(Band lxx. p. 21), by Max Buchner, and in the folk-lore contained in P. Ehmann's paper on "Popular Notions in Japan," in the current volume of *Œsterreich. Monatsschr. für den Orient*, p. 58.

DR. F. SOSSET has published in the *Revue de l'Université de Bruxelles* (vol. i. p. 481) a painstaking account of weaving in Ancient Greece, and has employed various representations from Greek vases and other sources to illustrate the accounts given by the classical writers. Those who are interested in the development of the industrial arts should consult his memoir.

THE contemporaneity of Man with the Gigantic Fossil Sloth Megalonyx appears to be now established, Mr. H. C. Mercer having recently obtained distinct evidence on this point in the Big Bone Cave, Van Buren County, Tennessee. The full report, which will be published by the Archæological Department of the University of Pennsylvania, will be awaited with interest, as it should provide data towards the solution of the problem of the length of time man has existed in the New World.

THE British Museum possesses several very beautiful and valuable examples of Ancient Mexican mosaic work. These, together with examples in other European museums, have been figured and described by Mr. A. Oppel in *Globus* (Band lxx. p. 4). The most important material of these mosaics is turquoise; in none is it wanting, and on one shield in Vienna it is the only stone employed, tesseræ of shell (white, light red, and purple-red), nacre, malachite, gold, obsidian, and other materials are also employed. The masks, head-dresses, shields, and other objects which were decorated in this sumptuous manner, were evidently employed in the ancient religious ceremonies.

UNDER the title of "Common Sense in Chess," an abstract of twelve lectures delivered by Mr. Lasker in London last year, has been published by Messrs. Bellairs and Co. As an exposition of the methods of this brilliant player, this pamphlet will be read with much interest, more especially since, instead of the exhaustive variations of the openings customary in works of this class, an attempt is made to base the conduct of the game upon a few simple general principles. These principles are advanced in the opening chapter as empirical rules, to which the games worked out in the subsequent chapters supply the proof.

WE are glad to be able to report a considerable step in advance made by the Observatory at Athens by the publication, from the 4th ult., of a daily weather report containing twenty-five stations in Greece, and about double that number of exterior stations. The report is accompanied by two charts, one showing the isobars and general meteorological conditions at 8 a.m. over a large part of Europe, and one showing wind and temperature over Greece and adjacent islands. Observations have been made regularly at the Athens Observatory since 1858, some of which have been published and discussed; but we are not aware that the issue of synchronous charts, in the form adopted by other countries, has been before attempted.

THE additions to the Zoological Society's Gardens during the past week include a Squirrel Monkey (*Chrysothrix sciurea*) from Guiana, presented by Mrs. Turner-Turner; a Huanaco (*Lama huanacos*, ♂) from Bolivia, presented by Mr. J. F. Schwann; a Passerine Owl (*Glaucidium passerinum*), European, presented by Miss Bloxam; four Rough-keeled Snakes (*Dasypeltis scabra*), a Lineated Boodon (*Boodon lineatus*), a Rhomb-marked Snake (*Psammophylax rhombeatus*), a Delaland's Lizard (*Nucras delalandii*) from South Africa, presented by Mr. Frederick A. Story; an Agile Wallaby (*Halmaturus agilis*, ♀) from Australia, an Indian Python (*Python molurus*) from India, seven Peruvian Snakes (*Tachymenis peruviana*), nine —— Lizards (*Liolæmus* sp. inc.), five Gay's Frogs (*Calyplocephalus gayi*), six Bibron's Frogs (*Paludicola bibroni*) from Chili, deposited; a Brazza's Monkey (*Cercopithecus brazzæ*, ♀) from French Congoland, a Tayra (*Galictis barbara*) from South America, a Patagonian Conure (*Conurus patagonus*) from La Plata, purchased.

IN our report of the celebration of the Kelvin jubilee, on p. 177 of our issue of June 25, Prof. Cleveland Abbe was inadvertently credited with being the "head of the Meteorological Office, Washington." To prevent misapprehension, it may be desirable to state that the responsible position of Chief of the U.S. Weather Bureau is actually filled by Prof. Willis L. Moore.

OUR ASTRONOMICAL COLUMN.

DOUBLE STAR ORBITS.—In the *Astronomical Journal*, No. 378, Dr. See gives the complete list of the various double star orbits that he has computed and published in various journals. This is a useful compilation, and testifies to a considerable amount of industry, and exhibits his great interest in the subject. The "probable uncertainty" which he has attached to some of the elements is, however, very different from "the probable error," which is an arithmetical result, and has a definite meaning. The "limits of uncertainty" attached to the period and excentricity, give Dr. See's estimate of the degree of success with which he has handled incorrect and inadequate measures. Almost simultaneously with the appearance of Dr. See's paper comes, in *Ast. Nach.*, No. 3364, Dr. Doberck's results of his investigation of the orbit of γ Virginis, and it is scarcely necessary to remark, that he has had under review precisely the same observations that Dr. See has used. If Dr. Doberck is able to add one or two more recent observations, they have been made at a time when the companion is near aphelion, and have little influence on the orbit. Nevertheless, the period and excentricity differ more from the values that Dr. See has obtained than his assigned values of uncertainty. If, then, the treatment of the same observations, by experts in this class of computation, lead to sensibly different orbits, it is to be feared that new material, arising from the continued observation of stars that have been much less frequently measured than γ Virginis, will lead to still wider discrepancies.

ROTATION PERIOD OF JUPITER.—The movements of the various spots, &c., on the surface of Jupiter have been employed since the time of Schrœter (1787) for observing the period of rotation of the planet. During the last opposition two very marked spots have been specially persistent, and by means of one of them, the "Garnet" spot, Prof. A. A. Rambaut has made a new determination of the period (*Scien. Proc. Roy. Dublin Soc.*, vol. viii. p. 389). All the values hitherto found have demonstrated that the various parts of the surface rotate at different speeds, so this new value simply refers to the zone in which the spot is situated. This is the one having a zenographical latitude of $+13°$, the previously accepted period of which was 9h. 55m. 33·9s. The time was measured by taking the intervals between the transits of the spot over the fixed wire of the micrometer on the "South" equatorial. The time of central transit was taken as the mean of the preceding contact, bisection, and following contact of the spot. Corrections were applied for three sources of error which affect the result, viz.: (1) *Parallax*, (2) *velocity of light*, (3) *phase*. The final value of the rotation of this spot is 9h. 55m. 33·36 ± 0·53s., which agrees within one-fifth of a second with Schrœter's value.

TELLURIC LINES.—Prof. Ricco has been investigating the relative behaviour of the chief atmospheric lines of the solar spectrum under various observing conditions (*Mem. del Soc. Spettroscopisti Italiani*, vol. xxv. pp. 127–134, 1896). The lines particularly under discussion were 6868 (β), 6517, 6278 (α), 5943 (rainband), and 5800 (δ). Observing the spectrum with a direct vision spectroscope, the relative intensities of these lines were measured in three districts, Etna, Nicolosi, and Catania, with the sun at varying altitudes at each station. From the measured altitudes, the thickness of the absorbing stratum of air traversed was calculated for each observation. The tension of the aqueous vapour in the air was also recorded at the time each line was measured. On plotting the results graphically, and summing up the measures at each station, the general con-

clusion is that the intensities of all the lines were nearly proportional to the mass of air traversed. The lines 6868 (β), 6517, 6278 (α), and 5800 (δ) were practically of the same intensity, for equal masses of air, at all the three observing stations, showing that the presence of water-vapour had little or no influence on them, and indicating that their origin was most probably atmospheric oxygen. The *rain-band* line (5943), however, has, for equal masses of air, a much less (about one-third) intensity at Etna than at the other two stations. The mean vapour tensions at the three places, Etna, Nicolosi, and Catania, were as 3 : 7 : 10, so that this line 5943 is evidently due to aqueous vapour. The fact that when the observations are plotted the curves pass through or near the origin, indicates that the atmospheric oxygen and water-vapour are the sole causes of these telluric lines.

EXPLANATION OF SOLAR PHENOMENA.—In the June number of the *Astro Physical Journal*, J. Fényi discusses several new explanations of the various features of the solar surface, emphasising several physical facts, hitherto neglected, the consideration of which simplify the conception of the causes of the solar phenomena. He assumes that the prominences are masses of real matter in violent motion, and also that they are ejected into *free space*. The crucial point of his argument is that when a mass of hydrogen, say, is projected from the photosphere, and has passed through the chromosphere into free space, it is not diffused immediately, but takes a certain time, termed the *expansion interval*, which varies *directly* as the diameter of the mass, and is *inversely* proportional to the square root of the absolute temperature. By following out in detail the phenomena of eruptive prominences, he explains them all on this view, especially their unusual brightness and rapid dissolution. The *white* prominences he accounts for as being the expanded gaseous portions of former ordinary prominences, rendered visible by reflected sunlight. The *corona* he regards as being due to more distant masses of these gaseous materials, primarily ejected as prominences, the enormous length of some coronal streamers being no difficulty if they are admitted to be projected in free space. *Faculæ* will then be produced by these gaseous matters falling down on the photosphere again, their superior brightness being due to the heat generated during their fall, together with the actual radiation received from the sun itself. Their prevalence in sun-spot zones is explained if they are the consequence of eruptive prominences, which themselves favour these zones. This dispenses with the view that faculæ are projected prominences, and regards them as the *result* of prominence action. The much-disputed question of the reason of distorted spectral lines in prominences is greatly simplified by this explanation. If a mass of ascending gas as a prominence encounters a descending mass from a previous eruption, the resultant motion will in general be tangential to the solar surface, and will be capable of producing the enormous velocities in the line of sight which have been measured in prominence spectra, and which could not be explained as being the result of mere explosions from the photosphere.

NEW FORM OF APPARATUS FOR THE PRODUCTION OF RÖNTGEN RAYS.

SOME time in the month of March this year, after working with various forms of tubes, it occurred to the writer to abolish the glass vessel by converting the ordinary concave kathode into a nearly complete sphere, with the platinum anode at its centre. A simple experiment with a Jackson bulb proved that the rays from the anode could pass through the material of the kathode as they would through a similar piece of unelectrified aluminium placed outside the bulb. Hence it became fairly evident at the outset that the proposed plan would work to some extent.

Under the guidance of Prof. Lodge, and in his research laboratory, experiments were commenced. The first arrangement was a simple one. The sphere was made in two halves, one half of copper and the other of aluminium. The two halves were joined together with marine glue only. The anode was held in position by ebonite fixed in the copper hemisphere. A section of this simple arrangement is shown in Fig. 1. The section is drawn to scale, the diameter of the sphere being 2 inches. This early apparatus showed signs of success, and it was decided to invest in a larger sphere—one of 3½ inches in diameter. The joints were now made much more carefully, and the apparatus so designed that it could be fitted together or taken to pieces in half an hour's time. The hemispheres of copper and aluminium were soldered together, but the joints (A and B, Fig. 1) were made by compressing indiarubber washers by means of suitably made screws. With this convenient apparatus the behaviour of various sizes and shapes of anodes was observed. In all the experiments a small thick plate of platinum, having a plane surface of about ¼ square inch, was reserved for that portion of the anode which received the kathode rays; the remainder of the anode was sometimes of aluminium and sometimes of copper. The various forms tried are shown in Figs. 2 to 8.

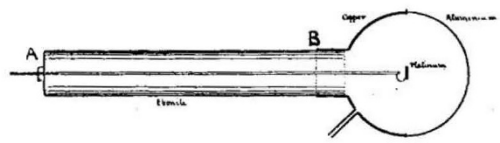
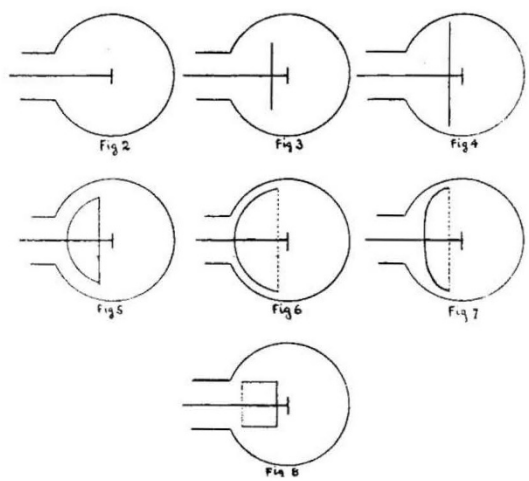


Fig 1

In Fig. 2 we have the simplest possible anode—the platinum plate alone. It is the same arrangement as that of Fig. 1, the only difference being that of dimensions. This form possessed an enormous resistance, so that only with low vacua could a current be made to pass through. For this reason the behaviour of this form was unsteady and its periods of activity very short. With higher vacua and greater potentials, no doubt this form would be more successful. Another form tried was that shown in Fig. 3. The anode here was very considerably enlarged by placing a circular plate of metal just behind the platinum, at a place where no kathode rays could fall on it. By this means the area of the anode surface was increased sixteen-fold approximately. The resistance was thereby much reduced, and it became possible to work at higher vacua. This form gave a more powerful and a considerably more uniform radiation than that of its predecessor.



The next step was to increase still further the area of the anode (see Fig. 4). The anode now nearly filled the sphere. The result, however, was not so good, tending to show that the best size of anode is something less than Fig. 4, and greater than Fig. 2; but Prof. Lodge thinks that this is a question of the particular vacuum employed. Another differently-shaped anode was next tried. This was formed of a metallic hemisphere with a flat plate in front of it (see Fig. 5). The idea was to get all, or nearly all, of the electric discharge, and so possibly most of the kathode radiation also, to take place between the outer aluminium hemisphere and the anode. The idea probably is a crooked one; anyhow, this form proved less successful than others. The plate was next removed, and the hemisphere was replaced by a larger one, as in Fig. 6. For some unknown reason this form gave no radiation whatever, although the