No. 740,787. PATENTED OCT. 6, 1903.

J. C. VETTER.

RHEOSTAT.

APPLICATION FILED NOV. 19, 1902.

NO MODEL.

Fig. 1.

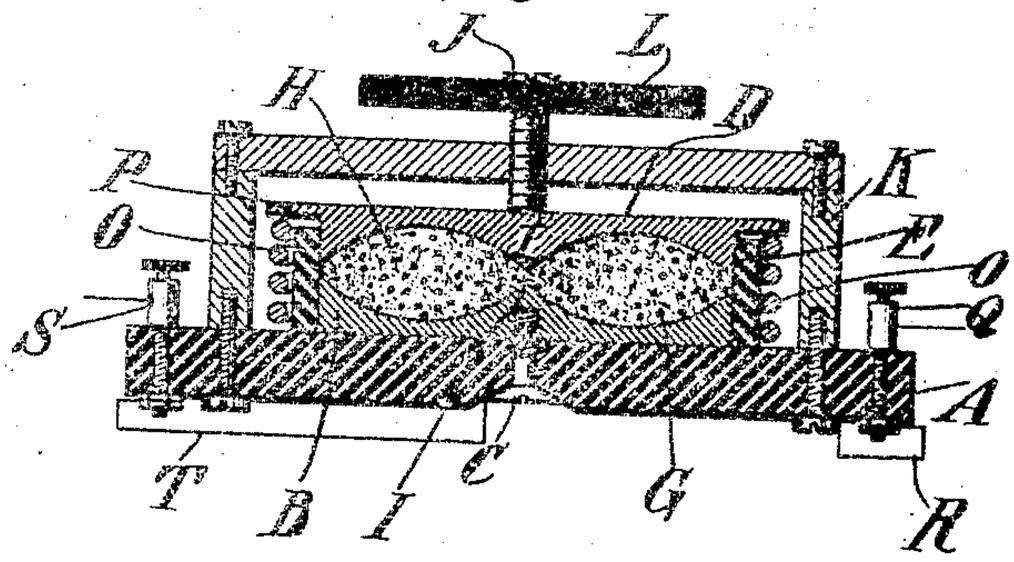
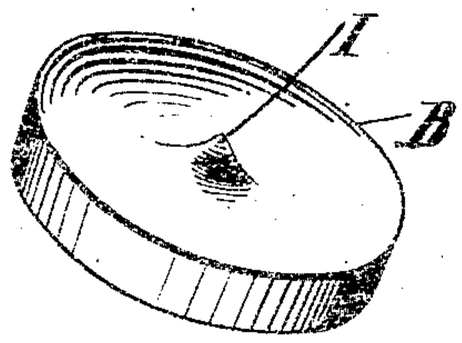


Fig. 2.



Witnesses
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No. 740,787. Patented October 6, 1903.

UNITED STATES PATENT OFFICE.

JOSEPH C. VETTER, OF ASTORIA, NEW YORK.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 740,787, dated October 6, 1903.

Application filed November 19, 1902. Serial No. 131,989. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH C. VETTER, a citizen of the United States, and a resident of Astoria, State of New York, have invented certain new and useful Improvements in Rheostats, of which the following is a specification, accompanied by drawings.

My invention relates to rheostats and to a resistance thereof; and its objects are to improve upon the construction of rheostats in general, although my apparatus is intended more especially for controlling circuits of low amperage, such as used in medical work. The apparatus may, however, be used in any connection to which it may be adapted.

Other objects of my invention are to enable very small variations in current to be obtained with great accuracy and secure efficiency and durability with simplicity of parts.

Further objects of my invention will hereinafter appear; and to these ends my invention consists of apparatus for carrying out the above objects embodying the features of construction, combination of elements, and arrangement of parts, substantially as hereinafter fully described in this specification and shown in the accompanying drawings, in which—

Figure 1 is a vertical transverse sectional view of a rheostat embodying my invention, and Fig. 2 is a perspective view of one of the electrodes.

Referring to the drawings, A represents a base of suitable insulating material upon which the apparatus is arranged. The principle upon which the rheostat operates is that of a compressible and expansible conductor, the conductivity and resistance of which are varied by a varying pressure thereon. While this compressible and expansible conductor may be formed in various ways, in this instance I have shown it consisting of a mass of elastic and relatively inelastic particles which may be compressed or squeezed into dense and compact form, thereby decreasing the resistance of the mass within certain limits, as desired.

According to the construction shown one electrode B is secured to the base A in any suitable manner, as by means of the screw C, while another electrode D is adapted to be moved to and from the electrode B, and the mass of conducting material is arranged between the two electrodes and preferably confined laterally, as by means of the receptacle E, which, as shown, is of insulating material—as, for instance, hard rubber.

The mass of material forming the resistance consists of any suitable granulated or powdered elastic material, such as soft rubber, as shown, the larger particles G representing particles of such elastic material, while the finer particles H are of material which is relatively inelastic compared with the particles G, such as granulated or powdered carbon or any other suitable conductor or semiconductor. The particles of material G and H are in this instance mixed together dry, although I am not to be understood as limiting myself to a dry mixture nor to a mechanical mixture only.

Any suitable proportion may be obtained between the elastic and relatively inelastic granulated material, it only being necessary that they be mixed in such proportions that the greatest conductivity is obtained under pressure, it being desirable that the minimum amount of the elastic material, such as rubber, be used to impart to the mass sufficient elasticity to obtain very small variations in conductivity under pressure.

As the upper electrode D is pressed down upon the mass of particles between the electrodes it will be seen that the particles of conducting material will be pressed closer together into more intimate contact with each other, thus lessening the air-gaps between the particles and increasing the conductivity of the mass. The particles G of elastic material are also squeezed together, and if not of compressible material themselves their shape and the conformation will be changed without substantial diminution in size, so that as the pressure on the mass is gradually released the elastic particles G will tend to spring back into their original form, thus disturbing the finer particles H and tending to expand the mass and force the electrode D away from the electrode B. In other words, the elastic particles G tend to restore the material after compression to its loosened form and at the same time force the upper electrode D away from the electrode B. When the material is being compressed, the parti-

cles of rubber permit the compression to take place gradually only, so that the particles of carbon or other granulated material make gradual contact one with another and are not immediately compressed to final density. This gradual compression of the carbon particles makes possible very small variations in the conductivity of the material and thus permits small variations in the current to be obtained.

It will be seen that the upper and lower electrodes of the apparatus are dished or hollowed on the inside and each provided with inwardly-projecting portions I, adapted to be brought into contact when desired and complete the metallic circuit from one electrode to the other. It has been found that it is not necessary that the inwardly-projecting points I of the electrodes be brought into actual contact to get the maximum current. By forming the electrodes as shown, dished or hollowed, it will be seen that the particles are not only compressed in a vertical direction, but at angles to the vertical in directions normal to the curvature of the surfaces of the electrodes, so that the particles are squeezed together into compact and dense form.

Any suitable means may be provided for pressing the electrode D toward the electrode B, as shown in this instance a screw J being supported in the frame K and adapted to be screwed down upon the electrode D by means of a milled hand-wheel L, preferably of insulating material, as shown. In this instance a spring O is shown for insuring the movement of the electrode D away from the electrode B when the pressure on the said last-named electrode is gradually decreased. The spring O, as shown in this instance, surrounds the receptacle E and bears against the base or plate A and against a flange P on the electrode D, so that when the said electrode is pressed downward the spring O is compressed, tending to raise the electrode when the pressure is gradually removed.

Any suitable electrode connections may be made which will include the granular resistance as a part of the circuit, as shown one binding-screw Q being connected, by means of a wire R, with the frame K, while another binding-screw S is connected, by means of a wire T, with the central screw C, which holds the electrode B upon the base-plate A, circuit thus being completed with the apparatus from one electrode to the other.

Obviously some features of my invention may be used without others, and my invention may be embodied in widely-varying forms, and

Therefore, without limiting myself to the construction shown and described nor enumerating equivalents, I claim, and desire to obtain by Letters Patent, the following:

1. A rheostat comprising two electrodes, a mass of elastic granular particles and relatively inelastic granular particles confined from expanding laterally between said electrodes and forming a conductor, and means for varying the pressure upon said mass of particles to vary its resistance, substantially as set forth.

2. An electric resistance consisting of a mass of elastic granular particles and relatively inelastic granular particles, substantially as set forth.

3. An electric resistance consisting of a mass of elastic non-conducting granular particles and relatively inelastic conducting granular particles, substantially as set forth.

4. A rheostat comprising a base, two electrodes one of which is connected to the base, a spring tending to force the other electrode away from the base, adjustable means for resisting the action of said spring and a mass of granular compressible and expansible conducting material confined laterally between said electrodes, substantially as set forth.

5. A rheostat comprising an inelastic receptacle, cup-shaped electrodes in the same having centrally-arranged and inwardly-projecting portions adapted to be moved into contact with each other, a compressible and expansible granulated or powdered conductor between said electrodes, and means for varying the pressure upon the said conductor to vary its resistance.

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

JOSEPH C. VETTER.

Witnesses:
H. G. OGDEN, Jr.,
E. VAN ZANDT.