Dr. F. A. Gooch began work in the laboratory on the 2d of April, and since that time has been occupied almost exclusively with analyses of spring-deposits and rocks collected in the Yellowstone national park. He has completed analyses of waters from the Giantess geyser, and the Excelsior spring (or geyser), both in the park, and of a basalt from the same region, and a rhyolite from Washoe, Nev. —— Dr. Henry Erni also began work in April, and has been engaged in various mineral determinations of a qualitative character; notably, upon an alleged tin ore from Clay county, Ala., and phosphatic rocks and marls from Mississippi and Alabama.

The following analyses have also been made at the laboratory at Washington: galenite from near Washington; chlorite from Georgetown, D.C.; nephrite from Point Barrow, Alaska; margarite from Gainesville, Ga., and Iredell county, N.C.; copper ore from Lee's ferry, Arizona; fulgurite from Mount Thielson in Oregon; and water from Bear River in Utah. The latter was collected by Mr. I. C. Russell, and proves to be an ordinary river-water; the greatest impurity being carbonate of lime, of which there are contained .1080 of a gram to the litre, the total solid contents being .1845 of a gram to the litre. The fulgurite was collected by Mr. E. E. Hayden, and is being made the subject of special study by Mr. J. S. Diller. Some of the results of his examination will be given in a future number.

In the New-Haven laboratory, during March, Messrs. Barus and Hallock continued their high-temperature observations. Most of the work has been done with thermo-electric couples. The boiling-point of mercury has been redetermined with great accuracy. During April the boiling-point of zinc was the subject of study. It seems probable, from the present outlook, that these high-temperature researches will be very satisfactory in their results, and that they will render possible a wide range of investigations hitherto impracticable in the domain of physical geology.

In the laboratory at Denver, Mr. Hillebrand has been busy with the chemical examination of rocks from the Silver-Cliff district. He has proved the existence, at this locality, of several minerals not hitherto known to occur in North America. The results of his examinations also point to the existence, in one of these minerals, of silver in a very rare form, if, indeed, not in a combination hitherto unknown in the mineral kingdom. In March, eleven rock specimens were analyzed, and a number of interesting minerals from Ouray, Col. (some of them probably new to science), were examined.

In the laboratory at San Francisco, Dr. Melville was busy, in March and April, with routine work connected with Mr. Becker's investigations.

Paleontology. — Prof. O. C. Marsh, in April, had two field-parties at work in Jurassic beds in Wyoming Territory, and one in the Jurassic in Colorado. Although the weather was very unfavorable during a great part of the time, interesting results were obtained.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Engineers' club, Philadelphia.

May 17. — The secretary presented for Mr. Edward Parrish an illustrated account of the effect of sea-water on the iron of Brandywine shoal lighthouse. This lighthouse was built in 1849–50, near the mouth of the Delaware Bay, and stands in about six feet of water. It was the first screw-pile structure built in the United States, and had but few predecessors in the world. The house is supported on nine piles of hammered iron, surrounded by fifty-two piles of rolled iron, acting as an ice-fender. The whole is strengthened by systems of braces and ties. The effect of the water on the iron, continually submerged, has been to produce longitudinal seams or grooves, with occasional holes on the surface, in some cases seriously reducing the strength. The most extensive corrosion is observed on the hammered iron. Round rods in the air are altered in section, approximating an irregular polygon with longitudinal grooves. —— Prof. L. M. Haupt read a paper on rapid transit, giving valuable data relative to the effects of velocity of movement on the ratio of increase of population, and contrasting the situation in New York and Philadelphia. In comparing the topography of the two cities, a silhouette of Manhattan Island was laid on a map of Philadelphia (same scale), showing that the island, from the Battery to 150th Street (nine miles and a half), only extended from League Island to Erie Avenue. From this it was inferred, that, if there was need for elevated roads in New York, there was greater need for them in Philadelphia, "as the necessity is proportional to the extent of surface of a city, and the distance of its residents from the business centres." The former commercial supremacy of Philadelphia was considered, with the reasons for the rapid decline in the ratio of increase of population, which has diminished from seventy-nine per cent in the decade 1840–50, to twenty-five per cent for 1870–80; while Camden's population has increased from fifty-one per cent in 1850–60, to a hundred and eight per cent in 1870–80. In short, Philadelphia is overflowing because her time-limits of travel are too restricted. Assuming the time-limit at thirty minutes each way, or one hour per day, at the usual velocities of travel, the limits of the 'Pedestrian city' were found to be a square with diagonals of 4 miles, and area 8 square miles; 'Horse-car or cable city,' were found to be a square with diagonals of 6 miles, and area 18 square miles; 'Elevated railroad city,'

were found to be a square with diagonals of 12 miles, and area 72 square miles; 'Underground city,' were found to be a square with diagonals of 20 miles, and area 200 square miles. The total area of Philadelphia is 129 square miles, and, of the built-up portion, 13¼, or ten and a half per cent. Deducting from the square representing the 'Street-car city' the salient intercepted by the Delaware River, it leaves just the same area, or 13¼ square miles, showing the city to have reached the limit of street-car travel. The areas benefited vary as the squares of the velocity of travel: hence elevated roads would be worth to the city four times as much as surface lines, and underground roads about eleven times as much. Since 1850 Philadelphia has lost, in population, one-half a million people, equivalent to a revenue, on the real estate which they would have occupied and improved, of about two million dollars per annum. The two broad zones of the overcrowded portion of the city were also outlined; and the extent of the benefits to be conferred by only two lines of elevated roads were clearly shown, by diagrams, to extend to the entire city. Elevated roads occupy an intermediate position in cost of construction, rate of travel, and general utility, between surface and underground structures; and there can be no doubt that the time has fully arrived when this city, for her own sake, requires them, and should heartily co-operate with any parties so proposing to improve and extend her resources. The following were some of the conclusions arrived at: 1°. The city has reached and already surpassed the ordinary limits of street-car travel. 2°. The ratio of increase of population is rapidly declining, chiefly from lack of more rapid and cheaper means of transit. 3°. The present steam-roads in the city cannot supply the demand, as they have surface line trains, which must move slowly, and cannot be run at close intervals: fares are too high, and stations too distant. 4°. Camden, N.J., is rapidly gaining population at the expense of Philadelphia. 5°. The annual loss to the city in revenue, from the cause, will reach millions of dollars. 6°. Unless relief is afforded, the city will be corralled by time-limits, and the density of the population must increase rapidly at the expense of health and morality. 7°. Two lines of elevated railroads at right angles to each other, and properly located, would benefit an area equal to double that of the built-up portion of the city. 8°. The fears of opponents of elevated roads, of losses to the city or the individual from withdrawal of patronage or depreciation of property, are shown by experience in New York to be groundless. 9°. If Philadelphia desires to retain even the present low rate of increase in population, and high rate of salubrity, she must promptly respond favorably to the request of her citizens to be permitted to build elevated roads. 10°. The limits of the city are not such as to warrant any corporation in building an underground road, were it recommended or allowed, with any fair prospect of returns for many years. —— Mr. William H. Ridgway read a paper upon the action of water in the modern turbine, claiming that it is nothing more than an improved Barker's mill, and that there is no such thing as the water spurting through the shutes, and impinging on the buckets, as is generally believed; the wheel, on the contrary, taking a velocity very much greater than that of the inflowing water. —— Mr. J. J. de Kinder presented an illustrated description of a method of removing condemned machinery by dynamite, as practised by him in the case of the side-levers of the old Cornish pumping-engine at Spring Garden water-works, Philadelphia, which weighed twenty-nine thousand pounds each. Drilling, tapping, and breaking each beam in two, with half a pound of dynamite, and without injury to the building or other machinery, occupied thirteen hours. Even had despatch been unnecessary, it might have taken two weeks to do this work by the ordinary methods.

Academy of natural sciences, Philadelphia.

Botanical section, May 12.— Mr. Thomas Meehan referred to his theory that a fasciated branch is due, not to 'over-luxuriance' of life, but to a degradation of vital power, as published before the American association in 1870. A number of phenomena, conceded to result from low vital conditions, were considered by him to be inseparably connected with fasciation, the essential feature of which is the production of an extraordinary number of buds, with a corresponding suppression of the normal internodal spaces. This is precisely the condition of a flowering branch; and all its attendant phenomena find their analogue in a fasciated stem. Taking the test of vital power as the ability to retain life under equal circumstances, we find the leaves on a fasciated branch dying before those on the rest of the tree. In severe winters the branches in the fasciation wholly die in many cases, while those on other portions of the tree survive. Precisely the same circumstances attend inflorescence. The leaves, in their procession from a normal condition to petals, lose this evidence of vitality in proportion to the degree of transformation. The petal dies before the sepal, the sepal before the bract, and the bract before the leaves, in the general order of anthesis in a compound flower; though there are cases, where, secondary causes coming into play, this rule may be reversed. In a general way, however, the soundness of the point would not be disputed. From all these facts in analogy, it might be said that a fasciated branch is an imperfect and precocious attempt to enter on the flowering or reproductive stage.

Natural science association, Staten Island.

May 10. — Mr. Hollick read a paper upon recent discoveries of Indian implements at Tottenville, describing in detail the net-sinkers and hammerstones. These latter, according to Mr. Rau, were employed as hammers, "since they show the most distinct traces of violent contact with hard substances." The Tottenville hammerstones, with two exceptions, are made of soft sandstone, evidently with no intention of using them upon any hard substance; and there seems to be no doubt that in this locality they were used in cracking the oysters among whose shells they are so

plentifully found. Muncy, Penn., where Mr. Rau found his specimens, is on the banks of the Susquehanna, and no doubt shell-fish were caught and eaten there as at Tottenville; but this explanation of the use of the hammerstones does not seem to be insisted upon by him. The Tottenville specimens are made of such soft stone that one can hardly imagine any other use to which they could be put. The number of net-sinkers in use must have been immense, as even at the present time, upon the surface of the ground, they may be picked up in considerable number. One day, in about half an hour, fourteen were found. The extent of these shell-heaps can only be computed in acres. —— Mr. George F. Kunz of New York presented a stone head found near Clifton, Staten Island, about two hundred feet east of the railroad just above the Fingerboard Road, in a low swamp filled with the roots of the swamp-oak. A rustic-basket worker, named James Clark, came upon the stone head while digging up the roots of a high huckleberry-bush, at least ten years of age, growing at the edge of the swamp. The soil is a compact, light creamy brown, sandy clay, in which a stone like this could be buried for an age without much disintegration. When striking in his pick, at a depth of from twelve to eighteen inches, he turned up the head, his pick striking and indenting the chin. The material of which it was formed is a brown sandstone, apparently more compact than the common New-Jersey sandstone, and composed almost entirely of grains of quartz, with an occasional small pebble. The weight of the head is about eight pounds, its height seven inches, and it measures four inches through the cheeks, six inches from the tip of the nose through to the back of the head, and an inch and seven-eighths across the nostrils. The eyes are an inch and a quarter long, and five-eighths of an inch wide; they are raised in the centres, and have a groove running around close to the lids. A round hole a fifth of an inch deep had been drilled in the lower part of the nose, in the space between the two nostrils, evidently designed for a nose ornament, and both nostrils were hollowed out. The cheeks, in their lower part, are sunken in a very curious manner, causing the cheek-bones to stand up very high. The forehead is low, and retreats at an angle of sixty degrees. A trace of what had been or was to be the ear is perceptible on the right side. The back and upper parts of the head are almost entirely rough and unworked, as if it had never been finished, or was originally a part of some figure. The surface is rough and slightly weathered; the cheeks, forehead, and chin having single grains of sand apparently raised above the surface, as if by age and exposure. The discoverer, in cleaning it, had scraped the eyes and beneath the nose with a nail, and his shovel had formed a groove in one of the cheeks, — all of which scratches or marks have a very different appearance from the general surface, and are plainly recent. The style is Mexican, or still more resembles Aztec work.

Minnesota academy of natural sciences, Minneapolis.

May 6. — Mr. Warren Upham described three remarkable chains or series of lakes observed in Martin county, Minn., during his examination of that region as assistant on the state geological survey. These are familiarly known as the east, central, and west chains of lakes. The east chain extends twelve miles from north to south, and includes nine lakes, which vary from a half-mile to two miles in length. About five miles farther west, the central chain of lakes, parallel with the foregoing, reaches about twenty miles in an almost perfectly straight north to south course, including nineteen lakes of similar size with those of the east chain. The west chain is some thirty-five miles long, and is made up of about thirty lakes. Its course is south-south-east, beginning at Mountain Lake in Cottonwood county, and extending to Tuttle's Lake on the line between Martin county and Iowa. The surface of this region is everywhere a prairie of unmodified glacial drift or till, with no considerable deposits of gravel and sand. Its contour is moderately undulating, averaging twenty-five to forty feet above the lakes, the shores of which rise to this height in steep banks or bluffs. No other lakes arranged in such series have been observed, either in this state or elsewhere. The explanation of their origin which seems most probable is, that they mark interglacial avenues of drainage, occupying portions of valleys that were excavated in the till, after ice had long covered this region, and had deposited most of the drift-sheet, but before the last glacial epoch, which again enveloped this area beneath a lobe of the continental glacier, partially filling these valleys, and leaving along their courses the present chains of lakes. —— Mr. Upham also briefly described the belts of knolly and hilly drift, which have been traced through Minnesota by the geological survey. Nearly all of these belts are believed to be terminal or marginal moraines, accumulated along the boundaries of the ice-sheet of the last glacial epoch, as moraines are formed at the end and along the sides of alpine glaciers. The outermost morainic belt, running in a looped course across Wisconsin, Minnesota, Iowa, and Dakota, marks the farthest limits of this ice; and other belts of such drift accumulations, found at various distances back from this, mark stages where the ice halted in its departure. These drift hills and knolls are finely developed on the Coteau des Prairies, in south-western Minnesota and eastern Dakota, as also on the Coteau du Missouri, farther west. They surround Lake Minnetonka, and reach to the west edge of Minneapolis; they are also seen between this city and St. Paul, and east and north of St. Paul: indeed, they cover a considerable fraction of the whole state. From Lake Minnetonka a broad belt of morainic drift stretches a hundred and twenty-five miles north-west to the Leaf Hills, where the most massive development of this formation within the state is found, its highest elevations being from one hundred to three hundred and fifty feet above the general level. The outermost belt of these drift-hills has been named the Altamont moraine. No less than ten other morainic belts are distinguishable in Minnesota, showing successive stages in the recession of the ice-sheet. These moraines have been named from localities where they are conspicuously ex-

hibited, as follows, in their order from south to north: the Gary moraine, the Antelope, Kiester, Elysian, Waconia, Dovre, Fergus Falls, Leaf Hills, Itasca, and Mesabi moraines. The last of these crosses the northern part of the state, from the head waters of the Mississippi River, to Grand Portage on the north shore of Lake Superior. —— Mr. C. F. Sidmer gave some account of the manufacture of the Chamberlain illuminating-gas, made of petroleum, water, and air, and called attention to some of its advantages.

NOTES AND NEWS.

THE following is a complete list of the papers read to the scientific sections of the Royal society of Canada, at its recent meeting in Ottawa, of which an account is given elsewhere in this number: — In the physical section: F. N. Gisborne, Electrical induction in underground and aerial metallic conductors; C. Baillargé, A particular case of the hydraulic ram, or water-hammer; R. Steckel, The form of the contracted liquid vein, affecting the present theory of the science of hydraulics; T. Sterry Hunt, The origin of crystalline rocks; J. G. MacGregor, The density and the thermal expansion of aqueous solutions of sulphate of copper; E. Haanel, Blowpipe re-actions on plaster-of-paris tablets; Description of apparatus for distinguishing flame-coloring constituents when occurring together in an assay; T. E. Hamel, Essai sur la constitution atomique de la matière; N. F. Dupuis, The algebraical development of certain functions; E. J. Chapman, Contributions to our knowledge of the iron ores of Ontario; J. C. K. Laflamme, Note sur une fait météorologique particulier à Quebec. In the geological and biological section: A. R. C. Selwyn, Note of observations, in 1883, on the geology of a part of the north shore of Lake Superior; George Lawson, Revision of the Canadian Ranunculaceae; J. W. Dawson, Geology and geological work in the old world, in their relation to Canada; T. S. Hunt, The Taconic question in geology; W. Saunders, Note on the occurrence of certain butterflies in Canada; E. J. Chapman, Some deposits of titaniferous iron ore in the counties of Haliburton and Hastings (Ontario); Mimetism in inorganic nature; T. J. W. Burgess and J. Macoun, A monograph of Canadian ferns; L. W. Bailey, Geological contacts and ancient erosion in the Province of New Brunswick; G. F. Matthew, Illustrations of the fauna of the St. John group (part iii., Conocoryphidae, with notes on the Paradoxidae); G. M. Dawson, The glacial deposits in the neighborhood of the Bow and Belly Rivers; R. Bell, The geology and economic minerals of Hudson's Bay and northern Canada; J. C. K. Laflamme, Note sur certains dépôts aurifères de la Beance; Découverte de l'emeraude au Saguenay; J. F. Whiteaves, A description of a supposed new ammonite from the upper cretaceous rocks of Fort St. John on the Peace River; On a new decapod crustacean from the Pierre shales of Highwood River, N.W.T.; E. Gilpin, Notes on the manganese ores of Nova Scotia; D. Honeyman, A revision of the geology of Antigonish county, Nova Scotia; S. Obalski, Notes sur la constitution géologique de l'apatite Canadienne.

— It is to be hoped that there will be no lack of papers from chemists on this side of the Atlantic before Section B of the British association, and that the titles will be sent in as early as possible to Prof. H. E. Roscoe, president of Section B, British association, P.O. box 147, Montreal. The subjects for special discussion, as already announced, are, 1°, The constitution of the elements; 2°, Chemical changes in relation to micro-organisms. The first will be introduced by Professor Dewar, probably on Friday, Aug. 29; the second, by Professor Frankland, on Monday, Sept. 1.

— The land-office maps of the United States, and of certain of the states and territories, give a fair outline of our horizontal topography, with rough mountain shading, and, in addition to this, present various details — concerning public lands and land-offices; Indian, military, naval, and lighthouse reservations; railroad and large private grants, confirmed and unconfirmed — not to be found in our ordinary atlases. The latest edition, issued under the direction of Hon. N. C. McFarland, commissioner, includes the general map of the country, six and a half by four feet, dated 1883, on a scale of 40 miles to an inch; Alabama, 1882, 12 miles to an inch; Arizona, 1883, 15 miles; Colorado, 1881, 15 miles; Dakota, 1882, 18 miles; Florida, 1883, 12 miles; Idaho, 1883, 16 miles; Indian Territory, 1883, 12 miles; Louisiana, 1879, 14 miles; Minnesota, 1884, 15 miles; Montana, 1883, 18 miles; New Mexico, 1882, 16 miles; Utah, 1884, 15 miles; Washington, 1883, 15 miles; Wyoming, 1883, 15 miles. These state maps have the coasts, river-lines, townships, lettering, etc., in black; water-areas in blue; and reservations in red or green. Although we have to lament the lack of adequate representation of the relief of the land, the maps cannot be adversely criticised on account of this want; for the measurement of the vertical element of our topography has never been undertaken by the land-office: its work has been simply to measure off the public lands for sale, and to present such maps of the surveyed districts as shall serve to locate the various townships and sections. In the western mountainous region, the land-surveys follow only the lower country, and the adjacent mountains are merely roughly sketched; indeed, in some cases so roughly as to lose all of their characteristic form. But, on the other hand, some of the open country is shown in finer, or at least in *more*, detail than on any other maps yet published. Thus we find the lake districts of Florida and Minnesota well illustrated; and the number of lakes and ponds dotted over the plains of Colorado gives a clew to a peculiar chapter in their physical history. So, also, the branching and meandering of rivers in the Mississippi valley are drawn with greater variety of form, and hence, we may suppose, with a nearer approach to precision, than in our common atlases.

The post-office department also has a series of post-route maps, grouped in areas of several states together, and prepared especially for office use. The