

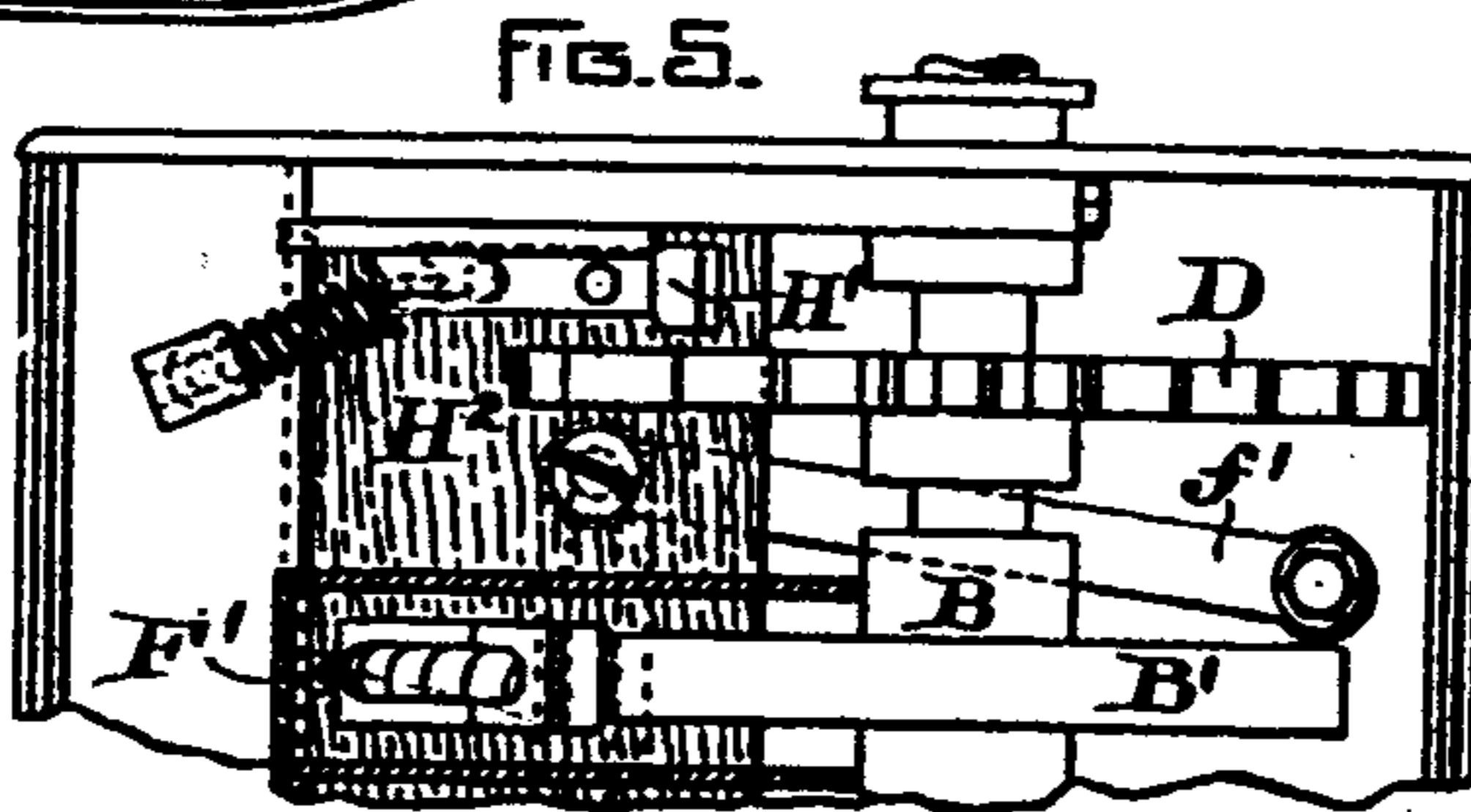
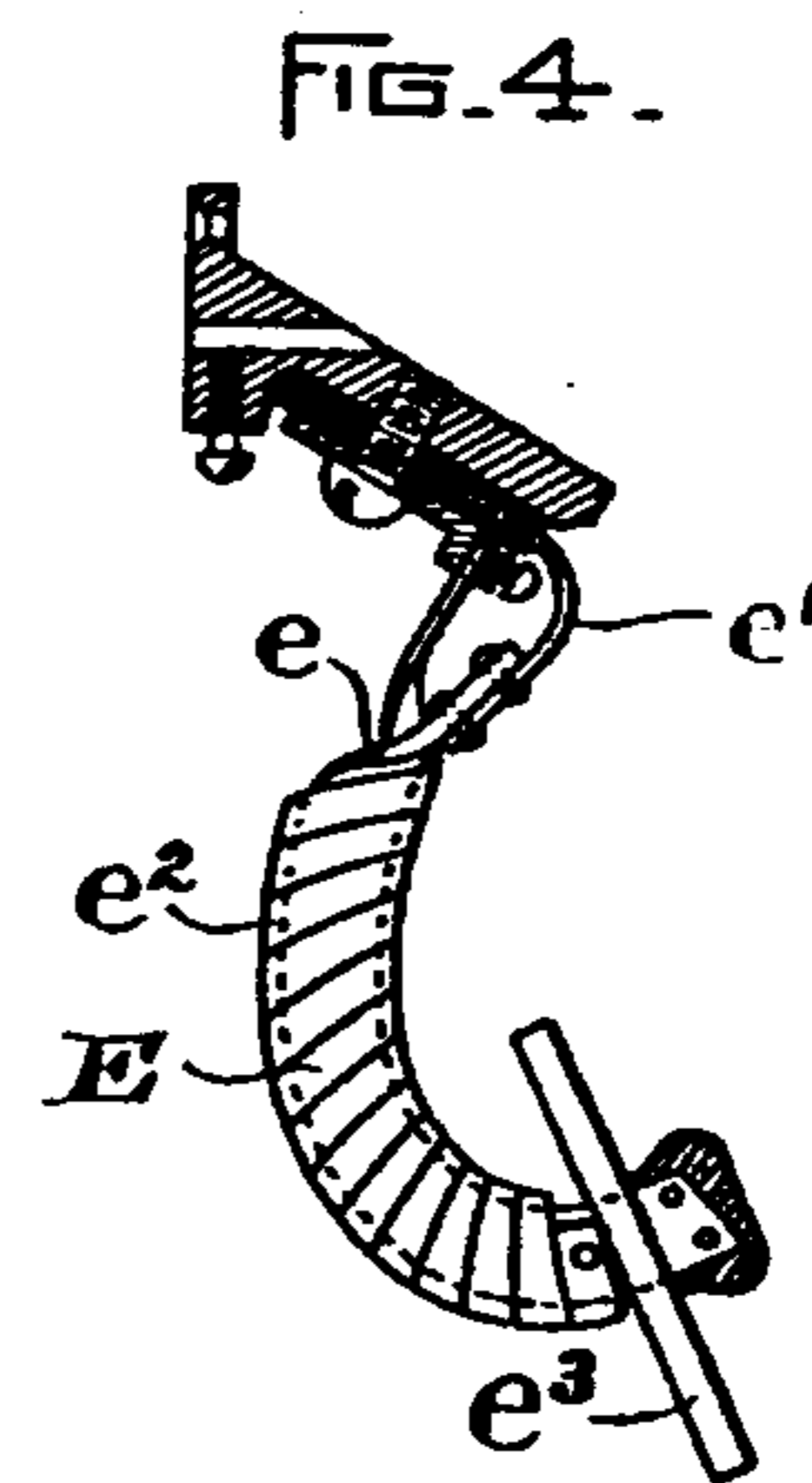
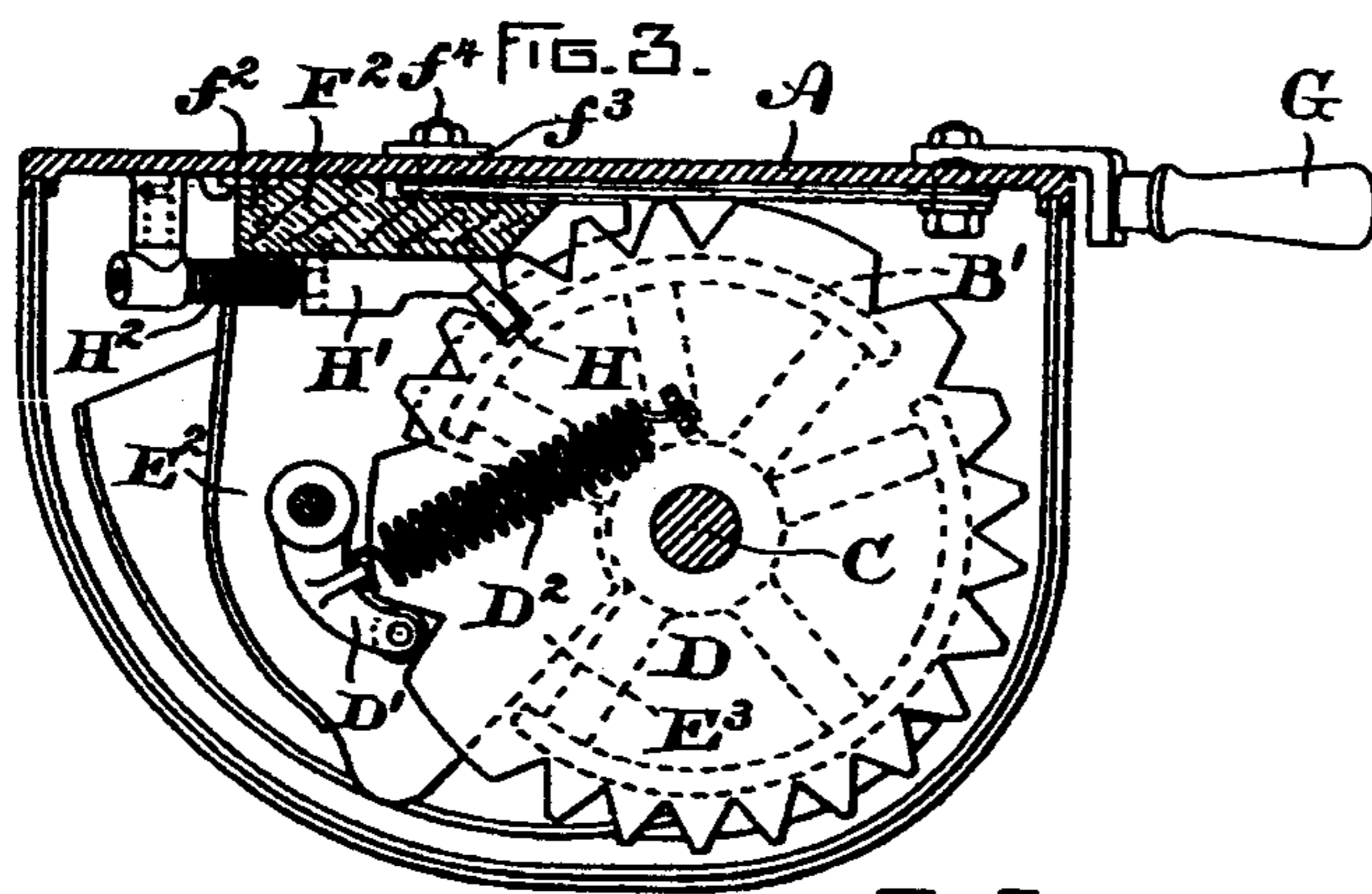
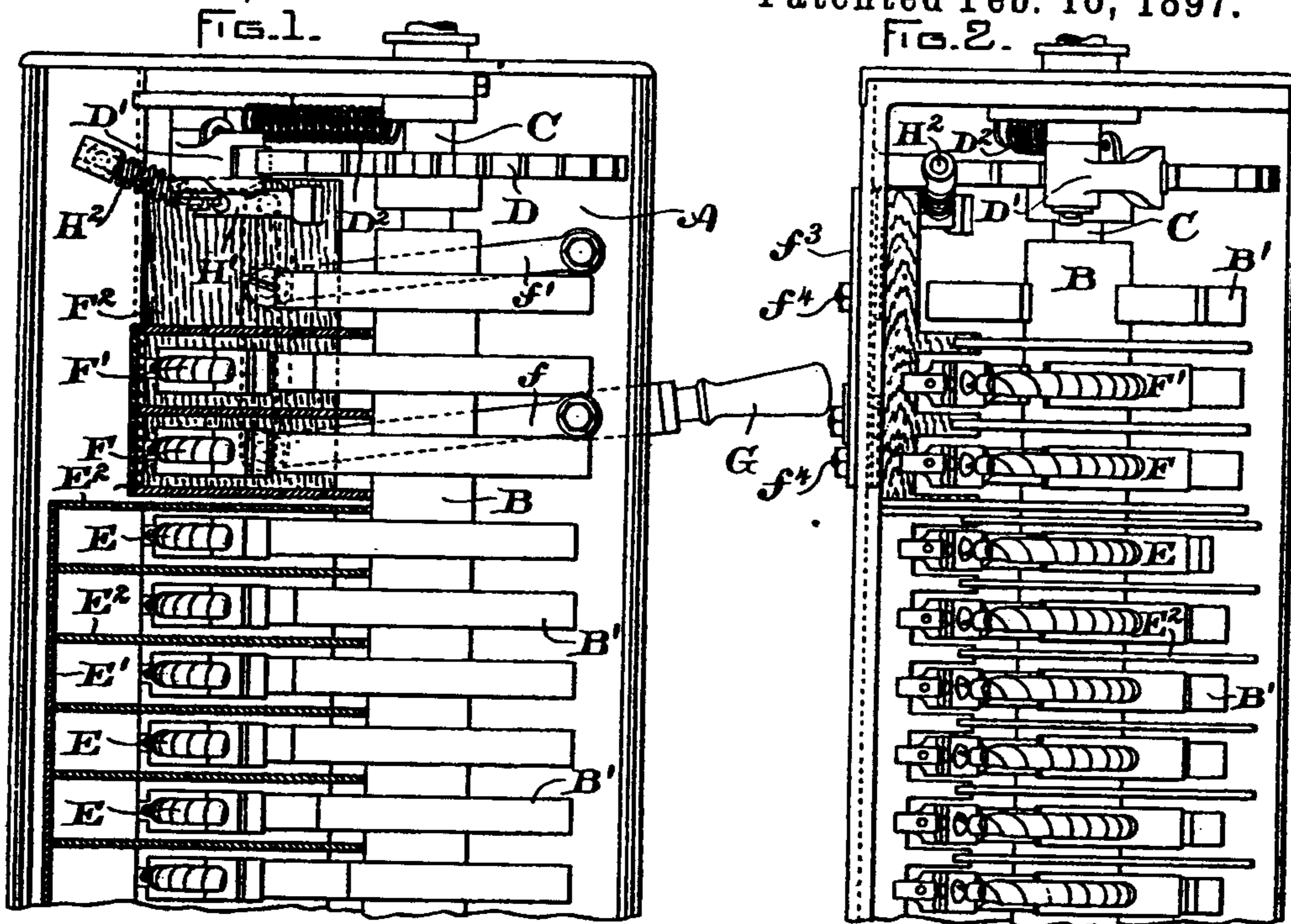
(No Model.)

2 Sheets—Sheet 1.

E. A. SPERRY.  
ELECTRIC CONTROLLER.

No. 577,081.

Patented Feb. 16, 1897.



WITNESSES.  
A. H. Abell.  
W. H. McDonald.

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Edmund A. Sperry,  
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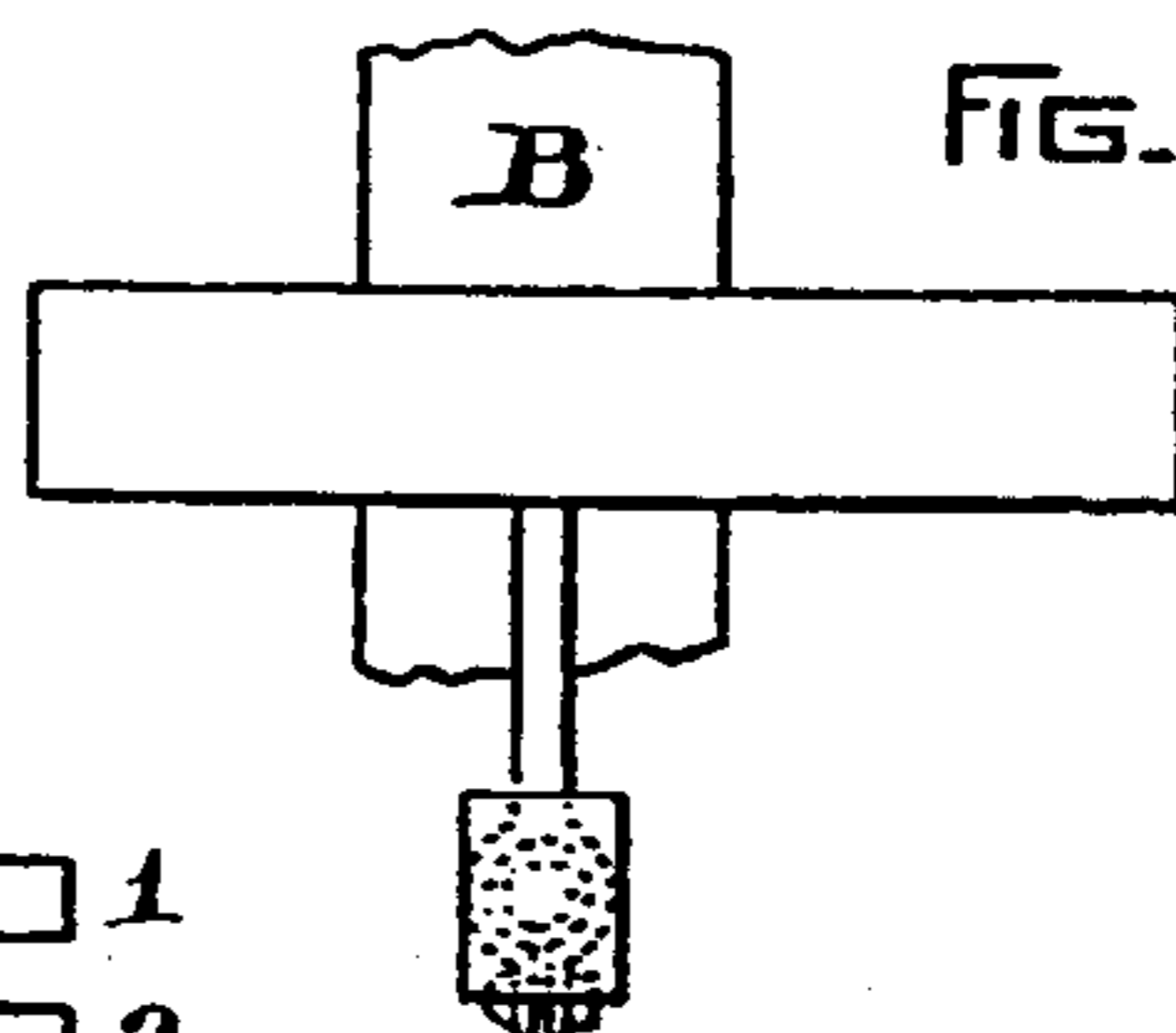
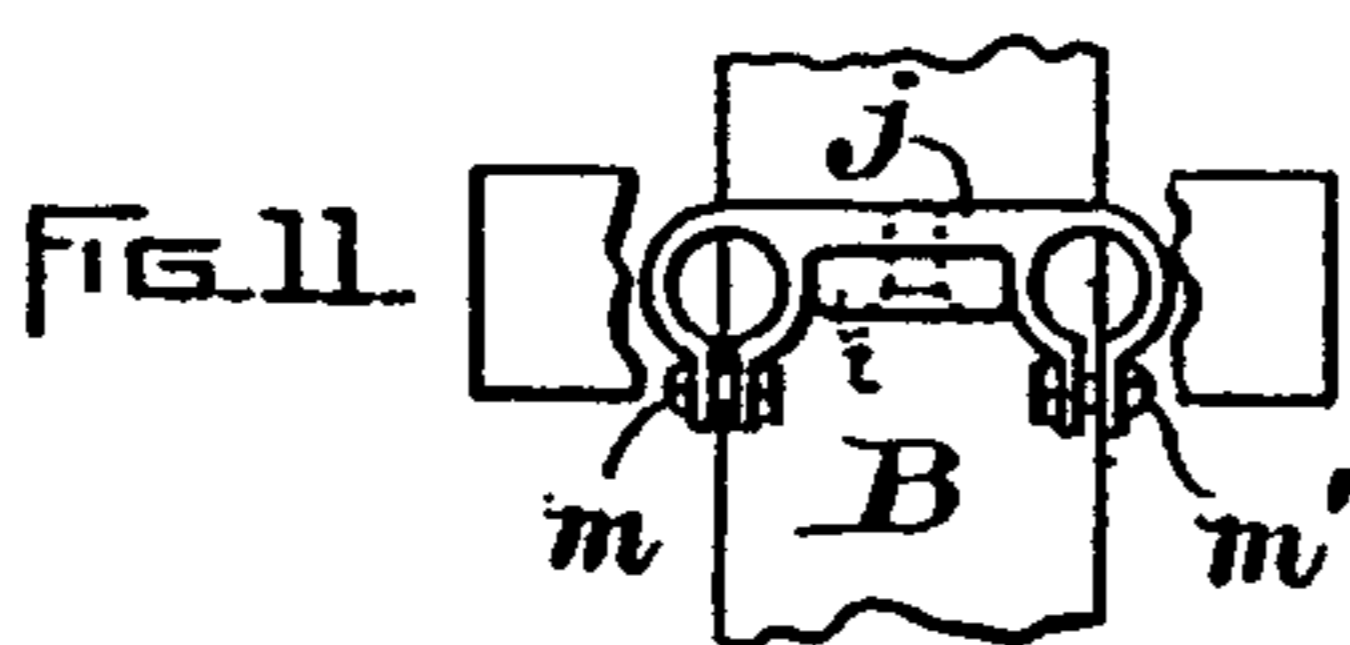
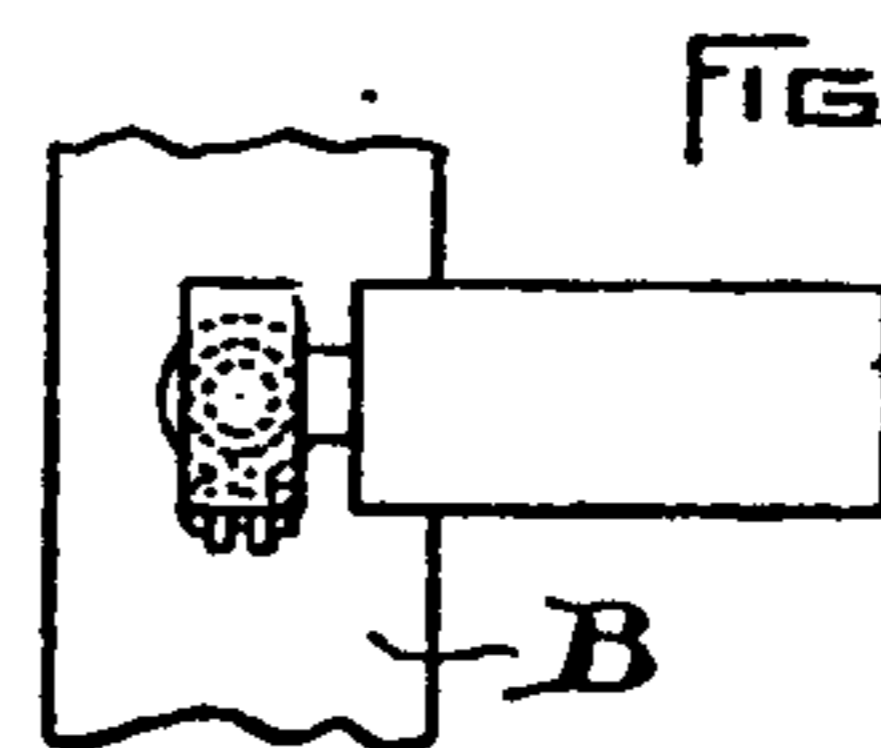
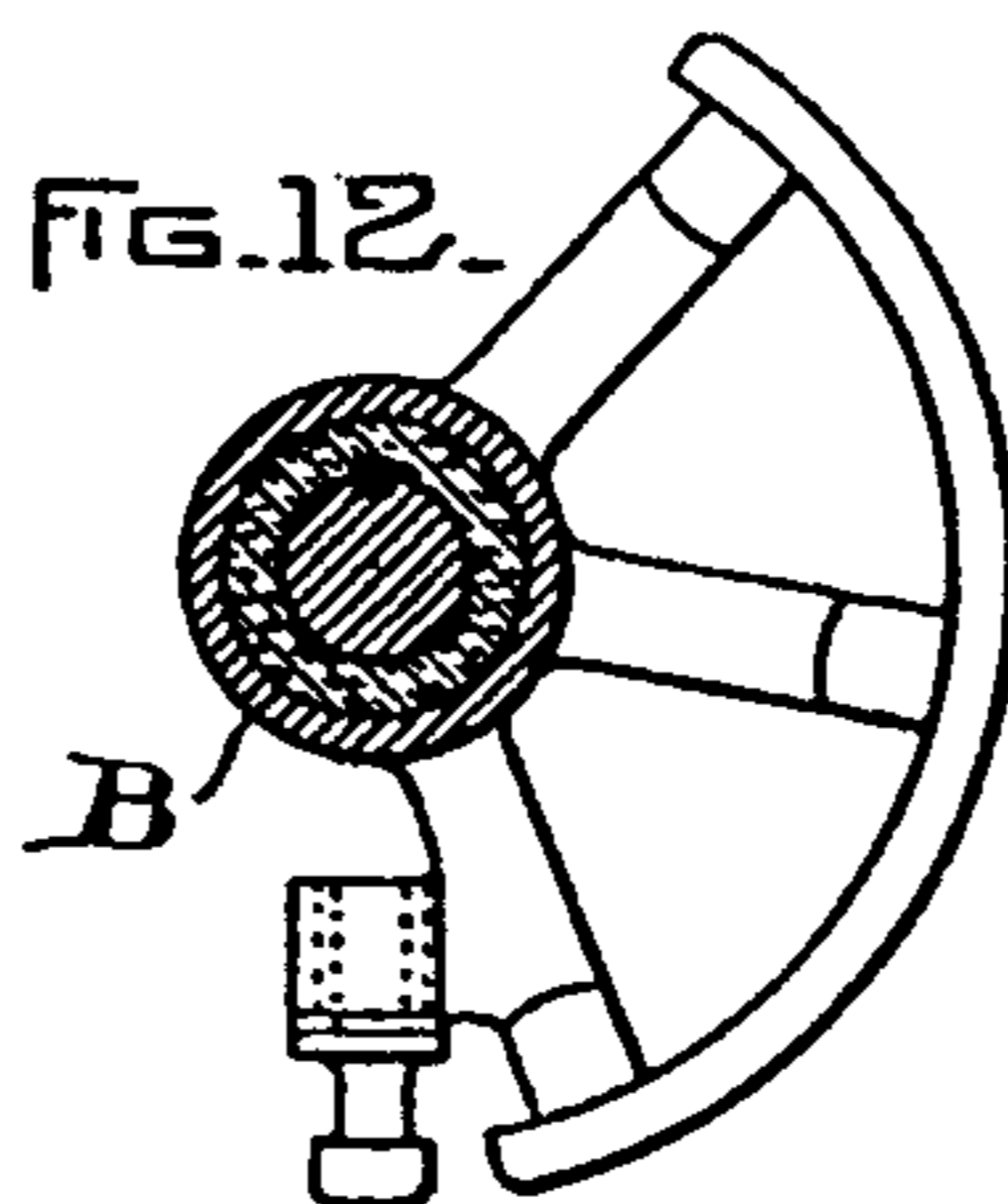
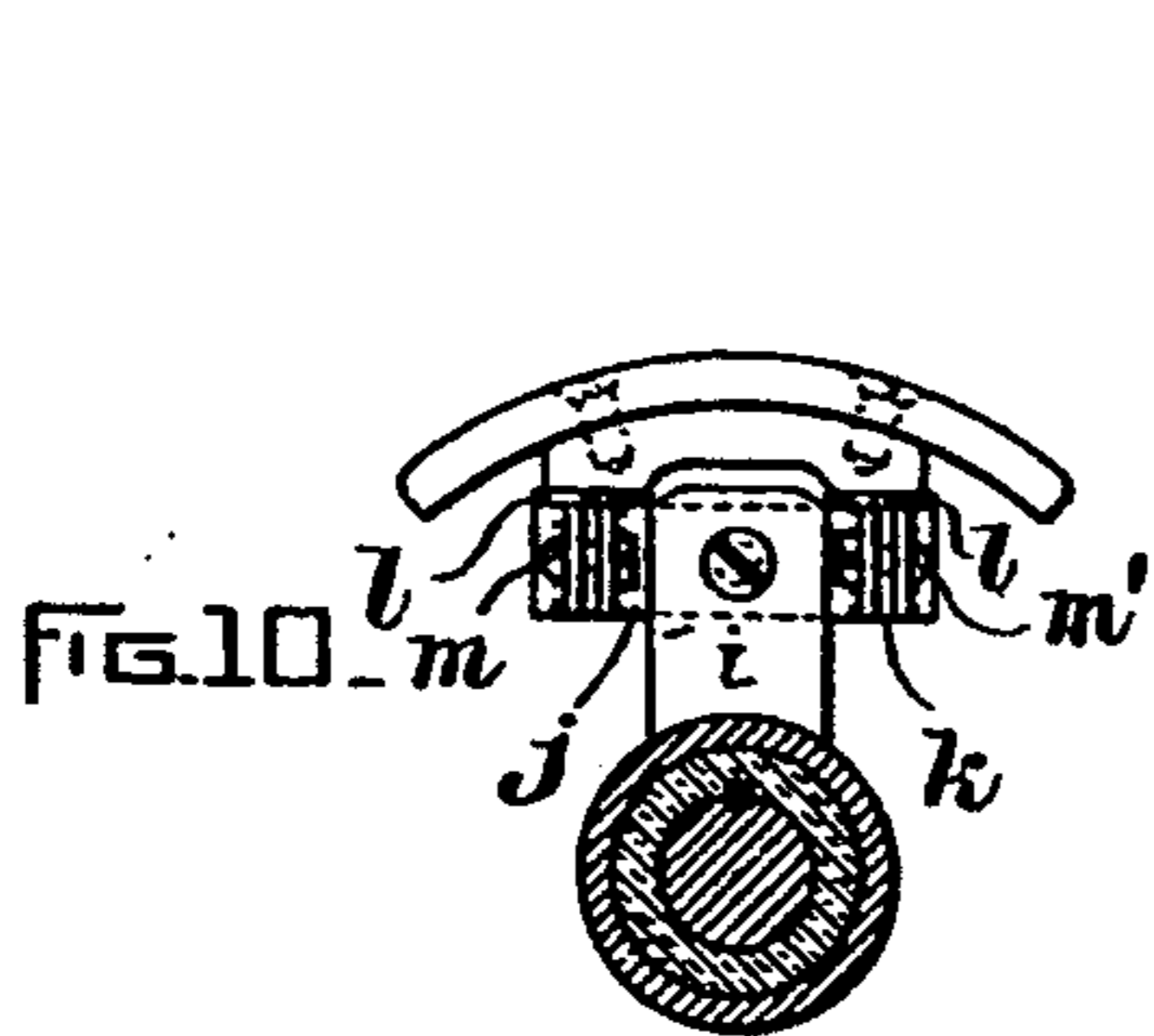
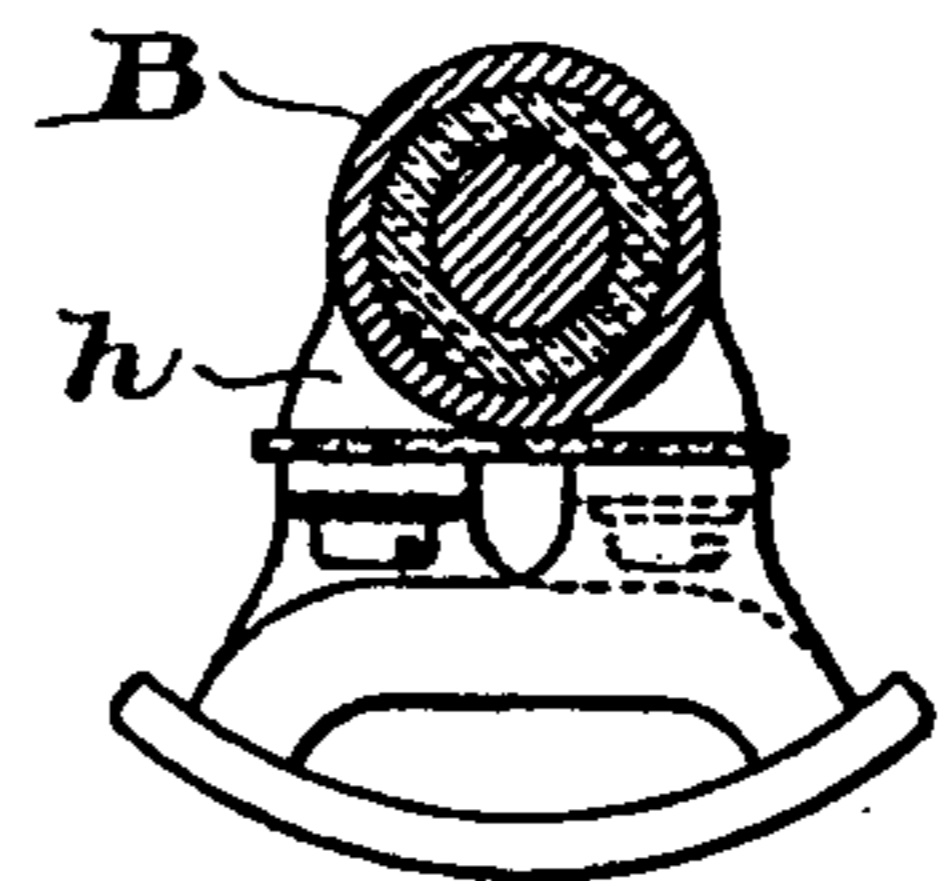
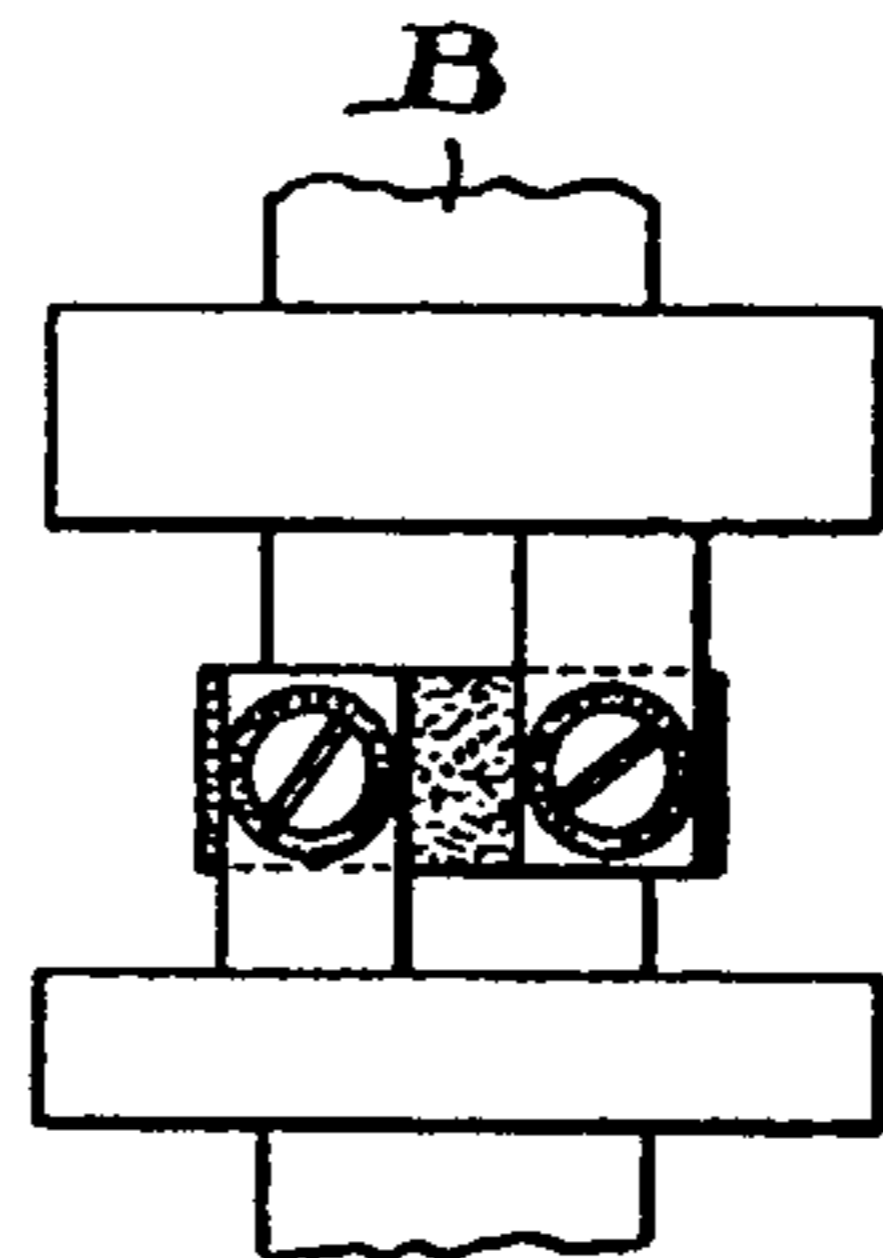
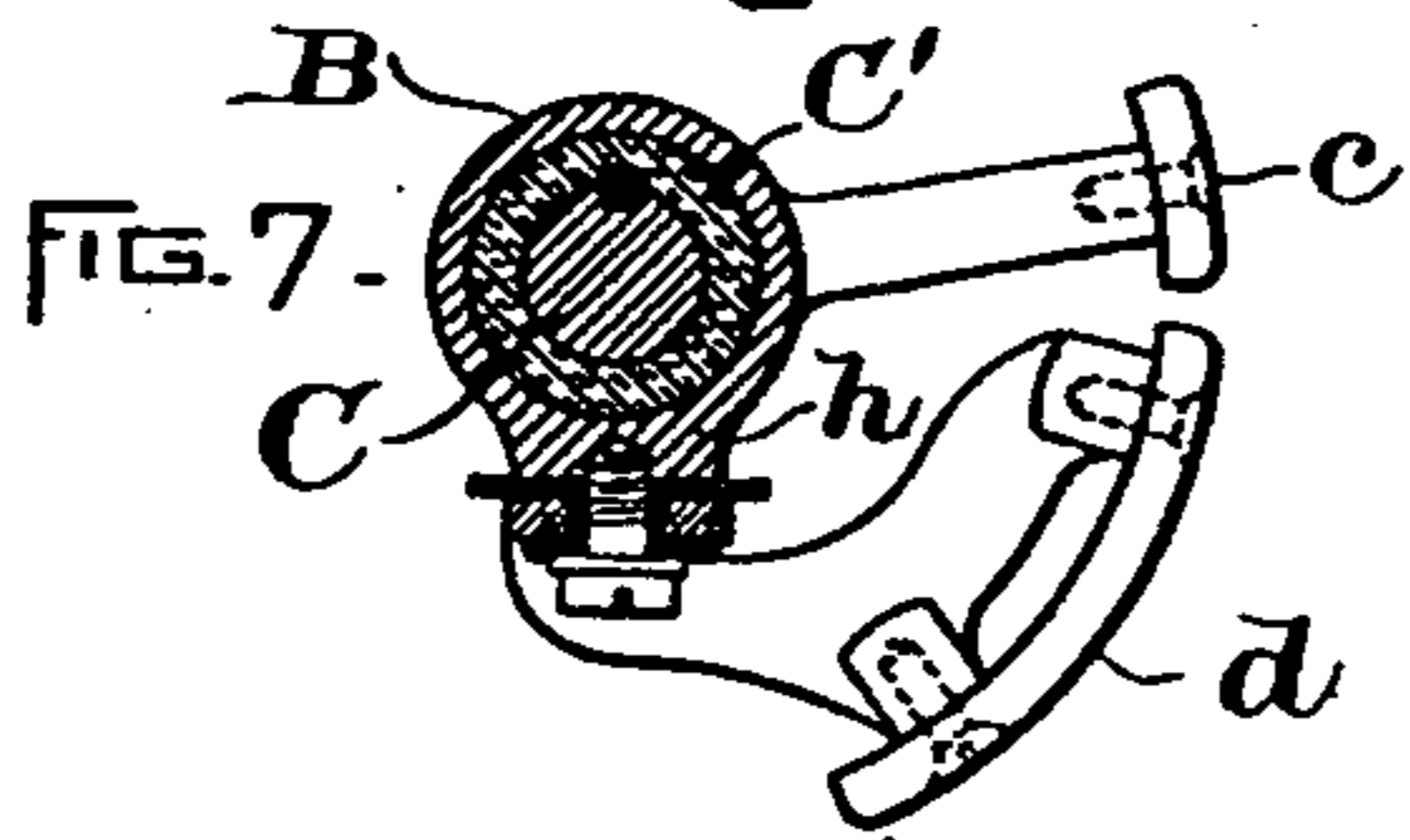
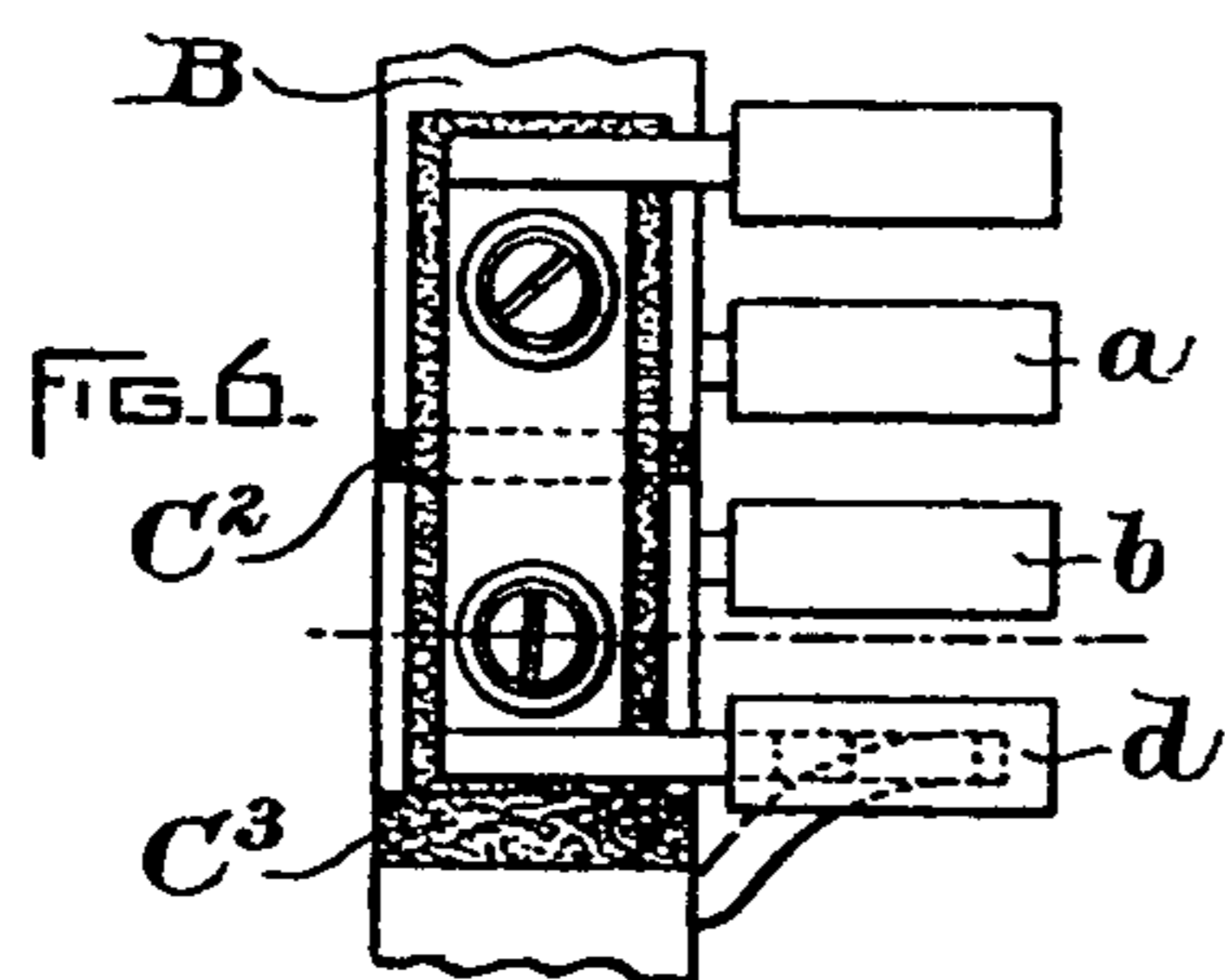
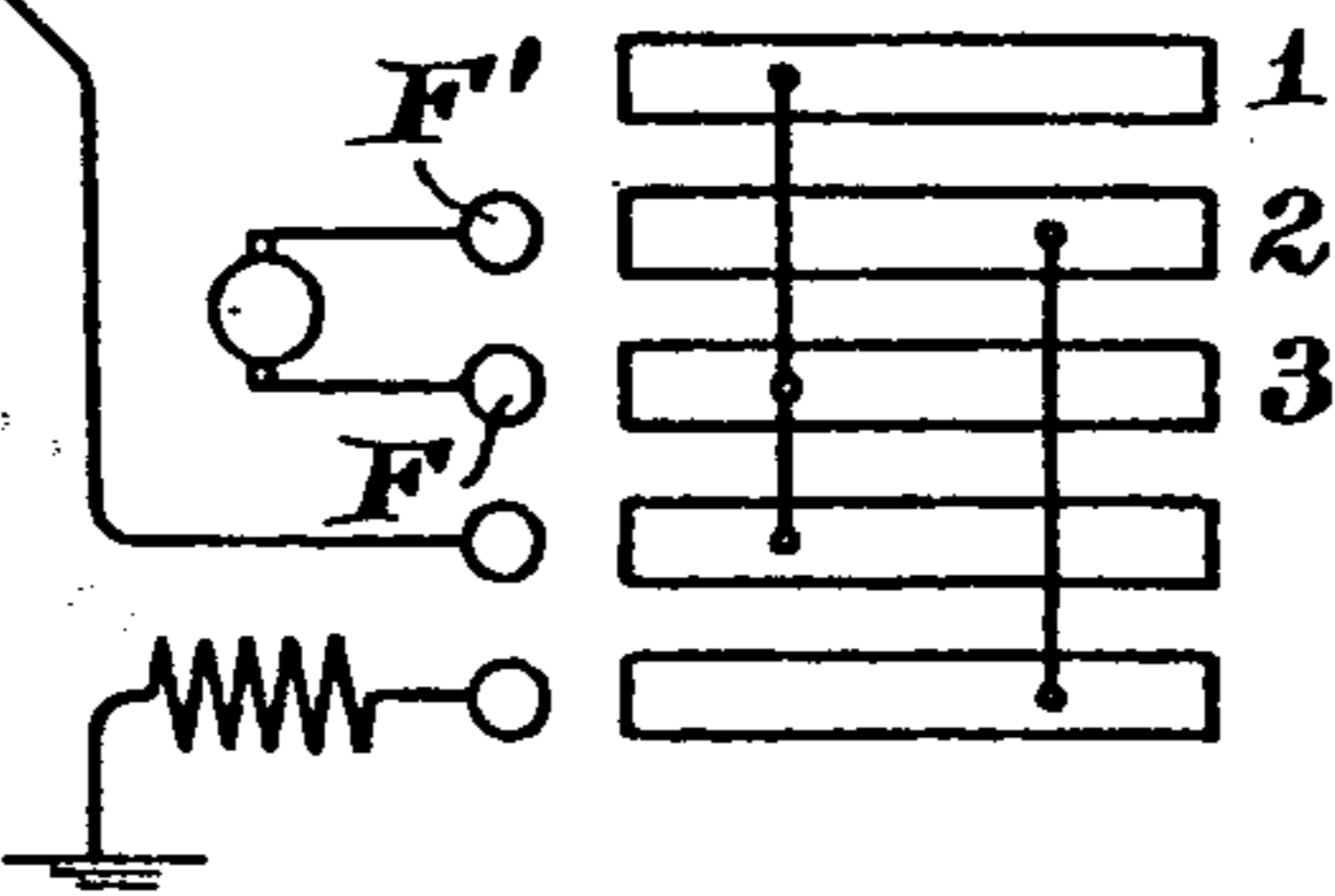


FIG. 15.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CLEVELAND, OHIO, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

## ELECTRIC CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 577,081, dated February 16, 1897.

Application filed September 21, 1896. Serial No. 606,489. (No model.)

*To all whom it may concern:*

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Cleveland, county of Cuyahoga, State of Ohio, have  
5 invented certain new and useful Improvements in Electric Controllers, (Case D, 330,) of which the following is a specification.

The present invention relates to electric controllers, and has for its objects to simplify  
10 their construction and to reduce to a minimum the amount of permanent wiring required in the controller-casing. This is accomplished by dispensing with the separate reversing-switch usually situated in the right-  
15 hand side of the case and mounting the reversing-switch contacts directly upon the commutating-cylinder.

A further object of the invention is to arrange the brushes of the reversing-switch so  
20 that they are movable in a direction parallel to the axis of the commutating-cylinder and to provide each of them with a movable blow-out magnet and arc-deflector.

The commutating switch-cylinder of a controller is usually made of metal divided electrically into two or more parts, and it is sometimes necessary to extend the contacts of one part between the contacts of another. This causes considerable trouble on account of the  
30 insulation. One object of the present invention is to provide means for supporting the contacts which extend between other contacts of the same or different potential and at the same time insulate them in a suitable manner. Certain details of construction are also  
35 designed to be covered by my claims.

In carrying out the invention the usual contacts are mounted on the controller-cylinder, as are also those used for the reversing-  
40 switch. The present controller being designed for a single motor, three rows are shown, the brushes engaging with the middle and top rows when the vehicle is being propelled forward and with the middle and lower  
45 rows when running backward.

The contact-brushes are so constructed that a separate magnetic field is provided for each brush, as described in my Patent No. 537,130, dated April 9, 1895. In addition to this they  
50 are separated from one another by arc deflectors or chutes. The arc-deflectors for the

brushes which engage with the reversing-switch contacts are adapted to move with the brushes as they are raised or lowered to engage with the contacts on the cylinder.

The brushes for the reversing-switch are  
55 mounted on an insulating-support, which is moved up and down by means of a parallel-motion device operated by a suitable handle. To prevent the reversing-switch from being  
60 operated when the circuit is completed, an interlock is provided between the switch and the controller-cylinder, which permits the brushes to be moved only when the commutating-cylinder is in the "off" position.

For the purpose of mounting a short contact or contacts extending between other contacts lugs are cast either upon the hub of the cylinder or upon the arms, to which the contacts are secured, they being provided with  
70 suitable insulation.

In the accompanying drawings, attached to and made part of this specification, Figure 1 is a partial front elevation of a controller embodying the invention. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view with  
75 the cover removed. Fig. 4 is a detail of a contact-brush. Fig. 5 is a view showing the contact-brushes in their upper position. Figs. 6 to 14, inclusive, are detail views of contacts  
80 and means for mounting the same; and Fig. 15 is a diagram of the connections of the reversing-switch.

Inside of the casing A is a cylinder B, provided with contacts B' for establishing various circuit connections. The cylinder shown  
85 is adapted to control the dynamo-electric machine when used for propelling and braking purposes, that is, it is provided with a double set of contacts, those on the left of the "off" position being for braking purposes and those  
90 on the right for power. The cylinder B is mounted on a shaft C, which is provided with suitable bearings. To insure the step-by-step movement of the cylinder, a star-wheel D is  
95 also mounted on the shaft and provided with two sets of notches, one set on either side of the "off" or center position, while engaging therewith is a lug D', provided with a friction-roller and spring D<sup>2</sup>.

A contact-brush E is provided for each row  
100 of contacts B' on the cylinder B. These are

separated one from the other by means of an arc-deflector consisting of a number of chutes formed by the vertical piece E, and the transverse pieces E<sup>2</sup>. Each brush constitutes a  
5 blow-out magnet.

Referring to Fig. 4, the iron core *e* is secured to the base by a suitable spring *e'* and is insulated therefrom. Wound around the core, but insulated therefrom, is a flat conductor *c*<sup>2</sup>, secured at one end to the base and  
10 at the other to the metal piece forming the electrode. To prevent the arc from jumping to the flat conductor *c*<sup>2</sup>, an arc-deflector *c*<sup>3</sup>, carried by the core *e*, is employed. This is preferably made of some refractory material.  
15

The upper three rows of contacts are utilized for the reversing-switch. In case two or more motors are used the number of rows of contacts would be increased, but as the  
20 operation of the switch is the same it will be unnecessary to describe it.

The brushes F and F' may be of the construction shown in Fig. 4 and are adapted to engage with the middle and lower contacts  
25 of the reversing-switch, or the middle and upper contacts, the former establishing connections of the motor-armature causing it to rotate in one direction and the latter in the opposite. The brushes are inclosed in separate chutes and are mounted on the insulating-base F<sup>2</sup>. This is moved up and down  
30 by means of the arms *f* and *f'*, constituting a parallel-motion device and actuated by the handle G. The base F<sup>2</sup> is made of wood or other insulating material and provided on  
35 the left-hand edge with a plate *f*<sup>2</sup>, which engages with a lug cast on the back of the controller-casing. This permits the base F<sup>2</sup> to slide in a vertical direction. Extending from  
40 the base F<sup>2</sup> through the back of the casing A are two studs *f*<sup>1</sup>. These are provided with nuts and a connecting-plate *f*<sup>3</sup> and are adapted to move in a vertical direction, actuated by the arms *f* and *f'* of the parallel-motion  
45 device.

In the star-wheel D is a notch H, which in the "off" position of the cylinder stands directly over the lug H', mounted on the insulating-base F<sup>2</sup>. This is so arranged that it can pass  
50 upward through the notch in this position, but when the star-wheel is in a position other than the one shown it will engage either the top or bottom side of the star-wheel and the reversing-switch cannot be operated. Engaging with the lug H' is a spring-pressed  
55 plunger H<sup>2</sup>. This is arranged to work above and below the center of its support, so as to hold the contact-brushes F F' in their upper and lower positions.

Fig. 5 shows the reversing-switch contact-brushes F and F' moved upward so that they engage with the middle and upper rows of the reversing-switch contacts, and the lug H' occupies a position above the star-wheel D.  
60

The transverse pieces E<sup>2</sup> of the arc-deflector are made as shown in dotted lines in Fig. 3. The projecting pieces E<sup>3</sup> extend inward to-

ward the hub of the cylinder, protecting the contacts from injury by arcing, a space being left between the power and brake contacts,  
70 as shown in Fig. 2. The pieces are moved up and down with the brushes F and F'. It will be seen that each reversing-switch brush is provided with a movable blow-out magnet and also an arc-deflector, so that the maxi-  
75 mum effect is obtained at all times.

Figs. 6 and 7 are detail views of means for supporting short contacts. The contacts *a*, *b*, *c*, and *d* are carried by separate parts of the cylinder differing in their electrical rela-  
80 tion. The shaft C is surrounded with insulation C', outside of which is the hub of the cylinder B, which, on account of the relation which certain of the contact-rings bear to each other, is divided electrically into parts  
85 by means of the insulating-rings C<sup>2</sup> C<sup>3</sup>. The hub of the cylinder B is cast with a projection *h*, upon which the contacts *d* are mounted, and insulated therefrom. The contact-plates being secured to their support by means  
90 of screws, can be readily detached in case they become worn or injured by sparking and new ones inserted in their places.

Figs. 8 and 9 show a construction similar to the one above described, except that each  
95 support has a single contact secured thereto, and the projection *h* on the hub of the cylinder B furnishes a support for two electrically-separate contacts.

In Figs. 10 and 11 is shown a modification  
100 in which the hub of the cylinder B is provided with spokes or projections *i*, to which are secured by screws or other suitable means pieces *j*. The latter are provided with spring ends adapted to clamp the pins *k*, projecting  
105 downward from the contacts. Between the pins *k* and the pieces *j* are pieces of tubular insulation *l*, provided with enlarged heads. To remove the contact, the screws *m m'* are  
110 released. A new contact may then be inserted in its place. It is very desirable to be able to replace contacts either on account of wear or because it is necessary to change their length. By my invention I am enabled to  
115 change the entire relation of the motor-circuit without removing the cylinder.

Figs. 12, 13 and 14 show contacts mounted like those previously described, except that the lugs supporting the short contacts are cast integral with the arms supporting the  
120 main contacts.

Fig. 15 illustrates the connections of the reversing-switch. The brushes F F' are adapted to engage with contacts 3 and 2 when the car is to be propelled in one direction, and with  
125 2 and 1 when in the opposite.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electric controller, the combination of a cylinder provided with contacts for  
130 establishing various connections of the motor-circuits, brushes engaging with the contacts, and means for changing the relation between the brushes and the contacts on the

cylinder by a movement of one relative to the other in a direction transverse to the plane of rotation of the cylinder.

2. In an electric controller, the combination of a reversing-switch cylinder, brushes engaging therewith, an arc-extinguishing means, a separate inclosing chute for each brush, and means for changing the relation between the brushes and magnet, and the switch-cylinder.
3. In an electric controller, the combination of a cylinder provided with contact-rings for establishing various circuit relations of the motor, brushes engaging with the rings, and means for moving certain of the brushes so that they will engage with different contact-rings.
4. In a reversing-switch for an electric motor, the combination of a number of contact-rings mounted on a cylinder, brushes engaging with the rings, and a parallel-motion device for shifting the brushes.
5. In a reversing-switch for an electric motor, the combination of a number of contact-rings mounted on a cylinder, a number of brushes less than that of the rings engaging therewith, and means for moving the brushes in a direction parallel to the axis of the cylinder.
6. In a controller, the combination of a contact-cylinder, brushes engaging therewith, means for moving the brushes in a direction parallel to the axis of the cylinder, and a blow-out magnet for each brush.
7. In a controller, the combination of a controller-cylinder, brushes engaging therewith, and a separate blow-out magnet and inclosing chute for each brush.
8. In a controller, the combination of a switch-cylinder, contacts on the cylinder for

changing the motor connections reversing-switch contacts also mounted on the cylinder and adapted to move therewith, brushes engaging with the contacts, and means for moving certain of the brushes in a direction parallel to the axis of the cylinder for the purpose of reversing the armature connections.

9. In a controller, the combination of a contact-cylinder, a disk mounted on the shaft of the cylinder and provided with a slot, a lug carried by the brush-support and registering with the slot when the cylinder is in its "off" position, and means for holding the lug in position above or below the disk.

10. In an electric controller, the combination of a contact-cylinder, a reversing-switch, brushes and contacts therefor, a disk carried by the shaft of the contact-cylinder and provided with a slot, a lug actuated by the reversing-switch adapted to pass through the slot when the contact-cylinder is in the "off" position, and to engage with the top or bottom of the disk when the contact-cylinder is in other than its "off" position.

11. In an electric controller, the combination of a metal cylinder divided electrically into sections, and contacts removably secured to a section extending between the contacts of another section.

12. In an electric controller, the combination of a metal cylinder divided electrically into sections, lugs cast on the hub or permanent parts of the cylinder, and contacts mounted on the lugs and insulated therefrom.

In witness whereof I have hereunto set my hand this 11th day of September, 1896.

ELMER A. SPERRY.

Witnesses:

WALTER KRITCH,  
J. CHINNOCK.