No. 740,831. PATENTED OCT. 6, 1903.

A. EIMER.

RHEOSTAT.

APPLICATION FILED DEC. 3, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig: 1

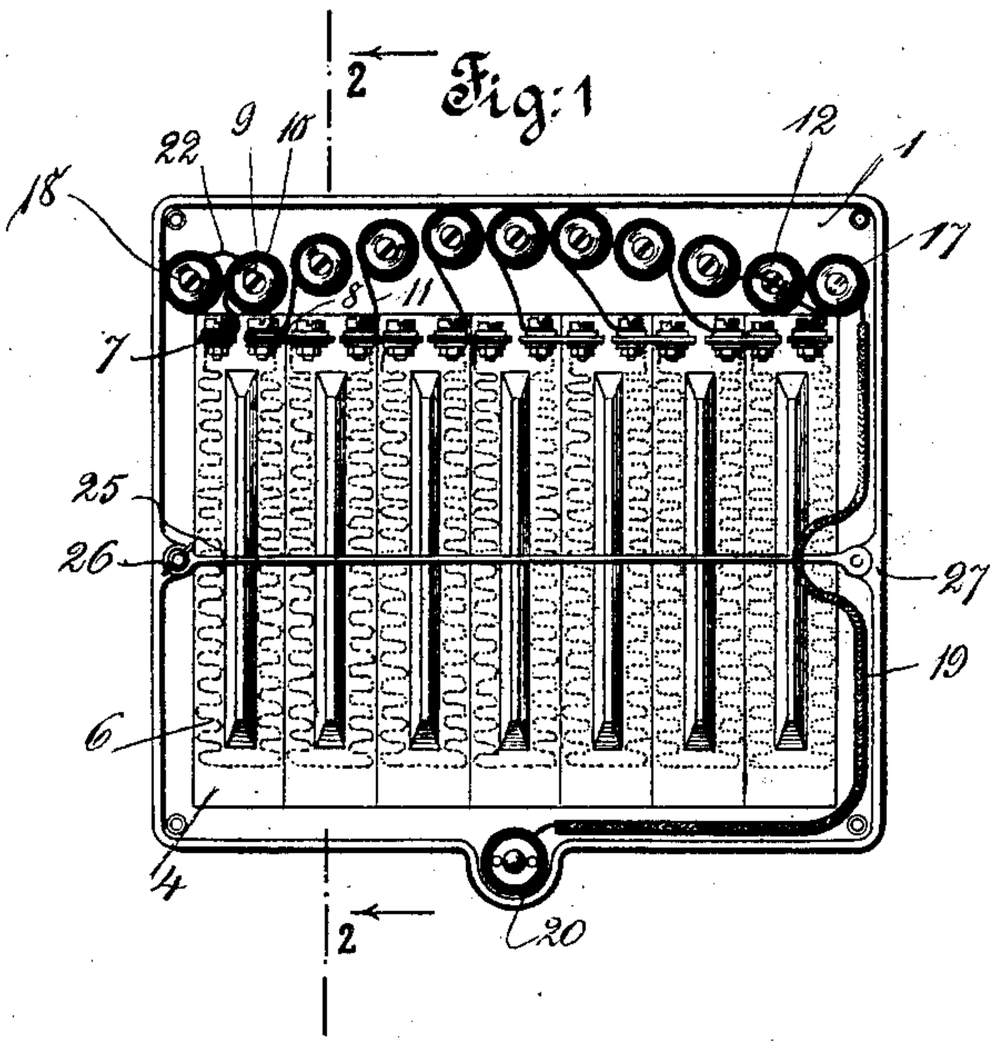


Fig: 2

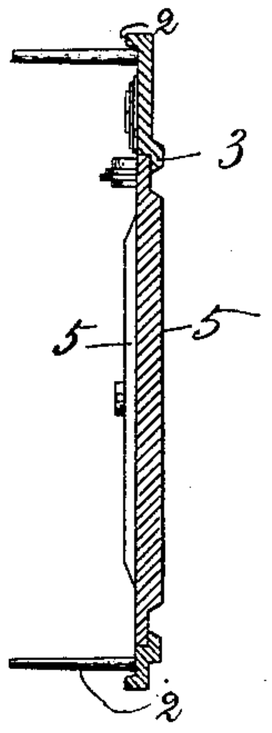


Fig: 5

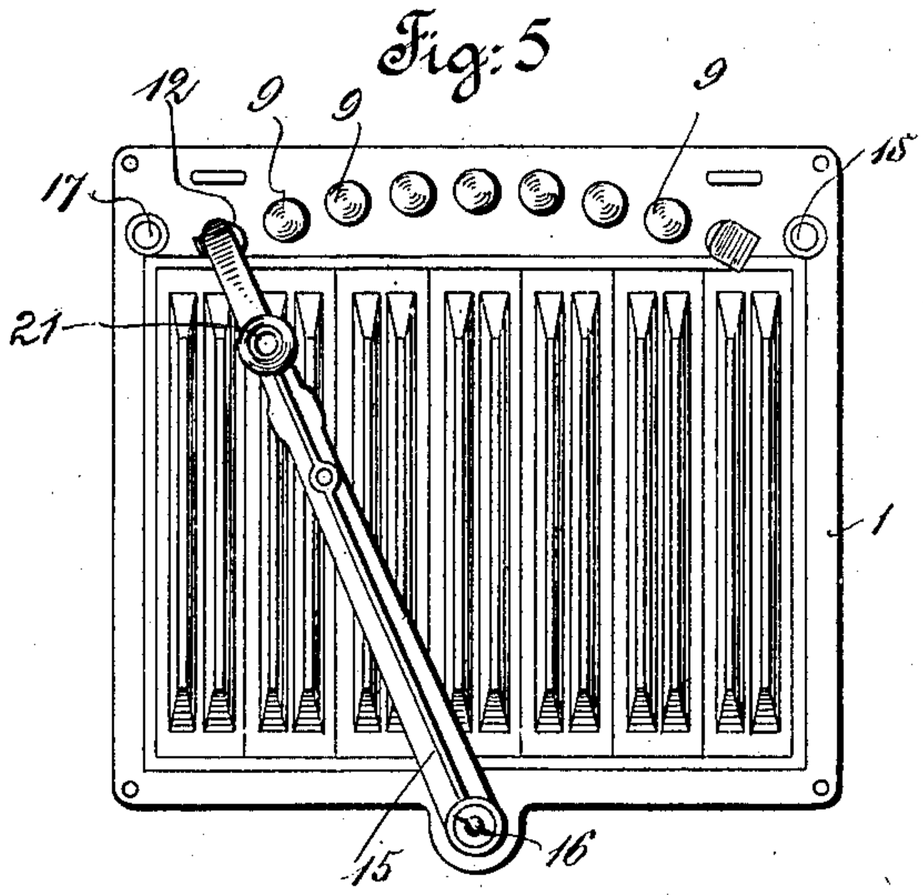


Fig: 3

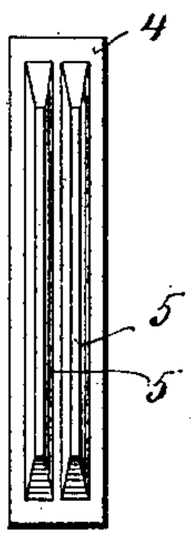


Fig: 4

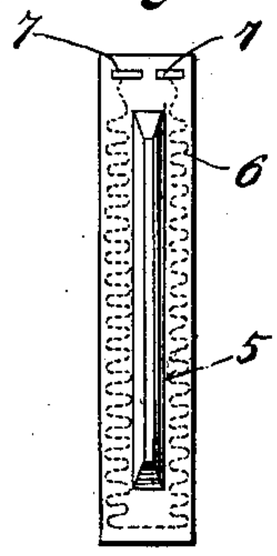
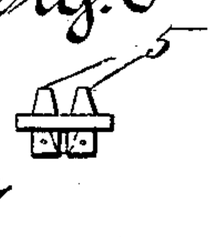


Fig: 6



WITNESSES:

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Edward F. Daly

INVENTOR

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Kenyon & Kenyon

ATTORNEYS

No. 740,831. PATENTED OCT. 6, 1903.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig: 7

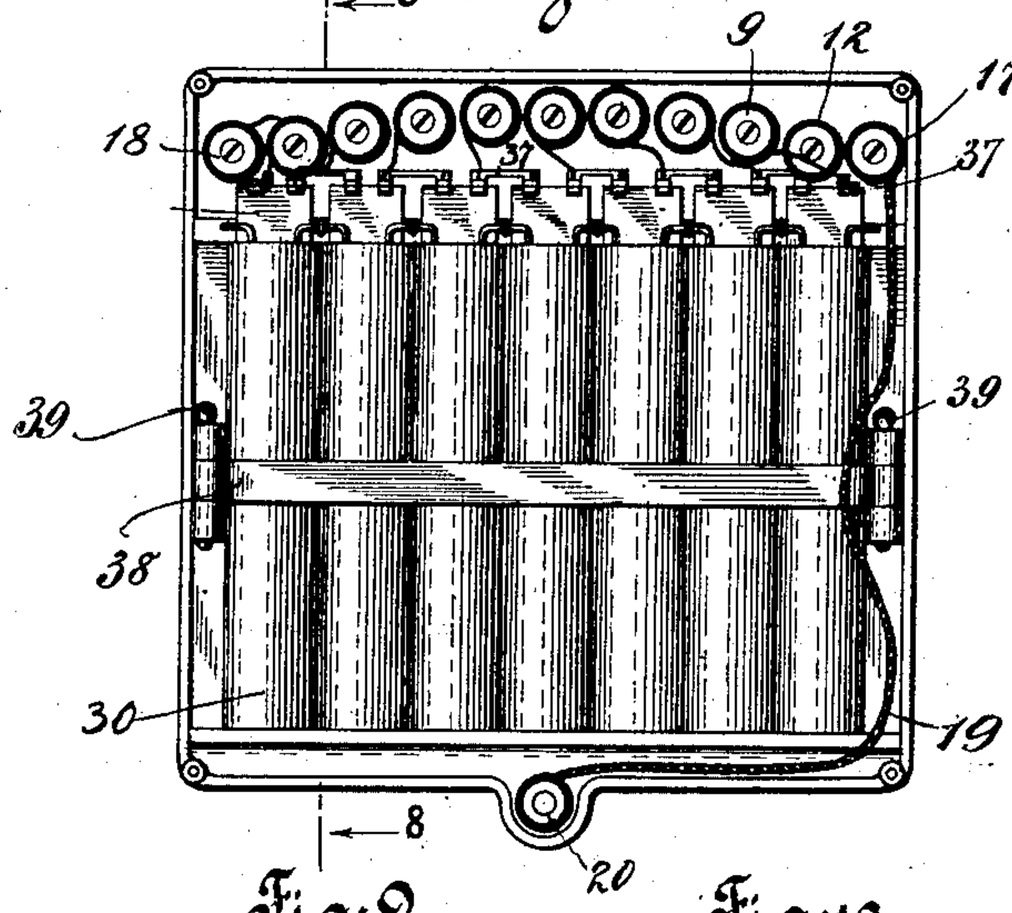


Fig: 8

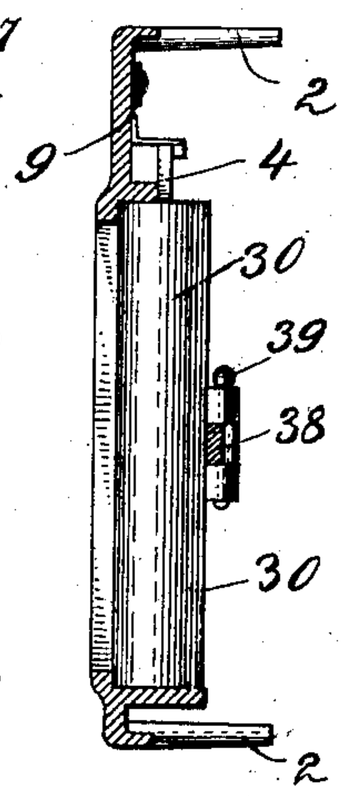


Fig: 9

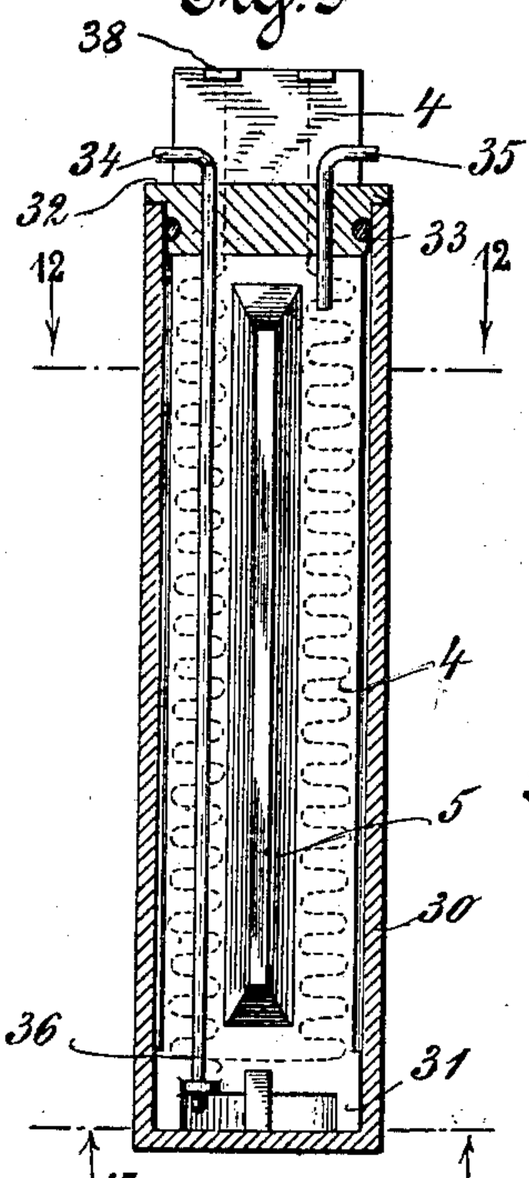


Fig: 10

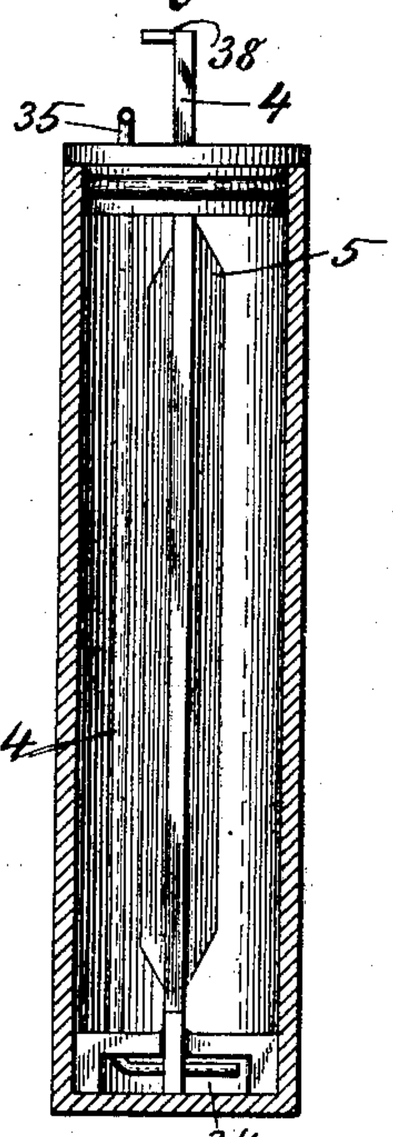
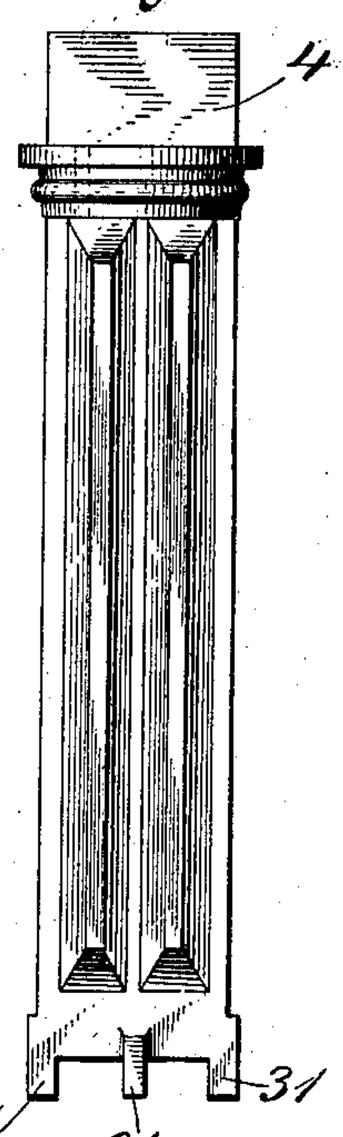


Fig: 11



WITNESSES:

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Fig: 12

Fig: 13

Fig: 14

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No. 740,831. PATENTED OCT. 6, 1903.

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RHEOSTAT.

APPLICATION FILED DEC. 3, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 15.

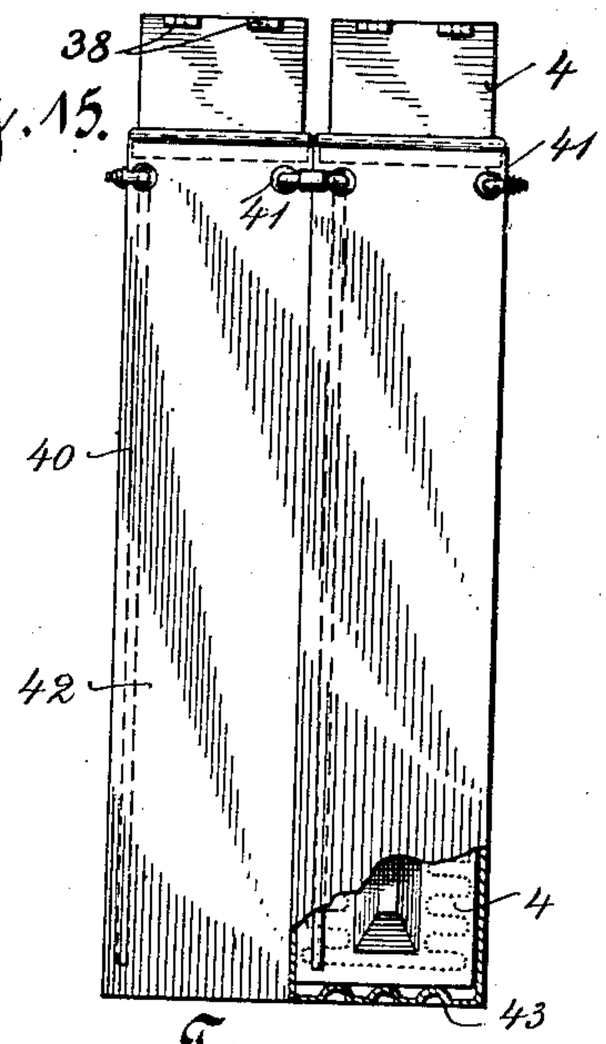


Fig. 16.

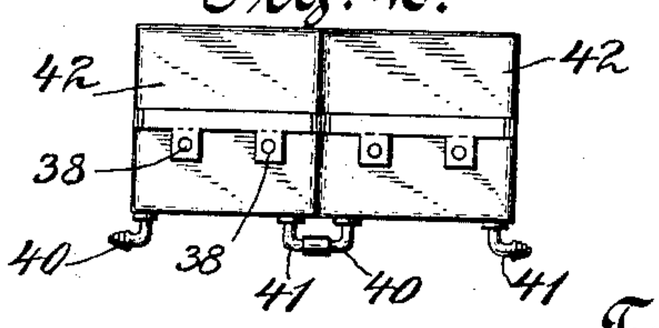


Fig. 17.

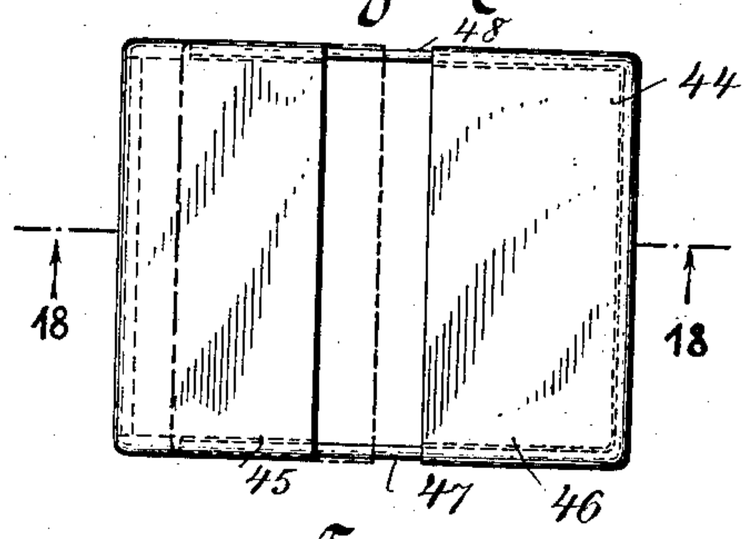


Fig. 18.

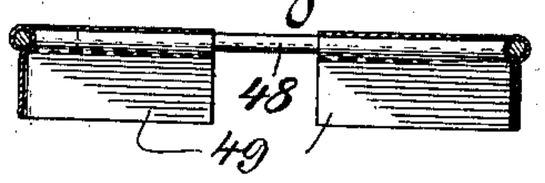


Fig. 19.

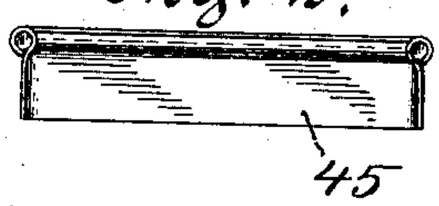


Fig. 20.

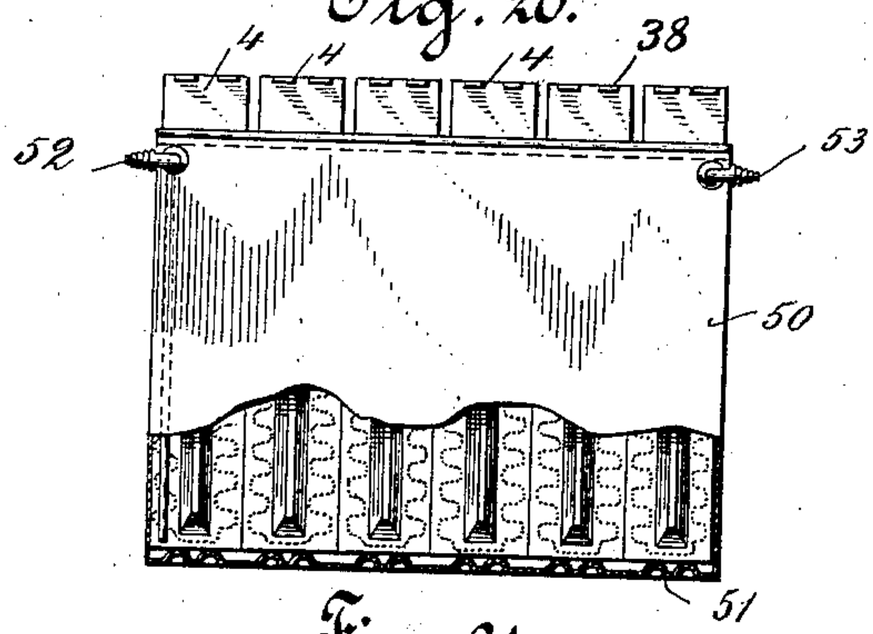
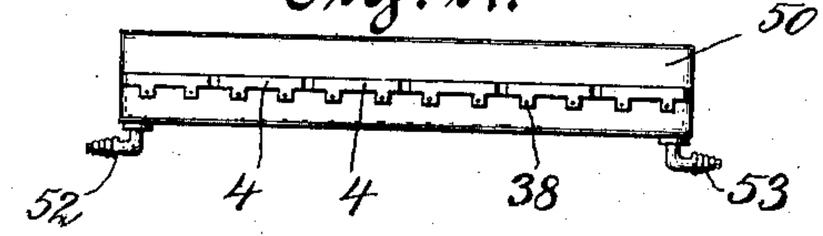


Fig. 21.



WITNESSES:

J. J. Gempler

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ATTORNEYS

No. 740,831. Patented October 6, 1903.

UNITED STATES PATENT OFFICE.

AUGUST EIMER, OF NEW YORK, N. Y.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 740,831, dated October 6, 1903.

Application filed December 3, 1902. Serial No. 133,678. (No model.)

To all whom it may concern:

Be it known that I, AUGUST EIMER, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Rheostats, of which the following is a specification.

My invention relates to rheostats; and it has for its object to provide a means for varying the amount of current supplied to an electrical device and also to provide a means for preventing the current from overheating the rheostat.

The invention consists in providing a rheostat having resistance-bodies located on a removable support and means for conducting the heat away from the resistance-bodies and the removable support.

The invention also consists in providing the removable plates which support the resistance-bodies with flanges for conducting the heat away from the resistance-bodies.

The invention also consists in providing a jacket for allowing a stream of water to circulate over the resistance-bodies and around the support.

The invention also consists in providing removable plates having separable contacts and means for temporarily retaining the plates in the rheostat-frame.

The invention also consists in other features of construction and combinations of parts, hereinafter described and claimed.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 illustrates a rear view of the rheostat, showing the resistance-bodies located on the removable plates. Fig. 2 illustrates a sectional view of the rheostat, taken on line 2 2, as shown in Fig. 1. Fig. 3 illustrates a front view of one of the removable plates. Fig. 4 illustrates a rear view of one of the removable plates. Fig. 5 illustrates a front view of the rheostat. Fig. 6 illustrates an end view of one of the removable plates, showing the terminals of the resistance-body. Fig. 7 illustrates a rheostat having removable plates surrounded by water-jackets. Fig. 8 illustrates a sectional view of the rheostat shown in Fig. 7, taken on line 8 8. Fig. 9 illustrates a sectional view of one of the water-jackets. Fig. 10 illustrates another sectional view, which is taken on a line at right angles to the view illustrated in Fig. 9. Fig. 11 illustrates one of the rheostat-plates used in connection with the form of rheostat shown in Fig. 7. Fig. 12 illustrates a section of the rheostat-plate and the water-jacket, taken on line 12 12 of Fig. 9. Fig. 13 illustrates a sectional view of the water-jacket, taken on line 13 13, shown in Fig. 9. Fig. 14 is a top view of the rheostat-section. Fig. 15 illustrates two sections of a modification of the rheostat shown in Fig. 7. Fig. 16 illustrates a top view of the sections illustrated in Fig. 15. Fig. 17 illustrates a top view of the cover used for closing the top of the form of the water-jacket shown in Fig. 15. Fig. 18 illustrates a sectional view of the cover, taken along the line 18 18, shown in Fig. 17. Fig. 19 illustrates a movable segment of the cover. Fig. 20 illustrates a further modification of the rheostat. Fig. 21 illustrates a top view of the modification shown in Fig. 20.

Referring to Figs. 1 and 5, 1 indicates a rheostat-frame having the legs 2 for supporting the said frame. The frame 1, however, may be supported by any other suitable means. The rheostat has at its center a rectangular opening into which projects a flange 3. There are a plurality of removable plates or sections located within the opening and supported on the flange 3. The plates 4 have a plurality of cooling-flanges 5, which form a part of the plate and are located both on the front and the rear of the plate. As shown in the figures, one flange is located on the rear of each of the plates and two flanges are located on the front. A resistance-body 6 is located on but insulated from the surface of the plate 4. Any insulating substance, such as enamel, may be used for insulating the resistance-bodies. The insulating substance completely surrounds the resistance-body 6 and forms a means of attachment of the resistance-body to the plate, as well as a means for insulating the body from the plate. As the resistance-body becomes heated by the passage of an electric current through it it heats the plate, and the plate in turn conducts the heat to the cooling-flanges, from which the heat is conveyed to the air of the atmosphere.

The resistance-bodies extend in a zigzag or wave-line form from one end of the plate to

the opposite end on one side of the flange 5 and then back along the opposite side of the flange 5. The ends of the resistance-bodies are connected to posts 7, located on each of the plates. The adjacent posts of the different plates are connected together by means of strips 8. At the upper end of the frame 1 are located insulated contact-posts 9, which may be arranged in the form of an arc of a circle. The contact-posts are located in insulating-washers 10, which insulate the posts from the frame 1. The post located on the right side of each of the plates, as illustrated in Fig. 1, is connected to each of the contact-posts 9 consecutively by the wires 11, the binding-posts of the first plate, located on the left side of the plate, as shown in Fig. 1, being connected to the first contact-post 9. An extra contact-post 12 is provided, which is not connected to any of the plates. As the contact-posts are connected with an external circuit the resistance-bodies are connected in the circuit.

An arm 15, located on the front of the rheostat-frame and pivoted thereto by the pivot-pin 16, is adapted to make contact with the posts 9 one after the other as the arm 15 is moved. The arm 15 is provided with a handle 21, whereby the arm may be readily moved over the contact-posts 9.

The rheostat is connected to an external circuit through the binding-posts 17 and 18, which are supported on the frame 1 and insulated therefrom. The binding-post 17 is connected, by means of a wire 19, to the pivot-pin 16, which is insulated from the frame by the insulating-collar 20. The binding-post 18 is connected to the first contact-post 9 by means of a strip 22.

When the switch-arm 15 is in contact with the binding-post 12, the circuit between the terminals 17 and 18 is broken, since the binding-post 12 is not connected to any part of the rheostat. If the arm 15 is moved to the right, so as to make contact with the succeeding contact-post 9, as shown in Fig. 5, the current will pass from this contact-post through all of the resistance-bodies of the rheostat. Since these resistance-bodies are all connected in series, the current will flow consecutively through each of the said resistance-bodies. When the arm 15 is moved to the next binding-post, the current will then pass from the binding-post 17 to the arm 15 and through all but one of the resistance-bodies located on the plates of the rheostat. When the arm is moved to the third contact-post, the current will pass through all of the resistance-bodies but two. Thus as the arm is moved over the contact-posts the resistance is decreased, and the current allowed to pass between the terminals 17 and 18 is increased. When the arm 15 reaches the last contact-post located at the right, as shown in Fig. 5, the circuit connections will be from the binding-post 17 to the switch-arm 15 to the contact-post 9, which is directly connected to the binding-post 18 by the strip 22. When the arm is in this position, the current does not flow through any of the resistance-bodies, and hence the current will not be materially diminished. When the arm is moved in the opposite direction, the current is diminished.

In order to retain the plates 4 in the rheostat-frame 1, a means is provided which may be readily opened, so as to allow the removal of the plates 4. A preferable form of the retaining means for releasably retaining the plates in their position is illustrated in Fig. 1. It consists of a rod 25, pivoted on the frame by the pivot-pin 26 and extending across the rear of the rheostat-plates 4. The rod 25 presses against the flange 5 on the plates 4 and securely retains the plates in the frame. At the opposite end of the rod 25 from the pivot-pin 27 is located a thumb-screw 26, which secures that end of the rod to the frame 1. When any of the plates are to be removed or to be replaced, the rod is opened by merely unscrewing the thumb-screw 26, so as to allow the plates to be lifted clear of the frame 1.

By the above arrangement of devices I have provided an efficient rheostat whereby an electric current may be controlled and the parts of the rheostat may be readily separated and repaired. By the use of the cooling-flanges a much higher current may be controlled, and the current may be allowed to flow for any length of time without injury either to the insulating material used in insulating the resistance-body from the plate and without burning out the resistance-body.

In order to keep the heating-body cool when very high currents are used, I have provided a water-jacket which completely surrounds the resistance-bodies. A current of water is allowed to flow through the jacket. The water serves as a means of insulation of the resistance-body, due to the high resistance of the water. Other fluids may also be used to serve as an insulation for the resistance, such as toluol.

In Fig. 7 is illustrated a form of a rheostat having cylindrical water-jackets surrounding each of the plates. The plates and the water-jackets are removably supported by the frame similar to the way in which the plates of the rheostat shown in Fig. 1 are supported. In the rheostat shown in Fig. 7 each of the plates 4 is surrounded by a cylindrical jacket 30. The plate 4 has at its lower end four extending legs 31, which are adapted to support the plate in the cylindrical jacket. If the rheostat is so positioned that the jackets 30 are located in a horizontal plane, the feet 31 will prevent any lateral movement of the plates. Around the upper end of the plate 4 and below the top thereof is located a sealing-plug 32, having a gasket 33. When the sealing-plug, together with the gasket, is placed in the upper end of the cylinder 30, the plug is adapted to tightly close the said upper end. Pipes 34 and 35 are supported in the sealing-plug 32. The pipe 34 extends down-

ward to the lower end of the jacket and is at that point supported by a lug 36, located upon plate 4. The pipe 34 passes to the front of the plate 4 at a point just below the lug 36 and feeds the water into the jacket at the front of the plate 4. The pipe 35, which constitutes the exit for the water, extends just below the surface of the sealing-plug. When the pipe 37 is connected to a source of water-supply, the water passes through the tube 34 to the front of the plate and then rises from the lower part of the jacket to the pipe 35, which opens at the rear of the plate, and thence to the next jacket. This permits of a constant flow of cool water through the jackets and around the resistance-bodies. The plate 4 in this form of a rheostat may also be provided with cooling-flanges 5, located on the front and the rear of the plate 4. The cooling-flanges in this case will conduct the heat from the supporting-plate to the circulating fluid instead of to the atmosphere, as in the form of rheostat shown in Fig. 1. At the upper end of the plate 4 there are located a pair of contacts 38, which are connected to the ends of the resistance-body. When the plate is placed in the frame 1 of the rheostat, the contacts 38 make contact with the spring-contacts 37, located upon the frame 1. The spring-contacts are connected to the contact-posts in the same way as the connecting-posts of the rheostat shown in Fig. 1. The arrangement of the spring-contacts 37 and the contacts 38, located on the end of the plates 4, may be reversed and the spring-contacts placed upon the plates 4 instead of on the frame, or both of the contacts may be spring-contacts. By this arrangement of the spring-contacts the sections may be easily removed or replaced without disconnecting or connecting any of the connecting-wires of the rheostat. I have also provided a means for retaining the sections in the frame. The retaining means can be easily opened, so that the sections can be easily removed or replaced. The retaining means consists of a rod or bar 38, fastened at each end to the frame by means of a pintle 39. When either of the pintles located at the ends of the bar 38 are removed, the pintle at the opposite end forms a hinge, which permits the bar to swing to an opened position. When the bar is opened, the plates, together with the cooling-jackets, may be readily removed.

In Figs. 15 to 21, inclusive, I have illustrated a modification of the cooling-jacket shown in Fig. 7. The cooling-jacket shown in Fig. 15 is rectangular in shape, and the pipes for circulating the fluid are connected together at the sides of the jackets instead of at the top. In this form of rheostat the plates are supported in a vertical position, and the water is allowed to freely flow through the pipes. The inlet-pipe 40 extends downward to the lower end of the rheostat and may extend underneath the plate to the opposite side to cause the water to circulate on both sides of the plate. The exit-pipe 41 opens at the top of the jacket 42. The pipe 41 is connected by any suitable means with the pipe 40 of the preceding jacket. When the first inlet-pipe 40 is connected with a water-supply, the water passes into the first jacket and then circulates through the jacket and out through the pipe 41 into the pipe 40 of the next jacket, thus keeping the jacket perfectly cool.

In order to permit circulation below the bottom of the plate, the lower end of the jacket 42 has corrugations 43, which support the plate 4 and allow a free passage of the water underneath the plate.

The upper end of the jacket 42 is closed by means of a cover, which surrounds the plate 4. The cover 45 is formed of two segments 45 and 46. One of the segments, 46, has two rods 47 and 48 located on opposite ends of the segment 46 and securely attached thereto. The edges of the ends of the segment 45 are spun over, so as to surround and loosely engage with the rods 47 and 48 and permit free movement of segment 45 along the rods 47 and 48. The segments 45 and 46 can thus be easily separated by sliding them along the rods. The segments are provided with flanges 49, which are adapted to fit the upper end of the jacket 42. When the plate 4 is inserted in the jacket 42, the upper end of the jacket is closed by placing the cover over the end of the plate 4 and closing the segments together and then pushing the cover 44 down until the flange 49 fits into the jacket 42. This will close the upper end of the jacket 42 and prevent loss of water by evaporation.

In Figs. 20 and 21 is illustrated another form of rheostat wherein all the plates are located in a single receptacle 50. The lower end of the water-jacket 50 has corrugations 51, which support the plates and allow the water to circulate underneath the plates. An inlet-pipe 52 is provided, which extends to the bottom of the receptacle to allow the water to enter at that point. An exit-pipe 53 is also provided, which opens at the top of the jacket and allows the water to leave the jacket.

What I have described above is merely the preferred form of the embodiment of my invention. The invention can be embodied in many different arrangements of instrumentalities without in any way departing from the spirit of my invention. Any fluid can be substituted for water, and many forms of connecting devices can be used in place of the connecting device described above.

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

1. In a rheostat the combination of a frame, a plurality of removable sections carried by the said frame, a resistance-body supported on the said frame, each of the said sections having a resistance-body and a pair of contact-springs connected to the ends of the said resistance-body and a corresponding pair located on the said frame, means for connecting one or more of the said resistance-bodies with an external circuit.

2. In a rheostat the combination of a frame having a plurality of removable sections, a resistance-body located on each of the said sections, contact-posts located on the said frame, spring-contacts connected to the said contact-posts, contacts connected to the ends of the said resistance-bodies and adapted to make connections with the said springs by merely dropping said sections in place, means for connecting any one of the said contact-posts with an external circuit.

3. In a rheostat the combination of a plurality of resistance-bodies, means for inclosing the said resistance-bodies, cooling-flanges associated with each of the said resistance-bodies, pipe connections for allowing a fluid to circulate through the inclosing means.

4. In a rheostat the combination of a plurality of sections, each of said sections having a resistance-body, means for inclosing the said sections, pipe connections for allowing a fluid to flow into the said inclosing means, means for supporting the said sections in the said inclosing means so as to allow the circulation of the said fluid, means for connecting any number of the said resistance-bodies with an external circuit.

5. In a rheostat the combination of a removable section, a resistance-body located near the surface of the removable body, a jacket for inclosing the said section, pipe connections for circulating a fluid through the said jacket, means for connecting the said resistance-body with an external circuit.

6. In a rheostat the combination of a removable section having a resistance-body, cooling-flanges located on the said section, a jacket surrounding the said section, pipe connections for causing a fluid to circulate through the said jacket, means for connecting the said resistance-body with an external circuit.

7. In a rheostat the combination of a removable section having a resistance-body, cooling-flanges located on the said section, a jacket surrounding the said section, pipe connections for allowing a fluid to enter the said jacket and means for supporting the said section in the said jacket to allow a complete circulation throughout the said jacket.

8. In a rheostat the combination of a plurality of removable sections, a resistance-body located on each of the said sections, a cooling-jacket surrounding each of the said sections, means for causing a fluid to circulate through said jackets and means for connecting the said resistance-bodies with an external circuit.

9. In a rheostat the combination of a frame, a plurality of removable sections, a jacket surrounding each of the said sections, pipe connections for allowing a fluid to circulate through the said jackets in series, means for connecting any number of the said resistance-bodies with an external circuit.

10. In a rheostat the combination of a frame, a plurality of removable cooling-jackets, a resistance-body located in each of the said jackets, and means for releasably retaining said jackets in the said frame.

11. In a rheostat the combination of a frame, a plurality of removable sections, each of the said sections having a resistance-body, a cooling-jacket surrounding each of the said sections, spring-contacts connected to the ends of each of the said resistance-bodies and located on the said sections, corresponding spring-contacts located on the said frame, pipe connections for allowing a fluid to circulate through the said jacket and means for connecting any number of the said resistance-bodies with an external circuit.

12. In a rheostat the combination of a plurality of removable sections, each of said sections having a resistance-body, a cooling-jacket surrounding each of the said sections, inlet and exit pipes connecting the said cooling-jackets together, contact-posts located on the said frame, spring-contacts for connecting the said resistance-bodies to the said contact-posts, means for connecting any one of the said contact-posts with an external circuit.

13. In a rheostat the combination of a cooling-jacket, a resistance-body located in the said jacket, an inlet and an exit pipe for allowing a fluid to circulate through the said jacket, spring-contacts connected to the end of the said resistance-body and means for connecting the said spring-contact with an external circuit.

14. In a rheostat the combination of a removable plate having a resistance-body, a jacket surrounding said plate, a cover for the said jacket also surrounding the said plate.

15. In a rheostat the combination of a removable section, a resistance-body located on the said section, a jacket surrounding the said section, a cover for inclosing a part of the said section in the said jacket, means for allowing a fluid to circulate through the said jacket and means for connecting the said resistance-body with an external circuit.

16. In a rheostat the combination of a section having a resistance-body, a jacket surrounding the said section, a cover for the said jacket having a removable segment, whereby the said section may be surrounded by the said cover.

17. In a rheostat the combination of a resistance-body, a cooling-jacket for the said resistance-body, pipe connections for allowing a fluid to circulate through the said jacket, a cover having a movable segment and a flange, whereby the said resistance-body is inclosed in the said jacket.

18. In a rheostat the combination of a plate, a resistance-body located on the said plate, a jacket surrounding the said resistance-body, a cover for inclosing a part of the said plate and having a removable segment and a flange for fitting into said jacket, pipe connections for allowing a fluid to circulate through the said jacket and means for connecting the said resistance with an external circuit.

19. In a rheostat the combination of a plate having a resistance-body, a jacket surrounding the said plate, a cover having a plurality of segments connected together by rods, one of the said segments being movable along the said rods, each of the said segments having a flange adapted to fit in the said jacket.

20. In a rheostat the combination of a receptacle, an insulating fluid located within the said receptacle, a resistance-body immersed in the said insulating fluid and supported by a body having flanges, means for causing the said fluid to circulate through the said receptacle whereby the said resistance-body is kept cool and its parts insulated.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST EIMER.

Witnesses:
W. HARRES,
JACOB B. TOCH.