

(No Model.)

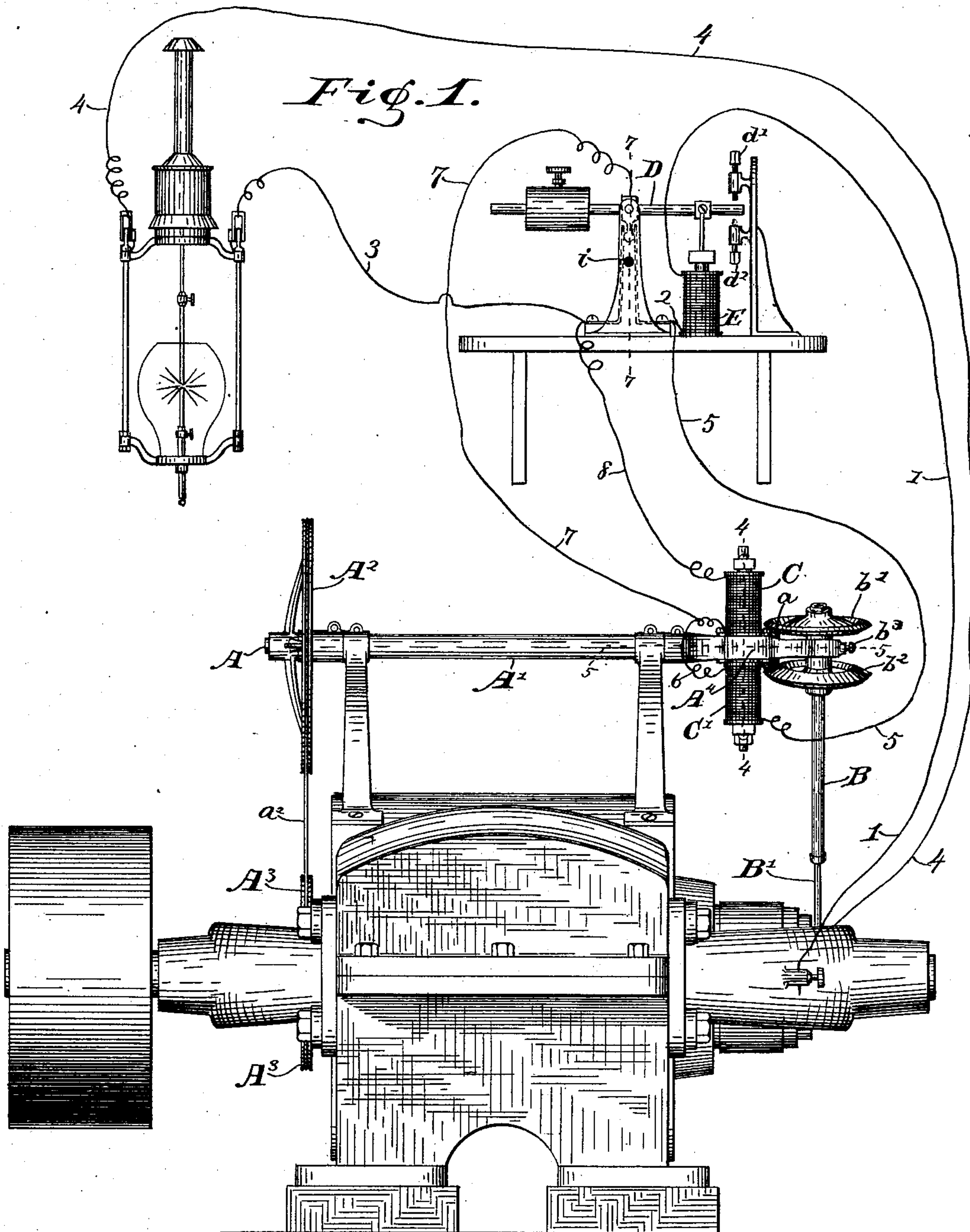
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C. D. JENNEY.

AUTOMATIC REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 373,369.

Patented Nov. 15, 1887.



WITNESSES.

Cha<sup>s</sup> McLeonard  
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(No Model.)

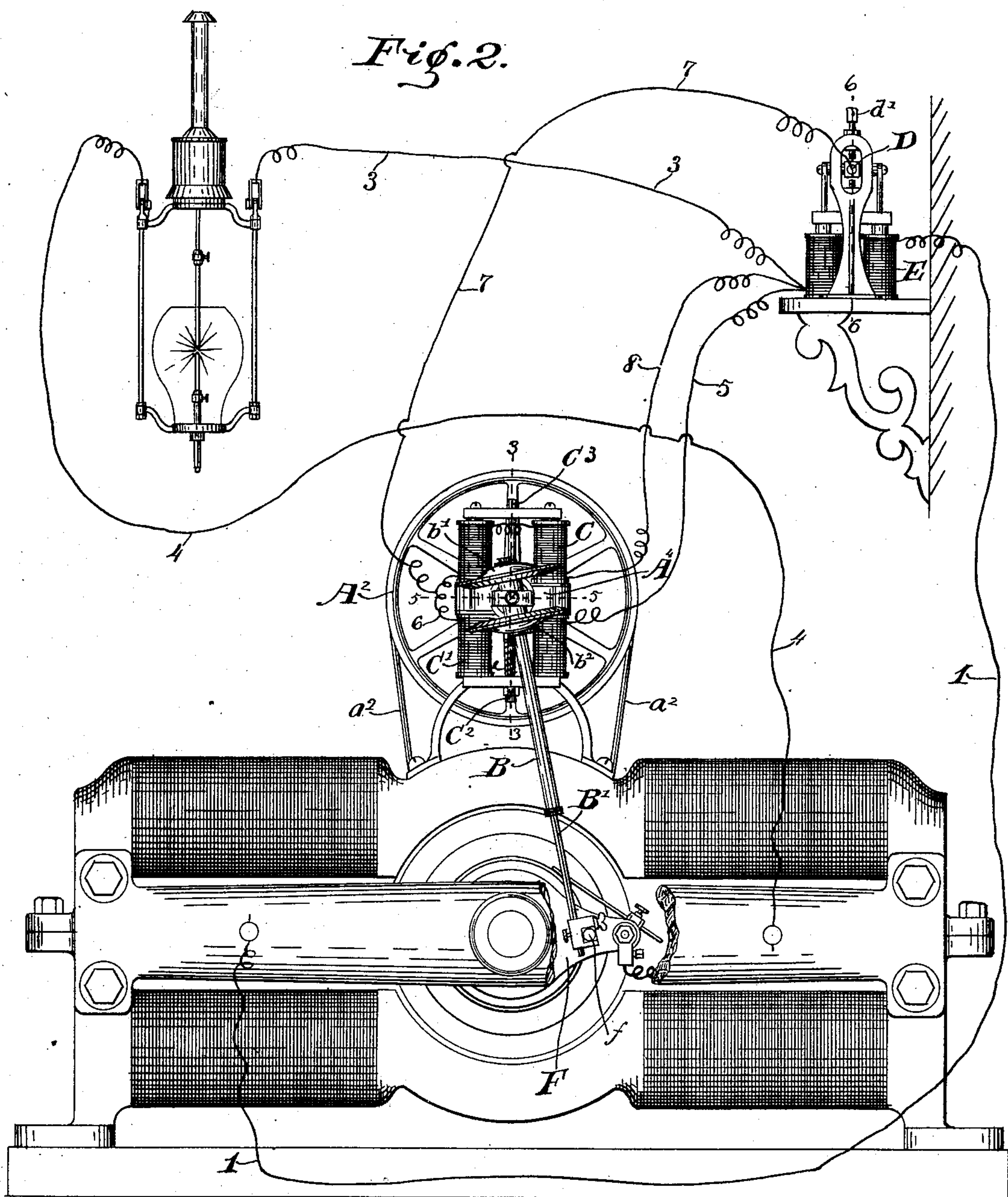
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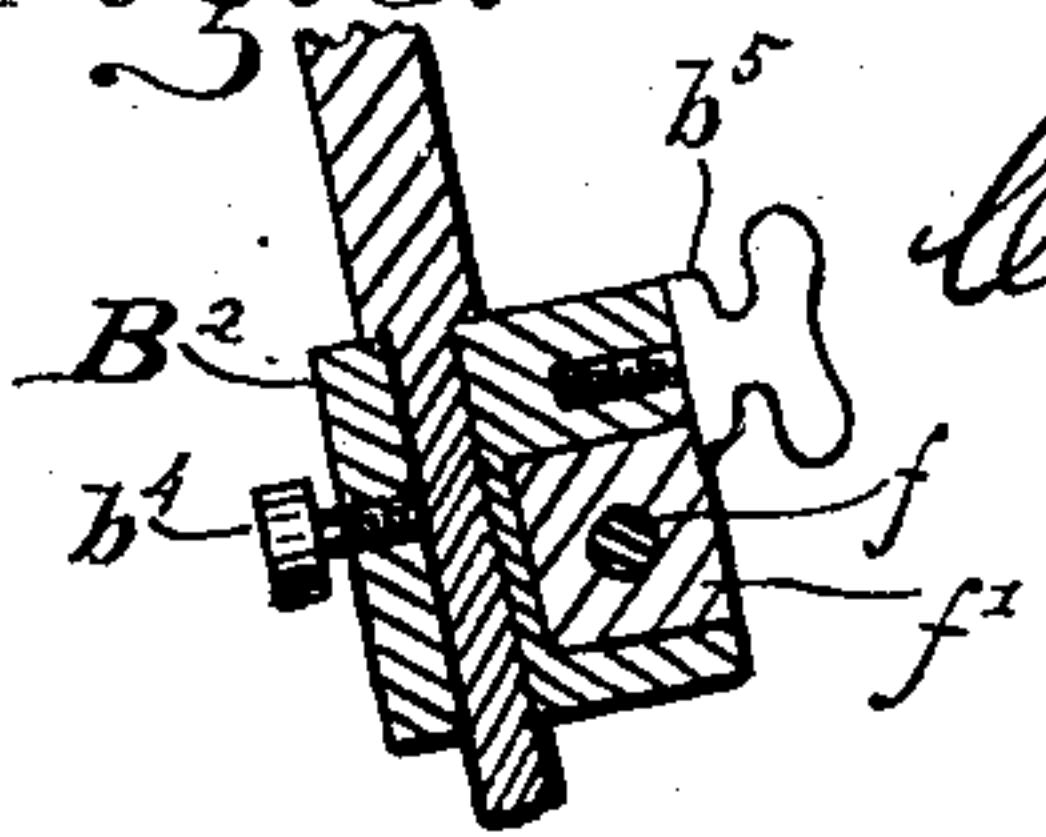
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WITNESSES.

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*Fig. 8.*



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(No Model.)

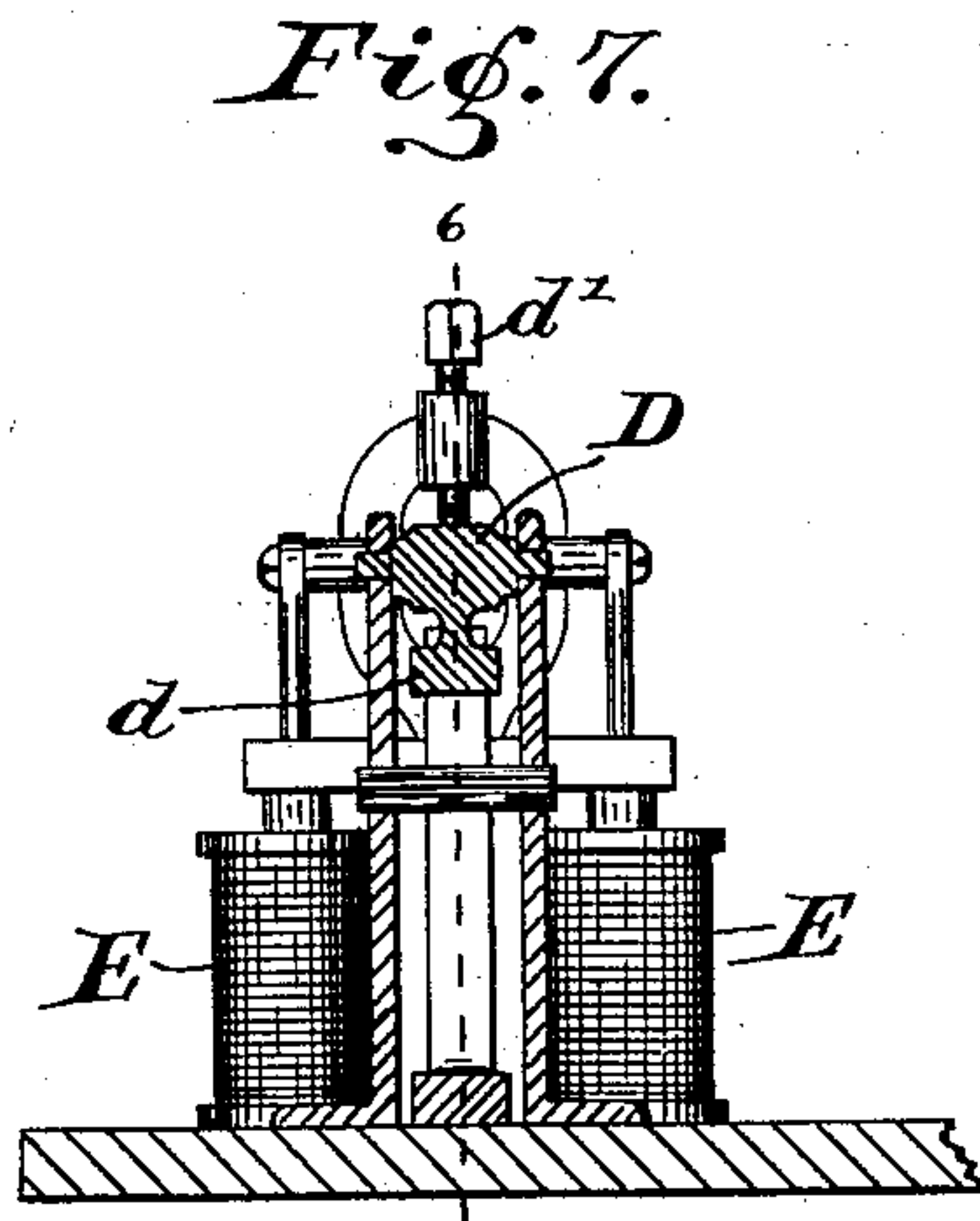
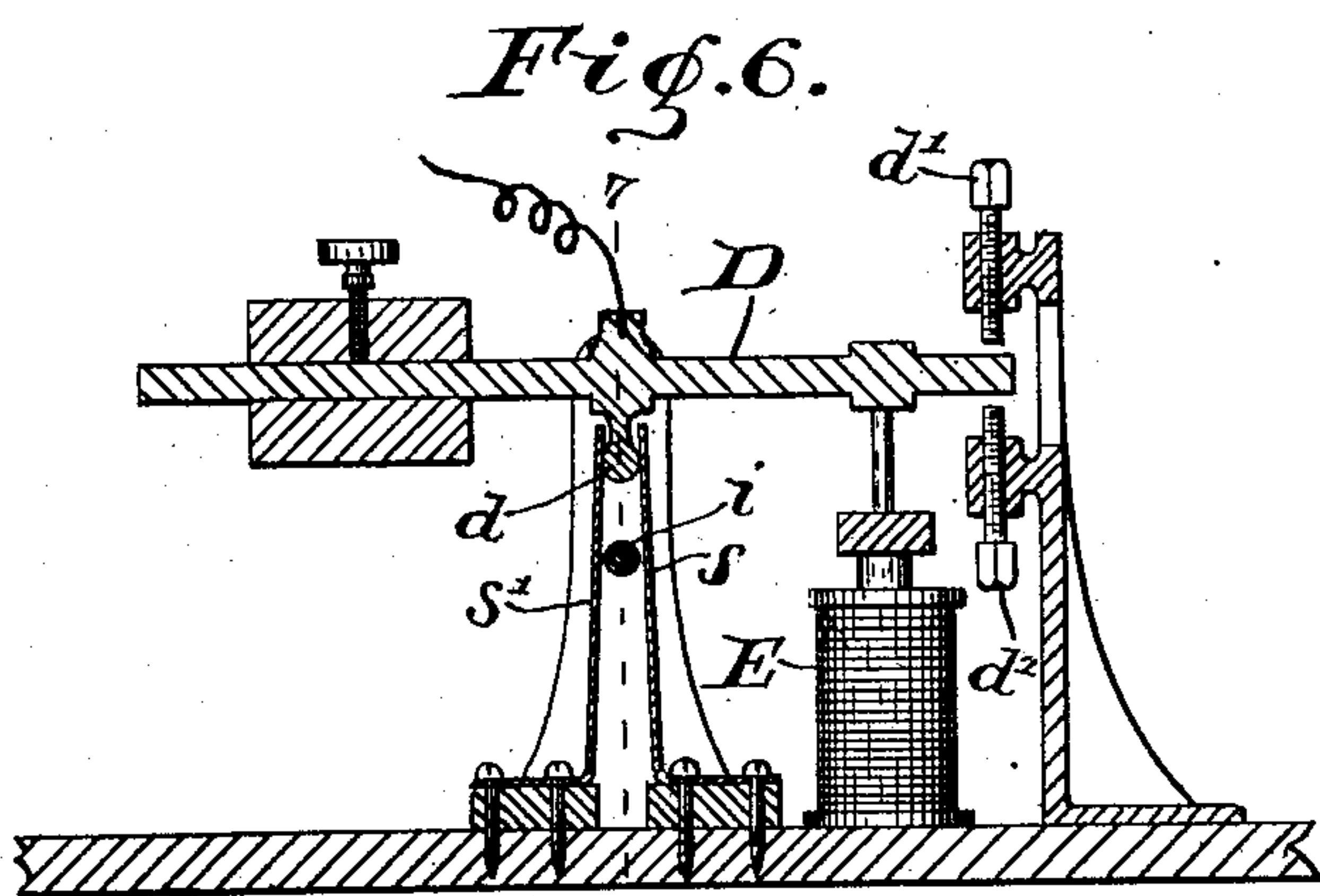
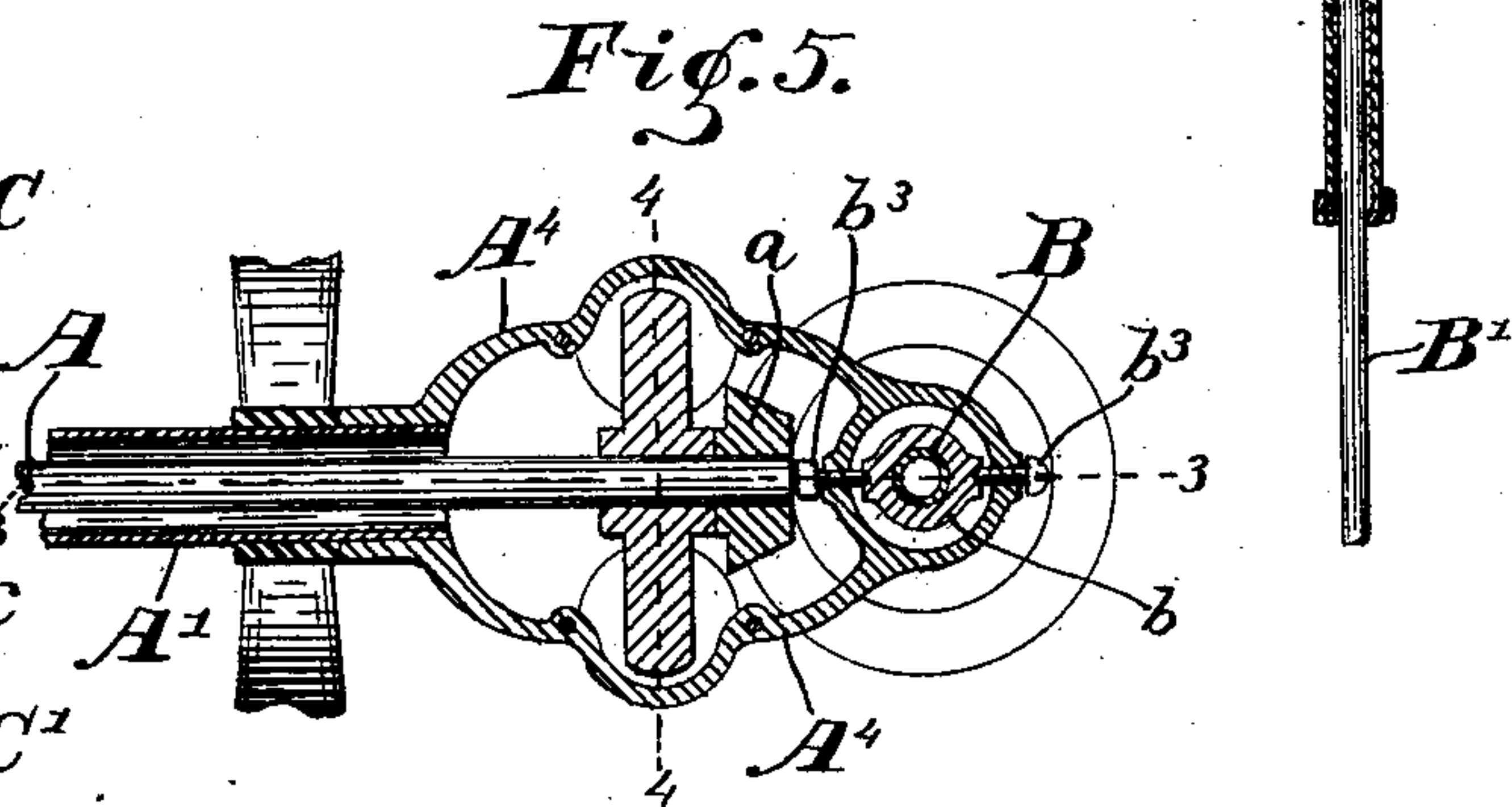
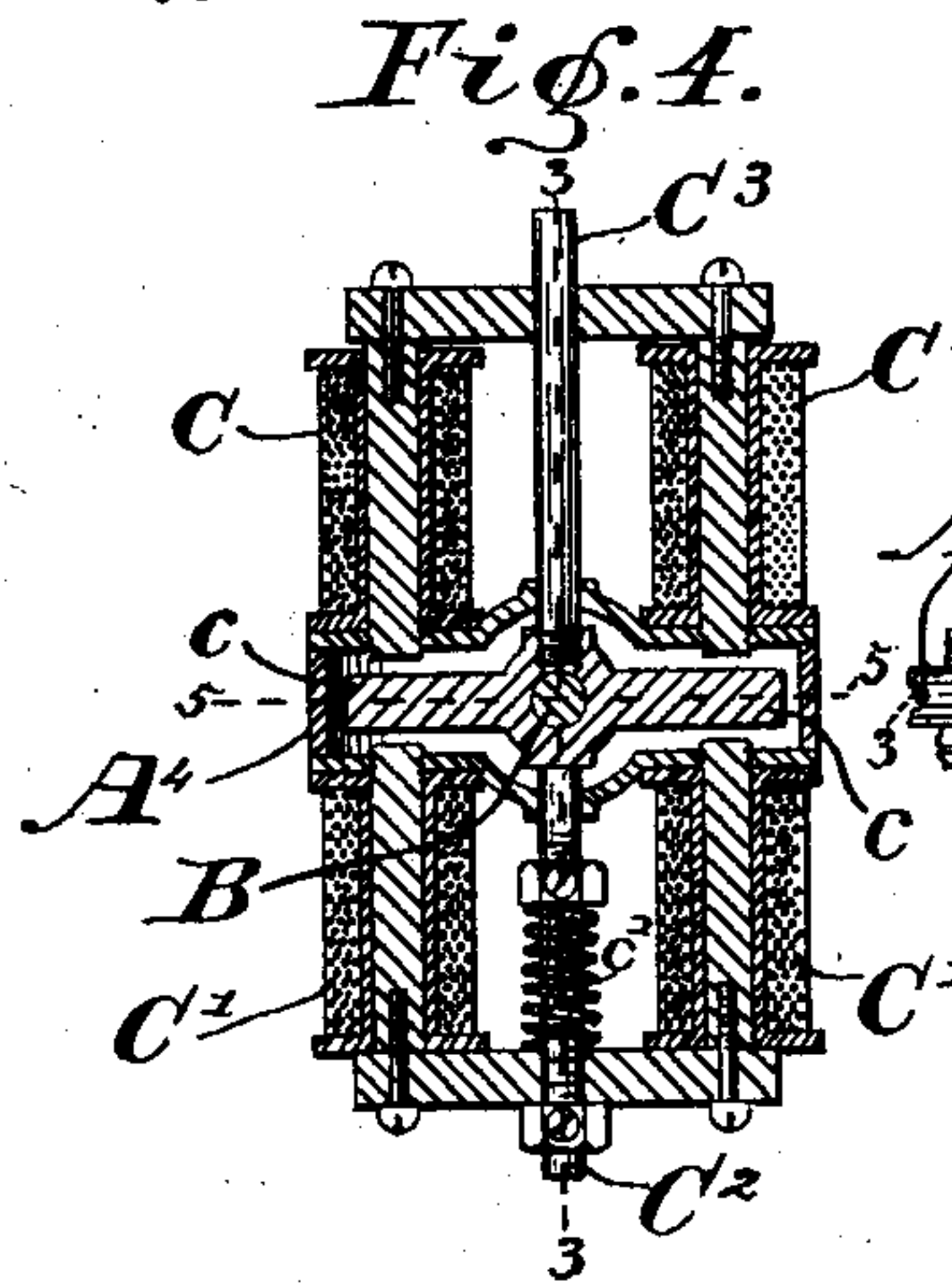
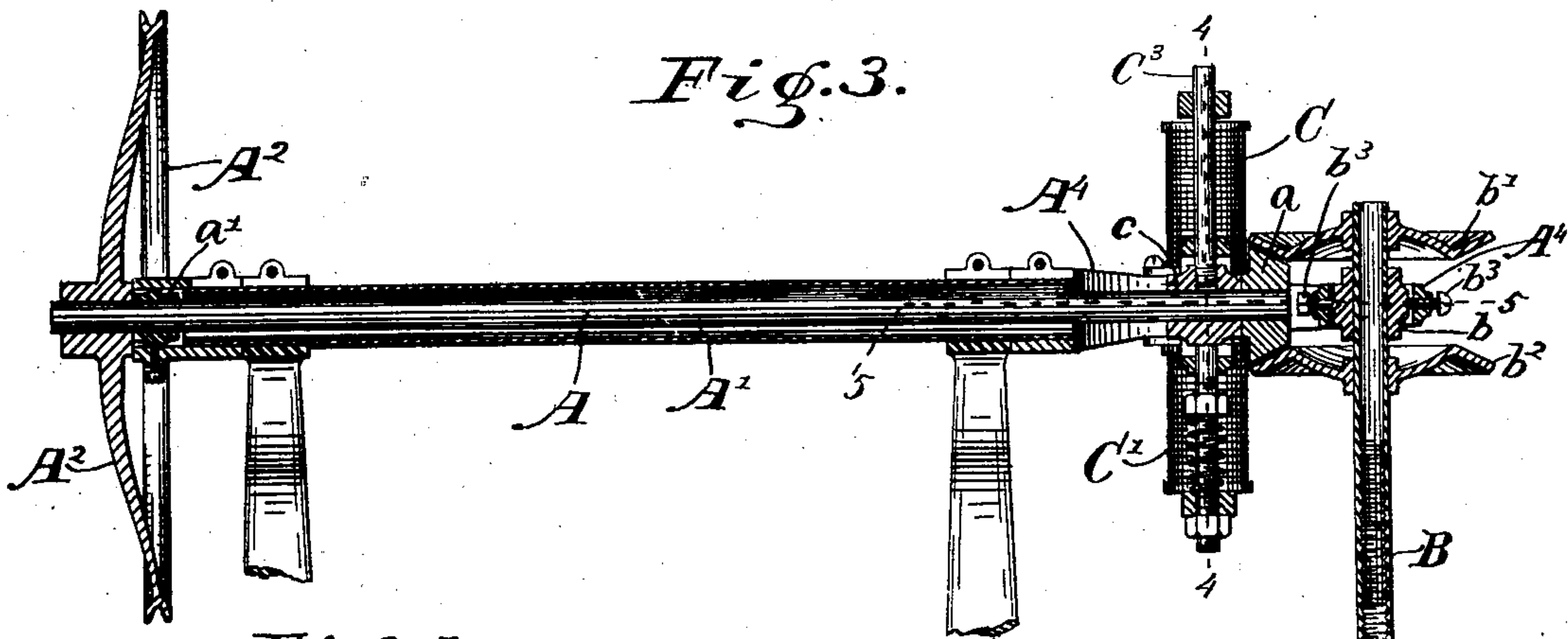
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No. 373,369.

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WITNESSES.

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# UNITED STATES PATENT OFFICE.

CHARLES D. JENNEY, OF INDIANAPOLIS, INDIANA.

## AUTOMATIC REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 373,369, dated November 15, 1887.

Application filed January 20, 1887. Serial No. 224,861. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES D. JENNEY, of the city of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Automatic Regulators for Dynamo-Electric Machines, of which the following is a specification.

The object of my said invention is to produce an improved device by which the commutator-brushes of dynamo-electric machines may be automatically adjusted as the electric current varies in intensity, and said current be thus maintained at an equal working strength at all times, as will be hereinafter more particularly described.

Referring to the accompanying drawings, which are made a part hereof and on which similar letters of reference indicate similar parts, Figure 1 is an end elevation of a dynamo-electric machine, showing my improved regulator and an electric lamp in side elevation; Fig. 2, a side elevation of the machine, showing my improved regulator in end elevation; Fig. 3, a longitudinal vertical section, on an enlarged scale, of that portion of the regulator which is attached directly to the machine, the telescopic shaft or rod which operates directly upon the brush-holder being brought into vertical position, so that it may also be shown in section, the view being otherwise on the dotted line 3 3; Fig. 4, a transverse vertical section on the dotted line 4 4; Fig. 5, a horizontal sectional view, looking downwardly from the dotted line 5 5; Fig. 6, a central vertical section of the switching portion of my improved regulator on the dotted line 6 6; Fig. 7, a transverse sectional view of the same, looking toward the right from the dotted line 7 7; and Fig. 8, a detail sectional view of the connection between the operating rod or shaft and the brush-holder rocker-arm.

In said drawings the portions marked A represent the driving-shaft of my improved regulator; B, an interiorly-screw-threaded hollow shaft, which, together with the rod B', connects the other mechanism to the brush-holder rocker-arm F; C C', oppositely-disposed electro-magnets, which operate, as will be hereinafter described, to vary the position of the shaft A; D, a pivoted bar having an

arm which extends between two contact-points, and is one element of the switching and cut-out device; E, the electro-magnet of said cut-out device; and F, the rocker-arm, carrying the brush-holders and brushes.

The shaft A is arranged within a hollow stationary tube, A', and is mounted at one end in a rocking box, a', and at the other in the combined bearing and armature c, located between the electro-magnets C C'. A wheel, A<sup>2</sup>, is mounted upon the outer end of this shaft, and should be so formed, as shown, that its bearing-surface will be in the same plane as the bearing-points of the rocking box a', so that the movement of the shaft, and consequently of said bearing, shall have as little effect as possible upon the position of this wheel. The pull of the belt, therefore, has little or no tendency to move that end of the shaft and its bearing which is between the electro-magnets. Said wheel is preferably driven by a belt, a<sup>2</sup>, from a similar wheel, A<sup>3</sup>, on the shaft of the dynamo-electric machine, as shown most plainly in Fig. 1. On the other end of this shaft A is a beveled friction-wheel, a, which extends between the similarly-beveled surfaces of two other friction-wheels, b' b<sup>2</sup>, which are rigidly mounted on the tubular shaft B, and thus, as this end of the shaft A is moved up or down by the force of the electro-magnets, (as will be presently described,) this friction-wheel a comes in contact with one or the other of the friction-wheels b' b<sup>2</sup>, and thus drives said tubular shaft in one or the other direction and elevates or depresses the rocker-arm carrying the brush-holders, and shifts the position of the brushes, as will be readily understood.

The tubular shaft B is mounted in a rocking box, b<sup>3</sup>, in an inclosing frame-work or housing, A<sup>4</sup>, rigidly mounted on the tube A' and forming a continuation thereof. As before stated, the interior of this tubular shaft is screw-threaded, and the rod B', which is connected to the rocker-arm, has a screw-threaded portion on its upper end which engages with the screw-threads in the interior of this shaft. Thus when this shaft is revolved the rod B' is drawn up or pushed down, and the rocker-arm moved accordingly, thereby shifting the brushes on the commutator, as will be readily



understood. The box *b*, being pivoted, as before described, permits the slight necessary oscillation incident to this movement.

The electro-magnets *C* and *C'* are secured upon the frame or housing *A*<sup>4</sup>, one above and the other below the combined bearing and armature *c*, in which the front end of the shaft *A* is mounted. When the current is running evenly and is just sufficient to do the desired work, these magnets are cut out, (as will be presently described,) and this combined bearing and armature then forms a bearing simply, and is held to such position as has previously been determined upon, which should be midway between the poles of the electro-magnets. A spring-mounted rod, *C*<sup>2</sup>, is secured between the cores of the magnets, and is so adjusted by a pair of nuts that it will just support this combined bearing and armature in this position. The spring *c*<sup>2</sup>, which supports this rod, is made of just sufficient strength, so that the power of the electro-magnets *C'*, when energized, will overcome its resistance and pull down the combined bearing and armature *c*, which will throw the wheel *a* into contact with the wheel *b*<sup>2</sup> and revolve the tubular shaft *B*, and thus move the brush-holder and brushes in one direction. When the electro-magnets *C* are energized, they serve to draw up the combined bearing and armature *c* away from the rod *C*<sup>2</sup> and against their poles, which will throw the wheel *a* into contact with the wheel *b'* and revolve the shaft *B* and move the brush-holder and brushes in the other direction. The pin *C*<sup>3</sup> is simply a guide-pin passing through the neutral portion of the electro-magnets *C* and through the frame or housing *A*<sup>4</sup>, and is rigidly connected to the combined bearing and armature *c*, thus preventing said combined bearing and armature from tipping or rocking. This pin is preferably hollow, and thus serves to convey the lubricant to the bearing in which the shaft *A* revolves.

The pivoted bar *D* has an arm, *d*, which extends down between and is normally in contact with both of two springs or contact-points, *s s'*. It is connected to the cores of the axial magnets *E* at one end and has a weight or spring mounted upon or attached to the other, which is preferably adjustable, so that it may be arranged to be overcome with more or less resistance, as the character of the current may require. Said devices are to be so arranged in practice that the bar *D* will be held at a substantially-horizontal position by the electro-magnetic force, and the arm *d* (as before explained) thus kept in contact with both the springs or contact-points *s s'*. When, however, from any cause, the current increases in quantity, the end of this bar to which the cores of the magnets are connected is pulled down, thus parting contact between the arm *d* and the spring or contact-point *s'*, and, in the arrangement shown, short-circuiting the electro-magnets *C* and throwing the electro-magnets *C'* into operation, thus pulling the wheel *a* into contact with the wheel *b*<sup>2</sup>, with the re-

sult previously described. When, from any cause, the current becomes unusually weak, the weight or spring on the other end of the bar *D* overcomes the electro-magnetic force, throwing the arm *d* forcibly against the spring or contact-point *s* and parting it from the spring or contact-point *s'*, thus short-circuiting the electro-magnets *C'* and throwing the electro-magnets *C* into operation, pulling up the combined bearing and armature *c*, thus bringing the wheel *a* into contact with the wheel *b'*, and turning the tubular shaft *B* and moving the brush-holder and brushes in the other direction. A bar, *i*, of insulating material is placed between the springs *s* and *s'* and limits their movement toward each other, thus insuring that neither will follow the arm *d* when said arm is moved away from it. Set-screws *d'* and *d''* are arranged above and below the bar *D* and limit its movement. These screws, as will be readily seen, may be adjusted as desired.

The rocker-arm *F* carries the brush-holders for the commutator-brushes, as usual. It also has a wrist-pin, *f*, by which it is connected to the rod *B'*. Said rod *B'* has secured to its lower end a block, *B*<sup>2</sup>, by a set-screw, *b*<sup>4</sup>, and into this block a bearing-block, *f'*, is fitted, and there secured by a button, *b*<sup>5</sup>. When it is desired to disconnect the rod from the rocker-arm, the button *b*<sup>5</sup> is given a quarter-turn, and the block *B*<sup>2</sup> can then be slipped off the bearing-block *f'*, and the rocker-arm is free to be moved by hand in the usual manner. After the rocker-arm has been set to approximately the position desired the rod *B'* is screwed up or down to about that position where the block *B*<sup>2</sup> may be slipped over the bearing-block *f'*, and there secured by turning the button to the position shown.

The normal course of the current when the machine is in operation is as follows: Leaving the dynamo-electric machine, it passes over the wire 1 to the electro-magnet *E*, thence by the wire 2 to the spring *s*, thence through the arm *d* to the spring *s'*, thence by the wire 3 to the lamp, and thence by the wire 4 back to the dynamo-electric machine.

When the current increases in quantity, the course is as follows: Leaving the machine, as before, it passes over the wire 1 to the magnets *E*, which being given greater energy thereby draw down the bar *D*, parting contact between the arm *d* and the spring *s*. Thence the current passes over the wire 5 to the electro-magnets *C'*, thence around the loop-wire 6 to the wire 7, thence to the bar *D*, over its arm *d* to the spring *s'*, thence over the wire 3 to the lamp, and thence by the wire 4 back to the machine. The current, as already explained, passing through the magnets *C'* draws down the combined armature and bearing *c*, throwing the wheel *a* into contact with the wheel *b*<sup>2</sup>, revolving the tubular shaft *B*, and raising the rocker-arm and the brushes carried thereby, thus decreasing the energy of the machine. When the desired change has been effected



and the current reduced to normal quantity or intensity, the conditions first described are restored, the contact is parted between the friction-wheels, and things move on in their regular manner.

When the current becomes too weak, the course is as follows: Leaving the machine over the wire 1, it passes, as before, through the electro-magnets E; but these are too weak to resist the weight or spring on the other end of the bar D, which overcomes them and forces the arm *d* away from the spring *s'* against the springs *s*. The current thence passes by the wire 2 to said spring *s*, thence through the arm *d* and bar D to the wire 7, thence to the loop-wire 6 and to the electro-magnets C, thence by the wires 8 and 3 to the lamp, and thence back over the line-wire 4 to the machine. The increased energy of the electro-magnets C pulls the combined armature and bearing *c* up, bringing the wheel *a* into contact with the wheel *b'*, revolving the tubular shaft B in the other direction and moving the brush-holder and brushes carried thereby down. As before, when the current is restored to normal quantity or intensity, the normal condition first described is restored. The course of the current as herein described may be reversed without materially affecting the operation of my regulator. This regulator may also by some changes in winding and connecting the coils be used with a dynamo for incandescent lighting.

It will be seen that by the described means a very sensitive regulator is produced and one which operates certainly and efficiently. By the various adjusting devices described it is capable of being adjusted to do any desired work and easily and quickly shifted from one position to another.

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

1. The combination, with the commutator-brushes of a dynamo-electric machine, of an automatic regulator consisting of a telescopic rod the sections of which are connected by a screw-threaded coupling, a shaft mounted at one end in a combined bearing and armature located between two sets of electro-magnets, and a series of wheels which are thrown into contact and adapted to revolve said shaft in one direction when one set of magnets is energized and to revolve it in the other direction when the other set of magnets is energized, and appropriate electrical connections and switches, substantially as described, and for the purposes specified.

2. The combination, with electro-magnets for operating a combined bearing and armature, of a vibrating bar carrying an arm extending between two contact points or springs, and an electro-magnet and a weight or spring operating oppositely on said bar, whereby an increase of current through said electro-magnet will switch the current in one direction and energize one set of magnets operating upon said

combined bearing and armature, and a decrease of current will permit said weight or spring to switch the current through the other set of electro-magnets operating upon said combined bearing and armature, and thus move said combined bearing and armature in one or the other direction and operate the mechanism accordingly, substantially as described.

3. The combination, in an automatic regulator for dynamo-electric machines, of a vibrating shaft, A, having a friction-wheel, *a*, on one end, a tubular interiorly-screw-threaded shaft or nut, B, having friction-wheels *b'* *b''*, and a rod having a screw-threaded portion fitting inside said tubular shaft or nut and engaging with the screw-threads therein and connected to the rocker-arm carrying the brushes at its lower end, substantially as described, and for the purposes specified.

4. The combination, with a rocker-arm carrying commutator-brushes and a regulator therefor, of a connection between said regulator and said rocker-arm, consisting of a block, B<sup>2</sup>, a bearing-block, *f'*, (mounted on a wrist-pin in said rocker-arm,) fitted therein, and a button for securing said bearing-block in place, substantially as shown and described.

5. The combination of a dynamo-electric machine, a shaft, A, driven from the shaft of said machine and adapted to vibrate somewhat, two sets of oppositely-disposed electro-magnets, an armature located between them, which also forms one of the bearings for said shaft, a telescopic shaft or rod adapted to be operated by said shaft A and extending down to and connecting with the rocker-arm carrying the commutator-brushes, said rocker-arm, and means for energizing alternately first one and then the other of said sets of electro-magnets as the current becomes stronger or weaker than is desired, substantially as and for the purposes set forth.

6. The combination of a dynamo-electric machine, an automatic current-regulator embodying a vibrating shaft mounted at one end in a rocking box and at the other end in a movable bearing, electro-magnetic devices for moving the same, and a wheel mounted on the end of said shaft and by which it is driven, said wheel being so formed as to extend in over said rocking box, so that the bearing-surface thereof shall be in the same plane as the bearing-points of said rocking box, substantially as shown and described.

7. The combination, in an automatic regulator for dynamo-electric machines, of a series of wheels and shafts, oppositely-disposed electro-magnets with an armature arranged between them, which serves also as a bearing for one of the shafts, a spring-supported sustaining-rod, C<sup>2</sup>, upon which said combined bearing and armature normally rests, and a guide-pin, C<sup>3</sup>, which holds said combined bearing and armature in position, substantially as shown and described.

8. The combination of a dynamo-electric machine, the commutator, the commutator-



brushes, the rocker-arm carrying the same, a screw-threaded rod connected thereto, a revoluble tube or nut connected to said rod and carrying friction-wheels, a vibrating shaft  
5 having a friction-wheel adapted to engage with the friction-wheels on said tube or nut, oppositely-disposed magnets for forcing said shaft in one or the other direction, and thus effecting engagement between the wheels, a switching device whereby as the quantity of current increases or decreases one or the other of said magnets will be energized, and the proper electrical connections and the line-wires, substantially as set forth.

15 9. The combination of a dynamo-electric machine, an electric device for operating the rocker-arm carrying the brush-holders and

brushes, and an automatic switch for energizing first one portion and then the other of said device, said switch consisting of a pivoted bar 20 having an arm, two springs or contact-points between which said arm extends, a bar or stop arranged between said springs composed of insulating material, and a solenoid for operating said pivoted bar, substantially as and for 25 the purposes set forth.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 11th day of January, A. D. 1887.

CHARLES D. JENNEY. [L. S.]

In presence of—

C. BRADFORD,  
CHARLES L. THURBER.