(No Model.)

J. DOYLE.

RHEOSTAT.

No. 311,820. Patented Feb. 3, 1885.

Fig. 1.

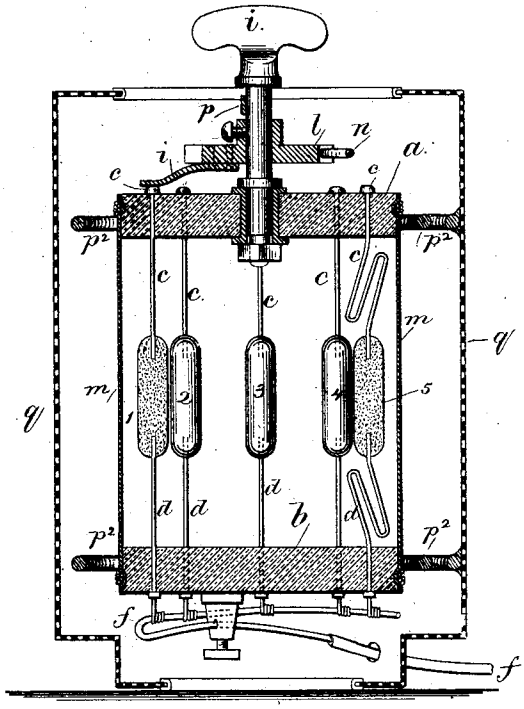


Fig. 3.

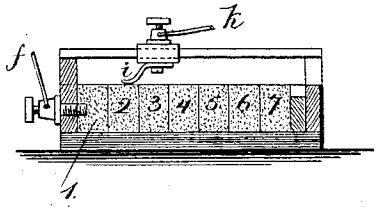
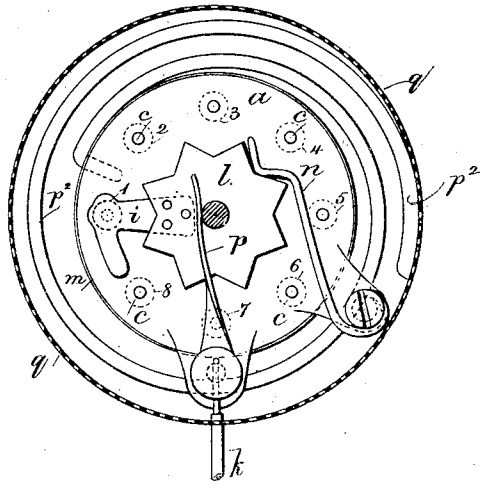


Fig. 2.



Witnesses

Chas. H. Smith

J. Staub

Inventor

John Doyle

by Samuel W. Serrell

atty

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN DOYLE, OF HOBOKEN, NEW JERSEY, ASSIGNOR TO HIMSELF, AND C. COLES DUSENBURY, OF WHITE PLAINS, NEW YORK.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 311,820, dated February 3, 1885.

Application filed March 31, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN DOYLE, of Hoboken, in the county of Hudson and State of New Jersey, have invented an Improvement in Rheostats, of which the following is a specification.

Rheostats for electric currents have been made with a sliding contact, by the movement of which more or less of the resistance has been placed in the electric circuit. The resistance has been uniform throughout; but the variation in the resistance has resulted from the greater or less length of the resisting material in the circuit. It has long been known that the conductivity of different substances varied, some being very poor conductors and others better conductors of electricity. In electric-lamp circuits the rheostat should be small, so as not to occupy much space, and at the same time the range of the resistance should be large.

My present invention relates to a rheostat having resistances that occupy but little space, and are composed of substances having different degrees of conductivity, and I group these together in such a manner as to occupy but little space, and surround them with an envelope that is a non-conductor of heat, so that any heat developed in the rheostat will not become a source of danger.

In the drawings, Figure 1 is a sectional elevation, and Fig. 2 is an end view, of the rheostat in an enlarged size. Fig. 3 is a separate view of the resisting sections in contact with each other, and having a movable contact.

The heads *a b* are of glass or other non-conducting material. The wires *c* pass through holes in the head *a*, and the wires *d* pass through holes in the head *b*. There is a space between the end of one wire *c* and the end of the corresponding wire *d*, and this space is to be more or less, as required. The respective wires *c d* in line with each other are united by materials of inferior but different specific conductivity, as at 1 2 3 4 5 6 7 8. I have used and find suitable a mixture of plumbago and borax moistened with alum-water, and molded, pressed, and baked around the adjacent ends of the respective wires *c d*. I find that the resistance is increased in proportion to the quantity of borax made use of. When there is but little borax, the plumbago offers very little resistance. As the proportion of borax is increased so the resistance is increased. I also find it advantageous to use some lamp-black, especially in rheostats requiring high resistance, the lamp-black being an equivalent of the borax, and acting in a similar manner, except that the borax acts to harden the plumbago.

In making my rheostat the compound is mixed with reference to the resistance required. For instance, the spaces between the ends of the conductors *c d* may be half an inch. Then the composition for No. 1 is to be the lowest resistance and for No. 8 the highest resistance. The composition, being placed around the ends of the respective pairs of wires, is firmly pressed and then dried and baked.

Upon the head *a*, I place a rotary switch, *i*, to the center of which the conductor *k* is connected by the spring *p;* and this switch *i* may be turned around into contact with the end of either pin or wire *c*, so that the electric circuit will be closed through the particular rheostat connected with that wire *c*. The circuit-wire *f* is connected with the outer ends of all the wires *d*. By turning the switch in one direction greater resistances will be brought successively into the circuit, and the reverse. The end of the switch should be wide enough to reach from one wire *c* to the next, so as to touch the second wire before leaving the first wire, thus preventing a spark. The rag or ratchet wheel *l* has teeth that are inclined in both directions and equal in numbers to the wires *c*, and a spring-pawl, *n*, pressing against such teeth, holds the switch at any place to which it may be moved, and completes a movement, if carelessly made, by turning the switch and holding it in contact with only one of the wires *c*. The wires *c d* may be zigzag, or bent back upon themselves, as shown in connection with rheostat No. 5, so as to increase their length and lessen the heat conducted to the heads *a b*. Around the rheostat I apply a case, *m*, of material that is a poor conductor of heat—such as asbestus cloth or mica—wrapped around the heads *a b*, and secured to the same by a binding of wire or otherwise. This prevents external contact with either of the resistances,

and avoids risk of fire or injury in consequence of any heat developed by the electric current in passing through the rheostat or resistance heating such resistance. As a further protection, I use a volute, p^2, of heavy wire near each end of the instrument. One end of each is connected with one of the heads, and the other end is connected with a covering, q, of perforated tin or other suitable material, there being, by preference, a head, r, at the back end to inclose the circuit-connections. The covering q is held in place by the volutes of wire, and does not become heated at its outer ends, even if the heads are hot, and the air-space between the heads and case and the covering q prevents any heat being conducted to or radiated from the said covering q. This instrument occupies very little space, and can be constructed with such a variety of poor conductors that the required resistance can be brought into the lamp or other electric circuit. In cases where the inferior conducting materials possessing different specific resistance, as aforesaid, are placed side by side or united up into a rod or single piece, as seen in Fig. 3, the circuit-conductor f can be connected at one end, and the movable switch device i may be slid along over and in contact with such varying resisting material to bring into action the desired resistance.

I claim as my invention—

1. The combination, with the conductors in a rheostat, of a range of materials of different specific conductivity, and a movable switch device for directing the current through the desired resistance, substantially as set forth.

2. The conductors $c\,d$ and the heads $a\,b$, supporting the same, in combination with the connections of different specific conductivity between the respective conductors, and a movable switch, substantially as set forth.

3. The combination of the heads $a\,b$, conductors $c\,d$, resistances of different specific conductivity, the switch, the circuit-connections, and the surrounding case of non-conducting material, substantially as set forth.

4. The heads $a\,b$, in combination with the conductors $c\,d$, the resistances of different specific conductivity uniting such conductors, the switch, the non-conducting case and surrounding covering q, and coils p^2, substantially as set forth.

5. A rheostat having a resistance composed of plumbago and borax, or its equivalent, mixed together, the resistance varying in proportion to the borax present in the mixture, substantially as set forth.

Signed by me this 26th day of March, A. D. 1884.

JOHN DOYLE.

Witnesses:
GEO. T. PINCKNEY,
WILLIAM G. MOTT.