LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twenty-eight of the preceding month; for the second issue, the thirteenth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

The Capture of Electrons by α-Particles

Davis and Barnes report (Phys. Rev. **34,** 152; July 1, 1929) that the capture of electrons by α-particles occurs not only when the accelerating voltage, V_0, is such as to give the electrons the same velocity as the α-particles, but also for a double series of values, V_n, satisfying the equation: $E_n=(V_0^{1/2}-V_n^{1/2})^2$, where E_n is the ionizing potential of He^+ in the n^{th} quantum state. They give, however, no mechanism for the effect.

As a two-body problem the effect is difficult to explain, but there is no reason for limiting oneself to the two body case. Henderson has shown (Proc. Roy. Soc. (London) **A109,** 157, 1925) that a beam of α-particles which has passed through matter contains He^+ ions, the ratio He^+/He^{++} depending on the velocity but not on the material. Consider a collision of a He^+ ion in the n^{th} quantum state with an electron accelerated by a potential approximately satisfying the equation above. The He^+ ion will be ionized, the products of the collision being an α-particle,—He^{++},—and two electrons practically at rest with respect to the stream of α-particles. The electrons will therefore be captured, giving *two* He^+ ions of high quantum state. When, by radiation, they have reached the n^{th} quantum state, they will be again ionized, giving *four* electrons, which upon capture give *four* He^+ ions. The process is therefore cumulative.

If more than half the He^+ ions skip the n^{th} quantum state, or pass through it without suffering an ionizing collision, the process will cease to maintain itself. This appears to have happened, under the conditions of Davis and Barnes, experiments, for $n>11$.

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