F. D. HALLOCK.

RHEOSTAT.

APPLICATION FILED JULY 6, 1908.

958,869.

Patented May 24, 1910.

3 SHEETS—SHEET 1.

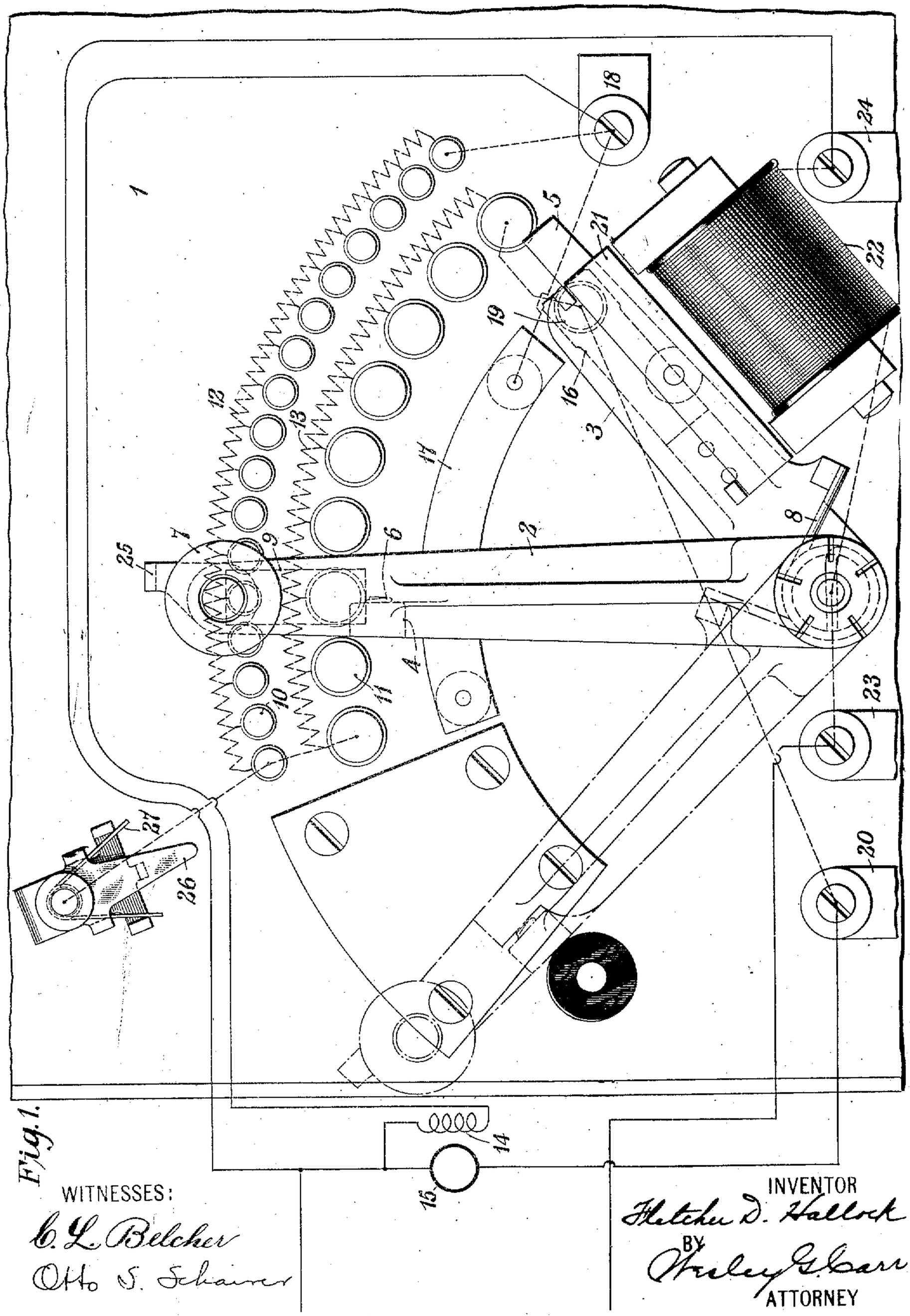

Fig. 1.

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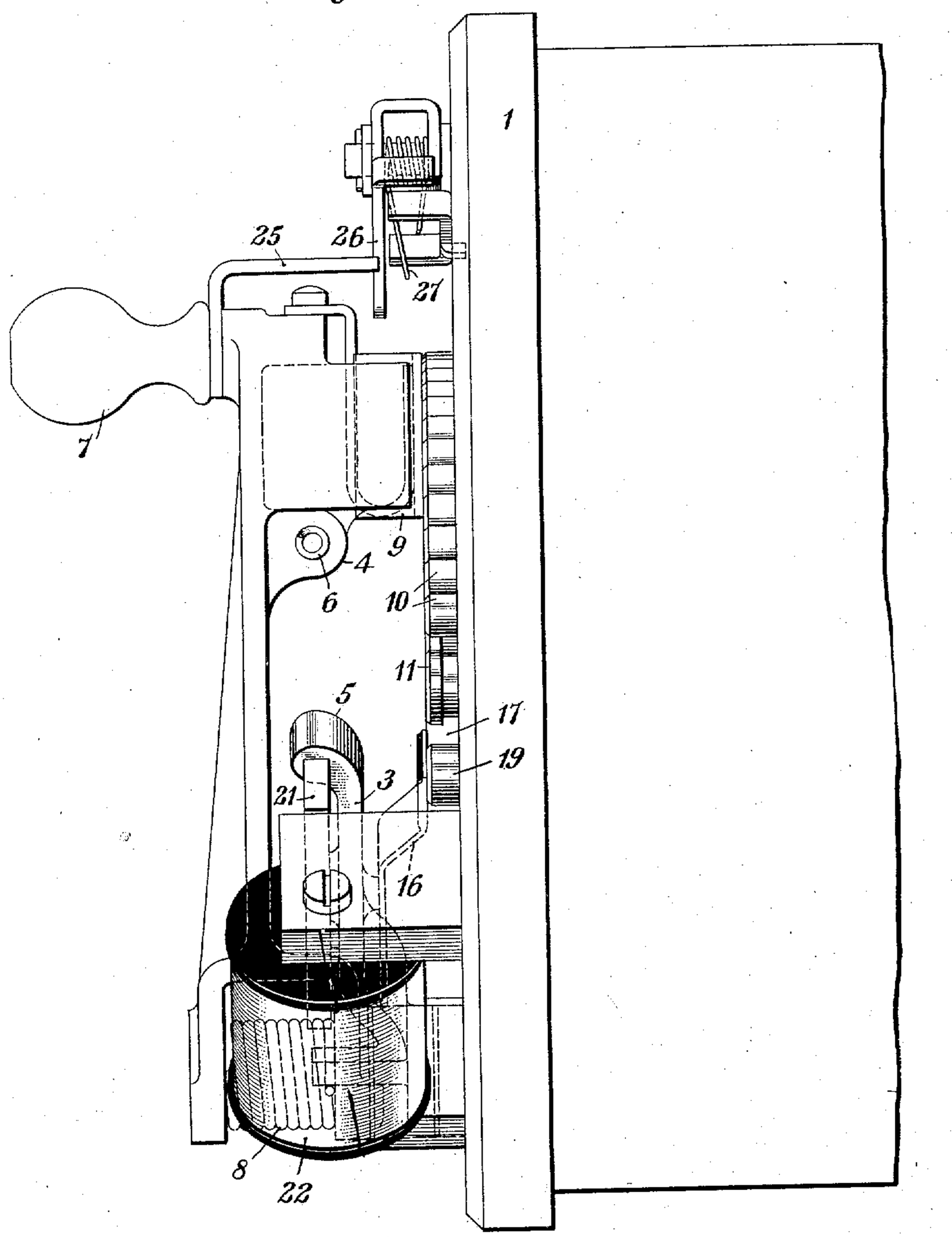
3 SHEETS—SHEET 2.

Fig. 2.



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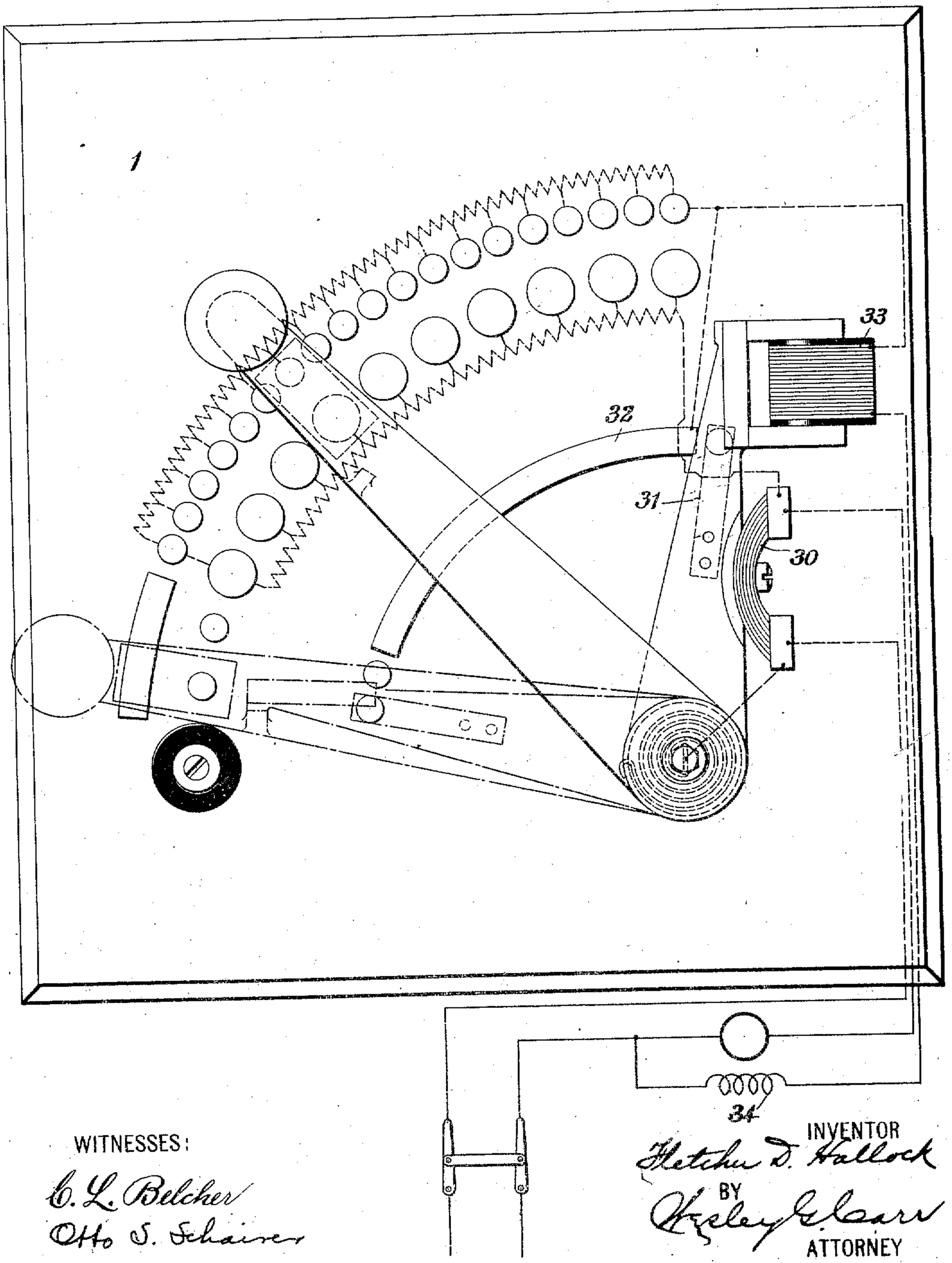
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

FLETCHER D. HALLOCK, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, OF EAST PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RHEOSTAT.

958,869. Specification of Letters Patent. Patented May 24, 1910.

Application filed July 6, 1908. Serial No. 442,225.

To all whom it may concern:

Be it known that I, FLETCHER D. HALLOCK, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rheostats, of which the following is a specification.

My invention relates to rheostats, and particularly to such rheostats as are employed for the purpose of starting electric motors and governing the speeds of operation thereof.

The object of my invention is to provide a rheostat of the character indicated that shall be adapted to prevent adjustment of the resistance in the field circuit of a motor in connection with which it is employed until the armature resistance is entirely removed from circuit, the improved and novel features residing in the specific construction and arrangement of the parts thereof, as will be hereinafter more particularly pointed out.

Figure 1 of the accompanying drawings is a face view of a rheostat constructed in accordance with the present invention, the circuit connections of the device being illustrated diagrammatically. Fig. 2 is a view in side elevation of the rheostat shown in Fig. 1, and Fig. 3 is a face view of a modified form of the rheostat.

Concentrically and pivotally mounted upon a panel or face-plate 1 are two arms 2 and 3 provided, respectively, with a lug 4 and an extension 5 that are adapted to engage each other in order that movement of the arm 3 from left to right may be effected by the arm 2, and movement of the arm 2 from right to left may be effected by the arm 3, a spring 6 being seated in the lug 4 for the purpose of cushioning the blows of the arm 3 upon the arm 2. The arm 2 is freely movable and is provided with an operating handle 7, whereas the arm 3 is constrained or biased in the usual manner, by means of a spring 8, toward its initial position, shown in broken and dotted lines in Fig. 1.

The arm 2 is provided with a brush 9 adapted to engage two rows or sets of stationary contact terminals 10 and 11 that are mounted upon the face-plate 1 concentrically with the pivotal connection thereto of the arms 2 and 3, and are connected, respectively, to suitable points of subdivision of two resistances 12 and 13, the said resistances being included, respectively, in circuit with the field magnet winding 14 and the armature winding 15 of an electric motor.

The arm 3 carries a flexible contact member 16 that is adapted to engage a conducting ring segment 17 mounted upon the face-plate 1 concentrically with the arm 3, the said segment being connected to a terminal 18 that is also connected to one extremity of the resistance 12. The segment 17 is engaged by the member 16 only during movement of the arm 3 from the first to the next to the last resistance-governing position, the member 16 engaging, in its final position, a terminal button 19 that is connected to one extremity of the resistance 13 and to a terminal 20 to which one terminal of the motor armature is connected.

Pivotally mounted upon the arm 3 is an armature 21 for an electro-magnet 22 the winding of which is here shown as connected between two terminals 23 and 24 that are adapted to be connected, respectively, to the conductors of a suitable supply circuit. The winding of the electro-magnet 22 may, however, be connected in such other desired and suitable arrangements that the arm 3 may be retained in its final position except upon failure of the line voltage or upon the occurrence of other abnormal circuit conditions. The terminal 23 is also connected to the arms 2 and 3.

The free end of the arm 2 is provided with an extension 25 that is adapted to engage a pivotally mounted terminal device 26 and to receive the arcs that occur upon interruption of the circuits and to thereby protect the terminals 10 and 11 and the brush 9 from such arcs, the said device 26 being normally maintained in its central position by means of a spring 27 and being connected to the extremities of the resistances 12 and 13.

The arms 2 and 3 normally occupy the positions shown in broken and dotted lines in Fig. 1, the circuits of the motor being then interrupted. In order to start the motor, the arms 2 and 3 should be moved from left to right. When the member 16 engages the segment 17 the field resistance 12 is short-circuited and the only effect of the

movement of the arms 2 and 3 is to gradually remove the resistance 13 from the armature circuit. However, when the arm 3 occupies its final position and the member 16 engages the button 19, the field resistance 12 is no longer short-circuited, and the field strength may then be adjusted by movement of the arm 2 independently of the arm 3 to any desired position, the arm 3 being retained in its final position by the attraction of the electro-magnet 22 for the armature 21, and the armature resistance 13 being then entirely removed from the circuit. Thus, it is seen that the arm 2 controls both the field and the armature resistances, but that the construction and arrangement of the parts is such that the said arm is effective to adjust only one of the resistances at a time, *i. e.*, first the armature resistance and then the field resistance.

If the voltage of the supply circuit falls below a predetermined value, or if other circuit conditions to which the electro-magnet 22 may be adjusted become abnormal, the armature 21 will be released and the spring 8 will return the arm 3 to its initial position, which carries with it also the arm 2. During the return movement of the two arms, the field magnet winding 14 is included in a closed circuit with both of the resistances 12 and 13 and the armature 15, and the field discharge may thus occur without injury to the winding.

The construction shown in Figs. 1 and 2 is particularly adapted for employment when comparatively small amounts of current are to be handled, but for controlling motors of large sizes, I prefer to employ a somewhat modified construction (Fig. 3) in which a brush 30 is employed for short-circuiting the armature resistance when the spring-actuated arm 31 occupies, and is retained in, its final position, the segment 32 extending over substantially the same angular distance as the contact terminals that are connected to the armature and field resistances. In Fig. 3, also, the winding of electro-magnet 33, whereby the arm 31 is retained in its final position, is connected in series with field magnet winding 34 of the motor controlled by the rheostat. The rheostat of Fig. 3 differs in other minor respects from that of Figs. 1 and 2 but its mode of operation is substantially the same and will be readily understood upon an inspection of the drawing, thus rendering it unnecessary to describe it more in detail.

I claim as my invention:

1. The combination with a movable member and two resistances adapted to be controlled thereby, of a second movable member, means operatively connecting the said members to cause the same to move together in one direction and permitting independent movement of the resistance governing member in the opposite direction, a stationary conducting segment, a contact device carried by the second movable member and engaging the stationary segment for a greater portion of the travel of the said member to short circuit one of the resistances, and means carried by the said second movable member for short-circuiting the other resistance at one of the limits of the travel of the said member.

2. The combination with a dynamo-electric machine having field and armature circuits and a resistance for each of said circuits, of a movable member controlling both of said resistances, a second movable member, a conducting segment, a contact device carried by the second movable member and engaging the stationary segment during the greater portion of the travel of the second movable member to short circuit the field resistance, and means carried by the second movable member for short-circuiting the armature resistance when the said member occupies one of its extreme positions.

3. The combination with a dynamo-electric machine having field and armature circuits and a resistance for each of said circuits, of a movable member controlling both of said resistances, a second movable member, means for retaining the second member in its extreme position during the continuance of normal circuit conditions, a stationary conducting segment, a contact device carried by the second movable member and engaging the stationary segment during movement of the said second member after it is in its extreme position to short circuit the field resistance, and means carried by the second movable member for short-circuiting the armature resistance when the said member occupies its extreme position.

In testimony whereof, I have hereunto subscribed by name this 30th day of June, 1908.

FLETCHER D. HALLOCK.

Witnesses:
H. C. NAGEL,
BIRNEY HINES.