

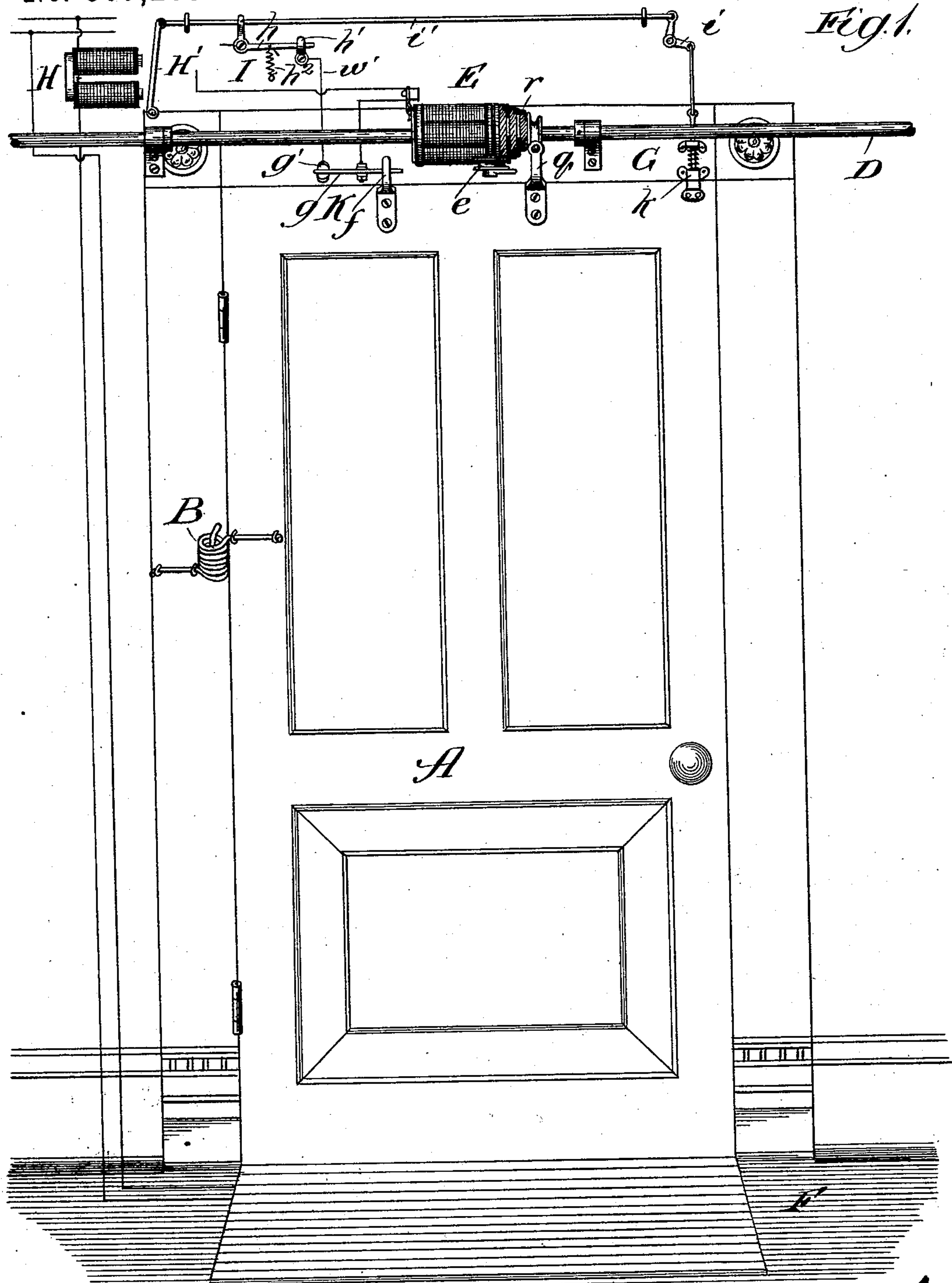
(No Model.)

3 Sheets—Sheet 1.

O. H. HICKS & R. F. TROY.  
ELECTRIC DOOR OPERATING APPARATUS.

No. 507,269.

Patented Oct. 24, 1893.



Witnesses:  
Chas. E. Gaylord,  
Jno. A. Christianson.

Inventors:  
Oliver H. Hicks,  
Robertus F. Troy,  
By *Dyrenforth and Dyrenforth*  
Attorneys.

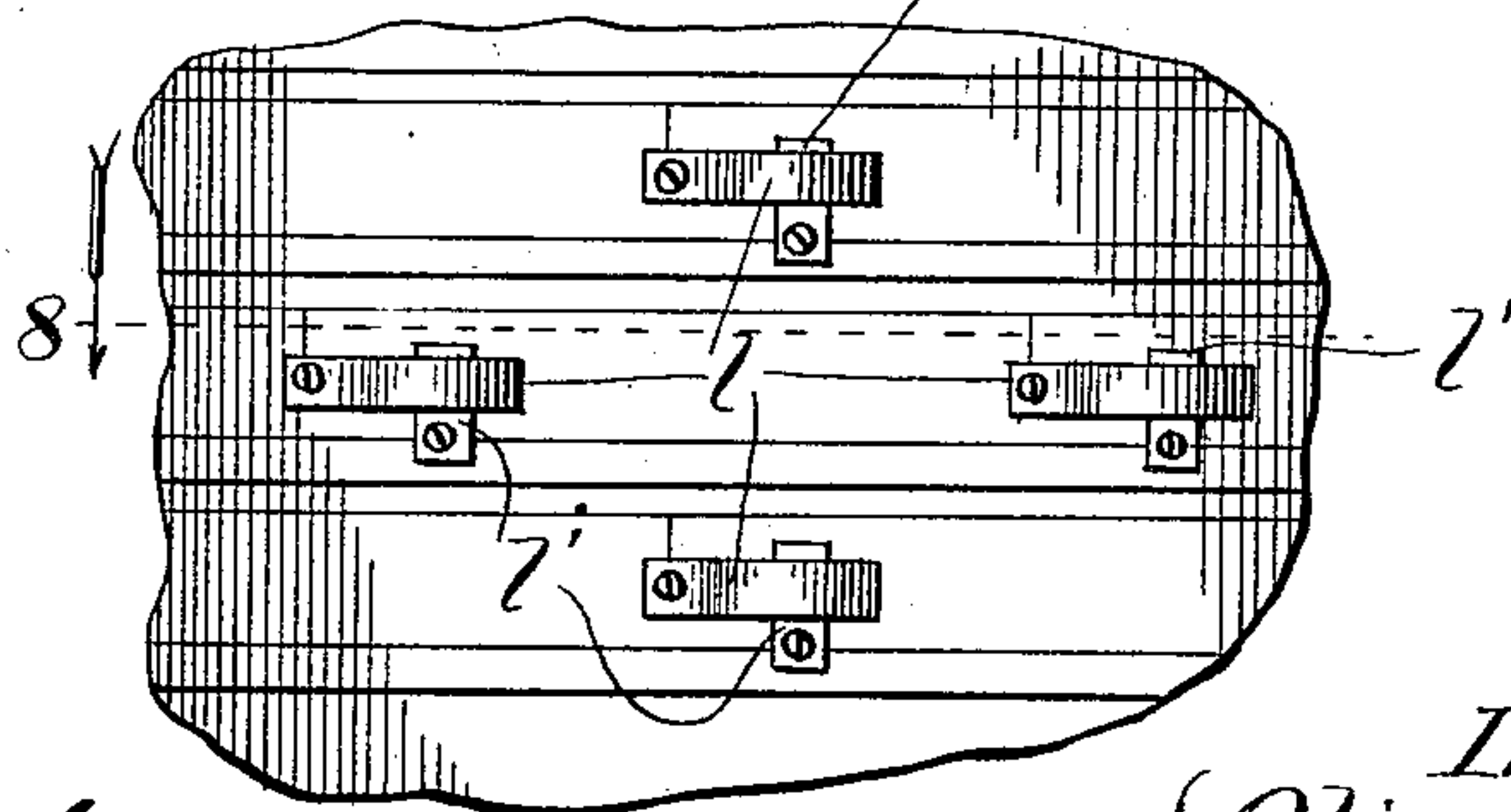
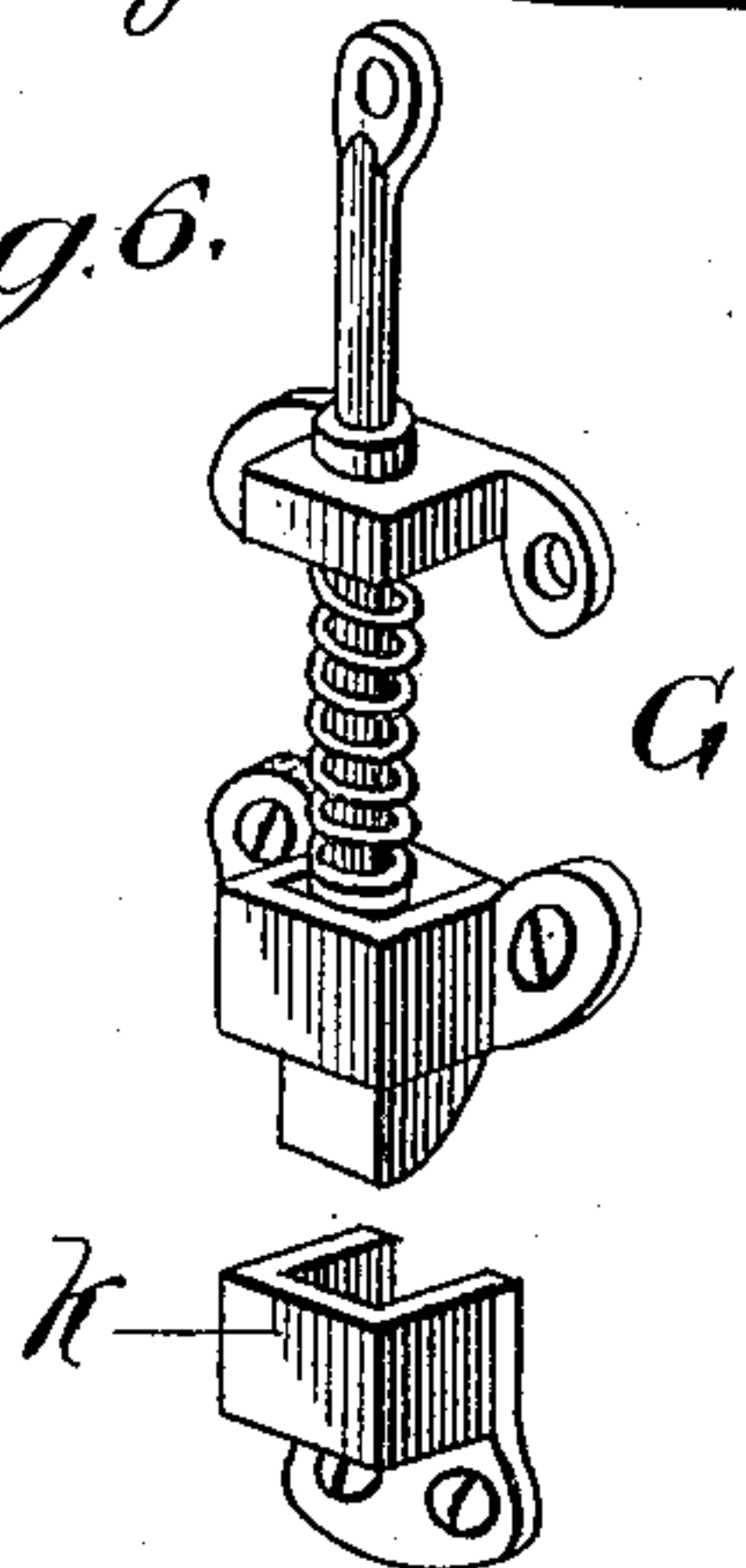
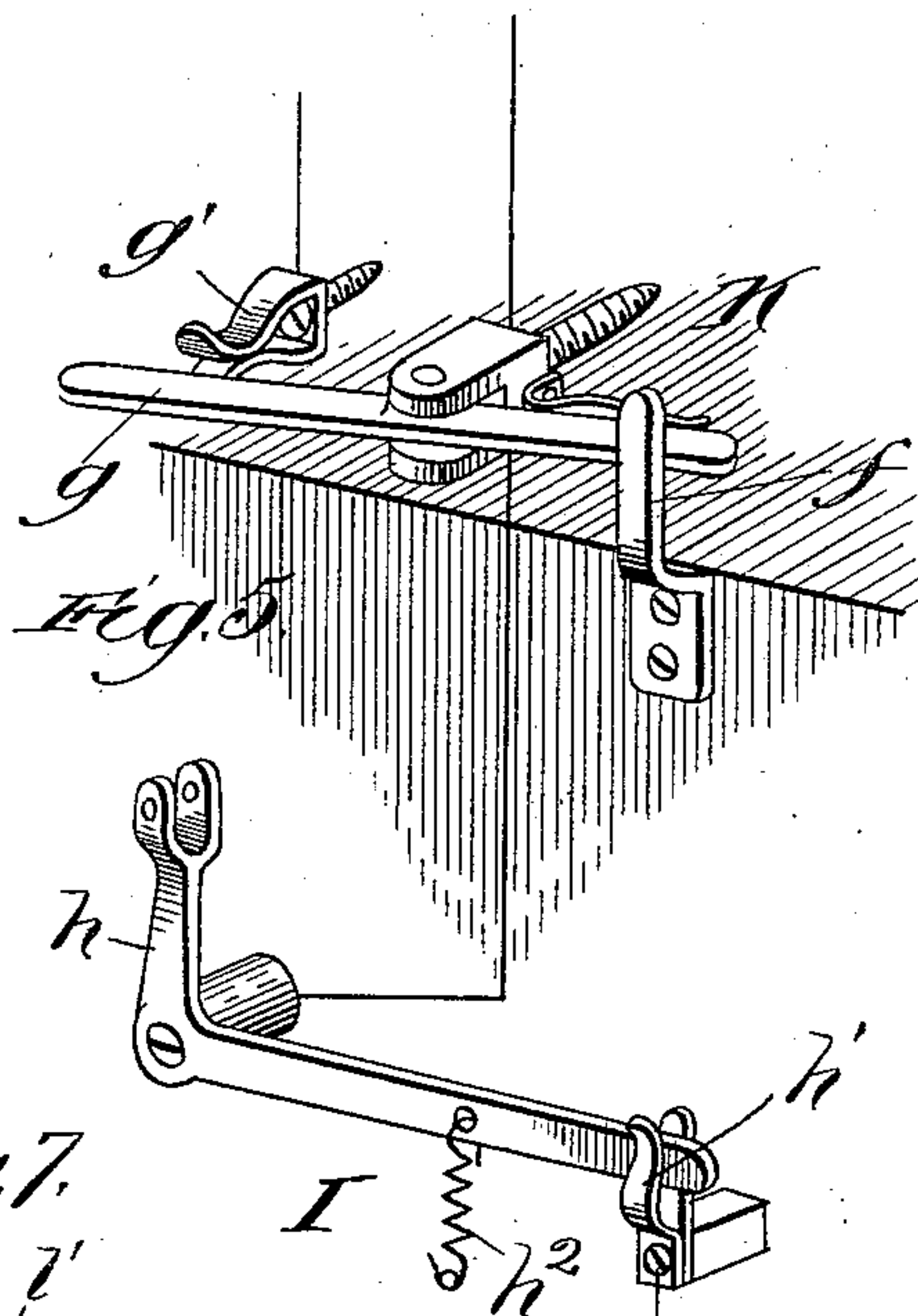
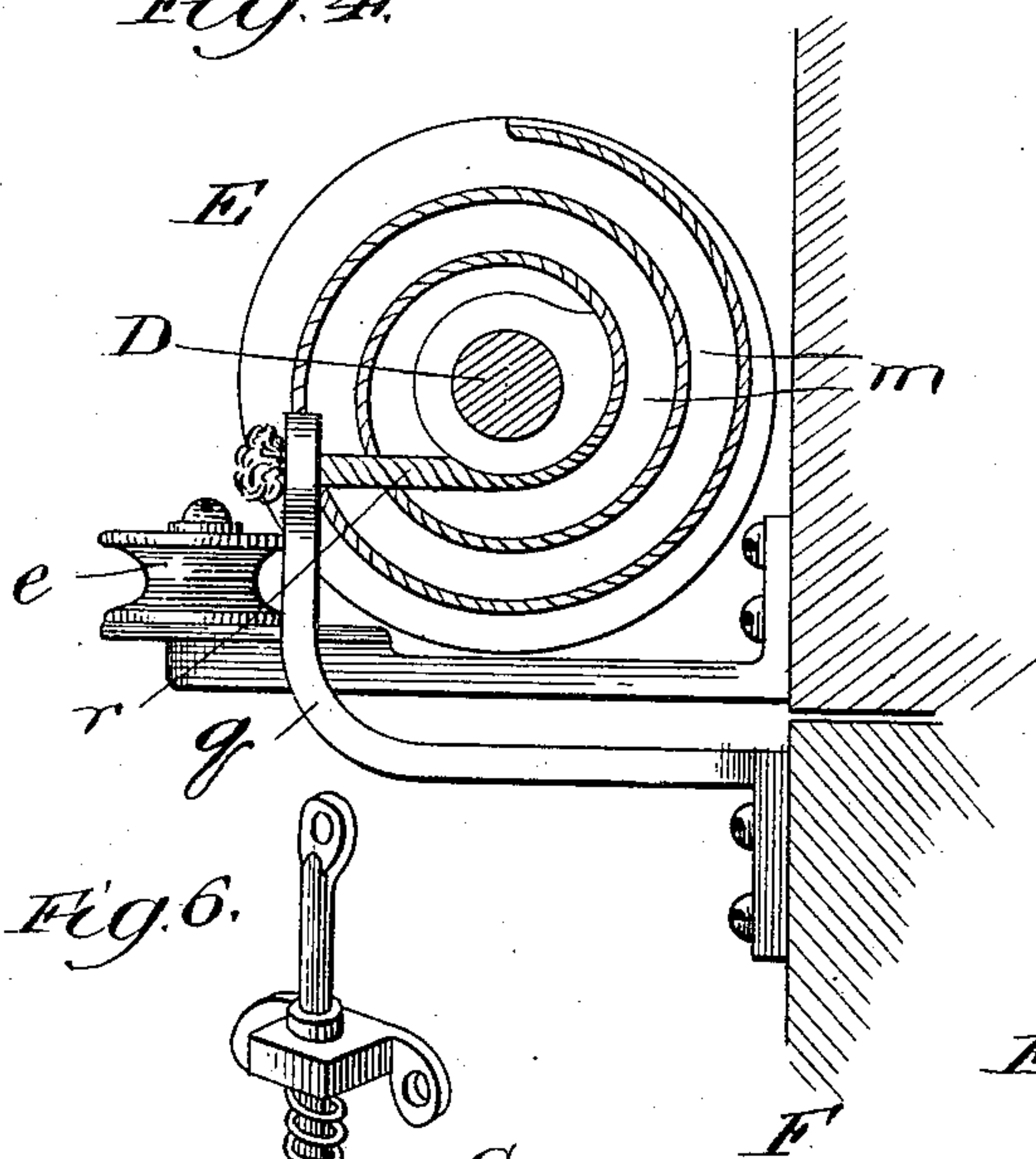
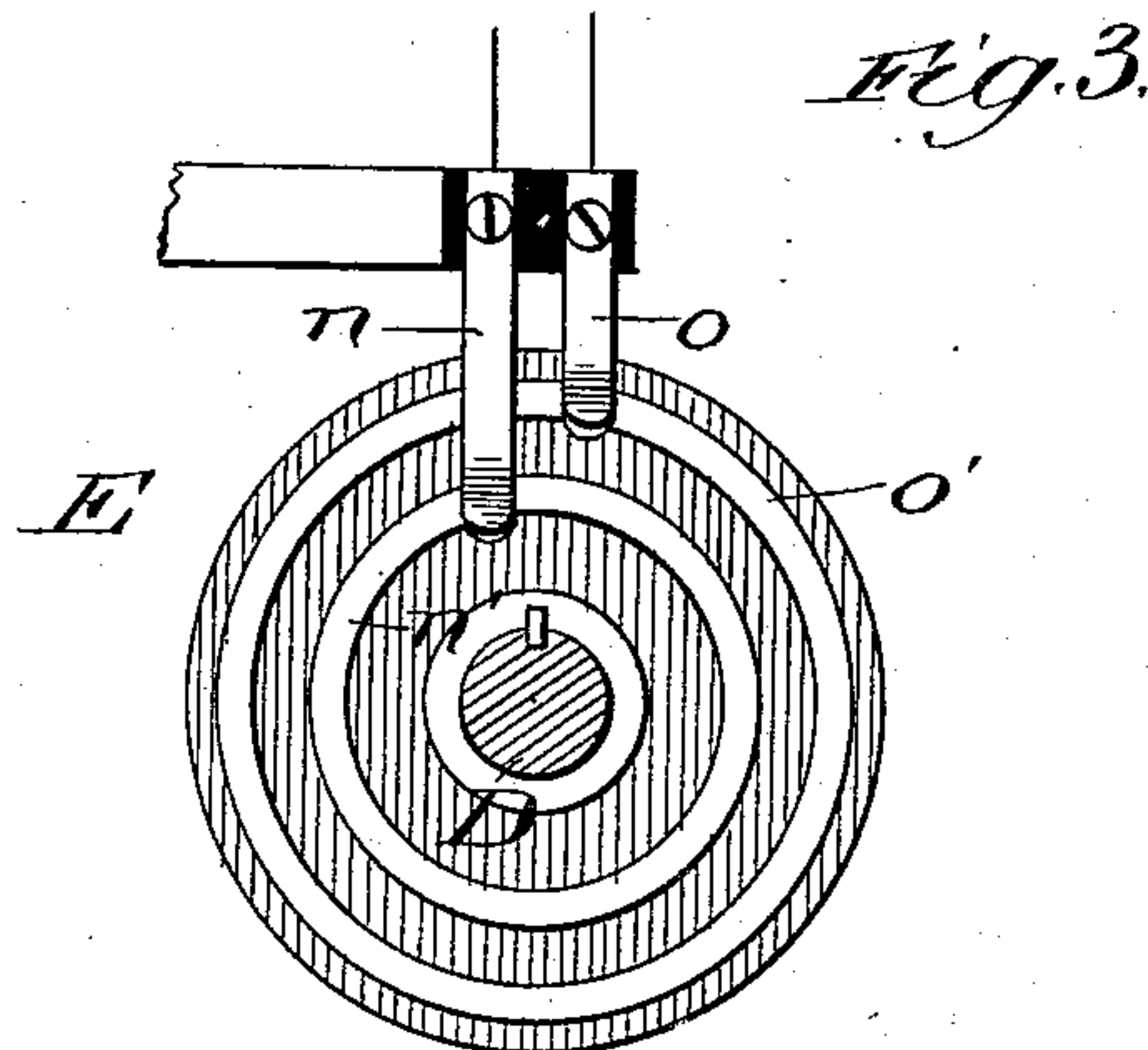
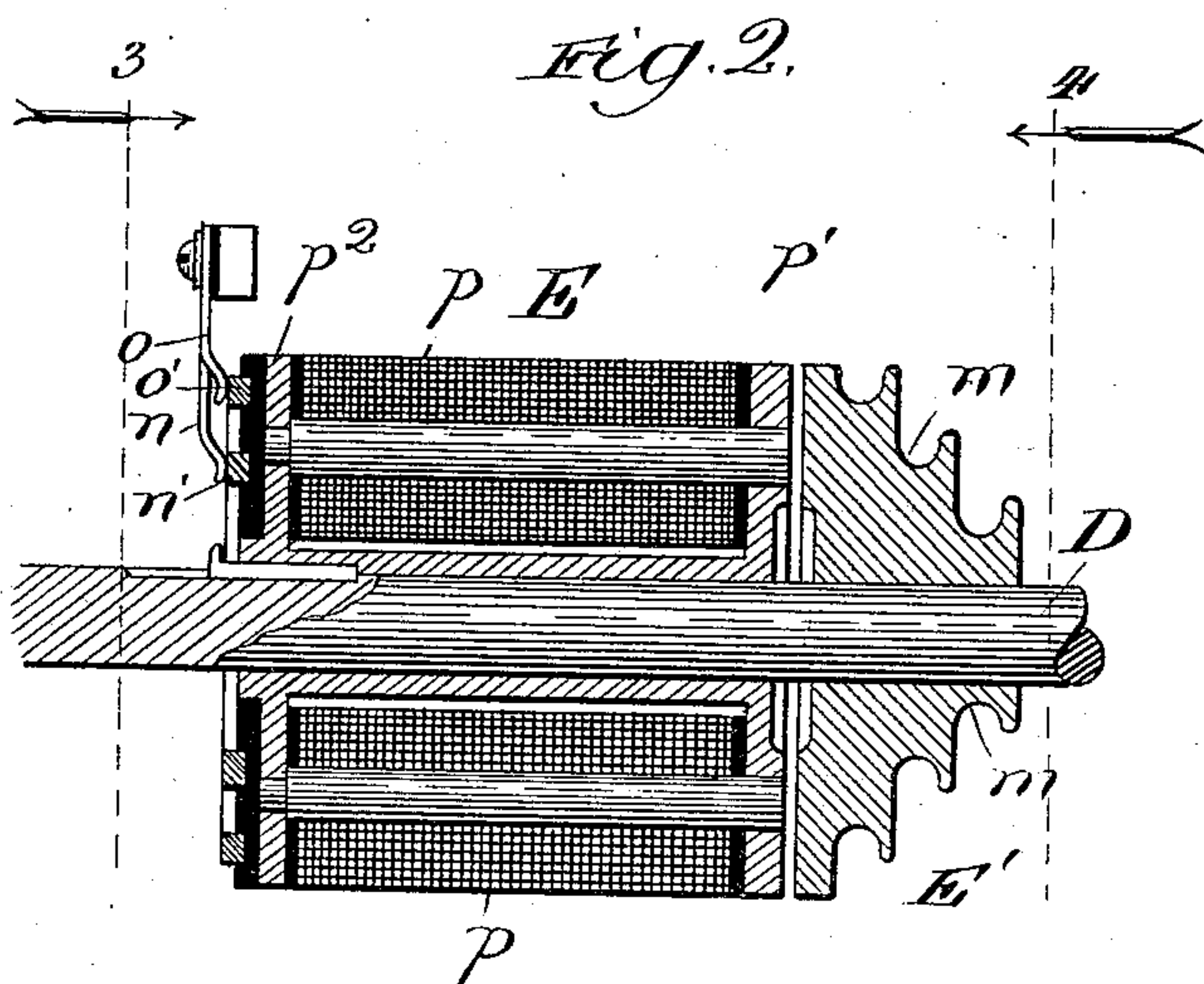
(No Model.)

3 Sheets—Sheet 2.

O. H. HICKS & R. F. TROY.  
ELECTRIC DOOR OPERATING APPARATUS.

No. 507,269.

Patented Oct. 24, 1893.



Witnesses:  
 Carl E. Gaylord,  
 Jno. A. Christianson.

Inventors,  
 { Oliver H. Hicks,  
 { Robertus F. Troy,  
 By Dymforth and Dymforth,  
 Attys.



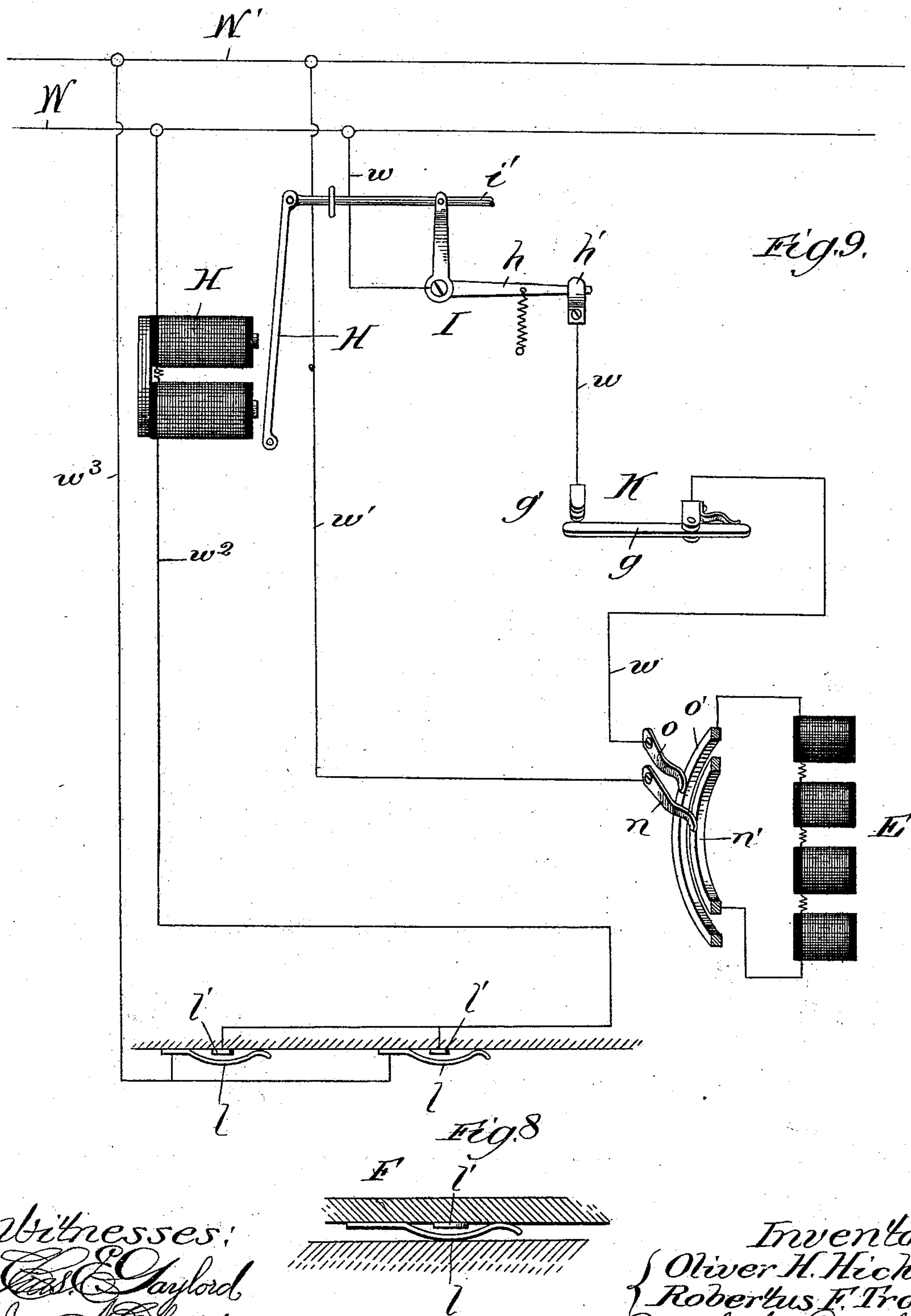
(No Model.)

3 Sheets—Sheet 3.

O. H. HICKS & R. F. TROY.  
ELECTRIC DOOR OPERATING APPARATUS.

No. 507,269.

Patented Oct. 24, 1893.



Witnesses,

Chas. Gaylord

Geo. A. Christianson.

*Inventors.*

Oliver H. Hicks,

Robertus F. Troy,

By *Dyrenforth* & *Dyrenforth*

Attest



# UNITED STATES PATENT OFFICE.

OLIVER H. HICKS AND ROBERTUS F. TROY, OF CHICAGO, ILLINOIS; SAID  
TROY ASSIGNOR TO SAID HICKS.

## ELECTRIC DOOR-OPERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 507,269, dated October 24, 1893.

Application filed May 15, 1893. Serial No. 474,344. (No model.)

*To all whom it may concern:*

Be it known that we, OLIVER H. HICKS and ROBERTUS F. TROY, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electric Door-Operating Apparatus, of which the following is a specification.

Our invention relates to an improvement in the class of door-operating devices represented in Letters Patent of the United States No. 461,122, granted to Robertus F. Troy, one of the joint applicants herein, on the 13th day of October, 1891.

Generally stated, the aforesaid patent describes a device comprising an electric motor operatively connected with a door, a switch for cutting the motor into and out of circuit and a platform in front of the door adapted to be operated to work the switch to set the motor in motion to operate the door.

The primarily essential function of the patented device referred to is to cause the approach of a person toward the door to produce opening thereof. This is also, and necessarily, the primarily essential function of our present improvement; but we propose, now, to provide as means for operating the door, a normally revolving motor and means connecting the door therewith which shall be caused, as by a person or other object in passing through the door-way, to engage with the motor in a manner to cause the motor to operate the door to open it, or to close it, or first to open it and then to close it, whichever be the particular result of the engagement referred to depending on the arrangement of suitable mechanism.

Thus the invention involved in our present improvement consists, in its broadest sense, in providing, for operating a door, a normally revolving motor and a connecting-medium between it and the door normally out of engagement with the motor and caused electrically to be engaged with the motor, as by a person or other object in passing through the door-way, and to operate the door accordingly.

Our invention also consists in the general construction of our improved mechanism for operating the door; and also in details of the

construction and combinations of parts, as hereinafter described and pointed out in the claims.

Referring to the accompanying drawings, Figure 1 shows by a view in elevation a swinging door with our improved operating mechanism applied to it. Fig. 2 shows a broken view of the shaft we employ as the rotary motor with an electric clutch upon it shown in longitudinal section. Figs. 3 and 4 are sectional views showing opposite ends of the clutch, the sections being taken, respectively, at the lines 3 and 4 on Fig. 2 and viewed as indicated by the arrows. Fig. 5 is a perspective view showing two circuit closing devices. Fig. 6 is a perspective view of a spring-bolt detail. Fig. 7 is a broken bottom plan view of the mat selected for illustration as the means for producing the primary electrical contact. Fig. 8 is a broken section taken at the line 8 on Fig. 7 and viewed in the direction of the arrow. Fig. 9 is a diagrammatic view showing the electric circuits employed for controlling the operations of the apparatus constructed as represented by the preceding figures.

A is a door represented as of the variety supported at one edge on hinges to swing in a horizontal plane, though our invention is applicable to other varieties of door.

In accordance with our preferred arrangement, we adapt the door A to be closed against a spring B, represented in Fig. 1 as a coiled spring with its opposite ends secured, respectively, to the door, near its hinged side, and the adjacent side of the frame, whereby when the door is released from the means which hold it in its closed condition, the resilient force of the spring will open it; and the operation is hereinafter so described, though the mechanism may readily be adapted, and it is within the spirit of our invention so to adapt it, to open the door against a closing spring, or to both open and close the door positively, as by suitable clutch-connections thereof with the motor, (properly arranged relatively on the latter) such as the connection hereinafter described for closing the door and thereby setting a spring to open it.

D is the motor, which we prefer to provide as a normally rotating shaft, driven by steam



or other power and supported in bearings above the plane of the door, as represented, because it affords a simple and most convenient form of motor for our purpose in such buildings as would employ our device which are equipped with power plants, with which the shaft D may readily be geared to rotate normally or continuously and without objectionable noise. However, we do not limit our improvement to the use of this particular kind of motor, but intend to include, as within our invention, any suitable kind of normally or continuously revolving motor, including an electric motor. On the shaft D is a clutch E having one member fastened on the shaft to rotate with it and the other member loose thereon, and connected by a cord  $r$  with a finger  $q$  on the door and projecting beyond its upper end.

From the description, thus far, of the parts, it will be apparent that when the two members of the clutch are brought into engagement, the door being open, the rotating shaft D will wind the cord upon the clutch and draw the door closed, thereby also setting the spring B; and that when the two clutch-members are disengaged, the resilient force of the spring will open the door.

An electric clutch is the most convenient variety of clutch for our purpose and we therefore employ the same, that shown comprising, as the member fast on the shaft D, a number of electro-magnets  $p$  extending lengthwise between heads  $p'$  and  $p''$ , the first-named being non-magnetic, or of brass, with the ends of the cores, or poles, extending through it, and the generator-connection being made at the opposite end through brushes  $o$  and  $n$  contacting with metal rings  $o'$  and  $n'$ ; and the loose member is the armature  $E'$  formed with a circumferential spiral groove  $m$  to receive the cord  $r$  and afford desirable increasing and decreasing leverage thereon.

The clutch E is contained in an electric circuit comprising the conductor  $w$  having interposed circuit-closers I and K and leading to the brush  $o$  from the source of current-supply, as a line-wire W of an incandescent electric-lamp circuit, and the conductor  $w'$  leading to the brush  $n$  from a line-wire W'.

Of course the particular source of the electric-current supply for the apparatus is immaterial, the incandescent-lamp circuit being selected because it is liable to be found in buildings wherein our device is employed and may then be conveniently utilized for our purpose. As the primary means for closing the circuit which contains the clutch E to cause it to attract its armature  $E'$  and wind the cord  $r$  upon it (thus, according to the plan illustrated, to close the door) we provide an electric mat F, though any other means located in the approach to the door in position to be unconsciously (or even intentionally) touched by a person in passing through the door-way and adapted thereby to close the circuit, may be used and would be within our invention.

The construction of the mat need involve no features of novelty, that shown comprising a flat strip of suitable mat-material (as rubber) covering the floor for a desired distance in front of the door (and one being provided at each side thereof) and carrying any desired number of spring contacts  $l$  at which terminates a wire  $w^3$  leading from the line-wire W', and rigid contacts  $l'$  at which terminates a wire  $w^2$  leading from the line-wire W.

With the use of an electric clutch on the continuously rotating motor, or shaft D, the clutch should, of course, be in a normally open circuit, which is maintained in that condition by the normal separation of the contacts  $l, l'$ . But then means must be provided for holding the door closed, against the tendency of the spring B to open it. As means for the purpose, we show a lock G comprising a spring-bolt supported to be reciprocated vertically on the frame of the door-way above the plane of the door, on which is a socket  $k$  in position to receive the end of the bolt, which is connected with one arm of a bell-crank  $i$  having its other arm connected, as by a rod  $i'$  with the free end of the pivotal armature  $H'$  of an electro-magnet H interposed in the wire  $w^2$  of the magnet-circuit formed with that wire and the wire  $w^3$ . Interposed in the wire  $w$  are the two circuit-closers I and K. The first-named comprises a bell-crank  $h$  having one arm pivotally connected with the rod  $i'$  and its other arm controlled by a spring  $h^2$  to tend normally to engage a contact  $h'$ , shown as a spring clip, and thereby close the circuit at that point on the wire  $w$ , which is continued from the contact  $h'$  to the circuit closer K comprising a similar contact  $g'$  with which there tends to engage, to close the circuit at that point, one end of a spring lever  $g$ , pivotally supported between its ends, and from which the wire  $w$  is continued to the clutch-brush  $o$ . A finger  $f$  extends from the door A upward beyond its upper edge across the plane of the lever  $g$ , which it engages when the door is closed and maintains separated from the contact  $g'$ , thereby, in that condition of the door, breaking the clutch-circuit at the device K.

The apparatus, constructed as described in detail, operates as follows: With the door A closed, the aforesaid magnet-circuit is open, normally, at the mat and the clutch-circuit formed with the wires  $w$  and  $w'$  is open at the circuit-closer K, by the pressure against the latter of the finger  $f$  on the door. A person stepping on the mat closes the magnet-circuit, whereby the magnet is energized to attract its armature with the result of withdrawing the bolt G by pulling the rod  $i'$  and with the further result of breaking the clutch-circuit at the device I by separating the bell-crank  $h$  from the clip  $h'$ . This last-named breaking of the circuit is required, since otherwise the door would no sooner begin to open under the action of the spring B than it would close again, for slight opening of the



door releases the lever *g* to close the clutch-circuit with the clip *g'*. So long as the mat-contact is maintained the armature *H'* will be attracted and keep the clutch-circuit open at the device *I*. The moment, however, that the person steps off the mat, or in other words, that the primary, or magnet, or mat, circuit is opened, the spring *h*<sup>2</sup>, assisted by the bolt-spring, produces engagement of the bell-crank *h* with the clip *h'* and causes the device *I* to close the clutch-circuit. Thereupon the magnets of the clutch *E* are energized and attract the pulley-armature, which is thus caused to rotate with the magnet-member and shaft *D* and wind upon it the cord *r*, thereby pulling the door to close it. When the door has closed (at which time the bolt *G* will have been sprung into its socket *k*) the finger *f* will engage the lever *g* to open the clutch-circuit at the device *K*. Then the apparatus will again be in its normal condition, ready to produce opening of the door by stepping on the mat.

A pulley *e* for the cord *r* will be noticed adjacent to the pulley-armature of the clutch. This serves as a guide for the cord to prevent the latter from being pulled to an undesirable angle as the door opens far back, whereby the angle of the cord would otherwise be such as to tend to direct it out of the last and larger section of the spiral groove *m*.

The apparatus is highly sensitive, as will be seen, being immediately responsive to closure of the mat-circuit or magnet circuit *w*<sup>2</sup>, *w*<sup>3</sup>, whereby, with the door in any position of opening, it will immediately start to close on stepping off the mat and, with the door in any position of closing, it will immediately start to open by stepping on the mat. So that there can be no confusion by reason of a succession of people stepping on and off the mat while the door is undergoing its opening and closing operations.

The nature of our improvement requires that the description of the particular mechanism we have selected for illustrating it shall be in the foregoing accurate detail. But we wish to be clearly understood as not limiting our invention to details except where manifestly intended to be so limited by the terms of the appended claims.

What we claim as new, and desire to secure by Letters Patent, is—

1. In combination with a door, a normally rotating motor, an electrically controlled con-

necting-medium between the motor and door, normally out of engagement with the motor, and primary actuating means, substantially as described, connected with such connecting-medium and operating, by pressure upon it, to control the engagement of said connecting-medium with the motor to operate the door, substantially as set forth.

2. In combination with a door, a spring set by operating the door in one direction to operate it in the opposite direction by the recoil of the spring, a normally rotating motor, an electric clutch on the motor having one of its members normally disengaged and connected with the door, and primary actuating means, substantially as described, connected with the clutch and operating by pressure upon it, to engage the clutch with the motor to operate the door against the spring, substantially as set forth.

3. In combination with a door, a spring controlling the operation of the door in one direction, a normally rotating motor, an electric clutch on the motor having one of its members normally disengaged and connected with the door, to operate it in the opposite direction, the clutch being in an electric circuit maintained open by the door when closed, an electro-magnet in a normally open electric circuit containing the primary circuit closer, said magnet having an armature operating to open and close the clutch-circuit, and a lock for the door operated by the armature, substantially as described.

4. In combination with a door, a rotary shaft *D* carrying an electric clutch *E* having its pulley-armature connected by a cord *r* with the door, the clutch being in an electric circuit containing circuit-closers *I* and *K*, a spring *B* for controlling the operation of the door in one direction, a magnet *H* in a normally open electric circuit containing a primary circuit-closer *F*, the magnet-armature being operatively connected with the circuit-closer *I*, means on the door for opening the clutch-circuit at *K* when the door is closed, and a lock *G* connected with and operated by the armature, the whole being constructed and arranged to operate substantially as described.

OLIVER H. HICKS.  
ROBERTUS F. TROY.

In presence of—  
M. J. FROST,  
W. N. WILLIAMS.