A REPLY TO MR. W. D. COOLIDGE'S PAPER "A POWERFUL RÖNTGEN RAY TUBE WITH A PURE ELECTRON DISCHARGE."[1]

BY J. E. LILIENFELD.

MR. Coolidge objects (p. 412–413) that the author's vacuum "is not high enough to justify the conclusions drawn." In his preceding reply to Mr. Langmuir's objections the author has developed the reasons which make him believe that the vacuum reached in the General Electric Co.'s Laboratory was by no means higher and probably lower than the author's vacuum. As to the freeing the electrodes from gas, the author's opinion is that it is only important to heat the electrodes during the pumping nearly to their melting point and to exhaust as long as gases are developed. If then during the working of the tube the electrode temperature remains sufficiently below the temperature reached during the exhaustion, no more gas can be given out to the vacuum. This is the kind of work the author did, and he obtained nearly perfect results[2] by it. As he does not know which construction of the author's tubes Mr. Coolidge studied, he cannot say why Mr. Coolidge failed in his experiments.

Again, as developed in the preceding reply to Mr. Langmuir, the author never assumed that there is "no such thing as a pure electron discharge." As a matter of fact the author proved that the space charge disappears practically, if the space density of the electrons becomes larger than a certain limiting value. In a space where this limiting value is not reached there may be a perfectly unipolar conductivity. Again, the author did not assume the positive charges to be ions, and even called attention[3] to the fact that owing to the exceedingly small number of ions in his tube there is practically no disintegration of the electrodes. So he cannot agree with Mr. Coolidge's views on any point.

The author intends to publish a paper concerning his own further developed experimental work and limits himself at present to the above reply to Mr. Coolidge's objections.

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[1] PHYS. REV., December, 1913, p. 409.

[2] See the pictures published by Rosenthal, Fortsch. a. d. Gebiete d. Röntgenstralhen, vol. XVIII, Tafel XVII (1912) and Vol. XX, Tafel XXII (1913).

[2] Fortschritte, vol. XVIII, p. 258, (a), and (b).