Break-circuit Chronometers.

GENTLEMEN,—

Will you kindly permit me to correct a slight error of statement which appears on page 55 of your January number, just received?

Col. Tupman is mistaken in supposing that the three break-circuit chronometers recently constructed by Dent are the first instruments of the sort ever made in England. Parkinson and Frodsham fitted up one for me in 1877, and in 1878 I had it in use at our eclipse station near Denver, where our guest Mr. Ranyard, and, I presume, several other English astronomers, who at various times visited our camp, must have seen it.

At that time, however, break-circuit chronometers had ceased to be a novelty in the United States. In 1872 the Coast Survey Observers had two of them in the outfit of our "Sherman Expedition;" and in 1874 all eight of the American Transit of Venus parties were supplied with them. I think the first was made by Bond & Co. of Boston, in 1870 or 1871; but Negus of N.Y., and other makers, at once followed suit. They have been in common use here for more than 12 years, and have quite supplanted clocks in all field astronomy and in many small observatories.

Princeton, N.J.,
1887, Jan. 18.

Yours very truly,
C. A. YOUNG.

NOTES.

THE SIX INNER SATELLITES OF SATURN.—Prof. Asaph Hall continues in Appendix I. to the volume of Washington Observations for 1883 the important series of studies he has been making during the last several years on the orbits of the satellites of the outer planets. The present memoir is concerned with the six inner satellites of Saturn, Prof. Hall's leading purpose having been to determine, if possible, the motions of the perisaturnia, since if these could be accurately observed, the mass of the ring could be found, Bessel's determination of the mass of the ring from the motion of the perisaturnium of Titan being unsatisfactory, since the influence of the figure of Saturn was neglected. The observations of the satellites here discussed were made by Profs. Newcomb and Hall with the great Washington reflector in 1874 and the following years. For Rhea, Dione, and Tethys the observed places have been compared with places computed from the orbits found by Dr. W. Meyer and corrections to his elements have been deduced therefrom. The result of the comparison shows that the orbits of all three satellites have practically no eccentricity, whilst circular orbits also satisfy the observations of Mimas and Enceladus within the limits of probable error. The five inner

satellites of Saturn therefore move in orbits which are sensibly circular—a remarkable result which, of course, sets aside all consideration of the motion of their lines of apsides. Prof. Hall, however, draws attention to the fact that the observations at his disposal are not sufficiently accurate to afford the means of determining the eccentricity for the three inner satellites. Some more exact means of observation than that offered by the filar micrometer is needed; perhaps observations of the conjunctions of the satellites with the ends of the ring, the Cassinian division, and the sides of the ball might prove more effective.

Prof. Hall has computed the mass of Saturn from the elements found for the four outer of the six satellites observed, and obtains the following mean result:—$M=\frac{1}{3478\cdot7\pm1\cdot10}$, closely agreeing with Dr. Meyer's value, $M=\frac{1}{3482\cdot93\pm5\cdot50}$.

The five inner satellites move in the plane of the ring; or, at least, so nearly that they may be assumed to do so in all calculations of their motions. It is therefore easy to supply tables of their motions, and Prof. Hall furnishes them at the end of his paper, together with the elements of the ring for the period 1875–1950.

Total Solar Eclipse of 1886, August 29.—At the meeting of the Royal Society on 1886 Dec. 16, a preliminary account, by Capt. Darwin, of the observations of the eclipse of the Sun at Grenada in last August, was read. The principal interest of this communication relates to the results Capt. Darwin obtained with the coronagraph, a reflecting telescope arranged like that employed by Dr. Huggins for obtaining photographs of the corona at other times than during eclipses. The practicability of this method was to be tested in two ways—1st. By comparing photographs taken before or after the eclipse with photographs of the corona taken during totality, a similarity of form indicating that the corona had been photographed. No such similarity between the haloes on the plates exposed in full sunshine (of which a considerable number were taken on Aug. 28) and the true corona has yet been traced. 2nd. To take photographs during the partial phase; then, if the light of the corona produces any effect on the plate, the limb of the Moon should be visible against it. None of the plates taken during the partial phase show the Moon eclipsing the corona, and many show what is unmistakably a "false corona," *i. e.* an increase of density *in front of* the Moon. The results, therefore, are adverse to the possibility of obtaining photographs of the corona in sunlight; but Capt. Darwin does not consider that the method is yet proved to be impossible. The trial was not conclusive, because the conditions were very unfavourable. In order to reduce the air-glare to a minimum, the air should be clear and dry, the Sun near the zenith, and the station at a considerable elevation. But at the time of the eclipse the air was saturated

with moisture, the sky of a hazy blue, the Sun low, and the station near the sea-level. It was also the general impression that the corona itself was not so bright as on other occasions.

The Temple Observatory.—Mr. G. M. Seabroke has published his Report for the year 1886. From it we learn that the instruments are all in good working order, and that another spectroscope, made specially for use on comets and faint objects, has been provided. Mr. Percy Smith has continued the measures of double stars during the year, 88 sets of measures having been made. Mr. Seabroke has been occupied with the measurement of motion of stars in the line of sight with the spectroscope on the reflector, and has completed 100 sets of measures. These observations, as well as the corresponding ones of previous years, have been published in the January Number of the 'Monthly Notices.'

Observations for Stellar Parallax*.—In this paper Prof. Asaph Hall gives the observations with the reductions for four stars, the results being exhibited in the following table :—

Date.	Star.	Parallax.	No. of Obs.
Feb. 23, 1883, to Mar. 4, 1884.	40 (o^2) Eridani.	$+0''\cdot223\pm0''\cdot0202$.	30
July 31, 1883, to Apr. 15, 1886.	6 B Cygni.	$-0\cdot021\pm0\cdot0077$.	54
May 24, 1880, to July 2, 1881.	α Lyræ.	$+0\cdot134\pm0\cdot0055$.	128
Oct. 24, 1880, to Jan. 26, 1886.	61 Cygni.	$+0\cdot270\pm0\cdot0101$.	101

Prof. C. H. F. Peters, of the Litchfield Observatory, having pointed out that in the reduction of the observations of α Lyræ and 61 Cygni, published in Appendix I. to Washington Observations for 1879, the correction for temperature was applied with a wrong sign, Prof. Hall has reduced them (incorporating in the case of the latter star some further measurements), with the results given above. It may be remarked that Sir R. S. Ball, using one of Prof. Hall's comparison stars, has found for the parallax of 6 B Cygni the value $+0''\cdot482\pm0''\cdot054$. Generally Prof. Hall remarks that his observations for stellar parallax give results that are smaller than those found by other observers. This is shown most strikingly in the case of 61 Cygni, since the parallax of this star has been found by several astronomers to be very nearly $+0''\cdot5$.

The new Algol-Variable in Cygnus †.—Further observations seem to indicate that the period of this interesting object is about three days. Mr. Chandler gives the following elements for it :—1886 Dec. $9^d\ 6^h\ 22^m$ Camb. M.T. $+[2^d\ 23^h\ 56^m\cdot0]$ E. From these elements the following ephemeris is derived (Washington M.T.) :—Feb. $28^d\ 4^h\ 15^m$; March $3^d\ 4^h\ 11^m$, $6^d\ 4^h\ 7^m$, $9^d\ 4^h\ 3^m$.

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* Washington Observations for 1883 ; Appendix II.
† Gould's Astr. Journ. No. 150.

PROBABLE NEW VARIABLE IN ANDROMEDA *.—Mr. Backhouse finds that 28 Andromedæ is probably variable within small limits and in a short period. It is possibly of the Algol type.

MOTION OF THE LUNAR APSIDES.—We regret to notice, in the 'Sidereal Messenger' for February, a "paradoxical" article by Mr. E. Colbert on the above subject. It may possibly have been intended for a joke; if so, it is a poor one, and the editor should have indicated its character for the benefit of the uninitiated.

NAMES OF MINOR PLANETS.—The new Minor Planet No. 264, discovered by Prof. Peters, has been named by him Libussa. No. 256 has been named Walpurga by Herr Palisa.

THE Astronomische Nachrichten No. 2766 contains an exhaustive comparison by Dr. F. Scheiner of the star magnitudes of the 'Uranometria Argentina' (Gould), with those of the catalogues of Bessel, Argelander, Lalande, and Schjellerup.

Elements and Ephemeris of Comet 1887 *b* (*Brooks, Jan.* 22) †.
By Dr. H. OPPENHEIM.

THE following elements have been computed from observations made at Strassburg, Kiel, and Paris, on Jan. 25, 27, and 29 respectively. Parallax and aberration have been taken into account.

T = 1887 March 18·8369, Berlin M.T.

$\pi - \Omega$ ..... 161° 8′ 18″
Ω 280 37 6
i 103 51 21
log q ..... 0·20722

} Mean Eq. 1887·0.

$\Delta\lambda \cos\beta = -2''$, and $\Delta\beta = +2''$.

Ephemeris for Berlin Midnight.

1887.	R.A. h m s	Decl. ° ′	Log Δ.	Log r.	Brightness.
Feb. 26..	3 15 58	+58 58·1	0·1317	0·2135	1·2
Mar. 2..	3 30 26	54 30·7	0·1456	0·2113	
6..	3 42 12	50 19·3	0·1613	0·2095	1·1
10..	3 52 8	46 26·5	0·1783	0·2083	1·0

The brightness at discovery is taken as unity.

* Liverpool Astr. Soc. Circ. No. 15.
† Dun-Echt Circular, No. 135.