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C. L. SPAULDING & R. E. AUSTIN.

HIGH FREQUENCY INDUCTION APPARATUS.

APPLICATION FILED APR. 25, 1904.

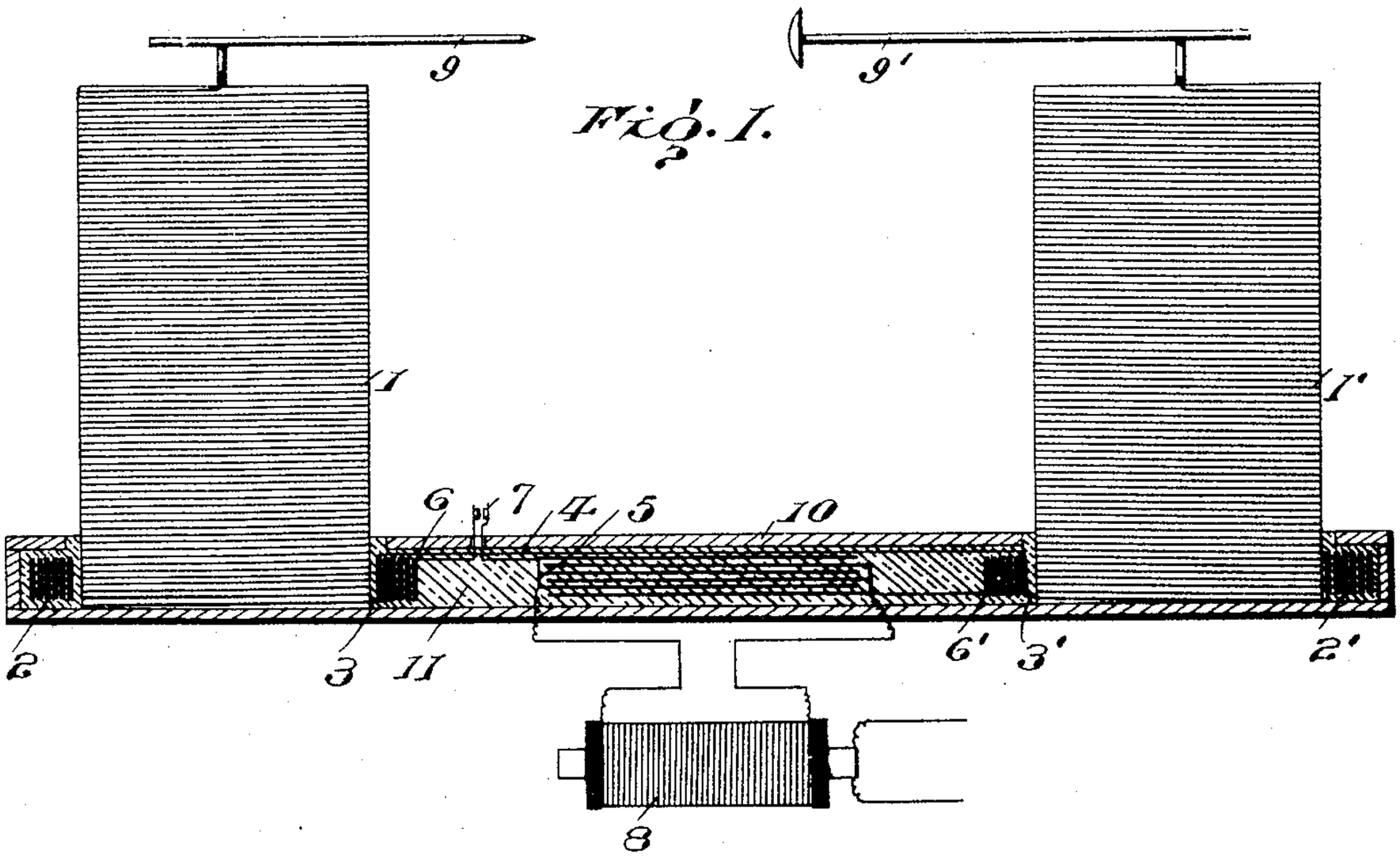

Fig. 1.

Fig. 2.

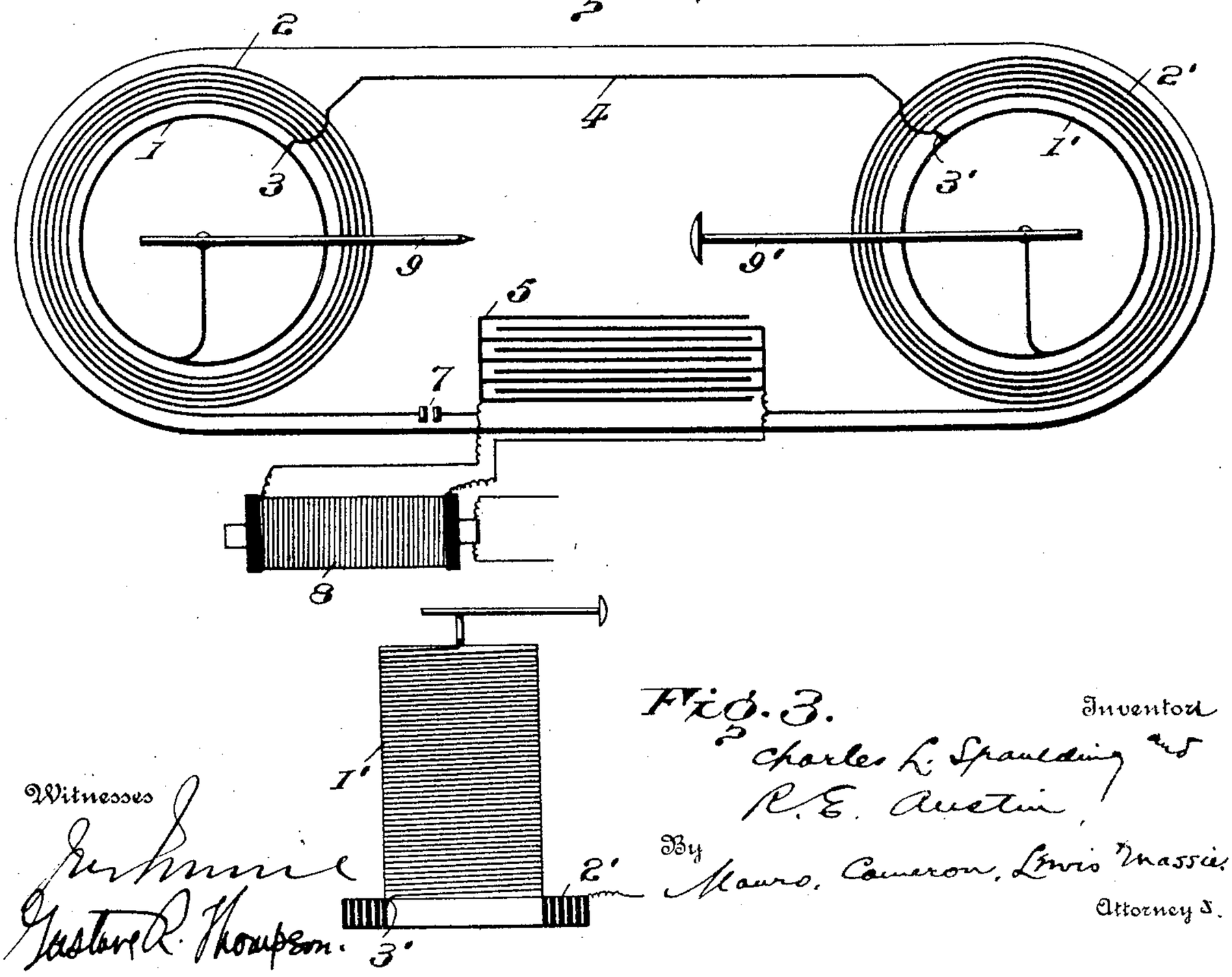

Fig. 3.

Witnesses
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No. 779,673. Patented January 10, 1905.

UNITED STATES PATENT OFFICE.

CHARLES L. SPAULDING AND ROBERT E. AUSTIN, OF KANSAS CITY, MISSOURI, ASSIGNORS OF ONE-THIRD TO WILLIAM R. CLARKE, OF KANSAS CITY, MISSOURI.

HIGH-FREQUENCY INDUCTION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 779,673, dated January 10, 1905.

Application filed April 25, 1904. Serial No. 204,876.

To all whom it may concern:

Be it known that we, CHARLES L. SPAULDING and ROBERT EMMETT AUSTIN, of Kansas City, Missouri, have invented a new and useful High-Frequency Induction Apparatus, which invention is fully set forth in the following specification.

This invention relates to high-frequency induction apparatus, and more especially to induction-coils, and has for its principal objects the prevention of leakage between the different coils, diminution of the interposed insulation, and obtainment of a greater amount of energy from the primaries.

The apparatus consists in its essential features of a plurality of primary and secondary coils and a condenser in circuit with the primary coils. The latter are preferably connected with the secondary coils for the purposes hereinafter set forth.

Certain mechanical expressions of the inventive idea are shown in the accompanying drawings, which are designed merely as illustrations to assist in the description of the invention and not as defining the limits thereof.

Figure 1 is an elevation, partly in section, showing the general arrangements of the parts. Fig. 2 is a diagrammatic plan view showing the circuit connections. Fig. 3 is a detached detail view of a modification.

1 1′ designate two secondary coils wound in a single layer on suitable supports or cylinders. Primary coils 2 2′ are located near the lower ends of the induction-coils and connected therewith at 3 3′ and with each other by the metallic connection 4. In circuit with the primary coils is a condenser 5 of suitable capacity, which has its connections at 6 6′ with the primary coils. Between the condenser and one of the primaries is a spark-gap 7, and connected with the condenser is an induction-coil or transformer 8. At the upper ends of the secondaries are provided suitable sparking rods 9 9′, and the several coils, with the condenser, are provided with a case 10, which may be filled with any suitable insulating material 11.

The operation of the apparatus as thus described is as follows: The induction-coil or transformer 8 charges the condenser 4, and said condenser discharges through the primaries 2 2′ and across the spark-gap 7, thus completing the primary circuit of the apparatus. This primary circuit, which is of an oscillating or alternating character, induces currents in the secondaries 1 1′, which are oppositely or otherwise so wound that when the lowermost turn of one is positive the lowermost turn of the other is negative. Consequently the lowermost turns when connected together have a potential practically *nil* and the potentials rise from below upward, so that at the points marked 3 3′ there is a tendency of the secondaries to spark into the primaries. Such tendency is overcome by connecting the lowermost turn of each secondary to the innermost turn of its corresponding primary at 3 3′. Thus the connecting-wire 4 becomes the common carrier both of the primary currents from the condenser and of the currents generated in the secondaries 1 1′. The tendency to spark between primaries and secondaries being very greatly reduced, the primaries can be placed very close to the bases of the secondaries, thus greatly increasing the inductive influence. The potential in the secondaries rises as they ascend until it is at a maximum at their tops, where they are connected to the sparking rods 9 9′.

The primaries are preferably made of a few turns of coarse copper ribbon or wire in the form of an annulus, as illustrated, though they may take in other forms, such as that of a helix, where each succeeding turn is superimposed on the preceding turn. The form or shape of the primaries may be varied and may be square or round, as is best suited to the particular type of apparatus desired. The primaries are illustrated as located in the same plane with the condenser and are connected in series across an interposed spark-gap. Other arrangements may, however, be made without departing from the principle of the invention, such as connecting the primaries in multiple and placing the condenser in other positions than between them.

The secondaries preferably consist of a single layer of wire wound on two cylinders and are of such dimensions as are best suited to the type of apparatus to be constructed. The form of these cylinders may be round, square, or elliptical. Each primary is placed below or outside of and below its corresponding cylindrical secondary and preferably as near the base of said secondary as possible, although the primaries need not necessarily be at the bases of their corresponding secondaries, but may be nearer the middle of said secondaries. The windings of the secondaries may terminate above those of the primaries, as shown in Fig. 3. In this type of apparatus the lowermost turns of the secondary may be connected together by a separate wire and need not be joined to the primaries, though where the primaries are placed very close to the secondaries we prefer to make the connections as illustrated in Fig. 2. In making these connections the lowest turn of the secondary is preferably connected to the innermost turns of the primary.

The character of the discharge between the terminals 9 9′ may be adapted to the particular use desired by properly varying the capacity of the condenser and the inductance of the primary coils.

In the preferred form of the apparatus herein illustrated the primary coils are flat and the secondaries are cylindrical, being several times the length of the former and extending upward through the cover of the case above the flat primaries. The coils may, however, be made to take on other forms and the parts may vary in size and relative proportion without departing from the spirit of the invention.

What is claimed is—

1. In an induction apparatus, a plurality of primaries, a condenser in the circuit with the primaries, and secondaries associated with and connected to the primaries respectively.

2. In an induction apparatus, a plurality of flat coil primaries, a condenser and spark-gap in the circuit joining their terminals, and secondaries associated with and connected to each of the primaries.

3. In an induction apparatus, a plurality of primaries in series, a condenser in the circuit, and secondaries associated with and connected to each of the primaries.

4. In an induction apparatus, a plurality of primaries, a condenser in the circuit joining their terminals, and secondaries associated with and connected to each of the primaries.

5. In an induction apparatus, a plurality of primaries, a condenser and spark-gap in the circuit joining their terminals, and secondaries associated with and connected to each of the primaries.

6. In an induction apparatus comprising two primaries and two secondaries, a condenser located in the circuit of the primaries, a spark-gap between the condenser and one of the primaries, connections between the primaries and the ends of the secondaries, and sparking terminals attached to the other ends of the secondaries.

7. In an induction apparatus, two primary coils in series and two secondary coils, each primary coil surrounding the end of its corresponding secondary coil and having its inner turn connected to one end of the said secondary, a condenser in the circuit of the primary coils and connected to the outer turns of the same, a spark-gap between the condenser and one of said primary coils, and sparking rods for the terminals of the secondary coils.

8. An induction apparatus, comprising two primary coils in series and two secondary coils, each primary coil surrounding the end of its corresponding secondary coil and having its inner turn connected to one end of said secondary coil, a condenser in the circuit of the primary coils and connected to the outer turns of the same, a spark-gap between the condenser and one of said primary coils, sparking rods for the terminals of the secondary coils, and a box surrounding the primaries and condenser and provided with apertures through which the secondaries protrude.

9. In an induction apparatus, a plurality of flat coiled primaries and cylindrical secondaries, said primaries being located at the extremities of said secondaries.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

CHARLES L. SPAULDING.
R. E. AUSTIN.

Witnesses:
WM. R. CLARKE,
EDWARD ABELES.