

of water in passing through ports, valves, and discharge pipes to force main. Also a friction of pumps and pressure required to lift valves.

Mr. J. E. Denton read a paper on Proposed Principal Cause of Superior Economy for Multiple Expansion Engines, in which he called attention to the fact that most recent experiments on engines indicate that the cylinder condensers of engines were approximately proportional to the product of time of admission, range of temperature, surface exposed to steam during admission, which would make it probable that the percentage of cylinder condensation of multiple expansion engines was not greater, and was possibly less, than the single expansion engines having equal expansion.

CHEMISTRY.

Professor Caldecott presented a report on methods of analysing water.

Professor Seaman presented the report of the committee on Chemical Instruction in Public Schools. The importance of giving due place to science in secondary programmes appears the greater when it is remembered that the larger proportion of their students do not pass on to college or technical schools. This fact is made very clear by the analysis of the results of a recent inquiry by the Bureau of Education as to the number of secondary students preparing for colleges or superior schools of science. The proportion of such students in the several classes of schools was as follows:—High Schools, 15 per cent.; private schools for girls, 10 per cent.; private schools for boys, 63 per cent.; private schools for both sexes, 10 per cent. But a part of the Public School scholars reach the High School, so that, if some instruction is not given in the Grammar School, many children will remain entirely ignorant of chemistry, and our opinion is that it should not only be taught in the High School, but that it should form a part of the instruction given in the higher grades of the Grammar School.

The report of the committee was adopted.

The Explosiveness of Celluloids was discussed by Mr. Chas. E. Munro. He said there were two varieties of celluloid—the translucent and opaque. The opaque variety was the one used more largely in manufacture of articles for wearing apparel and pianoforte keys. Owing to the presence of pyroxylin in these bodies there was a popular belief that they were explosive, but this was denied by manufacturers. The books on the subject showed that similar differences of opinion existed among writers upon the subject. Prof. Munro gave results of experiments for testing the stability, flashing point, and explosiveness of the two varieties.

Prof. Romyn Hitchcock gave an account of some investigations in Spectrum Photography made by Mr. Victor Schumann, Leipsic.

Dr. H. W. Wiley pointed out some of the peculiarities of butter to which he had before called attention. These suggestions referred to the low standard of the volatile oils in butters made from the milk of cows fed on substances such as cotton seed. He also gave an account of the analysis of seed of *calacanthus plaucus* and the discovery of a new alkaloid calacanthine by Dr. Eccles.

Prof. John W. Longley stated that a system of International Standards had been arranged for with England, France, Germany, Sweden, and the United States. A description of the system would be given, and the section asked to name one chemist to act with six others to conduct the analysis on behalf of the American committee of the International Standard, and to co-operate with European analysts.

Mr. R. Hitchcock read a paper on the Action of Light on Silver Chloride. He stated that as a result of experiments with thin films of chloride exposed to light it was found that there was invariably a loss in weight. An apparatus was arranged in which thin plates of glass such as are used for covers of microscopical mounts, covered with translucent film of silver chloride, could be exposed to sunlight in a current of hydrogen gas and the chlorine set free absorbed in a solution of silver-nitrate.

GEOLOGY AND GEOGRAPHY.

A very interesting paper on the Topographic Types of North Eastern Iowa was read by Mr. W. J. McGee. In that country the rivers, instead of flowing through the valleys, flow along the tops of the ridges. This peculiarity was accounted for by showing that during the latter part of the glacial period the valleys of that region were filled with ice, and the ridges of earth being more readily acted upon by the water formed by the melting ice river beds were formed on them, where they continue until the present day.

The Relation of the Lake Ridges in Ohio, New York, and Ontario to the Southern lines of Glacial Drainage was discussed by Rev. G. Frederick Wright, of Oberlin.

The papers of Mr. Frank Leverett also dealt with a phase of the glacial period—the Glacial Phenomena of Northern Indiana and North-eastern Illinois.

Sir William Dawson reviewed Certain Remarkable New Fossil Plants from the Erian and Carboniferous, and on the Characters and Affinities of the Paleozoic Gymnosperms. The paper referred, first, to the discovery of Mr. R. D. Lacey, of Pittston, Pa., of a remarkably perfect specimen of a fossil plant allied to those known as *Cordulites*. It was found in the Catskill or Upper Erian formation, and consisted of a stem or large branch with leaves and spikes of fruit laid out on a slab of sandstone. The specimen represented a new genus and species (*Dictyo-cordulites Laceyi*), and served to connect together and illus-

trate several types of ancient plants known hitherto only in fragments. Reference was also made to certain curious fruits found by Mr. Lacey in the Carboniferous of Pennsylvania, and to the discovery by Mr. F. Bain in the Permian of Prince Edward Island of specimens showing the structure of the stem of the tree known as *Fylodendron* and also showing its leaves and fruit. These discoveries were applied to the illustration of a number of forms of plant life of the paleozoic rocks intermediate between the modern pines and cycads, and serving to connect these with plants of lower grade allied to the club-mosses and ferns. The whole of the facts showed the existence in the paleozoic period of a great many plants referable to different families, genera and species of gymnosperms, a type now represented by comparatively few forms.

Rev. H. C. Hovey, D.D., of the *Scientific American*, read an interesting paper on the Mammoth Cave.

A paper was presented on Areas of Continental Progress in North America, and the influences of those Areas on the work carried on in them. A special interest attaches to this paper owing to the fact that it was practically a review of the author's own great work, "A Manual of Geology." Professor Dana embodied in the essay all his most recent observations and conclusions, and with the candour peculiar to the class of master-thinkers to which he belongs, pointed out modifications that he would have to make in his past conclusions.

After a slight discussion on Prof. Dana's paper, Prof. Hall gave an interesting talk on the Origin and History of Geological Societies and Associations in America. In 1824 a society for furthering geological study was organized by a few enthusiastic students, but shortly afterwards it ceased to exist. In 1840 the scientists engaged in the State geological surveys throughout America organized into a society called the American Geological Association. Its principal aim was to discuss and devise a suitable nomenclature. After some years had passed this association was united to a society started by the naturalists, and the new organization was known as the American Association of Geologists and Naturalists. Shortly afterwards this society was joined by the Physicians and Chemists, and the result was the organization of the present Association for the Advancement of Science.

Prof. Hall then gave a paper on New Genera and Species of *Dictyo-Spongiae*. In the course of it he recounted his own discoveries in rocks of the Devonian period, and remarked on the age of the rocks in which fossil sponges were found. In the discussion that followed the reading of this paper Sir William Dawson pointed out that in Canadian rocks the fossil sponges were found as far back as the Cambrian period.

Dr. Alexander Winchell, of Ann Arbor, read a paper entitled The Geological Position of the Ogishke Conglomerate. He said the Ogishke Conglomerate was a very remarkable formation named from a little lake in North-Western Minnesota. It was at first supposed to be of only local extent, but now appeared to extend northward to Thunder Bay north of Lake Superior, and thence with frequent exposures to the eastern shore of that lake. It was in fact the slate conglomerate Sir William Logan described from the so-called Huronian system of rocks on the shores of that lake. It had a wide distribution in Ontario.

Mr. Robert Bell, B. A. Sc., M.D., LL.D., assistant director of the Geological Survey of Canada, read a paper on The Origin of Gneiss and other Primitive Rocks. He said that the stratification of some varieties of primitive gneiss was possibly due to floe structure in a molten mass. But this theory was not applicable to the stratification of all gneisses. The great gneiss era of North America was divided into the Upper Laurentian and a primitive gneiss series or Lower Laurentian. The former was of undoubted aqueous origin, and was differentiated into recognizable subdivisions, which could be mapped out. These divisions differed from each other widely in character, and had many points of resemblance to later sedimentary rocks.

Prof. J. Richards Dodge read a paper on Certain Aspects of Agriculture in the Arid Region. This paper discussed the problems which are involved in peculiar conditions, showing how the farmer adopts methods to suit new circumstances, and evolves success from soils which were doomed to barrenness by the partial science of former days, which took no cognizance of the science of practical agriculture. Resolutions were adopted urging upon the United States Congress to establish a proper administration of the timber lands in the hands of the Government, and encourage scientific development of natural resources by legislative enactments.

Carefully prepared papers of botanical and entomological papers were also read in their respective sections.

ANTHROPOLOGY.

Col. Garrick Mallory, of Washington, in his address to the section read an exhaustive and interesting paper, The Israelites and Indians. Referring to the theories held by so many that the Indians of America are the lost ten tribes of Israel, he demonstrated that though at first sight there were apparently good reasons for the supposition, the real similarity consisted in the Indians of the present times and the Israelites of the Old Testament times being on parallel planes of culture. He carefully reviewed and compared the religions of both on these planes, their religious theories and practices, and finally their sociological conditions. His conclusions led him into a review of the religion of the Israelites, which may be summarized as follows:

It has often been asserted that the Israelites were specially adapted to a spiritual religion; that monotheism was in their racial constitution; that whether through revelation, or because they were well adapted to receive such revelation, their idiosyncrasy directly led them to spiritual ideas, which to modern minds means monotheism. This was not the record of the historical books of the Old Testament, even after their manipulation. The prophets of Israel declared the exact contrary; they denounced their own people as rejecting spirituality and as not deserving the favour of Jehovah. This declaration is confirmed. The beliefs and practices of the Israelites were substantially the same as those of other bodies of people in the same stage. The Israelites were not a "peculiar" people. There is, racially, no peculiar people in the sense intended. Mankind is homogeneous in nature though placed in differing and ever advancing grades of culture.

Mr. W. J. McGee, of the United States Geological Survey Corps, Washington, D.C., read a paper on Some Principles of Evidence Relating to the Antiquity of Man. He said the principles of evidence relating to the antiquity of man might be summarized in a series of propositions, which it was the object of the paper to discuss. The primary propositions were: It was a fair presumption that any artificial object found on the surface was modern; also that any stone object of doubtful origin was natural; also that any unusual object found apparently within an unconsolidated deposit was an adventitious inclusion; also that an incongruous association was adventitious. These presumptions might be outweighed by direct or collateral evidence, and indeed had been so outweighed in all those cases which proved a high antiquity for human kind; but in weighing such direct or collateral evidence certain additional and more general principles must be recognized. The more general principles were: In inductive science the value of evidence varied with its consistency and its correlative character; the sufficiency of a given body of evidence varied inversely with the importance of the conclusion to which it tended; and every conclusion was tentative. In exact knowledge the sufficiency of evidence and the validity of conclusions varied inversely with the exactitude of the branch of science affected.

Mr. Walter Hough, U. S. National Museum, read an interesting paper on Aboriginal Fire-making, and gave a practical illustration of the manner in which it was done.

Prof. Romyn Hitchcock, gave a paper on Shinto—the Religion of the Japanese. The system began with three deities formed spontaneously in space, after which came two creator gods, who by natural processes, gave birth to the islands composing Japan, and afterwards to a host of deities to govern it. Some very interesting myths were related, the significance of which was not very clear, and finally the succession of generations concluded with the birth of the Mikado, who was a descendant of the sun or of the goddess Amaleransu, the deity of the sun. The native chronology ran back to 660 B.C., and the mythologic lore purported to go back about 10,000 years more. But no dates in Japanese history could be relied upon earlier than 400 A.D., when the historic era might be said to begin.

Rev. W. M. Beauchamp read an interesting paper on the Iroquois White Dog Feast.

Prof. J. Owen Dorsey read a paper on Siouan Terms for Mysterious and Serpent, and another on Gens and Sub-gens as Expressed in Four Siouan Languages.

Mr. W. H. Holmes, of the United States Bureau of Ethnology, Washington, D.C., followed with a paper, On the Evolution of Ornament—the American Lesson. He said the evolution of ornament was a topic of interest to all men. American art furnished a large body of data bearing upon this subject which deserved very careful consideration. This was especially true since the primitive character of our aboriginal art rendered its use in the study of questions of evolution comparatively easy.

Mr. Henry W. Henshaw, Washington, D.C., read a paper on the Missions and Mission Indians of California, which treated of the mission establishments and briefly described the natives and their aboriginal mode of life.

A paper on the evidences of successors of the successors of the Palaeolithic man in the Delaware was read by Prof. Chas. C. Abbott.

A paper on the Winnipeg Mound Region was read by George Bryce, LL.D. This region is the farthest north yet examined, and the mounds are chiefly on the Rainy, Red, and Souris rivers. Numerous skeletons have been exhumed, and a skull was exhibited by the reader to the members of the section. A large amount of unmanufactured articles, charcoal, red and yellow ochre, and charred birch bark was found. Manufactured articles were also obtained, such as stone implements, scrapers, gouges, chisels, axes, mallets, conjuror's tubes, sets of gaming stones, stone, bone, horn, and shell ornaments, pottery and copper implements. All the mounds of this region are built on prominent headlands and are oval or circular in form. There is a tradition among the Indians that the mound-builders were exterminated by the smallpox, but the essayist held it to be more likely that they were destroyed by the Sioux, Ojibways, Crees, and Iroquois about 300 years ago. It is probable, however, that the date of beginning the erection of the mounds was about 400 years earlier.

A paper was read in the Anthropological Section by Rev. J. O. Dorsey, Takoma Park, D.C., on Indian Personal Names. The writer submits a list of 6,000 Indian names, giving the English meanings of them.

Rev. Dr. McLean, of Moosejaw, in a paper on Gesture Languages of the Blackfoot Indians, pointed out the differ-