experimental observation to the effect that a hydrogen spectrum does not begin to form until the velocity of the passing and bombarding electron corresponds to about 11 volts, that is to say, a value of β_2 something like 2/300 the velocity of light. With this velocity, the second term of (61) is quite small compared with the first term. Hence, for our purposes the value of β_2 may be considered to be zero, and $A_2 = 1$, whence equation (61) reduces to

$$F = \frac{E_1 E_2}{R^3}\underline{R} \qquad (62)$$

This is merely the electrostatic force of the second charge upon the first. When the two charges have the same sign in this formula, the force is repulsion and the sign positive; but, when one is positive and the other negative, the sign is negative and the force an attraction, because it is to be remembered that the positive direction of the vector R is from the second to the first charge.

The forces upon A, B and C, according to (62), are shown in figure 25; the attraction upon C, pointing toward P, is twice as large as the repulsions upon A or B, pointing directly away from P. These forces are practically parallel, since the electron P is some distance away as compared with the small distance AC. The sum of the three forces is zero so far as any translational motion is concerned, but there is pro-

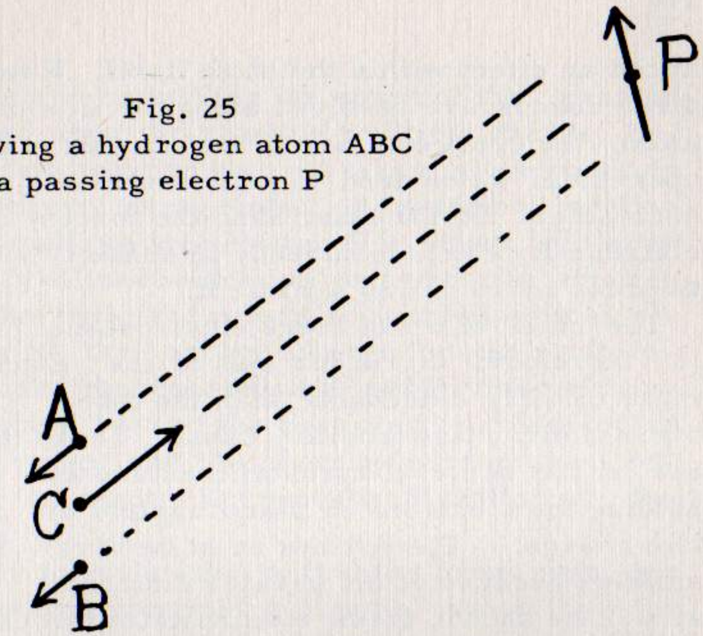

Fig. 25
Showing a hydrogen atom ABC and a passing electron P

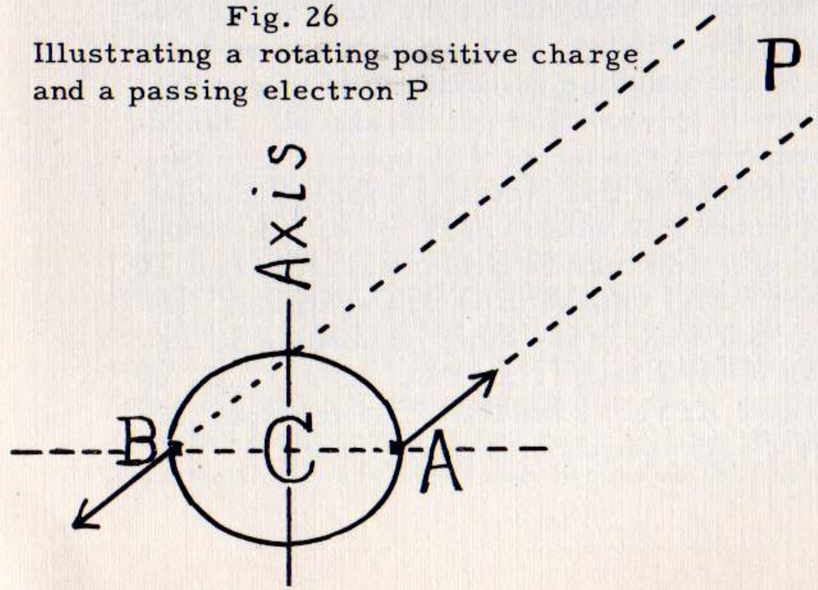

Fig. 26
Illustrating a rotating positive charge and a passing electron P