into sweet water, and even the *Astacus pachypus*, Rathke, of the mountain-lake Abrau, is a remainder of a maritime fauna; so also *Thelphusa*, which has gigantic representatives in the South Caspian. Certain crabs reach really gigantic size in the Ponto-Caspian region; such as *Eriphia spinifrons* and *Carcinus mænas* on the shores of Crimea and at Odessa. While most crabs reach a great development only in very salt and warm water, others reach the same size under the influence of reverse conditions. The Decapods of the Azov Sea have not yet been explored. The descriptions of the species and their varieties being given in Latin, as also the explanations to the plates, the work is rendered accessible to all zoologists, many of whom, however, will regret not to be able to understand the notes (mostly zoo-topographical, and sometimes adding minor details to the description), which are in Russian.

WE have received from the Johns Hopkins University the two last of the Studies on Historical and Political Science. One deals with land laws in mining districts, and describes the regulations for the use of land made by agreement among the miners themselves in the Western States. They show a return to primitive ideas, where use is made the proof of ownership, and equality in the size of the various lots is of prime importance. Mr. Shinn is the author of this number. The second, by the editor, Dr. Adams, describes the influence of the State of Maryland upon the land cessions of the United States, and is specially interesting for its references to Washington's project for devoting the present made to him by his native State, Virginia, to the establishment of a National University.

WITH the exception of a few pages, the whole of the last number (vol. vi. No. 4) of the *Boletin de la Academia Nacional de Ciencias* of Cordova (Argentine Republic) is occupied by a paper by M. Oscar Dœring on meteorological observations made by him at Cordova during 1883. These were a continuation of those made by him in 1882 on evaporation, and the various temperatures at six different depths. But for 1883 he has added other observations and arranged the tables as follows:—Atmospheric pressure, temperature of the air, the elastic force of the atmospheric vapour, relative humidity, evaporation in the shade and in the sun, temperature of the soil, solar radiation, storms, and rainfall. There is also a short paper on the observations of the German expedition to Bahia Blanca, to observe the transit of Venus.

THE additions to the Zoological Society's Gardens during the past week include two Wood Hares (*Lepus sylvaticus*) from North America, presented by Mr. F. J. Thompson; an Alexandrine Parrakeet (*Palæornis alexandri* ♀) from India, presented by Mr. W. Hay; a Common Magpie (*Pica rustica*), British, presented by Mr. H. Clare; a Slowworm (*Anguis fragilis*), British, presented by Mr. R. Gunter; a Short-tailed Wallaby (*Halmaturus brachyurus*) from Western Australia, deposited; two Brown Pelicans (*Pelecanus fuscus*) from the West Indies, purchased; an Isabelline Lynx (*Felis isabellina* ♂) from Tibet, received in exchange; two Spotted Ichneumons (*Herpestes nepalensis*) from Assam, received on approval.

OUR ASTRONOMICAL COLUMN

A COMET IN 1717.—In a note to the Royal Society (*Phil. Trans.*, No. 354) Halley reported that on Monday, June 10, 1717, in the evening, the sky being very serene and calm, he was desirous of examining Mars, then very near the earth, to ascertain whether in his 20-foot telescope he could distinguish the spot said to be seen upon his disk, and directing his telescope for that purpose he accidentally met with a small whitish appearance near the planet, which seemed to emit from its upper part a short kind of radiation, directed nearly towards the point opposite to the sun. The great light of the moon, then not far from full, and close at hand, hindered the object from being distinctly seen, but he determined its place to be nearly in 17° 12′ of Sagittarius with 4° 12′ south latitude. The position, he adds, would be more exactly found by means of two small stars near it, the more northerly of which had the same latitude and followed at the distance of about six minutes; the other was about four minutes south of the former, and followed it about a minute, "the angle at the northern star was somewhat obtuse, of about 100 degrees, and the distance of the nebula from it was sesquialteral to the distance of the two stars, or rather a little more." No motion being detected in over one hour, Halley doubted if it were a comet, but on June 15, the moon being down and the sky clear, he had a distinct view of the two stars, but there was no sign of the nebulosity where it had been observed on June 10. He was led by this circumstance to remark upon the number of comets which might escape notice, from their being telescopic objects, and adds that, although comets had been seen elsewhere in 1698, 1699, 1702, and 1707, he could not learn that any comet had been perceived in this country for the thirty-five years previous to the observation above described, which implies that none had been seen here since the year 1682, that of the appearance of the famous comet which bears Halley's name.

The small stars to which Halley refers would appear to be Nos. 16,627 and 16,631 in Oeltzen's Argelander.

THE VARIABLE STAR S CANCRI.—A minimum of this short-period variable being due during the night of February 20, Mr. Knott availed himself of a fine sky at Cuckfield to observe it as long as it was possible to do so. The watch commenced at 8h. 40m., and ended at 17h. 15m. At 9h. 23m. no change was noticeable, but soon after 9h. 30m. the star began to decline, and gradually fell from 8·1 to 10·4 mag., which point was reached about 15h. 30m. From that time till 17h. 15m. no certain change was detected, though at 17h. 15m. there was a suspicion of the star being possibly a trifle brighter. By this time it was 17h. past the meridian, and getting too low for observation. As it was not possible to follow the star till its advance on the rising curve, Mr. Knott was unable to fix the time of minimum with certainty, but considered the predicted time (16h. 22m.) was pretty correct. He remarks further that Prof. Schönfeld gives 8½h. as the time of decrease, and 13h. as that of increase. If this held for the minimum of February 20, and the decrease began at 9h. 30m., the minimum would not be reached before 18h., and the normal magnitude would not be attained before February 21, 8h. At 6h. 30m. on the latter date he doubted whether the star had recovered its normal brightness, but by 7h. or 7h. 30m. there seemed no doubt about it. Comparing the form of his curve with Prof. Schönfeld's, it appeared that on this occasion the star was longer in falling from 9·4 and 9·9 m. to the lowest point reached, than the observations of Prof. Schönfeld indicated; but Mr. Knott writes doubtfully upon this point, not having previously watched S Cancri through its changes. The next minimum may be expected on March 11, between 15h. and 16h. Greenwich time.

THE MELBOURNE OBSERVATORY.—We have received the nineteenth annual report of the Government Astronomer of Victoria to the Board of Visitors of the Melbourne Observatory. The new transit circle of 8 inches aperture, constructed for that establishment by Mr. Simms, was received in May last, and the mounting was completed early in July. At the time of drawing up the report (August, 1884) there were only wanting some steps and observing chairs, for the instrument to be brought into regular use. It is stated to be very similar in form and dimensions to the transit circles constructed by the same firm for the observatory at Cambridge and for that of Harvard College, U.S. The great reflector was in better condition than at the date of the previous report, nevertheless it is proposed to send the two specula, one after the other, to England, to be repolished. A number of stars selected by Prof. Auwers had been observed with the old transit circle, to assist in the formation of a fundamental catalogue of southern stars. Mr. Ellery mentions those of Herschel's nebulæ, which had been observed, and of which drawings had been made with the great telescope; the nebula of η Argûs, 30 Doradus, and the "Horseshoe" nebula are included in his list. Pons' comet was observed for position from January 6 to March 18. The completion of the telegraphic determination of Australian longitudes, it is reported, was only waiting a new series of exchanges between Sydney, Adelaide, and Melbourne; New Zealand had been connected with Sydney by a most successful set of time-exchanges through the cable. The connection of Brisbane

and Sydney was in progress, and, on this being completed, there would only remain to connect Western Australia, to have the longitudes of all the chief Australian and New Zealand cities and ports determined upon the same system.

Mr. Ellery recommends that a small expedition should be despatched from Melbourne to New Zealand for the observation of the total eclipse of the sun on September 9 in the present year, when the central line passes through Cook's Straits. Sir W. Jervois, the Governor of New Zealand, had promised all the aid he could render in the matter. The Board of Visitors supported an application to the Government of Victoria for the necessary funds. [Full details of the circumstances of this eclipse were given by Mr. Hind in the *Monthly Notices* of the Royal Astronomical Society for January last.]

ASTRONOMICAL PHENOMENA FOR THE WEEK, 1885, MARCH 8–14

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on March 8

Sun rises, 6h. 31m. ; souths, 12h. 10m. 51·6s. ; sets, 17h. 51m. ; decl. on meridian, 4° 42′ S. : Sidereal Time at Sunset, 4h. 57m.

Moon (at Last Quarter at 19h.) rises, 1h. 5m. ; souths, 5h. 40m. ; sets, 10h. 12m. ; decl. on meridian, 17° 25′ S.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on Meridian ° ′
Mercury ...	6 36 ...	11 56 ...	17 18 ...	8 22 S.
Venus ...	6 13 ...	11 18 ...	16 23 ...	11 26 S.
Mars ...	6 28 ...	11 52 ...	17 16 ...	7 44 S.
Jupiter ...	15 46 ...	22 58 ...	6 10* ...	13 8 N.
Saturn ...	9 56 ...	18 0 ...	2 5* ...	21 41 N.

* Indicates that the setting is that of the following nominal day.

Occultations of Stars by the Moon

March	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
10 ...	B.A.C. 6287 ...	6 ...	4 25 ...	5 38 ...	90 228
10 ...	B.A.C. 6292 ...	6 ...	5 6 ...	6 26 ...	54 280
11 ...	ρ' Sagittarii ...	4 ...	5 18 ...	6 38 ...	60 272

Phenomena of Jupiter's Satellites

March	h. m		March	h. m.	
8 ...	2 46	II. ecl. reap.	13 ...	0 27	I. occ. disap.
	6 12	IV. occ. disap.		3 14	I. ecl. reap.
9 ...	20 8	II. tr. egr.		19 1	III. tr. ing.
10 ...	5 23	III. occ. disap.		21 45	I. tr. ing.
11 ...	6 0	I. occ. disap.		22 39	III. tr. egr.
12 ...	3 19	I. tr. ing.	14 ...	0 5	I. tr. egr.
	5 38	I. tr. egr.		18 53	I. occ. disap.
				21 43	I. ecl. reap.

The Occultations of Stars and Phenomena of Jupiter's Satellites are such s are visible at Greenwich.

March 13, 19h.—Mercury in superior conjunction with the Sun.

RECENT ENGINEERING PATENTS[1]

SIR FREDERICK BRAMWELL stated that he had been determined in his choice of a subject by the consideration that H.R.H. the Prince of Wales had seen fit to appoint him chairman of the Executive Council of the International Inventions Exhibition, to be held at South Kensington this year. He therefore proposed to direct attention to some of those objects that ought to be contributed to that Exhibition which were more particularly connected with civil engineering.

Dealing, first, with materials of construction, the President remarked that probably few materials had been more generally useful to the civil engineer, in works which were not of metal, than Portland cement. During the last twenty-two years great improvements had been made in the grinding and in the quality of the cement. As regards bricks, although not now superior in quality to those made by the Romans, there was progress to be noted in the mode of manufacture and the materials employed. The brick-making machine and the Hofmann kiln had economised labour and fuel, while attempts were being made to utilise the waste of slate quarries. Certain artificial stones appeared at last to be produced with such a uniformity and power of endurance as to compare favourably with the best natural stone, or were even better, for they could be produced of the desired dimensions and shape, and were thus ready for use, without labour of preparation. The employment of wood, except in newly-developed countries, was decreasing, for one reason, because it was practically impossible so to use it as to obtain anything approaching to the full tensile strength. Many attempts had been made to render timber proof against rapid decay and ready ignition, and it was in these directions alone that progress could be looked for. With respect to preservation from fire, the wooden structures of the Health Exhibition were coated with asbestos paint, and to this their escope from destruction by a fire was due. Leaving the old-world materials of stone and wood, attention was directed to that form of iron known as steel. The President remarked that, in his judgment, the making of steel in crucibles was not so satisfactory a mode of obtaining uniformity in large masses as was either of the other two great systems of manufacture—the Bessemer and the Siemens—the two processes which had changed the whole complexion of the iron industry. He further said that, eight years ago, in a lecture he delivered at the Royal Institution, he had ventured to predict that steel made by fusion would supersede iron made by the puddling process, and that the use of iron so made would be restricted to the small articles produced by the village blacksmith. The first important revelation in steel manufacture was the ingots shown by Krupp, with other products, in the Great Exhibition of 1851. These showed an enormous step at the time when the production of steel involved the employment of the crucible. Within the last eight years a great improvement had been made by Messrs. Thomas and Gilchrist, by which it had been rendered possible to employ successfully, in the production of steel, iron derived from ores that, prior to the date of this invention, had been found wholly inapplicable for the purpose. In the manufacture of pig-iron improvement had been effected by increasing the dimensions of the furnaces and the temperature of the blast, by the better application of chemistry to the industry, by the total closing of the bottom of the furnace, and by the greater use of the waste gases. Copper, so long used in its alloyed condition of "gun-metal," had, within the last few years, been still further improved by alloying it with other substances so as to produce "phosphor-bronze" and "manganese-bronze," very useful materials to those engaged in the construction of machinery. With the increased dimensions of the main-shafts of engines, and of the solid forgings for the tubes of cannon, obtaining at the present day, composed, as they were, of steel, the operations of light steam-hammers were absolutely harmful, and the blows of even the heaviest hammers were not so efficacious as was pressure applied without blow. The time was not far distant when all steel in its molten state would be subjected to presusre, with the object of diminishing the size of any cavities containing imprisoned gases.

Within the period under consideration the employment of testing-machines had come into the daily practice of the engineer, for determining, experimentally, the various physical properties of materials—and of those materials when assembled into forms to resist strain, as in columns or in girders.

In those matters which might be said to involve the principles of engineering construction, there must of necessity be but little progress to note. Principles were generally very soon determined, and progress ensued, not by additions to the principles, but by improvement in the method of giving to those principles a practical shape, or by combining in one structure principles of construction which had hitherto been used apart.

Taking up, first, the subject of bridge construction—the President thought the St. Louis bridge might fairly be said to embody a principle, novel since 1862, that of employing for the arch ribs tubes composed of steel staves hooped together. Further, in suspension bridges, there had been introduced the light upper chain, from which were suspended the linked truss-rods, doing the actual work of supporting the load, the rods being maintained in straight lines, and without flexure at their joints due to their weight. In the East River Bridge at New York, the wire cables were not made as untwisted cables, and then hoisted into place, imposing severe strains upon many of the wires, but the individual wires were led over from side to side, each having

[1] Abstract of Presidential Address at the Institution of Civil Engineers, by Sir Frederick J. Bramwell, F.R.S., on January 13.