(No Model.)

E. THOMSON.

RHEOSTAT.

No. 500,631. Patented July 4, 1893.

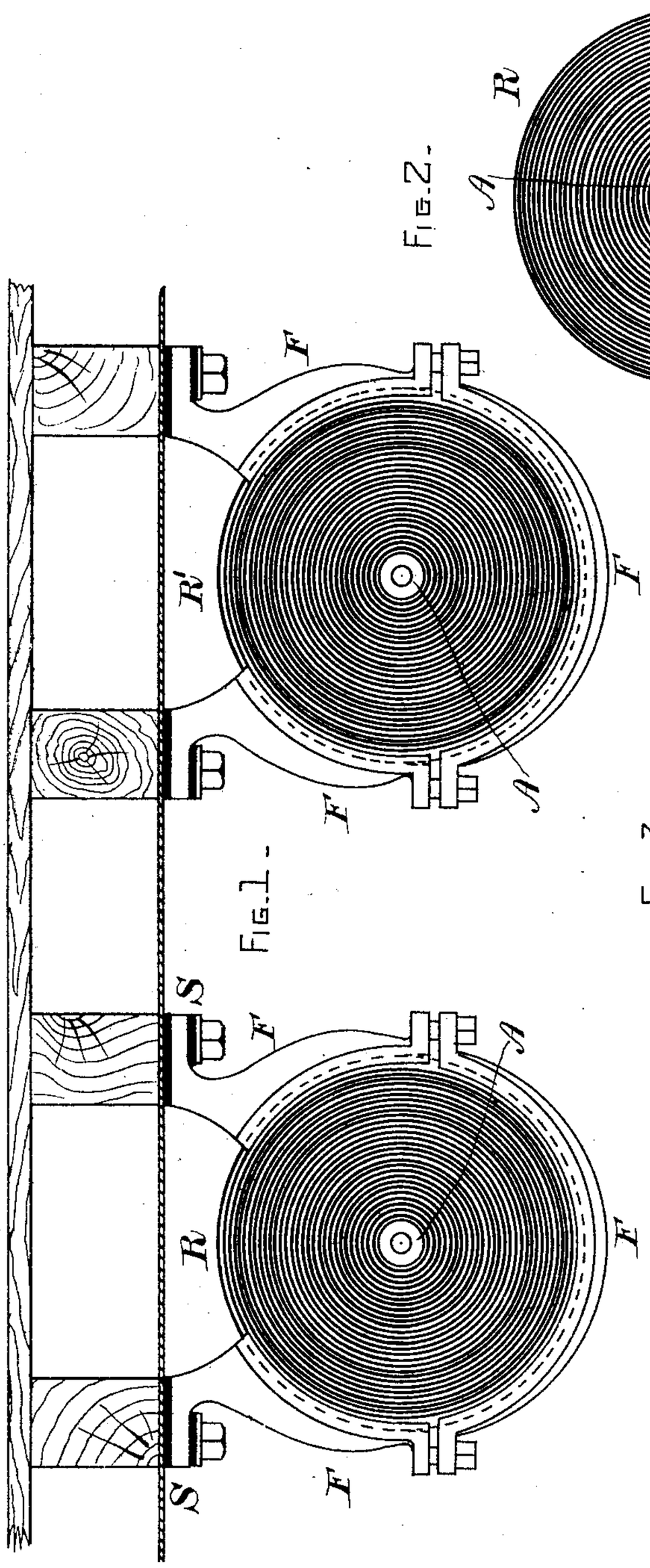

FIG. 1.

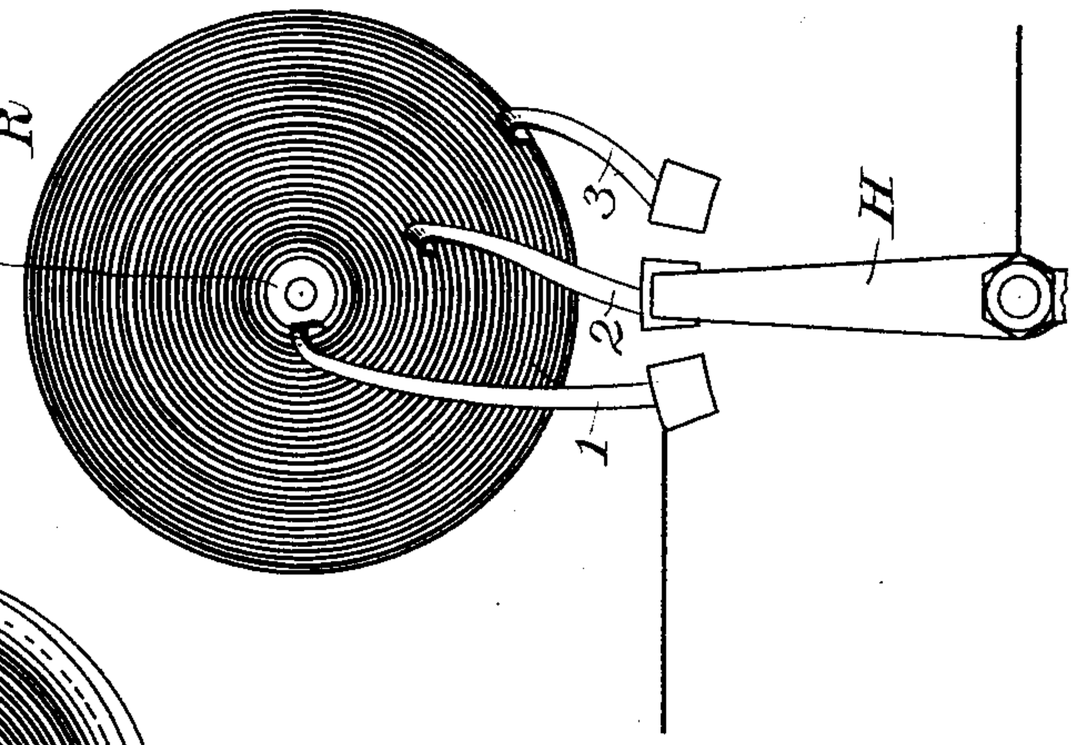

FIG. 2.

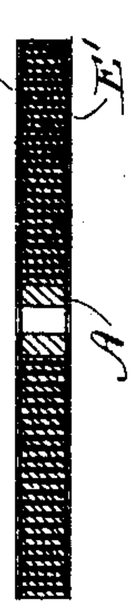

FIG. 3.

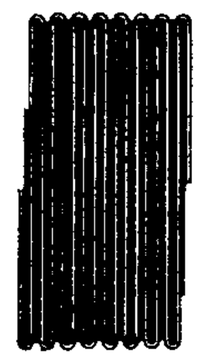

FIG. 5.

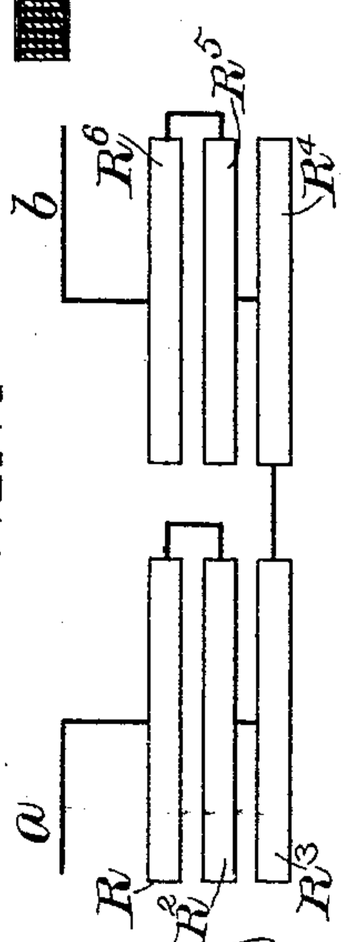

FIG. 4.

WITNESSES.

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UNITED STATES PATENT OFFICE.

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RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 500,631, dated July 4, 1893.

Application filed August 25, 1892. Serial No. 444,028. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, county of Essex, and State of Massachusetts, have invented a certain new and useful Improvement in Rheostats, of which the following is a specification.

My invention relates to the construction of rheostats or resistances suitable for being placed in an electric circuit for reducing a portion of the energy into heat, the heat being either used for practical purposes or thrown away, as required.

The invention consists in winding or laying contiguous layers of a conductor, such as a strip or wire of metal, with insulating sheets or strips supporting the same, such as interposed strips of thin asbestus paper, or cloth, other fire resisting materials replacing the asbestus if desired, and afterward coating the exterior thereof with some fusible but refractory non-conducting material such as enamel, so as to bind the convolutions in place relatively to each other, and also to confine and cement the interposed layer of asbestus or other fire or heat resisting material. The result of this construction is a resistance or rheostat which will stand high temperatures without injury, as it uses no combustible material when completed, and at the same time, it is very substantial and enables a considerable amount of energy to be changed into heat in a small compass.

The accompanying drawings will give an understanding of my invention.

Figure 1 is a view of a rheostat constructed in accordance with my invention. Fig. 2 is a modification. Fig. 3 is a section of a coil strip treated in accordance with my invention. Fig. 4 is a group of assemblage in series of a number of elements, and Fig. 5 is a modification.

In Fig. 1, R, R′ are spirally coiled ribbons of iron, or other resisting metal rolled into thin strips or ribbons and coiled up from the center outward. Simultaneously with the coiling there is introduced between the turns a strip of asbestus paper or cloth which serves to prevent the contact of the turns and insulates them. Preferably at the center of the coil or spiral is a block or small annulus A to which the beginning of the inside end of the ribbon is firmly fixed. The coiled ribbon may be held in a suitable frame of metal or heat resisting material F, as shown. This may be made in sections to suitably inclose and hold in place the resisting spiral R and the sections may be bolted together in any desired way. The center piece A and the outside frame F, F, F, constitute the electric terminals, whereby current may be passed through the spiral. It is evident, however, that the structure as so made would be fragile and without much rigidity. It would be liable to distortion, especially when it undergoes expansion and contraction by change of temperature. It is desirable to secure the coiled conductor in the position in which it is wound, and this I accomplish by coating its sides or the edges of the strip with a coating or enamel, or other fusible, vitrifying or non-conducting material, as indicated at E, E′, Fig. 3. This is thoroughly well melted onto the edges and holds the strips in place as well as the asbestus wound between them, and the result is a solid disk which can be handled or carried about without danger of distortion. Several of the frames F, F, with their inclosed spirals may be mounted to constitute a complete rheostat, when greater resistance is required. In this case, the outer frames are, of course, insulated from each other or from their supports, as at S, S, Fig. 1.

Where it is necessary to obtain a division of the resistance, as in applying the invention to the construction of a variable rheostat, or to a heating device, the temperature of which is to be controlled by varying the amount of resistance which it opposes to the current, the construction may be modified, as in Fig. 2, in which leading off conductors 1, 2, 3 are attached to various points on the coiled ribbon, running to contact plates over which a switch arm H is made to travel, and by moving which the various sections of the coil may be thrown into and out of circuit.

Fig. 4 shows a number of the resistance disks or spirals R, R^2, R^3, R^4, R^5, R^6, connected in series to constitute one resistance. In this case, the entering wire *a* may be attached to the center of the first resistance disk R, the outside periphery of which is attached to the

periphery of the next adjoining disk R^2, as by connecting the inclosing frames F, F, F, Fig. 1, one to the other. From the center of R^2 connection is made to the center of R^3; from the periphery of R^3 to the periphery of R^4; from the center of R^4 to the center of R^5, and from the periphery of R^5 to the periphery of R^6, the wire leading off being taken from the center of R^6 and marked *b* in the figure. Other groupings, it will be evident, may be made to suit the conditions.

Fig. 5 shows that instead of winding the ribbon or strip in a spiral it may be wound to and fro, or in other directions, and the whole insulated and treated as before, producing a slab or plate composed of a strip of resisting metal, insulation between the strips and an enamel outer facing.

My invention is particularly well adapted to the construction of rheostats subject to mechanical jar, or to degrees of heat approaching red heat, and the construction is simple and inexpensive.

What I claim as new, and desire to secure by Letters Patent, is—

1. A rheostat composed of a strip of metal wound into a flat plate, provided with insulating material between the turns, and rigid sides of refractory material, substantially as described.

2. An electric resistance composed of a flat spiral of metal having insulation between the turns, the whole being held between sides of rigid refractory material, substantially as set forth.

3. An electric resistance or rheostat composed of a strip wound or laid with incombustible insulating material, such as asbestus, between the convolutions, and with a refractory coating, as enamel, over the edges thereof for binding the strips in place relatively to one another and for holding the insulating material in place between the strips, substantially as described.

4. A rheostat consisting of a spiral or coiled ribbon, the turns of which are insulated by a non-combustible and comparatively infusible material, which turns are cemented together with the insulating material between the turns, by lateral coatings of enamel or other vitrifying or fusible material melted thereon, substantially as set forth.

5. A rheostat or heating resistance composed of a center terminal, a spirally wound ribbon connecting with said center terminal, a sheet or strip of asbestus, or similar heat resisting and comparatively infusible material interposed between the turns, and a coating of fusible enameling or vitrifying substance on the sides of the wound spiral for cementing the parts together and holding the insulating material between the strips in place.

6. A resistance plate or disk for rheostats or electric heaters, comprising, essentially, a strip of metal wound upon itself, with intervening strips of an incombustible, non-fusible, non-conductor, between the layers, and an outer coating on the side of the plate or disk of enamel, or vitrifying substance, fused on, which binds the strips together and coats the interposed insulating material at its edges so as to cement it in position, substantially as described.

7. In a rheostat or heating resistance, a wound strip or ribbon insulated by asbestus, or similar insulating material, between its layers or convolutions, coatings of enamel applied to the sides thereof, to cement and hold the turns together, and a frame-work inclosing the whole, substantially as set forth.

8. In a rheostat a frame-work constituting one terminal of the circuit, a center annulus or metal piece constituting the other terminal of the circuit, and between the two, the enamel coated, asbestus insulated, strip or spiral, substantially as set forth.

9. A rheostat comprising a flat coil of insulated metal, having its sides coated with enamel, and provided with conductors leading off from various points of the coil to suitable contact plates, substantially as described.

In witness whereof I have hereunto set my hand this 22d day of August, 1892.

ELIHU THOMSON.

Witnesses:
JOHN W. GIBBONEY,
BENJAMIN B. HULL.