| Feb. | h. | |
|---|---|---|
| 13 | 9 | Mercury in conjunction with and 3° 8′ north of the Moon. |
| 16 | 12 | Mercury at greatest elongation from the Sun 18° east. |
| 17 | 0 | Mercury at least distance from the Sun. |

*Variable Stars.*

| Star. | R.A. h. m. | Decl. ° ′ | | h. m. | |
|---|---|---|---|---|---|
| U Cephei | 0 52·4 | 81 16 N. | Feb. 14, | 19 58 | *m* |
| Algol | 3 0·9 | 40 31 N. | ,, 12, | 22 19 | *m* |
| R Aurigæ | 5 8·3 | 53 28 N. | ,, 18, | | *M* |
| R Canis Majoris | 7 14·5 | 16 12 S. | ,, 13, | 21 35 | *m* |
| | | | ,, 15, | 0 51 | *m* |
| S Cancri | 8 37·5 | 19 26 N. | ,, 16, | 21 43 | *m* |
| S Ursæ Majoris | 12 39·1 | 61 42 N. | ,, 15, | | *m* |
| R Boötis | 14 32·3 | 27 13 N. | ,, 17, | | *m* |
| δ Libræ | 14 55·0 | 8 4 S. | ,, 15, | 2 24 | *m* |
| U Coronæ | 15 13·6 | 32 3 N. | ,, 15, | 0 9 | *m* |
| W Herculis | 16 31·3 | 37 34 N. | ,, 18, | | *M* |
| U Ophiuchi | 17 10·9 | 1 20 N. | ,, 14, | 2 16 | *m* |
| | | and at intervals of | | 20 8 | |
| W Sagittarii | 17 57·9 | 29 35 S. | Feb. 16, | 0 0 | *m* |
| U Sagittarii | 18 25·3 | 19 12 S. | ,, 16, | 4 0 | *m* |
| R Scuti | 18 41·5 | 5 50 S. | ,, 18, | | *M* |
| R Lyræ | 18 51·9 | 43 48 N. | ,, 16, | | *m* |
| R Aquilæ | 19 1·0 | 8 4 N. | ,, 16, | | *M* |
| S Vulpeculæ | 19 43·8 | 27 1 N. | ,, 12, | | *M* |
| Y Cygni | 20 47·6 | 34 14 N. | ,, 12, | 19 56 | *m* |
| | | | ,, 15, | 19 50 | *m* |
| δ Cephei | 22 25·0 | 57 51 N. | ,, 13, | 2 0 | *m* |

*M* signifies maximum; *m* minimum.

*Meteor-Showers.*

| | R.A. ° | Decl. ° | |
|---|---|---|---|
| Near 49 Camelopardalis | 110 | 62 N. | Slow. |
| From Monoceros | 120 | 5 S. | Slow. |
| Near υ Herculis | 238 | 46 N. | February 17. |
| ,, σ Ophiuchi | 260 | 3 N. | Swift; streaks. |

## GEOGRAPHICAL NOTES.

THE French traveller, M. Thouar, who was believed to have perished on his way to the Gran Chaco, has returned to Port Pacheco with his companions. This news was lately sent from Buenos Ayres to Chuquisaca (Sucré).

IN the new number of *Appalachia* Mr. F. H. Chapin describes his ascent of a glacier on Mummy Mountain, Northern Colorado, lying directly north of Long's Peak, and in line with the centre of Estes Park. A single glance at the series of crevasses convinced Mr. Chapin that it was really a glacier, and not a mere accumulation of snow. To the same number Mr. S. H. Scudder contributes a paper on the White Mountains as a home for butterflies.

IN the paper contributed to the Berlin Geographical Society by Dr. H. Meyer on his ascent of Mount Kilimanjaro, he modifies his first statements as to the height which he attained; according to a statement of his companion, Dr. Meyer did not get within 2000 feet of the top.

IN the new Bulletin of the American Geographical Society will be found a useful paper by Mr. A. S. Packard, in which he brings together a *précis* of what was known of Labrador. Accompanying the paper is a good map, in which Mr. Packard has embodied information hitherto unpublished. Dr. Fr. Boas gives the results of his year's sojourn among the Eskimo.

IN the last number of the Proceedings of the Victoria Branch of the Australasian Geographical Society will be found a detailed account of Mr. Cuthbertson's expedition to explore the highlands of British New Guinea. The accompanying map gives a good idea of the nature of the country. Mount Obree was found to be only 8000 feet high, 2000 feet lower than previous estimates.

WE learn from the *Izvestia* of the East Siberian Branch of the Russian Geographical Society (vol. xvii. fasc. 1) that the vertical section of the Angara at its issue from Lake Baikal is 17,920 feet, and that the volume of water discharged from the great Siberian lake reaches 121,353 cubic feet per second. If this outflow were checked, the level of the lake would rise 7 feet in thirteen months.

DR. ROBERT SIEGER contributes to the Geographical Society of Vienna University a paper in which he discusses what information exists as to the changes of level in the African lakes. This shows clearly that for the last ten years at least these have been lowering in level, and, in the case of Tanganyika, to the extent of many feet. The changes which take place are almost entirely dependent on rainfall, and the probability is that there are periods of depression and periods of elevation. It is important that observations should be carried on both in African lakes and African rivers for a period sufficiently long to afford data numerous enough to warrant any conclusion to be drawn.

PROF. EUARD SÜSS, the able author of "Das Antlitz der Erde," recently read a paper to the Vienna Geological Society, on the history of the ocean, which is to some extent supplementary to that work. In this he points out that from the mouths of the Ganges all round the Pacific coasts of Asia and America to Cape Horn, the coasts are outlined by mountain-ranges which close in upon each other in great curves. From Cape Horn, again, all round the Atlantic and the Indian Oceans to the mouths of the Ganges, the coasts are unconnected with mountain-ranges, but are encircled by table-lands or broken mountain patches. We have thus, then, so far as the structure of the ocean basins is concerned, to distinguish between a Pacific and an Atlantic type. As regards the age of the oceans, Prof. Süss concludes from the geological formations that the Pacific is the oldest, next to that the Indian, and last of all the Atlantic. The oceans, he points out, are areas of depression. Each new depression would form a fresh receptacle for water, and so the shore-line of the land would be lowered. Prof. Süss seems to maintain that it is to this, and not to the actual rising of the land, that the elevation of the coast-line in certain regions is due.

MR. J. F. NEEDHAM has been engaged to conduct an expedition from Sadiya to the Hukeng Valley, and thence to Bhamo on the Upper Irrawady. His previous achievements in the Abor Hills, and the country lying between the Brahmaputra and the Zayal Chu, and his success in conciliating the unfriendly tribes on that frontier region, marked him out for selection as the proper officer to conduct the present mission.

THE new part (Nos. 133–34) of the *Zeitschrift* of the Berlin Geographical Society is mainly occupied with Dr. W. Sievers's account of the results of his exploration of the Sierra Nevada of Santa Marta in the north-east of the United States of Columbia, an excellent large-scale map accompanying the number. A considerable section of the paper deals with the geology of the region, after which Dr. Sievers treats of the surface formation, altitudes, climate, vegetation, and agriculture, the land-snails population.

NEWS from Victoria, in the Cameroons, states that the African traveller, Dr. Zintgraff, started for Rio del Rey in the steamer *Nachtigal*, accompanied by thirty porters. He is on his way to the Elephant Lake in order to establish a scientific station. The other half of the Expedition, under the command of Lieut. Zeuner, is to proceed up the Mungo River to Mundame, to reach the Elephant Lake from that part.

## OUR ELECTRICAL COLUMN.

IF a platinum plate be immersed in a porcelain or glass vessel containing dilute sulphuric acid, and another similar plate be immersed in another vessel containing caustic potash solution, then if the two vessels be connected by a siphon tube or a cotton wick, a current will be set up, but which rapidly diminishes owing to the polarization of the metal plates by the deposition of oxygen and hydrogen upon them. Becquerel removed the hydrogen by using nitric instead of sulphuric acid, and increased the current considerably. Dr. Alder Wright and Mr. C. Thomson (Royal Society, February 2, 1888) have been examining this form of battery, and have found many other acids which act in the same way, such as potassium permanganate, potassium bichromate, potassium ferricyanide, and bromine dissolved in sulphuric acid, ferric chloride, hydrochloric acid and chlorine. Moreover, they have removed the oxygen by using a concentrated solution of sodium hyposulphite made strongly alkaline with caustic soda, strong caustic soda with pyrogallol, cuprous chloride, ferrous sulphate, and ammonium chloride dissolved in ammonia. They also found the quantity of oxygen

and hydrogen evolved exactly proportional to the current passing. If a silver voltameter were included in the circuit, for every milligramme-equivalent (108 milligrammes) of silver deposited, 1 milligramme-equivalent of hydrogen occupying 11·2 cubic centimetres and 8 milligrammes of oxygen occupying 5·6 cubic centimetres at 0° C. and 760 millimetres, were liberated.

ALTHOUGH Sir William Thomson did not publish any electrical theoretical work in 1887, he perfected during that year his practical electrical measuring instruments. They are in use at the Grosvenor Gallery central station in London. There are no more beautiful or accurate instruments in the world, and they reach over an enormous range both of potential and of current measurement. They were admirably illustrated and described in *Industries* of January 27 by Prof. Fleming.

HERTZ (*Wiedemann Ann.* 1887), has shown that the ultra-violet rays have an influence on the passage of sparks. E. Wiedeman and H. Ebert have been repeating and verifying his experiments. The effect of light falling on the spark region was to lower the potential required to produce it. If a succession of sparks be sent, and a telephone be used, the effect of light falling on the sparks was to change not only the note but the whole character of the sound heard in the telephone. If a Geissler's tube were used, an intermittent and irregular discharge became steady and continuous. The effect was evident only on the negative pole.

IT is known that the magnetic qualities of iron diminish considerably when raised to 525° C. (red heat), but iron remains magnetic up to 650° C. Nickel loses its magnetic properties suddenly at 300° C. Lodeboer recently (January 9) read a paper before the Académie des Sciences, in which he showed that with magnetizing forces of 35, 100, and 200 C.G.S. units the iron retains its magnetic properties up to 680° C. ; that beyond this temperature it rapidly loses them ; that at 750° C. they scarcely exist, and at 770° C. they entirely disappear, to reappear only on cooling. It is known that the specific heat of iron undergoes a change of condition between 660° and 720° C., and the coincidence of these two changes is very interesting.

THE treatment of sewage by electricity is, it seems, likely to receive a practical test at the Metropolitan Board of Works' outfall at Crossness. Mr. Fewson, of Buckingham, made some experiments in this direction at Wimbledon last summer, and now Mr. W. Webster is about to do the same thing at one of the large tanks on the Thames. The electric current is said to have a wonderful disinfecting and purifying influence. The evolution of gas stirs up the liquid, the nascent oxygen is brought into rapid contact with the impurities and reduces them, precipitation is expedited, and the whole cleansed. It is to be hoped that the cost will not swamp this new and useful field for electricity.

THE extraordinary rise in the price of copper has attracted much attention to the use of iron for lightning conductors. Prof. Silvanus Thompson advocates iron in preference to copper under all circumstances. Iron is much used by the War Department to protect magazines. Dr. L. Weber recommends it even in a solid form rather than as a stranded rope, but the latter form is much more portable and workable ; moreover, Prof. Hughes showed it to be less subject to self-induction than a solid rod—an obstruction not to be neglected. Iron conductors are stronger, much cheaper, less easily fused, and less liable to theft than copper. There can be no objection to the use of iron.

THE electro-deposition of aluminium has attracted much attention since the introduction of the Cowles process. Herman Reinbold has proposed the following solution, with which he has obtained good but small results : alum 50 parts, water 300 parts, aluminium chloride 10 parts. This solution is heated to 200° F., and after cooling 39 parts of potassic chloride are added.

## *THE INSTITUTION OF MECHANICAL ENGINEERS.*

THIS Society held its forty-first annual general meeting in the theatre of the Institution of Civil Engineers on Thursday and Friday of last week. After the Annual Report had been presented and accepted, Mr. John Richards' paper "On Irrigating Machinery on the Pacific Coast" was read and discussed. The need of irrigation in this district arises from three causes : the lack of rain, which ceases altogether along the coast in summer-time ; the want of surface-water ; and the free percolation into the sandy soil beneath. The whole of the land in the country, excepting the low-lying sedimentary plains near the mouths of the rivers, and around the Bay of San Francisco, where water reaches the surface by capillary saturation, requires irrigation. Nearly all the land upon which water can be led, either by training small mountain streams, or by leading long canals from the rivers, has been occupied, so that the only remaining resource for getting water will be by lifting it from the rivers or the gravel strata by machinery. The paper is descriptive of the various pumps and hydraulic rams employed, and was illustrated by means of thirty-five figures.

Mr. William Geipel's paper "On the Position and Prospects of Electricity as applied to Engineering" refers to those branches of electric engineering which involve the employment of considerable power, and are in some way or other connected with the use of dynamos. They comprise electric transmission and distribution of power, and electric lighting, locomotion, and metallurgy.

In the author's opinion the transmission and distribution of power by electricity will occupy in the near future most of the attention of the electric engineer. Owing to its simplicity, the ease with which an electric motor can be applied to any purpose requiring power, and its high efficiency, it is certainly an approach to an ideally perfect system of transmission. In the United States great strides have been made in the applications of electric motors, which already rival those for lighting purposes. One of the great advantages of these applications is due to the low efficiency of belts and shafting where high speed is required and the demand for power is variable. By getting rid of shafting the necessity for additional stability in buildings is obviated, and constant lubrication is done away with. The distribution of power by electricity from a central station to small users can be effected from the same mains and generators as are used for electric light purposes ; as to whether gas through the medium of gas engines or electricity by means of electric motors should be used, will become entirely a question of economy and convenience. On the one hand the electric motor can be started and stopped with the greatest ease, it requires little attention, occupies little space, and can be placed anywhere, while against the use of the gas engine, the author brings forward its irregularity of speed owing to the intermittent impulse and the wear and tear in the valves and working parts. Shunt motors, which are now almost exclusively used, possess a practically perfect power of self-control, not only over their rate of speed with varying load, but over the energy absorbed, for they help themselves, as it were, to only such an amount of energy as will enable them to deal with the work imposed upon them. Another advantage in shunt motors, first pointed out by the late Sir William Siemens in 1880, is that they act as generators when themselves driven by any extraneous power, without any complication of the switch gear required with series motors. The author refers to various installations which have already taken place in Europe and America, which are paying their way, whilst at the Falls of Niagara plant is being put down to distribute power obtained from the Falls to neighbouring towns, including Buffalo, which is twenty miles distant ; the amount of power is stated at 15,000 h.p., of which 10,000 h.p. is contracted for at £3 per h.p.

Electricity has been applied with efficiency in collieries for underground hauling, pumping, ventilating, and drilling ; in ship-yards and similar works it has been proved to be a suitable and economical means of transmitting power for riveting, drilling, &c.

In its application to the transmission of power to great distances, electricity is found to be more economical than either hydraulic, pneumatic, or wire-rope transmission, and comparative tables are given showing the first cost of plant per horse-power transmitted, and also the working cost per horse-power transmitted per hour. For a distance of 22,000 yards the cost of installation for the transmission of 100 h.p. is £87, £310, £192, and £162 per h.p. for electric, hydraulic, pneumatic, and wire-rope transmission respectively ; whilst the cost per h.p. transmitted per hour is 4·08, 6·84, 4·50, and 9·73 pence.

Amongst many interesting applications, that made by the Marquis of Salisbury at Hatfield may be specially referred to. The River Lea is utilized to generate electricity by means of turbines, the electricity being transmitted to the house and over the estate for a variety of purposes. The motors at the house