
ADMINISTRATIVE REPORTS.

2 G. Rep.



SECOND ANNUAL

Report of the State Geologist.

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

To Governor Horace Boies and Members of the Geological Board:

GENTLEMEN:—I have the honor to present to you a report of the operations of the Iowa Geological Survey for the past year. During the year 1893 progress has been made as rapidly as circumstances would permit. In laying out the general plan of the work of the Survey the State has been roughly divided into two halves, separated approximately by the Des Moines river. The eastern, or more correctly, the northeastern part, has been under the general supervision of the State Geologist. In the western, or southwestern portion, the work has been carried on under the immediate direction of the Assistant State Geologist, in whose report will be found a fuller statement of the operations in that quarter of the State. On account of the very great importance of the coal deposits of Iowa, when compared from an economic point of view with any other single mineral product, the energies of the Survey have been directed to their investigation as one of the

principal lines of work. These investigations have been pursued both in the field and in the laboratory. The field work has been done by the Assistant State Geologist aided by other members of the Survey; the researches in the laboratory have been conducted by the Chemist. All geological phenomena connected with the accumulation and formation of coal, as well as its areal and stratigraphical distribution, have received deserved attention. But while the coal has been one of the chief objects of investigation, the clays, building stones, lime-burning rocks, soils, and other geological deposits of the coal-producing counties possessing an economic interest have not been neglected. Inasmuch, indeed, as the clay industries of Iowa are destined soon to take high rank as sources of public and private wealth, the clay deposits, particularly south and west of the margin of the Carboniferous outcrops, have been the subject of special investigation. Since, however, all the work in the southwest half of the State has been done under the immediate direction of Dr. Keyes, reference should be made to his administrative report for fuller details of what has been undertaken and what accomplished in the counties occupied by deposits of the Carboniferous and Cretaceous periods.

All the material requiring special chemical analysis has been examined by Professor Patrick. The extent and general character of this work is fully outlined in the accompanying report of the Chemist.

In eastern and northeastern Iowa, embracing the region occupied by Cambrian, Silurian and Devonian strata, the work has been pushed. I have personally given more than three months to active field work, beginning in Allamakee county in the extreme northeast, and carrying the observations into Winneshiek, Clayton, Fayette, Dubuque,

Delaware and Jones counties. The greater portion of the time was spent in Allamakee. The other counties mentioned need to be examined somewhat more in detail before it will be possible to prepare a satisfactory final report on their geological resources. It is in Allamakee county that we find the earliest of Iowa's Paleozoic strata. Omitting for the present the Sioux Quartzite of Lyon county, with respect to the age of which a definite opinion cannot yet be expressed, it may be said that in Allamakee are exposed the foundations upon which all the geological strata of the state have been built up. The Cambrian and Silurian strata of northeastern Iowa pass under a large proportion of the state, probably under it all; and it so happens that some of them possess a very direct economic interest, even in counties where they are buried under many hundreds of feet of younger sediments. The artesian waters of eastern Iowa have their source either in the Saint Peter or the Saint Croix sandstones; and usually the first question asked by the prospector for natural gas has respect to the depth of the Trenton limestone beneath the point chosen for the location of his well. Allamakee county furthermore is unlike the greater part of Iowa, in that it lies within the driftless area. The effects of erosion during the immeasurably long period since this corner of Iowa was permanently elevated above sea level, have been nowhere obscured, as in other portions of the state, by a mantle of glacial detritus. The river valleys have been cut something like six hundred feet below the level of the adjacent divides, and the edges of the geologic strata have been exposed to an extent unapproached outside the driftless area. Some of the formations thus exposed yield building stones of a quality unexcelled in the Mississippi valley, some are rich in deposits of lead ore, extensive

beds of iron ore occur in certain localities, ocher suitable for mineral paint is found in large quantities, while lining the valleys and spreading over even the highest hills are soils unique in origin and unsurpassed in fertility. For these reasons Allamakee county was properly selected as a typical area to be thoroughly studied and used as a standard with which adjacent areas might be compared. Certain geological questions can be studied and settled in Allamakee county better than elsewhere on account of the unusual facilities which the peculiar topographic features of the region afford. The determination of certain geological problems in one area at once affords a key to the explanation of geological phenomena elsewhere, and hence careful work in one locality is often the best and surest way of reducing the expense of pursuing satisfactory investigations in others.

Mr. H. F. Bain has spent considerable time in investigating the coal deposits east of the Des Moines river and along the Mississippi in Scott and Muscatine counties. He has also made some geological observations in Mahaska and Keokuk counties with the view of ascertaining more in detail, during the coming season, the economic resources of these districts.

Mr. A. G. Leonard spent several weeks in the lead and zinc regions of northeastern Iowa with the view of determining the extent of the present industry, and of learning more particularly the extent of the ore deposits. This work will be continued at the beginning of the coming season.

Mr. F. M. Fultz, of the Burlington high school, has made observations in Des Moines county with special reference to the distribution of the different geological formations. This work will form the basis of the more strictly

economic work of the county. Incidentally he has also given attention to some unusually fine glacial scorings which have been discovered in this part of the state.

Partly gratuitously and partly at a nominal sum above expenses, Professor Wm. H. Norton, of Mt. Vernon, has given to geological investigation the time that could be spared from his work in Cornell college. His duties with the Survey led him to study in detail the geological structure and the points of economic interest in Linn county. His researches have brought out many things that will be of interest to students of geological science not less than to those who are interested in geological deposits only so far as such deposits may become sources of immediate or prospective wealth. Professor Norton has also collected information regarding certain artesian and other deep wells, and has given considerable time to the study of outliers of Carboniferous strata in counties belonging within the proper Silurian and Devonian areas of Iowa.

Volunteer Assistants.—In Delaware county, Professor A. G. B. Wilson of Hopkinton, has been devoting the time he could spare from his regular duties to geological work. His time is given freely without pay, and his investigations will furnish detailed information with regard to the geological resources of a very important area.

Professor F. D. Merritt has made notes on the geology of Fayette county, giving special attention to soils and Pleistocene deposits.

Dr. P. J. Farnsworth has collected data respecting the geological phenomena of the region about Clinton, in Clinton county. Professor F. M. Witter has rendered similar service in Muscatine. Mr. Fred M. Irish began work about Dubuque, but owing to press of other duties he was only able to continue his investigations for a few

months. The work of all these volunteer assistants can be utilized to the great advantage of the Survey, and I desire here to make acknowledgment of my appreciation of their services; they have not only given their time without pay, but in most instances have generously borne their own expenses.

Mapping.—In Great Britain and on the continent of Europe accurate topographical maps are not only made the basis for geological mapping, but used in the field, they greatly facilitate the process of geological investigation. The United States Geological Survey has devoted a considerable share of its energies to the making of topographic maps as a basis for geological work. By a large proportion of geologists correct maps are regarded as absolutely essential to successful field investigation.

In Iowa elaborate topographical maps are out of the question. This work cannot be carried on extensively unless the scope and purposes of the Survey were very greatly enlarged. Work, however, in this direction has been undertaken on a limited scale. Three areas of the state, of rather small extent, have been thought worthy of mapping with the purpose of representing accurately in selected typical areas, embracing a limited number of square miles, certain geological facts of special importance.

The first of these areas, including about fifty square miles, covers the gypsum field about Fort Dodge. The field work in this area was done by Mr. E. H. Lonsdale and Mr. Fred Hess. The great commercial value of the gypsum made it desirable to ascertain the areal extent of the deposit, and to learn accurately its relation to other geological formations. Inseparably connected with these questions of areal distribution and stratigraphical rela-

tions are questions of its age and origin. Dr. Keyes estimates the value of the entire gypsum deposit, when manufactured and ready for use, at many millions of dollars. The importance of the area in question demands the employment of the best known methods of investigation in order that the highest attainable accuracy in the matter of geological facts and details may be secured.

The second area was chosen in Marion county, and the reason for selecting it lies in three important facts. First, the genetic history of the Coal Measures must be clearly appreciated before correct information regarding the distribution of the coal seams can be secured and recorded. Second, the rocks exposed along the Des Moines river in Marion county throw light of the highest importance on the history of the Coal Measure strata. Third, the geological structure of a very large area in central Iowa is such that the few square miles thus thoroughly studied, when described and illustrated, will enable the intelligent reader to appreciate the structure of many hundreds of square miles of which the smaller area stands as the typical representative. The topographical work in the Marion county area was done by Prof. C. D. Jameson who, with several of his students, gave his services without pay. The region is one unusually difficult to map, but its very roughness affords the desired facilities for studying its geological structure.

The third region mapped topographically is in north-eastern Iowa. This region is representative of a large area in the eastern part of the state; but apart from its representative characters, its peculiarities of topography and geological structure as already described demand much more of time and expense than would be bestowed on an average area of similar extent. The topographic

work was done by Mr. John G. Ratcliff, of Waukon, who furnished the map complete. The work, however, was undertaken by Mr. Ratcliff as a labor of love and not as a source of profit. His long residence in Iowa, and his experience as surveyor and railroad engineer rendered him familiar with every square mile of the area studied. He had run lines of levels in almost every direction throughout the region for prospective railroads, and all his notes were available without cost for the purpose of making the desired map. Upon undertaking the map he put special leveling parties in the field obtaining additional data for drawing the contours of the various ridges and ravines. He took a great deal of time from urgent private business to personally conduct investigations for the same purpose, besides which he gave all the time requisite for the office work on the map.

The work of the Survey is now inaugurated. A large share of the unavoidable preliminary investigations have been made. A few representative areas of special importance have been mapped. Data have been collected and the geological formations correlated over large areas that can now be worked up in detail with comparatively slight expense. In other words the foundation work that is preparatory to detailed investigation, and of necessity must come first has been done for a considerable portion of the state. Final investigations respecting coals, clays, building stones, and artesian waters are well advanced, as well as those relating to the geology and geological resources of a number of counties, and all this has been done notwithstanding the fact that the Survey has been in existence less than a year and a half.

During the past year the first volume of reports has been published and distributed according to law. This

report although necessarily general in its scope has been received with expressions of favor, both within the state and beyond its limits. While contributing to our knowledge of the geology and geological resources of Iowa it at the same time reflects credit on the intelligence and progressive spirit of a state already distinguished for its exalted position in all that relates to the intellectual elevation of its people.

A second volume, less general than the first and more directly concerned with economic questions, is in the hands of the printer. The body of this report has been prepared by Dr. Charles R. Keyes. It relates wholly to problems connected with the resources of our great coal field, and I feel assured that like its predecessor, it will prove an acceptable contribution to the literature of the important subject with which it deals and will further help to place Iowa before the world in the position she deserves as a state highly favored in the quality and intelligence of her citizenship as well as in the value and extent of her geological resources.

From almost every county urgent requests have come for immediate investigation of geological resources. It has been impossible to grant such requests. That would have required a force ten or twelve times as great as the appropriation for the Survey could support. Furthermore, a due regard for economy requires that the work must be pursued according to some definite plan; each district of the State will be examined in time, and only when the details are all in will we be able to present fully the information which the people of each separate district are anxious to receive.

SAMUEL CALVIN,
State Geologist.

