

trains at a distance. In some places three distinct rumblings were heard, separated by intervals of a few seconds, while at others only one or two were detected.

In this connection it may be interesting to state that Mr. W. F. Denning, of Bristol, England, our leading authority on meteors, has recently expressed the opinion that many of the window-shakings usually attributed to earthquake shocks are really due to the explosions of meteoric bodies high in the air. He has investigated a number of instances of this sort and has very strong evidence in favor of his view.

Knowing that sound travels at the rate of about 12 miles per minute, I have endeavored to compute the distance of the bodies by considering the interval between their passing and the hearing of the sound; the results are not very satisfactory.

It is pretty well agreed that the first bodies were the largest and most active of all. Some observers state that they burst into several pieces, and that they were continually giving off sparks which went to form their tails. It would naturally be expected that the interval between the passing of these bodies and the arrival of the first sound would be the time taken by sound to travel from its path to us.

Unfortunately the times are not accurately determined. The first bodies appear to have come well into view at about 9.05 (E.S.T.). Dr. Marsh, at Springville, gives it as 9.04½. Several in Toronto who consulted their watches give 9.05. An observer at Brampton gives 9.06 and one at Jarvis gives 9.08, as noted on a watch which may have been 50 seconds fast. Again, Mr. John Butterfield, of Toronto, states that on hearing the sound he immediately looked at his watch and the time was 9.12, which, he assures me, was closely accurate. From 9.05 to 9.12 is an interval of 7 minutes during which time sound would travel 84 miles, while the bodies passed within about 40 miles. Perhaps the sound heard was not produced by the first bodies.

Observers were also asked to state when the sound was heard; and some say just as the last bodies were disappearing,

while others say 1 minute, 2 minutes or 3 minutes after they had gone.

The estimates of the duration of the entire display also vary between wide limits. As has been stated, the beginning was in the neighborhood of 9.05, and Mr. Walter L. Haight, of Parry Sound, states that at the end of the flight he took out his watch and the time was 9.10. I have taken the average of 89 estimates, which run from 1 minute to 7 minutes, and find it to be 3.3 minutes. The bodies, when nearest to Toronto, were about 40 miles away, and sound would travel this distance in about 3.3 minutes. Hence, if the first noise heard was that produced by the first bodies it should have been heard just at the close of the display.

THE SIZE OF THE BODIES

It is interesting to consider the size of the bodies; but the observations again are very discordant and an accurate estimate is out of the question. However there is sufficient evidence to show that they were of considerable size.

Mr. Hewitson, of Jackson, states that the head of the first body was larger than the full moon, which is about 30' in diameter. Mr. Norman, at Mill Bridge, estimates the leader to have been half the diameter of the moon, while Mr. White, of Cobocok, places the size as three-quarters of that diameter. Colonel Winter, in Bermuda, states that the apparent diameter of the leading bodies was equal to that of the moon. Jackson was about 50 miles while the other places were all more than 100 miles away. On the other hand Mr. Barber, a University student, states that he did not think the diameter to have been more than $\frac{1}{15}$ of the moon's diameter.

Referring to this matter, Young (*General Astronomy*, Art. 762) says:

"As seen from a distance of many miles, the meteoric fire-ball sometimes appears to have a diameter as large as the moon, which would indicate a real diameter of several hundred feet. The great apparent size, however, is an illusion, partly due to irradiation, and partly, and subtly, to the fact that the meteor itself