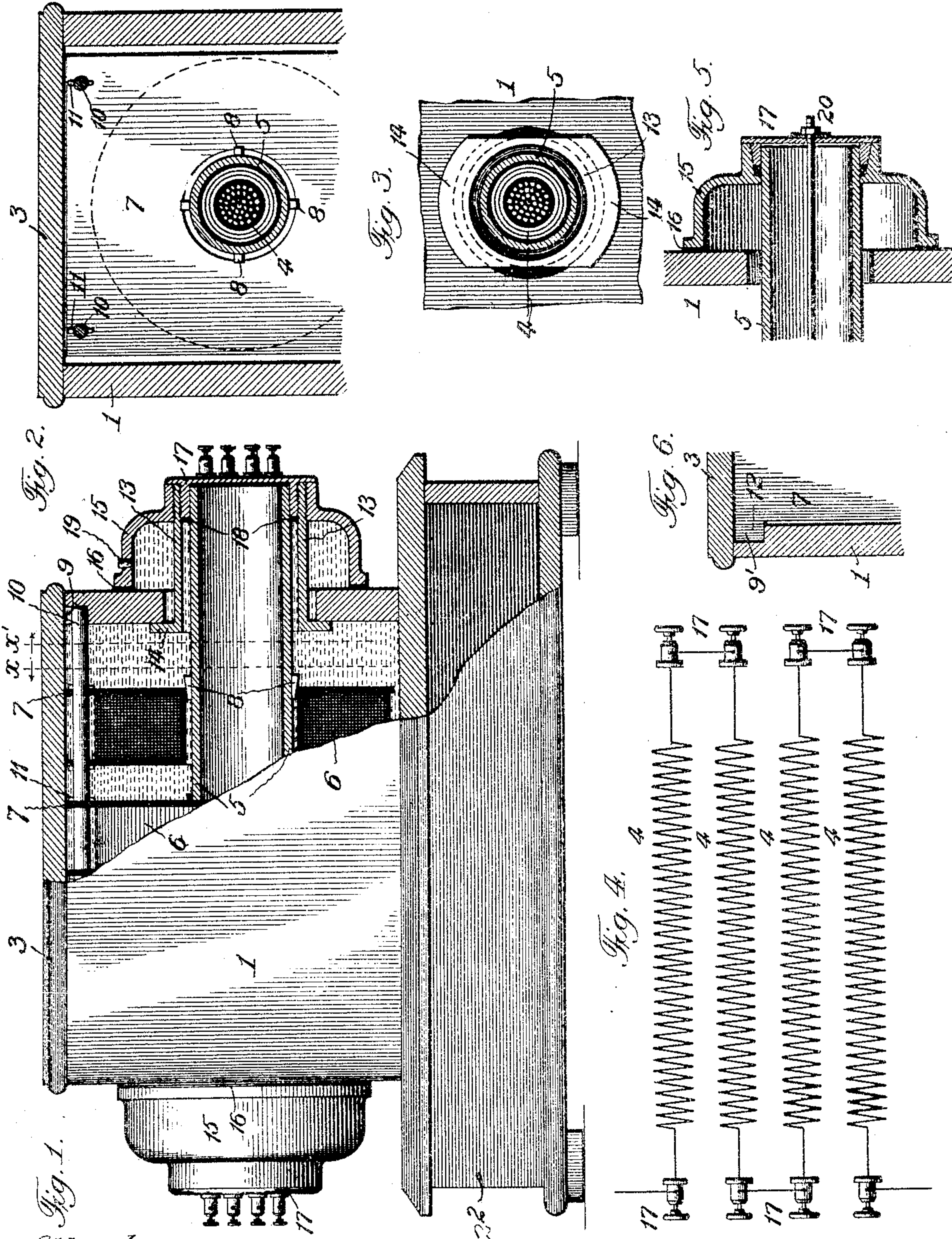


G. M. CHRISTOPH.  
INDUCTION APPARATUS.

APPLICATION FILED MAY 15, 1903. RENEWED OCT 21, 1904.

NO MODEL.



Attest:

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# UNITED STATES PATENT OFFICE.

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## INDUCTION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 777,496, dated December 13, 1904.

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*To all whom it may concern:*

Be it known that I, GEORGE M. CHRISTOPH, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Induction Apparatus, of which the following is a specification.

This invention relates more especially to that class of induction-coils employed in producing high-tension currents for X-ray and other like uses, and has for its object to provide a simple, durable, and efficient construction and arrangement of parts affording a high degree of insulation for the different windings of the apparatus and an avoidance of any sparking or leaping of the induced currents to near-by conductors, due to imperfect or defective insulation of the secondary windings of the apparatus.

In the accompanying drawings, illustrative of the present invention, Figure 1 is a view, partly in side elevation and partly in longitudinal section, of an induction apparatus embodying the present invention. Fig. 2 is a detail transverse section at line  $xx$ , Fig. 1. Fig. 3 is a detail transverse section at line  $xx'$ , Fig. 1. Fig. 4 is a diagram view of the connection of the primary coil. Fig. 5 is a detail longitudinal section of a modification. Fig. 6 is a detail transverse section of a modification.

Similar numerals of reference indicate like parts in the several views.

Referring to the drawings, 1 represents the usual housing or casing formed with the usual chambered base 2 for containing the electrical condenser generally employed in connection with the present class of induction apparatus. The housing 1 will preferably have the usual rectangular box-like form shown and be provided with a removable cover 3 for ready access to the parts contained within the housing.

4 is the primary coils, consisting of the usual series of individual windings surrounding the usual soft-iron core, and such windings are connected to binding or terminal posts hereinafter described.

5 is a sleeve of high-insulating material ar-

ranged between the primary and secondary coils of the apparatus. Such sleeve extends the entire length of the housing 1, with its ends projecting through orifices in the vertical end walls of said housing, as shown.

6 is the secondary coil, consisting of the usual series of individual bobbins having end heads 7, with the insulated windings thereof connected in series. The series of bobbins have the usual separated relation and are provided with central orifices for the passage or reception of the sleeve 5 aforesaid, and such orifices have a greater diameter than the sleeve, so as to leave an annular intervening space for the reception of a part of the semisolid insulating mass with which the interior of the housing is filled when the parts of the apparatus are completely assembled.

8 represents a series of wedges or distance-pieces inserted between the periphery of the sleeve 5 and the inner walls of the central orifices of the secondary coils 6 to maintain a positive concentric relation of such parts.

In the present invention the secondary coil 6 is suspended or supported wholly from the upper end of the housing 1 by means of supporting-recesses 9 in the upper ends of the vertical walls of such housing. In the construction shown in Figs. 1 and 2 of the drawings, 10 represents longitudinal supporting-rods, threaded through orifices in the respective end heads 7 of the series of bobbins comprising the secondary coil 6, with the ends of said rods resting in the recesses 9 aforesaid to constitute the described support of the secondary coil within the housing 1, the spaced relation of the series of bobbins being maintained by pins 11 passing transversely through said rods at the sides of the end heads 7 of such bobbins. In Fig. 6 of the drawings the end heads 7 are provided with lateral top extension 12, adapted to engage in supporting-recesses 9' in the upper ends of the side walls of the housing 1. In either case the lower ends of the series of bobbins are supported a distance away from the bottom of the interior of the housing, and a clear space is formed at such point for the reception of an uninterrupted layer of the semisolid insulating ma-



terial with which the interior of the housing is filled to afford increased insulation to the secondary coil.

13 represents supplementary sleeves of insulating material surrounding the respective ends of the insulating-sleeve 5 aforesaid. Such sleeves 13 pass through the orifices aforesaid in the end walls of the housing 1 and are provided with flanges 14 on their inner ends, which have abutment against the inner faces of such end walls, as shown. The diameter of the sleeve 5, supplementary sleeve 13, and orifices aforesaid in the end walls of the housing 1 are so proportioned that annular spaces are left between such parts for the reception of a portion of the semisolid insulating material which fills the interior of the housing, as before set forth.

15 represents annular cup-pieces screwing upon the outer ends of the supplementary sleeves 13 and having bearing against the outer faces of the end walls of the housing 1, as shown. The arrangement is such that with the cup-pieces screwed into place a tight joint will be formed around the orifices aforesaid in the end walls of the housing and the supplementary sleeves 13 clamped securely in proper concentric relation to the main insulating-sleeve 5.

16 represents interposed rubber gaskets for insuring a tight joint at the bearing-surface of the respective cup-pieces against the end walls of the housing.

17 represents end heads provided with annular screw-threaded necks, which screw into the outer ends of the supplementary sleeves 13 to close such ends and at the same time secure the primary coil 4 and the insulating-sleeve 5 against longitudinal displacement.

18 is an annular packing-ring arranged near the outer end of each supplementary sleeve 13 to afford an abutment for the end of the screw-threaded neck aforesaid of the end head 17 to afford a tight joint at such point when said head is screwed into place.

The interior of the annular pieces 15 in the present improvement form receiving-chambers for portions of the before-mentioned semisolid material which fills the interior of the main housing, and in order to permit of a ready flow of such material into such chambers to fill the same the sides of the flanges 14 are cut away, as shown in Fig. 3, to expose portions of the annular space between the auxiliary sleeves 13 and the orifices in the end walls, such spaces in turn having communication with the chambers aforesaid of the cup-pieces 15, as shown in Fig. 1 of the drawings.

19 is a vent-plug in the upper part of each cup-piece 15 for venting the chambers in said cup-pieces during the flow of insulating material into the same.

In the modification shown in Fig. 5 of the drawings the end heads have direct bearing against the cup-pieces, and a single central

bolt 20, which extends longitudinally through the apparatus, is adapted to draw the parts into proper position in an assemblage of the apparatus.

In the present invention the end heads 17 will be formed of any suitable insulating material and will carry a series of binding-posts 21, corresponding in number to the number of windings in the primary coil 4, and the arrangement is such that the binding-posts can be connected so as to place the primary windings in series in parallel or to cut out one or more of such windings as the judgment of the operator may direct.

With the described arrangement of binding-posts above set forth the necessity of the usual wiring or metal work on the bottom board of the housing 1 is avoided and a very perfect insulation attained at such point owing to such omission, as there are no near-by conductors to which the induced currents in the secondary coil can spark or leap.

Having thus fully described my said invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an induction apparatus, the combination of an inclosing housing provided with supporting-recesses in the upper part of the vertical walls, a secondary coil consisting of a series of bobbins the end heads of which have supporting connection with the recesses aforesaid, and a primary coil arranged centrally within the secondary coil.

2. In an induction apparatus, the combination of an inclosing housing provided with supporting-recesses in the upper part of its vertical walls, a secondary coil consisting of a series of bobbins the end heads of which have supporting connection with the recesses aforesaid the same comprising longitudinal rods threaded through said end heads and resting in said recesses, and a primary coil arranged centrally within the secondary coil.

3. In an induction apparatus, the combination of an inclosing housing provided with supporting-recesses in the upper part of its vertical walls, a secondary coil consisting of a series of bobbins the end heads of which have supporting connection with the recesses aforesaid, a primary coil arranged centrally within the secondary coil and separated therefrom by an insulating-sleeve, and distance-blocks inserted between such insulating-sleeve and the bore of said bobbins to maintain concentric relation of the coils.

4. In an induction apparatus, the combination of an inclosing housing provided with orifices in its end walls, a secondary coil consisting of a series of bobbins arranged within said housing, a primary coil arranged centrally within the secondary coil, an insulating-sleeve arranged between the primary and secondary coils and projecting through the end-wall orifices aforesaid, annular cup-pieces arranged outside the orifices in the end walls



to form annular insulating-chambers, and means for clamping said cup-pieces in place.

5 In an induction apparatus, the combination of an inclosing housing provided with orifices in its end walls, a secondary coil consisting of a series of bobbins arranged within said housing, a primary coil arranged centrally within the secondary coil, an insulating-sleeve arranged between the primary and  
10 secondary coils and projecting through the end-wall orifices aforesaid, annular cup-pieces arranged outside the orifices in the end walls to form annular insulating-chambers, end heads closing the outer ends of the cup-pieces  
15 and the insulating-sleeve, means for clamping the parts together, and a series of terminal posts on said end heads having connection with the windings of the primary coil.

20 6. In an induction apparatus, the combination of an inclosing housing provided with orifices in its end walls, a secondary coil consisting of a series of bobbins arranged within said housing, a primary coil arranged centrally within the secondary coil, an insulating-sleeve arranged between the primary and  
25 secondary coils and projecting through the end-wall orifices aforesaid, supplementary sleeves projecting through said orifices and

having flanged inner ends, annular cup-pieces attached to the outer ends of said supplementary sleeves, end heads closing the outer ends of said supplementary sleeves, and means for clamping the parts in place. 30

7. In an induction apparatus, the combination of an inclosing housing provided with  
35 orifices in its end walls, a secondary coil consisting of a series of bobbins arranged within said housing, a primary coil arranged centrally within the secondary coil, an insulating-sleeve arranged between the primary and  
40 secondary coils and projecting through the end-wall orifices aforesaid, supplementary sleeves projecting through said orifices and having flanged inner ends, annular cup-pieces attached to the outer ends of said supplementary sleeves, means for clamping  
45 the parts in place, and a series of terminal posts on the end heads having connection with the windings of the primary coil. 50

Signed at Chicago, Illinois, this 9th day of May, 1903.

GEORGE M. CHRISTOPH.

Witnesses:

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M. H. HOLMES.