

No. 662,422.

Patented Nov. 27, 1900.

W. GRUNOW, JR.
ELECTRICAL RESISTANCE.

(Application filed Apr. 5, 1900.)

(No Model.)

Fig. 1.

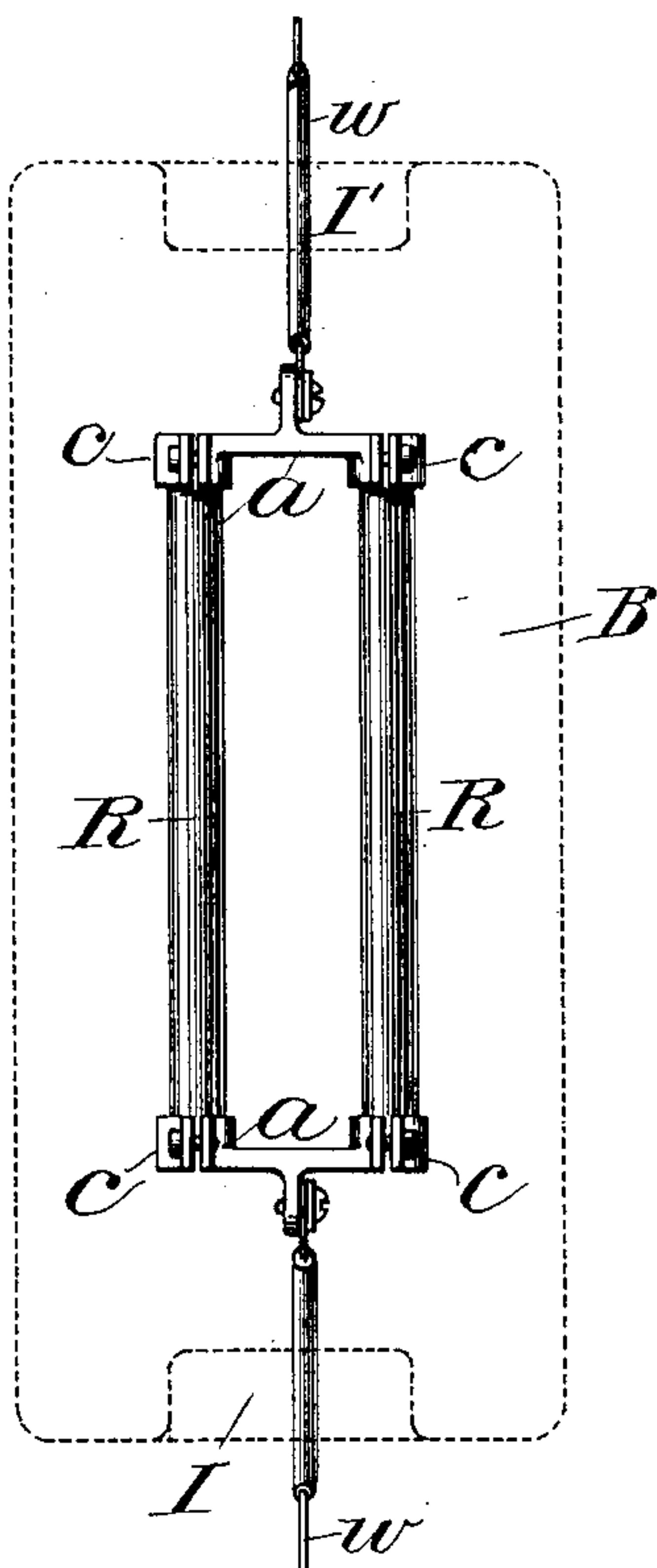


Fig. 3.

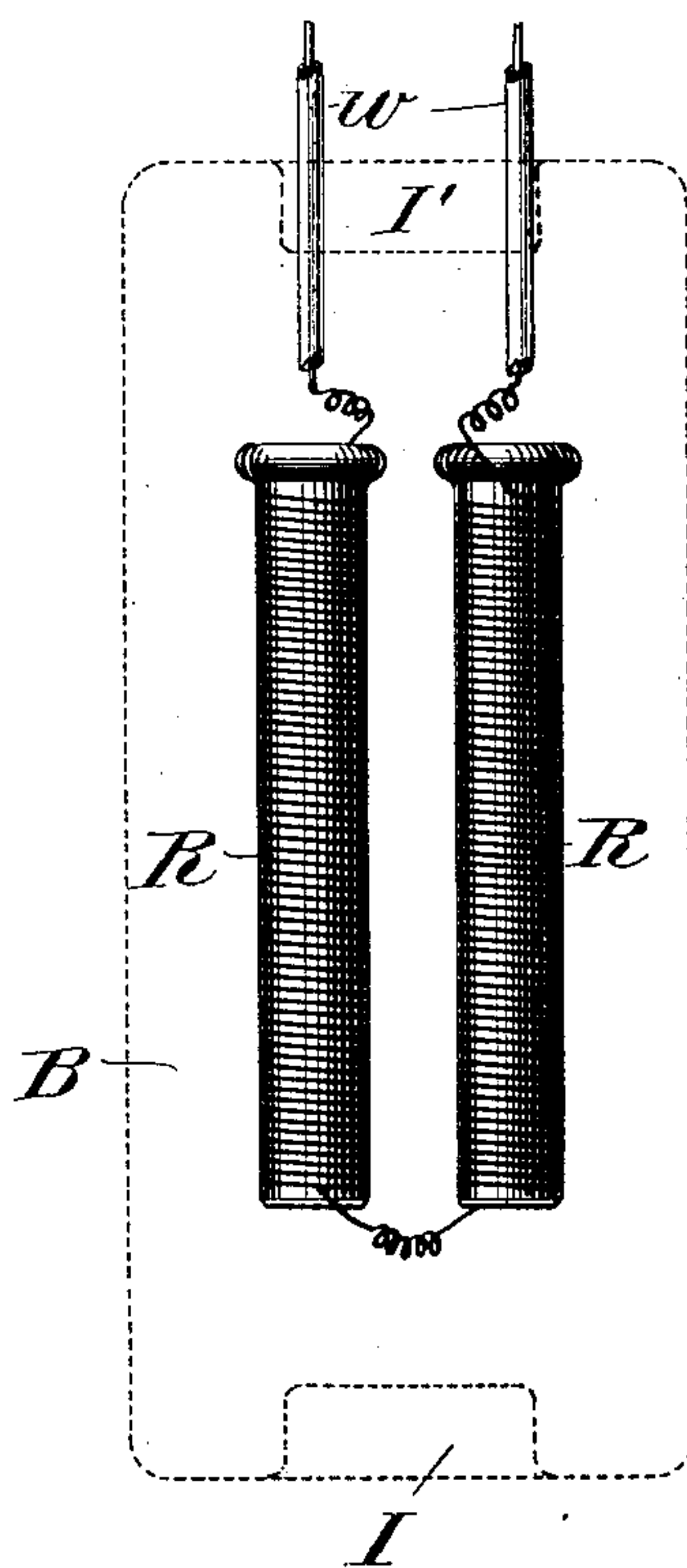


Fig. 2.

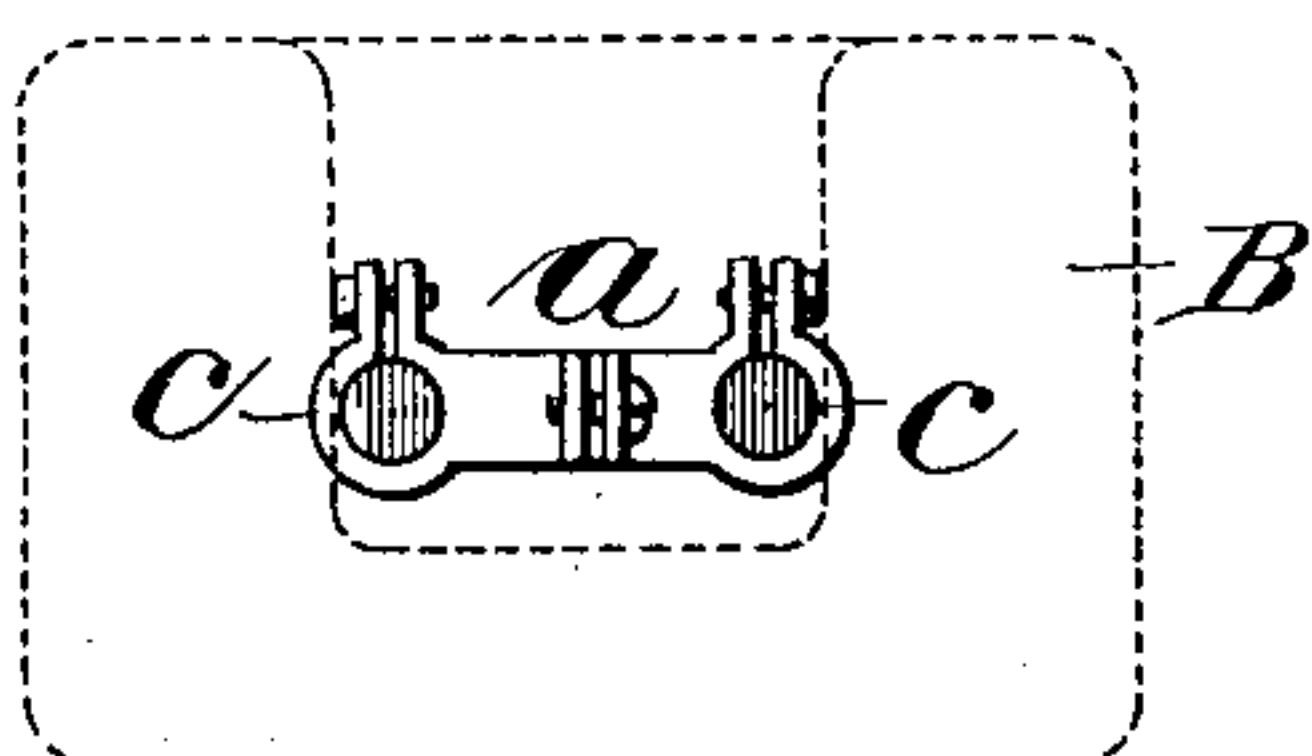


Fig. 4.

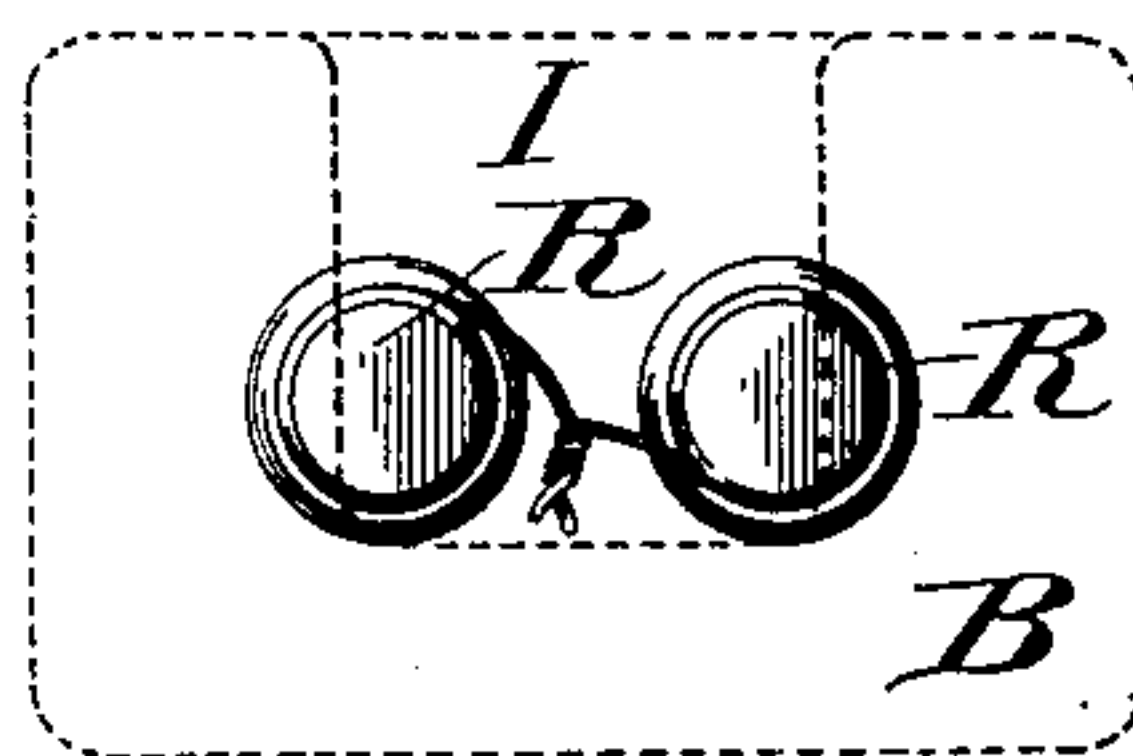
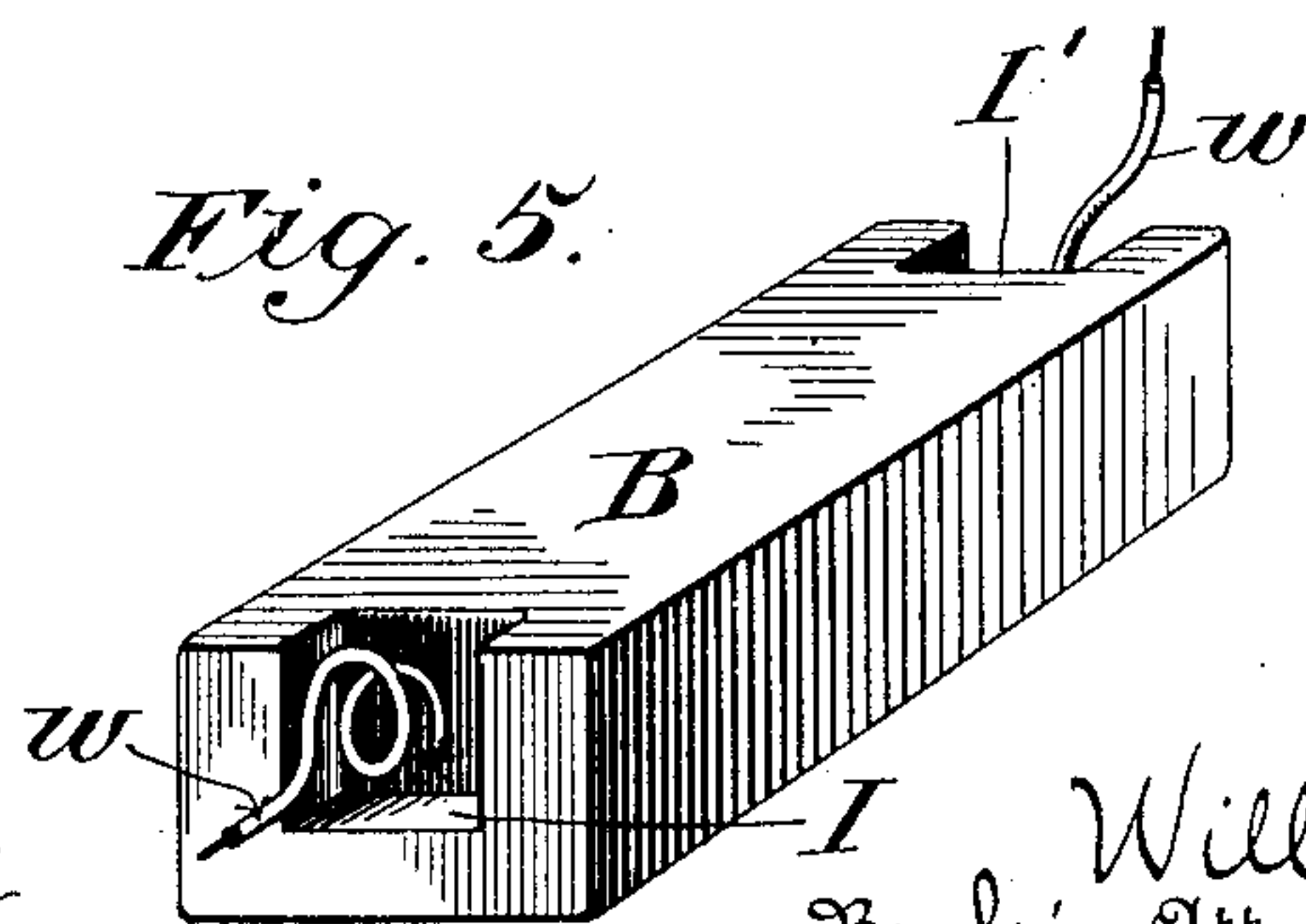


Fig. 5.



Witnesses
Edward Rowland
M. F. Keating

Inventor
William Grunow Jr.
By his Attorney
Charles D. Kintner

UNITED STATES PATENT OFFICE.

WILLIAM GRUNOW, JR., OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE
McELROY-GRUNOW ELECTRIC RAILWAY SYSTEM, OF SAME PLACE.

ELECTRICAL RESISTANCE.

SPECIFICATION forming part of Letters Patent No. 662,422, dated November 27, 1900.

Application filed April 5, 1900. Serial No. 11,648. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM GRUNOW, Jr., a citizen of the United States, and a resident of Bridgeport, county of Fairfield, and State of Connecticut, have made a new and useful Invention in Electrical Resistances, of which the following is a specification.

My invention has for its objects, first, to construct an electrical resistance which will withstand rough handling and permit of ready transportation without injury thereto; second, to provide an electrical resistance with a maximum radiating-surface of a non-absorbent insulating material; third, to construct an electrical resistance which is adapted for use in places where extreme moisture prevails or directly in the ground without requiring additional external inclosures, as in connection with underground or subsurface trolley systems of electric railways or electric-lighting circuits, whereby high potentials from the same can be readily and cheaply reduced to low potentials of current suitable for telegraph, telephone, and railway signaling purposes.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1 is a plan view of one form thereof, the surrounding or inclosing casing therefor being illustrated in dotted lines; and Fig. 2 is an end view as seen looking at Fig. 1 from the bottom toward the top of the drawings upon the supposition that the surrounding medium is of glass or other transparent material. Fig. 3 is a view similar to Fig. 1 of a modified form; and Fig. 4 is an end view of Fig. 3, similar in all respects to Fig. 2. Fig. 5 is a perspective view of the completed incased resistance-coil, drawn upon a smaller scale than are the other figures of the drawings.

My invention contemplates the construction of an electrical resistance made of one or more carbon or other high-resistant conducting-rods connected together in multiple or series, as required, by metallic clamps and provided with circuit connections at their ends and all embedded in an insulating medium of a vitreous or non-absorbent char-

acter which will offer large heat-radiating capacity and withstand rough usage.

It also contemplates the construction of an electrical resistance made of wire wound upon insulating-cores, together with circuit connections and the ends of insulated conductors, all similarly embedded.

For a full and clear understanding of the invention reference is had first to Fig. 1 of the drawings, in which is disclosed one form of my novel electrical resistance consisting of two or more rods *R R* of carbon, carbonized fiber, graphite, plumbago, or other well-known equivalent high-resistant conducting material, said rods being connected together at their opposite ends in multiple, as shown, or in series, when required, by metallic end plates *a*, having clamp extensions *c c c c*, adapted to be secured about the rods by screws. To the end plates *a* are secured, by screws or other circuit connections, conducting-wires *ww*, insulated as shown. I embed the entire resistance and circuit connections as thus constructed in a surrounding casing, preferably of vitrified stone, cement, glass, or other insulating material which is a non-absorbent and of such refractory nature as will admit of its being handled with ordinary care without damage. I mold or form in the ends of this surrounding casing, at the points where the conducting-wires pass out, indentations or pockets *I I'*, the function of which is to enable one to coil the insulated conducting-wires *ww* in a compact manner for shipment or use, so that the same may not be damaged.

In Figs. 3 and 4 a modified form of the invention is shown, in which the resistance is composed of German-silver or other highly-resistant wire wound in successive spirals around non-conducting cores, the ends being connected directly, as shown, to the insulated conductors *ww* and the entire structure and circuit connections embedded, as before, in a vitrified mass *B*. In this instance I have constructed the resistance that the conductors *ww* both pass out at one end and may therefore be coiled in the indentation or pocket *I'*.

Such resistances have many uses in the arts

and when once constructed are capable of being shipped from point to point and handled with less than ordinary care without any damage whatever. They also have an especial utility in connection with electric railways of the surface-contact type, in which it is often found necessary to utilize resistances under the ground, my novel resistance and the insulated conducting-wires attached to the opposite ends thereof being, when constructed as described, free from the annoyance of current leakage, it being obvious that the insulating-conductors may be of any length, thus enabling me to utilize the structure in any place where excessive dampness prevails and without liability of unnecessary current leakage.

I am aware that it is not broadly new with me to coat or surround an electrical resistance with vitreous material, and I make no claim hereinafter broad enough to include such a structure, my most generic claim being directed to an electrical resistance and circuit connections wholly embedded in a mass of vitreous material, preferably of box-like form, so as to present a large and effective radiating-surface and simultaneously afford a protection to the same from moisture, whereby it may be placed deeply in the ground or in moist places to further increase the radiating or cooling effects and be of such a nature as will enable the user to ship or handle quantities of such electrical resistances to the greatest advantage and with the least possible damage.

Having thus described my invention, what

I claim, and desire to secure by Letters Patent of the United States, is—

1. An electrical resistance and circuit connections therefor, together with insulated conductors attached to said circuit connections, said resistance, circuit connections and the ends of the insulated conductors being wholly embedded in a non-absorbent insulating mass, substantially as described.

2. An electrical resistance having circuit connections with insulated conductors, said resistance and the attached ends of the insulated conductors being wholly embedded in an insulating mass, substantially as described.

3. An electrical resistance composed of a conductor embedded in a mass of insulating material of box-like form; in combination with insulated conductors attached thereto and extending out of the mass, said mass being provided with one or more indentations or pockets for folding or winding the end conductors therein, substantially as described.

4. An electrical resistance embedded in a vitrified mass of box-like form; in combination with insulated conductors secured to the ends thereof and extending out of the mass, said mass being provided with indentations or pockets, one for each outwardly-extending conductor, substantially as described.

In testimony whereof I have hereunto subscribed my name this 4th day of April, 1900.

WILLIAM GRUNOW, JR.

Witnesses:

C. J. KINTNER,
M. F. KEATING.