Jacchia (1957a) found that C is independent of the meteor velocity; this result has been confirmed by the analysis of the complete set of data, precisely reduced by Jacchia, concerning Super-Schmidt material (Jacchia, Verniani and Briggs, unpublished). We therefore have observational evidence that the exponents n_p and n_v are equal—a result that is far from obvious. This being so, in the following n will refer both to n_v and n_p. Jacchia's results show also that C decreases in absolute value with the brightness. Hence the ratio τ_{op}/τ_{ov} must be a function of the brightness and consequently of the mass of the meteors. Knowing the values of C as a function of M_p allows us to determine τ_v as a function of τ_p. For meteors brighter than $M_p=-2$, we can safely assume $C=-1.9$; then $\tau_v=0.17\tau_p$. For meteors with M_p between -2 and $+1.5$ Jacchia's results can be approximately described by the linear equation

$$C=0.28M_p-1.34, \tag{4}$$

so that

$$\log\frac{\tau_v}{\tau_p}=0.11M_p-0.54. \tag{5}$$

Since at present only Öpik (1933, 1955 a and b) has studied theoretically the luminous efficiency in the visual range, his work has necessarily been the only basis for the computation of meteoric masses. In fact, Whipple (1938) approximated Öpik's results for bright meteors by assuming $\tau_v=\tau_{ov}v$ with $\tau_{ov}=8.5\times10^{-10}$ scm^{-1} in the spectrum range between 4500 and 5700 Å. All Harvard meteoric masses have been computed with this value and with the linear dependence of τ on v. Both τ_{ov} and the exponent n are very uncertain. Öpik (1958) writes that his basic work of 1933 is "a semi-empirical, semi-theoretical approach on the basis of a combination of classical and quantum-mechanical principle," but Thomas and Whipple (1951) have considered it only "a rough approximation." No attempt will be made here to summarize the work of Öpik; the number of assumptions he introduced to get his results is such that even a rough estimate of the errors involved in the final results is impossible. Only a comparison with direct experimental results can afford such an estimate. In the revision of his own work Öpik (1955a) confirmed $n=1$ for bright meteors and reduced the value τ_{ov} to about 60 percent of the preceding value. The uncertainty involved in τ_{ov} may, however, be as large as two orders of magnitude (Whipple and Hawkins, 1959). The determination of masses through the motion of meteoric trains led to a value of τ_{ov} about 220 ± 150 times less than Öpik's original value (Cook, 1955). Conversely, the extrapolation of recent results of McCrosky (1961) and McCrosky and Soberman (1962) on artificial meteors suggests an intermediate value between the two extremes, as does a work on a few clearly recognized asteroidal meteors (Cook, Jacchia, and McCrosky, 1963). A theoretical study on meteor density (Verniani, 1962) leads to the conclusion that Öpik's value cannot be wrong by orders of magnitude. We will later examine more closely the results obtained with artificial pellets and with the asteroidal meteors in searching for the range in which τ_{op} should lie and for its most probable value.

Current ideas, summarized by McKinley (1961), on the dependence of τ on velocity are that $n=1$ applies only to the brighter photographic meteors; for fainter meteors τ should vary more slowly than the first power of v, perhaps even as a negative power of v for fainter dustballs. In fact Öpik (1955b), obtained theoretically for dustballs $n=-0.88$ and then assumed the round relation $\tau_v=\frac{2000}{v}$ scm^{-1}, and Jacchia (1957b) found for faint Super-Schmidt meteors τ_p independent of velocity. This result was obtained from the fitting of the atmospheric profile computed by means of meteor decelerations to the standard atmosphere of that time (Minzner and Ripley, ARDC 1956), which had a slope different enough from the present U.S. Standard (1962) to produce a non-negligible error in n. A re-analysis of the Super-Schmidt meteors, using the new standard atmosphere, shows that n cannot be far from 1 (Jacchia, Verniani, and Briggs, unpublished). Unfortunately, the results are only slightly sensitive to a variation of n. The results of the present work show clearly that τ_p is independent of the brightness of meteors. A dependence of the luminous efficiency on the magnitude or on the mass should not be easy to justify theoretically, although it seems that the spectrum of meteors