THIRD DISCUSSION ON
"THE ELECTRICAL OPERATION AND MECHANICAL
DESIGN OF AN IMPULSE EXCITATION MULTI-
SPARK GROUP RADIO TRANSMITTER

(A Paper by Ensign Bowden Washington, U.S.N.R.F)

By

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In reply to Mr. Washington's discussion, which reached me this date, I should like to state that I am quite in accord with his definition of impact excitation, as is evidenced by definitions of the term given in my previous articles on the subject. If, however, thru accident or design, the gap circuit of an impulse transmitter delivers a little more than the single half cycle which characterizes its normal operation, it can hardly be placed in the ordinary quenched gap type of transmitter, inasmuch as the excitation of the antenna is still of the shock type. The major portion of the energy is unquestionably resident in the first half cycle.

In connection with the tests of the Kilbourne and Clark transmitter conducted by Mr. Washington at Harvard University in which he obtained two and one half oscillations, it is presumed that these tests were those conducted for the Marconi Company in 1916 during its suit against the Kilbourne and Clark Company. It may be stated that the defendant (Kilbourne and Clark) proved to the satisfaction of the Court that these tests were conducted under abnormal conditions, to-wit; abnormal gap length, and improper adjustment of the circuits, and that attempt was made to produce oscillations in the gap circuit rather than to demonstrate normal operation.

If the photographs showing a single impulse in the gap circuit were not indicative of impact excitation, they were not so considered by the Court. These were taken at the University of Washington by Lieutenant Greaves, who had considerable experience in this work at Harvard University, in the presence of Mr. F. A. Kolster, Mr. Frederick Simpson, myself and several others.

In the decision of the Court, in which the impulse nature of this transmitter was upheld, Judge Netterer rules as follows:

"The defendant, to demonstrate the fact of the 'single chunk'

(impact, E. W. S.) "conversion of antenna energy, introduced the result of experimentation conducted at the University of Washington with the Braun tube on the behavior of the Simpson Mercury Valve Transmitter. . . The deflection of the spot of light across the screen corresponds with the motions of the current, first in one direction and then in the other, and if the disturbing" (gap, E.W.S.) "circuit is not characteristically an oscillating circuit . . . the spot of light would appear as in the photograph. . . The contention of the plaintiff" (Marconi Company) "with relation to the Massachusetts" (Harvard University) "test, in which it was shown that there were two and one half oscillations in the circuit, and that this must refute the contention of the defendants with relation to the Washington University photographic test, may be answered by the suggestion that the Washington University result was obtained,—the photograph speaks for itself—and defendant's witnesses to that extent are corroborated. The Massachusetts experiments show that there were many elements that entered into the experiments with relation to the appliances and the adjustment of the apparatus. Dr. Zenneck's testimony, which does not seem to be denied, shows that photographs were only taken when the adjustments were such as to produce the desired result, and that the effort was for the purpose of obtaining evidence of oscillations in the trigger" (gap, E.W.S.) "circuit, rather than to present to the Court the result of all the experiments that were made, together with the adjustments for each result. . . No facts shown indicate that the oscillations" (antenna) "were the result of resonant transfer of energy."

I do not feel required to defend the term "partial discharge," the expression being taken from Zenneck's writings. I should say that the definition of "full charge" which Mr. Washington seeks, is that charge given the condenser by the time the peak of the transformer secondary wave has been reached, the separation of the gap permitting, or the maximum charge which the condenser can receive with a given secondary potential. This "full charge" will be recognized as distinct from the partial charge which the condenser ordinarily receives as a result of the minute separation of the impulse gaps, thus giving rise to several discharges of the condenser per alternation.

February, 17 1919.