Colorado School of Mines; the Transactions of the Connecticut Academy of Arts and Sciences, included in the Publications of Yale University; the Bulletin of the Chicago Academy of Sciences; and the Geological Series of the Bulletin of the Museum of Comparative Zoology of Harvard College.

There has been collected and turned over to the Treasurer of State, from the sale of reports, as required by law, the sum of $44.56.

Respectfully submitted,

JAMES H. LEES.

To PROFESSOR SAMUEL CALVIN,
State Geologist.