THE METEOROLOGICAL CONGRESS.*

MONDAY, August 21st, at ten A. M. the congresses of the Department of Science and Philosophy of the Congress Auxiliary of the Columbian Exposition were formally opened at the Memorial Art Institute of Chicago with an address of welcome by the President, Mr. C. C. Bonney, followed by responses from representatives of the various special congresses. At the close of this general session the different divisions met in rooms assigned to them, the Division of Meteorology, Climatology and Terrestrial Magnetism meeting in room XXXI, in which the regular sessions were held daily from 10 A. M. to 2 P. M. from August 21st to August 24th.

The chairman of the Congress not being able to be present in person the first day, Prof. F. H. Bigelow, representing Prof. Mark W. Harrington, opened the session at eleven A. M. of the 21st with a few words of welcome and a statement of the objects of the Congress.

The Congress had no legislative authority. The main purpose, as previously announced, was to collect together a series of memoirs "outlining the progress and summarizing the present state of our knowledge of the subjects treated," and to print them in full in the English language.

The meetings, while thus making the reading and discussion of papers a matter of secondary importance, were by no means lacking in interest or profit to those who were present. But few of the papers could be read in full, owing to their great number and the absence of many of the authors. In all about 130 papers were read by title, in abstract or in full, forming a most valuable collection of memoirs prepared by writers of authority in their respective lines of research.

Among so many papers of merit, a simple list of which would occupy several pages, individual mention cannot be fairly attempted.

While the papers were read in general session, they were assigned, in the program, to various sections, according to the subject, each section being placed in charge of a responsible chairman.

Section A. Prof. C. A. Schott, U. S. Coast Survey, and Mr. H. H. Clayton, U. S. Weather Bureau, Chairmen. The papers of this section are devoted to instruments, their history and relative merits, and to methods of observation, especially to methods of observing in the upper air.

Section B. Prof. Cleveland Abbe, U. S. Weather Bureau, Chairman. This section is the most extensive in its scope, dealing mostly with questions in dynamic meteorology; much attention is given to the study of thunderstorm phenomena in various countries.

Section C. Prof. F. E. Nipher, Washington University, Chairman, comprises a series of sketches of the climate of different portions of the globe.

Section D. Major H. H. C. Dunwoody, U. S. Army, Chairman, is devoted to the discussion of the relation of the various climatic elements to plant and animal life.

Section E. Lieut. W. H. Beehler, U. S. Hydrographic Office, Chairman, deals with questions relating to marine meteorology, particularly to ocean storms and their prediction, methods of observation at sea, and international co-operation. During the reading of a paper on the work of the Hydrographic Office of the Navy, Lieut. Beehler had on exhibition a fine bust of Lieut. Maury by the sculptor Valentine, of Richmond, Va.

Section F. Prof. Charles Carpmael, Director of the Canadian Meteorological Service, and Mr. A. Lawrence Rotch, Director of the Blue Hill Observatory, Chairmen, comprises papers relating to the improvement of weather services and especially to the progress of weather forecasting.

Section G. Prof. F. H. Bigelow, U. S. Weather Bureau, Chairman, deals with problems of atmospheric electricity and terrestrial magnetism and their cosmical relations.

Section H. Prof. Thomas Russell, of the U. S. Lake Survey, Chairman, has to do with rivers and the prediction of floods.

Section I. Oliver L. Fassig, Librarian U. S. Weather Bureau, Chairman, is devoted to historical papers and to bibliography, with special reference to the history of meteorology in the United States.

Prof. Mark W. Harrington, Prof. F. H. Bigelow, Capt. P. Pinheiro, of Rio Janeiro, and Lieut. W. H. Beehler successively presided over the meetings. The printed program distributed at sessions of the Congress contains a list of all papers presented; copies of this may be obtained from the Secretary upon application.

At the close of the last session a resolution was offered calling for recommendations by the Congress relating to (*a*) international co-operation in observations of auroras, (*b*) simultaneous Greenwich noon observations daily at all stations on land and sea, in addition to observations at other times, (*c*) investigation of the earth's magnetic polar current and the exact determination of the solar rotation. As the Congress had no legislative authority, it was agreed to hold a special session for the consideration of these questions after adjournment, on the following day.

Preparations have been begun for the printing of the papers and an effort will be made to complete the work at an early date. Oliver L. Fassig, U. S. Weather Bureau, Washington, D. C., is the Secretary.

*Held at Chicago, August 21st to August 24th, 1893.

SALT TIDE MARSHES OF SOUTH JERSEY.

BY JOHN GIFFORD, SWARTHMORE COLLEGE, PA.

THE mainland of the peninsula of South Jersey is fringed by many miles of marsh meadow. At times this level plain is completely covered by water. It consists of a mass of soft blue-black, bad-smelling mud, covered with a thick sod of grasses, rushes and sedges, and intersected by many winding, reed-fringed creeks, shallow bays, salt ponds and thoroughfares.

These marshes are separated from the ocean by a long line of low, sandy sea-islands, between which there are inlets through which the tides flow swiftly.

This stretch of marshland is of very recent origin. During Indian times it was probably a shallow sea. This accounts, perhaps, for the enormous quantities of clams and oysters which then existed. The majority of the bays in the marshes are very shallow and may, also, in the course of time, become unfit for oysters.

The rivers of South Jersey holding fine sand in suspension flowed into an ocean where there was practically no current. This material was then, in consequence, deposited, and there was thus formed a long sub-marine bank. This tripped the waves into breakers, which lifted the sand into a long line of low sea-islands.

The combined estuaries of these rivers formed a long, shallow inland sea, in which, owing to the slackening and meeting of currents, enormous quantities of silt were deposited. Wild water-fowl and winds disseminated the seeds of grasses and sedges on the mud bars, which were soon formed. The decay of each year's vegetation and the scum of mud left by every tide caused a gradual thickening of the sod. Three hundred thousand acres of marsh region have thus been recently formed.

Being an estuary, the scouring force of the tides prevents the formation of extensive beaches on the bay-side of Jersey. The sand is held in suspension until the cur-

rent is slackened by striking the ocean where a shoal is forming.

Since the formation of these marshes the beaches, by the action of wind and wave, have been moving inland. Inlets are becoming shallower, and the beaches, in places, have been completely blown from their original bed over on to the marshes, so that the marsh mud is often exposed on the ocean side.

This accounts for the size which the trees attain in these places. Many beaches support only a shrubby vegetation, others are covered with beautiful forests of trees of surprising size. Red cedar, holly, sassafras, oak, liquid amber, sour gum, magnolia, sweetgale and grape vines grow to be unusually large. Some of the finest specimens of holly in existence may be found on several of these beaches, and the red cedar which grows there is more durable than that of the mainland. The size of these trees is due to the fact that their roots have penetrated through the sand of the beach into the rich, black mud of the marsh beneath.

These forests are doomed. The wind picks up the fine white sand of the beach and piles it in dunes. These are often as high as the tree tops and are moving gradually inland, leaving only a mass of dark gray trunks behind. Unfortunately the trees themselves prevent the west and and north winds from blowing back the sand.

The fact that Jersey is slowly sinking complicates these changes. The marshes, in consequence, are intruding upon the mainland. Even white cedars, which only grow in pure fresh water, have been found buried in the marsh. Little islands and Indian shell heaps are slowly disappearing.

In the formation of these marshes organic agencies play an important part. An examination of the mud in shallow bays and salt ponds shows enormous quantities of beautiful diatoms. There, too, are many kinds of shells. Other animals, especially those of the crab tribe, completely honeycomb the marsh in places.

These meadows are very rich and valuable for farming. When banked and sluiced, although they shrink, they freshen and, after being worked for a time, yield enormous crops. In several places in South Jersey they have been converted into flourishing farms. In other places up the rivers they have been abandoned because of the muskrats which undermine the banks.

These vast stretches of marsh are richly colored, and at times, in places, are covered with white, pink and yellow flowers. They are alive, in season, with wild migratory water-fowl, infested with flies and mosquitoes and flecked with the sails of boats moving in the creeks and bays. In winter they are deserted and dreary, the monotony of which is only broken by a hay or fish house here and there or the remnants of a stranded schooner.

The collecting of the hay which grows on the marshes is one of the leading industries of that part of the state. It is still, in many places, cut with the scythe and carried on hand poles to large clumsy scows, which are rowed with two long oars to the landings.

There are 300,000 acres of marsh region in South Jersey. At least one-twentieth of this is cut for hay. An acre yields, without sowing or care, other than a little ditching, at times, and burning once a year, at least one and a half tons. The many creeks which bend in every direction render it easy of access. It is worth at least six dollars a ton. The annual crop is worth then not a cent less than $135,000.

The marshes are often too soft for horses; in places they are provided with wooden shoes, and many meadows are hard enough for the use of machines.

This hay is often baled and shipped away. The greater part is consumed at home. Poor qualities are used by glass factories for packing purposes.

The two plants of greatest value yielding hay on these marshes are *Spartina juncea* or "salt-hay" and *Juncus gerardi* or "black-grass." The one is a true grass, the other a rush. The salt hay is light in color, contains few seeds, is cut late in summer and is fed to horses. The black grass grows in brackish regions, is full of seeds, is dark in color, is cut in mid-summer and is fed to cattle.

If reclaimed on a very large scale, as in Louisiana, the writer believes that these marshes may and will soon be converted into flourishing farms.

METHODS OF PRESENTING GEOLOGY IN OUR SCHOOLS AND COLLEGES.*

BY MISS MARY E. HOLMES, PH.D., ROCKFORD, ILL.

BEFORE offering any suggestions as to "methods" of presenting this study, let us state a few axioms:

First. For the successful study of any subject there must be some foundation.

Second. Comparatively few of our high school pupils enter college.

Third. The large majority of school age will not advance beyond the grammar grade.

Fourth. The impressions earliest made are most enduring.

Fifth. If we would make geology a life force, a life inspiration to the masses generally and to those in our high schools and colleges, we must begin with the little children.

How early a child's attention may be profitably called to the elements of geology may be questioned, but I think as soon as he can talk, and understand what is said to him. Of course the first lessons will be very, very simple—mostly in *form* and *color*. He will gladly gather for you the "pitty stones," and you will notice that these, gathered *by himself*, and when *alone*, are generally either definitely colored, or smooth rounded ones, or smooth flattened ones, few being angular. With your aid let him separate the rounded from flattened, calling his attention to the difference in *shape*. Mix them and separate again. Repeat the process many times, at first always letting the child *hand you* the stones, you frequently asking: "Where shall we place this one?" Later, let him place them himself. In a few days he will have so mastered the distinction between *flat* and *round*, that he can separate quite correctly a large pile. Never continue the lessons till he is weary. When such signs appear suggest that he run out doors and play. In all probability he will return with another pocketful of stones. Appear pleased with his acquisitions and *be* pleased. He will detect any insincerity. Give him a box, or a low shelf of his *very own* for his treasures. With encouraging words, the child will thus spend many hours; they are not play, nor work, but happy, instructive seasons.

Having learned to separate round from flattened stones, call his attention to rough, *angular* forms. He will quickly note the difference. Show him that these are *angular* because *broken* from a larger stone. Illustrate by some broken toy of his own. Also show him how to make more angular ones by cracking these with a hammer. If he pounds his fingers, a little experience will remedy that as a frequent future result. He cannot appreciate the smoothing effect of water, so pass it by. Many lessons upon surfaces may be received unconsciously in this way, the child learning how to use his eyes, and to compare one object with another.

Next, take the *colors* of the stones. Separate them into piles, *dark* and *light*. Separate again the blackish, the red-

*A paper read before the Woman's Department in Geology in the World's Congress Auxiliary of the World's Columbian Exposition at Chicago, August 21, 1892.