(No Model.) 2 Sheets—Sheet 1.

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RHEOSTAT.

No. 559,349. Patented May 5, 1896.

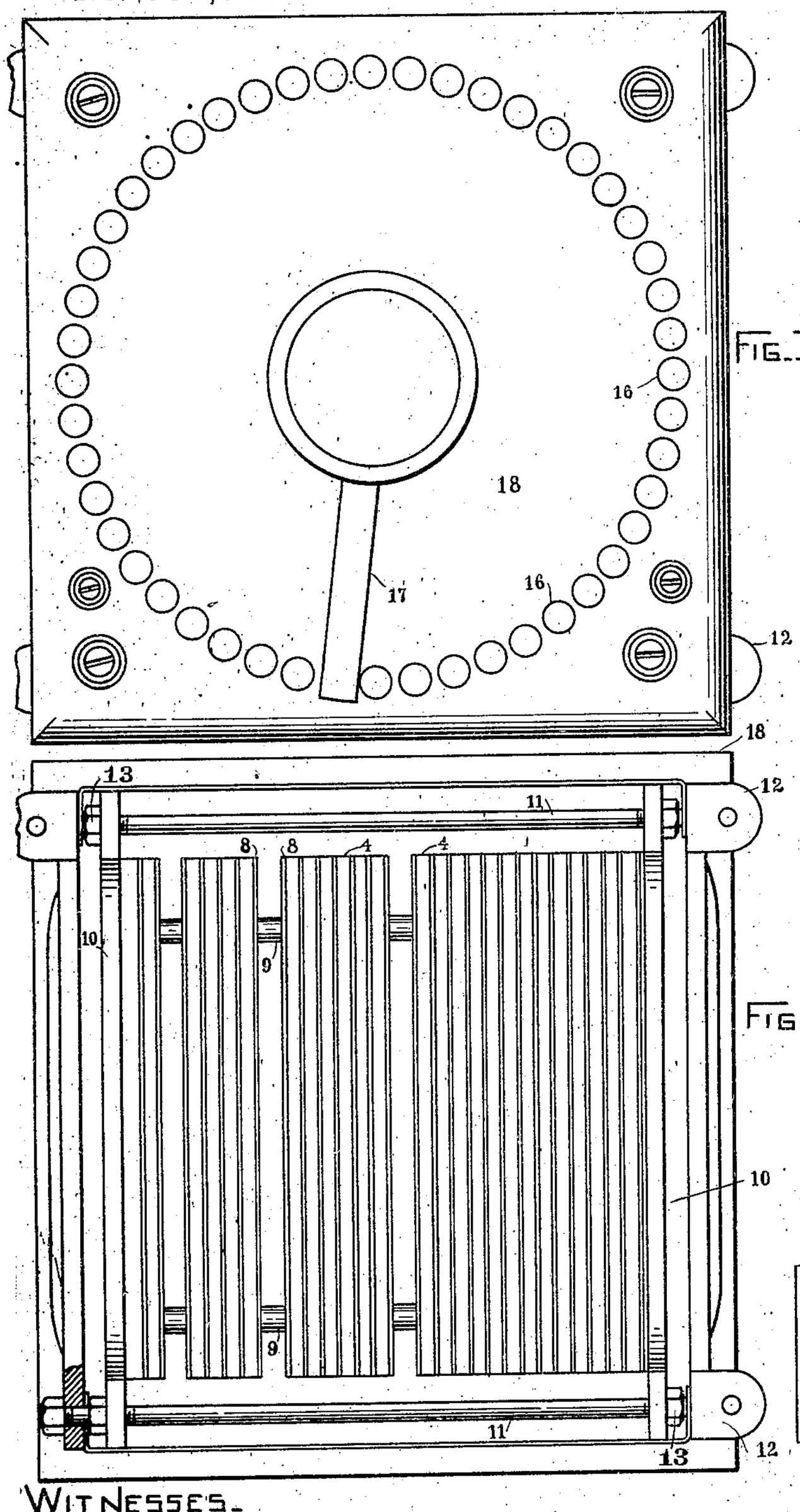


FIG. 1.

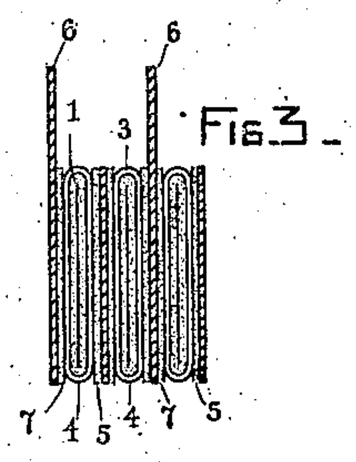
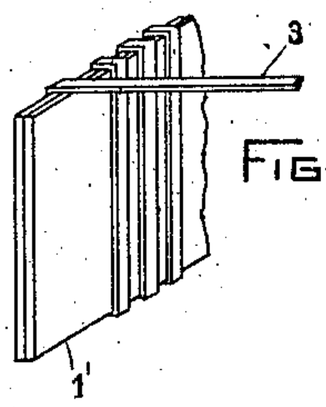


FIG. 3.



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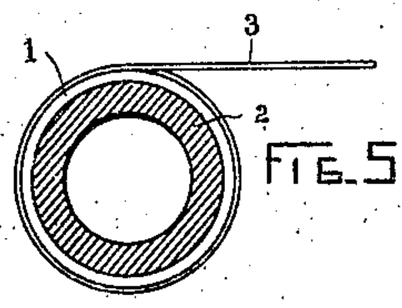

FIG. 5.

FIG. 2.

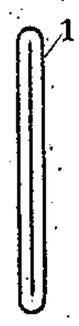

FIG. 6.

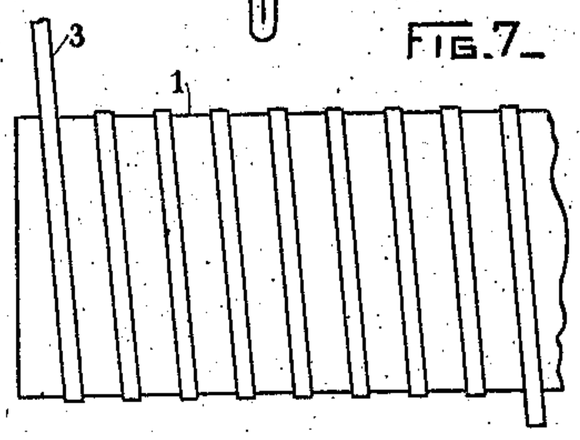

FIG. 7.

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(No Model.) 2 Sheets—Sheet 2.

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RHEOSTAT.

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FIG. 8.

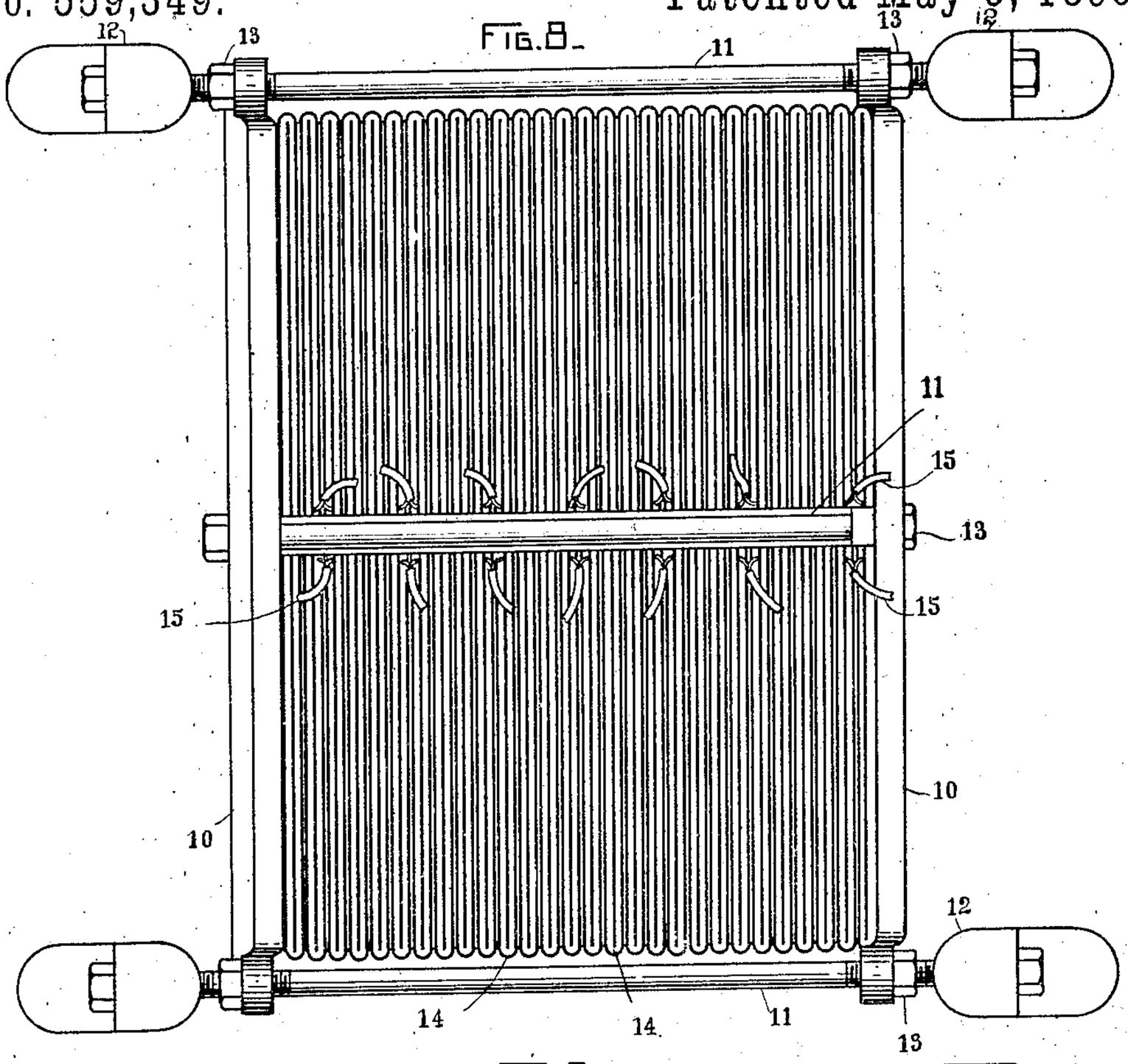

FIG. 9.

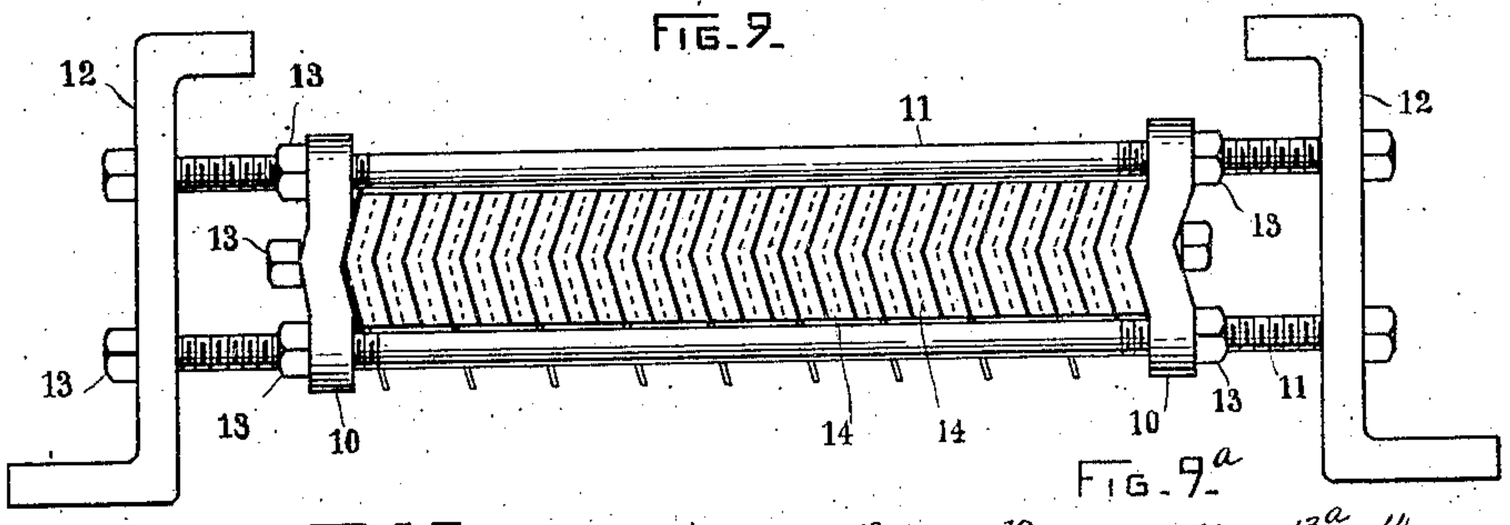

FIG. 9a.

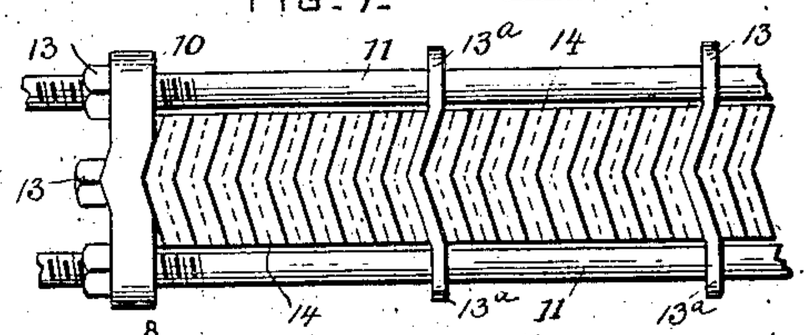

FIG. 10.

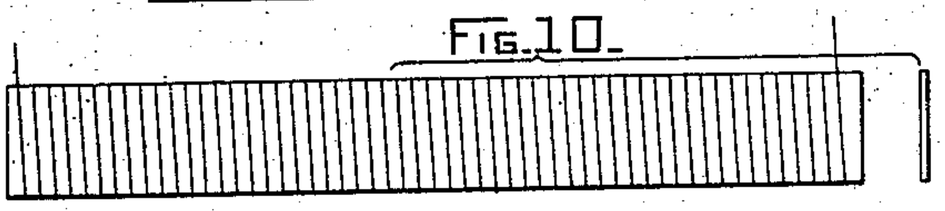

FIG. 11.

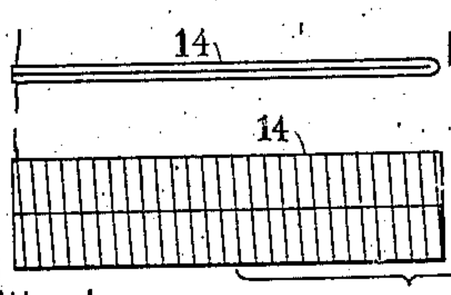

FIG. 12.

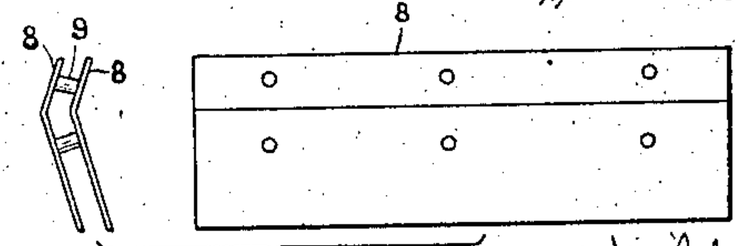

FIG. 13.

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UNITED STATES PATENT OFFICE.

WILLIAM S. ANDREWS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 559,349, dated May 5, 1896.

Application filed December 12, 1895. Serial No. 571,864. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. ANDREWS, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Rheostats, (Case No. 284,) of which the following is a specification.

This invention relates to rheostats, and has for its object to provide an improved rheostat which will be strong and durable and compact, may be easily taken apart and repaired, and will be effective in operation.

Referring to the accompanying drawings, Figure 1 is a plan view of the top of the rheostat. Fig. 2 is a plan view of the rheostat from the under side or bottom. Fig. 3 is a cross-section of a portion of the conductors, insulation, and radiating-plates packed together. Fig. 4 is a detail view showing a portion of one of the resistance-plates and illustrating one way of making the same. Figs. 5, 6, and 7 are other detail views showing the manner of making the resistance-plates. Figs. 8 and 9 are plan and end views showing, with top removed, a modified form of construction. Fig. 9ª is a detail view illustrating supporting-plates in conjunction with compression-plates. Figs. 10, 11, 12, and 13 are detail views of parts of the device.

In carrying out this invention particular reference is had to an improved construction in the resistance-plates and conductors, forming what will be hereinafter termed "resistance-cards." These cards are constructed as follows: Referring to Figs. 4 to 7, inclusive, a cylinder 1, of asbestos or other insulating material, mounted on a form or arbor 2, is wound spirally with a conductor 3, of German silver or other suitable metal, as shown in Figs. 5 and 7. The conductor 3 may be of any shape in cross-section, but is preferably in the form of a ribbon, or it may be a round wire. Instead of employing the cylindrical form 1 flat sheets 1' of asbestos laid together and wound with the conductor 3, as shown in Fig. 4, may be used. Cylinders 1 thus wound are then flattened in a press to the shape indicated in Figs. 3 and 6 and folded or doubled lengthwise, bringing the loose ends of the conductor at one end of the resistance-card and forming a resistance-card 4. This folded construction will be more particularly set forth in the description of the modification illustrated in Figs. 8 to 12, inclusive. These resistance-cards are packed side by side with sheets 5 of asbestos or other insulating material between them, as shown in Figs. 2 and 3, and built up into a rheostat, as shown in Fig. 2. Between the resistance-cards 4 are interpolated radiating-plates 6 to absorb the heat generated by the electric current and conduct it to the surface of the mass, where it is radiated. The plates 6 may be of iron or other metal. They are insulated by means of sheets 7 from the adjacent conductors 3. This insulation should be as thin as possible in order to present a minimum resistance to the transfer of heat from the conductors 3 to the radiating-plates 6. Ventilating-plates 8 are sometimes interpolated between the resistance-cards 4. These plates 8 are arranged and connected together in pairs by spacing-blocks 9. The plates 8 permit the passage of air and afford a larger radiating-surface. By means of these plates the cross-section of the conductor may be reduced with a given surface temperature, thus effecting an economy in material and space. They are applied more particularly to the larger sizes of rheostats, wherein it may be required to dissipate considerable heat energy.

The mass made up of the resistance-cards, radiating and ventilating plates, &c., as hereinbefore set forth, is clamped and compressed between compression-plates 10 of cast-iron or other metal into a solid and convenient form, as shown in Fig. 2, by means of rods 11, extending through the plates 10, and supports or uprights 12 at the corners of the rheostat and nuts 13 or other suitable means for tightening and compressing the mass between the plates 10. If desired, one or more supporting-plates 13ª may be used to add strength and rigidity to the structure, as shown in Fig. 9ª. These plates are usually similar in shape to the compression-plates and mounted in the same way on the rods 11, and may be located between the compression-plates at suitable distances apart to prevent sagging where a large number of cards are employed.

In the modification shown in Figs. 8 to 13,

inclusive, the resistance-cards 14 are formed in the shape of a broad V lengthwise by bending. The radiating-plates, ventilating-plates, and compression-plates, and also the supporting-plates, are formed of a similar shape. This construction has been found desirable, since the mass can be packed solidly together, so as to lock the resistance-cards, &c., into one another, and thereby form a structure which is more rigid than in the case of the flat form heretofore described, Figs. 1, 2, 3, &c. These resistance-cards 14 are constructed similarly to the resistance-cards 4 in other respects than this V shape, and are arranged in two blocks or sets having their ends abutting at the center of the rheostat, as shown in Fig. 8. The resistance-cards heretofore described in connection with Figs. 1, 2, 3, &c., are similarly arranged in two blocks with abutting inner ends. The conductors 3 are provided with loose ends 15 of sufficient length to join the next or adjacent resistance-card and also make any necessary connection to the contact points or plates of the rheostat. The advantage of this folded construction, heretofore described, of the resistance-cards is that these loose ends 15 are grouped at the center of the rheostat, as shown in Fig. 8, thereby making it more convenient to arrange the connections and secure them to the contact-points 16. (Shown in Fig. 1.) These loose ends 15 being in the first place bare of insulation are covered and insulated from each other by having tubes of asbestos cloth or other suitable insulating material slipped over them and secured in place by the application of silicate of soda. The ends of the conductors may be connected together by any suitable mechanical means or by an electric or other welding process, and they may be connected to the buttons, studs, or binding-posts of the switch by screw contact in the usual manner.

17 indicates the usual form of switch mounted in the center of the board or top 18 of the rheostat, and having sliding contact with the contact-points 16.

It will thus be seen that by means of this structure herein set out the several resistance-cards, radiating, ventilating, and supporting plates may be securely and rigidly held together by compression and that parts of them may be removed by releasing the nuts and rods and compression-plates.

A feature of this rheostat is that it contains no carbonizable material and that no soft solder is necessary in its construction. It may therefore be heated to a temperature limited only by the oxidation of the German silver, &c., or the metal forming the conductors.

What I claim is—

1. A resistance-card for rheostats, consisting of insulating material wound with a metallic conductor, and folded upon itself lengthwise so as to bring the ends of the conductor at one end of the card.

2. A resistance-card for rheostats, consisting of a tube of insulating material wound with a metallic conductor and flattened and folded upon itself lengthwise, the ends of the conductor being located at one end of the resistance-card.

3. A resistance-card for rheostats, of insulating material wound with a metallic conductor and having a broad V shape lengthwise.

4. A resistance-card for rheostats, consisting of a flattened tube of insulating material wound spirally with a metallic conductor and folded upon itself lengthwise, and being of a broad V shape throughout its length.

5. In a rheostat, resistance-cards formed of layers of insulating material wound with metallic conductors, radiating-plates interpolated between the resistance-cards, compression-plates between which the radiating-plates and the resistance-cards are located, and means for compressing and securing the resistance-cards and radiating-plates between the compression-plates, substantially as set forth.

6. A resistance-card formed of layers of insulating material wound with metallic conductors, radiating-plates interpolated between the resistance-cards, ventilating-plates interpolated between the resistance-cards, compression-plates between which said resistance-cards, radiating-plates and ventilating-plates are located, and means for tightening and securing said several plates between the compression-plates.

7. In a rheostat, resistance-cards formed of layers of insulating material wound with metallic conductors, radiating-plates interpolated between the resistance-cards, supporting-plates and ventilating-plates also interpolated between the resistance-cards, compression-plates between which said several plates are located, and means for securing and compressing said several plates between the compression-plates, substantially as set forth.

8. A ventilating-plate for rheostats, consisting of pairs of metallic plates coated with insulating material and secured together and held apart by spacing-blocks.

9. A resistance-card for rheostats, consisting of layers of insulating material wound with metallic conductors and folded lengthwise, the conductors having loose ends covered and insulated from each other, and secured in place by silicate of soda.

In witness whereof I have hereunto set my hand this 10th day of December, 1895.

WILLIAM S. ANDREWS.

Witnesses:

B. B. HULL,

GENEVIEVE HAYNES.