

REPORT OF DR. CHARLES R. KEYES.

IOWA GEOLOGICAL SURVEY, }
DES MOINES, December 29, 1893. }

SIR:—I have the honor to submit to you the following report of the work done under my direction during the past year.

As it has been thought advisable to divide the state in a general way into two parts, an eastern, or more correctly a northeastern half and a western, or southwestern half, with the dividing line approximately coincident with the Des Moines river, I have confined my efforts chiefly to the latter district. Being in charge of the office it was necessary to assume duties which prevented somewhat the undertaking of as much field work as might otherwise have been possible had circumstances been different.

As stated in the last annual report, the organization of the Survey was not effected until late in July, 1892, when the Geological Board held a meeting to adopt plans by which operations could be begun. Although field work was commenced at once, two months or more elapsed before a suitable office and the necessary equipments for successful work could be provided. The short time remaining, before winter put a stop to all outdoor work, was occupied chiefly in making general reconnaissances upon which detailed work could be based when field

operations were resumed in the spring. There has been, therefore, practically only one field season which could be devoted to the fundamental purposes of the survey.

During the several months of winter when investigations in the field had to be suspended entirely, the work of organization was continued. Plans for the field work of the ensuing season were mapped out, and the preliminary arrangements made. Forms of various kinds for records in the office were constructed. Circulars were prepared and sent out for giving and obtaining practical information in regard to the coals, building stones, clays and other useful mineral substances. Measures were taken to elaborate a system by which accurate statistics and facts could be collated concerning the different industries depending upon the natural resources of the state. Preparations were made for collecting, preserving and exhibiting to the best advantage the native wealth in what it is hoped will prove a permanent cabinet. Arrangements were effected by which the publications of the official surveys of the different states, of the federal government and of the various learned societies, would be received by the Survey, and there is now the beginning of a valuable reference library of geology. Besides an unusually large amount of routine work connected with the office and a heavy correspondence incidental to the organization of the Survey a considerable proportion of the matter published in the First Annual Report was prepared. The accumulated notes on the coal deposits were also written up as far as material would permit and the editorial work assumed.

As soon as the season opened field work was resumed. Several lines of work have been carried on in connection with other duties.

Coal.—Since the organization of the Geological Survey the coal deposits have received special attention and the investigations connected with them have formed one of the principal lines of inquiry. Work begun in the autumn of the first year was continued until the close of the field season. With the aid of several assistants, operations were resumed the following spring and continued without cessation during the year. During this period the coal seams and the strata associated with them were examined over most of the state. In the field work, in addition to personal examinations, assistance was rendered by other members of the Survey, and the notes bearing upon the subject which had been taken by them in connection with other duties were freely drawn upon.

The magnitude of the undertaking and the amount of labor which has been expended may be more fully appreciated when the fact is taken into consideration, that the area of the Coal Measures in Iowa is somewhat over twenty thousand square miles, and that isolated basins of Carboniferous outliers and the region bordering the productive Coal Measures which must be gone over in tracing the limits of the formation occupy fully five thousand square miles or more. The coal deposits are too extensive to be discussed in a single volume. The first part, now in press, forms a volume of 536 pages with 18 plates and 220 figures. It is somewhat preliminary and general in character and is intended to supply immediate demands for information. It is expected that later, studies on the nature and adaptabilities of the various coal beds, the most economical methods of mining the coal and the aerial extent of the individual seams will be carried on.

Gypsum.—Although regarded principally as a collateral subject, work in regard to the gypsum beds of Iowa

has been continued. The investigation of the deposit, as exhibited in the vicinity of Fort Dodge, may now be regarded as nearly complete. The area covered by the gypsum contains approximately twenty-eight square miles. The main body varies in thickness from two to thirty feet or more, with an average of perhaps sixteen feet. The Des Moines river and some of its tributaries have removed a considerable portion of the gypsum, yet there remain quantities sufficient to supply all demands for many years to come. At the lowest estimate the mass of gypsum which is found available in the region is not less than sixty millions of tons. The value of the product when brought to market at the present figures would be more than a hundred and fifty millions of dollars. The gypsum production has greatly increased during the past year and now amounts to fifty thousands of tons annually. The area has recently been mapped, in relief, by Mr. E. H. Lonsdale and Mr. Fred Hess, and a map has been prepared showing the distribution of the deposit, and its relation to the associated formations. A complete report on the subject is now ready. In it will be discussed all the information on the subject which is of practical importance.

Sioux Quartzite.—This is a very hard thoroughly vitreous rock whose occurrence has long been known in the extreme northwestern corner of the state. It is locally called Sioux "granite." It differs, however, from ordinary granite in not having in its make-up the more destructible constituents found in that rock and is consequently much more durable. Heretofore it has been known to extend over only a few acres in this state. Recent visits to the locality have shown that the rock covers a number of square miles at least. There are, therefore, in the state

inexhaustable quantities of the most durable building stones. Its beautiful color and the ease with which it is quarried has caused it to become quite popular, and its use throughout this and neighboring states is rapidly increasing. Not only is it of importance economically, but its interest from a scientific standpoint is also great. A little additional work in the region will enable a full discussion of the subject to be made ready soon.

County Work.—Detailed mapping and investigation has been undertaken in several counties. Those which have been the subject of special personal consideration during the past year have been selected on account of work which had been previously done in them in person. By extending the investigations the information obtained years ago may be utilized to great advantage.

In Des Moines county there was finished up some work which was begun several years ago during a residence at Burlington. Much valuable data was brought together then and certain areas carefully mapped. With some special attention to the subject from a more strictly economic point of view, the report on the county has been completed. During the past year Mr. F. M. Fultz, of Burlington, has been supplementing the information which had already been acquired before the organization of the Survey and looking up certain points which needed further consideration. With some additional personal work which will be done early during the coming season it is expected that a report on the entire county will be ready for publication before the end of another year.

Another county which presented similar favorable conditions was Marion county. The greater part of the geological structure of this region had been carefully worked out some years ago during the construction of a

detailed section of the Coal Measures in Central Iowa. The principal line of investigation was along the Des Moines river which traverses Marion from northwest to southeast. During the past year supplementary work has been taken up in this region. Professor Jameson has made a topographical map of a selected area, which will be used in constructing a relief model illustrative of the structure and arrangement of the coal-bearing strata of Central Iowa. The entire county is now practically mapped as regards the distribution of the different formations. Many facts relating to the economic resources have been brought together. A report on this district is in preparation and the work is well towards completion.

Webster county is another district which afforded very favorable opportunities for taking up the work of the district as a whole. When the examinations of coal and gypsum were undertaken in Webster county, full notes were made respecting the other deposits of economic value. The collateral work thus finished probably embraced nearly half of the entire amount necessary to be accomplished in order to prepare a full and complete report on the natural features of the county. The mapping is practically finished.

Mr. S. W. Beyer has undertaken to investigate artesian waters. The subject involves not only the collection of data concerning the depth of flowing wells now existing in the state, but also the preservation of records of all deep borings and prospect holes, as well as information regarding mineral springs. Among the chief points considered in each case are the nature and thickness of each stratum passed through in making the boring, the depth and lithological characters of the water-bearing stratum, the rate of flow and the temperature of the water. An

examination of the drillings is made wherever possible. Special attention has been given to the fundamental conditions regarding water supplies of this kind as applying particularly to Iowa. The borings are all located on maps of a suitable scale as fast as the records are obtained. By means of connected sections the water-bearing strata may be located accurately for each district. The depth at which the principal horizons should be encountered may thus be calculated approximately for any particular place. Furthermore, the limits of the different areas which will supply flowing wells may be determined. The preparation of the report on the work done is now well advanced towards completion.

In addition to the investigations on the artesian waters some local area work has been also taken up. The territory examined has Story county for a center. The principal work in this direction has been done in Boone county. The greater part of this district has been gone over and detailed information obtained in regard to its mineral wealth. In Marshall county work has also been started and considerable progress made.

Mr. H. F. Bain, in addition to other duties which have been referred to, has spent a part of the past season in investigating the coal deposits in certain of the counties lying in the southeastern part of the state. Mr. Bain also paid particular attention to the resources of Appanoose county. He will probably continue these investigations with the object of making a complete report on the district. At the close of the field season several weeks were devoted to the study of the Cretaceous deposits of northwestern Iowa. A detailed geological section was made along the Sioux river from Sioux City to the extreme northwestern corner of the state. One of the chief results

of this work, besides making out the stratigraphical relations of the different beds, was the discovery in Iowa of the Fort Pierre member of the Cretaceous. From the clays of this formation and the chinks of the Niobrara which are found directly beneath, a good grade of Portland cement may be manufactured. Tests on these materials are now being made. While in this portion of the state the relations of the Sioux quartzite were also studied.

Mr. E. H. Lonsdale has undertaken an investigation of the clays. During the field season he has visited all the industries based upon clays in the western half of the state. Examinations of the deposits and the methods in use were noted. During the coming season it is expected that a similar examination of the clays will be extended over eastern Iowa. An account of the work done is already well advanced. A similar statement of operations conducted during the coming season will also be prepared. With this account of the clay industries will be incorporated a full description of the clay deposits of the entire state and the geological formations in which they occur. The properties of the different clays and all facts of economic value pertaining to the working and preparation of them will be fully discussed.

Previous to the beginning of the clay work, Mr. Lonsdale investigated the material resources of Montgomery county and has in preparation a comprehensive report. From this county as a center, investigations were also pushed into the neighboring counties and many valuable notes obtained.

Mr. A. C. Spencer, began, early in the summer, to study the coal deposits and general geological features of certain counties in southeastern Iowa. Later in the season he spent several weeks in Webster and Humboldt

counties in tracing the boundaries of the Lower Carboniferous limestones and the Coal Measures.

During the summer months Mr. A. J. Jones worked in the northern part of the Iowa coal field studying the coal deposits and the associated clays, the latter with special reference to their adaptability for the manufacture of the various kinds of clay products.

Mr. C. H. Gordon, formerly of Keokuk, devoted two months time to making out the geological features and economic resources of Van Buren county. A complete report of this district is now nearly completed. Several weeks were also put in in Lee county in the continuance of lines of work begun during several years residence.

Prof. J. L. Tilton, of Simpson College, Indianola, has given such attention to field work in Warren county as his other duties would permit. One of the principal lines of work taken up was the construction of a detailed section along Middle river from Ford to Winterset in Madison county. The object was to connect accurately the Lower Coal Measures, where well understood, with a typical Upper Coal Measure section and at the same time to ascertain the thickness of the strata. Preliminary work having for its ultimate aim the determination of the useful deposits of the county was also begun.

In the office, Mr. F. C. Tate has acted as draughtsman and has been engaged continuously in preparing maps and illustrations for the reports as they have been made ready for publication. Miss Nellie E. Newman has acted as secretary to the Survey. Respectfully submitted,

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TO PROF. SAMUEL CALVIN,
State Geologist.

