announced. J. M. Schuver is south-west of Abyssinia, about the head-waters of the Blue Nile. Aubrey and Hamon, Révoil and Soleillet, are French explorers working inward from the Red Sea.

English exploration in the lake region is to be renewed under Joseph Thomson, who is sent by the Royal geographical society to explore Mounts Kenia and Kilimandjaro and the country beyond them. H. E. O'Neill, British consul at Mozambique, has lately undertaken several inland expeditions, and will be probably heard from again. Johnson, of the Universities mission, has recently shown that the Ludjende branch of the Rovuma heads in a lake supposed to correspond to Livingston's Shirwa. Many other missions have stations in the lake region. James Stewart has been sent to construct a road between Lakes Nyassa and Tanganyika. He had a steamer on the former, and has executed a survey of it.

A. Raffray, who had explored part of Abyssinia while French consul at Massaua, has been sent as consul to Tamatave on the eastern coast of Madagascar, where he will probably continue his geographic studies; Paiva de Andrada, with a company of experts, has examined the mineral riches of the lower Zambesi, but no full reports are yet made public; Giraud left Marseilles for Zanzibar last July, hoping to penetrate to Bangweolo lake and then west to the Atlantic; Cardoso and Franco left Mozambique in September last, to enter Umzeila's country; and Dr. Holub intends to return to south Africa early this year, prepared for a journey from the Cape to the Zambesi.

Australasia. — The government of West Australia has sent an expedition, under J. Forrest, to the north-western coast to institute surveys, as he had found valuable agricultural lands there in a previous trip. Michlucho-Maclay, who has spent a year in Europe after his long stay in New Guinea, returns to Sydney to continue zoölogical studies there. While in Europe, he received £2,200 from the emperor of Russia toward the publication of his previous explorations. Last March the Rev. W. S. Green accomplished the ascent of Mount Cook, the highest of the New Zealand Alps, with the aid of two Swiss guides. He proposed to attempt a similar excursion in New Guinea. Dr. Finch has returned from ethnological studies in Australasia and Oceanica. Schadenberg, Meyer, and Landau have been in the Philippines; and the latter goes to Japan. H. de Vésine, Larue, and M. Geny have undertaken an expedition in Sumatra.

As the reports and results of these various explorers are published, it is our hope to present an outline of them to the readers of SCIENCE.

THE WEATHER IN DECEMBER, 1882.

THE monthly weather-review of the U. S. signal-service for December, 1882, shows that the meteorology of the month was of unusual interest. The following may be mentioned as the prominent characteristics: —

The temperature was below the mean in all districts east of the Rocky Mountains, except in the lower Missouri valley, and above the mean from these mountains to the Pacific. The lowest temperature noted was — 35°, in Dakota; and the highest, 95°, in Arizona. The cold was unusual in the southern states, there being frosts as far south as central Florida. The special frost warnings were of great value to the sugar and fruit growers in this section.

The rainfall reports, which were received from over five hundred stations, show in general a deficiency; but there was a marked excess in the northern Pacific district, causing floods in Oregon and Washington Territory. Snow in California on the 12th, causing considerable damage to the evergreen foliage, was the special feature of the precipitation record.

The average pressure was normal; but the depressions, as is usual in December, were well marked, ten being charted. Of these, one was observed from the Pacific to the Atlantic, and across the ocean to the English coast; one was formed by the union of two centres; while two presented the unusual phenomenon of separating each into two distinct centres, which afterwards re-united. Five of the depressions pursued an easterly track, and four a northeasterly. Four of the areas were traced completely across the Atlantic.

The wind velocities were often high; the greatest recorded being 116 miles an hour, at Mount Washington. Velocities of 70 miles were noted on the coast of North Carolina. The following 'total movements of the wind' in miles deserve note: Mount Washington, 23,411; Cape May, 12,901; Pike's Peak, 12,548; Hatteras, 12,279. The velocities at Mount Washington invariably exceed those of any other station, month after month; while those at Pike's Peak are smaller, though the elevation of the station is more than twice as great. In this month the velocity at Cape May, on the coast, exceeded that at Pike's Peak, over 14,000 feet in altitude.

Auroras were frequently noted, but none

were of special interest; earthquakes were reported in New Hampshire and California on the 19th, and in Maine on the 31st.

HISTORY OF THE APPLICATION OF THE ELECTRIC LIGHT TO LIGHTING THE COASTS OF FRANCE.

I.

THE value to navigation of thoroughly lighting our coasts is too evident to require any argument in its favor; and, in view of the immense interests at stake, there is no question but that improved methods of lighting should be adopted, almost regardless of expense, providing that the advantages gained are in any way commensurate with the cost.

France has long appreciated this; and it is to her that the world owes the Fresnel lens and many improved lamps burning successively whale, vegetable, and mineral oils. She has finally led the way, as usual, in the use of the electric light, which has been definitely adopted for the lighting of her coasts, after many expensive and conclusive experiments; and, when the plan has been fully carried out, France can boast of having the best and most systematic method of coast-lighting of any country in the world.

The United States has followed France. Our optical apparatus has been almost exclusively imported from that country. We use lamps made after French patterns, and now we are making experiments to determine its value for our lighthouses. This is deemed sufficient excuse for giving full details of the French system. The information has naturally been mostly obtained from French sources.

It was in 1863 that the electric light was for the first time used in lighthouses. The experiment was made with an Alliance machine in the first-order lighthouse of la Hève, near Havre; and the results were so satisfactory that doubtless all the lighthouses would have been immediately furnished with electric lights, had it not been for the great expense attending a general alteration. It was proved that the electric light was seen about eight kilometres farther than the oil-light, and that, in time of fog, the range of the former light was more than double that of the latter.

M. Quinette de Rochemont, ingénieur des ponts et chaussées, published in 1870 a report upon the lighthouses at la Hève. Below are some extracts: —

"The electric light having been installed for six years at la Hève, enough time has elapsed to allow us to form an exact idea of the value of this means of producing light for the lighting of coasts. Sailors take pleasure in recognizing the good services rendered them by the electric light. The advantages of the system have been highly appreciated: the increase of the range of the light is very apparent; and, above all, in slightly foggy weather, many ships can continue their voyage, and enter the port at night, which they could not do when oil was used. The light, which at first was rather unsteady, gradually acquired a remarkable fixity, — thanks to the improvement of the apparatus and to the experience gained by the keepers. The fears which were at first entertained regarding the delicacy of certain parts of the apparatus are not realized in practice. The accidents have been rare, the extinctions short and very few, — two only during this period of six years having had a notable duration: one, of an hour, was due to an accident to the steam-engine; the other, of four hours, should, it appears, be attributed to malevolence. Under these circumstances it seems hardly worth while to worry about possible accidents."

Since 1863 experience has only confirmed the favorable views of M. Quinette. The lighthouses of Gris-Nez, France; Cape Lizard, England; Odessa, Russia; and Port Said, Egypt, — have been provided with electric apparatus; and there is a question of placing it in the lighthouses of Planier and Palmyre, France, and in several lighthouses in other foreign countries.

The following information was furnished by MM. Sautler and Lemonnier: —

"When the light is to be fixed, the optical part of the apparatus is composed of a lenticular drum of proper form, which renders the rays horizontal in the vertical plane while allowing them to diverge in the horizontal plane. The dimensions of this drum vary from a diameter of half a metre for a fourth-order light to one metre in a first-order light. This increase in diameter of the apparatus is sensibly proportional to the increase in diameter of the carbon-pencils between which the voltaic arc is produced, and which determines very nearly the dimensions of the electric light. It follows from this, that the vertical divergence remains the same in the different types of apparatus. When the light is to be revolving, the fixed lens is surrounded by a movable drum formed of straight vertical lenses of which the form varies according to the characteristics desired to be given to the light."

Revolving electric lights have this great advantage over revolving oil-lights: the flashes can be given a duration equal to that of the eclipses. In oil-lights, when the light is concentrated in the form of flashes, there are two ends in view: 1°, to augment the intensity, and consequently the range, of the light; 2°, to create an appearance different from that of a fixed light. The first can only be obtained by giving the flash a duration much shorter than that of the eclipse; or, in other terms, by making the angle of the luminous beam a small part of the angle subtended by the lens. Moreover, this angle depends on the dimensions