TABLE 1.—*Duration of civil twilight.*

[Time required for the sun to pass from the horizon to a point 6° below or vice versa.]

North latitude.	0°	10°	20°	25°	30°	32°	34°	36°	38°	40°	42°	44°	46°	48°	50°
Date.	Minutes of time.														
Jan. 1	26	26	28	29	31	31	32	33	34	35	37	38	40	42	45
11	26	26	28	29	30	31	32	33	34	35	36	38	39	41	44
21	26	26	27	28	30	30	31	32	33	34	35	37	38	40	43
Feb. 1	25	25	27	28	29	30	31	31	32	33	34	36	37	39	41
11	25	25	26	27	29	30	30	31	32	33	34	35	36	38	39
21	24	25	26	27	28	29	29	30	31	32	33	34	35	37	38
Mar. 1	24	25	26	27	28	28	29	30	31	32	33	34	35	36	38
11	24	24	26	27	28	28	29	30	30	31	32	34	35	36	37
21	24	24	26	27	28	28	29	30	30	31	32	33	35	36	38
Apr. 1	24	24	26	27	28	29	29	30	31	32	33	34	35	37	38
11	24	25	26	27	28	29	30	30	31	32	33	34	36	37	39
21	25	25	26	27	29	29	30	31	32	33	34	35	37	39	41
May 1	25	25	27	28	29	30	31	32	33	34	35	37	38	40	42
11	25	26	27	28	30	31	32	33	34	35	36	38	40	42	45
21	26	26	28	29	31	32	32	34	35	36	38	40	41	44	47
June 1	26	26	28	29	31	32	33	34	36	37	39	41	43	46	49
11	26	27	28	30	32	32	34	35	36	38	39	42	44	47	51
21	26	27	29	30	32	33	34	35	36	38	39	42	44	48	51
July 1	26	27	28	30	32	32	34	35	36	38	39	42	44	47	51
11	26	26	28	29	31	32	33	34	36	37	39	41	43	46	49
21	26	26	28	29	31	32	33	34	35	36	38	40	41	44	47
Aug. 1	25	26	27	28	30	31	32	33	34	35	36	38	40	42	45
11	25	25	27	28	29	30	31	32	33	34	35	37	38	40	42
21	25	25	26	27	29	29	30	31	32	33	34	35	37	39	41
Sept. 1	24	25	26	27	28	29	30	30	31	32	33	34	36	37	39
11	24	24	26	27	28	29	29	30	31	32	32	34	35	36	38
21	24	24	26	27	28	28	29	30	31	31	32	33	35	36	38
Oct. 1	24	24	26	27	28	28	29	30	30	31	32	34	35	36	37
11	24	25	26	27	28	28	29	30	31	32	33	34	35	36	38
21	24	25	26	27	28	29	29	30	31	32	33	34	35	37	38
Nov. 1	25	25	26	27	29	29	30	31	32	33	34	35	36	38	40
11	25	26	27	28	29	30	31	32	32	34	35	36	37	39	41
21	26	26	27	28	30	30	31	32	33	34	35	37	38	40	43
Dec. 1	26	26	28	29	30	31	32	33	34	35	36	38	40	41	44
11	26	26	28	29	31	31	32	33	34	35	37	38	40	42	45
21	26	27	28	29	31	31	33	33	34	36	37	39	40	43	45

In Table 2 are given photometric measurements of the intensity of twilight with the sun at different distances from the horizon, made by Mr. A. H. Thiessen at Salt Lake City, Utah. They are in accord with Mount Weather observations published in this REVIEW, December 1914, 42:652, and show that on clear days with the sun 6° below the horizon the twilight is less than 1 per cent as intense as it is immediately after sunset: or, the illumination is approximately that produced by a standard candle at a distance of 3 feet, namely, 0.1 foot-candle, as compared with 10,000 foot-candles at noon on a bright summer day. And yet, on November 6, 1913, I was able to read a graduated circle to tenths of degrees until the sun was nearly 7° below the horizon, by holding the instrument normal to the bright western sky.

TABLE 2.—*Photometric measurements of daylight and twilight illumination at Salt Lake City, Utah, on a surface normal alternately to the zenith and the western horizon Dec. 15, 1914.*[1]

	Sun's—		Illumination.
	Hour angle.	Altitude.	
	H. m.	°	*Foot-candles*
Time of observed sunset	4 19	+2.8	[2] 206
	4 22	+1.6	[3] 87
	4 25	+1.1	
Computed time center of sun's disk was on true horizon, disregarding atmospheric refraction	4 37	±0.0	
	4 41	−0.6	[2] 42
	4 44	−1.1	[3] 20
	5 01	−4.0	[2] 1.6
	5 06	−4.8	[3] 0.4
	5 12	−5.2	[2] 0.12
	5 14	−6.2	[3] 0.07

[1] Dec. 15, 1914. Sunset clear behind Oquirrh Mountains, which are about 2,000 feet above the valley.
[2] Photometric surface normal to western horizon.
[3] Photometric surface normal to zenith.

A LUNAR HALO OF JULY 24, 1861.

Mr. William B. Frew, now 87 years of age and for many years our cooperative observer at Aledo, Ill., sends the accompanying old sketch, by himself, of an interesting case of lunar halos and paraselenæ which he observed in Mercer County, Ill., on July 24, 1861. He states:

The moon seemed to be giving full light. The circles were plainly marked and the "mocks" had about half the brilliancy of the moon. The paraselenæ were very bright, specially within the interior ring. The cross of light near the moon had about half the light of the moon and gradually decreased toward the circumference of the circle. The lower circle was too near the horizon to present another intersection below.

At about 11 o'clock the next day [July 25, 1861] parhelia of precisely the same form, though not quite so brilliant, were observed. I recollect the whole scene as one of the most beautiful I ever saw in that line.

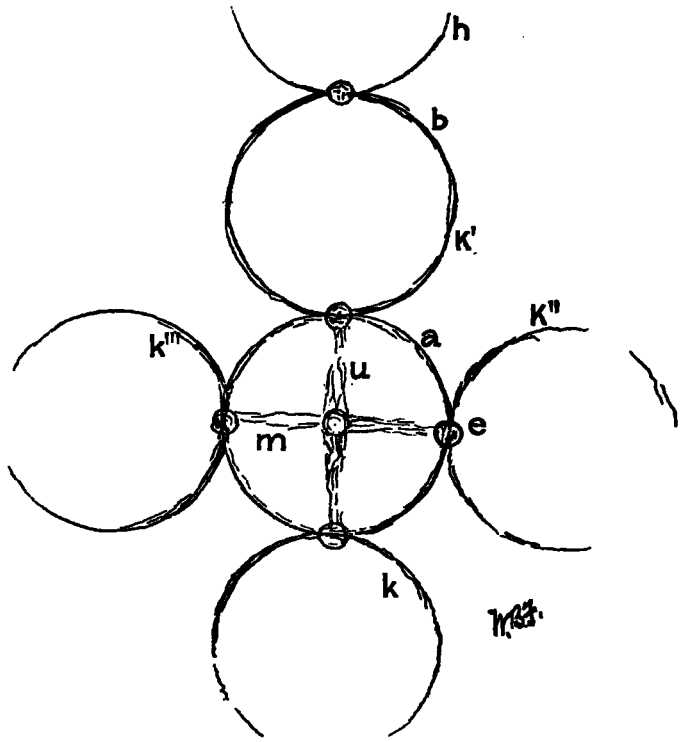

FIG. 1.—Lunar halos observed and sketched in Mercer County, Ill., July 24, 1861 (W. B. Frew).

Mr. Frew's old sketch is faithfully reproduced here in figure 1, just as he furnished it. To the writer it seems probable that the four fragmental curves k–k''' were actually the extraordinary tangential arcs to the 22°-halo, and that the curve k' of this group was not actually continuous through the arc b as here represented. On this interpretation, the arc h was probably the circumzenithal arc and b with its bright spot was the arc and vertical paraselena of 46°. Perhaps the detached fragment of an arc indicated to the right of k'' was also part of the 46°-halo.

The lunar cross mu is of course composed of a part of the paraselenic circle, m, and a lunar pillar, u, of Bravais' "second class."

Unfortunately, the absence of all instrumental measurements greatly detracts from the value of the record.

Somewhat similar lunar halos and crosses observed in North Dakota and in Pennsylvania during February, 1894, will be found described in this REVIEW, February, 1894, 22:76.—C. A., jr.