observations made at Helwan, the first order station of Egypt. The size of this part has been considerably reduced by the omission of observations for every hour and the publication of the results in a more summarised form. This part also includes an important paper by Mr. H. E. Hurst on the reduction of the observations of terrestrial magnetism. (2) Climatological tables, including rainfall and river gauge observations. The chief features of the year were the heavy rainfall in April and October, and the high Nile flood, which began early and was about 15 per cent. above the normal; the rainfall was, however, deficient in Egypt generally. With regard to relative humidities, it is found that the values in the Sudan computed from Jelinek's tables (Leipzig, 1903) not uncommonly fall below 10 or even 5 per cent. As it seems improbable that the surface air is ever so dry as this, the validity of the tables in extreme conditions is under consideration. A first order station for the Sudan is in course of formation at the Gordon College, Khartoum.

IN a publication of the Egyptian Survey Department entitled "Magnetic Observations made during 1911 at the Khedivial Observatory, Helwan," particulars are given of the mean monthly and annual values of the magnetic elements at Helwan during 1911, and of the diurnal variations in declination and in horizontal and vertical intensity for each month and the year. Days of incomplete record and those of disturbance character "2," on the international scale, are omitted, the days actually utilised being 330 for declination, 317 for horizontal, and 291 for vertical intensity. Particulars are given of eight disturbances—occupying parts of thirteen days—in which the range of the horizontal intensity exceeded 0·001 C.G.S. The largest ranges observed were 0·00188 in horizontal intensity, 0·00044 in vertical intensity, and 11′ in declination.

WE have received from the publishers (Messrs. A. Hermann et Fils) an interesting tract by MM. C. Jordan and R. Fiedler on convex closed curves, and others connected with them. The topic was suggested by questions of probability, and we are occasionally reminded of the work of Crofton, one of the great authorities in this field. But probability is not actually treated here; the main part consists of tangential polar formulæ and discussion of derived curves such as pedals, parallel curves, &c. On p. 34 there is an interesting figure such as is often produced in a street by one wheel of a cart which has twice turned round. Each turn generally involves a slight backing, and then the trace of the inner wheel contains two adjacent cusps and an ordinary node. Various examples due to Euler, Kepler, Newton, &c., are given as illustrations.

A METHOD of detecting the presence of polarised light in the light from a sky obscured by thick clouds is described by Mr. A. E. Oxley in the July number of the Proceedings of the Cambridge Philosophical Society. It depends on the use of a Babinet compensator, with its principal direction set at 45° to that of the observing Nicol, and of a special rhomb in front of the compensator which allows part of the incident light to pass without change while it introduces a phase difference of $\pi/2$ into the remainder of the beam. When the edges of this rhomb are parallel to the principal direction of the Nicol, bands are seen in the field of view even when the amount of polarised light present is too small to produce colours in a selenite plate, and the apparatus also allows the mean plane of polarisation of the incident light to be ascertained.

IN the June number of the *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, M. A. Verneuil describes a form of muffle or crucible furnace suitable for laboratory work up to a temperature of 1600° C. If a crucible is to be heated, it is surrounded by a cylindrical block of refractory material which rests on a brick pillar and is provided with a lid which leaves openings for the escape of the burnt gas. The gas is introduced into the space between the crucible and its surrounding cylinder by a passage which is tangential to the inner surface of the cylinder at the point of entry. By this means the jet of gas and compressed air is given a spiral form and a higher temperature is attained, while the durability of the furnace is increased. The idea of the spiral flame seems worthy of general adoption in furnace design.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR SEPTEMBER:

SEPTEMBER	3.	13h. 57m. Saturn in conjunction with the Moon (Saturn 6° 20′ S.).
	7.	1h. 22m. Neptune in conjunction with the Moon (Neptune 5° 43′ S.).
	,,	16h. 0m. Mercury at greatest elongation W. of the Sun (17° 58′).
	8.	20h. 59m. Venus in conjunction with Mars (Venus 0° 30′ N.).
	9.	1h. 0m. Mercury in conjunction with α Leonis (Mercury 0° 5′ N.).
	,,	7h. 15m. Mercury in conjunction with the Moon (Mercury 3° 18′ S.).
	11.	21h. 43m. Mars in conjunction with the Moon (Mars 0° 4′ N.).
	12.	1h. 1m. Venus in conjunction with the Moon (Venus 0° 41′ N.).
	16.	3h. 0m. Saturn stationary.
	,,	13h. 33m. Jupiter in conjunction with the Moon (Jupiter 4° 54′ N.).
	20.	15h. 13m. Uranus in conjunction with the Moon (Uranus 4° 34′ N.).
	22.	22h. 9m. Sun enters Sign of Libra. Equinox.
	25.	23h. 45m. Moon eclipsed, invisible at Greenwich.
	30.	19h. 22m. Saturn in conjunction with the Moon (Saturn 6° 29′ S.).

THE VARIABILITY OF POLARIS.—The confirmation of the variability of the pole star, by the selenium photometer method, is announced by Mr. Joel Stebbins in No. 4596 of the *Astronomische Nachrichten*. He observed the star for light-changes in 1904 with a polarising photometer, but difficulties prevented a definite conclusion being arrived at for so small a variation as 0·10 mag. Again in 1910 he attempted to find the variability with the selenium photometer, but meeting with difficulty in the selection of a suitable comparison star, postponed the research.

In the meantime, Dr. Hertzsprung announced a variation of about 0·15 mag., determined from photographs; so Mr. Stebbins again took up the observation of Polaris, using β Ursæ Minoris as the comparison star. This is some 17° away, and, as the correction for differential absorption becomes too great if the altitudes are not nearly the same, the time of observation was unusually restricted. However, Mr. Stebbins secured measures on seventeen nights between March 4, 1911, and April 8, 1912, and from these he finds a variation of 0·078 mag., thus fully confirming Hertzsprung's result, for the two light-curves are practically in the same phase. The difference in amplitude is probably explained by the fact that Hertzsprung employed the actinic rays, whereas the selenium photometer utilises those on the red side of the visual region, and variables of this type (Cepheid) usually show greater variations photographically than they do visually.

A photographic comparison made at Harvard last year by Mr. King showed a variation of about 0·10 mag.

The comparison star, β Ursæ Minoris, used by Mr. Stebbins, has been described as a variable, but the results give no indication of change while it was under observation during this research.

THE SOLAR ECLIPSE OF APRIL 17.—Two interesting papers dealing with the solar eclipse of April last are published as abstracts from the *Astronomische Nachrichten* by Prof. Schorr and Dr. Graff.

In the former, Prof. Schorr describes the observations made at the Hamburg Observatory, and reproduces a number of the excellent photographs taken by the various instruments. In the latter, Dr. Graff describes in detail the profile of the moon's limb at the time of mid-eclipse. He tabulates the elevations and depressions for every 2° of the limb, and then shows them, exaggerated ten times, on a drawing. They are also shown and named on a set of altitude curves covering the entire limb. The important part played by the lunar profile during this eclipse gives an added interest and importance to these deductions.

γ GEMINORUM A SPECTROSCOPIC BINARY OF EXCEPTIONALLY LONG PERIOD.—From observations made at the Ottawa Observatory, combined with earlier observations made at other observatories, Mr. Harper has deduced elements for the orbit of the spectroscopic binary γ Geminorum. The period comes out at about 2175 days (nearly six years), so that the star is unique among binaries discovered spectroscopically in having so long a period. Betelgeuse, a star of a very much later type, possibly has a similar period, but definitive elements have not yet been derived for its orbit. The spectrum of γ Geminorum is of the Sirian type, and the periods for other spectroscopic binaries of this type range from a fraction of a day up to 100 days, so that the star may be looked upon as bridging the gulf between the periods of the longest spectroscopic and the shortest visual binary. (The Journal of the R.A.S. Canada, vol. vi., No. 3.)

THE HAMBURG OBSERVATORY.—With the reports for 1910 and 1911 of the work done at the Hamburg Observatory, Prof. Schorr issues a most interesting brochure containing photographs of the new buildings and instruments at Bergedorf, where the work of the observatory is now carried on. Among the instruments now erected is a large refractor, a 7½-in. meridian circle, and a reflector of 40 in. aperture and 10 ft. focal length; but, according to the 1911 report, the objective of the refractor is still unmounted. The reports show that observations of comets and planets, the time-service for various ports, and a new reduction of the Hamburg star catalogue are occupying the attention of the staff.

REGIONAL GEOLOGY IN EUROPE.

J. J. SEDERHOLM'S summary of the prequaternary rocks of Fennoscandia, with its admirable coloured geological map of Norway, Sweden, and Finland, is now issued in French as Bulletin 24 of the Commission géologique de Finlande. Under the director's active guidance, six further bulletins were published in 1911. V. Tanner has drawn a number of interesting conclusions from his discovery of brachiopods, resembling Kutorgina or Acrotreta, in dyke-like masses of sandstone filling cracks in granite in the Åland Islands, at the entry to the Gulf of Finland (Bull. 25, p. 10). These fossils are probably of Lower Cambrian age, and the cracks were opened, perhaps through earthquake action, in a surface of pre-Cambrian rocks which had been already worn down to a peneplane. It is urged that the present Fennoscandian peneplane, which includes the surface of the islands, represents only a small further degradation of that which was formed towards the close of pre-Cambrian times.

Bulletins 27 to 30 are extracted from the Atlas of Finland, published in 1910, and form an illustrated summary of the surface-forms and geology of the country, drawn up by the director. No. 27, "Esquisse hypsométrique de la Finlande," includes a new contoured map in colours, which shows how large a part of the country lies below 300 metres. The contours, though the scale of the map is 1 : 2,000,000, even bring out some of the eskers, such as the fine ridge of Kangasala on the road from Tavastehus to Tammerfors. A geological map on the same scale accompanies No. 28, on "Les roches préquaternaires de la Finlande," and the extent to which the country is covered by glacial deposits is shown by that in No. 29, on "Les dépôts quaternaires." Here the eskers, and the huge terminal moraines from Hangö to Joensuu, some 600 kilometres in length, stand out prominently in red, and show the form of the great ice-lobe and the course of its subglacial waters at the epoch when stagnation set in. In common with many Scandinavian geologists, Sederholm pictures the eskers as formed in the late glacial sea as the ice shrank back, the south-eastern end of each being thus older than that towards the Gulf of Bothnia. The sandy marginal moraines, running across the course of the ice-movement, are described as "oses marginales." The words "ose" and "oses" have been adopted for the more difficult *ås* and *asar* in Fennoscandian literature, whether written in French or English (p. 6).

Bulletin 30 takes a still wider field, and deals with "La géologie quaternaire et la géomorphologie de la Fennoscandia." The coloured maps show the extension of the Scandinavian ice-sheets, the isobases indicated by the present positions of raised beaches, and the lines of fracture traceable in the prequaternary relief. The block-structure of so much of the Fennoscandian surface, and notably of the Finnish lowland, is referred to fracturing and faulting during the Alpine epoch of unrest. The scarps along the sides of fjords or rivers are held to be more often due to earth-movement than to ordinary erosion, though eroding agents have, of course, acted along the lines of weakness thus produced. As we write, we recall a granite cliff on the farm of Eskola by the Kyminjoki, and Wilhelm Ramsay's exposition of it as we sat upon the grass above the river. The gift of these excellent summaries to geologists is a further reminder of the hospitality of Fennoscandian lands.

Visitors to Norway will profit by the description of the Bergen district by C. F. Kolderup and H. W. Monckton, written in connection with the excursion of the Geologists' Association in 1911 (Proc. Geol.