No. 812,089. PATENTED FEB. 6, 1906.

H. F. PROVANDIE.

ELECTRIC TRANSFORMER AND CONNECTIONS.

APPLICATION FILED NOV. 11, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

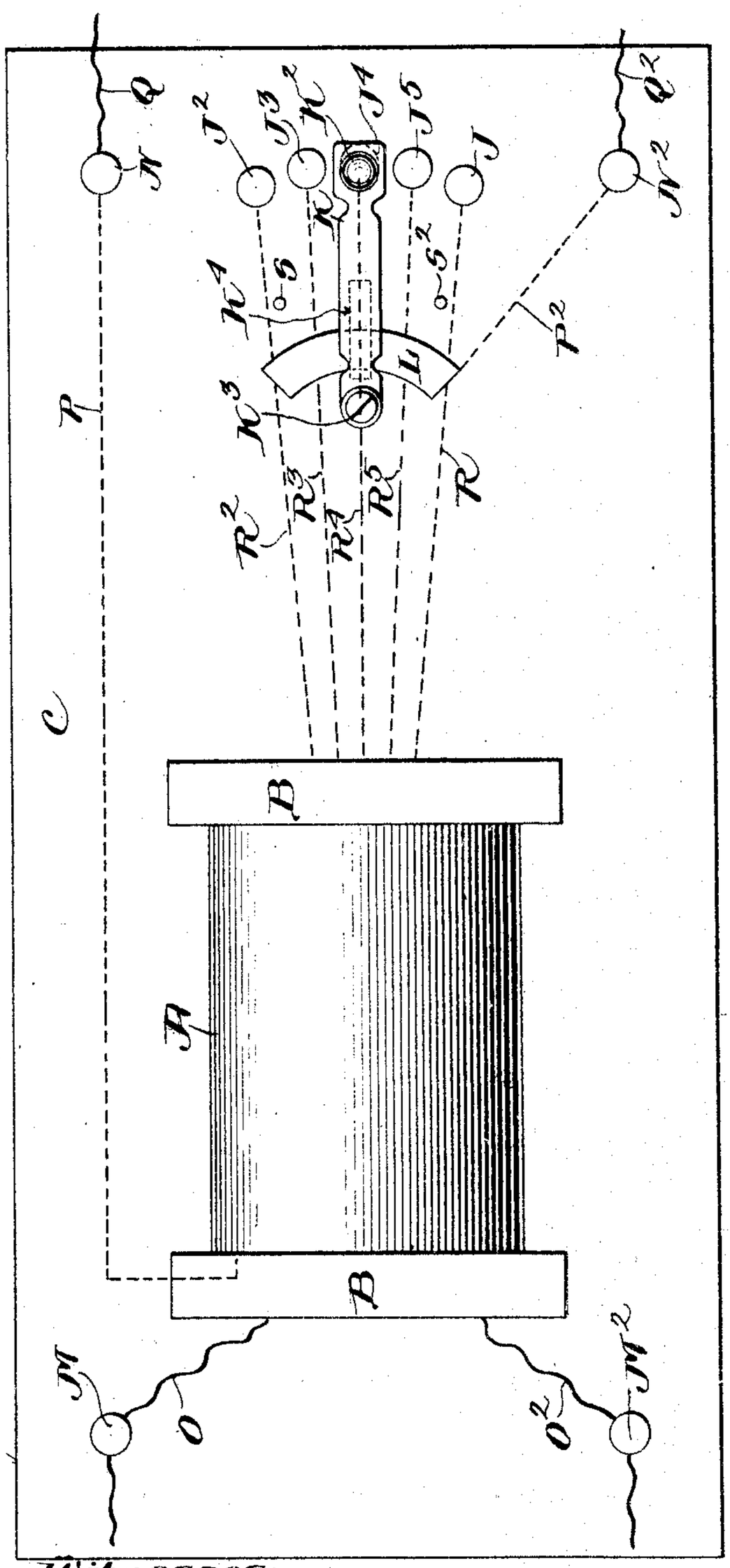
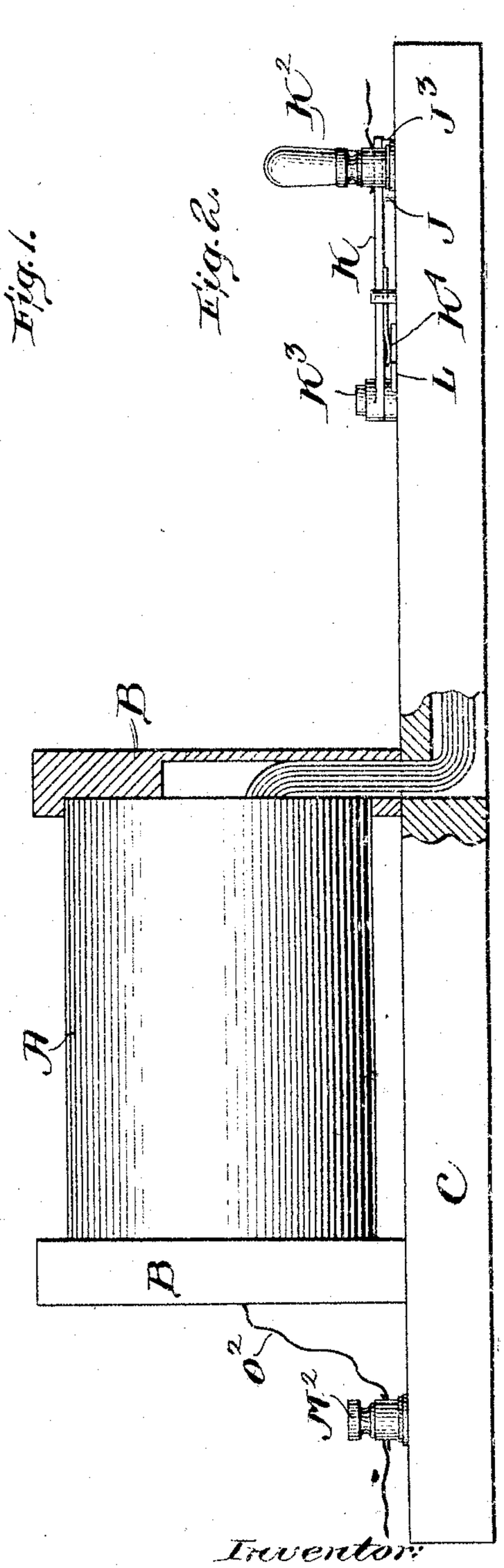


Fig. 2.



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2 SHEETS—SHEET 2.

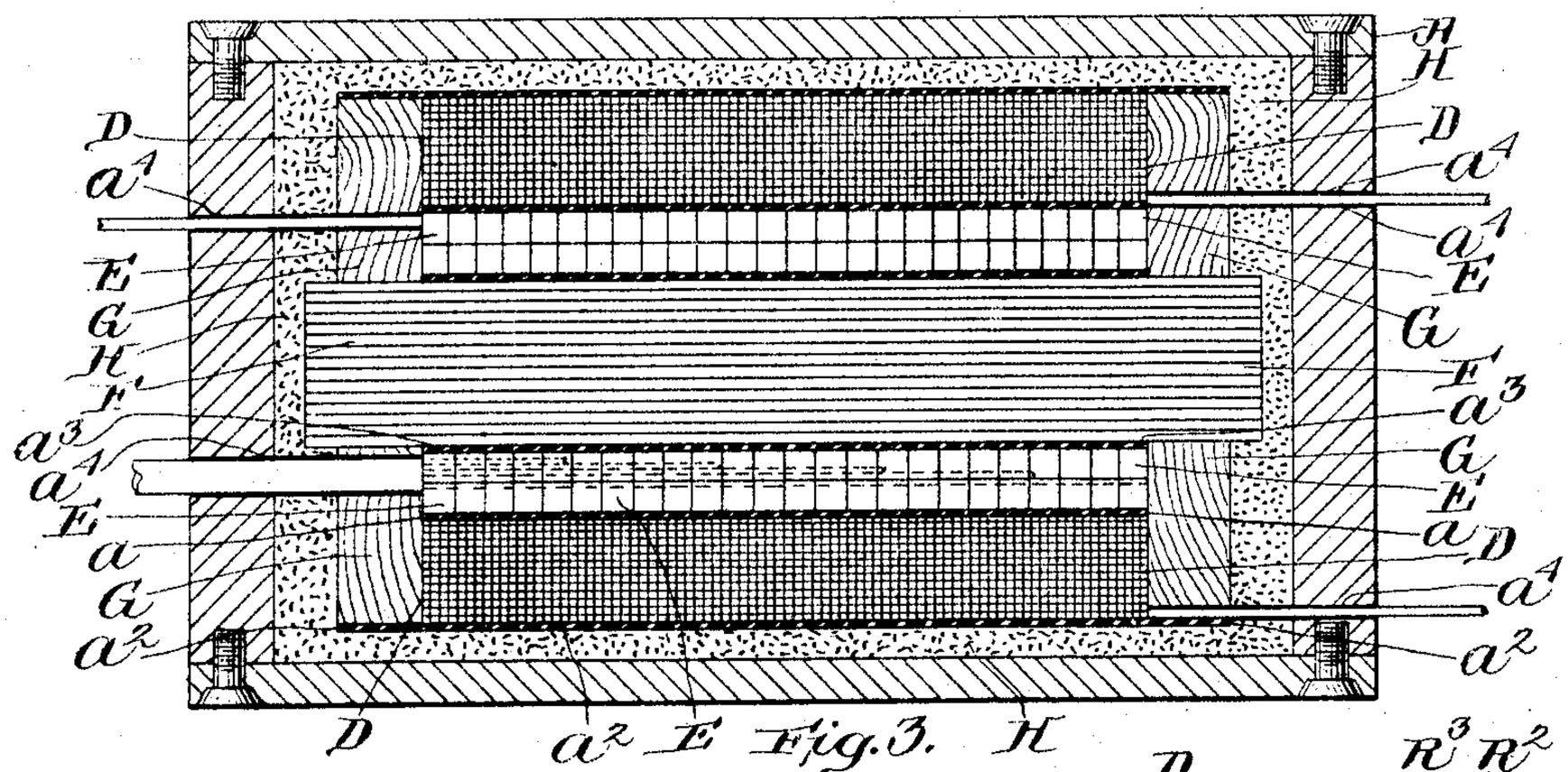

Fig. 3.

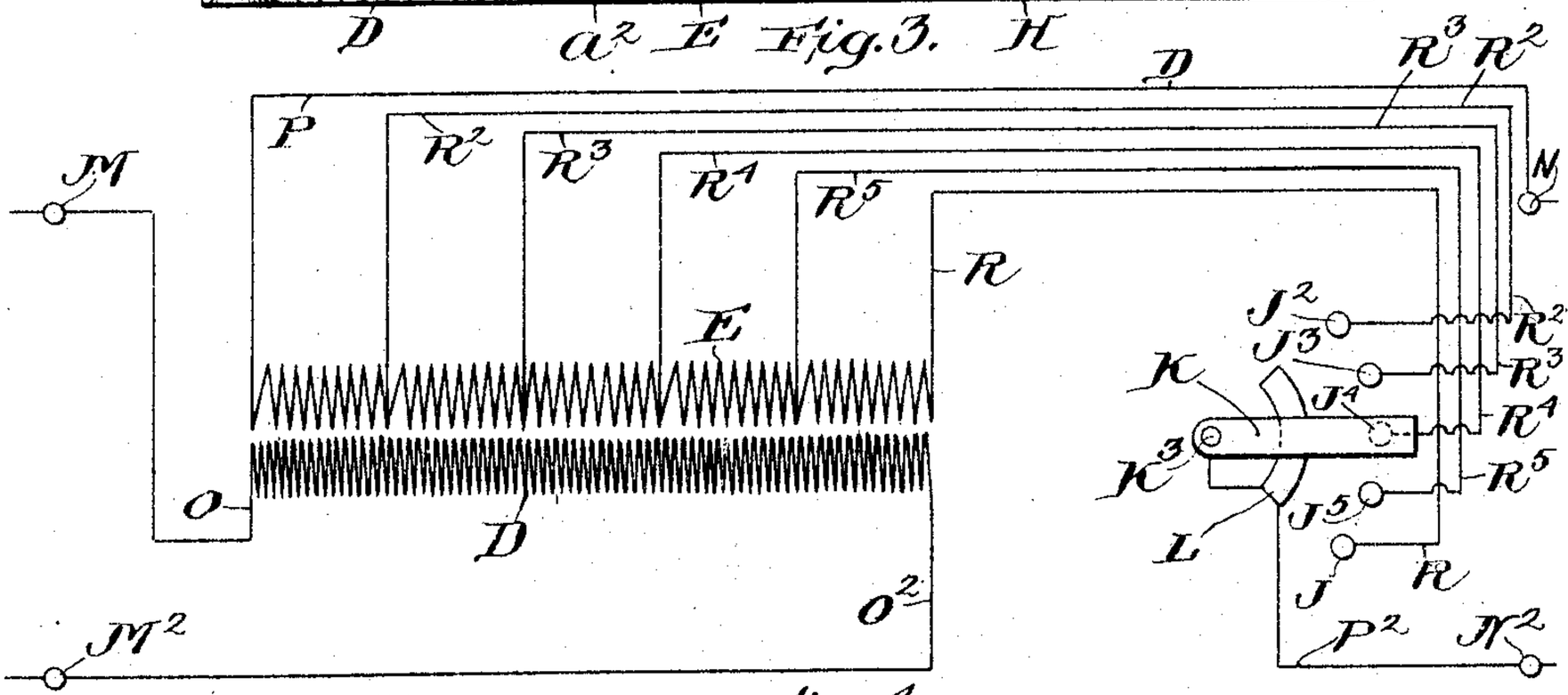

Fig. 4.

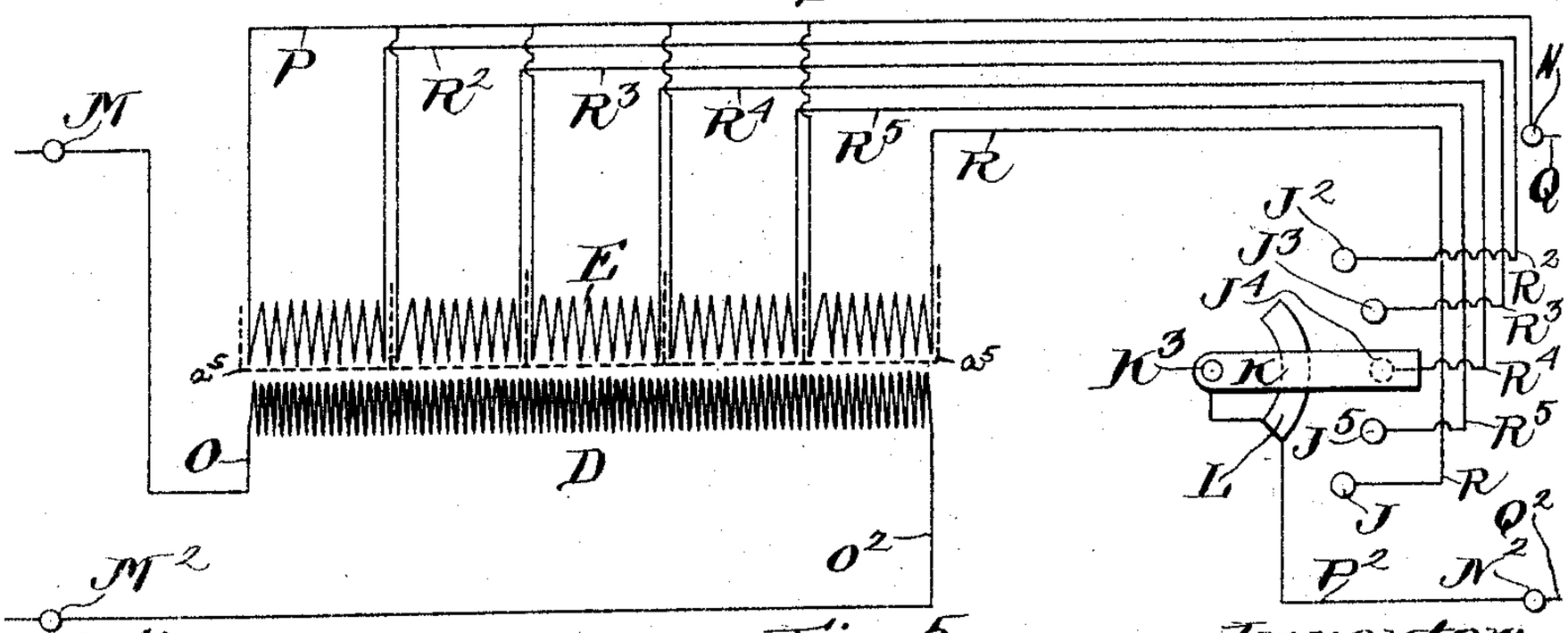

Fig. 5.

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UNITED STATES PATENT OFFICE.

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ELECTRIC TRANSFORMER AND CONNECTIONS.

No. 812,089. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed November 11, 1904. Serial No. 232,365.

To all whom it may concern:

Be it known that I, HERBERT F. PROVANDIE, a citizen of the United States, residing at the town of Melrose, in the county of Middlesex and State of Massachusetts, have invented a new and useful Combined Electric Transformer and Connections, of which the following is a specification.

The invention consists in the combination, with the secondary coil or winding, of a series of separate electric connections at points along its length, a series of separate metal buttons each in separate electrical connection with one of said separate electric connections of the secondary coil, and a metal switch in electric connection with one of the said electric connections of the secondary coil and arranged or adapted to be placed in and out of electric connection with any one of said buttons, and all so that with a predetermined ratio or proportion of said electric connections between said buttons, said switch, and said secondary coil voltages of correspondingly different and determined presures can be secured from one and the same secondary coil to be transmitted with suitable electric connections for a use or an application, as may be desired.

In the accompanying plates of drawings this invention is illustrated.

Figure 1 is a plan view of a transformer, metal buttons, an electric switch common to all of said buttons, and electric connections between said buttons, a switch, and secondary and primary coils, all and severally shown as arranged on a wooden board or table common to all. Fig. 2 is a side elevation of the parts illustrated in Fig. 1, but with some parts broken out and in vertical section. Fig. 3 is a central horizontal longitudinal section of the transformer, showing its interior construction. Figs. 4 and 5 are diagrams, as hereinafter explained.

In the drawings, A is a cylindrical shell of soft iron closed at its opposite ends by iron heads. This shell is supported horizontally and at its opposite closed heads or ends on wooden standards B B, both attached to a common base-board C of wood. This shell A contains a primary winding or coil D and a secondary winding or coil E, and the former or primary coil is wound around and about the latter or secondary coil, which in turn is about a central core F. This core F is made up of bunched iron wires or rods extending lengthwise of and within the secondary coil, and at each end these wires are severally supported in wooden heads G G, and between these heads the primary and secondary windings or coils extend and are confined.

a is the insulation of any suitable material about the secondary coil E and between it and the primary coil D.

a^2 is the insulation of any suitable material about the outside of the primary coil D and the wooden heads G.

a^3 is the insulation of any suitable material about the core F and between it and the secondary coil E, and a^4 is the insulation of any suitable material about the wires leading from the coils to the outside of the shell.

The two coils, core, and wooden heads, all as above described, are contained within the shell A, and thereabout and between the wooden heads G G, the ends of the core F, and the heads of the shell A and the insulation a^2, surrounding the primary coil D, and between it and the shell the shell and said parts as a whole are surrounded with and packed about with filings or small particles of iron H.

J J^2 J^3 J^4 J^5 are a series of separate or detached metal buttons, preferably arranged in the arc of a circle at one end upon the table-board C.

K is a horizontal arm or switch with a wooden handle K^2. This switch is fulcrumed on a vertical pin K^3, secured to table C, and it is arranged so that as it is swung on its fulcrum it will move over and in close contact with the several buttons J J^2, &c.

K^4 is a metal bent spring secured to the under side of the switch K and bearing on a stationary metal plate L, attached to the upper side of the base-board C.

M M^2 and N N^2 are two sets of binding-posts secured to the base-board, a set at each of its opposite ends and of the shell A. The binding-posts M M^2 are electrically connected by wires O O^2 to the opposite ends or poles of the primary coil and any suitable source of alternating electric currents. The binding-posts N N^2 are electrically connected by wires P P^2, the one, N, by wire P to one end or pole of the secondary coil E and the other, N^2, by wire P^2 to the metal plate L, on which the arm or switch K bears. Again, the binding-posts N N^2 are electrically connected by wires Q Q^2, as may be desired or necessary for the use or purpose, in connection with which the electric current from the secondary coil is to be used or adapted.

Each button J J^2, &c., is connected by a sep-

arate wire R R^2 R^3 R^4 R^5, respectively, to the secondary coil E, and the connection of the button J with said coil is at its end or pole opposite to that connected to the binding-post N by wire P, and the connection of the other buttons J^2 J^3 J^4 J^5 with said coil E is in each instance at a point thereof intermediate of or between said two end connections, and these several intermediate points of connection may be either at regular or equal distances apart, as is shown, Figs. 4 and 5, or at irregular or unequal distances apart. The several wire connections between the binding-post N and the buttons J J^2, &c., and secondary coil E, as also the connection between binding-post N^2 and plate L, are shown in Fig. 1 by dotted lines and in the diagrams Figs. 4 and 5 by full lines.

S S^2 are stops at opposite sides of the switch K and secured to the base-board C to limit the swing of the switch in either direction.

The diagram Fig. 4 shows the secondary coil E as a whole in one continuous winding from end to end, whereas in the diagram Fig. 5 it is shown as in separate windings, corresponding to the intermediate wire connections of the coil therein shown, as also in Fig. 4, and these separate windings constitute as a whole the secondary coil E, and each has one end connected by wire to its respective button-head J^2, J^3, J^4, or J^5, as the case may be, and the opposite ends of the series as a whole are connected, respectively, by wire P to the binding-post N and by wire R to the button-head J.

The primary and secondary coils D and E, core F, together with the necessary insulation thereof and all within the shell A, substantially as described, constitute as one whole the electric transformer, and it in its separate parts and their combination and arrangement as described serve under this invention as an electric transformer.

The diagram Fig. 4 shows the secondary coil E as one whole and in a continuous and simliar winding throughout its whole length. The diagram Fig. 5 shows the secondary coil E, as it were, in similar and separate sections or windings electrically continuous with each other, and a^5 is insulation of any suitable material in separate pieces and about and around and extending between said sections.

From the foregoing description of the parts, their respective constructions and relative arrangement as to each other and all and severally making up the electric transformer, and the several electric connections with the primary and secondary coils or windings, switch, and metal buttons, and otherwise all as set forth, it is plain that with the switch on any one of the buttons J J^2, &c., an electric current is thereby established through the secondary coil and such button and thence to and through the device, apparatus, or whatever other appliances, &c., in connection with which the same is to be used, and so with a predetermined ratio or proportion of said electric connections between said buttons and the secondary coil represented by the number of windings in a single section or in the combination of two or more sections of the secondary coil, voltages of correspondingly different and determined pressures can be secured from one and a common secondary coil of the transformer, the same being transmitted through the electric connections at the binding-posts for use or application as desired.

One example of the utility of this invention is for the heating of a cauterizing instrument which therefor is suitably electrically connected at the binding-posts N N^2. Again, one adaptation of this invention for practical purpose is with a winding of the primary coil for a pressure of one hundred and thirteen volts and a carrying capacity of five amperes, making five hundred and sixty-five watts in the primary coil, requiring eleven hundred and fifty turns, and this would produce in the secondary winding or coil a quantity of current at any pressure in the secondary coil, the windings of which are directly proportional to the primary winding or coil. For illustration, with eleven hundred and fifty turns in the primary coil and 10.2 ampere-turns in the secondary coil it would be possible to draw from this secondary unit on a dead-shot circuit of the secondary the same quantity of current as the primary would take at full load—to wit, five hundred and sixty-five watts—with a loss of two per cent. and this pressure in the secondary being one volt; but if the turns in the secondary are in direct proportion to the primary windings any voltage can be obtained in the secondary from unity upward and without limit, as may be desired. Again, all else being properly adjusted, as has been explained, plainly different pressures or voltages of current can be secured from one and the same secondary coil and similarly through the cauterizing instrument, if that is the instrument in connection as stated, by simply suitably manipulating the switch, and, again, that these different pressures or voltages will be varied according to the button of the series of buttons having the switch closed upon it and as follows—to wit, with the switch closed upon the button J^2 the pressure would be one volt, with the switch closed upon the button J^3 the pressure would be two volts, with the switch closed upon the button J^4 the pressure would be three volts, with the switch closed upon the button J^5 the pressure would be four volts, and with the switch closed upon the button J the pressure would be five volts, the highest pressure or voltage under the conditions above explained and with the number of sections of the secondary coil and buttons shown and described. However, it is evident that

the secondary-coil sections and separate buttons to correspond therewith may be increased or decreased in number at pleasure, and, again, that the secondary-coil sections may vary or differ as to their respective ampere-turns and that the initial pressure of the alternating or intermittent current through the primary coil may be more or less than one hundred and thirteen volts, as above stated, all as and in a manner well known and understood by electricians, and therefore needing no particular description herein.

It may be well to here observe that one side of each of the several sections of the secondary coil are common to one another and act as one side of the transformed current and that the other side of the several sections of the secondary coil are separately connected in the order of their relative voltages to the metal buttons $J J^2$, &c., commonly known as "rheostat-buttons," and a switch or arm which closed across one of said buttons completes the other side of the transformed current.

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

A primary coil or winding, a secondary coil or winding within the primary coil, a core of bunched longitudinal wires within the secondary coil, wooden heads supporting the opposite ends of the core, insulation of primary and secondary coils and of core and secondary coil, and surrounding primary coil, a closed shell or case containing primary and secondary coils, core and wooden heads and then said insulations, and iron particles packed within the shell about the insulation surrounding the primary coil, in combination with insulated electric wires, one leading from one pole and another from the opposite pole of the primary coil and respectively connected to the opposite poles of any suitable source of electric energy, a series of electric contacts, insulated electric wires, one connected to each of the electric contacts and the others connected to the secondary coil, but severally at separate intermediate points and at one end only of its length, insulated electric wires severally connected to the secondary coil at intermediate points of its length and to the electric insulated wire leading from one pole of the primary coil, an electric switch arranged to be placed in and out of contact with each of said electric contacts, and an insulated electric wire connected to said switch and to a binding-post separate from the binding-post connected to one pole of the primary coil, all as substantially as described and for use and operation and purposes specified.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HERBERT F. PROVANDIE.

Witnesses:

CHARLES J. SMITH,

ALBERT W. BROWN.