A LARGE PROMINENCE

By J. EVERSHED

By a fortunate chance the writer was able to secure a good series of plates, showing the development and final rapid ascent of a very large prominence. This was of a type that has seldom been recorded previously.

At this observatory it is part of the usual routine with the spectroheliograph to secure daily two good plates of the prominences. These are obtained ordinarily between the hours of eight and nine in the morning, when definition is at its best. On February 18, 1908, the second plate exposed turned out to be rather a poor one, but the first, exposed at $8^h\ 23^m$, was good. The prominences were, however, small, and there seemed to be nothing of special interest on the limb. Fortunately, it was thought worth while to expose a third plate. This was done at $9^h\ 38^m$, and the result showed that there had occurred a remarkable development of a prominence shown faintly in the first two plates, extending from the position-angle 89° to 127°.

Realizing the unusual nature of the newly developed group of prominences, arrangements were made to continue photographing this part of the limb throughout the day, which was fortunately perfectly clear from sunrise to sunset. It should be stated that visual observations in the *Ha* line, were made between $8^h\ 40^m$ and $10^h\ 30^m$, and this region of the limb was sketched by Mr. Sitarama Aiyar between $8^h\ 43^m$ and $9^h\ 3^m$. His drawings show a moderately bright mass of prominences, extending from position-angle 89° to 121°, having bright condensations at 91° and 97°. The sodium and magnesium lines were noted as bright at 91°. The main mass was estimated at 50″ in height at $8^h\ 50^m$, and 85″ an hour later. A smaller but bright prominence was situated at P. A. 135°, and this also increased during the observation from 45″ to 80″.

Twenty photographs in all were secured during the day, two exposures being made on each plate after the first three, and fourteen of these are shown in the accompanying reproductions (Plate I). The

definition became very poor between 12^h and 17^h and good guiding was then impossible, the image moving bodily on the slit plate. This is shown in the irregularities of the limb seen in Nos. 7 to 10. Later, the definition improved, but the last plate, exposed at $18^h\ 2^m$, was much underexposed, owing to thick smoke from forest fires passing over the sun's disc. The image No. 12 is somewhat distorted through the electric guiding control failing to act; and the disk excluding the photosphere had to be moved, to prevent fogging the plate. The position-angle of the small bright prominence seen in all the photographs except No. 1 was 135°, equal to solar latitude −63°, and from this position the prominence extends to P. A. 89°, equal to solar latitude −17°.

Notwithstanding the very sudden appearance of such an enormously extended mass between the hours of 8 and 9, the subsequent increase in size took place quite slowly. Visual observations in the *Ha* line showed scarcely any evidence of motion in the line of sight, such as usually accompanies great eruptions. The actual increase in height determined from measurements at a definite point on the limb (P. A. 116″) is shown in the following table, which also gives the approximate rate of ascent in the mean interval between successive pairs of photographs. The most striking feature is the accelerating velocity with which the entire mass leaves the sun. A reference to the last four photographs of the series here given will show this clearly. The prominence also appears to diminish in brightness as it ascends, but this is no doubt due in part to the rapidly diminishing altitude of the sun, which at $17^h\ 41^m$ was only 8°, and at $18^h\ 2^m$ was less than 3° above the horizon; the two images in the last plate were too faint for reproduction.

Another feature of interest is the long filament joined to the main mass and arching over the small bright prominence. In the negatives it appears to be connected with the top of the small prominence at $11^h\ 5^m$ but becomes disconnected at $14^h\ 36^m$; at $17^h\ 11^m$ it is joined to the chromosphere beyond, at P. A. 139°. The movement of the whole mass, from this time on, is greatest at the parts most remote from the filament, and gives one the impression that the latter acted like a flexible cord, holding one end of the mass to the sun and forcing it to swing out in a curve.

HEIGHTS OF PROMINENCE MEASURED AT POSITION-ANGLE 116°

Number of Plate	Indian Standard Time*	Mean Height in Seconds of Arc	Approximate Velocity of Ascent
	h. m.		km per sec.
271.....	8 23	...	
274.....	9 38	81	
			12
275.....	9 54	100	
	10 1		
			1.2
276.....	11 5	107	
	11 13		
			2.5
279.....	14 30	150	
	14 36		6.7
280.....	16 5	202	
	16 10		
			24
281.....	17 11	337	
	17 17		
			37
282.....	17 32	405	
	17 41		
			84
283.....	17 56	Too faint to measure	
	18 2	585	

* 5^h 30^m in advance of Greenwich mean time.

The writer has met with only two previous examples of prominences having the same characteristics as the one of February 18 last, and in neither instance was it possible to follow out the changes at all completely. The first was observed in its earlier stages at the writer's private observatory at Kenley, on the date October 3, 1892. Between 7^h and 9^h G.M.T. it was a large mass of complex filaments, extending from latitude $-21°$ to $-39°$ on the S.E. limb, with small bright prominences at $-15°$ and $-42°$. At 2:00 P.M. Kalocsa M. T., it was observed by Herr Fényi, and at this time had attained the height of 8′ 51″. His measurements indicated a rapid rise of the upper part, which showed a mean velocity exceeding 36 km per second. At 2^h 55^m nothing remained of the higher part. Displacements of the spectral lines did not occur.[1]

The other prominence, apparently of the same type, was photographed here, on April 9, 1907. Like the former, it consisted of a

[1] *Astronomy and Astrophysics*, 12, 38, 1893.

huge mass of interlaced filaments. It extended from solar latitude +16° to +38° on the east limb. Only three photographs were obtained, and the heights measured on these are as follows:

No. of Plate	I. S. T.	Height	Approximate Velocity of Ascent
452.....	$8^h\ 34^m$	105″	7 km per sec.
456.....	8 55	117	12 km per sec.
457.....	9 13	135	

An increasing rate of ascent is here indicated. The prominence had disappeared on the following day. It would be interesting to know whether this prominence was observed in its later stages elsewhere.

It is perhaps worthy of remark that the disc photographs in K light, obtained on the dates April 9, 1907, and February 18, 1908, show no flocculi nor any kind of disturbance at or near the positions of the prominences.

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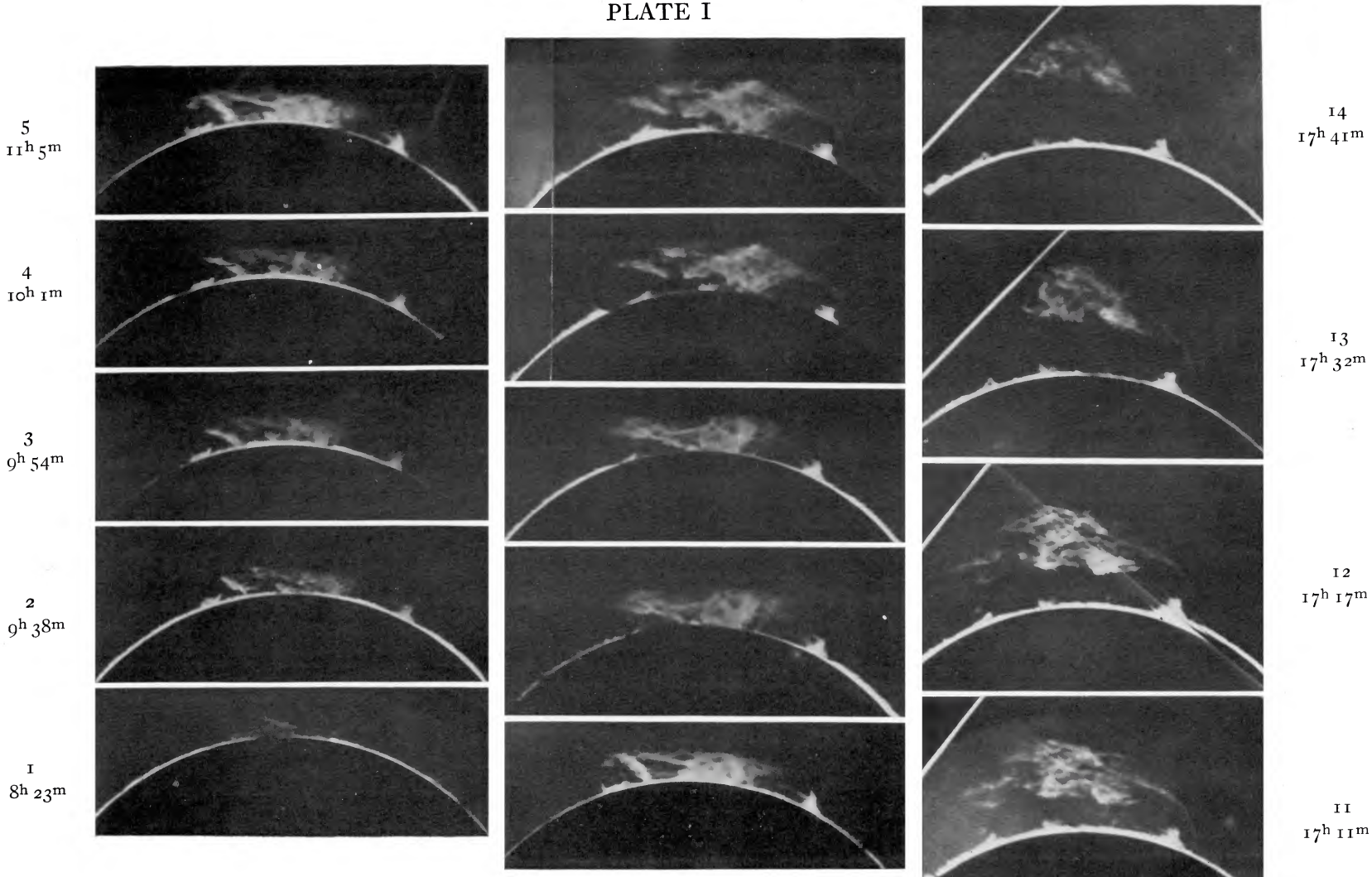
1908ApJ....28...79E

PLATE I



PROMINENCE OF FEBRUARY 18, 1908 (Indian Standard Time)