These additions have enlarged the book from 132 to 181 pages, and have correspondingly increased its value. It would be difficult to find an elementary class-book of commercial geography constructed on better lines, or in which the information is more concisely and accurately stated.

THE additions to the Zoological Society's Gardens during the past week include a Spotted Owl (*Athene brama*), four Grey Francolins (*Francolinus ponticerianus*), three Rain Quails *Coturnix coromandelica*), an Indian House Sparrow (*Passer domesticus*), two Red-headed Buntings (*Emberiza luteola*), two Nutmeg Finches (*Munia rubro-nigra*), a Spotted Turtle Dove (*Turtur meena*) from India, presented by Mr. E. W. Harper, a West African Love Bird (*Agapornis pullaria*) from West Africa, presented by Mrs. Robinson; a Reticulated Python (*Python reticulatus*) from Malacca, presented by Mr. Sigismund Bruzaud; an American Black Bear (*Ursus americanus*, var. *cinnamonea*) from the Rocky Mountains, two Common Cassowaries (*Casuarius galeatus*) from India, a Red-vented Parrot (*Pionus menstruus*), two Orange-flanked Parrakeets (*Brotogerys pyrrhopterus*) from South America, a Scops Owl (*Scops* ——) from Formosa, deposited; a Short-billed Toucan (*Ramphastos brevicarinatus*) from Central America, received in exchange.

OUR ASTRONOMICAL COLUMN.

MOTION AND MAGNITUDE.—Students of elementary astronomy often believe that stellar motions in the line of sight soon produce changes in the magnitudes of stars. Motion towards the earth involves, of course, a certain increase of magnitude, and a motion of recession must carry with it a decrease, but the amount in the case of a star is far too small to be measurable, even if the magnitudes are observed during many generations. At the meeting of the Amsterdam Academy on November 24, Prof. Oudemans communicated the results of an investigation to determine exactly how long stars of which the velocity in the line of sight are known would have to go on moving, in order to produce a change of 0·1 magnitude. From his own list of parallaxes in vol. 122 of the *Astr. Nachrichten*, and Vogel and Scheiner's list of proper motions in the line of sight ("Potsdam Observations," vii. i. p. 153, 154), fourteen stars were selected, four of them receding from, and the remaining ten approaching, the solar system. Adopting a solar parallax = 8″·815, and the logarithm of the proportion of the increase of brilliancy for one magnitude = 0·400, he found that the period required is given by the formula

$$\frac{6195}{\text{parallax} \times \text{motion}}$$ years for stars that are receding from, and $$\frac{5916}{\text{parallax} \times \text{motion}}$$ years for those that are approaching to the solar system; the parallax being expressed in seconds, and the motion in geographical miles (1 geographical mile = 4·61 English miles). Aldebaran proved to be the only star of which the brightness could, since Ptolemy's time, have experienced a loss of 0·1 magnitude by its radial motion, provided that the parallax 0″·52, found by Otto Struve, is trustworthy. Elkin found a value = 0″·12, and adopting this value, the period becomes 4⅓ times longer. For the other stars the result was 5500 years at least for Procyon; while most of them gave tenthousands of years as the result.

THE RECENT TRANSIT OF MERCURY.—Details of several of the American observations are published in *Astronomical Journal*, No. 330. At most of the stations, some of the contacts could not be observed on account of clouds, but, on the whole, a fair amount of success attended the observers. Prof. Young observed the first and second contacts, and reports that there was a sort of "hardening" of the sun's limb close to the expected point of first contact a few seconds before the actual contact took place; he has now observed this phenomenon four times, and states that "it may be due to the planet's obscurvation of the brightest part of the chromosphere close to the disc of the sun, or to some diffraction effect at the limb of the planet." A large "black drop" was observed two seconds before the second contact. Prof. Todd failed to observe the contacts on account of unfavourable weather, but obtained some results during the passage across the disc. He says:—"The planet appeared perfectly circular, sharply defined about the limb, unattended by any halo or atmospheric ring, and of the same colour as the umbræ of the spots on the sun. No attendant satellite of Mercury was seen, nor could any bright spot be discerned upon the centre of the disc, although intently looked for. Any satellite smaller than 100 miles would have escaped detection."

THE NEW ACHROMATIC OBJECT-GLASS.—*Engineering* for November 23 and 30 contains a full account of a fine 12½ inch equatorial that has just been built by Messrs. Thomas Cooke and Sons, York, for the new observatory at Rio de Janeiro, together with a sketch of the Buckingham Works at York. The description is accompanied with twenty-nine detailed drawings of the instrument. It appears that the works are the only ones in this country where every part of a modern astronomical telescope is constructed; with the exception of the actual making of the glass, everything is done on the premises, even the heavy cast-iron pillars being made in the firm's own foundry. The new instrument, with Messrs. Cooke's standard form of equatorial mounting for large refracting telescopes, is fully equipped for all branches of astronomical research. The clock, too, has all the latest improvements for adjustment. The object-glass is of the three lens form, invented by Mr. Taylor, who deserves the thanks of astronomers for producing an objective which, whilst made of durable kinds of glass, and of moderate focal length, is perfectly achromatic. How this end is attained was described in these columns on March 15 (vol. xlix. p. 464). A section of the lens is shown in Fig. 1. The first, L_1, is made of baryta light flint, having a refractive index of 1·5637 for the D ray, and its reciprocal of dispersive power is 50·6. The second lens, L_2, is made of a new glass known as boro-silicate flint. This glass has a refractive index of 1·54685 for the D ray, and the reciprocal of its dispersive power is 50·2. The third lens, L_3, is made of light silicate crown glass having the following characteristics: refractive index for D ray, 1·5109; reciprocal of dispersive power 60·4. By suitably proportioning the various radii of the lenses, the middle negative lens may be made to almost exactly compensate for the dispersion effected by the other two, and this without necessitating any exceptionally great focal length. If necessary this may be made so small as fifteen times the aperture, and there is no difficulty whatever in making a glass with a focal length of eighteen apertures. A small space is provided between the second and third lens, the object of this being to make the correction for spherical aberration as complete as possible; and when the thickness of this space is properly proportioned, there is an entire absence of spherical aberration for all colours of the spectrum. Object-glasses made on this plan have been tested by astronomers for visual and photographic observations. In both cases the stellar images showed no indications of residual colour, the lenses behaving just like the mirror of a reflector.

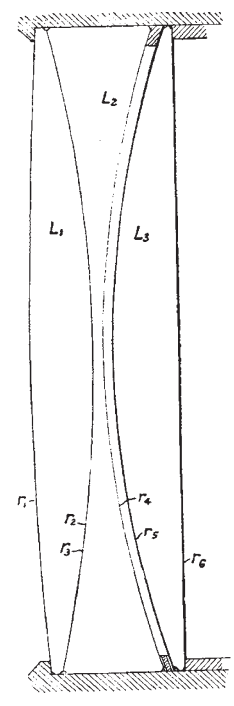

FIG. 1.—Section of the New Object-glass.

EPHEMERIS FOR SWIFT'S COMET.—The surmise noted in these columns last week has proved to be correct. M. Schulhof shows pretty conclusively, in the current *Comptes-rendus*, that Swift's new comet is really identical with De Vico's comet 1844 I. The subjoined ephemeris is from one given by Prof. Lamp in the *Astronomische Nachrichten*, No. 3266.

Ephemeris for Berlin Midnight.

1894.	R.A. (app.) h. m. s.	Decl. (app.) °	Brightness.
Dec. 13 ...	23 21 36 ...	−5 33·9	
,, 15 ...	26 46 ...	4 55·7 ...	0·53
,, 17 ...	31 52 ...	4 17·9	
,, 19 ...	36 54 ...	3 40·5 ...	0·48
,, 21 ...	41 53 ...	3 3·5	
,, 23 ...	23 46 48 ...	−2 26·9 ...	0·43

The brightness of the comet on November 21 has been taken as unity.

A NEW STAR?—The Rev. T. E. Espin has announced that a very red star of the eighth magnitude, not in the Bonn Durchmusterung, was found by him on November 29, in R.A. 17h. 54·3m. Decl. + 58° 14′. The spectrum belongs to Secchi's Type IV.

PROF. VICTOR MEYER'S NEW METHOD OF DETERMINING HIGH MELTING POINTS.

A DESCRIPTION of improved apparatus for the determination of high melting points, by his admirable new method, is contributed to the current *Berichte* by Prof. Victor Meyer, in conjunction with his students Messrs. Riddle and Lamb. The simplicity of the method will doubtless cause it to take rank immediately among the standard processes for the determination of physical constants, and alongside the universally popular method of determining vapour densities, which we likewise owe to the distinguished Heidelberg professor. Naturally, however, operations at temperatures higher than those at which the hardest varieties of glass soften, must perforce be conducted in apparatus constructed of platinum, just as in the cases of the determinations of vapour density at the same high temperatures. One of the main advantages of the method is that it only necessitates the use of a very small quantity of the substance whose melting point is to be determined, thus enabling it to be extended to compounds of the most extreme rarity.

The method is based upon the principle of measuring the temperature by means of a miniature air thermometer constructed of platinum, the air contained in which is expelled, at the moment when the fusion of the substance under investigation occurs, by means of a soluble gas into a gas-measuring vessel filled with a liquid capable of dissolving the expelling gas. The substance whose melting point is to be determined is placed in a small and very narrow platinum tube, which is fixed to the bulb of the air thermometer during the operation, and both are immersed in a bath of a fused salt whose melting point is considerably below that of the substance under investigation. Hence the operation of determining a high melting point by this method is perfectly analogous to that usually adopted in determining ordinary melting points lower than the temperature of boiling mercury.

The air thermometer is simplicity itself. It consists of a spherical platinum bulb of about 25 c.c. capacity, from which rise parallel to each other two relatively long capillary tubes, also of platinum. One of the tubes passes down into the interior of the sphere, almost touching the opposite inner surface, while the other only just pierces the envelope. Both are bent at right angles at their upper extremities, in opposite directions. In order to eliminate all errors due to the capillary tubes a compensator is also employed, consisting of a long capillary U-tube of the same bore and bent at right angles at the extremities, so as to form an exact counterpart of the capillary portion of the air thermometer. The small tube containing the substance is firmly fixed by means of stout platinum wire so that its lower portion is in close contact with the sphere; the walls of the tube are of the same thickness as those of the sphere. The salt employed for the purposes of a bath is contained in a capacious platinum crucible, supported over a table furnace in a miniature basket of platinum gauze. One of the capillary tubes of the air thermometer is ready to be connected with an apparatus for generating pure carbon dioxide, and the other is attached to a gas-measuring burette similar to the well-known Schiff nitrogen apparatus, but somewhat narrower, and surrounded by the outer tube of a Liebig's condenser, through which a stream of cold water is continually passed. This arrangement enables the air to be collected and measured in the proximity of the furnace. The measuring burette is filled with a concentrated solution of caustic potash. The temperature of the water-jacket is measured by a thermometer immersed in a small accessory reservoir, through which the water passes immediately after leaving the jacket. A very simple device has been adopted for determining the exact moment when fusion occurs. Before the experiment the little test-tube is heated until the substance melts; a fine platinum wire, furnished with a thickened end, is then inserted in it, and allowed to become fixed by the solidification of the substance. The fine wire is then passed over a pulley some distance overhead, and the free depending end is attached to a weight; just below the weight a bell is hung.

When everything is ready for the actual operation of determining a melting point, the salt in the crucible is fused, the lower part of the air thermometer and its attached substance-tube are inserted in the bath of liquid, as is likewise the compensator, connection with the measuring burette is made, and the carbon dioxide apparatus is arranged to be delivering the pure gas. When the temperature of the bath at length attains that of the melting point of the substance, the portion of the latter in immediate contact with the walls of the platinum tube fuses, and instantly the wire is released, and the weight falls and strikes the bell. The moment the sound is heard, connection with the carbon dioxide apparatus is established, and the air contained in the thermometer is displaced and driven into the measuring burette. The compensator is similarly treated, and the quantity of air which it contained deducted from that contained in the thermometer. From the resulting volume, together with the knowledge previously obtained concerning the capacity of the thermometer and compensator and the known expansion of air, the melting point is obtained by a very simple calculation.

Four groups of interesting results have already been obtained by use of the new method, indicating the dependence of the melting point upon atomic weight. They are as follows:

Salt.	Melting point.	Salt.	Melting point.
Potassium chloride	800·0	Potassium iodide	684·7
Potassium bromide	722·0	Rubidium iodide	641·5
Potassium iodide	684·7	Cæsium iodide	621·0
Sodium chloride	815·4	Calcium chloride	806·4
Sodium bromide	757·7	Strontium chloride	832·0
Sodium iodide	661·4	Barium chloride	921·8

It will be observed that in the halogen salts of both sodium and potassium a diminution of melting point accompanies a rise in the atomic weight of the halogen; also that a lowering of the melting point accompanies a rise in the weight of the metallic atom in the case of the iodides of the alkali metals potassium, rubidium, and cæsium, while the reverse occurs with respect to the chlorides of the alkaline earthy metals calcium, strontium, and barium. Whether there is rise or fall of the melting point with ascending atomic weight, however, the salt of intermediate molecular weight invariably exhibits an intermediate melting point.

A. E. TUTTON.

SCIENCE IN THE MAGAZINES.

THERE are very few articles on purely scientific subjects in the magazines received by us this month. Apparently the magazine-reading public thinks a scientific pabulum unsuitable for Christmas reading; or is it that men of science are too deeply engrossed in their researches to cultivate the art of writing interestingly upon the wonders of nature? Literary men frequently play fast and loose with natural phenomena and laws, and are often pilloried for doing so; but, on the other hand, many men of science do not pay due regard to the literary polish which is essential to an attractive style.

The first number of the *Fortnightly* under the new editor, Mr. W. L. Courtenay, contains two articles of interest to our readers, one on "A True University of London," by Mr. Montague Crackenthorpe, and the other on "The Spread of Diphtheria," by Dr. Robson Roose. Mr. Crackenthorpe deals broadly with the whole question of the expediency of establishing in London a University which shall teach as well as examine. He defines the work of a true metropolitan University as follows: (1) To do the work of the higher teaching by its own professorial staff, and to superintend and aid its being done by other educational agencies in the metropolis. (2) To examine and to