where we have inserted in expressions like (11) the values of $E_1'^*$, $\mathbf{p}_1'^*$, etc., in terms of E^*, p^*, $\mathbf{p}'^*$. The spurs in (14) are easily evaluated if we remember that the spurs of all the Dirac matrices and their products are zero, excepting that of the unit matrix.

We get finally for the differential effective cross-section dQ^* for the scattering of the electron through an angle between θ^* and $\theta^* + d\theta^*$ in the system L* the expression

$$dQ^* = \frac{\pi}{8}\frac{e^4}{m^2c^4\gamma^{*2}}\Big[\frac{1}{(\gamma^{*2}-1)^2\sin^4\frac{1}{2}\theta^*}\{1+4(\gamma^{*2}-1)\cos^2\tfrac{1}{2}\theta^* + 2(\gamma^{*2}-1)^2(1+\cos^4\tfrac{1}{2}\theta^*)\} + \frac{1}{\gamma^{*4}}\{3+4(\gamma^{*2}-1)+(\gamma^{*2}-1)^2(1+\cos^2\theta^*)\} - \frac{1}{\gamma^{*2}(\gamma^{*2}-1)\sin^2\frac{1}{2}\theta^*}\{3+4(\gamma^{*2}-1)(1+\cos\theta^*) + (\gamma^{*2}-1)^2(1+\cos\theta^*)^2\}\Big].\sin\theta^*\,d\theta^*. \quad (15)$$

This is just dQ. We may, if we choose, express it in terms of θ and γ by using the relations (1) and (2). This would only lead to very complicated expressions, and it is more convenient to leave it in its present form. dQ is the differential effective cross-section for the scattering of the electron through an angle between θ and $\theta + d\theta$ in the system in which the positron is initially at rest. But (15) is clearly quite symmetrical between the positron and electron, so that dQ also gives the effective cross-section for the scattering of the positron through an angle between θ and $\theta + d\theta$ in the system in which the electron is initially at rest. We shall henceforth use L to denote any system in which either the electron or the positron is initially at rest.

For many purposes it is more convenient to express the scattering in terms of the number of particles initially at rest which after the collision receive a certain fraction ε of the kinetic energy of the colliding particle. Let E'_R denote in the system L the energy after the collision of the particle which was initially at rest. (It may be either an electron or a positron.) Then E'_R is connected with θ by the usual relativistic formula†

$$E'_R = \tfrac{1}{2}mc^2\{\gamma + 1 - (\gamma - 1)\cos\theta^*\}. \quad (16)$$

If ε be the ratio of the kinetic energy of this particle after the collision to

† Møller, 'Ann. Physik,' vol. 14, p. 531 (1932), formula (70).