

No. 622,748.

Patented Apr. 11, 1899.

W. H. WOODMAN.  
RHEOSTAT.

(Application filed Nov. 17, 1898.)

(No Model.)

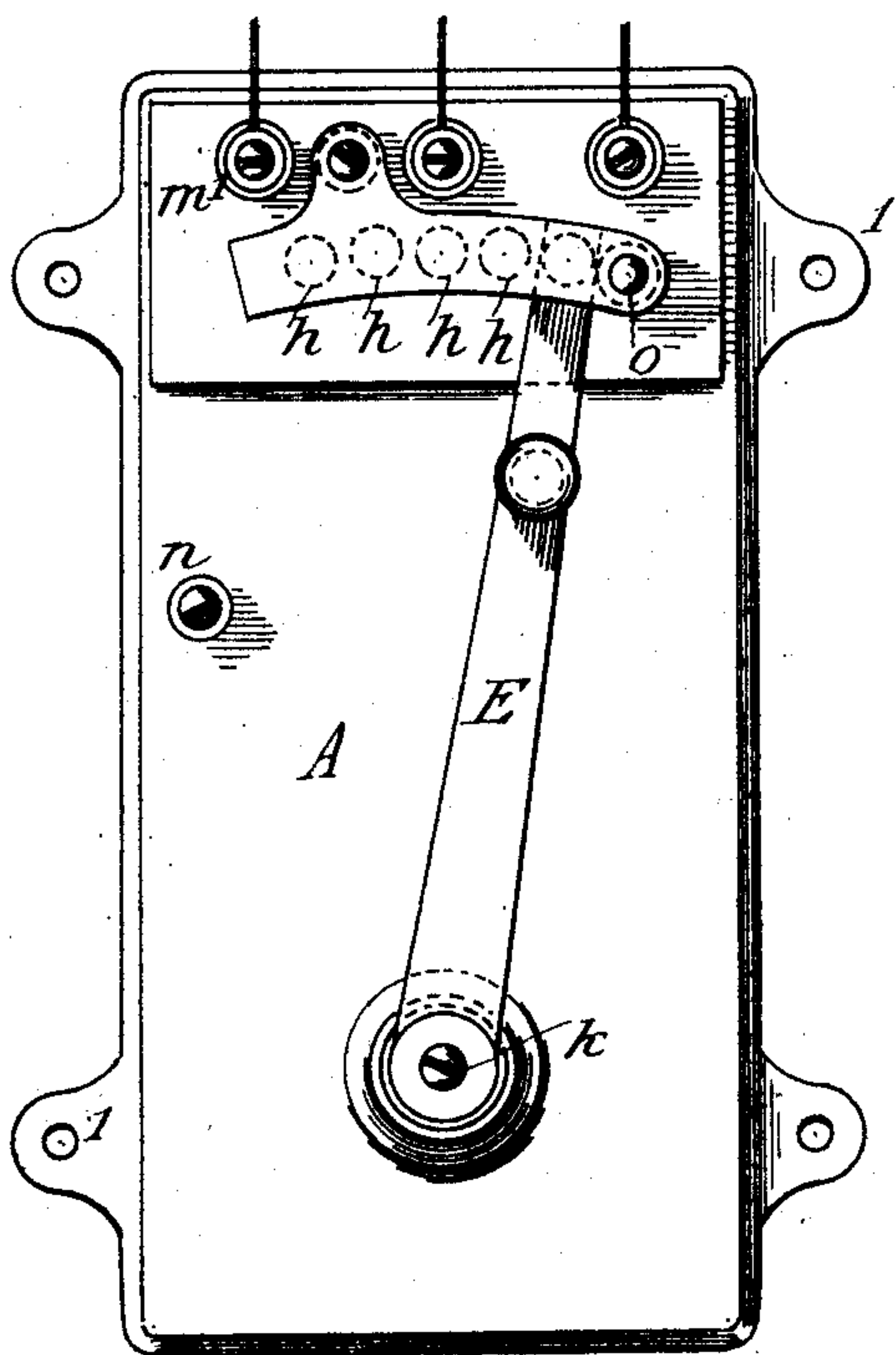


Fig. 1.

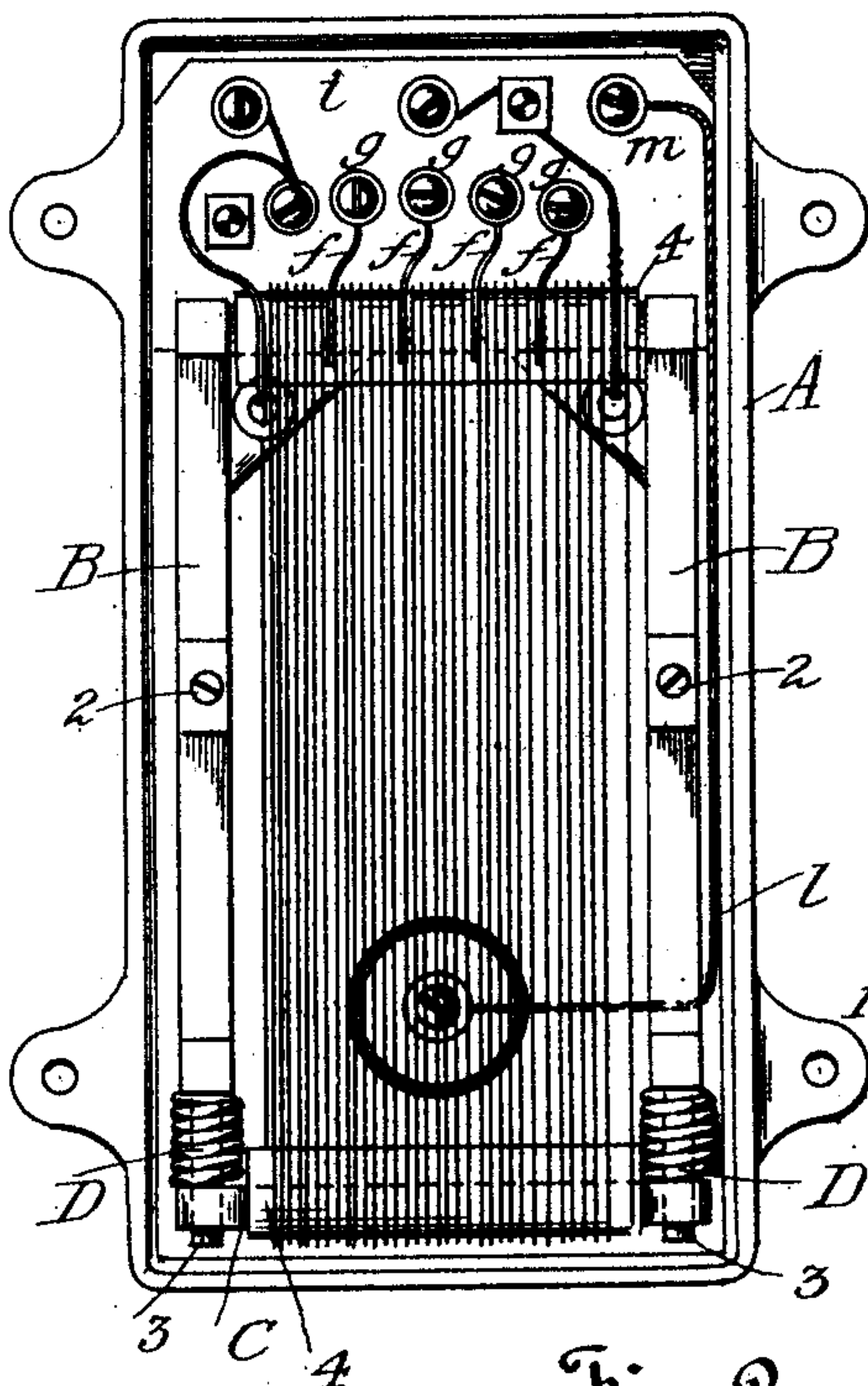


Fig. 2.

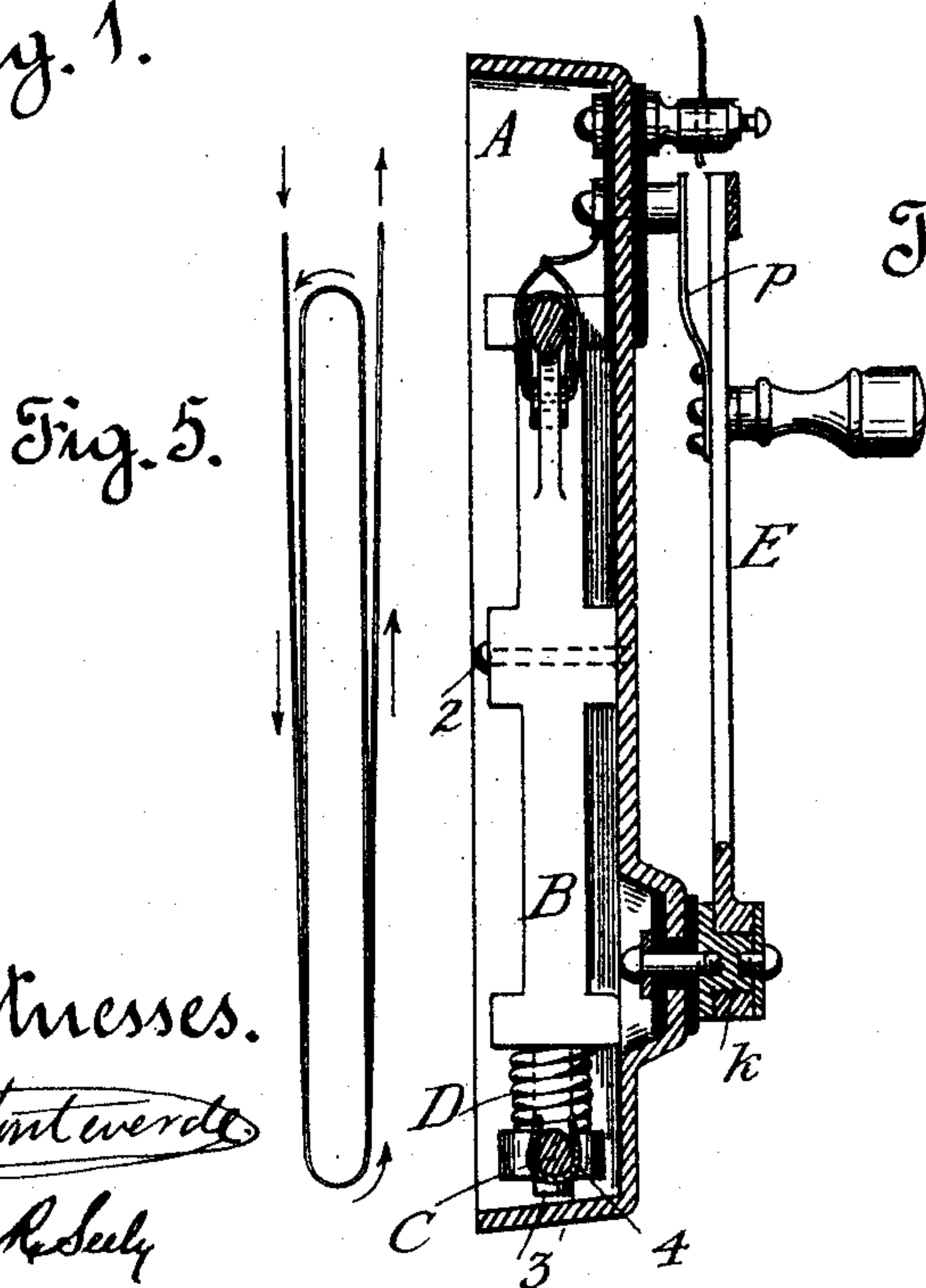


Fig. 3.

Fig. 5.

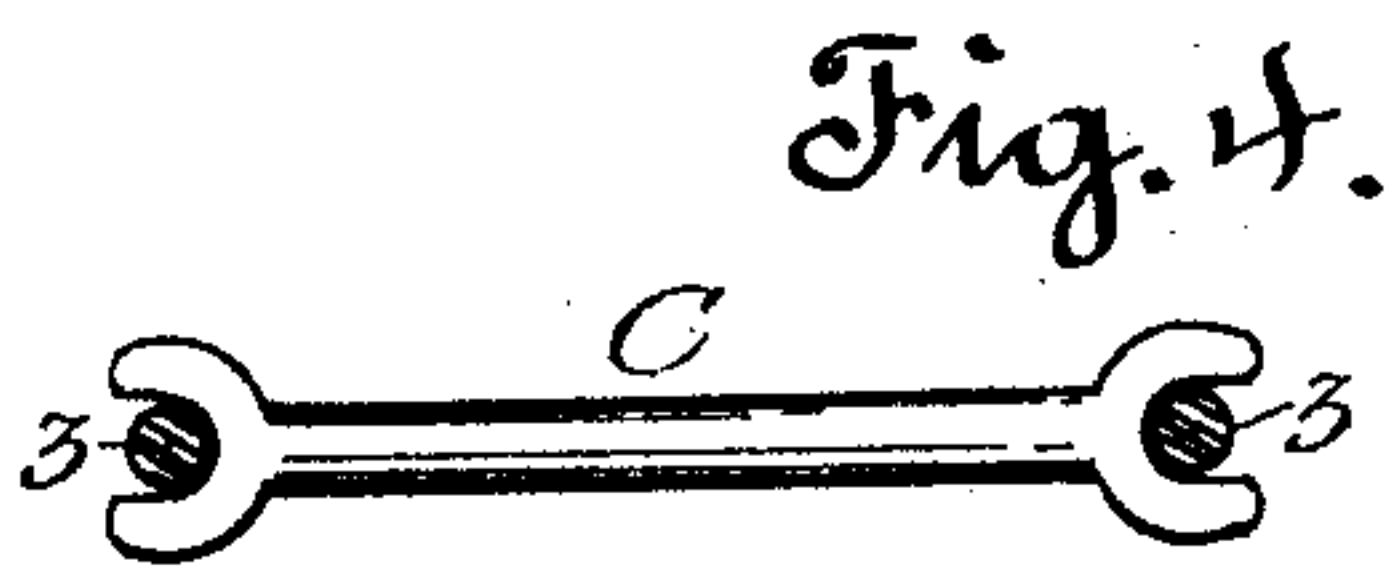


Fig. 4.

Witnesses.  
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*M. S. Sully*

Inventor.  
*William H. Woodman*  
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# UNITED STATES PATENT OFFICE.

WILLIAM H. WOODMAN, OF SAN FRANCISCO, CALIFORNIA.

## RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 622,748, dated April 11, 1899.

Application filed November 17, 1898. Serial No. 696,709. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. WOODMAN, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Rheostats, of which the following is a specification.

My invention relates to apparatus for introducing resistance into electrical circuits.

The object of my invention is to prevent short-circuiting by contact of the wires of the resistance with each other when expanded by heat; and to accomplish this object I provide an expansible frame for supporting the resistance-wires, which is normally compressed by their tension, but which expands automatically to maintain such tension when any part of the resistance becomes heated.

I have shown my invention as applied to a rheostat for furnishing regulated resistance, but have also employed it for the purposes of an electrical heating apparatus.

In the accompanying drawings, Figure 1 is a front elevation. Fig. 2 is a rear elevation. Fig. 3 is a central vertical section. Fig. 4 is a detail view of one end of the rheostat-frame, showing a movable end piece. Fig. 5 shows the winding of the resistance.

A represents the casing or box of the rheostat, adapted to be secured to a wall or other support by ears 1. Within this casing and secured to it, as by the screws 2, is a frame B, which carries the resistance. I have illustrated one of such frames in the drawings; but more than one can be used, if desired, in a single casing. This frame is shown as of rectangular shape, consisting of two sides and two ends, the sides and one end being preferably formed in one piece. The other end C is a separate piece, the ends of which are forked to bear and move upon projecting ends 3 of the side pieces. Interposed between the forks of the bar C and the main portions of the side pieces are coil-springs D.

The conductor which forms the resistance is preferably composed of a suitable length of wire extending back and forth between and over the end pieces of the frame and insulated from the frame by sheets of mica 4 or other suitable non-conductor. The normal tension of this conductor is designed to hold the springs D under compression.

The resistance is divided into sections by wires *f*, which connect the series of screws *g* to different points in the resistance, as shown. These screws pass through the casing and connect with the outside series of contacts *h*. A sheet *i*, of mica or other suitable material, protects that part of the casing which contains the electrical connections.

The switch or lever E for controlling the resistance is mounted upon a pin *k*, which extends through the casing and is connected by the conductor *l* to the screw *m* and binding-post *m'*.

On the outside of the casing the switch E has a range of movement limited by the insulated stops *n* and *o*. Its contact *p* can thus be brought to bear upon any of the series of contacts *h* for the purpose of short-circuiting sections or the whole of the resistance. In the position shown in Fig. 1, for example, the entire resistance is cut out, the current being short-circuited directly through the switch without passing through any of the resistance.

In the operation of a resistance of this character heat is developed in the small conducting-wire. The expansion produced by this causes the wires when rigidly supported to buckle out of line. This renders the wires liable to interfere by contacts among themselves, producing short circuits in the resistance and resulting in a very unsatisfactory and uncertain operation. My construction obviates all trouble from this source and in an exceedingly simple way. The rheostat-frame being expansible, any loosening of the resistance caused by heating is instantly taken up by one or both of the springs, which always tend to keep the wires taut. As the springs are held under pressure by the normal tension of the wires, the subsequent contraction as the wires cool restores the normal relation.

I do not limit myself to exact details of form or of construction herein described and shown in my drawings, as I desire to avail myself of such modifications and equivalents as fall properly within the spirit of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for producing electrical



resistance, a frame for supporting the conductor which forms the resistance, such frame being expansible but normally held under compression by tension of said conductor.

5 2. In an apparatus for producing electrical resistance, a frame for supporting the conductor which forms the resistance, such frame being expansible but normally held under compression by tension of said conductor, and  
10 a spring opposing said tension and tending to expand the frame.

3. In an apparatus for producing electrical resistance, a frame for supporting the conductor which forms the resistance, such frame  
15 having a movable member to which the conductor is connected.

4. In a rheostat, a frame for supporting the conductor, having a movable member, springs interposed between the fixed and movable  
20 parts of the frame, and a conductor connected to both parts of the frame.

5. In a rheostat, a frame having a movable end piece, springs bearing on said end piece and tending to elongate the frame, and a conductor carried by the frame and normally under  
25 tension which is opposed to said springs.

6. In a rheostat, a frame for supporting the resistance-wire comprising a rigid member forming three sides of said frame, a movable member forming the fourth side and guided  
30 on the rigid member, a pressure-spring bearing at each end of the movable member, and a continuous conductor coiled over and between the two members and holding such springs under compression. 35

7. In an apparatus for affording electrical resistance an outer casing, in combination with an inner frame having a movable member, a resistance supported by said frame so as to draw upon the said movable member,  
40 springs bearing upon the movable member in opposition to the tension of the conductor, electrical connections and a switch for controlling the resistance.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 24th  
45 day of October, 1898.

WILLIAM H. WOODMAN.

Witnesses:

L. W. SEELY,  
H. J. LANG.