(No Model.)

2 Sheets—Sheet 1.

M. J. WIGHTMAN.

RHEOSTAT.

No. 411,947. Patented Oct. 1, 1889.

Fig 1.

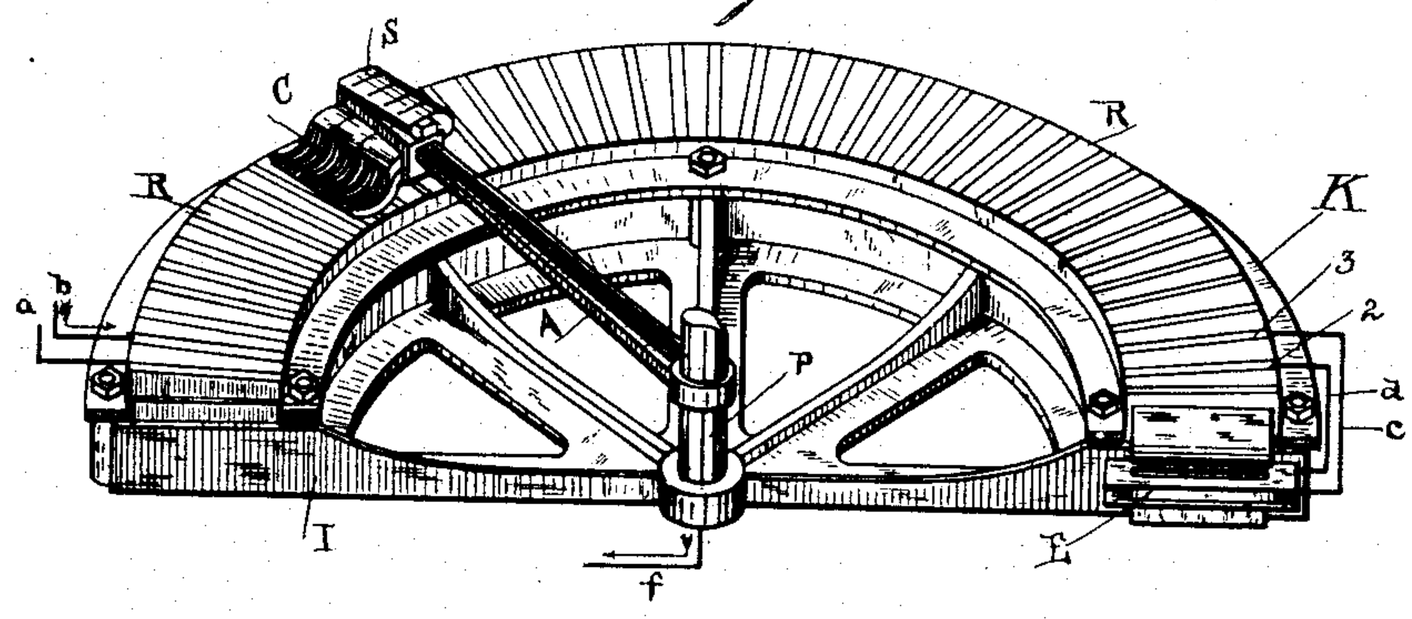


Fig 2.

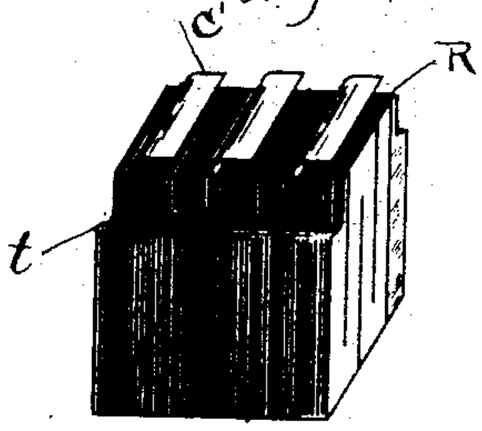


Fig 4

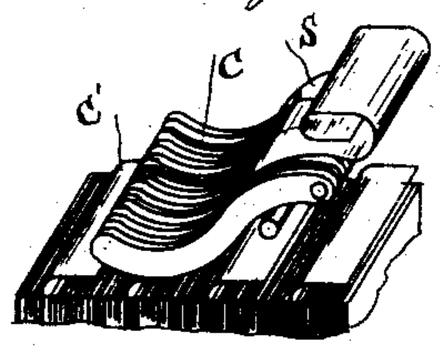


Fig 11.

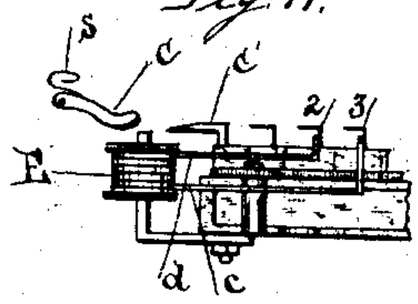
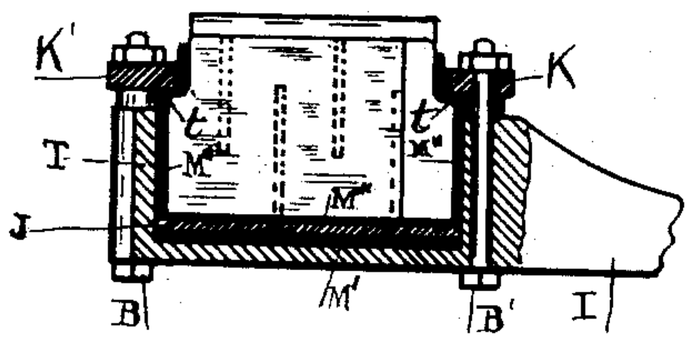


Fig 3.



Witnesses:
Thos. H. Capel
Thos. F. Conley

Inventor:
Merle J Wightman
By
H. C. Townsend
Attorney.

(No Model.) 2 Sheets—Sheet 2.

M. J. WIGHTMAN.

RHEOSTAT.

No. 411,947. Patented Oct. 1, 1889.

Fig. 5.

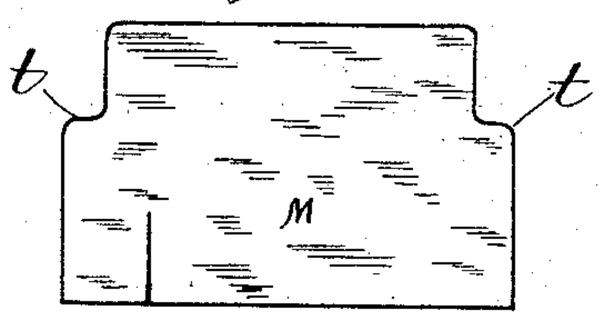


Fig. 6.

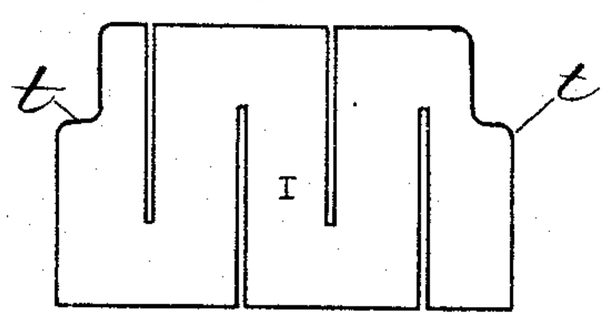


Fig. 7.

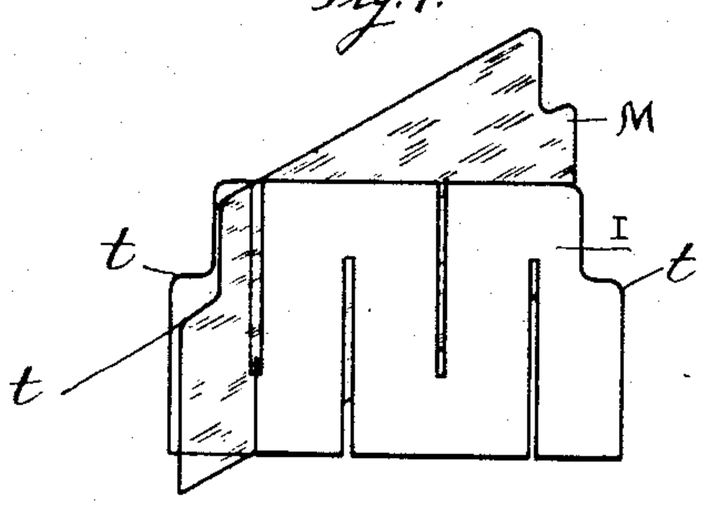


Fig. 10.

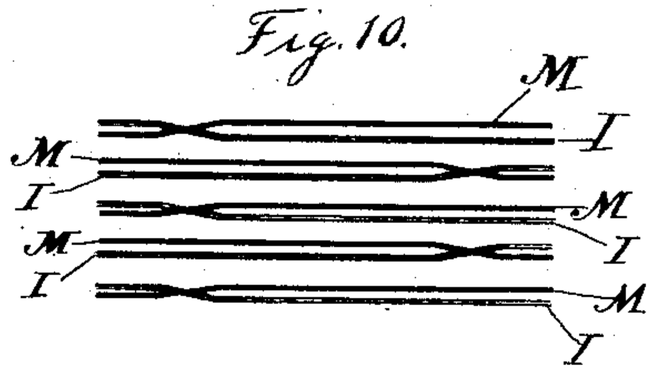


Fig. 8.

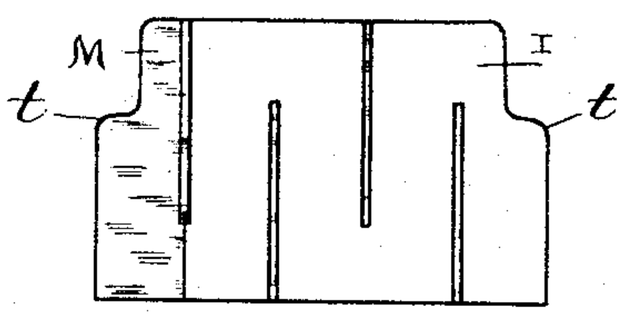


Fig 9

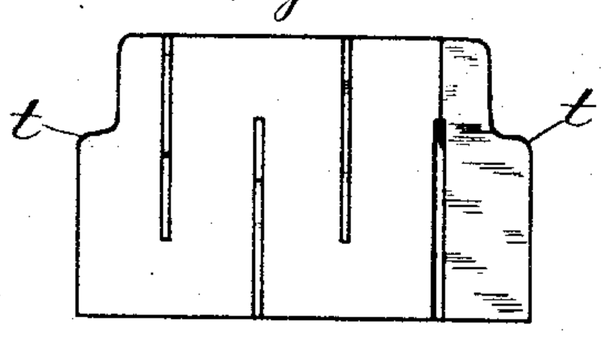


Fig. 14.

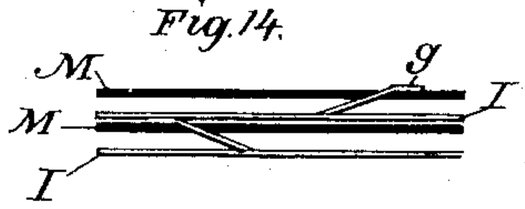


Fig. 12.

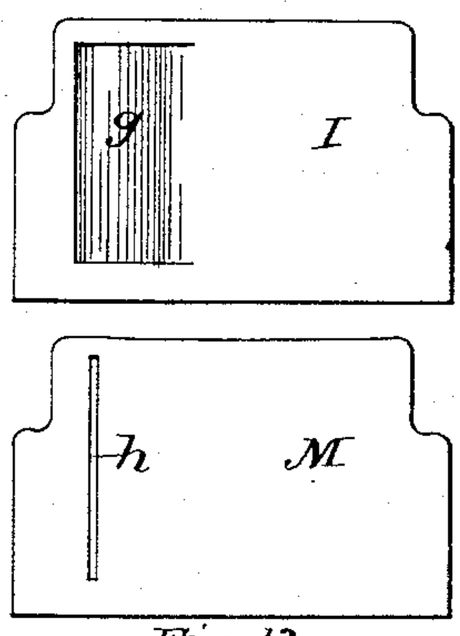


Fig. 13.

Witnesses:

Thos. H. Cooney

Inventor:

Merle J. Wightman

By H. C. Townsend

Attorney.

UNITED STATES PATENT OFFICE.

MERLE J. WIGHTMAN, OF LYNN, MASSACHUSETTS.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 411,947, dated October 1, 1889.

Application filed July 5, 1889. Serial No. 316,650. (No model.)

To all whom it may concern:

Be it known that I, MERLE J. WIGHTMAN, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Rheostat, of which the following is a specification.

My invention relates to the construction of controllable or adjustable rheostats or electrical resistances.

The object of my invention is to obtain rigidity and strength of construction, together with ease and cheapness of manufacture, and at the same time to produce a rheostat which shall occupy little space, and be, therefore, well adapted for use in situations where a bulky and cumbersome apparatus could not be readily employed—as, for instance, under electric street-cars.

A further object of my invention is to facilitate the substitution of new parts for parts broken or disarranged by accident.

My invention consists, first, in a novel electric-resistance pile comprising alternate layers or sheets of conducting and insulating material piled together, and having each conducting strip or layer connected at one end, or to one side of its center, to the strip adjoining it on one side, and at its other end or side of its center to a strip or sheet of conducting material adjoining it on the other side.

My invention consists, further, of an electric-resistance pile composed of a series of pairs of sheets of conducting and insulating material intersecting one another and piled together, with the successive sheets of conducting material in electrical contact.

My invention consists, also, in other features of construction and improvements in the details, whereby the conducting-strips are so disposed and held that when heated by the current or subjected to jars or shocks it is impossible for them to become displaced from their normal or proper position.

My invention consists, also, in a means whereby injury to the contacts of the rheostat shall be prevented when the contact-arm leaves the final contact of the series.

In the accompanying drawings, Figure 1 is a perspective view of an apparatus embodying my invention. Fig. 2 shows a part of the resisting-conductor and the contacts therefor. Fig. 3 is a cross-section through the trough or holder in which the sheets of conducting and insulating material disposed to make an artificial resistance are built up. Fig. 4 illustrates a perspective view of the movable contact or wiper which I prefer to use in connection with the resistance. Figs. 5 and 6 are side elevations of the sheets or layers of conducting and insulating material in the forms I prefer to employ. Fig. 7 shows a pair of sheets of conducting and insulating material as interlocked and prior to the disposing of them in parallel positions to one another. Fig. 8 shows the two sheets as disposed preparatory to use for forming the pile. Fig. 9 illustrates an adjoining pair in a similar condition. Fig. 10 is a plan showing the relative disposition of the pairs of insulating and conducting sheets. Fig. 11 is a side elevation showing the final contacts of the rheostat as combined with the device for rupturing the arc as the movable contact leaves the final contact of the series. Figs. 12 and 13 indicate modifications in the manner of forming the sheets so that they may intersect. Fig. 14 is an edge view of the sheets, Figs. 12 and 13, as combined.

I is a frame, of iron or other suitable material, made in the form of a semicircle, but which may, of course, form a complete circle or be of any other desired shape. At the outer part of this frame is a trough, box, or holder T, adapted to hold a pile of the sheets or layers of conducting or insulating material set edgewise therein. These sheets or layers are preferably made with shoulders *t t*, as shown in Figs. 5 and 6, so that by the application of suitable clamping-plates K K′ and bolts B B′ the pile of sheets may be firmly held in its trough or support. The sheets or layers of conducting and insulating material are indicated by the letters I M, respectively. The insulating material is mica or some other non-combustible insulator, while the conducting material through which the current flows is preferably iron. The sheets of mica and iron are placed side by side, with the iron and mica alternating.

In order to form an electrical connection between adjoining sheets of conducting ma-

terial, I prefer to arrange the conducting and insulating layers so that they shall intersect, thereby permitting a part of each conducting-sheet integral therewith to make electrical contact with the body of the conducting-sheet at the other side of the insulator. I preferably interlock the sheets of conducting and insulating material in pairs by slotting them at their edges, as indicated in Figs. 5 and 6. The conducting and insulating sheets and strips are placed astride or intersecting each other, as shown in Fig. 7, and are then forced into substantial parallelism, as indicated in Figs. 8 and 10. The point of intersection or interlocking is considerably to one side of the middle of each sheet, as shown more clearly in Fig. 10, so that the electric current instead of passing directly across the sheets of conducting material will be obliged to pass lengthwise through the same. Pairs of sheets formed as described are placed together as a pile with the crossed or intersecting portions of alternating pairs at opposite ends, as indicated in Fig. 10, thus forming a metallic conducting portion through which the current passes back and forth through the series of plates I.

The position of the slot or point of interlocking may be determined at pleasure and the resistance of the conductor may be varied. It is thus possible for the constructor to make the resistance of any desired character, or the pile may be reconstructed at pleasure, the pairs of plates being interlocked or made to intersect at a new point.

While I prefer to so combine the pairs of plates or sheets that the conducting-sheets shall make contact or connection by parts integral with the sheets themselves, I do not limit myself to this, since it is obvious that the pile may be built up from alternating sheets of conducting and insulating material and connections be made in other ways, so that the current would pass to and fro through the successive sheets. The intersection of the sheets so that the conducting-sheet may form a part integral with it on the opposite side of the non-conducting sheet might be by means of a tongue and slot, as indicated in Figs. 12 and 13, the conducting-sheet I being stamped out with a tongue *g*, while the non-conducting sheet M is provided with a slot *h*, through which the tongue may pass, as indicated in Fig. 14.

A is an arm carrying at its end a contact C, revoluble around a center P. The contact C moves over a series of contacts C′, consisting of the bent-over ends of plates of conducting material placed in the pile and preferably consisting of independent plates of considerably greater thickness than the plates I and interposed at intervals in the pile. The contact C consists of a series of freely-pivoted plates, as shown more clearly in Fig. 4, held down by a spring S, so as to make good connection with the contacts C′.

In the bottom of the trough or holder T is placed a considerable thickness of good insulating material—such as several layers of mica M′—upon which rests a slab of slate J, or similar material, and a superposed layer of mica M″, upon which the pile directly rests. The sides of the trough are likewise lined with heavy layers of good insulating material M″, as indicated, in the same manner. Pairs of plates or sheets, such as shown in Fig. 10, are introduced into the trough in sufficient number to fill the same, and are firmly pressed together flatwise in any suitable manner. In order to complete any empty space left at the ends of the trough and to secure good compression, dummy-plates, of insulating material or other substance, may be firmly wedged in. The manner of compressing or holding the plates firmly together in a pile, so as to make good contact at the points where the conducting plates or sheets touch, is, however, a matter of detail that may be indefinitely varied. One end of the pile of conducting-plates is connected to one end or pole *a b* of the circuit in which the resistance is to be varied, while the contact-arm A is connected to the other pole by a wire *f*. The contacts C are preferably curved at their lower edge, in order to permit a free movement of the same in either direction over the plates of contact C′.

Fig 11

In order to prevent damage to the contact C as it leaves the final contact C′ of the series, I apply an arc-rupturing electro-magnet E, as shown more clearly in Fig. 5, the magnetic field of such magnet being arranged to act upon the space at which the arc is liable to form. The coils of this electro-magnet may be connected by wires *c d* into circuit between two contacts C′ near the terminal contacts, so that as the contact C nears the point of rupture the coils of the magnet E will be included in the electric circuit with the series of conducting-plates forming the artificial resistance, but in a shunt or branch around those plates included between the contacts numbered 2 3.

What I claim as my invention is—

1. An electric-resistance pile consisting of alternate layers of conducting and insulating material, having the parts of each conducting-strip to either side of its center connected, respectively, to the two adjoining conducting-strips.

2. An electric-resistance pile consisting of a series of interlocked pairs of sheets of insulating and conducting material, having the successive sheets of conducting material in electrical contact alternately at opposite sides of their centers.

3. An electric-resistance pile consisting of a series of pairs of sheets of conducting and insulating material intersecting to one side of their center and piled together with the successive sheets of conducting material in electric contact.

4. An electric-resistance pile made up of alternate layers of conducting material and a non-combustible insulator.

5. An electric-resistance pile consisting of alternate sheets of mica and a conducting material, with the successive sheets of the conducting material in electrical contact.

6. An electric-resistance pile consisting of alternate layers of conducting and insulating material piled together, with the successive conducting-layers in electrical connection through parts integral with them.

7. An electric-resistance pile consisting of alternate sheets or layers of mica and iron, having the successive sheets of iron in electrical connection.

8. In a rheostat, a pile of alternate sheets of insulating and conducting material clamped in a holder or trough lined with insulating material, as and for the purpose described.

9. An electric-resistance pile formed of sheets of conducting and insulating material formed with shoulders, as and for the purpose described.

10. An artificial electric resistance consisting of interlocked or crossing sheets of iron and mica having shoulders at their opposite ends, in combination with a holder or trough into which the same are set edgewise and clamping-plates for engaging with the shoulders, as and for the purpose described.

11. The combination, with an artificial electric resistance, of an arc-rupturing magnet applied to the final contact of the series and connected to the resistance-circuit, as described, so as to be energized as the moving contact nears the terminal contact.

12. The combination, with an artificial electric resistance and the fixed contacts therefor, of a movable contact and an arc-rupturing magnet the field of which includes the arc-forming space at the final contact of the series.

13. In an electric-resistance pile, alternate sheets of conducting and non-conducting material provided with slots extending inward from their edges, as and for the purpose described.

14. An electric-resistance plate formed with shoulders at its ends and with one or more slots extending inward from its edges, as and for the purpose described.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 1st day of July, A. D. 1889.

MERLE J. WIGHTMAN.

Witnesses:

J. W. GIBBONEY,

HERMAN BERGHOLTZ.