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THE "PILOT CHART" of last month contained a small telegraph chart (reproduced in *Science* of April 5) of the Bay of North America, to illustrate the admirable facilities that exist for the establishment of a more complete system of telegraphic weather-reports and storm-warnings for the benefit of commerce, to include Mexico, Central America, the West Indies, and the Windward Islands. A hurricane chart accompanying the "Pilot Chart" for May, with the tracks of a few hurricanes selected as typical of those that occur in this region, illustrates still more strikingly the importance of this project, besides containing information of value to navigators during the coming hurricane season. The recent terrible disaster at Samoa, March 16, caused by a tropical cyclone, may well call attention to the fact that West Indian hurricanes are among the most severe that occur anywhere in the world. Every consideration of expediency, economy, and common sense, urges the importance of taking full advantage of every possible facility for getting early and reliable information regarding the formation and progress of these terrific storms, for the benefit of commerce along the Atlantic and Gulf coasts, and in the West Indies, the Caribbean Sea, and the Gulf of Mexico. The completion of the Nicaragua Canal will add tenfold importance to this subject, but its importance to American commerce is already so great that such a system should be in full operation now.

THE SEVENTH ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

EVER since the foundation of the present United States Geological Survey, its scope and fitness to accomplish the great work intrusted to it, have grown, its work thus steadily gaining greater economic and scientific importance. It would be useless at the present day to dwell upon the value of geological work, to the appreciation of which the people of the United States have fully awakened. Even the people of the Western States, who are so entirely guided by practical considerations, acknowledge their necessity by appropriating funds for geological investigations or by maintaining geological surveys.

The lack of trustworthy maps has compelled the United States Geological Survey to include this indispensable preliminary work in its operations, and the great and important work is furthered with commendable energy. Ever since the first of the topographic sheets were printed, and since they have become accessible to the public, the demand for such maps has increased, and the lack is more sorely felt in regions where they do not exist. The publication of the map of New Jersey, the first of the States that can boast of a good map, and the imminent completion of the map of Massachusetts, will greatly help to bring home to the public the necessity of providing for the publication of the maps of the whole country. In the year 1886, considerable portions of New Jersey and Massachusetts, of the Appalachian region, of Kansas and Missouri, a portion of Texas, a small part of Arizona, and several valleys of California, were surveyed, and the mapping of the Yellowstone National Park was completed.

Regarding the scope of the geological work of the survey, the following passage of Major Powell's report will be read with interest: "The Geological Survey inherited much unfinished work of different surveys in the Western Territories, previously prosecuted under the auspices of the government. Since it seemed desirable to carry forward and complete these surveys as rapidly as possible, investigations were continued in the fields covered by them, and thus the early organization of the survey was determined in part by antecedent geologic work. At the same time, however, demands for local geologic and mineralogic investigations came from various portions of the country, including the older and long settled States; and, as soon as the legality of such action was established, the geologic operations of the survey were extended into the other States, and a number of divisions were organized, and intrusted with the investigations.

"It should be explained that by its organic law the Geological Survey is inhibited, both implicitly and directly, from making a geologic survey upon a cadastral plan; i.e., from making investigations relating to the value of properties of individuals. Accordingly, its work in economic geology is limited to the observation and mapping of the formations within which mineral resources lie; the general distribution and characteristics of coal-beds, ore bodies, and other valuable mineral deposits; and the investigation of questions relating to the origin and taxonomic relations of the formations themselves and of their contained minerals.

"Within the above limitations it has been found possible to make the scientific investigation of the survey of high economic value (1) by extending its operations into those portions of the different States in which the natural resources have not yet been fully developed, and (2) by developing and applying such systems of classification of the formations as will at the same time enable and compel the geologist to discriminate in the field, and clearly distinguish on the maps of the survey those rock-masses which are economically important. Both of these means of rendering these investigations of the survey of maximum value to the country have been adopted. Moreover, friendly relations exist between the United States Geological Survey and the geologic surveys prosecuted under the auspices of different States of the Union; and in many cases partial co-operation with these States has been effected in such manner that the State geologists leave to the federal survey the investigation of such general scientific questions as involve operations beyond the limits of their own States as well as within them, and avail themselves of the results of this investigation, and in return permit the general survey to utilize the results of their own more strictly economic studies."

We cannot enter into a detailed description of the work in the various divisions of the geological branch of the survey which cover extensive portions of the United States. Professor R. Pumpelly continued his researches on the archæan geology of the New England States; Mr. G. K. Gilbert, those on the Appalachian region. Of considerable practical as well as scientific interest, are Professor N. S. Shaler's researches on the swamps of the Atlantic coast. It is estimated that there are 100,000 square miles of coastal lands in the country, which, subject to inundation by tidal and fluviatile waters, are valueless in their present condition. It would appear, from the experience of other countries, that, by the employment of proper methods, these lands might be reclaimed, and rendered among the most valuable of the agricultural lands of the United States. But the relative altitude of land and sea is not constant: in some places the ocean is encroaching upon the land, and elsewhere the land is emerging from beneath the oceanic waters; and even where the level of the coastal land is stationary, the shores are undermined and eaten away by the waves, and thus the sea gains upon the land in another way. The examination of the causes of the changes of coast-line must, in some cases, precede engineering operations for reclaiming land. Connected with these questions of oscillation of the land and the formation of coastal marshes, is that relating to the origin and distribution of the bog ores, phosphatic beds, etc., now in process of formation in the marshes of the Atlantic coast, and embedded in the cenozoic formations thereof, constituting one of the most important of the mineral resources of the Atlantic States.

Other important branches of the geologic division are the surveys of the copper-bearing rocks of the Lake Superior region, Professor T. C. Chamberlin's investigations on glacial geology, and the various Western surveys.

The present report is accompanied by a number of important papers, each illustrative of another part of the work of the survey. Professor T. C. Chamberlin treats the rock-scorings of the great ice invasions; Mr. Joseph P. Iddings describes the structure and petrographic character of Obsidian Cliff in the Yellowstone National Park. The classification of the early Cambrian and the pre-Cambrian formations is the subject of a paper by Mr. R. D. Irving. Professor William Morris Davis's paper on the structure of the triassic formation of the Connecticut valley gives a preliminary sketch of the work done by the archæan division, in charge of Professor R. Pumpelly. The division of mining industries is represented by T. M. Chatard's paper on salt-making processes in the United States.

There are two geological monographs on limited areas: Mr. W. J. M'Gee's description of the geology of the head of Chesapeake Bay, and Professor N. S. Shaler's report on the geology of Martha's Vineyard. After a survey of the Island of Nantucket, Professor Shaler undertook an investigation of the Island of Martha's Vineyard, and the results of this work are embodied in the present monograph.

He found that the front of the ice during the last glacial period remained for some time on the Island of Nantucket. After the disappearance of the ice, the region was suddenly elevated above the level of the sea, after having been depressed below its level during the continuance of the glacial conditions. Since that time it has undergone a depression of about twenty feet. From Professor Shaler's investigation on Martha's Vineyard, it appears that the tertiary beds of that island belong to a great delta deposit accumulated during the middle and later stages of the tertiary age; they have been subjected to a considerable amount of dislocation by the action of mountain-building forces; they thus indicate the action of these forces at a much later date than any for which they have been observed elsewhere on the eastern shore of the continent. Among the interesting studies incident to this inquiry is that of a bowlder train originating in a hill having a diameter transverse to the motion of the ice of less than one thousand feet. Professor Shaler found that it has a fan-like shape; being, at a distance of fifteen miles from the point of origin, not less than eighteen thousand feet in width.

The report is printed and illustrated as beautifully as all the preceding reports. In the brief space allotted to us we can do no more than call attention to some of the important contributions contained in it. The fortunate combination of work that is of scientific and economic value, which is characteristic of our Geological Survey, cannot fail to bring home to the minds of the people the necessity of work of this kind and its eminent usefulness to the public good.

TWELFTH ANNUAL REPORT OF THE NEW JERSEY STATE BOARD OF HEALTH.

IN addition to the valuable and suggestive report of the secretary, Dr. E. M. Hunt, this volume contains the following articles: I. "The Sanitary Necessity for the Control of the Construction of Dwellings," by Henry Mitchell, M.D. In support of the ground which he takes, that there is such a necessity, the writer refers to the fact, that, of two hundred houses examined in Chicago in which diphtheria existed, but four were perfect in their sanitary arrangements. The same has been found true in other cities. He claims, that, by the loss of life in New Jersey from diseases which are preventable, the State loses annually $5,576,000; if consumption is added to this list, the amount would reach $12,000,000. A satisfactory organization for health-protection could be made at an expense of fifty cents per capita of the population. II. "Our Charitable and Penal Institutions," by Ezra M. Hunt, M.D. In this paper Dr. Hunt describes the condition of the almshouses, jails, etc., of the State, and makes suggestions for their improvement. III. "Water-Supply from Wells, in its Relation to Health," by Francis A. Wilber, M.D. The writer of this paper discusses (1) the source of supply of well-water; (2) its collection; (3) the sources of its impurities; (4) nature's means for removing such impurities, and the failure of these means; (5) the relation between these impurities and public health. He says that absolutely pure water is one of the greatest luxuries of modern life; and nothing in our modern civilization marks more strongly public enlightenment in matters of health than does the interest now being taken in the subject of water-supply for towns and cities. IV. "Ice as a Source of Disease," by William K. Newton, M.D. Several instances are given in which ice was the cause of sickness. Dr. Newton says that it has been abundantly proved that the use of ice cut from streams, ponds, or lakes polluted by sewage or organic refuse of any kind, is dangerous to health. V. "The Water-Supplies of New Jersey," by A. Clark Hunt, M.D. In this paper the writer gives the population of the principal towns and cities of the State, the number of houses contained therein, the source of the water-supply, the size of the reservoirs and of the water-pipes, the daily consumption and the character of the water. VI. "Diseases of Workers in Textile goods," by Drs. J. W. Stickler and J. B. Stubbart, and Mr. F. B. Lane. This is a continuation of the inquiry into State industries, which has been carried on by the State board for a number of years, to the value of which we have frequently referred.

The secretary, in an introduction, well says that it is the high duty of the State to see to it that those upon whom it must depend for productive labor are enabled to pursue that labor without undue peril to health and life: hence all machinery should be properly guarded, all factories should be examined by those expert in detecting the causes of ill health or undue exposure, and those of younger age should be protected from kinds and degrees of work unfavorable to full development and to proper schooling. As a result of the inquiry into the health of those who work in woollen goods, the reporters say, that while there is a slight tendency to bronchitis, catarrh, and rheumatism, workers in wool are to be congratulated on having an occupation which is not necessarily unsafe or unhealthy. They say, however, that there is need of more care as to dust. Workers in cotton suffer from diseased conditions much more than workers in wool, owing to the large amount of dust and the overheated rooms. Of 72 employees engaged in this work, 11 had catarrh; 7, headache; 8, rheumatism; 4, malaria; 2, bronchitis; 3, sore eyes; 3, sore throat; 1, pneumonia. Rheumatism and catarrh are the prevailing deseases. VII. "Means for Preventing the Spread of Contagious Diseases in Cities," by J. C. Bayles, M.E., president of the New York Health Department. This paper describes the methods and appliances employed by the New York department, including the three hospitals for the care of contagious diseases, and the disinfecting plant. D. C. English, M.D.,