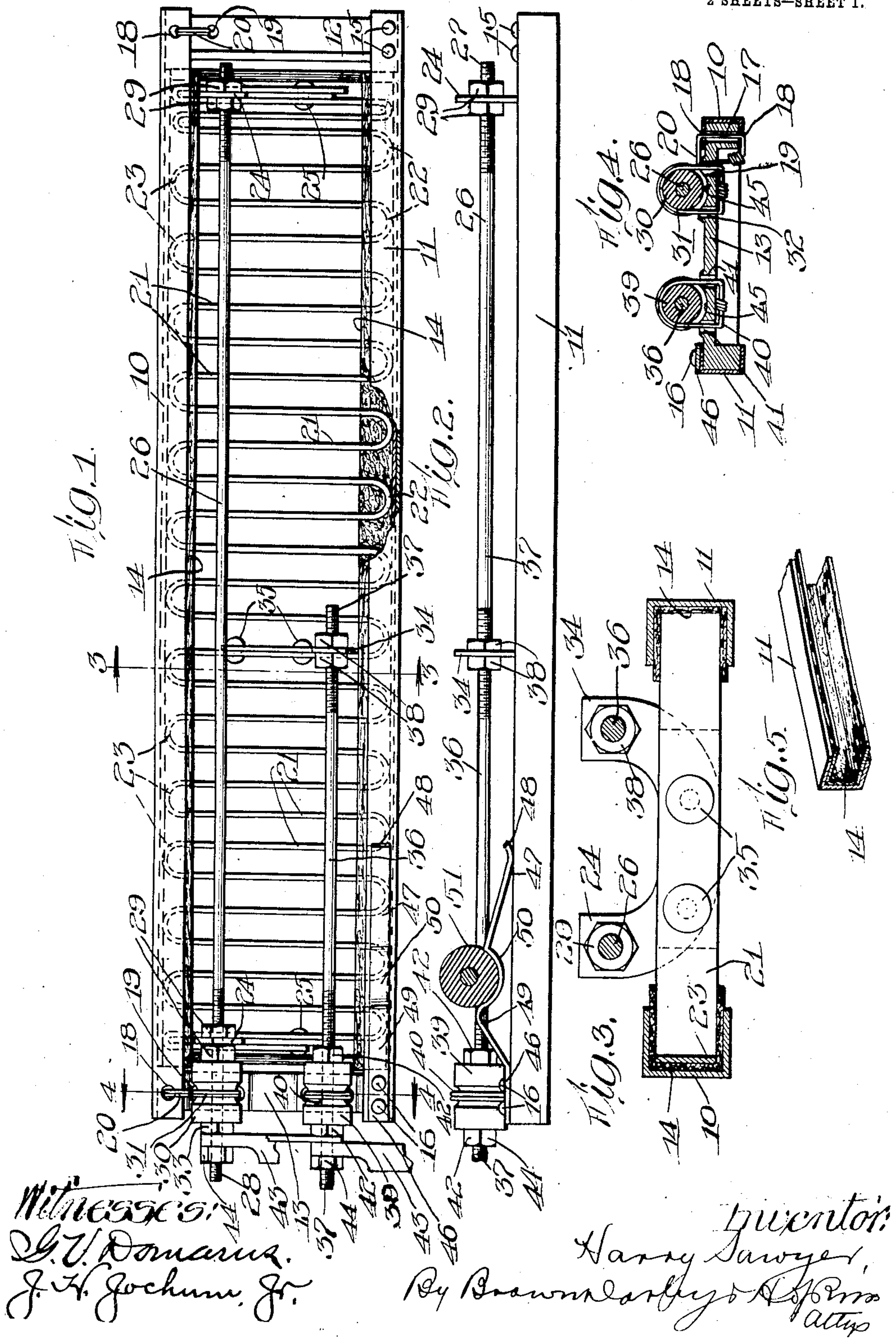


No. 841,054.

PATENTED JAN. 8, 1907.

H. SAWYER.  
RESISTANCE CARD.  
APPLICATION FILED JULY 14, 1906.

2 SHEETS—SHEET 1.



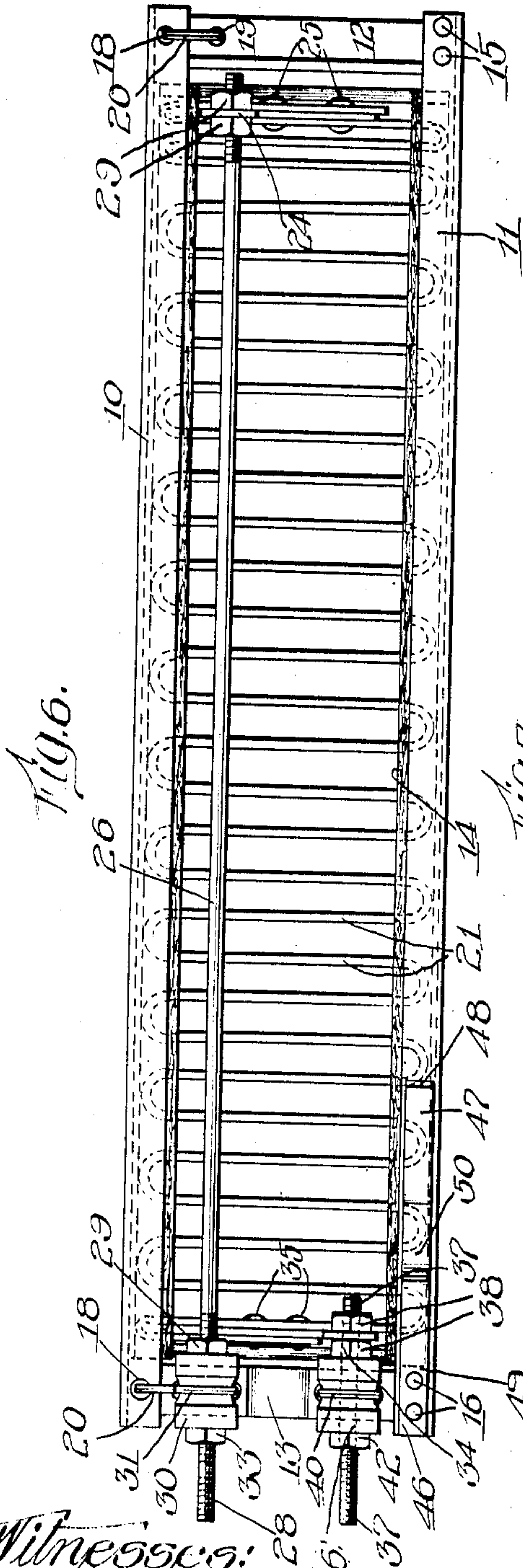
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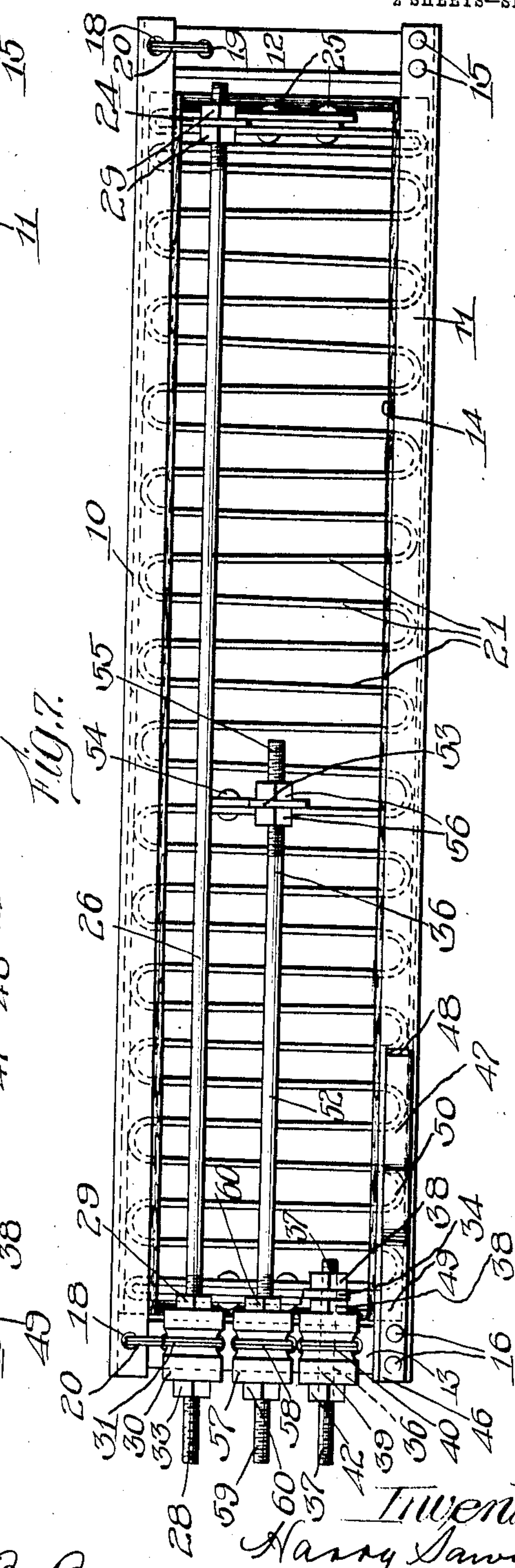
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

HARRY SAWYER, OF MUSKEGON, MICHIGAN.

## RESISTANCE-CARD.

No. 841,054.

Specification of Letters Patent.

Patented Jan. 8, 1907.

Original application filed February 5, 1906, Serial No. 299,660. Divided and this application filed July 14, 1906. Serial No. 326,179.

*To all whom it may concern:*

Be it known that I, HARRY SAWYER, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Resistance-Cards, of which the following is a full, clear, and exact specification.

This invention relates to improvements in resistance-cards, particularly adapted for use with electric controllers and the like; and the object of the same is to provide an improved resistance-card constructed from a strip of resistance material so arranged as to form walls suitably spaced from each other to dispense with the necessity of an insulating material between the adjacent faces of the walls.

A further object is to provide an improved form of resistance-card in which the resistance material is thoroughly insulated from the supporting-frame.

A further object is to provide an improved resistance-card which will be simple and cheap in construction and effective in operation.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear the invention consists in the features of novelty in the construction, combination, and arrangement of the several parts hereinafter more fully described and claimed, and shown in the accompanying drawings, illustrating an exemplification of the invention, and in which—

Figure 1 is a top plan view of a resistance-card constructed in accordance with the principles of this invention. Fig. 2 is a side elevation of Fig. 1. Fig. 3 is a cross-section on line 3 3 of Fig. 1. Fig. 4 is a cross-section on line 4 4 of Fig. 1. Fig. 5 is an enlarged detail perspective view of a portion of one side of the frame, showing the insulating material seated therein. Figs. 6 and 7 are plan views showing different methods of connecting the resistance material.

In this exemplification of the invention the card preferably consists of a frame comprising side members 10 11 and end members 12 13, one of the side members 10 being removable to permit the insertion and removal of the resistance strip or material to be hereinafter described.

The end members 12 13 are preferably castings and are connected by means of the side pieces 10 11, which latter are preferably constructed of heavy sheet metal, such as iron folded or bent to form substantially U-shaped troughs or channels. These troughs or channels are each lined with insulating material 14, such as asbestos or any other material suitable for the purpose, the edges of which preferably project beyond the edges of the side members 10 11. These side members are arranged so that their open portions face each other, and the end pieces 12 13 are secured between these members near the ends thereof and with their extremities preferably standing within the trough or channel.

The side piece or member 11 is secured to the end pieces 12 and 13 in any suitable manner, such as by means of bolts or rivets 15 16, while the side piece or member 10 is removably held in position. Any desired means may be employed to accomplish this purpose; but there is shown a simple fastening means in which the side and end members 10 12, and 13 are provided with registering apertures 17 18, while the side member is provided with an additional aperture 19, adjacent the aperture 17. A suitable fastening member 20, preferably of some flexible material, such as heavy wire or the like, is threaded through these apertures, and the ends thereof are secured beneath the frame in any suitable manner, such as by twisting them together.

The resistance material preferably consists of a ribbon or strip 21 of suitable material, preferably of about one-half inch wide or of a width equal to the width of the space, groove, or channel in the side pieces or members 10 11. This strip may be constructed of a single continuous piece of material or a plurality of pieces fastened together and is bent or folded back and forth upon itself with a zigzag or serpentine shape, with the adjacent walls of the bends or convolutions spaced from each other, the length of the bends or convolutions being substantially equal to the distance between the end walls of the channels or grooves in the side pieces or members 10 11 when the frame is assembled.

The side piece or member 10 of the frame being removed, the ends 22 of the convolu-



tions or coils which constitute one side of the resistance material are inserted in the insulated groove or channel of the side piece or member 11. The other side 10 is then placed in position with the ends 23 standing within the groove or channel, the latter being secured in position in the manner before set forth.

The ends of the resistance material or strip 21 preferably terminate short of the ends 12 of the frame, and adjacent the ends of these strips are arms, projections, or brackets 24, which latter are secured thereto in any suitable manner, preferably by means of bolts or rivets 25, which pass through the strip 21 and the brackets, arms, or projections 24. These arms, projections, or brackets 24 are each provided with an aperture or opening through which passes a rod or bar 26, which latter is preferably provided with threaded extremities 27 28. Nuts 29 engage the threaded portions of the bar or rod 26 on each side of the arms, projections, or brackets 24 and serve as a means for holding and securing said rod or bar, and to prevent the same from becoming displaced an insulator or insulated bushing 30 is secured to the front end 13 of the frame in any suitable manner, such as by means of a flexible member of wire or other material 31, which surrounds the insulator or bushing 30 and passes through the aperture 19 and an adjacent aperture 32 in said members, (see Fig. 4,) the end of this fastening device or member 31 being suitably secured, as by twisting them together. The extremity of the rod or bar 26 passes through this insulator or bushing 30 and is held in position by means of one of the nuts 29 and a nut 33. A similar bracket, arm, or projection 34 is also secured to the strip 21 at any desired point, preferably midway of its length, and is held in position in any suitable manner, preferably by means of bolts or rivets 35, and said arm, bracket, or projection 34 is provided with an opening through which passes a bar or rod 36, having threaded ends 37, one end of which is engaged by nuts 38 on each side of the arm, bracket, or projection 34.

An insulator or insulated bushing 39 is secured to the front end of the frame in any suitable manner, preferably by means of a flexible member, such as wire or other suitable material 40, which surrounds said bushing or insulator 39 and passes through apertures 41 in the end member 13, with the ends suitably secured together. The free end of the rod or bar 36 passes through this bushing or insulator and is secured and held in position by means of the nuts 42 engaging the threaded end of the rod or bar on each side of the bushing. The free extremities of these rods or bars 26 36 serve as the means by

which electrical connection is made with the resistance-strip 21 through the medium of the conductors 43, which surround the said rods and are removably held in engagement therewith by means of binding or clamping nuts 44.

The arrangement of the card as shown in Figs. 1 and 2 is what is termed "center-connected"—that is, the rod 36 is connected to the center of the card and the rod 26 is connected to both ends. This puts two halves of the resistance material in parallel, making it equivalent to a shorter and heavier conductor.

Suitable seats or sockets 45 may be provided in the front end member 13 of the frame, as more clearly shown in Fig. 4, which serve as an additional means to hold the insulators or bushings 30 39 in position.

It will be seen that the rods or bars 26 36 and the resistance material 21 are thoroughly insulated from the supporting-frame.

Any suitable means may be employed for preventing displacement of the resistance-card; but a simple and efficient means for that purpose comprises a spring 46, which is secured to the upper face of one of the side members of the frame, preferably the stationary member 11, preferably by means of the bolts or rivets 16, and adjacent the forward end of the member. The free end 47 of this spring is slightly rounded, as at 48, so as to have a yielding bearing with the face of the frame member 11. This spring is bowed upward or raised intermediate its ends, as at 49, and is provided with a seat or depressed portion 50, and the end 47 is preferably inclined from the seat or depressed portion 50 to its extremity 48.

This improved resistance-card is preferably adapted to be inserted in a controller-frame, (not shown,) so that the depressed portion 50 of the spring 46 will engage a projection 51, supported by the controller-frame. The fastening-spring, together with the support, however, form no part of this present application, but is included in my original application, filed February 5, 1906, Serial No. 299,660, and of which this application is a division.

In Fig. 6 a modified arrangement of the card is shown wherein the two rods 26 and 36 are connected to the opposite ends of the resistance material, thereby putting the whole in series and designated as "end-connected" cards.

In Fig. 7 a third method is shown by means of which the resistance material 14 may be divided into two separate sections and may be connected up as separate cards. In this arrangement the rods 26 36 are connected to the opposite ends of the resistance material in a manner similar to that shown in Fig. 6.



An additional or third rod or conductor 52, similar to the rods 36 26, is provided and is connected to the center of the resistance material by means of a suitable arm or bracket 53, held in any desired manner, such as by means of bolts or rivets 54, and the end 55 of the rod which engages the bracket is preferably threaded and prevented from displacement by means of suitable nuts 56, engaging the threaded end on each side of the arm or bracket 53. A suitable insulator 57 is secured to the front 13 of the frame, preferably between the insulators 30 and 39, by means of a flexible fastening 58, such as wire or the like. The free end 59 of this rod 52 is preferably screw-threaded and passes through the insulator 57 and is prevented from displacement by means of nuts 60, engaging the rod on each side of the insulator.

In order that the invention might be fully understood, the details of an embodiment thereof have been thus specifically described; but

What I claim is—

1. A resistance-card comprising a frame, a resistance material removably supported within the frame, means for insulating the resistance material from the frame, conductors one end of which are connected to the resistance material, and means for securing the other end of the conductors to and insulating the same from the frame.

2. A resistance-card comprising a frame, a continuous strip of resistance material supported by the frame, said material being folded to form spaced walls, means for insulating the material from the frame, and conductors, one end of which are connected to the resistance material, the other ends being insulated from and connected to the frame.

3. A resistance-card comprising a separable frame, a removable resistance material within the frame and insulated therefrom, and conductors connected to the resistance material and having their free ends secured to and insulated from the frame.

4. A resistance-card comprising a separable frame, the sides of said frame being recessed or trough-shaped, insulating material within the recess or trough and having its ends projecting beyond the edges of the side members, a resistance material in the frame, the edges of which enter the recess or trough and stand between the insulating material, and conductors, one end of which are connected to the resistance material, the other end being secured to and insulated from the frame.

5. A resistance-card comprising a separable frame, a resistance material secured within and insulated therefrom, said resistance material comprising a strip of heavy material folded back and forth upon itself across

the frame, to form spaced walls with the ends thereof alternately connected, and conductors, one end of which are connected to the resistance material, the other ends being insulated from and connected to the frame.

6. A resistance-card comprising a hollow, separable frame, a strip of resistance material within and extending across the frame, insulating material disposed between the ends of the resistance material and the frame, oppositely-disposed brackets secured to the resistance material and projecting beyond the plane thereof, a pair of rods respectively and removably engaging the brackets, the free ends of said rods being insulated from and secured to the frame.

7. A resistance-card comprising a hollow, separable frame, a strip of resistance material within the frame, said strip being bent back and forth upon itself to form spaced walls, insulating material disposed between the ends of the resistance-strip and the frame, insulators secured to the front of the frame, brackets secured to the resistance-strip, and rods removably connected at one end to the brackets, the other ends thereof being secured to and passing through its respective insulator.

8. A resistance-card comprising a separable frame, a resistance material secured within and insulated from the frame, the front of the frame being provided with recesses, insulators secured within the recesses, connectors, one end of which are secured to and project beyond the insulators to form a binding-post, the other ends thereof being removably connected to the resistance material.

9. A resistance-card comprising a framework having side and end members, said side members being provided with a channel or groove in their adjacent faces, one of said side members being removable, means for securing said removable members in position, a continuous strip of resistance material, removably supported by the frame, said material being bent to form spaced walls with the ends of the walls within the grooves or channels, means for insulating the material from the frame, and conductors, one end of which are connected to the resistance material, the other ends being insulated from and connected to the frame.

10. A resistance-card comprising a framework having side and end members, said side members being provided with a channel or groove in their adjacent faces, one of said side members being removable and provided with apertures adjacent the ends thereof, the end members being also provided with apertures adjacent the removable side member, a flexible fastening member passing through the adjacent apertures for securing said side member in position, a continuous strip of re-



sistance material removably supported by the frame and bent to form spaced walls, means for insulating the material from the frame, and conductors, one end of which are  
5 connected to the resistance material, the other ends being insulated from and connected to the frame.

In testimony whereof I have signed my

name to this specification, in the presence of two subscribing witnesses, on this 26th day 10 of June, A. D. 1906.

HARRY SAWYER.

Witnesses:

J. L. HAGA,

OTTO ALBERT.