of a horse-shoe-shaped electro-magnet. A similar disposition was previously employed by M. Marcel Deprez in the excellent little electromotors shown by him before the French Physical Society last year.

IN the latest pattern of telephone transmitter sent by Mr. Edison to this country, the button of compressed carbon derived from paraffin-smoke has been abandoned in favour of another device. A small rod of ordinary hard carbon, of the quality used in producing the electric light, is mounted behind a mica disk and adjusted in loose contact with a light spring faced with platinum. This arrangement is therefore nothing more or less than a *microphone* attached to the back of a disk which receives the vibrations of the voice.

AT a late meeting of the Académie des Sciences, M. Wardon made a suggestion to substitute nickel for steel as a material for compass needles. M. Wardon adopts a circlet of the metal of a form similar to that devised by M. Duchemin. When the apparatus was submitted under the direction of the Ministere de la Marine to a comparative trial with that of M. Duchemin, it was found to be decidedly inferior for nautical purposes; for the oscillations of the magnetised circlet are extremely slow, owing to the comparatively feeble intensity of magnetisation of nickel.

GEOGRAPHICAL NOTES

AT the last meeting, October 15, of the Russian Geographical Society, the Secretary, M. Sreznevsky, read a detailed report on the geographical work done during the past summer. After having spoken of the gallant geographical feat of Prof. Nordenskjöld, he sketched the results of the expeditions of Col. Prshevalsky, MM. Potanin, Alferaki, and Pyevtsoff, and of the expedition engaged in exploring for the Central Asian Railway. As to ethnography and statistics, the secretary mentions the researches by M. Kuznetsoff in Western Russia, by M. Syrkou in Bulgaria, the anthropological researches of M. Meredlenovsky in the Crimea, M. Polyakoff in the Ural Mountains and Caucasus, M. Kibalchich on the banks of the Dnieper, and M. Micluchо-Maclay in Australia. As to this last, the Society engaged him to return to Europe, for the publication of the very rich results of his explorations, but he prefered to take part in a zoological exploration undertaken by Australian naturalists. The pecuniary position of M. Maclay is a very critical one. After having undertaken his extensive travels without sufficient means, he has received from the Society about 7,000 roubles, which sum was certainly quite insufficient to meet the great expenses necessitated by these travels. Now he has contracted debts for about 15,000 roubles at the Singapore bankers, and the Society seeks private subscriptions, the means for paying these debts, in which it is supported by the opinion of the whole of the Russian press. Finally Prof. R. Lentz made a communication on the labours of the International Conference in the Meteorology of the Polar regions. The Geographical Society will take an active part in the organization of the meteorological stations in these regions.

THE *Moscowskiya Vyedomosti* has received the following information as to the Amu-darya expedition, dated Katty-kourgan, October 19. At Termez the expedition was divided into two parts: one has gone in boats down the Amu to Fort Petro-Alexandrovsk, the other through Surkhan and Rafiuaghan rivers to the Vaksh river. The results of the expedition are important: it has explored the Amu-Darya throughout its length, and its two branches, the Vaksh and the Pyandj rivers, for fifty miles above their junction. The topographers have prepared maps of these parts of the two rivers, and completed the maps of the Amu by several details; several latitudes and longitudes are determined astronomically, and zoological collections obtained. A levelling of the Amu is made up to Chardjuy. We notice the appearance of a Russian work by M. Lokhtin, "The Amu-Darya River and its former Connection with the Caspian." It contains a description of the river, a sketch of the historical data as to the Amu, and a review of the hypotheses as to the causes of the changes of its bed; it is accompanied by a map. The third, fourth, and fifth volumes of the "Report of the Amu-Darya Expedition," contain reports by M. Zuboff on hydrographical works in the lower parts of the Amu-Daria; by M. Dorandt, on the astronomical, magnetical, and hydrometrical measurements; and by Prof. Schmidt, on the slime of the Amu River.

THE death, from paralysis, in India, is announced, of Major Herbert Wood, author of a well-known work on the Aralo-Caspian Region, on the hydrography of which he contributed several papers to this journal.

THE last number of the *Isvestia* of the Russian Geographical Society, contains the proceedings of a meeting of the Society in October, 1878, and several interesting papers:—By M. Prshevalsky, on the observations of Dr. Richthofen; by K. Scharnhorst, on the barometric measurements of heights in Central Asia; by M. Mayeff, on the upper parts of the Amu-Darya, according to the description of Ibn-Dast; and by M. Miclucho-Maclay, on the Agomes Islands. The notes contain information as to the travels of MM. Prshevalsky, Nordenskjöld, and Grigorieff. In the note by Colonel Scharnhorst, on the barometrical measurements of heights made by M. Prshevalsky during his journey to Lake Lob-Nor, the measurements being calculated by comparison with barometrical observations at Nukus and at Omsk, the heights of which above the sea-level are exactly known from geodetical measurements, they are trustworthy, and the error does not exceed 100 feet. The height of Tashkend, calculated by comparison of six years' barometrtcal observations with those made at Omsk, Kazalinsk, Nukus, Petro-alexandrovsk, Baku, and Astrakhan, is 1,516 feet. The other places of general interest are: Kuldja, 2,080 feet; the passes across the Narat and Yuldus Mountains, 10,370 feet and 10,040 feet; the junction of Khabtragay and Baltangay Rivers, 5,320 feet; the town of Kurl, 3,240 feet; Lake Lob-Nor, 2,500 feet; Lake Sayram, 6,920 feet; and Guchen, town, 2,310 feet.

WE are glad to notice the appearance of an "Annuaire for Turkestan" (*Turkestanskiy Kalendar*) for 1880, which contains much useful information as to the mineral riches of the country, its meteorology, financial situation, and statistics, besides a route-map and a map of the general-governorship of Turkestan. We learn from this Annuaire that Turkestan possessed in 1877 only thirty-five schools, with 1,848 scholars.

THE November number of the Geographical Society's periodical contains three short papers: Notes on the Topography of the Sierra Nevada of Santa Marta, U.S. of Columbia, by Mr. F. A. A. Simons; Exploration of Oregon in 1878 by the Wheeler Survey; and Pévtsof's Expedition in North-West Mongolia, by Mr. E. D. Morgan. The first-named is illustrated by a map, which is not particularly well lithographed. The geographical notes, however, are the chief feature of the number. The Dutch Arctic Expedition claims the place of honour, and two pages are devoted to Dr. Holub's career. There is also a long account of the native territories south of the Zambesi, abridged from a report to Sir Theophilus Shepstone, which embodies information hitherto unattainable, and the more valuable as it has been revised by Dr. Holub. The exploration of the Swat River by the *Mullah* is recorded. The concluding thirteen pages are taken up with notes on new books and new maps, the map part bearing a close resemblance to a catalogue.

MR. STANFORD has published a new Library Map of the World, on Mercator's projection. The size is 5 feet by 3 feet, and has several new and admirable features. The currents in the ocean are shown by strong blue waved lines. The areas occupied by these currents, which are chiefly caused by the great periodical winds, have an oscillating boundary or limit, as waved lines are better calculated to indicate this, than the firm and sharply defined lines frequently used. A few of the lines in each current have arrow heads to indicate the direction. Figures in blue upon these waved lines, give the maximum and minimum rates in nautical miles per twenty-four hours. These are selected, we believe, from innumerable observations that have been registered and examined by Captains Evans and Hull of the Hydrographic Department, and published in their invaluable "Wind and Current Charts." The drift currents in the Indian Ocean and China Sea change with the Monsoon winds, and in the chart they are shown as they flow during the south-west monsoon, which blows from April to September. The trade and monsoon winds are named over the map in red letters, and the areas over which they generally blow are tinted in colours. The areas over which north-east winds blow are coloured blue, the areas for south-east winds pink; other areas are differently coloured in accordance with the particular direction of the winds which blow over them. A graduated scale at either side of the chart shows the sun's progress to and fro between the tropics; to the left of the chart the sun's vertical action may be traced as he proceeds northward to the Tropic of Cancer, and to the right, his return journey southward to the Tropic of Capricorn. Dates are given at intervals of five days, the intervening days being

© 1879 Nature Publishing Group

indicated by small red dots. In spare spaces to the north of the chart, small inset maps have been drawn to give the completion of the geography in the Polar areas, and upon these will be found, indicated by colour, the average summer limit of open water as far as known. The curves of equal magnetic variation are also shown upon these small maps, and the spots known as the magnetic poles are named. The northern limit of woods, beyond which trees are unknown, is shown upon the small map of the Arctic regions. The principal ocean mail routes are shown by broken black lines, and upon the longer lines the names of ports of departure and arrival are named. The number of days, the average of numerous voyages is noted on each line, and the distances in nautical miles from port to port are also given. The submarine telegraph cables are shown by strong black lines with dots at short intervals, and the various cables to the United States are identified by having their dates attached. The land is coloured politically giving the most recent territorial divisions, and a bright red colour is reserved for British possessions, which enables the reader to see easily how frequent are the stepping stones of British territory over the face of the earth. Altogether it will be seen this map is well calculated to serve a great variety of useful purposes; its execution is all that could be desired.

DR. NACHTIGAL has received a telegram from Malta to the effect that Herr Gerard Rohlfs's expedition, having reached and explored the Kufara Oasis, was there set upon and plundered. Herr Rohlfs and Dr. Anton Stecker were consequently compelled to return to Benghazi, though they hoped to receive help and compensation from the Turkish Provincial Government.

TRÜBNER AND CO. will shortly publish a new work on Madagascar, under the title of "The Great African Island: Chapters on Madagascar," by the Rev. James Sibree, jun The work will contain a popular account of recent researches in the physical geography, geology, and exploration of the country, and its natural history and botany; and in the origin and divisions, customs and language, superstitions, folk-lore, and religious beliefs and practices of the different tribes. It will contain physical and ethnographical maps.

GEOLOGISTS will be glad to learn the appearance of a trustworthy map of mines in Russia in Europe by Prof. W. Möller, "Carte des Gites miniers de la Russie d'Europe."

WE notice in the last number of the *Bulletin* of the Belgian Geographical Society a paper on the colour of eyes and hair in Belgium, by M. Vanderkindere, with maps: on the Zambeze, by M. Wauters; and the quarterly report on the demographical and medical statistics.

THE Church Missionary Society a short time back entertained the idea of establishing a sanatorium on the west coast of Africa, and the matter, it may be remembered, caused some discussion between their adviser, Capt. R. F. Burton, and the Rev. T. J. Comber, a Baptist missionary, at one of the Geographical Society's meetings last session. It was proposed to place the sanatorium on Mount Cameroons, which rises to a height of over 13,000 feet, just in the angle of the Gulf of Guinea, opposite Fernando Po. Two agents of the Society accordingly proceeded thither in the missionary steamer *Henry Venn*, and ascended the mountain to the highest peak. Their report was favourable to the suitability of a spot some 7,500 feet high, known as Mann's Spring, but to build a residence there and cut a road to it would, it appears, cost more than the Society can afford in order to recruit the health of their missionaries.

UNDER the heading of ethnography, a paper by Père Petitot, on the Asiatic origin of the Indians of Arctic America is commenced in the current number of *Les Missions catholiques*.

THE great work undertaken by the Russian Geographical Society under the title of "Works of the Ethnographical and Statistical Expedition to South-Western Russia" is now completed. The whole work consists of seven volumes, in nine fascicules, or nearly 4,800 pages, and it contains abundant most useful information as to those countries which afford so great an interest by the variety of their population.

WE notice the appearance of the following important works recently published by the Russian Geographical Society:—(1) The eighth volume of its *Memoirs* (*Zapioki*), which contains a "General Sketch of a Theory of Constant Marine Currents," by Colonel Schilling, and a "Note on the New Map of Persia," by General Stebnitzky, with the map itself, which is one of the most important acquisitions to the exact cartography of Asia during recent years.—(2) The fourth volume of the translation of Ritter's "Asia," being the description of the Altay and Sayan Mountains within the limits of the Russian Empire, with a very important appendix (far larger than the original work itself), by MM. Potanin and Semenoff, being a *résumé* of all new information acquired from 1832 to 1875.—(3) "The Kashgar Land" (*Kashgaria*), an historical and geographical sketch, of the country, of its military forces, industry, and trade, by M. Kuropatkin, with additions of General Stubendorff and M. Sreznevsky.—(4) "A Journey to the Holy Land of the Prince Radzivil-Sirotka during the Years 1582 to 1584," published and annotated by M. Hildebrandt; and (5) The two first volumes of a "Catalogue of the Library of the Geographical Society," containing books on mathematical, physical, and general geography. The importance of this catalogue will be realised by all those who know what a number of works appear in Russian on the geography of Russia and Asia, and how difficult it is to know them. We notice with pleasure that the catalogue contains detailed indexes of all papers that have appeared in the publications of the Geographical Society. An important work, being the description of M. Potanin's journey to north-western Mongolia is already in the press.

CELESTIAL PHOTOMETRY

THE volume of the annals of the Harvard Observatory just issued is one of great importance to astronomical science, as the new director, Prof. Pickering, has included in it the photometric observations which have lately been carried on with so much vigour. The first chapter is devoted to a description of the forms of instruments—many of them new—which have been employed, and in this notice we shall limit ourselves to an analysis of this part of the volume.

The first instrument employed was constructed by attaching a Nicol to a double-image prism in such a way that it could turn freely around its axis. By a graduated circle and index, the angle could be measured to tenths of a degree. When two bright objects were viewed through this instrument, two images of each were formed by the double-image prism, either of which, by turning the Nicol, could be made as faint as was desirable. Whatever their relative light, the faint image of the brightest could thus always be reduced to equality with the bright image of the faint object. The true relative brightness is then deduced from the angle through which the Nicol is turned.

This form of photometer may be used without a telescope in the comparison of bright stars which are sufficiently near each other, but the loss of light is large. By Fresnel's formula for the reflection of light, each of the four surfaces of the prisms will reflect four per cent. The amount they would transmit, were there no other losses, would therefore be $(\cdot 96)^4 = \cdot 849$. This supposes that the faces of the Nicol are perpendicular to its axis. If made of the usual form, the loss would be still greater. The unavoidable defects of the surface, dust, absorption, and the reflection at the surface of the balsam cementing the prism, reduce still further the transmitted light. About ·80 will remain under favourable circumstances. Since the prism forms two equal images, only one half or ·40 can pass into each, and when the two images are reduced to equality, their brightness will be only ·20 or ·40 of that of the fainter object. For any but the brightest of the heavenly bodies, it is accordingly necessary to increase the light by means of a telescope.

The following general remarks occur on this form of instrument.

"Since the relative positions of the Nicol and double-image prism are unimportant, either might be placed in front of the object-glass, between the object-glass and the field-lens, between the field-lens and eye-lens, or between the eye-lens and the eye. Unless the double-image prism is placed in front of the object-glass, two images of the latter will, in general, be formed, giving two emergent pencils, both of which must pass without loss into the eye. There is danger that on moving the eye one or other of these pencils will be partially cut off, thus reducing the brightness of one of the objects. If the two images to be compared are brought very near together, this is less likely to occur. On the other hand, at least one of the images of a double-image prism is not achromatic; and, if the prism is placed in front of the object-glass, the colour becomes very marked. In this case, also, it becomes difficult to obtain a prism having such flat surfaces that the images will not be distorted, since any irregularities are

© 1879 Nature Publishing Group